Ma

KEY STAGE 3

ALL TIERS

2000

Mathematics tests

Mark scheme for Paper 2

Tiers 3-5, 4-6, 5-7 and 6-8

QCA

DfEE

Department for Education and Employment

Excellence in schools

Index to mark schemes

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 which 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.

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 below with the prescribed correct action. Unless otherwise specified in the mark scheme, markers will 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, and if still uncertain contact the supervising marker.
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'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 without altering the original intention or difficulty level of the question. For each misread that occurs, deduct one mark only.
The correct answer is in the wrong place.	Where a pupil has shown understanding of the question, the mark(s) should be given. In particular, where a word or number response is expected, a pupil may meet the requirement by annotating a graph or labelling a diagram elsewhere in the question.

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

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

If so, award the mark.</td></tr>
<tr><td>in questions not testing accuracy, the correct answer has been given but then rounded or truncated;</td><td>If so, award the mark.</td></tr>
<tr><td>the pupil has continued to give redundant extra working which does not contradict work already done;</td><td>If so, award the mark.</td></tr>
<tr><td>the pupil has continued, in the same part of the question, to give redundant extra working which does contradict work already done.</td><td>If so, do not award the mark. Where a question part carries more than one mark, only the final mark should be withheld.</td></tr>
<tr><td>The pupil's answer is correct but the wrong working is seen.</td><td colspan="2">A correct response should always be marked as correct unless the mark scheme states otherwise.</td></tr>
<tr><td>The correct response has been crossed (or rubbed) out and not replaced.</td><td colspan="2">Mark, according to the mark scheme, any legible crossed (or rubbed) out work that has not been replaced.</td></tr>
<tr><td>More than one answer is given.</td><td colspan="2">If all answers given are correct (or a range of answers are 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>

General guidance

Throughout the marking of the key stage 3 mathematics tests, the following general guidelines should be observed unless specific instructions to the contrary are given. This guidance reflects decisions made to ensure fairness and consistency of marking.

Responses involving probability

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

	Accept ✓	Take care ! Do not accept ×
For example: *0.7*	✓ 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

Responses involving money

	Accept ✓	Do not accept ×
For example: *£3.20* *£7*	✓ Any unambiguous indication of the correct amount eg £3.20(p), £3 20, £3,20, 3 pounds 20, £3-20, £3 20 pence, £3:20, £7.00 ✓ The £ sign is usually already printed in the answer space. Where the pupil writes an answer other than in the answer space, or crosses out the £ sign, accept an answer with correct units in pounds and/or pence eg 320p 700p	× Incorrect or ambiguous use of pounds or pence eg £320, £320p or £700p, or 3.20 or 3.20p not in answer space. × Incorrect placement of decimal points, spaces, etc or incorrect use or omission of 0 eg £3.2, £3 200, £32 0, £3-2-0 £7.0

Responses involving the use of algebra

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

Responses involving time

	Accept ✓	Take care ! Do not accept ×
A time interval *For example:* *2 hours 30 min*	✓ Any unambiguous indication eg 2.5 (hours), 2h 30 ✓ Digital electronic time ie 2:30 Note that 2:30 is accepted for 2h 30m because it is a common electronic expression (eg the time interval shown on an oven timer).	× Incorrect or ambiguous time interval eg 2.3(h), 2.30, 2-30, 2h 3, 2.30min ! The time unit, hours or minutes, is usually printed in the answer space. Where the pupil writes an answer other than in the answer space, or crosses out the given unit, accept an answer with correct units in hours or minutes, unless the question has asked for a specific unit to be used.
A specific time *For example:* *8.40am*	✓ 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 × Incorrect placement of divisors, spaces, etc or incorrect use or omission of 0 eg 840, 8:4:0, 084, 84

Responses involving co-ordinates

	Accept ✓	Do not accept ×
For example: *(5, 7)*	✓ 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)

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 and 6-8, and a total of 121 marks in tier 5-7. The extension paper carries 41 marks.

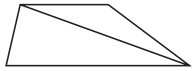
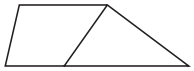
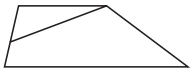
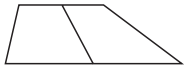
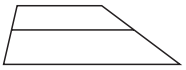
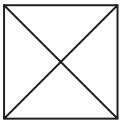
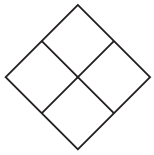
Awarding levels

The sum of the marks gained on paper 1, paper 2 and the mental arithmetic paper determines the level awarded. A copy of the level threshold tables which show the mark ranges for the award of different levels will be sent to each school by QCA in July 2000.

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 2000 key stage 3 mathematics tests and mark schemes were developed by the Mathematics Test Development Team at QCA.

