Education Support Pack

# Maths and Problem Solving

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# Contents

# Introduction

# This Pack

This pack has been written to give mathematical problem solving a context that is real to the students, interesting and fun. It invites the students to use and apply the mathematics that they have learned in the dedicated daily maths lesson to a variety of problem solving activities. Each activity could be used as part of the daily maths lesson or could be done at a different time in the day following on from a particular skills session. The activities could be done in succession towards the end of an academic year when all the appropriate skills have been covered, or at regular intervals throughout Years 3 and 4. Each activity contains at least four different storyboards for the students to work through, with complete lesson plans including introduction, development and plenary. It is not necessary to stick rigidly to this; each part can be tailored to suit the needs of your group or class, as can the groupings or pairings.

The context for the stories is established in a storyboard at the beginning. This can be revisited at any time to remind the students about the Berry family. In addition, at the start of each activity there is an introductory storyboard that explains what the family have been doing and what is going to happen in the tasks that follow. Each introduction also includes a section where students can practise the mathematical skills and concepts that they will need before going on to the main tasks in the development section.

The problem solving activities have been written to get a balance between pure mathematical problems and problems that are set in a 'realistic' context. For example, there is a storyboard in which the family plan their holiday abroad and organise their luggage – the real problem involves reading different scales. These activities present problems in an imaginative context designed to engage and motivate the students.

When setting the students off to work on their storyboards, you may advise some of the group on the best methods to use to arrive at the correct answers. However, the student notes are written in such a way that the more able groups could work through on their own and then discuss the methods they employed during the plenary.

It is important to build some time into the lesson to draw the whole problem together and reach a conclusion. This gives an opportunity for discussing the final results as well as explaining and justifying different methods. It also provides an opportunity for the students to present their work. All the activities could be printed out as a final display for the wall or a class book. Alternatively, you may choose to have no formal recording at all, preferring just to work from the rough jottings the students have made and discussing their findings and methods. The methods employed by the students to complete each activity are likely to vary greatly depending upon when in the term the activity is attempted, the methods recently covered, and in some cases school policy on tackling problems.

Each of the activities is referenced to the National Curriculum and the National Numeracy Strategy.

## Structure

The pack is divided into three main sections.

- **Introduction**: This comprises an overview of curriculum coverage and an introduction to Kar2ouche.
- **Activities**: The 10 activities provide a range of tasks based around real life problems that the Berry family encounter whilst preparing for their holiday in the USA. Activities 1-5 have been created with Year 3 students in mind, activities 6-10 are for Year 4 students.
  - **Activity 1 At the Post Office**
    The students are introduced to the two families featuring in all the activities. They meet Phillip Berry from England and Juan Gomez from America, who are penfriends. Phillip and his mum go to the post office to post a birthday card and present for Juan. They have a number of other letters to post and Mum also has other things to buy. The students have to solve word problems involving money in 'real life' using one or more steps, including making up different amounts, finding totals, giving change and working out which coins to use. They need to explain how each problem was solved.
  - **Activity 2 Earning Holiday Money**
    Rebecca Berry and her brother Phillip talk about going to visit Juan in America. They know that it will be expensive and decide to save as hard as they can to help fund the trip. They begin earning extra money by cleaning cars and doing additional jobs. The students have to solve word problems involving money in 'real life' using one or more steps. They also have to explain how the problems were solved.

- **Activity 3 A Day Out**
  The family decide to take a picnic and go out for the day. Phillip and Rebecca make some drinks and biscuits to take with them. The students have to read and begin to write the vocabulary related to mass and capacity and know the relationships between units of measurement. They also solve word problems involving measures in 'real life', using one or more steps.
- **Activity 4 Weights and Measures**
  Rebecca is keen to find out if she is as big as Phillip and so the family measure their heights and weight. The students have to read the various scales for height and weight to answer a range of questions. They gain practice in reading and ordering various different scales. Finally, they practise using unmarked scales by measuring other students in their class.
- **Activity 5 Timetables**
  The students read analogue clocks and explore am and pm times before looking closely at Phillip's school timetable. They construct his timetable for him and answer questions about it. They join Phillip and Rebecca on a day off school solving word problems involving time in 'real life' using one or more steps. They begin to write the vocabulary related to time, use units of time and understand the relationships between them. They also read the time to five-minute intervals.
- **Activity 6 Booking the Holiday**
  The skills part of this activity involves adding up amounts of money mentally and converting pounds to pence and back again. The students then work through a number of storyboards, one involving finding the best price for the Berry family to take a flight to America. Once the flights are booked, the family go out for a meal to celebrate. This involves selecting items from a menu and working out total costs and the change due. There is an opportunity at the end for the students to share what they have done and explain their methods and reasoning.
- **Activity 7 Holiday Shopping**
  In this activity the students get to practise answering mental maths questions about money. They are encouraged to answer very quickly. They go on to estimate amounts of money and then total them up, beginning with the most significant digits. Finally, they go holiday shopping with the Berry family, and see if Phillip can stick to a budget in a department store. They work out the best value suitcase from a variety of special offers.

- **Activity 8 Sports Day**
  In this activity the students practise their estimating skills by suggesting a suitable length for a range of objects and selecting an appropriate unit of measurement. They go on to work through some length problems by helping Phillip with his school sports day. Finally, they calculate area and perimeter linked to the sports day activities.
- **Activity 9 What's the Time?**
  The students work through activities related to time. First they work out how long it will be until a particular event occurs. Then they take part in a time quiz where they answer questions about time and the language of time. They go on to answer some time problems by following Phillip Berry and his family to their dentist, who is running late. Finally, they help Phillip to plan his evening's TV viewing from a specific time budget.
- **Activity 10 Ready to Go?**
  The students help the Berry family pack for their Washington trip. They help the family find out what the temperature will be in Washington whilst they are over there by reading different thermometers. They then help Phillip to pack his suitcase. He needs help weighing the items and making choices in order to stay within his weight limit.

Once all the prepared activities have been worked through, it is easily possible to create your own mathematical problem-solving activities using the characters, backgrounds and props for your own lesson ideas. For ideas about how to do this, see 'Making Your Own Activities Using Kar2ouche' later in this section.

- **Appendices**: This section consists of the following resources.
  - **Appendix A** Extracts from the text/audio palette that you can photocopy and use away from the computer if necessary.
  - **Appendix B** Optional sheet on which the students can show their working out.
  - **Appendix C** Using Kar2ouche with Special Needs.

# What is Kar2ouche?

Kar2ouche is a multimedia authoring tool, and is used in a series of content titles focused on enhancing learning in a number of different subjects. In each instance the application's functions and interface are the same; it is just the backgrounds, characters, props and texts that change. Consequently, once students have learned to use Kar2ouche they are able to use it across a range of subjects.

## Enhancing Learning

Not only does Kar2ouche help students develop the skills relevant to particular subject areas, it also facilitates the development of more generic thinking skills. Thus students are encouraged to know *how* and *why* as well as *what*.

| | |
|---|---|
| ***Information-processing skills*** | Using Kar2ouche students can be encouraged to:<br>• identify key images, text, ideas – extract what is essential<br>• sort the relevant from the irrelevant<br>• organise and where necessary prioritise ideas<br>• sequence events<br>• compare and contrast their work with the work of others<br>• analyse the relationships between characters<br>• develop cultural awareness. |
| ***Reasoning skills*** | Using Kar2ouche students can be encouraged to:<br>• justify decisions using evidence<br>• make informed choices<br>• work out subtexts<br>• consider alternative perspectives/interpretations<br>• articulate ideas. |
| ***Enquiry skills*** | Using Kar2ouche students can be encouraged to:<br>• work collaboratively to question text<br>• observe events and predict subsequent action<br>• consider consequences<br>• reflect critically on written text, their own work and the work of peers. |

| | |
|---|---|
| ***Creative thinking skills*** | Using Kar2ouche students can be encouraged to:<br>• offer interpretations of texts/situations<br>• create multimedia texts<br>• respond imaginatively to texts/situations. |
| ***Evaluation skills*** | Using Kar2ouche students can be encouraged to:<br>• engage in collaborative working and dialogue<br>• review, modify and evaluate work produced. |
| ***Communication skills*** | Using Kar2ouche students can be encouraged to:<br>• engage in group discussion<br>• present ideas to a group<br>• use visual aids and images to enhance communication<br>• listen, understand and respond critically to others<br>• read for meaning<br>– extract meaning beyond the literal<br>– analyse and discuss alternative interpretations, ambiguity and allusion<br>– explore how ideas, values and emotions are portrayed<br>– consider how meanings are changed when texts are adapted to different media. |

To summarise, Kar2ouche encourages students to:

- make sense of information – understand texts
- reason – interpret, justify, compare, observe and predict
- enquire – investigate multiple meanings and perspectives
- create – respond imaginatively
- evaluate – modify and improve
- communicate/articulate ideas.

# Making Your Own Activities Using Kar2ouche

You, and your students, can use Kar2ouche in a range of contexts and number of ways. You can devise your own activities in Kar2ouche to introduce texts and ideas to students using one PC and a data projector; alternatively, you might want to create partially made storyboards for individuals or pairs to use on a network. When a computer network is not always readily available, you might also use the software to create your own worksheets and handouts for students to use in the classroom.

Roughly, you can use Kar2ouche to create:

- storyboards
- animations
- publications.

### *Storyboards*

These are particularly useful in encouraging students to show their understanding and ability to extract key information. By producing storyboards, students often show their ability to summarise and synthesise key information. They can be asked to create:

- a summary of a particular event or piece of text in a specified number of frames
- step-by-step witness reconstructions, as if for the police
- a summary with speech bubbles or captions containing important quotations
- a storyboard with their own commentary or summary in their own words
- alternative beginnings
- alternative endings
- before and after shots
- additional episodes
- alternative interpretations of a key moment where the text is ambiguous
- outlines of structure
- explorations of subtext through the use of thought bubbles
- illustrations of the difference between what people say and what they may think with reference to evidence
- presentations for class

- illustrations of alternative points of view/debate
- imagined meetings between characters
- photographs/freeze frames for a particular moment
- a proposal for a new film/advert/documentary etc to be presented to a board of executives.

In all of these, students can add sound, their own digital images, special effects and recordings of their own voices.

**If time is limited, you can partially complete storyboards that students complete in the lesson.**

Partially completed storyboards may comprise, for example:

- the first and last frames – students make the frames for the central section
- storyboards that contain blank thought bubbles, blank speech bubbles and/or blank text boxes
- storyboards with questions in text boxes or caption windows
- storyboards with text in the caption window – students create the pictures
- storyboards with odd frames missing
- sequencing activities
- a quiz – 'who says what?', 'what happens next?' etc.

Alternatively, students can create their own incomplete storyboards for others to complete – this could be a sort of consequences game – what happens next?

### *Animations*

Students who have access to Kar2ouche out of class time can enjoy creating animations. As with storyboards, animations enable students to demonstrate their understanding and ability to extract key information. Most of the activities listed below *can also be created as still storyboards*. Students may be told that they have been commissioned to create:

- a news programme
- a documentary
- a TV chat show
- a TV interview
- a film trailer
- an opening sequence of a film or credits (representing a particular genre)
- an advertisement
- a musical score
- a fashion show, to show fashions of the time.

### *Publications*

As a plenary, students can present their storyboards to the class either using a data projector or on screen. Alternatively, they can use the print facility to create publications in Kar2ouche or copy into a word-processing/desktop publishing program. Within Kar2ouche you can produce a template for students who need the help of a scaffold. Writing scaffolds can be produced by completing step-by-step frames offering prompts and starter questions. The frames are then arranged in the correct order on a blank template in the printing screen. In this way you can set up letters, newspapers, diaries and the like. The types of publication the students produce could include:

- newspaper front pages – using Kar2ouche to compose the pictures (students may choose to create broadsheets and tabloids to compare the differences)
- storybooks – picture above, story below (concentrating on structure/settings etc)
- cartoon strips (or film strips)
- graphic novels
- estate agents' details
- diary entries (with photos/pictures)
- letters (with pictures)
- photo albums
- magazine spreads
- advertising posters
- 'wanted' posters
- guides
- catalogues
- book and magazine covers.

In all of these activities, students may be asked to consider audience and purpose. You can stipulate this audience. As you get used to the software, you'll find the possibilities almost endless.

# Useful Hints

## Readability

When using Kar2ouche with younger students, you may like to change the screen fonts. Do this by going into the Utilities screen and clicking on the question mark. Go to the third page and change the Window, Bubble and Tool tip fonts. Window and Bubble work well on Comic Sans 12, whereas the Tool tip works at Comic Sans 14 bold. You will need to type in your password. The default password is 'password', but your network manager may have changed this, so check first.

## Saving

It's good practice to remind students to save work shortly after they have begun. Tell them that they need to give the storyboard a distinctive name. You can also set the automatic save time and save path in the Utilities screen.

## Presentations

Many of the activities culminate in a presentation of some sort. Ideally, this will involve a networked data projector and possibly an interactive whiteboard. Alternatively, you could use a data projector linked to a standalone computer and disks on which students have recorded their work. Other methods of sharing work might include:

- a network management system allowing all students to see, simultaneously, the same presentation on their individual computer screens
- saved files in a shared area to which students can gain access at their own speed
- students moving around the room to view presentations at the machines on which the work was produced.

You may, therefore, need to discuss with your ICT coordinator what methods are available to you and your class.

## Copying

## Adding Text and Images

To add text to the text/audio palette, type what you want to add using a word-processing package and save as a .txt file. Insert this into the text/audio screen by clicking on the orange **open file** icon at the top of the text/audio palette, navigating to the file you have created and opening it. It will then appear (without audio) in the text/audio palette.

You can save digital photographs and scanned pictures on the computer, and insert as additional backgrounds. To insert these go into the composition screen, click on the backgrounds tab and the orange **open file** icon at the bottom of the backgrounds palette. Please check available disk space before adding too many of your own backgrounds as they tend to be heavy on memory and can slow down computers with little free hard disk space and/or slow processors.

## Websites

Where appropriate, reference has been made to a number of websites. All were live at time of writing, but it is worth checking their currency and suitability for your particular classes before using them in your lessons.

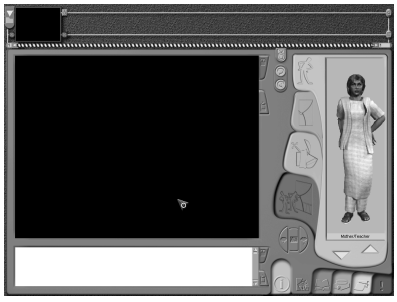
## Getting in Touch

We would welcome feedback on the materials we are providing and if you have additional suggestions for mathematical and problem solving activities it would be great to share them with other teachers. We'd also like to know what other titles you'd like to see. You can get in touch with us by:

- visiting our web page **www.kar2ouche.com**
- e-mailing **esp@kar2ouche.com**
- writing to – Education Support Packs, Immersive Education, The Old Malthouse, Paradise Street, Oxford OX1 1LD.

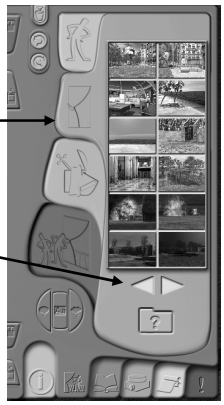
# If You Haven't Used Kar2ouche Before – A Starter

If students have not used Kar2ouche before, they should refer to the QuickStart Guide, or work through the Apprentice Activities in Kar2ouche *Composer*. However, if they haven't had time to do this, a good way of showing them the main functions is to demonstrate how to create a title sheet. This introduces selecting backgrounds, adding and posing characters, introducing text bubbles, as well as adding text and sound. Students can pick up other skills as they go.

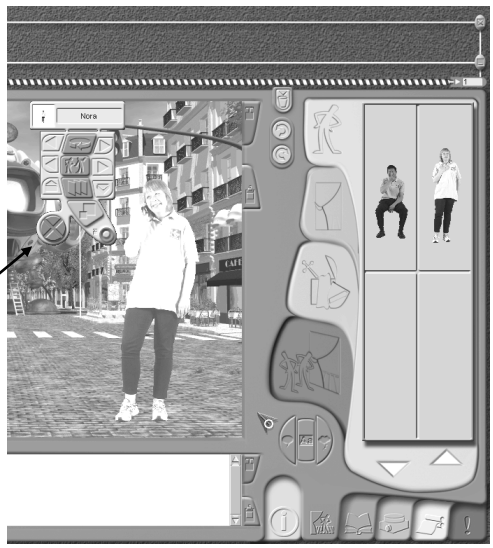


### *To create a title slide*

1. Ask students to open Kar2ouche – the first screen they see is the composition screen.
2. Next ask them to select a background by clicking on the blue background tag. They should click again to see six backgrounds and yet again to see twelve. (Do not click again, otherwise they return to a single view.) They can scroll through the backgrounds using the green arrows at the bottom. Once they have browsed the backgrounds they should select one they like by left clicking on it. It will appear in the composition window.

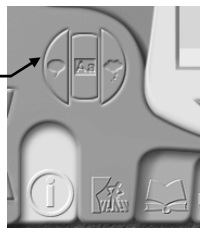


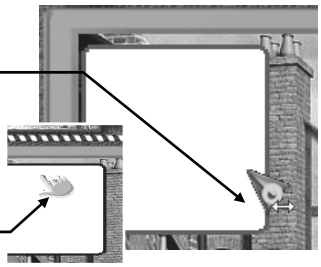
3. Having selected a background, students should choose a character to add to the frame. They do this by clicking on the green character tab (click once more to see four characters, click again to see sixteen) and scrolling through using the green arrows at the bottom. They select the character by left clicking (holding down) and dragging it into the frame. Now for the fun. This character can be resized, posed and rotated by right clicking on it in the frame. This brings up the manipulator tool.



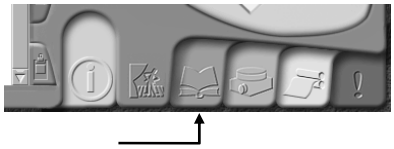

- To rotate the character students click on the left and right facing arrowheads at either side of the top icon.
- To repose the character they click on the arrow heads either side of the central characters icon.
- To resize the character students should left click on the blue squares at the bottom of the manipulator tool then, drag the mouse towards them to make the character bigger or backwards to make it smaller.
- The bottom icon allows the layering of characters and/or props.
- The character can be moved around by left clicking and dragging.

4. Next ask students to add a text bubble. They can do this by left clicking on the text bubble icon. The text bubble will appear in the top left hand portion of the screen. Students can then write in their name, form and the title of the storyboard they are about to complete. If they need to make the bubble bigger, they do this by passing the cursor over the right or bottom borders until a double arrowhead appears. They should then click and drag to size. To move the bubble to elsewhere on the screen students should hover over the top of the bubble until the hand appears, left click to grab it and then drag to position.

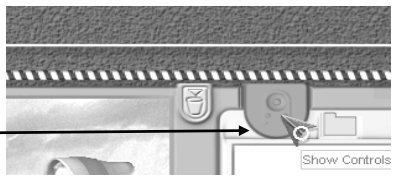




5. Finally, students could be asked to add some sound, either in the form of a sound effect or a recording of their own voice. In either case they should begin by clicking on the text/audio tab at the bottom of the screen.



Next they should click on the show controls icon at the top of this text/ audio frame. This will bring up the audio control panel.



To add a sound effect they should click on the orange folder, then select one of the sound effects offered by clicking on it and then on open. If they want to preview these sound effects they should click on the effect and then on play. To record their own voices students press on the red microphone icon and speak into their microphones. To stop the recording they should press the square red button. They will be prompted to give their soundfile a name. They type this into the box and then click on save. The sound is attached to their frame.

Students will now know how to use the main functions of Kar2ouche. Encourage them to play in order to learn what other things it can do, for instance how to attach a soundfile to a frame.

# Activities

**Teacher Notes**

# **Activity 1** At the Post Office

| | |
|---|---|
| ***Key Stage/Year*** | Key Stage 2/Year 3 |
| ***Group Organisation*** | Students work mainly in pairs with some small group and whole class discussion to explain how they worked out their answers. |
| ***Suggested Timing*** | 2-3 sessions |

## Overview of Task

The students are introduced to the two families featuring in all the activities. They meet Phillip Berry from England and Juan Gomez from America, who are penfriends. Phillip and his mum go to the post office to post a birthday card and present for Juan. They have a number of other letters to post and mum also has other things to buy. The students have to solve word problems involving money in 'real life' using one or more steps, including making up different amounts, finding totals, giving change and working out which coins to use. They need to explain how each problem was solved.

## Objectives

**All students will:** recognise all British coins and notes and be able to exchange sums of money for their equivalent value in smaller notes or coins. They will understand and use £ and p notation.

**Most students will:** use any of the four operations and their own strategies to solve money problems including finding totals and giving change.

**Some students will:** use any of the four operations and their own strategies to solve money problems using one or more steps. They will explain their methods and reasoning orally and, where appropriate, write a number sentence to show how the problem was solved.

## Curriculum References

***Key Stage 2 Mathematics***

**Solving Numerical Problems 4a** choose, use and combine any of the four number operations to solve word problems involving money in 'real life'; **4b** choose and use an appropriate way to calculate and explain their methods and reasoning; **4c** estimate answers by approximating and checking that their results are reasonable by

thinking about the context of the problem, and where necessary checking accuracy.

***National Numeracy Strategy***

## Numbers and the Number System

Counting, properties of numbers and number sequences (p.2-7)

- Count larger collections by grouping them: for example, in tens, then other numbers. (p.3)

## Calculations

Understanding addition and subtraction (p.24-29)

- Extend understanding of the operations of addition and subtraction, read and begin to write the related vocabulary, and continue to recognise that addition can be done in any order. Use the +, – and = signs. (p.25,29)

Mental calculation strategies (+ and –) (p.32-41)

- Use knowledge that addition can be done in any order to do mental calculations more efficiently. For example:
  put the larger number first and count on;
  add three or four small numbers by putting the largest number first and/or by finding pairs totalling 9, 10 or 11;
- Find a small difference by counting up from the smaller to the larger number (e.g. 102 - 97). (p.33)

Pencil and paper procedures (+ and –) (p.42-45)

- Use informal pencil and paper methods to support, record or explain HTU ± TU, HTU ± HTU.
- Begin to use column addition and subtraction for HTU ± TU where the calculation cannot easily be done mentally. (p.43,45)

## Solving Problems

Making decisions (p.60-61)

- **Choose and use appropriate operations (including multiplication and division) to solve word problems,** and appropriate ways of calculating: mental, mental with jottings, pencil and paper.
  (For examples, see pages 62-71.) (p.61)

Problems involving 'real life', money and measures (p.66-71)

- Solve word problems involving numbers in 'real life', money and measures, using one or more steps, including finding totals and giving change, and working out which coins to pay. Explain how the problem was solved. (p.67,69,71)

- Recognise all coins and notes. **Understand and use £ and p notation** (for example, know that £3.06 is £3 and 6p). (p.69)

## Outcomes

By the end of this activity students will have:

- a storyboard showing specified amounts of money in three different ways
- a storyboard totalling different coins, beginning with the most significant amount
- a storyboard totalling amounts and working out change, and then writing number sentences linked to posting letters at the post office
- a sheet showing working out and number sentences from the **How Much is That?** storyboard
- a storyboard in which they perform calculations and make up specified amounts of money in different ways.

