Ma

KEY STAGE
3

ALL TIERS

2003

Mathematics tests

Mark scheme for Paper 2

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 2 at all tiers. The paper 1 mark scheme is printed in a separate booklet. 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 10 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.

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.

Questions with a *UAM* element are identified in the mark scheme by an encircled U with a number that indicates the significance of using and applying mathematics in answering the question. The *U* number can be any whole number from 1 to the number of marks in the question.

The 2003 key stage 3 mathematics tests and mark schemes were developed by the Mathematics Test Development Team at QCA.

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.

What if …

The final answer is wrong but the correct answer is shown in the working.	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;	If so, award the mark.
	in questions not testing accuracy, the correct answer has been given but then rounded or truncated;	If so, award the mark.
	the pupil has continued to give redundant extra working which does not contradict work already done;	If so, award the mark.
	the pupil has continued, in the same part of the question, to give redundant extra working which does contradict work already done.	If so, do not award the mark. Where a question part carries more than one mark, only the final mark should be withheld.
The pupil's answer is correct but the wrong working is seen.	A correct response should always be marked as correct unless the mark scheme states otherwise.	
The correct response has been crossed or rubbed out and not replaced.	Mark, according to the mark scheme, any legible crossed or rubbed out work that has not been replaced.	
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 should be awarded unless prohibited by the mark scheme. If both correct and incorrect responses are given, no mark should be awarded.	
The answer is correct but, in a later part of the question, the pupil has contradicted this response.	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.	

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 ✓ 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 or ambiguous use of pounds or pence eg £320, £320p or £700p, or 3.20 or 3.20p not in the answer space. × 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 ✓ Digital electronic time ie 2:30	× Incorrect or ambiguous time interval eg 2.3(h), 2.30, 2-30, 2h 3, 2.30min ! 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 ✓ Unambiguous change to 12 or 24 hour clock eg 17:20 as 5:20pm, 17:20pm	× Incorrect time eg 8.4am, 8.40pm × 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 × 2 or 2 × n or n2 or n + n for 2n n × 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 × 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 × 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. ✓ Equivalent decimals, fractions or percentages eg 0.700, $\frac{70}{100}$, $\frac{35}{50}$, 70.0% ✓ A probability correctly expressed in one acceptable form which is then incorrectly converted, but is still less than 1 and greater than 0 eg $\frac{70}{100} = \frac{18}{25}$	The following four categories of error should be ignored if accompanied by an acceptable response, but should not be accepted on their own. ! A probability that is incorrectly expressed eg 7 in 10, 7 out of 10, 7 from 10 ! 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.

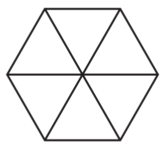
A total of 120 marks is available in tiers 3–5, 4–6 and 6–8.
A total of 122 marks is available in tier 5–7.

Awarding levels

The sum of the marks gained on paper 1, paper 2 and the mental mathematics 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 Monday 23 June 2003. 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.

Hexagons

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
1						
a				1m	Gives a correct explanation eg ■ Each shape has six sides ■ They all have six corners ■ 6 sides	✓ ***Minimally acceptable explanation*** eg ◆ 6 edges ◆ 6 lines ◆ 6 points ! ***Incorrect statement alongside a correct explanation*** Condone eg, accept ◆ 6 equal sides
b				1m	Draws a regular hexagon of any size with vertices on the dots of the grid	! ***Lines not ruled or accurate*** Accept provided the pupil's intention is clear ! ***Internal lines shown*** Ignore provided the outer shape is a regular hexagon eg, accept ◆ 

Cities

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
2						
a				1m	172	
b				1m	Indicates York and London, in either order	
c				1m	Indicates London and gives the value 13	
d				2m *or* 1m	332 Shows the three correct values 120, 91 and 121 or Shows three values, two of which are correct, then adds them correctly eg ■ 120 + 91 + *134 (error)* = 345	

Number cards

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
3						
a				1m	Four hundred and nine or Nine hundred and four	✓ *Correct words even if cards not completed, or completed incorrectly* ! *Digits used* Accept provided the place value is interpreted eg, for the first mark, accept ◆ 4 hundred and 9 ◆ 400 and 9 ◆ 400 and 9 units ! *Omission of the word 'and'* Accept if unambiguous eg, for the first mark, accept ◆ Four hundred nine ◆ 4 hundred – nine ◆ 4 hundreds 9 units ◆ 4 hundred + nine ◆ 400 + 9 eg, for the first mark, do not accept ◆ 400 9 ! *Within their number in words, digits other than 4 and 9 used* Provided both their digits are non-zero, and the number shown by the cards and the number in words are the same, penalise only the first occurrence Otherwise, do not accept ✗ *Place value not interpreted* eg, for the first mark ◆ Four, zero and nine
				1m	Four hundred and ninety or Nine hundred and forty	
b				1m	853	
				1m U1	538	

Late

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
4						
a				1m	10	
b				1m	19	
c				1m U1	Indicates Wednesday and gives a correct explanation The most common correct explanations: Refer to the number of pupils or to the number of lates eg ▪ 24 were late that day, more than on any other day ▪ More pupils were late than on any other day ▪ Biggest number of lates Refer to the heights of the bars for the three year groups eg ▪ That day is always the tallest ▪ It's the one that was highest most often	✓ *Unambiguous abbreviation* eg • Wed • W Markers may find the following totals useful: Monday 10 Tuesday 12 Wednesday 24 Thursday 8 Friday 8 ✓ *Minimally acceptable explanation* eg, for the first category • 24 • 8 in Y7, 7 in Y8, 9 in Y9 • It has many lates eg, for the second category • The charts show more were late then • Taller bars ! *Explanation could be referring to all three year groups/charts or to just one year group/chart* Do not accept explanations that refer explicitly to one year group/chart eg • The tallest bar is 9 and that is a Wednesday • More pupils were late in yr 9 on that day • The chart shows more were late then • Tallest bar Otherwise accept eg • Wednesday is the highest • Most pupils ! *Ambiguous statement* eg • That was the day everyone was late • Year 7, 8 and 9 all came late Ignore if accompanied by a correct response, but do not accept on its own

