

Unit 8
Properties of numbers and number sequences
Reasoning about numbers

Five daily lessons

National
Numeracy Strategy

Year 4
Autumn term

Unit Objectives
Year 4

- Recognise and extend number sequences formed by counting from any number in steps of constant size extending beyond zero when counting back e.g. count on in steps of 25 to 500 and then back to, say, –100.
- Recognise odd and even numbers up to 1000 and some of their properties, including the outcome of sums or differences of pairs or odd/even numbers.
- Solve mathematical problems or puzzles, recognise and explain patterns and relationships, generalise and predict.
- Make and investigate a general statement about familiar numbers, by finding examples that satisfy it.

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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:

- Resource sheet 8.1
- Resource sheet 8.2
- Resource sheet 8.3
- Activity sheet 8.1
- OHT 8.1
- OHT 8.2
- OHT 8.3
- OHT 8.4
- Number cards
- Counting stick
- Cubes
- 2-D shapes
- OHT counters
- Whiteboards
- OHP calculator

Link Objectives

Year 3

Year 5

- Describe and extend number sequences: **count on or back in tens or hundreds, starting from any two- or three-digit number.**
- Count on or back in twos starting from any two-digit number, and recognise odd and even numbers to at least 100.
- Count on in steps of 3, 4, or 5 from any small number to at least 50, then back again.
- Solve mathematical problems or puzzles, recognise simple patterns and relationships, generalise and predict.

- Recognise and extend number sequences formed by counting from any number in steps of constant size, extending beyond zero when counting back.
- Make general statements about odd or even numbers, including the outcomes of sums and differences.
- Solve mathematical problems or puzzles, recognise and explain simple patterns and relationships, generalise and predict.

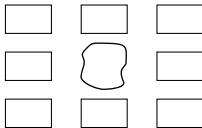
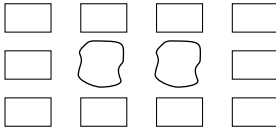
(Key objectives in bold)

Planning sheet	Day One	Unit 8 <i>Properties of numbers and number sequences</i> <i>Reasoning about numbers</i>	Term: <i>Autumn</i>	Year Group: 4
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities / Focus Questions
<p>To count on or back in 10, 100, 1000 from any whole number up to 10 000.</p> <p>VOCABULARY consecutive sequence</p> <p>RESOURCES Resource sheet 8.1</p>	<ul style="list-style-type: none"> Prepare number cards from Resource sheet 8.1. <div>+1000</div> <div>-1000</div> <div>+10</div> <div>-10</div> <div>+100</div> <div>-100</div> Tell the children that they will be counting in steps. Which step will depend on which card you hold up. Choose a starting number e.g. 43 and hold up <div>+10</div> Let the children count up and then show <div>-10</div> card. Children count down. Change start number remembering the range stated in the objective. Change the number card. Extend the activity by selecting the cards randomly. 	<p>To recognise and extend number sequences formed by counting from any number in steps of constant size.</p> <p>VOCABULARY sequence, predict rule increase, decrease</p> <p>RESOURCES Counting stick OHP calculator</p>	<ul style="list-style-type: none"> Demonstrate with the counting stick counting in steps of 2 starting from a two-digit number. Move on to counting up in steps of 3, 4, 5. Tell the children the start number and the step e.g. start 27 step +3. <div>Q What would the number at the end of the stick be?</div> Using an OHP calculator enter a start number and set the constant function to +2, then get the children to say the numbers as you press the equals key. Repeat with +3, +4, +5. Children have to say the next number before equals key is pressed. Repeat with -2, -3, -4, -5. Ask children to look at this sequence: 17, 20, 23, 26. Ask questions like: <div>Q What is the next number in the sequence? ...and the next?</div> <div>Q So what is the rule for this sequence?</div> Give the children these sequences. Working with a partner can they work out the next three numbers? (1) 48, 41, 34, 27 (2) 135, 137, 139, 141 (3) 268, 266, 264, 262 (4) 194, 189, 184, 179 (5) 348, 351, 354, 357 Take feedback and discuss answers. Ask the children (still in pairs) to work out the three numbers that come before the first number in each sequence. Discuss answers. 	<ul style="list-style-type: none"> Write on the board: 89, 79, 69 Ask what the next number is, and what rule they used to get it. <div>Q Will the sequence reach zero?</div> <div>Q What happens after you reach 9?</div> Reflect on the important points to remember: <ul style="list-style-type: none"> compare two numbers to establish the step size; check with the next number; in sequences the numbers increase or decrease. Tell the children they will be extending their own number sequences tomorrow. <div> <p>By the end of the lesson children should be able to:</p> <ul style="list-style-type: none"> Recognise and extend number sequences by counting on and back in any steps. <p>(Refer to supplement of examples, section 6, page 16.)</p> </div>