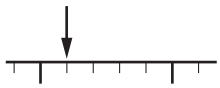
Tier & Question						
3-5	4-6	5-7	6-8		**Menu**	
1					**Correct response**	**Additional guidance**
a				**1m**	**1.06**	
				1m	**3.94**	**!** *Follow through from an incorrect total* Allow provided the total is more than £1, and is not an integral number of pounds.
b				**1m**	**16**	

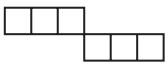
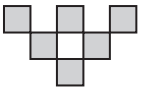
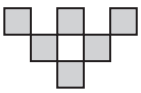
Tier & Question					*Marking overlay available*	**Making Shapes**
3-5	4-6	5-7	6-8			
2					**Correct response**	**Additional guidance**
a				**1m**		✖ *For part (a), the example repeated* ! *Line not ruled but intention clear* In parts (a) to (d), penalise only the first occurrence. ! *Line not drawn accurately* Accept lines to a vertex to ± 2mm. However, lines to a side must be unambiguously to a side rather than to a vertex, hence do not accept lines that are within ± 2mm of a vertex.
b				**1m**	A line through a vertex and a side eg ▪  ▪ 	
c				**1m**	A line through opposite sides eg ▪  ▪ 	
d				**1m**		
e				**1m**	Four congruent squares, each midpoint and line within ± 2mm, and ruled, ie 	

Tier & Question					Calculations	
3-5	4-6	5-7	6-8			
3					**Correct response**	**Additional guidance**
a				**1m**	**662**	
b				**1m**	**6000**	
c				**1m**	**483**	
d				**1m**	**56**	✗ *Answer – 56*

Tier & Question					Sun Cream	
3-5	4-6	5-7	6-8			
4					**Correct response**	**Additional guidance**
a				**1m**	**8**	
b				**1m**	**UK**	✓ *Unambiguous indication* eg • Blackpool. • A warm place.
				1m	**Medium**	✓ *Abbreviation* eg • M

Tier & Question						Rulers
3-5	4-6	5-7	6-8			
5					**Correct response**	**Additional guidance**
a				**1m**	**120**	! *Incorrect units* Ignore.
b				**1m**	**11.60**	! *Both money answers omit final zero* Mark as 0, 1
c				**1m**	**2.90**	
d				**1m**	**5**	! *Incorrect units* Ignore.

Tier & Question						Measuring
3-5	4-6	5-7	6-8			
6					**Correct response**	**Additional guidance**
a				**1m**	**190 ± 1**	
b				**1m**	Correct place identified eg ▪ 	✓ *Within ± 2mm* ✓ *Any unambiguous identification* × *Scale redrawn using an easier numbering system*

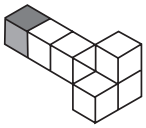
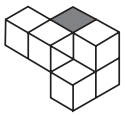
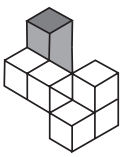
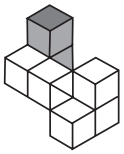
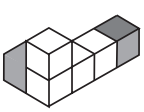
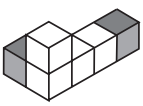
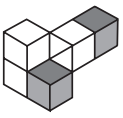
Tier & Question					**Shapes**	
3-5	4-6	5-7	6-8			
7	**1**				**Correct response**	**Additional guidance**
a	a			**1m**	Area **5**	
				1m	Perimeter **12**	
b	b			**1m**	Any shape of area 6cm^2	✓ ***Shape connected at vertices*** Accept if unambiguous eg •  • 
c	c			**1m**	Correct perimeter Note: If the pupil uses whole squares, aligned with complete edges touching, the perimeter is **10**, **12** or **14** cm.	! ***Follow through from incorrect shape using whole squares*** Allow provided the area > 4 cm^2 and the shape is not a copy of the diagram in (a). ! ***Follow through from shape using diagonals*** Allow measuring, ± 2mm, but do not allow answers rounded to the nearest centimetre unless a more accurate value is seen. × ***Follow through from shape with an enclosed space*** eg • 
d	d			**1m**	**7**	
e	e			**1m**	Explains that the diagonals of the grid are greater than 1	✓ ***Minimally acceptable explanation*** eg • Because the lines go through the middle of a square. ✓ ***Diagonal measured as 1.3 to 1.5 cm inclusive*** ✓ ***Perimeter measured as 9 to 10 cm inclusive*** × ***Partial response*** eg • I measured the perimeter.

Tier & Question					Tokens	
3-5	4-6	5-7	6-8			
8	2				Correct response	Additional guidance
a	a			**1m**	Correct explanation focusing on **more gold** eg ▪ 4 gold and only 1 silver. ▪ Not as many silver. ▪ Gold to silver is 4 to 1 or Explains there would need to be an equal amount of each colour eg ▪ There's not the same number of gold and silver. ▪ Only one silver. There should be 4	✓ *Minimally acceptable explanation* eg ◆ Better/More chance of getting gold. ◆ Only one silver. ✓ *Correct probability expressed in words* At this level, accept eg ◆ It's a 1 in 5 chance of getting silver. ✗ *Incorrect information, even if accompanying a correct response* eg ◆ More gold, it's a 1 in 4 chance of getting silver. ◆ More gold, so she must take out a gold. ✗ *Information restated with no indication of more gold* eg ◆ 4 gold and 1 silver. ✗ *Use of 'even' for 'equal'*
b	b			**1m**	**3**	✓ *Gold and silver inserted in the correct proportions* eg ◆ 2 gold, 5 silver.
c	c			**1m**	At least one of **5**, **6**, **7** or **8**	✓ *Any unambiguous indication* eg ◆ Tokens drawn. ✓ *A correct range* eg ◆ More than 4 ◆ 6 - 8 ✓ *A correct value expressed as a ratio or fraction of 8* eg ◆ $\frac{7}{8}$ ✗ *Not quantified* eg ◆ More gold than silver.

