Name and Surname : .... SLT

Grade/Class : 11/......... **Mathematics Teacher** : ....

Hudson Park High School

GRADE 11
MATHEMATICS
FINAL ASSESSMENT Paper 2

November 2021

Marks : 150 Date : 29 November 2021

Time : 3 hours

Examiner : SLT Moderator(s) : PHL

INSTRUCTIONS

1. Illegible work, in the opinion of the marker, will earn zero marks.
2. Number your answers clearly and accurately, exactly as they appear on the question paper.
3. NB
   - **Leave *2 lines* open between each of your answers.**
4. NB
   - **Fill in the details requested on the front of this Question Paper and Answer Booklet.**
   - **Hand in your submission in the following manner :**
     Answer Booklet (on top)
     Question Paper (below)

   Do NOT staple the Answer Booklet and Question Paper together.
5. Employ relevant formulae and show all working out.
   Answers alone *may* not be awarded full marks.
6. (Non-programmable and non-graphical) Calculators may be used, unless their usage is specifically prohibited.
7. Round off answers to 2 decimal places, where necessary, unless instructed otherwise.
8. If (Euclidean) GEOMETRIC statements are made, REASONS must be stated appropriately.

QUESTION 1

1.1. Given the following data values :

10,5	15	17,7	20	21	22	23,6	24	26,7	29

1.1.1. Determine the

(a) mean (1)

(b) median (1)

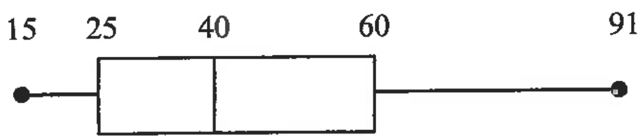
(c) standard deviation (1)

(d) variance (1)

1.1.2. How many data values lie below 1 standard deviation of mean ?
Show all working out. (2)

1.1.3. Comment on the distribution of the data. Justify your answer. (2)

1.2. The box and whisker diagram below shows the performance of a Grade 11 Class in a Standardised Test. Values are in % :



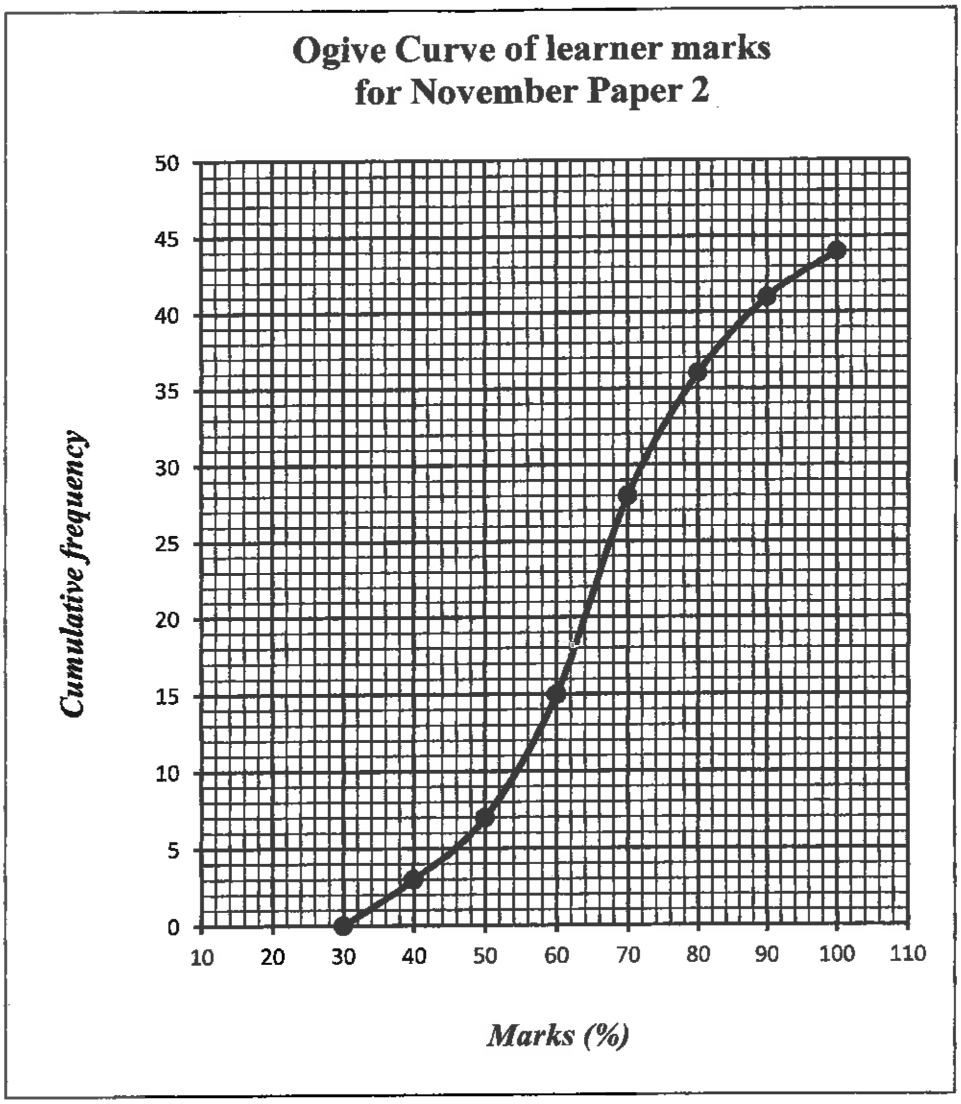
1.2.1. Would a result of 91 % be classified as an outlier ? Justify your answer. (3)

