



NATIONAL SENIOR CERTIFICATE EXAMINATION  
EXEMPLAR 2008

**MATHEMATICS: PAPER II**  
**MARKING GUIDELINES**

Time: 3 hours

150 marks

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**SECTION A****QUESTION 1**

(a) (1)

$$m_{BD} = \frac{10-2}{2-6} \quad \checkmark$$

$$\therefore m_{BD} = -2 \quad \checkmark$$

$$\therefore m_{AC} = \frac{1}{2} \quad \checkmark$$

(3)

(2)

$$M\left(\frac{2+6}{2}; \frac{10+2}{2}\right)$$

$$= M(4; 6) \quad \checkmark$$

$$\therefore y - 6 = \frac{1}{2}(x - 4) \quad \checkmark$$

$$\therefore y = \frac{1}{2}x + 4 \quad \checkmark$$

(3)

(3)

$$4 = \frac{-8 + x_c}{2} \quad \checkmark$$

$$\therefore x_c = 16$$

$$6 = \frac{0 + y_c}{2} \quad \checkmark$$

$$\therefore y_c = 12$$

$$C(16; 12) \quad \checkmark \quad \checkmark$$

(4)

(4)

$$m_{AC} = \frac{1}{2}$$

$$\tan \hat{CAO} = \frac{1}{2} \quad \checkmark$$

$$\therefore \hat{CAO} = 26,6^\circ \quad \checkmark$$

$$\therefore \hat{CEO} = 90^\circ + 26,6^\circ = 116,6^\circ \quad \checkmark$$

(3)

(b) (1)

$$x^2 - y^2 - 4x - 4y = 0 \quad \checkmark$$

$$\underbrace{(x-2)^2}_{\checkmark} + \underbrace{(y-2)^2}_{\checkmark} = 8 \quad \checkmark$$

(4)

$$(2) \quad r = \sqrt{8} = 2\sqrt{2} \quad \checkmark$$

(1)

(3)

$$m_{PQ} = \frac{2 - \frac{16}{5}}{2 - \frac{18}{5}} \quad \checkmark$$

$$m_{PQ} = \frac{3}{4}$$

$$m_{MN} = -\frac{4}{3} \quad \checkmark$$

$$y - \frac{16}{5} = -\frac{4}{3} \left( x - \frac{18}{5} \right) \quad \checkmark$$

$$\therefore y = -\frac{4}{3}x + 8 \quad \checkmark$$

(4)

[22]

**QUESTION 2**

- (1) 3 units up and 7 units to the left.  $\checkmark$   
 centre of circle (-7; 3)  $\checkmark$   
 radius remains 6 units  $\checkmark$

(3)

- (2)  $r = 6 \times 2,5 = 15$   $\checkmark$   
 $x^2 + y^2 = 225$   $\checkmark$

(3)

- (3)  $36\pi : 225\pi$   $\checkmark$   
 $= 1 : 6,25$   
 $\therefore \text{scale factor} = 6,25$   $\checkmark$

(2)

[8]

**QUESTION 3**

- (a) (1) Min = 43, Max = 90  $\checkmark$   
 $Q_1 = 46$   $\checkmark$   
 $Q_2 = \frac{48 + 49}{2} = 48,5$   $\checkmark$   
 $Q_3 = 58$   $\checkmark$

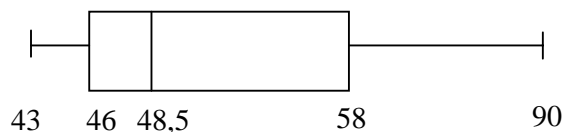
(4)

$\checkmark$

$\checkmark$

(2) Correct whiskers:

Correct quartiles  
Shape and set out ✓



(3)

(3) Wrote a test (anything feasible). ✓

(1)

(b) (1) Median = 23 minutes ✓

(1)

(2) IQR = 27 - 19  
= 8 ✓

(1)

(3) 80 - 12 = 68 ✓ ✓

(2)

[12]

**QUESTION 4**

(a) 4,2037 ✓✓✓

(3)

(b)

$$\begin{aligned} & \frac{\sin 2x \cdot (-1)}{\cos[ -(90^\circ - x) ]} \quad \checkmark \\ & = \frac{-\sin 2x}{\sin x} \quad \checkmark \\ & = \frac{-2 \sin x \cos x}{\sin x} \quad \checkmark \\ & = -2 \cos x \quad \checkmark \end{aligned}$$

(4)

