Ma

KEY STAGE 3

ALL TIERS

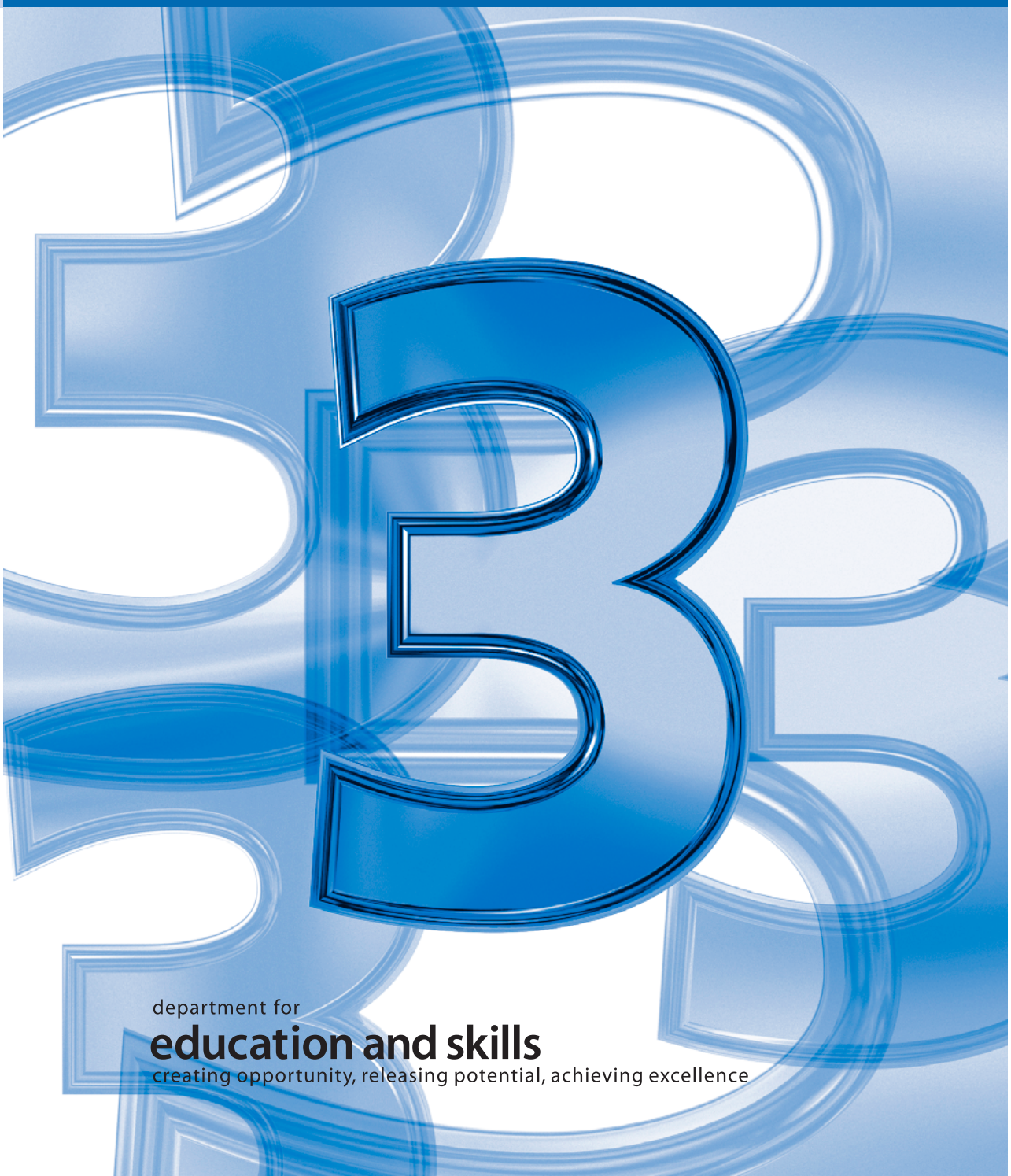
2005

Mathematics tests

Mark scheme for Paper 2

Tiers 3–5, 4–6, 5–7 and 6–8

2005



QCA

department for education and skills
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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 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.

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.

For graphical and diagrammatic responses, including those in which judgements on accuracy are required, marking overlays have been provided at the centre page of this booklet.

The 2005 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, algebra, coordinates, negative numbers 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 ...

<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>
</table>

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 the use of algebra

For example: $2 + n$ $n + 2$ $2n$ $\frac{n}{2}$ n^2

Accept ✓	Take care ! Do not accept ×
✓ Unambiguous use of a different case or variable eg N used for n x used for n	! Unconventional notation eg $n \times 2$ or $2 \times n$ or $n2$ or $n + n$ for $2n$ $n \times n$ for n^2 $n \div 2$ for $\frac{n}{2}$ or $\frac{1}{2}n$ $2 + 1n$ for $2 + n$ $2 + 0n$ for 2 Within a question that demands simplification, do not accept as part of a final answer involving algebra. Accept within a method when awarding partial credit, or within an explanation or general working. × Embedded values given when solving equations eg in solving $3x + 2 = 32$, $3 \times 10 + 2 = 32$ for $x = 10$ To avoid penalising the two types of error below 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.
✓ Words used to precede or follow equations or expressions eg $t = n + 2$ tiles or tiles = $t = n + 2$ for $t = n + 2$	! Words or units used within equations or expressions eg n tiles + 2 n cm + 2 Do not accept on their own. Ignore if accompanying an acceptable response.
✓ Unambiguous letters used to indicate expressions eg $t = n + 2$ for $n + 2$	× Ambiguous letters used to indicate expressions eg $n = n + 2$ for $n + 2$

Responses involving coordinates *For example: (5, 7)*	
Accept ✓	**Do not accept ×**
✓ Unconventional notation eg (05, 07) (five, seven) (x, y) (5, 7) (x=5, y=7)	× Incorrect or ambiguous notation eg (7, 5) (y, x) (7, 5) (5x, 7y) (5^x, 7^y) ($x - 5$, $y - 7$)

Responses involving negative numbers *For example: –2*	
Accept ✓	**Do not accept ×**
	To avoid penalising the error below more than once within each question, do not award the mark for the *first* occurrence of the error within each question. Where a question part carries more than one mark, only the final mark should be withheld. × Incorrect notation eg 2–

Responses involving probability

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

For example: 0.7 or $\frac{7}{10}$ or 70%

Accept ✓	Take care ! Do not accept ×
✓ Equivalent decimals, fractions and percentages eg 0.700, $\frac{70}{100}$, $\frac{35}{50}$, 70.0%	The first **four** categories of error below should be ignored if accompanied by an acceptable response, but should not be accepted on their own. However, to avoid penalising the first **three** types of error below 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 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 that is incorrectly expressed eg 7 in 10 7 over 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
	! 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

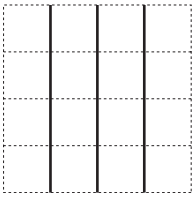
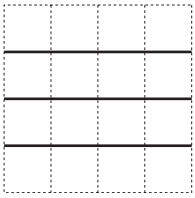
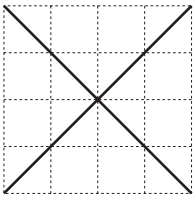
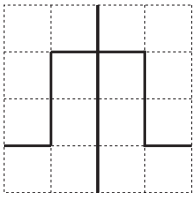
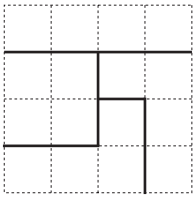
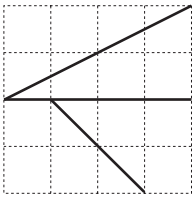
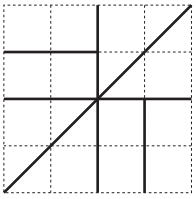
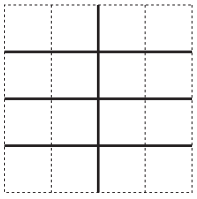
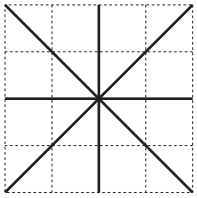
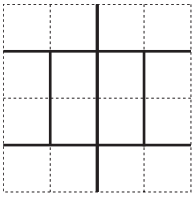
The total marks awarded for a double page will be written in the box at the bottom of the right-hand page, and the total number of marks obtained on the paper will be recorded on the front of the test paper.

