1380_3H					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)	$\frac{4}{20}=\frac{2}{10}$	$\frac{1}{5}$	2	M1 $\frac{4}{20}$ oe A1 cao [SC: B1 fo $\frac{16}{20}$ if M0 scored]
	(b)	$\frac{6}{20}\times 100$ or $\frac{6}{20}=\frac{5\times 6}{5\times 20}$	30	2	M1 $\frac{6}{20}\times 100$ A1 cao or M1 $\frac{6}{20}=\frac{5\times 6}{5\times 20}$ A1 cao
	(c)	10 – 1.50 = 8.50 8.50 ÷2 = 4.25 or 10 ÷ 2 = 5 1.50 ÷ 2 = 0.75	5.75	2	M1 10 – 1.50 (= 8.50) and '8.50' ÷ 2 (= 4.25) or 10 + 1.50 (=11.50) and '11.50' ÷ 2 or 10 ÷ 2 and 1.50 ÷ 2 or $2x \pm 1.5(0) = 10$ oe A1 cao
2	(a)	$4^2 + 6^2 = 2 \times 5^2 + 2$	4th line	1	B1 cao
	(b)	$10^2 + 12^2 = 2 \times 11^2 + 2 = 244$	10th line	2	M1 for two of $10^2 + 12^2$, $2 \times 11^2 + 2$, 244 A1 for a fully correct line 10
	(c)	$2 \times 1000^2 + 2$ $= 2 \times 1\,000\,000 + 2$	2 000 002 or 2 million and 2	2	M1 $2 \times 1000^2 + 2$ A1 for 2 000 002 or 2 million and 2

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Question		**Working**	**Answer**	**Mark**	**Notes**
3		Exterior angle = $\frac{360}{6}$ = 60 Interior angle = 180 – 60 = 120 120 + 90 = 210 360 – 210 = OR Sum of interior angles = 4 × 180 = 720 Interior angle = 720 ÷ 6 = 120 120 + 90 = 210 360 – 210 = OR Exterior angle = $\frac{360}{6}$ = 60 Exterior angle = 90 90 + 60 =	150	4	M1 $\frac{360}{6}$ (= 60) M1 (Interior angle =) 180 – '60' M1 (dep on at least M1) 360 – ('120' + 90) A1 cao [SC: B2 answer of 210] OR M1 4 × 180 or 720 seen M1 '720' ÷ 6 M1 (dep on at least M1) 360 – ('120' + 90) A1 cao OR M1 $\frac{360}{6}$ (= 60) M1 (Exterior angle =) $\frac{360}{4}$ or 180 – 90 or 90 seen as exterior angle on diagram M1(dep on at least M1) '90' + '60' A1 cao
4			3.1	2	M1 sight of 11th value or digits 31 A1 3.1

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Question		**Working**	**Answer**	**Mark**	**Notes**
5	(a)	Vertices at (–4, 2), (–4, 0), (0, 0) and (–2, 2)	Correct translation	2	M1 for any translation A1 cao
	(b)	Vertices at (4, 4), (2, 4) and (2, 8)	Correct reflection	2	M1 Line $y = x$ drawn or correct reflection in $y = -x$ A1 cao
6		Distance = 25 + 45 + 30 = 100 Travel time = 100 ÷ 50 = 2 9 am + 2h + 3h **OR** 25 ÷ 50 + 45 ÷ 50 + 30 ÷ 50 = 30 min + 54 min + 36 min = 120 min = 2 hours 9 am + 2h + 3h	2 pm	4	M1 adding 2 or 3 distances with at least 2 correct) M1 '100' ÷ 50 (= 2 hours) M1 9 + 3 + '100 ÷ 50' oe A1 cao **OR** M1 for $\frac{25}{50}$ (= 30 min) or $\frac{45}{50}$ (= 54 min or $\frac{30}{50}$ (= 36 min) M1 for adding 2 or 3 times (from at least 2 correct distances) (= 2 hours) M1 9 + 3 + '30 + 54 + 36' oe A1 cao