Slicing cubes

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
5						
a				1m	6	! *Number of faces of both pieces given* Accept if unambiguous eg, for part (a) accept ◆ 6 and 6 ◆ 6 + 6 ! *Total number of faces given* Penalise only the first occurrence, provided answers of 12 are given for both parts (a) and (b). Otherwise do not accept eg ◆ 12, 12, 10 Mark as 0; 1; 1 ◆ 12, 12, 9 Mark as 0; 1; 0 ◆ 12, 14, 10 Mark as 0; 0; 0
b				1m	6	
c				1m	5	! *For part (c), follow through* Accept follow through as their (b) – 1, provided their (a) is equal to their (b) eg ◆ 5 (part (a)) 5 (part (b)) 4 (part (c))

Buying a bicycle

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
6						
				2m	£ 26.89	! *Answer rounded to 27* Accept for 2m only if a correct method or a more accurate value is seen ✘ *For 2m, negative value* eg ◆ –26.89
				or 1m U1	Shows the digits 20688 or Shows or implies a correct method eg ■ 8.62 × 24 – 179.99 ■ 27 with no evidence of an incorrect method ■ –26.89 ■ Digits 2689 seen	! *Incorrect order for subtraction* Condone eg, accept ◆ 179.99 – 8.62 × 24

Kings and queens

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
8	**1**					
a	a			**1m**	50	
b	b			**1m**	Elizabeth (I)	✗ ***Point identified but not interpreted*** eg ◆ f
c	c			**1m**	Indicates (81, 63) on the chart	! ***Point not accurately indicated*** Accept provided the point is nearer to (81, 63) than to any other point with integer coordinates

School uniform

3-5	4-6	5-7	6-8	Mark	Correct response	Additional guidance
7	2					
a	a			1m	54	
b	b			1m	16	
c	c			2m	Gives all three correct values correctly positioned, ie 10, 20, 10	
				or 1m	Gives any two correct values correctly positioned or Gives three values that sum to 40, one of which is correct and correctly positioned or Gives the correct value for No, ie 20, and gives values for Yes and Don't know that are the same eg ■ 5, 20, 5	
d	d			1m U1	Gives two labels in the two boxes of either the first row or the first column specifying sex and gives two labels in the two boxes of either the first row or the first column specifying yes or no, or other mutually exclusive labels that address the question eg, for sex ■ Boys, girls ■ Female, male ■ G, B eg, for yes or no ■ Yes, no ■ ✓, ✗ ■ N, Y ■ Have a pet, Do not have a pet	

Admission

Tier & Question 3-5	4-6	5-7	6-8	Mark	Correct response	Additional guidance
9	3					
				3m	*£ 5.65*	
				or 2m	Shows the digits *565* eg ■ *56.50* or Shows the values 11.15 and 16.8(0) or Shows one of the values 11.15 or 16.8(0), then follows through using their incorrect value to give their correct saving eg ■ 11.15 before, 4.90 + 3.50 + 3.50 + 4.90 = *14.80 (error)* after, 14.80 − 11.15 = 3.65 or Shows the correct difference for each category eg ■ 1.7, 1, 1.95 ■ 1.7 + 2 × 1 + 1.95 or Shows the correct difference for two of the categories, then follows through using their incorrect difference to give their correct saving eg ■ 1.7 + 1 + 1 + *1.85 (error)* = 5.55 or Shows the value £ 4.65 (from calculating using one child, rather than two)	! ***Values or differences shown in working in pence, without units given*** Accept for 2m, provided both values or all differences are in pence

Admission (cont)

Tier & Question 3-5	4-6	5-7	6-8	Mark	Correct response	Additional guidance
9	3					
				or 1m	Shows any of the following:	
					Digits 1115	
					or	
					Digits 168(0)	
					or	
					Any two of the correct differences 1.7(0), 1, 1.95	! ***Values or differences shown in working in pence, without units given*** Accept for 1m
					or	
					Digits 465 (from calculating using one child, rather than two)	
					or	
					The values 8.65 and 13.3(0) (from calculating using one child, rather than two)	
				U1		

Cubes in bags

Tier & Question 3-5	4-6	5-7	6-8	Marks	Correct response	Additional guidance
12	**4**				**Correct response**	**Additional guidance**
a	a			**1m**	27	
b	b			**2m** *or* **1m**	Both correct, ie 24 and 28, either order At least one correct and not more than one incorrect eg ▪ 20, 24, 28 ▪ 24, 27 or Gives the values 6 and 7	

Temperature

Tier & Question 3-5	4-6	5-7	6-8	Marks	Correct response	Additional guidance
10	**5**				**Correct response**	**Additional guidance**
a	a			**1m**	1.5 or equivalent	
b	b			**1m**	37.9 or equivalent	
c	c			**2m** *or* **1m**	46.5 or equivalent Shows or implies a complete correct method with not more than one error eg ▪ (115.7 – 32) × 5 ÷ 9 ▪ $\frac{115.7 - 32}{9} \times 5$ ▪ 115.7 – 32 = *82.7 (error)*, 82.7 × 5 ÷ 9 = 45.9(…) ▪ 46 ▪ 47 ▪ Digits 465 seen	**!** ***For 1m, necessary brackets omitted*** As this is a level 4 mark, condone eg, accept ◆ 115.7 – 32 × 5 ÷ 9

Drawing

3-5	4-6	5-7	6-8	Mark	Correct response	Additional guidance
11	**6**	**1**			**Correct response**	**Additional guidance**
a	a	a		**1m**	Draws a rectangle of area 12 eg ■ 1 by 12 ■ 2 by 6 ■ 3 by 4 ■ 1.5 by 8	! ***Lines not ruled or accurate*** Accept provided the pupil's intention is clear ✓ ***Edge of grid used as edge of shape***
b	b			**1m**	Draws a rectangle of area 12, with different dimensions from one credited in part (a)	
c	c	b		**1m**	Draws a triangle of area 6 eg ■ Base 6, perpendicular height 2 ■ Base 4, perpendicular height 3 ■ Base 5, perpendicular height 2.4	