1.2.2 If there are 28 learners in the class, approximately how many learners achieved between 40 % and 60 % ? (2)

[13]

QUESTION 2

The results for the November Paper 2 examination, for a certain school, are presented below in the form of an ogive curve :



2.1. How many Mathematics learners are there at this school ? (1)

2.2. For the following, show all working out and clearly indicate (on the ogive) where any values were read off :

2.2.1. Determine the upper quartile test result. (2)

2.2.2. How many learners got more than 56 % ? (2)

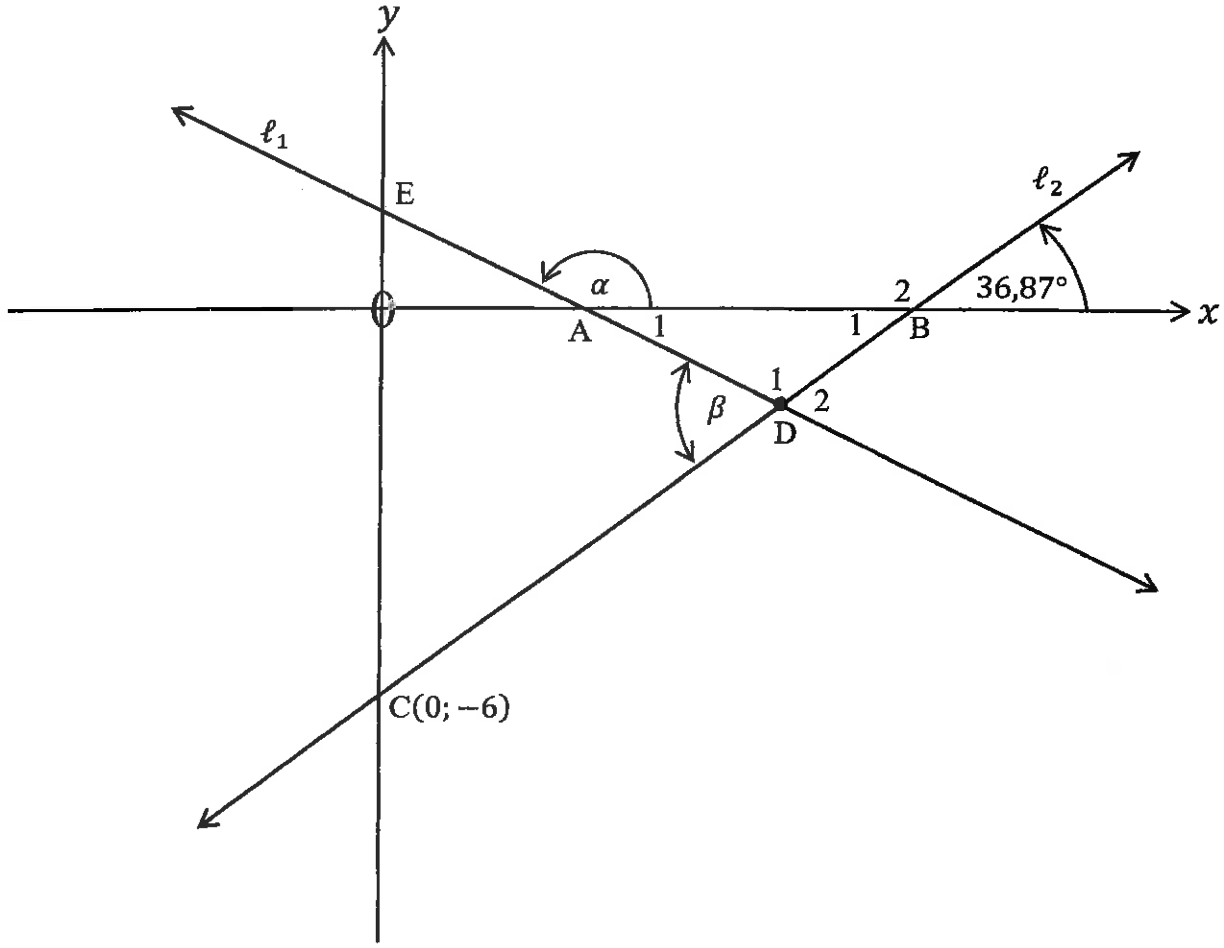
2.3. State the modal class, in the form $\cdots < x \leq \cdots$. (1)

2.4. Write down the position of the twentieth percentile. (1)

[7]

QUESTION 3

Lines ℓ_1 and ℓ_2 are shown below. The equation of ℓ_1 is $2y + x = 4$ and C(0; −6).



