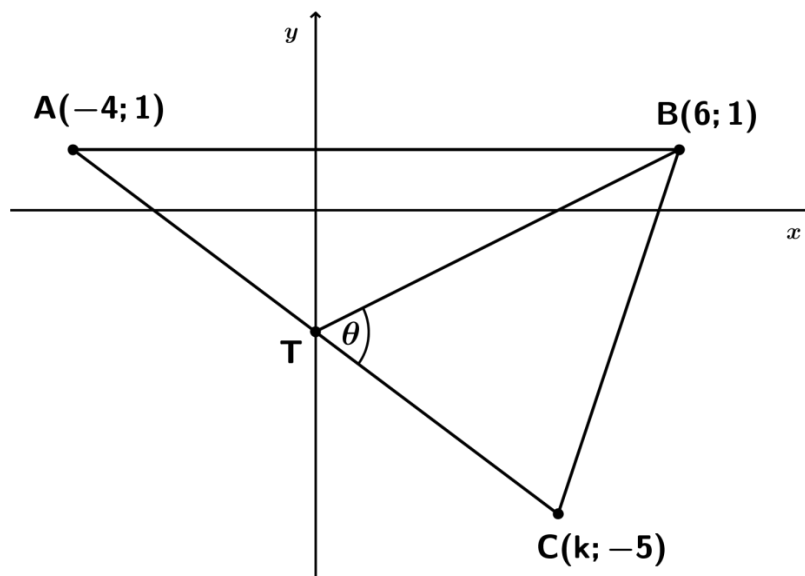


SECTION A

QUESTION 1

- (a) In the diagram, triangle ABC is drawn with $A(-4; 1)$, $B(6; 1)$ and $C(k; -5)$. T is a point on the y-axis. The line ATC has equation $y = -\frac{3}{4}x - 2$. Angle $B\hat{T}C = \theta$.



- (1) Show that $k = 4$.

(4)

- (2) Determine the equation of the line TB in the form $y = mx + c$.

(3)

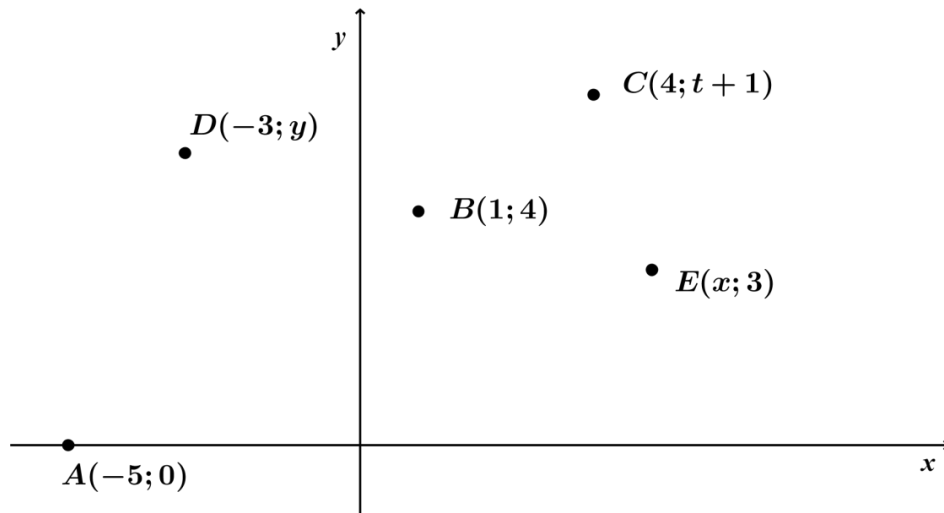
(3) Determine the area of triangle ABC.

(3)

(4) Determine, correct to one decimal digit, the size of θ .

(5)

- (b) $A(-5; 0)$, $B(1; 4)$, $C(4; t + 1)$, $D(-3; y)$ and $E(x; 3)$ are points in the Cartesian plane.



- (1) Determine x and y if B is the midpoint of DE .

