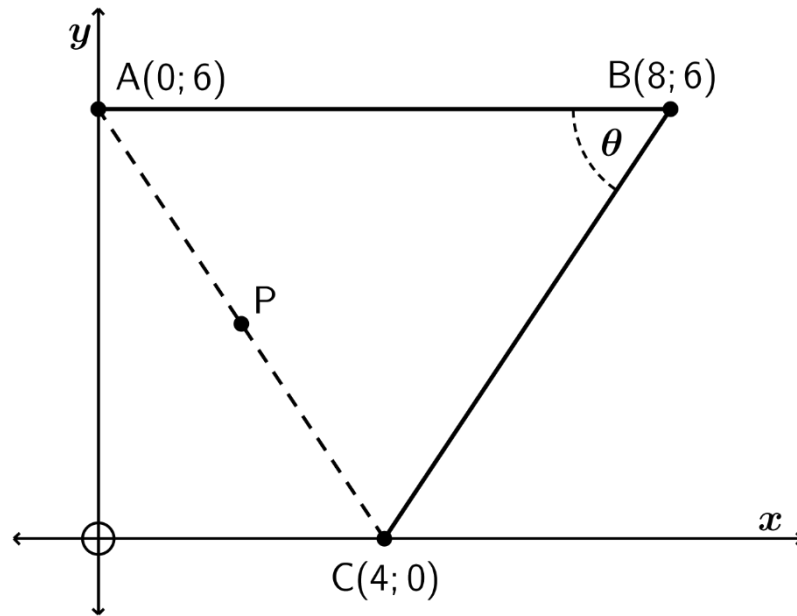


SECTION A

QUESTION 1

- (a) The diagram shows the points $A(0; 6)$, $B(8; 6)$ and $C(4; 0)$. $\widehat{ABC} = \theta$.
Point P is the midpoint of AC.



- (1) Calculate the length of BC, leaving your answer in simplified surd form.

(2)

- (2) Determine the size of angle θ .

(3)

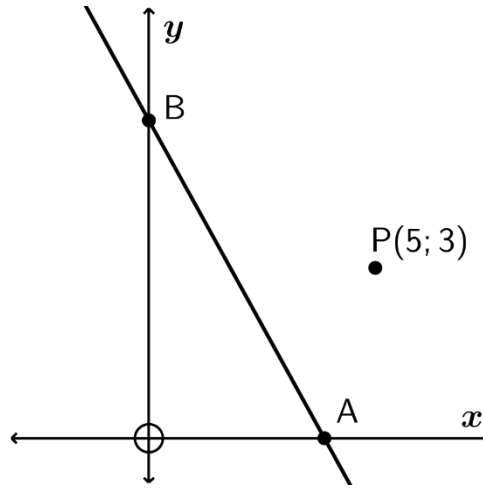
(3) Use analytical methods to show that O, P and B are NOT collinear.

(4)

(4) Determine the area of triangle ABC.

(2)

(b) The diagram shows a line with gradient -2 intersecting the x -axis at A and the y -axis at B. Point P(5; 3) is indicated.



(1) If the area of $\triangle AOB$ is 16 units², determine the coordinates of point A.

(4)

(2) The line through P perpendicular to AB cuts the x -axis at C. Determine the coordinates of point C.

(4)

QUESTION 2**PLEASE ENSURE THAT YOUR CALCULATOR IS IN DEGREE MODE**

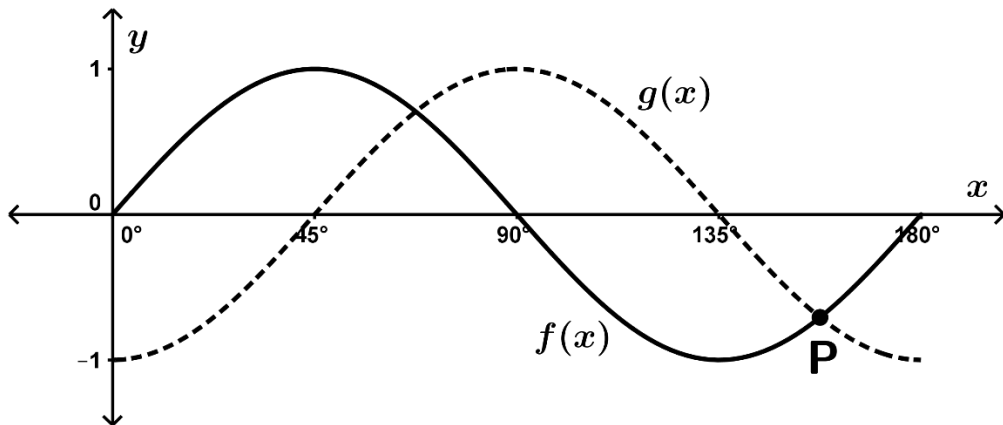
(a) Simplify as far as possible: $\frac{\sin(360^\circ - \theta) \cdot \cos(90^\circ + \theta)}{1 - \cos^2(-\theta)}$

