OCR
Oxford Cambridge and RSA

H

GCSE (9–1) Mathematics

J560/05 Paper 5 (Higher Tier)

Thursday 7 June 2018 – Morning

Time allowed: 1 hour 30 minutes

You may use:
- geometrical instruments
- tracing paper

Do not use:
- a calculator

First name									
Last name									
Centre number						Candidate number				

INSTRUCTIONS
- Use black ink. You may use an HB pencil for graphs and diagrams.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Read each question carefully before you start to write your answer.
- Where appropriate, your answers should be supported with working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. If additional space is required, use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the barcodes.

INFORMATION
- The total mark for this paper is **100**.
- The marks for each question are shown in brackets **[ ]**.
- This document consists of **20** pages.

No calculator can be used for this paper

Answer **all** the questions.

1 **(a)** Calculate.

$$\frac{3}{5}+\frac{5}{8}$$

Give your answer as a mixed number in its simplest form.

(a) ..... **[3]**

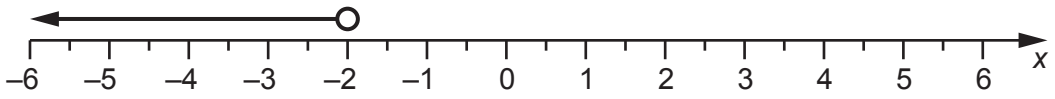
(b) Work out.

$$5\times10^{4}-1.6\times10^{3}$$

Give your answer in standard form.

(b) ..... **[3]**

2 Gemma's solution to the inequality $3x + 1 > -5$ is shown on the number line.



Is Gemma's solution correct?
Explain your reasoning.

..... **[3]**

3 Work out.

(a) $\begin{pmatrix} -3 \\ 2 \end{pmatrix} + \begin{pmatrix} 5 \\ 7 \end{pmatrix}$

(a) $\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ **[1]**

(b) $\begin{pmatrix} 3 \\ 4 \end{pmatrix} - 2\begin{pmatrix} 1 \\ -3 \end{pmatrix}$

(b) $\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ **[2]**

4 Here is the nutritional information for a 110 g serving of cereal.

Carbohydrates	99.4 g
Proteins	9.5 g
Fats	1.1 g

Emily says that more than 90% of this serving is carbohydrates.

Is she correct?
Explain your reasoning.

.....

..... **[3]**

5 The table shows the relative frequencies of the results for a football team after a number of games.

Result of game	won	lost	drew
Relative frequency	0.2	0.45	

(a) Complete the table. **[2]**

(b) The team lost 10 more games than they won.

How many games did the team play altogether?

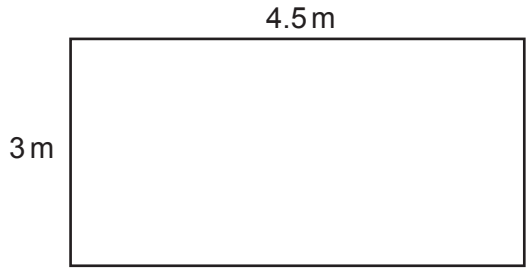
(b) ..... **[3]**

6 Jack sent 15% more text messages in March than in February.
Jack sent 460 text messages in March.

How many more texts did Jack send in March than in February?

..... **[4]**

7 Here is the floor plan of a rectangular room.



Not to scale

Tim buys carpet tiles for this room.

Each tile is a square measuring 50 cm by 50 cm.
The tiles are only sold in packs of ten.
Each pack costs £20.
Tim pays for fitting at a rate of £7.50 per square metre, with any fraction of a square metre rounded up.

Work out the **total** cost of the tiles and fitting.

£ ..... **[6]**

8 Hannah wants to display all the possible outcomes when rolling two fair 6-sided dice.

(a) Give a reason why a tree diagram is not the best method to use.

..... **[1]**

(b) **(i)** Draw a sample space to display all the possible outcomes. **[2]**

(ii) Show that the probability of the scores on the two dice adding to 11 is $\frac{1}{18}$.