3.1. Calculate the size of

3.1.1. α (2)

3.1.2. β (3)

3.2.1. Calculate the gradient of ℓ_2. (1)

3.2.2. Write down the equation of ℓ_2. (1)

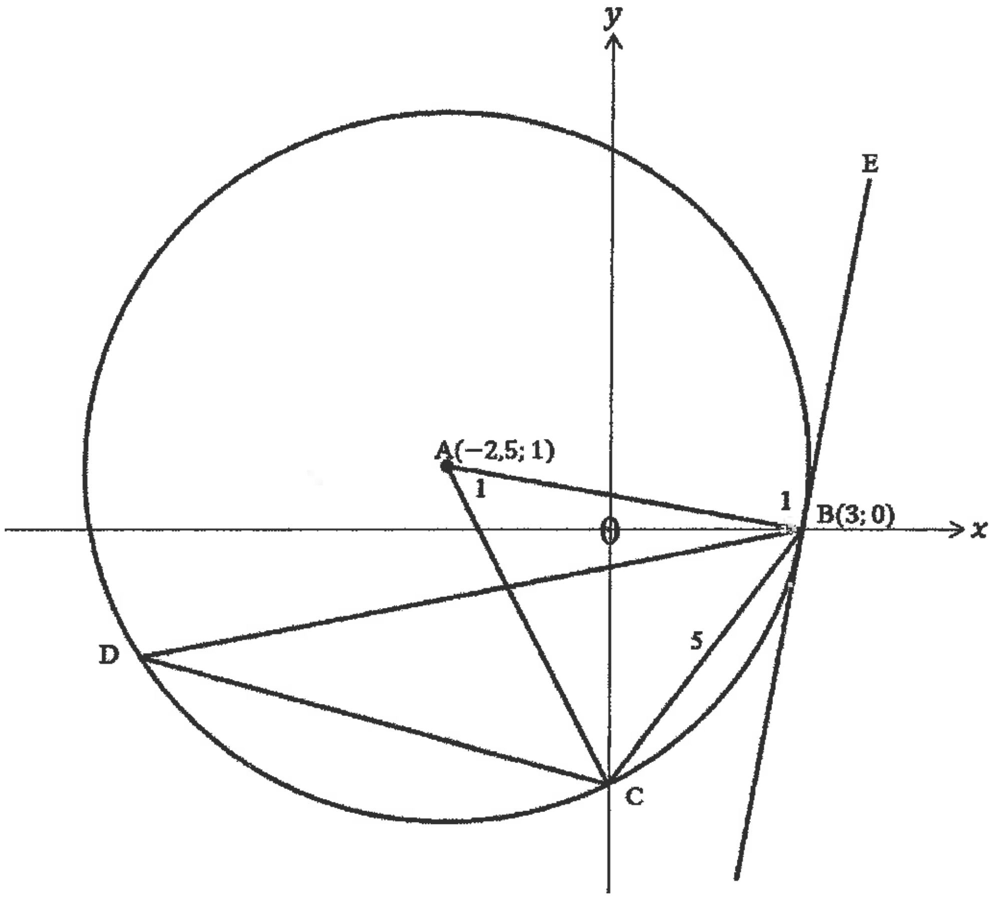
3.2.3. Calculate the coordinates of D. (3)

3.3. Determine the area of ΔCDE. (3)

[13]

QUESTION 4

$A(-2,5; 1)$ is the centre of the circle passing through points $B(3; 0)$ and C. BC = 5 units and BE is a tangent to the circle at point B.



4.1.1.	Calculate the gradient of AB.	(2)
4.1.2.	Give the reason why $\widehat{B}_1 = 90°$.	(1)
4.1.3.	Determine the equation of tangent BE.	(3)

4.2. Calculate the

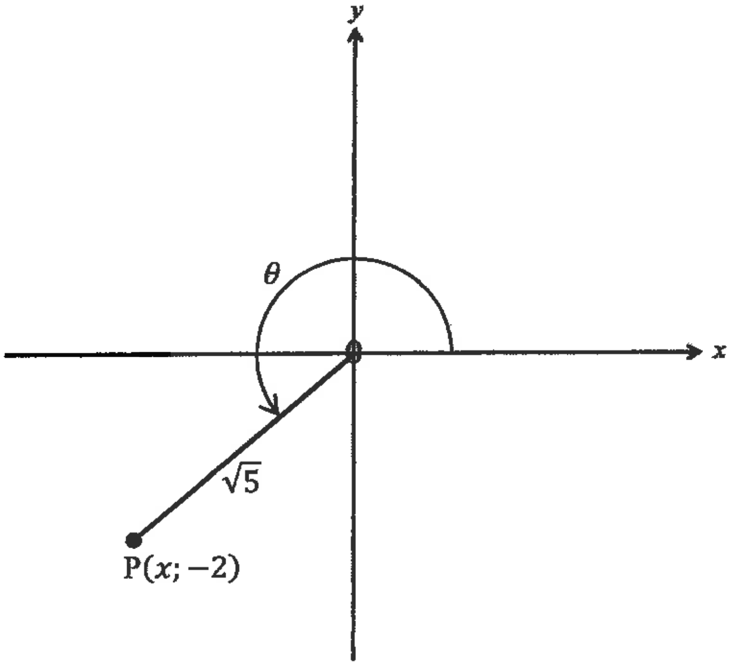
4.2.1.	length of AB (in surd form)	(2)
4.2.2.	size of $\widehat{A}_1$	(4)