(4)

(b) Prove the identity: $\frac{\sin 2\theta - \sin \theta}{\cos 2\theta + \cos \theta} = \frac{\sin \theta}{\cos \theta + 1}$

(5)

- (c) The diagram shows the graphs of $f(x) = \sin 2x$ and $g(x) = -\cos 2x$ for $0^\circ \leq x \leq 180^\circ$. Point P is a point of intersection of the two graphs.



- (1) Write down the period of g .

_____ (1)

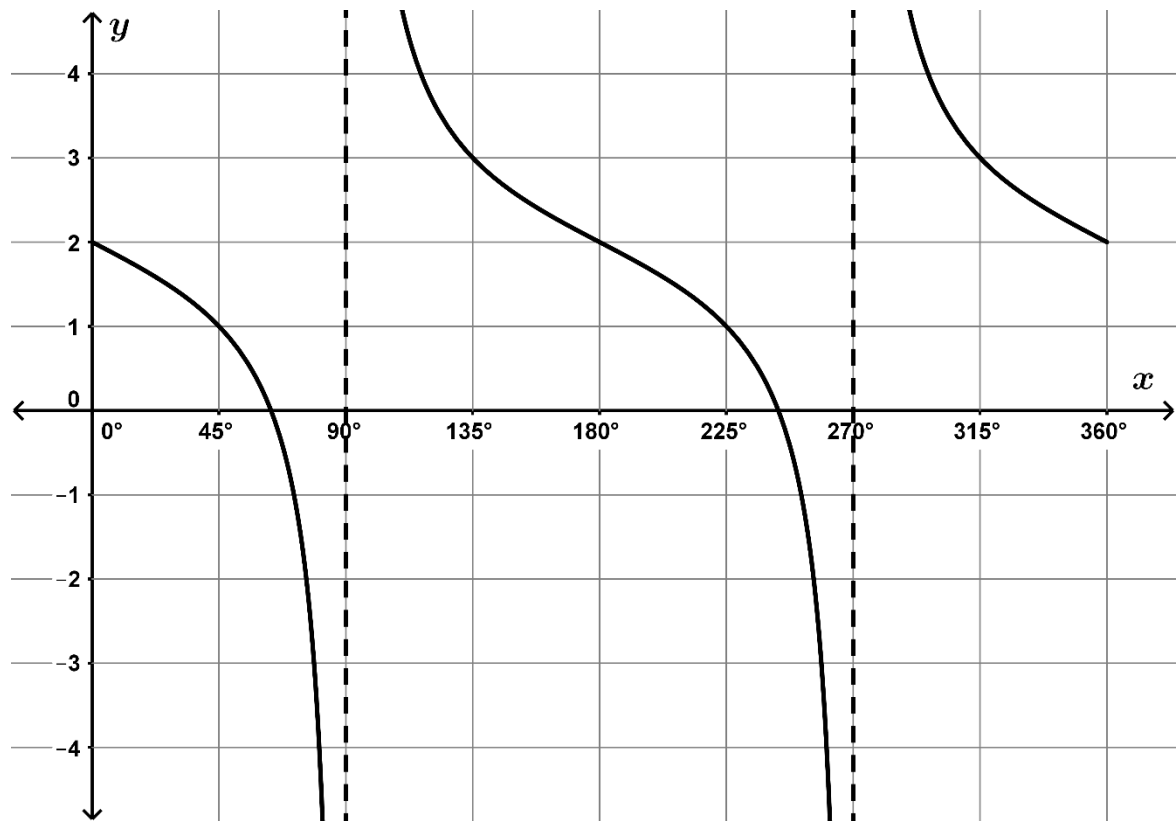
- (2) Calculate the coordinates of point P. Clearly show your working.

