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KEY STAGE
3

ALL TIERS

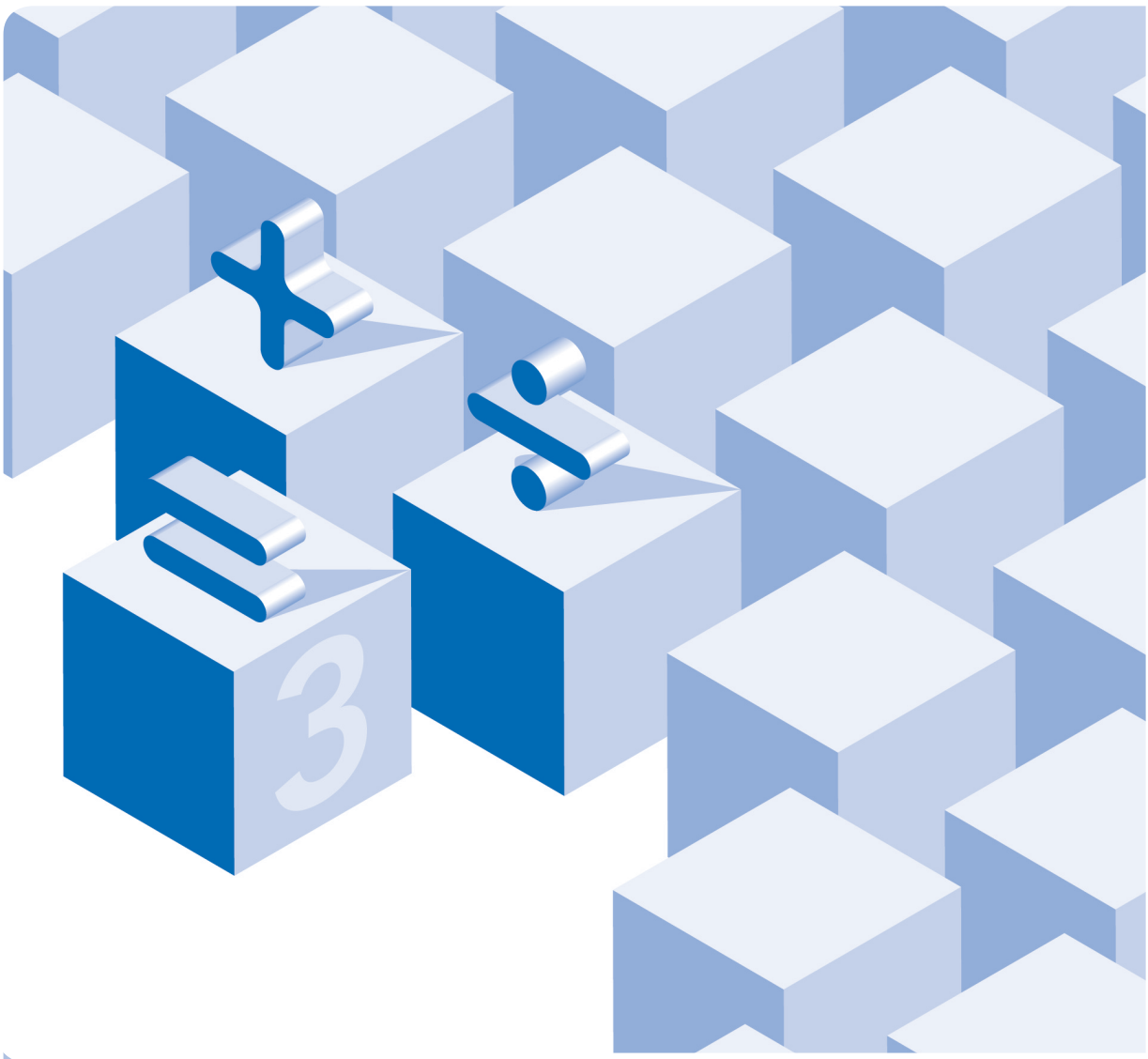
2007

Mathematics tests

Mark scheme

for Paper 1

Tiers 3–5, 4–6, 5–7 and 6–8



National curriculum assessments

Introduction

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

This booklet contains the mark scheme for paper 1 at all tiers. The paper 2 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 as the centre pages of this booklet.

The 2007 key stage 3 mathematics tests and mark schemes were developed by the Test Development team at Edexcel.

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 specifically to the marking of questions that involve money, negative numbers, algebra, time, coordinates 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>The final answer is wrong but the correct answer is shown in the working.</td><td colspan="2">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:</td></tr>
<tr><td></td><td>■ the incorrect answer is due to a transcription error</td><td>If so, award the mark.</td></tr>
<tr><td></td><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></td><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></td><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 indication of the amount eg £320, £320p or £700p
✓ The unit, £ or p, is usually printed in the answer space. Where the pupil writes an answer outside the answer space with **no** units, accept responses that are unambiguous when considered alongside the given units eg with £ given in the answer space, accept 3.20, 7 or 7.00	✗ Ambiguous use of units outside the answer space eg with £ given in the answer space, do not accept 3.20p outside the answer space
✓ Given units amended eg with £ crossed out in the answer space, accept 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 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 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 time

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

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, 2.30 min ! The unit, hours and/or minutes, is usually printed in the answer space. Where the pupil writes an answer outside the answer space, or crosses out the given unit, accept answers with correct units, unless the question has specifically asked for other units to be used.

A specific time *For example: 8:40 am 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 5:20 pm, 17:20 pm	× Incorrect time eg 8.4 am, 8.40 pm × 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 ×**
✓ Unconventional notation eg (05, 07) (five, seven) ($\overset{x}{5}$, $\overset{y}{7}$) ($x = 5$, $y = 7$)	× Incorrect or ambiguous notation eg (7, 5) ($\overset{y}{7}$, $\overset{x}{5}$) ($5x$, $7y$) (5^x, 7^y) ($x - 5$, $y - 7$)

Responses involving probability

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

For example: 0.7 $\frac{7}{10}$ *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.