Planning sheet	Day Two	Unit 8 <i>Properties of numbers and number sequences</i> <i>Reasoning about numbers</i>	Term: <i>Autumn</i>	Year Group: 4
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities / Focus Questions
<p>To explain methods and reasoning about numbers and shapes.</p> <p>VOCABULARY explain reason</p> <p>RESOURCES OHT 8.1 true / false cards Resource sheet 8.1 Resource sheet 8.2</p>	<ul style="list-style-type: none"> Display OHT 8.1 first statement only. Give pairs of children true / false cards. Allow a short time for pairs to agree whether the statement is true or false. <p>Ask pairs to show the appropriate true / false card and explain their reasoning.</p> <p>Repeat for other statements.</p>	<p>Recognise and extend number sequences formed by counting from any number in steps of constant size, extending beyond zero when counting back.</p> <p>VOCABULARY negative</p> <p>RESOURCES Counting stick OHP calculator</p>	<ul style="list-style-type: none"> Using the counting stick consolidate the previous day's lesson, counting up and back in steps of a constant size. Try 3s and 6s, 2s and 4s and 8s, 5s and 10s. <p>Point to the middle of the counting stick and tell the children that this is zero. From zero count up in 4s to 20 then back to zero. Ask:</p> <div>Q What is the next number below zero?</div> <p>Make sure children count backwards using negative 4, negative 8 etc.</p> <ul style="list-style-type: none"> Using an OHP calculator enter 9 \square 3. <p>Pressing equals repeatedly will take number down to zero. Ask the children to predict what the next number will be when continuing to press equals. Repeat for -5, -6.</p> <p>Ask the children to make up sequences that:</p> <p style="padding-left: 40px;">end in 14 end in 10 end in 3</p> <p>in each case by counting up and also by counting down.</p> <ul style="list-style-type: none"> Discuss the sequences the children have found. Look out for those including negatives. Get children to write them on the board and explain them. Discuss methods and strategies. <p>Ask the children to devise some sequences that go up, then down, in 6s and 12s, in 8s and in 4s.</p> <p>Discuss the sequences and ask the children to explain their methods and strategies.</p>	<ul style="list-style-type: none"> Write on the board \square 50 60 70 \square \square <p>Choose children to supply the missing numbers giving the reason for their choice.</p> <p>Repeat with other sequences e.g. 1 2 \square \square \square</p> <div>Q Are there other possibilities?</div> <p>\square \square 95 98 \square 104 107 \square</p> <p>\square \square \square \square \square 7 12 \square \square</p> <div> <p>By the end of the lesson children should be able to:</p> <ul style="list-style-type: none"> Recognise and extend number sequences by counting on and back in any steps, extending beyond zero when counting back. <p>(Refer to supplement of examples, section 6, page 16.)</p> </div>

