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YOUR NAME:

YOUR TEACHER:



PRELIMINARY EXAMINATION 2015

GRADE 12 MATHEMATICS PAPER 2

TIME: 3 HOURS

MARKS: 150

EXAMINER: M. Phungula

MODERATORS: H. Botes

S.

Dzingwa

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

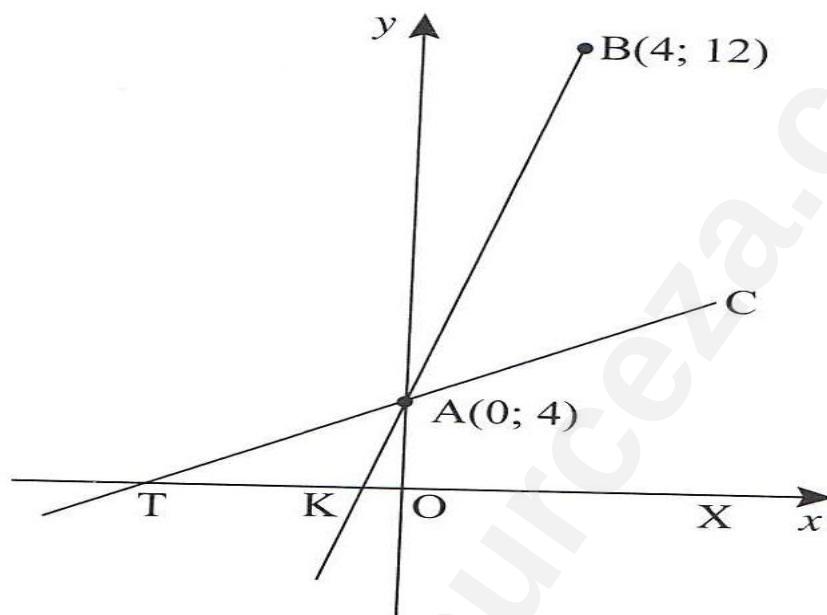
1. Write your name on top of this front page.
2. This question paper consists of 21 pages and a separate Information Sheet.
3. Answer ALL the questions on this question paper.
4. Diagrams are not drawn to scale.
5. You may use an approved non-programmable and non-graphical calculator, unless otherwise stated.
6. Round off your answers to one decimal digit where necessary.
7. All the necessary working details must be clearly shown.
8. It is in your own interest to write legibly and to present your work neatly.

DO NOT WRITE IN THIS GRID

Q 1	Q 2	Q 3	Q 4	Q 5	Q 6	Q 7	Q 8	Q 9	Q 10	Q 11	Q 12	Q 13	Q 14	TOTAL

SECTION A**QUESTION 1**

- a) In the diagram, A is the point (0;4) and B is the point (4;12). The straight line CAT has a gradient of $\frac{1}{3}$. KAB is a straight line.