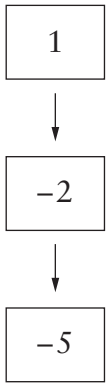
A total of 120 marks is available in each of tiers 3–5, 4–6, 5–7 and 6–8.

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 NAA website *www.naa.org.uk/tests* from Monday 25 June 2007. 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						
3-5	4-6	5-7	6-8		**Euros**	
1					**Correct response**	**Additional guidance**
				1m	305	
				1m	1005	
				1m	1030	

Tier & Question						
3-5	4-6	5-7	6-8		**Number line**	
2					**Correct response**	**Additional guidance**
				2m	Gives all three correct values in the correct positions, ie  	
				or		
				1m	Gives at least two correct values in the correct positions	! ***For 1m, follow through*** Accept as their previous incorrect value – 3, provided their previous incorrect value < 3 eg, for 1m accept • 1 *–3 (error)* –6 • *2 (error)* –1 –4

Tier & Question						
3-5	4-6	5-7	6-8		**36 times table**	
3					**Correct response**	**Additional guidance**
				1m	36	
				1m	5	
				1m U1	396	

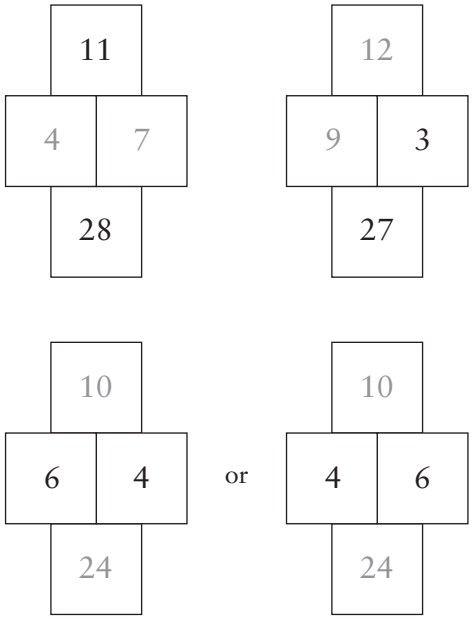
Tier & Question					Feeding times	
3-5	4-6	5-7	6-8			
4					**Correct response**	**Additional guidance**
a				**1m**	12:35(pm)	! *Throughout the question, omission of pm* Condone eg, for part (a) accept • 12:35 × *Throughout the question, incorrect times* eg, for part (a) • 12:35am
b				**1m**	Tigers	✓ *Unambiguous indication* eg • T
c				**1m**	30	
d				**1m** U1	Gives three correct times, ie Elephants at 2:15(pm) Otters at 1:00(pm) Seals at 4:00(pm) or Elephants at 3:20(pm) Otters at 1:00(pm) Seals at 4:00(pm)	✓ *Use of the 24 hour clock*

Tier & Question					Work out	
3-5	4-6	5-7	6-8			
5					**Correct response**	**Additional guidance**
				1m	121	
				1m	7	

Tier & Question						
3-5	4-6	5-7	6-8			**Dollars**
6					**Correct response**	**Additional guidance**
a				**1m**	12	
b				**1m**	5	
c				**1m**	40	

Tier & Question						
3-5	4-6	5-7	6-8			**Divisibility**
7					**Correct response**	**Additional guidance**
a				**1m**	Indicates only 15, 20 and 30, ie ☐ ✓ ☐ ✓ ✓	
b				**1m**	Indicates only 12, 15 and 30, ie ✓ ✓ ☐ ☐ ✓	
c				**1m**	Indicates only 15 and 30, ie ☐ ✓ ☐ ☐ ✓	**!** *Follow through* For part (c), accept follow through as all values indicated that were also indicated in both parts (a) and (b), provided this is not all or none of the boxes

Tier & Question					Populations	
3-5	4-6	5-7	6-8			
8	1				Correct response	Additional guidance
a	a			**1m**	Harrogate	✓ *Unambiguous indication* eg, for part (a) • H
b	b			**2m**	Completes all three of the sentences correctly, ie Ash Vale London 100	
				or **1m**	Completes two of the sentences correctly	

Tier & Question						
3-5	4-6	5-7	6-8			**Number grids**
9	2				**Correct response**	**Additional guidance**
				3m	Completes all three grids correctly, ie  	
				or		
				2m	Completes the first two grids correctly or Completes the third grid correctly and gives any two correct entries in the first two grids or Completes the third grid correctly, gives any one correct entry in the first grid, makes an error in the right hand entry of the second grid, but follows through correctly to give their product	
				or		
				1m	Gives any two correct entries in the first two grids or Completes the third grid correctly or Gives any one correct entry in the first grid, makes an error in the right hand entry of the second grid, but follows through correctly to give their product	
				U1		

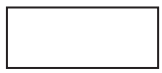
Tier & Question						
3-5	4-6	5-7	6-8		**Babies**	
10	**3**				**Correct response**	**Additional guidance**
a	a			**1m**	Gives a value greater than 62.5, but less than 63.5	
				1m	Gives a value greater than 52.5, but less than 53.5	! *The two values in part (a) transposed but otherwise correct* Mark as 0, 1
b	b			**1m**	Indicates the correct point at (34, 72)	! *Inaccurate indication* Accept any unambiguous indication within 2mm of the correct intersection of the grid

Tier & Question						
3-5	4-6	5-7	6-8		**Cards for fractions**	
11	**4**				**Correct response**	**Additional guidance**
a	a			**1m**	Gives either $\frac{2}{6}$ or $\frac{4}{12}$	
b	b			**1m**	Gives a correct fraction between $\frac{1}{2}$ and 1, ie $\frac{4}{6}, \frac{6}{8}, \frac{6}{10}, \frac{8}{10}, \frac{8}{12}$ or $\frac{10}{12}$	

