



# Key stage 2 mathematics

## Sample questions, mark schemes and commentary for 2016 assessments

### Introduction to sample materials

The new national curriculum will be assessed for the first time in May 2016. This set of sample materials is being published to give teachers an indication of how the new curriculum will be assessed. The materials presented here primarily focus on new areas of the curriculum and how questions assessing those areas might appear.

The examples in this document have not been through the rigorous development process that live tests go through. We will decide on final question formats once we have data from trialling the test materials. This means that some of the question types may not appear in the live tests. We will publish complete sample tests in 2015 that will reflect our findings and will be indicative of the final live tests.

These materials have been reviewed by teachers and their comments have been taken into account.

As the questions have not been trialled in schools, the mark schemes do not consider the full range of acceptable responses or include example pupil responses. They only give a basic indication of the types of response that would be credited.

The questions in the English grammar, punctuation and spelling, mathematics and science tests will appear in order of difficulty, where possible. In English reading, the texts appear in order of difficulty. In these sample materials, the texts and questions are not necessarily in order of difficulty, nor do they reflect the range of question difficulties that will appear in the final tests.

Test frameworks that illustrate the test model, content domain and performance descriptors for the 2016 national curriculum tests are on GOV.UK at [www.gov.uk/sta](http://www.gov.uk/sta). Please note that these sample materials are not designed to match the frameworks in terms of ratios of question/item type or coverage. They do not form complete tests as described by the test frameworks and are, therefore, not sample tests.

We recommend that these materials are not used for assessment purposes.

## Key features of the mathematics tests

From 2016, questions in the mathematics national curriculum tests will be linked to specific areas of the new national curriculum. These references are shown in the test frameworks. The tests will be written to meet the test specification set out in the test frameworks.

At key stages 1 and 2, the new tests for mathematics will have two components. The first component is an arithmetic paper testing fluency through calculation. The second component assesses the ability to reason and apply mathematics.

The key change for statutory assessment at both key stages 1 and 2 will be the introduction of an arithmetic paper. All of the questions in this paper intend to assess pupils' arithmetic ability; therefore the questions themselves will be context free.

The mathematics test will consist of three papers.

- **Paper 1:** an arithmetic paper. Questions will be context free. They will assess number, calculations and fractions. Note that the 'fractions' strand in the new national curriculum covers fractions, decimals and percentages.

Pupils will be expected to use formal methods to solve specific arithmetic questions, eg long multiplication and long division. There will be clear guidance in the test booklet and the administration guide to indicate when a formal method is required. Two marks will be available for these questions. One mark may be awarded if an appropriate formal method is used but the final answer is incorrect. Each question in the arithmetic paper will have a grid area to encourage appropriate working out.

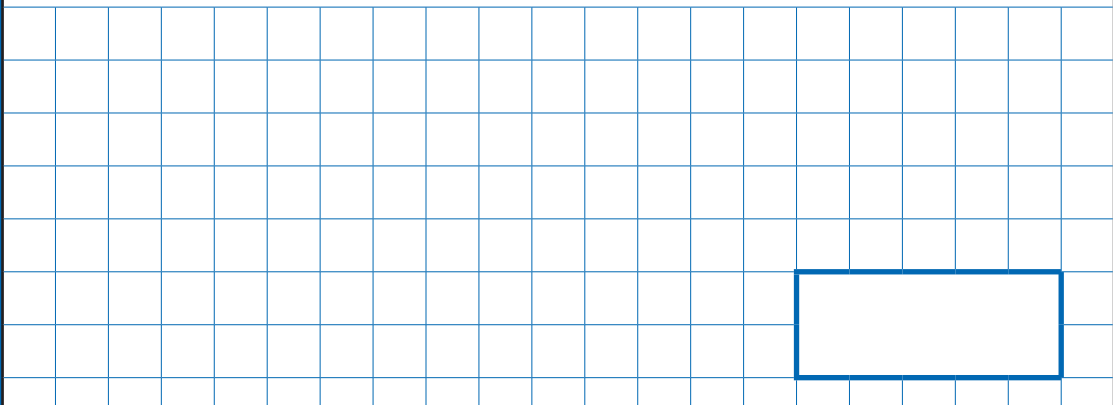
- **Paper 2 and Paper 3:** assesses pupils' ability to apply mathematics to problems and to reason. There won't be significant differences in format or difficulty between the two papers. Questions will be linked to the specific strands and year group references described in the key stage 2 mathematics Test framework. The tests will contain a mixture of contextualised and context-free questions, and real life and abstract problems.

