Ma

KEY STAGE 3

ALL TIERS

2002

Mathematics tests

Mark scheme for Paper 1

Tiers 3–5, 4–6, 5–7 and 6–8

department for education and skills
creating opportunity, releasing potential, achieving excellence

QCA Guarding standards

Introduction

The test papers will be marked by external markers. The markers will follow the mark scheme in this booklet, which is provided here to inform teachers.

This booklet contains the mark scheme for paper 1 at all tiers. The paper 2 and the extension paper mark schemes are printed in separate booklets. Questions have been given names so that each one has a unique identifier irrespective of tier.

The structure of the mark schemes

The marking information for questions is set out in the form of tables, which start on page 11 of this booklet. The columns on the left-hand side of each table provide a quick reference to the tier, question number, question part, and the total number of marks available for that question part.

The '**Correct response**' column usually includes 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 correct working, and whether the marks are independent or cumulative;
- examples of some different types of correct response, including the most common and the minimum acceptable.

The '**Additional guidance**' column indicates alternative acceptable responses, and provides details of specific types of response that are unacceptable. Other guidance, such as when 'follow through' is allowed, is provided as necessary.

General guidance

Using the mark schemes

Answers that are numerically equivalent or algebraically equivalent are acceptable unless the mark scheme states otherwise.

In order to ensure consistency of marking, the most frequent procedural queries are listed on the following two pages with the prescribed correct action. This is followed by further guidance, relating to marking of questions that involve money, time, coordinates, algebra or probability. Unless otherwise specified in the mark scheme, markers should apply the following guidelines in all cases.

What if ...

The pupil's response does not match closely any of the examples given.	Markers should use their judgement in deciding whether the response corresponds with the statement of requirements given in the 'Correct response' column. Refer also to the additional guidance.
The pupil has responded in a non-standard way.	Calculations, formulae and written responses do not have to be set out in any particular format. 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 indicating a response. Any correct method of setting out working, however idiosyncratic, is acceptable. Provided there is no ambiguity, condone the continental practice of using a comma for a decimal point.
The pupil has made a conceptual error.	In some questions, a method mark is available provided the pupil has made a computational, rather than conceptual, error. A computational error is a 'slip' such as writing $4 \times 6 = 18$ in an otherwise correct long multiplication. A conceptual error is a more serious misunderstanding of the relevant mathematics; when such an error is seen no method marks may be awarded. Examples of conceptual errors are: misunderstanding of place value, such as multiplying by 2 rather than 20 when calculating 35×27; subtracting the smaller value from the larger in calculations such as $45 - 26$ to give the answer 21; incorrect signs when working with negative numbers.
The pupil's accuracy is marginal according to the overlay provided.	Overlays can never be 100% accurate. However, provided the answer is within, or touches, the boundaries given, the mark(s) should be awarded.
The pupil's answer correctly follows through from earlier incorrect work.	'Follow through' marks may be awarded only when specifically stated in the mark scheme, but should not be allowed if the difficulty level of the question has been lowered. Either the correct response or an acceptable 'follow through' response should be marked as correct.
There appears to be a misreading affecting the working.	This is when the pupil misreads the information given in the question and uses different information. If the original intention or difficulty level of the question is not reduced, deduct one mark only. If the original intention or difficulty level is reduced, do not award any marks for the question part.
The correct answer is in the wrong place.	Where a pupil has shown understanding of the question, the mark(s) should be given. In particular, where a word or number response is expected, a pupil may meet the requirement by annotating a graph or labelling a diagram elsewhere in the question.

<table>
<tr><td rowspan="4">The final answer is wrong but the correct answer is shown in the working.</td><td>Where appropriate, detailed guidance will be given in the mark scheme and must be adhered to. If no guidance is given, markers will need to examine each case to decide whether:

the incorrect answer is due to a transcription error;</td><td>

If so, award the mark.</td></tr>
<tr><td>in questions not testing accuracy, the correct answer has been given but then rounded or truncated;</td><td>If so, award the mark.</td></tr>
<tr><td>the pupil has continued to give redundant extra working which does not contradict work already done;</td><td>If so, award the mark.</td></tr>
<tr><td>the pupil has continued, in the same part of the question, to give redundant extra working which does contradict work already done.</td><td>If so, do not award the mark. Where a question part carries more than one mark, only the final mark should be withheld.</td></tr>
<tr><td>The pupil's answer is correct but the wrong working is seen.</td><td colspan="2">A correct response should always be marked as correct unless the mark scheme states otherwise.</td></tr>
<tr><td>The correct response has been crossed (or rubbed) out and not replaced.</td><td colspan="2">Mark, according to the mark scheme, any legible crossed (or rubbed) out work that has not been replaced.</td></tr>
<tr><td>More than one answer is given.</td><td colspan="2">If all answers given are correct (or a range of answers is given, all of which are correct), the mark should be awarded unless prohibited by the mark scheme. If both correct and incorrect responses are given, no mark should be awarded.</td></tr>
<tr><td>The answer is correct but, in a later part of the question, the pupil has contradicted this response.</td><td colspan="2">A mark given for one part should not be disallowed for working or answers given in a different part, unless the mark scheme specifically states otherwise.</td></tr>
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Marking specific types of question

Responses involving money

For example: £3.20 £7

Accept ✓	Do not accept ×
✓ Any unambiguous indication of the correct amount eg £3.20(p), £3 20, £3,20, 3 pounds 20, £3-20, £3 20 pence, £3:20, £7.00	× Incorrect or ambiguous use of pounds or pence eg £320, £320p or £700p, or 3.20 or 3.20p not in the answer space.
✓ The £ sign is usually already printed in the answer space. Where the pupil writes an answer other than in the answer space, or crosses out the £ sign, accept an answer with correct units in pounds and/or pence eg 320p, 700p	× Incorrect placement of decimal points, spaces, etc or incorrect use or omission of 0 eg £3.2, £3 200, £32 0, £3-2-0, £7.0

Responses involving time

A time interval *For example: 2 hours 30 mins*

Accept ✓	Take care ! Do not accept ×
✓ Any unambiguous indication eg 2.5 (hours), 2h 30	× Incorrect or ambiguous time interval eg 2.3(h), 2.30, 2-30, 2h 3, 2.30min
✓ Digital electronic time ie 2:30	! The time unit, hours or minutes, is usually printed in the answer space. Where the pupil writes an answer other than in the answer space, or crosses out the given unit, accept an answer with correct units in hours or minutes, unless the question has asked for a specific unit to be used.

A specific time *For example: 8.40am, 17:20*

Accept ✓	Do not accept ×
✓ Any unambiguous, correct indication eg 08.40, 8.40, 8:40, 0840, 8 40, 8-40, twenty to nine, 8,40	× Incorrect time eg 8.4am, 8.40pm
✓ Unambiguous change to 12 or 24 hour clock eg 17:20 as 5:20pm, 17:20pm	× Incorrect placement of separators, spaces, etc or incorrect use or omission of 0 eg 840, 8:4:0, 084, 84

Responses involving coordinates

For example: (5, 7)

Accept ✓	Do not accept ×
✓ Unambiguous but unconventional notation eg (05, 07) (five, seven) ($\overset{x}{5}$, $\overset{y}{7}$) (x=5, y=7)	× Incorrect or ambiguous notation eg (7, 5) (5x, 7y) (x5, y7) (5^x, 7^y)

Responses involving the use of algebra

For example: $2 + n$ $n + 2$ $2n$

Accept ✓	Take care ! Do not accept ×
✓ The unambiguous use of a different case eg N used for n ✓ Unconventional notation for multiplication eg $n \times 2$ or $2 \times n$ or $n2$ or $n + n$ for $2n$ $n \times n$ for n^2 ✓ Multiplication by 1 or 0 eg $2 + 1n$ for $2 + n$ $2 + 0n$ for 2 ✓ Words used to precede or follow equations or expressions eg $t = n + 2$ tiles or tiles = $t = n + 2$ for $t = n + 2$ ✓ Unambiguous letters used to indicate expressions eg $t = n + 2$ for $n + 2$ ✓ Embedded values given when solving equations eg $3 \times 10 + 2 = 32$ for $3x + 2 = 32$	! Words or units used within equations or expressions should be ignored if accompanied by an acceptable response, but should not be accepted on their own eg do not accept n tiles + 2 n cm + 2 × Change of variable eg x used for n × Ambiguous letters used to indicate expressions eg $n = n + 2$ However, to avoid penalising any of the three types of error above more than once within each question, do not award the mark for the *first* occurrence of each type within each question. Where a question part carries more than one mark, only the final mark should be withheld. × Embedded values that are then contradicted eg for $3x + 2 = 32$, 3 x 10 + 2 = 32, $x = 5$

Responses involving probability

A numerical probability should be expressed as a decimal, fraction or percentage only.