Ages

Tier & Question						
3-5	4-6	5-7	6-8		**Correct response**	**Additional guidance**
14	**7**	**2**				
a	a	a		**2m**	Gives complete correct interpretations for both Barry and Carol, by referring to both the following aspects: The given context of age The meaning of the given numbers and operations eg, for Barry ▪ One year younger (than Tina) ▪ Aged one less (than T) eg, for Carol ▪ Twice as old (as T) ▪ Double her age ▪ 2 × Tina years old	! ***Incomplete interpretation*** Do not accept as complete an interpretation that lacks reference to one of the two aspects eg, for Barry ◆ Tina minus 1 [no reference to the given context] ◆ Younger [no reference to the –1] ◆ One year different [ambiguous reference to subtraction] eg, for Carol ◆ Twice Tina [no reference to the given context] ◆ Much older than Tina [no reference to the × 2] ◆ 2 Tina's age [no reference to the multiplication] ! ***Interpretation using comparison with age of person other than Tina*** Accept provided the interpretation is unambiguous eg, accept as complete and correct for Barry ◆ Four years younger than Ann
				or **1m**	Gives a complete correct interpretation for either Barry or Carol by referring to both aspects or Gives interpretations for both Barry and Carol that give the meaning of the given numbers and operations but contain no reference to the given context of age eg ▪ For Barry, Tina minus 1 For Carol, Twice Tina	

Ages (cont)

3-5	4-6	5-7	6-8	Mark	Correct response	Additional guidance
14	**7**	**2**			**Correct response**	**Additional guidance**
b	b	b		**2m**	Gives all three correct expressions in their simplest forms eg ▪ $n + 4$, n, $2n + 1$	✓ *1n or n1 for n in a fully simplified expression* ✗ *n 0 as a fully simplified expression for n* ! *Use of multiplication sign* If a multiplication sign is used, an expression cannot be accepted as fully simplified eg, for Carol, do not accept as fully simplified ◆ $2 \times n + 1$
				or **1m**	Gives any two correct expressions in their simplest forms or Gives all three correct expressions, even if not simplified	
c	c	c		**1m** **1m**	61 62	✗ *Incomplete processing* eg, for the first mark ◆ $2 \times 30 + 1$ eg, for the second mark ◆ 2×31 ✗ *Incorrect notation* eg, for the first mark ◆ $61n$

Grid percentages

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
13	**8**	**3**				
a	a	a		**1m**	60	
				1m	60	! *Percentage of diagram not shaded given* Provided correct percentage unshaded is given consistently, ie 40 given for both, mark as 0, 1
b	b	b		**1m**	Gives a correct explanation in which both $\frac{1}{8}$ and the link to 100% are shown or implied eg ▪ It's $\frac{1}{8}$ and $\frac{1}{8}$ of 100 is $12\frac{1}{2}$ ▪ 1 out of 8 is equivalent to 12.5 out of 100 ▪ $8 \times 12\frac{1}{2} = 100$ ▪ $100 \div 8 = 12.5$ ▪ It's $\frac{1}{8}$, and $1 \div 8 = 0.125$	✓ *Minimally acceptable explanation* eg ◆ 8 squares is 100 so 1 is $12\frac{1}{2}$ ◆ $100 \div 8$ ◆ 100 divided by the number of squares ◆ $\frac{1}{8} = 0.125$! *The link is to a different percentage* Accept provided the relevant fraction is shown or implied eg, accept ◆ 2 squares is 25%, 1 square is half of that ◆ 4 squares is 50%, $50 \div 4$ ✗ *Incomplete explanation* eg ◆ 8 squares is 100% ◆ 1 square out of 8 shaded ◆ $12\frac{1}{2}\% = \frac{1}{8}$ ✗ *Incorrect order of division* eg ◆ $8 \div 100 = 12\frac{1}{2}$
c	c	c		**1m**	Indicates a total of three squares on the diagram	

Data collection

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
15	9	4				
a	a	a		1m U1	Indicates 1 or 2 and gives a correct explanation eg, for 1 ▪ It will take a lot of time to write the name every time ▪ You won't have time to put the whole name ▪ It will not tell you straightaway how many of each type there are ▪ It will just give a long list of words ▪ It would take ages to count up all the trees at the end ▪ You could easily miscount the totals ▪ It's hard to draw a graph from it ▪ It will take up a lot of paper eg, for 2 ▪ It will not tell you straightaway how many of each type there are ▪ It will just give a long list of letters ▪ It would take ages to count up all the trees at the end ▪ You could easily miscount the totals ▪ It's hard to draw a graph from it ▪ It will take up a lot of paper ▪ Some names of trees might start with the same letter ▪ You might not have a code for the type of tree you see	✓ *Minimally acceptable explanation for 1 or 2* eg • Too long • Not efficient • It does not tell you how many there are ! *Explanation for 1 or 2 that refers to an improvement to the design* Accept provided the improvement relates to one of the correct explanations eg, for 1, accept • It's quicker to write only the first letter eg, for 1 or 2, accept • Using a tally chart tells you how many there are eg, for 1 or 2, do not accept • Using a tally chart is better ✗ *Explanation for 1 or 2 that refers to pupils not knowing what type the trees are* eg • They might not know the trees' names ✗ *Explanation for 2 that refers to use of codes* eg • They might find the codes confusing • They could forget the key • It does not list the actual names
b	b	b		1m U1	Indicates 3 and gives a correct explanation eg ▪ It is quick to do a tally chart ▪ Tally marks are easy to write ▪ It's easy to see the number of each type ▪ It shows clearly which types are most common ▪ It's easy to see the mode ▪ You can count up the totals quickly ▪ It is less likely you will miscount ▪ It's more likely to be accurate ▪ It's easy to draw a graph from a tally chart ▪ It does not take up much space	✓ *Minimally acceptable explanation* eg • It's quick • It's efficient • You just put a line • It collects the data together • It's easy to understand • It's simple to use • It's organised • It tells you how many there are ✗ *Incomplete explanation* eg • It's easy • It's simple • It's effective • It's clear • It can be understood • It's not confusing ! *Reference to disadvantages of the design* eg • There might be lots of 'Other' and they will not know what type they were • They have to decide in advance which sorts to include Ignore alongside a correct explanation