(c) John achieved full marks. ✓

$$\begin{aligned} & \tan 2x \quad \checkmark \text{ -- change in period } (90^\circ). \text{ Asymptotes at } 45^\circ. \quad \checkmark \\ & \sin(90 - x) = \cos x \quad \checkmark \\ & \cos^2(60 - x) + \sin^2(60 - x) = 1 \quad \checkmark \quad \checkmark \end{aligned}$$

(6)

(d) (1)

$$\begin{aligned} & \frac{1 - (1 - 2 \sin 2\theta)}{2 \sin \theta \cos \theta} \quad \checkmark \quad \checkmark \\ & = \frac{2 \sin^2 \theta}{2 \sin \theta \cos \theta} \quad \checkmark \\ & = \frac{\sin \theta}{\cos \theta} \quad \checkmark \\ & = \tan \theta \quad \checkmark \end{aligned}$$

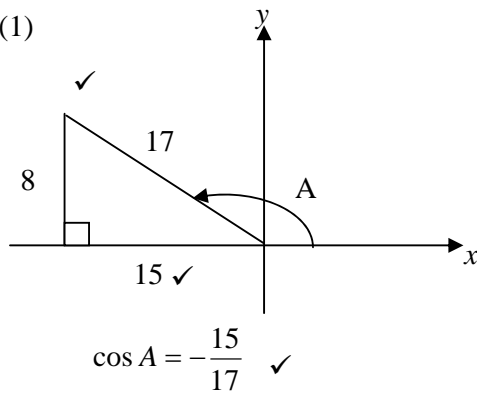
(5)

(2)

$$\begin{aligned} \tan 22,5^\circ & = \frac{1 - \cos 45^\circ}{\sin 45^\circ} \quad \checkmark \\ & = \frac{1 - \frac{\sqrt{2}}{2}}{\frac{\sqrt{2}}{2}} \quad \checkmark \\ & = \frac{\frac{2 - \sqrt{2}}{2}}{\frac{\sqrt{2}}{2}} \quad \checkmark \\ & = -1 + \sqrt{2} \quad \checkmark \end{aligned}$$

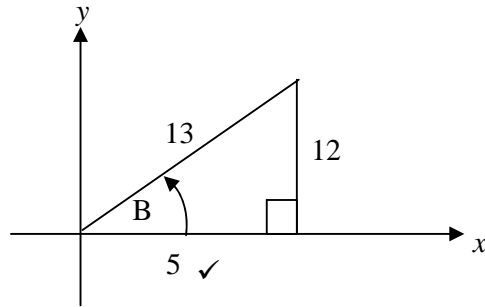
(4)

(e) (1)



(3)

(2)



$$\begin{aligned}
 & \tan(720^\circ + (A + B)) \\
 &= \tan(A + B) \quad \checkmark \\
 &= \frac{\sin(A + B)}{\cos(A + B)} \quad \checkmark \\
 &= \frac{\sin A \cdot \cos B + \cos A \cdot \sin B}{\cos A \cdot \cos B - \sin A \cdot \sin B} \\
 &= \frac{\frac{8}{17} \cdot \frac{5}{13} + \left(-\frac{15}{17}\right) \cdot \frac{12}{13}}{\left(-\frac{15}{17}\right) \cdot \frac{5}{13} - \frac{8}{17} \cdot \frac{12}{13}} \quad \checkmark \\
 &= \frac{140}{171} \quad \checkmark
 \end{aligned}$$

(4)

(f)

$$\begin{aligned}
 & \sin \theta = -2 \cos \theta \\
 & \therefore \frac{\sin \theta}{\cos \theta} = -2 \quad \checkmark \\
 & \therefore \tan \theta = -2 \quad \checkmark \\
 & \therefore \theta = -63,48^\circ + 180^\circ k; k \in \mathbb{Z} \quad \checkmark \\
 & \quad \checkmark
 \end{aligned}$$