A total of 120 marks is available in each of tiers 3–5 and 4–6.
A total of 121 marks is available in each of tiers 5–7 and 6–8.

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 20 June 2005. 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.

Tier & Question					4 by 4 grid	
3-5	4-6	5-7	6-8			
1					**Correct response**	**Additional guidance**
a				**1m**	Correctly divides the square into quarters in a different way from the given example eg ■  ■  ■  ■ 	! ***Throughout the question, lines not ruled or accurate, or lines not using the intersections of the grid*** Accept provided the pupil's intention is clear ! ***Throughout the question, quarters or eighths are not congruent*** Accept provided the intention is clear for all pieces to have the same area eg, for part (a) accept ◆  ◆  eg, for part (b) accept ◆ 
b				**1m**	Correctly divides the square into eighths eg ■  ■  ■ 	

Tier & Question						Heating
3-5	4-6	5-7	6-8			
2					**Correct response**	**Additional guidance**
a				**1m**	Indicates the correct times in the correct order eg ▪ 6 and 9:30	✓ *Indication of morning* eg • 6 am and 9:30 am ! *Times not accurate* Accept ± 5 minutes of the correct times eg, for 9:30 accept • 9:25 to 9:35 inclusive ! *Use of 'half'* Accept colloquial use of 'half' or $\frac{1}{2}$ eg, for 9:30 accept • Half (or $\frac{1}{2}$) 9 Do not accept an incorrect time eg, for 9:30 do not accept • 9 half (or $\frac{1}{2}$) × *Time(s) incorrect* eg • 6 pm and 9:30 • 6 and 21:30 • 6 and 9.5
				1m	$3\frac{1}{2}$ or equivalent	! *Follow through from the first mark* Accept as the time interval between their two times, provided their answer is not a whole number of hours ! *'Half' in words* Condone eg, accept • 3 and a half
b				**2m** *or* **1m**	Indicates only 17(:00) and 23(:00) correctly on the diagram, with no incorrect times shown Indicates either 17(:00) or 23(:00) correctly on the diagram, with not more than one error or Indicates any two times on the diagram with a difference of 6 hours	! *Positions not accurate* Accept provided the pupil's intention is clear ! *Arrows do not indicate 'on' or 'off'* For 2m, condone unless the times are incorrectly labelled as 'on' or 'off' In this case, mark as 1, 0 For 1m, ignore any labels

Tier & Question						Tickets
3-5	4-6	5-7	6-8			
3					**Correct response**	**Additional guidance**
a				**1m**	*5*	✖ *For the first mark, £5* ! *Values not rounded* Penalise only the first occurrence, even if the non-integer part is incorrect eg, for parts (a) and (b) • 5.2(...) or 5.3 6.8(...) or 6.9 Mark as 0, 1
b				**1m**	6	
c				**1m** (U1)	£ 22	

Tier & Question					Unit	
3-5	4-6	5-7	6-8			
4					**Correct response**	**Additional guidance**
a				**1m**	Indicates grams	✓ *Unambiguous indication*
				1m	Indicates litres	! *For both responses, correct but less suitable units indicated* Mark responses of kilograms then millilitres as 0, 1
b				**1m**	Indicates one of the given units not credited in their (a), and gives an example of something it could measure eg ■ Use metres to measure the distance of a running track ■ Use millimetres to measure the length of a ruler ■ Use kilograms to measure the mass of a person [only if kilograms not given for the first mark in (a)] ■ Use millilitres to measure the volume of drink in a can [only if millilitres not given for the second mark in (a)] ■ Use grams to measure the mass of a piece of cheese [only if grams not given for the first mark in (a)] ■ Use litres to measure the capacity of water in a swimming pool [only if litres not given for the second mark in (a)]	! *Imprecise description of the property to be measured* Condone provided the pupil's intention is clear eg, accept ◆ Use metres to measure the size of a garden ◆ Use millilitres to measure the amount/quantity of drink in a can ◆ Use kilograms to measure the weight of a person ! *Units for the correct property given, but not the most suitable for their example* Condone eg, accept ◆ Use millilitres to measure the volume of water in a swimming pool ! *Property given with object unspecified or omitted* Condone eg, accept ◆ Use millimetres to measure the length of something ◆ Use kilograms to measure the mass × *Object given without explicit indication of the property to be measured* eg ◆ Use millimetres to measure a ruler ◆ Use kilograms to measure a person × *Units used that are not from the given list* eg ◆ Use centimetres to measure the length of a ruler
				(U1)		

Tier & Question						Paralympics
3-5	4-6	5-7	6-8			
5					**Correct response**	**Additional guidance**
a				**1m**	19	✗ *For part (a), –19*
b				**1m**	2100	✗ *For part (b), –2100* ! ***Responses to parts (a) and (b) transposed but otherwise correct*** Mark as 0, 1
c				**2m** ***or*** **1m**	Completes the three entries of the table correctly, ie 123 | Australia | 3824 Shows the value 123 or 3824, even if in an incorrect position	! ***Abbreviation or incorrect spelling of Australia*** Condone eg, accept • Aus • A ! ***For 2m or 1m, 3824 rounded*** Accept 3800 or 3820 Do not accept 4000

Tier & Question						
3-5	4-6	5-7	6-8		**Half price**	
6					**Correct response**	**Additional guidance**
a				**1m**	£ 2.84	
b				**1m**	£ 13.98	

Tier & Question						
3-5	4-6	5-7	6-8		**Teachers**	
7					**Correct response**	**Additional guidance**
a				**1m**	187 860	
b				**1m**	1350	✖ *−1350*

Tier & Question						
3-5	4-6	5-7	6-8		**Membership**	
8	**1**				**Correct response**	**Additional guidance**
a	a			**1m**	October	✓ *Unambiguous indication of month* eg • O ! *Correct frequency of 32 given* Ignore alongside indication of the correct month, but do not accept on its own
b	b			**1m**	11	

Tier & Question					Factor	
3-5	4-6	5-7	6-8			
9	2				**Correct response**	**Additional guidance**
a	a			**1m** U1	Indicates Yes and gives a correct explanation eg ■ 3 × 10 = 30 ■ 30 ÷ 3 = 10 ■ 30 is a multiple of 3 ■ 3 goes into 30 exactly ■ 30 is in the 3 times table	✓ *Minimally acceptable explanation* eg ◆ 3 × 10 ◆ 30 ÷ 3 has no remainder ◆ 30 divides by 3 ◆ 3 goes into 30 ◆ 30 ÷ 10 ◆ 3 + 0 = 3 which is in the 3 times table ! *Use of repeated addition* Condone eg, accept ◆ Keep going up in 3s and you get to 30 ! *Use of 'it' or other ambiguous language* Condone provided either 3 or 30 is used, implying 'it' is the other number eg, accept ◆ 30 divides by it ◆ The lower number goes into it ◆ It's in the 3 times table eg, do not accept ◆ It goes into it 10 times ! *Response contains an incorrect statement* Ignore alongside a correct response eg, accept ◆ 30 divides by 3 as 3 is a multiple of 30 eg, do not accept ◆ 3 ÷ 30 = 10 ◆ 30 goes into 3 exactly × *Incomplete or incorrect explanation* eg ◆ 3 is a factor of 30 ◆ 30 ÷ 3 ◆ It adds up to 30 ◆ They're both in the 3 times table ◆ Because there is a 3 in it
b	b			**1m**	Gives a factor of 30 greater than 3, ie 5, 6, 10, 15 or 30	

