



# education

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Department:  
Education  
**REPUBLIC OF SOUTH AFRICA**

## MARKING GUIDELINE

**NATIONAL CERTIFICATE (VOCATIONAL)  
NQF LEVEL 4**

**NOVEMBER 2009**

**MATHEMATICS**  
(Second Paper)

**This memorandum consists of 8 pages.**



$$\checkmark = 1 \text{ MARK} \quad \checkmark = \frac{1}{2} \text{ MARK}$$

**QUESTION 1**

1.1.1 Perpendicular to the chord.  $\checkmark$  (1)

1.1.2 A right angle.  $\checkmark$  (1)

1.2.  $MP = PN = 100 \text{ mm}$   $\checkmark$  ( line from centre ,  $90^\circ$  to chord bisects the chord )  $\checkmark$   
 $OM = \sqrt{100^2 + 75^2}$   $\checkmark$   
 $= 125 \text{ mm}$   $\checkmark$  (4)

1.3  $v = 90^\circ$   $\checkmark$  (angle subtended by diameter is a right angle)  $\checkmark$   
 $w = 40^\circ$   $\checkmark$  (straight line)  $\checkmark$   
 $x = 70^\circ$   $\checkmark$  (angle at centre is twice angle at circumference)  $\checkmark$   
 $z = 70^\circ$   $\checkmark$  (angles subtended by arc BC)  $\checkmark$   
 $y = 70^\circ$   $\checkmark$  (alternate angles)  $\checkmark$  (10)

Reasons could differ : mark correct

1.4  
 1.4.1  $x^2 + y^2 = r^2$   
 $6^2 + 8^2 = r^2$   $\checkmark$   
 $r^2 = 100$   $\checkmark$   
 $x^2 + y^2 = 100$   $\checkmark$  (3)

1.4.2  $m_{ON} = \tan \theta$   
 $= \frac{\text{opp}}{\text{adj}}$   $\checkmark$   
 $= \frac{8}{6}$  (2)  
 $= \frac{4}{3}$   $\checkmark$



$$1.4.3 \quad m_{\text{tangent}} \times m_{ON} = -1$$

$$\therefore m_{\text{tangent}} = -\frac{3}{4} \quad \checkmark \checkmark$$

$$\text{Equation of tangent : } y = -\frac{3}{4}x + c$$

$$8 = -\frac{3}{4}(6) + c \quad \checkmark$$

$$c = 8 + \frac{18}{4}$$

$$c = 12\frac{1}{2} \quad \checkmark$$

$$\text{Equation of tangent : } y = -\frac{3}{4}x + 12\frac{1}{2} \quad \checkmark$$

(5)

$$1.4.4 \quad M(-6 ; 8) \quad \checkmark \quad \checkmark$$

(2)

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**QUESTION 2**

2.1

$$(2j)^5 x j^9$$

$$= 32j^5 x j^9 \quad \checkmark$$

$$= 32j^{14} \quad \checkmark$$

$$= 32(j^2)^7 \quad \checkmark$$

$$= 32(-1)^7$$

$$= -32 \quad \checkmark$$

(2)

2.2

$$2.2.1 \quad \frac{-3+4i}{2-6i} \times \frac{2+6i}{2+6i} \quad \checkmark$$

$$= \frac{-6-18i+8i+24i^2}{4-36i^2} \quad \checkmark$$

$$= \frac{-6-10i+24(-1)}{4-36(-1)} \quad \checkmark$$

$$= \frac{-6-10i-24}{40} \quad \checkmark$$

$$= \frac{-30-10i}{40}$$

$$= -\frac{3}{4} - \frac{1}{4i} \quad \checkmark$$

(5)



$$\begin{aligned}
 2.2.2 &= (-3 + 4i)(2 - 6i) \\
 &= -6 + 18i + 8i - 24i^2 \quad \checkmark \\
 &= -6 + 26i - 24(-1) \quad \checkmark \\
 &= 18 + 26i \quad \checkmark
 \end{aligned}
 \tag{3}$$

$$\begin{aligned}
 2.2.3 &= (-3 + 4i) - (2 - 6i) \\
 &= -3 + 4i - 2 + 6i \quad \checkmark \\
 &= -5 + 10i \quad \checkmark
 \end{aligned}
 \tag{2}$$