4.3.	Determine the size of $\widehat{D}$.	(2)
4.4.	Determine the coordinates of F (not shown), if BAF was the diameter of the circle.	(2)

[16]

QUESTION 5

5.1. In the diagram, $PT = \sqrt{5}$, $P(x;-2)$ and θ are shown :



Without the use of a calculator, determine the following, simplifying fully :

5.1.1. $\sin\theta$ (1)

5.1.2. $\tan(1980° - \theta)$ (5)

5.2. Without the use of a calculator, simplify fully : $\dfrac{2\cos^2(180°+\theta) - 5\sin(270°+\theta) - 3}{3\cos^2\theta + \cos(-\theta) + 3\sin^2\theta}$ (7)

5.3. Prove the identity. : $\dfrac{1}{\tan\theta} = \dfrac{\sin^2\theta}{\tan\theta - \sin\theta\cos\theta}$ (5)

5.4. Determine general solutions of :

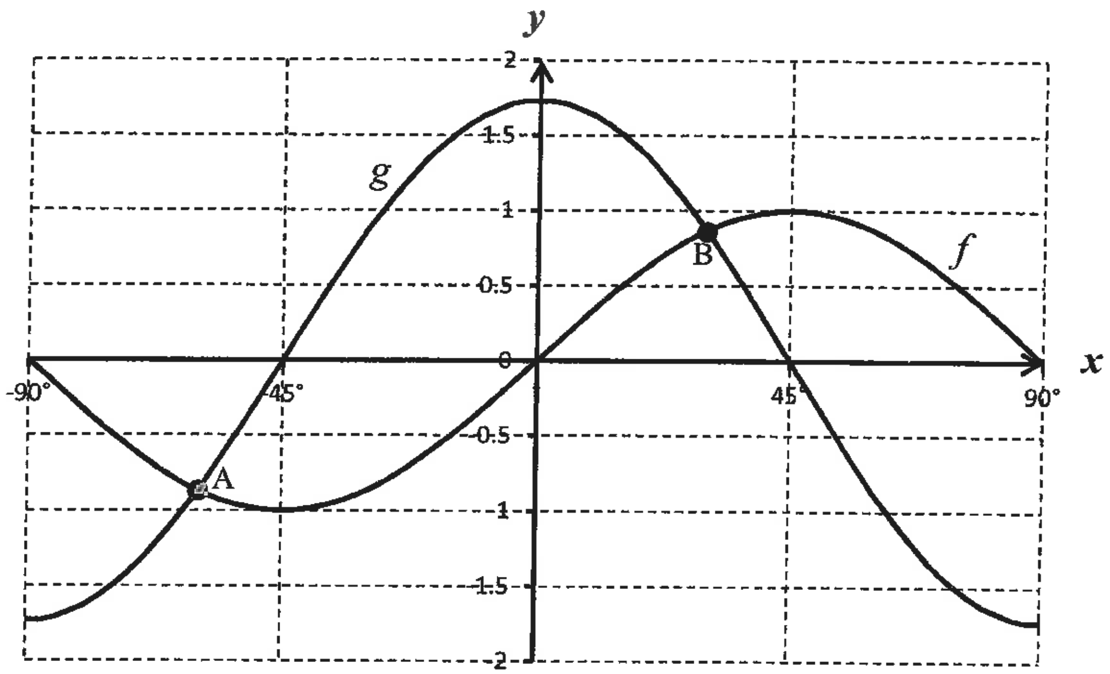
5.4.1. $3\cos\theta + 2\sin 170° = 0$ (3)

5.4.2. $\sin(2\theta + 10°) + \cos(\theta - 50°) = 0$ (5)

[26]

QUESTION 6

Shown below are the graphs of $f(x) = \sin 2x$ and $g(x) = \sqrt{3}\cos 2x$ for $-90° \leq x \leq 90°$.
The graphs intersect at points A and B.