Tier & Question					**Temperatures**	
3-5	4-6	5-7	6-8			
9	**3**				**Correct response**	**Additional guidance**
a	a			**1m** **1m**	**77** **80**	
b	b			**1m**	**32** and **30** in the correct order.	
c	c			**2m** *or* **1m**	Shows both rules give a value of 50 eg ▪ 10 × 1.8 + 32 = 50, 10 × 2 + 30 = 50 50 seen	✓ *Minimally acceptable response* eg • 50, 50 ! *Incorrect units* Ignore.

Tier & Question					**Coaches**	
3-5	4-6	5-7	6-8			
10	**4**				**Correct response**	**Additional guidance**
a	a			**2m** *or* **1m**	**58** 57 or 57.(..) seen or 3000 ÷ 52 seen	✓ *58 shown as a minimum* eg • 58 or more.
b	b			**1m**	**24 360**	! *Follow through as their (a) × 420* If their answer to (a) is not an integer, accept their (a) rounded or truncated, and accept the answer then rounded or truncated to the nearest penny.
c	c			**1m**	**8.12**	✓ *Follow through from their part (b)* ie (b) ÷ 3000 ✓ *Answer from their (b) rounded or truncated to the nearest penny*

Tier & Question						
3-5	4-6	5-7	6-8		**Cereal**	
11	**5**	**1**			**Correct response**	**Additional guidance**
a	a	a		**1m**	$\frac{1}{4}$, or equivalent probability	✓ *Correct response accompanied by description of the probability* Ignore the description eg, accept • 25%, that's fairly likely.
				1m	$\frac{1}{2}$, or equivalent probability	
b	b	b		**1m**	0, or equivalent probability	✓ *Probability of zero expressed in words or as a fraction, even if the denominator is 'incorrect', or as a ratio* eg • None. • Impossible. • $\frac{0}{3}$ • $\frac{0}{4}$ • 0:4
				1m	$\frac{2}{3}$, or equivalent probability	

Tier & Question						
3-5	4-6	5-7	6-8		**Drawing**	
12	**6**	**2**			**Correct response**	**Additional guidance**
a	a	a		**1m**		✓ *Freehand* Accept if the pupil's intention is clear. ✓ *Hidden lines made visible*
b	b	b		**1m**		✓ *Internal lines omitted* eg, for part (c) • 
c	c	c		**1m**		✗ *External edges omitted* eg, for part (d) • 
d	d	d		**1m**	 or 	! *Shading* Ignore.

Tier & Question						Huts
3-5	4-6	5-7	6-8			
13	7	3			Correct response	Additional guidance
a	a	a		**2m**	33	
				or		
				1m	Correct method eg ■ 4 × 8 + 1	✓ *For 1m, method is repeated addition with not more than one computational error* eg ◆ 13 + 4 + 4 + 4 + 4 + 4 ◆ 17, 21, 25, 29, 32
b	b	b		**2m**	20	
				or		
				1m	Correct method eg ■ 80 ÷ 4 seen	
c	c	c		**1m**	Correct expression of $m = 5h + 1$ eg ■ 	

Tier & Question						
3-5	4-6	5-7	6-8		**Canteen**	
14	8	4			**Correct response**	**Additional guidance**
				1m	Gives a correct explanation. The most common correct explanations are: Explaining events are **not equally likely** eg ■ Not many people work in the canteen. ■ They might not be equal chances. ■ The probability is different for each group. ■ There are different amounts of pupils and teachers. ■ The number of pupils is more than one third. ■ The probability needs to be out of all the pupils, teachers and canteen staff. or Explaining the statement **implies equal numbers** of pupils, teachers and canteen staff eg ■ It would be true if there were 20 pupils, 20 teachers and 20 dinner people. or Giving a **counter-example** eg ■ Suppose there were 190 pupils, 8 teachers and 2 canteen staff. The probability would not be a third.	! *Explanation infers exact quantities required* Accept if accompanied by a correct response eg, accept ◆ Each probability is different. You need to know the numbers in each group. eg, do not accept ◆ You need to know the exact numbers in each group. × *Incorrect statement, even if accompanied by a correct response* eg ◆ It's not equal chances, the probability is 1 divided by the whole school. ◆ It depends on how many children there are. If there were 10 children the probability would be 0.1 × *Incomplete or ambiguous statement* eg ◆ More pupils. ◆ There is more than 1 pupil, 1 teacher and 1 canteen staff. ◆ More than 3 people. ◆ There are 3 choices but there's more than 3 papers in the box. ◆ It depends on how many pupils, teachers and canteen staff there are.

