Index to mark schemes

First published in 2002

Produced in Great Britain by the Qualifications and Curriculum Authority under the authority and superintendence of the Controller of Her Majesty's Stationery Office and Queen's Printer of Acts of Parliament.

The Qualifications and Curriculum Authority is an exempt charity under Schedule 2 of the Charities Act 1993.

Qualifications and Curriculum Authority
83 Piccadilly
London
W1J 8QA
www.qca.org.uk/

Further teacher packs may be purchased (for any purpose other than statutory assessment) by contacting:
QCA Publications, PO Box 99, Sudbury, Suffolk CO10 2SN
(tel: 01787 884444; fax: 01787 312950)

Order ref: QCA/02/831

Ma

KEY STAGE 3

ALL TIERS

2002

Mathematics tests

Mark scheme for Paper 2

Tiers 3–5, 4–6, 5–7 and 6–8

QCA Guarding standards

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

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 and the extension paper mark schemes are printed in separate booklets. Questions have been given names so that each one has a unique identifier irrespective of tier.

The structure of the mark schemes

The marking information for questions is set out in the form of tables, which start on page 10 of this booklet. The columns on the left-hand side of each table provide a quick reference to the tier, question number, question part, and the total number of marks available for that question part.

The '**Correct response**' column usually includes two types of information:

- a statement of the requirements for the award of each mark, with an indication of whether credit can be given for correct working, and whether the marks are independent or cumulative;
- examples of some different types of correct response, including the most common and the minimum acceptable.

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

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.

General guidance

Using the mark schemes

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

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

What if …

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

What if ...

<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 coordinates

For example: (5, 7)

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

Responses involving the use of algebra

For example: 2 + n n + 2 2n

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

Responses involving probability

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

For example: 0.7

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

Recording marks awarded on the test paper

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

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

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

Awarding levels

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

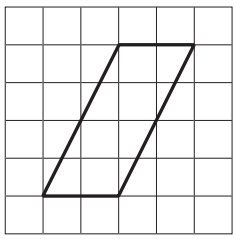
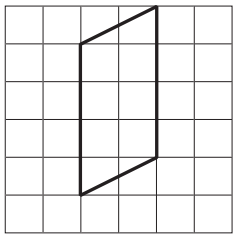
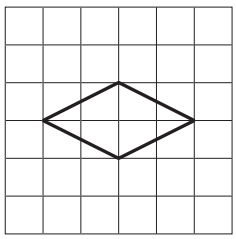
Schools will be notified of pupils' results by means of a marksheet, which will be returned to schools by the External Marking Agency with the pupils' marked scripts. The marksheet will include pupils' scores on the test papers and the levels awarded.

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

Tier & Question						Game
3-5	4-6	5-7	6-8			
1					**Correct response**	**Additional guidance**
a				**1m**	430	
b				**1m**	609	
c				**1m**	391	! *Follow through as 1000 – their (b)* Accept, provided their (b) < 1000

Tier & Question					*Marking overlay available*	Travelling to school
3-5	4-6	5-7	6-8			
2					**Correct response**	**Additional guidance**
a				**1m**	5	
b				**1m**	6	
c				**1m**	4	
d				**1m**	Indicates the triangle west of the school	! *More than one symbol ringed* Do not accept if more than one triangle is ringed. Accept if the only triangle ringed is the correct one, as some pupils may mark the diagram to help with other parts of the question
e				**2m** *or* **1m**	Draws a square, within the angle tolerance as shown on the overlay, touching the 3km line Fulfils any two of the three conditions below. The symbol drawn is a square; has direction within the angle tolerance as shown on the overlay; touches the 3km line	! *Square not accurate* Accept, including in any orientation, provided there is no ambiguity within the context of the question ! *Square touches the lines indicating the angle tolerance* Accept, provided the square does not extend beyond the dashed lines shown on the overlay ! *Rings round existing symbols* Ignore in part (e)

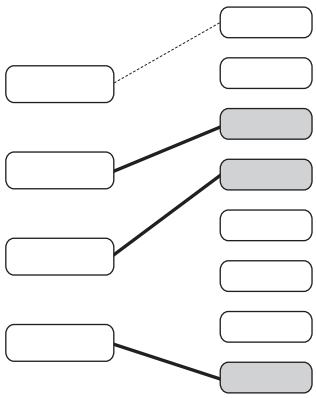
Tier & Question					Holiday	
3-5	4-6	5-7	6-8			
3					**Correct response**	**Additional guidance**
a				**1m**	£ 10	✗ *Incorrect response* eg • – 10
b				**3m** *or* **2m**	£ 22 Shows the digits 22 eg ■ 220 ■ 2.20 or Shows the values 586 and 608 or Shows one of the values 586 and 608 and correctly subtracts using their incorrect total eg ■ Woman 586, man *648 (error)*, 648 − 586 = 62 ■ 194 + 196 + 196 = *486 (error)* 289 + 319 = 608 so it's 122 more or Shows a complete correct method with the only error in the final answer eg ■ 289 + 319 − (194 + 196 + 196) = *32 (error)* *or* **1m** Shows one of the values 586 or 608	

Tier & Question					Describing shapes	
3-5	4-6	5-7	6-8			
4					**Correct response**	**Additional guidance**
a				**1m**	Draws a square	! *Lines not ruled, or internal lines drawn* Accept provided the pupil's intention is clear
b				**1m**	Draws a rectangle, or draws a square that is a different size from the one in part (a)	
c				**1m**	Draws a parallelogram with no right angles eg ▪  ▪  ▪ 	
d				**2m** *or* **1m**	All four entries correct, ie 4 4 2 4 At least two entries correct	✓ *Unambiguous indication that the sides are the same length* eg, for the final value of 4 • All • The • Yes

Tier & Question					**School trip**	
3-5	4-6	5-7	6-8			
5					**Correct response**	**Additional guidance**
a				**1m**	60	
b				**2m**	All three correct, ie 5 6 10	
				or **1m**	Any two correct	