For example: 0.7

Accept ✓	Take care ! Do not accept ×
✓ A correct probability that is correctly expressed as a decimal, fraction or percentage.	The following four categories of error should be ignored if accompanied by an acceptable response, but should not be accepted on their own.
✓ Equivalent decimals, fractions or percentages eg 0.700, $\frac{70}{100}$, $\frac{35}{50}$, 70.0%	! A probability that is incorrectly expressed eg 7 in 10, 7 out of 10, 7 from 10
✓ A probability correctly expressed in one acceptable form which is then incorrectly converted, but is still less than 1 and greater than 0 eg $\frac{70}{100} = \frac{18}{25}$	! A probability expressed as a percentage without a percentage sign.
	! A fraction with other than integers in the numerator and/or denominator.
	However, each of the three types of error above should not be penalised more than once within each question. Do not award the mark for the *first* occurrence of each type of error unaccompanied by an acceptable response. Where a question part carries more than one mark, only the final mark should be withheld.
	! A probability expressed as a ratio eg 7 : 10, 7 : 3, 7 to 10
	× A probability greater than 1 or less than 0

Recording marks awarded on the test paper

All questions, even those not attempted by the pupil, will be marked, with a 1 or a 0 entered in each marking space. Where 2m can be split into 1m gained and 1m lost, with no explicit order, then this will be recorded by the marker as 1 0

The total marks awarded for a double page will be written in the box at the bottom of the right-hand page, and the total number of marks obtained on the paper will be recorded on the front of the test paper.

A total of 120 marks is available in each of tiers 3–5, 4–6, 5–7 and 6–8. The extension paper carries 42 marks.

Awarding levels

The sum of the marks gained on paper 1, paper 2 and the mental arithmetic paper determines the level awarded. Level threshold tables, which show the mark ranges for the award of different levels, will be available on the QCA website (*www.qca.org.uk*) from Wednesday, 26 June 2002. QCA will also send a copy to each school in July.

Schools will be notified of pupils' results by means of a marksheet, which will be returned to schools by the External Marking Agency with the pupils' marked scripts. The marksheet will include pupils' scores on the test papers and the levels awarded.

The 2002 key stage 3 mathematics tests and mark schemes were developed by the Mathematics Test Development Team at QCA.

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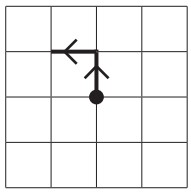
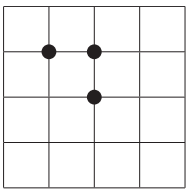
Tier & Question						Half
3-5	4-6	5-7	6-8			
1					Correct response	Additional guidance
				1m	Both correct, ie more than half ✓ half ✓	

Tier & Question					Robot	
3-5	4-6	5-7	6-8			
2					**Correct response**	**Additional guidance**
a				**1m**	Correct diagram, ie 	✓ *Unambiguous indication* eg ◆  ! *Arrows incorrect or omitted* Ignore
b				**1m**	A correct route, showing 2 Norths and 1 East eg ■ North North East ■ N E N ■ East N N	✓ *Identical steps combined* eg, in part (b) ◆ Move 2m north, then 1m east ! *Other compass points used* eg, in part (b) ◆ North-east East West-north Penalise only the first occurrence ! *More than the specified number of steps used* Do not accept in part (d). Otherwise penalise only the first occurrence, unless this error occurs alongside the error given above (other compass points used) in which case ignore ! *Follow through from part (b) to part (c)* If the compass directions in part (b) are incorrect, accept the same directions used in part (c) but in a different order eg, from part (b) as W, N, N ◆ N W N ✗ *Compass directions not specified* Do not accept the route shown only by lines on the diagram, or other ways of specifying directions eg ◆ Forward Right Forward
c				**1m**	A different correct route, also showing 2 Norths and 1 East	
d				**1m**	A correct route, showing one step in any direction and its inverse eg ■ North South ■ W E	

Tier & Question					Computation	
3-5	4-6	5-7	6-8			
3					**Correct response**	**Additional guidance**
a				**1m**	573	
b				**1m**	446	
c				**1m**	168	
d				**1m**	26	

Tier & Question					Olympic Games	
3-5	4-6	5-7	6-8			
4					**Correct response**	**Additional guidance**
				3m	103	
				or		
				2m	Shows or implies correct totals of 131 and 28 and the intention to subtract, even if the notation is incorrect eg ■ 41 + 43 + 47 = 131, 11 + 10 + 7 = 28 131 − 28 = *117 (error)* ■ 28 − 131 = *117 (error)* ■ 117 given as the answer	! ***Intention to subtract not explicit*** Accept implicit intention to subtract eg ◆ 131 and 28 seen, with 102 given as the answer
					or	
					Shows or implies correct differences of 30, 33 and 40 and the intention to add eg ■ 41 − 11 = 30, 43 − 10 = 33, 47 − 7 = 40 30 + 33 + 40	! ***Intention to add not explicit*** Accept implicit intention to add eg ◆ 30, 33 and 40 seen, with 113 given as the answer
					or	
					Shows a complete correct method with not more than one error, that is followed through correctly to an answer eg ■ 41 + 43 + 47 = *132 (error)*, 132 − 28 = 104 ■ 30 + *23 (error)* + 40 = 93	! ***Method not explicit*** Accept implicit methods eg ◆ *121 (error)* and 28 seen, with 93 given as the answer but no other working shown
				or		
				1m	Shows the totals 131 and 28	
					or	
					Shows the differences 30 and 33 and 40	
					or	
					Shows a complete correct method with not more than two errors	

Tier & Question						
3-5	4-6	5-7	6-8		**Pictogram key**	
5					**Correct response**	**Additional guidance**
				2m	Correct for both male and female, ie 2 circles for male, $1\frac{1}{2}$ circles for female	! *Drawings not accurate or the same size, or the half circle is not closed* Accept provided the pupil's intention is clear ! *Symbol other than circle used to represent 4 people* Do not accept multiple symbols, eg circles and squares used. However, if the only error is to use a different symbol consistently for both male and female, mark as 1, 0
				or **1m**	Correct for either male or female	

Tier & Question						
3-5	4-6	5-7	6-8		**Two steps**	
6					**Correct response**	**Additional guidance**
a				**1m**	40	
				1m	46	
b				**1m**	12	! *Units given* Ignore eg, accept • 12 cm ! *Step size shown on diagram* Accept if unambiguous, but do not accept incorrect further working eg, do not accept • 12 shown correctly on the diagram, but 24 given as the answer ! *Both step sizes shown* Accept if unambiguous eg, accept • 12, 12 • 12 and 12 Do not accept if ambiguous eg • 12 + 12

