MEMO

Senior College

FORM 4 (IEB)

Mathematics Paper 2

June 2015

Examiner: Mr R STEENHUISEN	**Moderator:** Mrs A GUNNING
TIME: 1 ½ hours	**TOTAL: 80**
NAME :	

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY BEFORE ANSWERING THE QUESTIONS.

- This question paper consists of 9 pages. Please check that your question paper is complete.
- Read and answer all questions carefully.
- It is in your own interest to write legibly and to present your work neatly.
- Number your answers exactly as the questions are numbered.
- **All necessary working which you have used in determining your answers must be clearly shown.**
- Approved non-programmable calculators may be used except where otherwise stated. Where necessary give answers correct to 2 decimal places.
- Diagrams have not necessarily been drawn to scale.
- A list of formulae have been provided on Page 1.
- **ANSWER ALL QUESTIONS ON THE QUESTION PAPER.**

QUESTION 1

Given the points $A(2;7)$ and $B(-8;-3)$

1..1 Find the co-ordinates of the midpoint of AB.

$$\text{Midpoint} = \left(\frac{2-8}{2}; \frac{7-3}{2}\right) = (-3;2)$$

(2)

1.2 Determine the length of line AB, leaving answer in surd form.

$$AB = \sqrt{(2+8)^2 + (7+3)^2}$$

$$= \sqrt{200}$$

OR $10\sqrt{2}$

(3)

1.3 Find the gradient of AB.

$$m_{AB} = \frac{7+3}{2+8} = \frac{10}{10} = 1$$

(2)

1.4 Determine the equation of the line which is parallel to AB, and which passes through the point $(1;-2)$.

$m = 1$ $\quad y = x + c$

$-2 = 1 + c$ $\quad$ sub $(1;-2)$

$c = -3$

$y = x - 3$

(4)

1.5 Find the value of k if the points A, B and $D(6;k)$ are collinear. (lie on the same straight line.)

$m_{AB} = 1$ $\quad m_{DA} = \frac{k-7}{6-2}$

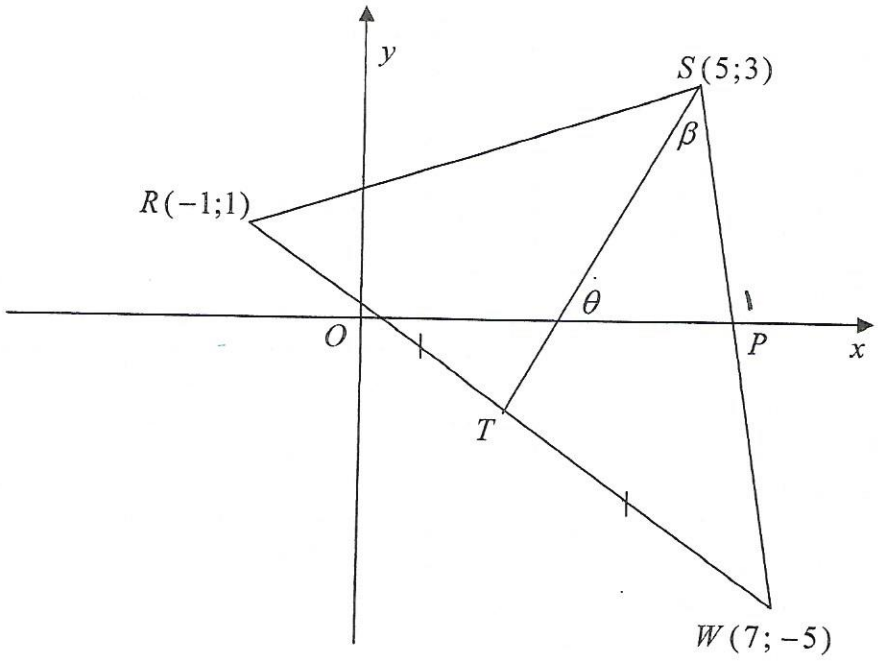
$\therefore \frac{k-7}{4} = 1$

$k - 7 = 4$ $\quad k = 11$

(4)

QUESTION 2

Refer to the figure. $R(-1;1)$, $S(5;3)$ and $W(7;-5)$ are points in the Cartesian plane. $RT = TW$ and $T\hat{S}P = \beta$.



