



"If you will it, it is no legend"

HERZLIA SENIOR HIGH SCHOOL

MATHEMATICS PAPER 2

GRADE 11

MONDAY 23RD NOVEMBER 2015

MARKS: 125

TIME: $2\frac{1}{2}$ HOURS

INSTRUCTIONS AND INFORMATION

1. This question paper consists of 10 pages with 10 questions.
2. Answer ALL the questions in the ANSWER BOOK.
3. Clearly show ALL calculations, diagrams and graphs that you have used in determining your answers.
4. Answers only will NOT necessarily be awarded full marks.
5. An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.
6. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. Write neatly and legibly.

QUESTION 1

The data below shows the ages (in years) of people who visited the library between 08:00 and 09:00 on a certain morning.

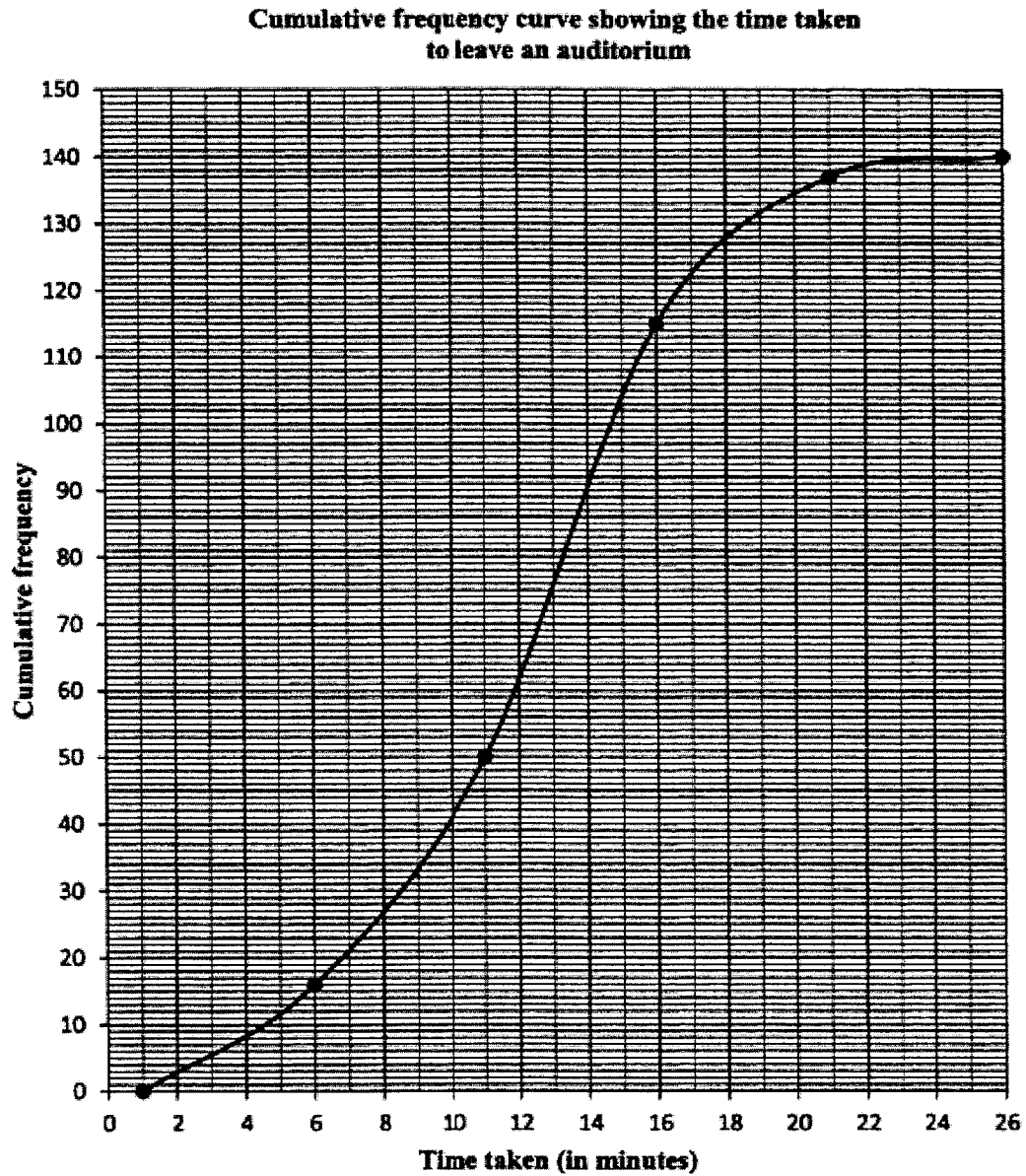
3	4	4	5	23	29	32	36	40	47	56	66	68	76	82
---	---	---	---	----	----	----	----	----	----	----	----	----	----	----