Tier & Question						
3-5	4-6	5-7	6-8			**Pentagon perimeter**
12	5				**Correct response**	**Additional guidance**
				1m	Shows or implies that the length of one side is 5.4cm ± 0.2cm eg ■ 5.4 ± 0.2 seen ■ 54 ± 2 seen ■ Answer of 26, 26.5, 27, 27.5 or 28 with no evidence of incorrect working ■ Answer of 260, 265, 270, 275 or 280 with no evidence of incorrect working	Markers may find the following values useful: Side length | Perimeter *5.1* | *25.5* 5.2 | 26 5.3 | 26.5 5.4 | 27 5.5 | 27.5 5.6 | 28 *5.7* | *28.5* × ***For the first mark, more than one value for the side length is given***
				1m	Shows or implies a correct method for finding their perimeter eg ■ Intention to multiply their side length by 5 ■ Intention to add all 5 of their side lengths ■ Answer of 26, 26.5, 27, 27.5 or 28 with no evidence of incorrect working ■ Answer of 260, 265, 270, 275 or 280 with no evidence of incorrect working ■ 5.4 seen, answer of *25.20 (error)* ■ 5.4 seen, answer of *45 (error)* ■ *5 (error)* seen, answer of 25	✓ ***For the second mark, follow through from their side length(s)*** × ***For the second mark, response does not show or imply an unambiguous or clear method for finding their perimeter***
				1m	Gives the correct value for their perimeter eg ■ Answer of 26, 26.5, 27, 27.5 or 28 with no evidence of incorrect working ■ Answer of 260, 265, 270, 275 or 280 with units amended to mm, and no evidence of incorrect working	! ***For the third mark, follow through from their side length(s)*** Accept follow through provided their calculation involves 'bridging the units' eg, from a side length of 5.7 accept ◆ 28.5 eg, from a side length of 5.1 do not accept ◆ 25.5

Tier & Question					Multiple and factor	
3-5	4-6	5-7	6-8			
13	6				Correct response	Additional guidance
a	a			**1m**	Gives two different 3-digit multiples of 4 eg ■ 100 104 ■ 132 236	
b	b			**1m**	Gives a 2-digit factor of 100, ie 10, 20, 25 or 50	! *Factors of 100 given that do not have 2 digits* eg, for both marks in part (b) ◆ 100 1 ◆ 2 5 Mark as 0, 1
				1m	Gives a different 2-digit factor of 100 from any credited for the first mark of part (b)	! *2-digit factors of 100 given within factor pairs* eg, for both marks in part (b) ◆ 10 × 10 20 × 5 ◆ 25 × 4 50 × 2 Mark as 0, 1 × *Negative factors*

Tier & Question					Same number	
3-5	4-6	5-7	6-8			
14	7				Correct response	Additional guidance
a	a			**1m**	7.5	✓ *Equivalent fractions and decimals*
b	b			**1m**	Gives the value 1.5 in each of the three boxes	

Tier & Question						
3-5	4-6	5-7	6-8		**Squares**	
15	**8**				**Correct response**	**Additional guidance**
				1m U1	Indicates No and gives a correct explanation eg ■ A rectangle is four-sided and also has four right angles	✓ *Minimally acceptable explanation* eg ◆ Rectangle ◆  ! *Response names rectangles, but also implies there are other examples* Condone provided there are no other incorrect examples named eg, accept ◆ Many shapes have four right angles, for example a rectangle eg, do not accept ◆ A rhombus and a rectangle must have four right angles × *Incomplete explanation* eg ◆ There is another four-sided shape with four right angles

Tier & Question						
3-5	4-6	5-7	6-8		$x = 8$	
16	**9**	**1**			**Correct response**	**Additional guidance**
a	a	a		**1m**	Indicates only 40, ie ☐ ☐ ✓ ☐ ☐	
b	b	b		**1m**	Indicates only 16, ie ☐ ☐ ✓ ☐ ☐	
c	c	c		**1m**	Indicates only 64, ie ☐ ☐ ☐ ✓ ☐	

Tier & Question						
3-5	4-6	5-7	6-8		**Grid**	
17	10	2			**Correct response**	**Additional guidance**
				3m	Gives all six correct values in the table, then gives the correct answer to the multiplication, ie	

×	**100**	40	3
30	**3000**	**1200**	**90**
6	600	**240**	18

Answer: **5148**

				or		
				2m	Gives at least four correct values in the table, even if the answer to the multiplication is incorrect or omitted or Gives at least three correct values in the table, then follows through to add correctly their six values that would give the answer to the multiplication or Gives the answer to the multiplication as 5148, even if the grid has not been used or has incorrect entries	
				or		
				1m	Gives at least three correct values in the table, even if the answer to the multiplication is incorrect or omitted or Gives at least two correct values in the table, then follows through to add correctly their six values that would give the answer to the multiplication	
				U1		

Tier & Question				Sweets		
3-5	4-6	5-7	6-8			
18	11	3			Correct response	Additional guidance
a	a	a		1m	$\frac{1}{20}$ or equivalent probability	
b	b	b		1m	Indicates green	✓ *Unambiguous indication of colour* eg ◆ G

Tier & Question				Completing calculations		
3-5	4-6	5-7	6-8			
19	12	4			Correct response	Additional guidance
				1m	Gives any two values that add to give –8 eg ■ –4 + –4 ■ 5 + –13 ■ 0 + –8	✓ *Fractions, decimals or negatives* × *Given operation changed* eg, for the first mark ◆ 0 – 8
				1m	Gives any two values that subtract to give –8, in the correct order eg ■ 2 – 10 ■ –5 – 3 ■ –12 – –4 ■ 0 – 8	

Tier & Question						
3-5	4-6	5-7	6-8			**Rectangles**
20	**13**	**5**			**Correct response**	**Additional guidance**
				2m	Gives three different pairs of positive numbers with a product of 24 eg ■ 1 24 2 12 3 8 ■ 4 6 1.5 16 5 4.8	× *Two correct values repeated in reverse order*
				or		
				1m	Gives two different pairs of positive numbers with a product of 24	