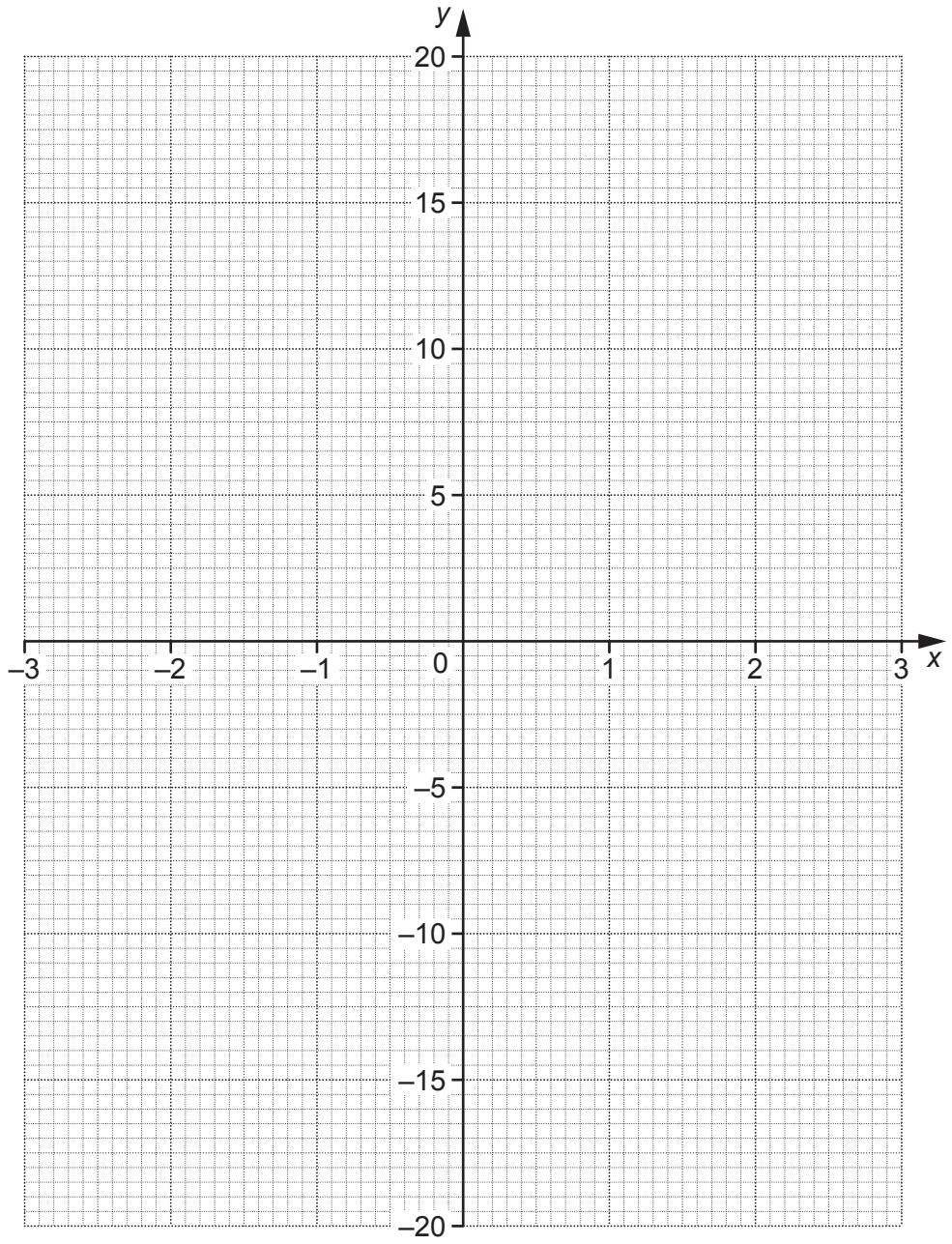
..... **[2]**

9 **(a)** Complete the table for $y = x^3 - 3x$.

x	-3	-2	-1	0	1	2	3
y	-18	-2		0	-2	2	18

[1]

(b) Draw the graph of $y = x^3 - 3x$ for $-3 \leqslant x \leqslant 3$.

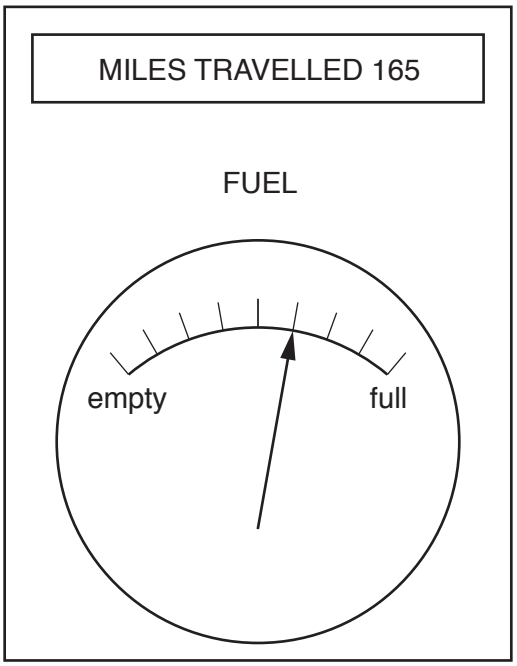


[3]

(c) Use your graph to solve $x^3 - 3x = 10$.

(c) $x =$ ..... **[1]**

10 Ifsaw noticed this information on her car's dashboard at the end of her journey.
She started her journey with a full tank of fuel and her miles travelled set to zero.



(a) Work out how far Ifsaw's car can travel on a full tank of fuel.

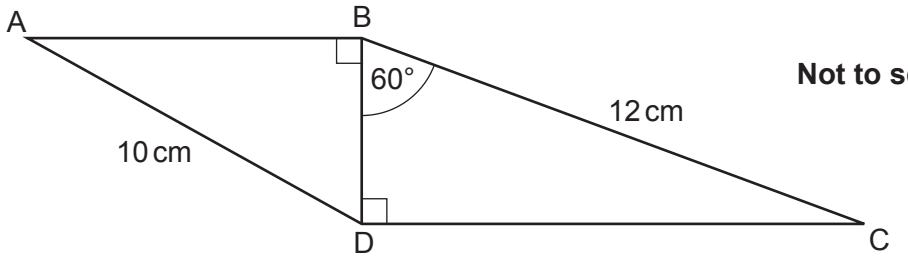
(a) ..... miles **[3]**

(b) What assumption have you made when answering part **(a)**?

.....

..... **[1]**

11 The diagram shows two right-angled triangles ABD and BCD, sharing a common side BD.
AD = 10 cm, BC = 12 cm and angle DBC = 60°.