Pupils will not be allowed to use calculators in any part of the mathematics test.

### Timings for the test

- **Paper 1:** 30 minutes
- **Paper 2 and Paper 3:** each will take 40 minutes.

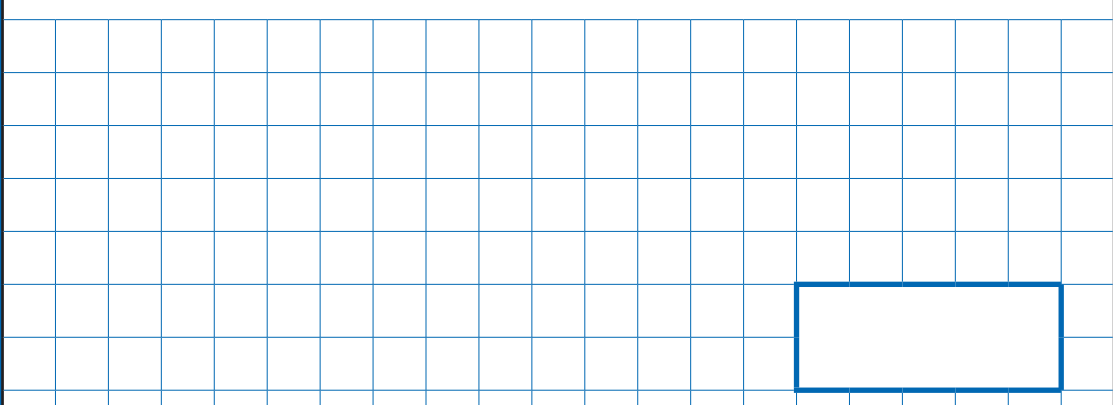
## Paper 1: arithmetic sample questions

1	$555 + 656 =$	<input style="width: 40px; height: 30px; border: 1px solid black;" type="text"/> 1 mark
		

Qu	Requirement	Mark	Additional guidance
1	1211	1 mark	

**Commentary:** This addition requires bridging in every column. Pupils need to recall and use known number facts; a small number of numeric steps are required. A simple response is needed.

**Content domain:** 3C2 - Add and subtract numbers with up to three digits, using formal written methods of columns for addition and subtraction.

2	$1 \frac{1}{7} - \frac{3}{7} =$	<input style="width: 40px; height: 30px; border: 1px solid black;" type="text"/> 1 mark
		

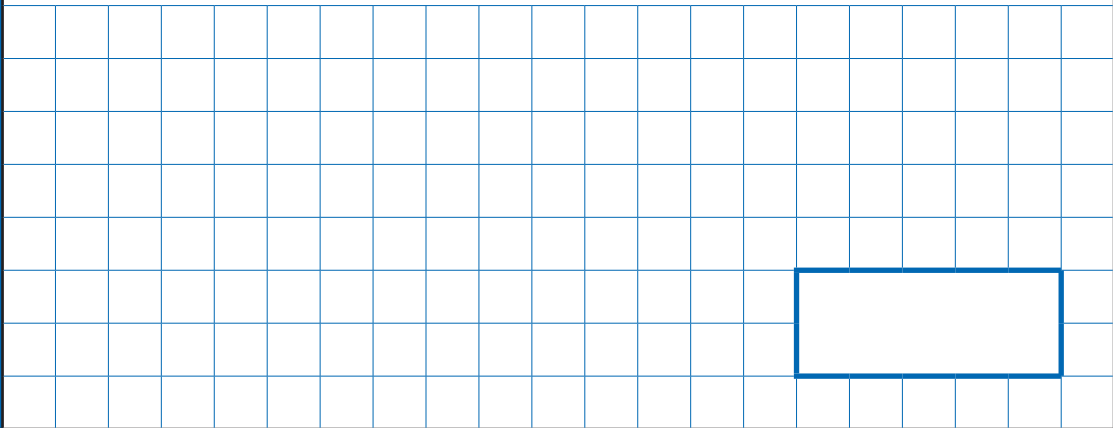
Qu	Requirement	Mark	Additional guidance
2	$\frac{5}{7}$	1 mark	

**Commentary:** The addition and subtraction of fractions is new to the curriculum. This question requires pupils to apply a learned procedure with two numeric steps and produce a simple response.