Tier & Question						
3-5	4-6	5-7	6-8			**Percentages**
21	**14**	**6**			**Correct response**	**Additional guidance**
a	a	a		**2m**	Gives all three correct values, ie 40 4 0.8	✓ *Throughout the question, equivalent fractions and decimals* ! *Throughout the question, incorrect use of percentage sign* Condone
				or		
				1m	Gives any two correct values	! *For 1m, follow through* Accept follow through as their 1st value ÷ 10 and/or their 2nd value ÷ 5 eg, for 1m accept ◆ *30 (error)* 3 0.6 ◆ 40 *0.4 (error)* 0.08
b	b	b		**1m**	44.8	! *Follow through as the sum of their three values from part (a)* Accept provided the sum is less than 80

Tier & Question						
3-5	4-6	5-7	6-8		**Positive and negative**	
22	**15**	**7**			**Correct response**	**Additional guidance**
a	a	a		**1m**	18	
b	b	b		**1m**	2	
c	c	c		**1m**	Indicates the equation $y = x^2$, ie 	

Tier & Question						
3-5	4-6	5-7	6-8		**Barrels**	
23	**16**	**8**			**Correct response**	**Additional guidance**
				2m	Gives all three correct fractions in their simplest form, ie $\frac{1}{4}$ $\frac{1}{3}$ $\frac{2}{3}$	× *Equivalent decimals*
				or		
				1m	Gives any two correct fractions in their simplest form or Shows a correct first step of simplification for all three correct fractions, even if there is incorrect subsequent simplification eg ■ $\frac{3}{12}$ $\frac{9}{27}$ $\frac{18}{27}$	! *For 1m, follow through* Accept their third fraction as their second fraction × 2, provided all three fractions are given in their simplest form eg, for 1m accept ◆ $\frac{1}{4}$ $\frac{1}{4}$ *(error)* $\frac{1}{2}$

Tier & Question				*Marking overlay available*	**Speed**	
3-5	4-6	5-7	6-8			
	17	9	1		**Correct response**	**Additional guidance**
	a	a	a	**1m**	Draws a straight line on the graph joining the points (0, 0) and (60, 30) within the tolerance as shown on the overlay (ie within 2mm), and labels the line 30 km/hour	✓ ***Unambiguous labelling*** eg, for 30 km/hour • 30 ! ***Labels omitted or incorrect*** For two correct lines of full length with labels omitted, mark as 0, 1 Do not accept incorrect labels ! ***Lines not of full length*** For two correct lines at least 5cm long but not of full length, mark as 0, 1 Do not accept lines less than 5cm long
	b	b	b	**1m**	Draws a straight line on the graph joining the points (0, 0) and (30, 60) within the tolerance as shown on the overlay (ie within 2mm), and labels the line 120 km/hour	

Tier & Question					Grey and black designs	
3-5	4-6	5-7	6-8			
	18	10	2		Correct response	Additional guidance
	a	a	a	**1m**	25	× *Equivalent fractions or decimals*
	b	b	b	**2m**	3 : 2	× *For 2m, correct ratio given in the form n : 1 or 1 : n* eg • 1.5 : 1 • $1 : \frac{2}{3}$
				or		
				1m	Gives the ratio 3 : 2 but includes words, letters or symbols eg ■ 3 grey : 2 black ■ $g = 3 : b = 2$ or Shows a correct ratio even if not in its simplest form, or there is incorrect further working eg ■ 60 : 40 ■ 6 : 4 ■ 1.5 : 1 ■ $1 : \frac{2}{3}$ or Gives the ratio 2 : 3	! *For 1m, incorrect use of percentage sign* Condone only within the ratio 3 : 2, ie for 1m accept 3% : 2%

Tier & Question					Counter probabilities	
3-5	4-6	5-7	6-8			
	19	11	3		**Correct response**	**Additional guidance**
	a	a	a	**2m**	Completes the table with the three correct values in the correct positions, ie Colour of counters / Number of counters / Probability Red / 6 / $\frac{2}{5}$ Blue / 3 / $\frac{1}{5}$ Green / 6 / $\frac{2}{5}$	✓ *Equivalent probabilities* × *Incorrect notation* eg • $\frac{1}{2.5}$
				or **1m** U1	Gives at least one correct value in the correct position	
	b	b	b	**1m** U1	Indicates that the probability has decreased, ie ☐ ✓ ☐ ☐	

Tier & Question					Three straight lines	
3-5	4-6	5-7	6-8			
	20	12	4		Correct response	Additional guidance
				1m U1	Gives a = 50 and gives a correct reason eg ■ Angle a is on a straight line with 130, so a = 180 – 130 ■ a is supplementary with 130, so a + 130 = 180 ■ The angle vertically opposite 130 is 130, 360 – (130 + 130) = 100, (angles at a point) a is $\frac{100}{2}$ = 50 (also vertically opposite)	✓ *Minimally acceptable reason* eg ◆ On a straight line ◆ Supplementary ◆ Opposite angles and angles at a point × *Informal reason without the correct geometrical property identified* eg ◆ 180 – 130 ◆ $\frac{360 - 260}{2}$ × *Incomplete reason* eg ◆ It is adjacent to the 130° angle
				1m U1	Gives b = 60 and gives a correct reason eg ■ Angle b is vertically opposite the 60° angle, so it is also 60° ■ The angle on a straight line with b is 120, so b is 360 – 120 – 120 – 60 (angles at a point)	✓ *Minimally acceptable reason* eg ◆ Opposite ◆ Angles on a straight line and angles at a point × *Informal reason without the correct geometrical property identified* eg ◆ b is equal to the 60° angle next to it × *Incomplete reason* eg ◆ It is the same as the 60° angle