6.1. Determine the general solution of: $\sin 2x = \sqrt{3}\cos 2x$. (3)

6.2. Now, supposing that $x_A = -60°$ and $x_B = 30°$, use the graphs to solve for x, where $-90° \leq x \leq 90°$:

6.2.1. $g(x) < 0$ (2)

6.2.2. $f(x).g(x) \geq 0$ (3)

6.2.3. $f(x) - g(x) > 0$ (2)

6.2.4. $x.f(x) \leq 0$ (3)

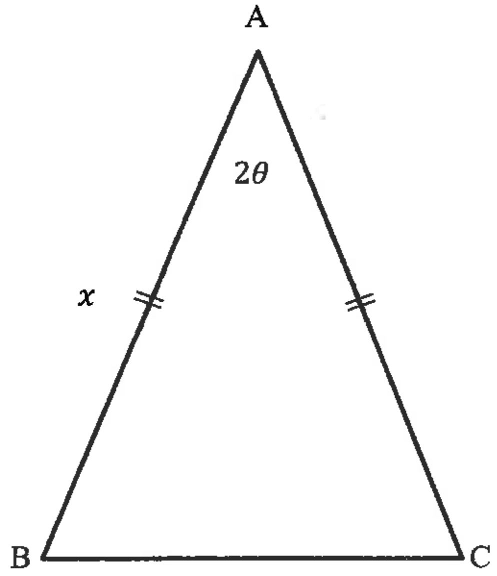
6.3. State the range of $h(x) = 5\sin 2x - 1$. (2)

6.4. Describe the transformation from f to i, if $i(x) = -\sin(2x - 50°)$. (3)

[18]

QUESTION 7

In ΔABC, AB = AC, AB = x and $\hat{A} = 2\theta$.



7.1.1. Determine an expression for $\hat{C}$, in terms of θ. Simplify fully. (2)

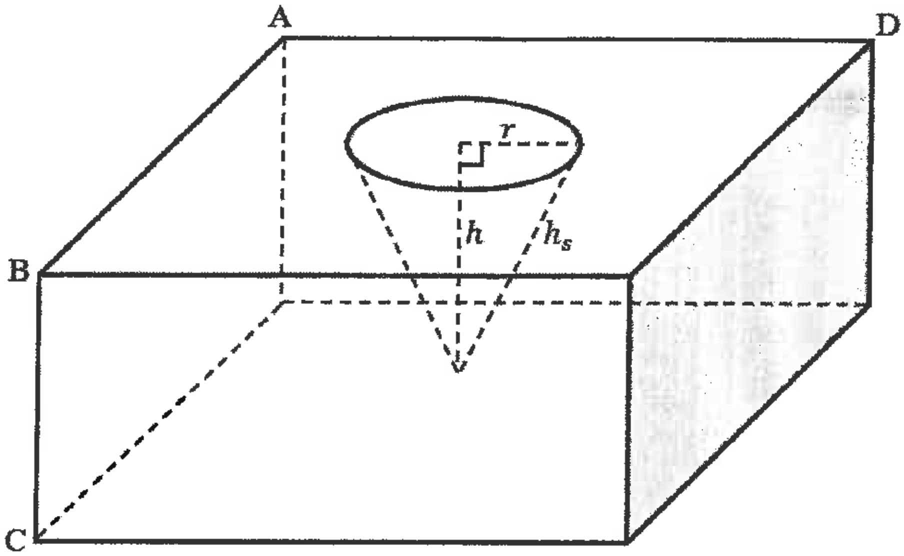
7.1.2. Hence, determine an expression for BC in terms of x and θ. (3)

7.2. If $\theta = 20°$ and $x = 15$ cm, calculate the area of ΔABC. (2)

[7]

QUESTION 8

8.1. The solid below was made by drilling a right circular cone out of a right rectangular prism.
AB = 13 cm, BC = 10 cm, AD = 15 cm, $r = 3$ cm and $h = 4$ cm.



$V = A.h$

$V = \frac{1}{3} A.h$

$A = b.h$

$A = \pi r^2$

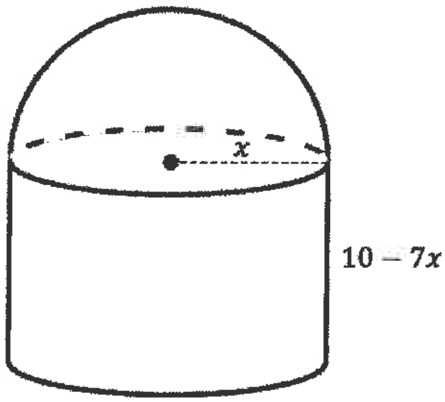
$A = \pi r h_s$

For the solid, calculate the :

8.1.1. volume, and (3)

8.1.2. total surface area. (5)

8.2. The solid below was made by placing a hemisphere on top of a cylinder.
The sphere and cylinder have the same radius of x units. The height of the cylinder is $(10 - 7x)$ units.



