Key stage 2

Mathematics test mark schemes

Paper 1: arithmetic
Paper 2: reasoning
Paper 3: reasoning

Standards & Testing Agency

Contents

1. Introduction

The Standards and Testing Agency (STA) is responsible for the development and delivery of statutory tests and assessments. STA is an executive agency of the Department for Education.

The 2017 test assesses the 2014 national curriculum. This test has been developed to meet the specification set out in the test framework for mathematics at key stage 2. The test frameworks are on the GOV.UK website at www.gov.uk/government/publications/key-stage-2-mathematics-test-framework.

A new test and mark schemes will be produced each year.

The key stage 2 tests will be marked by external markers.

Scaled score conversion tables are not included in this document. Conversion tables will be produced as part of the standards maintenance process. Scaled score conversion tables for the 2017 tests will be published at www.gov.uk/guidance/scaled-scores-at-key-stage-2 in July 2017.

The mark schemes are provided to show teachers and markers how the tests are marked. The pupil examples are based on answers gathered from the test trialling process.

2. Structure of the key stage 2 mathematics test

The key stage 2 mathematics test materials comprise:

- Paper 1: arithmetic (40 marks)
- Paper 2: reasoning (35 marks)
- Paper 3: reasoning (35 marks).

3. Content domain coverage

The 2017 test meets the specification set out in the test framework. Table 1 sets out the areas of the content domain that are assessed in papers 1, 2 and 3.

The references are taken from the test framework. A question assessing 4C7, for example, sets out to 'multiply two-digit and three-digit numbers by a one-digit number using a formal written layout' and is taken from the year 4 programme of study.

Table 1: content domain coverage of the 2017 key stage 2 mathematics test

Paper 1: arithmetic		Paper 2: reasoning		Paper 3: reasoning	
Qu.	**Content domain reference**	**Qu.**	**Content domain reference**	**Qu.**	**Content domain reference**
1	4N2b	1a	4S2	1	5C6b
2	4C2	1b	4S2	2	3C8
3	4F4	2	5C6b	3	4C8
4	4C6b	3	4C6a	4a	6N5/6S1
5	3C1	4	4C4/4S2	4b	6N5/6S1
6	5F8	5	4N2b	5	3M9a/4F10b
7	4C2	6	5F8	6	5S1
8	3C7	7	4M4c	7	6P2
9	4C6a	8	5C4	8	6C5
10	4C7	9	4F2	9	5S1/4S2
11	4C2	10	5N4	10	4M5
12	4F4	11a	6A2	11	6G5
13	3N2b	11b	6A2	12	4C8
14	6C9	12	6G2b	13	6G2a/4G4
15	6F5a	13	5M9a	14	6R1/5M9a
16	5C6a	14	6R4	15	3G2
17	5C7b	15	5N3b	16	5C8b
18	6F9a	16	5G4b	17	6F11/6F3
19	5C6b	17	6P3	18	5C5c/5C5d
20	6C7b	18	6R2	19	4N6
21	4F8	19	6C8/5M9a	20	5M7b/5C7a
22	6C7a	20	6F11	21a	6F4/6A3
23	5F4	21	5M9b/6R3	21b	6F4/6A3
24	6C7a	22	6R3	22	6A1
25	5F8	23	6F4	23	6A4
26	6F4			24	6M8b/6R1
27	6F5b				
28	6F5b				
29	6R2				
30	6F4				
31	6R2				
32	6F4				
33	6F9b				
34	6R2				
35	5F5				
36	6C7b				

4. Explanation of the mark schemes

The marking information for each question is set out in the form of tables (sections 7, 8 and 9).

The purpose of the mark scheme is to define the acceptable answers for each question within the test. Answers other than those listed may be acceptable if they meet the marking criteria.

The '**Qu.**' column on the left-hand side of each table provides a quick reference to the question number and part.

The '**Requirement**' column may include two types of information:

- a statement of the requirements for the award of each mark, with an indication of whether credit can be given for an appropriate method
- examples of some different types of correct answer.

The '**Mark**' column indicates the total number of marks available for each question part.

The '**Additional guidance**' column indicates alternative acceptable answers and guidance, such as the range of acceptable answers, where necessary. This column may also provide details of specific types of answer which are unacceptable. For most questions, however, there will be unacceptable answers that are not listed.

5. General marking guidance

5.1 Applying the mark schemes

To ensure consistency of marking, the most frequent procedural queries are listed in section 5.2 along with the action the marker will take. This is followed by further guidance on pages 13 to 15 relating to marking questions involving money, time and other measures. Unless otherwise specified in the mark scheme, markers will apply these guidelines in all cases.

Recording marks awarded

Marking will take place on screen with markers viewing scanned images of pupils' responses. Marks will be entered into the marking system in accordance with the guidance for the on-screen marking software.

For each question, markers will record the award 3, 2, 1 or 0 as appropriate, according to the mark scheme criteria. There will be provision in the software to record questions not attempted. The software will aggregate marks automatically.