Not to scale

Work out the length of AB.

..... cm **[6]**

12 Carol says that $64^{-\frac{1}{2}} = \frac{1}{32}$.

Explain her error and give the correct value of $64^{-\frac{1}{2}}$ in the form $\frac{p}{q}$.

.....

.....

.....

..... **[3]**

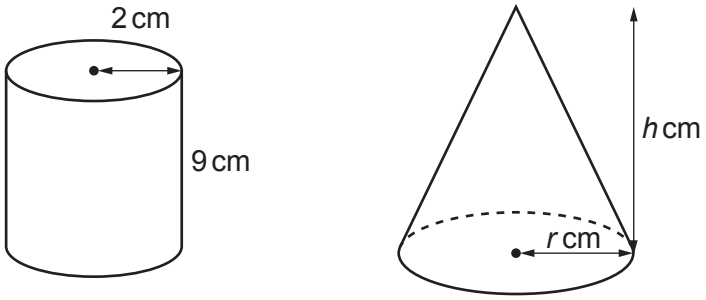
13 **(a)** Write $\frac{5}{12}$ as a recurring decimal.

(a) ..... **[2]**

(b) Convert $0.\dot{7}\dot{6}$ to a fraction.

(b) ..... **[2]**

14 The diagram shows a cylinder and a cone.



The cylinder has radius 2 cm and height 9 cm.
The cone has radius r cm and height h cm.

The ratio r : h is 1 : 4.
The volume of the cone is **equal to** the volume of the cylinder.

Work out the value of ***r***.

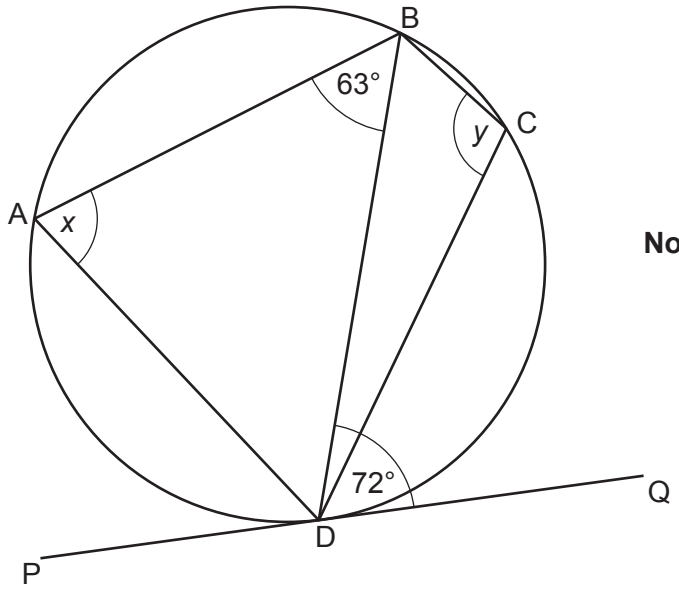
[The volume V of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... **[5]**

15 n is a positive integer.

Prove that $13n + 3 + (3n - 5)(2n + 3)$ is a multiple of 6. **[4]**

16 A, B, C and D are points on the circumference of a circle.



Not to scale

PQ is a tangent to the circle at D.
Angle BDQ = 72° and angle ABD = 63°.

(a) Work out angle *x*.
Give a reason for your answer.

Angle *x* = ...° because .....

..... **[2]**

(b) Work out angle *y*.
Give a reason for your answer.

Angle *y* = ...° because .....

..... **[2]**

17 $(x+a)(x+3)(2x+1) = bx^3 + cx^2 + dx - 12$

Find the value of a, b, c and d.

$a =$ .....

$b =$ .....

$c =$ .....

$d =$ ..... **[4]**

18 **(a)** A straight line passes through the point (0, 6) and is perpendicular to $y = 4x - 5$.

Find the equation of this line, giving your answer in the form $y = mx + c$.

(a) ..... **[3]**

(b) Work out the coordinates of the intersection of the graphs of $y = 4x - 5$ and $y = x^2 - 17$.