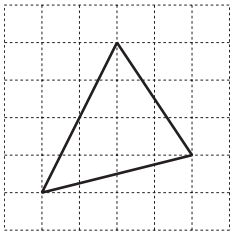
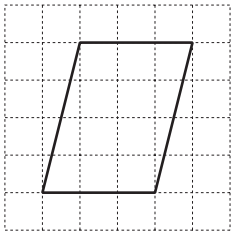
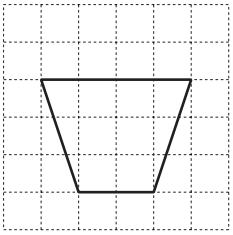
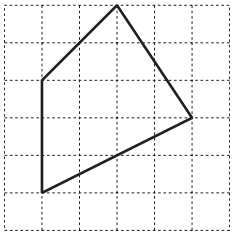
Tier & Question						
3-5	4-6	5-7	6-8		**Shapes on a grid**	
10	**3**				**Correct response**	**Additional guidance**
a	a			**1m**	20	
b	b			**1m**	60	! *Follow through* Accept follow through as their (a) × 3, provided their (a) was not 5
c	c			**1m** U1	4	! *Operation repeated* eg ◆ × 4 Condone × *More than one number given* eg ◆ 2 × 2

Tier & Question						
3-5	4-6	5-7	6-8		**Meal**	
11	**4**				**Correct response**	**Additional guidance**
				2m *or* **1m**	£ 276 Shows the digits 276 eg ■ 2.76 or Shows the value 23, with no evidence of an incorrect method or Shows or implies a complete correct method with not more than one computational or rounding error eg ■ $\frac{253}{11} \times 12$ ■ 253 ÷ 11 = *13 (error)* 253 + 13 = 266 ■ 12 ÷ 11 = 1.09(…), *1.09 (premature rounding)* × 253 = 275.77	× *For 1m, incorrect method* eg ◆ 11 + 12 = 23

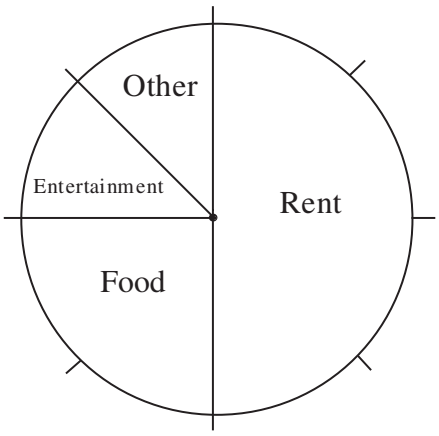
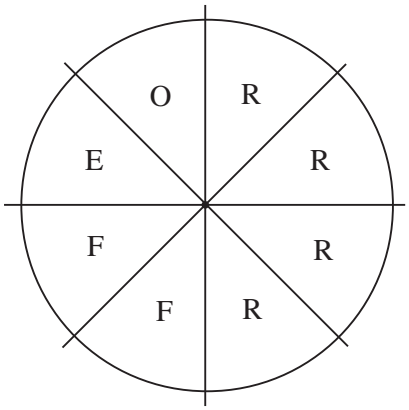
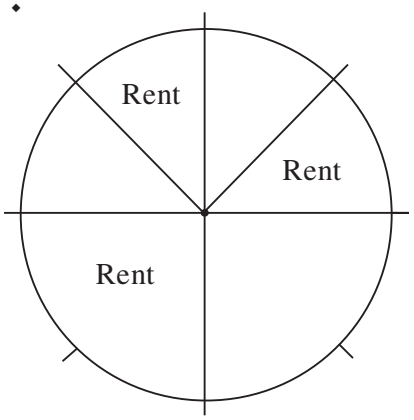
Tier & Question					Rhombus area	
3-5	4-6	5-7	6-8			
12	5				**Correct response**	**Additional guidance**
a	a			**1m**	10.2 to 10.4 inclusive and 6.6 to 6.8 inclusive, in either order	✓ ***Throughout the question, equivalent fractions or decimals***
b	b			**1m**	Gives the correct area using their values for the lengths of the diagonals in part (a) eg ■ From 10.3 and 6.7 in part (a), area of 34.505 (or 3450.5) or Gives the correct area using two values seen in part (b), even if they are different from their values for the lengths of the diagonals in part (a) eg ■ From 10 and 7 seen in part (b), area of 35	✓ ***Follow through as the product of their two values for part (a) ÷ 2*** As this is an algebra mark, accept follow through from whole numbers as well as decimals ! ***For part (b), their value rounded*** Accept correct rounding to the nearest integer or better, or truncation to one decimal place or better Do not accept incorrect rounding or truncation to an integer unless a correct method or a more accurate value is seen Markers may find the following values for the diagonals and corresponding areas useful: *(error)* 6.5 | 6.6 | 6.7 | 6.8 10.2 | *33.15* | 33.66 | 34.17 | 34.68 10.3 | *33.475* | 33.99 | 34.505 | 35.02 10.4 | *33.8* | 34.32 | 34.84 | 35.36 *10.5* | *34.125* | *34.65* | *35.175* | *35.7* *(error)*
				1m	Shows the correct unit for their area eg ■ 34.505 cm^2 ■ 3450.5 mm^2 ■ Product of their two values for part (a) ÷ 2 and cm^2 seen ■ Product of their two values for part (a) ÷ 2 × 100 and mm^2 seen	! ***Area not followed through from their (a) or omitted, but units given*** If the first mark in part (b) for their correct area has not been awarded, condone either cm^2 or mm^2 seen for the second mark in part (b)

Tier & Question						
3-5	4-6	5-7	6-8			**Mobile phones**
13	**6**				**Correct response**	**Additional guidance**
				1m	Gives a value between 1 and 2 inclusive	! *'Million' repeated* eg, for the first mark • $1\frac{1}{2}$ million • 1 500 000 Condone
				1m	Gives a value between 49.5 and 50.5 inclusive	
				1m	Gives a value between 10 and 12 inclusive	

Tier & Question						
3-5	4-6	5-7	6-8			**Arranging numbers**
14	**7**				**Correct response**	**Additional guidance**
				2m	Gives both correct ways that are different from the example given, ie 2 , 3 and 1 , 4 , 5 1 , 4 and 2 , 3 , 5	! *Operations given* Ignore eg, for 2, 3 accept • 2 + 3 ! *First and second groups transposed within an otherwise completely correct response [answer lines ignored]* eg • 1, 4, 5 and 2, 3 2, 3, 5 and 1, 4 Mark as 0, 1 × *Response satisfies the conditions, but does not use all the numbers and/or uses repeats* eg • 1 , 1 and 1 , 1 , 2 3 , 3 and 4 , 4 , 4
				or **1m**	Gives one of the two correct ways that are different from the example given	
				U1		

Tier & Question					What shape?	
3-5	4-6	5-7	6-8			
15	**8**				**Correct response**	**Additional guidance**
a	a			**1m**	Draws a triangle with no right angle eg ■ 	! *Lines not ruled or accurate* Accept provided the pupil's intention is clear ! *Vertices not on grid intersections* Accept provided it is clear that the conditions have been satisfied
b	b			**1m**	Draws a quadrilateral with no right angles eg ■  ■  ■ 	
c	c			**1m**	Indicates 1	✓ *Unambiguous indication including angle marked on diagram*

Tier & Question						
3-5	4-6	5-7	6-8	*Refer to the new algebra general guidance*	**Algebra grids**	
17	9	1			**Correct response**	**Additional guidance**
				1m	Completes the grid correctly, giving simplified expressions, ie $8k$ $3k$ $11k$	
				2m	Completes the grid correctly, giving simplified expressions eg ■ $3a + 3b$ $6a + 5b$ $13a + 10b$	
				or **1m**	Gives two correct simplified expressions	! ***For 1m, follow through*** Accept follow through from their incorrect expression for $6a + 5b$, provided their incorrect expression contains only a term in a and a term in b