5.2 General marking principles

Table 2: General marking principles for all papers

1.	**The pupil's answer does not match closely any of the examples given in the mark scheme.**	Markers will use their judgement to decide whether the answer corresponds with details in the 'Requirement' column of the mark scheme. Reference will also be made to the 'Additional guidance' column.
2.	**The pupil has answered in a non-standard way.**	Pupils may provide evidence in any form as long as its meaning can be understood. Diagrams, symbols or words are acceptable for explanations or for presenting an answer.
3.	**The correct answer or working has been crossed out or erased and not replaced.**	The mark(s) will not be awarded for crossed-out or erased answers or working.
4.	**More than one answer is given.**	If all answers given are correct (or a range of answers is given, all of which are correct), the mark(s) will be awarded unless the mark scheme states otherwise. If both correct and incorrect answers are given, the mark(s) will not be awarded unless the mark scheme states otherwise.
5.	**No answer is given in the expected place, but the correct answer is given elsewhere.**	Where a pupil has unambiguously indicated the correct answer, the mark(s) will be awarded. In particular, where a word or number is expected, a pupil may meet the requirement by annotating a graph or labelling a diagram elsewhere in the question.
6.	**The pupil's answer is correct, but the wrong working is shown.**	A correct final answer will be awarded the mark(s).
7.	**The pupil has used alternative notation for a decimal point in a number.**	No alternative notation is accepted as representing a decimal point in a number, e.g. a comma. Refer to section 6 for guidance on marking specific types of question.
8.	**The pupil has used a symbol as a thousands separator.**	If the pupil has used a comma as a thousands separator (positioned either correctly or incorrectly) and the digits are in the correct order, then the mark(s) will be awarded. If any other symbol, e.g. decimal point or apostrophe, is used, the mark(s) will not be awarded.

9. The answer in the answer box is wrong due to a transcription error.	A transcription error occurs when a pupil miscopies their answer from the **end of their working** into the answer box.
	Where appropriate, detailed guidance will be given in the mark scheme. For questions with no guidance, marks will only be awarded for a transcription error if the wrong answer is due to:
	• transposed digits in a number (e.g. 243 is written as 324)
	OR
	• one digit changed in a number of 4 or more digits (e.g. 2,345 is written as 2,845).
	The mark(s) will not be awarded for any other transcription error including:
	• a decimal point positioned incorrectly (e.g. 12.34 is written as 1.234 or 1234)
	• a change by a power of 10 (e.g. 200 is written as 20 or 2,000)
	• a digit added or removed (e.g. 123,456 written as 1233,456 or 12,456)
	• a negative sign added or removed.
10. The pupil's answer is numerically or algebraically equivalent to the answer in the mark scheme.	Answers should be given as single values in their simplest form unless the mark scheme states otherwise, e.g. for ☐ = 536 − 30, the answer 500 + 6 will not be awarded the mark.
	For integer answers, e.g. 20, the answer $\frac{20}{1}$ will be awarded the mark; $\frac{80}{4}$ will not be awarded the mark.
	For decimal answers that include recurring digit(s), there must be an unambiguous indication of the recurring digit(s). For example, for $\frac{1}{6}$, $0.1\dot{6}$ or $0.1\overline{6}$ will be awarded the mark and for $\frac{1}{7}$, $0.\dot{1}4285\dot{7}$ or $0.\overline{1}4285\overline{7}$ will be awarded the mark.
	Where alternative responses are acceptable, this will be indicated in the 'Additional guidance' column.

Table 3: General marking principles for paper 1 only (arithmetic)

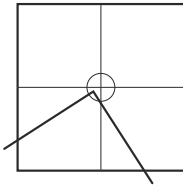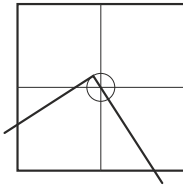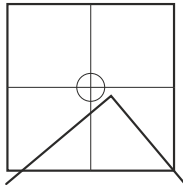|	
11. The answer in the answer box is wrong due to a misread of numbers given in the question.	Misreads are not allowed in paper 1; the mark(s) will not be awarded.
12. The pupil has not recorded their working beneath the given long multiplication or long division.	If a pupil carries out their working somewhere on the page other than beneath the given question as expected, then the pupil must start by rewriting the original question in order for it to be considered as a formal method. Please note that the operation sign does not need to be given for long multiplication, provided the pupil's working shows the intention to multiply.
13. The pupil's answer to the long division question includes a remainder.	If a pupil reaches an integer answer using a formal method with no more than one arithmetic error, for example 25, then the mark(s) will be awarded for 25 r0 or 25.0, but the mark(s) will not be awarded for 250 For answers with remainders, the remainder must be expressed correctly. If a pupil shows a remainder that is the same size as the divisor or larger, for example, a remainder of 28 or 29 when dividing by 28, the mark(s) will not be awarded because the method is incomplete. If a pupil reaches a non-integer answer using a formal method with no more than one arithmetic error, for example when dividing by 28, the pupil reaches the answer 6 r14, then the mark(s) will be awarded for $6\frac{14}{28}$ or 6.5, but the mark(s) will not be awarded for 6 r$\frac{14}{28}$ or 6.14 or 614
14. The pupil's long division method involves subtracting chunks of different sizes.	If a pupil's formal method involves subtracting chunks, it is not necessary to show a separate addition of the chunks. If the answer is not the correct total for their chunks, then that is treated as one arithmetic error. It should be noted that this method will only be accepted if all chunks are of different sizes.