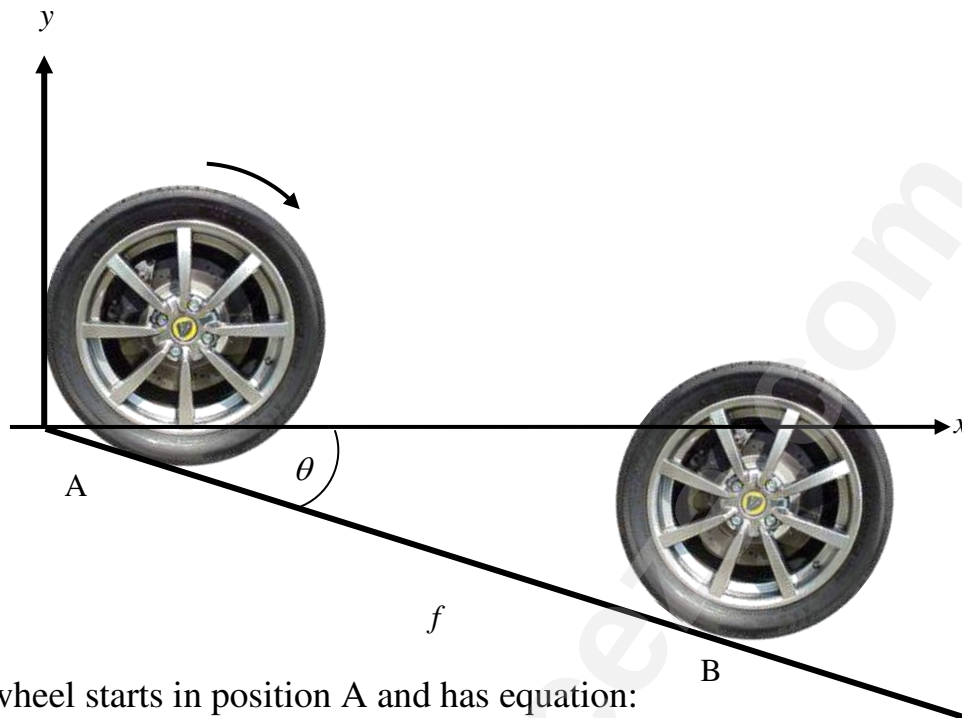


Determine:

- (1) $\hat{CTX}$ (2)

- (2) $\hat{BAC}$ (4)

- b) A wheel rolls down a hill represented by the straight line f .



The wheel starts in position A and has equation:

$$(x-0,5)^2 + (y-0,3)^2 = 0,25$$

The wheel rolls to a position B where its equation is then:

$$x^2 + y^2 - 4x + 2y + 4,75 = 0$$

- (1) State the co-ordinates of the centre of the wheel when it is in position A. (1)

- (2) Find the co-ordinates of the centre of the wheel when it is in position B. (3)

- (3) Find θ , the angle of inclination of the hill. (4)

- (4) If the units are in metres, how far has the wheel travelled from A to B down the hill? (3)

- (5) Through what angle has the wheel turned about its own axis? (3)

[20]

QUESTION 2

- a) If $\sin \theta = \frac{2\sqrt{6}}{5}$ and $90^\circ \leq \theta \leq 270^\circ$, without the use of a calculator and with the use of a diagram, calculate the value of :

- (1) $\tan \theta$ (3)

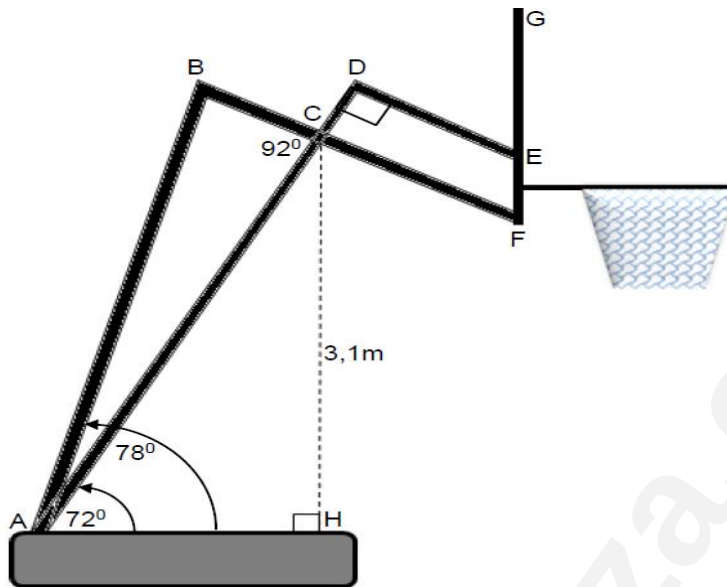
- (2) $\cos 2\theta$ (3)

- b) Simplify the following to a single trigonometric ratio of θ .

$$\sqrt{1 + \tan^2 \theta \cdot \cos(-\theta) \cdot \cos(180^\circ - \theta)} \quad \text{if } \theta \in (0^\circ; 90^\circ) \quad (5)$$

- c) Evaluate $\frac{4 \sin 15^\circ \cos 15^\circ}{\sqrt{2} \cos 405^\circ}$ without the use of a calculator. Show all working out. (4)

[15]

QUESTION 3

A portable metal tubing support for a basketball net is to be constructed for an indoor court with dimensions as shown in the diagram.