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Question		**Working**	**Answer**	**Mark**	**Notes**
7	(a)	$3(2t-4) = 2t+12$ $6t-12 = 2t+12$ $6t-2t = 12+12$ $4t = 24$	6	3	B1 $6t-12$ or $\frac{2t}{3}+\frac{12}{3}$ M1 correctly isolating their terms in t or their constant terms in an equation A1 cao
	(b)	$2(x-y)-3(x-2y)$ $=2x-2y-3x+6y$	$-x+4y$	2	M1 $2x-2y$ or $3x-6y$ or $-3x+6y$ A1 $-x+4y$ or $4y-x$ [SC: B1 for $-x-8y$ or $x+4y$ with or without working if M0 scored]
	(c)	$(x-5)(x+7)$ $= x^2-5x+7x-35$	$x^2+2x-35$	2	M1 3 out of 4 terms correct with correct signs or all 4 terms correct ignoring any sign errors A1 cao
8		$0.5 \times 0.6 = 0.3\ (0)$ 0.3×0.3	0.09	2	B1 0.5 or 0.6 or 0.3 seen B1 cao

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Question		**Working**	**Answer**	**Mark**	**Notes**
9		22.5% – 17.5% = 5% $180 \times \frac{5}{100}$ OR $180 \times \frac{22\frac{1}{2}}{100} = 40.50$ $180 \times \frac{17\frac{1}{2}}{100} = 31.50$ 40.50 – 31.50 OR 1.225 × 180 = 220.5 1.175 × 180 = 211.5 220.5 – 211.5	9	3	M1 22.5 – 17.5 M1 180 × '$\frac{5}{100}$' oe A1 cao OR M1 180 × $\frac{22\frac{1}{2}}{100}$ oe or 180 × $\frac{17\frac{1}{2}}{100}$ oe M1 (dep) '40.50' – '31.50' A1 cao OR M1 1.225 × 180 or 1.175 × 180 M1 (dep) '220.5' – '211.5' A1 cao [SC: Award M2 A0 for an answer of 9 with 1 arithmetic error]
10		*CBE* = 180 – 2 × 48 = 180 – 96 = 84 *DCB* = 84 OR *CBE* = 180 – 2 × 48 = 180 – 96 = 84 *CBA* = 180 – 84 = 96 *ACB* = 42	42	3	M1 correct method to find < *CBE* or 84 seen at *CBE* on the diagram M1 correct method to find an angle in triangle *ABC* or to find angle *DCB* (these angles may be seen on the diagram) A1 cao

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Question		**Working**	**Answer**	**Mark**	**Notes**
11	(a)	Plot (15, 22) and (55, 15)	Points plotted	1	B1 cao ± ½ square
	(b)		Describe relationship	1	B1 If the temperature increases so the time taken decreases oe (accept negative correlation)
	(c)		18 – 20	2	M1 draw LOBF between (20,18) and (20, 22) to (70,3) and (70,8) A1 18 – 20 (if M0 allow B2 for an answer in the range 18–20)
	(d)		Reason	1	B1 reason e.g LOBF would give negative time, you should not use the LOBF beyond your data
12		$9x + 12y = 600$ $8x + 12y = 576$ $x = 24$ $3 \times 24 + 4y = 200$ $6x + 8y = 400$ $6x + 9y = 432$ $y = 32$ $3x + 4 \times 32 = 200$	$x = 24$ $y = 32$	4	M1 correct process to eliminate either x or y (allow one arithmetical error) A1 either $x = 24$ or $y = 32$ M1 (dep on 1st M1) correct substitution of their value of x or y into one of the equations OR M1 (indep of 1st M1) correct process to eliminate the other variable (allow one arithmetical error) A1 cao for both $x = 24$ and $y = 32$
13	(a)	$(6 \times 10^8) \times (4 \times 10^7) = 24 \times 10^{8+7}$ 24×10^{15}	2.4×10^{16}	2	M1 $24 \times 10^{8+7oe}$ or 24 000 000 000 000 000 or 2.4×10^n A1 cao
	(b)	$(6 \times 10^8) + (4 \times 10^7)$ $= 6 \times 10^8 + 0.4 \times 10^8$	6.4×10^8	2	M1 $6\times10^8 + 0.4\times10^8$ or $60\times10^7 + 4\times10^7$ or 600 000 000 + 40 000 000 or 640 000 000 oe or 6.4×10^n A1 cao