$$\begin{aligned}
 2.3 &\frac{(2 \operatorname{cis} 300^\circ)^5}{(\sqrt{8} \operatorname{cis} 135^\circ)^2} \\
 &= \frac{2^5 \operatorname{cis} (300 \times 5)}{(\sqrt{8})^2 \operatorname{cis} (135 \times 2)} \quad \checkmark \\
 &= \frac{32 \operatorname{cis} 1500}{8 \operatorname{cis} 270} \quad \checkmark \\
 &= 4 \operatorname{cis} 1230 \\
 &= 4 \operatorname{cis} 150^\circ \quad \checkmark
 \end{aligned}
 \tag{3}$$

$$\begin{aligned}
 2.4 &\frac{6 \operatorname{cis} 75,5^\circ \times 7 \operatorname{cis} 23,5^\circ}{4 \operatorname{cis} 80^\circ} \\
 &= \frac{42 \operatorname{cis} 99}{4 \operatorname{cis} 80} \quad \checkmark \quad \checkmark \\
 &= 10,5 \operatorname{cis} 19^\circ \quad \checkmark
 \end{aligned}
 \tag{3}$$

$$\begin{aligned}
 2.5 &(x + y) + ix - iy = 7 + 2i \\
 &x + y + (x - y)i = 7 + 2i \quad \checkmark \\
 &x + y = 7 \text{ -----} 1 \quad \checkmark \\
 &x - y = 2 \text{ -----} 2 \quad \checkmark \\
 &(1 - 2) \quad 2y = 5 \quad \checkmark \\
 &y = 2\frac{1}{2} \quad \checkmark \\
 &\therefore x = 2 + y \quad \checkmark \\
 &= 2 + 2\frac{1}{2} \\
 &= 4\frac{1}{2} \quad \checkmark
 \end{aligned}
 \tag{4}$$

[22]



## QUESTION 3

$$\begin{aligned}
 3.1 \quad 3.1.1 \quad \frac{30}{60} &= 0,5 \\
 250^\circ 30' &= 250,5^\circ \quad \checkmark \\
 &= \frac{250,5}{57,3} \\
 &= 4,371 \text{ radians} \quad \checkmark
 \end{aligned}$$

or

$$\begin{aligned}
 180^\circ &= \pi \text{ radian} \quad \checkmark \\
 \therefore 250^\circ &= \frac{250,5^\circ}{180^\circ} \times \pi \\
 &= 4,371 \text{ radians} \quad \checkmark
 \end{aligned}$$

or

$$\begin{aligned}
 57,296^\circ &= 1 \text{ radian} \\
 250^\circ &= \frac{250,5^\circ}{57,296} \text{ radian} \quad \checkmark \\
 &= 4,371 \text{ radians} \quad \checkmark
 \end{aligned} \tag{2}$$

$$3.1.2 \quad \pi = 180^\circ \Rightarrow \frac{\pi}{9} = \frac{180}{9} = 20^\circ \quad \checkmark \tag{1}$$

$$\begin{aligned}
 3.2 \quad 3.2.1 \quad 8 \cos x + 4 &= 4,826 \\
 8 \cos x &= 0,826 \\
 \cos x &= 0,10325 \quad \checkmark \\
 x &= 84,074^\circ \quad \checkmark \\
 &= 1,467 \text{ rad} \quad \checkmark \\
 \\ 
 x_2 &= 360^\circ - 84,074^\circ \quad \checkmark \\
 &= 275,926^\circ \\
 &= 4,816 \text{ rad} \quad \checkmark
 \end{aligned} \tag{4}$$



$$3.2.2 \quad 1 - \cos^2 x - \cos x = 1$$

$$\cos x(-\cos x - 1) = 0 \quad \checkmark$$

$$\cos x = 0 \text{ or } \cos x = -1 \quad \checkmark \quad \checkmark$$

$$x = \frac{\pi}{2}; \frac{3\pi}{2}; \pi \quad \checkmark \quad \checkmark \quad \checkmark$$

or

$$x = 1,57; 4,712; 3,142$$

For answers left in degrees, penalise just 1 mark

(6)

$$3.2.3 \quad \sin\left(2x + \frac{\pi}{12}\right) = 0,5$$

$$\text{Ref } \angle = \frac{\pi}{6} \text{ or } 30 \quad \checkmark$$

$$2x + \frac{\pi}{12} = \frac{\pi}{6} + 2\pi k, k \in \{\text{integers}\} \quad \checkmark \quad \checkmark$$