$A = \pi r^2$

$A = 4\pi r^2$

$A = 2\pi r h$

8.2.1. Show that the total surface area of the solid is given by :

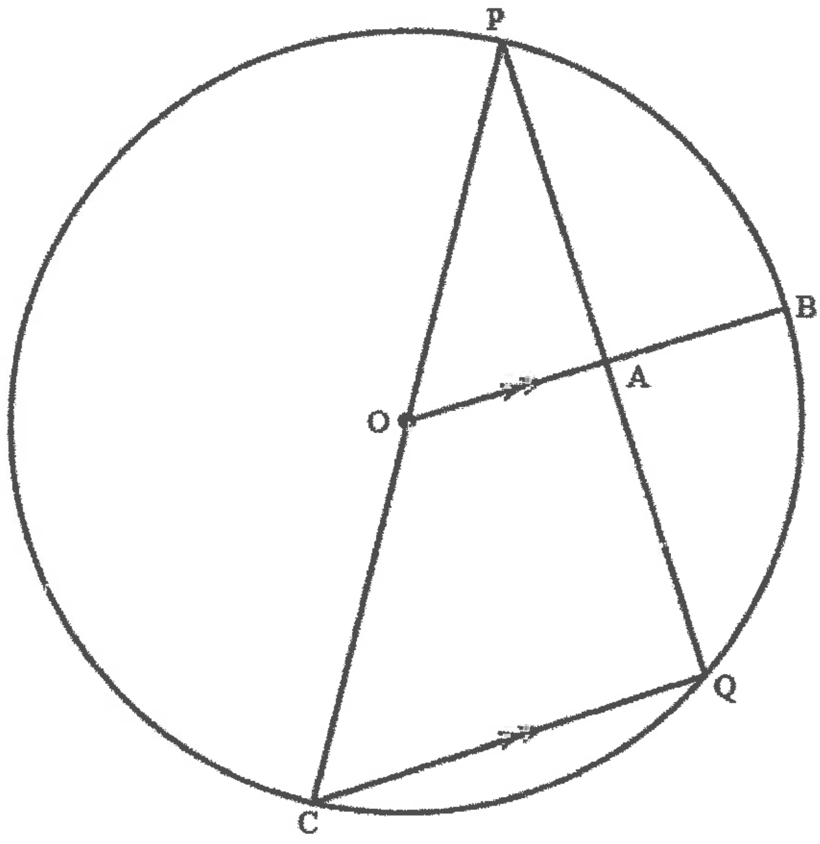
$$\text{TSA} = 20\pi x - 11\pi x^2$$ (3)

8.2.2. Now, determine the maximum possible total surface area that the solid can have. (3)

[14]

QUESTION 9

O is the centre of the circle and OAB || CQ. PQ = $6x$, AB = $x + 2$ and OP = $2x + 7$.



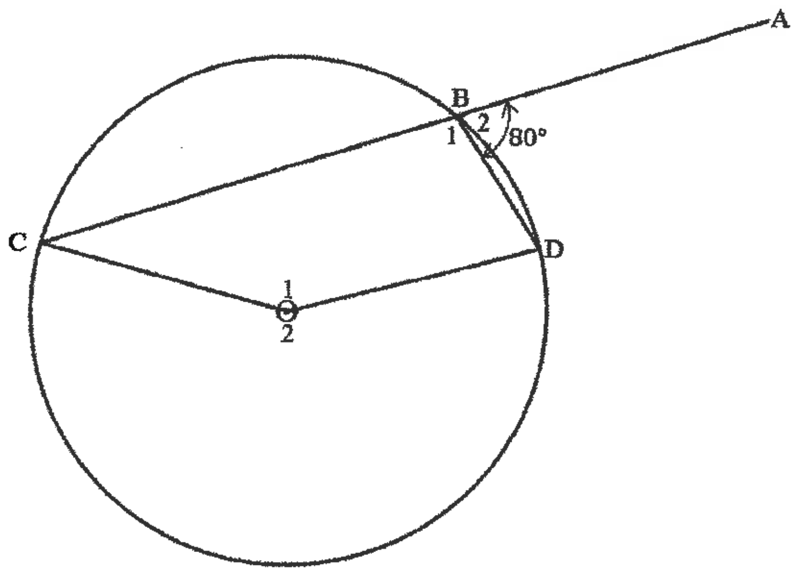
9.1. Prove that $O\hat{A}P = 90°$. (3)

9.2. Calculate the value of x. (6)

[9]