Tier & Question					Three straight lines (cont)	
3-5	4-6	5-7	6-8			
	20	12	4		Correct response	Additional guidance
				1m U1	Gives $c = 70$ and gives a correct reason eg ■ There are 180° in a triangle, so $c = 180 - 50 - 60$ ■ The exterior angle of a triangle is equal to the sum of the two opposite interior angles, so $c = 130 - 60$	✓ *Minimally acceptable reason* eg ◆ Angles in a triangle ◆ Exterior angle = sum of two opposite interior angles ◆ We've already got 50 and 60 in the triangle ! *Follow through* Accept as 180 – (their $a + b$), alongside a correct reason referring to angles in a triangle, or as 130 – their b alongside a correct reason referring to an exterior angle of a triangle × *Informal reason without the correct geometrical property identified* eg ◆ $180 - (a + b)$ ◆ $130 - b$ × *Incomplete reason* eg ◆ It is in a triangle ◆ All the inside angles add up to 180°

Tier & Question					**Ninths**	
3-5	4-6	5-7	6-8			
	21	**13**	**5**		**Correct response**	**Additional guidance**
	a	a	a	**1m**	Indicates $\frac{1}{10}$ and $\frac{1}{100}$, ie ☑ ☐ ☐ ☑ ☐	
	b	b	b	**1m**	Indicates 11%, ie ☐ ☐ ☐ ☑ ☐	
	c	c	c	**1m**	$\frac{2}{9}$	✓ *Equivalent fractions* × *Equivalent decimals or percentages* × *Incorrect notation* eg • $\frac{1}{4.5}$

Tier & Question					**Equation**	
3-5	4-6	5-7	6-8			
	22	**14**	**6**		**Correct response**	**Additional guidance**
				2m	$\frac{1}{2}$ or equivalent	
				or		
				1m	Shows or implies a correct first step of algebraic manipulation that removes the brackets eg ■ $2 \times 2n + 2 \times 5 = 12$ ■ $4n + 10 = 12$ ■ $2n + 5 = 6$ ■ $4n = 2$ ■ $2n = 1$ ■ $2 \div 4$ ■ $1 \div 2$	

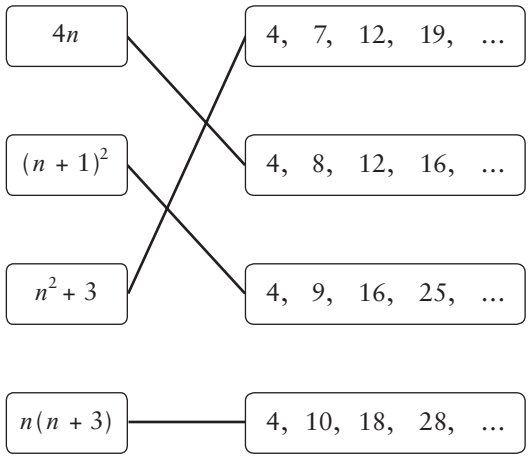
Tier & Question					Circle working	
3-5	4-6	5-7	6-8			
	23	15	7		**Correct response**	**Additional guidance**
				1m	Gives a correct explanation The most common correct explanations:	
					Show the correct working eg ■ It should be π × 16 not π × 8 ■ Needs to be π × radius^2, not π × diameter	✓ *Minimally acceptable explanation* eg ◆ 16 ◆ 4^2 ◆ 4 × 4 ◆ r^2 ◆ πr^2 × *Incomplete explanation* eg ◆ The 8 is wrong
					Address the misconception eg ■ He is finding the circumference not the area ■ He is using $2\pi r$, not πr^2 ■ He has done 4 × 2 instead of 4^2	✓ *Minimally acceptable explanation* eg ◆ Circumference ◆ It's not $2\pi r$ [or πd] ◆ He didn't square the 4 ◆ He didn't square the radius ! *Use of 'perimeter' for 'circumference'* Condone × *Incomplete explanation* eg ◆ He used the wrong formula ◆ He used the diameter ◆ He hasn't used the radius ◆ He doubled the radius
					Show that his working gives an incorrect answer eg ■ He gets 25.(…), but it should be 50.(…) ■ His answer is half as big as it should be	✓ *Minimally acceptable explanation* eg ◆ 50, not 25 ◆ It should be his answer × 2 × *Incomplete explanation* eg ◆ 50 ◆ His answer is too small
				U1		

Tier & Question						
3-5	4-6	5-7	6-8		**Thinking fractions**	
	24	**16**	**8**		**Correct response**	**Additional guidance**
				1m	6	
				1m	12	

Tier & Question						
3-5	4-6	5-7	6-8		**Cube**	
	25	**17**	**9**		**Correct response**	**Additional guidance**
			a	**1m**	$54x^2$	× *Unsimplified expression or unconventional notation* eg • $9x^2 \times 6$ • $9x^2 + 9x^2 + 9x^2 + 9x^2 + 9x^2 + 9x^2$ • $54xx$
			b	**2m**	Gives a correct, simplified expression, ie $27x^3$ or $(3x)^3$	! *Unsimplified expression or unconventional notation* eg • $3^3 \times x^3$ • $27 \times x \times x \times x$ For 2m, do not accept For 1m, condone
				or		
				1m	Shows or implies a correct method for finding the volume of the cube with not more than one error eg ▪ $3x \times 3x \times 3x$ ▪ $9x^2 \times 3x$ ▪ $9 \times 3 \times x^3$ ▪ $(\sqrt{9x^2})^3$	× *Conceptual error* eg • $\sqrt{9x^2} = 9x$ *(error)* $9x \times 9x \times 9x = 729x^3$

Tier & Question					Random numbers	
3-5	4-6	5-7	6-8			
		18	10		Correct response	Additional guidance
		a	a	**1m**	98	× *Key not interpreted* eg • 9|8
		b	b	**1m** U1	Gives a correct explanation that refers to the ordering of some or all of the numbers eg ■ He could find the row with the 28th number in it, then put that row in order to get the right one ■ If the row for the 50s is put in order, it is easier ■ He could put the numbers in each row in order of size	✓ *Minimally acceptable explanation* eg • Order the 5 row • The 6th line needs to go in order • Put it in order × *Incomplete or incorrect explanation* eg • He should rearrange the diagram • He needs to put the middle row in order ! *Explanation refers to producing a cumulative frequency chart* As this is not the simplest method available, do not accept without a complete explanation of method