Table 4: General marking principles for papers 2 and 3 only (reasoning)

15. More than one method is given.	If a pupil gives more than one method, then the intended method is taken as the one which leads to the answer in the answer box or an identified answer elsewhere. If no answer is given, then all methods must be appropriate for the method mark(s) to be awarded.
16. There appears to be a misread of numbers or information given in the question that affects the pupil's working and/or explanation.	This occurs when a pupil misreads a number given in the question and consistently uses a different number that does not alter the original intention or difficulty of the question. For example, if 243 is misread as 248, both numbers may be regarded as comparable in difficulty. However, if 243 is misread as 245 or 240, the misread number may be regarded as making the question easier. The misread of a number may affect the award of marks. Where appropriate, detailed guidance will be given in the mark scheme. If no guidance is given, markers will examine each case to decide whether the mark(s) will be awarded. The mark(s) will not be awarded if: • it is a **ONE-mark** question • there is more than one misread number in a question • the mathematics is simplified • it is an explanation question • it is a misread of other information (not numbers) • the misread number is the same as any other number in the question. For **TWO-mark** questions that have a method mark, one mark will be awarded if an appropriate method is correctly followed through with the misread number to give the correct follow-through answer, provided the mathematics has not been simplified. For **THREE-mark** questions, refer to the additional guidance.
17. A misread or an arithmetic error results in an answer with multiple decimal places.	In some instances, a misread or an arithmetic error in a method leads to an answer with multiple decimal places. In such cases, the method mark(s) will be awarded for an answer that is correctly truncated or rounded provided the method is appropriate. For example, 1.2345 is truncated to 1.234

18. The pupil has reversed values within a calculation involving subtraction or division.	When values within the calculation are reversed, the mark(s) will only be awarded when the answer corresponds to the correct calculation. For example, if the correct calculation is $12 \div 4$, the method mark(s) may be awarded for $4 \div 12 = 3$, but not for an answer other than 3 Reversed values within a calculation are not acceptable in 'explain' questions.
19. The pupil omits an operation sign within their working.	If the correct sign of $+$, $-$, $\times$, or $\div$ for an arithmetic operation is missing, then the mark(s) will only be awarded if the working shown by the pupil is clear enough to indicate that the required operation has been performed. This applies even if the results of the required operation are incorrect. For example, where the following is seen in working: $$\begin{array}{r} 456 \\ \underline{123} \\ \underline{} \end{array}$$ • if the answer is larger than the greater of the given values, e.g. 679, then addition is implied • if the answer is less than the first given value, e.g. 323, then subtraction is implied.
20. The pupil has used 'an appropriate method'.	For some questions, the mark scheme allows the award of the method mark(s) for 'evidence of an appropriate method', even if the answer is missing or incorrect. Refer to the 'Additional guidance' column where appropriate. For the award of the method mark(s) for an appropriate method, there must be evidence of **all** the steps of the appropriate method (i.e. any method that would lead to the correct answer if there were no arithmetic errors and no additional steps). This means that, for every step, either: • the appropriate calculation to be carried out must be shown **OR** • if the calculation has not been written down, the correct answer or correct follow-through answer must be shown.

21. The pupil has used a trial and improvement method.	'Trial and improvement' is regarded as an acceptable method, unless the mark scheme states otherwise. For a 'trial and improvement' method to be awarded the method mark(s): • there must be at least 3 trials, carried out correctly, which each reduce the range in which the answer is known to lie • there can be additional trials, which are correctly or incorrectly carried out, and which may not reduce the range in which the answer is known to lie • a final answer is not needed, unless the mark scheme states otherwise.
22. The answer in the answer box is wrong due to the pupil continuing to give extra working.	Extra working occurs when a pupil writes the correct answer in their working, and then continues to process the information further. If the extra working does not contradict the pupil's appropriate method, the method mark(s) will be awarded. If the extra working contradicts the pupil's appropriate method, the method mark(s) will not be awarded.
23. The pupil miscopies a value from one part of their method into the next part.	There will be instances when a pupil reaches a value in their working, then restarts from a different value. The mark(s) will not be awarded if: • it is a **ONE-mark** question • there is more than one miscopy in the working • the mathematics is simplified as a consequence of the miscopy • the miscopy does not follow transcription error rules (see point 9). The method mark(s) will only be awarded if an appropriate method is correctly shown using the miscopied number (which must follow transcription error rules).

24. The correct answer is embedded in the working.	An embedded answer occurs when a pupil shows the correct answer within their working but then selects the wrong answer from their working as their final answer or leaves the answer box blank. For example, if a pupil shows $2.5 \times 6 = 3 \times 5$ in the last line of their working and writes 5 in the answer box, whereas the correct answer is 3, then this will affect the award of marks. Where appropriate, detailed guidance will be given in the mark scheme. If no guidance is given, markers will examine each case to decide whether the mark(s) will be awarded. For **ONE-mark** questions, the mark will not be awarded. For **TWO-mark** questions that have a method mark, one mark will be awarded, provided the pupil does not give redundant extra working that contradicts work already done or which adds to their appropriate method. For **THREE-mark** questions, refer to the additional guidance.
25. The phrase 'sight of' is used in the mark scheme.	For some questions, the mark scheme allows the mark(s) to be awarded for sight of a particular number or numbers within a method. Such numbers are the correct answers to partial steps within a method. The mark(s) will be awarded if the given value is written anywhere associated with that question.
26. The pupil's answer correctly follows through from earlier incorrect work.	'Follow-through' marks for an answer will only be awarded when specifically stated in the mark scheme.
27. The pupil has drawn lines which do not meet at the correct point.	Markers will interpret the phrase 'slight inaccuracies in drawing' to mean 'within or on a circle of radius 2 mm with its centre at the correct point'. within the circle - accepted on the circle - accepted outside the circle - **not** accepted