Tier & Question						
3-5	4-6	5-7	6-8		**Percentages B**	
15	9	5			**Correct response**	**Additional guidance**
				1m	**2.12**	! *Redundant % sign* eg ◆ 2.12% Penalise first occurrence only.
				1m	**12.25**	✓ *25p expressed as a fraction of a pound*

Tier & Question						
3-5	4-6	5-7	6-8		**Sign**	
16	10	6			**Correct response**	**Additional guidance**
				1m	8	✓ *Answer between 8 and 8.1 inclusive*

Tier & Question						Teachers
3-5	4-6	5-7	6-8			
17	11	7			Correct response	Additional guidance
a	a	a		1m	20 to 23 inclusive	
b	b	b		1m	35 to 39 inclusive	
c	c	c		1m	40 000 to 50 000 inclusive	
d	d	d		1m	Indicates second statement with a correct justification. The most common correct justifications are: Comparing at least one category for both males and females eg ■ There are more 20-29 year old females than males. ■ More males are over 50 ■ Females start with bigger slices but then it changes. ■ The striped part is longer on the females than the males. ■ More black and striped part for females than males. or Comparing categories by using percentages within the inclusive ranges shown below, or reference to the approximate value shown in brackets (do not accept approximation without indication that it is only an estimate) eg ■ 13% of men are age 20-29, but it's more like 20% for women. ■ 50% of men will be over 50, but only about 40% of women. **males** / **females** 50+: 48-52 / 35-39 (40) 40-49: 22-26 (20) / 20-24 30-39: 11-15 (10) / 16-20 20-29: 11-15 (10) / 21-25 (20) 39 or less: 24-28 (30) / 39-43 49 or less: 48-52 / 61-65 (60) 40 or more: 72-76 (70) / 57-61 30 or more: 85-89 (90) / 75-79 (80)	! *Response does not refer to the chart* Accept only if accompanied by a correct response eg ◆ There are more 20-29 year old females than males and there are more young female teachers in my school. ! *Different categories compared for males and females* Accept only if one implies the other eg, accept ◆ 50% of males are 50+, but over 50% of females are younger than 50 eg, do not accept ◆ 50% of males are 50+, about 40% of females are younger than 30 ! *Use of 'young' or 'old' without categories specified* Accept only if justification implies which categories are being compared eg, accept ◆ 13% men, 23% women are young. Also accept young to refer to the first, or the first two, or the first three categories eg, accept ◆ 62% females young, only 50% males. ✗ *No comparison* eg ◆ 50% of males will be 50+ ✗ *Incorrect statement* eg ◆ Less females in each group. ◆ Female teachers most likely to be 20-29 ✗ *Ambiguous response with categories or gender not identified* eg ◆ There are more 50+ but less 20-29 ◆ Female is higher on the chart.

Tier & Question						Lift
3-5	4-6	5-7	6-8			
	12	**8**	**1**		**Correct response**	**Additional guidance**
	a	a	a	**1m**	**Ground floor** (0) and **12**, either order	
	b	b	b	**1m**	**60 ± 2**	
	c	c	c	**1m**	A line from (80, 22) to (125, 0) that has no positive gradients.	✓ *Extends the horizontal line at floor 22 before descending* Accept provided the descent takes 45 seconds with no further stops. ✓ *Line from (75, 22) to (120, 0)* ✓ *Line not ruled but intention clear* ✓ *Parts of the line show acceleration and deceleration*

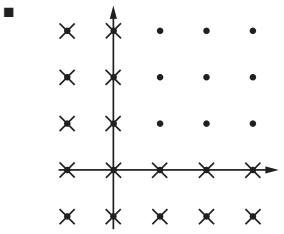
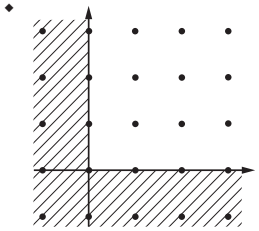
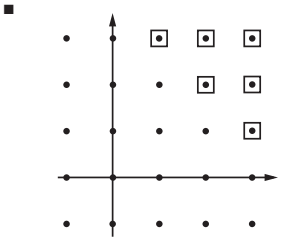
Tier & Question						Scores
3-5	4-6	5-7	6-8			
	13	**9**	**2**		**Correct response**	**Additional guidance**
	a	a	a	**1m**	**6**	
	b	b	b	**1m**	**1** and **5**, either order	
	c	c	c	**2m** *or* **1m**	Any set of three numbers that total 9 and have a range of 4 eg ▪ 1, 3, 5 ▪ 1.5, 2, 5.5 Their three numbers total 9 or Their three numbers have a range of 4	

Tier & Question						Polygons
3-5	4-6	5-7	6-8			
	14	10	3		Correct response	Additional guidance
	a	a	a	1m	**Correct explanation** The most common correct explanations refer to: The angles in a triangle summing to 180 eg ▪ Each triangle is 180° and 180 × 2 = 360 or The correct use of a relevant formula such as $180(n - 2)$ or $(2n - 4)$ right angles eg ▪ $180(4 - 2)$ ▪ $2 \times 4 - 4 = 4$, and $4 \times 90 = 360$	✓ *Minimally acceptable explanation* eg ◆ 2 × 180 ◆ Each triangle is 180 ✗ *Explanation lacks generality* eg ◆ Specific quadrilaterals used as examples. ◆ 4 × 90 = 360 ✗ *No evidence given* eg ◆ Because all 4-sided shapes have 360° ✗ *Incomplete use of external angles* eg ◆ If you turn all the way round the shape you turn 360° ✗ *Use of corners* eg ◆ Cut the corners and put them together and it makes a complete turn.
	b	b	b	1m	**540**	
	c	c	c	2m *or* 1m	**900** Correct method eg ▪ 5 × 180 ▪ 180 × (7 − 2) ▪ 360 + 360 + 180 ▪ 360 + 540	! *Follow through as part (b) + 360* Allow, provided (b) > 360 ! *Throughout the question, the only error is to use an incorrect, but consistent, value for the number of degrees in a triangle* Mark part (c) as 1, 0 provided (c) > 360