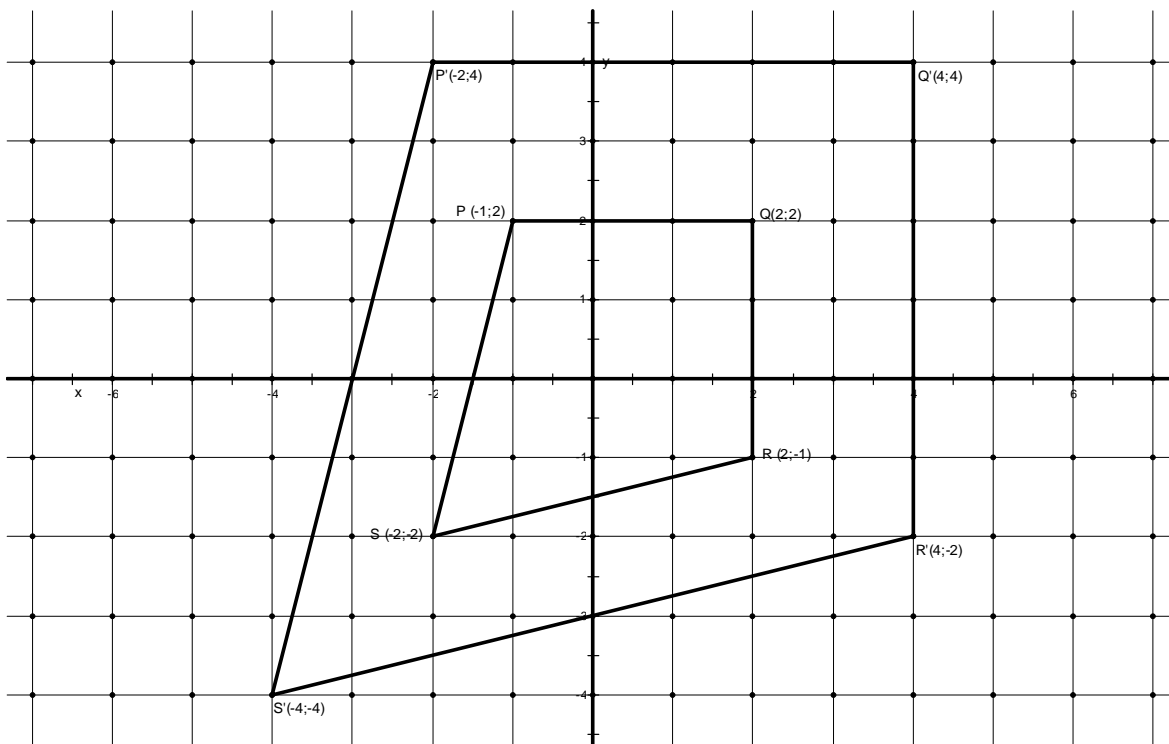
(4)  
[33]

**75 marks**

**SECTION B**

**QUESTION 5**

(a) (1) Each correct co-ordinate ✓



(4)

(2)

$$(Q'S')^2 = (-4 - 4)^2 + (-4 - 4)^2 \quad \checkmark$$

$$= \sqrt{128}$$

$$(P'R')^2 = (-2 - 4)^2 + (4 + 2)^2$$

$$= \sqrt{72}$$

$$Area = \frac{1}{2} \times \sqrt{72} \times \sqrt{128} \quad \checkmark$$

$$= 48 \text{ units}^2$$

$$\text{Area PQRS} : \text{Area P'Q'R'S'} \quad \checkmark$$

$$= 12 : 48$$

$$= 1 : 4 \quad \checkmark$$

$$k = 2 \therefore k^2 = 4 \quad \checkmark$$

(4)

$$(3) \quad m_{P'R'} = \frac{4+2}{-2-4} = -1 \quad \checkmark$$

$$m_{Q'S'} = \frac{4+4}{4+4} = 1 \quad \checkmark$$

$$\therefore m_{P'R'} \times m_{Q'S'} = -1 \quad \checkmark$$

(3)

(b)

$$Y = r \sin(\theta + 60^\circ) \quad \checkmark$$

$$Y = r(\sin \theta \cos 60^\circ + \cos \theta \sin 60^\circ)$$

$$Y = r \left( \frac{y}{r} \times \frac{1}{2} + \frac{x}{r} \times \frac{\sqrt{3}}{2} \right) \quad \checkmark$$

$$Y = \frac{1}{2}y + \frac{\sqrt{3}}{2}x \quad \checkmark$$

$$X = r \cos(\theta + 60^\circ) \quad \checkmark$$

$$X = r(\cos \theta \cos 60^\circ - \sin \theta \sin 60^\circ)$$

$$X = r \left( \frac{x}{r} \times \frac{1}{2} - \frac{y}{r} \times \frac{\sqrt{3}}{2} \right) \quad \checkmark$$

$$X = \frac{1}{2}x - \frac{\sqrt{3}}{2}y \quad \checkmark$$

$$V \left[ \frac{1}{2}(-6) - \frac{\sqrt{3}}{2}(-4); \frac{1}{2}(-4) + \frac{\sqrt{3}}{2}(-6) \right] \quad \checkmark$$

$$= V(-3 + 2\sqrt{3}; -2 - 3\sqrt{3}) \quad \checkmark$$

(8)