**Content domain:** 6F4 - Add and subtract fractions with different denominations and mixed numbers, using the concept of equivalent fractions.

**3**

$$120 - 15 \times 5 =$$



1 mark

Qu	Requirement	Mark	Additional guidance
3	45	1 mark	

**Commentary:** In year 6 pupils are required to use their knowledge of the order of operations to carry out calculations involving the four operations, i.e. BODMAS. In this question, it is necessary to evaluate  $15 \times 5$  before subtracting from 120. This requires pupils to apply a learned procedure to a problem with a small number of steps where there is a simple response.

**Content domain:** 6C9 - Use their knowledge of the order of operations to carry out calculations involving the four operations.

4	$\begin{array}{r} 2376 \\ \times 15 \\ \hline \end{array}$	
<b>Show your method</b>	<div style="border: 2px solid #005596; width: 150px; height: 40px; margin: auto;"></div>	<div style="border: 1px solid black; width: 40px; height: 30px; display: inline-block;"></div> 2 marks

Qu	Requirement	Mark	Additional guidance
<b>4</b>	<p>Award <b>TWO</b> marks for the correct answer of 35640</p> <p>If the answer is incorrect award <b>ONE</b> mark for evidence of using the formal method of long multiplication which contains no more than one arithmetical error, eg:</p> <ul style="list-style-type: none"> <li>■           <math display="block">\begin{array}{r} 2376 \\ \times 15 \\ \hline 11880 \\ 23760 \\ \hline \end{array}</math> <p>wrong answer</p> </li> </ul>	<p><b>Up to 2 marks</b></p>	<p>Working must be carried through to reach an answer for the award of <b>ONE</b> mark.</p> <p>In all cases accept follow-through of <b>ONE</b> error in working.</p> <p><b>Do not</b> award any marks if:</p> <ul style="list-style-type: none"> <li>■ The error is in the place value, eg by omission of the zero when multiplying by tens eg:           <math display="block">\begin{array}{r} 2376 \\ \times 15 \\ \hline 11880 \\ 2376 \\ \hline \end{array}</math> <p>wrong answer</p> </li> <li>■ The final (answer) line of digits is missing</li> </ul>

**Commentary:** This question illustrates the increased demand of multiplying a 4-digit number by a 2-digit number. It is presented vertically, to encourage pupils to use a formal written method.

Only the use of a formal written method will gain the method mark should the pupil calculate incorrectly.

**Content domain:** 6C7a - Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal method of long multiplication.

<b>5</b>	2 8   1 6 5 2	<div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto;"></div> 2 marks
<b>Show your method</b>		

Qu	Requirement	Mark	Additional guidance
<b>5</b>	Award <b>TWO</b> marks for the correct answer of 59.  If the answer is incorrect, award <b>ONE</b> mark for the formal method of long division, eg:  $  \begin{array}{r}  \text{Wrong answer} \\  28 \overline{) 1652} \\  \underline{- 140} \phantom{0} \\  252 \\  \underline{- 252} \\  0  \end{array}  $	<b>Up to 2 marks</b>	Working must be carried through to reach an answer for the award of <b>ONE</b> mark.  In all cases accept follow-through of <b>ONE</b> error in working.  <b>Do not</b> award any marks if the final answer is missing.

**Commentary:** This question illustrates the increased demand of dividing a 4-digit number by a 2-digit number. It is presented vertically, to encourage pupils to use a formal written method. Only the use of a formal written method will gain the method mark should the pupil calculate incorrectly.

**Content domain:** 6C7b - Divide numbers up to 4 digits by a two-digit whole number using the formal method of long division.