Tier & Question						Hedging
3-5	4-6	5-7	6-8			
	15	**11**	**4**		**Correct response**	**Additional guidance**
	a	a	a	**2m** *or* **1m**	**78.(0..)** Digits 650(00) ÷ digits 833 or Digits 78(0..) seen	
	b	b	b	**2m** *or* **1m**	**88.6** or **88.5(..)** or **89** Digits 2437(5) ÷ digits 2751(15) or An otherwise correct response, with the decimal point omitted or incorrectly placed.	**!** ***Answer 88*** Accept provided there is no evidence of an incorrect method.
	c	c	c	**1m**	Privet, with digits 17(..) and 13(..) seen. or Privet, by comparing unit prices for both plants eg ■ One privet is 1.3, so 125 would cost 162.5, so privet is cheaper. ■ 5 privet cost £6.50, 5 beech cost £8.50 so beech is more expensive. ■ Privet, 212.5 ÷ 125 is bigger than 45.5 ÷ 35 ■ 4 × 35 = 140 and 4 × 45.5 = 182, so more privet for less money than beech. or Privet, by using ratio to compare prices (condone the use of rounded/truncated values) eg ■ 125 ÷ 35 = 3.57, × 45.5 = 162.45 so privet cheaper. ■ 125 ÷ 35 = 3.57, 212 ÷ 3.57 = 59.4, privet.	✓ ***Use of rounded or truncated values for 212.50 and/or 45.50*** eg ◆ 212 and 45 used, resulting in 1.696 rounded or truncated for beech, and 1.2857.. rounded or truncated for privet. ✓ ***Use of rounded or truncated values for intermediate values*** **!** ***Conclusion not shown*** Accept only if prices are correct and identified with the correct plant eg, accept ◆ Privet 1.3, beech 1.7 eg, do not accept ◆ Digits 17(..) and 13(..) seen without linking to relevant plants. **!** ***Plants per pound calculated*** Accept only if the correct interpretation is shown eg, accept ◆ You'd get 0.588 beech plants with one pound, and 0.769 privet plants for one pound so privet is cheaper. eg, do not accept ◆ 125 ÷ 212.5 = 0.588, 35 ÷ 45.5 = 0.769, so privet is cheaper.

Tier & Question						Area
3-5	4-6	5-7	6-8			
	16	12	5		Correct response	Additional guidance
	a	a	a	**2m** *or* **1m**	**452** Correct method eg ■ $\pi \times 12^2$ ■ $\pi \times 12 \times 12$ ■ 452.(..) ■ 144π	✗ *Use of mm^2 as evidence of 12^2* eg ◆ $3.14 \times 12mm^2$
	b	b	b	**1m**	**226**	✓ *Follow through as part (a) ÷ 2* ! *Answer not rounded to the nearest mm^2* Accept if their answer to part (a) was 452.(..) or 144π, ie this error has already been penalised.
	c	c	c	**2m** *or* **1m**	**15** or **15.0(..)** Correct method eg ■ √their (b) ■ $\sqrt{(72\pi)}$	! *For 2m, follow through as √(their b)* Accept answers rounded or truncated, provided there is no evidence of an incorrect method. ! *Method is trial and improvement* Do not penalise as an incorrect method, but do not credit as a correct method.

Tier & Question						Pitch
3-5	4-6	5-7	6-8			
		13	6		Correct response	Additional guidance
		a	a	**1m**	**92.5**	✓ *Use of extra zero(s)* eg, for part (a) • 92.500
		b	b	**1m**	**49.5**	✓ *Use of centimetres* eg, for part (b) • 49m 50cm
		c	c	**2m**	Calculates **3000 ÷ 2(their a + their b)**	! *Answer given with little or no working* For 2m, accept 10.6 or 10.56(..) For 2m, accept 11 with sight of 142 or 284 or 2 × (92.5 + 49.5) Do not accept 11 with no relevant working.
				or **1m**	Correct method seen, ie 3000 ÷ 2(their a + their b) or Uses their (a) and their (b) rounded to at least 1 d.p., with a correct follow through answer. or Uses the values 93 and 50 to give an answer of 11 or 10.5 or 10.4(..) eg ▪ 286 × 11 = 3146, so 11	! *Answer rounded or truncated* Accept to the nearest integer, or rounded to at least 1 d.p. Do not accept a truncated value unless a more accurate value is seen. ✓ *Method is trial and improvement* For 2m, accept trials of 2(their a + their b) leading to a correct solution. The minimum amount of working is their solution × 2(their a + their b) > 3000 eg • 11 × 284 is more than 3000 ! *Use of 93 or 50, with one of their (a) or (b)* For 1m, accept their correct answer with a correct method seen. ! *Use of 1km rather than 3km* Only accept as a valid method if subsequently multiplied by 3 ✖ *Use of 300 for 3000*

