



1	(a)	$\frac{6}{1-2x} = 5$ $6 = 5 - 10x$	M1	Remove fraction	
		$10x = -1$ $x = -\frac{1}{10}$	A1	o.e.	
	(b)	$3c(4a^2 - b^2)$ $= 3c(2a + b)(2a - b)$	M1 A1		
	(c)	$3x + 4y = 1$ ---- (1) $5x - 6y = 8$ ---- (2)			
		$(1) \times 3$ $9x + 12y = 3$ ---- (3) $(2) \times 2$ $10x - 12y = 16$ ---- (4) $(3) + (4)$ $19x = 19$	M1	Elimination or substitution s.o.i.	
		$x = 1$	A1		
		$y = -\frac{1}{2}$	A1	o.e.	
	(d)	$\frac{3x+5-2(x+4)}{(x+4)(x-3)}$ $= \frac{3x+5-2x-8}{(x+4)(x-3)}$ $= \frac{x-3}{(x+4)(x-3)}$ $= \frac{1}{x+4}$	M1 M1 A1	Join fraction Simplify	
					[10]



2	(ai) (a)	26 minutes	B1		
	(ai) (b)	Upper Quartile = 36 minutes Lower Quartile = 14 minutes	M1	Either one seen	
		22 minutes	A1		
	(aii)	Required probability = $\frac{80-72}{80}$	M1	72 s.o.i.	
		$= \frac{1}{10}$	A1	o.e.	
	(bi)	60 children	B1	c.a.o.	
	(ci)	$k = 54$	B1		
	(cii)	37.7°	B1		
					[8]



3	(a)	\$813.54	B1	c.a.o.	
	(b)	35 cm : 5.6 km 1 cm : 0.16 km	M1	Find 1 cm on map in any unit o.e.	
		1 cm : 160 m 1 cm ² : 25600 m ²	M1	Square map scale	
		0.24 cm ² : 25600 m ² × 0.24			
		6144 m ²	A1		
	(c)	Let A : B : C = 10x : 15x : 12x	M1	Equalize ratios o.e.	
		$\frac{3}{8}(12x) + 10x = 87$ $\frac{29}{2}x = 87$ $x = 6$	M1	Finds 1 unit using any valid method o.e.	
		222 students	A1		
	(di)	(0.3 0.35 0.35)	B1	c.a.o.	
	(dii)	(73.4 55.1)	B1	o.e.	
	(diii)	Koh and Min obtained a final grade of 73.4 and 55.1 respectively.	B1	o.e.	
					[10]



4	(ai)	Angle $ACB = \text{Angle } DAE = 90^\circ$ (Given) Angle $CAB = \text{Angle } DAE$ (Shared angle)	M1		
		By AA Similarity test, the two triangles are geometrically similar.	A1	Must state AA	
	(a ii)	$\tan 30^\circ = \frac{1.25}{DE} \Rightarrow DE = \frac{1.25}{\tan 30^\circ} = 2.165063509 \text{ cm}$ $\sin 30^\circ = \frac{1.25}{AE} \Rightarrow AE = \frac{1.25}{\sin 30^\circ} = 2.5 \text{ cm}$ $\sin 30^\circ = \frac{AC}{8} \Rightarrow AC = 8 \sin 30^\circ = 4 \text{ cm}$ $\cos 30^\circ = \frac{BC}{8} \Rightarrow BC = 8 \cos 30^\circ = 6.29820323 \text{ cm}$	M3	M1 for any 1 side M1 for any 3 sides M1 for all sides	
		Perimeter $= (AC - AE) + (AB - AD) + BD + BC$ $= 17.34326674 \text{ cm}$ $= 17.3 \text{ cm}$ (3 s.f.)	A1		
	(bi)	Angle $RST = 180^\circ - 2x^\circ$ (Base angles of an isos. triangle)	M1	With reason given	
		$180 - 2x = 135 + x$	A1		
		$3x = 45$			
		$x = 15$ (Shown)	AG		
	(bii)	12 sides	B1		
	(biii)	Sum of interior angles of $PQRST = (5 - 2) \times 180^\circ = 540^\circ$	M1	s.o.i.	
		Angle $PTS = \frac{540^\circ - 3(150^\circ)}{2} = 45^\circ$	M1	s.o.i.	
		Angle $RTP = 45^\circ - 15^\circ = 30^\circ$	A1		
					[12]