- 1.1 Determine:
 - 1.1.1 The mean age of the visitors (2)
 - 1.1.2 The median of the data (1)
 - 1.1.3 The interquartile range of the data (3)
 - 1.1.4 The standard deviation of the data (2)
- 1.2 Draw a box and whisker diagram for the data. (3)
- 1.3 By making reference to the box and whisker diagram, comment on the skewness of the data set. (1)

[12]

QUESTION 2

The cumulative frequency curve (ogive) drawn below shows the time taken (in minutes) for 140 patrons to leave an auditorium after watching a show.

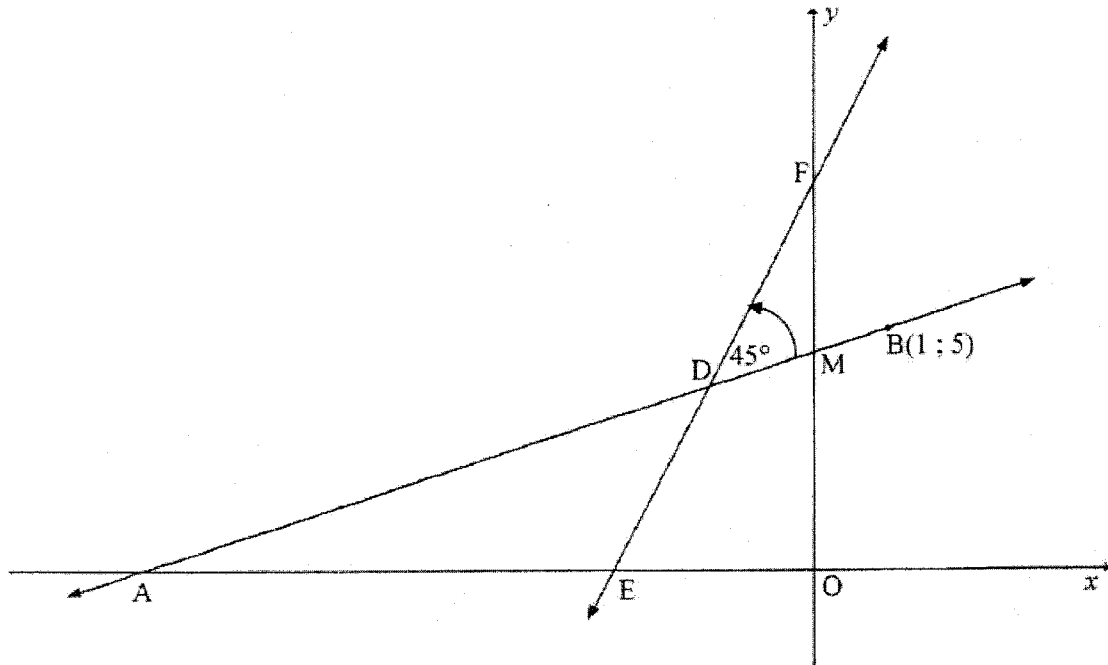


- 2.1 Estimate the number of people who took more than 15 minutes to leave the auditorium. (2)
- 2.2 Estimate the number of people who took between 8 and 12 minutes to leave the auditorium. (2)
- 2.3 Write down the modal class for the data. (1)

[5]

QUESTION 3

In the diagram below, E and F respectively are the x - and y -intercepts of the line having equation $y = 3x + 8$. The line through B(1;5) making an angle of 45° with EF, as shown below, has x - and y -intercepts A and M respectively.