2.1 Show that the co-ordinates of T are $(3;-2)$.

$T\left(\frac{-1+7}{2};\frac{1-5}{2}\right) = (3;-2)$ ✓m ✓

(2)

2.2 Find the equation of the line ST.

$m_{ST} = \frac{3+2}{5-3} = \frac{5}{2}$ ✓

$y = \frac{5}{2}x + c$

$3 = \frac{5}{2}(5) + c$ ✓m $\quad c = \frac{-19}{2}$ $\quad y = \frac{5}{2}x - \frac{19}{2}$ ✓

(3)

2.3 Determine whether or not $R\hat{S}W = 90°$. Explain

$m_{RS} = \frac{3-1}{5+1} = \frac{1}{3}$ ✓ ✓m

$m_{SW} = \frac{3+5}{5-7} = -4$ ✓

$\therefore m_{RS} \times m_{SW} \neq -1$ $\quad R\hat{S}W \neq 90°$

✓concl.

(4)

QUESTION 2 contd

2.4 Find the size of θ, the inclination of ST.

$m_{ST} = \frac{5}{2}$ ✓cla $\quad \tan\theta = \frac{5}{2}$

$\theta = 68,2^\circ$ ✓

(2)

2.5 Hence, calculate the value of β. ($T\hat{S}P$)

$m_{SW} = -4$

$\tan \hat{P}_1 = -4$ ✓m

$\hat{P}_1 = 104,04^\circ$ ✓ $\quad \therefore \beta = 104,04^\circ - 68,2^\circ$ ✓cla

$\beta = 35,84^\circ$ ✓

(4)

2.6 Calculate the co-ordinates of a point $D(x\,;y)$, if $RSWD$ is a parallelogram.

MAX $\frac{2}{4}$ FOR ANSWER ONLY.

$\frac{x+5}{2} = 3$ $\quad \frac{y+3}{2} = -2$

✓m ✓m

$x+5 = 6$ $\quad y+3 = -4$

$x = 1$ $\quad y = -7$

$D(1\,;-7)$ (DIAGS OF PARM BISECT)

✓ ✓

(4)

QUESTION 3

Given the points $C(-11\,;-4)$, $D(-5\,;3)$ and $E(1\,;k)$.

Calculate the value(s) of k if $DE = 3CD$.

$DE^2 = 9CD^2$

✓m ✓ ✓

$(1+5)^2 + (k-3)^2 = 9\left[(-11+5)^2 + (-4-3)^2\right]$

$36 + k^2 - 6k + 9 = 765$

$k^2 - 6k - 720 = 0$ ✓

(6)

✓m OR WITH QUAD FORM.

$(k+24)(k-30) = 0$

$k = -24$ or $k = 30$

✓ ✓

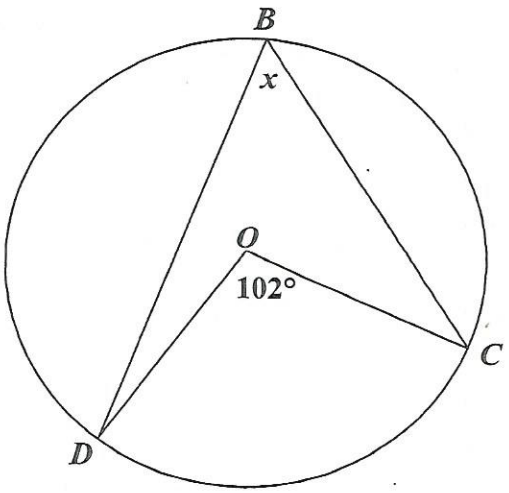
TOTAL SECTION A : 40

SECTION B

QUESTION 4

Giving reasons, find the value of x in each of the following, **where O is circle centre :**

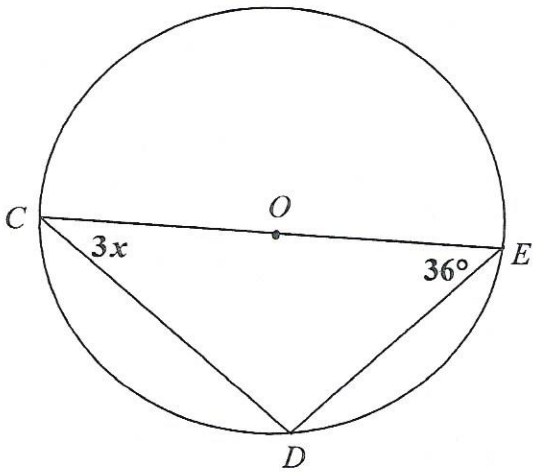
4.1



$x = 51°$ ✓ (∠ at centre x2 ∠ at circumf.) ✓

(2)

