

Assessing pupils' progress in mathematics at Key Stage 3

Year 8 assesment package
Number
Teacher pack



Year 8 Number task: 1-2-5-10 and Percentages

Levels 3/4/5/6

Note that for classes consisting of only pupils at levels 3 and 4, teachers may wish to explore the material in lesson 1 more thoroughly, using the probing questions, rather than progressing to lesson 2.

Also note that for classes consisting mainly of pupils at level 6, teachers may wish to omit some of the content of lesson 1 to enable a more thorough exploration of the content of lesson 2.

The lesson plans in this pack are set out in two columns. The left-hand column has indicative times for activities, highlights the resource sheets required and also has some examples of questions which teachers may wish to use with pupils during the activities. The right-hand column describes each activity in detail.

APP ASSESSMENT CRITERIA

These lessons may generate evidence to help inform judgements against a number of assessment criteria, including the following:

Numbers and the number system

- level 5: use understanding of place value to multiply and divide whole numbers and decimals by 10, 100 and 1000 and explain the effect

Calculating

- level 5: use a calculator where appropriate to calculate fractions/percentages of quantities
- level 6: calculate percentages and find the outcome of a given percentage increase or decrease

Shape, space and measure

- level 4: use and interpret coordinates in the first quadrant

Using and applying mathematics

- level 5: show understanding of situations by describing them mathematically using symbols, words and diagrams
- level 6: solve problems and carry through substantial tasks by breaking them into smaller, more manageable tasks, using a range of efficient techniques, methods and resources, including ICT; give solutions to an appropriate degree of accuracy.

LESSON 1: 1-2-5-10

Resources

- Each group needs a set of the four cards A to D created from the teacher resource sheet:
1-2-5-10 tables, cards A to D (T5L1resource1)

Preparation: before the lesson, print or stick sufficient copies of the resource sheet onto card and cut them out. One copy will provide sets of cards for two groups

- Each pupil needs one of the following worksheets, depending on ability:
Level 3/4 pupils: *Using 1-2-5-10 sheet 1 (T5L1assess1)*
Level 4/5 pupils: *Using 1-2-5-10 sheet 2 (T5L1assess2)*
Level 5/6 pupils: *Using 1-2-5-10 sheet 3 (T5L1assess3)*
- Paper for group work and any rough working

Starter
10 minutes

Think about the value of the coins. Is there a quick way of making sure you use as few coins as possible? [Start with highest denomination and work down.]

[For each amount] *What is the maximum and minimum number of coins possible?*

[18p max 18, min 5 if 10p not used]
[18p max 18, min 4]
[28p max 28, min 5 if 20p not used]
[28p max 28, min 4]
[58p max 58, min 6 if 50p not used]
[58p max 58, min 4]

What do you notice about the pattern of coins we have: 1, 2, 5, 10, 20, 50?

How many pence is £1? £2? £5? ...

If you can make 28 pence using 20p, 5p, 2p and 1p, how might you make £28?

What about £2.80? What do you notice about the number and type of coins each time?

What does 0.5 on a calculator mean? [Check the pupils' understanding of decimal place value in the context of money, exploring the misconception that, on a calculator, 0.5 means 5p.]

Is £10 the same as £10.00? Does it matter which way it is written?

What is the correct way to write 204 pence in pounds? £2.04 or £2.40?

If you worked out a money problem in pounds on a calculator and the display read 1.9, would it mean £1 and 90 pence or £1 and 9 pence? How would you write 1.9 in pounds?

What other currencies do you know? Do they use the pattern 1-2-5-10?

Tell the pupils that you have in your pocket several 1p coins, several 2p coins and several 5p coins. Ask pupils how they could use your coins to make 18 pence. Discuss the combinations suggested. What if you use a 10p coin?

Now using 1p, 2p, 5p and 10p coins, ask for different ways of making 28 pence. What if you use a 20p coin?

What about 58p? What if you use a 50p coin?

List, vertically, all the coins used so far, i.e.

1p
2p
5p
10p
20p
50p

Continue the list with £1 and £2 coins and then show the values of British bank notes, in pence as well as in pounds, i.e. add these rows:

£1 = 100p
£2 = 200p
£5 = 500p
£10 = 1000p
£20 = 2000p
£50 = 5000p

Explain that the £2 coin was introduced only in 1998. Why might the government have introduced this coin? [There was no £2 note.]

Now focus on the **multiplicative relationships** between the values, starting by looking at the values in pence. What patterns can be seen? Look at the relationships between:

1p, 10p, 100p, 1000p; and
2p, 20p, 200p, 2000p; and
5p, 50p, 500p, 5000p.

Look at multiplication/division by 10, 100 and 1000.

Now ask for the values of the coins of 50p or less in pounds to complete the list:

£ 0.01 = 1p
£ 0.02 = 2p
£ 0.05 = 5p
£ 0.10 = 10p
£ 0.20 = 20p
£ 0.50 = 50p
£ 1 = 100p
£ 2 = 200p
£ 5 = 500p
£10 = 1000p
£20 = 2000p
£50 = 5000p

	<p>Use the multiplicative relationships between the values to make links with multiplication and division of decimals by 10, 100 and 1000. Is the relationship between 10p and £10 clearer if £10 is written as £10.00?</p> <p>Discuss the pattern of 1-2-5-10 seen in the table. Why are these numbers good ones to use for coins and bank notes?</p>																				
<p>Group activity 5 minutes</p>	<p>Ask the pupils to discuss with a neighbour how to multiply a number by 18. Tell them that for this activity the only multiplication tables they can use are 1 or 2 or 5 or 10.</p> <p>Note that some pupils will benefit from teacher input here.</p>																				
<p>Mini-plenary 5 minutes</p> <p><i>Which rows are easiest to work out? Why? In which order will you complete the rows? What rules could you give to a friend to show them how to complete the table?</i></p>	<p>Ask the pupils to present their methods. Use any misconceptions to promote discussion.</p> <p>As part of the discussion, show a 1-2-5-10 table and discuss how it can be used to calculate 18×15, i.e.</p> <table border="1" data-bbox="695 801 991 994"> <tr><td colspan="2">lots of 15</td></tr> <tr><td>1</td><td>15</td></tr> <tr><td>2</td><td>30</td></tr> <tr><td>5</td><td>75</td></tr> <tr><td>10</td><td>150</td></tr> </table> <p>$150 + 75 + 30 + 15 = 270$</p> <p>Will 18×15 give the same answer as 15×18?</p> <p>Now show the 1-2-5-10 table for 'lots of 18', i.e.</p> <table border="1" data-bbox="695 1160 991 1352"> <tr><td colspan="2">lots of 18</td></tr> <tr><td>1</td><td>18</td></tr> <tr><td>2</td><td>36</td></tr> <tr><td>5</td><td>90</td></tr> <tr><td>10</td><td>180</td></tr> </table> <p>Which rows do we add to work out 15×18? Why?</p> <p>Which of these two tables is more 'efficient'? Why?</p>	lots of 15		1	15	2	30	5	75	10	150	lots of 18		1	18	2	36	5	90	10	180
lots of 15																					
1	15																				
2	30																				
5	75																				
10	150																				
lots of 18																					
1	18																				
2	36																				
5	90																				
10	180																				
<p>Group activity 5 to 10 minutes, dependent on ability</p> <p>T5L1resource1</p> <p><i>Can you write your method more formally? E.g. for card A:</i> $14 \times 19 = 10 \times 19 + 4 \times 19$ $= 10 \times 19 + 2(2 \times 19)$</p>	<p>Give each group a set of cards made from the teacher resource sheet: 1-2-5-10 tables, cards A to D (T5L1resource1)</p> <p>Tell the pupils that the cards show four different ways to use a 1-2-5-10 table to find the answer to 14×19. How? Which of the four tables do they think is most efficient? Why?</p> <p>Note that some pupils may need support, since subtracting values is being introduced for the first time.</p>																				