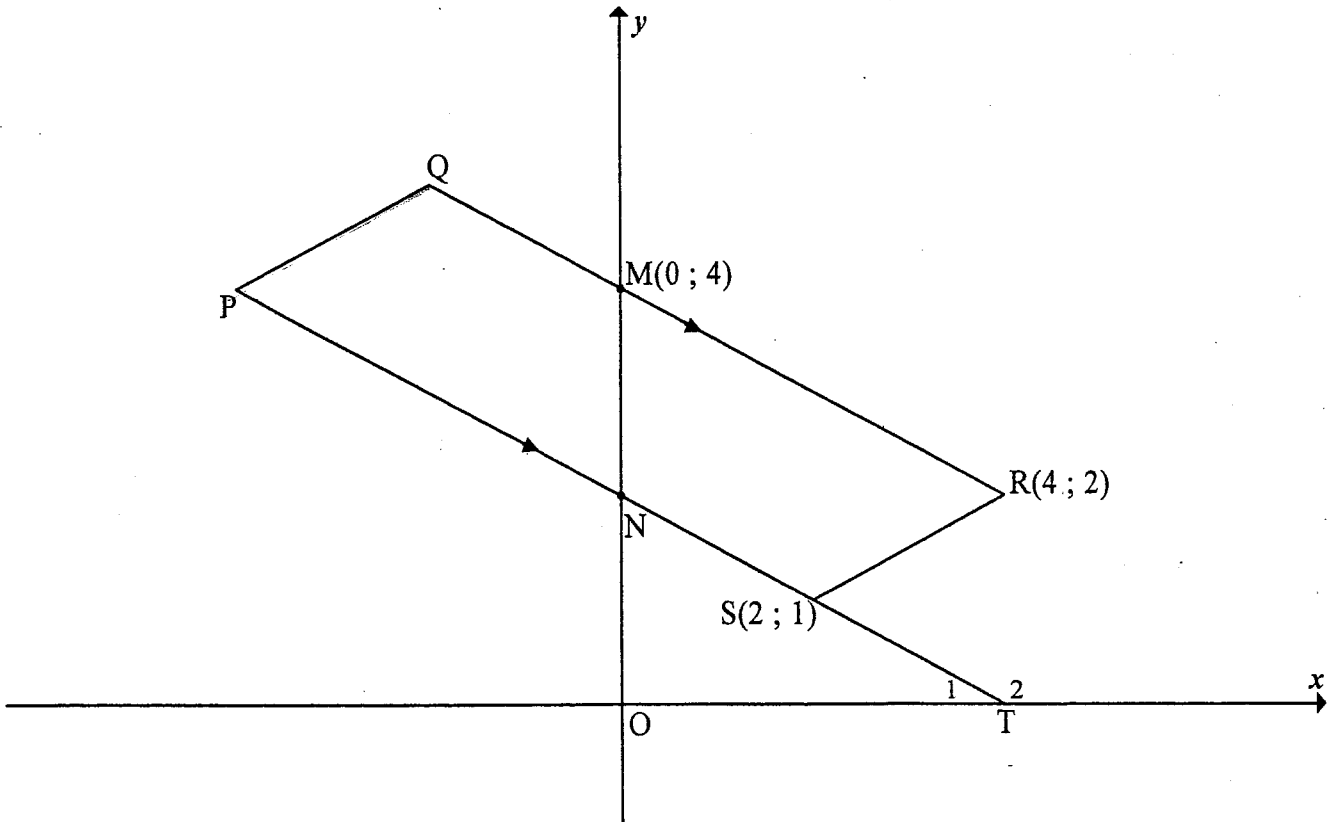
- 3.1 Determine the coordinates of E. (2)
- 3.2 Calculate the size of \hat{DAE} . (3)
- 3.3 Determine the equation of AB in the form $y = mx + c$. (4)
- 3.4 If AB has equation $x - 2y + 9 = 0$, determine the coordinates of D. (4)

[13]

PLEASE TURN OVER

QUESTION 4

In the diagram below, P, Q, R(4;2) and S(2;1) are the vertices of a quadrilateral with $PS \parallel QR$. M(0;4) and N are the y-intercepts of QR and PS respectively. PS produced cuts the x-axis at T.