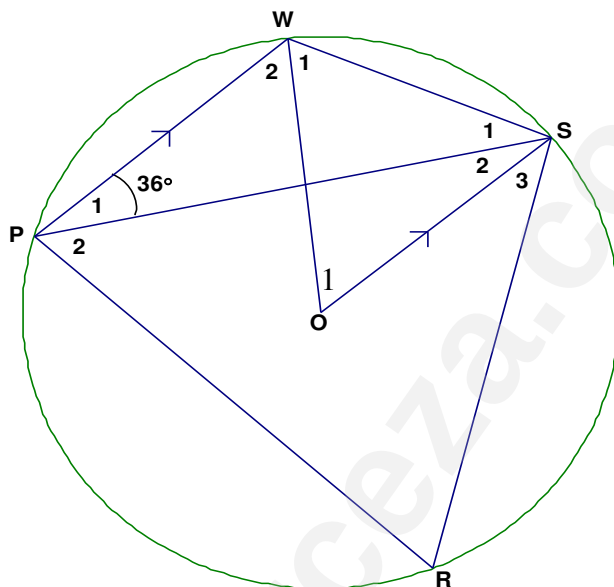
- a) Show that distance AC is 3,26 m. (2)

- b) If $\angle BCA = 92^\circ$ find the length of tubing needed for AB. (3)

[5]

QUESTION 4

- 1) In the diagram, O is the centre of the circle. PWSR is a cyclic quadrilateral. PS, WO and OS are drawn. $PW \parallel OS$ and $\hat{P}_1 = 36^\circ$.



Calculate the sizes of the following angles with reasons:

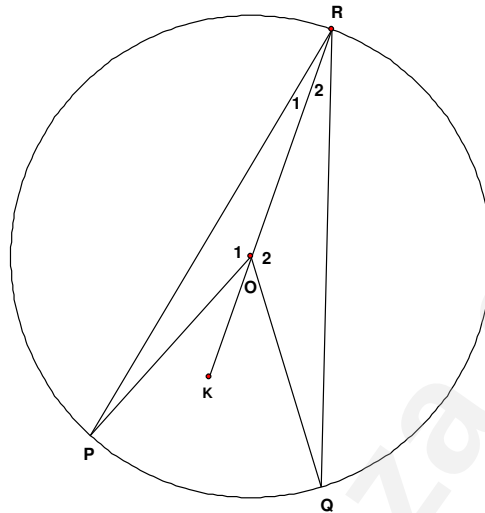
a) $\hat{O}_1$ (2)

b) $\hat{S}_2$ (2)

c) $\hat{OSW}$ (3)

d) $\hat{R}$ (3)

- 2) In the figure O is the centre of the circle. Use the sketch to prove that the angle subtended by an arc at the centre of the circle is double the size of the angle subtended by the same arc at any point on the circumference of the circle. (6)