<p>Assessment activity Maximum 15 minutes</p> <p>T5L1assess1 T5L1assess2 T5L1assess3</p>	<p>Give out the assessment sheets as listed below.</p> <p>Level 3/4 pupils: <i>Using 1-2-5-10 sheet 1 (T5L1assess1)</i></p> <p>Level 4/5 pupils: <i>Using 1-2-5-10 sheet 2 (T5L1assess2)</i></p> <p>Level 5/6 pupils: <i>Using 1-2-5-10 sheet 3 (T5L1assess3)</i></p> <p>Stress that for this activity you want to find out whether they can use 1-2-5-10 tables. You are interested in their method so they will need to write down enough for you to understand what they have done. Advise pupils that they should try to use the most efficient methods where possible, but if they want to check using a different method, that's fine.</p>																				
<p>Plenary 5 to 10 minutes</p> <p><i>What does 'percentage' mean? How do you find 50% of an amount? What other percentages do you know how to find?</i></p> <p><i>What is 100% of £19?</i></p> <p><i>How can we write 10% as a fraction or decimal?</i></p> <p><i>How do you know that 10% of £19 is £1.90?</i></p> <p><i>If 10% of £19 is £1.90, what other percentages of £19 can you find? How would you find 5%? How would you find 1%?</i></p> <p><i>Will this relationship (between the tables) always hold? Why?</i></p> <p><i>Is, say, 24% of 15 the same as 15% of 24? Which of these is the easier calculation?</i></p>	<p>Show a 1-2-5-10 table for 'lots of 200' (or a more difficult number for able groups), i.e.</p> <table border="1" data-bbox="694 808 991 999"> <thead> <tr> <th colspan="2">lots of 200</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>200</td> </tr> <tr> <td>2</td> <td>400</td> </tr> <tr> <td>5</td> <td>1000</td> </tr> <tr> <td>10</td> <td>2000</td> </tr> </tbody> </table> <p>Now discuss together how to complete a 1%-2%-5%-10% table for 'percentages of 200', i.e.</p> <table border="1" data-bbox="694 1111 991 1301"> <thead> <tr> <th colspan="2">of 200</th> </tr> </thead> <tbody> <tr> <td>1%</td> <td>2</td> </tr> <tr> <td>2%</td> <td>4</td> </tr> <tr> <td>5%</td> <td>10</td> </tr> <tr> <td>10%</td> <td>20</td> </tr> </tbody> </table> <p>What do they notice?</p> <p>Discuss together what percentages of 200 can be worked out quickly using the 1%-2%-5%-10% table.</p>	lots of 200		1	200	2	400	5	1000	10	2000	of 200		1%	2	2%	4	5%	10	10%	20
lots of 200																					
1	200																				
2	400																				
5	1000																				
10	2000																				
of 200																					
1%	2																				
2%	4																				
5%	10																				
10%	20																				

LESSON 2: PERCENTAGES

Resources

- For each group, access to a computer with the Excel spreadsheet *Playing with percentages* loaded. Sheet 1 should show the value 200 in blue in cell C2. Sheet 2 should also show the value 200 in blue in cell C2 (but sheet 1 should be the one on display at first)
- The teacher should have access to this spreadsheet, ideally with a whiteboard or large screen, for the starter activity
- Each group needs the following worksheets:
 - What percentage? sheet 1 (T5L2pupil1)*
 - What percentage? sheet 2 (T5L2pupil2)*
- Each pupil needs one or more of the following worksheets, depending on ability:
 - Level 4/5 pupils: *What's missing? sheet 1 (T5L2assess1)*
 - Level 5/6 pupils: *What's missing? sheet 2 (T5L2assess2)*
- Pupils who complete the assessment with confidence may wish to attempt the next in the series of worksheets. For level 5/6 pupils, the following worksheet is available:
 - Extension activity: *Doing and undoing (T5L2assess3)*
- Paper for group activity, any rough working and assessment tasks where needed

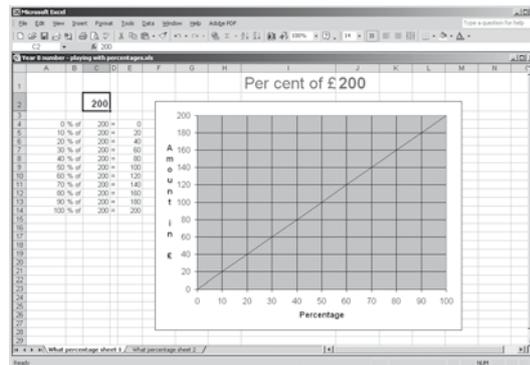
Starter

5 minutes

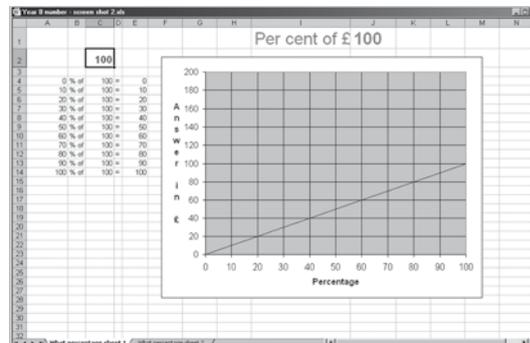
Excel spreadsheet *Playing with percentages*

Remind the pupils that in the last lesson they found some percentages of 200. Ask for a few simple percentages of 200. Why is 200 an easy amount to find percentages of? What would a graph showing percentages of 200 look like?

Show the graph 'Per cent of £200' using sheet 1 of the Excel spreadsheet *Playing with percentages*.



What would change if the graph was 'Per cent of £100'? Change the blue amount shown in cell C2 and press return, i.e.