[19]

**QUESTION 6**

$$(1) \quad A(1; 1) \quad \checkmark$$

$$D(0; 0)$$

$$\therefore y = x \quad \checkmark$$

(2)

(2)

$$DA = \sqrt{2} \quad x^2 + y^2 = 2 \quad \checkmark$$

$$DB = 2\sqrt{2} \quad x^2 + y^2 = 8 \quad \checkmark$$

$$DC = 3\sqrt{2} \quad x^2 + y^2 = 18 \quad \checkmark$$

(6)

✓



(3) Gradient of tangents = -1

$$\begin{array}{lll}
 A(1; 1) & B(2; 2) & \checkmark & C(3; 3) & \checkmark \\
 y_A = -x + 2 & & \checkmark & & \\
 y_B = -x + 4 & & \checkmark & & \\
 y_C = -x + 6 & & \checkmark & & 
 \end{array}$$

(6)

(4)

$$\begin{array}{ll}
 r = n\sqrt{2} & \checkmark \checkmark \\
 \therefore x^2 + y^2 = 2n^2 & \checkmark
 \end{array}$$

(3)

[17]

**QUESTION 7**

(a) (1)  $\sigma = 500\sqrt{2}$  ✓

(1)

(2)

$$\begin{array}{ll}
 \bar{x} = \frac{5a + 10d}{5} & \checkmark \\
 \therefore \bar{x} = a + 2d & \checkmark
 \end{array}$$

$$\begin{array}{ll}
 \sigma = \sqrt{\frac{4d^2 + d^2 + d^2 + 4d^2}{5}} & \checkmark \\
 = d\sqrt{2} & \checkmark \\
 & \checkmark
 \end{array}$$

(4)

(3)

arithmetic

$$\sigma = d\sqrt{2} \quad \checkmark$$

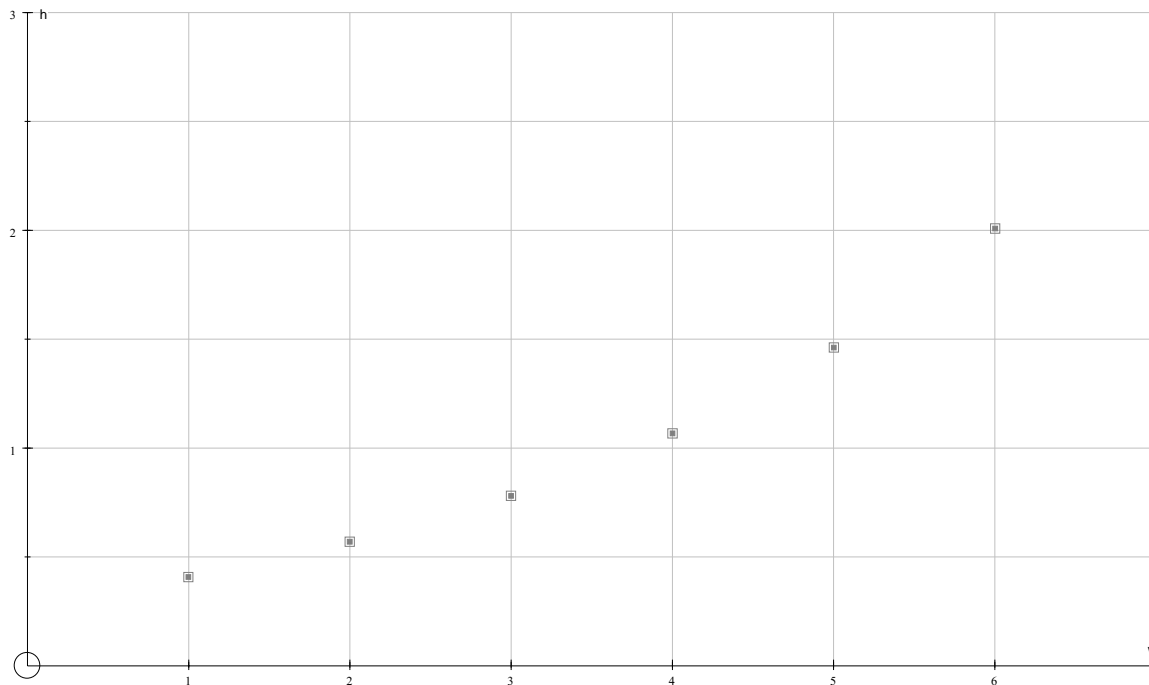
✓

(2)