_____ (5)

- (3) For what values of x is $f(x).g(x) < 0$?

_____ (2)

(d) The graph shows the curve of $f(x) = a \tan x + b$ for $x \in [0^\circ; 360^\circ]$.



(1) Determine the values of a and b .

(2)

(2) On the same set of axes given above, draw the graph of $g(x) = 3 \sin x - 1$.

(4)

(3) Without solving the equation, write down the number of solutions there are for $f(x) = -g(x)$ for $x \in [0^\circ; 360^\circ]$.

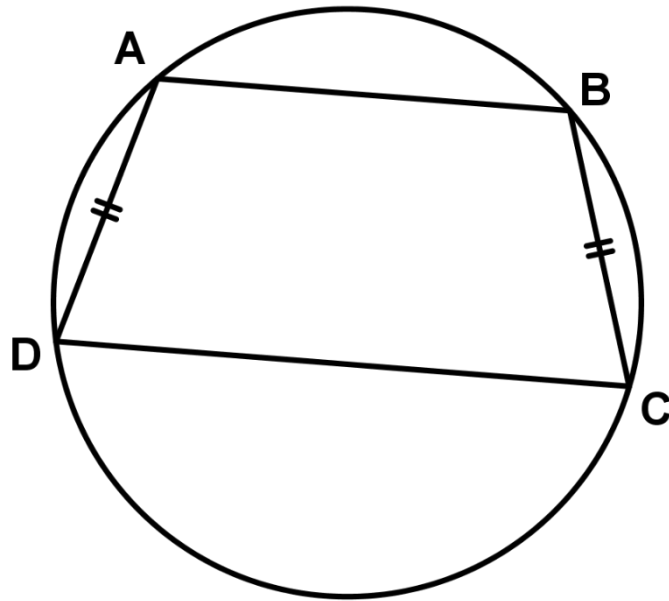
(1)

[24]

(b) (1) Complete the following statement:

Equal chords subtend _____ (1)

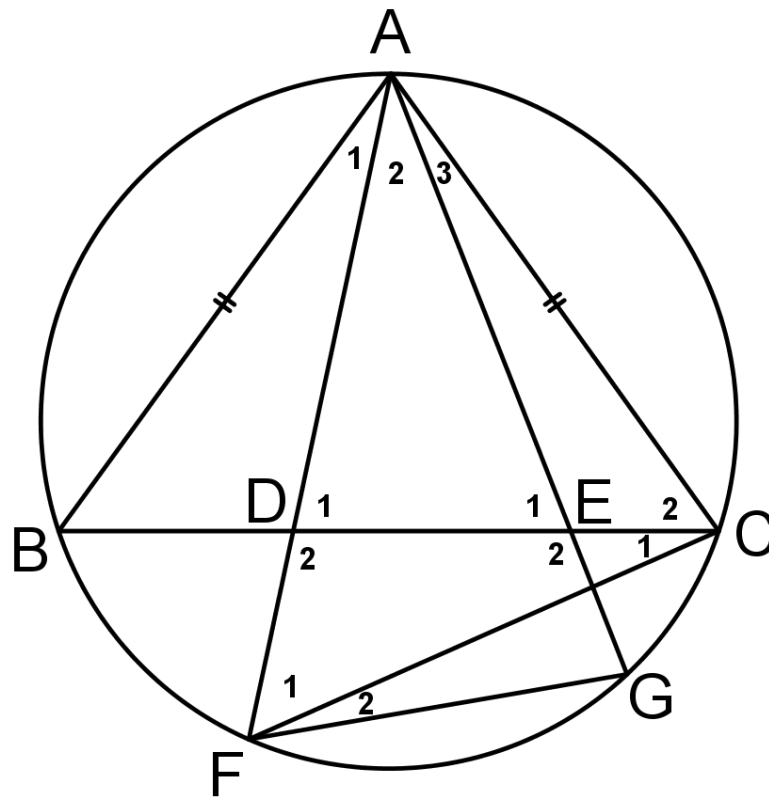
(2) In the diagram below, ABCD is a cyclic quadrilateral with $AD = BC$.



Prove, giving reasons, that $AB \parallel DC$.