Tier & Question					Geometric mean	
3-5	4-6	5-7	6-8			
		19	11		Correct response	Additional guidance
		a	a	**1m**	90	
		b	b	**1m** U1	Indicates Yes and gives a correct explanation eg ■ –2 × 8 = –16, but you can't find the square root of a negative number ■ Multiplying negative by positive gives a negative, but √negative is impossible ■ The numbers must be both positive or both negative for a positive product, as you can't find the square root of a minus number	! *Indicates No* Accept provided their explanation refers to imaginary numbers eg, accept ◆ You can use an imaginary number ◆ 4*i* eg, do not accept ◆ –4 ✓ *Minimally acceptable explanation* eg ◆ You can't find the square root of a minus number ◆ You can't find the square root of –16 × *Incomplete or incorrect explanation* eg ◆ You can't find the square root ◆ When you do √–16 the calculator would say 'error' ◆ –2 × 8 = –16, which is not a square number ◆ It doesn't work with negative numbers ◆ The numbers must be both positive or both negative ◆ –2 × 8 = –18, but then you can't do √–18

Tier & Question					Sequences	
3-5	4-6	5-7	6-8			
		20	12		**Correct response**	**Additional guidance**
		a	a	**2m**	Matches all four *n*th term rules correctly, ie  	! ***Rule matched to more than one sequence*** For 2m or 1m, do not accept as a correct match
				or		
				1m	Matches at least two *n*th term rules correctly	
		b	b	**2m**	4, 11, 30 and 67, in the correct order	
				or		
				1m	Gives at least two of the four correct terms, even if their positions are incorrect or Shows the values 1, 8, 27 and 64 or Shows a complete correct method for all four terms provided the 'cubed' has been interpreted, even if there is further incorrect working eg ▪ 1 × 1 × 1 + 3 2 × 2 × 2 + 3 3 × 3 × 3 + 3 4 × 4 × 4 + 3	

Tier & Question						
3-5	4-6	5-7	6-8		**Rhombus**	
		21	**13**		**Correct response**	**Additional guidance**
				2m	145	
				or		
				1m	Shows the value 35 or Shows a complete correct method with not more than one computational error eg ■ 180 – 110 = 70, 180 – 70 ÷ 2 ■ (540 – 110 – 70 – 70) ÷ 2 ■ 180 – 110 = 70 70 ÷ 2 = *25 (error)* 180 – 25 = 155	

Tier & Question						
3-5	4-6	5-7	6-8		**Counters**	
		22	**14**		**Correct response**	**Additional guidance**
				2m	5	
				or		
				1m	Shows or implies that half the counters are green or that half are red or black eg ■ $1 - \frac{1}{3} - \frac{1}{6} = 1 - \frac{2}{6} - \frac{1}{6}$ $= \frac{3}{6}$ ■ Green is $\frac{3}{6}$ ■ $\frac{1}{3} + \frac{1}{6} = \frac{1}{2}$ ■ Total = 30 ■ Red + black = 15 or Shows or implies a complete correct method with not more than one computational error eg ■ 15 × 2 ÷ 6 ■ 15 ÷ 3	
				(U1)		

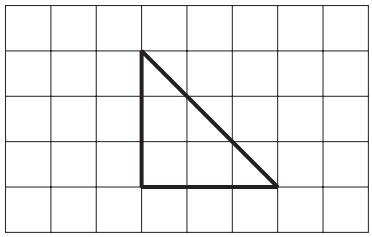
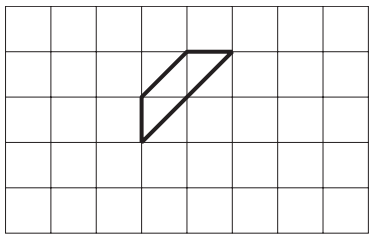
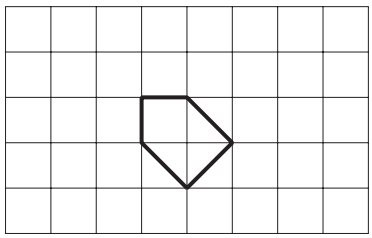
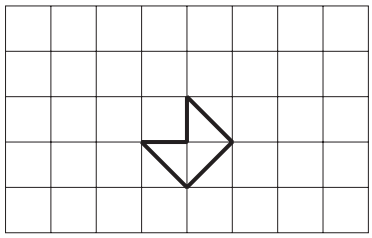
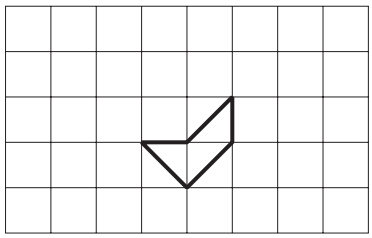
Tier & Question						
3-5	4-6	5-7	6-8	*Marking overlay available*	**Fence plan**	
		23	**15**		**Correct response**	**Additional guidance**
				2m	Completes the perpendicular bisector, fulfilling the four conditions below: 1. Ruled 2. Within the tolerance as shown on the overlay 3. Touching or crossing both roads 4. Evidence of correct construction arcs that are centred on A and B, are of equal radii, and show at least one intersection	! *Use of construction arcs on the overlay* Note that these are to give a visual guide as to whether the correct centres have been used, and do not indicate tolerance × *Spurious construction arcs* Do not accept arcs drawn without compasses or arcs that do not show a distinct intersection, eg arcs that just touch ! *Perpendicular bisector is not a solid line* Condone provided the pupil's intention is clear
				or		
				1m	Completes the perpendicular bisector with all of conditions 1 to 3 fulfilled or Fulfils condition 4, even if the perpendicular bisector is incorrect or omitted	