- 4.1 Calculate the gradient of RS. (2)
- 4.2 Given that the equation of PQ is $2y = x + 12$, calculate, with reasons, the length of PQ. (3)
- 4.3 Determine the equation of PT in the form $y = mx + c$. (3)
- 4.4 Hence, write down the coordinates of N. (1)
- 4.5 Calculate, with reasons, the size of \hat{RNS} . (4)

[13]

QUESTION 5

5.1 Given that $\sin 23^\circ = \sqrt{k}$, determine, in its simplest form, the value of each of the following in terms of k , WITHOUT using a calculator:

5.1.1 $\sin 203^\circ$ (2)

5.1.2 $\cos 23^\circ$ (2)

5.1.3 $\tan(-23^\circ)$ (2)

5.2 Simplify the following WITHOUT using a calculator. Show all your working:

5.2.1
$$\frac{\tan 135^\circ \cdot \sin^2 135^\circ \cdot \cos 23^\circ}{\sin 67^\circ \cdot \tan 150^\circ \cdot \sin 240^\circ}$$
 (6)

5.2.2
$$\frac{\tan(360^\circ - x) \cdot \cos(180^\circ + x) \cdot \sin(90^\circ - x)}{\sin(180^\circ - x) \cdot \cos(-x)}$$
 (6)

5.3 Determine the general solution of the following:

5.3.1 $\sin \theta = 2 \cos \theta$ (3)

5.3.2 $6 - 10 \cos \theta = 3 \sin^2 \theta$ (6)

5.4 Prove the following identity:

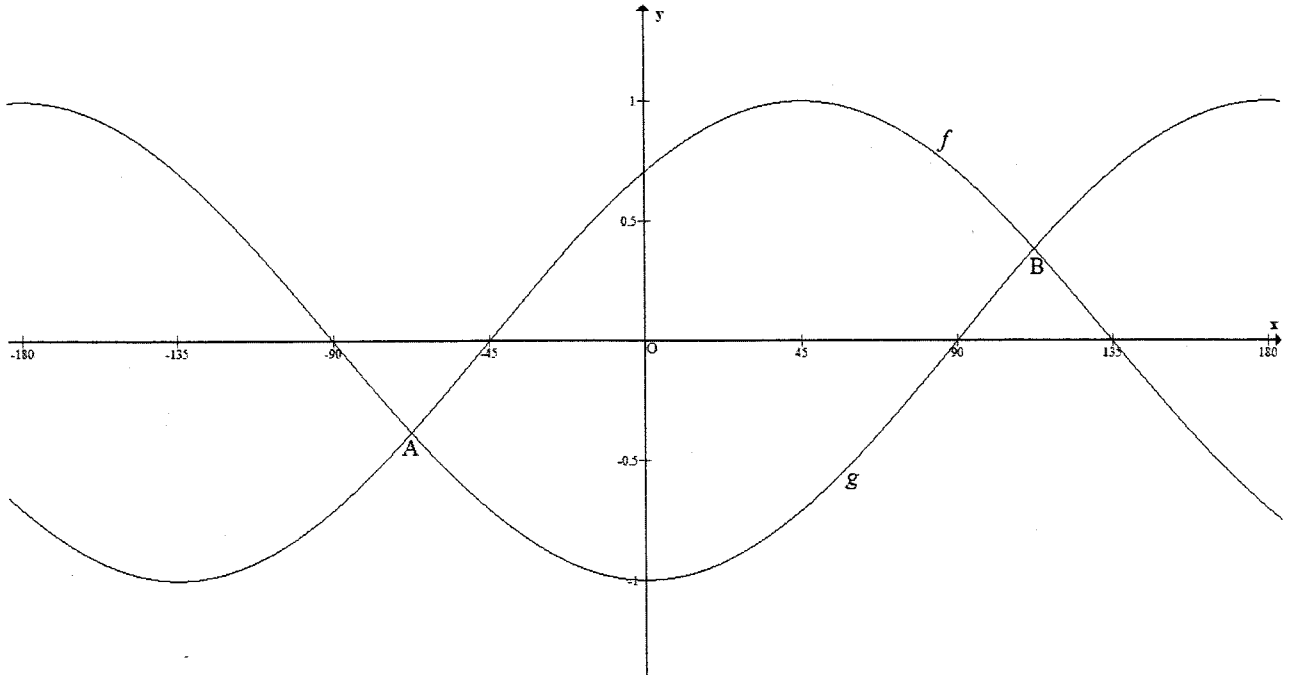
$$\cos^2 x \left[\frac{1}{\sin x - 1} + \frac{1}{\sin x + 1} \right] = -2 \sin x \quad (5)$$

[32]

PLEASE TURN OVER

QUESTION 6

In the diagram below, the graphs of $f(x) = \sin(x - p)$ and $g(x) = q \cos x$ are shown for the interval $-180^\circ \leq x \leq 180^\circ$.