6. Marking specific types of question: summary of additional guidance

6.1 Answers involving money

	Accept		Do not accept
Where the £ sign is given, e.g. £3.20, £7 £ ☐	£3.20 Any unambiguous indication of the correct amount, e.g. £3.20p £3 20 pence £3 20 £3-20 £3:20 £3;20	£7 £7.00	Incorrect placement of pounds or pence, e.g. £320 £320p Incorrect placement of decimal point or incorrect use or omission of 0 or use of comma as a decimal point, e.g. £3.2 £3 200 £32 0 £3-2-0 £3,20
Where the p sign is given, e.g. 40p ☐ p	40p Any unambiguous indication of the correct amount, e.g. £0.40p 0 40p £0-40p 0:40p £0;40p		Incorrect or ambiguous use of pounds or pence or use of comma as a decimal point, e.g. 0.40p £40p £0,40p

	Accept	Do not accept
Where a unit is not given, e.g. £3.20, 40p	£3.20 40p 320p £0.40 Any unambiguous indication of the correct amount, e.g. £3.20p £0.40 pence £3 20 pence £0 40p £3 20 £0-40 £3-20 £0:40 £3:20 £0;40 £3;20 £.40 3.20 0.40 320 40 3 pounds 20	Incorrect or ambiguous use of pounds or pence or use of comma as a decimal point, e.g. £320 £40 £320p £40p £3.2 0.4 3.20p 0.40p £3,20 0,40 £0,40p

6.2 Answers involving time

	Accept	Do not accept
A time interval, e.g. 2 hours 30 minutes	2 hours 30 minutes Any unambiguous, correct indication, e.g. (0)2 h 30 150 minutes (0)2 h 30 min 150 (0)2 30 2.5 hours (0)2-30 $2\frac{1}{2}$ hours Digital electronic time, e.g. (0)2:30 (0)2;30	Incorrect or ambiguous time interval or use of comma as a decimal point, e.g. 2.30 230 2.3 2.30 min 2.3 hours 2,5 hours 2.3 h 2,30 2 h 3

	Accept	Do not accept
A specific time, e.g. 8:40 am, 17:20	(0)8:40 am (0)8:40 twenty to nine Any unambiguous, correct indication, e.g. (0)8.40 (0)8;40 0840 (0)8 40 (0)8-40 Unambiguous change to 12 or 24-hour clock, e.g. 17:20 as 5:20 pm or 17:20 pm	Incorrect time, e.g. 8.4 am 8.40 pm Incorrect placement of separators, spaces, etc. or incorrect use or omission of 0 or use of a comma as a decimal point, e.g. 840 8:4:0 8.4 084 8,40

6.3 Answers involving measures

	Accept	Do not accept
Where units are given, e.g. 8.6 kg kg m l	8.6 kg Any unambiguous indication of the correct measurement, e.g. 8.60 kg 8.6000 kg 8 kg 600 g	Incorrect or ambiguous use of units or use of comma as a decimal point, e.g. 8600 kg 8 kg 600 8,60 kg 8,6000 kg

If a pupil gives an answer with a unit different to the unit in the answer box, then their answer must be equivalent to the correct answer provided, unless otherwise indicated in the mark scheme.

If a pupil leaves the answer box empty but writes the answer elsewhere on the page without any units, then that answer is assumed to have the units given in the answer box and the conditions listed above.

7. Mark schemes for Paper 1: arithmetic

Qu.	Requirement	Mark	Additional guidance
1	1,040	**1m**	
2	2,525	**1m**	
3	$1\frac{1}{6}$ **OR** $\frac{7}{6}$	**1m**	Accept equivalent mixed numbers, fractions or an **exact** decimal equivalent, e.g. $1.1\overline{6}$ (accept any unambiguous indication of the recurring digit). **Do not** accept rounded or truncated decimals.
4	505	**1m**	
5	285	**1m**	
6	5.714	**1m**	
7	5,100	**1m**	
8	264	**1m**	
9	8	**1m**	
10	668	**1m**	
11	4,088	**1m**	
12	$\frac{6}{25}$	**1m**	Accept equivalent fractions or an **exact** decimal equivalent, e.g. $\frac{24}{100}$ or 0.24
13	1,159	**1m**	
14	56	**1m**	
15	$\frac{2}{5}$	**1m**	Accept equivalent fractions or an **exact** decimal equivalent, e.g. $\frac{12}{30}$ or 0.4
16	1,200	**1m**	
17	83	**1m**	
18	0.004	**1m**	
19	2,345,000	**1m**	