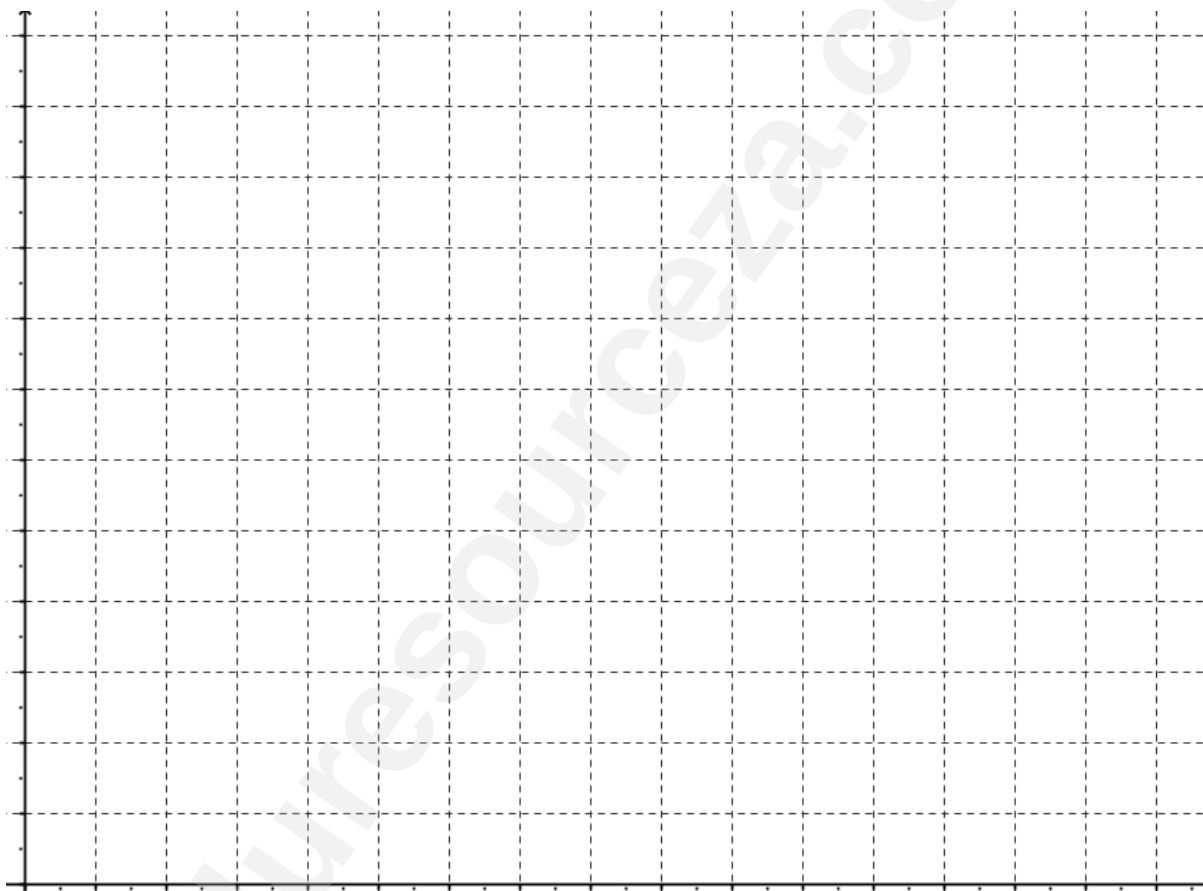
[16]

QUESTION 5

The data below shows the marks of the Grade 12 trial examination and the corresponding final examination marks for 11 learners.

Trial examination marks(x)	80	68	94	72	74	83	58	68	65	75	88
Final examination marks(y)	72	71	96	77	82	72	58	83	78	80	92

- a) Draw a scatter plot of the data above on the grid (3)



- b) Calculate the values of the point $P(\bar{x}; \bar{y})$ (4)

- c) Give the equation of line of best fit. (2)

[9]

