

Unit 8

Five daily lessons

Calculation, percentage, ratio and problem solving

*National
Numeracy Strategy*

Year 6

Summer term

Unit Objectives

Year 6

- **Multiply and divide decimals mentally by 10 or 100 and integers by 1000, and explain the effect.**
- **Understand percentage as the number of parts in every 100 and find simple percentages of whole-number quantities.**
- **Solve simple problems involving ratio and proportion.**

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This Unit Plan is designed to guide your teaching.

You will need to adapt it to meet the needs of your class.

Resources needed to teach this unit:

- Activity sheet 8.1
- OHT 8.1
- OHT 8.2
- OHT 8.3
- OHT 8.4
- Self-assessment sheet 8.1
- Self-assessment sheet 8.2
- Hundred grid
- OHP calculators
- Class set of calculators
- Centimetre squared paper

Year 5

Link Objectives

Year 7

- **Multiply and divide any positive integer up to 10 000 by 10 or 100 and understand the effect.**
- Begin to understand percentage as the number of parts in every 100 and find simple percentages of small whole-number quantities, e.g. 25% of £8.
- Solve simple problems using ideas of ratio and proportion ('one for every...' and one in every...').

(Key objectives in bold)

- Understand percentage as 'the number of parts per 100'. **Recognise the equivalence of percentages, fractions and decimals;** calculate simple percentages, and use percentages to compare simple proportions.
- Multiply and divide integers and decimals by 10, 100 and 1000 and explain the effect.
- Understand the relationship between ratio and proportion; use direct proportion in simple contexts: use ratio notation, reduce a ratio to its simplest form and divide a quantity into two parts in a given ratio; solve simple problems about ratio and proportion using informal strategies.

Planning sheet	Day One	Unit 8 <i>Calculation, percentage, ratio and problem solving</i>	Term: Summer	Year Group: 6	
Oral and Mental		Main Teaching		Plenary	
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/Focus Questions	
Multiply and divide decimals mentally by 10 and 100 and integers by 1000 and explain the effect.	<ul style="list-style-type: none">Write on the board: 100 large nails weigh 655 g.<div>Q What do 10 nails weigh?</div><p>Collect responses and discuss the children's methods. Establish that the answer is obtained by dividing the total weight by 10 and so the nails weigh 65.5 g.</p><div>Q What do 1000 nails weigh?</div><p>Establish that the answer is obtained by multiplying the total weight by 10 and so the nails weigh 6550 g or 6.55 kg.</p><div>Q What would 1 nail weigh?</div><p>Collect responses and confirm 1 nail weighs 6.55 g or 655 cg. Discuss the children's methods.</p>Repeat using different statements involving weight, capacity and length. Get the children to multiply and divide by 10, 100 and 1000 mentally.	<ul style="list-style-type: none">Solve simple problems involving ratio and proportion. <p>VOCABULARY digit sequence pattern</p> <p>RESOURCES Hundred grid</p>	<ul style="list-style-type: none">Explain that a computer prints the three digits of 123 one at a time. Write on the board the sequence: 1, 2, 3, 4, 5, 6... Say that a computer is programmed to print consecutive whole numbers. Up to 6, it will have printed 6 digits.<div>Q What numbers will the computer have printed in this sequence if 19 digits have been printed?</div><p>Collect answers and discuss strategies. Confirm all the numbers to 14 have been printed.</p><div>Q If the computer prints the numbers 1 to 30, how many digits have been printed?</div>Discuss the children's strategies. Encourage them not to list the numbers but to think of blocks of digits.<div>Q Which numbers in the sequence have only one digit?</div><p>Agree they are the numbers 1 to 9, a total of nine digits.</p><div>Q Which numbers in the sequence have two digits?</div><p>Agree they are the numbers 10 to 99.</p><div>Q How many numbers and digits are there from 10 to 99?</div>	<p>Collect answers. Use a hundred grid to help children to see the patterns of 10 to 19, 20 to 29 and 90 to 99. Establish there are 90 numbers with a total of 180 digits.</p> <div>Q If the computer prints 1 to 100, how many digits does it print?</div> <p>Establish there are $9 + 180 + 3 = 192$ digits.</p> <div>Q When the computer has printed 1000 digits, what number has it reached?</div> <p>Discuss the children's answers and strategies.</p> <ul style="list-style-type: none">Encourage the children to build up patterns using groups of numbers: 100 to 199, 200 to 299, etc. to identify the group with the one thousandth digit.Say that this time you want them to work out the number of digits printed by the computer, but the same strategies for solving the problem will apply. Ask:<div>Q When the computer prints the number 1000, how many digits will have been printed?</div> <p>Discuss the children's answers and strategies. Establish how the above patterns lead to the answer.</p>	<ul style="list-style-type: none">Tell the children that the digit 8 was not printed properly, but appeared as the letter S.<div>Q If the computer prints 1 to 100 what proportion of the digits appeared as the letter S?</div><p>Collect the children's responses and discuss their methods. Remind children there are 192 digits in the numbers 1 to 100. Agree that 20 of these would appear as the letter S. Establish that proportion is usually given as a fraction and in this case, the answer is 20/192. Remind children to read this as 'twenty, one hundred and ninety-two seconds'.</p><p>HOMEWORK – Ask the children to find what proportion of digits would appear as the letter S if this faulty computer printed the numbers 1 to 1000.</p><p>ASSESSMENT – Explain to the children that during the week they will be completing 'My Mathematics' Self-assessment sheets they will take to their secondary school.</p>