Coins

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
16	10	5				
a	a	a		1m	Gives a correct explanation eg ■ $\frac{2}{4} = \frac{1}{2}$ ■ Two of the four coins are 10p so half of them are 10p ■ 20p is $\frac{1}{4}$, so is 1p, and $\frac{1}{4} + \frac{1}{4} + \frac{1}{2} = 1$ ■ Each coin has $\frac{1}{4}$ chance and $\frac{1}{4} + \frac{1}{4} = \frac{1}{2}$	✓ ***Minimally acceptable explanation*** eg ◆ $\frac{2}{4}$ ◆ Two out of four ◆ Two is half of four ◆ Two are tens, two not ✗ ***Incomplete explanation*** eg ◆ It's 50/50 ◆ There are two tens, a twenty and a 1p ◆ There are two 10ps ◆ Half the coins are 10ps ◆ 20p is $\frac{1}{4}$, so is 1p
b	b	b		1m U1	Identifies the values of the four coins as 20, 10, 2 and 1 and gives the probability $\frac{1}{4}$, or equivalent probability	! ***Values of coins identified but doubt expressed as to whether this is the only possible combination*** Condone ✗ ***Probability stated without values of coins identified***

Explaining why

Tier & Question 3-5	4-6	5-7	6-8	Mark	Correct response	Additional guidance
17	11	6				
				1m U1	Indicates AD and CD are both 12, and justifies that triangle ACD is equilateral eg ▪ The sides are the same length ▪ All sides are 12 ▪ AC = AD = CD	✓ *Minimally acceptable justification* eg • Sides are the same • They are equal ✗ *Incorrect justification* eg • The sides are even ! *Reference to angles* Ignore, ie do not accept a justification based on angles alone and do not penalise incorrect information about angles given alongside a correct response
				1m U1	Indicates angle y is 60 and gives a correct justification either as a calculation or as a known fact eg ▪ $180 \div 3$ ▪ $60 \times 3 = 180$ ▪ That's how many degrees there are in one angle in an equilateral triangle	✓ *Minimally acceptable justification* eg • 60×3 • $60 + 60 + 60$ • All the angles are the same ✗ *Incomplete justification* eg • Angles in a triangle add up to 180 ! *Incorrect notation* Ignore for both this mark and the next eg, for angle y as 60, accept • 60°C
				1m U1	Indicates angle x is 30 and gives a correct justification eg ▪ Triangle ADB is a reflection of triangle ABC so x is half y ▪ All angles in an equilateral triangle are 60° The reflection shows half so it must be 30° ▪ Angles in ABC add up to 180, and $180 - 90 - 60 = 30$	✓ *Minimally acceptable justification* eg • x is half y • $2x = y$ • $60 \div 2$ • It is half • $180 - 90 - 60$! *Follow through* Accept for angle x as their $y \div 2$ provided it is accompanied by a correct justification that either does not use a value for y or uses their value for y, and provided their y is not 0, 90 or greater than or equal to 180

Water

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
18	**12**	**7**				
a	a	a		**2m**	8	✓ *Value qualified* eg ◆ About 8
				or **1m**	Shows a complete correct method eg ▪ $\frac{1.8 \times 1000}{225}$ ▪ 1.8 ÷ 0.225 ▪ 225 × 2 = 450 450 × 2 = 900 900 × 2 = 1800 2 × 2 × 2 or Shows the value 1800 or 0.225	
b	b	b		**1m**	48	

Ratio of ages

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
	13	8	1			
	a	a	a	1m	7 : 5	! *Ratio correct but not written as simply as possible* Provided there is no incorrect simplification, penalise only the first occurrence ! *Incorrect order* If the only error is to write each ratio in the incorrect order, ie 5 : 7 and 6 : 7, do not award the mark for part (a) but award the mark for part (b)
	b	b	b	1m	7 : 6	
	c	c	c	1m U1	Indicates No and gives a correct explanation eg ▪ That would make their ages equal which is not possible as the sister is 6 years younger ▪ They will never be the same age as he is always 6 years older ▪ To make them the same age, Paul would have to stop getting older for a number of years	✓ *Minimally acceptable explanation* eg ◆ They'd be the same ◆ They are not the same age ◆ His sister is 6 years younger ◆ Paul is older ◆ They were born in different years ◆ That would mean Paul had stopped getting older for a number of years ◆ That means they would've had to be the same age in the first place ✗ *Incorrect statement* eg ◆ She will always be 8 years younger ✗ *No or incomplete interpretation* eg ◆ 7 : 7 is the same as 1 : 1 ◆ It wouldn't be equal

Sizing

Tier & Question 3-5	4-6	5-7	6-8	Mark	Correct response	Additional guidance
	14	9	2			
				2m	Gives the correct order of A, C, B accompanied by one of the following explanations, whether stated or implied: Side lengths of A and C are 6 (or √36) and 9 (or 36 ÷ 4) respectively Area of C is 81 (or 9 × 9) Perimeter of A is 24 (or 6 × 4)	! ***Correct order given in unconventional way*** Accept provided it is unambiguous eg, accept • Area, perimeter, side length ✓ ***For 2m or 1m, side length of A implied by 6 × 6 seen*** ! ***For 2m or 1m, incorrect working or incorrect units alongside a correct response*** Ignore ! ***Their explanation does not explicitly state which property and/or square is being considered*** Accept provided the explanation links the relevant values to 36 and accompanies the correct ordering eg, for side lengths of A and C for 2m accept • Area 36 so 6 perimeter 36 so 9, A, C, B • 36 = 6 × 6 36 = 9 + 9 + 9 + 9 A, C, B for 1m accept • 36 = 6 × 6 A, C, B However, as many of the relevant values can be obtained from incorrect reasoning, do not accept only values 6 and 9 seen
				or 1m	Gives one of the correct explanations as above, but does not order or orders incorrectly or Gives the correct ordering but justifies only with reference to the side length of A as 6 (or √36) or Gives the correct ordering but justifies only with reference to the side length of C as 9 (or 36 ÷ 4) or Shows both that the area of B is 1296 (or 36 × 36) and the perimeter of B is 144 (or 36 × 4)	
				U1		