(3)

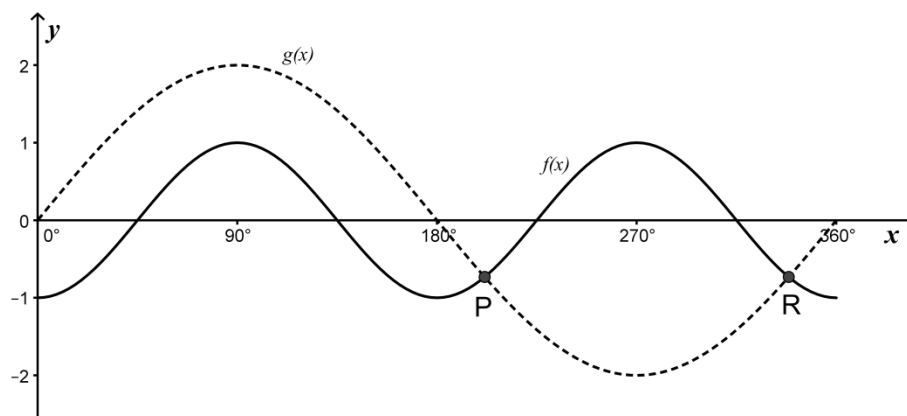
- (2) Determine the value of t if A , B and C all lie on the same straight line.

(4)

[22]

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

- (a) The diagram shows the graphs of $f(x) = a \cos bx$ and $g(x) = c \sin dx$ for $0^\circ \leq x \leq 360^\circ$. Points P and R are indicated.



- (1) Write down the values of a , b , c and d .

(4)

- (2) Write down the period of f .

(1)

- (3) If the co-ordinates of P are $(200^\circ; -1,75)$, write down the co-ordinates of R.

(1)

- (4) Write down the value of k if $f(x) - k = g(x)$ has only one solution for $x \in [0^\circ; 360^\circ]$.

(2)

(b) Simplify as far as possible: $\frac{\cos(90^\circ - \theta) - \sin(180^\circ + \theta)}{\sin 2\theta}$

(4)

(c) Solve for θ if $\cos \theta = \sin 210^\circ$ and

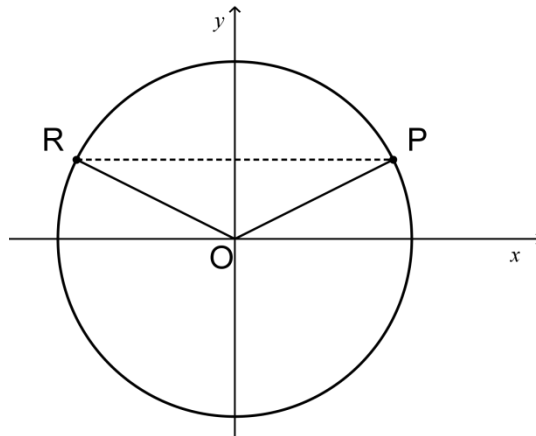
(1) $0^\circ < \theta < 180^\circ$

(2)

(2) $-180^\circ < \theta < 0^\circ$

(2)

- (d) In the diagram below, points P and R lie on the circle $x^2 + y^2 = 20$.
Point R is the reflection of P in the y-axis.



- (1) If the horizontal distance PR is 8 units, determine the co-ordinates of R.

(3)

- (2) Determine, to the nearest degree, the size of angle \widehat{POR} .

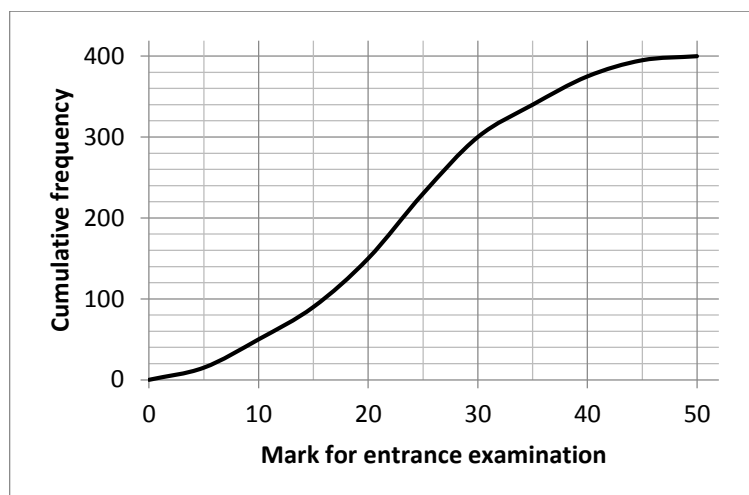
(4)