Planning sheet	Day Three	Unit 8 <i>Properties of numbers and number sequences</i> <i>Reasoning about numbers</i>	Term: <i>Autumn</i>	Year Group: 4
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities / Focus Questions
<p>To classify polygons using criteria such as number of right angles, whether or not they are regular, symmetry properties.</p> <p>VOCABULARY right angles, symmetry, regular, irregular</p> <p>RESOURCES 2-D shapes OHT 8.2</p>	<ul style="list-style-type: none"> Show OHT 8.2 <p>Point to two 2-D shapes on the OHP. Ask children questions such as:</p> <div>Q How are these shapes different?</div> <div>Q How are they the same?</div> <p>– drawing out criteria as in the objective.</p> <p>Repeat with other pairs of shapes.</p>	<p>Recognise odd and even numbers up to 1000 and some of their properties.</p> <p>Make and investigate a general statement about familiar numbers by finding examples that satisfy it.</p> <p>RESOURCES Whiteboards Cubes Resource sheet 8.3</p>	<ul style="list-style-type: none"> Check children's recognition of odd and even numbers as follows: <p>Ask them to write any 3 odd numbers on a whiteboard / paper and to hold them up for you to see.</p> <p>Jot down on class board a selection from what you see (include some single-digit, and two- and three- digit numbers).</p> <p>Ask for a definition of an odd number. (If children are hesitant, get them to think about why e.g. 2 is NOT ODD).</p> <p>Draw a box on board and put title 'Statements about odd numbers '. Jot down the definitions the children have given.</p> <p>Repeat the process for even numbers.</p> <p>Say you want to see if there are other statements you could make about odd or even numbers to add to the boxes.</p> <p>Have Resource sheet 8.3 for suggestions you could make for investigation.</p> <p>Give children time to investigate and write examples in their books.</p>	<ul style="list-style-type: none"> Take feedback. <p>Add statements to the boxes.</p> <p>See if anyone can suggest why a statement such as $0 + 0 = E$ might be true.</p> <p>Model using children or practical materials such as cubes.</p> <div>Q How do you know that this <i>could not</i> be true.?</div> <p>I bought a lolly for 26p and a drink for 32p. I paid 57p.</p> <p>Make up other examples in which the children need to draw on what they have found for explanation.</p> <div> <p>By the end of the lesson children should be able to:</p> <ul style="list-style-type: none"> Recognise odd and even numbers and some of their properties; Make and investigate a general statement about familiar numbers by finding examples that satisfy it. <p>(Refer to supplement of examples, section 6, pages 18, 80.)</p> </div>

Planning sheet	Day Four	Unit 8 <i>Properties of numbers and number sequences</i> <i>Reasoning about numbers</i>		Term: <i>Autumn</i>	Year Group: 4																																							
Oral and Mental		Main Teaching			Plenary																																							
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities		Teaching Activities / Focus Questions																																							
To know by heart multiplication facts for 2, 3, 4, 5 and 10 times tables.	<div>• Show OHT 8.3</div> <table><tr><td>9</td><td>4</td><td>16</td><td>18</td><td>25</td></tr><tr><td>24</td><td>10</td><td>28</td><td>21</td><td>3</td></tr><tr><td>30</td><td>2</td><td>8</td><td>25</td><td>60</td></tr><tr><td>7</td><td>12</td><td>40</td><td>50</td><td>35</td></tr><tr><td>6</td><td>22</td><td>15</td><td>20</td><td>14</td></tr></table> <div>Use counters (OHT).</div> <div>Cover 3 numbers in the 4 times table.</div> <div>Choose children to say multiplication fact for their number.</div> <div>e.g. 12 4 × 3 = 12</div> <div>Remove counters.</div> <div>Repeat with other multiplication tables.</div> <div>3 numbers in 5 times table, 10 times table etc.</div> <div>Cover all the numbers in 4 times table.</div> <div>Cover all numbers in 5 times table etc.</div> <div>Bring out related facts: 15 in 3s and 5s, and relationship between 2s and 4s.</div>	9	4	16	18	25	24	10	28	21	3	30	2	8	25	60	7	12	40	50	35	6	22	15	20	14	<div>Solve mathematical problems or puzzles.</div> <div>Recognise and explain patterns and relationships, generalise and predict.</div> <div>VOCABULARY consecutive</div> <div>RESOURCES Number cards Activity sheet 8.1</div>	<div>• Use number cards from range 2-6.</div> <div>Child chooses card e.g. 3, from pile. Stick on board / write on OHT</div> <table><tr><td>2</td><td>3</td><td>4</td></tr></table> <div>Write number before, number after.</div> <div>Generate five sets of numbers and ask:</div> <div>Q What do we call these sets of numbers?</div> <div>Explain that we call these consecutive numbers.</div> <div>• Use Activity sheet 8.1</div> <table><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr></table> <div>Ask children to work in pairs to find sets of consecutive numbers which give totals –</div> <div>up to 20</div> <div>up to 30</div> <div>more than 30</div> <div>less than 10.</div> <div>Discuss methods used to find total. Pull out the relationship through questioning. (Some children may see that the total is 3 times the middle number.)</div>	2	3	4	1	2	3	4	5	6	7	8	9	10	11	12	<div>• Recap meaning of the word ‘consecutive’.</div> <div>Write on board sets of three consecutive numbers.</div> <div>e.g. 24, 25, 26</div> <div>Find total.</div> <div>Q What about 240, 250, 260?</div> <div>Use other examples.</div> <div>Q If we know that the total is 30 which three consecutive numbers would we have used?</div> <div>Use other examples</div> <div>e.g. 36, 42</div> <div>and then extend to 333, 666 if you can.</div> <div>HOMEWORK – Take the sheet home and investigate five consecutive numbers. Explain how you can work out the answer to someone in your home.</div> <div>By the end of the lesson children should be able to:</div> <div>• Tackle number problems in a systematic manner;</div> <div>• Recognise simple patterns;</div> <div>• Generalise and predict.</div> <div>(Refer to supplement of examples, section 6, page 78.)</div>
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RESOURCES OHT 8.3 OHT counters																																												