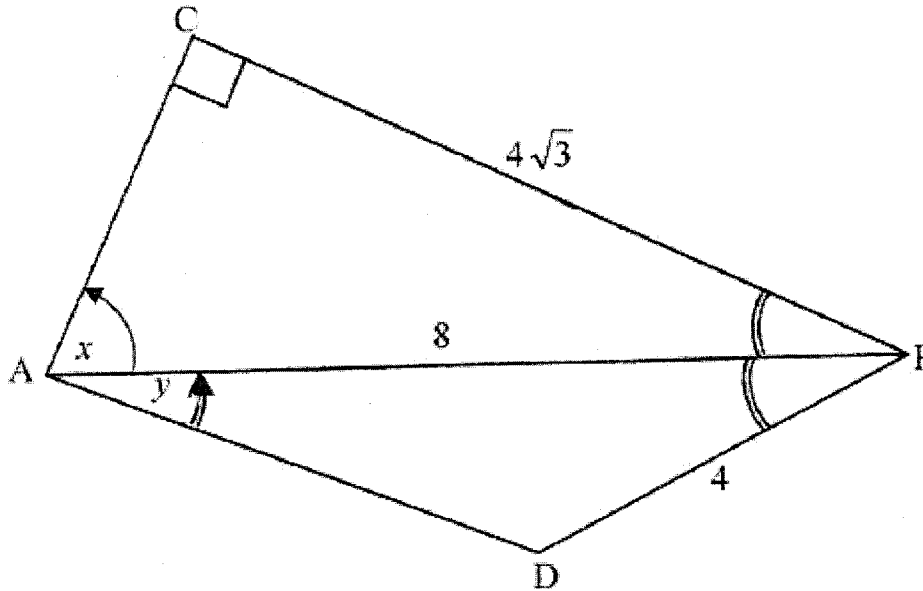


- 6.1 Determine the values of p and q . (2)
- 6.2 The graphs intersect at A $(-67,5^\circ; -0,38)$ and B. Determine the coordinates of B. (2)
- 6.3 Determine the value(s) of x in the interval $-180^\circ \leq x \leq 180^\circ$ for which $f(x) - g(x) < 0$. (2)
- 6.4 The graph f is shifted 15° to the right to obtain a new graph h .
- 6.4.1 Write down the equation of h in its simplest form. (1)
- 6.4.2 Write down the value of x for which h has a minimum in the interval $-180^\circ \leq x \leq 180^\circ$. (1)

[8]

QUESTION 7

In the figure below, $\triangle ACP$ and $\triangle ADP$ are triangles with $\hat{C} = 90^\circ$, $CP = 4\sqrt{3}$, $AP = 8$ and $DP = 4$. PA bisects \hat{DPC} . Let $\hat{CAP} = x$ and $\hat{DAP} = y$.

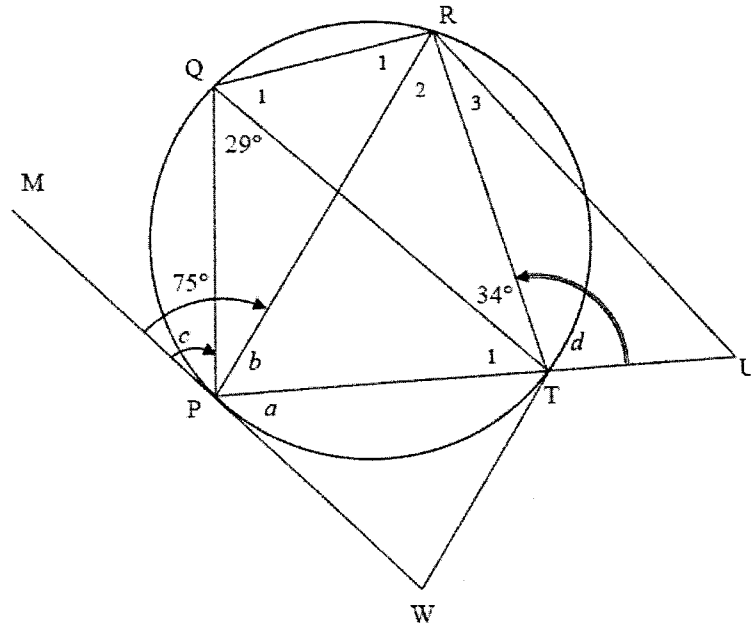


- 7.1 Determine the value of x . (2)
- 7.2 Calculate the length of AD . (3)
- 7.3 Determine y . (2)
- 7.4 Calculate the area of $\triangle ADP$. (2)
- [9]