Tier & Question						**Dots**
3-5	4-6	5-7	6-8		Correct response	Additional guidance
		14	**7**			
		a	a	**2m**	All points with $x \leq 0$ and $y \leq 0$ identified eg 	✓ *Correct region identified* eg, for part (a) 
				or **1m**	All points with negative co-ordinates identified, even if some or all of the points with zero ordinates are omitted, and no incorrect points. or Not more than three values omitted.	! *Points identified with alternative notation* Accept if unambiguous, for example in (b) crosses with a square around. ! *Points in parts (a) and (b) identified using the same notation* If both parts are completely accurate, mark as 1, 1 in (a) and 1 in (b). If the only error is that some or all of the points with $x = 0$ and $y = 0$ are omitted, mark as 1, 0 in (a) and 1 in (b).
		b	b	**1m**	All points with $x + y \geq 4$ identified eg 	! *All points other than (2 , 1) identified using the same notation* Mark as 1, 0 in (a) and 1 in (b). ! *Remaining points for which x > y identified using a different notation* Ignore.
		c	c	**1m**	**(2 , 1)**	

Tier & Question						
3-5	4-6	5-7	6-8		**Families**	
		15	**8**		**Correct response**	**Additional guidance**
		a	a	**1m**	Shows a correct total for each bar eg ■ $1 \times 1 + 2 \times n + 5 \times 3 + 6 \times 4 + 3 \times 5$ ■ $1,\ 2n,\ 15,\ 24,\ 15$ or Fully explains $2n$ with reference to the context eg ■ There are $2n$ children in the families that have 2 children. ■ There are 2 children in n families. or Fully explains 55 eg ■ $1 + 15 + 24 + 15 = 55$	! ***Correct working for each bar shown, but subsequent working marred by computational error*** Accept provided there is not more than one such 'slip' eg ◆ $1 \times 1 = 1$ $5 \times 3 = 5$ $6 \times 4 = 24$ $3 \times 5 = 15$ $2 \times n = 2n$
		b	b	**1m**	Correct expression eg ■ $15 + n$	✓ ***Expression not simplified*** eg ◆ $1 + n + 5 + 6 + 3$
		c	c	**2m** ***or*** **1m**	**10** Correct equation formed eg ■ $3 = \frac{55 + 2n}{\text{their (b)}}$	✓ ***For 1m, follow through from part (b), even if non-algebraic***

Tier & Question						Triangles
3-5	4-6	5-7	6-8			
		16	**9**		**Correct response**	**Additional guidance**
		a	a	**1m**	**Correct explanation** The most common correct explanations are: Showing or implying that 6^2 is added to 8^2, with either 10^2 or the use of √ eg ■ $6^2 + 8^2 = 10^2$ ■ $6^2 + 8^2 = 100$, $\sqrt{100} = 10$ ■ 10 is $\sqrt{100}$, and 100 = 64 + 36 ■ $AB^2 + BC^2 = 100$, $\sqrt{} = 10$ ■ $AB^2 + BC^2 = AC^2$ or Referring to the 3, 4, 5 triangle ■ Each side is double 3, 4, 5 ■ It's the 3, 4, 5 triangle. ■ The 3, 4, 5 triangle must have a right angle.	✖ ***Answer found through scale drawing*** Do not accept in any part of this question. ✖ ***Incomplete explanation that does not refer to either 10^2 or √*** eg ◆ $AB^2 + BC^2 = 100$ ◆ 36 + 64 = 100 = 10 ✓ ***Minimally acceptable explanation*** eg ◆ 6, 8, 10 triangle. ✖ ***Incomplete explanation*** eg ◆ Because of Pythagoras. ◆ If it wasn't 10 it wouldn't be right-angled. ◆ $a^2 + b^2 = c^2$ (without linking to the diagram).
		b	b	**2m** ***or*** **1m**	**√136** or **11.7** or **11.6(..)** Complete correct method eg ■ $\sqrt{(6^2 + 10^2)}$ ■ √136 = (incorrect)	! ***Answer 12 or 11*** Accept only if a valid method, or more accurate response, seen. ✓ ***Use of tangent to find an angle, then correct use of sine or cosine*** ✖ ***Partial Method*** If Pythagoras is used, the square root must be seen or implied. Do not accept $AD^2 = 136$ as sufficient.

Tier & Question						Triangles (cont)
3-5	4-6	5-7	6-8			
			9		Correct response	Additional guidance
			c	**3m**	**6** or **5.9(..)**	
				or		
				2m	Both angles correct, ie x as 37 or 36.9 or 36.8(..), and y as 31 or 30.9(..) or Complete correct method eg ■ $\tan^{-1} 0.75 - \tan^{-1} 0.6$ ■ $\cos^{-1} 0.8 - \cos^{-1}(10 \div$ their b)	! *Incorrect evaluation of angles* For 2m, accept provided correct trigonometric ratios are shown, and the angles are subtracted eg ◆ tan $x = 6 \div 8$, $x = 43°$ tan $y = 6 \div 10$, $y = 34°$ $43 - 34 = 9$ × *Misunderstanding of trigonometric ratio* eg ◆ tan $x = 6 \div 8$, $x = 0.75°$
				or		
				1m	One angle correct. or Correct trigonometric ratios for both angles identified ■ tan $y = 0.6$, tan $x = 0.75$ ■ tan $= 6 \div 10$, tan $= 6 \div 8$	