(4)

(c) In the diagram, $AB=AC$ and D and E are points on BC . AD and AE are produced to meet the circumscribed circle of $\triangle ABC$ at F and G respectively.



(1) Prove that $\widehat{G} = \widehat{B} + \widehat{A}_1$

(4)

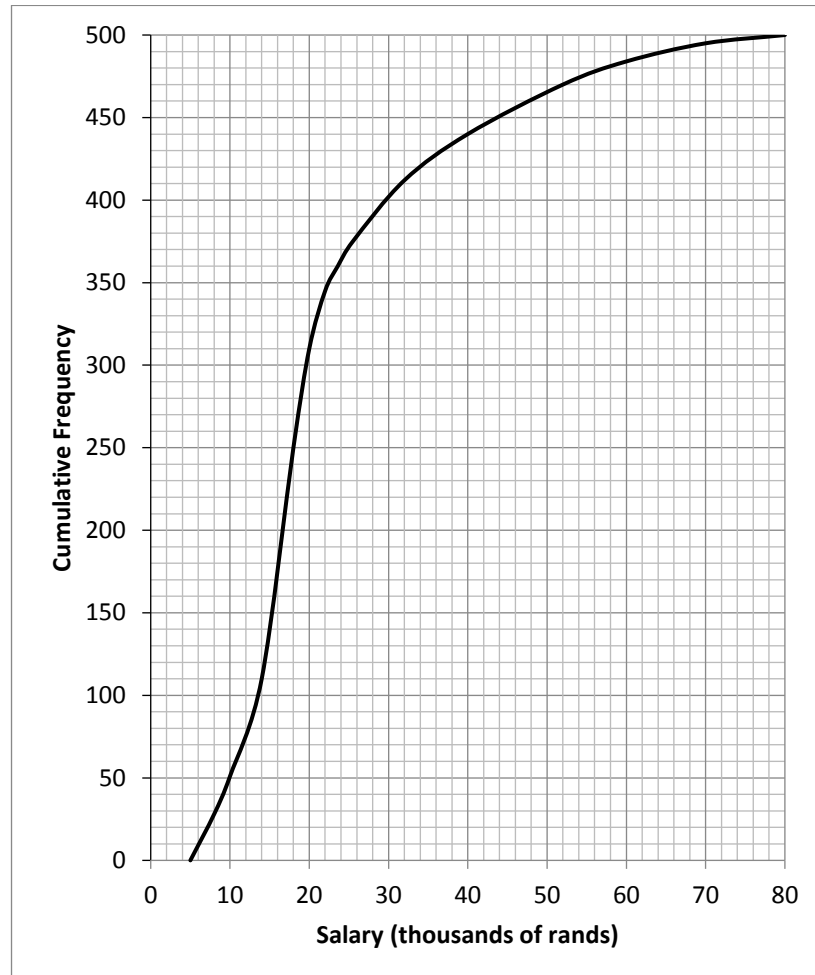
(2) Hence prove that DFGE is a cyclic quadrilateral.

(3)

[17]

QUESTION 4

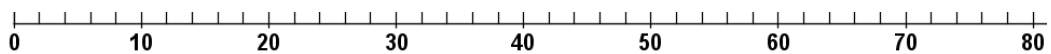
- (a) The cumulative frequency graph shows the monthly salaries, in thousands of rands, of a sample of 500 shoppers in Sandton City. The lowest salary is R5 000 and the highest salary is R80 000.



- (1) How many shoppers earned more than R40 000 per month?

(1)

- (2) Use the cumulative frequency graph to draw a box-and-whisker plot for the data.



(4)

(3) Comment on the skewness of the distribution of the data.

(1)

(4) An 'outlier' is defined as any value which is more than 1,5 times the interquartile range above the upper quartile, or more than 1,5 times the interquartile range below the lower quartile.

(i) How high must a salary be in order to be classified as an outlier?

(2)

(ii) Show that none of the salaries is low enough to be classified as an outlier.

(2)

(b) Consider the following pairs of points:

x	1	3	4	6	7	10	14	17
y	40	37	35	30	28	22	17	11

- (1) Calculate the equation of the line of best fit in the form $y = A + Bx$.
Give A and B correct to **3 decimal places**.