Tier & Question					Calculations	
3-5	4-6	5-7	6-8			
7					Correct response	Additional guidance
				2m	All four decisions correct, ie ✓ × ✓ ×	
				or **1m**	Any three correct decisions or Both crosses are left blank, ie ✓ ✓ 	

Tier & Question					Areas	
3-5	4-6	5-7	6-8			
8	1				Correct response	Additional guidance
a	a			**1m**	12	
b	b			**1m**	3	✓ *Follow through as part (a) ÷ 4* If their (a) ÷ 4 is not an integer, accept values rounded or truncated to one or more decimal places
c	c			**1m**	12	✓ *Follow through as part (b) × 4, or as part (a)* Note that follow through from part (b) must be exact eg, from 3.2 in part (b), accept 12.8 only

Tier & Question						Signs
3-5	4-6	5-7	6-8			
9	2				Correct response	Additional guidance
				1m	$5 + 2 = 10 - 3$	✓ *Other correct signs* eg, for the first mark • $5 + {}^{+}2 = 10 + {}^{-}3$
				1m	$12 - 3 = 3 \times 3$	eg, for the first mark • $6 \div {}^{-}6 = 7 \div {}^{-}7$
				1m	$2 + 1 = 9 \div 3$	
				1m	$6 - 6 = 7 - 7$ or $6 \div 6 = 7 \div 7$	

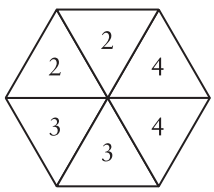
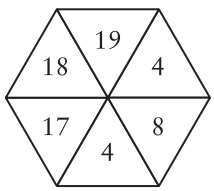
Tier & Question					**Angles**	
3-5	4-6	5-7	6-8			
10	**3**				**Correct response**	**Additional guidance**
a	a			**1m**	Indicates 'acute', ie ☐ ☑ ☐ ☐	
b	b			**1m**	Indicates 'No' and gives a correct explanation The most common correct explanations: State the angles are the same eg ▪ They are both 45° ▪ They both have the same amount of turn ▪ The first diagram is an enlargement of the second diagram ▪ Angle B fits onto angle A exactly ▪ They are the same, you just see more of A Address the misconception eg ▪ It's how much turn, not how long the lines are ▪ Just because the arms are longer it doesn't make it bigger	! *Angles measured* Accept as 45 ± 2° provided both angles are the same, but do not accept incorrect measurements eg, do not accept ◆ Both are 45° or 135° ✓ *Minimally acceptable explanation* eg ◆ They are the same ✓ *A and B used to refer to the diagram rather than the angle* eg ◆ If you enlarge B it is the same as A ! *Response refers to the squares* Accept if there is unambiguous reference to the angles eg ◆ They both go through the diagonal Do not accept if ambiguous eg ◆ They both have the same number of squares within them (could be referring to area) ✓ *Minimally acceptable explanation* eg ◆ It's just that the lines are longer ◆ Because one is smaller in size doesn't mean the angle is smaller ✓ *Implicit reference to the length of the lines* eg ◆ B is a bit smaller but it's the same angle ◆ A has been drawn bigger than B

Tier & Question					Factors	
3-5	4-6	5-7	6-8			
11	**4**				**Correct response**	**Additional guidance**
a	a			**2m**	All five correct factor pairs, in any order, with none duplicated or incorrect eg ▪ 1, 16 2, 8 4, 4 8, 2 16, 1	
				or **1m**	At least three factor pairs correct	
b	b			**2m**	All correct, ie (1) (2) (3) (4) 5 (6) 7 8 9 10 11 (12)	
				or **1m**	At least four correct and none incorrect or At least five correct and not more than one incorrect or Identifies all numbers that are not factors of 12, ie 1 2 3 4 (5) 6 (7) (8) (9) (10) (11) 12	

Tier & Question					Thinking of rules	
3-5	4-6	5-7	6-8			
12	5				Correct response	Additional guidance
a	a			**1m**	12	✓ *Multiple steps* eg, for the first rule • 2, then add another 10 • 3, then × 2
				1m	3	
				1m	Correct response eg ▪ Add 6 ▪ + 6 ▪ $\times \frac{3}{2}$ ▪ Add the number you first thought of	! *The starting value of 6 is repeated* Ignore if inserted before the given operation eg, accept • first rule: 6 add 12 If 6 is inserted immediately after the given operation, penalise only the first occurrence eg • first rule: add 6 + 12 Do not accept 6 repeated after their rule eg • first rule: add 12 + 6 × *For the third rule, the operation is not specified* eg • 6
b	b			**1m**	Gives a correct rule eg ▪ Divide by 2 ▪ ÷ 2 ▪ Halve the first number ▪ Take half of the first number away	! *Embedded rule* Accept provided both calculations are shown and use the same rule eg • 10 ÷ 2 and 8 ÷ 2 ✓ *Use of 'half' for halve* eg • Half × *Incorrect rule* eg • $-\frac{1}{2}$ × *Inverse rule* eg • Double × *Result used to define the rule* eg • Take the smaller number away from the bigger • 10 − 5 = 5, 8 − 4 = 4

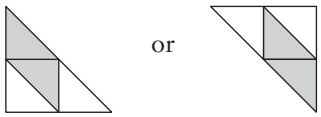
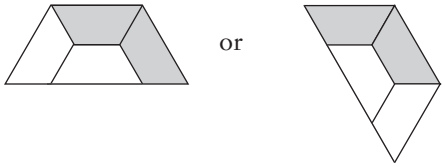
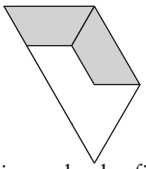
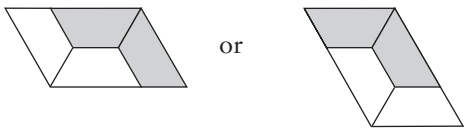
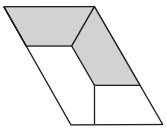
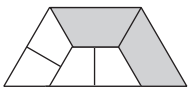
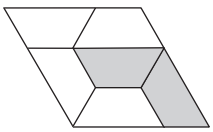
Tier & Question					Car parking	
3-5	4-6	5-7	6-8			
13	6				Correct response	Additional guidance
				2m	75 p	
				or		
				1m	Shows a correct multiplicative method even if there are computational errors eg ▪ 15 ÷ 8 × 40 ▪ 40 ÷ 8 × 15 ▪ 15 × 5 ▪ 15 × 10 ÷ 2 or Shows a correct additive method with not more than one computational error eg ▪ 15 + 15 + 15 + 15 + 15 ▪ 8 15 16 30 24 45 32 *50 (error)* 40 65	

Tier & Question					Heights	
3-5	4-6	5-7	6-8			
14	7				Correct response	Additional guidance
a	a			**1m**	1.2(0)	✓ *Correct height in centimetres, with units given*
b	b			**1m**	1.15	
c	c			**1m**	170	✗ *Height in metres*

Tier & Question						
3-5	4-6	5-7	6-8		**Spinning**	
15	**8**	**1**			**Correct response**	**Additional guidance**
a	a	a		**1m**	Gives a correct probability eg ▪ $\frac{1}{4}$ ▪ $\frac{2}{8}$ ▪ 25%	
				1m	Gives a correct probability eg ▪ 1 ▪ 100%	✓ *Equivalent fractions* eg ◆ $\frac{8}{8}$ ◆ $\frac{1}{1}$! *Probability not quantified* Ignore descriptors alongside correct probabilities, but do not accept on their own eg, do not accept ◆ Certain ◆ Definite
b	b	b		**2m**	Shows exactly two fours, exactly two even numbers other than four, and any two odd numbers eg ▪  ▪  	! *Use of zero* Note zero is defined as an even number
				or **1m**	Shows exactly two fours or Shows exactly four even numbers, even if the other two entries are left blank	 ✓ *Four fours*