Tier & Question					**Place names**	
3-5	4-6	5-7	6-8			
6	**1**				**Correct response**	**Additional guidance**
a	a			**1m**	49	
b	b			**1m**	30	

Tier & Question					Dinner time	
3-5	4-6	5-7	6-8			
7	**2**				**Correct response**	**Additional guidance**
a	a			**2m**	All three rows correct, ie ☐ ☐ ☑ ☐ ☐ ☑ ☑ ☐ ☐	! *Frequencies shown* For 2m or 1m, if the correct box for a row has been identified ignore any frequencies shown, even if incorrect. If the correct box for a row has not been identified, and all 9 frequencies are correct, mark as 1, 0 eg • 38 18 42 36 26 44 36 28 30
				or **1m**	Any two rows correct	
b	b			**2m**	12	
				or **1m**	Shows at least one of the following totals: 106 (or 70), 94 (or 58) or Shows both of the differences 2 and 14, with no evidence of an incorrect method	! *Signs incorrect* Ignore

Tier & Question					**Which calculation?**	
3-5	4-6	5-7	6-8			
8	**3**				**Correct response**	**Additional guidance**
a	a			**1m**	Joins the first to 4 – 3	The following shows the correct responses: 
				1m	Joins the second to (3 × 27) + (4 × 25)	
				1m	Joins the third to (4 × 25) – (3 × 27)	
b	b			**1m**	The question refers to the total number of pupils in year 9 eg ▪ Altogether, how many people are in year 9? ▪ How many pupils are there in year 9?	✓ ***Response is a statement rather than a question*** eg, for the first category ◆ It's the total number of people in year 9 ◆ All the pupils in all the classes in the oldest year
					or	✗ ***Incomplete response*** eg ◆ How many pupils altogether?
					The question refers to both 4 and 25, and interprets the significance of the multiplication sign eg ▪ How many pupils are there altogether in 4 classes of 25?	✓ ***Response processes the 4 × 25 correctly*** eg ◆ Altogether there are 100 pupils in year 9 ◆ 100 pupils are in year 9
					or	✗ ***Incomplete response*** eg ◆ How many pupils altogether in 4 classes? ◆ It's the number of classes in year 9 with the number of students ◆ Four classes with 25 pupils in year 9
					Interprets the calculation in a valid way whilst still referring to year 9 eg ▪ If there were always 4 classes in year 9, how many classes would there have been in 25 years?	✗ ***Response does not refer to the given context*** eg ◆ 25 pupils each have 4 rulers. How many rulers do they have altogether? ✗ ***Response matches a different calculation*** eg ◆ If there are 100 students in year 9 and only 4 teachers, how many pupils are in each class?

Tier & Question					Throwing coins	
3-5	4-6	5-7	6-8			
9	4				Correct response	Additional guidance
a	a			**1m**	Indicates 'True' and gives a correct explanation that implies there are two outcomes, both of which are equally likely eg ▪ There are two equally likely possibilities, heads or tails ▪ A head is just as likely as a tail ▪ Both sides are equally likely	✓ *Minimally acceptable explanation* eg, implicit reference to equally likely ◆ There are 2 sides ◆ It can land on H or T eg, implicit reference to two outcomes ◆ It's 50 – 50 ◆ It's an even chance ◆ As it's a fair coin × *Incomplete explanation* eg ◆ You don't know what will come up next ◆ Coins sometimes land on heads ◆ It is equal ◆ It's a fair chance
b	b			**1m**	Indicates 'False' and gives a correct explanation The most common correct explanations: State the outcome cannot be predicted with certainty eg ▪ Each throw is random ▪ You don't know what you will get. It's just chance ▪ You don't know until you've thrown ▪ You never know which side the coin will land on Show there are alternative outcomes eg ▪ You might get 4 heads ▪ There are more possibilities like HHHH, HHHT, HHTH and so on ▪ You could get just one tail	✓ *Minimally acceptable explanation* eg, for the first category ◆ It's random ◆ It's chance eg, for the second category ◆ You might get something different ◆ You don't know that's what you'll get ◆ Each one could land on any side ! *Explanation refers to one throw of one coin* Condone provided reference is made to both uncertainty and two outcomes eg ◆ It can land on either side ◆ It could land on H or T × *Incomplete explanation* eg ◆ It could be anything ◆ You don't know ◆ It's not certain × *Incorrect or ambiguous explanation* eg ◆ There are five different outcomes ◆ You are as likely to get 3 heads and 1 tail ◆ It's 50 – 50

Tier & Question						
3-5	4-6	5-7	6-8		**Folding**	
10	**5**				**Correct response**	**Additional guidance**
a	a			**2m**	Both correct, ie 12 by 4 (either order) and 6 by 8 (either order) *or* **1m** One correct, the other incorrect or omitted	
b	b			**1m**	3	

Tier & Question						
3-5	4-6	5-7	6-8		**Yards**	
11	**6**	**1**			**Correct response**	**Additional guidance**
a	a	a		**1m**	91.44	✓ *91 or 91.4*
b	b	b		**2m**	109 or 109.(…) with no evidence of an incorrect method *or* **1m** Shows the digits 109(…) but the decimal point is positioned incorrectly or omitted or Shows the correct inverse operations, in any order eg ■ × 100, ÷ 2.54, ÷ 36 or Shows ÷ 91.44	! *Answer of 110* Accept provided a more accurate value or a correct method is seen × *Correct answer from an incorrect method* eg • 100 − 91.44 = 8.56, 100 + 8.56 is about 109 ! *Answers to parts (a) and (b) reversed* Treat as a misread and deduct the first mark only