Ensure that the pupils understand how the spreadsheet works and that they can change only the value in blue (the amount) in cell C2 by typing over and pressing return. (All other cells are locked.)

<p>Group activity 15 minutes</p> <p>T5L2pupil1 T5L2pupil2</p> <p><i>What happens to the graph as the amount increases/decreases?</i></p> <p><i>Will any amount generate a curve instead of a straight line? Justify your answer.</i></p> <p><i>How can you tell if you have made a mistake in finding a percentage of an amount?</i></p> <p><i>Why does every percentage graph pass through (0,0)?</i></p> <p><i>If 50% of an amount is £(choose value), how can you predict 200%? What about 150%? Or 25%?</i></p> <p><i>How might you go about finding 75% of an amount if you know 200% of the same amount?</i></p>	<p>Pupils work in groups on a computer using the spreadsheet to create the graphs shown in <i>What percentage? sheet 1 (T5L2pupil1)</i>.</p> <p>Note that for both sheet 1 and sheet 2 of the spreadsheet, the blue value should be showing 'per cent of £200' initially. Also note that teacher support may be needed to ensure that pupils are clear about the task.</p> <p>Stress that pupils should work together to work out what the blue number (the amount) should be. Discourage trial and improvement methods.</p> <p>Ask the pupils to record their answers on paper as they solve each problem.</p> <p>As groups finish, distribute <i>What percentage? sheet 2 (T5L2pupil2)</i> and tell them to use the second page of the spreadsheet to create the graphs.</p> <p>If there is time, pupils can then create and solve their own percentage questions.</p>																																			
<p>Mini-plenary 5 minutes</p>	<p>Discuss their strategies. What did they find easy? What did they find more difficult? Why were they not given the graphs for the final four questions? [To force them to deduce 100% rather than being given a visual representation.]</p> <p>NB: answers are (reading from left to right for each row):</p> <table data-bbox="592 1093 1390 1211"> <tr> <td><i>What percentage? sheet 1 (T5L2pupil1)</i></td> <td>i</td> <td>60</td> <td>ii</td> <td>150</td> </tr> <tr> <td></td> <td>iii</td> <td>400</td> <td>iv</td> <td>800</td> </tr> <tr> <td></td> <td>v</td> <td>2000</td> <td>vi</td> <td>600</td> </tr> </table> <table data-bbox="592 1249 1390 1417"> <tr> <td><i>What percentage? sheet 2 (T5L2pupil2)</i></td> <td>i</td> <td>100</td> <td>ii</td> <td>40</td> </tr> <tr> <td></td> <td>iii</td> <td>125</td> <td>iv</td> <td>60</td> </tr> <tr> <td></td> <td>v</td> <td>80</td> <td>vi</td> <td>30</td> </tr> <tr> <td></td> <td>vii</td> <td>50</td> <td>viii</td> <td>180</td> </tr> </table> <p>Why is working out 100% so important? How would they work out 100% if they knew what 50% of it was? What if they knew 200%? What if they knew 25%? Or 75%?</p>	<i>What percentage? sheet 1 (T5L2pupil1)</i>	i	60	ii	150		iii	400	iv	800		v	2000	vi	600	<i>What percentage? sheet 2 (T5L2pupil2)</i>	i	100	ii	40		iii	125	iv	60		v	80	vi	30		vii	50	viii	180
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	iii	125	iv	60																																
	v	80	vi	30																																
	vii	50	viii	180																																

<p>Assessment activity 20 minutes Calculators not allowed</p> <p>T5L2assess1 T5L2assess2 T5L2assess3</p>	<p>Each pupil should complete one of the following worksheets:</p> <p>Level 4/5 pupils: <i>What's missing? sheet 1 (T5L2assess1)</i></p> <p>Level 5/6 pupils: <i>What's missing? sheet 2 (T5L2assess2)</i></p> <p>Explain that the questions are not in order of difficulty, and that if they find one difficult they should move on to the next question and come back to the previous one later. Stress that in the final question, pupils should show their mathematical ability by writing percentages that are difficult.</p> <p>Note that level 6 pupils may be advised to omit the final part of the assessment in <i>What's missing? sheet 2</i> to enable them to progress to the extension worksheet: <i>Doing and undoing (T5L2assess3)</i></p>
<p>Plenary 5 minutes</p> <p><i>What is the simplest fraction you could write instead of 300%?</i></p> <p><i>How can you tell this fraction must be a whole number?</i></p> <p><i>Which percentages are easy to work with? Which are difficult? How does knowing the factors of 12 help you to predict whether finding a given percentage of 12 will be difficult or easy to work out?</i></p>	<p>For classes consisting primarily of pupils who worked on the extension worksheet, discuss findings, reminding pupils of the meaning of 'reciprocal', e.g.</p> <p>If 15% of $X = Y$ then $\frac{3}{20}$ of $X = Y$ so $\frac{20}{3}$ of $Y = X$</p> <p>For other classes, tell the pupils that this time they are going to work with the number 12.</p> <p>Write on the board: 50% of a number is 12. What is the number?</p> <p>Discuss the answer, then write: 25% of a number is 12. What is the number?</p> <p>Ask pupils to work in groups to choose other percentages to complete the following: % of a number is 12. What is the number?</p>

Teacher resource sheet

T5L1resource1

1-2-5-10 tables, cards A to D

Note: to save card, two duplicate sets are shown here

Card A: 14×19

lots of 19	
1	19
2	38
5	95
10	190

$$190 + 38 + 38 = 266$$

Card B: 14×19

lots of 14	
1	14
2	28
5	70
10	140

$$140 + 70 + 28 + 28 = 266$$

Card C: 14×19

lots of 14	
1	14
2	28
5	70
10	140

$$140 + 140 - 14 = 266$$

Card D: 14×19

lots of 19	
1	19
2	38
5	95
10	190

$$190 + 95 - 19 = 266$$

Card A: 14×19

lots of 19	
1	19
2	38
5	95
10	190

$$190 + 38 + 38 = 266$$

Card B: 14×19

lots of 14	
1	14
2	28
5	70
10	140

$$140 + 70 + 28 + 28 = 266$$

Card C: 14×19

lots of 14	
1	14
2	28
5	70
10	140

$$140 + 140 - 14 = 266$$

Card D: 14×19

lots of 19	
1	19
2	38
5	95
10	190

$$190 + 95 - 19 = 266$$

Pupil sheets

Use the 1-2-5-10 tables to work out the answers.

16 × 13

lots of 13	
1	13
2	26
5	65
10	130

13 × 16

lots of 16	
1	16
2	32
5	80
10	160

17 × 14

lots of 14	
1	
2	
5	
10	

17 × 14

lots of 17	
1	
2	
5	
10	

32 × 11

lots of	
1	
2	
5	
10	

16 × 400

lots of	
1	
2	
5	
10	

Use the 1-2-5-10 tables to work out the answers.