PLEASE TURN OVER

QUESTION 8

In the diagram below, points P, Q, R and T lie on the circumference of a circle. MW and TW are tangents to the circle at P and T respectively. PT is produced to meet RU at U. $\hat{MPR} = 75^\circ$, $\hat{PQT} = 29^\circ$ and $\hat{QTR} = 34^\circ$. Let $\hat{TPW} = a$, $\hat{RPT} = b$, $\hat{MPQ} = c$ and $\hat{RTU} = d$.

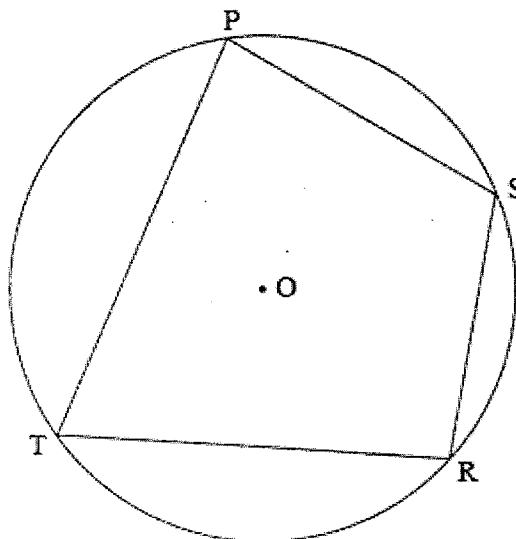


Calculate, giving reasons, the values of a , b , c and d .

[9]