## Paper 2 and Paper 3: contextualised and applied questions

6

Write the missing digits to make the addition correct.



$$\begin{array}{r}
 \begin{array}{|c|c|c|} \hline 1 & & 1 \\ \hline \end{array} \\
 + \\
 \begin{array}{|c|c|c|} \hline & 1 & \\ \hline \end{array} \\
 \hline
 \begin{array}{|c|c|c|} \hline 9 & 0 & 0 \\ \hline \end{array}
 \end{array}$$

1 mark

Qu	Requirement	Mark	Additional guidance
6	$  \begin{array}{r}  \begin{array}{ c c c } \hline 1 & 8 & 1 \\ \hline \end{array} \\  + \\  \begin{array}{ c c c } \hline 7 & 1 & 9 \\ \hline \end{array} \\  \hline  \begin{array}{ c c c } \hline 9 & 0 & 0 \\ \hline \end{array}  \end{array}  $	1 mark	

**Commentary:** This question illustrates the use of formal methods for addition.

**Content domain:** 4C2 - Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate.

**7**

Complete this sentence.

Every number with a factor of **10** must also have factors of and  and 

1 mark

Qu	Requirement	Mark	Additional guidance
7	1, 2 and 5	1 mark	Numbers may be given in any order.

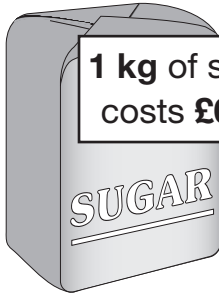
**Commentary:** This question assesses pupils' ability to identify factors.**Content domain:** 5C5a - Identify multiples and factors, including finding all factor pairs of a number and common factors of two numbers.



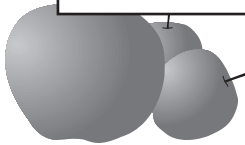
One toffee apple needs:  
**1 stick,**  
**100g of sugar,**  
**1 apple.**



**50 sticks**  
 cost **£6.25**



**1 kg of sugar**  
 costs **£0.99**



**100 apples**  
 cost **£22.50**

Children buy just enough sticks, sugar and apples to make **100** toffee apples.

They sell all 100 toffee apples for **£1 each**.

The profit goes to charity.

Work out how much money goes to charity.

✎

Show  
your  
method

£

3 marks

Qu	Requirement	Mark	Additional guidance																								
8	<p>Award <b>THREE</b> marks for the correct answer of £55.10</p> <p>Award <b>TWO</b> marks for a complete correct method with one arithmetic error, eg</p> <table style="margin-left: 20px;"> <tr> <td>■ Sticks</td> <td>£12.50</td> </tr> <tr> <td>Sugar</td> <td>£ 9.99 (error)</td> </tr> <tr> <td>Apples</td> <td>+ <u>£22.50</u></td> </tr> <tr> <td>Total</td> <td>£44.99</td> </tr> <tr> <td colspan="2"> </td> </tr> <tr> <td>Profit</td> <td>£100.00</td> </tr> <tr> <td></td> <td>- <u>£ 44.99</u></td> </tr> <tr> <td></td> <td>£ 55.01</td> </tr> </table> <p><b>OR</b></p> <p>If the answer is incorrect, award <b>TWO</b> marks for evidence of a correct total for all the ingredients, eg</p> <table style="margin-left: 20px;"> <tr> <td>■ Sticks</td> <td>£12.50</td> </tr> <tr> <td>Sugar</td> <td>£ 9.90</td> </tr> <tr> <td>Apples</td> <td>+ <u>£22.50</u></td> </tr> <tr> <td>Total</td> <td>£44.90</td> </tr> </table> <p><b>OR</b></p> <p>Award <b>ONE</b> mark for sight of £12.50 <b>and</b> £9.90</p>	■ Sticks	£12.50	Sugar	£ 9.99 (error)	Apples	+ <u>£22.50</u>	Total	£44.99			Profit	£100.00		- <u>£ 44.99</u>		£ 55.01	■ Sticks	£12.50	Sugar	£ 9.90	Apples	+ <u>£22.50</u>	Total	£44.90	Up to 3 marks	Answer need not be obtained for the award of <b>TWO</b> marks or <b>ONE</b> mark.
■ Sticks	£12.50																										
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Total	£44.90																										

**Commentary:** This is an example of a question assessing measurement with reference to money. The required conversion element is referenced to 6M9. Pupils will need to go through several steps to get a final answer for the profit made. This is a 3 mark question with opportunities to gain partial credit at two marks and one mark.