16 × 13

lots of 13	
1	13
2	26
5	65
10	130

13 × 16

lots of 16	
1	
2	
5	
10	

17 × 14

lots of	
1	
2	
5	
10	

32 × 11

lots of	
1	
2	
5	
10	

16 × 400

lots of	
1	
2	
5	
10	

16% of 400

of 400	
1%	
2%	
5%	
10%	

Use the 1-2-5-10 tables to work out the answers.

17 × 14

lots of	
1	
2	
5	
10	

32 × 11

lots of	
1	
2	
5	
10	

16 × 400

lots of	
1	
2	
5	
10	

16% of 400

of 400	
1%	
2%	
5%	
10%	

14% of 30

of	
1%	
2%	
5%	
10%	

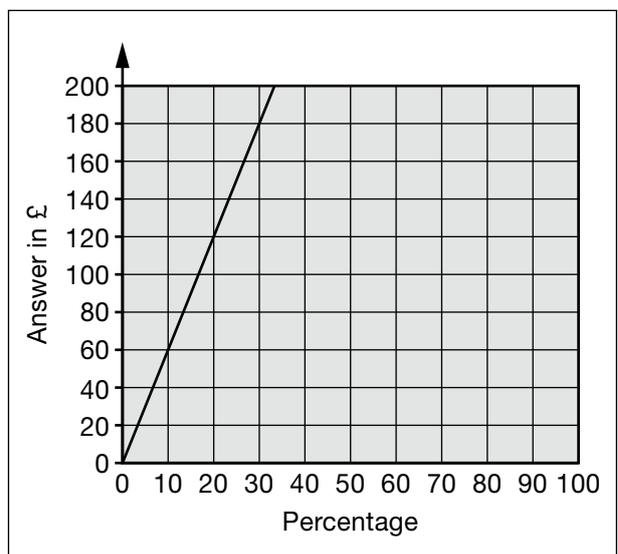
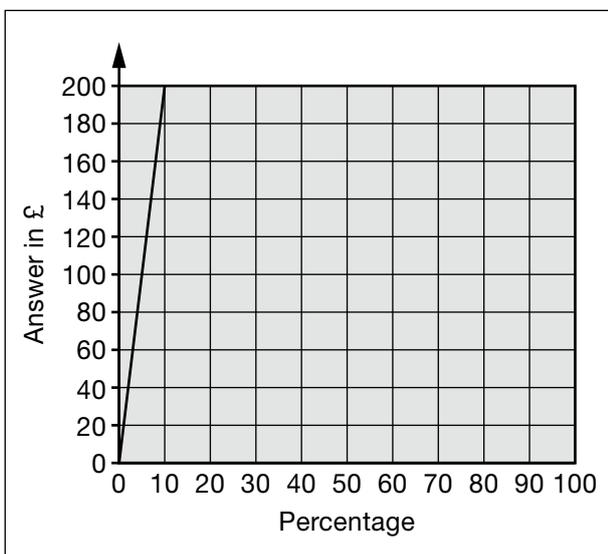
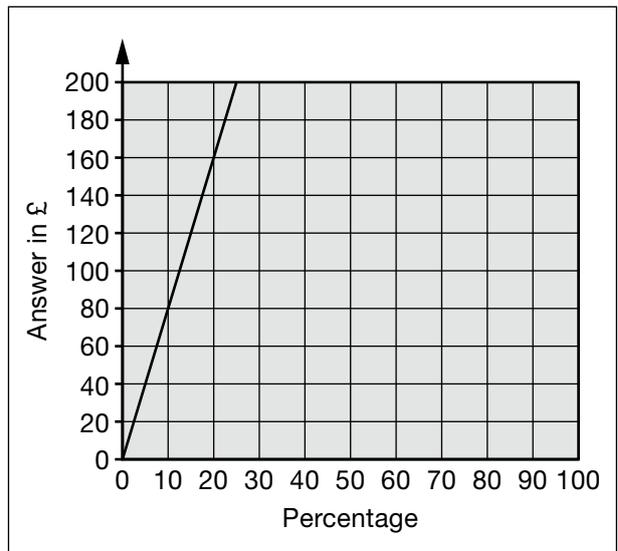
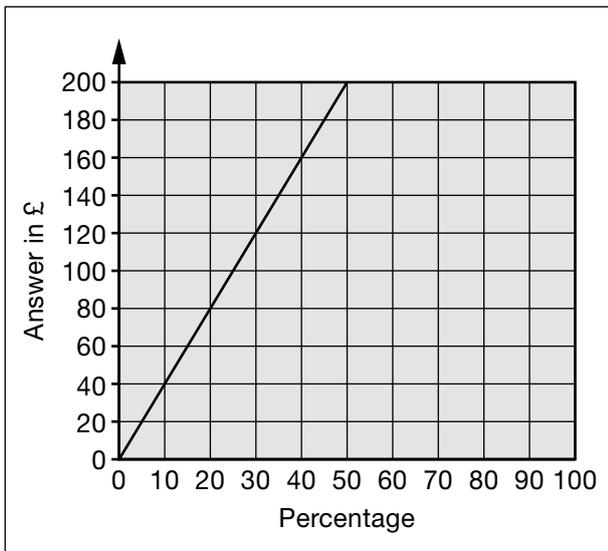
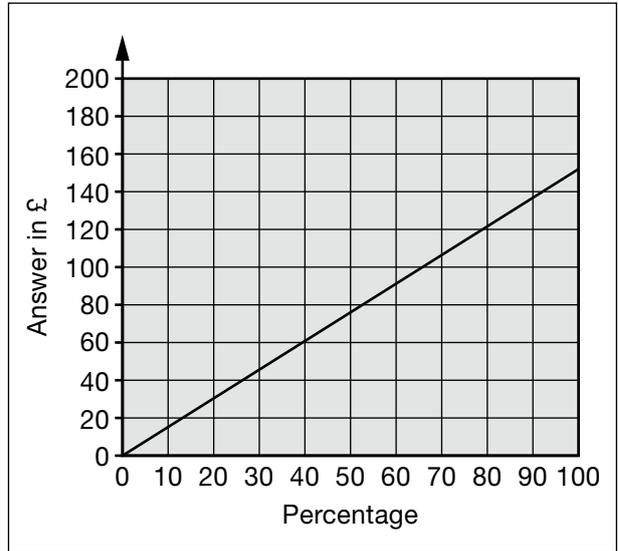
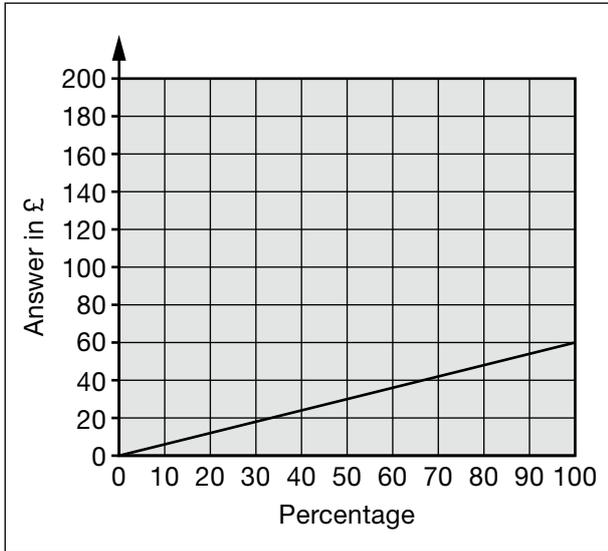
27.5% of 92