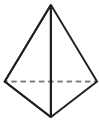| Qu.	Requirement	Mark	Additional guidance
20	Award **TWO** marks for the correct answer of 42 If the answer is incorrect, award **ONE** mark for a formal method of division with no more than **ONE** arithmetic error, i.e. • long division algorithm, e.g. $$\begin{array}{r} 42 \text{ r}2 \\ 17\overline{)714} \\ -\ \ 680 \quad (40 \times 17) \\ \hline 36 \quad \textit{(error)} \\ -\ \ \ \ 34 \quad (2 \times 17) \\ \hline 2 \end{array}$$ **OR** $$\begin{array}{r} 43 \quad \textit{(error)} \\ 17\overline{)714} \\ -\ \ 680 \quad (40 \times 17) \\ \hline 34 \\ -\ \ \ \ 34 \quad (2 \times 17) \\ \hline 0 \end{array}$$ • short division algorithm, e.g. $$\begin{array}{r} 4\ \ 1 \text{ r}7 \\ 17\overline{)71^24} \quad \textit{(error in carrying digit)} \end{array}$$	**Up to 2m**	Working must be carried through to reach a final answer for the award of **ONE** mark. Short division methods must be supported by evidence of appropriate carrying figures to indicate the use of a division algorithm, and be a complete method. The carrying figure must be less than the divisor.
21	5.55	1m	
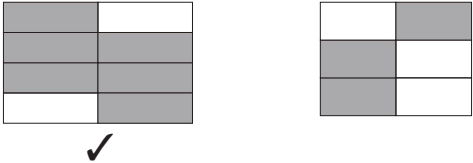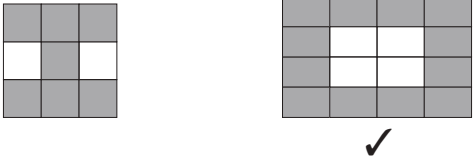
Qu.	Requirement	Mark	Additional guidance
22	Award **TWO** marks for the correct answer of 109,963 If the answer is incorrect, award **ONE** mark for a formal method of long multiplication with no more than **ONE** arithmetic error, e.g. • $\begin{array}{r} 4781 \\ \times \quad 23 \\ \hline 14343 \\ 95620 \\ \hline 209963 \text{ (error)} \end{array}$ **OR** • $\begin{array}{r} 4781 \\ \times \quad 23 \\ \hline 14343 \\ 95630 \text{ (error)} \\ \hline 109973 \end{array}$	Up to 2m	Working must be carried through to reach a final answer for the award of **ONE** mark. **Do not** award any marks if the error is in the place value, e.g. the omission of the zero when multiplying by tens: $\begin{array}{r} 4781 \\ \times \quad 23 \\ \hline 14343 \\ 9562 \text{ (place value error)} \\ \hline 23905 \end{array}$
23	$\dfrac{3}{8}$	1m	Accept equivalent fractions or an **exact** decimal equivalent, e.g. 0.375
24	Award **TWO** marks for the correct answer of 19,228 If the answer is incorrect, award **ONE** mark for a formal method of long multiplication with no more than **ONE** arithmetic error, e.g. • $\begin{array}{r} 418 \\ \times \quad 46 \\ \hline 2508 \\ 16720 \\ \hline 18228 \text{ (error)} \end{array}$ **OR** • $\begin{array}{r} 418 \\ \times \quad 46 \\ \hline 2508 \\ 16620 \text{ (error)} \\ \hline 19128 \end{array}$	Up to 2m	Working must be carried through to reach a final answer for the award of **ONE** mark. **Do not** award any marks if the error is in the place value, e.g. the omission of the zero when multiplying by tens: • $\begin{array}{r} 418 \\ \times \quad 46 \\ \hline 2508 \\ 1672 \text{ (place value error)} \\ \hline 4180 \end{array}$
25	23.129	1m	
26	$\dfrac{11}{20}$	1m	Accept equivalent fractions or an **exact** decimal equivalent, e.g. 0.55
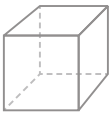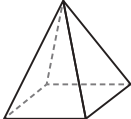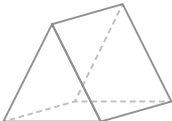
Qu.	Requirement	Mark	Additional guidance
27	$\dfrac{1}{5}$	**1m**	Accept equivalent fractions or an **exact** decimal equivalent, e.g. $\dfrac{4}{20}$ or 0.2
28	$\dfrac{5}{16}$	**1m**	Accept equivalent fractions or an **exact** decimal equivalent, e.g. 0.3125
29	207	**1m**	**Do not** accept 207%
30	$3\dfrac{1}{6}$ **OR** $\dfrac{19}{6}$	**1m**	Accept equivalent mixed numbers, fractions or an **exact** decimal equivalent, e.g. $3.1\overline{6}$ (accept any unambiguous indication of the recurring digit). **Do not** accept rounded or truncated decimals. **Do not** accept $2\dfrac{7}{6}$
31	35	**1m**	**Do not** accept 35%
32	$\dfrac{5}{24}$	**1m**	Accept equivalent fractions or an **exact** decimal equivalent, e.g. $\dfrac{10}{48}$ or $0.208\overline{3}$ (accept any unambiguous indication of the recurring digit). **Do not** accept rounded or truncated decimals.
33	180	**1m**	
34	150	**1m**	**Do not** accept 150%
35	$85\dfrac{1}{2}$	**1m**	Accept equivalent fractions or an **exact** decimal equivalent e.g. $\dfrac{171}{2}$ or 85.5

Qu.	Requirement	Mark	Additional guidance
36	Award **TWO** marks for the correct answer of 38 If the answer is incorrect, award **ONE** mark for a formal method of division with no more than **ONE** arithmetic error, i.e. • long division algorithm, e.g. $$\begin{array}{r} 38\ \text{r2} \\ 59\overline{)2242} \\ -\ 1770 \quad (30 \times 59) \\ \hline 474 \quad (error) \\ -\ 472 \quad (8 \times 59) \\ \hline 2 \end{array}$$ **OR** $$\begin{array}{r} 35 \quad (error) \\ 59\overline{)2242} \\ -\ 1770 \quad (30 \times 59) \\ \hline 472 \\ -\ 472 \quad (8 \times 59) \\ \hline 0 \end{array}$$ • short division algorithm, e.g. $$\begin{array}{r} 3\ 7\ \text{r48} \quad (error) \\ 59\overline{)224^{47}2} \end{array}$$	Up to 2m	Working must be carried through to reach a final answer for the award of **ONE** mark. Short division methods must be supported by evidence of appropriate carrying figures to indicate the use of a division algorithm, and be a complete method. The carrying figure must be less than the divisor.