Tier & Question					Interpreting algebra	
3-5	4-6	5-7	6-8			
16	9	3			**Correct response**	**Additional guidance**
				1m	Gives a correct interpretation, by referring to at least 3 of the 4 aspects listed below 1. **The meaning of *a* and *b*** (eg by using Ann and Ben, or A and B) 2. **The meaning of the + and = signs** (eg by using key words such as 'sum of' or 'total' or 'altogether' or 'add') 3. **The value 69** 4. **The given context** (eg by referring to age or years) eg, accept ▪ The sum of the ages of Ben and Ann is 69 (all aspects shown) ▪ Altogether A and B are 69 years old (all aspects shown) ▪ Altogether, *a* and *b* are 69 years old (1st aspect missing) ▪ Ann's + Ben's age = 69 (2nd aspect missing) ▪ The sum of the ages of A and Ben (3rd aspect missing) ▪ Together, Ann and Ben are 69 (4th aspect missing)	! ***Ben's age taken to be 30*** Accept Ann's age unambiguously shown as 39, with reference to both the meaning of *a* and the given context eg, accept ◆ Ann is 39 years old ◆ A's age = 39 ◆ A is 9 years older than B In English, ages are commonly referred to without years, so also accept the following ◆ A is 39 However, do not accept other responses that do not refer to both the meaning of *a* and the given context eg ◆ Ann = 39 Also, do not accept incorrect computation eg ◆ Ann is 29 years old
				1m	Gives a correct interpretation, by referring to the **given context** (eg by referring to age or years) **and** at least 1 of the 2 aspects listed below 1. **The meaning of *b* and *c*** (eg by using Ben and Cindy, or B and C) 2. **The meaning of the '2' or '2×'** (eg by using key words such as 'twice' or 'half' or 'two times') eg, accept ▪ Ben is twice as old as C ▪ C is half B's age ▪ B is twice C's age ▪ *b* is twice *c*'s age (1st aspect missing) ▪ B = 2 × C's age (2nd aspect missing)	! ***Ben's age taken to be 30*** Accept Cindy's age unambiguously shown as 15, with reference to both the meaning of *c* and the given context, and applying the additional guidance as given in part (a)

Tier & Question					Interpreting algebra (cont)	
3-5	4-6	5-7	6-8			
16	9	3			**Correct response**	**Additional guidance**
				1m	Gives a correct interpretation by referring to the **mean** **and** either the **given context**, or **28**, or both eg ■ The mean age of Ann, Ben and Cindy is 28 ■ 28 is the mean age ■ 28 is the mean (no reference to the given context) ■ The mean age (no reference to 28) or Gives a correct interpretation by referring to the **total of 84** **and** the **given context** eg ■ The total age of Ann, Ben and Cindy is 84 ■ 84 is the sum of their ages or Gives a correct interpretation, by referring to the **given context** **and** the **denominator of 3** (eg by showing ÷ 3) **and** at least 2 of the 3 aspects listed below 1. **The meaning of *a*, *b* and *c*** (eg by using Ann, Ben and Cindy, or A, B and C, or by using inclusive key words such as 'their' or, minimally, 'the') 2. **The meaning of the + signs** (eg by using key words such as 'sum of' or 'total' or 'altogether' or 'add') 3. **The value 28** eg, accept ■ The sum of their ages divided by 3 is 28 ■ Add A's age to B's age to C's age then divide by 3 gives the answer 28 ■ Their total age ÷ 3 is 28 ■ The ages of A + B + C, then divide by three equals 28 (2nd aspect missing) ■ Add up the ages then divide by 3 (3rd aspect missing)	✓ *Use of 'average' for mean* × ***Partial or incorrect processing*** eg ◆ The total of their ages is 3 × 28 ◆ 3 × 28 = *82 (error)* which is the sum of their ages ! ***Ambiguity as to whose age is divided by 3*** Pupils who reproduce the statement in the order shown can introduce ambiguity Do not accept such responses eg, accept ◆ (Ann + Ben + Cindy's age) ÷ 3 = 28 ◆ Ann + Ben + Cindy's ages ÷ 3 = 28 eg, do not accept ◆ Ann + Ben + Cindy's age ÷ 3 = 28 ◆ Ann's + Ben's + Cindy's age ÷ 3 = 28 ! ***Ben's age taken to be 30*** Ignore if accompanying a correct response, otherwise do not accept eg, do not accept ◆ (39 + 30 + 15) ÷ 3 = 28 ! ***Within the question, two equations solved correctly but with no credit given*** eg ◆ $a = 39$, $c = 15$ Mark as 0, 0, 1

Tier & Question					Growing shapes	
3-5	4-6	5-7	6-8			
17	10	2			**Correct response**	**Additional guidance**
a	a	a		**1m**	Completes the bigger triangle, ie 	! *Lines not ruled or accurate* Accept provided the pupil's intention is clear
b	b	b		**1m**	Completes the trapezium, ie 	! *Parts (b) and (c) transposed* Mark part (b) as 0, then part (c) as 1 ! *Internal lines missing* eg, for part (b) ◆  Penalise only the first occurrence
c	c	c		**1m**	Completes the parallelogram, ie 	× *Incorrect internal lines* eg, for part (c) ◆  ! *Four more congruent triangles or trapezia joined* eg, for part (b) ◆  eg, for part (c) ◆  Penalise only the first occurrence

Tier & Question					Halfway	
3-5	4-6	5-7	6-8			
18	11	4	1		Correct response	Additional guidance
	a	a		**1m**	9.2 or equivalent value	
				1m	24	
	b	b		**2m**	1140	
				or **1m**	Shows a correct efficient method eg ■ 30 × 38	! ***30 × 38 or 1140 seen in the working*** Note that some pupils show 30 × 38 or 1140 as part of their calculation of 33 × 38 eg ◆ 30 × 38 = 1140 3 × 38 = 114 1140 + 114
					or Shows both 1026 and 1254	Do not accept as evidence of a correct efficient method
					or Shows one of 1026 or 1254, but makes error(s) when finding the other value, then follows through correctly to give a final answer eg ■ 27 × 38 = 1026, 33 × 38 = *1354 (error)* 1026 + 1354 = 2380 2380 ÷ 2 = 1190 ■ 27 × 38 = *926 (error)* 1254 − 926 = 328 328 ÷ 2 = 164 926 + 164 = 1090 ■ 1026 ÷ 2 = 513 *1250 (error)* ÷ 2 = 625 513 + 625 = 1138 ■ 27 × 38 = *1034 (error)*, 33 × 38 = 1254 1034 + 220 = 1254 1034 + 110 = 1144	! ***Their incorrect value is odd*** Accept rounding or truncation to an integer value eg ◆ 27 × 38 = *1023 (error)*, 33 × 38 = 1254 1023 + 231 = 1254 1023 + 115 = 1138

Tier & Question						Survey
3-5	4-6	5-7	6-8			
19	12	5			Correct response	Additional guidance
a	a	a		**1m**	English	✓ *Unambiguous indication* eg, for English ◆ 2 eg, for Maths ◆ 7
b	b	b		**1m**	Maths	
c	c	c		**1m**	Gives a correct explanation The most common correct explanations: Calculate the percentages to show they are different eg ■ 30% for boys, but only 15% for girls Show that the totals are different eg ■ It's 3 out of 10 for boys but 3 out of 20 for girls ■ There are more girls so it's a smaller percentage ■ The total for girls is 20, but for boys it is 10 ■ There are twice as many girls as boys ■ Take the boys to be 100%, then the girls will be 200%	× *Percentages calculated incorrectly* × *Incomplete explanation* eg ◆ The percentages are different for boys and girls ✓ *Minimally acceptable explanation* eg ◆ There are more girls ◆ It's out of different numbers ◆ It depends on how many boys and girls there are ◆ You need to look at the percentage, not just the number ◆ The percentage for boys is higher ◆ There are 10 boys and 20 girls (implicit comparison) × *Incorrect explanation accompanying a correct statement* eg ◆ Because he asked 20 girls and 10 boys and that is not a fair thing to do in a survey ◆ There are more girls than boys so *girls (error)* have a bigger percentage than the boys ◆ There are 10 boys and 20 girls so it couldn't be equally popular × *Incomplete explanation* eg ◆ The total for girls is 20
d	d	d		**1m**	English	

