


Name and Surname : .....

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

Hudson Park High School



GRADE 11  
**MATHEMATICS**  
November Paper 2

Marks : 

150
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Time : 3 hours

Date : November 2020

Examiner : SLT

Moderator(s) : FRD 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 the Answer Booklet.  
• Hand in your submission in the following manner :  
    Question Paper (on top)  
    Answer Booklet (below)  
• ***Do not staple your Question Paper and Answer Booklet 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. Consider the following set of data :

14	17	19	22	24	27	33	38	40	45	50	70
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For this data :

- 1.1. Calculate the
- 1.1.1. median (1)
  - 1.1.2. interquartile range (2)
  - 1.1.3. mean (1)
  - 1.1.4. standard deviation (1)
- 1.2. What percentage of the data lies within one standard deviation of the mean ? (2)
- 1.3. Comment on the distribution of the data. Justify your answer. (2)
- 1.4. Will 70 be an outlier ? Justify your answer. (2)

[11]

## QUESTION 2

2. The results of a recent Mathematics Test for the Grade 11's at a certain school were found to be :

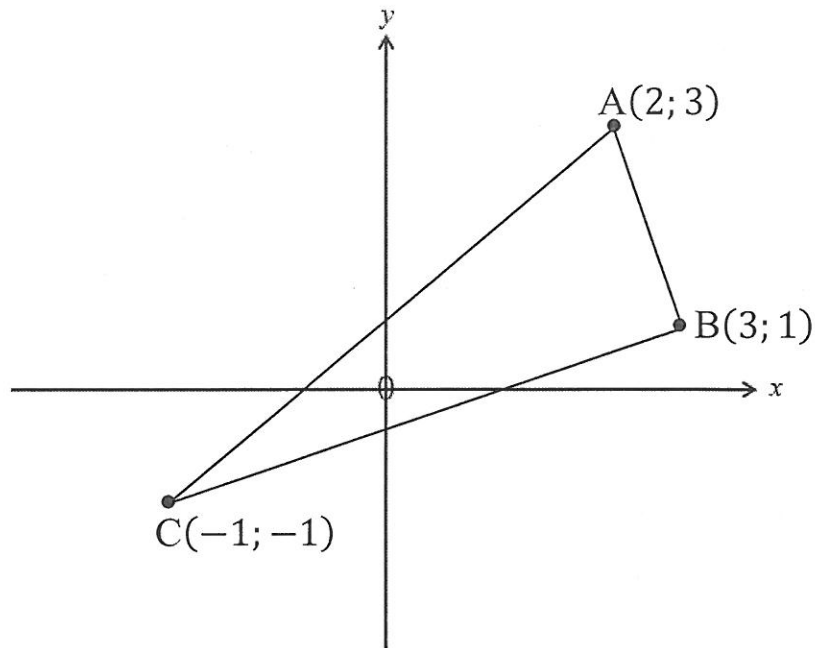
Mark %	Frequency	Cumulative frequency
$30 < x \leq 40$	2	
$40 < x \leq 50$	17	
$50 < x \leq 60$	25	
$60 < x \leq 70$	36	
$70 < x \leq 80$	20	
$80 < x \leq 90$	11	
$90 < x \leq 100$	3	

- 2.1. Complete the cumulative frequency column in the table. (1)
- 2.2. State the modal interval. (1)
- 2.3. Estimate the mean test result. (3)
- 2.4. State the positions of the
- 2.4.1. upper quartile (1)
- 2.4.2. 60<sup>th</sup> percentile (1)
- 2.5. Draw an ogive graph for the data. (3)
- 2.6. How many learners achieved more than 84 % ?  
Clearly indicate, on your ogive graph, where any values were read off. (2)

[12]