Nets

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
	15	10	3			
	a	a	a	1m	Shows that the surface areas are different The most common correct explanations: Calculate A as 38, B as 32 eg ■ A is 4 × 8 + 6 = 38, B is 3 × 8 + 8 = 32 State that the difference is 6 eg ■ A has 6 more squares than B Manipulate the nets to a form where comparison may be drawn without further computation eg ■ A is 6 × 8 − 10 but B would be 6 × 8 − 16	✓ *Minimally acceptable explanation* eg • 38, 32 • 4 × 8 + 6 isn't the same as 3 × 8 + 8 • 6 more ✗ *Incomplete explanation* eg • I counted the squares • There are more squares in A than in B ! *Units given* Ignore eg, accept • 38^2cm, 32^2
	b	b	b	2m *or* 1m	Shows that the volume of A is equal to that of B eg ■ (length, width, height | volume) A: 4, 3, 1 | 12 B: 3, 2, 2 | 12 ■ A is 3 × 4 × 1 = 12, B is 2 × 3 × 2 = 12 ■ 3 × 4 × 1 = 2 × 3 × 2 ■ A is one layer of 12 cubes and B is two layers of 6 cubes Shows the value 12, with no evidence of an incorrect method for this value	✓ *Minimally acceptable explanation* eg • Both 12 • 12, 12 ✗ *Incomplete explanation* eg • Both the same ! *Units given* Ignore ! ***Responses to parts (a) and (b) transposed but otherwise correct*** Mark part (a) as 0 but mark part (b) as 1, 0

Beaches

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
	16	11	4			
	a	a	a	2m	Gives three correct integer values that sum to 1620, ie 535, 1085, 0 or 534, 1086, 0 or 530, 1090, 0	✓ *For 2m, entry for flies left blank* ✓ *For 2m, proportion taken as $\frac{1}{3}$ and $\frac{2}{3}$* eg ◆ 540, 1080, 0
				or 1m	Gives a value for sandhoppers that is either between 534 and 535 inclusive or is 540, or a value for beetles that is either between 1085 and 1086 inclusive or is 1080 or Gives all three correct integer values but in the wrong order	
	b	b	b	2m	Gives three correct integer values, ie 2, 8, 5	
				or 1m	Gives any two correct integer values or Gives all three correct integer values but in the wrong order or Gives two correct values not rounded to the nearest integer, with the third either correct but not rounded to the nearest integer, or such that the total is 15, ie 1.95, 7.95, 4.95 or 2.1, 7.95, 4.95 or 1.95, 8.1, 4.95 or 1.95, 7.95, 5.1	! ***Correct values are truncated to 1dp*** For 1m, accept provided all three correct values are truncated, or two correct values are truncated and the total is 15, ie 1.9, 7.9, 4.9 or 2.2, 7.9, 4.9 or 1.9, 8.2, 4.9 or 1.9, 7.9, 5.2

Beaches (cont)

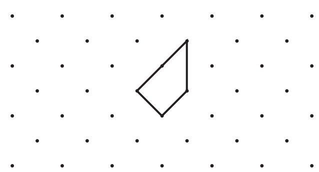
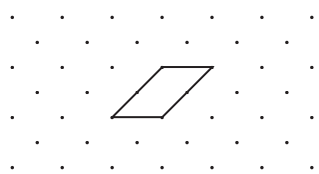
Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
	16	11	4			
	c	c	c	1m	Explains that there are fewer animals altogether on the cleaned beach, and also refers to at least one of the following aspects: The presence or increase of flies The smaller proportion of sandhoppers or beetles The relative proportions of sandhoppers or beetles The increase in the number of species eg ▪ Attracts some flies, but fewer animals overall ▪ There are much less of them, and they're not all sandhoppers and beetles ▪ There aren't as many animals, and a smaller percentage of them are sandhoppers ▪ The numbers have gone down, but there are always more beetles than anything else ▪ Without cleaning you get more animals but fewer types of animals	! *Follow through from parts (a) and (b)* Do not accept if their incorrect values lead to different conclusions about the changes. However condone use of their incorrect values within an otherwise correct statement ✗ *Values stated without interpretation* eg ◆ There were 1620 animals on the uncleaned beach and 15 on the cleaned, with 33% sandhoppers on the uncleaned and 13% on the cleaned ✗ *No reference to the change in the total number of animals* eg ◆ It attracts some flies but kills sandhoppers and beetles

Tier & Question					Equations	
3-5	4-6	5-7	6-8			
	17	12	5		**Correct response**	**Additional guidance**
				1m	4	✗ $\frac{12}{3}$ ✗ *Answer of t* = $\frac{4}{6}$
				1m	$7\frac{1}{2}$ or equivalent	✓ $\frac{15}{2}$ ✗ *Answer of r* = $\frac{5}{7.5}$

Star design

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
	18	13	6			
		a	a	2m	34	
				or 1m	Shows a complete correct method with not more than one computational error eg ■ 26 × 6 = 156, 360 − 156 = 204, 204 ÷ 6 ■ (360 ÷ 6) − 26 ■ (180 − 3 × 26) ÷ 3 ■ w + 26 = 60, so 60 − 26 ■ 360 − 156 = *214 (error)* $\frac{214}{6}$ = 35.6(…)	! ***Decimal values rounded or truncated*** Condone
		b	b	2m	52	
				or 1m	Shows a complete correct method with not more than one computational error eg ■ 180 − (13 + 13) = 154 360 − 2 × 154 ■ 26 × 2 ■ 180 − 2 × 13 = *157 (error)* 180 − 157 = 23 23 × 2 = 46	