Planning sheet	Day Two (page 1 of 2)	Unit 8 <i>Calculation, percentage, ratio and problem solving</i>	Term: <i>Summer</i>	Year Group: 6
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/ Focus Questions
<p>To find simple percentages of small whole-number quantities.</p> <p>VOCABULARY percentage per cent % approximate</p> <p>RESOURCES OHP calculator</p>	<ul style="list-style-type: none"> Write on the board: <ul style="list-style-type: none"> A 25% of 40 B 60% of 35 C $33\frac{1}{3}\%$ of 90 D 15% of 64 E 30% of 320 F 23% of 1500 G 47% of 426 H 99% of 800 <p>Ask the children to work in pairs and find the percentages. Ask them to decide which percentages they can find mentally or with jottings and which they would need a calculator to find.</p> <ul style="list-style-type: none"> Collect the children's answers and methods. Encourage them to use their knowledge of equivalents, e.g. that finding 25% is the same as finding $\frac{1}{4}$, and to use methods that build on from finding 10%, 5% and 1%, etc. Highlight that G might require a calculator. Remind children that 47% is just below 50% so the answer to G is approximately 200. <div>Q How could we use a calculator to answer G?</div> <p>Discuss the children's responses and use the OHP calculator to demonstrate their methods.</p> <ul style="list-style-type: none"> Write on the board: 77% of 376. <div>Q What is an approximate answer?</div> <p>Establish that 77% is just above 75% and 75% of 400 is 300, so the answer is about 300. Use the OHP calculator to confirm the answer. Repeat with other percentages. Establish that comparing the percentages to familiar and easy to calculate percentages, 10%, 25%, $33\frac{1}{3}\%$, etc. helps when approximating.</p>	<ul style="list-style-type: none"> Understand percentage as the number of parts in every 100, and find simple percentages of small whole-number quantities and money. <p>VOCABULARY estimate round relative cost</p> <p>RESOURCES OHP calculator Calculators Self-assessment sheet 8.1</p>	<ul style="list-style-type: none"> Write on the board: Sale – 20% off all prices. Explain that this is a sign in a shop window. <div>Q If an item is priced at £124.99, what is the sale price?</div> <p>Discuss the children's suggestions and methods. Encourage them to round £124.99 to £125, find 10% and double, to get £25 and a sale price of £100.</p> <ul style="list-style-type: none"> Give out calculators. <div>Q Would we get this answer using a calculator?</div> <p>Collect responses and ask the children to work through the problem on their calculators. Confirm the calculator display shows 99.992 or £99.99 when rounded to the nearest penny, one penny less than when we estimated before.</p> <div>Q If we take off 20% what percentage are we left with?</div> <p>Agree it is 80%. Use the OHP calculator to demonstrate how to find 80% of £124.99 by multiplying 124.99 by 0.8. Emphasise that 80% is 80 hundredths and in decimal form is 0.8.</p> <div>Q If an item is priced at £234.75, what is the sale price?</div> <p>Ensure the children can use the calculator to find the answer and interpret the display correctly as £187.80. Ask the children to find the sale price of other items. Collect answers and discuss.</p> <ul style="list-style-type: none"> Say that this time we want to find the original price after the 20% has been deducted. Ask: <div>Q If the sale price is £115, what was the original price of the item?</div> <p>Collect answers and discuss methods. Agree that £115 represents 80% of the original price and we want the full 100%.</p> <div>Q How could we calculate 100%?</div> <p>Take suggestions then agree to look at one way:</p> <div>Q How can we find the cost of 1% of this item?</div> <p>Establish that $£115 \div 80$ gives the relative cost of 1%.</p> <div>Q How can we find the full 100% cost?</div>	<ul style="list-style-type: none"> Remind the children that with a 20% reduction the shopkeeper made a profit, but with a 30% reduction he made a loss. Collect the children's answers to the breakeven percentage and using the OHP calculator, confirm that with 28.5% reduction the shopkeeper just about breaks even. <p>HOMEWORK – Another shopkeeper adds 30% to the cost of her items to make a profit. In a sale, what percentage reduction would be breakeven for her?</p>