(3)

- (2) Calculate the correlation coefficient correct to **3 decimal places** and describe the correlation.

(2)

- (3) An interesting feature of the line of best fit is that it always passes through the point $(\bar{x}; \bar{y})$, where \bar{x} is the mean of the x -values and \bar{y} is the mean of the y -values. Confirm that this is true for the given data.

(3)

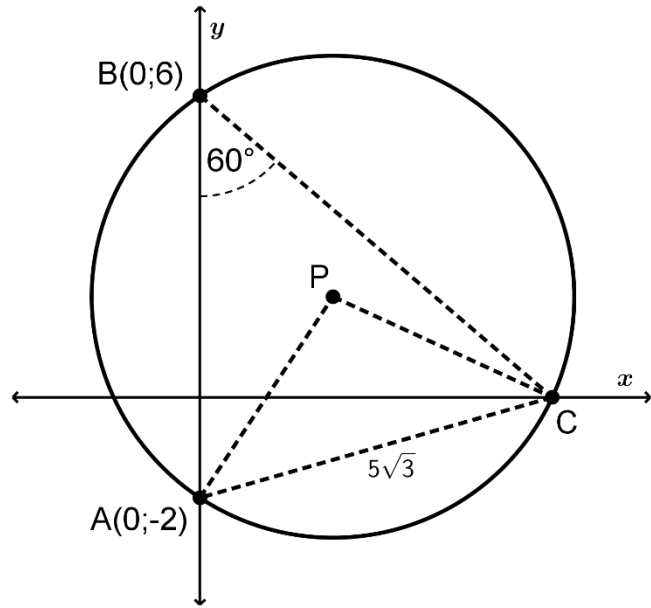
[18]

78 marks

SECTION B

QUESTION 5

- (a) The diagram shows a circle with centre P passing through $A(0; -2)$, $B(0; 6)$ and point C on the x -axis.
 $AC = 5\sqrt{3}$ and $\widehat{ABC} = 60^\circ$.



- (1) Giving a reason, write down the size of angle \widehat{APC} .

_____ (2)

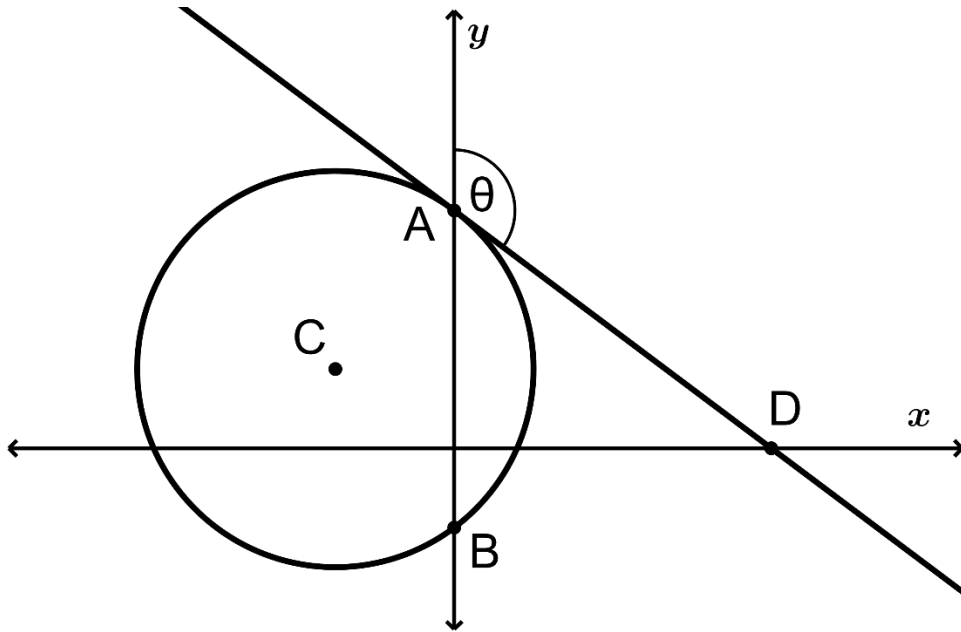
- (2) Hence determine r , the radius of the circle.

 _____ (3)

- (3) Hence determine the equation of the circle in the form $(x - a)^2 + (y - b)^2 = r^2$.