$$2x = \frac{\pi}{12} + \frac{\pi}{6} + 2\pi k; -\frac{\pi}{12} + \frac{5\pi}{6} + 2\pi k$$

$$2x = \frac{\pi}{12} + 2\pi k; \frac{3\pi}{4} + 2\pi k$$

$$x = \frac{\pi}{24} + \pi k; \frac{3\pi}{8} + \pi k \quad \checkmark$$

$$x = \frac{\pi}{24}; \frac{25\pi}{24}; \frac{3\pi}{8}; \frac{11\pi}{8} \quad \checkmark \quad \checkmark \quad \checkmark \quad \checkmark$$

or

$$x = 0; 131; 3,272; 1,178; 4,320$$

$$2x + 15^\circ = 240^\circ$$

$$2x = 225^\circ$$

$$x = 112,5^\circ \quad \checkmark$$

$$x = 3,272\text{rad} \quad \checkmark$$

$$2x + 15^\circ = 270^\circ$$

$$2x = 225^\circ$$

$$x = 127,5^\circ \quad \checkmark$$

$$x = 4,320\text{rad} \quad \checkmark$$

(8)



- 3.3 3.3.1  $\cos(A - B) = \cos A \cos B + \sin A \sin B$  ✓ (1)
- 3.3.2  $\sin(A + B) = \cos(90^\circ - A - B)$  ✓  
 $= \cos\{(90^\circ - A) - B\}$  ✓  
 $= \cos(90^\circ - A) \cos B + \sin(90^\circ - A) \sin B$  ✓  
 $= \sin \cos B + \cos A \sin B$  ✓ (4)
- 3.4 3.4.1  $\sin EAC$  ✓ (1)
- 3.4.2  $\hat{A}CE = x - y$  ✓  
 $\hat{E}AC = 90^\circ - x$  ✓  
 from 3.4.1  
 $\frac{AE}{\sin ACE} = \frac{EC}{\sin EAC}$  ✓  
 $\frac{2}{\sin(x - y)} = \frac{EC}{\sin(90^\circ - x)}$  ✓  
 $EC = \frac{2 \cos x}{\sin(x - y)}$  ✓ ✓ (6)
- 3.4.3  $EC = \frac{2 \cos 33^\circ}{\sin(13^\circ)} = 7,456m$  ✓  
 $\frac{EB}{EC} = \sin y$  ✓  
 $EB = EC \sin 20^\circ = 7,456 \sin 20^\circ$   
 $EB = EC \sin 20^\circ = 7,456 \sin 20^\circ = 2,550m$  ✓  
 Height of wall =  $AB = 2 + 2,550 = 4,550$  m ✓  
 $\frac{AB}{EC} = \cos y$  ✓  
 $AB = EC \cos 20^\circ = 7,456 \cos 20^\circ = 7,006$  ✓  
 Length of wall = 7,006 m  
 Area =  $4,550 \times 7,006 = 31,877 \text{ m}^2$  ✓ (7)

[40]



**QUESTION 4**

- 4.1.2  $R92\,501,00 \div 12$  ✓  
 $R7\,708,42$  ✓  
 UIF = 1% of R7 708,42 ✓  
 = R77,08 ✓  
 OR  
 Yearly UIF = 1% of R92 501,00  
 = R925,01  
 Monthly = R925,01  $\div 12$   
 = R77,08 (3)
- 4.2.1  $R10\,890 \times 12 = R130\,680$   
 $+ \underline{R\,11\,200}$   
 $R141\,880$  ✓ (2)
- 4.2.2 Refer to tax table  
Tax on R141 880  
 = R21 960 + 25% of (R141 880 - R122 000)  
 = R21 960 + R4 970  
 = R26 930 ✓  
Total tax after rebate  
 = R26 930 - R7 200  
 = R19 730 ✓  
Total monthly tax  
 = R19 730  $\div 12$   
 = R1 644,17 ✓  
After tax monthly income  
 = R10 890 - R1 644,17  
 = R 9 245,83 ✓ (4)
- 4.2.3 She wanted to receive her full bonus of R11 200 ✓ (1)  
 ✓ [10]
- TOTAL: 100**