4.2



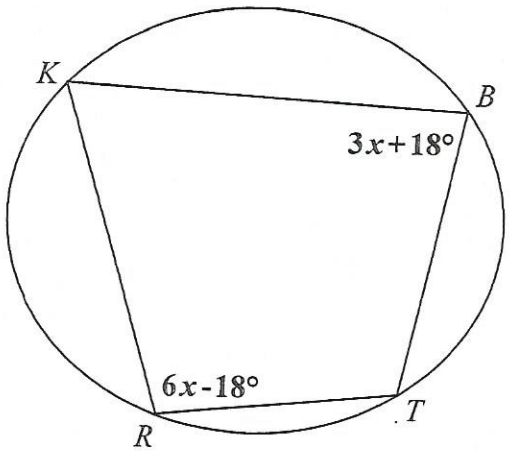
$\hat{D} = 90°$ ✓ (∠ in semic.) ✓ reason

$3x = 54°$ (sum ∠s of Δ)

$x = 18°$ ✓

(3)

4.3



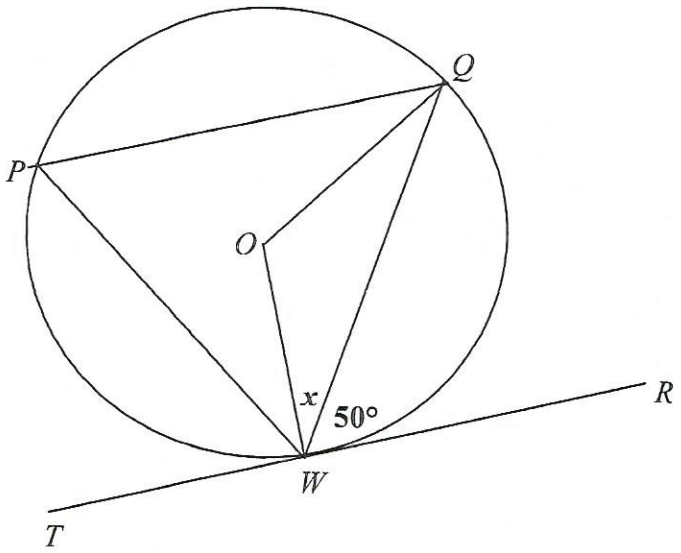
$3x + 18^\circ + 6x - 18^\circ = 180^\circ$ (opp Ls cyclic quad) ✓m ✓m ✓

$9x = 180^\circ$

$x = 20^\circ$ ✓

(4)

4.4 *TR* is a tangent and $Q\hat{W}R = 50°$.



$\hat{P} = 50^\circ$ ✓ (tang. chord ✓ th)

$\therefore Q\hat{O}W = 100^\circ$ ✓ (∠ at centre x2 ∠ at ✓ circumf)

$2x = 80^\circ$ ✓ (sum ∠s Δ ; isos Δ)

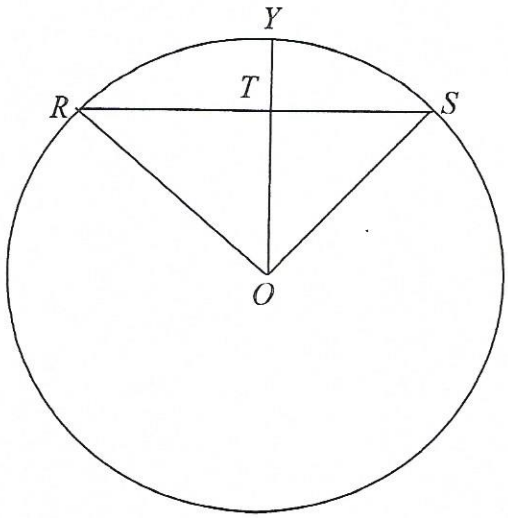
$\therefore x = 40^\circ$ ✓

(4)

QUESTION 5

In the figure below, O is the centre of the circle. $RT = TS = 4cm$ and $YT = 1cm$.

Find the length of the radius of the circle.