Planning sheet	Day Two (page 2 of 2)	Unit 8 <i>Calculation, percentage, ratio and problem solving</i>	Term: <i>Summer</i>	Year Group: 6
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/ Focus Questions
			<p>Agree we multiply the answer by 100. On the board write $(£115 \div 80) \times 100$. Use the OHP calculator to confirm that the original cost of the item was £143.75. Ask the children to find the original price of other sale items. Collect answers and discuss.</p> <ul style="list-style-type: none"> Explain that the shopkeeper buys an item and adds 40% to this price to make a profit when he sells it. <div>Q If the shopkeeper pays £85 for the item, what is the selling price?</div> <p>Collect answers and discuss methods. Remind the children that 100% represents the full price of £85 the shopkeeper pays. If we increase the price we will have over 100%.</p> <div>Q What would 200% represent?</div> <p>Establish that if 100% is £85 then 200% is double or £170. Repeat for 300%, 400% and 150%.</p> <p>Agree that in the shopkeeper's case, adding 40% means we will get 140% and the selling price will be $£85 \times 1.4$. Use the OHP calculator to confirm the selling price is £119. Ask the children to find the selling price of other items. Collect answers and discuss.</p> <ul style="list-style-type: none"> Explain that the shopkeeper buys an item for £79, then adds his 40% profit to get the selling price. This item does not sell so is in the sale, and reduced by 20%. <div>Q What is the sale price? What profit does the shopkeeper make?</div> <p>Collect answers and discuss methods. With the children, work through the problem and record on the board:</p> <p>Cost: £79 Selling Price (+40%): £110.60 Sale Price (–20%): £88.48 Profit: $£88.48 - £79 = £9.48$</p> <p>Ask the children to find the shopkeeper's profit for other sale items. Collect answers and discuss.</p> <ul style="list-style-type: none"> Explain to the children that the shopkeeper always adds 40% but reduces some items by more than 20% in the sale. Ask: <div>Q If in the sale the shopkeeper reduced selected items by 30% would he make a profit?</div> <p>Collect the children's answers and reasons.</p> <div>Q How can we test to see if he makes a profit?</div> <p>Agree that an example will help and with the children work through the problem using the £79 example to show the shopkeeper makes a loss of £1.58.</p> <p>If necessary use other examples to confirm that the shopkeeper makes a loss.</p> <div>Q In the sale what percentage reduction would result in breakeven for the shopkeeper?</div>	<p>ASSESSMENT –</p> <ul style="list-style-type: none"> Give out Self-assessment sheet 8.1. Explain that the sheet is to help children to identify what mathematics they have been able to do during the week. There will be some time in each lesson for them to complete the sheet. Ask the children to work out the first cloud question on the sheet. Say that you want them to write their answers in the middle loop. When they have done this they should show their work to a friend. Some children may need help. <p>Tell the children they should tick the box to say if they required any help.</p> <ul style="list-style-type: none"> Give the children a few minutes to complete the task. Ask them to put the sheet away ready for the next lesson.