## Resources

Kar2ouche *Maths and Problem Solving*

- **Notes and Coins** storyboard
- **Totals** storyboard
- **Meet the Family** storyboard
- **Going to the Post Office** storyboard
- **How Much is That?** storyboard
- **Money Combinations** storyboard

Sheet 1.1 *How Much is That?*

Sheet 1.2 *Money Bags*

Appendix B *Jottings and Working Out* (optional)

Real or demonstration money would also be useful.

**Key words/phrases:** note, amount, value, worth, more/most expensive, less/least expensive, change, denominations

# Activities

### *Introduction*

1. Using real or demonstration money, check students are familiar with all coins and notes including 50p, £1, £5 and £10. Discuss the value of each coin and note. Ask students to think of items that cost about 50p, £1, £2, £5 and £10.

2. When you are happy that students know their coins and notes, ask them to open and complete the **Notes and Coins** storyboard.

**Content of Notes and Coins storyboard**

This comprises a series of frames displaying single coins or notes starting with a 50p piece. The students have to drag notes or coins from the props palette to make up the total of this amount. They are asked to do each one in three different ways. They then do the same for £1, £5 and £10. There are clear instructions in the caption windows for the students to follow.

3. Explain how to write amounts of money using the correct £ and p notation. When students are confident with this, they can open and complete the **Totals** storyboard. Remind them that they should start by adding the coins/notes with the largest denominations.

**Content of Totals storyboard**

This comprises a series of frames showing different combinations of notes and coins and a text box. The students have to find the total amount of the notes and coins and type this amount into the text box. They are reminded to start with the most significant amount. An example of one of these frames is a 20p coin, a 10p coin and 4 x 5p coins. The students drag the coins into the appropriate order to make it easiest to find the total amount and then enter this amount into the text box (**50p**). Less able students can stop at an appropriate point. The amounts given are as follows:

**Frames 1a and 1b:** 20p, 10p and 4 x 5p (**50p**) – example frame

**Frame 2:** 50p, 2 x 5p, 2 x 2p and 1p (**65p**)

**Frame 3:** 50p, 10p, 3 x 5p and 2p (**77p**)

**Frame 4:** 3 x 20p, 3 x 10p, 5p and 2 x 1p (**97p**)

**Frame 5:** £1, 10p and 2 x 5p (**£1.20**)

**Frame 6:** £1, 50p, 20p, 5p and 2p (£**1.77**)

**Frame 7:** 2 x £1, 20p, 10p, 2p and 1p **(£2.33**)

**Frame 8:** 2 x £1, 2 x 50p, 10p and 2p (**£3.12**)

**Frame 9:** £2, 50p, 2 x 20p, 5p and 2 x1p (**£2.97)**

**Frame 10:** £2, 2 x 50p, 20p, 3 x 10p and 3 x 2p (**£3.56)**

**Frame 11:** 2 x £2, 50p, 3 x 10p, 2p and 2 x 1p (**£4.84)**

**Frame 12:** £2, 2 x 50p and 2 x 20p **(£3.40)**

**Frame 13:** 2 x £2, 4 x 20p, 10p and 5p **(£4.95)**

**Frame 14:** £5, £2, 3 x £1 and 50p **(£10.50)**

**Frame 15:** 2 x £5, 4 x £1 and 2 x 50p **(£15.00)**

**Frame 16:** 3 x £5, £1, 4 x 50p, 20p and 10p **(£18.30)**

**Frame 17:** £10, £5, 2 x £1 and 50p (**£17.50)**

**Frame 18:** 2 x £10, £1 and 2 x 20p **(£21.40)**

**Frame 19:** 3 x £10, 3 x £5, 50p and 20p (**£45.70)**

**Frame 20:** £20, £5, 50p, 4 x 10p and 3 x 5p **(£26.05)**

## *Development*

4. All of the activities in this pack are based around two families: one living in London, England and the other in Washington, DC in the USA. By watching the storyboard **Meet the Family**, the students get to know the families and in particular the two boys Phillip Berry and Juan Gomez. There is a link to this storyboard in each activity in this pack.

**Content of Meet the Family storyboard**

**Frame 1:** Phillip: Hi! I'm Phillip Berry. It's really great to meet you. I'm 10. I live near London.

**Frame 2:** Phillip: I really like sport, particularly football and swimming.

**Frame 3:** Phillip: Come and meet the rest of my family.

**Frame 4:** Phillip: This is Mum. She's a history teacher and she's really into computers. Say hi, Mum. Mum: Hello!

**Frame 5:** Phillip: Let's go and see Dad and Becca. They're upstairs.

**Frame 6:** Phillip: Here they are in Becca's room. Say hi, guys! Rebecca and Dad: Hello!

**Frame 7:** Phillip: Dad works for a big pharmaceutical company that is based in the USA, which means he travels there quite a lot – don't you Dad? Dad: That's right son. That's how I got you and Juan writing to each other, isn't it?

**Frame 8:** Phillip: Yes, I was just coming to that! I have a penfriend called Juan. We write and email one another all the time. Come and see my photograph of him.

**Frame 9:** Phillip: Here they all are, the Gomez family: Juan, his mum and grandma and his little sister Nayda. They live near Washington in the USA. I'd love to meet up with Juan one day.

**Frame 10:** Rebecca: Phillip, you've forgotten me!

**Frame 11:** Phillip: Oh yes, I guess I should introduce you too. Come in.

**Frame 12:** Phillip: And this is my kid sister Rebecca. Rebecca: Becca!

**Frame 13:** Phillip: Sorry! Becca's eight and she's kind of OK. Rebecca: Thanks a lot!

**Frame 14:** Phillip: So that's my family. It was nice to meet you – see you soon!

5. Students open and watch the **Going to the Post Office** storyboard. This will establish the context for the other storyboards in this activity.

**Content of Going to the Post Office storyboard**

The frames show Phillip and his mum getting ready to go to the post office. Phillip is talking about his penfriend, Juan in America. He hopes to meet him one day.

**Frame 1:** Mum and Phillip are standing in the hallway of their house. Phillip: Mum, it's Juan's birthday at the end of this month. When should we send his present? Mum: I think we should post it today to allow plenty of time for it to get to America. I've got a letter I want to post to Mrs Gomez too.

**Frame 2:** Rebecca: Can you send my birthday thank-you letters at the same time?

**Frame 3:** Mum: We should be able to get to the post office before lunch if we go now. Have you got everything Phillip? Phillip: Yes, let's get going.


6. Students open and complete the **How Much is That?** storyboard. This requires students to work out totals and how much change should be given. They should do their working out and write their number sentences on Sheet 1.1 *How Much is That?*

**Content of How Much is That? storyboard**

Students work through each frame and enter their answers in the appropriate spaces on screen. They will need Sheet 1.1 to hand too.

**Frames 1–4:** Phillip needs to send a parcel and card to the USA. The assistant weighs each one separately. The students have to work out the total cost (**£6.35 and 40p**). Question in caption window – What is the total cost of sending the parcel and the card? Discuss how you worked out the answer. Write a number sentence on your sheet to show how the problem was solved.

**Frame 5:** Phillip hands over a £5 note and a £2 coin to pay. The students now work out the change. Question in caption window – How much change will Phillip receive? (**25p**) Discuss how you worked out the answer. Write a number sentence on your sheet to show how the problem was solved.

**Frames 6–8:** Mum has two letters to send to America and three letters for England. The students have to work out the total cost of doing this (**2 x 45p and 3 x 30p = £1.80**).

Question in caption window – How much change will Mum receive? (**£3.20**) Discuss how you worked out the answer. Write a number sentence to show how the problem was solved.

**Frame 9 and 10:** Phillip then works out how much was spent in total at the post office that morning. Question in caption window – How much did they spend in total? (**£8.55**)Discuss how you worked out the answer. Write a number sentence to show how the problem was solved.

7. Students open and complete the **Money Combinations** storyboard. This involves students working out which coins they need to pay for some stamps.

**Content of Money Combinations storyboard**

The students work, frame by frame, through each sum given in the caption windows, entering their answers in the text boxes on screen.

**Frame 1:** Title and instructions.

**Frame 2:** Outline of a purse for the students to drag the coins from the props palette into. Caption window – Phillip has 23p in his pocket. What is the lowest number of coins he could have that make up this amount? (**3**) Drag coins from the props palette into the purse to show your answer.

**Frame 3:** Caption window – What is the highest number of coins that would make up 23p? (**23**) Drag coins from the props palette into the purse to show your answer.

**Frame 4:** Caption window – In his other pocket, Phillip finds 22p. How much does he now have? (**45p**) Show your sum in the text box.

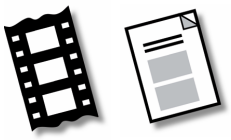
**Frame 5:** Caption window – What is the highest number of coins that could make up this **total** amount? (**45**) Drag coins from the props palette into the purse to show your answer.

**Frame 6:** Caption window – Phillip goes to his piggy bank and opens it up. The value of the coins in there comes to £1.12. What coins might he see? Only five of the coins can be the same! Drag coins from the props palette into the purse to show your answer.

### *Plenary*

8. Ask different pairs of students to show the **How Much is That?** storyboard and share their number sentences. Discuss whether they have given:
   - sufficient information to show how they worked out the answer
   - too much information that is not required to find the answer
   - words that show it as an addition/subtraction problem.

### *Extension/ Homework*



9. This part of the activity can be done as a storyboard – **Money Bags**. Alternatively, if the students do not have access to Kar2ouche at this point, they can use Sheet 1.2 *Money Bags*. Explain to the students that the Berry family have a large glass bottle in their kitchen where they put all their loose change. Mum has decided it is time to count up all this money, so she gets hold of some special money bags and asks the family to help her out with counting it. Her money bags are for:
   - 5p coins (bags take 50p worth and are red)
   - 10p coins (bags take £1 worth and are blue)
   - 20p coins (bags take £2 worth and are yellow)
   - 50p coins (bags take £5 worth and are green)
   - £1 coins (bags take £10 worth and are orange).

   How many different combinations of coloured bags can the students find that make up the amounts: £1.50, £3.50, £4.00, £5.50 and £11.00? You could give them a range of different amounts to work with.

**Content of Money Bags storyboard**

**Frame 1:** The family talking in the kitchen. Mum: Come on everyone! I think it's time to count up the change we've been collecting in the bottle in the kitchen.

**Frame 2:** Phillip: Wow Mum! We've been collecting that for ages! Rebecca: I wonder how much is in there?

**Frame 3:** Mum: We're going to use different coloured money bags to help us do this easily. Caption window – Help the family to count up different amounts of money. They are going to put them into money bags.

**Frame 4:** Money bags on a plain coloured background. Red bags hold 50p worth of 5p coins, blue bags hold £1 worth of 10p coins, yellow bags hold £2 worth of 20p coins, green bags hold £5 worth of 50p coins and orange bags hold £10 worth of £1 coins.

**Frame 5:** Caption window – Which money bag combinations could you use to make up £1.50? Drag the bags into the frame from the props palette to show the combination you have chosen. (**three red bags; one red bag and one blue bag**)

**Frame 6:** Caption window – What other combination of bags could you use?

**Frames 7-11:** Caption window – Show the money bag combinations you could use to make up £3.50. (**seven red bags; three blue bags and one red bag; one yellow bag, one blue bag and one red bag; one blue and five red; two blue and three red**)

**Frame 12:** Caption window – Show the money bag combinations you could use to make up £4.00. Add extra frames for each additional combination. (**eight red; four blue; three blue and two red; two blue and four red; one blue and six red; two yellow; one yellow and two blue; one yellow, one blue and two red; one yellow and four red**)

**Frame 13:** Caption window – Show the money bag combinations you could use to make up £5.50. Add extra frames for each additional combination. (**11 red; five blue and one red; four blue and three red; three blue and five red; two blue and seven red; one blue and nine red; two yellow, one blue and one red; two yellow and three red; one yellow, three blue and one red; one yellow, two blue and three red; one green and one red**)

**Frame 14:** Caption window – Show the money bag combinations you could use to make up £11.00. Add extra frames for each additional combination. (**22 red; 11 blue; 10 blue and two red; nine blue and four red; eight blue and six red; seven blue and eight red; six blue and 10 red; five blue and 12 red; four blue and 14 red; three blue and 16 red; two blue and 18 red; one blue and 20 red; five yellow and one blue; five yellow and two red; four yellow and three blue; four yellow, two blue and two red; four yellow, one blue and four red; four yellow and six red; two green and one blue; two green and two red; one orange and one blue; one orange and two red**)

10. Using the post office background and a selection of props, ask students to make their own storyboard illustrating a subtraction or addition problem using money. Alternatively, you could give your group a series of number sentences to illustrate or storyboard.

***Student Notes***

# Activity 1 At the Post Office

## Objectives

In this activity you will meet the different members of the Berry family who need help with their maths problems. You will solve word problems involving money in 'real life' situations using one or more steps. You will find totals, give change and work out which coins to use to pay. You will also explain how you solved the problems. By the end of this activity you will recognise all British coins and notes and know how to use £ and p notation.

## Outcomes

At the end of this activity you will have:

- a storyboard showing different amounts of money in different ways
- a storyboard totalling different coins, beginning with the most significant amount
- a storyboard totalling amounts and working out change, and then writing number sentences linked to posting letters at the post office
- a sheet showing working out and number sentences from the **How Much is That?** storyboard
- a storyboard in which you perform calculations and make up specified amounts of money in different ways.

## Resources

To complete this activity you will need:

- Kar2ouche *Maths and Problem Solving*
- Sheet 1.1 *How Much is That?*
- Sheet 1.2 *Money Bags*
- Appendix B *Jottings and Working Out*

## Activities

### *Introduction*

1. Do you know what 50p, £1, £5 and £10 notes look like? Can you think of items that cost about 50p, £1, £2, £5 and £10?
2. Open the **Notes and Coins** storyboard and complete it by dragging combinations of coins and notes from the props palette to match the totals shown.

   click here to open the **Notes and Coins** storyboard.
3. Open the **Totals** storyboard and complete it by finding the total amount of money in each frame. Remember to start by adding the coins/notes with the largest denominations.

   click here to open the **Totals** storyboard.

***Student Notes***

### *Development*

4. Open and watch the **Meet the Family** storyboard. You will find out about two families who need help with their maths.

   click here to open the **Meet the Family** storyboard.

5. Open and watch the **Going to the Post Office** storyboard. This will set the scene for the other storyboards in this activity.

   click here to open the **Going to the Post Office** storyboard.

6. Open and complete the **How Much is That?** storyboard. In this you need to work out totals and the correct change. Your teacher will give you Sheet 1.1 *How Much is That?* for you to write your number sentences on.

   click here to open the **How Much is That?** storyboard.

7. Open the **Money Combinations** storyboard and complete it by working out which coins you need to pay for the stamps.

   click here to open the **Money Combinations** storyboard.

### *Plenary*

8. Be ready to show the **How Much is That?** storyboard. The group/class will discuss whether you have given enough information to work out the answer, or given information that is not required. They will decide which words in your number sentences show it to be an addition/subtraction problem.

### *Extension/Homework*

9. The Berry family have a large glass bottle in their kitchen where they put all their loose change. Mum has decided it is time to count up all this money. She gets hold of some special money bags and asks the family to help her out with counting it. Her money bags are for:
   - 5p coins (bags take 50p worth and are red)
   - 10p coins (bags take £1 worth and are blue)
   - 20p coins (bags take £2 worth and are yellow)
   - 50p coins (bags take £5 worth and are green)
   - £1 coins (bags take £10 worth and are orange).

   How many different combinations of coloured bags could make up these amounts of money: £1.50, £3.50, £4.00, £5.50 and £11.00? This activity has been made into the **Money Bags** storyboard. If you don't have access to Kar2ouche at this stage, you can use Sheet 1.2 *Money Bags.*

   click here to open the **Money Bags** storyboard.

10. Make up your own money problems using the post office background and a selection of props. Make your own storyboard illustrating a subtraction or addition problem. Your teacher may give you a series of number sentences for you to illustrate or storyboard.

*Sheet 1.1*

# How Much is That?

Use this sheet to write out your number sentences and any working out that you need to do. There is a space for each question.

**What is the total cost of sending the parcel and the card?**

**How much change will Phillip receive?**

**How much change will Mum receive?**

**How much did they spend in total?**

**Don't forget to write sentences in response to each question explaining how you worked it out.**

***Sheet 1.2***

# Money Bags

Here are the money bags with the different values that they contain. Colour in the money bags so that they are the right colour. The values are as follows: red bag (5p coins to the value of 50p), blue bag (10p coins to the value of £1), yellow bag (20p coins to the value of £2, green bag (50p coins to the value of £5), orange bag (£1 coins to the value of £10).


Using different combinations of the coloured money bags, make up the amounts in the table below. The first one has been started for you.

| | Red 50p | Blue £1 | Yellow £2 | Green £5 | Orange £10 |
|---|---|---|---|---|---|
| £1.50 | 3 | 0 | 0 | 0 | 0 |
| | | | | | |
| £3.50 | | | | | |
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| | Red 50p | Blue £1 | Yellow £2 | Green £5 | Orange £10 |
|---|---|---|---|---|---|
| £5.50 | | | | | |
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**Teacher Notes**

# **Activity 2** Earning Holiday Money

| | |
|---|---|
| ***Key Stage/Year*** | Key Stage 2/Year 3 |
| ***Group Organisation*** | Students work mainly in pairs with some small group and whole class discussion to explain how they worked out their answers. |
| ***Suggested Timing*** | 2-3 sessions |

## Overview of Task

Rebecca Berry and her brother Phillip talk about going to visit Juan in America. They know that it will be expensive and decide to save as hard as they can to help fund the trip. They begin earning extra money by cleaning cars and doing additional jobs. The students have to solve word problems involving money in 'real life' using one or more steps. They also have to explain how the problems were solved.

## Objectives

**All students will:** use mental addition, subtraction or simple multiplication and their own strategies to solve money problems.

**Most students will:** use any of the four operations and their own strategies to solve money problems including finding totals and giving change.

**Some students will:** use any of the four operations and their own strategies to solve money problems using one or more steps. They will explain methods and reasoning orally and, where appropriate, write a number sentence to show how the problem was solved.

## Curriculum References

***Key Stage 2 Mathematics***

**Solving Numerical Problems 4a** choose, use and combine any of the four number operations to solve word problems involving money in 'real life'; **4b** choose and use an appropriate way to calculate and explain their methods and reasoning; **4c** estimate answers by approximating and checking that their results are reasonable by thinking about the context of the problem, and where necessary checking accuracy.

***National Numeracy Strategy***

### Calculations

Understanding addition and subtraction (p.24-29)

- Extend understanding of the operations of addition and subtraction, read and begin to write the related vocabulary, and continue to recognise that addition can be done in any order. Use the +, – and = signs. (p.25,29)
- Extend understanding that more than two numbers can be added; add three or four single-digit numbers mentally, or three or four two-digit numbers with the help of apparatus or pencil and paper. (p.27)

Pencil and paper procedures (+ and –) (p.42-45)

- Use informal pencil and paper methods to support, record or explain HTU ± TU, HTU ± HTU.
- Begin to use column addition and subtraction for HTU ± TU where the calculation cannot easily be done mentally. (p.43,45)

### Solving Problems

Making decisions (p.60-61)

- **Choose and use appropriate operations (including multiplication and division) to solve word problems,** and appropriate ways of calculating: mental, mental with jottings, pencil and paper.

Problems involving 'real life', money and measures (p.66-71)

- Solve word problems involving numbers in 'real life', money and measures, using one or more steps, including finding totals and giving change, and working out which coins to pay. Explain how the problem was solved. (p.67,69,71)
- Recognise all coins and notes. **Understand and use £ p notation** (for example, know that £3.06 is £3 and 6p). (p.69)

## Outcomes

By the end of this activity students will have:

- a storyboard showing the answers to one-step and several-step money problems
- a storyboard answering questions about how much money the children made by running errands.

## Resources

Kar2ouche *Maths and Problem Solving*

- **Meet the Family** storyboard
- **Making Money** storyboard
- **Car Wash** storyboard
- **Jobs** storyboard

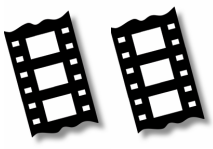
Sheet 2.1 *Jobs*

Appendix B *Jottings and Working Out* (optional)

**Key words/phrases:** note, amount, value, worth, more/most expensive, less/least expensive

## Activities

### *Introduction*



1. If necessary, students could watch the **Meet the Family** storyboard to remind themselves of the context.
2. To begin this activity the students need to open and watch the **Making Money** storyboard. This will set the scene for the other storyboards in the activity. Ask the students what sort of jobs they do to make money.

**Content of Making Money storyboard**

Phillip and Rebecca talk to Mum about how much they'd like to go to the USA and visit Juan and his family. They realise just how expensive it will be and want to earn some extra money to put towards the trip. Mum is really pleased that they're so keen and is proud of their intentions, but encourages them to earn some spending money. The students talk about how they could earn this extra money.

**Frame 1:** Phillip: Do you think we'll ever get to visit Juan and his family in America? Mum: Yes, I hope so, but it'll cost a lot of money. We'll have to save really hard over the next few months.

**Frame 2:** Phillip: We'll help out Mum. We could do jobs for people! Mum: That's really thoughtful of you, but why don't you just save up to earn your spending money for the trip?

**Frame 3:** Phillip: How can we do that? Mum: Why don't you run some errands for people? Rebecca: We could do jobs for people like washing cars and helping around the house.

## *Development*

3. Students open and complete the **Car Wash** storyboard. This requires them to work out a number of problems involving money. Encourage students to discuss how they worked out their answers with a partner. Were they able to do it in their heads or did they use apparatus and/or pencil and paper to help them?

**Content of Car Wash storyboard**

The children plan how they will earn their money.

**Frame 1:** Outside their home. Rebecca: Let's get started on washing cars, Phillip. What do we need to do to get started? Phillip: We need some stuff to clean the cars with. Sponges and car cleaner first of all, and then we'll have to find some buckets.