of	
1%	
2%	
5%	
10%	

What percentage? sheet 1

Name(s): _____

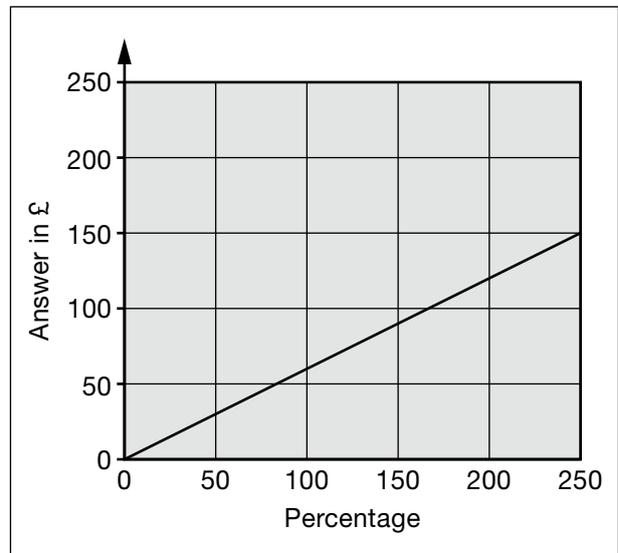
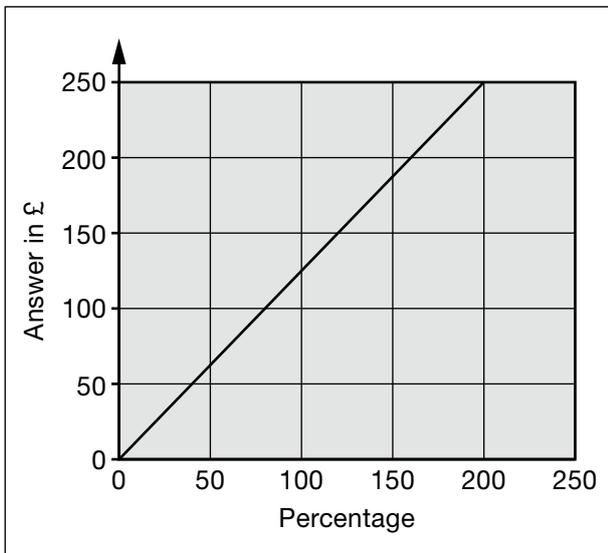
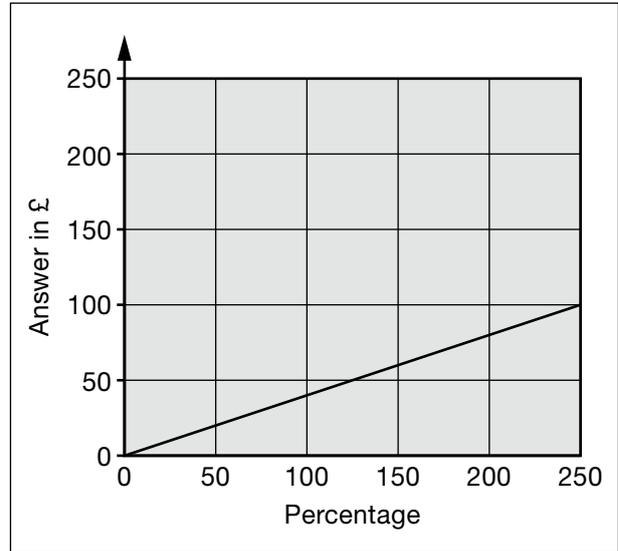
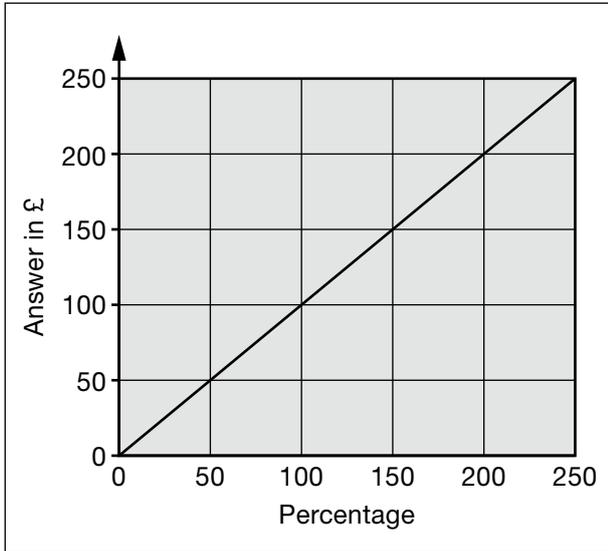
Change the blue number (the amount) to make these graphs.



What percentage? sheet 2

Name(s): _____

Change the blue number (the amount) to make these graphs.



Now change the blue number (the amount) so that the straight-line graph goes through:

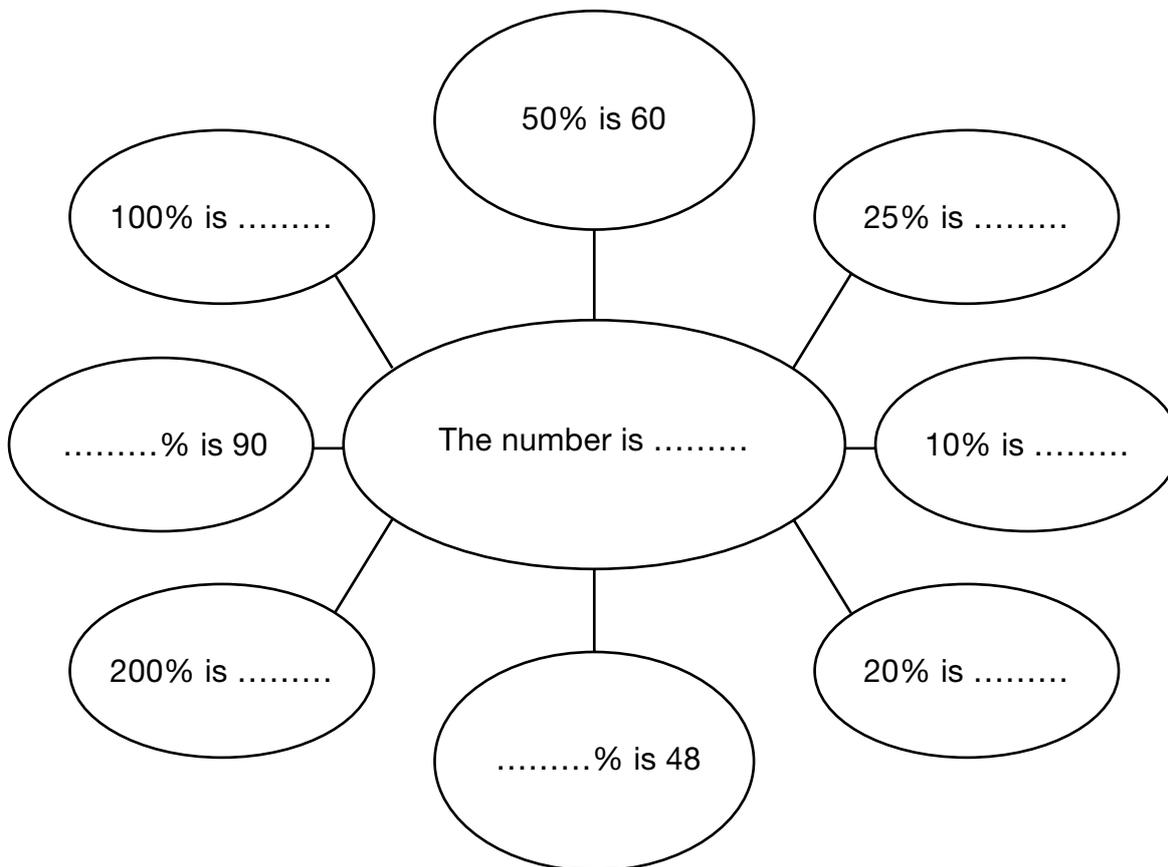
(250, 200)

(250, 75)

(250, 125)

(125, 225)

1. Fill in the missing numbers and percentages.



2. On a separate sheet of paper, do your own percentage web diagram. Start by writing **'The number is 36'** in the middle of your web. Then write some of your own percentage facts for the number 36.

T5L2assess2

What's missing? sheet 2

Name: _____

Fill in the missing numbers.

50% of it is 40	→	the number is
200% of it is 30	→	the number is
20% of it is 8	→	the number is
40% of it is 28	→	the number is
150% of it is 36	→	the number is

25% of it is	←	the number is 52
.....% of it is 40	←	the number is 200
11% of it is	←	the number is 150
.....% of it is 77	←	the number is 44
90% of it is	←	the number is 0.1

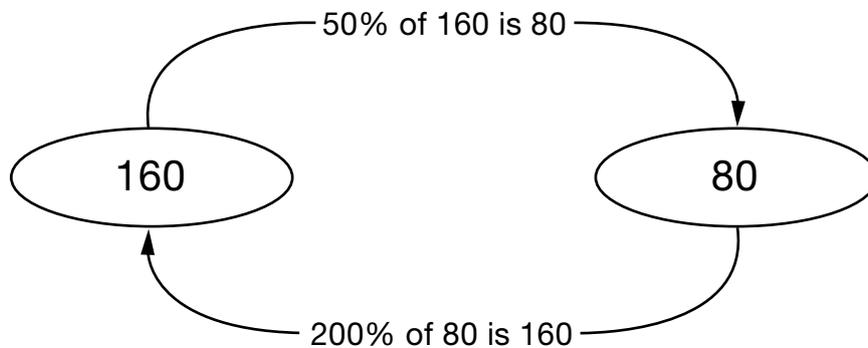
The number is 38

On a separate sheet of paper, write different percentage facts for the number 38. Remember to write your name on your paper.

Doing and undoing

Name: _____

Look at this diagram.



Does finding 200% of a number always 'undo' finding 50% of a number?

How do you know?

Hint: you may find it helpful to write 50% as a fraction.

How do you 'undo' finding 25% of a number? or 20%? or $33\frac{1}{3}\%$?

Each of the percentages used so far can be written as a fraction with a numerator of 1

How do you undo percentages that cannot be written as a fraction with a numerator of 1?

For example: 80%, 30%, $66\frac{2}{3}\%$, 150% and so on.

Continue on a separate sheet of paper. Remember to write your name on it.

Solutions and performance indicators

LESSON 1: 1-2-5-10

Solutions

Using 1-2-5-10 sheets 1 and 2 (target levels 3/4 and 4/5)		T5L1assess1 and 2																														
Solutions	Notes																															
<p>16 × 13 given as 208</p> <p>Evidence of using appropriate values from the table, e.g.</p> <ul style="list-style-type: none"> • 130 + 65 + 13 • 130 + 26 + 26 + 26 	<p>Good responses show evidence of completing (where applicable) and using appropriate values from the table.</p> <p>Better responses also evaluate the answer correctly from their selected values.</p>																															
<p>13 × 16 given as 208</p> <p>Evidence of (completing and) using appropriate values from the table, e.g.</p> <ul style="list-style-type: none"> • 160 + 32 + 16 • 160 + 3 × 16 • 160 + 80 – 32 																																
Using 1-2-5-10 sheets 1, 2 and 3 (target levels 3/4, 4/5 and 5/6)		T5L1assess1, 2 and 3																														
Solutions	Notes																															
<p>17 × 14 given as 238</p> <p>Evidence of completing and using appropriate values in the table, e.g.</p> <p>For sheets 2 and 3 and the first 17 × 14 on sheet 1:</p> <ul style="list-style-type: none"> • <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td colspan="2">lots of 14</td></tr> <tr><td>1</td><td>14</td></tr> <tr><td>2</td><td>28</td></tr> <tr><td>5</td><td>70</td></tr> <tr><td>10</td><td>140</td></tr> </table> <p style="margin-left: 20px;">140 + 70 + 28</p> <p>For sheets 2 and 3 and the second 17 × 14 on sheet 1:</p> <ul style="list-style-type: none"> • <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td colspan="2">lots of 17</td></tr> <tr><td>1</td><td>17</td></tr> <tr><td>2</td><td>34</td></tr> <tr><td>5</td><td>85</td></tr> <tr><td>10</td><td>170</td></tr> </table> <p style="margin-left: 20px;">170 + 34 + 34</p> • <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td colspan="2">lots of 17</td></tr> <tr><td>1</td><td>17</td></tr> <tr><td>2</td><td></td></tr> <tr><td>5</td><td>85</td></tr> <tr><td>10</td><td>170</td></tr> </table> <p style="margin-left: 20px;">170 + 85 – 17</p> 	lots of 14		1	14	2	28	5	70	10	140	lots of 17		1	17	2	34	5	85	10	170	lots of 17		1	17	2		5	85	10	170	<p>Good responses show evidence of completing and using appropriate values in the table.</p> <p>Better responses use the most efficient combinations of values and also evaluate the answer correctly from their selected values.</p>	
lots of 14																																
1	14																															
2	28																															
5	70																															
10	140																															
lots of 17																																
1	17																															
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10	170																															
lots of 17																																
1	17																															
2																																
5	85																															
10	170																															

Solutions

Notes

32×11 given as 352

Evidence of completing and using appropriate values in the table, e.g.