Planning sheet	Day Three	Unit 8 <i>Calculation, percentage, ratio and problem solving</i>	Term: Summer	Year Group: 6																					
Oral and Mental		Main Teaching		Plenary																					
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/ Focus Questions																					
Use all operations to identify and carry out calculations using brackets.	<ul style="list-style-type: none">Display OHT 8.1. Explain that the numbers 1 to 16 are scattered at random about the grid. Say that you want the children to make ‘calculation snakes’. They can use all four operations. They are to record their calculations using brackets appropriately. <div>Q Which operations do you do first when carrying out a calculation?</div> <p>Ensure children remember that they carry out the brackets first, then + and × before – and ÷.</p> <ul style="list-style-type: none">Write on the board: (11 + (15 ÷ 5)) ÷ 2 = 7. <p>Check the calculation with the children. Explain that this is a calculation snake from 11 to 15 to 5 to 2 to 7. This is a five-step snake as five numbers that are next to one another are used in the calculation. Tell the children they can use any of those numbers that are next to one another and each number once only.</p> <div>Q What is the longest possible calculation snake?</div> <p>Agree it could be 16 steps, when every number has been used once. Remind them the numbers they use must be next to one another and the last number must be the answer to the calculation.</p> <ul style="list-style-type: none">Ask the children to work in pairs. Give them five minutes to make as many calculation snakes as they can and record them on a sheet of paper.Stop the class and ask the children to exchange sheets to check each others’ calculations. <div>Q What calculation snake have you found?</div> <p>Collect some answers and work through the calculations with the class to confirm the correct use of brackets and order of operations.</p> <div>Q What is the biggest calculation snake so far?</div> <p>Collect answers and confirm calculations.</p>	<ul style="list-style-type: none">Understand percentages as the number of parts in every 100 and find simple percentages. <p>VOCABULARY percentage break even reduction</p> <p>RESOURCES OHP calculator Calculators Self-assessment sheet 8.1</p>	<ul style="list-style-type: none">Refer to the homework from days 1 and 2. Discuss the answer and the children’s strategies. With the children, work through the problem from day 2 with an item costing £100.Write on the board:<table><tr><td>Cost</td><td>Selling price (+30%)</td><td>Sale Price (??%)</td></tr><tr><td>£100</td><td>£130</td><td>£100</td></tr></table>Explain that we want to reduce the £130 by £30 and we want to find the percentage reduction needed to do this. <div>Q How do we find this percentage?</div> <p>Discuss how to use trial and improvement systematically. Use the OHP calculator and record the steps on the board, e.g.</p> <table><tr><td>£130 – 10%</td><td>£130 × 0.9 = £117</td><td>(too much)</td></tr><tr><td>£130 – 20%</td><td>£130 × 0.8 = £104</td><td>(too much)</td></tr><tr><td>£130 – 25%</td><td>£130 × 0.75 = £97.50</td><td>(too little)</td></tr><tr><td>£130 – 22%</td><td>£130 × 0.78 = £101.40</td><td>(too much)</td></tr><tr><td>£130 – 23%</td><td>£130 × 0.77 = £100.10</td><td>(close)</td></tr></table> <p>At each stage, identify the multiplier and decide whether to take a larger or smaller percentage off the £130. Agree that a reduction of 23% in the sale is close to breakeven.</p> <ul style="list-style-type: none">Give the children other breakeven problems to solve with calculators, e.g. the shopkeeper adds 45% to cost prices as profit. Collect answers and confirm the percentage breakeven reductions, e.g. about 31% in the above case.Ask the children to work through the problem where the shopkeeper adds 50% to cost as profit. Collect answers and point out we wanted to reduce £150 by £50. <div>Q What fraction of £150 is £50?</div> <p>Encourage the children to recognise that £50 is 1/3 of £150.</p> <div>Q How do we represent 1/3 as a percentage?</div> <p>Remind the children it is 33 1/3%.</p> <p>On the OHP calculator, carry out 50 ÷ 150 and say this decimal represents 1/3. Since we want per hundred, we multiply this by 100. Use the OHP calculator to confirm the answer is 33 1/3% or 33% to the nearest whole number.</p> <ul style="list-style-type: none">Ask the children to use this method to find other breakeven sales percentages given profit percentages.Collect answers and work through some on the board to confirm the children can carry out the calculations on the calculator, read the display correctly and round answers to the nearest whole number.	Cost	Selling price (+30%)	Sale Price (??%)	£100	£130	£100	£130 – 10%	£130 × 0.9 = £117	(too much)	£130 – 20%	£130 × 0.8 = £104	(too much)	£130 – 25%	£130 × 0.75 = £97.50	(too little)	£130 – 22%	£130 × 0.78 = £101.40	(too much)	£130 – 23%	£130 × 0.77 = £100.10	(close)	<ul style="list-style-type: none">Write on the board: Cost £100. <div>Q If we add 10% as profit, what is the selling price?</div> <p>Agree it is £110, and the profit is £10.</p> <div>Q What percentage do we reduce £110 by to get to £100?</div> <p>Establish that we want £10 as a percentage of £110, and using calculators agree this is just over 9%. Discuss the fact that adding 10% then reducing by 9% represents no change.</p> <div>Q If we increase £100 by 10% then decrease the answer by 10% will we get back to £100?</div> <p>Discuss the children’s responses. Confirm that: £100 + 10% is £110 and £110 – 10% is £99 so we do not get back to £100. Collect in the calculators.</p> <p>ASSESSMENT –</p> <ul style="list-style-type: none">Ask the children to complete the next two cloud questions on Self-assessment sheet 8.1, then discuss their answers with a friend as before. Remind them to tick the appropriate box to say whether they needed help or not.Give the children a few minutes to complete the task, helping children who need it.Ask the children to put the sheet away carefully for the next lesson.
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RESOURCES OHT 8.1																									