Tier & Question					Counters	
3-5	4-6	5-7	6-8			
		17	**10**		**Correct response**	**Additional guidance**
					Note that as there are many alternative correct justifications, for ease of use this mark scheme shows categories of response, with 1m and 0m responses shown alongside.	
				2m	Chooses A; justifies **using fractions** of totals of **30** and **26** then converting to fractions that have **common denominators** eg ■ $\frac{12}{30} = \frac{26}{65}$, but $\frac{10}{26} = \frac{25}{65}$, choose A ■ $\frac{12}{30} = \frac{312}{780}$, $\frac{10}{26} = \frac{300}{780}$ which is less, so A **or common numerators** eg ■ $\frac{12}{30} = \frac{10}{25}$, B is $\frac{10}{26}$, A more chance. ■ $\frac{12}{30} = \frac{120}{300}$, $\frac{10}{26} = \frac{120}{312}$ so A	✓ *Unconventional fractions used* In this context, accept eg, for 2m • A is $\frac{4}{10}$, B is $\frac{3.8}{10}$ so A • A because $\frac{12}{30} > \frac{11.5}{30}$ • A because $\frac{12}{30} = \frac{10.4}{26}$, $> \frac{10}{26}$
				or **1m**	Converts to a form that enables comparison, but makes an incorrect or no conclusion eg ■ $\frac{12}{30} = \frac{26}{65}$, but $\frac{10}{26} = \frac{25}{65}$ so choose B or Shows a complete correct method with only one computational error, then chooses the correct bag for their calculation eg ■ $\frac{12}{30} = \frac{5}{6} = \frac{65}{78}$ but B is $\frac{30}{78}$, so choose A ■ $\frac{12}{30} = \frac{1}{3} = \frac{26}{78}$ but B is $\frac{30}{78}$, so choose B or Chooses bag A and partially justifies by cancelling both fractions correctly, even if not to their simplest form eg ■ $\frac{12}{30} = \frac{2}{5}$, $\frac{10}{26} = \frac{5}{13}$, so A ■ A because $\frac{12}{30} = \frac{6}{15}$, B is $\frac{5}{13}$	✗ *Fractions not cancelled* eg • A is $\frac{12}{30}$, B is $\frac{10}{26}$, so A

Tier & Question						Counters (cont)
3-5	4-6	5-7	6-8			
		17	**10**		**Correct response**	**Additional guidance**
				or **2m**	Using totals of **30** and **26** then converting to **decimals** or **percentages** eg ■ $\frac{12}{30} = 0.4$, $\frac{10}{26} = 0.38$, so A ■ 0.4 > 0.38(..), A best. ■ A is 40%, B is 38%, choose A	! *Decimals or percentages rounded or truncated* Accept provided a comparison can still be made.
				or **2m**	**Comparing** an amount of counters eg ■ If A had 26 counters it would be $\frac{12}{30} \times 26 = 10.4$, that's less so choose A ■ A: red is 40%, 40% for B would be only 10.4 red, that's smaller. ■ B is 38% red, 38% of 30 = 11.4 so A best.	! *Partial credit* For 1m, mark as for the previous page ie ◆ Correct method, with incorrect or no conclusion. ◆ Correct method, with one computational error, followed by their correct conclusion.
				or **2m**	Using ratio of **red : yellow** in the form of *a* **:** *b* The ratio must enable comparison eg ■ 12 : 18 would be the same as 10 : 15 but B has an extra yellow, so it must be bag A ■ In A, red to yellow is 1 : 1.5, in B it's 1 : 1.6 so I'd choose A ■ Ratio R to Y is 0.666 : 1 for A, 0.625 : 1 for B, so A is better.	
				or **2m**	Using totals **18 and 16** (or **30 ÷ 12** and **26 ÷ 10**) Note that although these can be correct methods, many pupils apply these numbers with no understanding, hence this category is marked as follows.	
				or **2m**	For 2m, correct interpretation **must** be shown and the ratio must enable comparison eg ■ $\frac{12}{18} = \frac{96}{144}$, $\frac{10}{16} = \frac{90}{144}$ If there were 144 yellow there would be 96 red in A but only 90 in B, so choose A ■ $\frac{\text{Red}}{\text{Yellow}} = \frac{12}{18} = 0.67$, but $\frac{\text{Red}}{\text{Yellow}} = \frac{10}{16} = 0.625$, so A ■ Ratio red over yellow is $\frac{12}{18} = \frac{2}{3} = \frac{16}{24}$, for B it's $\frac{10}{16} = \frac{5}{8} = \frac{15}{24}$, so A ■ 30 ÷ 12 = 2.5, so for every red ball there are 2.5 balls in bag A. It's 2.6 for B so choose A	! *For this category only, chooses A, but no interpretation shown* Accept for 1m only eg ◆ $\frac{12}{18} = \frac{96}{144}$, $\frac{10}{16} = \frac{90}{144}$ so A ◆ 30 ÷ 12 = 2.5, 26 ÷ 10 = 2.6, A × *Incorrect interpretation shown* eg ◆ A: Probability of red is $\frac{12}{18} = \frac{2}{3}$ B: Probability of red is $\frac{10}{16} = \frac{5}{8}$, so A ◆ 12 ÷ 18 = 66% chance of getting red, 62.5% for B so A ◆ 30 ÷ 12 = 2.5 red, 26 ÷ 10 = 2.6 red, A