**Frame 2:** Rebecca: Sponges are 50p each, car cleaner is £1.40. We'll borrow the money from Dad. We'll probably need four sponges and one bottle of car cleaner. Caption window – How much will they need to borrow from Dad? (**£3.40**)

**Frame 3:** Rebecca: How much shall we charge? Phillip: How about £4 for a car, and maybe £2 for a motor bike?

**Frame 4:** Rebecca: Good idea. Let's get started!

**Frame 5:** Three cars and one motorbike. Text box – Monday with space for answer below. Caption window – Work out the total earned today, and enter the amount in the text box. (3 x £4 and 1 x £2 = **£14**)

**Frame 6:** Five cars and two motorbikes. Text box – Wednesday with space for answer below. Caption window – Work out the total earned today, and enter the amount in the text box. (5 x £4 and 2 x £2 = **£24**)

**Frame 7:** Four cars and one motorbike. Text box – Friday with space for answer below. Caption window – There is not much cleaner left on Friday, so it's discount day for cars. The children now charge £3 for cars and £2 for motorbikes. Work out the total earned today. Enter the amount in the text box. (4 x £3 and 1 x £2 = **£14**)

**Frame 8:** Text box with spaces for the totals for Monday, Wednesday and Friday. Below space for their expenses and room for the final profit total. Caption window – How much did they earn? How much do they owe Dad for the cleaner and sponges? What is their total profit? Complete the sum in the text box above. (£14 + £24 + £14 = **£52** less expenses of £3.40 = **£48.60**)


4. Students open the **Jobs** storyboard and follow the instructions. They need Sheet 2.1 *Jobs* to help them. They refer to prices on the Sheet and enter their answers in the appropriate boxes on screen.

**Content of Jobs storyboard**

**Frame 1:** Title and instructions – List all the jobs the children have done over the week and use Sheet 2.1 *Jobs* to find out how much they have earned.

**Frame 2:** Rebecca: I've washed up four times this week, vacuumed two rooms, tidied my room and hung out the washing.

**Frame 3:** Phillip: I've bathed the dog, laid the table four times and tidied my bedroom.

**Frame 4:** Caption window – How much money has Rebecca made? Enter the sum and its total in the text box above. (4 x 50p (£2); 2 x 70p (£1.40); 1 x £1; 1 x 30p = **£4.70**)

**Frame 5:** Caption window – How much money has Phillip made? Enter the sum and its total in the text box above. (1 x £1.50; 4 x 25p (£1); 1 x £1 = **£3.50**)

**Frame 6:** Two text boxes with space for sums. Caption window – Who made the most money? How much more money? (£4.70 – £3.50 = **£1.20**) What do they have in total now? (£4.70 + £3.50 = **£8.20**) Enter the answers into the appropriate text boxes above.

***Plenary***

5. Discuss the work the pairs/individuals have done. Tell students that:
   - Dad is pleased with his clean car and agrees to double the money they have made by doing the Car Wash.
   - Mum is so impressed with how hard they have worked that she gives each child another £10.

   Work out together how much the children have made separately and in total for their trip to America.

***Extension/ Homework***

6. Using Sheet 2.1 *Jobs,* ask students to imagine that this is the money they could earn by doing various jobs. Tell them they have a fortnight to earn £25 for a new computer game. Ask them to say what jobs they would do and when. They can show their ideas in a poster either designed using Kar2ouche or on paper.

***Student Notes***

# Activity 2 Earning Holiday Money

## Objectives

During this activity you will solve word problems involving money in 'real life' situations. You may need to use one or more steps to find the totals. You will also need to explain how you solved each problem.

## Outcomes

At the end of this activity you will have:

- a storyboard showing the answers to one-step and several-step money problems
- a storyboard answering questions about how much money the children made by running errands.

## Resources

To complete this activity you will need:

- Kar2ouche *Maths and Problem Solving*
- Sheet 2.1 *Jobs*
- Appendix B *Jottings and Working Out* (optional) or notepaper

## Activities

### *Introduction*

1. If you haven't used this software for a while, open the **Meet the Family** storyboard to remind yourself about the characters.

   click here to open the **Meet the Family** storyboard.

2. Open and watch the **Making Money** storyboard. This will set the scene for the rest of the activity. What sort of jobs do you do to make money?

   click here to open the **Making Money** storyboard.

### *Development*

3. Open the **Car Wash** storyboard and complete it by following the instructions. When you have finished, your teacher may ask you to explain how you arrived at the answers, so make notes as you go.

   click here to open the **Car Wash** storyboard.

4. Open and complete the **Jobs** storyboard. Enter your answers in the storyboard as you work them out. Sheet 2.1 *Jobs* will provide important data and space to record your answers as you go.

   click here to open the **Jobs** storyboard.

***Student Notes***

### *Plenary*

5. Dad is pleased with his clean car and agrees to double the money Phillip and Rebecca have made. Mum is also impressed with how hard they have worked, so gives each child another £10. Work out how much each child has made altogether for their trip to America.

### *Extension/Homework*

6. Using Sheet 2.1 *Jobs*, imagine that this is the money you could earn by doing various jobs. You have a fortnight to earn £25 for a new computer game. What jobs will you do and when? If you have access to Kar2ouche, show your answer by designing a poster in the printing screen. Alternatively, use paper and colours.

*Sheet 2.1*

# Jobs

| Job | Pay |
|---|---|
| Vacuum cleaning | 70p a room |
| Washing up | 50p a meal |
| Bathing the dog | £1.50 |
| Hanging out the washing | 30p |
| Laying the table | 25p |
| Tidying their bedroom | £1.00 |

**Rebecca:** I've washed up four times this week, vacuumed two rooms, tidied my room and hung out the washing.

| Job | Pay | Number of times | Total |
|---|---|---|---|
| Washing up | | | |
| Vacuuming | | | |
| Tidying room | | | |
| Hanging out washing | | | |
| | | TOTAL | |

**Phillip:** I've bathed the dog, laid the table four times and tidied my bedroom.

| Job | Pay | Number of times | Total |
|---|---|---|---|
| Bathing dog | | | |
| Laying table | | | |
| Tidying room | | | |
| | | TOTAL | |

**Extension**

You have two weeks to earn £25 to buy a new computer game. What jobs will you do, how often and when?

**Teacher Notes**

# **Activity 3** A Day Out

| | |
|---|---|
| ***Key Stage/Year*** | Key Stage 2/Year 3 |
| ***Group Organisation*** | Students work mainly in pairs with some small group and whole class discussion to explain how they worked out their answers. |
| ***Suggested Timing*** | 2-3 sessions |

## Overview of Task

The family decide to take a picnic and go out for the day. Phillip and Rebecca make some drinks and biscuits to take with them. The students have to read and begin to write the vocabulary related to length, mass and capacity and know the relationships between units of measurement. They also solve word problems involving measures in 'real life', using one or more steps.

## Objectives

**All students will:** read and begin to write the vocabulary related to length, mass and capacity. They will also suggest suitable units to measure length, mass or capacity.

**Most students will:** know the relationship between units of measurement and begin to solve problems involving length, mass and capacity in a variety of contexts. They will recognise unit fractions and fractions that are several parts of a whole.

**Some students will:** solve problems involving measures in a variety of contexts, using standard units. They will also explain their methods and reasoning orally and, where appropriate, write a number sentence using numbers and signs to show how the problem was solved.

## Curriculum References

***Key Stage 2 Mathematics***

**Solving Numerical Problems 4a** choose, use and combine any of the four number operations to solve word problems involving measures of length, mass and capacity in 'real life'; **4b** choose and use an appropriate way to calculate and explain their methods and reasoning; **4c** estimate answers by approximating and checking that their results are reasonable by thinking about the context of the problem, and where necessary checking accuracy.

**Understanding Measures 4a** recognise the need for standard units of length, mass and capacity, choose which ones are suitable for a task, and use them to make sensible estimates in everyday situations; convert one metric unit to another.

***National Numeracy Strategy***

## Numbers and the Number System

Fractions (p.20-23)

- **Recognise unit fractions such as $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{10}$ and use them to find fractions of shapes and numbers**.
  Begin to recognise simple fractions that are several parts of a whole, such as $\frac{3}{4}$, $\frac{2}{3}$ or $\frac{1}{10}$.
  Begin to recognise simple equivalent fractions: for example, five tenths and one half, five fifths and one whole.
  Compare familiar fractions: for example, know that on the number line one half lies between one quarter and three quarters.
  Estimate a simple fraction. (p.21,23)

## Calculations

Pencil and paper procedures (+ and –) (p.42-45)

- **Use informal pencil and paper methods to support, record or explain HTU ± TU, HTU ± HTU.**
  Begin to use column addition and subtraction for HTU ± TU where the calculation cannot easily be done mentally. (p.43,45)

## Solving Problems

Making decisions (p.60-61)

- **Choose and use appropriate operations (including multiplication and division) to solve word problems,** and appropriate ways of calculating: mental, mental with jottings, pencil and paper.
  (For examples, see pages 62-71.) (p.61)
- **Problems involving 'real life', money and measures (p.66-71)**
- Solve word problems involving numbers in 'real life', money and measures, using one or more steps, including finding totals and giving change, and working out which coins to pay. Explain how the problem was solved. (p.67,69,71

## Measures, Shape and Space

Measures (p.72-79)

- Read and begin to write the vocabulary related to length, mass and capacity.
- Know the relationships between kilometres and metres, metres and centimetres, kilograms and grams, litres and millilitres.
- Suggest suitable units and measuring equipment to estimate or measure length, mass or capacity. (p.75)

## Outcomes

By the end of this activity students will have:

- a storyboard where they have selected the appropriate units of measurement for a range of different items
- a storyboard in which they have worked out fractions
- a storyboard where they have worked out the answers to capacity problems
- a sheet showing their answers to capacity problems
- a storyboard detailing their answers to weight problems that relate to a recipe.

## Resources

Kar2ouche *Maths and Problem Solving*

- **Suitable Units** storyboard
- **Fractions** storyboard
- **Meet the Family** storyboard
- **Day Out** storyboard
- **Making a Fruit Drink** storyboard
- **Making Biscuits** storyboard

Sheet 3.1 *How Much?*

Sheet 3.2 *My Recipe*

Appendix B *Jottings and Working Out* (optional)

**Key words/phrases:** measure, size, compare, measuring scale, weigh, capacity, holds, litre, millilitre, millimetre, centimetre, metre, kilometre, gram, kilogram, mass.

# Activities

## *Introduction*

1. There are two sections to the introduction, each revising different concepts. The ability of the group and the time in the year when you tackle these activities will determine how long you spend on the introduction. You may find you wish to use this introduction as the first lesson and then go on to tackle the development section in the next available lesson. Each storyboard will help you to check that the group is familiar with the necessary concepts before moving on.

2. Check that the students are familiar with units of length, capacity and mass. When you are satisfied that they are ready, ask them to open and complete the **Suitable Units** storyboard.

**Content of Suitable Units storyboard**

**Frame 1:** A bottle of shampoo, a jug, a can of cola, a bottle of wine. Students are instructed to select the appropriate units of measurement to go with these items. They can choose from litres/millilitres, metres/centimetres and kilograms/grams. They drag the appropriate label to each object.

**Frame 2:** A roll of wallpaper, a desk, a book, a length of material and a ruler. Students are instructed to select the appropriate units of measurement to go with these items. They can choose from millimetres, centimetres and metres.

**Frame 3:** A person, an apple, a bag of sugar and a bag of flour. Students are instructed to select the appropriate units of measurement to go with these items. They can choose from grams and kilograms.

**Frame 4:** Labels that need organising. Students are required to match – 1 litre with 1000ml; $\frac{1}{2}$ litre with 500ml; $\frac{1}{4}$ litre with 250ml; $\frac{1}{10}$ litre with 100ml.

3. In this storyboard students work with the fractions $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{3}$, $\frac{2}{4}$ and $\frac{1}{2}$. You may need to reduce the length of the storyboard for students who have difficulty with some of these fractions. Delete the frames you think are too difficult and save with an alternative title. Students open the **Fractions** storyboard and follow the instructions.

**Content of Fractions storyboard**

**Frame 1:** Three cars: one red and two blue. Caption window – What fraction of the cars is red and what fraction is blue?

**Frame 2:** Four trees: three yellow and one green. Caption window – What fraction of the trees is yellow and what fraction is green?

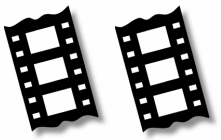
**Frame 3:** Two cats: one ginger and one black. Caption window – What fraction of the cats is ginger and what fraction is black?

**Frame 4:** Six cars: four red and two blue. Caption window – Give the fractions as before.

**Frame 5:** Eight trees: six yellow and two green. Caption window – State the fractions as before.

**Frame 6:** Six cats: three ginger and three black. Caption window – State the fractions.

## *Development*



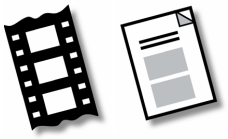
4. If the students have not used this software for some time, they might like to remind themselves of the characters by opening the **Meet the Family** storyboard.
5. Students open and listen to the **Day Out** storyboard. This continues the story that is developing in each activity.

**Content of Day Out storyboard**

**Frame 1:** Phillip: I've just had an email from Juan. He went to see some ice-hockey last night. That sounds such fun. Can we do something really fun today? Rebecca: Yes! Can we go ice-skating?

**Frame 2:** Dad: Well it's such a lovely day, why don't we drive to the beach? You could email Juan tonight and tell him about it.

**Frame 3:** Phillip: I like that idea. Can we make stuff to put into the picnic hamper? Dad: Sure, let's get busy!



6. Students open and complete the **Making a Fruit Drink** storyboard. This requires students to answer problems involving capacity. If necessary, you may like to give the students Appendix B *Jottings and Working Out* so that they have somewhere to record their answers and show their working out.

**Content of Making a Fruit Drink storyboard**

**Frame 1:** Rebecca and Dad in the living room. Rebecca: Dad, can we make some fruit cocktail drink to take on the picnic? Dad: That's a good idea. Let's go into the kitchen and find a recipe.

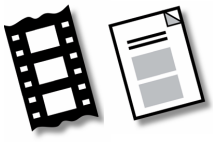
**Frame 2:** Rebecca: I know how to make it, we made some at Brownies last year. I'll get everything out ready. Dad: Show me what you've done so far.

**Frame 3:** Rebecca with a large jug ready to fill with the fruit cocktail. Rebecca: So far, I've put in 200ml of apple juice, 150ml of orange juice and 100ml of lemon juice. Just the lemonade to go. Dad: How much lemonade do you need to add so that the drink fills the 1-litre container? (**550ml**) Caption window – Type the amount that Rebecca needs to add in the text box.

**Frame 4:** Text boxes labelled apple juice, orange juice, lemon juice, lemonade, fizzy water and lime juice, with space for students to add the amount of each. Phillip: I'm going to make some fruit cocktail too. Caption window – Phillip has the choice of mixing apple juice, orange juice, lemon juice, lemonade, fizzy water and/or lime juice. Choose which ingredients you want him to use. Say how many millilitres of each he needs to add together to make up 1 litre of drink.

**Frame 5:** Cup, litre container and Dad. Caption window – A cup holds 100ml of drink. What fraction of the 1-litre container is that? ( $\frac{1}{10}$ ) Fill in the text box.

**Frame 6:** Image of a number of cups, litre container and Dad. Caption window – If Dad pours out $\frac{3}{10}$ of the drink, how many cups has he filled? (**3**) Delete the extra cups.



7. Students open and complete the mass problems in the **Making Biscuits** storyboard. Encourage them to discuss how they worked out their answers with a partner. They should record their answers on Sheet 3.1 *How Much?*

**Content of Making Biscuits storyboard**

**Frame 1:** Mum: We could make some biscuits to take on the picnic too. What flavour do you want to make? Rebecca and Phillip: Chocolate!

**Frame 2:** Mum: OK, let's go into the kitchen and find a recipe. Rebecca: Here's one.

**Frame 3:** Mum: Read out the ingredients we need. Rebecca: Flour – 250g; Butter – 200g; Sugar – 250g; Chocolate – 75g.

**Frame 4:** Mum: How many biscuits does the recipe make? Rebecca: 24.

**Frame 5:** Recipe written out against a background of the family busy with their baking.

**Frame 6:** Phillip: If Becca and I share all the biscuits, how many will we get each? Caption window – Write your answer in the text box and on the *How Much?* sheet.

**Frame 7:** Rebecca: That's a bit greedy. What about if we shared them among everyone, how many would we get then? Caption window – Write your answer in the text box and on the *How Much?* sheet.

**Frame 8:** Recipe card and blank recipe card. Caption window – Rewrite the recipe so that it only makes 12 biscuits.

***Plenary***

8. Explain that the students have used a whole range of skills and methods in the activity and ask them to discuss the ones they found most difficult. Use the discussion to devise some more practice problems.

***Extension/ Homework***

9. Sheet 3.1 *How Much?* also gives the cost of the ingredients for the chocolate biscuits. Ask the students to work out the cost of making 24 biscuits, then 12 and 4. They should record their answers on the sheet.
10. Ask the students to find another recipe for baking that uses metric measures. Ask them to write it on Sheet 3.2 *My Recipe*. Tell them to complete the sheet by working out half quantities of all the ingredients and, if possible, quarter quantities too.

***Student Notes***

# **Activity 3** A Day Out

## Objectives

During this activity you will read and begin to write vocabulary related to length, mass and capacity and know the relationships between units of measurement. You will solve word problems involving measures in 'real life', using one or more steps.

## Outcomes

At the end of this activity you will have:

- a storyboard where you selected the appropriate unit of measurement for a range of different items
- a storyboard in which you have worked out fractions
- a storyboard where you worked out the answers to some capacity problems
- a sheet showing your answers to the capacity problems
- a storyboard detailing your answers to weight problems relating to a recipe.

## Resources

To complete this activity you will need:

- Kar2ouche *Maths and Problem Solving*
- Sheet 3.1 *How Much?*
- Sheet 3.2 *My Recipe*
- Appendix B *Jottings and Working Out*

## Activities

### *Introduction*

1. Open and complete the **Suitable Units** storyboard. Match the appropriate unit of measurement with the correct object.

   click here to open the Suitable Units storyboard.

2. Open and complete the **Fractions** storyboard. Work out the fraction being shown and enter the answer in the appropriate box.

   click here to open the **Fractions** storyboard.

### *Development*

3. If you have not used this content title for a while, you might like to remind yourself about all the characters that appear in the story.

   click here to open the **Meet the Family** storyboard.

***Student Notes***

4. Open and listen to the **Day Out** storyboard. This will set the scene for the other storyboards.

   click here to open the **Day Out** storyboard.

5. Open and complete the **Making a Fruit Drink** storyboard. Work out the quantities of each ingredient needed to make a litre of drink. Your teacher may give you Appendix B *Jottings and Working Out* to record your answers on.

   click here to open the **Making a Fruit Drink** storyboard.

6. Open and complete the **Making Biscuits** storyboard. Refer to Sheet 3.1 *How Much?* for the ingredients. Discuss how you worked out the answers with a partner.

   click here to open the **Making Biscuits** storyboard.

### *Plenary*

7. You have been doing lots of work on many different concepts. Did you find this confusing? What did you find most difficult during this activity? Where do you think you might need more practice?

### *Extension/Homework*

8. The recipe sheet (Sheet 3.1 *How Much*?) also gives the cost of the ingredients for the chocolate chip biscuits. Work out the cost of making the full quantity of 24 biscuits. Then work out the cost of making 12 biscuits and 4 biscuits. Write the answers on the sheet.
9. Find another recipe for baking that uses metric measurements. Copy the ingredients onto Sheet 3.2 *My Recipe*. Work out the half quantities of all the ingredients and then, if possible, what the quarter measurements are. Record your answers on the sheet.

***Sheet 3.1***

# How Much?

Look carefully at this recipe for chocolate chip biscuits.

**Chocolate Chip Biscuits**
Flour – 250g
Butter – 200g
Sugar – 250g
Chocolate – 75g
*Makes 24 biscuits*

If they divide the biscuits between them, how many will Phillip and Rebecca get each?

If they divide them between the whole family, how many will each member of the family get?

Rewrite the recipe so that it only makes 12 biscuits.

Now work out the cost. The first line has been completed to help you start.

| Cost of ingredients | Operation to find cost of ingredients | Cost for ingredients in biscuits |
|---|---|---|
| Flour 80p per 1kg | *Divide by four: 80 ÷ 4 =* | *20p* |
| Butter 60p per 500g | | |
| Sugar 50p per 500g | | |
| Chocolate £2.00 per 150g | | |
| TOTAL | | |

How much would four biscuits cost to make? Show your working out.

How much would 12 biscuits cost to make? Show your working out.

***Sheet 3.2***

# My Recipe

Copy out your recipe. Now work out $\frac{1}{2}$ quantities for all the ingredients. If you can, work out $\frac{1}{4}$ quantities too.

Recipe for:.....

| Ingredients | Full metric measurements | $\frac{1}{2}$ measurements | $\frac{1}{4}$ measurements |
|---|---|---|---|
| | | | |
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What sum do you need to do to work out $\frac{1}{2}$ quantities?

.....

How do you work out $\frac{1}{4}$ quantities?

.....

.....

.....

**Quantities**

| Full quantity of biscuits<br>Number | $\frac{1}{2}$ quantity of biscuits<br>Number | $\frac{1}{4}$ quantity of biscuits<br>Number |
|---|---|---|
| | | |

**Teacher Notes**

# **Activity 4** Weights and Measures

| | |
|---|---|
| ***Key Stage/Year*** | Key Stage 2/Year 3 |
| ***Group Organisation*** | Students work mainly in pairs. |
| ***Suggested Timing*** | 2-3 lessons |

## Overview of Task

Rebecca is keen to find out if she is as big as Phillip and so the family measure their heights and weight. The students have to read the various scales for height and weight to answer a range of questions. They gain practice in reading and ordering various different scales. Then they read the scale on the side of a measuring jug and answer addition and subtraction questions as liquid is poured in and out of this jug. Finally, they practise using unmarked scales by measuring other students in their class.

## Objectives

**All students will:** read and begin to write the vocabulary related to length, mass and capacity and read a simple scale to the nearest labelled division.

**Most students will:** know the relationship between units of measurement and begin to use decimal notation for metres and centimetres and read a scale to the nearest marked division.

