



THIRD SPACE
LEARNING

Mathematics

Paper 3

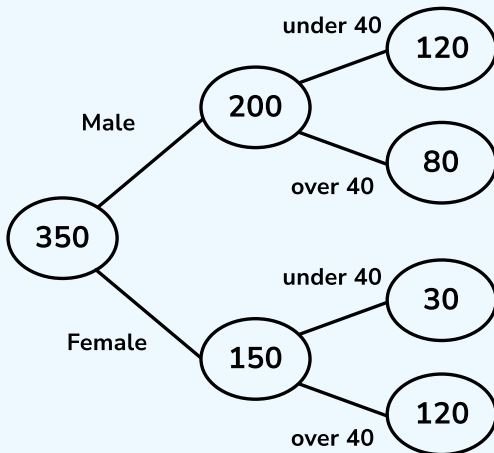
(Calculator)

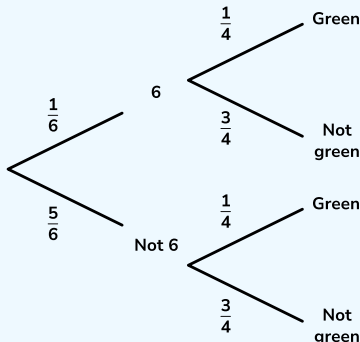
Higher Tier

Mark Scheme

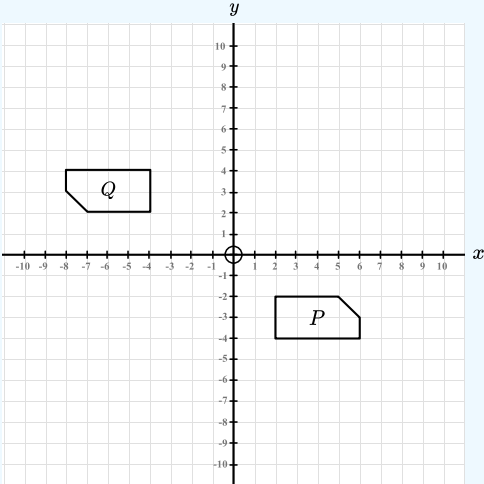
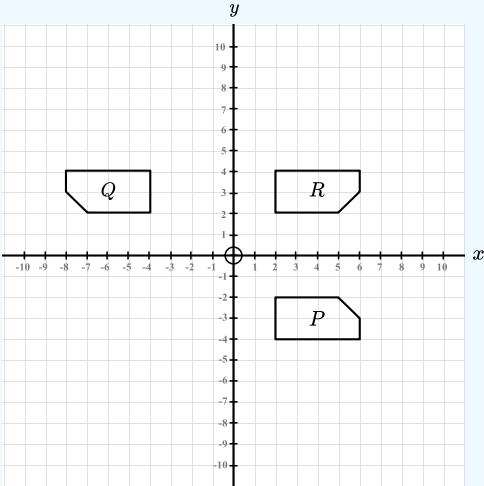
Edexcel GCSE

SET 1B

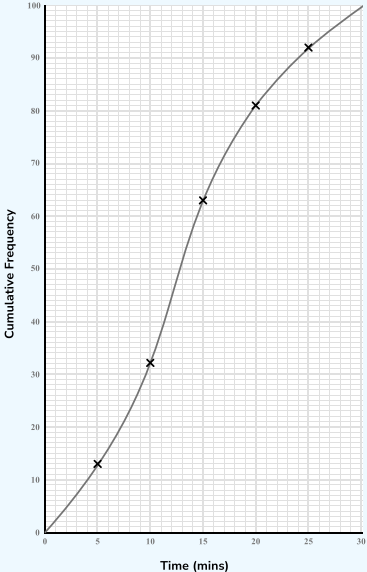
Question	Working	Answer	Notes
Q1a	 <p>Total under 40: $120 + 30 = 150$ Total over 40: $80 + 120 = 200$</p>	$150 : 200$ $3 : 4$	M1 200 and 150 correctly placed M1 120 and 80 or 30 and 120 correctly placed M1 Frequency tree fully correct A1 $150 : 200$ oe
Q2a	$180 - 90 - 64 = 26^\circ$	26°	A1 26°
Q2b	$10.5 \div 7 = 1.5$ $12 \times 1.5 = 18$	18	M1 $10.5 \div 7 = 1.5$ A1 $12 \times 1.5 = 18$
Q3	$10 \times 5.5 = 55$ $55 - 6 + 0 = 49$ $49 \div 10 = 4.9$	4.9 years	P1 Calculating the total time for the 10 teachers to be 55 years P1 Subtracting 6 and adding 0 and dividing by 10 A1 4.9
Q4a		6.21×10^5	B1 6.21×10^5