(b) (1) exponential  
 no common ratio or difference ✓  
 or difference in height is not constant. ✓

(2)

(b) (2) ✓ ✓ ✓



(3)  
[12]

**QUESTION 8**

(a) (1)

$$\begin{aligned}
 LHS &= \sin A \cdot \cos B + \cos A \cdot \sin B - (\sin A \cdot \cos B - \cos A \cdot \sin B) \quad \checkmark \\
 &= \sin A \cdot \cos B + \cos A \cdot \sin B - \sin A \cdot \cos B + \cos A \cdot \sin B \quad \checkmark \\
 &= 2 \cos A \cdot \sin B \quad \checkmark
 \end{aligned}$$

(3)

$$\begin{aligned}
 (2) \quad & \sin(3x + 2x) - \sin(3x - 2x) \quad \checkmark \quad \checkmark \\
 &= 2 \cos 3x \cdot \sin 2x \quad \checkmark \quad \checkmark
 \end{aligned}$$

(4)

$$\begin{aligned}
 (3) \quad & 2 \cos 3x \cdot \sin 2x = 0 \\
 & \cos 3x = 0 \quad \checkmark \quad \text{or} \quad \sin 2x = 0 \quad \checkmark \\
 & 3x = \pm 90^\circ + k \cdot 180^\circ \quad \text{or} \quad 2x = k \cdot 180^\circ; \quad k \in Z \\
 & x = \pm 30^\circ + k \cdot 60^\circ \quad \checkmark \quad \checkmark \quad \text{or} \quad x = k \cdot 90^\circ \quad \checkmark
 \end{aligned}$$

(5)

(b)

$$\cos(2x + 20^\circ) = \cos[180^\circ - (x - 11^\circ)] \quad \checkmark$$

$$\therefore 2x + 20^\circ = 180^\circ - x + 11^\circ + k \cdot 360^\circ; \quad k \in Z \quad \checkmark$$

$$3x = 171^\circ + k \cdot 360^\circ$$

$$x = 57^\circ + k \cdot 120^\circ \quad \checkmark$$

or

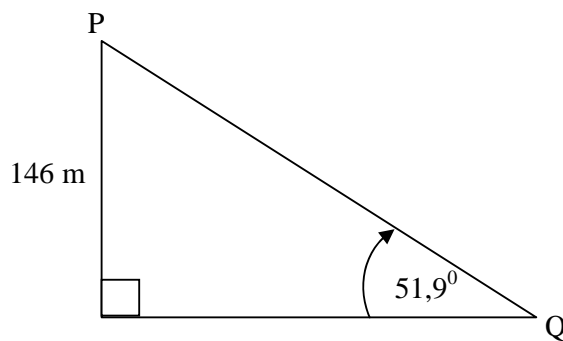
$$2x + 20^\circ = -180^\circ + x - 11^\circ + k \cdot 360^\circ \quad \checkmark$$

$$x = -211^\circ + k \cdot 360^\circ \quad \checkmark$$

$$\therefore x = -63^\circ; \checkmark \quad x = 149^\circ \quad \checkmark$$

(7)

(c) (1)



$$\sin 51,9^\circ = \frac{146}{PQ} \quad \checkmark$$

$$\therefore PQ = 185,53 \text{ metres} \quad \checkmark$$

(2)

(2)

In  $\Delta PQR$ ,  $PQ = 176,4 \text{ m}$  and  $QR = 100 \text{ m}$

$$PR^2 = 185,53^2 + 100^2 - 2(185,53)(100)\cos 128,1^\circ \quad \checkmark$$

$$PR = 259,46 \text{ metres} \quad \checkmark$$

(2)

(3) (i)

$$V = \frac{1}{3} \times \text{base area} \times \perp \text{height}$$

$$2\,590\,000 = \frac{1}{3} \times A \times 146 \quad \checkmark$$

$$\therefore A = 53219,18 \text{ m}^2 \quad \checkmark$$

(2)

- (c) (3) (ii)
- $53219,18 : 7700$  ✓
- $= 6,9\dots:1$
- $\therefore 7$  soccer stadiums ✓

(2)  
[27]

**75 marks**

**TOTAL FOR THIS PAPER: 150 MARKS**