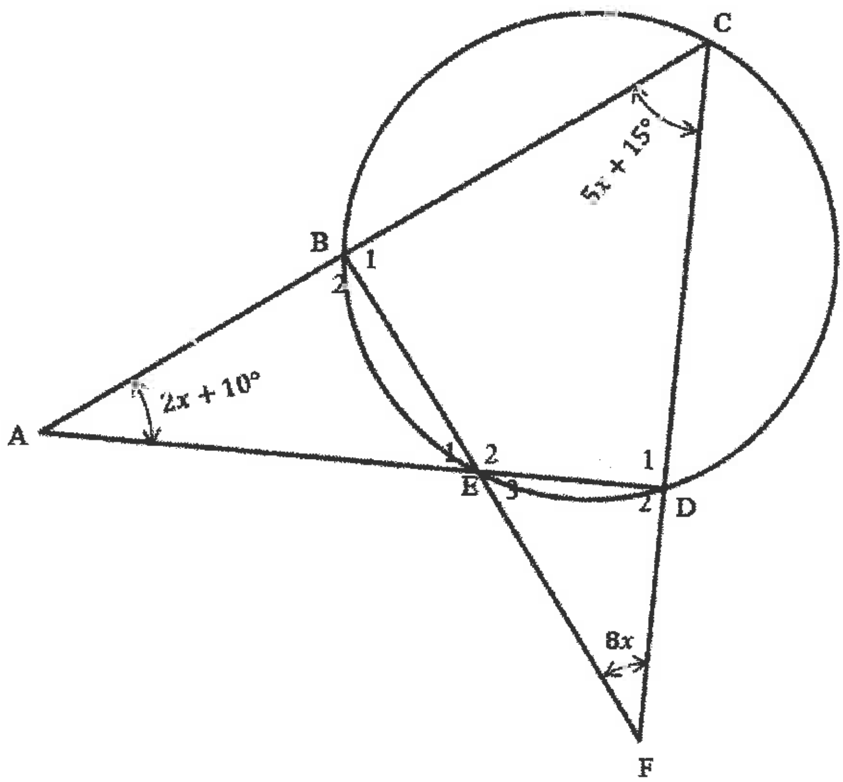
QUESTION 10

10.1. O is the centre of the circle and $\hat{B}_2 = 80°$.



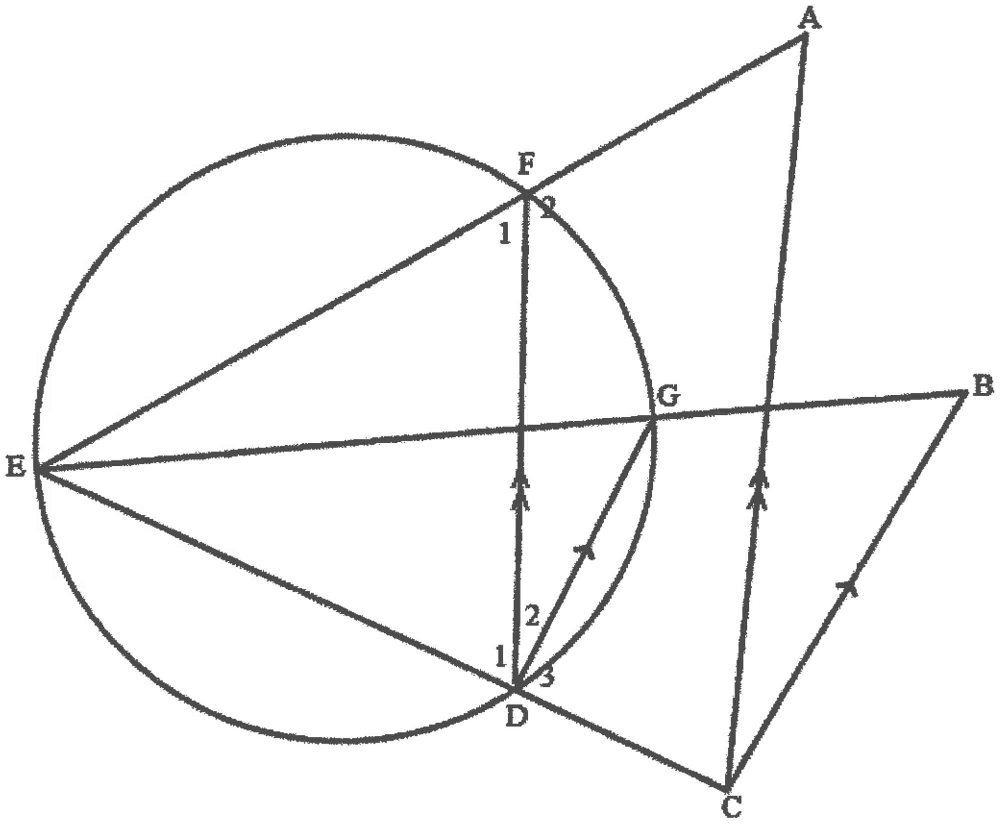
Determine the size of $\hat{O}_1$. (4)

10.2. BCDE is a cyclic quadrilateral. $B\hat{C}D = 5x + 15°$, $B\hat{A}E = 2x + 10°$ and $B\hat{F}C = 8x$.



Calculate the value of x. (5)