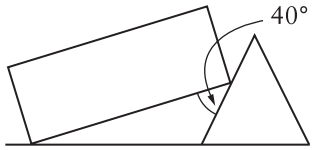
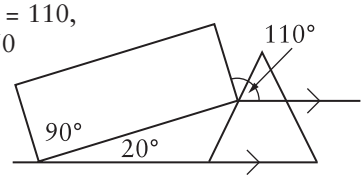
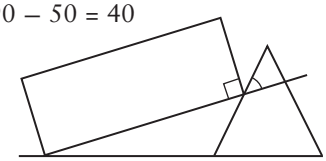
Tier & Question					Solving	
3-5	4-6	5-7	6-8			
20	15	6	2		Correct response	Additional guidance
a	a	a		**2m**	All three correct, ie 23 20 33	✖ *Incorrect notation* eg ◆ $23x$ for 23
				or **1m**	Any two correct	
b	b	b		**2m**	3	! *Ambiguous notation* eg ◆ × 3 Mark as 1, 0
				or **1m**	Subtracts 11 from both sides to give a correct algebraic equation eg ■ $2y = 17 - 11$ ■ $2y + 11 - 11 = 17 - 11$ ■ $2y = 6$	
	c	c		**2m**	Correct value eg ■ $2\frac{1}{2}$ ■ $\frac{5}{2}$ ■ 2.5	✓ *Equivalent fraction or decimal* eg ◆ $2\frac{2}{4}$ ◆ $\frac{10}{4}$ ✖ *For 2m, incomplete processing* eg ◆ $10 \div 4$
				or **1m**	Collects together like terms eg ■ $9y - 5y = 13 - 3$ ■ $4y = 10$ ■ $y = 10 \div 4$ or Shows working in which the only error is to add, rather than subtract, 3 to the right-hand side, resulting in the solution $y = 4$ eg ■ $9y + 3 = 5y + 13$ so $4y = 16$ *(error)* so $y = 4$ or Shows working in which the only error is to add, rather than subtract, $5y$ to the left-hand side, resulting in the solution $y = \frac{5}{7}$, or equivalent fraction or decimal between 0.71 and 0.72 inclusive eg ■ $9y + 3 = 5y + 13$ $14y$ *(error)* $= 10$ so $y = \frac{10}{14}$	✖ *Simplified expressions which are not equated* eg ◆ $9y - 5y = 4y$ $13 - 3 = 10$! *Method used is trial and improvement* Note that no partial credit can be given Also note that the correct solution must be explicitly stated rather than embedded eg, do not accept ◆ $5 \times 2.5 + 13 = 9 \times 2.5 + 3$ without 2.5 identified as the solution

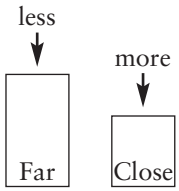
Tier & Question					Dropping litter	
3-5	4-6	5-7	6-8			
	13	7	3		Correct response	Additional guidance
	a	a	a	**1m**	Gives a correct reason The most common correct reasons are: The sample size is too small eg ▪ They should ask more than 10 ▪ Not enough people ▪ 10 is too small, he should ask 100 People might not respond honestly eg ▪ They might be embarrassed so won't be honest ▪ They will lie ▪ They are not likely to admit to it ▪ They might ignore the pupils People might not remember eg ▪ They might not remember doing it People might not be consistent eg ▪ They might only drop it on some days so they would say they don't drop it every day ▪ They might not drop it every day but still drop it sometimes The sampling method may lead to bias eg ▪ They might only ask people in a clean area with not much litter ▪ He might only ask young people	✓ *Question would be difficult to answer* eg ◆ No-one would know if they did drop it every day ✓ *Implicit reference to the sample size being too small* eg ◆ Those 10 might not drop litter but others might ◆ Those people might not have any litter to drop ✗ *In part (a) or part (b), conceptual misunderstanding* The most common of these imply that everyone in the country should be asked, or that the figure of 93% must be proved exactly, or that the exact conditions applied by the newspaper must be replicated, or that you should select the people being surveyed according to the desired outcome eg ◆ 10 people is not all of us ◆ There are a lot more than 10 people in England ◆ It is not possible to get a figure of 93% with only 10 people ◆ 10 is too difficult, he should ask 100 ◆ You don't know how many people the newspaper asked ◆ You might ask the wrong people ! *In part (a) or part (b), more than one reason given within one response* Do not accept a correct response accompanied by an incorrect response from the same category. Otherwise ignore irrelevant or incorrect further responses. If two correct reasons from different categories are given in the first response space, both marks should be awarded
				1m	Gives a correct reason from a different category to one already credited	

Tier & Question					Dropping litter (cont)	
3-5	4-6	5-7	6-8			
	13	7	3		Correct response	Additional guidance
	b	b	b	**1m**	Gives a correct reason The most common correct reasons are:	✗ *Method is time consuming* eg • It would take too long
					The sample might be biased due to the time of week or the time of day	✓ *Minimally acceptable correct reason* eg • They might drop more at the weekend • At lunchtime there will be more litter
					Recording people walking past may produce an inappropriate sample size, ie too big to be practical or too small to be of use	✓ *Minimally acceptable correct reason* eg • You can't observe everyone • Not enough people are around then
					Some people may be counted more than once	✓ *Minimally acceptable correct reason* eg • People may pass more than once
					People might change their behaviour if they are being observed	✓ *Minimally acceptable correct reason* eg • They'll see the pupils and stop
					The sample might be biased because only one position is used	✓ *Minimally acceptable correct reason* eg • The shop may be in a clean area • People drop more in towns
					The sample might be biased due to the type of shop	✓ *Minimally acceptable correct reason* eg • It might be a burger shop • Children might not go to that shop
					The results might be affected by whether there is a bin nearby	
					People may not have litter to drop	
					Although people have litter, they may drop it elsewhere/ at a different time	✓ *Minimally acceptable correct reason* eg • They won't all drop it outside one shop • A person is only observed for 30 seconds
					Although people drop litter, accurate observation may be difficult	✓ *Minimally acceptable correct reason* eg • Will they always see the person who is dropping it?
				1m	Gives a correct reason from a different category to one already credited	

Tier & Question					Negatives	
3-5	4-6	5-7	6-8			
	14	8	4		Correct response	Additional guidance
				1m	Gives two negative numbers, the second of which is 5 less than the first eg ▪ −8 _ −13 ▪ −1 _ −6	✖ *Zero used as a negative* eg ◆ −0 ! *Incorrect notation* eg ◆ 15 − Penalise only the first occurrence
				1m	Gives two negative numbers, the second of which is 5 more than the first eg ▪ −6 _ −1 ▪ −15 _ −10	! *Neither calculation is correct but the numbers used in the second set of boxes are the same as in the first set, but in reverse order* If all the numbers are negative, mark as 0, 1 eg ◆ −7 then −3 in the first, −3 then −7 in the second