[23]

QUESTION 3

A university entrance examination was written by 400 students. Scores ranged from 5 out of 50 to 50 out of 50. The data is represented below:

Score (x)	Cumulative Frequency
$x \leq 50$	400
$x \leq 45$	395
$x \leq 40$	375
$x \leq 35$	340
$x \leq 30$	300
$x \leq 25$	230
$x \leq 20$	150
$x \leq 15$	90
$x \leq 10$	50
$x \leq 5$	15



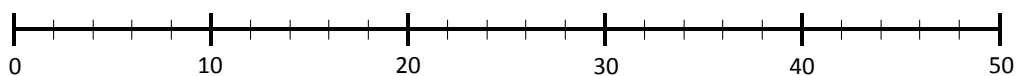
- (a) How many students scored more than 35 out of 50 for the entrance examination?

_____ (1)

- (b) How many students obtained marks in the interval $20 < x \leq 25$?

_____ (1)

- (c) Use the axis below to draw a box-and-whisker plot for the data. [Use the data provided to estimate values for the lower quartile, median and upper quartile.]



(5)

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

(1)

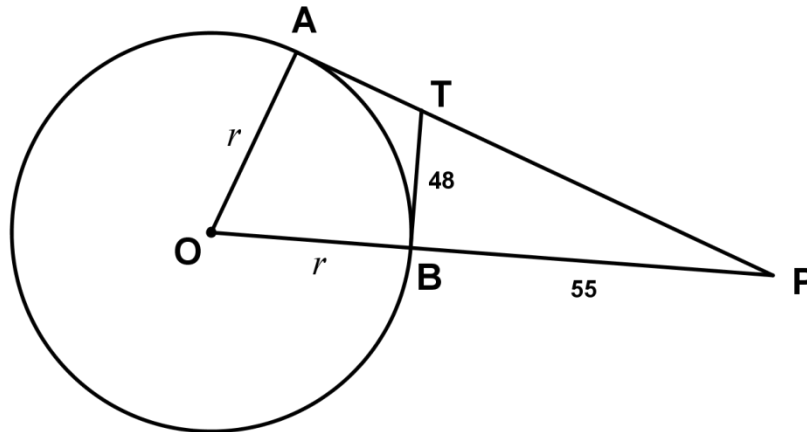
(e) One interpretation of the skewness of the data is that university entrance standards are dropping. Provide an alternative explanation that could account for the skewness of the data.

(2)

[10]

QUESTION 4

- (a) In the diagram below, TA and TB are tangents to the circle with centre O. AT produced meets OB produced at P. $TB = 48$ cm, $BP = 55$ cm and $OA = OB = r$ cm.



- (1) Explain why BOAT is a cyclic quadrilateral.

(2)

- (2) Explain why $TA = 48$ cm.

(1)

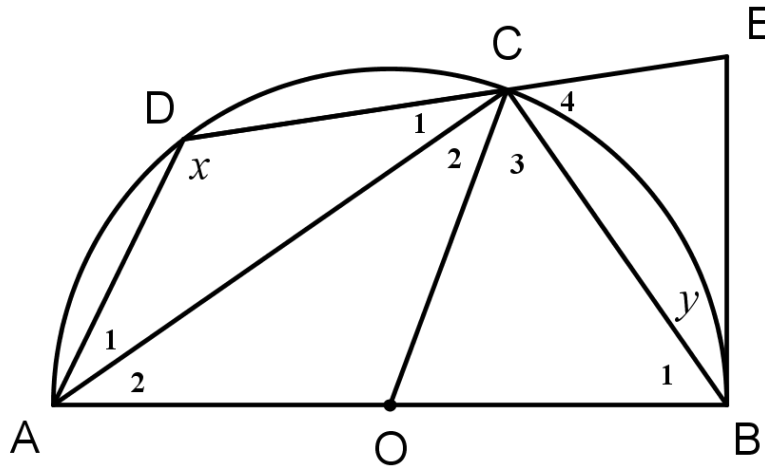
- (3) Prove that $\triangle POA \sim \triangle PTB$.