10.3. FD || AC and DG || CB. E, F, G and D are concyclic.

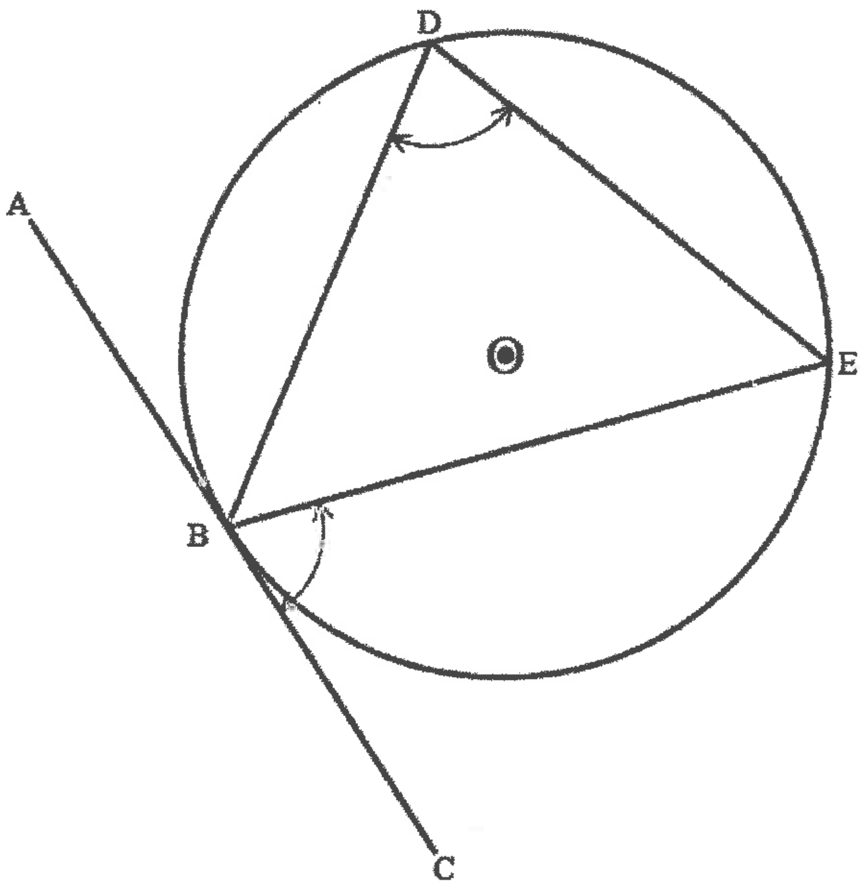


Prove that AECB is a cyclic quadrilateral. (5)

[14]

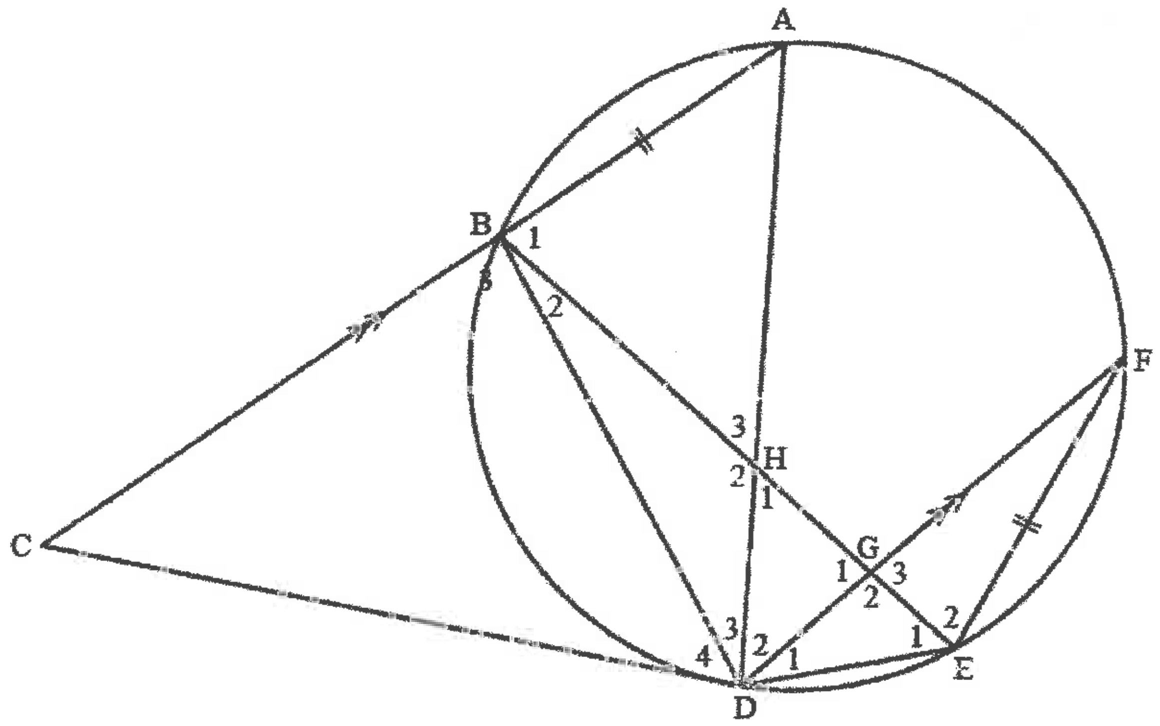
QUESTION 11

11.1. ABC is a tangent to the circle, with centre O, at point B.



Prove the THEOREM which states that $B\hat{D}E = E\hat{B}C$. (5)

11.2. CD is a tangent to the circle at D. CBA || DGF and BA = EF.



Prove that :

11.2.1. $\hat{D}_2 = \hat{D}_4$ (3)

11.2.2. $\hat{H}_2 = \hat{E}_1 + \hat{E}_2$ (5)

[13]

TOTAL	150