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Question		**Working**	**Answer**	**Mark**	**Notes**
14	(a) (i)		– 0.6 to – 0.5 5.5 to 5.6	3	B1 for both, accept – 0.6 to – 0.5 and 5.5 to 5.6
	(ii)		–1.4, 6.4		M1 draw $y = 6$ or one value correct A1 –1.4, 6.4 ± 0.2
	(b)	Draw $y = x - 4$	$x = 0.2$, $y = -3.8$ $x = 5.8$, $y = 1.8$	3	B1 draw $y = x - 4$ M1 use the points of intersection, can be implied by one value ft their line A1 $x = 0.2$, $y = -3.8$ and $x = 5.8$, $y = 1.8$ ± 1 sq [SC: B2 for $x = 3 \pm \sqrt{8}$, $y = -3 \pm \sqrt{8}$ if B0 A0 scored]
15	(a)		$200 < C \leq 400$	1	B1 cao
	(b)		7, 18, 27, 37, 45, 50	1	B1 cao
	(c)		correct cumulative frequency diagram	2	B1 ft for all 6 points plotted correctly (± 1 sq) at top end of intervals dep on sensible table B1 ft (dep on previous B1) for points joined by curve/line segments [SC: B1 ft from sensible table for 6 points plotted not at ends but consistently within each interval **and** joined or 5 'points' correctly plotted at the top end of intervals]
	(d)	50 – 32	17 – 19	2	M1 Line drawn up to the cumulative frequency graph at 700 or correct reading at 700 ± ½ square or 31 – 33 seen A1 ft graph

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Question		**Working**	**Answer**	**Mark**	**Notes**
16		½ (12 + 8) × 6 = 60 '60' × 20 = 1200 1200 × 5 = 6000 6000 ÷ 1000 = 6	6	5	M1 ½ (12 + 8) × 6 oe or 60 seen M1 (dep) '60' × 20 M1 (indep) '1200' × 5 A1 6000 cao A1 ft (dep on 1st or 3rd M1 scored) for 6
17	(a)	$-10 - 2 \times 3 \times (-5)^2 = -10 - 150$	–160	2	M1 $-10 - 2 \times 3 \times (-5)^2$ or 75 or 150 or –150 seen A1 cao
	(b)	$y = p - 2qx^2$ $2qx^2 = p - y$ $x^2 = \frac{p-y}{2q}$	$x = \pm\sqrt{\frac{p-y}{2q}}$	3	M1 at least one correct process from isolate $2qx^2$, divide by q, or by 2 or by $2q$ M1 (dep on M1) attempt to square root both sides of $x^2 =$ ' $\frac{p-y}{2q}$ ' A1 $x = \pm\sqrt{\frac{p-y}{2q}}$ oe condone omission of ±
18	(a)		1	1	B1 cao
	(b)		–2	1	B1 cao
	(c)	$9^{-3/2} = 1/9^{3/2} = 1/3^3$	$\frac{1}{27}$	2	M1 use of reciprocal eg $1/9^{3/2}$ or square root eg 3^{-3}, $\frac{1}{3^3}$ or $\sqrt{729}$ seen or 27 seen or – 27 seen A1 cao

