GCSE MATHEMATICS · HIGHER

Targeting Grade 9

Paper 8 · Mark scheme · Calculator · 40 marks

M method mark **P** process mark **A** accuracy mark (depends on the M or P marks before it)
B independent mark **C** communication mark **ft** follow through **oe** or equivalent

Q	Working	Answer	Mark	Notes
1(a)	$P = \dfrac{kx^2}{y}$ Multiplier $= \dfrac{1.1^2}{0.8} = 1.5125$	Increase of 51.25%	M1 M1 A1	Must state increase
1(b)	y must be multiplied by $1.1^2 = 1.21$	Increase of 21%	M1 A1	

Q	Working	Answer	Mark	Notes
2	Amir: 1.032^n; Bea: $1 + 0.045n$ Compares for some value of n $n = 21$: $1.937\ldots < 1.945$; $n = 22$: $1.9996\ldots > 1.99$	22	P1 P1 P1 A1	Uses multipliers (or any starting amount) Both years shown

Q	Working	Answer	Mark	Notes
3(a)	x: upper bound 7.5 (truncated); y: lower bound 3.245 $\frac{7.5}{3.245-2}=\frac{7.5}{1.245}$	6.024	B1 M1 A1	
3(b)	Lower bound $=\frac{7.4}{1.255}=5.896\ldots$	6	M1 A1	Both bounds round to 6 (1 s.f.) but not to the same value to 2 s.f.

Q	Working	Answer	Mark	Notes
4	Box: $2d\times 2d\times d=4d^3$ Balls: $4\times\frac{4}{3}\pi\left(\frac{d}{2}\right)^3=\frac{2}{3}\pi d^3$ Fraction filled $=\frac{\frac{2}{3}\pi}{4}=\frac{\pi}{6}$	47.6	P1 P1 P1 A1	Or any value of d

Q	Working	Answer	Mark	Notes
5(a)	Frequencies 15, 20, 30, 25, 10 Median is the 50th value: 35 before 155, so $\frac{15}{30}\times 5$ into $155<h\leqslant 160$	157.5	M1 M1 A1	Uses frequency $=$ fd $\times$ class width Accept 157.5 to 157.6
5(b)	$\frac{1}{2}\times 25+10=22.5$ students out of 100	22.5	M1 A1	

Q	Working	Answer	Mark	Notes
6(a)	$\cos B = \dfrac{7^2 + 8^2 - 13^2}{2 \times 7 \times 8}$ $= \dfrac{-56}{112} = -\dfrac{1}{2} \Rightarrow B = 120°$		M1 A1	 Shown
6(b)	Area $= \frac{1}{2} \times 7 \times 8 \times \sin 120° = 24.24\ldots$ $\frac{1}{2} \times 13 \times d = 24.24\ldots$	 3.73	M1 M1 A1	

Q	Working	Answer	Mark	Notes
7(a)	$20t - 4.9t^2 = 15 \Rightarrow$ $4.9t^2 - 20t + 15 = 0$ $t = \dfrac{20 \pm \sqrt{400 - 294}}{9.8}$ $t = 0.990\ldots$ and $t = 3.091\ldots$	 2.10	M1 M1 A1 A1	
7(b)	Greatest height when $t = \dfrac{20}{9.8} = 2.04\ldots$ (midway between the roots)	 20.4	M1 A1	Or completing the square

Q	Working	Answer	Mark	Notes
8	Triangle PQX is equilateral, where X is a point of intersection, so angle $XPY = 120°$		P1	X, Y the two points where the circles meet
	Sector $= \frac{120}{360} \times \pi \times 6^2 = 12\pi$		P1	
	Triangle $PXY =$ $\frac{1}{2} \times 6^2 \times \sin 120° = 15.58\ldots$		P1	
	Segment $= 12\pi - 15.58\ldots = 22.11\ldots$		P1	
	Overlap $= 2\times$ segment		P1	
		44.2	A1	
		Total	**40**	