Pupils are expected to use known facts and procedures. However, there is computational complexity because of the number of steps involved. There are no spatial or data interpretation demands. There are demands associated with response strategy because pupils will have to organise their method.

**Content domain:** 6M9 5M9 - Solve problems involving the calculation and conversion of units of measure using the decimal notation up to three decimal places where appropriate.

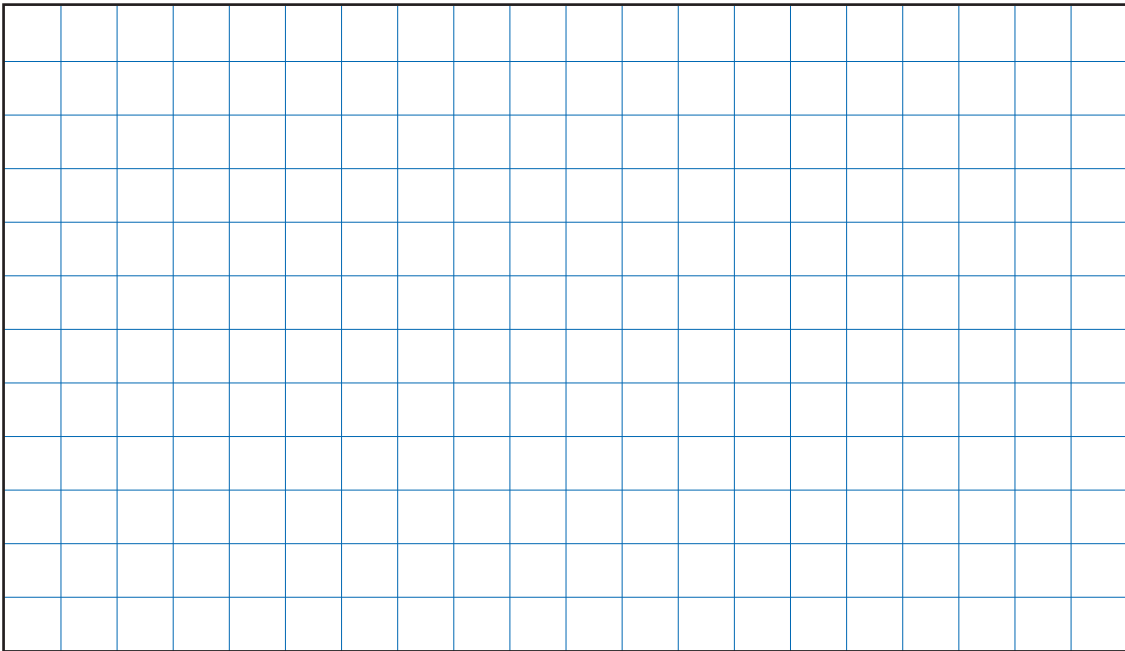
9

Write the missing fraction.