Tier & Question						
3-5	4-6	5-7	6-8		**Powers**	
		24	**16**		**Correct response**	**Additional guidance**
				1m	12	! *Answer embedded in working* Accept provided there is no ambiguity and any statements made are correct eg, for the first mark accept • 5^{12} [shown in working] Otherwise, penalise only the first occurrence eg, for the first and second marks • $m = 5^{12}$ $n = 5^4$ Mark as 0, 1
				1m	4	! *Incomplete processing* Penalise only the first occurrence eg, for the first and second marks • 8 + 4 8 – 4 Mark as 0, 1

Tier & Question						
3-5	4-6	5-7	6-8			**Dissection**
		25	**17**		**Correct response**	**Additional guidance**
				2m	Gives both correct pairs of dimensions eg ■ A: 6cm by 8cm (either order) B: 2cm by 8cm (either order)	
				or		
				1m	Gives one correct pair of dimensions, even if assigned to the incorrect rectangle eg ■ 6cm by 8cm (either order) seen ■ 2cm by 8cm (either order) seen or Shows or implies that the ratio of the shorter side of A to the shorter side of B is also 3 : 1, even if there is incomplete processing or other incorrect working eg ■ 6, 2 seen as shorter sides ■ 48 ÷ 8, 16 ÷ 8 ■ $3 \times 8x = 8y$ ■ Answer of A: 3cm by 4cm B: 1cm by 4cm ■ The side of the square is *6cm (error)*, so A is 4.5cm wide and B is 1.5cm wide	× *48, 16 seen without further processing*

Tier & Question						Coins
3-5	4-6	5-7	6-8			
		26	18		Correct response	Additional guidance
				2m	Gives the correct set of eight coins, ie 1p, 1p, 2p, 2p, 2p, 2p, 5p, 10p in any order	
				or		
				1m	Shows the set of four coins 1p, 2p, 2p, 20p or	
					Shows evidence of understanding that the total number of coins must be $4x$ and the number of 1p coins must be x, where $x \neq 1$ eg ■ 1p, 1p, 2p, 2p, 2p, 5p, 5p, 10p ■ It could be three 1p coins and twelve coins altogether ■ For every four coins there is one 1p and three that are not 1p	× ***For 1m, number of coins is not a multiple of 4, even if total value is 25p*** eg ◆ 1p, 1p, 2p, 2p, 2p, 2p, 5p, 5p, 5p
				(U1)		

Tier & Question						
3-5	4-6	5-7	6-8			**Increases by 3**
			19		**Correct response**	**Additional guidance**
				2m	Gives all three correct values, ie 3 6 9	
				or		
				1m	Gives two correct values	**!** *Incomplete processing* Withhold only 1m for the first occurrence eg, for 1m accept • 3 2 × 3 3 × 3 **!** *For 1m, follow through* For the second value, accept their first value × 2, provided this does not give a value of 0 or 2 For the third value, accept their first value × 3 or their second value × $\frac{3}{2}$, provided this does not give a value of 0 or 3

Tier & Question					Perimeters	
3-5	4-6	5-7	6-8			
			20		**Correct response**	**Additional guidance**
			a	**1m**	Draws the correct triangle in any orientation eg ■ 	! *Lines not ruled or accurate* Accept provided the pupil's intention is clear ! *Side lengths labelled* Ignore, even if incorrect
			b	**1m**	Draws a correct shape in any orientation, ie  or  or  or 	

Tier & Question						
3-5	4-6	5-7	6-8		**More powers**	
			21		**Correct response**	**Additional guidance**
				1m	100	
				1m	6	

Tier & Question						
3-5	4-6	5-7	6-8		**Threes**	
			22		**Correct response**	**Additional guidance**
			a	**1m**	Indicates Odd and gives a correct explanation eg ■ Odd × odd = odd and since 3 is odd, it doesn't matter how many times you do 3 × 3 × 3… the answer will still be odd ■ 3 is odd, so 3 × 3 gives an odd answer 9, then 9 × 3 gives an odd answer 27 and so on	✓ *Minimally acceptable explanation that states or implies that 3 is odd* eg ◆ Odd × odd = odd and 3 is odd ◆ It's 3 × 3 × 3… and odd × odd = odd ◆ 3 is odd, so multiplying it by itself over and over again will always give an odd answer ◆ Any power of an odd number is odd, eg $3^2 = 9$ × *Incomplete or incorrect explanation* eg ◆ Odd × odd = odd ◆ You get $3^2 = 9$, $3^3 = 27$ etc and they always come out to be odd ◆ It's 3 multiplied by itself 100 times ◆ It can't be even ◆ Whenever 3 has a power the answer is always odd ◆ Because 3 is an odd number ◆ Multiplying by 3 always gives an odd answer
				U1		
			b	**1m**	Indicates only the value 3^{200}, ie ☑ ☐ ☐ ☐ ☐	

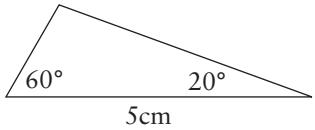
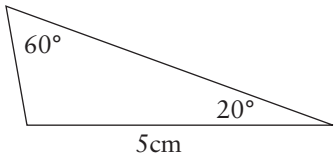
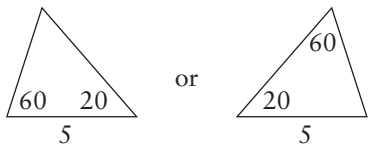
Tier & Question						Tan 35
3-5	4-6	5-7	6-8			
			23		Correct response	Additional guidance
			a	**1m**	7	
			b	**1m**	Gives the value 70 with a correct method, including evidence that the height of the triangle has been taken as 7 eg ■ $\frac{20 \times 7}{2} = 70$ ■ $10 \times 7 = 70$ ■ $20 \times 3.5 = 70$ ■ tan 35 × 10 × 10	× *Method used is accurate or scale drawing* ! *Follow through* Accept follow through as 10 × their (a) instead of 70 and their (a) instead of 7 eg, with their (a) as 0.07 accept ◆ $\frac{20 \times 0.07}{2} = 0.7$