Let $OS = x$ (radius) $\quad O\hat{T}S = 90°$ (midpt ch th) ✓

$\therefore OT = x - 1$ ✓

In ΔOTS: $OS^2 = OT^2 + TS^2$ (Pythag)

$x^2 = (x-1)^2 + 16$ ✓m ✓

$x^2 = x^2 - 2x + 17$ ✓m

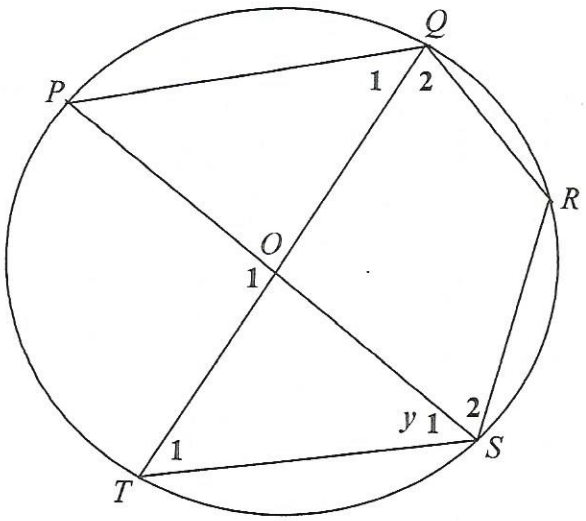
$2x = 17$

$x = \frac{17}{2}$ ✓

(6)

QUESTION 6

In the diagram, O is the centre of the circle and $\hat{S}_1 = y$



6.1 Name, with reasons, three other angles each equal to y.

$\hat{Q}_1 = y$ ✓ (∠s in same segm) ✓

$\hat{T}_1 = y$ ✓ (isos △ ; radii) ✓

$\hat{P} = y$ ✓ (isos △ ; radii) ✓

(6)

6.2 If $y = 44°$, determine, with reasons, the size of the following angles:

(a) $\hat{R}$

$\hat{T}_1 = y = 44°$ ✓

$\therefore \hat{R} = 136°$ ✓ (opp ∠s cyclic quad) ✓

(3)

(b) $\hat{O}_1$

$\hat{O}_1 = 2y$ ✓ (∠ at centre x2 ∠ at circumf.) ✓

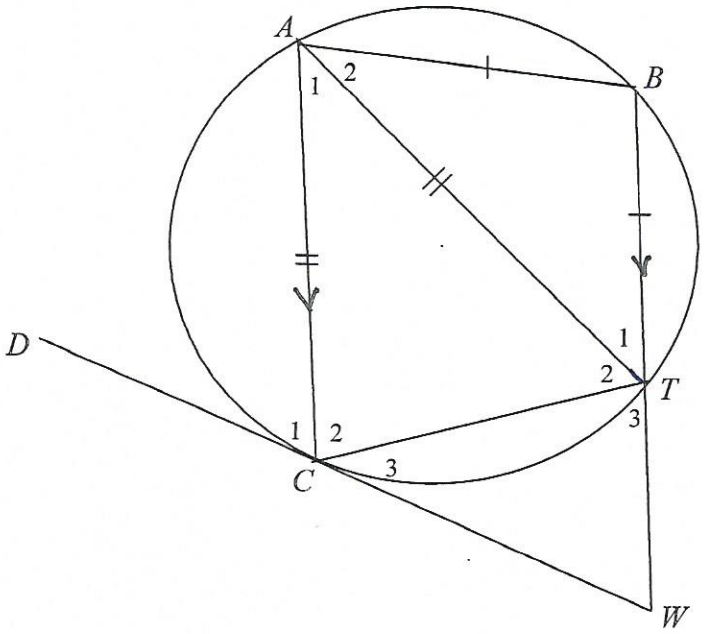
$\therefore \hat{O}_1 = 88°$ ✓

(3)

QUESTION 7

In the figure below, $BW \parallel AC$, $AB = BT$ and $AT = AC$.

DCW is a tangent to the circle at C and BTW is a straight line.



7.1 If $\hat{C}_1 = x$, name three other angles each equal to x. (reasons not required)

$\hat{T}_2 = x$ ✓

$\hat{C}_2 = x$ ✓

$\hat{T}_3 = x$ ✓

(3)

7.2 Express $A\hat{B}T$ in terms of x.

$A\hat{B}T = 180° - x$ ✓ ✓ cla

(2)

7.3 If $\hat{C}_3 = k$, give, with reasons, two other angles each equal to k.

$\hat{A}_1 = k$ ✓ (tang ch th ✓)

$\hat{T}_1 = k$ ✓ (alt ∠s = AC || BT ✓)

(4)

or $\hat{A}_2 = k$ (isos Δ)

TOTAL SECTION B : 40