### QUESTION 3

3. A(2; 3), B(3; 1) and C(-1; -1) are shown.

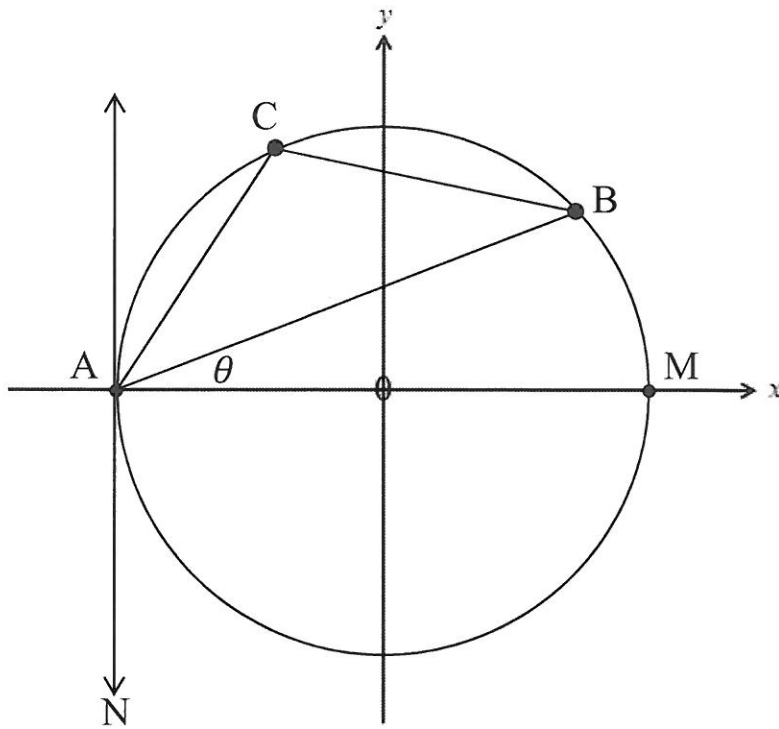


- 3.1.1. Calculate the length of AB, in surd form. (2)
- 3.1.2. Now, if the point D(3,5;  $d$ ) (not shown in the diagram) is positioned such that  $AB = AD$ , calculate the value(s) of  $d$ . (5)
- 3.2. Prove that  $\widehat{ABC} = 90^\circ$ . (4)
- 3.3. If B, A and E( $e$ ; -8) (not shown in the diagram) are collinear, calculate the value of  $e$ . (3)
- 3.4. Determine the equation of AC in the form  $ax + by + c = 0$ , where  $a, b, c \in \mathbb{Z}$ . (4)
- 3.5. Determine the equation of line BF (not shown in the diagram), if  $BF \parallel AC$ . (3)
- 3.6. Give the reason why AC is the diameter of the circle passing through points A, B and C. (1)
- 3.7. Determine the coordinates of H (not shown in the diagram), if ABHC is a parallelogram. (2)

[24]

**QUESTION 4**

4.  $A(-5; 0)$ ,  $B(3; 4)$ ,  $NA$  is a tangent to the circle (whose diameter is  $AM$ ) at point  $A$ .



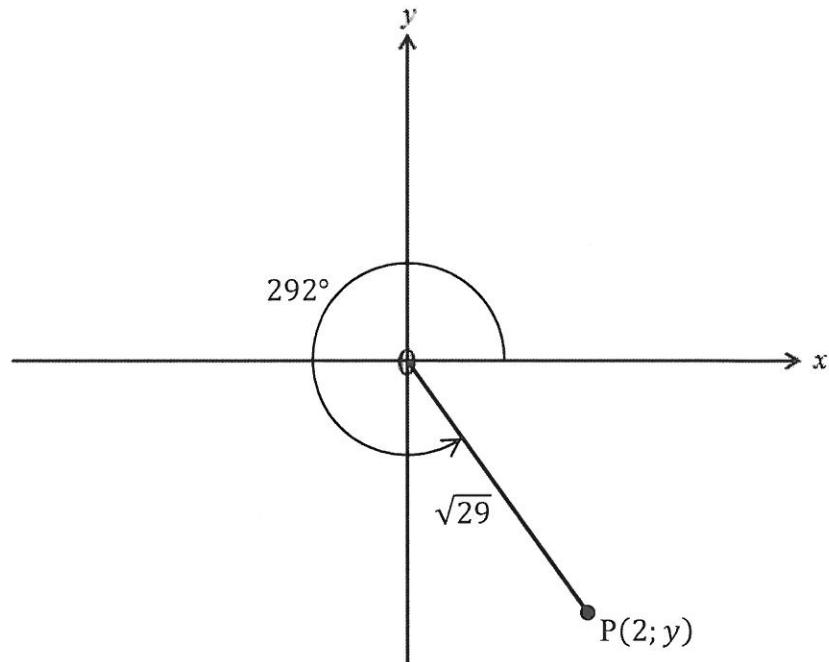
- 4.1.1. Give the reason why  $\widehat{NAM} = 90^\circ$ . (1)
- 4.1.2. Write down the equation of tangent  $NA$ . (1)
- 4.2.1. Calculate the size of  $\theta$ . (2)
- 4.2.2. Now, determine the size of  $\widehat{ACB}$ . (2)
- 4.3. Write down the coordinates of the midpoint of  $AB$ . (2)