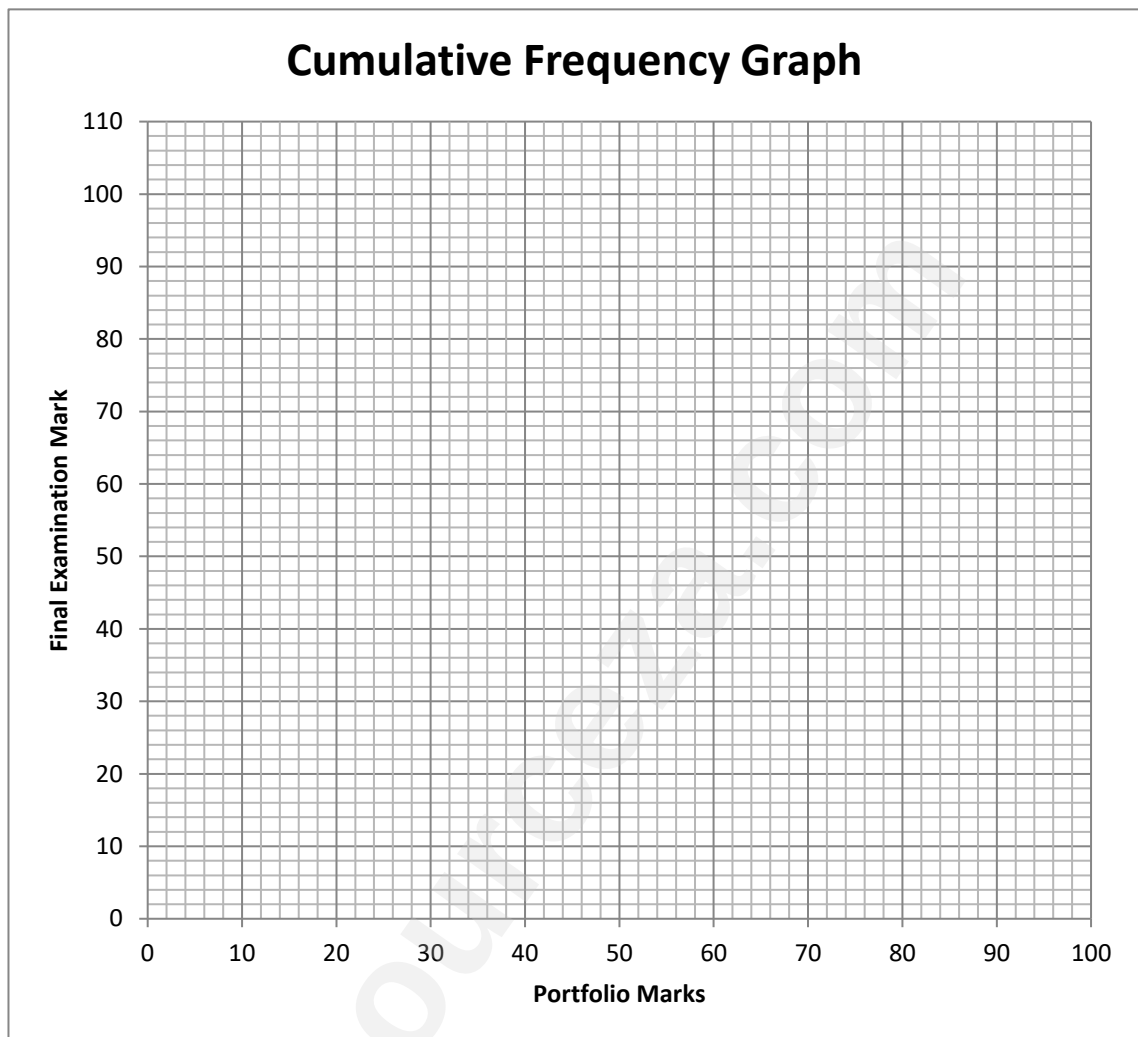
QUESTION 6

The following data is collected in a Curro High School. It depicts the results of Mathematics Portfolio marks of 100 learners.

- (a) Complete the Cumulative frequency column. (2)

Mark Intervals	Number of learners	Cumulative Frequency
$30 \leq x < 40$	3	
$40 \leq x < 50$	15	
$50 \leq x < 60$	18	
$60 \leq x < 70$	19	
$70 \leq x < 80$	28	
$80 \leq x < 90$	15	
$90 \leq x < 100$	2	

- (b) Draw an ogive representing the given data on the following graph. (4)



- (c) Show on the curve where you would find the median, lower quartile and upper quartile. Give the estimated values on the graph. (3)