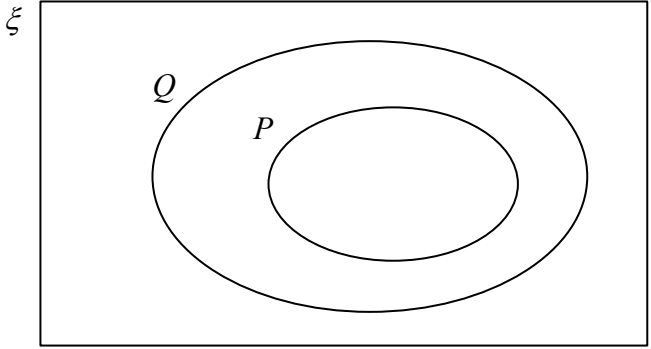
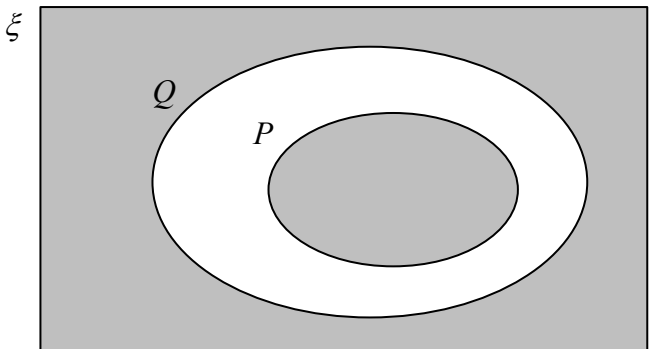


5	(a)	$\frac{2^{671}}{2^{100}(2)}$	M1	Numerator or denominator s.o.i.	
		$= 2^{570}$	A1		
	(b)	Initial value = \$1280 At time $t = T$, value = $1.5 \times \$1280 = \1920	M1	s.o.i.	
		Tangent drawn on graph	M1		
		Gradient $= \frac{2400 - 1000}{6.6 - 2}$ $= 304.3478261 = 304.35$ (2 d.p.)	A1	To 2 d.p. Accept ± 5	
		304.35 dollars/year	B1	Correct units	
	(a)	When $x = 0$, $y = \frac{1}{4}$. $\frac{1}{4} = ka^0 \Rightarrow k = \frac{1}{4}$	M1	o.e.	
		When $x = 2$, $y = 9$. $9 = \frac{1}{4}a^{-2} \Rightarrow a = \frac{1}{6}$	M1		
		When $x = 3$, $y = \frac{1}{4} \left(\frac{1}{6} \right)^3 = \frac{1}{864}$.	A1	c.a.o.	
					[9]



6	(ai)	$\text{Area} = \frac{1}{2}(9)(12)\sin(1.1+0.8)$ $= 51.10020474 \text{ cm}^2 = 51.1 \text{ cm}^2 \text{ (3 s.f.)}$	M1 A1	o.e.	
	(aii)	Using sine rule, $\frac{AC}{\sin 1.5} = \frac{9}{\sin(\pi - 1.5 - 1.1)}$ $AC = \frac{9 \sin 1.5}{\sin(\pi - 1.5 - 1.1)} = 17.41499707 \text{ cm}$	M1 A1		
		Using cosine rule, $CD = \sqrt{17.41488707^2 + 12^2 - 2(17.41488707)(12)\cos 0.8}$ $CD = 12.49346372 \text{ cm}$	M1 A1		
		$CM = \frac{3}{5} \times 12.49346372$ $= 7.496078231 \text{ cm} = 7.50 \text{ cm (3 s.f.)}$	A1	c.a.o.	
	(bi)	By Pythagoras Theorem, $PR = \sqrt{16^2 + 16^2} = \sqrt{512}$ $PY = \frac{1}{2}\sqrt{512}$ $\tan 70^\circ = \frac{XY}{PY}$ $\Rightarrow XY = \frac{1}{2}\sqrt{512} \tan 70^\circ = 31.08415863 \text{ cm}$	M1	Find height of pyramid	
		Volume of pyramid $= \frac{1}{3}(16)^2(31.08415863) = 2652.51487 \text{ cm}^3$	M1		
		$\text{Number of cubes} = \frac{2652.51487}{3.5^3} = 61.86... = 61$	M1	Maximum number of cubes s.o.i	
		Remaining volume $= 2652.51487 - 61(3.5)^3 = 37.13987 \text{ cm}^3$	M1		
		$\frac{4}{3}\pi r^3 = 37.13987$ $r = \sqrt[3]{\frac{3}{4\pi} \times 37.13987}$ $= 2.069746976 = 2.07 \text{ (3 s.f.)}$	M1 A1		
					[13]



