

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 $x > -2$ 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	M2 A1	M1 for $3x > -5 - 1$ oe or evaluates $3x + 1$ correctly for $x = -3$ or $x = -4$, or $x = -5$ or $x = -6$ 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	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 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

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	(b)		$\binom{1}{10}$	2	B1 for answer $\binom{1}{k}$ or $\binom{k}{10}$	
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 $10 \div (0.45 - 0.2)$ 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 $460 \div \left(\frac{100+15}{100}\right)$ oe or M1 for 115% oe	400 as answer implies B3 e.g. 1.15, $\frac{23}{20}$

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7			225[.00] nfww	6	B3 for 54 [tiles] OR M1 3×4.5 oe or 300×450 oe or $4.5 \div 0.5$ or $450 \div 50$ oe soi and M1 0.5×0.5 oe or 50×50 oe or $3 \div 0.5$ or $300 \div 50$ oe soi AND M1 for <i>their</i> 6×20 M1 for <i>their</i> 14×7.5	Could be on diagram Could be on diagram <i>their</i> 6 is correct number of packs for <i>their</i> number of tiles – must be positive integer, implied by 120 <i>their</i> 14 is <i>their</i> 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

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	(b)	(i)	Attempts sample space 36 correct outcomes	M1 A1	Presented in any clear form, including list or table Pairs shown or accept as totals in table	For M1, accept two by two table drawn with row and column labelled 1 to 6 [with no entries or with incorrect entries] 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		

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10	(a)		440	3	M2 for $165 \div 3 \times 8$ or M1 for 165 is $1 - \frac{5}{8}$ soi or for $165 \div 3$ soi If 0 scored, SC1 for answer 264	M1 implied by 55 or 275 seen (from $165 \div 5 \times 8$)
	(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 $\sqrt{10^2 - \text{their } BD^2}$ or M1 for $\text{their } BD^2 + AB^2 = 10^2$ oe or for $10^2 - \text{their } BD^2$	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 $0 < \text{their } BD < 10$ and BD must be identified first on diagram or in working

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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. $\div 2$ and square rooting. Accept $\sqrt{\quad}$ or [square] root for square root Each step must be correctly evaluated but FT previous step Allow method marks in either order
13	(a)		0.416 ⁸	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 $\frac{22}{7}$ for π

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15			$[13n + 3 +] 6n^2 + 9n - 10n - 15$ $6n^2 + 12n - 12$ $6(n^2 + 2n - 2)$ and is a multiple of 6 oe	M2 A1 A1	M1 for two or three of $6n^2 + 9n - 10n - 15$ Dep on M2 A1 and no errors seen Accept $(6n^2 + 12n - 12) \div 6 = n^2 + 2n - 2$ and is a multiple of 6 oe	For M2 accept $6n^2 + - [1]n - 15$ For M1, accept expansion on grid with negative signs shown For A1, condone $6n^2 + 12n - 12 = 0$ 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 – <i>their</i> 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 – <i>their</i> 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

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17			$a = -4$ $b = 2$ $c = -1$ $d = -25$	4	B4 for 4 correct values For 3 marks or less, FT $7 + 2 \times \text{their } a$ for c and FT $3 + 7 \times \text{their } a$ 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. $y - 6 = -\frac{1}{4}(x - 0)$

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	(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 <i>their</i> 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 Vertical axis labelled 'frequency density' and a correct linear scale shown	3 1	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 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

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	(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 42 is 25% of [total] 168 oe	M1 A1	or 168 – 54 – 50 – 44 ÷ 2 with no errors seen	Accept 22 for 44 ÷ 2 Accept e.g. $\frac{1}{4}$ 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 $\left[(\sqrt{2})^7 = \right] 2^3 \times \sqrt{2}$	For M1 accept $2 \times 2 \times 2$ 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 $(\sqrt{2})^{12} = 2^6$ oe or for $\frac{n-1}{2} = 6$ oe	e.g. $(\sqrt{2})^6 = 8$ and $(\sqrt{2})^9 = 16\sqrt{2}$

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	(b)		$\frac{14}{3-\sqrt{2}} \times \frac{3+\sqrt{2}}{3+\sqrt{2}} \text{ or better}$ $\frac{14(3+\sqrt{2})}{7}$ $2(3+\sqrt{2}) \text{ or } 6 + 2\sqrt{2}$	M1 B3 A1	If written in a single fraction, must have brackets or M2 for $\frac{14(3+\sqrt{2})}{9+3\sqrt{2}-3\sqrt{2}-(\sqrt{2})^2}$ or better or M1 for numerator or denominator correct Dep on M1B3 earned	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