- | lots of 32 | |
|------------|-----|
| 1 | 32 |
| 2 | 64 |
| 5 | 160 |
| 10 | 320 |

$320 + 32$
- | lots of 11 | |
|------------|-----|
| 1 | |
| 2 | 22 |
| 5 | |
| 10 | 110 |

$320 + 22$

Good responses show evidence of completing and using appropriate values in the table.

Better responses use the most efficient combinations of values and also evaluate the answer correctly from their selected values.

16×400 given as 6400

Evidence of completing and using appropriate values in the table or modifying the table, e.g.

- | lots of 400 | |
|-------------|------|
| 1 | 400 |
| 2 | 800 |
| 5 | 2000 |
| 10 | 4000 |

$4000 + 2000 + 400$
- | lots of 16 | |
|------------|-----|
| 1 | 16 |
| 2 | 32 |
| 5 | 80 |
| 10 | 160 |

$10 \times 160 \times 4$
- | lots of 16 | |
|------------|------|
| 1 | |
| 2 | |
| 5 | |
| 10 | |
| 100 | 1600 |

1600×4

Solutions

Notes

16% of 400 given as 64

Evidence of completing and using appropriate values in the table, e.g.

- | % of 400 | |
|----------|----|
| 1 | 4 |
| 2 | 8 |
| 5 | 20 |
| 10 | 40 |

$40 + 20 + 4$

Good responses show evidence of completing and using appropriate values in the table, possibly using their values from the 16×400 table.

Better responses also evaluate the answer correctly from their selected values.

Solutions**Notes**

14% of 30 given as 4.2 or equivalent

Evidence of completing and using appropriate values in the table, e.g.

- | % of 30 | |
|---------|-----|
| 1 | 0.3 |
| 2 | 0.6 |
| 5 | 1.5 |
| 10 | 3 |

 $2 \times 0.6 + 3$

- | % of 30 | |
|---------|-----|
| 1 | 0.3 |
| 2 | |
| 5 | 1.5 |
| 10 | 3 |

 $3 + 1.5 - 0.3$

Good responses show evidence of completing and using appropriate values in the table.

Better responses use the most efficient combinations of values and also evaluate the answer correctly from their selected values.

27.5% of 92 given as 25.3 or equivalent

Evidence of completing and using appropriate values in the table or modifying the table, e.g.

- | % of 92 | |
|---------|------|
| 1 | 0.92 |
| 2 | 1.84 |
| 5 | 4.6 |
| 10 | 9.2 |

 $18.4 + 4.6 + 1.84 + 0.92 \div 2$

- | % of 92 | |
|---------|-----|
| 1 | |
| 2 | |
| 5 | 4.6 |
| 10 | 9.2 |
| 2.5 | 2.3 |

 $2 \times 9.2 + 4.6 + 2.3$

- | % of 92 | |
|---------|-----|
| 1 | |
| 2 | |
| 5 | 4.6 |
| 10 | |

 $92 \div 4 + 4.6 \div 2$

LESSON 1: 1-2-5-10

Performance indicators

Note that performance indicators involving an element of ‘Using and applying mathematics’ are given in **bold**.

Worksheet	Performance indicators
<p><i>Using 1-2-5-10 sheet 1</i> (target level 3/4) T5L1assess1</p>	<p>Level 3: At this level, pupils are generally able to:</p> <ul style="list-style-type: none"> • use completed 1-2-5-10 tables to evaluate the product of simple two-digit numbers, e.g. 13×16; • complete 1-2-5-10 tables correctly, given a simple two-digit number, e.g. 14. <p>However, they are less likely to be able to:</p> <ul style="list-style-type: none"> • complete all four rows of 1-2-5-10 tables, including the 5 row, consistently correctly for any two-digit number; • check that answers to the same calculations are the same even if different methods were used; • select appropriate values to evaluate the product of any simple two- or three-digit numbers, e.g. 17×14 or 16×400; • use one of the more efficient methods available, modifying the 1-2-5-10 table where appropriate. <p>Level 4: At this level, pupils are generally able to:</p> <ul style="list-style-type: none"> • complete 1-2-5-10 tables consistently for any two-digit number; • select appropriate values to evaluate the product of any simple two- or three-digit numbers, e.g. 17×14 or 16×400. <p>However, they are less likely to be able to:</p> <ul style="list-style-type: none"> • evaluate correct products consistently using their selected values; • check that answers to the same calculations are the same even if different methods were used; • use one of the more efficient methods available, modifying the 1-2-5-10 table where appropriate; • extend the method to apply it to finding a simple percentage of an amount, e.g. 16% of 400. <p>Level 5: At this level, pupils are generally able to:</p> <ul style="list-style-type: none"> • select appropriate values to evaluate the product of any simple two- or three-digit numbers, e.g. 17×14 or 16×400; • evaluate correct products consistently using their selected values; • often use one of the more efficient methods available; • extend the method to apply it to finding a simple percentage of an amount, e.g. 16% of 400.
<p><i>Using 1-2-5-10 sheet 2</i> (target level 4/5) T5L1assess2</p>	<p>However, they are less likely to be able to:</p> <ul style="list-style-type: none"> • use the method accurately to find more complex percentages of quantities that involve decimal calculations; • consistently use one of the more efficient methods available, modifying the table where appropriate. <p>Level 6 and above: At these levels, pupils are generally able to:</p> <ul style="list-style-type: none"> • give evidence for the performance indicators listed previously for pupils working at level 5; plus • use the method accurately to find more complex percentages of quantities that involve decimal calculations; • consistently use one of the more efficient methods available, modifying the table where appropriate.
<p><i>Using 1-2-5-10 sheet 3</i> (target level 5/6) T5L1assess3</p>	<p>However, they are less likely to be able to:</p> <ul style="list-style-type: none"> • use the method accurately to find more complex percentages of quantities that involve decimal calculations; • consistently use one of the more efficient methods available, modifying the table where appropriate. <p>Level 6 and above: At these levels, pupils are generally able to:</p> <ul style="list-style-type: none"> • give evidence for the performance indicators listed previously for pupils working at level 5; plus • use the method accurately to find more complex percentages of quantities that involve decimal calculations; • consistently use one of the more efficient methods available, modifying the table where appropriate.