8. Mark schemes for Paper 2: reasoning

Qu.	Requirement	Mark	Additional guidance
1a	200	**1m**	
1b	50	**1m**	
2	The correct number circled as shown: 9,700 907 9,007 970 (9,070)	**1m**	Accept alternative unambiguous positive indications, e.g. number ticked.
3	Three boxes completed correctly as shown: × **7** **6** 9 63 54 **8** 56 48	**1m**	
4	Award **TWO** marks for the correct answer of 1,609 If the answer is incorrect, award **ONE** mark for evidence of an appropriate method, e.g. • 5,895 + 1,344 = 7,239 8,848 − 7,239	**Up to 2m**	Answer need not be obtained for the award of **ONE** mark.
5	Award **TWO** marks for three boxes completed correctly as shown: <table><tr><th>Number</th><th>1,000 more</th></tr><tr><td>3,500</td><td>4,500</td></tr><tr><td>85</td><td>1,085</td></tr><tr><td>8,099</td><td>9,099</td></tr><tr><td>14,250</td><td>15,250</td></tr></table> If the answer is incorrect, award **ONE** mark for two boxes completed correctly.	**Up to 2m**	
6	Numbers in order as shown: 0.328 0.96 1.253 1.9	**1m**	
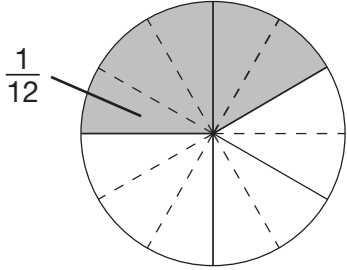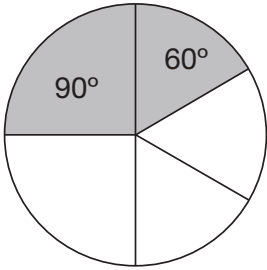
Qu.	Requirement	Mark	Additional guidance
7	Award **TWO** marks for three boxes completed correctly as shown: 60 months = **5** years 72 hours = **3** days 84 days = **12** weeks If the answer is incorrect, award **ONE** mark for two boxes completed correctly.	Up to 2m	

8	Award **TWO** marks for the correct answer of 1,048
	
	If the answer is incorrect, award **ONE** mark for evidence of an appropriate method, e.g.
	
	• 1,793 + 8,728 = 10,521
	  10,521 – 9,473
	
	OR
	
	• 9,473 – 8,728 = 745
	  1,793 – 745
		Up to 2m	Answer need not be obtained for the award of **ONE** mark.