Ks and ms

3-5	4-6	5-7	6-8	Mark	Correct response	Additional guidance
	19	14	7			
		a	a	1m	Draws any shape with perimeter $4k + m$ eg ■ 	! *Lines not ruled or drawn accurately* Accept provided the pupil's intention is clear ! *Multiple attempts with some incorrect* Accept provided it is clear which is the pupil's final answer
				1m	Draws any shape with perimeter $2(2k + m)$ eg ■  ■ 	
		b	b	1m	Gives a correct expression eg ■ $2m^2$ ■ $2 \times m^2$ ■ $2m \times 2m \div 2$	! *Units given* Ignore ✗ *Correct expression that is incorrectly simplified* eg, for part (b) ◆ $2m \times m = 3m$
		c	c	1m	Gives a correct expression eg ■ $4k^2$ ■ $4 \times k^2$ ■ $4k \times 2k \div 2$ ■ $(4k \times 4k) \div 4$	

Ks and ms (cont)

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
	19	14	7			
		d	d	1m U1	Gives a correct explanation eg ■ They are the same triangle so $2m^2 = 4k^2$ hence $m^2 = 2k^2$ ■ The areas of the triangles are equal, and if you divide $2m^2$ by 2 you get m^2, divide $4k^2$ by 2 you get $2k^2$ ■ If you multiply both sides by 2, you get the areas of the two triangles. Since they are the same, they must be equal	✓ ***Explanation uses Pythagoras' theorem*** eg ◆ Using Pythagoras, $m^2 = k^2 + k^2$ ✓ ***Minimally acceptable explanation*** eg ◆ $2m^2 = 4k^2$! ***Explanation equates expressions for parts (b) and (c) that are correct but not simplified*** Accept as minimal provided neither expression is a quotient or includes a division sign eg, accept ◆ $2 \times m \times m = 2 \times k \times 2 \times k$ eg, do not accept ◆ $2m \times 2m \div 2 = 4k \times 2k \div 2$! ***Follow through*** Accept only if both parts (b) and (c) are incorrect, but not m^2 and $2k^2$, and neither expression is a quotient or contains a division sign, and they lead to the relationship shown in part (d) eg, from (b) as $4m^2$ and (c) as $8k^2$, accept ◆ $4m^2 = 8k^2$ ✗ ***Incomplete explanation*** eg ◆ The areas of the triangles are equal ◆ Divide them by 2

Giraffe

Tier & Question 3-5	4-6	5-7	6-8	Mark	Correct response	Additional guidance
		15	8	3m *or* 2m	Gives a correct answer in days, ie 14 or 14.1 or 14.2 or 14.16(…) or Gives a correct answer in days and hours, ie 14 days and 4 hours Shows a complete correct method, with not more than one computational error eg ■ 1.3 × 24 = 31.2cm per day, 600 − 158 = 442cm to grow, 442 ÷ 31.2 ■ 600 − 158 = 442 442 ÷ 1.3 = 340 340 ÷ 24 ■ 6 − 1.58 = 4.42 4.42 ÷ 0.013 ÷ 24 ■ $\frac{600}{31.2} - \frac{158}{31.2}$ or Gives an answer of 15	! *Answer of 15* For 3m, do not accept unless a correct method or a more accurate value is seen eg, accept ◆ 31.2 × 10 = 312, 31.2 × 5 = 156 so 15 days = 626cm ! *Range of values given* Accept range between 14 and 15 inclusive eg, accept ◆ 14 to 15 ! *Method used is trial and improvement or counting on* For 3m, do not accept a correct value shown in working unless it has been identified as the answer eg, accept ◆ 158 + 14 × 31.2 = 594.8 so 14 days For 2m, accept trial and improvement and counting on as types of correct method eg, accept ◆ 158 + 14 × 31.2 = 594.8 ◆ 0 days = 1.58 1 day = 1.892 : : 14 days = 5.948 ✓ *For 2m, values approximated to 2 significant figures or better* eg ◆ 1.3 × 24 is about 31cm per day Needs to grow about 440cm 440 ÷ 31 ◆ 0 days = 1.58 1 day = 1.89 : : 14 days = 5.92 ✗ *For 2m, inconsistent units* eg ◆ 4.42 ÷ 1.3 ÷ 24

Giraffe (cont)

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
		15	8			
				or **1m**	Shows the digits 142 or 141(…) eg ▪ 0.141 or Shows the digits 312 and 442 or Shows the digits 34 eg ▪ 340 or Shows or implies a complete correct method in which the only error is to omit the subtraction of the height at birth eg ▪ Answer of 19.2(…) ▪ Digits 192(…) seen ▪ 600 ÷ 1.3 ÷ 24	✓ ***Trial and improvement or counting on as types of correct method***
				U1		

Long-eared owls

3-5	4-6	5-7	6-8	Mark	Correct response	Additional guidance
		16	**9**			
		a	a	**1m**	Shows a complete correct method eg ▪ $1 \times 9 + 2 \times 17 + 3 \times 24 + 4 \times 6 + 5 \times 5 + 6 \times 1$ ▪ $9 + 34 + 72 + 24 + 25 + 6$	✓ *Correct description of method* eg • Multiply the number of mammals found by the frequency, then add them ✗ *Incomplete method* eg • 9, 34, 72, 24, 25, 6 • Multiply the number of mammals found by the frequency
		b	b	**2m** ***or*** **1m**	2.7 Shows or implies a correct method eg ▪ 2.74(…) ▪ $170 \div 62$ ▪ $170 \div (9 + 17 + 24 + 6 + 5 + 1)$	
		c	c	**2m** ***or*** **1m**	38 000 Shows or implies a complete correct method eg ▪ $2.7(\ldots) \times 1.4 \times 10\,000$ ▪ 37 800 ▪ 38 387 ▪ Their (b) $\times$ 14 000 or Shows the digits 38	✓ ***For 2m, follow through from part (b) as their (b) × 14 000, rounded to the nearest thousand, provided their (b) is such that rounding is required***