RESOURCES
OHT 8.1

VOCABULARY
percentage
break even
reduction

RESOURCES
OHP calculator
Calculators
Self-assessment
sheet 8.1

Planning sheet	Day Four (page 1 of 2)	Unit 8 <i>Calculation, percentage, ratio and problem solving</i>	Term: <i>Summer</i>	Year Group: 6						
Oral and Mental		Main Teaching		Plenary						
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/Focus Questions						
<p>Use all four operations to identify and carry out calculations mentally.</p> <p>Use brackets.</p> <p>RESOURCES OHT 8.2</p>	<ul style="list-style-type: none">Display OHT 8.2. Explain that this time the children are to make calculation snakes using the numbers from the grid on OHT 8.2 but every snake must include x or ÷ as well as using any of + or – and brackets.Write on board: $(8 + 2 + 10) \div 4 = 5$ Identify the snake 8 to 2 to 10 to 4 to 5. Say that this is a five-step snake. Confirm that the calculation is correct. <div>Q What three-step snakes can you see that use ÷?</div> <p>Collect some answers and confirm that the children understand the order of the division and write $16 \div 2 = 8$ rather than say ‘2 into 16 is 8’.</p> <ul style="list-style-type: none">Ask the children to work in pairs. Give them six minutes to find as many calculation snakes as they can and record them on a sheet of paper.Stop the class and ask pairs of children to exchange sheets and check each others’ calculations. <div>Q What calculation snakes have you found?</div> <p>Collect some answers and work through the calculations with the class to confirm whether the calculations are correct.</p> <div>Q What is the longest calculation snake so far?</div> <p>Collect answers and confirm calculations.</p>	<ul style="list-style-type: none">Solve simple problems involving ratio and proportion. <p>VOCABULARY diagonal perimeter area squared ratio one to two one to five</p> <p>RESOURCES Activity sheet 8.1/ OHT 8.3 Centimetre squared paper OHP calculator Calculators Self-assessment sheet 8.1</p>	<ul style="list-style-type: none">On the board, draw a square with the two diagonals as shown below:  8 cm Tell the children the sides of the square are each 8 cm.Q What is the perimeter of this square? What is the area of this square? <p>Collect answers and record on the board:</p> <table><tr><td>Side</td><td>Perimeter</td><td>Area</td></tr><tr><td>8 cm</td><td>32 cm</td><td>64 cm²</td></tr></table> <ul style="list-style-type: none">Say that you want to know the length of the diagonals of the square.Q How can we find the length of the diagonals? <p>Remind the children that the diagonals are of equal length so we need only find one. Collect suggestions and agree we need to draw and measure the diagonals.</p> <ul style="list-style-type: none">Give out centimetre squared paper and rulers. Show OHT 8.3, say that you want the children to find the perimeter, area and length of diagonals of squares with sides of 1 cm to 12 cm. Complete the table together for the square with sides of 8 cm. Give out Activity sheet 8.1 and explain to the children that they should ignore the last two columns and the last three rows. Remind them to draw the squares very carefully using pencil and ruler and measure the diagonals as accurately as they can in centimetres and millimetres.Collect answers and record some of them on OHT 8.3, confirming answers to perimeters and areas and to the lengths of some of the diagonals. If necessary get the children to check their results. Ask the children to compare the lengths of the diagonals of the squares with sides of 4 cm and 8 cm. Establish that the diagonal in the square with sides of 8 cm is double that of the 4 cm square, as are the sides.Q Can you see other relationships? <p>Collect and discuss the children’s responses.</p> <ul style="list-style-type: none">In the headings of the last two columns write: Perimeter ÷ Diagonal (P÷D) Area ÷ (Diagonal)² (A ÷ D²)	Side	Perimeter	Area	8 cm	32 cm	64 cm ²	<ul style="list-style-type: none">Say that during the lesson we noticed that the length of the diagonals of the squares increased and decreased in the same way the sides did. If we double the length of the sides, we double the lengths of the diagonals. Identify the squares with sides of 2 cm and 10 cm.Q What is the ratio of the sides of these squares? <p>Establish it is 2 to 10 or 1 to 5 as the sides have been increased by a multiple of 5.</p> <div>Q Are the diagonals in the same ratio on the sides?</div> <p>Collect the children’s responses and confirm that they are, but remind them measurements lead to errors.</p> <p>Ask the children to identify other ratios of sides and diagonals of squares.</p> <p>ASSESSMENT – Ask the children to complete the last cloud question on Self-assessment sheet 8.1. Help children who need it. Ask the children to discuss the work with a friend and to tick the appropriate box.</p> <ul style="list-style-type: none">Give the children a few minutes to complete the task.Discuss the four questions with the class, and ask them to put their sheets away carefully for the next lesson.
Side	Perimeter	Area								
8 cm	32 cm	64 cm ²								