**Some students will:** read a scale to the nearest division.

## Curriculum References

***Key Stage 2 Mathematics***

**Understanding measures 4b** interpret numbers and read scales with increasing accuracy.

***National Numeracy Strategy***

### Calculations

Pencil and paper procedures (+ and –) (p.42-45)

- Use informal pencil and paper methods to support, record or explain HTU ± TU, HTU ± HTU.
  Begin to use column addition and subtraction for HTU ± TU where the calculation cannot easily be done mentally. (p.43,45)

### Solving Problems

Making decisions (p.60-61)

- **Choose and use appropriate operations (including multiplication and division) to solve word problems,** and appropriate ways of calculating: mental, mental with jottings, pencil and paper.
  (For examples, see pages 62-71.) (p.61)

Problems involving 'real life', money and measures (p.66-71)

- Solve word problems involving numbers in 'real life', money and measures, using one or more steps, including finding totals and giving change, and working out which coins to pay. Explain how the problem was solved. (p.67,69,71)

### Measures, Shape and Space

Measures (p.72-79)

- Read and begin to write the vocabulary related to length, mass and capacity.
  Measure and compare using standard units (km, m, cm, kg, g, l, ml), including using a ruler to draw and measure lines to the nearest half centimetre (see page 77)
- Know the relationships between kilometres and metres, metres and centimetres, kilograms and grams, litres and millilitres.
- Suggest suitable units and measuring equipment to estimate or measure length, mass or capacity. (p.75)
- Read scales to the nearest division (labelled or unlabelled). Record estimates and measurements to the nearest whole or half unit (e.g. 'about 3.5kg'), or in mixed units (e.g. '3m and 20cm'). (p.77)

## Outcomes

By the end of this activity students will have:

- a storyboard where they have stated the weight of a range of items by reading the display on weight scales
- a storyboard showing the different amounts of drink contained in measuring jugs
- a storyboard that shows the family's height and weight
- a sheet showing the family's height and weight along with answers to additional problems.

## Resources

Kar2ouche *Maths and Problem Solving*

- **Reading Scales** storyboard
- **Drinks** storyboard
- **Meet the Family** storyboard
- **Tallest and Heaviest** storyboard

Sheet 4.1 *Who is the Tallest and Heaviest?*

**Key words/phrases:** measuring division, approximately, capacity, empty, holds, contains, grams, kilograms, litres, millilitres, weight, scales, measuring jugs.

## Activities

### *Introduction*

1. Using a variety of weighing scales and measuring jugs, demonstrate how to read scales accurately.
2. Students open the **Reading Scales** storyboard and complete it by reading the scales and typing each measurement into a box.

**Content of Reading Scales storyboard**

**Frame 1:** Weighing scale with clear scale for the students to read. The students see a bag of sugar, scale reads **1kg**. Caption window – Read the scale to find out how heavy the item of food is. Type your answer in the text box.

**Frame 2:** The students see a bag of flour, scale reads **500g**. Caption window – Read the scale to find out how heavy the item of food is. Type your answer in the text box.

**Frame 3:** The students see three apples, scale reads **480g**. Caption window – Read the scale to find out how heavy the item of food is. Type your answer in the text box.

**Frame 4:** The students see two bananas, scale reads **260g**. Caption window – Read the scale to find out how heavy the item of food is. Type your answer in the text box.

**Frame 5:** The students see a bar of chocolate, scale reads **200g**. Caption window – Read the scale to find out how heavy the item of food is. Type your answer in the text box.

**Frame 6:** The students see some sweets, scale reads **115g**. Caption window – Read the scale to find out how heavy the item of food is. Type your answer in the text box.

3. The students open the **Drinks** storyboard and work through the instructions.

**Content of Drinks storyboard**

The students see a range of different measuring jugs containing amounts of drink. They have to read the scale and type in the amount they see.

**Frame 1:** How many millilitres of drink is in the jug? (**175ml**)

**Frame 2:** How many millilitres of drink is in this jug? (**225ml**)

**Frame 3:** How much in this one? (**275ml**)

Next they see an amount of drink in a jug and are told that a certain amount will be added or taken away. They work out what the new amount is and type the answer in a text box.

**Frame 4:** 500ml in jug. Caption window – If you tip 250 millilitres out of this jug, how much will be left? (**250ml**)

**Frame 5:** 400ml in jug. Caption window – If you tip 150 millilitres out of this jug, how much will be left? (**250ml**)

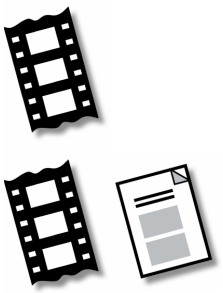
**Frame 6:** 225ml in jug. Caption window – If you tip 175 millilitres out of this jug, how much will be left? (**50ml**)

**Frame 7:** 75ml in jug. Caption window – If you add 150 millilitres, how much will be in the jug? (**225ml**)

**Frame 8:** 225 ml in jug. Caption window – If you add 75 millilitres, how much will be in the jug? (**300ml**)

**Frame 9:** 500ml in jug. Caption window – If you add 500 millilitres, how much will be in the jug? (**1 litre**)

## *Development*



4. If the students have not been using this content title for a while, they may like to watch the **Meet the Family** storyboard again.
5. Students open the **Tallest and Heaviest** storyboard. They need a copy of Sheet 4.1 *Who is The Tallest and Heaviest?* to record their answers. Those who are able should also explain how they worked out their answers or at least write the sum. They will need to complete the sheet when they have finished working on the storyboard.

**Content of Tallest and Heaviest storyboard**

The students have to read the weight and height scales. They use Sheet 4.1 to record their answers. They also have to enter their answers on screen. The height chart is marked at 10cm intervals, the weight scales are marked at every 5kg interval.

**Frame 1:** Rebecca: Mum, these jeans are too short. I'm going to need some new ones before we go on holiday. Mum: Goodness me, you've certainly grown.

**Frame 2:** Rebecca: Do you think I'm as tall as Phillip now? Mum: You should measure yourselves and find out.

**Frame 3:** Phillip: There's no way you're as tall as me Becca. I'm nearly as tall as Dad. Rebecca: Well let's find out shall we?

**Frame 4:** Picture of Rebecca standing against height chart. The students have to read her height. (**1m 28cm**) Caption window – Work out how tall Rebecca is and write her height in the text box next to the chart.

**Frame 5:** Picture of Phillip standing against height chart The students have to read his height. **(1m 42cm)** Caption window – Work out how tall Phillip is and write his height in the text box next to the chart.

**Frame 6:** Picture of Mum standing against height chart. The students have to read her height. (**1m 59cm)** Caption window – Work out how tall Mum is and write her height in the text box next to the chart.

**Frame 7:** Picture of Dad standing against height chart. The students have to read his height. **(1m 75cm**) Caption window – Work out how tall Dad is and write his height in the text box next to the chart.

**Frame 8:** Mum: I'd like to see if I've lost any weight on my diet. I used to weigh 67kg. Rebecca: Why don't we all weigh ourselves too?

**Frame 9:** Picture of Mum standing on scales. She weighs 64kg. Caption window – How heavy is Mum? Record your answer on the *Who is the Tallest and Heaviest?* sheet.

**Frame 10:** Picture of Phillip standing on scales. He weighs 31kg. Caption window – How heavy is Phillip? Record your answer on the *Who is the Tallest and Heaviest?* sheet.

**Frame 11:** Picture of Rebecca standing on scales. She weighs 28kg. Caption window – How heavy is Rebecca? Record your answer on the *Who is the Tallest and Heaviest?* sheet.

**Frame 12:** Picture of Dad standing on scales, he weighs 82kg. Caption window – How heavy is Dad? Record your answer on the *Who is the Tallest and Heaviest?* sheet.

**Frame 13:** Text boxes for the students to put all the family's weights in. They have to put them in order starting with the lightest person. Caption window – Type in the weights of all the family, then order them from lightest to heaviest. Don't forget to finish off your sheet when your storyboard is complete.

***Plenary***

6. Discuss how students coped with reading the height and weight scales. What did they have to do to find everyone's weight and height accurately? Did everyone get the same answer? If not, why? Talk about reading unmarked and partially marked scales accurately.

***Extension/ Homework***

7. Give the students the task of working in a small group to find out everyone's height. However, they are not allowed to use a metre stick or tape measure. Give them an unmarked strip that measures 2 metres. Can they find out everyone's height accurately? Get them to note down the tallest and smallest person. If there is time, they could create a storyboard to record their measurements.
8. Ask students to measure their families using a strip of paper.

***Student Notes***

# **Activity 4** Weights and Measures

## Objectives

During this activity you will read scales of different types to the nearest division and practise using unmarked scales

## Outcomes

At the end of this activity you will have:

- a storyboard in which you have stated the weight of a range of items by reading the display on weight scales.
- a storyboard showing the different amounts of drink contained in measuring jugs
- a storyboard that shows the family's height and weight
- a sheet showing the family's height and weight along with your answers to additional problems.

## Resources

To complete this activity you will need:

- Kar2ouche *Maths and Problem Solving*
- Sheet 4.1 *Who is the Tallest and Heaviest?*

## Activities

### *Introduction*

1. Open the **Reading Scales** storyboard and complete it by reading the scales and writing each measurement in the blank text box.

   click here to open the **Reading Scales** storyboard.

2. Now open and complete the **Drinks** storyboard by following the instructions.

   click here to open the **Drinks** storyboard.

### *Development*

3. If you have not used this software for some time, open and watch the **Meet the Family** storyboard to remind yourself about Phillip and his family.

   click here to open the **Meet the Family** storyboard.

4. Next you need to open and watch the **Tallest and Heaviest** storyboard. Work out the answers to the problems and record your answers in the blank text boxes and on Sheet 4.1 *Who is the Tallest and Heaviest?*

   click here to open the **Tallest and Heaviest** storyboard.

***Student Notes***

### *Plenary*

5. The height and weight scales were not completely marked. How did you manage to read them? Did everyone in your class have the same answers? Discuss any differences.

### *Extension/Homework*

6. Your teacher will sort you into small groups and give you a strip of paper that measures 2 metres. Your task is to try to find out the height of everyone in your group using just this strip. You can't use a metre stick or tape measure! Write down everyone's height, and show who is the tallest and smallest. If you have time, make a storyboard recording everyone's height and explaining how you managed to find this information.
7. Find the heights of all the members of your family using a strip of paper.

***Sheet 4.1***

# Who is the Tallest and Heaviest?

Record your answers from the *Tallest and Heaviest?* storyboard below.

| Name | Height in m/cm (height chart) | Weight in kg (weighing scales) |
|---|---|---|
| Mum | | |
| Dad | | |
| Phillip | | |
| Rebecca | | |

Is Rebecca taller than Phillip?

What is the difference in their heights?

How much taller is Dad than Mum?

What did Mum weigh before her diet?

How much weight has she lost on her diet?

How much heavier is Dad than Mum?

Can you put the family in order, from lightest to heaviest and from smallest to tallest?

**Teacher Notes**

# **Activity 5** Timetables

| | |
|---|---|
| ***Key Stage/Year*** | Key Stage 2/Year 3 |
| ***Group Organisation*** | Students work mainly in pairs with some small group and whole class discussion to explain how they worked out their answers. |
| ***Suggested Timing*** | 2-3 lessons |

## Overview of Task

The students read analogue clocks and explore am and pm times before looking closely at Phillip's school timetable. They construct his timetable for him and answer questions about it. They join Phillip and Rebecca on a day off school solving word problems involving time in 'real life' using one or more steps. They begin to write the vocabulary related to time, use units of time and understand the relationships between them. They also read the time to five-minute intervals.

## Objectives

**All students will:** use units of time and begin to understand the relationships between them.

**Most students will:** use a calendar, read the time to five-minute intervals and use mental calculation strategies to solve time problems set in a variety of contexts.

**Some students will:** explain their methods and reasoning orally and, where appropriate, write a number sentence using numbers and signs to show how the problem was solved.

## Curriculum References

***Key Stage 2 Mathematics***

**Solving Numerical Problems 4a** choose, use and combine any of the four number operations to solve word problems involving measures of time in 'real life'; **4b** choose and use an appropriate way to calculate and explain their methods and reasoning; **4c** estimate answers by approximating and checking that their results are reasonable by thinking about the context of the problem, and where necessary checking accuracy.

**Understanding Measures 4d** read the time from analogue and digital 12-hour clocks; use units of time – seconds, minutes, hours, days, weeks – and know the relationship between them.

***National Numeracy Strategy***

### Solving Problems

Making decisions (p.60-61)

- **Choose and use appropriate operations (including multiplication and division) to solve word problems,** and appropriate ways of calculating: mental, mental with jottings, pencil and paper.
  (For examples, see pages 62-71.)

### Measures, Shape and Space

Measures (p.72-79)

- Read and begin to write the vocabulary related to time.
  **Use units of time and know the relationships between them (second, minute, hour, day, week, month, year).** Suggest suitable units to estimate or measure time.
  Use a calendar. Read the time to 5 minutes on an analogue clock and a 12-hour digital clock, and use the notation 9:40. (p.79)

## Outcomes

By the end of this activity students will have:

- a storyboard where they have read the time on analogue clocks
- a storyboard showing Phillip's timetable worked out from a given amount of subject hours
- a storyboard displaying the answers to a range of time problems.

## Resources

Kar2ouche *Maths and Problem Solving*

- **Ordering Times** storyboard
- **Meet the Family** storyboard
- **School Timetable** storyboard
- **Phillip's Timetable** storyboard
- **Day Trip** storyboard

Sheet 5.1 *Phillip's Timetable*

Appendix B *Jottings and Working Out (*optional)

**Key words/phrases:** century, calendar, date, am and pm, earliest, latest

# Activities

## *Introduction*

1. Check that students are able to tell the time to five-minute intervals. Ask them to write the equivalent digital time to an analogue time that you show them and vice versa.
2. Explain the use of am and pm when using a 12-hour digital clock.
3. Students open the **Ordering Times** storyboard and complete it by reading the times and writing them in words before putting the frames in the correct order.

**Content of Ordering Times storyboard**

Students are given a range of frames showing a series of different activities that take place at different times. The analogue times are shown clearly in each frame. The students have to type the correct time that is being shown in words. Finally, they order the frames in the printing screen.

**Frame 1:** Mum catching bus. The clock shows 9.05am. Students type **five minutes past nine**.

**Frame 2:** Man in café for lunch. The clock shows 12.30pm. They type **half past twelve**.

**Frame 3:** Children walking to school. The clock shows 8.25am. They type **twenty-five past eight.**

**Frame 4:** Child going upstairs to bed. The clock shows 7.55pm. They type **five to eight.**

**Frame 5:** Children coming home from school. The clock shows 3.30pm. They type **half past three**.

**Frame 6:** Child watching TV. The clock shows 1.45pm. They type **quarter to two**.

**Frame 7:** Mum shopping for clothes. The clock shows 10.15am. They type **quarter past ten**.

**The correct order of the frames is: 3; 1; 7; 2; 6; 5; 4.**

The final frame has text boxes showing different times in (am and pm). The students have to drag the times into order starting with the earliest – 5.00am, 6.30am, 9.05am, 11.55am, 1.20pm, 2.45pm, 3.25pm, 5.00pm, 6.10pm, 6.35pm, 8.50pm, 10.05pm, 11.50pm.

## *Development*

4. The students can watch the **Meet the Family** storyboard again if they have not seen it for a while.
5. Students open and listen to the **School Timetable** storyboard. This will set the scene for the other storyboards.

**Content of School Timetable storyboard**

Juan has sent Phillip a copy of his school timetable to look at. He is curious to know all about Phillip's school and what things are different.

Phillip looks at it really carefully and comments on the time the day starts and a few other things that are really different.

He finds a copy of his own school timetable and asks Dad to help him to scan it so that he can send it to Juan.

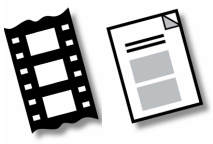
**Frame 1:** Phillip: Dad, Dad! Come and look at this! Dad: OK Phil, calm down. What have you got?

**Frame 2:** Phillip: Juan has emailed me his school timetable. It's really cool to see all the different stuff he does. Can I scan my timetable and send it to him? Can we do it now, can we?!

**Frame 3:** Dad: It certainly is very different from your school day, Phillip. Look how early they begin their lessons in the morning. Phillip: But they finish earlier too, then they do clubs and sport and fun stuff like that.

**Frame 4:** Dad: Go and find your school bag and I'll help you to use the scanner. Phillip: I've had a better idea. I think my timetable is on the school website. We could download it from there.

**Frame 5:** Dad: I didn't know that! What a good idea. Phillip: Let's do it now.



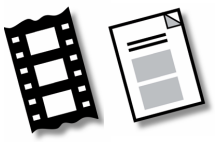
6. In the **Phillip's Timetable** storyboard the students have to make up Phillip's timetable using Sheet 5.1 *Phillip's Timetable* to help them.

**Content of Phillip's Timetable storyboard**

**Initial frames:** Students see a blank timetable background with 20 hours to fill in. They are instructed to look at the accompanying Sheet 5.1 *Phillip's Timetable.* The students use this sheet to create Phillip's timetable. The sheet shows how many hours of each subject there should be.

**Subsequent frame:** Students drag the appropriate subjects from the props palette into the subject spaces. They can choose what order the subjects go in but they must stick to the allocations given on the sheet.

**Final frame:** Once they have created the timetable, students click on the next frames and see the timetable again, this time partially filled in. There are some subjects missing. They have to identify what is missing and add them in. For example, there are only three hours of Literacy shown.



7. Students open and complete the **Day Trip** storyboard. It may be useful for them to have the sheet *Jottings and Working Out* (Appendix B) to make notes on as they are working.

**Content of Day Trip storyboard**

The students work through each frame and answer the questions by typing into boxes on screen. Phillip's school has an INSET day so the children do not have to go to school. Mum is taking Phillip and Rebecca shopping and to the cinema.

**Frame 1:** Mum: Are you two ready? The bus is at 10.35. Phillip: I am. Rebecca: Hang on! I need to fetch my purse.

**Frame 2:** In town. Mum: That didn't take long. It's only five past eleven. Which shop do you want to go to first? Phillip: I'm not going shopping with you two! Can't I meet you somewhere? Caption window – How long did the bus journey take? Write the time in the text box.

**Frame 3:** Mum: OK Phillip, but you need to be very sensible. Shall we meet up for lunch at the new pizza place you wanted to go to? Phillip: Great. What time?

**Frame 4:** Mum: Let's meet at quarter to one. What time does your watch say? Phillip: 11.20. Caption window – How long have they got to shop? Write your answer in the text box.

**Frame 5:** Outside pizza restaurant. Phillip: Looks like I'm 10 minutes early. Caption window – What time does Phillip arrive? Write your answer in the text box.

**Frame 6:** Rebecca: Hi Phillip! Sorry we're late. Phillip: Yes, 20 minutes late! Caption window – What time do Mum and Rebecca arrive? How long has Phillip had to wait? Write your answers in the text boxes.

**Frame 7:** In restaurant. Rebecca: What time does the film start? Phillip: It starts at 2.00 and lasts 85 minutes. Caption window – The family was planning to catch the quarter-to-four bus home. Will they make it? Write your answer in the text box.

**Frame 8:** Phillip: Look at all this traffic! Rebecca: We'll never get home! Caption window – The journey takes an extra 20 minutes due to the bad traffic. How long does it take them to get home? How long have they spent on the bus in total (to and from town)?

***Plenary***

8. Ask students to talk about the mistakes it's easy to make when telling the time and answering questions to do with time. Explore the concept of am and pm and why it is important to use these terms, for instance 9.00 could be in the morning or evening. What about 12.00, do they know when to put am or pm here? Do they know what other terms they can use for 12.00, such as noon, midday, midnight?

***Extension/ Homework***

9. Ask the students to make their own storyboard showing a typical day at school. They should work out how long in minutes they spend on each subject and other activities, such as playing outside, eating, assembly and so forth. They should write the time they spend on the activity in a text box in each frame they create. In the final frame they should add the minutes to check that they total the length of the school day. If they don't, they should get a partner to help them check where they went wrong. If Kar2ouche isn't available, they could plan on paper and make the storyboard later.

***Student Notes***

# **Activity 5** Timetables

## Objectives

During this activity you will solve word problems involving time in 'real life' using one or more steps. You will read and begin to write the vocabulary related to time and use units of time. As well as reading the time, you will help Phillip to create his school timetable and work out the hours he has for each subject.

## Outcomes

At the end of this activity you will have:

- a storyboard showing you can read the time on analogue clocks
- a storyboard showing Phillip's timetable worked out from a given amount of subject hours
- a storyboard displaying the answers to a range of time problems.

## Resources

To complete this activity you will need:

- Kar2ouche *Maths and Problem Solving*
- Sheet 5.1 *Phillip's Timetable*
- Appendix B *Jottings and Working Out*

## Activities

### *Introduction*

1. Your teacher will show you a time on an analogue clock. Write down how the same time would appear on a digital clock. Your teacher will then show you a time on a digital clock. Write the analogue time.
2. How do you show whether a time is in the morning or in the afternoon?
3. Open the **Ordering Times** storyboard and complete it by reading the times, typing them in words in the text boxes and then putting the frames in the correct order.

   click here to open the **Ordering Times** storyboard.

### *Development*

4. If you haven't seen it for some time, open the **Meet the Family** storyboard to remind yourself all about Phillip and his family.

   click here to see the **Meet the Family** storyboard.

5. Open and listen to the **School Timetable** storyboard. You will find out what Phillip is up to in this activity.

   click here to open the **School Timetable** storyboard.

***Student Notes***

6. Open and complete the **Phillip's Timetable** storyboard. You will need Sheet 5.1 *Phillip's Timetable* to help you do this. You need to follow the onscreen instructions carefully to make up Phillip's timetable for the week.

   
   
   to open the **Phillip's Timetable** storyboard.

7. Phillip and Rebecca have a day off school. Open the **Day Trip** storyboard to find out what they got up to on their day off. Complete the storyboard by answering the questions in the text boxes.

   
   
   to open the **Day Trip** storyboard.

### *Plenary*

8. What mistakes are easy to make when telling the time and answering questions to do with time? Think about am and pm and why it is important to use them.
9. What about 12.00, do you know when to put am or pm here? What other words can you use to describe 12.00?

### *Extension/Homework*

10. Make your own storyboard showing a typical day at school. Work out how long in minutes you spend on each subject and activity you do, for example playing outside, eating, assembly and so on. Write the time in minutes that you spend on this activity in a text box in each frame. Add up your times to check that they total the length of the school day. If you can't use the computer straightaway for this, you could plan on paper first and complete the storyboard later.

*Sheet 5.1*

# Phillip's Timetable

Using the blank timetable background, create Phillip's weekly school timetable so that he can email it to Juan. It does not matter where you put the subjects, just as long as you have the right number of hours for each one. Try not to put too many hours of the same subject in any one day.