Pictures

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
		17	10			
		a	a	**1m**	Gives a correct explanation eg ■ $6 \div 4$ ■ $4 \times 1.5 = 6$ ■ A is $\frac{2}{3}$ of B, so B is $\frac{3}{2}$ of A ■ One and a half lots of 4 is 6 ■ Half of 4 is 2, then add it on ■ Using areas, $33.6 \div 22.4 = 1.5$ and the heights are the same	✓ ***Minimally acceptable explanation*** eg ◆ Every 1cm wide on A is 1.5cm on B ◆ Width A + half again ◆ It's A enlarged by half its original size ◆ A fits into B one and a half times ✗ ***Incomplete explanation*** eg ◆ 4×1.5 ◆ Using areas, $33.6 \div 22.4 = 1.5$
		b	b	**1m**	7	
			c	**1m**	Gives a correct explanation by referring to both dimensions eg ■ Horizontal and vertical stretch factors are different ■ 1.25 is not the same as 1.5 ■ The enlargements would have to be the same ■ $6 \div 4 \neq 7 \div 5.6$ ■ $4 \div 6 = 0.67$, but $5.6 \div 7 = 0.8$ ■ $4 \div 5.6 \neq 6 \div 7$ ■ $5.6 \times 1.5 = 8.4$, but $h = 7$	! ***Follow through*** Accept follow through from their (b), provided their (b) is not 8.4 ✗ ***Restatement of question with no interpretation*** eg ◆ Horizontal is 1.5 Vertical is 1.25
			d	**1m**	4.2 or equivalent	

Coffee

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
		18	11			
			a	**2m**	Gives three correct values that sum to 100 eg ▪ Retailers 25 Growers 3 Others 72 ▪ Retailers 25.14 Growers 2.86 Others 72	Note to markers: Accept as correct the following values Retailers: 25, 25.1, 25.14(…) or $25\frac{1}{7}$ Growers: 3, 2.9, 2.86, 2.85(…) or $2\frac{6}{7}$ Others: 72
				or **1m**	Gives any two correct values or Gives three correct values that sum to 100 but in an incorrect order or Shows or implies a complete correct method with not more than one computational or rounding error eg ▪ $44 \div 175 \times 100 = 25$ $5 \div 175 \times 100 = 2$ *(rounding error)* $100 - 25 - 2 = 73$ or Shows or implies a complete correct method with not more than two rounding errors provided the three values sum to 100 eg ▪ Retailers 25.2 *(rounding error)* Growers 2.8 *(rounding error)* Others 72	

Coffee (cont)

Tier & Question 3-5	4-6	5-7	6-8			Correct response	Additional guidance
		18	11		Correct response	Additional guidance
			b	2m	Gives the value £ 1.91 or £ 1.92	! *Method used is trial and improvement* Accept correct values from this method for 2m, but do not accept as a complete correct method for 1m
				or 1m	Shows or implies a complete correct method with not more than one computational or rounding error eg ■ $\frac{0.44}{23} \times 100$ ■ $\frac{44}{23}$ ■ 23% = 44 10% = 19 67% = *127 (rounding error)* So £ 1.90 or Shows the digits 191(...) or 192 eg ■ 191 ■ 19.13	

Cissoid of Diocles

Tier & Question 3-5	4-6	5-7	6-8	Mark	Correct response	Additional guidance
		19	12	1m	3.227486(...)	✗ *Negative value or fewer than six digits shown after the decimal point* ✗ *Correct value shown in working but final answer incorrect*
				2m	Gives both correct values, ie 3.23 and −3.23, in either order	✓ *For 2m, answer given as ± 3.23* ! *For 2m, follow through from the first mark* Accept, even from a negative value, provided their incorrect value has at least 4sf and both the positive and negative values are consistent eg, from 1.5117 for the first mark, accept • 1.51 and −1.51
				or 1m	Gives one correct value, ie 3.23 or −3.23 or Gives consistent positive and negative values even if there is no, or incorrect, rounding eg ▪ 3.22748 and −3.22748 ▪ 3.22 and −3.22 ▪ ± 3.2	! *For 1m, their incorrect value for the first mark correctly rounded to 3sf* Accept, even from a negative value, provided their incorrect value has at least 4sf, even if the other value is incorrect or omitted eg, from 3.4882 for the first mark, accept • 3.49 ! *For 1m, both the positive and negative of their incorrect value for the first mark given* Accept provided both the positive and negative values are consistent, even if there is no, or incorrect, rounding eg, from 3.4882 for the first mark, accept • 3.488 and −3.488

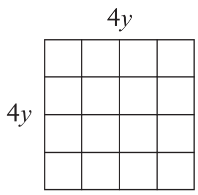
Populations

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
			13			
			a	1m	India	✓ *Unambiguous indication* eg ◆ 1.0×10^9 for India
				1m	Gambia	
			b	3m	Gives a correct value with no evidence of an incorrect method eg ■ 220	! ***Limits used or answer not given to 2sf*** Accept values in the following ranges: Difference 212 to 229 inclusive UK 242 to 258 inclusive US 29 to 31 inclusive ✗ ***For 3m or 2m, incorrect method*** eg ◆ $2.8 \times 10^8 - 6 \times 10^7$! ***Incorrect order of division*** Do not treat as a misread, ie do not accept
				or 2m	Shows correct values for both countries eg ■ UK 250, US 30.(…) or Shows or implies a complete correct method with not more than one computational error eg ■ $6.0 \times 10^7 \div 2.4 \times 10^5$ then subtract $2.8 \times 10^8 \div 9.3 \times 10^6$ ■ $250 - 2.8 \times 10^8 \div 9.3 \times 10^6$ ■ Answer of −220	
				or 1m	Shows a correct method or value for one of the countries eg ■ $6.0 \times 10^7 \div 2.4 \times 10^5$ ■ $2.8 \times 10^8 \div 9.3 \times 10^6$	