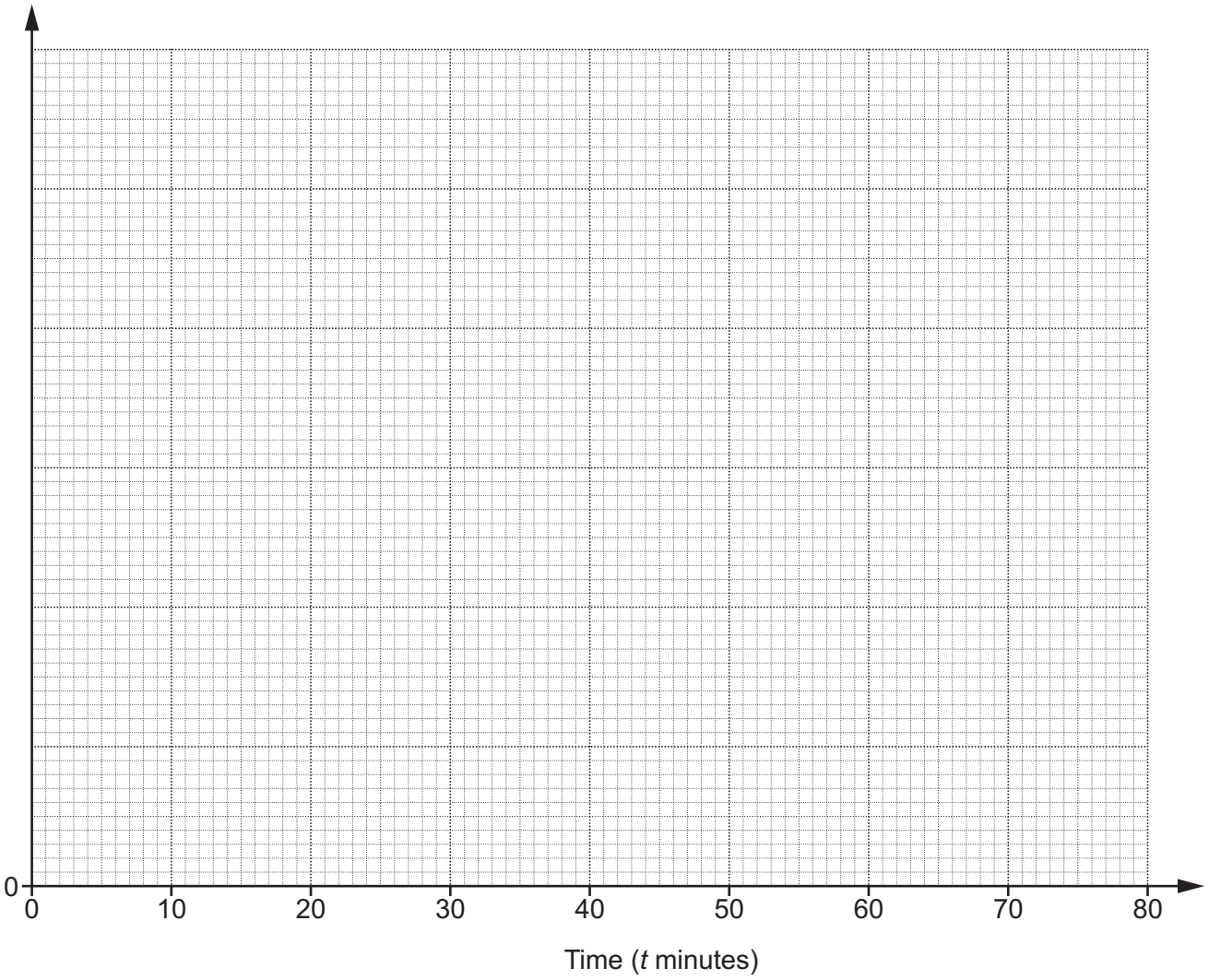
(b) (..... , ...)

(..... , ...) **[6]**

19 Ceri records the time taken, t minutes, to travel to school for a sample of 168 students at her Academy.

Time taken (t minutes)	Frequency
$0 < t \leqslant 10$	54
$10 < t \leqslant 20$	50
$20 < t \leqslant 40$	44
$40 < t \leqslant 80$	20

(a) Draw a histogram to represent this information.



[4]

(b) Ceri says

The longest time that any of these students took to travel to school was 80 minutes.

Is she correct?
Give a reason for your answer.

.....

..... **[1]**

(c) Ceri also claims that 25% of all of the students at this Academy took more than 30 minutes to travel to school.

(i) Show how Ceri might have worked out her claim. **[2]**

(ii) State one assumption that Ceri has made in making her claim.

.....

..... **[1]**

20 In the following equation, n is an integer greater than 1.

$$(\sqrt{2})^n = k\sqrt{2}$$

(a) (i) Find k when $n = 7$.

(a)(i) $k =$ ..... **[2]**

(ii) Find n when $k = 64$.

(ii) $n =$ ..... **[2]**

(b) Show that $\dfrac{14}{3-\sqrt{2}}$ can be written in the form $a + b\sqrt{2}$. **[5]**

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

OCR
Oxford Cambridge and RSA

GCSE

Mathematics (9-1)

Unit **J560/05:** Paper 5 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for June 2018

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

Annotations used in the detailed Mark Scheme.

Annotation	Meaning
	Correct
	Incorrect
BOD	Benefit of doubt
FT	Follow through
ISW	Ignore subsequent working (after correct answer obtained), provided method has been completed
M0	Method mark awarded 0
M1	Method mark awarded 1
M2	Method mark awarded 2
A1	Accuracy mark awarded 1
B1	Independent mark awarded 1
B2	Independent mark awarded 2
MR	Misread
SC	Special case
^	Omission sign

These should be used whenever appropriate during your marking.

The **M**, **A, B**, etc annotations must be used on your standardisation scripts for responses that are not awarded either 0 or full marks.
It is vital that you annotate these scripts to show how the marks have been awarded.
It is not mandatory to use annotations for any other marking, though you may wish to use them in some circumstances.

Subject-Specific Marking Instructions

1. **M** marks are for using a correct method and are not lost for purely numerical errors.
   A marks are for an accurate answer and depend on preceding **M** (method) marks. Therefore **M0 A1** cannot be awarded.
   B marks are independent of **M** (method) marks and are for a correct final answer, a partially correct answer, or a correct intermediate stage.
   SC marks are for special cases that are worthy of some credit.

2. Unless the answer and marks columns of the mark scheme specify **M** and **A** marks etc, or the mark scheme is 'banded', then if the correct answer is clearly given and is not from wrong working **full marks** should be awarded.