Tier & Question						
3-5	4-6	5-7	6-8			**1976 v 2002**
16	**10**	**2**			**Correct response**	**Additional guidance**
a	a	a		**1m**	£ 4	
b	b	b		**2m**	Completes the pie chart correctly eg ▪  	! *Labels abbreviated* Accept unambiguous indications of category names eg, for 2m accept ◆  Do not accept amounts of money as the only labels, but ignore alongside correct labels
				or **1m**	Draws all four sectors correctly but fails to label or labels incorrectly or Draws and labels any two of the sectors correctly or Makes an error in drawing either the rent or the food sector provided rent sector > food sector, and follows through correctly to divide the remaining space into two equal sectors for entertainment and other	! *Lines not ruled or accurate* Accept provided the pupil's intention is clear × *Sector not continuous* Do not accept as a correct sector eg, for the rent sector do not accept ◆ 

Tier & Question					Pens	
3-5	4-6	5-7	6-8			
18	11	3			**Correct response**	**Additional guidance**
				2m	Indicates the village shop and gives a correct justification, based on correctly calculating a pair of comparable values eg ■ At the supermarket $6.25 \times 6 = 37.5(0)$ At the village shop $7.20 \times 5 = 36$ ■ $6.25 \times 6 - 7.2 \times 5 = 1.5$ ■ $6.25 \div 5 = 1.25$, $7.20 \div 6 = 1.2(0)$ ■ £75 for 60 or £72 for 60 ■ For £1 you get $\frac{4}{5}$ of a pen or $\frac{5}{6}$ of a pen ■ You pay 95p extra for 1 more pen, but they're at least £1.20 each so it must be a better deal	✗ *For 2m, no decision* ✓ *For 2m, correct decision and any pair of comparable values shown* Note that common pairs (in pounds) are: 37.5 and 36 (per 30 pens) 1.25 and 1.2 (per 1 pen) 6.25 and 6 (per 5 pens) 7.5 and 7.2 (per 6 pens) 75 and 72 (per 60 pens) 18.75 and 18 (per 15 pens) 0.95 and 1.2 [or 1.25] (1 extra pen) 0.8 and 0.83(…) (pens per pound) ! *For 2m or 1m, comparison is per 5 pens or per 6 pens but the given price is not restated* Condone eg, for 2m accept ◆ At the supermarket, 6 pens would be £7.50
				or **1m**	Shows a correct pair of comparable values but makes either an incorrect or no decision or Shows a complete correct method for finding a pair of comparable values with not more than one computational or rounding error, and follows through to make their correct decision eg ■ 6×6.25, 5×7.20 [village shop indicated] ■ $6.25 \div 5 = 1.05$ *(error)*, $7.20 \div 6 = 1.20$ [supermarket indicated] or Makes a correct decision but the justification uses only the difference between a pair of comparable values eg ■ The packs of 6 would be £1.50 cheaper ■ A pen is 5p cheaper	! *Additional incorrect working* Ignore
				U1		

Tier & Question						Counters
3-5	4-6	5-7	6-8			
20	**12**	**4**			**Correct response**	**Additional guidance**
a	a	a		**1m**	$\frac{1}{3}$ or equivalent probability	! *Value rounded* Accept 0.33 or better, or the percentage equivalents
b	b	b		**1m**	3	

Tier & Question					*Marking overlay available*	From London
3-5	4-6	5-7	6-8			
19	**13**	**5**			**Correct response**	**Additional guidance**
a	a	a		**1m**	160 ± 2	
b	b	b		**1m**	350 ± 5	
c	c	c		**2m**	Indicates the correct position of Madrid within the tolerance as shown on the overlay	! *For 2m, Madrid not labelled* Condone provided the intended position is clear
				or **1m**	Indicates an angle of 195° ± 2° clockwise from north, within the tolerance as shown on the overlay or Shows a length of 6.5cm ± 0.2cm, within the tolerance as shown on the overlay, even if it is incorrectly positioned	! *For 1m, angle indicated with a short line* Accept provided the angle is within the tolerance as shown on the overlay, were the line to be extended ! *For 1m, angle or length indicated by a point without a line joined to London* Accept provided the angle or length is within the tolerance as shown on the overlay

<table>
<tr><th colspan="4">Tier & Question</th><th colspan="3" rowspan="2">How many?</th></tr>
<tr><th>3-5</th><th>4-6</th><th>5-7</th><th>6-8</th></tr>
<tr><th>21</th><th>14</th><th>6</th><th></th><th></th><th>Correct response</th><th>Additional guidance</th></tr>
<tr><td>a</td><td>a</td><td>a</td><td></td><td>1m</td><td>Gives the correct number of boys and girls, ie
<table><tr><th>Number of boys</th><th>Number of girls</th></tr><tr><td>18</td><td>9</td></tr></table></td><td rowspan="3">! Numbers correct but numbers of boys and girls transposed
Penalise only the first occurrence
eg, for all three parts
• 9, 18
13, 15
18, 9
Mark as 0, 1, 1

! Values given as tallies
Condone provided they are grouped in fives</td></tr>
<tr><td>b</td><td>b</td><td>b</td><td></td><td>1m</td><td>Gives the correct number of boys and girls, ie
<table><tr><th>Number of boys</th><th>Number of girls</th></tr><tr><td>15</td><td>13</td></tr></table></td></tr>
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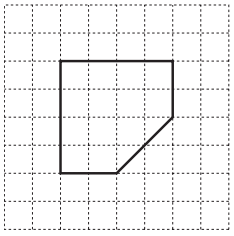
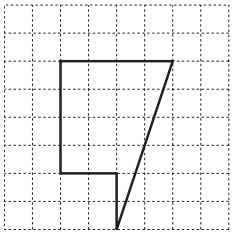
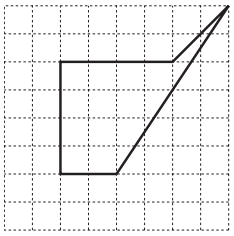
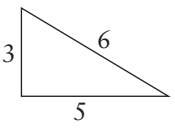
<table><tr><th>Number of boys</th><th>Number of girls</th></tr><tr><td>9</td><td>18</td></tr></table></td></tr>
</table>

Tier & Question						
3-5	4-6	5-7	6-8		**Pentagon**	
22	**15**	**7**			**Correct response**	**Additional guidance**
				1m	Draws only two more lines on the grid to make a pentagon with area 14cm^2 eg ▪  ▪  ▪ 	! *Lines not ruled or accurate* Accept provided the pupil's intention is clear × *More than two lines drawn* eg ◆ Given line(s) extended
				U1		

Tier & Question						
3-5	4-6	5-7	6-8		**Using a calculator**	
23	**16**	**8**			**Correct response**	**Additional guidance**
				1m	4410	
				1m	2.5 or equivalent	! *For the second mark, answer given as an improper fraction* Accept only if fully simplified eg, accept ◆ $\frac{5}{2}$ eg, do not accept ◆ $\frac{105}{42}$