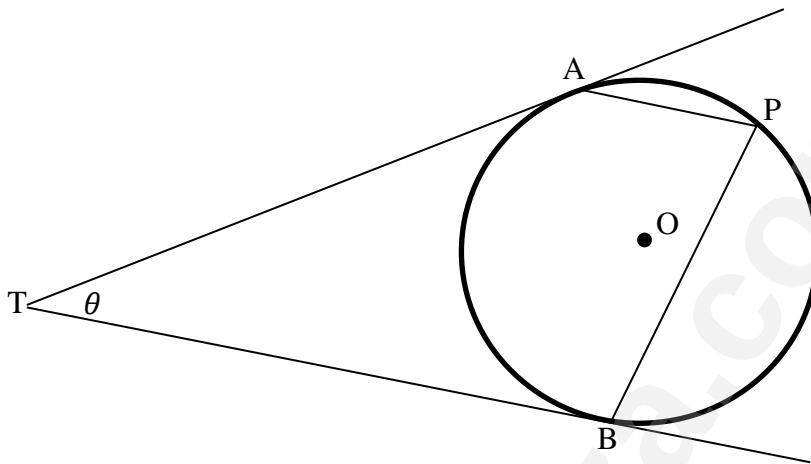
- (d) Determine the estimated mean and standard deviation. (3)

[12]

TOTAL FOR SECTION A = 77 MARKS

QUESTION 8

In the diagram below, A, B and P lie on a circle centred at O. The tangents to the circle at A and B meet at the point T and $\widehat{ATB} = \theta$. Express $\widehat{APB}$ in terms of θ . (5)



[5]

- c) Prove that $\triangle COT \sim \triangle KET$. (3)

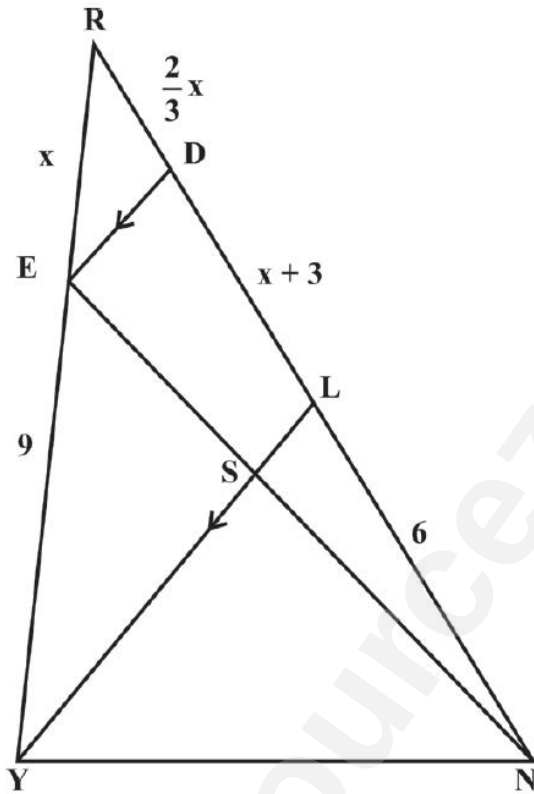
- d) Determine the length of CO if OT = 1 unit and KT = 9 units. (3)

- e) Determine the size of $\hat{K}$ correct to 2 decimal digits. (2)

[14]

QUESTION 10

NL = 6 units. RE = x units; RD = $\frac{2}{3}x$ units; EY = 9 units and DL = $x + 3$ units.
S is a point on YL and ED // YL.



- a) Show that L is the midpoint of DN by first solving for x . (4)

- b) If SL = 1,4 units write down the length of DE. (1)

- c) If Area $\triangle RED = 2,7$ units² determine the area of $\triangle REN$. (3)

QUESTION 11

The median of an odd set of n numbers is p , and the mean is q . Give answers to the following in terms of n , p and q .

