

## SPRINGBOARD 6 LESSON 25 USING A CALCULATOR TO SOLVE PROBLEMS 3

### TOTAL TIME



#### Objectives:

- Use a calculator to solve problems choosing the appropriate operation
- Interpret the meaning of a calculator display in the context of a word problem

#### Vocabulary:

- unit
- decimal number
- litres

#### By the end of the lesson the children should be able to:

- select the required sequence of operations when using a calculator to solve a problem;
- interpret the calculator display correctly in the context of the problem.

#### Resources:

- calculators
- OHP calculator
- Activity Sheet 25.1
- whiteboards and pens

### ORAL AND MENTAL STARTER



Write on the board  $339 \div 12$ .

#### Q: What is $339 \div 12$ ?

Use the OHP calculator to show that the answer on the display is 28.25.

Present the following problem.

339 goldfish are to be divided equally between 12 ponds. How many goldfish will be in each pond?

Write on the board 28.25. Explain that this answer means that 28 fish would be in each pond with some fish left over. Write this information below 28.25 as shown below:

28.25  
28 goldfish in each pond . some goldfish left over

Ask the children to work in pairs to think of a word problem involving a quantity such as sweets, stamps, etc. for which this calculation could be the answer. For each question offered, write the answer under the number 28.25 as for the example above.

28.25

28 goldfish in each pond . some goldfish left over  
 28 merit marks for each child . some merit marks left over  
 28 eggs in each basket . some eggs left over

**Q: If the problem was £339 divided between 12 people what would the answer 28.25 represent?**

Confirm that because we are dividing money the two numbers after the decimal point represent pence and the answer 28.25 means that the 12 people will each get £28.25.

### MAIN TEACHING ACTIVITY



On the board write  $17 + 365 \times 11$ .

**Q: How do we do this on a calculator?**

Establish that children can use the calculator correctly to work this out. Write  $365 \times 11 + 17$  on the board and confirm that this represents the same calculation. Explain why it is safer to work out this calculation on a calculator.

Explain that the answer to this calculation is the age of a child in days who is 11 years and 17 days old. There are 365 days in 1 year (except leap years which we will ignore).

**Q: What calculation would we carry out to calculate the age in days of a child who is 13 years and 27 days?**

Get the children to record the calculation on their whiteboards. Establish that the calculation would be  $365 \times 13 + 27$ . Confirm that the answer is in days.

**Q: What would the calculation be for a child who is 4 days away from their 12th birthday?**

Get the children to discuss the calculation in pairs. Share the different methods presented by the children.

Give out Activity Sheet 25.1.

Ask the children to read the first question.

**Q: About how many years old do you think Mary is?**

Discuss the children's estimates and explanations. Establish why Mary must be less than 10 years old.

**Q: What calculation should we do to work out how old Mary is in years and days?**

Remind the children that there are 365 days in each year. Establish that the required calculation would be  $2000 \div 365$  and get the children to record the calculation and the calculator display in the 'Show your method' box.

**Q: What does the answer 5.47945205 mean?**

Explain that this answer tells us how old Mary is in years.

**Q: Which number in the calculation tells us Mary's age in whole years?**

Establish that the children understand that the number 5 represents the number of years and that the decimal represents part of a year.

**Q: Is Mary closer to 5 years of age or 6 years of age?**

Establish that the decimal part of the number is less than one half so Mary is closer to 5 years of age.

**Q: How can we work out how many days the decimal part of the number represents?**

Take the children's responses and discuss their approaches.

**Q: How many days old would Mary be if she was exactly 5 years old?**

Establish that the answer is 1825 days and that the calculation that gives this answer is  $365 \times 5$ .

Get the children to record this information in the 'Show your method' box. Discuss what the children have recorded and remind them that Mary is 2000 days old.

**Q: How can we work out how old Mary is in years and days?**

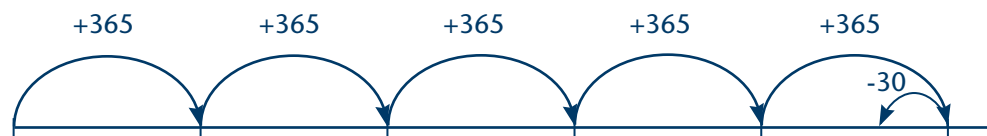
Agree that Mary is 5 years and 175 days old and that we calculate the 175 by subtracting 1825 from 2000.

Say that there is another way to work out the number of days. On the OHP calculator subtract 5 from the display to get 0.47945205. Multiply this answer by 365. Explain that this answer (175) is the number of days left over when 2000 is divided by 365.

Ask the children to read the second word problem. Invite them to ask questions about the problem in order to develop their understanding. For example, they may need to ask how many days there are in April.

**Q: Can we draw a diagram to help us to work out how many days old David is?**

Suggest that a number time line might give a good visual image of the problem. Invite a child to draw one on the board and get the children to draw their own line in the 'Show your method' box.



**Q: What calculation should we do to answer this question?**

Get the children to record their calculation in the 'Show your method' box. Establish that the required calculation would be  $365 \times 5 - 30$ . Relate this to the method shown on the number line. Ask the children to do this calculation on their calculators.