(3)

(4) Hence, or otherwise, calculate the length of r .

(4)

- (b) In the diagram below, EB is a tangent to the semi-circle with centre O passing through A, B, C and D. DC produced meets the tangent at E. $\widehat{ADC} = x$ and $\widehat{EBC} = y$.



- (1) Name, giving reasons, two right angles in the figure.

(4)

- (2) Show, giving reasons, that $x - y = 90^\circ$.

(4)

- (3) Determine, giving reasons, \widehat{COA} in terms of y .

(2)

[20]

75 marks

SECTION B**QUESTION 5**

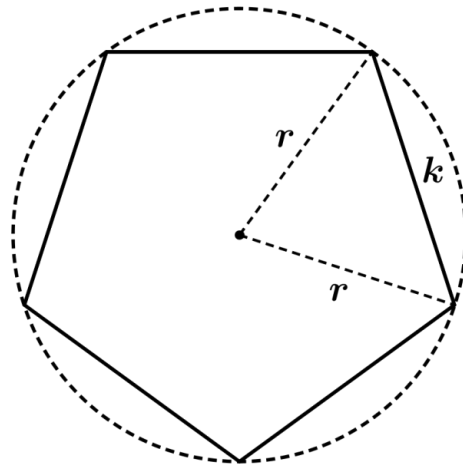
- (a) (1) Prove the identity: $\frac{1 - \cos 2x}{\sin 2x} = \tan x$

(4)

- (2) Hence, or otherwise, determine a value for $\tan 15^\circ$ without using a calculator.

(3)

- (b) The diagram shows a regular pentagon with side length k . The distance from the centre to each vertex is r , the radius of the circumscribed circle.



- (1) Use the sine rule to determine k if $r = 10 \text{ cm}$.

(4)

- (2) If the angle between the two radii is θ , show that the ratio $\frac{k}{r}$ can be written as $2 \sin\left(\frac{\theta}{2}\right)$.

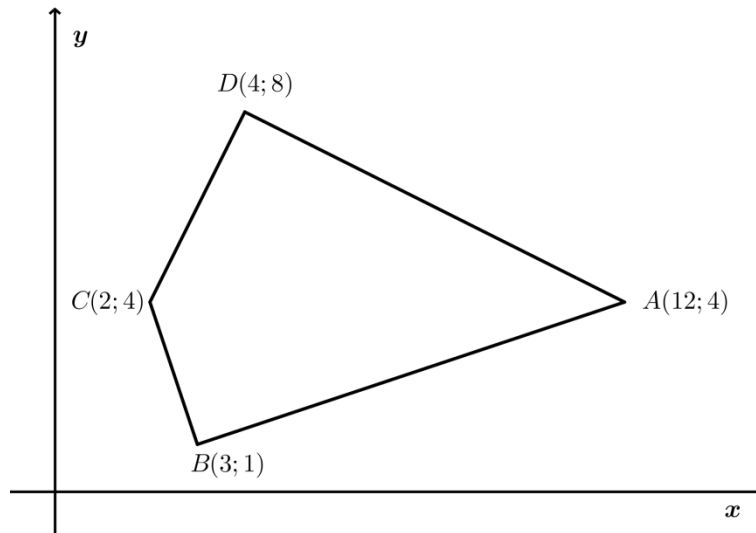
(4)

- (3) Hence determine how many sides a regular polygon has in which the ratio $\frac{k}{r}$ is 0,261.

(4)

QUESTION 6

- (a) The diagram shows quadrilateral ABCD with A(12; 4), B(3; 1), C(2; 4) and D(4; 8).