Tier & Question						
3-5	4-6	5-7	6-8		**Tennis prizes**	
	17	**9**	**1**		**Correct response**	**Additional guidance**
				2m	Indicates France and gives a correct justification eg ■ 1000 000 ÷ 2.7 = 370 370.(…), 780 000 ÷ 1.54 = 506 493.(…) ■ $\frac{1000\,000}{2.7} < \frac{780\,000}{1.54}$ ■ 1000 000 ÷ 2.7 × 1.54 = 570 370.(…) ■ 780 000 ÷ 1.54 × 2.7 = 1 367 532.(…)	✓ *For 2m, minimally acceptable justification* eg ◆ 370 370 and 506 493 (or 506 494) seen ◆ $\frac{1000\,000}{2.7}, \frac{780\,000}{1.54}$ ◆ 1000 000 ÷ 270 = 3703.(…) (or 3704), 780 000 ÷ 154 = 5064.(…) (or 5065) ◆ 570 370.(…) seen ◆ 1 367 532.(…) seen ! *Values rounded or estimated* For 2m, accept values of 370 0(00) and 500 0(00) or better, 570 000 or better, or 1 400 000 or better Accept other estimates only if a correct method or a more accurate value is seen eg, accept ◆ £1 is about $2\frac{1}{2}$ dollars, so 1000 000 dollars is about £400 000, £1 is about $1\frac{1}{2}$ euros, so 780 000 euros is about £500 000 × *For 2m or 1m, justification simply repeats the decision made* eg ◆ 1000 000 Australian dollars are less than 780 000 euros
				or **1m**	Indicates France and gives a partial justification eg ■ 1000 000 ≈ £400 000, 780 000 ≈ £500 000 ■ Australia: 370 France: 506 [values truncated with no indication of method or that original values were of the same magnitude] or Gives a correct justification but makes an incorrect or no decision or Gives a correct justification with not more than one computational or rounding error, but follows through to make their correct decision	
				U1		

Tier & Question				*Marking overlay available*	**Enlargement**	
3-5	4-6	5-7	6-8			
	18	**10**	**2**		**Correct response**	**Additional guidance**
				2m	Draws the correct enlargement with vertices within the tolerances as shown on the overlay	! *Lines not ruled or accurate* Accept provided the pupil's intention is clear ! *Construction lines shown* Ignore
				or **1m**	Within an otherwise correct enlargement, the only error is that the vertices are not correctly joined or Their enlargement is the correct size and orientation as shown by the overlay, with vertices joined correctly, but is in the incorrect position	× *Enlargement is the correct size but in an incorrect orientation*

Tier & Question						Heron of Alexandria
3-5	4-6	5-7	6-8			
	19	11	3		Correct response	Additional guidance
				2m	√56, 2√14, 7.48(…) or 7.5, with no evidence of an incorrect method	✓ *Equivalent fractions or decimals* ! *For 2m, answer of 7* Do not accept unless a correct method or a more accurate value is seen × *Incorrect method* eg ◆ 3 × 5 ÷ 2 = 7.5 ◆ 
				or **1m**	Shows or implies at least two of the following three correct steps 1. Shows or implies that the value of s is 7 2. Substitutes correctly the values of a, b and c and their s into the expression $s(s-a)(s-b)(s-c)$ 3. Takes the square root of the correct result of their substitution eg ■ 56 seen [step 3 omitted] ■ $7(7-3)(7-5)(7-6)$ [step 3 omitted] ■ $\sqrt{7 \times 4 \times 2 \times 2}$ *(error)* = 10.5(…) or 10.6 [step 2 incorrect] ■ $\sqrt{14(14-3)(14-5)(14-6)}$ = 105.(…) [step 1 incorrect] ■ 7.4 [correct value truncated] or Shows the value 51, 51.3(…) or 51.4 [the only error is to use s as 11] or Shows the value 21, 21.1(…) or 21.2 [the only error is to take the square root of 7 before multiplying by 4 and 2]	

Tier & Question						Hands
3-5	4-6	5-7	6-8			
	20	**12**	**4**		**Correct response**	**Additional guidance**
	a	a	a	**1m**	$\frac{7}{15}$ or equivalent probability	! *Value rounded or truncated* Accept 0.46(…) or 0.47 or the percentage equivalents Do not accept 0.5 unless a correct method or a more accurate value is seen
	b	b	b	**1m**	$\frac{1}{10}$ or equivalent probability	! *Follow through* Accept follow through from an incorrect total number of pupils seen in part (a), provided their total is not 4, 16 or 27 eg, from $\frac{14}{29}$ for part (a) accept • $\frac{3}{29}$
	c	c	c	**1m**	$\frac{2}{3}$ or equivalent probability	! *Value rounded* Accept 0.66(…) or 0.67 or the percentage equivalents

Tier & Question						Screens
3-5	4-6	5-7	6-8			
	21	**13**	**5**		**Correct response**	**Additional guidance**
				1m	8	
				1m	6	! *Values transposed but otherwise correct* Mark as 0, 1 ! *The only error is to work with ratios that are prematurely rounded* For the first value between 7.65 and 8.1 inclusive (excluding 8), and for the second value between 5.85 and 6.3 inclusive (excluding 6), mark as 0, 1

Tier & Question						
3-5	4-6	5-7	6-8		**Spinning**	
	22	**14**	**6**		**Correct response**	**Additional guidance**
				2m	0.15 or equivalent probability	× *For 2m, incorrect notation* eg • $0.1\frac{1}{2}$ • 0.1.5
				or **1m**	Shows or implies the intention to add the given probabilities, subtract the sum from 1 and then divide by 2, even if there are errors eg ■ 0.1 + 0.6 = 0.7 $\frac{1 - 0.7}{2}$ ■ 0.3 ÷ 2 ■ $\frac{1.5}{10}$	

Tier & Question						
3-5	4-6	5-7	6-8	*Refer to the new algebra general guidance*	**Number**	
	23	**15**	**7**		**Correct response**	**Additional guidance**
				2m	11	
				or **1m**	Forms or implies a correct equation eg ■ $8x - 66 = 2x$ ■ $6y = 66$ ■ $66 \div 6$	! *Method used is trial and improvement* Note that no partial credit can be given ! *Equation involving words* Accept provided the operation involved in 'twice the number I was thinking of' has been interpreted eg, for 1m accept • Number × 8 minus 66 = number × 2 • 66 is the same as 6 times the number eg, for 1m do not accept • $8x - 66$ = twice x
				(U1)		

Tier & Question					A level results	
3-5	4-6	5-7	6-8			
	24	16	8		Correct response	Additional guidance
				2m	6300	! *Incorrect use of % sign* Ignore
				or **1m**	Shows the digits 63(00) or Shows the value 13 680 or 19 980 or Shows the digits 1368(0) and 1998(0) or Shows a complete correct method with not more than one computational error eg ■ $\frac{37}{100} \times 54\,000 - \frac{19}{100} \times 72\,000$ ■ $37 \times 540 - 19 \times 720$	

Tier & Question					*Refer to the new algebra general guidance*	**Solutions**
3-5	4-6	5-7	6-8			
	25	**17**	**9**		**Correct response**	**Additional guidance**
		a	a	**1m**	Indicates No and gives a correct explanation The most common correct explanations:	
					Show that the two sides of the equation are not equal when $y = 17$ eg ■ $14 \times 17 - 51 = 187$, but $187 + 4 \times 17 = 255$ ■ $14y - 51 = 187$, so it will go over when you add the $4y$ ■ The equation simplifies to $10y = 238$, but $10 \times 17 = 170$	✓ *Minimally acceptable explanation* eg ◆ $187 \neq 255$ ◆ $14 \times 17 - 51 \neq 187 + 4 \times 17$ ◆ $14 \times 17 - 51 = 187$ so you don't need $4y$ ◆ $14y - 51 = 187 + 0$ × *Incomplete or incorrect explanation* eg ◆ When you substitute $y = 17$ into both sides, you get different answers ◆ $14 \times 17 - 51 = 187$ ◆ $14 \times 17 - 51 = 187$, but $187 + 4 \times 17 = 225$ *(error)*
					Show the correct solution or show a correct method for solving the equation that demonstrates that the solution cannot be 17 eg ■ $14y - 51 = 187 + 4y$ $10y = 238$ $y = 23.8$ ■ $(187 + 51) \div 10 \neq 17$	✓ *Minimally acceptable explanation* eg ◆ 23.8 or equivalent seen ◆ $10y = 238$, so $y \neq 17$ × *Incorrect explanation* eg ◆ $18y = 238$ $y = 13.2$ ◆ $10y = 136$ $y = 13.6$
					Show or imply that $y = 17$ is a correct solution to $14y - 51 = 187$ eg ■ $14 \times 17 - 51 = 187$, but there is another 4×17 to add to the 187 on the other side	✓ *Minimally acceptable explanation* eg ◆ If $y = 17$, $14y - 51 = 187$, without $+ 4y$ ◆ The left-hand side is 187, but the other side is 187 plus something × *Incomplete explanation* eg ◆ If $y = 17$, $14y - 51 = 187$