   Do not award the marks if the answer was obtained from an incorrect method, ie incorrect working is seen and the correct answer clearly follows from it.

3. Where follow through (**FT**) is indicated in the mark scheme, marks can be awarded where the candidate's work follows correctly from a previous answer whether or not it was correct.

   Figures or expressions that are being followed through are sometimes encompassed by single quotation marks after the word *their* for clarity, eg FT 180 × (*their* '37' + 16), or FT 300 – $\sqrt{}$(*their* '$5^2 + 7^2$'). Answers to part questions which are being followed through are indicated by eg FT 3 × *their* (a).

For questions with FT available you must ensure that you refer back to the relevant previous answer. You may find it easier to mark these questions candidate by candidate rather than question by question.

4. Where dependent (**dep**) marks are indicated in the mark scheme, you must check that the candidate has met all the criteria specified for the mark to be awarded.

5. The following abbreviations are commonly found in GCSE Mathematics mark schemes.

   - **figs 237**, for example, means any answer with only these digits. You should ignore leading or trailing zeros and any decimal point eg 237000, 2.37, 2.370, 0.00237 would be acceptable but 23070 or 2374 would not.
   - **isw** means **ignore subsequent working** after correct answer obtained and applies as a default.
   - **nfww** means **not from wrong working**.
   - **oe** means **or equivalent**.
   - **rot** means **rounded or truncated**.
   - **seen** means that you should award the mark if that number/expression is seen anywhere in the answer space, including the answer line, even if it is not in the method leading to the final answer.
   - **soi** means **seen or implied**.

6. In questions with no final answer line, make no deductions for wrong work after an acceptable answer (ie **isw**) unless the mark scheme says otherwise, indicated by the instruction 'mark final answer'.

7. In questions with a final answer line following working space,

   (i) if the correct answer is seen in the body of working and the answer given on the answer line is a clear transcription error allow full marks unless the mark scheme says 'mark final answer'. Place the annotation ✓ next to the correct answer.

   (ii) if the correct answer is seen in the body of working but the answer line is blank, allow full marks. Place the annotation ✓ next to the correct answer.

   (iii) if the correct answer is seen in the body of working but a completely different answer is seen on the answer line, then accuracy marks for the answer are lost. Method marks could still be awarded. Use the M0, M1, M2 annotations as appropriate and place the annotation × next to the wrong answer.

8. In questions with a final answer line:

   (i) If one answer is provided on the answer line, mark the method that leads to that answer.

   (ii) If more than one answer is provided on the answer line and there is a single method provided, award method marks only.

   (iii) If more than one answer is provided on the answer line and there is more than one method provided, award zero marks for the question unless the candidate has clearly indicated which method is to be marked.

9. In questions with no final answer line:

   (i) If a single response is provided, mark as usual.

   (ii) If more than one response is provided, award zero marks for the question unless the candidate has clearly indicated which response is to be marked.

10. When the data of a question is consistently misread in such a way as not to alter the nature or difficulty of the question, please follow the candidate's work and allow follow through for **A** and **B** marks. Deduct 1 mark from any **A** or **B** marks earned and record this by using the MR annotation. **M** marks are not deducted for misreads.

11. Unless the question asks for an answer to a specific degree of accuracy, always mark at the greatest number of significant figures even if this is rounded or truncated on the answer line. For example, an answer in the mark scheme is 15.75, which is seen in the working. The candidate then rounds or truncates this to 15.8, 15 or 16 on the answer line. Allow full marks for the 15.75.

12. Ranges of answers given in the mark scheme are always inclusive.

13. For methods not provided for in the mark scheme give as far as possible equivalent marks for equivalent work. If in doubt, consult your Team Leader.

14. Anything in the mark scheme which is in square brackets […] is not required for the mark to be earned, but if present it must be correct.

Question			Answer	Marks	Part marks and guidance	
1	(a)		$1\frac{9}{40}$	3	Mark final answer **M2** for $\frac{24[k]+25[k]}{40[k]}$ or better (k is positive integer) or **M1** for two equivalent fractions with common denominator of 40[k] attempted with one numerator correct If **0** scored, **SC1** for answer 1.225	Could be separate fractions M2 soi by $\frac{49[k]}{40[k]}$ oe Could be seen in 2 different fractions without addition
	(b)		4.84×10^4	3	**M2** for figs 484 in final answer or **B1** for 50 000 or 50×10^3 **seen** or for 1600 or 0.16×10^4 **seen**	Allow M2 if correct answer oe seen in working
2			Correct solution is $x > -2$	**M2**	**M1** for $3x > -5-1$ **oe** or evaluates $3x + 1$ correctly for $x = -3$ or $x = -4$, or $x = -5$ or $x = -6$	For M2 accept in words, x is greater than –2, accept correctly drawn solution on a number line For M1 condone incorrect inequality sign or 'equals' e.g. $x = -2$ implies M1 M1 implied by –8 or –11 or –14 or -17
			No and number line shows $x < -2$ **oe** or No and draws the correct inequality on number line or No [the circle is correctly placed but] the arrow points the wrong way **oe**	**A1**	After **0** scored, allow **SC1** for number line shows $x < -2$ **oe isw** or for [the circle is correctly placed but] the arrow points the wrong way **oe**	But for A1 or SC1 if just 'it points the wrong way' oe accept this provided there is no incorrect statement about where the circle should be placed **and** no incorrect working shown
3	(a)		$\begin{pmatrix}2\\9\end{pmatrix}$	1		In (a) and (b) penalise first occurrence of fraction line in vector