Tier & Question						Scales
3-5	4-6	5-7	6-8			
12	7	2			Correct response	Additional guidance
a	a			**1m**	14 to 14.2 inclusive	
b	b			**1m**	220 to 230 inclusive	✓ *Fractional value*
c	c			**2m** *or* **1m**	35 to 36 inclusive Shows how to use the scale to find 1000g, even if the scale is read incorrectly eg ▪ Work out what it is for 100g, then × 10 ▪ 400g + 400g + 200g ▪ 200g is 7, 5 × 7 ▪ 100g is 4 *(error)* ounces, 4 × 10 ▪ 500g is 17 *(error)*, then double 17 ▪ 250 is 9, 9 × 4 = *32 (error)* or Shows a correct multiplication, or a correct addition, that would give an answer within the correct range, even if this is followed by incorrect processing eg ▪ 3.6 × 10 ▪ 5 × 7 ▪ 14 + 14 + 7	! *Follow through from part (a)* Accept provided it is explicit in the working that the method incorporates this incorrect value ✗ *Poor mathematical communication* Do not infer incorrect reading of the scale eg ◆ 3 × 10 (No indication of method through written working or through markings on the scale, and answer to the calculation is outside the acceptable range)

Tier & Question						
3-5	4-6	5-7	6-8		**Security lock**	
13	**8**	**3**			**Correct response**	**Additional guidance**
a	a	a		**2m**	24, with no incorrect working	✗ *24 obtained from listing that includes duplication*
				or		
				1m	Shows a correct method eg ▪ 4 × 6 ▪ There are 6 ways for the letter A and it is the same for each of the other letters or Lists in a systematic way for any one of the letters or any one of the numbers eg ▪ C1, C2, C3, C4, C5, C6 ▪ A / 6, 5, 4, 3, 2, 1 ▪ A1, B1, C1, D1	
b	b	b		**1m**	$\frac{1}{6}$ or equivalent probability	! *Decimal or percentage rounded or truncated* Accept 0.17 or 0.167 or 0.166(…), or the equivalent % values. Do not accept 0.16

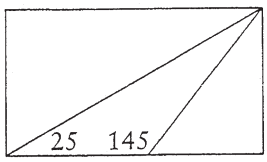
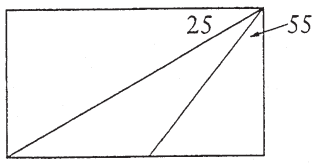
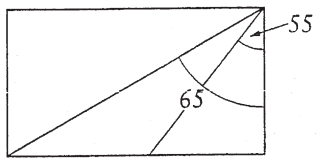
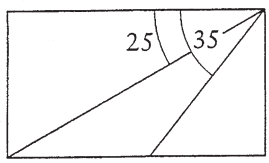
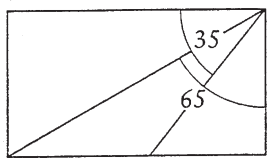
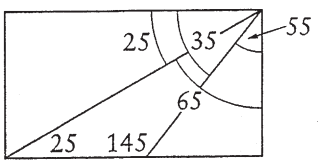
Tier & Question						
3-5	4-6	5-7	6-8		**Screenwash**	
14	**9**	**4**			**Correct response**	**Additional guidance**
a	a	a		**1m**	600	
b	b	b		**1m**	50	
b	b	b		**1m**	Indicates 'No' and gives a correct explanation The most common correct explanations: State that 25% implies a total of 4 parts but there are 5 eg ▪ There are 5 parts not 4 ▪ There are 4 parts of water not 3 State what 25% would imply eg ▪ 25% would be 1 part screenwash to 3 parts water ▪ It would give a total of 125% Refer to the correct percentage of 20% eg ▪ It's 20% ▪ 1 out of 5 = 20 out of 100	✓ *Minimally acceptable explanation* eg, for the first category ◆ 1 : 4 means 5 parts altogether ◆ It's 1 out of 5 ◆ There are 5 parts ✓ *Use of information from part (a)* eg ◆ 150ml × 5 = 750 not 600 ✗ *Incomplete explanation* eg ◆ It's less than a quarter screenwash ◆ It's more than 75% water ◆ There are more than 4 parts ◆ 1 part with 4 parts

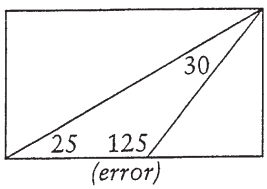
Tier & Question				*Marking overlay available*		**Net**
3-5	4-6	5-7	6-8			
15	10	5			**Correct response**	**Additional guidance**
a	a	a		**1m**	Indicates the correct shape, ie 	
b	b	b		**1m**	Lines correct ie uses a ruler to draw both straight lines from a common point, within the tolerance for length as implied by the overlay	✓ *Lines correct length but outside of the arcs shown on the overlay*
				1m	Angle correct ie draws or indicates the angle within the tolerance as shown on the overlay	
				1m	Arc correct ie draws the arc within the tolerance as shown on the overlay. (Ignore continuation of the arc beyond the lines denoting the angle)	✓ *Follow through from an incorrect angle* ! *Follow through from incorrect straight lines* Accept, provided both lines are the same length and compasses have been used. Note the dashed lines on the overlay are a visual aid to help identify those who have not used compasses × *Arc shown as a series of points* ! *Extra information added to the net in an attempt to show a 3-D drawing* Penalise one mark only, by withholding the final mark that would otherwise have been awarded