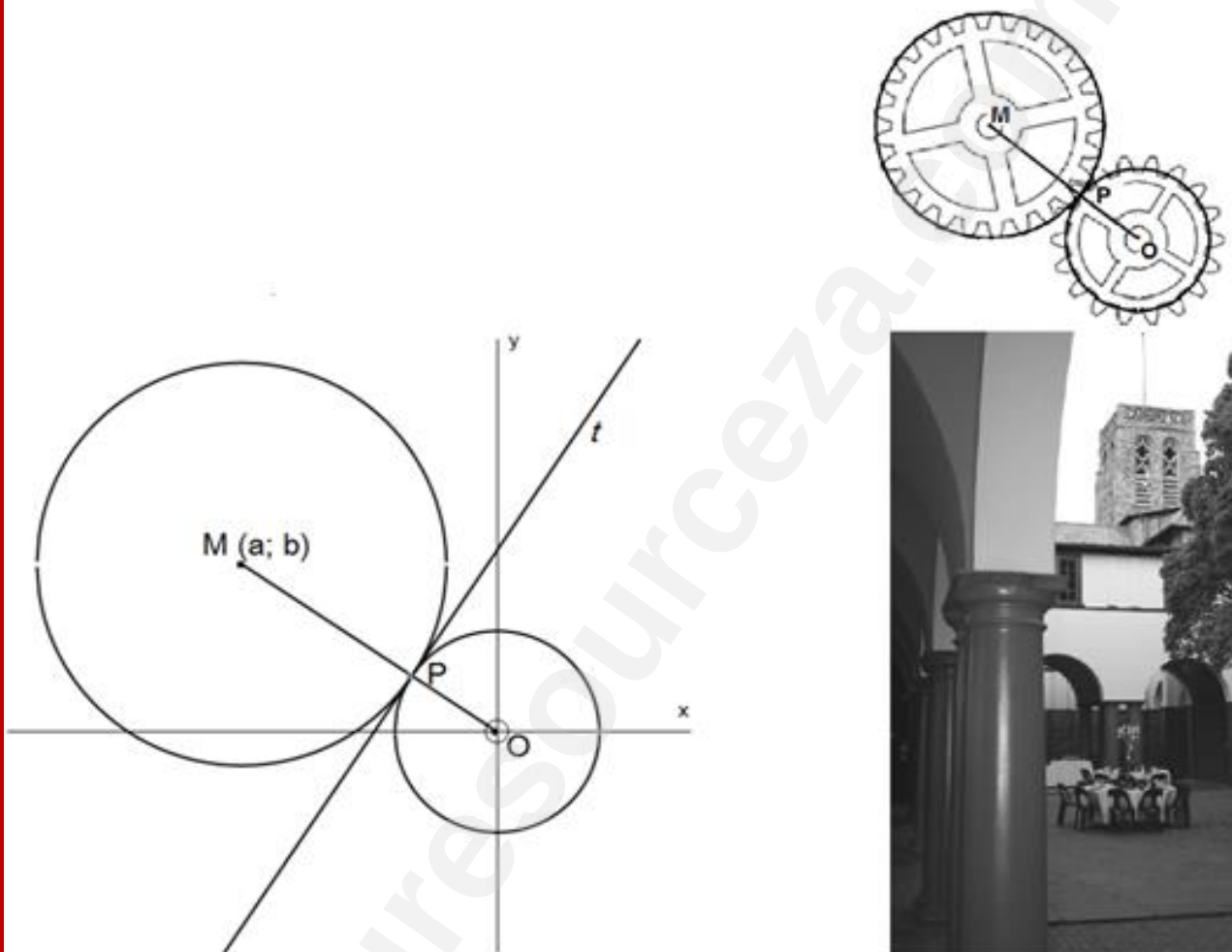
- (a) If the largest number is increased by 10, write down the new mean and the new median. (3)

- (b) A number, m , is inserted between the median and the next lower number. Write down the new mean and the new median. (4)

[7]

QUESTION 12

Two of the cogs that form part of the clock in the tower are represented in the diagram below. The two cogs are represented by a smaller circle with centre O, the origin, and larger circle with centre M. The point of contact of the two circles is at point P (-3;2).



The radius of the larger circle is $2\sqrt{13}$.