$$\frac{1}{3} + \frac{1}{4} + \boxed{\phantom{000}} = 1$$

1 mark



Qu	Requirement	Mark	Additional guidance
9	$\frac{5}{12}$	1 mark	

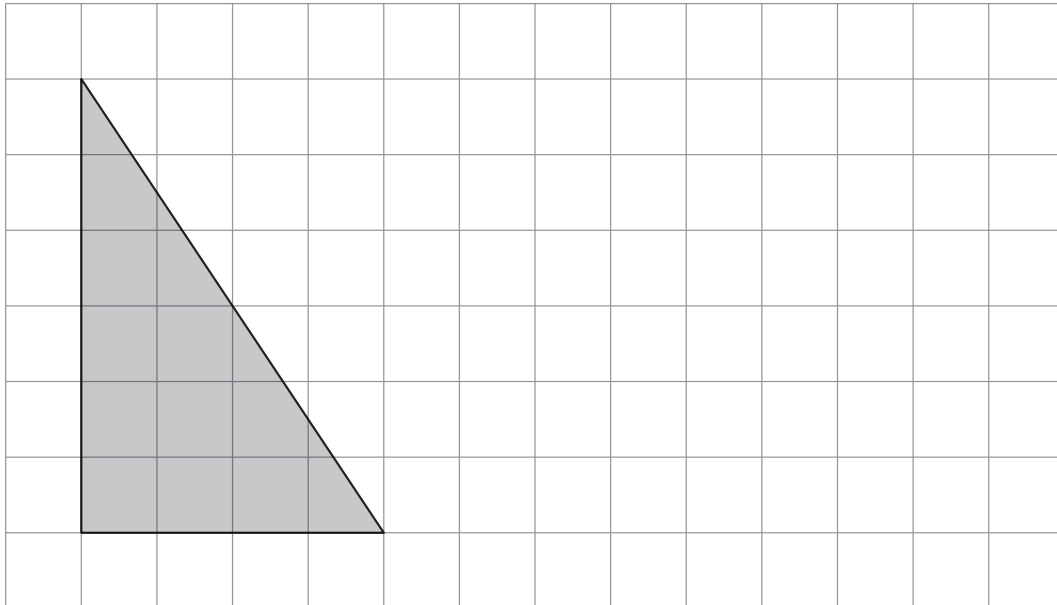
**Commentary:** This question assesses pupils' ability to add and subtract fractions using the concept of equivalent fractions. The grid provides space for pupils to work out their answer. Pupils should be encouraged to write their final answer in the box, but a clear, unambiguous, correct answer on the grid would be awarded the mark.

**Content domain:** 6F4 - Add and subtract fractions with different denominators and mixed numbers using the concept of equivalent fractions.

**10**

Draw a rectangle on the grid that has **half** the area of the shaded triangle.

Use a ruler.



1 mark

Qu	Requirement	Mark	Additional guidance
10	A rectangle with area $6\text{cm}^2$	1 mark	A rectangle must be drawn but need not be shaded.

**Commentary:** By the end of key stage 2, pupils are expected to be able to calculate the area of a triangle and a rectilinear figure. This question allows pupils to approach the problem using a number of strategies including calculating the area of the triangle or manipulating the image mentally or counting squares.

Pupils are expected to use known facts and procedures to solve this more complex problem. There are a small number of numeric steps together with a demand centred on manipulating the geometric information that is given. The response strategy requires the construction of an answer set.

**Content domain:** 6M7 5M7 - Recognise that shapes with same areas can have different perimeters and vice versa, recognise when it is possible to use formulae for area and volume of shapes, calculate the area of parallelograms and triangles.



Qu	Requirement	Mark	Additional guidance
11	<p>Award <b>TWO</b> marks for the correct answer of £12396</p> <p>If the answer is incorrect, award <b>ONE</b> mark for evidence of an appropriate method, eg:</p> <ul style="list-style-type: none"> <li>■ <math display="block">\begin{array}{r} \text{£}8264 \\ \times \quad 4 \\ \hline \text{£}33056 \\ \\ \text{£}33056 \\ - \quad 8264 \\ \hline \text{£}24792 \\ \\ \text{£}24792 \div 2 \end{array}</math></li> <li><b>OR</b></li> <li>■ <math display="block">\begin{array}{r} \text{£}8264 \\ \times \quad 3 \\ \hline \text{£}24792 \\ \\ \text{£}24792 \div 2 \end{array}</math></li> <li><b>OR</b></li> <li>■ <math display="block">\begin{array}{l} \text{£}8264 \div 2 = \text{£}4132 \\ \text{£}8264 + \text{£}4132 \end{array}</math></li> </ul>	<b>Up to 2 marks</b>	Answer need not be obtained for the award of <b>ONE</b> mark.

**Commentary:** In year 6 pupils are expected to interpret and solve problems using pie charts. In this question pupils can use a number of strategies including using angle facts or using fractions to complete the proportional reasoning required.

Pupils are expected to use known facts and procedures to solve this more complex problem. There are a small number of numeric steps but there is a demand associated with interpretation of data (or using spatial knowledge). The response strategy requires pupils to organise their method.

**Content domain:**

6S1 - Interpret and construct pie charts and line graphs and use these to solve problems.

5G4 - Identify angles at appoint and one whole turn (total 360°).

For more information, please contact the national curriculum assessments helpline on 0300 303 3013 or email [assessments@education.gov.uk](mailto:assessments@education.gov.uk).

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