Tier & Question					*Refer to the new algebra general guidance*	**Solutions (cont)**
3-5	4-6	5-7	6-8			
	25	**17**	**9**		**Correct response**	**Additional guidance**
		b	b	**1m**	Indicates No and gives a correct explanation The most common correct explanations:	
					Show that the two sides of the equation cannot be equal when $y = 17$ eg ■ $3 \times 17^2 = 867$, not 2601 ■ $y^2 = \frac{2601}{3}$ $= 867$, but $17 \times 17 = 289$ ■ If $y = 20$, $3y^2 = 1200$ which is still smaller than 2601, so y can't be 17 ■ 17^2 ends in a 9, then this number × 3 ends in a 7, so it can't be 2601	✓ *Minimally acceptable explanation* eg ◆ 867 ◆ $3 \times 289 \neq 2601$ ◆ $y^2 = 867$, but $17^2 \neq 867$ ◆ 17^2 ends in 9, then × 3 ends in 7 × *Incomplete explanation* eg ◆ $3 \times 17^2 \neq 2601$ ◆ When you substitute $y = 17$ into the equation, you don't get 2601 ◆ $3 \times 17 \times 17$ is far too small to be 2601
					Show the correct solution or show a correct method for solving the equation that demonstrates that the solution cannot be 17 eg ■ $3y^2 = 2601$ $y^2 = 867$ $y = \pm 29.(\ldots)$	✓ *Minimally acceptable explanation* eg ◆ It's $\pm 29.(\ldots)$ ◆ $\sqrt{\frac{2601}{3}} \neq 17$! *Only positive solution shown* Condone eg, accept as minimal ◆ It's $29.(\ldots)$ × *Incorrect explanation* eg ◆ $y^2 = 1300.5$ $y = 36.(\ldots)$
					Address the misconception eg ■ $(3 \times 17)^2 = 2601$, so $3 \times 17^2 \neq 2601$ ■ Square 17 first, then × 3 and your answer is much smaller than 2601	✓ *Minimally acceptable explanation* eg ◆ $(3 \times 17)^2 = 2601$ ◆ 17^2 then $\times 3 \neq 2601$ ◆ They've squared $3y$, not just y ◆ You do the power, then multiply ◆ True for $(3y)^2$ ◆ $9y^2 = 2601$ × *Incomplete explanation* eg ◆ $3 \times 17^2 \neq 2601$

Tier & Question						
3-5	4-6	5-7	6-8	*Refer to the new algebra general guidance*	**Simplify**	
	26	**18**	**10**		**Correct response**	**Additional guidance**
				1m	$9 + 2k$	
				1m	$k(k + 6)$ or $k^2 + 6k$	
				1m	$6k^2$	
				1m	$3k$	

Tier & Question					Watching	
3-5	4-6	5-7	6-8			
		19	12		Correct response	Additional guidance
				2m	*5* hours 12 minutes	
				or **1m**	Shows or implies a correct method for finding the time interval for Friday, Saturday or Sunday eg ■ 26 ÷ *5* ■ 5.2 ■ *5* hours *20 (error)* minutes ■ *5* hours *2 (error)* minutes ■ 1560 ÷ 10 × 2 ■ 312 or Shows or implies a correct method for finding the time interval for Monday, Tuesday, Wednesday or Thursday eg ■ 2 hours 36 minutes ■ 26 ÷ 10 ■ 2.6 ■ 156 or Shows a correct conversion of a number of hours or minutes to hours and minutes eg ■ *1.3* hrs *(error)* = 1 hour 18 minutes ■ *3.71*(…) hrs *(error)* = 3 hours 42(…) or 43 minutes ■ *1460 (error)* ÷ *5* = 292, 292 mins = 4 hours 52 minutes	✖ *For 1m, number of hours or minutes is equivalent to a multiple of* $\frac{1}{4}$ *hour*
				U1		

Tier & Question						Milk
3-5	4-6	5-7	6-8			
		20	11		Correct response	Additional guidance
				1m	Indicates chart 2, 3 or 4 and gives a correct reason The most common correct reasons for chart 2:	
					Refer to the increasing width of the milk bottles as the height increases eg ■ The taller the milk bottle, the wider it is so the bigger ones look much bigger than the smaller ones than they should ■ In a correct bar chart only the height should increase, but here the area increases ■ If you double the amount of milk, the area of the bottle is actually 4 times as big	✓ *Minimally acceptable reason* eg ◆ The one for D looks smaller than it should ◆ The biggest one looks too big ◆ Only the height should change ◆ They are different widths × *Incomplete reason* eg ◆ The bottles are all different sizes
					Refer to the rounded tops of the bottles or the specific problem they cause eg ■ The tops are curved so you can't read off an accurate number of litres ■ You don't know whether to read from the top or middle of the oval tops	✓ *Minimally acceptable reason* eg ◆ The tops are not flat ◆ It's hard to see what the bottles go up to ◆ It's hard to read the number of litres × *Incomplete reason that does not refer to the vertical scale either explicitly or implicitly* eg ◆ It's hard to read the data exactly
					Refer to problems with the way the bottles overlap/touch eg ■ Some of the bottles cover up parts of other bottles, so you can't really see the relative sizes ■ They're overlapping and might be hiding something important ■ The breeds are separate so there should be gaps between the bottles	✓ *Minimally acceptable reason* eg ◆ Bits are hidden so you can't compare ◆ They overlap so you can't see it properly ◆ Different types shouldn't have touching bottles × *Incomplete reason* eg ◆ The bottles overlap ◆ They shouldn't be touching ◆ It's confusing

Tier & Question					Milk (cont)	
3-5	4-6	5-7	6-8			
		20	11		**Correct response**	**Additional guidance**
				1m cont	The most common correct reasons for chart 3:	
					Refer to the lines joining the points eg ■ You can't join the points because there is nothing between two different types of cow ■ You might think the lines in between tell you how much milk cross-breeds produce ■ Points should be joined with dotted lines	✓ *Minimally acceptable reason* eg ◆ You shouldn't join them ◆ They're joined ◆ Nothing between the points ◆ Discrete data ◆ Dotted lines
					Refer to the common purpose for this type of chart eg ■ A line graph shows trends or changes, but there's no link between these groups ■ A line graph needs numbers on both axes ■ It makes it look like there's a decrease then an increase then a decrease again, but the categories are not connected	✓ *Minimally acceptable reason* eg ◆ Not continuous ◆ The *x*-axis should be something like time ◆ Not something going up and down × *Incomplete reason* eg ◆ It's a scatter graph
					The most common correct reasons for chart 4:	
					Refer to the fact that it shows proportions rather than quantities eg ■ You can't tell how many litres were produced, just the proportions ■ It's fine for comparing the breeds with each other, but nothing else	✓ *Minimally acceptable reason* eg ◆ You can't tell how many ◆ You don't know the amount of milk ◆ Only fractions ◆ There are no numbers
					Refer to the difficulty in calculating quantities even if the total is known eg ■ It takes much longer to work out the number of litres using the angles than by reading straight from a bar chart	✓ *Minimally acceptable reason* eg ◆ It's hard to work it out ◆ You need to know the total
					Refer to the difficulty in distinguishing between sectors of different sizes eg ■ It's hard to tell which is the biggest slice ■ I can't see whether S is bigger than A or the other way round	✓ *Minimally acceptable reason* eg ◆ You can't tell which is biggest ◆ Hard to see the difference between slices × *Incomplete reason* eg ◆ Pie charts are hard to read
				(U1)		
				1m	Indicates a different chart from one previously credited and gives a correct reason	
				(U1)		
				1m	Indicates a different chart from one previously credited and gives a correct reason	
				(U1)		