Tier & Question					Puzzle	
3-5	4-6	5-7	6-8			
	16	9	5		Correct response	Additional guidance
				2m	Writes three correct algebraic expressions, the first two of which may be unsimplified eg, for the first box ■ $2n + 4$ ■ $n + 4 + n$ eg, for the second box ■ $n + 2$ ■ $(2n + 4) \div 2$ eg, for the third box ■ n	! ***Expression for the third box not fully simplified*** Given the context of the question, this expression must be simplified at least as far as $n + 2 - 2$ or $\frac{2n}{2}$ eg, do not accept ◆ $\frac{2n+4}{2} - 2$ × ***For 2m, incorrect algebraic notation*** eg, for the second box ◆ $2n + 4 \div 2$
				or **1m**	Writes correct algebraic expressions for the first two boxes, even if unsimplified or Writes correct algebraic expressions for the last two boxes and fully simplifies, indicating that the pupil has worked upwards eg ■ $n + 9$ *(error)* $n + 2$ n or Within an otherwise correct response, the only error is in the notation for the expression for the second box eg ■ $2n + 4$ $2n + 4 \div 2$ *(error in notation only)* n or The expression for the first or second box is incorrect, but is then followed through correctly including full simplification of the expression for the third box eg ■ $n + 9$ *(error)* $\frac{n + 9}{2}$ $\frac{n + 5}{2}$ (or $0.5n + 2.5$) ■ $2n + 4$ $n + 4$ *(error)* $n + 2$	× ***For the third box, incorrect simplification to n*** eg ◆ $n + 9$ *(error)* $\frac{n + 9}{2}$ $\frac{n + 9}{2} - 2 = n$ *(error)*

Tier & Question						
3-5	4-6	5-7	6-8		**Rectangle rest**	
		10	**6**		**Correct response**	**Additional guidance**
		a	a	**2m**	50	
				or		
				1m	Calculates, or shows on the diagram, that the other acute angle in the white triangle is 40 eg ▪  ▪ 180 − 60 = 120, 120 + 20 = 140, 180 − 140 = 40 or Shows a complete correct method with not more than one computational error eg ▪ 180 − (20 + 120) = *50 (error)*, 90 − 50 = 40 ▪ 20 + 90 = 110, 110 − 60  ▪ 180 ÷ 3 = 60, 60 − 20 = *50 (error)* 180 − 90 − 50 = 40 	✗ *40 seen without being located on the diagram or without supporting working*
		b	b	**2m**	Gives a correct justification eg ▪ ∠DEB is 120 (180 − 60), ∠EBD is 30 (180 − 90 − 60), so ∠BDE is 30 (180 − 120 − 30) As ∠BDE = ∠EBD then triangle BDE is isosceles	✓ *Minimally acceptable justification* eg ◆ Angle at B = 180 − 90 − 60 = 30, so the angles in the triangle are 120, 30, 30 ✗ *For 2m or 1m, angle of 30 not justified, or justified only by assuming the triangle is isosceles* eg ◆ The angles in triangle BDE are 30, 30 and 120 ◆ 180 − 60 = 120, 180 − 120 = 60, 60 ÷ 2 = 30
				or		
				1m	Shows working to justify that ∠DBE is 30 eg ▪ 180 − (90 + 60) = 30	

Tier & Question					**Mice**	
3-5	4-6	5-7	6-8			
	17	**11**	**7**		**Correct response**	**Additional guidance**
	a	a	a	**1m**	50 ± 2	
	b	b	b	**1m**	55 ± 2	
	c	c	c	**1m**	Indicates 'No' and gives a correct explanation The most common correct explanations: Refer to the fact that the number of mice is unknown eg ▪ It's only percentages, the real data is not shown ▪ You need to know the actual numbers ▪ It may be out of different amounts of mice ▪ There may be more mice in homes close to woodland Refer to the limitations of percentage bar charts eg ▪ The charts only allow you to compare the proportions	✓ ***Indicates 'Yes' and qualifies their decision by stating the assumption needed*** eg ◆ Provided the total number of mice is about the same ✓ ***Minimally acceptable explanation*** eg ◆ They've used % so you can't tell ◆ They only show the percentage ◆ You don't know how many mice were found altogether ! ***Explanation specifies which location gets more mice*** The explanation must be the correct way round, ie  eg, do not accept ◆ There may be more mice in homes far from woodland ! ***Explanation refers to number of homes or people, rather than number of mice*** Condone these errors eg, accept ◆ It may be out of different amounts of homes ◆ They might have asked different amounts of people who lived close to or far from woodland ! ***Irrelevant explanation*** If accompanied by a correct explanation, ignore eg, accept ◆ There may be more mice close to woodland or *the homes could be dirtier* ! ***Explanation interprets the percentages in terms of probability, or states that the percentages may not be accurate*** eg ◆ It doesn't mean there must be more, just that it is more likely ◆ There could be more mice that weren't found Ignore if accompanying a correct response, otherwise do not accept

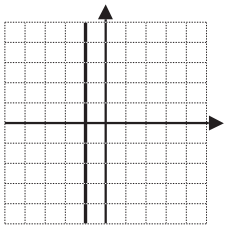
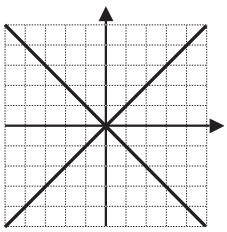
Tier & Question				*Marking overlay available*	**Straight lines**	
3-5	4-6	5-7	6-8			
	18	**12**	**8**		**Correct response**	**Additional guidance**
		a	a	**1m**	Indicates 'Yes' and gives a correct explanation eg ■ When $x = 25$, $3x = 75$ ■ $3 \times 25 = 75$ ■ y must be $3 \times x$	✓ *Explanation does not explicitly state that the line goes through the origin* eg ◆ (2.5, 7.5) is on the line and you can times them both by 10 ◆ The line goes up three for every one it goes across ◆ $25 \div 25 = 1$, $75 \div 25 = 3$ and (1, 3) is on the line ✓ *Minimally acceptable explanation* eg ◆ $y = 3 \times x$ ◆ You multiply the number on the x-axis by three × *Equation restated but not interpreted* eg ◆ $y = 3x$ × *Incomplete explanation* eg ◆ It goes (1, 3), (2, 6) and so on ◆ (2.5, 7.5) is on the line
		b	b	**3m** *or* **2m**	$(2\frac{1}{2}, 11)$ Shows $x = 2\frac{1}{2}$ or $y = 11$ or Shows a complete correct method for solving algebraically with not more than one error eg ■ $4x + 1 = 6x - 4$ so *3 (error)* $= 2x$ $x = 1.5$ so $y = 4 \times 1.5 + 1 = 7$ ■ $y - 4x = 1$, $y - 6x = -4$, so $2x =$ *3 (error)*, so $x = 1.5$ and $y = 6 \times 1.5 - 4 = 5$ ■ $3y = 12x + 3$ $2y = 12x - 8$ $y = -5$ *(error)* $-5 = 4x + 1$ so $x = -1.5$ or For at least 4cm, draws both lines on the graph within the tolerance as shown on the overlay	✓ *Equivalent fraction or decimal*