Tier & Question						Satellites
3-5	4-6	5-7	6-8			
			11		Correct response	Additional guidance
			a	**2m**	**5.82×10^6**	✓ *Answers rounded* eg, for part (a) • 6×10^6 eg, for part (b) • 2.5×10^7 ✓ *For (a), minimises A and maximises B* For 2m, accept 5.765×10^6 For 1m, accept digits 576(..) seen. ✓ *For (a), minimises 5.82* For 2m, accept 5.815×10^6 For 1m, accept digits 5815 seen. ! *Unconventional standard form notation* Penalise the first occurrence only.
				or **1m**	Digits 582(..) seen eg ■ 5820000 ■ 5820 ■ -5.82×10^6 or Shows 15300000 and 9480000, then makes no more than one computational error when subtracting, then correctly converts their answer into standard form eg ■ 15300000 − 9480000 = 5720000 = 5.72×10^6	
			b	**2m**	**2.478×10^7**	✓ *For (b), **maximises** A and maximises B* For 2m, accept $2.48(..) \times 10^7$ For 1m, accept digits 248(..) seen.
				or **1m**	Digits 247(..) or 248 seen or Shows 2.4×10^7 or Shows 15300000 and 9480000, then makes no more than one computational error when adding, then correctly converts their answer into standard form eg ■ 15300000 + 9480000 = *2678000* = 2.678×10^7	

Tier & Question					Homework	
3-5	4-6	5-7	6-8			
			12		Correct response	Additional guidance
			a	**2m**	Complete correct method, using mid-points eg ■ 15 90 45 630 75 1575 105 945 3240, ÷ 50 ■ 6 × 15 + 14 × 45 + 21 × 75 + 9 × 105, then ÷ 50 ■ 90 + 630 + 1575 + 945 is 3240, and 64.8 × 50 = 3240	! *3240 seen with no working* As this could come from 64.8 × 50, allow 1 mark only.
				or **1m**	Showing that at least 2 mid-points are multiplied by the frequency, even if the others are incorrect or omitted. or An otherwise complete correct method with clear intent to use the mid-points, but inaccurate values used eg ■ 15 90 45.5 637 75.5 1585.5 105.5 949.5 3262 ÷ 50	× *Mid-points used incorrectly* eg ◆ 15 + 45 + 75 + 105 = 240, ÷ 50 = 4.8, and 4.8 × 13.5 = 64.8
			b	**2m**	**67 ± 1**	✓ *For 2m, 67 seen then rounded to 70*
				or **1m**	Correct method seen or implied eg ■ Vertical line seen. ■ Correct marking on the *x*-axis. or Correct point identified on the graph and a value of between 63 and 70 inclusive given.	× *The horizontal line only seen*
			c	**2m**	**4**	
				or **1m**	46 seen or Value between 3.5 and 4.5 or The correct horizontal line shown or implied on the graph, with the scale misinterpreted but leading to a value of less than 10	

Tier & Question						Pyramid
3-5	4-6	5-7	6-8			
			13		**Correct response**	**Additional guidance**
			a	**1m**	**50**	✗ *Inaccurate answer due to rounding of one third* eg, in part (b) ◆ 9.06
			b	**1m**	**9**	✓ *9.0*
			c	**2m** *or* **1m**	**2.5** or equivalent Complete correct method eg ■ $25 = \frac{1}{3}.b^2.12$ $\frac{25}{4} = b^2$ $b = \sqrt{\frac{25}{4}}$ ■ √(25 × 3 ÷ 12) ■ $\sqrt{(6\frac{1}{4})}$	
			d	**1m**	Correct formula eg ■ $V = \frac{m^3}{6}$ ■ $V = \frac{\frac{1}{3}m^2m}{2}$	✓ *Formula not explicit for V* eg ◆ $6V = m^3$ ◆ $m = \sqrt[3]{(6V)}$ ✗ *Formula omits V* eg ◆ $\frac{m^3}{6}$

Tier & Question					Pots	
3-5	4-6	5-7	6-8			
			14		**Correct response**	**Additional guidance**
			a	**1m**	**0.0009,** or equivalent probability eg ■ $\frac{9}{10000}$ ■ 0.09%	
			b	**2m**	**0.0582,** or equivalent probability eg ■ $\frac{582}{10000}$	✓ *0.058 or equivalent* ! *0.06* Do not accept unless a correct method, or a more accurate value, is seen.
				or **1m**	Correct method eg ■ $(0.03 \times 0.97) \times 2$ or 0.029(1), or equivalent probability, seen.	
			c	**1m**	**Yes,** with justification The most likely justifications involve: The use of **80** eg ■ $0.97 \times 80 = 77.6$ ■ $0.03 \times 80 = 2.4$ ■ Yes, since only 2.4 will crack. or The use of **75**, with a **correct explanation** interpreting the calculation eg ■ $0.03 \times 75 = 2.25$ so that's only 72 made, but there's enough for 5 more pots and with such a low probability you wouldn't expect more than one to crack. ■ $0.03 \times 75 = 2.25$, that gives you enough for 77 pots. ■ $0.97 \times 75 = 72.75$, but with the clay for 5 more pots you are going to break one so you'll have enough. or The use of **100** eg ■ As 3 broke in every 100, there will be enough. ■ As 3 in every 100 break, it's not likely 5 will break. ■ Yes, because only 3 will break. ■ Yes, only about 2 will break.	✓ *Comparing probabilities* eg ◆ Yes, because 5 in 80 is more than 3 in 100 × *Incorrect use of 75* eg ◆ $0.03 \times 75 = 2.25$ $80 - 2.25 = 77.75$, so that's enough.

First published in 2000

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
29 Bolton Street
London
W1Y 7PD
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/00/534