**On Phillip's timetable there should be:**

5 hours of Numeracy

5 hours of Literacy

3 hours of Science

1 hour of History

1 hour of Geography

1 hour of R.E.

2 hours of P.E.

1 hour of Art

1 hour of French

**Teacher Notes**

# Activity 6 Booking the Holiday

| | |
|---|---|
| ***Key Stage/Year*** | Key Stage 2/Year 4 |
| ***Group Organisation*** | This activity lends itself well to paired work, particularly when selecting flight prices, but is also suitable for individual study depending upon the number of computers available. |
| ***Suggested Timing*** | 1-2 sessions |

## Overview of Task

The skills part of this activity involves adding up amounts of money mentally and converting pounds to pence and back again. The students then work through a number of storyboards, one involving finding the best price for the Berry family to take a flight to America. Once the flights are booked, the family go out for a meal to celebrate. This involves selecting items from a menu and working out total costs and the change due. There is an opportunity at the end for the students to share what they have done and explain their methods and reasoning.

## Objectives

**All students will:** add up a number of coins and notes mentally and solve word problems involving addition and subtraction in the context of money.

**Most students will:** develop and refine written methods for column addition and subtraction of whole numbers less than 1000. They will understand decimal notation and place value for tenths and hundreds and use it in the context of money.

**Some students will:** extend written methods to include column addition and subtraction of numbers greater than 1000.

## Curriculum References

***Key Stage 2 Mathematics***

**Solving Numerical Problems 4a** choose, use and combine any of the four number operations to solve word problems involving money in 'real life'; **4b** choose and use an appropriate way to calculate and explain their methods and reasoning; **4c** estimate answers by approximating and checking that their results are reasonable by thinking about the context of the problem, and where necessary checking accuracy.

***National Numeracy Strategy***

## Numbers and the Number system

Fractions and decimals (p.22-31)

- Understand decimal notation and place value for tenths and hundredths, and use it in context. For example:
  order amounts of money;
  convert a sum of money such as £13.25 to pence, or a length such as 125cm to metres;
  round a sum of money to the nearest pound.

## Calculations

Rapid recall of addition and subtraction facts (p.38-39)

- Consolidate knowing by heart:
  addition and subtraction facts for all numbers to 20.

Mental calculation strategies (+ and –) (p.40-47)

- Find a small difference by counting up (e.g. 5003 - 4996). (p.40)
- Partition into tens and units, adding the tens first. (p.40)
- Continue to use the relationship between addition and subtraction.
- Add 3 or 4 small numbers, finding pairs totalling 10, or 9 or 11.
- Add three two-digit multiples of 10, such as 40 + 70 + 50. (p.42)

Pencil and paper procedures (+ and –) (p.48-51)

- Use informal pencil and paper methods to support, record or explain additions/subtractions.
- Develop and refine written methods for:
  column addition and subtraction of two whole numbers less than 1000, and addition of more than two such numbers;
- money calculations (for example, £7.85 ± £3.49). (p.48,50)

Pencil and paper procedures (x and ÷) (p.66-69)

- Approximate first. Use informal pencil and paper methods to support, record or explain multiplications and divisions.

## Solving Problems

Making decisions (p.74-74)

- Choose and use appropriate number operations and appropriate ways of calculating (mental, mental with jottings, pencil and paper) to solve problems.

Problems involving 'real life', money and measures (p.82-89)

- Use all four operations to solve word problems involving numbers in 'real life', money and measures (including time), using one or more steps, including converting pounds to pence and metres to centimetres and vice versa. (p.82-89)

## Outcomes

By the end of this activity students will have:

- a storyboard that shows conversion from pounds to pence and vice versa
- a storyboard where they have worked out the best price for flights to Washington from a range of different options
- a storyboard where they have selected items from a menu, and worked out cost and change.

## Resources

Kar2ouche *Maths and Problem Solving*

- **Pounds and Pence** storyboard
- **Meet the Family** storyboard
- **Telephone Call** storyboard
- **Booking Flights** storyboard
- **At the Café** storyboard

Appendix B *Jottings and Working Out*

Sheet 6.1 *Café Menu*

Calculators (for Homework/Extension)

Travel brochures

**Key words/phrases:** pounds, pence, coin, note, penny, pound, price, cost, pay, change, how much, total, amount, value, worth

# Activities

### *Introduction*

1. Tell the students that all the tasks in this activity are about money. For much of the activity students will need to decide what sums are necessary in order to add and subtract specified sums of money.
2. Demonstrate or ask nominated students to show you how to write out sums of money correctly with a pound sign and a decimal place. This should be revision. Spend as long on it as you feel necessary to be sure that the group is confident with what they are doing.
3. Next show the students how to write amounts such as 53p as £0.53 and £1.50 as 150p. Give them several examples to check they understand what you mean. Write up a few where they have to convert from pounds to pence and back again.

4. Students open and work through the **Pounds and Pence** storyboard. This gives the students practice in converting pounds to pence and back again. They then have small amounts of money to add up mentally (coins and notes). The students work through the storyboard frame by frame. You can add problems using larger numbers to challenge more able students.

**Content of Pounds and Pence storyboard**

In frames 1-10 of the storyboard Rebecca instructs the students to convert an amount of money from pounds to pence or vice versa and then write their answer in the empty text box. Phillip then asks them to suggest something that costs around this amount.

**Introductory Frames:** title and example.

**Frame 1:** Text box shows £0.53. Convert this to pence. **(53p)**

**Frame 2:** Text box shows £0.75. Convert this to pence. **(75p)**

**Frame 3:** Text box shows £0.89. Convert this to pence. **(89p)**

**Frame 4:** Text box shows £1.09. Convert this to pence. **(109p)**

**Frame 5:** Text box shows £2.33. Convert this to pence. **(233p)**

**Frame 6:** Text box shows 43p. Convert this to pounds. **(£0.43)**

**Frame 7:** Text box shows 51p. Convert this to pounds. **(£0.51)**

**Frame 8:** Text box shows 86p. Convert this to pounds. **(£0.86)**

**Frame 9:** Text box shows 91p. Convert this to pounds. **(£0.91)**

**Frame 10:** Text box shows 100p. Convert this to pounds. **(£1.00)**

In each of the following frames we see either Phillip or Rebecca standing to the side looking at the coins and notes. They ask the students to put the coins and notes in order and then type the added-up total into the text box.

**Frame 11:** Image of 2 x 50p, 1 x 10p, 1 x 5p and 2 x 2p. Students are instructed to drag the coins into order, largest first, and then type the total into the text box. **(£1.19)**

**Frame 12:** Image of 1 x £1, 1 x 50p, 3 x 10p, 2 x 5p and 2 x 1p. Students are instructed to drag the coins into order, largest first, and then type the total into the text box. **(£1.92)**

**Frame 13:** Image of 2 x £2, 2 x 50p, 3 x 5p and 1 x 2p. Students are instructed to drag the coins into order, largest first, and then type the total into the text box. **(£5.17)**

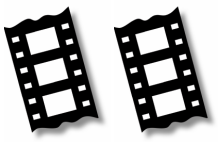
**Frame 14:** Image of 1 x £5, 1 x £1, 1 x 50p and 2 x 20p. Students are instructed to drag the notes and coins into order, largest first, and then type the total into the text box. **(£6.90)**

**Frame 15:** Image of 1 x £10, 1 x £5, and 1 x 50p. Students are instructed to drag the notes and coins into order, largest first, and then type the total into the text box. **(£15.50)**

**Frame 16:** Image of 1 x £20, 1 x £10, and 4 x 50p. Students are instructed to drag the notes and coins into order, largest first, and then type the total into the text box. **(£32.00)**

**Frame 17:** Image of 2 x £20, 1 x £5, and 4 x £1. Students are instructed to drag the notes and coins into order, largest first, and then type the total into the text box. **(£49.00)**

## *Development*



5. If the students do not remember the Berry family, they can watch the **Meet the Family** storyboard before they start.
6. The students watch the introductory storyboard that sets the scene for the rest of this activity. Ask them to open the **Telephone Call** storyboard and watch carefully.

**Content of Telephone Call storyboard**

Phillip receives a call from Juan in America.

**Frame 1:** Mum: Come quickly, Phillip! Juan is on the phone from America!

**Frame 2:** Juan: Hey, Phillip!

**Frame 3:** Phillip: Hello, Juan! How are you?

**Frame 4:** Juan: I'm good. My mom told me that you're really going to come over and see us?

**Frame 5:** Phillip: Yes, that's right. We talked about it a couple of weeks ago. We're all really excited.

**Frame 6:** Juan: That's so cool. When will you be coming?

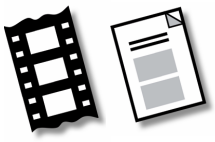
**Frame 7:** Phillip: Well, we haven't arranged anything yet. I'll talk to Mum and Dad and find out when.

**Frame 8:** Juan: That'll be good. I want to get stuff organised for when you get here; there's so much I want to show you.

**Frame 9:** Phillip: Well, I'll call you as soon as I have any news. Great talking to you Juan. Bye!

**Frame 10:** Juan: Bye Phillip!

**Frame 11:** Phillip: MUM, can we talk about going to America!



7. Students open the **Booking Flights** storyboard. They could use Appendix B *Jottings and Working Out* to record their answers.

**Content of Booking Flights storyboard**

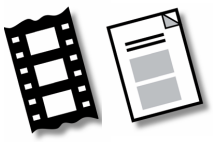
**Opening frames:** The family are sitting around the computer, selecting flights from a website. Mum: Right, we need to try and get a good deal on these flights. Rebecca: Have you found a good website? Mum: Yes, AirKar2ouche is offering reasonable prices. I'll just type in our details. Phillip: Let me see. Oh, there is a lot to think about. When shall we go? Mum: I think August. Let's see what the price options are.

**Subsequent frame 1:** The next frame shows a page from the website where they are presented with price options. The students are required to choose the cheapest flight for the family. There are four different combinations to select from:

1. Adult £640/Child £449 **(£2178)**
2. Adult £550/Child £295 **(£1690)**
3. Adult £530/Child £340 **(£1740**)
4. Adult £535/Child £344 **(£1758)**

The students are instructed to carry out the necessary calculations to work out the cost of each combination before deciding the best price for the whole family. They are reminded that they will need to explain the type of calculations they did to the rest of the group later.

Finally, they are asked to work out the difference between the most expensive and cheapest flight so that they can see how much they are saving. (**£488**)



8. Students open the **At the Café** storyboard and follow the instructions. The menu from the café is available as Sheet 6.1 *Café Menu*. They may also use Appendix B *Jottings and Working Out* to show their equations and explain their methods. This information will be used in the plenary.

**Content of At the Café storyboard**

**Introductory frames:** These show the family going out to lunch in town following the successful booking of their holiday. They enter the café and choose what they want to eat from the menu. The menu is presented in a separate frame so that the students can see the choices and prices clearly. Mum: Now we're all booked up, let's go out and have lunch. It's all so exciting! Dad: Yes we should celebrate, I'll drive us all into town. Phillip: Yes we've saved so much money on our flights, we should be celebrating!

**Frames for first calculation:** The family make their choices. Each one is presented in a separate frame. The students are instructed to total the cost of the meal as they go and enter this in the text boxes on screen.

- Mum chooses quiche and salad £2.90 and mineral water £2.40. (**£5.30**)
- Dad chooses soup £1.25 and a cup of tea 90p. (**£2.15**)
- Phillip chooses ham and cheese toasted sandwich £2.55 and orange juice £1.10. (**£3.65**)
- Rebecca chooses jacket potato £1.70 and apple juice £1.10. (**£2.80**)

**Frames for next series of calculations:** Students add up the totals for the whole meal and enter the results. (**£13.90**) In the following frame Mum pays with a £20 note and the students are instructed to work out the change that will be given. (**£6.10**)

**Frames for next series of calculations:** When they have eaten the main course there is a frame showing the family deciding to have coffee and cake. The students have to work out if they have enough money left to have coffee and cake. (**£4.25**) Their choices are as follows:

- Dad – none
- Phillip – scone and cream £2.15
- Mum – coffee £1.20
- Rebecca – iced bun 90p

**Final frame:** Students are instructed to find out if they have any money left at the end of the meal from their £20. **(£1.85)**

## *Plenary*

9. The students will have two sets of working out to share with you and the rest of the group. The first is for **Booking Flights.** Ask what the total cost was to fly the Berry family to Washington and how each group worked it out. The students could come out to a whiteboard and write out their methods using their *Jottings and Working Out* sheets to prompt them. It would be helpful if you used a data projector to go through the **At the Café** storyboard frame by frame and get the students to talk you and the rest of

the group through what they did. Highlight the different methods and, if there is time, go through any common errors.

***Extension/ Homework***

10. Give the students a copy of Sheet 6.1 *Café Menu* to create their own maths problems based around a visit to a café with this menu. If they have access to Kar2ouche, they could present it as a storyboard, maybe with Phillip or Rebecca and two friends going there after school.
11. Ask the students to get hold of some travel brochures. Give them a budget and ask them to book a holiday for a family of four. They should use calculators for this activity.

***Student Notes***

# **Activity 6** Booking the Holiday

## Objectives

In this activity you will use maths to help you solve problems about money. You'll practise converting pounds to pence and adding up coins and notes quickly. Then you'll help the Berry family to book the cheapest flight they can find to America. You'll also join the family at the café where you have to help them to total up their choice for lunch and find the right change.

## Outcomes

At the end of this activity you will have:

- a storyboard that shows conversion from pounds to pence and vice versa
- a storyboard where you have worked out the best price for flights to Washington from a range of different options
- a storyboard where you have selected items from a menu, and worked out cost and change.

## Resources

To complete this activity you will need:

- Kar2ouche *Maths and Problem Solving*
- Appendix B *Jottings and Working Out*
- Sheet 6.1 *Café Menu*
- calculators for the extension activity
- travel brochures

## Activities

### *Introduction*

1. Practise writing pounds as pence and pence as pounds with a partner and/or your teacher.
2. Open and work through the **Pounds and Pence** storyboard. Follow the instructions carefully. Phillip and Rebecca will tell you where to type your answers.

   click here to open the **Pounds and Pence** storyboard.

### *Development*

3. You can watch the **Meet the Family** storyboard again if you have not seen it for some time or want to remind yourself about all the characters.

   click here to open the **Meet the Family** storyboard.

4. When you are ready you can open the **Telephone Call** storyboard where Phillip will be getting a telephone call from Juan. Once you have seen the storyboard you will be ready to help the Berry family organise their trip to America.

   click here to open the **Telephone Call** storyboard.

***Student Notes***

5. Open the **Booking Flights** storyboard and follow the instructions carefully. You can ask your teacher for a sheet to jot down your answers if you think you would like to use pencil and paper methods to help you to solve the problems**.**

   click here to open the **Booking Flights** storyboard.

6. The Berry family are so pleased with the cost of their flights that they decide to go out to celebrate. Open the **At the Café** storyboard to work out the cost of the family's lunch. Your teacher may give you a *Jottings and Working Out* sheet.

   click here to open the **At the Café** storyboard.

### *Plenary*

7. Your teacher will ask you to talk about the storyboards you have worked through in this activity. You may be asked to share what you have done, in particular the methods you used, so make sure you have your sheets ready and can show clearly how you worked out your answers.

### *Extension/Homework*

8. Your teacher will give you Sheet 6.1 *Café Menu*. You can work out your own word problems using the figures on this menu. If you have access to Kar2ouche, you could build up your own storyboard illustrating some maths problems and creating your own café scene.
9. Go into a local travel agent and ask for some holiday brochures. Your teacher will give you a budget and a calculator. You have to book a holiday for a family of four without going over the budget you've been given!

***Sheet 6.1***

# Café Menu

Use this menu to start off your own word problems.

## *Café Kar2ouche*

### Drinks

Coffee .....£1.20
Tea .....£0.90
Mineral water .....£2.40
Orange juice .....£1.10
Apple juice .....£1.10
Fizzy drinks .....£1.50

### Hot food

Toasted sandwiches .....£2.55
*cheese; ham and cheese; mozzarella and tomato*

Jacket potatoes .....£1.70
*cheese; cheese and beans; cottage cheese; tuna*

Soup of the day .....£1.25

Quiche and salad .....£2.90

### Desserts

Carrot cake .....£2.05
Iced bun .....£0.90
Chocolate cake .....£1.90
Cinnamon swirl .....£0.90
Danish pastry .....£1.10
Scone and cream .....£2.15

**Teacher Notes**

# Activity 7 Holiday Shopping

| | |
|---|---|
| ***Key Stage/Year*** | Key Stage 2/Year 4 |
| ***Group Organisation*** | Individuals and pairs |
| ***Suggested Timing*** | 2-3 sessions |

## Overview of Task

In this activity the students get to practise answering mental maths questions about money. They are encouraged to answer very quickly. They go on to estimate amounts of money and then total them up, beginning with the most significant digits. Finally, they go holiday shopping with the Berry family, and see if Phillip can stick to a budget in a department store. They work out the best value suitcase from a variety of special offers.

## Objectives

**All students will:** add coins and notes together, largest amount first. They will also use written methods to calculate simple problems involving money.

**Most students will:** recall facts about addition and subtraction for each number up to 20, and multiplication facts for x 2, x 3, x 4, x 5 and x 10.

**Some students will:** use all four operations of number to solve word problems using one or more steps, as well as understand decimal notation and place value for tenths and hundredths.

## Curriculum References

***Key Stage 2 Mathematics***

**Solving Numerical Problems 4a** choose, use and combine any of the four number operations to solve word problems involving money in 'real life'; **4b** choose and use an appropriate way to calculate and explain their methods and reasoning; **4c** estimate answers by approximating and checking that their results are reasonable by thinking about the context of the problem, and where necessary checking accuracy.

***National Numeracy Strategy***

## Numbers and the Number system

Fractions and decimals (p.22-31)

- Understand decimal notation and place value for tenths and hundredths, and use it in context. For example:
  order amounts of money;
  convert a sum of money such as £13.25 to pence, or a length such as 125cm to metres;
  round a sum of money to the nearest pound.

## Calculations

Rapid recall of addition and subtraction facts (p.38-39)

- Consolidate knowing by heart:
  addition and subtraction facts for all numbers to 20.

Mental calculation strategies (+ and –) (p.40-47)

- Find a small difference by counting up (e.g. 5003 - 4996). (p.40)
- Partition into tens and units, adding the tens first. (p.40)
- Continue to use the relationship between addition and subtraction.
- Add 3 or 4 small numbers, finding pairs totalling 10, or 9 or 11.
- Add three two-digit multiples of 10, such as 40 + 70 + 50. (p.42)

Pencil and paper procedures (+ and –) (p.48-51)

- Use informal pencil and paper methods to support, record or explain additions/subtractions.
- **Develop and refine written methods for:**
  **column addition and subtraction of two whole numbers less than 1000, and addition of more than two such numbers;**
- money calculations (for example, £7.85 ± £3.49). (p.48,50)

Pencil and paper procedures (x and ÷) (p.66-69)

- Approximate first. Use informal pencil and paper methods to support, record or explain multiplications and divisions.

## Solving Problems

Making decisions (p.74-74)

- Choose and use appropriate number operations and appropriate ways of calculating (mental, mental with jottings, pencil and paper) to solve problems.

Problems involving 'real life', money and measures (p.82-89)

- Use all four operations to solve word problems involving numbers in 'real life', money and measures (including time), using one or more steps, including converting pounds to pence and metres to centimetres and vice versa.

## Outcomes

By the end of this activity students will have:

- a storyboard where they have answered some money problems in a time limit and a sheet where the answers have been recorded
- a storyboard where set amounts of money have first been estimated and then added up
- a storyboard where clothing items for Phillip's holiday have been chosen and costed, sticking within a strict budget
- a storyboard which shows different offers for purchasing new luggage, and the best value choice.

## Resources

Kar2ouche *Maths and Problem Solving*

- **Money Questions** storyboard
- **Money and Estimating** storyboard
- **Meet the Family** storyboard
- **Getting Ready** storyboard
- **Phillip's Shopping** storyboard
- **Luggage Shopping** storyboard

Appendix B *Jottings and Workings Out*

Sheet 7.1 *Money Answers*

Sheet 7.2 *Money and Estimating*

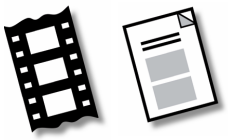
Real or demonstration money

**Key words/phrases:** guess, estimate, nearly, roughly, coin, note, penny, pence, pound, price, cost, spend, pay, change, expensive, value, worth, total, amount, how much, how many

# Activities

***Introduction***

1. Remind students that they are still going to be working through a range of different problem solving activities involving money, continuing the story of Phillip and the Berry family. The family have booked a trip to Washington to see Juan and the rest of the Gomez family, and they now need to get their things ready.
2. As a warm-up activity, recall addition, subtraction and division facts up to 20 and multiplication facts x 2, x 3, x 4, x 5, x 10. Try to emphasise speed and accuracy and the importance of knowing these facts really well, as they will help with many aspects of mathematical work.



3. Students open the **Money Questions** storyboard, where they have to decide which operation they will need to complete a number of short equations. This can be done in pairs or individually and students should record their answers on Sheet 7.1 *Money Answers*. Some students might like to complete only the first 10; others can work through the whole storyboard. When they have finished, go through the answers checking their workings as you go.

**Content of Money Questions storyboard**

Each sum below appears on screen and is also read aloud. Students write their answers on the sheet as quickly as they can before the storyboard moves on to the next frame. Most frames are, unless specified, set to move on to the next one after 10 seconds. The students could try to complete each sum in the time given, but can pause if necessary or even move back a frame if it moves on too quickly. If desired, the frames can be set to a shorter time by altering the length of each frame in the presentation screen.