Planning sheet	Day Four (page 2 of 2)	Unit 8 <i>Calculation, percentage, ratio and problem solving</i>	Term: <i>Summer</i>	Year Group: 6
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/Focus Questions
			<p>Ask the children to use calculators to work out these calculations in their tables giving the answers to three decimal places. Using the OHP calculator, work through the example for the square with sides of 8 cm to confirm the children can do the calculations using calculators.</p> <ul style="list-style-type: none"> When the children have finished ask: <div>Q What do you notice about the numbers in these two columns?</div> <p>Establish that the numbers in the two columns don't change much. $P \div D$ are all about 2.8 (precisely 2.828 to 3 decimal places). $A \div D^2$ are all about 0.5 (precisely 0.5).</p> <ul style="list-style-type: none"> Write on the board: $P \div D = 2.8$ (or agreed number); $A \div D^2 = 0.5$ (or agreed number). In the table write 13 cm, 15 cm, 20 cm in the last three rows of the first column. <div>Q What are the perimeters of these squares?</div> <p>Collect answers and add these to the table.</p> <ul style="list-style-type: none"> Return to the square with sides of 12 cm. Say that we know its perimeter is 48 cm. <div>Q If we know $48 \div D = 2.8$ (or agreed value), how could we calculate the length of diagonal of this square?</div> <p>Encourage the children to rearrange this as $D \times 2.8 = 48$ and $D = 48 \div 2.8$, and recognise that as $48 \div 16 = 3$, D is bigger than 16. Use the OHP calculator to confirm that D, the diagonal, is about 17 cm. Ask children to use the same method to find the diagonals for the squares with sides of 13 cm, 15 cm and 20 cm.</p> <p>Collect answers and agree the diagonals are about 19 cm, 21 cm and 29 cm respectively. Add the values to the tables on OHT 8.3 and ask the children to record this on their Activity sheet.</p> <ul style="list-style-type: none"> Say that for the square with sides of 12 cm, the diagonal is about 17 cm and D^2 is about $17 \times 17 = 289$. <div>Q If $A \div 289 = 0.5$ (or agreed value), what is the area A of this square?</div> <p>Encourage the children to rearrange this as $A = 0.5 \times 289$, and to recognise that 0.5×289 is about 150 and $150 \div 289$ is about 0.5 so the area is about 150 cm^2. Use the OHP calculator to confirm from the calculations that the area is about 145 cm^2. Agree that for a square with sides of 12 cm the area is $12 \times 12 = 144 \text{ cm}^2$.</p> <ul style="list-style-type: none"> Ask the children to use the same method to find estimates for the areas of the squares with sides of 13 cm, 15 cm and 20 cm and check their answers. 	