Question			Answer	Marks	Part marks and guidance	
	(b)		$\begin{pmatrix}1\\10\end{pmatrix}$	2	**B1** for answer $\begin{pmatrix}1\\k\end{pmatrix}$ or $\begin{pmatrix}k\\10\end{pmatrix}$	
4			Correct attempt to find 90% or 10% of 110 99 or 11 **and** 10.6 [She is] correct **oe**	**M1** **A1** **A1**	or $\frac{99.4}{110}[\times 100]$ **oe** or $\frac{9.5+1.1}{110}[\times 100]$ **oe** or 90.36 to 90.4 or 9.6[4] **and** 10 Dep on M1A1 earned	M1 implied by 99 seen or 11 and 10.6 seen or 90.36 or 9.6[4] and 10 seen Be aware of 90.36 or 9.6[4] appearing without written evidence as possible calculator use Other methods are possible
5	(a)		[0].35 **oe**	2	**M1** for 1 – (0.2 + 0.45) **oe**	isw conversion to other forms M1 implied by answer 0.53
	(b)		40	3	**M2** for 10 ÷ (0.45 – 0.2) **oe** or **M1** for 0.45 – 0.2 **soi**	e.g. 0.25 **oe** associated with 10 [games] then 4 × 10 soi Allow with algebra, eg for M1 $0.45x - 0.2x = 10$
6			60	4	**B3** for [Feb =] 400 or **M2** for 460 ÷ $\left(\frac{100+15}{100}\right)$ **oe** or **M1** for 115% **oe**	400 as answer implies B3 e.g. 1.15, $\frac{23}{20}$

Question			Answer	Marks	Part marks and guidance	
7			225[.00] **nfww**	6	**B3** for 54 [tiles] OR **M1** 3 × 4.5 **oe** or 300 × 450 **oe** or 4.5 ÷ 0.5 or 450÷ 50 **oe soi** and **M1** 0.5 × 0.5 **oe** or 50 × 50 **oe** or 3 ÷ 0.5 or 300 ÷ 50 **oe soi** AND **M1** for *their* 6 × 20 **M1** for *their* 14 × 7.5	Could be on diagram Could be on diagram *their* 6 is correct number of packs for *their* number of tiles – must be positive integer, implied by 120 *their* 14 is *their* answer to (3 × 4.5) rounded up to next integer, implied by 105
8	(a)		Too many branches **oe**	1		Accept e.g. Takes too long oe Tree would be too big oe Too complicated oe Too hard to draw oe Tree diagrams are better for fewer outcomes oe Do not accept e.g. Trees can only have two branches

Question			Answer	Marks	Part marks and guidance	
	(b)	(i)	Attempts sample space	M1	Presented in any clear form, including list or table	For M1, accept two by two table drawn with row and column labelled 1 to 6 [with no entries or with incorrect entries]
			36 correct outcomes	A1	Pairs shown or accept as totals in table	For M1 accept as a list of at least 6 different pairs or totals with no others or no repeats If listing as pairs on table, condone e.g. (2, 1) listed as (1, 2) etc
		(ii)	$\frac{2}{36}=\frac{1}{18}$	2	**M1** for (5, 6) and (6, 5) identified or for $2\left(\frac{1}{6}\times\frac{1}{6}\right)$ **oe**	Accept indicated on sample space
9	(a)		2	1		
	(b)		Fully correct graph	3	**B2FT** for 7 correctly plotted points or **B1FT** for 5 or 6 correctly plotted points	Mark in 70% zoom, use overlay, mark curve first For 3 marks, curve must pass through or touch circles on overlay Condone ruled sections for $-3 \leq x \leq -2$, $-1 \leq x \leq 1$ and $2 \leq x \leq 3$. No vertical section on curve of more than 5 small squares must have min and max Condone slight feathering If curve incorrect, mark the plots use the overlay, plots must lie inside or touch circles. If large blob for plot, check centre of blob
	(c)		2.5 to 2.7	1		

Question			Answer	Marks	Part marks and guidance	
10	(a)		440	3	**M2** for 165 ÷ 3 × 8 or **M1** for 165 is $1-\frac{5}{8}$ **soi** or for 165 ÷ 3 **soi** If **0** scored, **SC1** for answer 264	M1 implied by 55 or 275 seen (from 165 ÷ 5 × 8)
	(b)		Correct comment	1	Any statement that implies the assumption that the rate of petrol consumption remains constant	e.g. Speed stays the same Same type of roads The car uses fuel at the same rate Does not get stuck in traffic Weather stays the same See AG
11			8 **nfww**	6	**B1** for cos 60 = 0.5 **oe soi** **M1** for $\frac{BD}{12}$ = cos 60 **oe** **A1** for [BD =] 6 AND **M2** for $\sqrt{10^2 - their\ BD^2}$ or **M1** for *their* $BD^2 + AB^2 = 10^2$ **oe** or for $10^2 -$ *their* BD^2	nfww - must check method before giving 6 marks must not come from wrong working e.g. sin 30 = 0.5 e.g. $\frac{BD}{12}$ = sin 30 For M2 or M1 0 < *their* BD < 10 and BD must be identified first on diagram or in working

