[C100/SQP321]

Mathematics Higher Paper 2 Specimen Marking Instructions (for examinations from Diet 2008 onwards)

NATIONAL QUALIFICATIONS

Note: In the Specimen Marking Instructions the Marking Scheme indicates which marks awarded are strategy marks (ss), which marks awarded are processing marks (pd) and which marks awarded are interpretation and communication marks (ic).



| 011 | Marking Scheme | Illustrations of evidence |
|-----|--|---|
| | Give 1 mark for each • | for awarding a mark at each • |
| 1 | (a) 3 marks (b) 3 marks (c) and (d) 5 marks | |
| | ¹ ic: interpret "median" ² ss: find gradient of median ³ ic: state equation of median ⁴ ss: know to find gradient of "base" ⁵ ss: find perpendicular gradient ⁶ ic: state equation of altitude ⁷ ss: juxtaposition of two equations ⁸ pd: solve for one variable ⁹ pd: solve for other variable ¹⁰ pd: find gradient of new line ¹¹ ic: know and use condition for parallel lines | • ¹ mid of $AB = (6, 1)$ • ² $m_{median} = \frac{7-1}{4-6} = -3$ • ³ median : $y - 7 = -3(x - 4)$ • ⁴ $m_{BC} = \frac{7-1}{4-10} = -1$ • ⁵ $m_{alt} = +1$ • ⁶ altitude : $y - 1 = 1(x - 2)$ • ⁷ $y = -3x + 19$ and $y = x - 1$ • ⁸ $x_p = 5$ • ⁹ $y_p = 4$ • ¹⁰ $m_{PQ} = \frac{4-1}{5-8} = -1$ • ¹¹ $m_{CB} = -1$ and so PQ is parallel to CB |
| 2 | (a) 1 mark (b) 7 marks | |
| | ¹ ic: interpret diagram ² ic: interpret diagram for components ³ ic: interpret diagram for components ⁴ pd: evaluate scalar product ⁵ pd: evaluate length ⁶ pd: evaluate length ⁷ ss: know formula for angle ⁸ pd: process the angle | • ¹ $AB = 1, AD = 4, AE = 5$ • ² $\overrightarrow{HB} = \begin{pmatrix} 1 \\ -4 \\ -5 \end{pmatrix}$ • ³ $\overrightarrow{HC} = \begin{pmatrix} 1 \\ 0 \\ -5 \end{pmatrix}$ • ⁴ $\overrightarrow{HB.HC} = 1 + 0 + 25 = 26$ • ⁵ magnitude of HB = $\sqrt{42}$ • ⁶ magnitude of HC = $\sqrt{26}$ • ⁷ cos HBC = (26) / $\sqrt{42}\sqrt{26}$ • ⁸ HBC = 38·1 ° or 0.665 radians |

| Qu | Marking Scheme Give 1 mark for each • | Illustrations of evidence for awarding a mark at each • |
|----|--|--|
| 3 | (a) 4 marks (b) 3 marks | |
| | ¹ ss: know to expand and expand ² ic: compare coefficients ³ pd: process "k" ⁴ pd: process "a" ⁵ ic: use result ⁶ pd: start to solve ⁷ pd: complete solving | • ¹ $k \sin x \circ \cos a \circ - k \cos x \circ \sin a \circ$ • ² $k \cos a \circ = 5, k \sin a \circ = 12$ • ³ $k = 13$ • ⁴ $a = 67 \cdot 4$ • ⁵ $13\sin(x - 67 \cdot 4) \circ = 6 \cdot 5$ • ⁶ $x - 67 \cdot 4 = 30$ and $x = 97 \cdot 4$ • ⁷ $x - 67 \cdot 4 = 150$ and $x = 217 \cdot 4$ |
| 4 | (a) 4 marks (b) 6 marks (c) 3 marks | |
| | **** ************************************ | • $\frac{1}{dx} \frac{dy}{dx} =$ • $\frac{2}{dx} \frac{dy}{dx} = 4x - 2$ • $\frac{3}{m_{x=1}} = 2$ • $\frac{4}{y} - 3 = 2(x - 1)$ • $\frac{5}{y} = 2x + 1$ • $\frac{6}{x^2} + (2x + 1)^2 + 8(2x + 1) + 11 = 0$ • $\frac{7}{5x^2} + 20x + 20 = 0$ • $\frac{8}{5(x + 2)^2} = 0$ • $\frac{9}{equal roots so line is tangent}$ • $\frac{10}{Q} = (-2, -3)$ • $\frac{11}{line cuts y - axis at (0, 1)(= T, say)}$ • $\frac{12}{QT} = \begin{pmatrix} 2\\4 \end{pmatrix}, \overrightarrow{TP} = \begin{pmatrix} 1\\2 \end{pmatrix}$ • $\frac{13}{QT} = 2\overrightarrow{TP} and QT : TP = 2 : 1$ |

| Qu | Marking Scheme Give 1 mark for each • | Illustrations of evidence for awarding a mark at each • |
|----|--|---|
| 5 | (a)7 marks(b)4 marks \cdot^1 ss: know to equate \cdot^2 pd: solve for x | • ¹ $x^2 = 6x + 16$ • ² $(x - 8)(x + 2) = 0$ and $x = 8$, $x = -2$ |
| | ³ ss: know to integrate (upper-lower) ⁴ ic: interpret limits ⁵ pd: integrate ⁶ ic: substitute limits ⁷ pd: process results ⁸ ss: set derivative to zero ⁹ pd: differentiate and solve ¹⁰ ic: know to justify (eg know of maximum parabola) ¹¹ ic: interpret maximum area and connection | • ³ $A = \int (6x + 16 - x^2) dx$ • ⁴ $A = \int_{-2}^{8} dx$ • ⁵ $3x^2 + 16x - \frac{1}{3}x^3$ • ⁶ $\left[192 + 128 - \frac{512}{3} \right] - \left[12 - 32 + \frac{8}{3} \right]$ • ⁷ $\frac{500}{3}$ • ⁸ $\frac{dA}{dx} = 0$ • ⁹ $x = 3$ • ¹⁰ nature table or "-5" ⇒ maximum parabola • ¹¹ triangle area _{max} = $125 = \frac{3}{4}$ of enclosed area |
| 6 | 5 marks • ¹ ic: interpret half-life • ² ss: take logarithms • ³ pd: complete evaluation of " <i>k</i> " • ⁴ ic: substitute new data • ⁵ pd: process | • ¹ $\frac{1}{2}A_0 = A_0e^{-1600k}$ • ² -1600k = ln $\frac{1}{2}$ • ³ k = 0.0004332 • ⁴ A(3200) = A_0e^{-3200k} • ⁵ A(3200) = $A_0 \times 0.2500$ and 25% |
| 7 | 5 marks | |
| | ¹ ic: state value of trig function ² ss: substitute expression for cos 2x ³ pd: process ⁴ ss: know to review info in diagram ⁵ pd: equate expressions and solve | • $\cos(2x) = \frac{6}{10}$ • $2\cos^2(x) - 1 = \frac{6}{10}$ • $\cos(x) = \sqrt{\frac{4}{5}}$ • $\cos(x) = \frac{6}{DB}$ • $DB = 6\sqrt{\frac{5}{4}} = 3\sqrt{5}$ |

[END OF SPECIMEN MARKING INSTRUCTIONS]