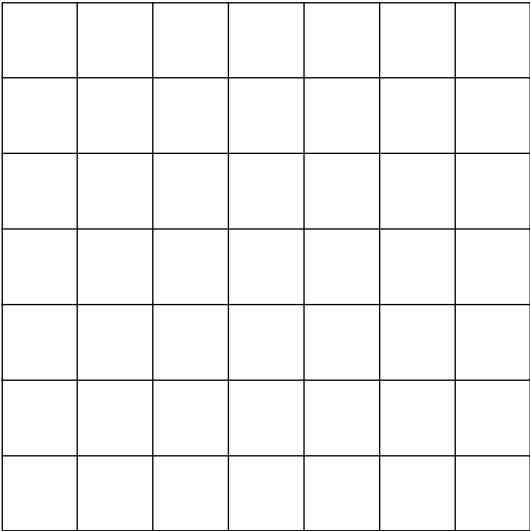
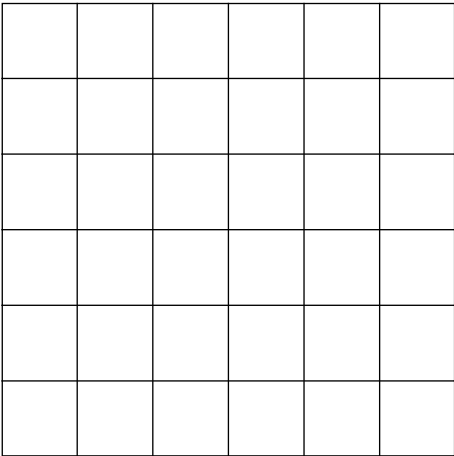
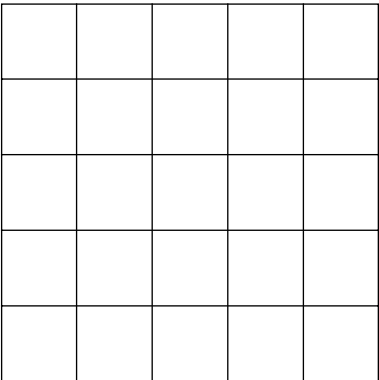
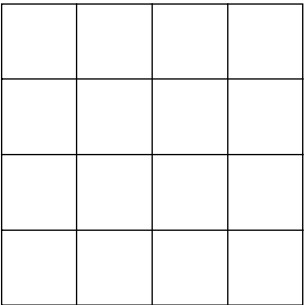
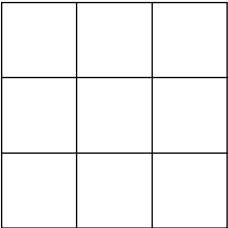
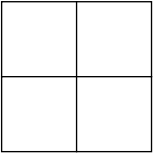
Planning sheet	Day Five (page 1 of 2)	Unit 8 <i>Calculation, percentage, ratio and problem solving</i>	Term: <i>Summer</i>	Year Group: 6
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities/Focus Questions
<p>To multiply and divide decimals by 10, 100 and integers by 1000.</p>	<ul style="list-style-type: none"> Write on the board: 101.37. Ask questions involving \times and \div 10 and 100, e.g. <div>Q What is $101.37 \div 10$?</div> Record the correct answers on the board. Using 10 137 ask questions involving \times and \div by 10, 100 and 1000. Add any new numbers on the board. From the list of numbers on the board, select two numbers. <div>Q Which is the larger/ smaller number?</div> Using the larger number ask: <div>Q What do I divide this number by to get this smaller number?</div> Repeat using other pairs of numbers and asking for answers involving \times and \div. Use another starting number and repeat the process. 	<ul style="list-style-type: none"> Solve simple problems involving ratio and proportion. <p>VOCABULARY perimeter area ratio double triple one to two one to three</p> <p>RESOURCES OHT 8.4 Centimetre squared paper Self-assessment sheet 8.2</p>	<ul style="list-style-type: none"> Show OHT 8.4. Explain that on the OHT there are squares with sides of 1 cm to 7 cm. With the class complete the table. Point to the two squares with sides of 1 cm and 2 cm. <div>Q What is the ratio of the sides, the perimeters, the areas of these two squares?</div> Agree that the ratio of sides and perimeters is 1 to 2 and for the areas it is 1 to 4. Repeat using the two squares with sides of 2 cm and 4 cm. <div>Q If I take a square and double the lengths of the sides, what will be the ratio of the perimeters and the areas?</div> Use pairs of squares, 3 cm and 6 cm, 4 cm and 8 cm, etc. to confirm these ratios are always 1 to 2 and 1 to 4. Point to the two squares with sides of 1 cm and 3 cm. <div>Q What is the ratio of the sides, the perimeters, and the areas of these two squares?</div> Agree the ratios are 1 to 3 and 1 to 9. Use other pairs of squares, e.g. 2 cm and 6 cm, to continue the relationship. Use the diagrams and the table to confirm the ratios of perimeters and areas for squares with sides in ratios 1 to 2 and 1 to 3. Point to the square with sides of 5 cm. <div>Q If I double the length of the sides of this square, what will happen to the perimeter and the area of the square?</div> Establish the perimeter doubles while the area is four times bigger. Repeat with other squares, including those outside the range of the table. Point to the square with sides of 3 cm. <div>Q If I make the length of the sides of this square three times longer, what will happen to the perimeter and the area of the square?</div> Establish the perimeter is three times longer and the area nine times bigger. Repeat with other squares, including those outside the range of the table. Point to the square with sides of 2 cm. <div>Q If I make the sides of this square four times longer what happens to the perimeter and area?</div> 	<p>ASSESSMENT –</p> <ul style="list-style-type: none"> Give out Self-assessment sheet 8.2. Give the children time to read and complete the ‘J’ problem on the sheet and to give their explanations. Help the children who need it and get the children to tick the appropriate box. Discuss the solution to the problem with the class. Explain that the table on the bottom half of the sheet is for the children to summarise how well they have been able to answer each question. Ask the children to look at the statements in the left-hand column. The questions alongside each statement are intended to remind the children what each statement means. Ask the children to look back on their work to help them fill in the table. Encourage the children to complete each statement by putting a tick in one box. Ask the children to complete the target statement by choosing one of the three areas of mathematics where they think they need to improve. For those children who were able to answer all the questions without help, discuss the learning objectives for Year 7 shown on the front page of the unit.