**Frame 1:** What is 5p times 4? (**20p**)

**Frame 2:** Multiply 4p by 9. (**36p**)

**Frame 3:** If I had 35p and I lost 15p what would I have left? (**20p**)

**Frame 4:** How many 5p coins make 25p? (**5**)

**Frame 5:** I have 7p. How much more do I need to make 20p? (**13p**)

**Frame 6:** How many piles of four pennies are in 16p? (**4**)

**Frame 7:** I have 23p, my friend has 16p. What do we have combined? (**39p**)

**Frame 8:** How many 10ps in £1? (**10**)

**Frame 9:** I had 55p. I spent 21p. What do I have left now? (**34p**)

**Frame 10:** How many 5p coins in 20p? (**4**)

**Frame 11:** 18p subtract 7p. What's the answer? (**11p**)

**Frame 12:** I have 4p. How much more do I need to make 19p? (**15p**)

**Frame 13:** How much is 4 times 5p, 4 times 15p, 4 times 20p? (**20p, 60p, 80p = £1.60**) *20 second for the 3 sums.*

**Frame 14:** How many times can I take 3p from 27p? (**9**)

**Frame 15:** Multiply 7p by 3. What's the answer? (**21p**)

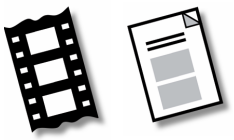
**Frame 16:** What do I add to 8p to make 19p? (**11p**)

**Frame 17:** Write two amounts which make 17p. (for example, **10p + 7p** or **2p + 15p**) *20 second for the 3 sums.*

**Frame 18:** How many 2p coins make 20p, 40p, 50p? (**10, 20, 25**)

**Frame 19:** How much less than 13p is 6p? (**7p**)

4. Using demonstration money, give the students coins and notes to add up mentally. Discuss the best ways of doing this. Encourage them to start with the largest coins/notes first. As you increase the amounts to total, introduce the idea of estimating first and getting a rough idea of what the amount might be. Talk about why this is a good idea and where the students might use it in real life.



5. The students should work in pairs for this part of the session to estimate amounts and compare their ideas. They need to open the **Money and Estimating** storyboard, then add the amounts shown (using pencil and paper methods if necessary) and assess whose estimate was closest. They will need Sheet 7.2 *Money and Estimating* to record their answers.

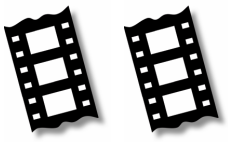
**Content of Money and Estimating storyboard**

**Frame 1:** Instructs students to add up the various amounts of money mentally. In the first instance they are required to make a quick estimate and enter a sensible guess in the blank text box. The frames are set to move on to the next one after 10 seconds. The students could try to complete the addition in the time given, but can pause if necessary or even move back a frame if it moves on too quickly. If desired, the frames can be set to a shorter time by altering the length of each frame in the presentation screen. When they have estimated all of the frames the students are instructed to go back and complete the actual addition. They can enter the true totals on Sheet 7.2 *Money and Estimating*. They are reminded to begin with the largest amounts first. Although they do not have to show their working, they are told that they may be asked to explain the methods they used.

**Subsequent frames:** The amounts the students need to add up are as follows:

1. coins to the value of 10p
2. coins to the value of 50p
3. coins to the value of £1
4. coins to the value of £1
5. coins to the value of £2
6. coins to the value of £2
7. coins to the value of £5
8. coins to the value of £10.

## *Development*



6. If it is some time since the students worked with this software, they might like to watch the **Meet the Family** storyboard again.
7. Students watch the **Getting Ready** storyboard, setting the scene for the rest of this activity.

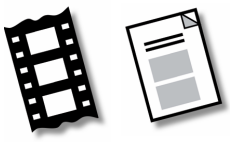
**Content of Getting Ready storyboard**

**Frame 1:** In the kitchen. Mum: Did you get a reply to the email you sent to Juan last night? Phillip: Yes, he's real excited; I mean really excited! It'll be so good to meet him at last.

**Frame 2:** Mum: That's good. Now let me just look at the calendar. Gosh, we've only got just over a month before we go.

**Frame 3:** Mum: We should think about getting things ready. I'm sure you kids have grown out of all your last summer's clothes.

**Frame 4:** Rebecca: Well, my jeans are too short! Great, I love new stuff, it means we'll have to go shopping! Phillip: Hmmm.



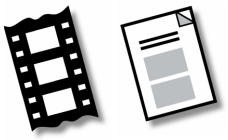
8. Students open **Phillip's Shopping** storyboard and work through it carefully. They will need a copy of Appendix B *Jottings and Working Out* to record their sums.

**Content of Phillip's Shopping storyboard**

**Frame 1:** Introduction and instructions: Phillip and his mum in a large department store where Phillip needs to buy: two T-shirts, a pair of shorts, a sunhat and some flip-flops. Mum: Right, Phillip, we need to buy your new stuff for the holiday. You need T-shirts, shorts, a sunhat and some flip flops. Phillip: Gosh that's quite a lot to find and there's plenty to choose from. Mum: Yes, and remember we have a budget of £15 to spend. Phillip must select from the wide choice and not go over his budget of £15.

**Subsequent frames:** Show a range of items from which Phillip must select. Students have to estimate the cost of his choices by rounding the amounts up and entering their estimate on a sheet. These are the prices of the various items Phillip has to choose from: T-shirt (£2), T-shirt (£2.75), T-shirt (£1.75), sweatshirt (£6.25); shorts (£4), shorts (£4.25); hat (£2.45), cap (£4.50); flip-flops (£1), flip-flops (£1.40), sandals (£5). Students add the totals using pencil and paper methods as necessary. If the final total comes to over £15, they decide which items to swap or not purchase and subtract these from the total.

**Final frame:** Phillip meets up with his mum, and in blank speech bubbles the students add his comments on how much he has spent and what change his mum will get.



9. Finally, the family need new suitcases. Students open the **Luggage Shopping** storyboard. Again, they might like to use Appendix B *Jottings and Working Out* to record their working.

**Content of Luggage Shopping storyboard**

**Introductory frames:** Background and instructions. The Berry family go to the luggage department to treat themselves to new luggage for their trip. They are presented with several different offers from which to select. Students work out which is the best value for money. Each offer is presented in a different frame. The family work out that they need three suitcases: a large one for Dad, a medium one for Mum and another large one for Phillip and Rebecca to share. The students decide which offer provides best value and explain their reasons why.

**Frame 1:** Offer A (medium suitcase) – Special offer: was £25.00, now half price.

**Frame 2:** Offer B (three medium and two small suitcases) – Three for two, buy three suitcases and get the cheapest free. (Cases at £8, £12, £15 and £19)

**Frame 3:** Offer C (large suitcase) – Buy this suitcase for £21 and get a free backpack!

**Frame 4:** Offer D (medium suitcase) – Suitcase priced £19.99. Sale! Get two for £30.00!

**Frame 5:** Offer E (large suitcase) – 50% off all suitcases, prices are £32 and £34.

**Frame 6:** Offer F (small suitcase) – Priced £16, with a 25% reduction.

**Closing frames:** Space to explore possible combinations.

***Plenary***

10. Share the work done on each of the storyboards. Make sure that each pair/individual explains the methods they used and highlight common pitfalls. If appropriate, show alternative methods that the students could have used and emphasise any particular one that you felt would have worked better for the group.

***Extension/ Homework***

11. Ask students to create their own 'three for two' offers. Discuss who benefits most from such sales tactics. If they have access to Kar2ouche, they can create their own storyboard showing special offers in a sale. Under each frame they should write the number sentences for each sum involved.

***Student Notes***

# Activity 7 Holiday Shopping

## Objectives

You will practise answering mental maths questions about money and estimate totals. Once you have made your estimates, you will add up the sums of money and check how close you were. Finally, you will go shopping with the Berry family, help Phillip stick to a budget and decide which suitcases the family should buy from a variety of offers.

## Outcomes

At the end of this activity you will have:

- a storyboard where you have answered some money problems in a time limit and a sheet where the answers have been recorded
- a storyboard where you have estimated and then added up specific amounts of money
- a storyboard where you have chosen clothing items for Phillip's holiday and have stuck to a strict budget
- a storyboard showing different offers for purchasing new luggage, and the best value choice.

## Resources

To complete this activity you will need:

- Kar2ouche *Maths and Problem Solving*
- Sheet 7.1 *Money Answers*
- Sheet 7.2 *Money and Estimating*
- Appendix B *Jottings and Working Out*

## Activities

### *Introduction*

1. Open the **Money Questions** storyboard and work your way through the questions as quickly and accurately as you can. Your teacher will give you Sheet 7.1 *Money Answers* to record your answers. Try to work quickly through each of the questions.

   click here to open the **Money Questions** storyboard.

2. Open the **Money and Estimating** storyboard, which contains a number of notes and coins. With a partner, estimate how much there is in each frame. Write your answers in the text boxes and on Sheet 7.2 *Money and Estimating*. When you have estimated, drag the notes and coins into an easy order to add up. Write the actual total next to your estimates.

   click here to open the **Money and Estimating** storyboard.

***Student Notes***

### *Development*

3. You might like to revisit the **Meet the Family** storyboard to remind yourself about Phillip, his family and friends.

   click here to open the **Meet the Family** storyboard.

4. Next you need to watch the **Getting Ready** storyboard to find out what the family need to do to prepare for the trip.

   click here to watch the **Getting Ready** storyboard.

5. Open **Phillip's Shopping** storyboard and follow the instructions carefully. Your teacher will give you a *Jottings and Working Out* sheet so that you have somewhere to write and record your answers.

   click here to open **Phillip's Shopping** storyboard.

6. Using the same sheet, open the **Luggage Shopping** storyboard and keep a careful record of the decisions you make and why.

   click here to open the **Luggage Shopping** storyboard.

### *Plenary*

7. Your teacher will ask you to share the work you did on the two main storyboards. Make sure you are clear about how you got to the answers so that you can explain this to the rest of your group.

### *Extension/Homework*

8. Can you create your own 'three for two' offers? Who benefits most from this kind of offer? If you have access to Kar2ouche, create a storyboard showing a sale in a shop. Underneath each frame write the number sentences for each sum involved. If you can't use the computer, then produce a poster about the sale.

***Sheet 7.1***

# Money Answers

You will see and hear these questions on the **Money Questions** storyboard. Add your answers to the table below. If you want, you can use the space to show your working.

| | |
|---|---|
| 1. What is 5p times 4? | |
| 2. Multiply 4p by 9. | |
| 3. If I had 35p and I lost 15p what would I have left? | |
| 4. How many 5p coins make 25p? | |
| 5. I have 7p. How much more do I need to make 20p? | |
| 6. How many piles of four pennies are in 16p? | |
| 7. I have 23p, my friend has 16p. What do we have combined? | |
| 8. How many 10ps in £1? | |
| 9. I had 55p. I spent 21p. What do I have left now? | |

| | |
|---|---|
| 10. How many 5p coins in 20p? | |
| 11. 18p subtract 7p. What's the answer? | |
| 12. I have 4p. How much more do I need to make 19p? | |
| 13. How much is 4 times 5p, 4 times 15p, 4 times 20p? | |
| 14. How many times can I take 3p from 27p? | |
| 15. Multiply 7p by 3. What's the answer? | |
| 16. What do I add to 8p to make 19p? | |
| 17. Write two amounts which make 17p. | |
| 18. How many 2p coins make 20p, 40p, 50p? | |
| 19. How much less than 13p is 6p? | |

*Sheet 7.2*

# Money and Estimating

Enter your estimates in the first two columns. Now you need to go back to the storyboard **Money and Estimating** and work out the totals more carefully, using whatever method you choose. You can show your working if you like. If you don't, just be prepared to explain how you did it to your teacher and/or other members of your class.

| | Estimate 1 | Estimate 2 | Addition |
|---|---|---|---|
| **1** | | | |
| **2** | | | |
| **3** | | | |
| **4** | | | |
| **5** | | | |
| **6** | | | |
| **7** | | | |
| **8** | | | |

**Teacher Notes**

# Activity 8 Sports Day

| | |
|---|---|
| ***Key Stage/Year*** | Key Stage 2/Year 4 |
| ***Group Organisation*** | Ability grouped pairs |
| ***Suggested Timing*** | 1-2 sessions |

## Overview of Task

In this activity the students practise their estimating skills by suggesting a suitable length for a range of objects and selecting an appropriate unit of measurement. They go on to work through some length problems by helping Phillip with his school sports day. Finally, they calculate area and perimeter linked to the sports day activities.

## Objectives

**All students will:** use, read and write standard metric units of measurement.

**Most students will:** suggest suitable units and measuring equipment to estimate or measure length.

**Some students will:** convert up to 1000cm to metres and vice versa, measure and calculate the area and perimeter of rectangles using standard units.

## Curriculum References

***Key Stage 2 Mathematics***

**Solving Numerical Problems 4a** choose, use and combine any of the four number operations to solve word problems involving measuring in 'real life'; **4b** choose and use an appropriate way to calculate and explain their methods and reasoning; **4c** estimate answers by approximating and checking that their results are reasonable by thinking about the context of the problem, and where necessary checking accuracy.

***National Numeracy Strategy***

## Numbers and the Number System

- Read and write the vocabulary of estimation and approximation. Make and justify estimates up to about 250, and estimate a proportion.

Fractions and decimals (p.22-31)

- Understand decimal notation and place value for tenths and hundredths, and use it in context. For example:
  order amounts of money;
  convert a sum of money such as £13.25 to pence, or a length such as 125cm to metres;
  round a sum of money to the nearest pound. (p.28)

## Calculations

Pencil and paper procedures (+ and –) (p.48-51)

- Use informal pencil and paper methods to support, record or explain additions/subtractions.
- Develop and refine written methods for:
  column addition and subtraction of two whole numbers less than 1000, and addition of more than two such numbers;
  money calculations (for example, £7.85 ± £3.49). (p.48,50)
- Pencil and paper procedures (x and ÷) (p.66-69**)**
- Approximate first. Use informal pencil and paper methods to support, record or explain multiplications and divisions.

## Solving Problems

Making decisions (p.74-74)

- Choose and use appropriate number operations and appropriate ways of calculating (mental, mental with jottings, pencil and paper) to solve problems.
- Problems involving 'real life', money and measures (p.82-89)
- Use all four operations to solve word problems involving numbers in 'real life', money and measures (including time), using one or more steps, including converting pounds to pence and metres to centimetres and vice versa. (p.82-89)

## Measures, Shape and Space

Measures (p90-101)

- Use, read and write standard metric units (km, m, cm, mm, kg, g, l, ml), including their abbreviations,
  and imperial units (mile, pint). (p.90)

- Know and use the relationships between familiar units of length, mass and capacity.
  Know the equivalent of one half, one quarter, three quarters and one tenth of 1km, 1m, 1kg, 1litre in m, cm, g, ml.
- Convert up to 1000 centimetres to metres, and vice versa. (p.90)
- Suggest suitable units and measuring equipment to estimate or measure length, mass or capacity.
- Measure and calculate the perimeter and area of rectangles and other simple shapes, using counting methods and standard units

## Outcomes

By the end of this activity students will have:

- a storyboard where they have recorded the appropriate unit of measurement for a range of given items and a suitable estimate of their length
- a storyboard where they have answered a range of length problems and recorded their working out and answers on a sheet
- a storyboard showing perimeter calculations for rectangles and squares with a sheet showing their method.

## Resources

Kar2ouche *Maths and Problem Solving*

- **Units and Estimating** storyboard
- **Meet the Family** storyboard
- **Sports Day** storyboard
- **Sports Problems** storyboard
- **Swimming** storyboard

Sheet 8.1 *Sports Answers*

Sheet 8.2 *Swimming*

**Key words/phrases:** length, width, long, short, longer, shorter, edge, perimeter, area, kilometre, metre, centimetre, millimetre, ruler, metre stick, tape measure

# Activities

## *Introduction*

1. Talk about the different units we use for measuring length. Make a list of all the ones the students come up with. It is likely that they will give you some imperial measurements as well as metric. Put these into a separate list and talk about why you have done this. You might like to explain that when Phillip visits Juan he'll see that Americans use imperial rather than metric measures. Remind the group about all the different things we use to measure length and the best ones for the job, for example, ask whether they would use a ruler to measure the length of the playground. Why not?

2. Ask the students to open the **Units and Estimating** storyboard. This asks the students for suitable units for measuring a variety of different objects.

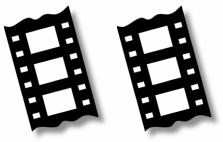
**Content of Units and Estimating storyboard**

**Initial frames:** Students are asked what units of measurement they would use to measure the lengths of: a rubber, pencil, desk top, carpet, exercise book, playground, swimming pool. They click on the following frame for the answer. Students choose from millimetre, centimetre and metre.

**Subsequent frames:** A selection of objects that students are likely to come across in their own school. They are asked to give a suitable estimate of their length. The objects include a ruler, pencil, book, desk, classroom and classmate. Students type their estimations into text boxes in the frames.

3. When everyone has completed the **Units and Estimating** storyboard, go through their estimates and consider which are the most accurate. If there is time, perhaps at a different point in the day, allow the group to go and measure the objects for themselves and compare the results with their estimates.

## *Development*



4. If it is some time since the students used this software, they might like to watch the **Meet the Family** storyboard again to remind themselves about Phillip, his family and friends.
5. Students watch the **Sports Day** storyboard before they go any further. This shows Phillip talking to his mum about the forthcoming school sports day. Phillip is the class representative so will be helping with the organisation of the day. His mum suggests that Juan might like to hear all about it.

**Content of Sports Day storyboard**

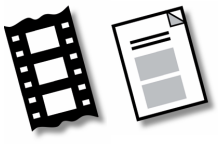
**Frame 1:** Phillip: Hey Mum, it's sports day next week. I've got loads to do. I'm the class sports representative. I have to help Mrs Gruber organise it all.

**Frame 2:** Mum: That's great, Phillip. I'm sure you'll be a great help to her.

**Frame 3:** Mum: Why don't you tell Juan all about it? It's about time you contacted him again. Do they have sports days in America?

**Frame 4:** Phillip: I'm not sure. I'll go and email him now.

6. Explain that as class sports representative Phillip has to help his teacher with recording race times, organising the equipment for the various events, measuring jumps and throws. He also gets to compete in various events. Students will work through a storyboard to help with his very busy day.



7. Students open the **Sports Problems** storyboard. Here they will find Phillip on the sports field with his teacher and some other children. Students need a copy of Sheet 8.1 *Sports Answers* on which to record their working out and answers.

**Content of Sports Problems storyboard**

Each frame contains a different sports-based problem.

**Frame 1:** Phillip helps his teacher to mark out the track for the 100m race, the 200m race and the 210m hurdles. Caption window – If the tracks were laid out end to end without any gaps, how long would they measure? Would that be less or more than a kilometre? (**less**) Write your answer on the sheet your teacher gives you.

**Frame 2:** Phillip throws the discus three times. Caption window – The first time he threw it 2m 10cm; the second time 2m 15cm and the final throw was 2m 30cm. If he added up all of his throws, what would the total distance be? (**6m 55cm**) Write your answer on your sheet.

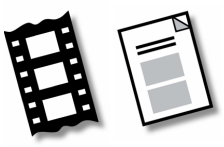
**Frame 3:** Phillip has to help put out the hurdles. Caption window – Each lane for the 110m hurdles needs six hurdles. There are six lanes. How many hurdles will Phillip and his friends need to set up the race? (**36**) The 210m hurdles needs twice as many. What will the total be? (**72**) Write your answers on your sheet.

**Frame 4:** Phillip measuring his classmates' long jumps. Caption window – In the long jump Bill jumped 1m 34cm, Sarah jumped 2m 12cm and Danny jumped 1m 55cm. How far did they jump altogether? (**5m 1cm**) How much further did Danny jump than Bill? Convert their total jump lengths into cm. (**501cm**) Write your answers on your sheet.

**Frame 5:** Phillip continues to measure his classmates' long jumps. Caption window – Danny jumped 2m 25cm on his second try at the long jump. This was 75cm longer than on his first try. How far in metres did he jump on his first try? (**1.5m**) Write your answer on your sheet.

**Frame 6:** Phillip watches his friend fall. Caption window – Sarah ran the 100m race. Unfortunately she fell after just 80m. If she managed to get up, how much further would she have to run to finish? (**20m**)

**Frame 7:** Phillip watches his friend run. Caption window – Bill takes part in the cross country run, which is a total distance of 2km. He stops for a drink after 525m. How much further does he have to run? (**1475m**)



8. The **Swimming** storyboard also provides problems to solve: this time with length and perimeter. The students can use Sheet 8.2 *Swimming* on which to work out and record their answers.

**Content of Swimming storyboard**

**Frame 1:** Introduction – The school sports day includes a swimming gala. Phillip is a very good swimmer and really enjoys the different events. He arrives early at the swimming pool on the morning of the gala and talks to his teacher.

**Frame 2:** Phillip: This is a really big swimming pool. How long is it? Teacher: It's a 25-metre pool: a good distance to swim.

**Frame 3:** Phillip: Wow, that always sounds like a long way to race. How far is the pool all the way around? Teacher: I'm not sure, but you could work it out by calculating the perimeter. The width of the pool is 12 metres. Caption window – Show Phillip how to work out the perimeter of the pool on your answer sheet. There are several ways to do this. Try to show more than one way.

**Frame 4:** Phillip looks at the large electronic scoreboard on the wall at the side of the pool. Phillip: Gosh, will our names appear on that board? Teacher: Yes, and the race you're in.

**Frame 5**: Phillip: It's so big. I'd like to know how big it is, but I can't reach to measure it! Teacher: You don't need to reach it. It's a square board. You only need to reach to measure the bottom length just down there. Caption window – Phillip finds that the length of the bottom is 4 metres. Show the perimeter of the whole thing. How do you know this? (**16m**) Write your method and answer on your sheet.

***Plenary***

9. Spend time revisiting the problems the students worked through in the **Sports Day** storyboard.

10. Talk about the way the students calculated the perimeter of the swimming pool and electronic scoreboard in the **Swimming** storyboard. Write a rule together for remembering how to do this.

***Extension/ Homework***

11. Ask the students to calculate the area of the pool and the board. They need to show how they did this. Ask them to write clear instructions for someone else so that they could do it easily.
12. Students could write down ideas for a storyboard about area and perimeter. When they have access to Kar2ouche, they could create their own storyboard with sums for other students in the class to work through.

***Student Notes***

# Activity 8 Sports Day

## Objectives

Working through this activity you will practise estimating length and select appropriate units of measurement. You will then work through some length problems by helping Phillip with his school sports day. Finally, you'll calculate area and perimeter linked to the sports day activities.

## Outcomes

At the end of this activity you will have:

- a storyboard where you have recorded the appropriate unit of measurement for a range of given items and a suitable estimate of their length
- a storyboard where you have answered a range of length problems and recorded your working out and answers on a sheet
- a storyboard showing perimeter calculations for rectangles and squares with a sheet showing your working out methods.

## Resources

To complete this activity you will need:

- Kar2ouche *Maths and Problem Solving*
- Sheet 8.1 *Sports Answers*
- Sheet 8.2 *Swimming*

## Activities

### *Introduction*

1. What different units do we use to measure length? What different types of equipment do we have to help us to do this?
2. Have you ever estimated length before? When might it be useful to do this? Open the **Units and Estimating** storyboard to practise this.

   click here to open the **Units and Estimating** storyboard.