## PLENARY



Remind children of the goldfish problem in the oral and mental starter.

Explain that the decimal part of the answer is telling us that we would have to divide a number of goldfish less than 12 between the 12 ponds.

**Q: How can we work out the number of goldfish left over?**

Explain that we can put 28 goldfish in each of the 12 ponds.

**Q: If we put 28 goldfish in each of the 12 ponds how many goldfish is that?**

Get the children to work out the answer on their calculators and confirm that the answer is 336 goldfish.

**Q: How many goldfish are left over?**

Agree that the answer is  $339 - 336 = 3$  goldfish.

Present the following problem:

246 goldfish are to be put into 11 ponds. How many goldfish will be in each pond?

**Q: What calculation should we do to answer this question?**

Establish that the required calculation will be  $246 \div 11$ . Get the children to do this calculation on their calculators and confirm that the answer is 22.36363636.

**Q: What does the 22 mean in the answer?**

Establish that this means we could put 22 goldfish in each pond.

**Q: How can we calculate how many goldfish will be left over?**

Discuss the children's responses and suggestions.

Confirm that we are placing 22 goldfish in 11 ponds. This means that there are  $246 - 22 \times 11$  goldfish left over.

Ask children to work this calculation out on their calculators. Ensure that children can do this correctly.

**Remember:**

- The decimal part of a number is less than 1.
- The remainder from a division calculation carried out on a calculator is expressed as a decimal.
- For calculations such as  $246 - 22 \times 11$  it is safer to do the calculation in two steps when using a calculator.

**LESSON 25 RELATED TEST QUESTION  
2002 TEST B (CALCULATOR PAPER)**

11



185 people go to the school concert.

They pay **£1.35** each.

How much ticket money is collected?

£

Programmes cost **15p** each.

Selling programmes raises **£12.30**

How many **programmes** are sold?

Show your method. You may get a mark.

**LESSON 25 RELATED TEST QUESTION  
2002 TEST A (NON-CALCULATOR PAPER)**

18



6 green apples for 75p



10 red apples for 90p

Jason bought some bags of green apples and some bags of red apples.

He spent **£4.20**

How many **bags** of each type of apple did he buy?

Show your working. You may get a mark.

Nika and Hassan bought some bags of apples.

Nika says,

*'I bought more apples than Hassan, but I spent less money.'*

Explain how this is possible.

**GUIDANCE FROM MARK SCHEME**

Question	Requirement	Additional Guidance
11a	£249.75	Accept £249.75p <b>OR</b> £249 75 <b>Do not accept</b> £24975p <b>OR</b> £24975
11b	Award <b>TWO</b> marks for the correct answer of 82 If the answer is incorrect, award <b>ONE</b> mark for evidence of an appropriate method, e.g. 1230 ÷ 15 <b>OR</b> 12.30 ÷ 0.15	Accept for <b>ONE</b> mark £82 <b>OR</b> 82p as evidence of an appropriate method. <b>Do not accept</b> 12.30 ÷ 15 as evidence of an appropriate method. Answers need not be obtained for the award of the mark.

Question	Requirement	Additional Guidance
18a	award <b>TWO</b> marks for correct answer as shown: <b>2</b> bags of green apples <b>3</b> bags of red apples	<b>Both</b> numbers must be correct for the award of marks.
	If the answer is incorrect, award <b>ONE</b> mark for evidence of appropriate working, e.g. Listing of cost of apples: 75 90 150 180 225 270	Calculation must be performed for the award of <b>ONE</b> mark.
18b	An explanation that shows how it is possible to buy more apples but spend less money, e.g. ■ 'Nika buys 2 bags of red apples, giving 20 apples for £1.80, and Hassan buys 3 bags of green apples, giving 18 apples for £2.25'.	<b>Do not accept</b> vague or arbitrary explanations, e.g. ■ 'She got bigger bags than he did'; ■ 'She bought a lot of small ones'. Ignore slight errors in arithmetic that do not contradict the explanation.

### ANALYSIS OF CHILDREN'S ANSWERS

- Some two-thirds of children working at level 3 answered part (a) of question 11 correctly. A significant proportion of children, however, lost the mark through inappropriate use of units, often recording the calculator-displayed number without taking account of the context. For part (b), very few children were awarded only the mark for method. A significant proportion of children incorrectly multiplied the given values together. The most commonly recorded method was a standard short or long division, as children interpreted 'show your method' as 'do not use a calculator'.
- A significant proportion of levels 3 and 4 children omitted question 18; only one-fifth of level 3 children were awarded the two marks for part (a). Those who answered it correctly often showed no working. Almost no children working at level 3 or 4 gave a credit-worthy explanation for part (b). Attempts at an explanation were generally about the bags of apples, not the quantity or cost of apples.

### IMPLICATIONS FOR PLANNING

- There should be planned teaching activities that involve children in interpreting their calculator displays to take account of the context of the problem.
- Children should be given questions that ask 'How much?' or 'How many?' and that require each of the four operations, not just multiplication.
- Children should be taught that using a calculator is not the method by which they solved the problem, but that their calculations were their methods of solution.
- In the main teaching activity, children should discuss their solutions, compare one another's explanations, and be asked to write a brief explanation that includes a calculation.