Tier & Question						
3-5	4-6	5-7	6-8	*Refer to the new algebra general guidance*	**Sequences**	
		21	**13**		**Correct response**	**Additional guidance**
		a	a	**1m**	28	
		b	b	**2m**	Gives all three correct terms in any order eg ■ $-1, 0, \frac{1}{9}$	! *First two terms shown as fractions* eg, for the first term ◆ $\frac{-1}{1}$ eg, for the second term ◆ $\frac{0}{4}$ For 2m, accept provided there is no further incorrect processing ! *For 2m or 1m, $\frac{1}{9}$ rounded* Accept 0.11 or better Do not accept 0.1 unless a correct method or a more accurate value is seen
				or **1m**	Gives any two correct terms or Shows or implies correct substitution and interpretation of the 'squared' for all three terms, even if there is further incorrect processing eg ■ $\frac{1-2}{1\times1}, \frac{2-2}{2\times2}, \frac{3-2}{3\times3}$ ■ $-\frac{1}{1} = 1$ *(error)* $\frac{0}{4} = 4$ *(error)* $\frac{1}{9} = 0.9$ *(error)*	

Tier & Question				**Bracket multiplication**		
3-5	4-6	5-7	6-8			
		22	**14**		**Correct response**	**Additional guidance**
				1m	Gives a correct expression without brackets eg ■ $y^2 - 6y$	! *Unconventional notation* Condone eg, for the first mark accept ◆ $y \times y - y6$ × *Incorrect further working* eg, for the first mark ◆ $y^2 - 6y = -5y^2$
				1m	Gives a correct expression without brackets eg ■ $k^2 + 5k + 6$ ■ $k^2 + 2k + 3k + 6$	

Tier & Question						
3-5	4-6	5-7	6-8		**Parallelogram**	
		23	**15**		**Correct response**	**Additional guidance**
				1m U1	Gives h = 80 and gives a correct reason eg ■ h is an alternate angle with the 80° angle marked ■ The angle on the straight line with h is supplementary with 80 so 180 – 80 = 100, then h = 180 – 100 ■ For the bottom trapezium, h + 60 + 120 + 100 = 360, so h = 360 – 280	✓ *Minimally acceptable reason* eg ◆ Alternate ◆ Supplementary to 80, on a straight line ◆ Quadrilateral 360 – 280 × *Informal justification without correct geometrical property identified* eg ◆ It's the same as the 80 because of the parallel lines ◆ 180 – 100 ◆ 360 – 280 × *Incomplete reason* eg ◆ It is the same as the 80° angle marked ◆ Angles in a quadrilateral add up to 360° ◆ It's opposite the 80° on the other side
				1m U1	Gives j = 120 and gives a correct reason eg ■ The angle on a straight line with j is 60 because it is an alternate (or corresponding) angle with the 60 marked, so j = 180 – 60 ■ It's a supplementary angle with angle B so it's 180 – 60 ■ For the bottom trapezium, j + 100 + 80 + 60 = 360, so j = 360 – 240 ■ In the parallelogram, angles A and C are equal, so j = (360 – 60 – 60) ÷ 2 ■ Angle C is supplementary with the 60° marked so is 180 – 60 = 120 j is the opposite angle in the parallelogram to angle C	✓ *Minimally acceptable reason* eg ◆ Alternate (or corresponding), on a straight line ◆ Supplementary to 60 ◆ Quadrilateral 360 – 240 ◆ Parallelogram 240 ÷ 2 ◆ Parallelogram 180 – B ! *For angle j, follow through* Accept as 200 – their h, alongside a correct reason referring to the quadrilateral containing both angles × *Informal justification without correct geometrical property identified* eg ◆ 180 – 60 ◆ 360 – 240 ◆ 240 ÷ 2 ◆ 180 – B × *Incomplete reason* eg ◆ It is the same as angle C which is 120° ◆ Angles in a quadrilateral add up to 360° ◆ j and 60 are angles on a straight line so add up to 180°

Tier & Question						
3-5	4-6	5-7	6-8		# Rich and poor	
		24	**16**		**Correct response**	**Additional guidance**
				2m	22.5(…) or 23	! *Incorrect use of % sign* Ignore
				or **1m**	Shows the value 22, or a value between 22.2 and 22.9 inclusive (excluding 22.5(…))	
					or	
					Shows or implies both the values $\frac{59}{6}$ and $\frac{41}{94}$ or both the values $\frac{6}{59}$ and $\frac{94}{41}$ eg ■ Each rich person has $9\frac{5}{6}$% Each poor person has $\frac{41}{94}$% ■ Rich = 59 ÷ 6, poor = 41 ÷ 94 ■ Suppose the total wealth was £1 million Each of the 6 people would have £98 333(.33) Each of the others would have only £ 4361(.70) ■ 9.8 : 0.44 ■ 2.3 : 0.10	! *For 1m, values rounded* For $\frac{59}{6}$, accept 9.8 or 9.83(…) Do not accept 10 unless a correct method or a more accurate value is seen For $\frac{41}{94}$, accept 0.44 or 0.43(…) Do not accept 0.4 unless a correct method or a more accurate value is seen For $\frac{6}{59}$, accept 0.10(…) Do not accept 0.1 unless a correct method or a more accurate value is seen For $\frac{94}{41}$, accept 2.3 or 2.29(…) Do not accept 2 or 2.2 unless a correct method or a more accurate value is seen
					or	
					Shows or implies a correct method with not more than one computational or rounding error eg ■ 59 ÷ 6 ÷ 41 × 94 ■ 94 ÷ 41 ÷ 6 × 59 ■ 9.8 ÷ *0.4 (rounding error)* = 24.5	× *For 1m, necessary brackets omitted* eg ◆ 59 ÷ 6 ÷ 41 ÷ 94
				U1		

Tier & Question					Area	
3-5	4-6	5-7	6-8			
		25	17		Correct response	Additional guidance
				2m	$100 - \frac{25\pi}{2}$ or 60.7(…) or 60.8 or 61	✓ ***Pupil working in mm²*** For 2m, accept values in the correct response column × 100 For 1m, accept values or methods in the correct response column × 100
				or **1m**	Shows the value $\frac{25\pi}{2}$ or 39.(…), or the value $\frac{25\pi}{4}$ or 19.6(…) or Shows a complete correct method with not more than one computational or rounding error eg ■ $10^2 - 5^2 \times \pi \div 2$ ■ $25 \times \pi \div 2 = 40$ *(rounding error)*, $100 - 40 = 60$	! ***The only error is to use the area of a whole circle rather than half a circle*** eg • $100 - 25\pi$ • 21.4(…) or 21.5 or 21 Mark as 1, 0 × ***Conceptual error*** eg • $10^2 - 5^2 \times \pi \div 2 = 20 - 5\pi$ • $100 - 2 \times \pi \times 5 = 68.6$
				(U1)		
				1m	Shows the correct unit for their area or method eg ■ 60.8 cm^2 ■ 39.(…) and cm^2 seen ■ 100 and cm^2 seen ■ 6073 mm^2 ■ $100^2 - 50^2 \times \pi \div 2$ and mm^2 seen	! ***Incorrect or no working or value for area seen, but units given*** If neither mark for calculating the shaded area has been awarded, condone cm^2 seen for the final mark