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Question		**Working**	**Answer**	**Mark**	**Notes**
19		$ACB = 90^o$ angle in a semi circle $CBD = 180 - ACB$ co-interior angles add to 180° $CBD = 90°$ $DCB = CDB = (180^o - 90^o) \div 2$ base angles of an isosceles triangles	45	4	B1 $ACB = 90$ (could be on the diagram) or 45 seen in a correct position on the diagram B1 answer of 45 B1 angle in a semicircle = 90 B1 base angles isosceles triangle are equal or alternate angles are equal
20	(a)	$2x^2 - 9x + 4 = (2x - 1)(x - 4)$	$(2x - 1)(x - 4)$	2	M1 $(2x \pm 1)(x \pm 4)$ A1 cao
	(b)	$(2x - 1)(x - 4) = (2x - 1)^2$ $2x - 1 = 0$ or $x - 4 = 2x - 1$ for $x = ½$ or $x = -3$ OR $2x^2 - 9x + 4 = 4x^2 - 4x + 1$ $2x^2 + 5x - 3 = 0$ $(2x - 1)(x + 3) = 0$ OR $(2x - 1)(x - 4) = (2x - 1)^2$ $(2x - 1)[2x - 1 - (x - 4)] = 0$ $(2x - 1)(x + 3) = 0$	$x = \frac{1}{2}, -3$	4	M1 '$(2x - 1)(x - 4)$' $= (2x - 1)^2$ M1 dep for $2x - 1 = 0$ or for $x - 4 = 2x - 1$ oe A1 for $x = ½$ or $x = -3$ A1 cao OR M1 attempts to expand RHS (at least 3 terms with two correct) M1 dep attempts to get $ax^2 + bx + c = 0$ (allow one error) or $2x^2 + 5x - 3$ seen A1 $(2x - 1)(x + 3)$ seen or correct substitution into the quadratic formula A1 cao OR M1 '$(2x - 1)(x - 4)$' $= (2x - 1)^2$ M1 dep attempt to factorise $(2x - 1)[2x - 1 - (x - 4)]$ A1 $(2x - 1)(x + 3)$ seen A1 cao [SC: Answer of -3 or ½, no working, scores B1]

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Question		**Working**	**Answer**	**Mark**	**Notes**
21		$6^2-(2\sqrt{3})^2=36-12=24$ Area $=\frac{1}{2}\times 2\sqrt{3}\times\sqrt{24}=\sqrt{72}$ $=\sqrt{36\times 2}=6\sqrt{2}$	proof	5	M1 $6^2-(2\sqrt{3})^2$ or $\sqrt{48}$ seen or $(2\sqrt{3})^2+x^2=6^2$ oe A1 $\sqrt{24}$ oe M1(dep on M1) $\frac{1}{2}\times 2\sqrt{3}\times$ '$\sqrt{24}$' A1 $\sqrt{72}$ oe A1 $6\sqrt{2}$ or $(k)=6$
22	(a)	Probability tree diagram	$\frac{6}{10}, \frac{4}{10}$ $\frac{8}{11}, \frac{3}{11}, \frac{7}{11}, \frac{4}{11}$	2	B1 $\frac{6}{10}, \frac{4}{10}$ oe on first two branches B1 $\frac{8}{11}, \frac{3}{11}, \frac{7}{11}, \frac{4}{11}$ on remaining branches
	(b)	$\frac{6}{10}\times\frac{8}{11}+\frac{4}{10}\times\frac{4}{11}$ $=\frac{48}{110}+\frac{16}{110}$ $=\frac{64}{110}=\frac{32}{55}$	$\frac{64}{110}$	4	M3 $\frac{6}{10}\times\frac{8}{11}+\frac{4}{10}\times\frac{4}{11}$ oe (M2 $\frac{6}{10}\times\frac{8}{11}$ or $\frac{4}{10}\times\frac{4}{11}$ oe or $\frac{6}{10}\times$ their $\frac{8}{11}+\frac{4}{10}\times$ their $\frac{4}{11}$ oe) (M1 their $\frac{6}{10}\times$ their $\frac{8}{11}$ or their $\frac{4}{10}\times$ their $\frac{4}{11}$ oe provided each component < 1) A1 $\frac{64}{110}$ oe