7	(a)	1. Disagree; The elements $\{1, 2, 3, 4\} \notin \xi$.	B1	o.e.	
		2. Agree; The factors of 24 are all not multiples of 5.	B1	o.e.	
	(bi)		B1	c.a.o.	
	(bii)		B1	FT from (b)(i)	
	(ci)	$\frac{83}{220}$	B1	c.a.o.	
	(cii)	$\left(\frac{18}{30} \times \frac{17}{29} \times \frac{16}{28}\right) + \left(\frac{12}{30} \times \frac{11}{29} \times \frac{10}{28}\right)$	M2	M1 for each case	
		$= \frac{37}{145}$	A1	c.a.o.	
					[8]



8	(ai)	When $x = p$, $y = 2p + 1$. $\frac{1}{2}(1 + 2p + 1)(p) = \frac{15}{4}$	M1	Form equation	
		$p(p + 1) = \frac{15}{4}$ $4p^2 + 4p = 15$ $4p^2 + 4p - 15 = 0$ (Shown)	A1 AG		
	(aii)	$(2p - 3)(2p + 5) = 0$	M1		
		$p = \frac{3}{2}$ or $p = -\frac{5}{2}$ (Reject)	A2	A1 for reject o.e.	
	(aiii)	$AC = \sqrt{\left(0 - \frac{3}{2}\right)^2 + (1 - 4)^2}$	M1	o.e.	
		$= 3.354101966$ units $= 3.35$ units (3 s.f.)	A1		
	(bi)	$x = 2$	B1		
	(bii)	Gradient $= \frac{-5 - (-2)}{1 - (-4)} = -\frac{3}{5}$	M1	o.e.	
		$y = -\frac{3}{5}x + c$ $0 = -\frac{3}{5}(2) + c \Rightarrow c = \frac{6}{5}$	M1	Find y-intercept	
		$y = -\frac{3}{5}x + \frac{6}{5}$ $5y = -3x + 6$ $3x + 5y = 6$	A1	c.a.o.	
					[11]



9	(a)	3 hour 31 minutes	B1	c.a.o.	
	(b)	336 km	B1	c.a.o.	
	(c)	Total distance travelled = $95 + 260 + 135 + 317 = 807$ km Time taken to drive = $\frac{807}{90} = 8$ hours 58 minutes	M1	*	
		<u>Manchester:</u> Range = $420 - 95 - 260 = 65$ km Range to be charged = $336 - 65 = 271$ km	<u>York:</u> Range = $336 - 135 = 201$ km Range to be charged = $336 - 201 = 135$ km	M1	FT from * Calculate either range to be charged s.o.i.
		Time taken to charge $= \frac{271}{193} \times 30 = 42.124$ mins	Time taken to charge $= \frac{135}{64} \times 30 = 63.28125$ mins	M1	FT from drive time Calculate either time taken to charge s.o.i.
		Cost to charge $= \$ \frac{45}{100} \times 271 = \121.95	Cost to charge $= \$ \frac{25.1}{100} \times 135 = \33.885	M1	FT from time taken Calculate either cost to charge s.o.i.
		Total time taken = 10 hours 43.405 minutes Total Cost = \$155.835	M1	Both correct	
		Erin's calculations are correct.	A1	M0A0	
	(d)	As a larger percentage of the car battery is charged, the charging rate decreases, which will length the total time of the journey.	B1		
					[9]

END OF MARKING SCHEME



General Certificate of Education Ordinary Level 2025
Mathematics 4052/02
Syllabus 4052 Paper 2
SUGGESTED Solutions & Marking Scheme Mark Allocation
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