Tier & Question				*Marking overlay available*	**Straight lines (cont)**	
3-5	4-6	5-7	6-8			
		12	**8**		**Correct response**	**Additional guidance**
		b	b	***or*** **1m** ***cont***	Shows $4x + 1 = 6x - 4$ or equivalent or Attempts to solve simultaneously and forms two correct equations that would allow elimination of x, or subtracts the two given equations to eliminate y eg ▪ $3y = 12x + 3$ $2y = 12x - 8$ ▪ $6y = 24x + 6$ $4y = 24x - 16$ ▪ $0 = 2x - 5$ or Indicates, on the graph or elsewhere, at least two correct points on each of the lines or Draws one line on the graph within the tolerance as shown on the overlay, and at least of length 4cm	
		c	c	**1m**	Gives a correct explanation eg ▪ Both have gradient of $\frac{1}{2}$ but they pass through (0, 3) and (0, 5) ▪ Same gradient, different intercepts ▪ The lines are parallel but are not the same or Gives a correct algebraic interpretation eg ▪ $\frac{1}{2}x + 3 \neq \frac{1}{2}x + 5$ because $3 \neq 5$ ▪ The difference will always be 2 ▪ No matter what value you put in for x, the ys will never be the same	✓ *Implicit assumption that the lines are different* eg ◆ Both have gradient of $\frac{1}{2}$ ◆ Same slope ◆ The lines are parallel ✓ *Minimally acceptable explanation* eg ◆ The equations are the same except for the 3 and the 5 ◆ The second line will always be higher ✗ *Incomplete or no interpretation* eg ◆ Because the lines do not cross ◆ Different intercepts ◆ Because of the + 3 and the + 5 ◆ They have the same number of x ◆ Both have $\frac{1}{2}$ ◆ The difference is 2 ✗ *One value only considered* eg ◆ When $x = 10$, in the first line $y = 8$ but in the second line $y = 10$

Tier & Question						**Egyptians**
3-5	4-6	5-7	6-8			
	19	**13**	**9**		**Correct response**	**Additional guidance**
	a	a	a	**1m**	$\frac{7}{10}$ or equivalent fraction	✗ *Incorrect notation or incorrect further working* eg ◆ $\frac{3½}{5}$
	a or b	a or b	a or b	**1m**	In part (a) or (b), shows a correct method that enables addition or subtraction of fractions The most common correct methods: Show or imply correct common denominators eg, in part (a) ■ $\frac{5}{10} + \frac{2}{10}$ ■ $\frac{1}{2} = \frac{25}{50}$, $\frac{1}{5} = \frac{10}{50}$ ■ $\frac{3½}{5}$ eg, in part (b) ■ $\frac{1}{4} = \frac{5}{20}$ seen with no attempt to change the denominator of the fraction $\frac{9}{20}$ ■ $\frac{1}{4} = \frac{20}{80}$, $\frac{9}{20} = \frac{36}{80}$ ■ The answer is a fraction equivalent to $\frac{1}{5}$ Convert correctly to decimals or percentages, even if their value is subsequently incorrectly converted back to a fraction eg, in part (a) ■ 0.5 + 0.2 eg, in part (b) ■ 0.45 and 0.25 seen	
	b	b	b	**1m**	$\frac{1}{5}$	✓ *Answer as* $\frac{1}{4} + \frac{1}{5}$
		c	c	**2m** *or* **1m**	$\frac{5}{6}$ or equivalent fraction Shows or implies the fractions are $\frac{1}{2}$ and $\frac{1}{3}$ eg ■ $\frac{1}{2} + \frac{1}{3}$	✓ *Correct working and answer shown, but the two unit fractions are given on the answer line* ✓ *Minimally acceptable implication* eg ◆ 0.5 + 0.33 ✗ $\frac{1}{1}$ *as a unit fraction*

Tier & Question						Rearrange
3-5	4-6	5-7	6-8			
		14	10		Correct response	Additional guidance
			a	**2m**	Rearranges correctly to make e the subject eg ■ $e = \frac{p-2f}{2}$ ■ $e = \frac{1}{2}(p - 2f)$ ■ $e = \frac{p}{2} - f$ ■ $e = -f + \frac{1}{2}p$	✓ *Minimally acceptable correct rearrangement* eg ◆ $e = (p - 2f) \div 2$ ◆ $e = p \div 2 - f$ ✗ *For 2m, incorrect equation* eg ◆ $e = \frac{1}{2}p - 2f$
				or **1m**	Expands the brackets correctly eg ■ $p = 2e + 2f$ seen or Divides by 2 throughout eg ■ $\frac{p}{2} = e + f$ seen or Expands incorrectly to give $p = 2e + f$, then follows through correctly eg ■ $p = 2e + f$ *(error)* and so $e = \frac{p-f}{2}$	✗ *p incorrectly multiplied by 2 at the same time as the brackets expanded* eg ◆ $2p = 2e + 2f$ ✗ $e = \frac{p-f}{2}$ *without previous working shown* As there is no way of knowing how many errors were made, do not accept
			b	**2m**	Rearranges correctly to make d the subject eg ■ $d = c - 2r$	✓ *Minimally acceptable correct rearrangement* eg ◆ $d = (2c - 4r) \div 2$ ◆ $d = c - \frac{r}{0.5}$ ◆ $d = c - \frac{r}{\frac{1}{2}}$
				or **1m**	Shows $2r - c = -d$ or $\frac{1}{2}d = \frac{1}{2}c - r$ or As a correct first step, multiplies by 2, or divides by a half, throughout eg ■ $2r = c - d$ seen ■ $\frac{r}{0.5} = c - d$ seen ■ $\frac{r}{\frac{1}{2}} = c - d$ seen	

Tier & Question						What number?
3-5	4-6	5-7	6-8			
			11		Correct response	Additional guidance
			a	1m	Gives a correct explanation The most common correct explanations: Refer to blue counters being non-integers eg ■ If 0.2 represented 10, 0.05 would represent $2\frac{1}{2}$ which is not an integer ■ 2.5 blue is not possible ■ As the probability for yellow is 4 × blue, the number of yellow counters would have to be a multiple of four ■ If Y is 10, the total would be 50 but $\frac{1}{20}$ of 50 is a decimal number not a whole number Refer to green counters being non-integers eg ■ There would be 22.5 green counters	✓ *Minimally acceptable explanation* eg ◆ There would be half counters ◆ The numbers of counters would not be whole numbers ◆ You'd have half blues – not possible ! *Number of yellow counters stated to be a multiple of four* Accept if it is clear that this is an example eg ◆ The blue and green wouldn't be integers, there could be 20 yellow counters Do not accept if the statement is definitive eg ◆ The blue and green wouldn't be integers, there must be 20 yellow counters × *Incorrect calculation or statement* eg ◆ You can't have half counters but there would be 1.5 blue ◆ There would be $2\frac{1}{2}$ green
			b	2m *or* 1m	Completes the table correctly ie Blue: 1; Red: 6; Green: 9; Yellow: 4 Shows the number of blue counters is 1 or Shows R, G, Y are 6, 9, 4 respectively	! *Answers given as probabilities* If the numerators are the correct values and the denominators are 20, mark as 1, 0 eg ◆ $\frac{1}{20}, \frac{6}{20}, \frac{9}{20}, \frac{4}{20}$

Tier & Question					*Marking overlay available*	**Locus**
3-5	4-6	5-7	6-8			
		15	**12**		**Correct response**	**Additional guidance**
		a	a	**1m**	Correct line, ie $x = -1$, ruled, ie 	! ***Line not full length*** Do not accept lines that are less than 8 units in length ! ***Shading*** Within the question, ignore ! ***Line not continuous*** Within the question, accept lines that are shown as dotted or dashed but do not accept series of points
		b	b	**1m**	Both lines correct, ie 	! ***Lines not ruled or full length*** Accept provided there is no ambiguity and each line goes at least 2cm from the origin into each of the relevant quadrants ! ***Lines 'bounded'*** If boundary lines are drawn along one or more of $x = 5$, $x = -5$, $y = 5$, $y = -5$, ignore
		c	c	**2m** *or* **1m**	Locus completed that fulfils the four conditions below 1. Ruled 2. Within the tolerance as shown on the overlay 3. At least 5cm in length 4. Evidence of correct construction arcs that are centred on C and on D, and are of equal radii, and show both intersections Locus completed with all of the conditions 1 to 3 fulfilled or Condition 4 fulfilled even if the locus is incorrect or omitted	! ***Use of construction arcs on overlay*** Note that these are to give a visual guide as to whether the correct centres have been used, and do not indicate tolerance × ***Spurious construction arcs*** Do not accept as correct arcs that do not show two distinct intersections, eg arcs that just touch