 _____ (3)

- (b) The diagram shows a circle with centre C and equation $x^2 + y^2 + 6x - 4y = 12$. The circle cuts the y -axis at points A and B . AD is a tangent to the circle at A and cuts the x -axis at D . Angle θ is indicated.



- (1) Determine the coordinates of C as well as the radius of the circle.

(4)

(2) Determine the size of the angle θ .

(6)

[18]

QUESTION 6

Given: $\frac{6}{\tan \theta} - \tan \theta = 2 \sin 2\theta$

- (a) Show that the equation can be expressed as $4 \cos^4 \theta + 3 \cos^2 \theta - 1 = 0$.

(5)

(b) Hence solve the equation $\frac{6}{\tan \theta} - \tan \theta = 2 \sin 2\theta$ for $\theta \in (0^\circ; 180^\circ)$.

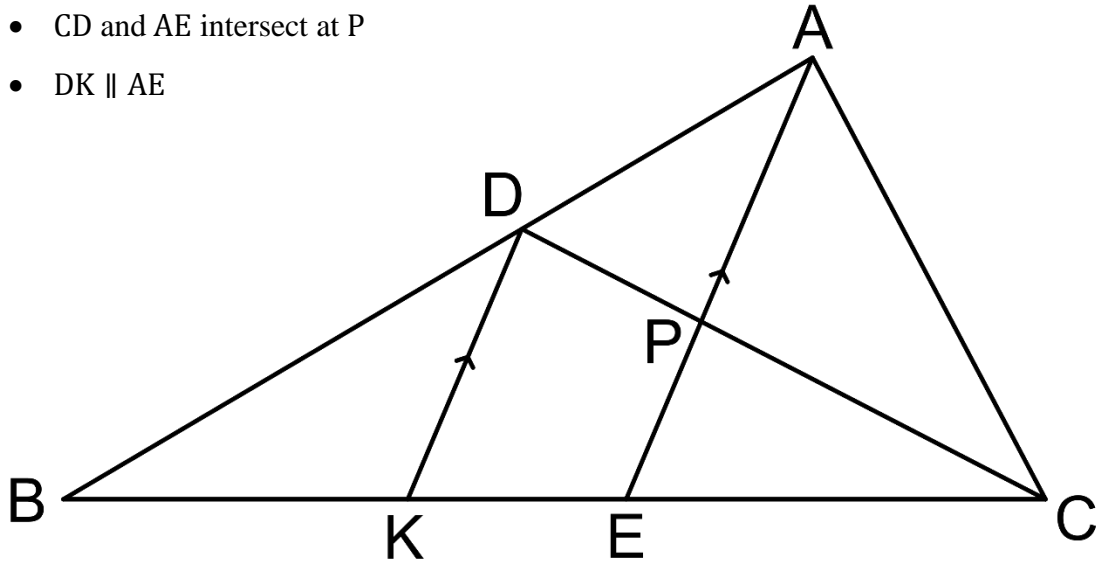
(4)

[9]

QUESTION 7

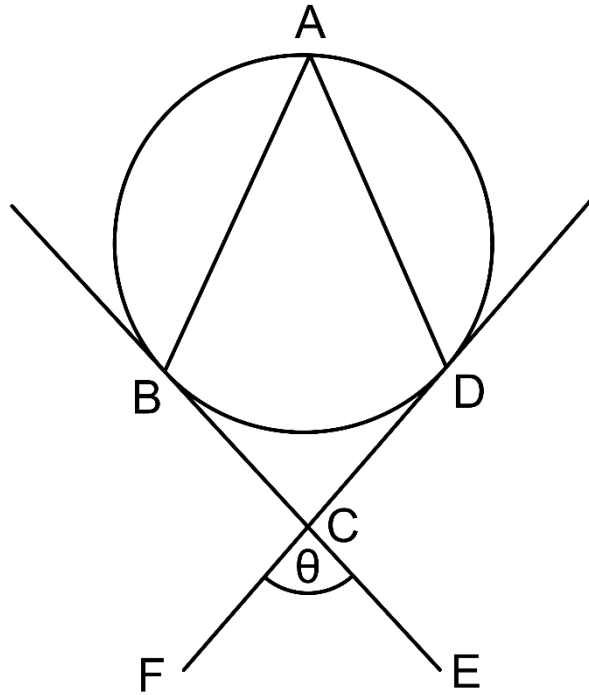
(a) The diagram shows triangle ABC. D, K and E are points on the sides of the triangle.