- a) Determine the equation of the smaller circle centred at the origin. (2)

- b) Determine the equation of the line OM. (2)

- c) Determine the equation of the common tangent, t . (4)

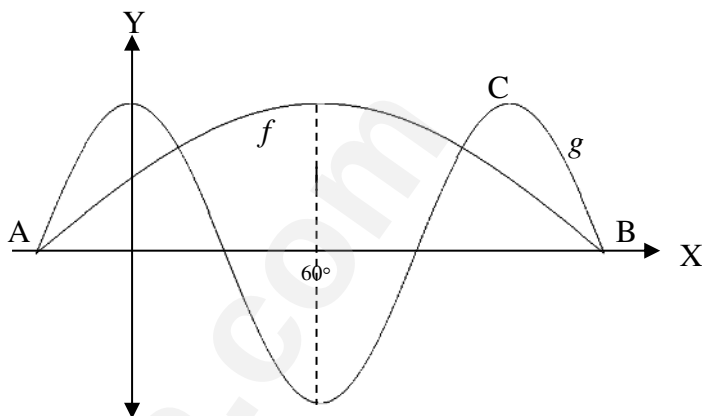
- d) If $x = a$ at point M, write b in terms of a . (1)

- e) Determine the equation of the larger circle. (8)

[17]

QUESTION 13

The sketch below represents the curves $f(x) = \sin(x - \alpha)$ and $g(x) = \cos \beta x$



(1) Using the graph, determine co-ordinates of:

(i) A (1)

(ii) B (1)

(iii) C (1)

(2) Determine the value of:

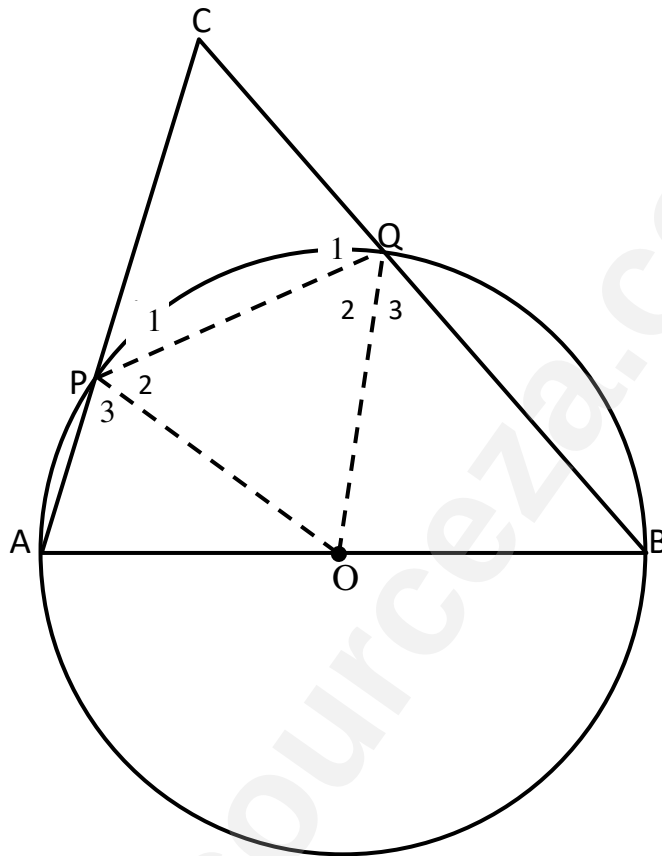
(i) α (1)

(ii) β (1)

[5]

QUESTION 14

In the diagram, AB is a diameter of a circle with centre O . The point C is chosen such that $\triangle ABC$ is acute – angled. The circle intersects AC and BC at P and Q respectively.



Let $\hat{P}_2 = x$ and $\hat{Q}_1 = y$

- a) Why is $\hat{Q}_1 = \hat{A}$? (1)

- b) Prove that OP is a tangent to the circle passing through P , Q and C . (5)

[6]

TOTAL FOR SECTION B = 73 MARKS