Question	Working	Answer	Notes
Q4b	$820000 + 39000 = 859000$	8.59×10^5	M1 Attempt to convert both numbers to ordinary numbers and add them or to change one number so that the powers of 10 are equal E.g. $(8.2 \times 10^5) + (0.39 \times 10^5)$ A1 8.59×10^5 must be in standard form
Q5	$T = \frac{40M - N^2}{3}$ $3T = 40M - N^2$ $3T + N^2 = 40M$ $\frac{3T + N^2}{40} = M$	$M = \frac{3T + N^2}{40}$	M1 Reaching $3T + N^2 = 40M$ A1 $M = \frac{3T + N^2}{40}$
Q6	Large: $\pi \times 3^2 \times 11 = 311.0\text{cm}^3$ Small: $\pi \times 2^2 \times 8 = 100.5\text{cm}^3$ $2 \times 100.5 = 201\text{cm}^3$	1 large	P1 Finding the volume of the large can P1 Finding the volume of the small can and doubling C1 Correct conclusion based on correct working
Q7a			A1 Fully correct

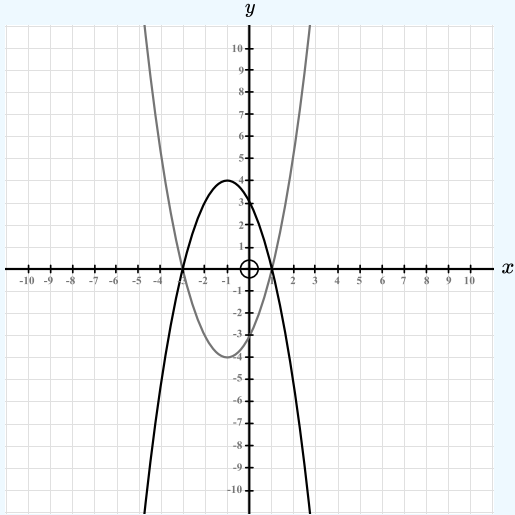
Question	Working	Answer	Notes
Q7b	$P(\text{win } 50p): \frac{1}{6}$ $\frac{1}{6} \times 120 = 20, 20 \times 50p = £10$ $P(\text{win } £5): \frac{1}{6} \times \frac{1}{4} = \frac{1}{24}$ $\frac{1}{24} \times 120 = 5, 5 \times £5 = £25$ $120 \times £1 = £120$ $£120 - £10 - £25 = £85$	£85	<p>P1 Calculating probability of winning 50p and probability of winning £5</p> <p>P1 Correct steps to find the total expected amount won (£10 + £25 = £35)</p> <p>P1 Subtracting from £120 to give £85</p>
Q8a	$£4800 \times 1000 = 4800000\text{cm}^3$	4800000cm^3	<p>M1 4800×1000</p> <p>A1 4800000cm^3</p>
Q8b	$4800000 \div 100^3 = 4.8$	4.8m^3	<p>M1 1m = 100cm seen or implied</p> <p>M1 Attempting to divide by 100 three times or to divide by 100^3</p> <p>A1 4.8m^3</p>
Q8c	$4.8 \times £1.58 = £7.58$	£7.58	A1 cao
Q9		$25.45 \leq w < 25.55$	<p>A1 25.45 and 25.55 seen</p> <p>A1 Fully correct including the correct inequalities</p>