Tier & Question					Piles of cards	
3-5	4-6	5-7	6-8			
16	11	6			**Correct response**	**Additional guidance**
a	a	a		**1m**	Correct expression eg ■ $4n + 5$ ■ $6n + 8 - (2n + 3)$	✗ *Incorrect expression* eg, for part (a) ◆ $6n + 8 - 2n + 3$ eg, for part (b) ◆ $6n + 8 \div 2$
b	b	b		**1m**	Correct expression eg ■ $3n + 4$ ■ $\frac{6n + 8}{2}$ ■ $(6n + 8) \div 2$	✓ *Correct expression repeated* eg ◆ $3n + 4$ and $3n + 4$
c	c	c		**2m** *or* **1m**	105 Shows the value 20 or Using an incorrect value of n, evaluates $5n + 5$ correctly eg, from $n = 26$ ■ $5 \times 26 + 5 = 135$ eg, from $n = 23$ ■ 120 or Using an incorrect value of n, evaluates $6n + 8$ correctly and then subtracts 23 eg, from $n = 24$ ■ $6 \times 24 + 8 = 152$, $152 - 23 = 129$ eg, from $n = 23$ ■ $6 \times 23 + 8 = 146$, $146 - 23 = 123$	! *Value for n if not stated* Accept if embedded eg ◆ $5 \times 21 + 5 = 110$ Do not accept if not specified and not embedded eg ◆ 120 (neither $n = 23$, nor $5 \times 23 + 5$ shown)

Tier & Question					Cycling	
3-5	4-6	5-7	6-8			
17	12	7			**Correct response**	**Additional guidance**
				2m	Gives a correct explanation The most common correct explanations: Show the mean is 39.9 which is less than 40 eg ■ 32.3 + 38.7 + 43.5 + 45.1 = 159.6, 159.6 ÷ 4 = 39.9 which is 0.1 too small ■ 39.9 < 40	! *Response does not refer to 40* eg ◆ The mean is 39.9 Accept provided this is not accompanied by an incorrect statement eg, for 2m do not accept ◆ 159.6 ÷ 4 = 39.9 so she rode more than 40km a day
					Show the total distance is 159.6 which is less than 160 eg ■ 40 × 4 = 160, 160 > 159.6	! *That 159.6 is less than 160 is not stated explicitly* The values of 159.6 and 160 must be shown, but accept implicit comparison eg ◆ It's 159.6 not 160 As in the previous category, for 2m do not accept a correct response accompanied by an incorrect statement
					Compare and interpret the daily differences in distance from 40 eg ■ − 7.7 + − 1.3 + 3.5 + 5.1 = − 0.4 so it's under 40 ■ 7.7 + 1.3 > 3.5 + 5.1	× *No interpretation* eg ◆ On Mon she did 7.7km less, Tues was 1.3km less, Wed was 3.5km more, Thurs was 5.1km more ! *Values rounded* eg ◆ 32 + 39 + 44 + 45 = 160 so the mean is 40
				or **1m**	Shows the value 159.6 or 160 or Shows a correct method to find the mean, or the difference between the mean and 40, with not more than one computational error eg ■ 32.3 + 38.7 + 43.5 + 45.1 = *158.6 (error)* 158.6 ÷ 4 = 39.65 ■ *− 8.7 (error)* − 1.3 + 3.5 + 5.1 = − 1.4 or Describes a complete correct method but does not completely evaluate eg ■ When you add them all up it doesn't come to more than 4 × 40	Mark as 1, 0 ! *Median calculated correctly* Accept for 1m, provided the word median is used and the statement is contradicted eg, accept for 1m ◆ The median is 41.1 so she is correct eg, do not accept ◆ The average is 41.1 so she is correct × *Incomplete method with no evaluation or interpretation* eg ◆ (32.3 + 38.7 + 43.5 + 45.1) ÷ 4

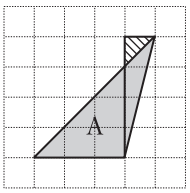
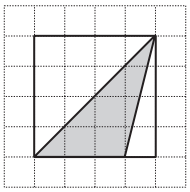
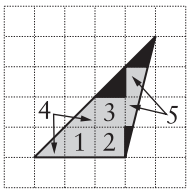
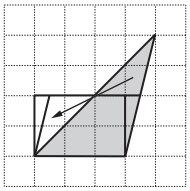
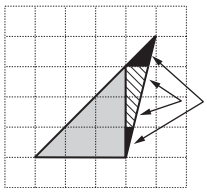
Tier & Question					Same volume	
3-5	4-6	5-7	6-8			
	13	8	1		Correct response	Additional guidance
	a	a	a	**1m**	Correct volume, ie 60	! *The value of 60 is shown to the power of 3* eg ◆ 60^3 ◆ 60^3cm Assume the power refers to units, ie mark as 1, 0
				1m	Correct units eg ■ cm^3 ■ Centimetres cubed	✓ *Informal but unambiguous language* eg ◆ Cube centimetres
	b	b	b	**1m**	6	! *Follow through as their part (a) ÷ 10* Accept provided the value is exact and not rounded ! *Incorrect units inserted* Ignore

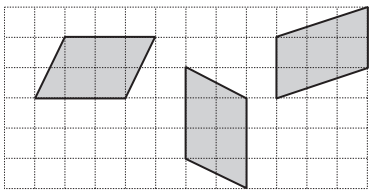
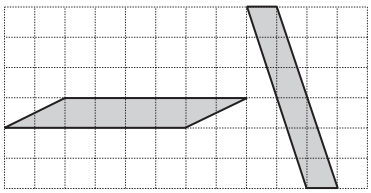
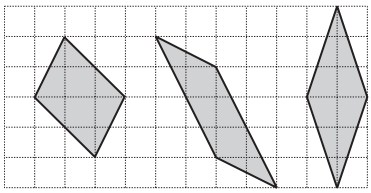
Tier & Question						
3-5	4-6	5-7	6-8		**Angles again**	
	14	**9**	**2**		**Correct response**	**Additional guidance**
				3m	10, with a correct and unambiguous method that clearly identifies the relevant angles being used by use of letters or, minimally, on the diagram The most common correct methods: Calculate ∠CAK and ∠AKC eg ■ ∠CAK = 25 (90 – 65) ∠AKC = 145 (180 – 35) 180 – 25 – 145 Use triangles ADC and KCB eg ■ ∠ACD = 25 (180 – 90 – 65) ∠KCB = 55 (180 – 90 – 35) 90 – 25 – 55 Use alternate angles to find ∠ACB then subtract ∠KCB eg ■ ∠ACB = 65 (alternate angles) ∠KCB = 55 (180 – 90 – 35) 65 – 55 Use alternate angles to find ∠KCD then subtract ∠ACD eg ■ ∠KCD = 35 (alternate angles) ∠ACD = 25 (90 – 65) 35 – 25 Use alternate angles to find ∠ACB and ∠KCD, and recognise that the total of these is 90 + *a* eg ■ ∠ACB = 65 (angles in a Z) ∠KCD = 35 (angles in a Z) (65 + 35) – 90	! ***Angles identified through a single letter*** Condone if otherwise unambiguous eg, for identification of ∠AKC accept ◆ K ✓ ***Minimally acceptable indication of method*** eg ◆  ◆  ◆  ◆  ◆  ! ***Redundant angles identified*** The mathematical communication should not allow ambiguity. Hence for 3m all of the identified angles must be correct. Note to markers: The correct angles are: 