Joining

Tier & Question 3-5	4-6	5-7	6-8	Mark	Correct response	Additional guidance
			14		**Correct response**	**Additional guidance**
			a	2m	Gives a complete correct justification eg ■ AC = √(28.8² + 12²) = 31.2 CD = √(5² + 12²) = 13 31.2 + 13 + 28.8 + 5	✓ ***Minimally acceptable justification*** eg ◆ 31.2 + 13 + 28.8 + 5 ◆ 31.2 + 13 + 33.8 ◆ 78 – 28.8 – 5 – 13 – 31.2 = 0
				or 1m	Shows at least one of the values 31.2, 13 or 44.2	
			b	2m	Gives a correct justification eg ■ 33.8² = 1142.44 13² + 31.2² = 169 + 973.44 = 1142.44 Pythagoras' theorem works so ACD is right-angled ■ 5 × 2.4 = 12 and 12 × 2.4 = 28.8 so ABC and BCD are similar right-angled triangles, and Angle ACD = angle ACB + angle BCD = angle CDB + angle BCD = 90° ■ Area of ACD $= \frac{1}{2}$ AD × BC $= \frac{1}{2}$ × 33.8 × 12 = 202.8 and $\frac{1}{2}$ CD × AC $= \frac{1}{2}$ × 13 × 31.2 = 202.8 so ∠ACD is 90°	✓ ***Minimally acceptable justification*** eg ◆ 13² + 31.2² = (28.8 + 5)² ! ***For 2m or 1m, use of trigonometry to show angle ACD is a right angle*** Accept for 2m provided both angle ACB and angle BCD are correctly evaluated and understanding is shown that they should sum to 90 Accept as correct for angle ACB values 67.4 or 67.38(…) Accept as correct for angle BCD any value in the range 22.58 to 22.64 inclusive eg ◆ $\tan^{-1}\frac{28.8}{12} + \tan^{-1}\frac{5`}{12}$ = 67.4 + 22.6 = 90 ◆ 67.38 and 22.58 together make 90 Accept for 1m either angle ACB or angle BCD correctly evaluated
				or 1m	Indicates understanding of the way Pythagoras' theorem can be used to prove that triangle ACD is right-angled eg ■ If right-angled, AC² + CD² = AD² ■ 1142.44 or Shows that triangles ABC and BCD are similar eg ■ 5 × 2.4 = 12 and 12 × 2.4 = 28.8 so ABC and BCD are similar triangles	✓ ***For 1m, follow through using their values for AC and CD from part (a)***
				U2		

Squares X

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
			15			
			a	1m U1	Gives a correct explanation The most common correct explanations: Give at least one counter-example for $9 + y^2$ eg ■ When $y = 5$, $9 + y^2 = 34$ which is not a square number ■ Let $y = 1$, $9 + 1 = 10$, and $\sqrt{10}$ is not an integer State that $9 + y^2$ only produces a square number for particular cases eg ■ It is only true when $y = -4$, 0 or 4 ■ It will only give the square numbers 9 or 25	✓ *Minimally acceptable explanation* eg ◆ When $y = 5$, $9 + y^2 = 34$ ✘ *Incomplete explanation* eg ◆ y^2 is a square number, but adding 9 doesn't make it still a square number ✘ *Incorrect explanation* eg ◆ It is only square when y is 0
			b	1m U1	Gives a correct explanation eg ■ $16y^2 = (4y)^2$ ■  ■ Two square numbers multiplied make a square number, ie $a^2b^2 = (ab)^2$, and 16 is 4^2 ■ $\sqrt{(16y^2)} = 4y$	✓ *Minimally acceptable explanation* eg ◆ It's $4y \times 4y$ ◆ You multiply by 4 before you square it ◆ $a^2b^2 = (ab)^2$ ◆ Two square numbers multiplied make a square number ✘ *Incomplete explanation* eg ◆ y^2 is a square number and 16 is a square number ◆ $\sqrt{16} = 4$, $\sqrt{y^2} = y$ ✘ *Explanation lacks generality* eg ◆ $y = 3$, $16 \times 3^2 = 144$ which is a square number

Tier & Question					**Cylinder**	
3-5	4-6	5-7	6-8			
			16		**Correct response**	**Additional guidance**
				3m	0.72 or $\frac{18}{25}$	! ***Answer given as 0.7 or 0.71(...)*** Accept for 3m only if a correct method, even if partial, or a more accurate value is seen
				or 2m	Shows or implies a correct method, even if values are rounded or truncated prematurely eg ▪ $4.5 \div 2.5^2$ ▪ $4.5\pi \div 6.25\pi$ ▪ $14.1 \div 19.6$	✗ ***For 2m, incorrect method*** eg ◆ $5 \div 4.5\pi \times 2 = 0.71$
				or 1m	Forms a correct equation relating the height and the volume of 4.5π eg ▪ $2.5^2 \times \pi \times h = 4.5 \times \pi$ or Shows or implies a correct method for calculating the area of the cross-section eg ▪ $2.5^2\pi$ ▪ 19.6(…)	

Triangle

Tier & Question 3-5	4-6	5-7	6-8		Correct response	Additional guidance
			17			
				1m	Forms a correct equation for the equal sides, and shows a correct first step of algebraic manipulation eg ■ $a = 4b$ ■ $b = \frac{a}{4}$ ■ $8b = 2a$	! *Correct equation for the equal sides implied by equation for the perimeter but not stated explicitly* eg ◆ $26b = 91$ ◆ $6\frac{1}{2} \times a = 91$ Award both the first and second marks
				1m	Forms a correct equation for the perimeter of the triangle, and simplifies eg ■ $3a + 14b = 91$ ■ $5a + 6b = 91$ ■ $22b + a = 91$ ■ $26b = 91$ ■ $6\frac{1}{2} \times a = 91$	
				1m	Gives both correct values, ie $a = 14$ and $b = \frac{7}{2}$ or equivalent, even if these do not follow from a correct algebraic method	

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EARLY YEARS

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