Tier & Question				Tests		
3-5	4-6	5-7	6-8			
			24		Correct response	Additional guidance
			a	1m	Indicates False and gives a correct explanation eg ■ The median was about 44.5 ■ The median is at the 2500th value and when you read the graph down from that value you can see it is greater than 40 ■ Only 1750 pupils got up to 38 marks and you need 2500 for the median ■ About 1750 pupils scored 38 or less which is the 35th percentile ■ Up to 38 is only 1750 pupils and that's less than half	! *Range of values* For the median on paper 1, accept 44 to 45 inclusive For the position of the median, accept 2500 or 2500.5 For a value corresponding to a mark of 38, accept 1700 to 1800 inclusive, or 34% to 36% inclusive ✓ *Minimally acceptable explanation* eg ◆ 44 to 45 inclusive seen ◆ Correct value for the median on paper 1 marked on *x*-axis ◆ The 2500th mark is bigger than 38 ◆ 1750 and 2500 seen ◆ 1750 and 35% seen × *Incomplete explanation* eg ◆ The 2500th value is not 38 ◆ 38 is not in the middle of the cumulative frequency ◆ 38 is too small to be the median ◆ Most pupils scored more than 38
			b	1m	Indicates True and gives a correct explanation eg ■ The LQ is about 33.5 The UQ is about 56.5 56.5 – 33.5 = 23 or Indicates either True or False and gives evidence that the inter-quartile range is between 22 and 24 inclusive, excluding 23 eg ■ The LQ is about 33 The UQ is about 57 57 – 33 = 24	! *Range of values* For the lower quartile on paper 1, accept 33 to 34 inclusive For the upper quartile on paper 1, accept 56 to 57 inclusive For the position of the lower and upper quartiles, accept 1250 or 1250.25 and 3750 or 3750.75 respectively ✓ *Minimally acceptable explanation* eg ◆ Correct values for the lower and upper quartiles on paper 1 marked on *x*-axis ◆ 33 to 34 inclusive and 56 to 57 inclusive seen ◆ From the 1250th to the 3750th marks is about 23 × *Incomplete explanation* eg ◆ The lower quartile taken away from the upper quartile gives 23 [no indication of quartiles on graph]

Tier & Question						Tests (cont)	
3-5	4-6	5-7	6-8				
			24			Correct response	Additional guidance
			c	1m		Indicates False and gives a correct explanation The most common correct explanations: Use values from the graph eg ■ The median on paper 1 is 44.5, the median on paper 2 is 51.5, so paper 1 is harder ■ About 850 pupils got less than 30 marks on paper 1 but only about 250 did on paper 2 ■ About 400 pupils got more than 65 marks on paper 1, but about 600 did on paper 2 Use or interpret the relative positions of the lines eg ■ The graph for paper 2 is always lower ■ The dotted line is always on the right of the other line ■ The marks on paper 2 were higher	! *Range of values* For the median on paper 1, accept 44 to 45 inclusive For the median on paper 2, accept 51 to 52 inclusive For any other values on the *x*-axis, accept the correct values ± 0.5 For corresponding values on the *y*-axis, accept the correct values ± 50 ✓ *Minimally acceptable explanation* eg ◆ The median on paper 1 is lower than the median on paper 2 ◆ More people got lower marks [paper 1 implied] ◆ Fewer people got lower marks on paper 2 ◆ More people got better marks on paper 2 ◆ The line for paper 1 is higher × *Incomplete or incorrect explanation* eg ◆ Paper 2 was easier ◆ Everybody's score is higher in paper 2 than in paper 1
				(U1)			

Tier & Question						
3-5	4-6	5-7	6-8			**Circle angle**
			25		**Correct response**	**Additional guidance**
				2m	50, with no evidence of an incorrect method	
				or		
				1m	Shows or implies that angle ABC is 90° or Shows a complete correct method with not more than one computational error eg ■ 180 – 110 – 30 = 40, 90 – 40 ■ 180 – 70 – 60 ■ 110 + 30 – 90	

Tier & Question						
3-5	4-6	5-7	6-8			**Inequalities**
			26		**Correct response**	**Additional guidance**
				1m	Gives two non-zero values x then y such that $\lvert x \rvert > \lvert y \rvert$ and either $x < 0$ or $y < 0$ eg ■ 2 ÷ –1 ■ –10 ÷ 4	
				1m	Gives two non-zero values x then y such that $\lvert x \rvert < \lvert y \rvert$ and either $x < 0$ or $y < 0$ eg ■ –1 ÷ 2 ■ 4 ÷ –10	

Tier & Question					Drawing triangles	
3-5	4-6	5-7	6-8			
			27		**Correct response**	**Additional guidance**
				1m	Indicates No and gives a correct explanation The most common correct explanations:	
					Show how the two triangles could be different eg ■ One could draw:  But the other one could draw:  ■ There are 3 different triangles possible because the 5cm side could be opposite the 20°, the 60° or the other angle ■ One could have those angles on either side of the 5cm line, but the other could have those angles on either side of a different line	✓ *Minimally acceptable explanation* eg ◆ The 5cm side could be in different places compared to the angles ! *Diagrams inaccurate* Accept provided the response makes the position of the 5cm sides relative to the angles clear eg, accept ◆  × *Incomplete explanation* eg ◆ They could have drawn three different triangles ◆ The angles are the same but the lengths may be different
					Reason generally from known facts eg ■ For them to be congruent, you need to know that the positions of the angles and sides correspond in the two triangles ■ It needs to be AA corresponding side, but we don't know the order in the two triangles	✓ *Minimally acceptable explanation* eg ◆ You don't know if there are corresponding sides × *Incomplete explanation* eg ◆ You don't know the arrangement of the side and angles, so you can't be sure
				U1		

Index to mark schemes

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