### *Development*

3. If you have not worked with the activities about Phillip Berry and his family for a while, then you could watch the **Meet the Family** storyboard to remind yourself all about them.

   click here to open the **Meet the Family** storyboard.
4. Open the **Sports Day** storyboard to find out what Phillip will be doing in this activity.

   click here to open the **Sports Day** storyboard.

***Student Notes***

5. Open the **Sports Problems** storyboard and get busy helping Phillip with his job as class sports representative! Your teacher will give you Sheet 8.1 *Sports Answers* for you to write your work on.

   click here to open the **Sports Problems** storyboard.

6. The school sports day includes events at the swimming pool. If you open the **Swimming** storyboard, you will find you have to work out the distance all around the outside of the pool. You can then work out the perimeter of the scoreboard. Record your working and answers on Sheet 8.2 *Swimming*.

   click here to open the **Swimming** storyboard.

### *Plenary*

7. Have you got all your answers ready on your *Sports Answers* sheet? Your teacher might ask you to explain how you got to each answer, so get ready.
8. How did you work out the perimeter of the pool? Can you think of a rule to explain how to do this? How did you work out the perimeter of the scoreboard when you only knew one length?

### *Extension/Homework*

9. Can you work out the area of the pool? Explain how you do this. Try to write clear instructions for someone else to follow so that they could do this easily.
10. Now you have worked out area and perimeter, make a storyboard or poster explaining to other students how to do this.

***Sheet 8.1***

# Sports Answers

As you work through the questions in the **Sports Problems** storyboard you will need to record your working out and answers in the boxes below.

| | |
|---|---|
| Phillip helps his teacher to mark out the track for the 100m race, the 200m race and the 210m hurdles. If the tracks were laid out end to end without any gaps, how long would they measure? Would that be less or more than a kilometre? | |
| Phillip throws the discus three times. The first time he threw it 2m 10cm; the second time 2m 15cm and the final throw was 2m 30cm. If he added up all of his throws, what would the total distance be? | |
| Each lane for the 110m hurdles needs six hurdles. There are six lanes. How many hurdles will Phillip and his friends need to set up the race? The 210m hurdles needs twice as many. What will the total be? | |
| In the long jump Bill jumped 1m 34cm, Sarah jumped 2m 12cm and Danny jumped 1m 55cm. How far did they jump altogether? How much further did Danny jump than Bill; how much further than Sarah? Convert their jump lengths into cm. | |
| Danny jumped 2.25m on his second try at the long jump. This was 75cm longer than on his first try. How far in metres did he jump on his first try? | |
| Sarah ran the 100m race. Unfortunately she fell after just 80m. If she managed to get up, how much further would she have to run to finish? | |
| Bill takes part in the cross country run, which is a total distance of 2km. He stops for a drink after 525m. How much further does he have to run? | |

***Sheet 8.2***

# Swimming

Help Phillip to work out the perimeter of the pool and scoreboard on this sheet.

| **Swimming pool** |
| --- |
| Length =<br>Width =<br>Perimeter = |
| What is the area? |
| **Scoreboard** |
| Length =<br>Width =<br>Perimeter = |
| What is the area? |

**Teacher Notes**

# **Activity 9** What's the Time?

| | |
|---|---|
| ***Key Stage/Year*** | Key Stage 2/Year 4 |
| ***Group Organisation*** | Mostly paired work |
| ***Suggested Timing*** | 1-2 sessions |

## Overview of Task

Students work through activities related to time: telling the time and problem solving. First they work out how long it will be until a particular event occurs. Next they take part in a time quiz where they answer questions about time and the language of time. They go on to answer some time problems by following Phillip Berry and his family to their dentist, who is running late. Finally, they help Phillip to plan his evening's TV viewing from a specific time budget.

## Objectives

**All students will:** use addition and subtraction to solve word problems involving time.

**Most students will:** read the time from an analogue clock to the nearest minute and understand the relationship between am and pm.

**Some students will:** explain methods and reasoning for answers orally and in writing.

## Curriculum References

***Key Stage 2 Mathematics***

**Solving Numerical Problems 4a** choose, use and combine any of the four number operations to solve word problems involving time in 'real life'; **4b** choose and use an appropriate way to calculate and explain their methods and reasoning; **4c** estimate answers by approximating and checking that their results are reasonable by thinking about the context of the problem, and where necessary checking accuracy.

***National Numeracy Strategy***

### Calculations

Pencil and paper procedures (+ and –) (p.48-51)

- Use informal pencil and paper methods to support, record or explain additions/subtractions

### Solving Problems

Making decisions (p.74-74)

- **Choose and use appropriate number operations and appropriate ways of calculating (mental, mental with jottings, pencil and paper) to solve problems.**
- (For examples of problems see pages 78, 82-89, 100.) (p.74)

Problems involving 'real life', money and measures (p.82-89)

- Use all four operations to solve word problems involving numbers in 'real life', money and measures (including time), using one or more steps, including converting pounds to pence and metres to centimetres and vice versa. (p.82-89)

### Measures, Shape and Space

Measures (p.90-101)

- Record estimates and readings from scales to a suitable degree of accuracy. (p.92,94)
- Use, read and write the vocabulary related to time. Estimate/check times using seconds, minutes, hours.
- Read the time from an analogue clock to the nearest minute, and from a 12-hour digital clock.
- Use am and pm and the notation 9:53.

## Outcomes

By the end of this activity students will have:

- a storyboard where they have read analogue clocks and calculated how long it will be until a given event begins
- worked through a time quiz storyboard
- a storyboard where they have worked through a range of time problems and recorded their answers
- a storyboard where they have planned the TV viewing for Phillip from a given TV schedule and time budget.

## Resources

Kar2ouche *Maths and Problem Solving*

- **Reading Times** storyboard
- **Time Quiz** storyboard
- **Meet the Family** storyboard
- **Going to the Dentist** storyboard
- **Waiting for the Dentist** storyboard
- **TV Schedule** storyboard

Sheet 9.1 *TV Schedule*

Analogue clock

TV listings magazines

**Key words/phrases:** calendar, am, pm, noon, midnight, today, yesterday, tomorrow, before, after, next, last, early, late, how long will it take, timetable, arrive, depart, hour, minute, second, o'clock, half past, quarter to, quarter past, clock, watch, hands

## Activities

### *Introduction*

1. Using a large analogue demonstration clock, spend a few minutes revising time with your group. Your questions should provide a lead-in to beginning the **Reading Times** storyboard. Show the students a particular time on the clock (say 1.30pm) and tell them that they will begin working on the computer at 1.41pm. Ask how many minutes before they start their computer work. Give them a couple more questions like this and then ask them to open the storyboard.

**Content of Reading Times storyboard**

Students open a series of frames showing the different times at which things are due to happen during a normal day. In the corner of each frame, an analogue clock shows the time. The students have to say how long it will be until the event begins, or what the time will be, by typing it into a box in the corner of the frame.

**Frame 1:** Clock reads 11.15am. Person hurrying down street to catch a bus. Speech bubble reads, 'I hope the bus is on time today. It should leave at 11.25am.' Caption window – How long until the bus is supposed to leave? (**10 minutes**) The students type the answer into a text box.

**Frame 2:** Clock reads 2.10pm. Person saying to the children, 'You've got 15 minutes left to finish.' Caption window – What time will the children finish? (**2.25pm**) The students type the answer into a text box.

**Frame 3:** Clock reads 10.50am. Person sitting down to read a newspaper saying, 'I was so ready for my 20-minute break!' Caption window – What time will their break finish? (**11.10am**) The students type the answer into a text box.

**Frame 4:** Clock reads 3.35pm. Child speaking to parent, 'Can I go and play with Paul, please?' Parent replies, 'Yes, but be back in 40 minutes for your tea.' Caption window – What time does the child have to be back? (**4.15pm**) The students type the answer into a text box.

**Frame 5:** Clock reads 7.20pm. Child asks parent, 'How long until I have to go to bed, Dad?' Dad replies, 'You've got 40 minutes.' Caption window – What time does he have to go to bed? (**8.00pm**) The students type the answer into a text box.

**Frame 6:** Clock reads 9.20pm. Person watching TV. Caption window – How long until the 10 o'clock news begins? (**40 minutes**) The children type the answer into a text box.

(instructions imply digital, actual clock face **will** be analogue.)

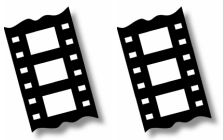
2. Ask the students a few questions to do with time, and mostly involving the language of time. Then direct them to have a go at the **Time Quiz** storyboard to see what they have remembered!

**Content of Time Quiz storyboard**

This is a hyperlinked storyboard where the students are given lots of questions about time and the language of time. They have several options from which to select and click on the answer they think is correct. If their selection is incorrect, they are directed to choose again.

- How many seconds in a minute? (**60**, 30, 120)
- How many minutes in an hour? (50, **60**, 120)
- How many minutes in quarter of an hour? (30, **15**, 45)
- How many minutes in half an hour? (15, **30**, 45)
- How many hours in a day? (12, **24**, 6)
- How many days in a week? (**7**, 14, 10)
- How many days in a fortnight? (10, 7, **14**)
- How many days in a year? (300, 200, **365**)
- How many days in a leap year? (**366**, 365, 300)
- How many days in September? (31, **30**, 25)
- How many days in January? (30, **31**, 25)
- How many days in May? (30, **31**, 25)

### *Development*



3. If it is some time since the students have used the software, they might like to watch the **Meet the Family** storyboard again to remind themselves about Phillip, his family and friends.
4. Students can watch the introductory storyboard **Going to the Dentist** to set the time problems in context.

**Content of Going to the Dentist storyboard**

Dad's car is being fixed, so the family are catching the bus to see the dentist. The dentist is running late and Phillip is anxious to get back on time as he doesn't want to miss his favourite TV show.

**Frame 1:** Dad: Come on! We'll be late if you don't get a move on. Mum: Yes, HURRY! Remember, we've got a bus to catch.

**Frame 2:** Dad: I'll see you all later. I hope it doesn't take too long for the garage to fix my car.

**Frame 3:** Mum: Here's the bus.

**Frame 4:** Phillip: What time is our appointment? Mum: Yours is at 2 o'clock.

**Frame 5:** Receptionist: I'm sorry, Mrs Berry, but the dentist is running about 20 minutes late.

**Frame 6:** Phillip: Mum, I need us to be back home for quarter past four! That's when my favourite TV programme begins!

5. Students can now work through both of the following **Waiting for the Dentist** and **TV Schedule** storyboards. Alternatively, divide the group in two: one half to work on one storyboard, the other group to work on the other.

**Content of Waiting for the Dentist storyboard**

**Introductory frames:** The family have to catch the bus to the dentist and then walk to the surgery. The bus stop is right by their house. The bus takes 20 minutes to get to the dentist and then it is a 10-minute walk to the surgery. Caption window – How long is their journey in total? (**30 minutes**) If they catch the 1.25pm bus, what time will they arrive at the dentist? (**1.55pm**) They miss this bus and have to catch the 1.35 bus. Can they still get there in time for their appointments? (**No**)

**Subsequent frames:** Their appointment times are as follows: Phillip 2 o'clock, Rebecca 2.30pm, and Mum after that. Each appointment lasts for half an hour. However, the dentist is running 20 minutes late. Caption window – What time should Mum's appointment have been? (**3.00pm**) What are the approximate new appointment times? (**2.20pm, 2.50pm and 3.20pm**) What time should they be ready to go home? (**3.50pm**)

The family must catch the 3.45pm bus home. Remember, the surgery is a 10-minute walk from the bus stop. Caption window – Will they catch the bus on time? (**No**) What time will they be at the bus stop? (**4.00pm**) How long will they have to wait for the bus? (**5 minutes**) The bus is running 10 minutes late. What time will it arrive now? (**4.15pm**) What time will they arrive home? (**4.35pm**)

**Final frames:** Phillip really wants to be home for the start of his favourite TV programme at 4.45pm. Caption window – Will he make it on time? (**Yes**)

**Content of TV Schedule storyboard**

**Introductory frames:** Phillip has a daily TV allowance of 90 minutes. His mum is anxious that he stick to this limit. We see Phillip in the television lounge with his mum. Mum: I hope you're not going to sit in here all day! Remember you can only watch 90 minutes TV today! Phillip: Oh yes, how could I forget! I guess I'd better have a look at what's on.

**Subsequent frames:** He plans his viewing schedule for the day by looking at *Telly Times* magazine. The students see a TV schedule in a frame followed by another frame in which there are a pile of different coloured text boxes containing the programmes and their duration. Students have to delete the programmes they do not want and then add up the number of minutes of their choices.

**Final frames:** They enter the total number of minutes into the text answer box. It must not exceed 90 minutes.

***Telly Times* schedule for the evening**

- 3.45pm Super Turtles (cartoon)
- 4.15pm Captain Crush (cartoon)
- 4.45pm School Sport challenge (kids' sports show)
- 5.00pm Newsround
- 5.35pm Pop Superstars
- 6.00pm News and Sport
- 6.45pm Local News
- 7.00pm The Planets (outer space serial)
- 7.30pm Kit Kar Wars (racing robotic cars)
- 8.00pm Paradise Street (soap opera)

***Plenary***

6. Look through the work the students have done in the development section. Go through all the answers from the **Waiting for the Dentist** storyboard and ask which questions the students struggled most with. Also look at all the different TV schedules the students created for Phillip. Did anyone struggle to stick to his time budget?

***Extension/ Homework***

7. Give each individual/pair a TV schedule magazine, and a viewing time budget. Get them to write a storyboard describing their evening's viewing. Ask them to select programmes that they think Phillip might like to see and then the ones that Rebecca would enjoy. The final decision should be a compromise between the two.

8. Ask students to rewrite Phillip's TV schedule, for a delay of 20 minutes and or with all the programmes beginning 20 minutes earlier. The students can use Sheet 9.1 *TV Schedule* to support this activity.

***Student Notes***

# **Activity 9** What's the Time?

## Objectives

By working through this activity you will practise reading the time, using am and pm. You will also remind yourself of a range of time facts. You'll then work through a range of problems to show that you can tell and use time properly.

## Outcomes

At the end of this activity you will have:

- a storyboard where you have read the time on analogue clocks and calculated how long it will be until a given event begins
- worked through a storyboard time quiz
- a storyboard where you have worked through a range of time problems and recorded your answers
- a storyboard where you have planned the TV viewing for Phillip from a given TV schedule and time budget.

## Resources

To complete this activity you will need:

- Kar2ouche *Maths and Problem Solving*
- Sheet 9.1 *TV Schedule*
- TV schedule magazines

## Activities

### *Introduction*

1. Open the **Reading Times** storyboard and work carefully through it.

   
   
   to open the **Reading Times** storyboard.

2. Open the **Time Quiz** storyboard and try to answer as many questions as you can. If you don't get to the right answer straight away, have another go.

   
   
   to open the **Time Quiz** storyboard.

### *Development*

3. If you have not used Kar2ouche *Maths and Problem Solving* for some time, you might like to watch the **Meet the Family** storyboard again to remind yourself about the family and characters.

   
   
   to open the **Meet the Family** storyboard.

***Student Notes***

4. Now open the **Going to the Dentist** storyboard to find out what the Berry family are up to now.

   click here to open the **Going to the Dentist** storyboard.

5. Phillip and his family run into a few problems with things being late on their afternoon at the dentist. Open the **Waiting for the Dentist** storyboard and work through the problems to see if Phillip makes it back home in time for his favourite TV show.

   click here to open the **Waiting for the Dentist** storyboard.

6. When the family are safely back home, Phillip sits down to watch TV for the evening. You need to help him plan his evening's viewing. Open the **TV Schedule** storyboard and work through the questions.

   click here to open the **TV Schedule** storyboard.

### *Plenary*

7. Your teacher will ask you to show what you have done during the lesson. You might need to print out your TV schedule for Phillip, but ask before doing so.

### *Extension/Homework*

8. You will need an old TV schedule magazine. Your job is to plan what you think Phillip and Rebecca might **both** like to watch one evening. Your teacher will tell you how long the two children will be allowed to watch TV that evening so that you can get planning. Remember to think about both children when you select the programmes. Open a new storyboard to show your choices.
9. In the **TV Schedule** storyboard, you planned Phillip's TV for an evening. Can you rewrite this as if all the programmes were delayed for 20 minutes? What time would all the programmes start if they began 20 minutes earlier? Your teacher may give you Sheet 9.1 *TV Schedule* to help you to do this activity.

***Sheet 9.1***

# TV Schedule

This is the TV schedule that Phillip is choosing from tonight.

| | | |
|---|---|---|
| 3.45pm Super Turtles (cartoon) | | |
| 4.15pm Captain Crush (cartoon) | | |
| 4.45pm School Sport challenge (kids' sports show) | | |
| 5.00pm Newsround | | |
| 5.35pm Pop Superstars | | |
| 6.00pm News and Sport | | |
| 6.45pm Local News | | |
| 7.00pm The Planets (outer space serial) | | |
| 7.30pm Kit Kar Wars (racing robotic cars) | | |
| 8.00pm Paradise Street (soap opera) | | |

Can you rewrite the schedule so that the programmes are aired

- 20 minutes later
- 20 minutes earlier?

**Teacher Notes**

# **Activity 10** Ready to Go?

| | |
|---|---|
| ***Key Stage/Year*** | Key Stage 2/Year 4 |
| ***Group Organisation*** | Mostly paired work, but if there are computers available, some sections could be done individually. |
| ***Suggested Timing*** | 1-2 sessions |

## Overview of Task

The students help the Berry family pack for the trip to Washington. They help the family find out what the temperature will be in Washington whilst they are over there by reading different thermometers. They then help Phillip to pack his suitcase. He needs help weighing the items and making choices in order to stay within his weight limit.

## Objectives

**All students will:** read marked scales on thermometers and weighing scales and solve word problems involving numbers in real life situations.

**Most students will:** record estimates and readings from scales to a suitable degree of accuracy. They will also choose and use appropriate number operations to solve several-step word problems.

**Some students will:** recognise negative numbers in context, on a temperature scale, and suggest suitable units and measuring equipment to estimate or measure mass.

## Curriculum References

***Key Stage 2 Mathematics***

**Solving Numerical Problems 4a** choose, use and combine any of the four number operations to solve word problems involving reading scales in 'real life'; **4b** choose and use an appropriate way to calculate and explain their methods and reasoning; **4c** estimate answers by approximating and checking that their results are reasonable by thinking about the context of the problem, and where necessary checking accuracy.

***National Numeracy Strategy***

### Calculations

Pencil and paper procedures (+ and –) (p.48-51)

- Use informal pencil and paper methods to support, record or explain additions/subtractions

### Solving Problems

Making decisions (p.74-74)

- Choose and use appropriate number operations and appropriate ways of calculating (mental, mental with jottings, pencil and paper) to solve problems.
  (For examples of problems see pages 78, 82-89, 100.) (p.74)

Problems involving 'real life', money and measures (p.82-89)

- Use all four operations to solve word problems involving numbers in 'real life', money and measures (including time), using one or more steps, including converting pounds to pence and metres to centimetres and vice versa. (p.82-89)

### Measures, Shape and Space

Measures (p.90-101)

- Record estimates and readings from scales to a suitable degree of accuracy. (p.92,94)
- Use, read and write the vocabulary related to time.
  Estimate/check times using seconds, minutes, hours.
- Read the time from an analogue clock to the nearest minute, and from a 12-hour digital clock.
- Use am and pm and the notation 9:53.

## Outcomes

By the end of this activity students will have:

- a storyboard where they have read the scale accurately on three different temperature scales and answered further problem questions
- a storyboard in which they have selected Phillip's clothing for his holiday so as to keep within a weight limit.

## Resources

Kar2ouche *Maths and Problem Solving*

- **Meet the Family** storyboard
- **Time to Pack** storyboard
- **Temperature** storyboard
- **Packing** storyboard

Sheet 10.1 *Backpack*

Weighing scales

Thermometer

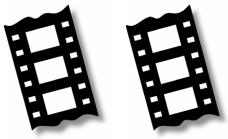
**Key words/phrases:** unit, scale, measurement, metre, centimetre, kilogram, gram, temperature, thermometer, average, maximum, minimum, line graph

## Activities

### *Introduction*

1. Talk to your class about all the different kinds of scales they may encounter in various places, for instance temperature scales and weight scales. Explain how reading them can be different as not all scales and thermometers look the same. Show the students an unmarked number line or scale and help them to work out how to mark various points on it.

### *Development*



2. If it is some time since the students have worked with this software, they might like to watch the **Meet the Family** storyboard again to remind themselves all about Phillip, his family and friends.
3. Next the students need to open the **Time to Pack** storyboard and watch carefully. This will establish the context for the tasks in this activity. This storyboard opens with Mum making a list of all the things they still have to get and have to do before they set off to meet up with the Gomez family in Washington.

**Content of Time to Pack storyboard**

**Frame 1:** Mum: I need to make a list of all the things we still need to get for our holiday. We still need insect repellent and sun cream.

**Frame 2:** Mum: I wonder if those new suitcases will hold everything we want to take with us.

**Frame 3:** Mum in the hallway about to shout upstairs. Mum: PHILLIP! BECCA!

**Frame 4:** Mum going into Phillip's room and giving him a suitcase. Mum: I want you to start packing this case – you'll have to share it. Phillip and Rebecca: MUM!

**Frame 5:** Mum: No moaning! Phillip, please go first.

**Frame 6:** Phillip by the suitcase. Phillip: I didn't realise we were sharing. I might not fit everything in that I wanted to take.

**Frame 7:** Phillip: Will it be really hot, Mum? Mum: I'm not sure, Phillip. We really ought to check.

**Frame 8:** Downstairs in the study by the computer. Mum: Let's see if we can find a website that will tell us the temperature in Washington at this time of year.

4. How students work through the following two storyboards will depend on the time available and the ability of the group. If time is limited, students could be divided into pairs and each pair given one storyboard to work through and then time allocated for everyone to feed back in the plenary.

**Content of Temperature storyboard**

Students look at a temperature comparison table on their computer and locate the average temperature in the Washington, DC region for the month of August.

**Frame 1:** Average temperature graph for Washington throughout the year. This is a line graph with maximum temperatures in red and minimum in blue. (max temperature August **30°c**)

**Frame 2:** Three thermometers – February (**-2°c**), April (**6°c**) and June (**27°c**). Students are instructed to read the thermometers and then type the temperature shown on each thermometer into the text box below.

**Frame 3:** Thermometers for August (**28°c**), October (**18°c**) and December (**0°c**). Again, the students read them and type in their readings as above.

**Final frame:** Caption window - Which month is the hottest? (**July**) Which is the coldest, (**February**) what is the difference between these two? (**33°c**) There is space in the frame for the students to enter their answers.