Tier & Question					Angles again (cont)	
3-5	4-6	5-7	6-8			
	14	9	2		Correct response	Additional guidance
				or **2m**	Indicates *a* is 10, even if the relevant angles are not identified clearly or correctly or Shows a complete correct method with the relevant angles clearly identified and with not more than one computational error, and follows through correctly to find their ∠ACK or Identifies clearly any two of the six correct angles as shown previously, even if others are incorrect	✓ *Minimally acceptable indication of method* eg • 
				or **1m**	Shows a complete correct method with not more than one computational error, and follows through correctly to find their ∠ACK, but their angles are not clearly identified or Identifies clearly any one of the six correct angles as shown previously, even if others are incorrect	

Tier & Question						
3-5	4-6	5-7	6-8		**Photos**	
	15	**10**	**3**		**Correct response**	**Additional guidance**
				4m	Gives a correct conclusion eg ▪ Film size 24, by £ 5.30	! *Method used is price per photo* This correct method will lead to a correct answer provided the values are not rounded or truncated If the values are rounded or truncated, mark as 1, 1, 0, 0 eg ◆ 24 size is 16p per photo, 36 is 17p per photo so 24 is cheaper by 1p per photo ◆ £3.74 ÷ 24 = 15p, £6.14 ÷ 36 = 17p 2 × 360 so £7.20 cheaper for 24 size
				or		
				3m	Shows £ 56.1(0) **and** £ 61.4(0) (the correct total cost for both film sizes) or Concludes film size 24, by £ 8.30 (only error is to omit the cost of postage or assume the total postage is the same) or Shows £ 56.1(0) or £ 61.4(0), and at least two of the values shown in the table below for the other film size, then follows through to their final conclusion Note there must not be more than one error throughout 24 film *(56.10)* | 36 film *(61.40)* £ 32.25 | £ 26.5(0) (buying film) £ 14.85 | £ 28.9(0) (printing film) £ 9 | £ 6 (postage) £ 23.85 | £ 34.9(0) (printing & postage)	
				or		
				2m	Shows £ 56.1(0) **or** £ 61.4(0) or Shows all values correct from two rows of the table above or Shows £ 47.1(0) and £ 55.4(0) (error is to omit cost of postage) or Concludes film size 24, by £ 11.05 (only error is to omit cost of buying film) or Concludes film size 36, by £ 8.75 (only error is to omit cost of printing film)	! *Both numbers of films incorrect* For 2m, provided the numbers of films are different, allow follow through to their final conclusion. Note the final answer must be the difference between (£6.14 × *their 10*) and (£3.74 × *their 15*) For 1m, allow correct evaluation of either total cost, ie £6.14 × *their 10*, or £3.74 × *their 15*, even if their numbers of films are the same
				or		
				1m	Shows all values correct from one row of the table above or Shows 15 and 10 (the correct number of films needed for both film sizes)	

Tier & Question						
3-5	4-6	5-7	6-8			**Equating**
	16	**11**	**4**		**Correct response**	**Additional guidance**
	a	a	a	**1m**	8	✓ ***Values substituted into the given equations*** Ignore
				1m	−3	✗ ***Incomplete processing***
	b	b	b	**1m**	Writes a correct expression eg ■ $3a + 6b - (2c - d)$ ■ $3a + 6b - 2c + d$ ■ $3a + 6b - 3$ ■ $7(2c - d)$ ■ $14c - 7d$ ■ $2c - d + 18$ ■ $\frac{7}{8}(3a + 6b)$	✗ ***Incorrect expression*** eg ◆ $3a + 6b - 2c - d$ ◆ $7 \times 2c - d$ ◆ $2c - d \times 7$ ✗ ***Expression uses only one of a or b, or only one of c or d*** Note these are not possible without substitution of specific values and such expressions must therefore be incorrect

Tier & Question					Same areas	
3-5	4-6	5-7	6-8			
	17	12	5		Correct response	Additional guidance
	a	a	a	**1m**	Correct explanation that states the area of the rectangle is 6 and justifies why the area of the triangle is also 6 The most common correct justifications for the triangle: Show, or imply by correct substitution, the relevant formula eg ■ $\frac{1}{2} b \times h$ ■ $b \times h \div 2$ ■ $3 \times 4 \div 2$ ■ 1.5×4 Divide the triangle into two parts as shown, then justify why the area of the smaller triangle is 1.5 eg ■  Area of A = 4.5 Area of rest of shape would be 2 but half is not shaded, so it's 4.5 + 2 − 0.5 Show the area of the triangle is half that of the enclosing square, less 2 eg ■  Area = $4^2 \div 2 - 2$ Show correct groupings eg ■  Area of triangle is 5 as shown and the bits shaded black makes 6 Use dissection eg ■ 	! *Units given* Ignore ! *Areas not evaluated* Accept if unambiguous and equated eg • $3 \times 2 = 3 \times 4 \div 2$ × *Incomplete explanation* eg • You add up the halves • Count the squares, join halves then join little bits to make 6 × *Spurious explanation* eg • One of the sloping sides marked as 4 and used as the height of the triangle • Triangle incorrectly grouped to show 6 Note to markers: Correct responses based on grouping must include the following pairings: 