9	Both shapes ticked as shown: 	1m	Accept alternative unambiguous positive indications, e.g. shapes circled.

Qu.	Requirement	Mark	Additional guidance
10	Award **TWO** marks for three boxes completed correctly as shown: to the nearest 10 — 84,520 to the nearest 100 — 84,500 to the nearest 1,000 — 85,000 If the answer is incorrect, award **ONE** mark for two boxes completed correctly.	**Up to 2m**	
11a	140	**1m**	The answer is a time interval (see page 14 for guidance).
11b	2	**1m**	
12	Award **TWO** marks for both pyramids ticked as shown: Cube ☐ Square-based pyramid ✓ Triangular prism ☐ Triangular-based pyramid ✓ If the answer is incorrect, award **ONE** mark for: • the two pyramids and not more than one incorrect shape ticked **OR** • only one correct shape ticked and no incorrect shape ticked.	**Up to 2m**	Accept alternative unambiguous positive indications, e.g. Y.
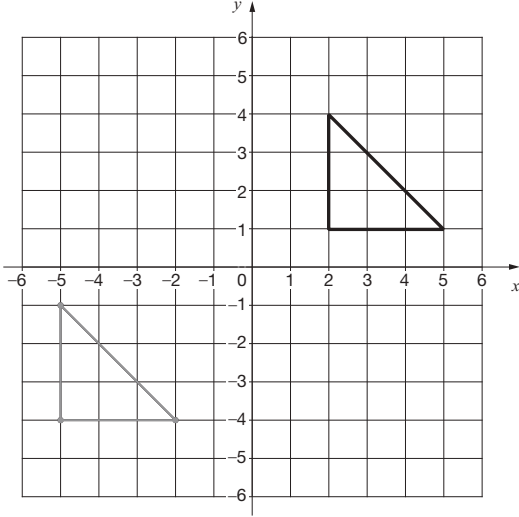
Qu.	Requirement	Mark	Additional guidance
13	Award **TWO** marks for the correct answer of £1.39 If the answer is incorrect, award **ONE** mark for evidence of an appropriate method, e.g. • 12 × 99p = £11.88 £11.88 – £10.49	**Up to 2m**	Accept for **ONE** mark an answer of £139 **OR** £139p as evidence of an appropriate method. Answer need not be obtained for the award of **ONE** mark.
14	18	1m	Accept 18:12 **OR** 12:18
15	2006	1m	**Do not** accept 'two thousand and six' in words.
16	540	1m	
17	Quadrilateral completed as shown: 	1m	Accept slight inaccuracies in drawing (see page 12 for guidance).
18	75	1m	
19	Award **TWO** marks for the correct answer of £1.68 If the answer is incorrect, award **ONE** mark for evidence of an appropriate method, e.g. • 20 – 14.96 = 5.04 5.04 ÷ 3	**Up to 2m**	Accept for **ONE** mark an answer of £168 **OR** £168p as evidence of an appropriate method. Answer need not be obtained for the award of **ONE** mark.
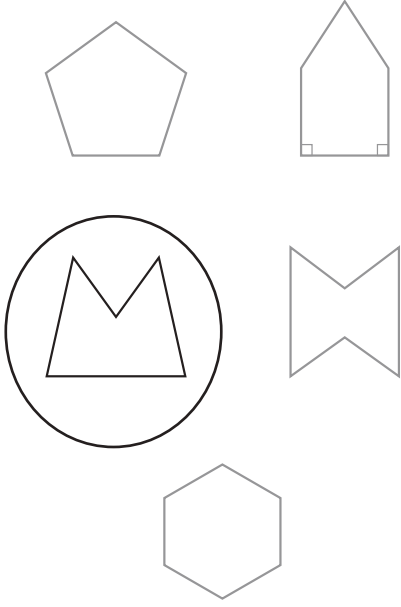
Qu.	Requirement	Mark	Additional guidance
20	An explanation showing that 0.25 is less than $\frac{2}{5}$, e.g. • $\frac{2}{5}$ is 0.4 > 0.25 • 0.25 is $\frac{5}{20} < \frac{8}{20}$ • 0.25 is 25% and $\frac{2}{5}$ is 40% and 25% is smaller than 40% • 0.25 is a quarter. You need 8 quarters to make 2, but only 5 lots of $\frac{2}{5}$ to make 2 • $\frac{2}{5}$ = 0.4 • $\frac{1}{4}$ is $\frac{1}{4}$ smaller than a half, but $\frac{2}{5}$ is only $\frac{1}{10}$ smaller, so $\frac{1}{4}$ is smaller than $\frac{2}{5}$	1m	**Do not** accept vague, incomplete or incorrect explanations, e.g. • Because $\frac{1}{4}$ is bigger than $\frac{2}{5}$ • Because $\frac{1}{4}$ comes first on a number line • Because 0.25 is $\frac{1}{4}$ Accept $\frac{2.5}{10}$ as an equivalent to $\frac{1}{4}$ in an explanation when comparing to $\frac{4}{10}$
21	Award **TWO** marks for the correct answer of 12.5 If the answer is incorrect, award **ONE** mark for evidence of an appropriate method, e.g. • 250 ÷ 20 **OR** • 20 km is 1 cm 100 km is 5 cm 50 km is 2.5 cm 5 cm + 5 cm + 2.5 cm	Up to 2m	Answer need not be obtained for the award of **ONE** mark. **Do not** accept incorrect proportions in any step without evidence of the calculation performed.
22	1:4	1m	Accept other equivalent ratios, e.g. 2:8 or 0.5:2 **Do not** accept reversed ratios, e.g. 4:1 or 8:2

Qu.	Requirement	Mark	Additional guidance
23	Award **TWO** marks for the correct answer of $\dfrac{7}{12}$ If the answer is incorrect, award **ONE** mark for evidence of an appropriate method, e.g. • $\dfrac{1}{4} + \dfrac{1}{6} =$ $\dfrac{3}{12} + \dfrac{2}{12} = \dfrac{5}{12}$ $1 - \dfrac{5}{12}$ **OR** • $\dfrac{1}{4} + \dfrac{1}{6} + \dfrac{1}{6}$ **OR** • $1 - \dfrac{1}{4} - \dfrac{1}{6}$ **OR** • $\dfrac{3}{12} + \dfrac{4}{12}$ **OR** • $90° + 60° = 150°$ $1 - \dfrac{150}{360}$	Up to 2m	Accept equivalent fractions or an **exact** decimal equivalent, e.g. $0.58\overline{3}$ Accept for **ONE** mark an answer between 0.58 and 0.59 inclusive. Answer need not be obtained for the award of **ONE** mark.

9. Mark schemes for Paper 3: reasoning

Qu.	Requirement	Mark	Additional guidance
1	10	1m	
2	5	1m	
3	95 × 6 **OR** 96 × 5	1m	
4a	7	1m	**Do not** accept –7 or 7–
4b	–2	1m	**Do not** accept 2–
5	£302.27	1m	
6	The correct time circled as shown: <table><tr><th>Leaves London</th><th>Arrives Paris</th></tr><tr><td>12:01</td><td>15:22</td></tr><tr><td>12:25</td><td>15:56</td></tr><tr><td>13:31</td><td>16:53</td></tr><tr><td>(14:01)</td><td>17:26</td></tr><tr><td>14:31</td><td>17:53</td></tr><tr><td>15:31</td><td>18:53</td></tr><tr><td>16:01</td><td>19:20</td></tr></table>	1m	Accept alternative unambiguous positive indications, e.g. 14:01 ticked or underlined. Accept 17:26 circled in addition to 14:01, provided no other time is circled. **Do not** accept only the arrival time 17:26 circled.
7	Triangle with vertices at (2,1) **AND** (2,4) **AND** (5,1) drawn on the grid as shown: 	1m	Accept slight inaccuracies in drawing (see page 12 for guidance).