**[ 8 ]**

## QUESTION 5

CALCULATORS MAY NOT BE USED IN QUESTION

5.1. Given  $OP = \sqrt{29}$  and  $P(2; y)$  :



5.1.1. Calculate the value of  $y$ . (1)

5.1.2. Determine

(a)  $\sin 292^\circ$  (1)

(b)  $\cos(-292^\circ)$  (1)

(c)  $\tan 68^\circ$  (1)

5.2. Simplify fully :  $\frac{\sin 197^\circ \cdot \tan 300^\circ \cdot \cos(2970^\circ + x)}{\sin(-x - 180^\circ) \cdot \cos 107^\circ}$  (6)

5.3. If  $\sin 25^\circ - k = 0$ , where  $0 < k < 1$ , use an appropriate diagram to determine the following, in terms of  $k$  :

5.3.1.  $\tan 25^\circ$  (3)

5.3.2.  $\tan 65^\circ$  (1)

[14]

## QUESTION 6

6.1. Given :  $\left(\frac{1}{\cos x} - \tan x\right)^2 = \frac{1 - \sin x}{1 + \sin x}$

6.1.1. Prove the given identity. (4)

6.1.2. For which value(s) of  $x$  will the given identity not be valid? (2)

6.2. Determine the general solution of :

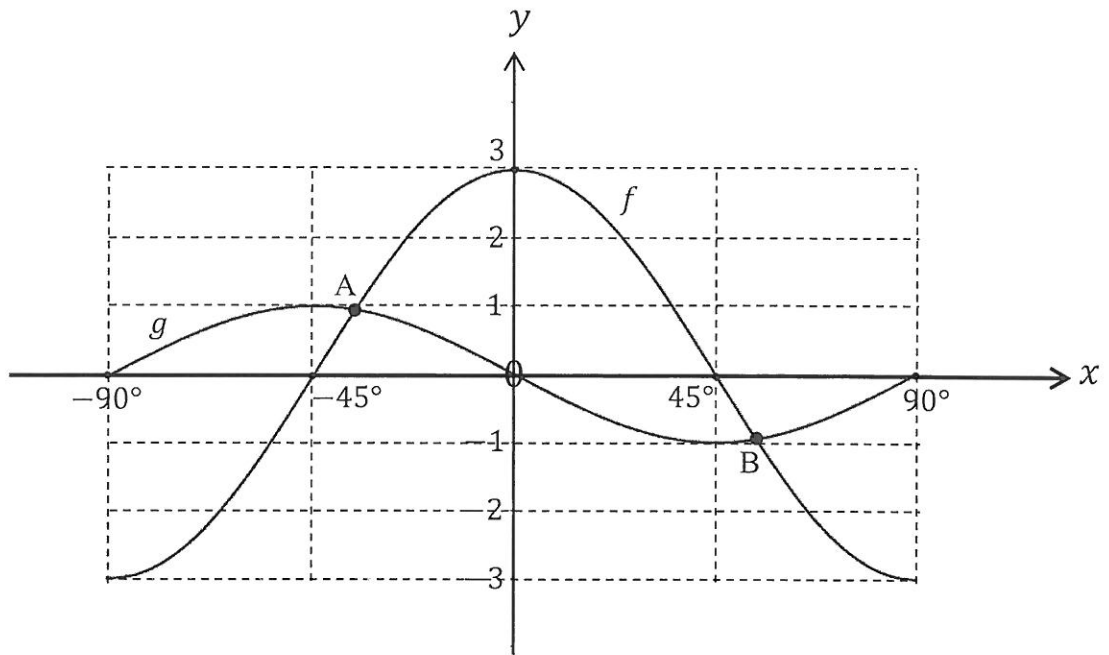
6.2.1.  $2 \sin x + 1 = 0$  (2)