Question	Working	Answer	Notes
Q10a			<p>M1 Enlargement scale factor -1</p> <p>A1 Fully correct enlargement from centre given</p>
Q10b			A1 Fully correct
Q10c		Reflection in the x axis	A1 Reflection in the x axis

Question	Working	Answer	Notes														
Q11	$(x + 3) (x - 7) (2x + 4)$ $(x^2 - 4x - 21) (2x + 4)$ $2x^3 - 4x^2 - 58x - 84$	$2x^3 - 4x^2 - 58x - 84$	M1 $(x^2 - 4x - 21)(2x + 4)$ or $(x + 3)(2x^2 - 10x - 28)$ A1 $2x^3 - 4x^2 - 58x - 84$														
Q12	Pentagon: $\frac{3 \times 180}{5} = 108^\circ$ Hexagon: $\frac{4 \times 180}{6} = 120^\circ$ $360 - 120 - 108 = 132^\circ$ Exterior angle: $180 - 132 = 48^\circ$ $360 \div 48 = 7.5$	No - if it was a regular polygon it would have 7.5 sides.	M1 Pentagon: $\frac{3 \times 180}{5} = 108^\circ$ Hexagon: $\frac{4 \times 180}{6} = 120^\circ$ M1 $360 - 120 - 108 = 132^\circ$ Exterior angle: $180 - 132 = 48^\circ$ C1 Correct conclusion following correct steps to show it could not be regular														
Q13a	<table><tr><th>Time (mins)</th><th>Cumulative frequency</th></tr><tr><td>$t < 5$</td><td>13</td></tr><tr><td>$t < 10$</td><td>32</td></tr><tr><td>$t < 15$</td><td>63</td></tr><tr><td>$t < 20$</td><td>81</td></tr><tr><td>$t < 25$</td><td>92</td></tr><tr><td>$t < 30$</td><td>100</td></tr></table>	Time (mins)	Cumulative frequency	$t < 5$	13	$t < 10$	32	$t < 15$	63	$t < 20$	81	$t < 25$	92	$t < 30$	100		M1 Correct cumulative frequencies calculated M1 Points correctly plotted A1 Points joined with smooth curve
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Question	Working	Answer	Notes
			
Q13b		No	<p>M1 Less than 18 minutes late = 75</p> <p>A1 More than 28 minutes late = 25% of the time so she is not right.</p>
Q14a		75°	B1 cao
Q14b	<p>Reflex angle BOC: $360 - 150 = 210^\circ$ since angles at a point sum to 360° Angle ABO: $360 - 210 - 75 - 12 = 63^\circ$ since angles in a quadrilateral sum to 360° Angle OBD: 90° since a radius meets a tangent at 90° Angle ABD: $90 - 63 = 27^\circ$</p>	27°	<p>M1 Angle BOC and ABO found</p> <p>M1 Angle OBD = 90° and $90 - \text{ABO}$</p> <p>A1 Correct answer following correct working with at least two correct reasons</p>

Question	Working	Answer	Notes
Q14c	Both right angled triangles because the angle subtended from a diameter is a right angle. They share the side BC. The hypotenuses are equal since they are diameters to the circle. Congruent by RHS.		C1 Stating that both are right angled triangles C1 Stating that the hypotenuse of both is a diameter to the circle therefore they are the same C1 Stating that they share the side BC so triangles are congruent by RHS
Q15	Number of vegetarian combinations: $5 \times 3 = 15$ Total combinations: $8 \times 6 = 48$ Percentage: $\frac{15}{48} \times 100 = 31.25\%$	31.25%	M1 Number of vegetarian combinations: $5 \times 3 = 15$ M1 Total combinations: $8 \times 6 = 48$ A1 Percentage: $\frac{15}{48} \times 100 = 31.25\%$
Q16	Material A: Mass = $2.6 \times 200 = 520\text{g}$ Material B: Mass = $6.1 \times 150 = 915\text{g}$ Material C: Density = $\frac{520 + 915}{200 + 150} = 4.1\text{g/cm}^3$	4.1g/cm^3	P1 Calculating the mass of materials A and B P1 Adding the masses and the volumes A1 4.1g/cm^3
Q17a	$x^2 + 4x + 9 = (x + 2)^2 - 4 + 9$ $= (x + 2)^2 + 5$	$= (x + 2)^2 + 5$	M1 $(x + 2)^2 \pm a^2$ A1 $(x + 2)^2 + 5$
Q17b		$(-2, 5)$	B1 cao
Q17c		0 real roots	B1 cao