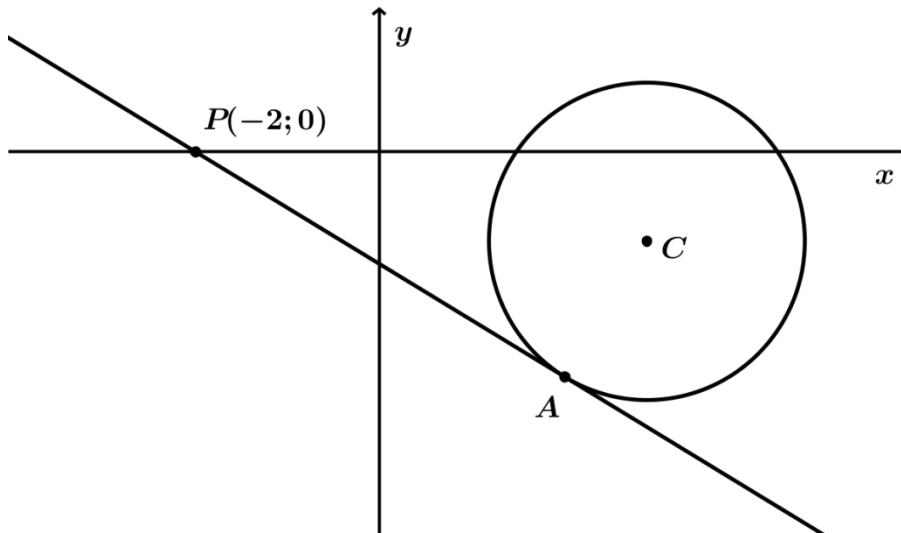
- (1) Show that $\widehat{ADC} = 90^\circ$.

(4)

- (2) If it is further given that $AB \perp BC$, find the equation of the circle passing through A, B, C and D in the form $(x - a)^2 + (y - b)^2 = r^2$

(4)

- (b) In the figure, P is the point $P(-2; 0)$ and the equation of the circle with centre C is $x^2 + y^2 - 6x + 2y + t = 0$. The tangent PA touches the circle at A.



- (1) Determine the co-ordinates of C, as well as the radius of the circle (in terms of t).

QUESTION 7

(a) Consider the following data points:

$A(1; 5)$ $B(2; 8)$ $C(4; 11)$ $D(5; 17)$ $E(7; 23)$ $F(10; 30)$ $G(12; 38)$

(1) Use a calculator to determine the equation of the least squares regression line, rounding to two decimal places.

(4)

(2) The correlation coefficient between x and y for the data is 0,995, correct to three decimal places. If the x -coordinate of one point and the y -coordinate of a different point are changed slightly, the correlation coefficient equals 1. Determine which two points need to be changed, and write down the new co-ordinates of these points.

(4)

(b) For a class test, scores ranged from 35 to 98, with a mean of 74. Which of the following is the most realistic value of the standard deviation: -10 ; 1 ; 12 ; 60 ? Explain your answer.

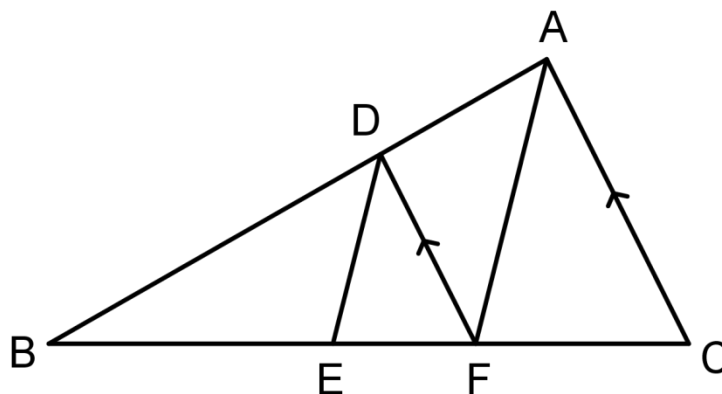
(2)

[10]

QUESTION 8

- (a) The diagram shows triangle ABC with $DF \parallel AC$. E is a point on BC such that

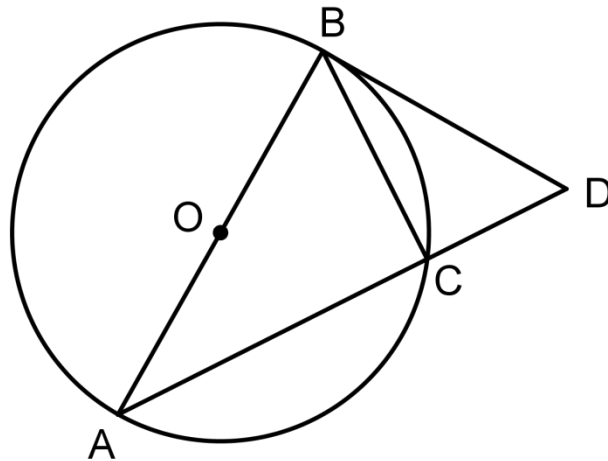
$$\frac{CF}{FB} = \frac{1}{2} \text{ and } \frac{CE}{BE} = \frac{3}{4}.$$



Prove that $DE \parallel AF$.