Question			Answer	Marks	Part marks and guidance	
12			She divided by 2 and did not square root **oe** $\frac{1}{8}$	**B1** **2**	 **M1** for square root [8 seen in answer] **M1** for reciprocal [implied by answer of form $\frac{1}{n}$, $n \neq 0$ or 32]	Must mention divide by 2 oe accept in symbols e.g. ÷ 2 **and** square rooting. Accept $\sqrt{}$ or [square] root for square root Each step must be correctly evaluated but FT previous step Allow method marks in either order
13	(a)		$0.41\dot{6}$	**2**	**B1** for answer 0.41...	For 2 marks accept e.g. 0.4166[6]… or 0.416r
	(b)		$\frac{76}{99}$	**2**	Mark final answer **M1** for 76.76... **seen** or answer $\frac{k}{99}$	
14			3 **nfww**	**5**	 **B4** for $4r^3 = 108$ **or better** or **B3** for $r^2h = 108$ or **M3** for $\pi \times 2^2 \times 9 = \frac{1}{3}\pi r^2 4r$ **oe** or for $\pi \times 2^2 \times 9 = \frac{1}{3}\pi\left(\frac{h}{4}\right)^2 h$ **oe** or **B2** for 36π or **M1** for $\pi \times 2^2 \times 9$ **or better** or **B1** for $4r$ or $\frac{h}{4}$ **seen**	nfww - must check method before giving 5 marks must not come from wrong working Condone use of other letter for r (or h) e.g. x For method marks allow use of 3.14, 3.142 or 22/7 for π

Question			Answer	Marks	Part marks and guidance	
15			[13n + 3 +] 6n^2 + 9n – 10n – 15	M2	**M1** for two or three of 6n^2 + 9n – 10n – 15	For M2 accept 6n^2 + – [1]n – 15 For M1, accept expansion on grid with negative signs shown
			6n^2 + 12n – 12	A1		For A1, condone 6n^2 + 12n – 12 = 0
			6(n^2 + 2n – 2) and is a multiple of 6 **oe**	A1	Dep on M2 A1 and no errors seen Accept (6n^2 + 12n – 12) ÷ 6 = n^2 + 2n – 2 and is a multiple of 6 **oe**	Do not accept each term is a multiple of 6 without showing the outcome n^2 + 2n – 2
16	(a)		72 and [angles in] alternate segment [are equal]	2	**B1** for 72	For 2 marks. In reason, must mention alternate segment or opposite segment with no incorrect statement seen
	(b)		108 and [opposite angles of a] cyclic quadrilateral [are supplementary] **oe**	2FT	**FT** 180 – *their* 72 with correct reason accept alt reason angles on a [straight] line [add up to 180] **and** [angles in] alternate segment [are equal] **oe** **B1FT** for 180 – *their* 72 or for a correct reason given	In reason, must mention cyclic quadrilateral with no incorrect statement If part (a) blank allow 2FT 180 – x in (b) with a correct reason or B1FT for 180 – x

Question			Answer	Marks	Part marks and guidance	
17			$a = -4$ $b = 2$ $c = -1$ $d = -25$	4	**B4** for 4 correct values For 3 marks or less, **FT** $7 + 2 \times$ *their a* for c and **FT** $3 + 7 \times$ *their a* for *d* OR **B3** for any 3 correct or **FT** OR **B2** for any 2 correct or **FT** or for reaching $2x^3 + (7 + 2a)x^2 + (3 + 7a)x + 3a$ **oe** OR **B1** for any one correct or **FT** or any correct product of two brackets	Mark answers first B2 for a fully correct 3-bracket expansion, could be unsimplified e.g. $2x^3 + 7x^2 + 2ax^2 + 3x + 7ax + 3a$ For B1, $2x^2 + x + 6x + 3$ or better or $x^2 + ax + 3x + 3a$ or better or $2x^2 + 2ax + x + a$ or better For B1 accept terms on a grid
18	(a)		$y = -\frac{1}{4}x + 6$	3	Mark final answer **B2** for correct equation **seen** or **M1** for [grad=] $-\frac{1}{4}$ **oe soi** **M1** for answer $y = kx + 6$ **oe** ($k \neq 0$)	For 3 marks accept $y = -0.25x + 6$ Does not have to be in form $y = mx + c$ e.g. $y - 6 = -\frac{1}{4}(x - 0)$

Question			Answer	Marks	Part marks and guidance	
	(b)		(6, 19) and (–2, –13)	**6**	**M2** for $x^2 – 4x – 12$ [= 0] or **M1** for $x^2 – 17 = 4x – 5$ **or better** **M2** for $(x – 6)(x + 2)$ [= 0] **oe** or **M1** for $(x + a)(x + b)$) [= 0] where $a + b = – 4$ or $ab = –12$ **B1** for either pair of coordinates correct or for $x = 6$ and $x = – 2$	 FT *their* 3 term quadratic equation or expression. Accept correct use of quad formula or complete the square M2 if completely correct, M1 if one error in formula or complete the square See AG for alt method
19	**(a)**		Correct histogram with blocks of height 5.4, 5, 2.2 and 0.5	**3**	**B2** for 3 correct blocks or **B1** for 2 correct blocks of different widths If **0** scored, **SC1** for 3 correct freq densities **soi** 5.4 **oe**, 5 , 2.2 **oe** and 0.5 **oe**	½ small square accuracy for heights, no gaps between blocks Condone good freehand if in tolerance Condone omission of vertical line at $t = 80$ Other correct histograms may be possible with different scales For SC1 oe accept e.g. $\frac{44}{20}$ isw for 2.2
			Vertical axis labelled ‘frequency density’ and a correct linear scale shown	**1**		At least 2 numbers shown for linear scale (other than zero), A correct linear scale could use e.g. 2 cm to 1 unit or 2 cm for 2 units Accept FD for frequency density label