Tier & Question					Same areas (cont)	
3-5	4-6	5-7	6-8			
	17	12	5		Correct response	Additional guidance
	b	b	b	**1m**	Draws a parallelogram, with no right angles, that has an area of 6 eg, base 3 perpendicular height 2, or vice-versa ▪  eg, base 6 perpendicular height 1, or vice-versa ▪  eg, a parallelogram consisting of two triangles each of base 3 and height 2, or vice-versa ▪ 	**!** *Not accurate and/or lines not ruled* Accept provided the pupil's intention is clear

Tier & Question						
3-5	4-6	5-7	6-8		**Libraries**	
	18	**13**	**6**		**Correct response**	**Additional guidance**
	a	a	a	**1m**	Indicates 'False' and gives a correct justification The most common correct justifications: Interpret the significance of 362.5 (± 10) eg ■ Half of 725 is 362.5 but it only fell to 500 ■ 363 < 500 ■ It fell to 500 but it should have dropped to about 360 ■ The drop is about 225 but it would need to be 362.5 State or imply that half of 725 < 500 eg ■ 500 is more than half of 725 State or imply that 500 × 2 > 725 eg ■ If you double the value for 1998 you would get 1000 libraries but there were far fewer than that open in 1988	! *Values read from the graph or calculated* Accept 725 ± 10 and 362.5 ± 10 and qualified approximations such as 'about 700' but do not accept incorrect calculations eg ◆ 725 ÷ 2 = *312.5 (error)* < 500 ✓ *Minimally acceptable justification* eg ◆ Half of 725 is 362.5 not 500 ◆ The graph doesn't fall as low as 360 × *The significance of 362.5 (± 10) is not interpreted* eg ◆ Half of 725 is 362.5 ✓ *Minimally acceptable justification* eg ◆ It only dropped from 725 to 500 ◆ 725 halved isn't 500 ◆ 500 is not half of 725 × *Numbers stated without interpretation* eg ◆ It dropped from 725 to 500 ! *Ambiguous reference to 'more than half' or 'less than half'* As the reference could be to the fall or the number of libraries open, condone ✓ *Explanation interprets the misconception prompted by the graph* eg ◆ Because the scale doesn't start at zero, it looks as if it has dropped much more than it has in reality

Tier & Question					Libraries (cont)	
3-5	4-6	5-7	6-8			
	18	13	6		Correct response	Additional guidance
	b	b	b	**1m**	Indicates 'Cannot be certain' and gives a correct justification that you cannot predict beyond the data set eg ■ No data is given for those years ■ The diagram doesn't show 2004 so there is not enough information ■ The trend might change ■ Although the graph shows the number is decreasing, we cannot know for certain that it will continue	✓ *Minimally acceptable justification* eg ◆ The diagram doesn't show 2004 ◆ It only goes to 1998 ◆ You can't predict the future ◆ Who can tell what will happen? ◆ Anything might happen ◆ They might decide they've closed enough ◆ There could be an increase or a decrease ◆ More libraries could open ◆ There is not enough information given ! *Justification describes the graph* Ignore if accompanying a correct response, otherwise do not accept eg, accept ◆ The graph is not falling at a steady rate and anything might happen eg, do not accept ◆ It is not falling at a steady rate ◆ The chart doesn't go in a steady pattern ◆ It is levelling out so there will probably be about 475 × *Incomplete justification* eg ◆ Some libraries could close down ◆ It is uncertain

Tier & Question					*Marking overlay available*	**Equations**
3-5	4-6	5-7	6-8			
	19	**14**	**7**		**Correct response**	**Additional guidance**
		a	a	**1m**	Draws a straight line within the tolerance, and at least of length, as specified by the overlay	! *Points not plotted* Ignore × *Points not joined*
		b	b	**2m** *or* **1m**	Draws a curve within the tolerance as specified by the overlay between (1, 12) and (12, 1), even if the curve is incorrect or omitted elsewhere The curve is within tolerance between (2, 6) and (6, 2), even if incorrect or omitted elsewhere or Plots 6 points correctly	

Tier & Question					**Walk**
3-5	4-6	5-7	6-8		
	20	**15**	**8**		**Correct response**	**Additional guidance**
				1m	Indicates 'steady speed', ie ☐ ☐ ☐ ✓ ☐	

Tier & Question					Swimming clubs	
3-5	4-6	5-7	6-8			
		16	**9**		**Correct response**	**Additional guidance**
		a	a	**1m**	Both correct, ie Mean as 25 years 3 months Range as 4 years 8 months	✓ *Years and months omitted* eg • 25, 3 4, 8
		b	b	**1m**	Indicates 'less than 1 year', ie ☐ ☐ ☑ ☐ ☐	
				1m	Indicates 'not possible to tell', ie ☐ ☐ ☐ ☐ ☑	

Tier & Question					*Marking overlay available*	**Arrow**
3-5	4-6	5-7	6-8			
	21	**17**	**10**		**Correct response**	**Additional guidance**
		a	a	**2m**	Correct enlargement within the tolerance as shown on the overlay, with vertices joined	! *Lines not ruled* Accept provided the pupil's intention is clear
				or **1m**	At least 5 vertices correct or The only error is to use an incorrect centre of enlargement, ie the enlargement is the correct size as shown by the overlay, with vertices joined, but is in the incorrect place	! *Construction lines shown* Ignore ✓ *For 1m, scale factor – 2*
		b	b	**1m**	Arrow head length as 4	
				1m	Angle as 40	
				1m	Vertical height as 12	

Tier & Question					**Questions**	
3-5	4-6	5-7	6-8			
		18	**11**		**Correct response**	**Additional guidance**
		a	a	**1m**	0.15 or equivalent probability	
				1m	0.65 or equivalent probability	
		b	b	**1m**	14	✓ *40 used within the answer* Accept eg • 14 out of 40 • $\frac{14}{40}$