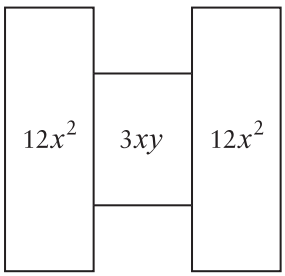
Tier & Question						MOT
3-5	4-6	5-7	6-8			
		16	13		Correct response	Additional guidance
		a	a	**1m**	Lower value between 150 and 151 inclusive Upper value between 260 and 270 inclusive	
		b	b	**1m**	Correct straight line, ruled, within ± 2mm at (400, 0) and (0, 400)	! *Line not full length* Accept provided the line is at least of length to cross the white 'pass' section of the graph, and would not be more than ± 2mm from (250, 150) and (150, 250)
				1m	Correct region, ie below the line, shaded	✓ *Only the white section on the graph within the correct region shaded* ! *Follow through* Accept provided their boundary is a straight line, ruled or unruled, with a negative gradient
		c	c	**1m**	Lower value between 200 and 201 inclusive Upper value between 260 and 270 inclusive	! *Follow through from parts (a) and (b)* Follow through can be awarded only if at least one mark was awarded in part (b), and their (b) allows follow through for two values of R Mark follow through as shown below Correct line in (b) and correct shading lower value: 200 to 201 inclusive upper value: their upper value from (a) Correct line in (b) but no shading lower value: 200 to 201 inclusive upper value: their upper value from (a) Correct line in (b), incorrect side shaded lower value: their lower value from (a) upper value: 199 to 200 inclusive Incorrect line in (b), 1m for shading lower value: their lower value from the graph upper value: their upper value from (a)

Tier & Question						Similarity
3-5	4-6	5-7	6-8			
			14		**Correct response**	**Additional guidance**
			a	**1m**	Gives a correct explanation eg ■ $\frac{10}{8} \neq \frac{14}{12}$ ■ $\frac{10}{14} \neq \frac{8}{12}$ ■ $\frac{8}{10} = \frac{h}{14}$ so $h = (14 \times 8) \div 10 \neq 12$ ■ $1.25 \times 12 = 15$ not 14 ■ Depth of board is 1.5 times the depth of the picture, but the length isn't	✓ *Values not explicitly stated to be different* eg ◆ $14 \div 10 = 1.4$ $12 \div 8 = 1.5$ ◆ Picture is in the ratio 4 : 5, board is in the ratio 6 : 7 ◆ 8 : 12 = 2 : 3 10 : 14 = 5 : 7
			b	**2m** *or* **1m**	11.2 or equivalent value Shows a correct method eg ■ $14 \times \frac{4}{5}$ ■ $\frac{14}{10} = \frac{h}{8}$	✓ *Correct method for part (b) shown in part (a)*

Tier & Question						Robotic
3-5	4-6	5-7	6-8			
			15		**Correct response**	**Additional guidance**
			a	**2m** *or* **1m**	$\frac{1}{64}$, or equivalent probability Shows a correct method eg ■ $(\frac{1}{4})^3$ ■ $0.25 \times 0.25 \times 0.25$	! *Non-exact decimal or percentage* The exact value is 0.015625 For 2m, accept rounding to 2sf or better For 1m, accept rounding or truncation to 0.01, 0.02 or 0.015, or the equivalent percentage values
			b	**1m**	$\frac{3}{64}$, or equivalent probability	! *Follow through as 3 × part (a)* Accept provided the resulting value is less than 1 ✗ *Incomplete processing* eg ◆ $\frac{1}{64} \times 3$

Tier & Question						
3-5	4-6	5-7	6-8		**Rectangles**	
			16		**Correct response**	**Additional guidance**
				1m	Multiplies out one of the pairs of brackets correctly eg ■ $(y + 5)(y + 1) = y^2 + 6y + 5$ seen ■ $(y + 10)(y - 3) = y^2 + 7y - 30$ seen	! *Expansion is not simplified* eg, for $(y + 5)(y + 1)$ ◆ $y^2 + 5y + 1y + 5$ Accept unsimplified expansions for the first two marks, but do not accept for the third mark
				1m	Forms an equation equating the two areas and multiplies out the other pair of brackets correctly eg ■ $(y + 5)(y + 1) = (y + 10)(y - 3)$ ■ $y^2 + 6y + 5 = y^2 + 7y - 30$	✓ *Implicit equating* eg ◆ $A = (y + 5)(y + 1)$ $A = (y + 10)(y - 3)$
				1m	Simplifies their equation by at least removing terms in y^2 eg ■ $6y + 5 = 7y - 30$ ■ $30 + 5 = y$ ■ $y = 35$	! *Follow through from their incorrect equation* Accept provided it has terms in both y^2 and y
				1m	35, with no incorrect algebra shown	✗ *For this mark, do not follow through* ! *35 with no supporting algebra* If there is no incorrect algebra, this final mark may be awarded. Do not accept 35 from incorrect algebra eg ◆ $y^2 + 6y + 5 = y^2 + 7y - 30$ $7y^2 + 5 = 8y^2 - 30$ *(error)* $35 = y$

Tier & Question						
3-5	4-6	5-7	6-8		**Oranges and lemons**	
			17		**Correct response**	**Additional guidance**
				3m	Correct simplified ratio, ie 2 : 3	✓ ***Ratio simplified to the form 1 : n or n : 1*** Accept if exact eg • 1 : 1.5 • $\frac{2}{3}$: 1
				or **2m**	Shows a correct but unsimplified ratio or Shows 3 : 2 or Shows a correct method that includes the proportion added eg ▪ 20% : 80% becomes 15% : 60%, then add 25% of orange ▪ Suppose the glass holds 500ml, that's 100 orange, 400 lemonade. After you've drunk, it's 75 orange, 300 lemonade then add 125 ml of orange	! ***The only error is to interpret 1 : 4 as 25% to 75%*** If the pupil follows through correctly to give the ratio of 7 : 9, mark as 1, 1, 0
				or **1m**	Indicates that the proportions after drinking are still 1 : 4 or equivalent eg ▪ Glass holds 200, drink $\frac{1}{4}$ so 150 left, which is still 1 : 4 ▪ 15% : 60% ▪ 1 : 4 then $\frac{3}{4}$: 3	

Tier & Question						Prism
3-5	4-6	5-7	6-8			
			18		**Correct response**	**Additional guidance**
			a	**1m**	Correct justification eg ■ $24x^2 + 3xy = (2 \times 6x \times 2x) + (3x \times y)$ ■ $6x \times 2x = 12x^2$, $3x \times y = 3xy$, $12x^2 + 12x^2 + 3xy = 24x^2 + 3xy$ ■ Area would be $6x \times (4x + y) = 24x^2 + 6xy$, but $3xy$ is missing ■ 	✓ *Minimally acceptable justification* eg ◆ $6x \times 2x + 6x \times 2x + 3x \times y$ ◆ $(6x \times 4x) + 3x \times y$ ✗ *Incorrect algebra* eg ◆ $6x \times 2x = 12x$, $12x + 12x = 24x^2$
			b	**2m** *or* **1m**	x Multiplies out $3x^2(8x + y)$ correctly eg ■ $24x^3 + 3x^2y$ or Factorises $24x^2 + 3xy$ correctly eg ■ $3x\,(8x + y)$	✓ ***1x*** ✗ *Partial factorisation* eg ◆ $3(8x^2 + xy)$

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