**Content of Packing storyboard**

Phillip in his bedroom wondering what he should take with him now that he knows just how warm it is going to be whilst they are away. There is space in each frame for the students to enter in their answers.

**Frame 1:** Phillip leaning over his case. Caption window – The weight limit for a suitcase is 32kg. Phillip has half that amount. What is his personal weight limit? (**16Kg**)

**Frame 2:** A range of labelled items of clothing. The labels state the weight of each item. Students are instructed to select what Phillip might choose to take and have to calculate the weight. They drag the chosen items into the suitcase.

**Frame 3:** A range of fun items with their weights. Students are instructed to calculate what weight Phillip has left and enter it into the text box, then select the fun items he could take with him.

***Plenary***

5. If students have been working on two different storyboards, they need to share what they have done. As they will have entered their answers on screen, the best way to view their work is by gathering the group around a large screen/data projector. If this is not going to be possible, then you will need to ask the group to print out their completed storyboards. Discuss the problems involved in reading different scales and what the issues could be if they are not read correctly.

***Extension/ Homework***

6. Students have to pack a bag for a sleepover. First they must decide what they want to take with them, then make a list of all items that are essential and other items they would like to take but could manage without. Next give them a weight restriction. The students could use copies of Sheet 10.1 *Backpack* to support their planning. Tell students that they will be judged according to who comes closest to the weight stipulated. They could then weigh all items at home (or at school if that is easier), and then they add the weights to their lists. When they have finished, look at everyone's work and see who came closest to the actual weight.

***Student Notes***

# **Activity 10** Ready to Go?

## Objectives

In this activity you will learn how to read different types of scales. Using the readings, you will help the Berry family to find out what the temperature will be when they are away. You will also help Phillip with his packing by totalling the weight of the items he wants to take with him and checking that he keeps within his weight limit.

## Outcomes

At the end of this activity you will have:

- a storyboard where you have read the scale accurately on three different temperature scales and answered further problem questions
- a storyboard in which you have selected Phillip's clothing for his holiday so as to keep within a weight limit.

## Resources

To complete this activity you will need:

- Kar2ouche *Maths and Problem Solving*
- Sheet 10.1 *Backpack*

## Activities

### *Introduction*

1. If you haven't done it before, your teacher will show you how to read different scales including ones that show weight and others that show temperature.

### *Development*

2. If you have not used Kar2ouche *Maths and Problem Solving* for a while, open the **Meet the Family** storyboard and remind yourself about Phillip Berry and his family.

   click here to open the **Meet the Family** storyboard.

3. Now open and watch the **Time to Pack** storyboard. This will show you what problems the family need to solve.

   click here to open the **Time to Pack** storyboard.

4. The next storyboard is called **Temperature** and is all about reading different thermometers to find out how warm it will be when the Berry family go to Washington, DC.

   click here to open the **Temperature** storyboard.

***Student Notes***

5. Phillip is almost ready to pack for Washington, but he hasn't realised that he will need to share a suitcase with his sister! Open the **Packing** storyboard and help him to stick to his weight limit.

   
   
   to open the **Packing** storyboard.

### *Plenary*

6. Soon you will be sharing your storyboard work with the rest of your group. If you don't have a data projector, you might need to print your storyboards in order to share your answers. Check with your teacher first. Think about any problems you might have had when reading all the different scales. Did other students in your group have similar problems?

### *Extension/Homework*

7. You are going to pack a bag for a sleepover. First you must decide what you want to take with you and make a list. Now divide that list into the things that you need and those that you could consider optional or a luxury. Your teacher will tell you what the maximum weight of the bag can be. The best packed bag will be the one that is closest to this limit. Weigh all the items on your list and total this amount. How close is it to the weight limit your teacher gave you? Your teacher may give you Sheet 10.1 *Backpack* to help you with this activity.

*Sheet 10.1*

# Backpack

Ask your teacher what the weight limit for your backpack is and begin planning for your sleepover. Remember to select your items carefully and try to get as close as you can to the set weight limit.

| What I would **like** to take: | |
|---|---|
| Essential items | Luxury items |
| | |
| Weight limit set by my teacher: | |
| Weight of my chosen items | |
| **Item** | **Weight** |
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# Appendices

# Appendix A
## Extracts from the Text/Audio Palette

***Meet the Family (Activity 1 and following)***

| | |
|---|---|
| Phillip: | Hi! I'm Phillip Berry. It's really great to meet you. I'm 10. I live near London. |
| Phillip: | I really like sport, particularly football and swimming. |
| Phillip: | Come and meet the rest of my family. |
| Phillip: | This is Mum. She's a history teacher and she's really into computers. Say hi, Mum. |
| Mum: | Hello! |
| Phillip: | Let's go and see Dad and Becca. They're upstairs. |
| Phillip: | Here they are in Becca's room. Say hi, guys! |
| Rebecca and Dad: | Hello! |
| Phillip: | Dad works for a big pharmaceutical company that is based in the USA, which means he travels there quite a lot – don't you, Dad? |
| Dad: | That's right, son. That's how I got you and Juan writing to each other, isn't it? |
| Phillip: | Yes, I was just coming to that! I have a penfriend called Juan. We write and email one another all the time. Come and see my photograph of him. |
| Phillip: | Here they all are, the Gomez family: Juan, his mum and grandma and his little sister Nayda. They live near Washington in the USA. I'd love to meet up with Juan one day. |
| Rebecca: | Phillip, you've forgotten me! |
| Phillip: | Oh yes, I guess I should introduce you too. Come in. |
| Phillip: | And this is my kid sister Rebecca. |
| Rebecca: | Becca! |
| Phillip: | Sorry! Becca's eight and she's kind of OK. |
| Rebecca: | Thanks a lot! |
| Phillip: | So that's my family. It was nice to meet you – see you soon! |

### *Going to the Post Office (Activity 1)*

Phillip: Mum, it's Juan's birthday at the end of this month. When should we send his present?

Mum: I think we should post it today to allow plenty of time for it to get to America. I've got a letter I want to post to Mrs Gomez too.

Rebecca: Can you send my birthday thankyou letters at the same time?

Mum: We should be able to get to the post office before lunch if we go now. Have you got everything, Phillip?

Phillip: Yes, let's get going.

### *Making Money (Activity 2)*

Phillip: Do you think we'll ever get to visit Juan and his family in America?

Mum: Yes, I hope so, but it'll cost a lot of money. We'll have to save really hard over the next few months.

Phillip: We'll help out, Mum. We could do jobs for people!

Mum: That's really thoughtful of you, but why don't you just save up to earn your spending money for the trip?

Phillip: How can we do that?

Mum: Well, the school has a jumble sale when it wants to raise money, so why don't you think about the things you might do?

Rebecca: We could do jobs for people like washing cars and helping around the house.

### *Car Wash (Activity 2)*

Rebecca: Let's get started on washing cars, Phillip. What do we need to do to get started?

Phillip: We need some stuff to clean the cars with. Sponges and car cleaner first of all, and then we'll have to find some buckets.

Rebecca: Sponges are 50p each, car cleaner is £1.40. We'll borrow the money from Dad. We'll probably need four sponges and one bottle of car cleaner.

Rebecca: How much shall we charge?

Phillip: How about £4 for a car, and maybe £2 for a motorbike?

Rebecca: Good idea. Let's get started!

### *Jobs (Activity 2)*

Rebecca: I've washed up four times this week, vacuumed two rooms, tidied my room and hung out the washing.

Phillip: I've bathed the dog, laid the table four times and tidied my bedroom.

### *Day Out (Activity 3)*

Phillip: I've just had an email from Juan. He went to see some ice-hockey last night. That sounds such fun. Can we do something really fun today?

Rebecca: Yes! Can we go ice skating?

Dad: Well it's such a lovely day, why don't we drive to the beach? You could email Juan tonight and tell him about it.

Phillip: I like that idea. Can we make stuff to put into the picnic hamper?

Dad: Sure, let's get busy!

### *Making a Fruit Drink (Activity 3)*

Rebecca: Dad, can we make some fruit cocktail drink to take on the picnic?

Dad: That's a good idea. Let's go into the kitchen and find a recipe.

Rebecca: I know how to make it, we made some at Brownies last year. I'll get everything out ready.

Dad: Show me what you've done so far.

Rebecca: So far, I've put in 200ml of apple juice, 150ml of orange juice and 100ml of lemon juice. Just the lemonade to go.

Dad: How much lemonade do you need to add so that the drink fills the 1-litre container?

Narrator: Type the amount that Rebecca needs to add in the text box.

Phillip: I'm going to make some fruit cocktail too.

Narrator: Phillip has the choice of mixing apple juice, orange juice, lemon juice, lemonade, fizzy water and/or lime juice. Choose which ingredients you want him to use. Say how many millilitres of each he needs to add together to make up 1 litre of drink.

Narrator: A cup holds 100ml of drink. What fraction of the 1-litre container is that? Fill in the text box.

Narrator: If Dad pours out $\frac{3}{10}$ of the drink, how many cups has he filled? Delete the extra cups.

### *Making Biscuits (Activity 3)*

| | |
|---|---|
| Mum: | We could make some biscuits to take on the picnic too. What flavour do you want to make? |
| Rebecca and Phillip: | Chocolate! |
| Mum: | OK, let's go into the kitchen and find a recipe. |
| Rebecca: | Here's one. |
| Mum: | Read out the ingredients we need. |
| Rebecca: | Flour – 250g; Butter – 200g; Sugar – 250g; Chocolate – 75g. |
| Mum: | How many biscuits does the recipe make? |
| Rebecca: | 24. |
| Phillip: | If Becca and I share all the biscuits, how many will we get each? |
| Rebecca: | That's a bit greedy. What about if we shared them among everyone, how many would we get then? |

### *Tallest and Heaviest (Activity 4)*

| | |
|---|---|
| Rebecca: | Mum, these jeans are too short. I'm going to need some new ones before we go on holiday. |
| Mum: | Goodness me, you've certainly grown. |
| Rebecca: | Do you think I'm as tall as Phillip now? |
| Mum: | You should measure yourselves and find out. |
| Phillip: | There's no way you're as tall as me, Becca. I'm nearly as tall as Dad. |
| Rebecca: | Well let's find out shall we? |
| Narrator: | Work out how tall Rebecca is and write her height in the text box next to the chart. |
| Narrator: | Work out how tall Phillip is and write his height in the text box next to the chart. |
| Narrator: | Work out how tall Mum is and write her height in the text box next to the chart. |
| Narrator: | Work out how tall Dad is and write his height in the text box next to the chart. |
| Mum: | I'd like to see if I've lost any weight on my diet. I used to weigh 67kg. |
| Rebecca: | Why don't we all weigh ourselves too? |
| Narrator: | How heavy is Mum? |
| Narrator: | How heavy is Dad? |
| Narrator: | How heavy is Phillip? |
| Narrator: | How heavy is Rebecca? |

Narrator: Record your answers on the *Who is the Tallest and Heaviest?* sheet.

### *School Timetable (Activity 5)*

Phillip: Dad, Dad! Come and look at this!

Dad: OK Phil, calm down. What have you got?

Phillip: Juan has emailed me his school timetable. It's really cool to see all the different stuff he does. Can I scan my timetable and send it to him? Can we do it now, can we?!

Dad: It certainly is very different from your school day, Phillip. Look how early they begin their lessons in the morning.

Phillip: But they finish earlier too, then they do clubs and sport and fun stuff like that.

Dad: Go and find your school bag and I'll help you to use the scanner.

Phillip: I've had a better idea. I think my timetable is on the school website. We could download it from there.

Dad: I didn't know that! What a good idea.

Phillip: Let's do it now.

### *Day Trip (Activity 5)*

Mum: Are you two ready? The bus is at 10.35.

Phillip: I am.

Rebecca: Hang on! I need to fetch my purse.

Mum: That didn't take long. It's only five past eleven. Which shop do you want to go to first?

Phillip: I'm not going shopping with you two! Can't I meet you somewhere?

Narrator: How long did the bus journey take? Write the time in the text box.

Mum: OK Phillip, but you need to be very sensible. Shall we meet up for lunch at the new pizza place you wanted to go to?

Phillip: Great. What time?

Mum: Let's meet at quarter to one. What time does your watch say?

Phillip: 11.20.

Narrator: How long have they got to shop? Write your answer in the text box.

Phillip: Looks like I'm 10 minutes early.

Narrator: What time does Phillip arrive? Write your answer in the text box.

Rebecca: Hi, Phillip! Sorry we're late.

Phillip: Yes, 20 minutes late!

Narrator: What time do Mum and Rebecca arrive? How long has Phillip had to wait? Write your answers in the text boxes.

Rebecca: What time does the film start?

Phillip: It starts at 2.00 and lasts 85 minutes.

Narrator: The family was planning to catch the quarter-to-four bus home. Will they make it? Write your answer in the text box.

Phillip: Look at all this traffic!

Rebecca: We'll never get home!

Narrator: The journey takes an extra 20 minutes due to the bad traffic. How long does it take them to get home? How long have they spent on the bus in total (to and from town)?

### *Telephone Call (Activity 6)*

Mum: Come quickly, Phillip! Juan is on the phone from America!

Juan: Hey, Phillip!

Phillip: Hello Juan! How are you?

Juan: I'm good. My mom told me that you're really going to come over and see us?

Phillip: Yes, that's right. We talked about it a couple of weeks ago. We're all really excited.

Juan: That's so cool. When will you be coming?

Phillip: Well we haven't arranged anything yet. I'll talk to Mum and Dad and find out when.

Juan: That'll be good. I want to get stuff organised for when you get here; there's so much I want to show you.

Phillip: Well, I'll call you as soon as I have any news. Great talking to you Juan. Bye!

Juan: Bye, Phillip!

Phillip: MUM, can we talk about going to America!

### *Money Questions (Activity 7)*

Rebecca: What is 5p times 4?

Phillip: Multiply 4p by 9.

Rebecca: If I had 35p and I lost 15p what would I have left?

Phillip: How many 5p coins make 25p?

Rebecca: I have 7p. How much more do I need to make 20p?

Phillip: How many piles of four pennies are in 16p?

Rebecca: I have 23p, my friend has 16p. What do we have combined?

Phillip: How many 10ps in £1?

Rebecca: I had 55p. I spent 21p. What do I have left now?

Phillip: How many times 5p coins in 20p?

Rebecca: 18p subtract 7p. What's the answer?

Phillip: I have 4p. How much more do I need to make 19p?

Rebecca: How much is 4 times 5p, 4 times 15p, 4 times 20p?

Phillip: How many times can I take 3p from 27p?

Rebecca: Multiply 7p by 3? What's the answer?

Phillip: What do I add to 8p to make 19p?

Rebecca: Write two amounts which make 17p.

Phillip: How many 2p coins make 20p, 40p, 50p?

Rebecca: How much less than 13p is 6p?

### *Getting Ready (Activity 7)*

Mum: Did you get a reply to the email you sent to Juan last night?

Phillip: Yes, he's real excited; I mean really excited! It'll be so good to meet him at last.

Mum: That's good. Now let me just look at the calendar. Gosh, we've only got just over a month before we go.

Mum: We should think about getting things ready. I'm sure you kids have grown out of all your last summer's clothes.

Rebecca: Well, my jeans are too short! Great, I love new stuff, it means we'll have to go shopping!

Phillip: Hmmm.

### *Sports Day (Activity 8)*

Phillip: Hey Mum, it's sports day next week. I've got loads to do. I'm the class sports representative. I have to help Mrs Gruber organise it all.

Mum: That's great, Phillip. I'm sure you'll be a great help to her.

Mum: Why don't you tell Juan all about it? It's about time you contacted him again. Do they have sports days in America?

Phillip: I'm not sure. I'll go and email him now.

### *Swimming (Activity 8)*

Narrator: The school sports day includes a swimming gala. Phillip is a very good swimmer and really enjoys the different events. He arrives early at the swimming pool on the morning of the gala and talks to his teacher.

Phillip: This is a really big swimming pool. How long is it?

Teacher: It's a 25-metre pool: a good distance to swim.

Phillip: Wow, that always sounds like a long way to race. How far is the pool all the way around?

Teacher: I'm not sure, but you could work it out by calculating the perimeter. The width of the pool is 12 metres.

Narrator: Show Phillip how to work out the perimeter of the pool on your answer sheet. There are several ways to do this. Try to show more than one way.

Narrator: Phillip looks at the large electronic scoreboard on the wall at the side of the pool.

Phillip: Gosh, will our names appear on that board?

Teacher: Yes, and the race you're in.

Phillip: It's so big. I'd like to know how big it is, but I can't reach to measure it!

Teacher: You don't need to reach it. It's a square board. You only need to reach to measure the bottom length just down there.

Narrator: Phillip finds that the length of the bottom is 4 metres. Show the perimeter of the whole thing. How do you know this? Write your method and answer on your sheet.

### *Reading Times (Activity 9)*

Person: I hope the bus is on time today. It should leave at 11.25am.

Narrator: How long until the bus is supposed to leave?

Person: You've got 15 minutes left to finish.

Narrator: What time will you finish?

Person: I was so ready for my 20-minute break!

Narrator: What time will their break finish?

Child: Can I go and play with Paul, please?

Parent: Yes, but be back in 40 minutes for your tea.

Narrator: What time does the child have to be back?

Child: How long until I have to go to bed, Dad?

Dad: You've got 40 minutes.

Narrator: What time does he have to go to bed?

Narrator: How long until the ten o'clock news begins?

### *Going to the Dentist (Activity 9)*

Dad: Come on! We'll be late if you don't get a move on.

Mum: Yes, HURRY! Remember, we've got a bus to catch.

Dad: I'll see you all later. I hope it doesn't take too long for the garage to fix my car.

Mum: Here's the bus.

Phillip: What time is our appointment?

Mum: Yours is at 2 o'clock.

Receptionist: I'm sorry, Mrs Berry, but the dentist is running about 20 minutes late.

Phillip: Mum, I need us to be back home for quarter past four! That's when my favourite TV programme begins!

***Time to Pack (Activity 10)***

Mum: I need to make a list of all the things we still need to get for our holiday. We still need insect repellent and sun cream.

Mum: I wonder if those new suitcases will hold everything we want to take with us.

Mum: PHILLIP! BECCA!

Mum: I want you to start packing this case – you'll have to share it.

Phillip and Rebecca: MUM!

Mum: No moaning! Phillip, please go first.

Phillip: I didn't realise we were sharing. I might not fit everything in that I wanted to take.

Phillip: Will it be really hot, Mum?

Mum: I'm not sure, Phillip. We really ought to check.

Mum: Let's see if we can find a website that will tell us the temperature in Washington at this time of year.

# Appendix B
## Jottings and Working Out

Use this sheet whenever you want to jot things down, do sums or organise yourself so that you can explain how you got to a particular answer.

# Appendix C
## Using Kar2ouche with Special Needs

It may be a truism to say that all children have special educational needs, but it does mean that teachers are always considering ways of differentiating the lessons that they teach in order to meet the requirements of individual students. A totally flexible learning and teaching tool, Kar2ouche is easily adapted to these needs so that the teacher and/or learning support assistant can create lessons that appeal to the full ability range from the least to the most able.

However, looking at the more widely used definition of special needs as referring to those students who experience some kind of sensory or learning difficulty, on average 20% of students in comprehensive schools fall into this category. A number of studies have shown that computers can enhance the learning experience of these children.

> 'From 1988-90 the Palm Project explored the effects of computers on pupils' autonomy in learning. The project found that not only were they more autonomous but also more motivated.'
>
> Glendon Ben Franklin in Leask, M Ed. (2001) *Issues in Teaching Using ICT*, Routledge.

In particular, multimedia products, such as Kar2ouche, appeal to a wide range of learning styles and have the advantage of being able to reinforce learning in a multi-sensory way through the use of visual and auditory stimuli. The fact that Kar2ouche enables students to create storyboards, animations and publications, plus manipulate and interpret text, also appeals to those with a preference for a kinaesthetic approach to learning.

Children with special needs are often prevented from functioning effectively in lessons because much of the work required is based on reading and writing, skills that are often underdeveloped. In Kar2ouche all of the text is provided with a soundfile so that students can access information even if their reading skills are impaired. Listening to increasingly complex texts extends a student's vocabulary whilst also increasing his or her attention span. By following the text as they listen, students begin to recognise words and are provided with a real context for their learning.

In addition, Kar2ouche enables children to record their own voices, thus providing an alternative to writing. This provides immediate gratification and the ability to communicate with their peers in a way that increases their confidence. 'Nothing motivates children with

special needs more than success, especially when their peer group can see that success is demonstrated on an equal basis without allowances being made.' (Angela McGlashon in Gamble, N and Easingwood, N (2000) *ICT and Literacy*, Continuum) Once confidence has been built, the speech and thought bubbles offer the opportunity for students to write in small bite-size chunks. This can be increased gradually by requiring students to produce a paragraph in the caption window and subsequently maybe use the writing frames and scaffolds provided in the education support packs that accompany the software.

The soundfiles and recording facility can therefore be seen to enable the learner to develop greater independence, and this encourages them to continue with tasks that may once have been beyond them. Using Kar2ouche makes a range of curriculum areas far more accessible to non-readers and also to children whose first language is not English. These children often find reading the language far more difficult than speaking it.

As well as children with learning difficulties, Kar2ouche enhances the learning of children with behavioural problems, such as attention deficiency syndrome. In trials, these students found the multi-sensory and creative approach motivating, non-threatening and rewarding. It has been shown in a range of research that students who experience difficulties interacting socially often find using computers less intimidating or confusing. However, ideal for pair or small group work, Kar2ouche can be used by the teacher to encourage collaborative learning, thereby supporting these students as they begin to develop the ability to express themselves in a social situation. Having rehearsed ideas in a small group, they are then more confident when required to present their ideas to the class or an adult.

For students with visual impairment, the teacher can go into the password-protected area to increase the size of the font. The soundfiles also help these children. Likewise, the brief sound-clips support dyslexic children, many of whom find processing large amounts of information in a single unit difficult. They can also control the pace of the reading and repeat it as necessary, thus allowing them to consolidate learning. For those whose hearing is impaired, the combination of text and exciting visual material is motivating and, by being able to attach pre-recorded soundfiles, students are provided with an effective means to communicate with their hearing peers. The record and playback facility also allows children with less severe hearing problems to rehearse their enunciation in a safe environment before sharing with others.

Every effort has been made to make Kar2ouche a fully flexible learning and teaching tool, to enable children of all abilities to have fun whilst engaging in activities that challenge them appropriately as they develop skills, knowledge and understanding in a range of curriculum subjects. To this end we are continuing to listen to teachers, support research projects and use findings to develop additional features that will help to move learning forward.