Planning sheet	Day Five (page 2 of 2)	Unit 8 <i>Calculation, percentage, ratio and problem solving</i>	Term: Summer	Year Group: 6	
Oral and Mental		Main Teaching			Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities		Teaching Activities/Focus Questions
			<p>Establish the perimeter is four times longer and the area is 16 times bigger. Confirm this is the case for the square with sides of 1 cm. Repeat with other squares.</p> <ul style="list-style-type: none"> Ask children to imagine a square and to make the sides ten times longer. <div>Q What happens to the perimeter and the area?</div> <p>Collect answers and discuss the children's strategies. Agree the perimeter is ten times longer while the area is 100 times bigger.</p> <div>Q If I know the ratio of the sides of two squares, how can I find the ratios of their perimeters and areas?</div> <p>Discuss the children's explanations and refer to the squares on the OHT to establish that the perimeters are in the same ratio as the sides, while this ratio has to be squared to get the ratio for the areas.</p> <div>Q Is this only true for squares: what if we double, triple the sides of rectangles or other shapes?</div> <ul style="list-style-type: none"> Give out centimetre squared paper and ask the children in pairs to draw rectangles and compound shapes of their own and find out what happens to the perimeters and areas when they increase the sides in the ratios 1 to 2 and 1 to 3. <p>Collect the children's answers and work through a compound shape to confirm the ratios of the perimeters and areas when all the sides are doubled and tripled. Encourage the children to explain why they think the ratios hold when any shape has all the lengths doubled and tripled.</p>		

6	4	16	14
13	3	2	1
11	5	9	7
8	15	10	12

40	8	16	4
5	2	10	5
15	3	20	2
45	30	25	50

Side	Perimeter	Area	Diagonal		
1 cm					
2 cm					
3 cm					
4 cm					
5 cm					
6 cm					
7 cm					
8 cm					
9 cm					
10 cm					
11 cm					
12 cm					



Side	Perimeter	Area
1 cm	4 cm	1 cm ²
2 cm		
3 cm		
4 cm		
5 cm		
6 cm		
7 cm		
8 cm		
9 cm		
10 cm		

My Mathematics by

Multiply and
divide 73.08 by
10 and 100

My calculations

Show or discuss with
a friend

I did these calculations:

on my own

with some help

Multiply and
divide 870 by 10,
100 and 1000

My calculations

Show or discuss with
a friend

I did these calculations:

on my own

with some help

Find, without a
calculator:
20% of 142 km
45% of 360 cl
33 $\frac{1}{3}$ % of 450 g
140% of £75

My calculations

Show or discuss with
a friend

I did these calculations:

on my own

with some help

Find with a
calculator:
37% of £42
22 $\frac{1}{2}$ % of 144 g
112% of 24 cl

My calculations

Show or discuss with
a friend

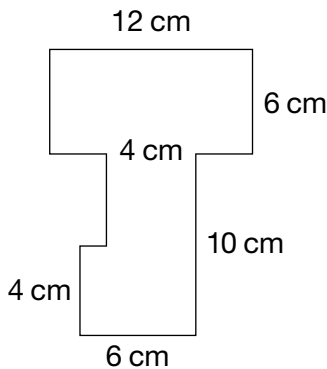
I did these calculations:

on my own

with some help

My Mathematics by

The 'J' problem



Jackie wants to make this J from card with gold trim around the edges. She plans to make all the lengths three times bigger.

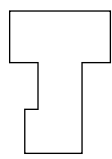
She says, 'If I find the perimeter and area of this smaller J shape, I can use ratios to find the perimeter and area of my big J.'

Explain how Jackie does this:

I explained my reasons:

on my own

with some help

Name:	School:
What I can do	
I can multiply and divide mentally by 10, 100 and 1000: on my own <input type="checkbox"/> with some help <input type="checkbox"/>	Multiply and divide 73.08 by 10, 100.
	Multiply and divide 870 by 10, 100 and 1000
I can find percentages of whole-number quantities, with and without a calculator: on my own <input type="checkbox"/> with some help <input type="checkbox"/>	Find, without a calculator: 20% of 142 km, 45% of 360 cl, $33\frac{1}{3}\%$ of 450 g, 140% of £75
	Find, with a calculator: 37% of £42, $22\frac{1}{2}\%$ of 144 g, 112% of 24 cl
I can solve problems involving ratio and proportion and explain my methods and reasoning: on my own <input type="checkbox"/> with some help <input type="checkbox"/>	The 'J' problem: 

My next target:

I want to get better at _____