Tier & Question						
3-5	4-6	5-7	6-8		**Circling**	
		19	**12**		**Correct response**	**Additional guidance**
				3m	25π or 78.5(...) or 79	✖ *For 3m, percentage truncated to 78* ! *Incorrect units seen within working* Ignore
				or **2m**	Shows or implies a correct method, even if values have been rounded or truncated eg ■ $\frac{9\pi}{36} \times 100$ ■ $9\pi \div 36$ ■ $\frac{\pi}{4}$ ■ $28.2(...) \div 6^2$ ■ $9\pi = 28$ *(rounded)*, $28 \div 36 = 0.778$ ■ $36 - 28.2$ *(truncated)* = 7.8, $7.8 \div 36 = 22$ *(rounded)*, $100 - 22$ ■ 78 or The only error is to give the percentage that is not shaded, ie 21.5 or 21.4(...) or 21	The following values are commonly seen Markers may find them useful $\pi \times 3^2$ 28, 28.2(...), 28.3 $(\pi \times 3)^2$ 88 to 89 inclusive $\pi^2 \times 3$ 29 to 30 inclusive ! $\pi 3^2$ *not evaluated or otherwise interpreted* As a common error is to evaluate $\pi 3^2$ as $(\pi 3)^2$, do not accept as evidence of a correct method
				or **1m**	Shows or implies a correct method for the area of the circle, even if the value has been rounded or truncated eg ■ 9π ■ $3 \times 3 \times \pi$ ■ 28.27(...) ■ 28 or Divides their area, even if incorrect, by 36 eg ■ $\pi 3^2 = 88.8$, $88.8 \div 36$	✓ *Their area represents the unshaded part of the diagram*

Tier & Question						Blackbirds
3-5	4-6	5-7	6-8			
		20	13		Correct response	Additional guidance
			a	**1m**	Indicates 'True' and gives a correct explanation eg ■ There are no males that are 121 – 125 ■ Males start at 126 – 130, females start at 121 – 125 ■ Some females are in the smallest category ■ The smallest female wing length is not on the male chart	✓ *Minimally acceptable explanation* eg ◆ The grey bar does not appear on the male chart ✓ *End points of categories taken as exact* eg ◆ No male is smaller than 126 ◆ The smallest female might be 125 but the smallest a male could be is 126 ! *Explanation refers to a bird being at the end point of a category* For both marks, accept reference to the possibility of such an occurrence but do not accept a definitive statement eg, for the first mark accept ◆ The smallest female could be 121, but the smallest a male could be is 126 eg, for the first mark do not accept ◆ The smallest female is 121, but the smallest male is 126 × *Incomplete explanation* eg ◆ 121 is less than 126
				1m	Indicates 'Not enough information' and gives a correct explanation eg ■ They are both within the same category so we need actual values ■ Both could be 140, we don't know ■ The exact lengths could be anything from 136 – 140 ■ Both have birds in 136 – 140 ■ All the males might be 136 but there might be a female that is 140	✓ *Minimally acceptable explanation* eg ◆ The charts don't show the sizes of individual birds ◆ You need the actual values ◆ It shows percentages not values ✓ *Explanation interprets the misconception prompted by the graph* eg ◆ Just because for 136 – 140 there is a bigger percentage of males than females, it doesn't mean the males must be bigger × *Incomplete explanation* eg ◆ The range is not given

Tier & Question						
3-5	4-6	5-7	6-8			**Blackbirds (cont)**
			13		**Correct response**	**Additional guidance**
			b	**3m**	Gives a value that is greater than 132 but smaller than or equal to 133, and shows a complete correct method that encompasses the stages described below 1. The correct mid-points of 128, 133 and 138 are identified 2. The percentages used are within range and sum to 100 3. The intention to multiply mid-points by percentages is shown or implied 4. The answer is calculated correctly from the sum of their multiplications	! *Range of percentages* Accept within the following values: 21 to 24 inclusive, 59 to 62 inclusive, 16 to 19 inclusive ! ***Stage 3 not shown and their mean is given to the nearest integer*** As spurious methods lead to seemingly correct values, do not accept as evidence of the intention to multiply
				or **2m**	Within an otherwise correct method, only one of stages 1, 2 and 4 is incorrect, or stage 4 is omitted eg, stage 1 incorrect ■ 21 × 128.5 + 60 × 133.5 + 19 × 138.5 = 13340 so mean is 133.4 eg, stage 2 incorrect ■ 128 22 2816 133 62 8246 138 18 2484 (*% sum to 102*) 13546 ÷ 100 (or 102), mean is 135 (or 133) eg, stage 4 omitted ■ 128 × 22 = 2816 133 × 61 = 8113 138 × 17 = 2346	
				or **1m**	Within an otherwise correct method, two of the stages are incorrect eg, stages 1 and 2 incorrect ■ 128.5 20 133 60 138.5 20 13320 ÷ 100 = 133.2 (stage 3 not shown but implied both by the correct total and the corresponding mean)	