Planning sheet	Day Five	Unit 8 <i>Properties of numbers and number sequences</i> <i>Reasoning about numbers</i>	Term: <i>Autumn</i>	Year Group: 4																				
Oral and Mental		Main Teaching		Plenary																				
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities / Focus Questions																				
<p>To know by heart multiplication facts for 2, 3, 4, 5 and 10 times tables.</p> <p>Derive quickly division facts for 2, 3, 4, 5 and 10 times tables.</p>	<ul style="list-style-type: none"> Show the children these numbers or write them on the board: <table border="1"> <tbody> <tr> <td>2</td><td>28</td><td>4</td><td>7</td><td>50</td></tr> <tr> <td>20</td><td>8</td><td>15</td><td>18</td><td>5</td></tr> <tr> <td>32</td><td>6</td><td>3</td><td>10</td><td>24</td></tr> <tr> <td></td><td></td><td></td><td></td><td>12</td></tr> </tbody> </table> <p>Give the children two minutes to talk to their partner about multiplication and division facts using these numbers.</p> <p>Take feedback from the children.</p>	2	28	4	7	50	20	8	15	18	5	32	6	3	10	24					12	<p>Solve mathematical problems or puzzles, recognise and explain patterns and relationships, generalise and predict.</p>	<ul style="list-style-type: none"> Set an investigation as follows: A garden pond is to be surrounded by paving stones. Use OHT 8.4 to show: <div style="text-align: center;">  </div> <div>Q How many stones do we need?</div> <div>Q How many stones would you need to surround two ponds?</div> <p>Use OHT 8.5 to show:</p> <div style="text-align: center;">  </div> <div>Q How many stones do we need?</div> <ul style="list-style-type: none"> Instruct the children to work in pairs and investigate how many stones they would need to surround 3, 4 or 5 ponds. Tell them that they can record in any way they like. Give them time to investigate, noting and encouraging <i>by questioning</i> those who can't get started. <i>Do not direct</i> children but observe and question. 	<ul style="list-style-type: none"> Begin by pulling out the numbers: 1 pond needs 8 stones 2 ponds need 10 stones etc. <p>Discuss ways in which children have recorded: pictures numbers placed randomly tabulation etc.</p> <p>Discuss efficiency of the different ways of recording.</p> <p>Start to predict: ask children how many stones might be needed for 10 ponds etc.</p> <p>Look at how far can you reasonably take the prediction.</p> <div> <p>By the end of the lesson children should be able to:</p> <ul style="list-style-type: none"> Tackle number problems in a systematic manner; Recognise simple patterns; Generalise and predict. <p>(Refer to supplement of examples, section 6, page 78.)</p> </div>
2	28	4	7	50																				
20	8	15	18	5																				
32	6	3	10	24																				
				12																				

RESOURCES
OHT 8.4
OHT 8.5

$+1000$	-1000	-10
$+10$	$+100$	-100

true

false

true

false

true

false

true

false

true

false

What sort of number do you get if you add a pair of even numbers together? Try a few pairs.

Is the result different if you add a pair of odd numbers together? Try a few pairs.

What sort of number do you get if you add an odd and an even number together. Try a few pairs.

What sort of numbers lie either side of a single digit odd number? Is it the same for a 2 digit or 3 digit odd number?

What sort of numbers lie either side of a single digit even number? Is it the same for a single digit even number? Is it the same for a 2 digit or 3 digit even number?

What sort of number do you get if you double an odd number? Try it a few times.

What sort of number do you get if you double an even number?