Qu.	Requirement	Mark	Additional guidance
8	Award **TWO** marks for any three of the following numbers written in any order: • 2 • 6 • 10 • 30 If the answer is incorrect, award **ONE** mark for two numbers correct.	**Up to 2m**	
9	5	**1m**	**Do not** accept 300 (minutes).
10	68 (ml) **OR** 0.068 (l)	**1m**	**Do not** accept incorrect units, e.g. 68 l **OR** 0.068 ml.
11	32	**1m**	
12	An explanation that shows Adam has four times as many balloons as Chen, e.g. • 24 × 6 is 4 times as many as 12 × 3 • 144 is four times 36 • 144 ÷ 4 = 36 • 144 ÷ 36 = 4 • 36 × 4 = 144 • Adam buys twice as many bags of twice as many balloons, so it's doubled twice • 24 is double 12 and 6 is double 3, so it's doubled twice • Chen buys half the amount of bags and each bag has half the number of balloons, so he has $\frac{1}{4}$ of the amount.	**1m**	**Do not** accept vague or incomplete explanations, e.g. • Adam buys more bags and there are more balloons in each bag • Adam buys twice as many bags of twice as many balloons • 24 is double 12 and 6 is double 3.

Qu.	Requirement	Mark	Additional guidance
13	The correct shape circled as shown: 	1m	Accept alternative unambiguous positive indications, e.g. shape ticked.
14	Award **TWO** marks for the correct answer of £0.90 If the answer is incorrect, award **ONE** mark for evidence of an appropriate method, e.g. • £1.35 × 2 = £2.70 £2.70 ÷ 3	Up to 2m	Accept for **ONE** mark an answer of £90p **OR** £0.9 as evidence of an appropriate method. Answer need not be obtained for the award of **ONE** mark.
15	The correct letter circled as shown: A C (E) L Z	1m	Accept alternative unambiguous positive indications, e.g. letter ticked.
16	Award **TWO** marks for the correct answer of 750 If the answer is incorrect, award **ONE** mark for evidence of an appropriate method, e.g. • 450 × 2 = 900 2,400 − 900 = 1,500 1,500 ÷ 2	Up to 2m	Answer need not be obtained for the award of **ONE** mark.

Qu.	Requirement	Mark	Additional guidance
17	Award **TWO** marks for all four rows completed correctly as shown: $1\frac{1}{2}$ (circled) 1.2 $1\frac{1}{4}$ 1.3 (circled) $1\frac{5}{100}$ 1.4 (circled) $1\frac{3}{5}$ (circled) 1.5 If the answer is incorrect, award **ONE** mark for three rows completed correctly.	Up to 2m	Accept alternative unambiguous positive indications of the correct numbers, e.g numbers ticked.
18	Both numbers correct as shown: $\boxed{9}$ + $\boxed{13}$ = 22 square prime number number	1m	Numbers must be in the correct order. **Do not** accept: $\boxed{3^2}$ + $\boxed{13}$ = 22 square prime number number
19	Award **TWO** marks for 12 **AND** 13 If the answer is incorrect, award **ONE** mark for: • only one correct number and no incorrect number **OR** • 12 **AND** 13 **AND** not more than one incorrect number.	Up to 2m	Accept for **ONE** mark an answer of 48 **AND** 52 **AND** no more than one incorrect number.

Qu.	Requirement	Mark	Additional guidance

20	Award **THREE** marks for the correct answer of 14
	
	If the answer is incorrect, award **TWO** marks for:
	
	• sight of 414 as evidence of 23 × 18 completed correctly
	
	OR
	
	• evidence of an appropriate method with no more than one arithmetic error, e.g.
	
	20 × 20 = 400
	
	     23
	× 18
	  230
	  184
	  314 *(error)*
	
	400 − 314 = 86
	
	Award **ONE** mark for evidence of an appropriate method.
		Up to 3m	Answer need not be obtained for the award of **ONE** mark.
			
			A misread of a number may affect the award of marks. No marks are awarded if there is more than one misread or if the mathematics is simplified.
			
			TWO marks will be awarded for an appropriate method using the misread number followed through correctly to a final answer.
			
			ONE mark will be awarded for evidence of an appropriate method using the misread number followed through correctly with no more than one arithmetic error.

Qu.	Requirement	Mark	Additional guidance
21a	$\frac{3}{8}$ written in the first box	1m	Accept equivalent fractions or an **exact** decimal equivalent, e.g. 0.375
21b	$2\frac{7}{8}$ **OR** $\frac{23}{8}$ written in the last box	1m	Accept equivalent fractions or an **exact** decimal equivalent, e.g. 2.875
22	Award **TWO** marks for the correct answer of 7 If the answer is incorrect, award **ONE** mark for evidence of an appropriate method, e.g. • 18 + 9 + 2 widths = 34 + 1 width 27 + 2 widths = 34 + 1 width 27 + 1 width = 34 34 − 27 **OR** • 34 − (18 + 9)	Up to 2m	Answer need not be obtained for the award of **ONE** mark. Award **ONE** mark for a method which uses algebraic representation correctly, e.g. • 34 + w = 18 + w + 9 + w 34 + w = 27 + w + w
23	Both numbers correct as shown: $b\ =\ \boxed{10}\ \times\ a\ -\ \boxed{1}$	1m	
24	Award **TWO** marks for the correct answer of 9 If the answer is incorrect, award **ONE** mark for evidence of an appropriate method, e.g. • 6 × 6 × 6 = 216 216 ÷ 6 = 36 36 ÷ 4 **OR** • 216 ÷ 24	Up to 2m	Answer need not be obtained for the award of **ONE** mark.

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