- $AD:DB = 2:3$
- $BE:EC = 4:3$
- CD and AE intersect at P
- $DK \parallel AE$



Determine, giving reasons, the numerical value of $CP:PD$.

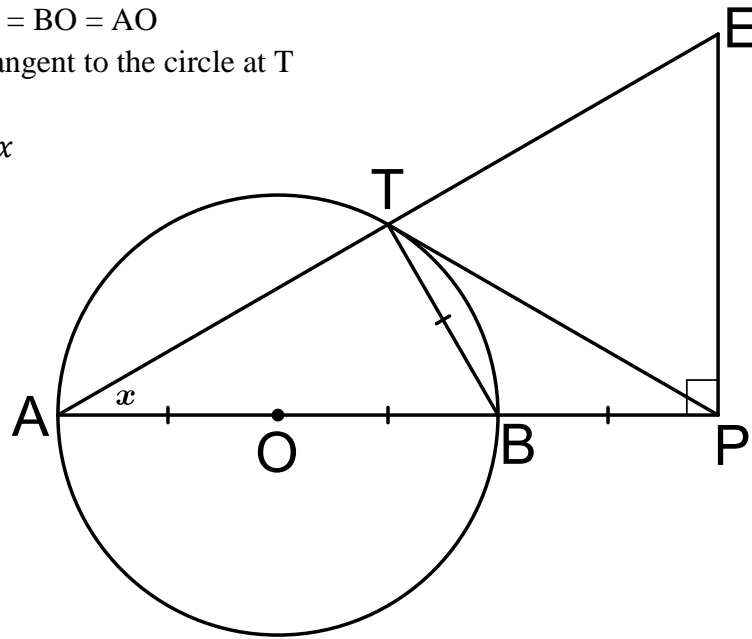
- (b) The diagram shows a circle passing through points A, B and D. BE and DF are tangents to the circle at B and D respectively. The tangents intersect at point C such that $\widehat{FCE} = \theta$.



If it is further given that $\widehat{BAD} = \widehat{FCE}$, determine, giving reasons, the value of θ .

(c) In the diagram, AB is a diameter of the circle with centre O.

- $BP = BT = BO = AO$
- PT is a tangent to the circle at T
- $EP \perp AP$
- Let $\hat{A} = x$



Giving reasons:

(1) Prove that TBPE is a cyclic quadrilateral.

(3)

(2) Use similarity to prove that $PT^2 = PB \cdot PA$.

(5)

(3) Prove that $PT = PE$.

(2)

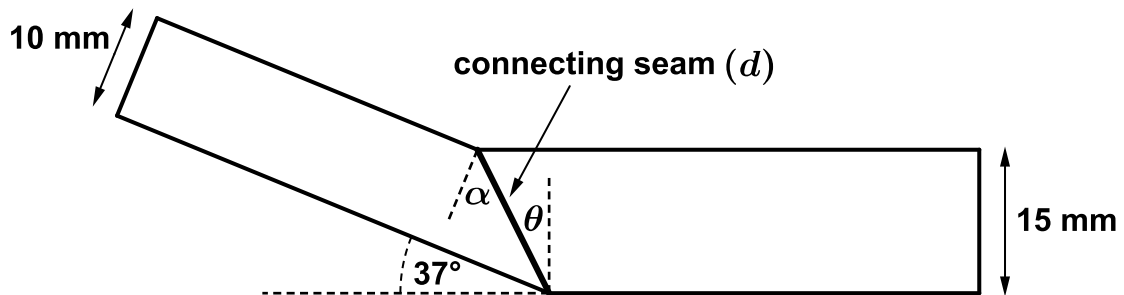
(4) Hence, or otherwise, determine the numerical value of $PT : AE$.

(5)

[26]

QUESTION 8

- (a) Two metal strips with different widths need to be welded together to form an angle of 37° as shown below. In order to accomplish this, the two strips need to be cut at angles α and θ as shown.



- (1) Express α in terms of θ .

(2)

- (2) Prove that $\frac{10}{\cos \alpha} = \frac{15}{\cos \theta}$.

(3)

- (3) Hence, or otherwise, determine the values of α and θ .