Question			Answer	Marks	Part marks and guidance	
	(b)		We don't know **oe** and correct reason	**1**	e.g. Not sure, as exact data not given.	Accept No with correct reason but do not accept 'yes' with any reason e.g. No, all we know is that the longest time is in the group from 40 to 80 See AG
	(c)	**(i)**	20 + 44 ÷ 2 = 42	**M1**	or 168 – 54 – 50 – 44 ÷ 2	Accept 22 for 44 ÷ 2
			42 is 25% of [total]168 **oe**	**A1**	with no errors seen	Accept e.g. ¼ of 168 = 42, 168 ÷ 4 = 42 $\frac{42}{168} = \frac{1}{4}$ etc oe These two steps may be done in reverse order
		(ii)	Correct statement on assumption made	**B1**		e.g. Sample is representative oe Distribution of students in the school is the same as the sample Data is distributed uniformly across the times/ the interval $20< t \leq 40$ oe Half of the students in $20< t \leq 40$ took longer than 30 minutes 22 of the students took between 30 and 40
20	**(a)**	**(i)**	8	**2**	**M1** for $\left[\left(\sqrt{2}\right)^7 =\right] \ 2^3 \times \sqrt{2}$	For M1 accept 2 × 2 × 2 for 2^3 Final answer $8\sqrt{2}$ scores M1
		(ii)	13	**2**	**B1** for 2 correct trials with $n > 3$ correctly evaluated or **M1** for $\left(\sqrt{2}\right)^{12} = 2^6$ **oe** or for $\frac{n-1}{2} = 6$ **oe**	e.g. $\left(\sqrt{2}\right)^6 = 8$ and $\left(\sqrt{2}\right)^9 = 16\sqrt{2}$

Question			Answer	Marks	Part marks and guidance	
	(b)		$\frac{14}{3-\sqrt{2}} \times \frac{3+\sqrt{2}}{3+\sqrt{2}}$ **or better**	**M1**		If written in a single fraction, must have brackets
			$\frac{14\left(3+\sqrt{2}\right)}{7}$	**B3**	or **M2** for $\frac{14\left(3+\sqrt{2}\right)}{9+3\sqrt{2}-3\sqrt{2}-\left(\sqrt{2}\right)^2}$ **or better** or **M1** for numerator or denominator correct	For B marks or method marks, allow numerator brackets expanded For M1, allow denominator unsimplified but not 9 – 2 or 7 if from wrong working Allow M1 for either numerator or denominator even if not in fraction
			$2\left(3+\sqrt{2}\right)$ or $6 + 2\sqrt{2}$	**A1**	Dep on M1B3 earned	

APPENDIX

Exemplar responses for Q10b

Response	**Mark**
Travelled at same speed	**1**
Car burns fuel same as for first 165 miles	**1**
Same amount of fuel is used for each bar	**1**
She travels constantly and does not stop BOD (speed is constant)	**BOD 1**
The roads are similar without having to stop and start in traffic	**1**
When the arrow reaches each point, she has travelled the same distance	**1**
The roads were similar for the rest of the journey	**1**
The tank empties at a consistent rate	**1**
Fuel gauge reading is accurate/correct	**1**
She did not have a fuel leak	**1**
She did not stop (not enough)	**0**
How efficiently she drove the car	**0**
The speed of the car	**0**
Car uses same amount of fuel each time	**0**
Every 4 bars would travel 165 miles (4 is incorrect – OK is 3 bars mentioned)	**0**
There are no diversions to her route	**0**
The fuel is used solely on covering distance (vague)	**0**
There are no hills (not enough as there may have been on the first part of the journey)	**0**

Exemplar responses for Q19b

Response	Mark
No all we know is that it lies between 40 and 80	**1**
They may have taken 80 minutes but we don't know that for sure – they may have all been less than 60	**1**
No [because the time section says 40< $t \leq 80$,] they may have been less than 80	**1**
No there is a range of values for the time so not definitely 80	**1**
No as the time is given as a range	**1**
No we are not give the accurate values	**1**
It might be but we would need to know the exact values to find out	**1**
Yes 80 is the highest value	**0**
Yes with any comment	**0**

Q18b alt algebraic method

	(b)		(6, 19) and (–2, –13)	**6**	**M2** for $y^2 - 6y - 247$ [= 0] or **M1** for $y = \left(\frac{y+5}{4}\right)^2$ - 17 **or better** **M2** for $(y + 13)(y - 19)$ [= 0] **oe** or **M1** for $(y + a)(y + b)$) [= 0] where $a + b = -6$ or $ab = -247$ **B1** for either pair of coordinates correct or for $y = 19$ and $y = -13$	FT *their* 3 term quadratic equation or expression. Accept correct use of quad formula or complete the square M2 if completely correct, M1 if one error in formula or complete the square See AG

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