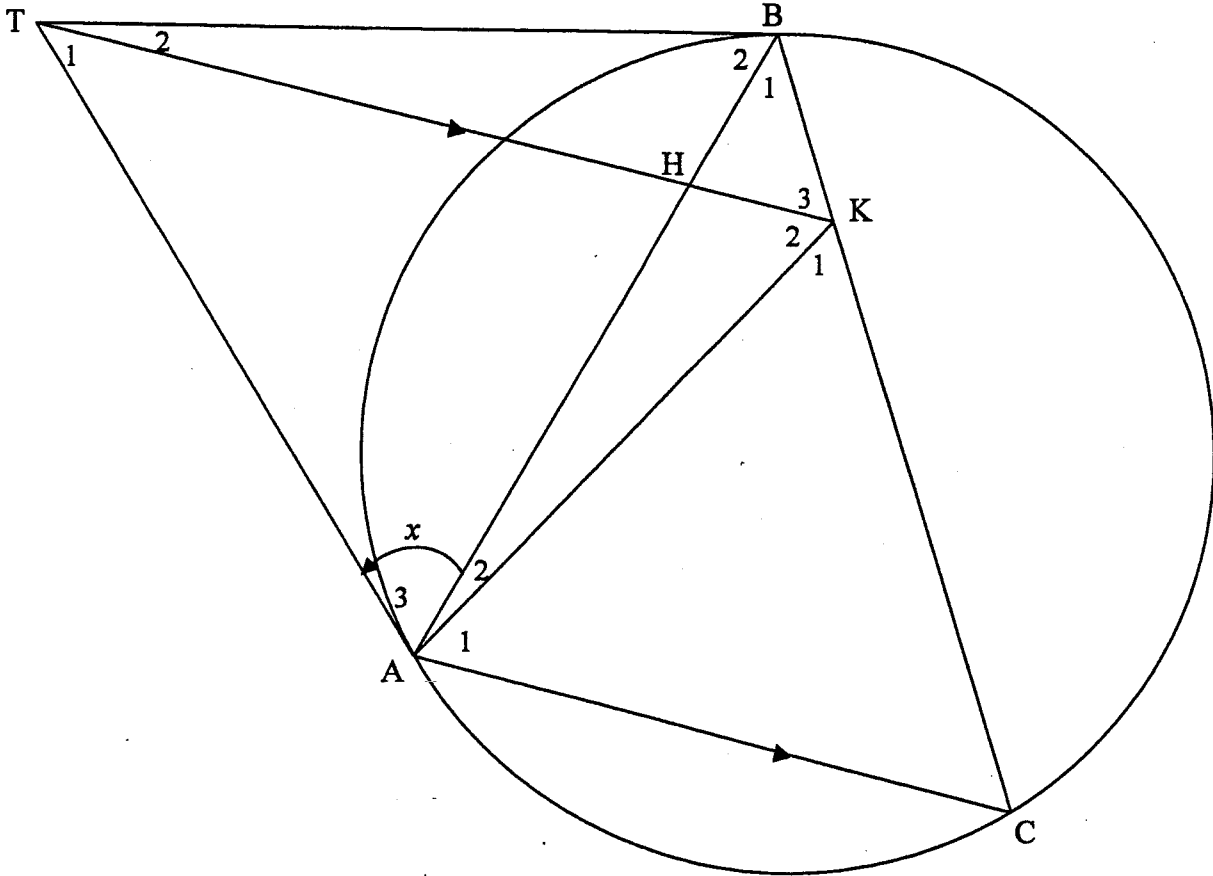
QUESTION 9

9.1 In the diagram below, O is the centre of the circle. PSRT is a cyclic quadrilateral. Prove the theorem that states $\hat{PTR} + \hat{PSR} = 180^\circ$.



(5)

- 9.2 In the diagram below, $\triangle ABC$ is drawn in the circle. TA and TB are tangents to the circle. The straight line THK is parallel to AC with H on BA and K on BC . AK is drawn. Let $\hat{A}_3 = x$.



Prove that:

9.2.1 $\hat{K}_3 = x$. (3)

9.2.2 $AKBT$ is a cyclic quadrilateral. (2)

9.2.3 TK bisects \hat{AKB} . (2)

9.2.4 TA is a tangent to the circle passing through the points A , K and H . (2)

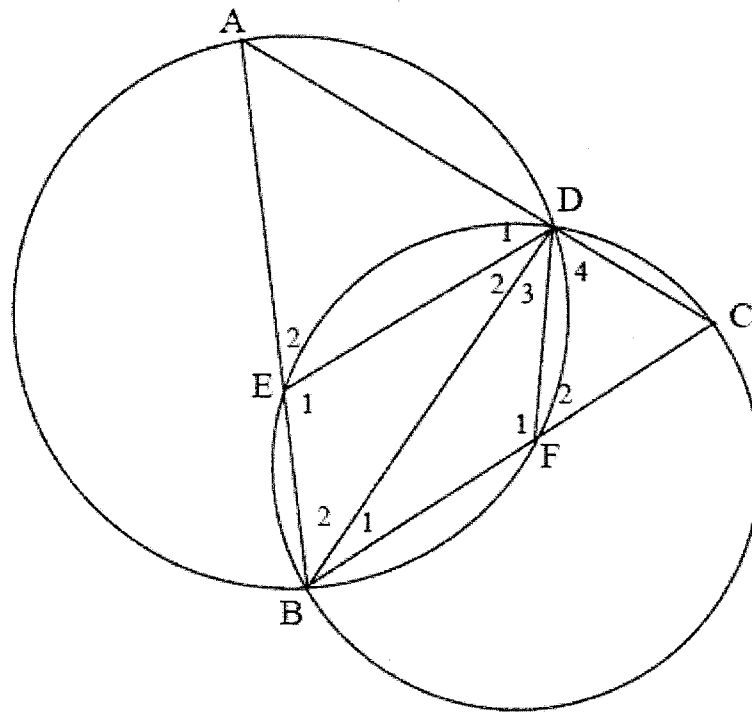
[14]

PLEASE TURN OVER

QUESTION 10

In the diagram below, two circles intersect one another at D and B. AB is a straight line such that it intersects the circle BCD at point E. BC is a straight line such that it intersects the circle ABD at F. DE, DB and DF are joined.

$\hat{F}_2 = 180^\circ - 2x$ and $FC = FD$.



10.1 Calculate the following in terms of x , giving reasons:

10.1.1 $\hat{D}EB$ (4)

10.1.2 \hat{A} (2)

10.2 Hence, or otherwise, prove $ED \parallel BC$. (4)

[10]

TOTAL : 125