Tier & Question						
3-5	4-6	5-7	6-8		**Fir trees**	
			18		**Correct response**	**Additional guidance**
				3m	Gives a correct cost of £3332 to £3348 inclusive, and shows or implies a correct method for their cost eg ■ 21 [value A] × 18 = 378 (119 − 21 [value A]) × 22 = 98 [value B] × 22 = 2156 (150 − 119) × 26 = 31 [value C] × 26 = 806 378 + 2156 + 806 = £3340 ■ 20 [value A] × 18 = 360 100 [value B] × 22 = 2200 30 [value C] × 26 = 780 Answer £3340 ■ 360 + 2200 + 780 = 3340	Note to markers: For the number of trees in each height range, accept values within the following ranges: Value A: 1.2m < h ≤ 1.5m 20 to 22 inclusive [accurate value 21] Value B: 1.5m < h ≤ 1.75m 118 to 120 inclusive − their A [accurate value 98] Value C: 1.75m < h ≤ 2m 150 − their B − their A [accurate value 31] Note that correct values **must** follow through
				or **2m**	Shows a complete correct method with not more than one error eg ■ 21 × 18 = 378 *89 (error)* × 22 = 1958 40 × 26 = 1040 Answer £3376 or Shows the values 20 to 23 inclusive [value A], 117 to 120 inclusive − their A [value B] and 150 − their B − their A [value C]	Markers may find the following totals useful: 1st reading: 20 / 21 / 22 2nd reading: 118 — 3348 3344 3340; 119 — 3344 3340 3336; 120 — 3340 3336 3332
				or **1m**	Shows the values 20 to 23 inclusive, 117 to 120 inclusive and 150 or Shows a complete correct method with not more than two errors eg ■ *24 (error)* × 18 = 432 *100 (error)* × 22 = 2200 26 × 26 = 676 Answer £3308	✗ ***For 1m, values obtained by dividing 150, not reading from the graph*** eg • 150 ÷ 3 = 50, 50 × 18 = 900 50 × 22 = 1100 50 × 26 = 1300 Answer £3300

Tier & Question					Changing shape	
3-5	4-6	5-7	6-8			
			19		**Correct response**	**Additional guidance**
			a	**2m**	21	
				or **1m**	Shows a correct method eg ■ $(1.1)^2$ ■ Digits 121 seen	! *Method uses a numerical value for the sides of the square* For 1m, accept a complete correct method with not more than one computational error eg, for a square of side 6 • $6.6^2 \div 36 \times 100 = 124$ *(error)* Answer: 24% Do not accept a conceptual error such as doubling rather than squaring, or any other error that would lead to a percentage decrease rather than a percentage increase
			b	**2m**	4 (decrease) or −4	✓ *For 2m, 4 with no indication of 'decrease'* × *For 2m, indication of a 4% increase*
				or **1m**	Indicates a 4% increase or Shows or implies a complete correct method with not more than one error eg ■ $100 - \frac{120 \times 80}{100}$ ■ Digits 96 seen, with no evidence of an incorrect method ■ $1.2 \times 0.8 = 0.92$ *(error)*, so 8% ■ 20% of 100 = 20, 100 + 20 = 120, 20% of 120 = 26 *(error)*, 120 − 26 = 94, so 6%	! *Method uses numerical values for the sides of the rectangle* Mark as for part (a) but note that there must be a percentage decrease rather than a percentage increase

Tier & Question						
3-5	4-6	5-7	6-8		**Which graph?**	
			20		**Correct response**	**Additional guidance**
			a	**1m**	Indicates graph D	
			b	**1m**	Indicates graph C	
			c	**1m**	Indicates graph B	

Tier & Question						Side and angle	
3-5	4-6	5-7	6-8				
			21			**Correct response**	**Additional guidance**
			a	**2m**		17 or 17.2(…), with no evidence of accurate or scale drawing	
				or **1m**		Shows or implies a correct method with not more than one computational or rounding error eg ■ 28 × cos 52 ■ cos 52 = *0.62 (premature rounding)*, 28 × 0.62 = 17.36 ■ 28sin 38 or Shows a correct trigonometric ratio eg ■ cos 52 = $\frac{w}{28}$ ■ sin 38 = $\frac{w}{28}$	! ***For 1m, incomplete notation that omits the angle*** eg ◆ cos = $\frac{w}{28}$ Do not accept unless evaluation or other indication shows that the relevance of the angle has been understood
			b	**2m**		35 or 34.9(…), with no evidence of accurate or scale drawing	
				or **1m**		Shows or implies a complete correct method with not more than one computational or rounding error eg ■ $\tan^{-1}\frac{42}{60}$ ■ $\tan^{-1}$ 0.7 ■ Answer of 34 or Shows a correct trigonometric ratio eg ■ tan $x = \frac{42}{60}$ ■ tan $y = \frac{60}{42}$ [unmarked angle labelled as y] or The only error is to find the unmarked angle, ie gives an answer of 55 or 55.1(…), with no evidence of accurate or scale drawing	✓ ***For 1m, incomplete but unambiguous notation*** eg ◆ tan = $\frac{42}{60}$

Tier & Question						Bowl
3-5	4-6	5-7	6-8			
			22		**Correct response**	**Additional guidance**
			a	**1m**	Shows or implies correct substitution into the formula with correct evaluation of at least the part in brackets eg ■ Value between 1134 and 1147 inclusive ■ 1150 ■ 365π ■ $\frac{1}{3} \times \pi \times 5 \times 219$ ■ $5.2(\ldots) \times 219$	! *For the first mark, value(s) rounded* For $\frac{1}{3}$, accept 0.33 or better For π, accept 3.14 or 3.142 or better eg, for the first mark accept ◆ $0.33 \times 3.14 \times 5 \times 219$ ◆ $5.1(\ldots) \times 219$
				1m	Shows the correct value for the volume of the bowl to 3 significant figures, ie 1150	! ***For the second mark, follow through from an incorrect volume or incorrect working*** Accept provided their volume is greater than 1000, and needs rounding to be given correct to 3 significant figures eg, from their volume as 1031.(…) or working of $4.71(\ldots) \times 219$ accept ◆ 1030 eg, from their volume as 1030 with no working, do not accept ◆ 1030
			b	**1m**	Gives a correct formula eg ■ $\frac{1}{3}\pi a^2 h$ ■ $\frac{\pi h a^2}{3}$	! *Unconventional notation* Condone eg, accept ◆ $\pi \times h \times a \times a \div 3$ × *Formula not completely simplified* eg ◆ $\frac{\pi h a^3}{3a}$ × *Incorrect name for variable within the context of the question* eg ◆ $\frac{1}{3}\pi r^2 h$

Tier & Question						
3-5	4-6	5-7	6-8		**Two circles**	
			23		**Correct response**	**Additional guidance**
			a	**1m**	Gives a correct explanation eg ■ Since BC is a diameter of the smaller circle, any angle made by joining points B and C to a point on the circle's circumference must be 90° ■ BC is a diameter (given) A is on the circumference (intersection of circles) ∴ ∠BAC = 90 ■ Angle BAC is an angle in a semicircle, so it must be a right angle	✓ *Minimally acceptable explanation* eg ◆ BC is a diameter ◆ Angles in a semicircle × *Incomplete or incorrect explanation* eg ◆ Angle BAC must be 90° ◆ Semicircle ◆ AB is a radius of the large circle, and AC is a tangent of the larger circle, so they must be at right angles
			b	**2m** *or* **1m**	8, with no evidence of accurate or scale drawing Shows the value 64 or Shows sufficient working to indicate correct application of Pythagoras' theorem eg ■ $10^2 - 6^2$ ■ $\sqrt{100 - 36}$ ■ $10 \times 10 - 6 \times 6$ or States or implies that triangle ABC is an enlargement of a 3, 4, 5 right-angled triangle eg ■ It's a 3, 4, 5 triangle with sides × 2 or Shows a complete correct method with not more than one computational error eg ■ $AC^2 = 11^2$ *(error)* $- 6^2$ $= 85$ $AC = 9.2$	× *For 1m, error is to square then add rather than subtract* eg ◆ $AC^2 = 10^2 + 6^2$

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