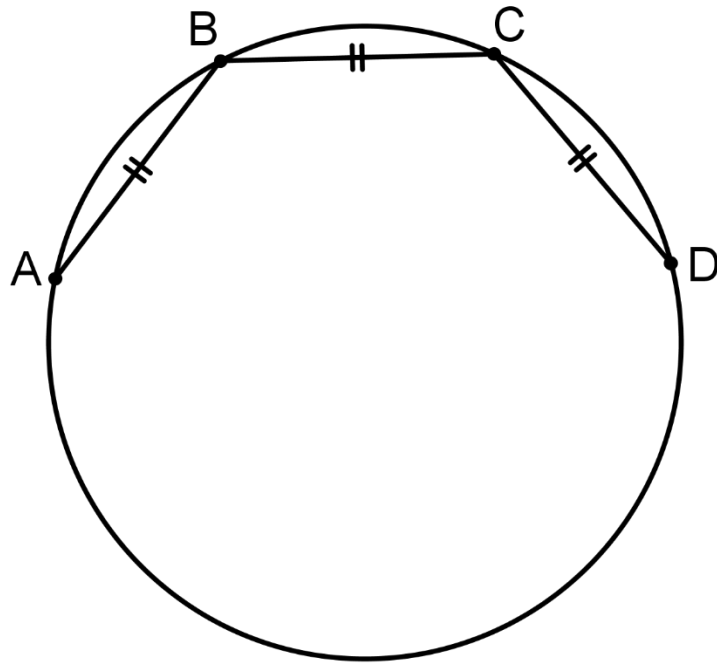
(b) In the diagram below, a circle with centre O is drawn.

- DB is a tangent to the circle at B
- AB is a diameter of the circle
- AD cuts the circle at C
- $BC = 6$ cm and $AC = 18$ cm



Determine, giving reasons, the length of DC.

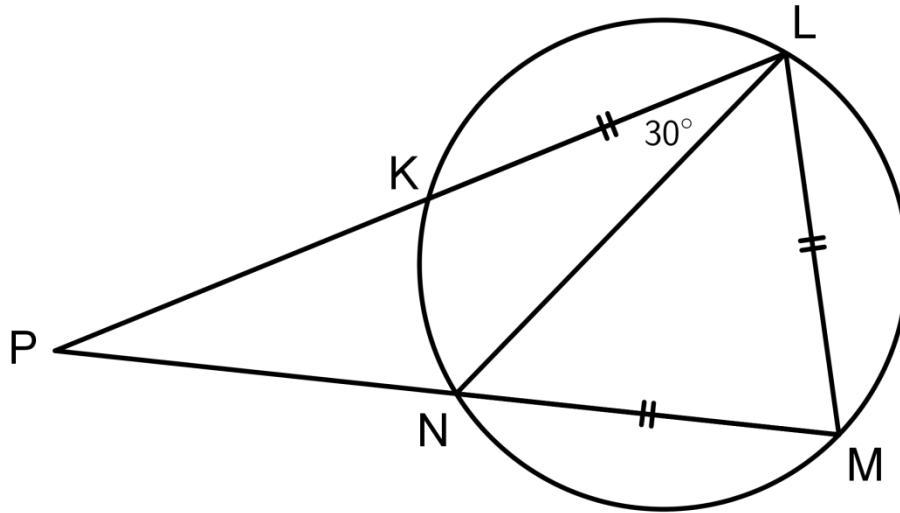
(c) (1) The diagram shows a circle with three equal chords, AB, BC and CD.



Prove that $\hat{A}BC = \hat{B}CD$.

(4)

- (2) In the diagram, chords KL, LM and MN are equal in length. PKL and PNM are straight lines. N and L are joined, and $\hat{P}LN = 30^\circ$.



Determine, giving reasons, the size of \hat{P} .

(4)

[21]

75 marks

Total: 150 marks