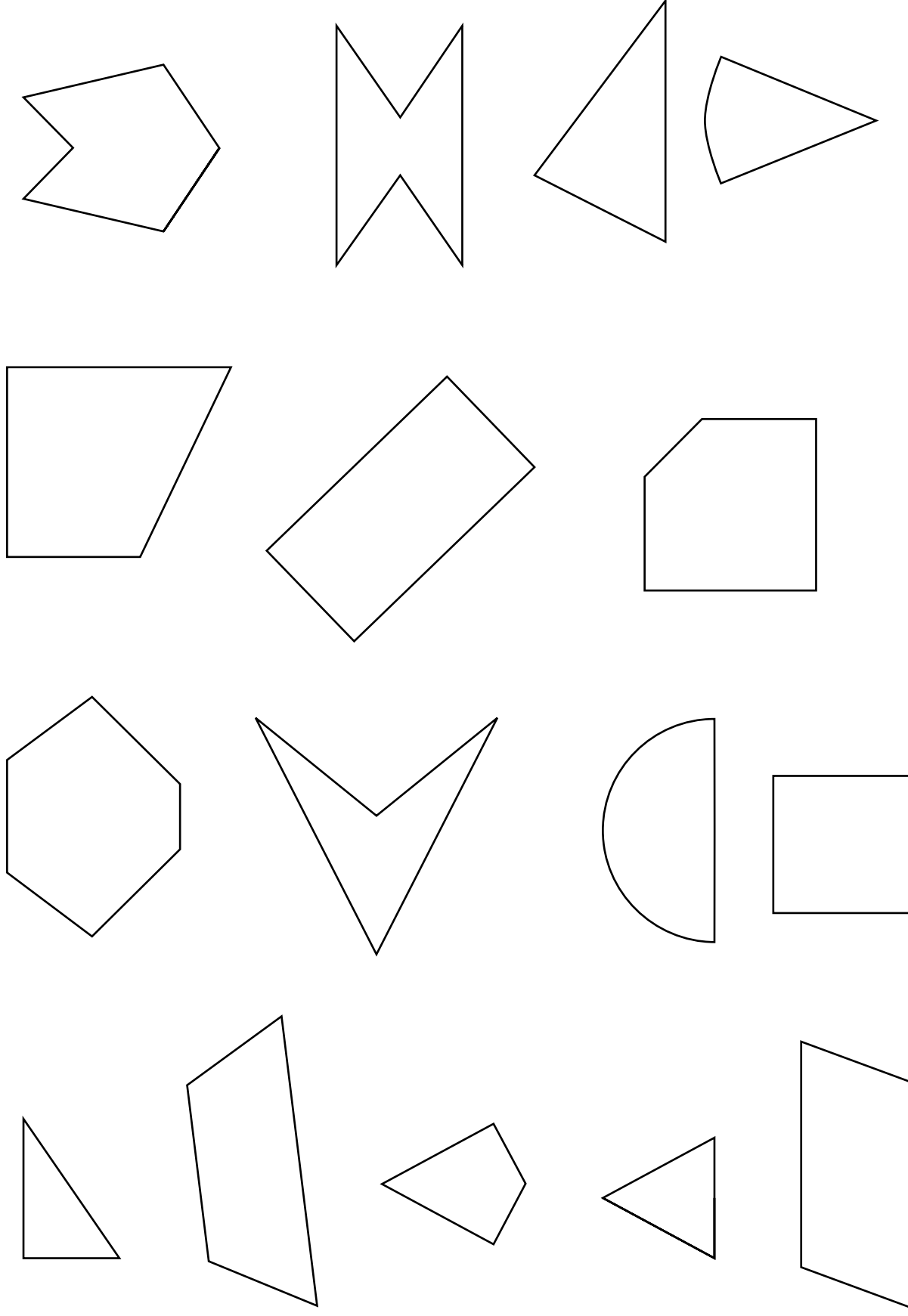
What sort of number of you get if you halve an even number?

1	2	3	4	5	6	7	8	9	10	11	12
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1	2	3	4	5	6	7	8	9	10	11	12
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1	2	3	4	5	6	7	8	9	10	11	12
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- $36 + 38 = \text{double } 35 \text{ plus } 4$
- Five thousand and thirty seven in figures is 500037.
- All triangles with two equal sides are isosceles.
- Pizzas cost £4.95
Coke costs 85p
Together a pizza and a coke costs £5.90
- The nearest 10 to 396 is 400.



9	4	16	18	25
24	10	28	21	3
30	2	8	25	60
7	12	40	50	35
6	22	15	20	14

(When using, cut out the pieces