LESSON 2: PERCENTAGES Solutions

What's missing? sheet 1 (target level 4/5)	T5L2assess1
Solutions	Notes
<p>1.</p>	<p>Good responses complete some of the missing values, following through from incorrect values where appropriate.</p> <p>Better responses identify what the number is and complete most other missing values correctly.</p>
<p>2. • Completes their own web diagram with 'The number is 36' in the centre, e.g.</p> <p>• Writes an example of their own, including different percentages from those in the previous diagram</p>	<p>Good responses show a web diagram based on the previous one with some correct percentages, following through from incorrect values where appropriate.</p> <p>Better responses show a more ambitious web diagram showing some different percentages from the previous one, with fewer errors.</p>

<i>What's missing? sheet 2 (target level 5/6)</i>		T5L2assess2
Solutions	Notes	
80 15 40 70 24	<p>Good responses complete some of the missing values correctly, particularly out of the first five.</p> <p>Better responses complete more of the missing values correctly.</p>	
13 20 16.5 or equivalent 175 0.09 or equivalent		
Any percentage facts for the number 38	<p>Good responses give a few simple percentage facts.</p> <p>Better responses give a range of more complex percentage facts.</p>	
<i>Doing and undoing (extension activity)</i>		T5L2assess3
Solutions	Notes	
<p>Indicates 'yes'</p> <p>A correct explanation, e.g.</p> <ul style="list-style-type: none"> '50% halves the number and then 200% doubles it again so it will always go back to the start' 'It's $\div 2$ then $\times 2$ and one is the opposite of the other' '50% is $\frac{1}{2}$ and 200% is 2' 	<p>Good responses show understanding that 50% is equivalent to $\frac{1}{2}$ or halving.</p> <p>Better responses also show why 200% is the opposite of this.</p>	
<p>Undo 25% by finding 400% or $\times 4$</p> <p>Undo 20% by finding 500% or $\times 5$</p> <p>Undo $33\frac{1}{3}\%$ by finding 300% or $\times 3$</p>	<p>Good responses show understanding of what to multiply/divide by in order to undo.</p> <p>Better responses also show understanding of how this is expressed as a percentage.</p>	
<p>Undo 80% by finding 125% or $\div 4$ and $\times 5$ (either order)</p> <p>Undo 30% by finding $333\frac{1}{3}\%$ or $\div 3$ and $\times 10$</p> <p>Undo $66\frac{2}{3}\%$ by finding 150% or $\div 2$ and $\times 3$</p> <p>Undo 150% by finding $66\frac{2}{3}\%$ or $\div 3$ and $\times 2$</p> <p>Any other examples of 'doing and undoing', possibly extending to more general reasoning about how to do this for any percentage</p>		

LESSON 2: PERCENTAGES Performance indicators

Note that performance indicators involving an element of 'Using and applying mathematics' are given in **bold**.

Worksheet	Performance indicators
<p><i>What's missing? sheet 1</i> (target level 4/5) T5L2assess1</p>	<p>Level 4: At this level, pupils are generally able to:</p> <ul style="list-style-type: none"> • work out a number and 25% of it, given 50% of the number; • understand that 100% of a number is the same as the number itself and that 200% is double the number; • write a few simple percentage facts about a given two-digit number, e.g. integer values corresponding to 100%, 50% or 25%. <p>However, they are less likely to be able to:</p> <ul style="list-style-type: none"> • complete <u>values</u> in percentage facts using percentages such as 10% or 20%, e.g. identifying that 10% of an amount is <u>12</u>; • complete simple <u>percentages</u> in percentage facts, such as identifying amounts as 75% or 40%, given other facts about the number, e.g. identifying that <u>75%</u> is 90; • write a range of percentage facts about a given two-digit number, including those involving non-integers. <p>Level 5: At this level, pupils are generally able to:</p> <ul style="list-style-type: none"> • complete <u>values</u> in percentage facts using percentages such as 10%, 20% or 90%, e.g. identifying that 10% is <u>12</u>; • complete simple <u>percentages</u> in percentage facts, such as identifying amounts as 75%, 40% or 20%, given other facts about the number, e.g. identifying that <u>75%</u> is 90; • find numbers themselves, given values corresponding to percentages such as 50%, 200% and 20%; • write a range of percentage facts about a given two-digit number, including those involving non-integers; • give an example to show that finding 200% of an amount will produce the opposite effect to finding 50% of an amount. <p>However, they are less likely to be able to:</p> <ul style="list-style-type: none"> • find numbers themselves, given values corresponding to percentages that are not factors of 100, e.g. 40% or 150%; • complete <u>percentages</u> in percentage facts, such as identifying amounts as percentages greater than 100; • reason about inverse operations in the context of percentages.
<p><i>What's missing? sheet 2</i> (target level 5/6) T5L2assess2</p>	<p>(See next page for level 6 indicators)</p>
<p><i>Doing and undoing</i> (extension activity) T5L2assess3</p>	<p>(See next page for level 6 indicators)</p>

Worksheet	Performance indicators
<p><i>What's missing? sheet 2</i> (target level 5/6) T5L2assess2</p>	<p>Level 6: At this level, pupils are generally able to:</p> <ul style="list-style-type: none"> • find a number, given percentages of it that are not factors of 100, e.g. 40% or 150%; • complete <u>percentages</u> in percentage facts, such as identifying amounts as percentages greater than 100; • write a wide range of complex percentage facts about a given two-digit number; • explain why finding 200% of an amount will always produce the opposite effect to finding 50% of an amount; • identify operations that 'undo' finding simple percentages such as 25% or 20% that <u>can</u> be written as fractions with a numerator of 1. <p>However, they are less likely to be able to:</p> <ul style="list-style-type: none"> • identify operations that 'undo' finding more complex percentages such as $33\frac{1}{3}\%$ that <u>can</u> be written as fractions with a numerator of 1; • identify operations that 'undo' finding percentages such as 80% or 30%, that <u>cannot</u> be written as fractions with a numerator of 1; • start to generalise about fractions and their reciprocals and relate this to percentages and their inverses. <p>Above level 6: At these levels, pupils are generally able to:</p> <ul style="list-style-type: none"> • give evidence for the performance indicators listed previously for pupils working at level 6, plus; • identify operations that 'undo' finding more complex percentages such as $33\frac{1}{3}\%$ that <u>can</u> be written as fractions with a numerator of 1; • identify operations that 'undo' finding percentages such as 80% or 30%, that <u>cannot</u> be written as fractions with a numerator of 1; • start to generalise about fractions and their reciprocals and relate this to percentages and their inverses.
<p><i>Doing and undoing</i> (extension activity) T5L2assess3</p>	

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