Question	Working	Answer	Notes
Q18	$9^x = (3^2)^x = 3^{2x}$ $81^y = (3^4)^y = 3^{4y}$ $3^{2x} \times 3^{4y} = 3^{2x+4y}$		M1 $9^x = (3^2)^x = 3^{2x}$ M1 $81^y = (3^4)^y = 3^{4y}$ C1 $3^{2x} \times 3^{4y} = 3^{2x+4y}$ with a concluding statement such as therefore $z = 2x + 4y$
Q19a		$y = f(x) + 5$	A1 $y = f(x) + 5$
Q19b			M1 Attempt at reflection in x axis A1 Correct curve with correct intersections with axes and turning point
Q20	$\frac{1}{2} \times BD \times 4 = 18$ so $BD = 9\text{cm}$ $AD^2 = 4^2 + 9^2 - 2 \times 4 \times 9 \cos(100)$ $AD^2 = 109.50266\dots$ $AD = 10.46435\dots$ Area ADE: $\frac{1}{2} \times 10.46435\dots \times 4 = 20.9287\dots$	20.9cm^2	P1 Finding length of BD P1 Substituting into the cosine rule A1 $AD = 10.46435\dots$ A1 Area ADE = 20.9cm^2

Question	Working	Answer	Notes
Q21	$\frac{x+2}{3x+7} \div \frac{2x+4}{8x+5} = \frac{x+2}{3x+7} \times \frac{8x+5}{2(x+2)}$ $= \frac{8x+5}{6x+14}$	$\frac{8x+5}{6x+14}$	<p>M1 Inverting the second fraction and multiplying</p> <p>M1 Cancelling a factor of $x+2$</p> <p>A1 $\frac{8x+5}{6x+14}$</p>
Q22a		$-\frac{1}{2}\mathbf{b} + \mathbf{a}$	<p>M1 $-\frac{1}{2}\mathbf{b}$ seen</p> <p>A1 $-\frac{1}{2}\mathbf{b} + \mathbf{a}$</p>
Q22b	$\overrightarrow{FE} = \frac{1}{2}\mathbf{b} + \frac{3}{2}\mathbf{a}$ $\overrightarrow{FG} = \frac{1}{2}\mathbf{b} + \mathbf{a} + k\mathbf{b} = \mathbf{a} + \left(\frac{1}{2} + k\right)\mathbf{b}$ $\overrightarrow{FE} = \frac{3}{2}\overrightarrow{FG}$ $\frac{1}{2}\mathbf{b} + \frac{3}{2}\mathbf{a} = \frac{3}{2}(\mathbf{a} + (\frac{1}{2} + k)\mathbf{b})$ <p>Equating coefficients for \mathbf{b}:</p> $\frac{1}{2} = \frac{3}{2}(\frac{1}{2} + k)$ $1 = 3(\frac{1}{2} + k)$ $1 = \frac{3}{2} + 3k$ $2 = 3 + 6k$ $-1 = 6k$ $k = -\frac{1}{6}$	$5:1$	<p>P1 Finding the vectors for FE and FG and using the coefficients for \mathbf{a} to realise</p> $\overrightarrow{FE} = \frac{3}{2}\overrightarrow{FG}$ <p>P1 Equating the coefficients for \mathbf{b}</p> <p>P1 Solving to find the value for k</p> <p>A1 Writing the ratio 5 : 1</p>

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