Tier & Question						
3-5	4-6	5-7	6-8		**Percentage change**	
		21	**14**		**Correct response**	**Additional guidance**
		a	a	**1m**	Indicates 70×1.09	
				1m	Gives a correct numerical interpretation for one of the calculations, even if it is not in question form eg, for 70×0.9 ▪ What is 70 decreased by 10%? ▪ Find 90% of 70 ▪ What is 70% of 90? ▪ What is $\frac{9}{10}$ of 70? eg, for 70×1.9 ▪ It increases 70 by 90% ▪ 190% of 70 eg, for 70×0.09 ▪ What is 9% of 70? ▪ 70 decreased by 91%	! *Units or context given* Ignore ! *Two or more steps used* eg, for 70×1.9 • Finds 90% of 70 then adds it on to 70 Penalise only the first occurrence ! *Multiplication sign not interpreted* eg, for 70×1.9 • $70 \times 190\%$ Penalise only the first occurrence × *Incorrect response* eg, for 70×1.9 • Increase 70 by 190%
				1m	Gives a correct interpretation for a different calculation	× *70×1.09 not chosen for the first mark, but interpreted later*
		b	b	**1m**	0.86	× *Two-step process* × *Incorrect % sign* eg • 0.86%
			c	**2m**	21	
				or **1m**	Shows the value 121 or Shows a correct method, working only with the percentage increases eg ▪ 1.1^2 ▪ 110×1.1 ▪ $110 + 11$ or Shows a complete correct method with not more than one computational error eg ▪ $70 + 10\% = 77$ $77 + 10\% = 84.7$ $\left(\frac{84.7 - 70}{70}\right) \times 100$ ▪ 10 increased by 10% is 11 11 increased by 10% is 12.1 2.1×10	

Tier & Question						Star
3-5	4-6	5-7	6-8			
			15		**Correct response**	**Additional guidance**
			a	**1m**	Correct interpretation eg ■ Number of hours it would take the spaceship to travel from Earth to the star ■ How many hours the journey would take	✓ *Minimally acceptable explanation* eg ◆ Number of hours to travel ◆ How many hours it takes ◆ Time taken to travel at 40 000 km per hour × *Incomplete interpretation that does not refer to both the journey and the units of time* eg ◆ Number of hours ◆ How long it takes ◆ Time taken to travel × *No interpretation* eg ◆ Distance times light-years divided by speed
				1m	Correct interpretation eg ■ Number of years it would take the spaceship to travel from Earth to the nearest star ■ Number of years from E to PC	✓ *Minimally acceptable explanation* eg ◆ Number of years to travel ◆ How many years to get there ✓ *Incomplete interpretation that does not refer to the journey* eg ◆ Number of years × *Incomplete interpretation that does not refer to the units of time* eg ◆ Time taken to travel × *Incorrect interpretation* eg ◆ Time taken to travel in years and in days
			b	**1m**	114 000	

Tier & Question						Trigonometry
3-5	4-6	5-7	6-8			
			16		Correct response	Additional guidance
			a	**2m**	8.4(...)	! *Answer 8* Accept provided a correct method or a more accurate value is seen
				or		
				1m	Shows a correct method eg ■ $14 \times \sin 37$ or Shows a correct trigonometric ratio eg ■ $\sin 37 = \frac{y}{14}$	✓ *Change of variable* ! *Incomplete notation that omits the angle* eg ◆ $\sin = \frac{y}{14}$ Do not accept unless evaluation or other indication shows that the relevance of the angle has been understood
			b	**2m**	64.6(...)	! *Answer 65* Accept provided a correct method or a more accurate value is seen
				or		
				1m	Uses 6 and 14 to form a correct trigonometric ratio using cosine, even if rounded or truncated eg ■ $\cos^{-1} \frac{6}{14}$ ■ $\cos m = \frac{6}{14}$ ■ $\cos m = 0.42857...$ ■ $\cos m = 0.43$ or Gives the answer 64 or 64.5(...) or Shows a complete correct method eg ■ $90 - \sin^{-1} \frac{6}{14}$	✓ *Change of variable* ✓ *Incomplete but unambiguous notation* eg ◆ $\cos = \frac{6}{14}$

Tier & Question						Satellite
3-5	4-6	5-7	6-8			
			17		Correct response	Additional guidance
				3m	27143.(...) or 8640π	! *Answer rounded to 30000* Accept provided a correct method or a more accurate value is seen ! *Answer 27000 or 27100 or 27140* Accept provided no incorrect method is seen
				or		
				2m	Shows a complete correct method even if values are rounded or truncated eg ■ $C = 2\pi r = 14400\pi$, so speed is $14400\pi \div 100 \times 60$ ■ $(12800 + 1600) \times \pi \times \frac{3}{5}$ ■ $(14400 \times 3.14) \times 60 \div 100$ or Shows a correct value in km/min eg ■ 144π ■ 452.(...) or The only error is to omit to add one of the values of 800 eg ■ 8160π ■ 25635.(...) or	
				or		
				1m	Shows or implies the correct length of one orbit eg ■ 14400π ■ $7200 \times 2\pi$ ■ $(12800 + 2 \times 800) \times \pi$ ■ 45238.9(...) or Shows or implies both ÷ 100 and × 60 eg ■ $\times \frac{3}{5}$ ■ × 0.6 ■ ÷ 1.66666(...) ■ ÷ (100 ÷ 60) ■ 7680π (no values of 800 added) ■ 24127.(...) (no values of 800 added) ■ 8640 (π omitted throughout)	✓ *For this mark, ÷ 100 × 60 converted to a decimal which is rounded or truncated* eg ◆ 1.7 ◆ 1.66

Tier & Question						**Simplify**
3-5	4-6	5-7	6-8			
			18		**Correct response**	**Additional guidance**
			a	**1m**	Correct explanation eg ▪ $\frac{a^2 - b^2}{a - b} = \frac{(a - b)(a + b)}{a - b}$	✓ ***Minimally acceptable explanation*** eg ◆ $a^2 - b^2 = (a - b)(a + b)$! ***Numerical substitution*** Ignore if accompanying a correct algebraic explanation, otherwise do not accept
			b	**1m**	a	✓ a^1 ***or*** a^1b^0
			c	**2m** ***or*** **1m**	$a - b$ Shows a correct partial simplification eg ▪ $\frac{a^2b - ab^2}{ab}$ (dividing through by ab) ▪ $\frac{a^3 - a^2b}{a^2}$ (dividing through by b^2) ▪ $a - \frac{a^2b^3}{a^2b^2}$ (partial fractions, first term simplified)	× ***Incorrect simplification*** eg ◆ $\frac{a - a^2b^3}{a^2b^2}$

Index to mark schemes