6.2.2.  $\sin(x - 20^\circ) + \cos 2(x + 30^\circ) = 0$  (5)

6.3. The graphs of

$$f(x) = 3 \cos 2x \quad \text{and} \quad g(x) = -\sin 2x$$

are sketched below.



6.3.1. Write down the

- (a) amplitude of  $g$  (1)
- (b) period of  $f$  (1)
- (c) range of  $h$ , if  $h(x) = 2 \cdot g(x - 28^\circ) - 3$  (2)

6.3.2. Calculate the  $x$ -values of points A and B. (5)

6.3.3. Use the graphs to solve for  $x$ , if  $x \in [-90^\circ; 90^\circ]$  :

- (a)  $g(x) - f(x) > 0$  (2)
- (b)  $f(x) \cdot g(x) \leq 0$  (3)

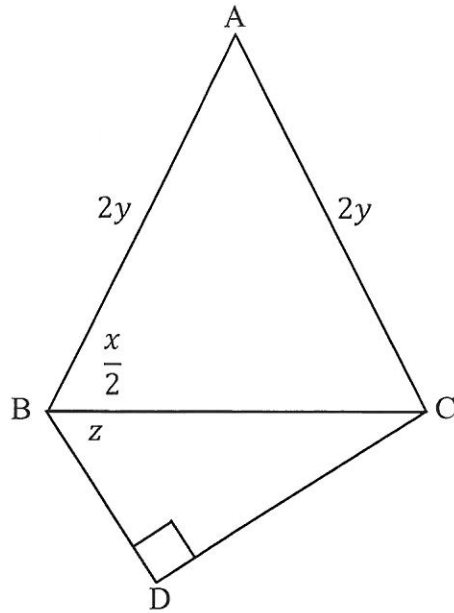
6.3.4. Describe the transformation from  $g$  to  $i$ , if  $i(x) = \sin(2x + 80^\circ)$ . (2)

[29]



QUESTION 7

7.  $AB = AC = 2y$ ,  $\widehat{CDB} = 90^\circ$ ,  $\widehat{CBD} = z$  and  $\widehat{ABC} = \frac{x}{2}$ .



7.1. Determine  $\widehat{A}$  in terms of  $x$ . (2)

7.2. Prove that :

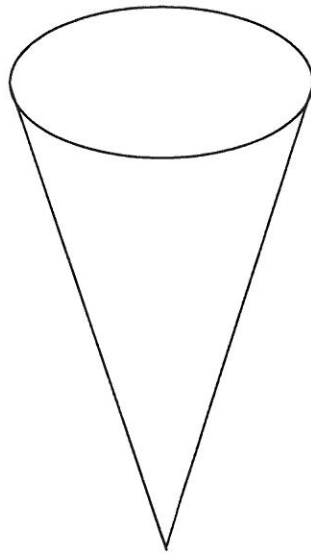
7.2.1.  $\text{area } \Delta ABC = 2y^2 \sin x$  (1)

7.2.2.  $CD = 2y \sin z \sqrt{2 + 2 \cos x}$  (5)

[ 8 ]

### QUESTION 8

- 8.1. The (right) solid cone shown below has a radius of 10 cm and a total surface area of  $100(\sqrt{5} + 1)\pi$  cm<sup>2</sup>.

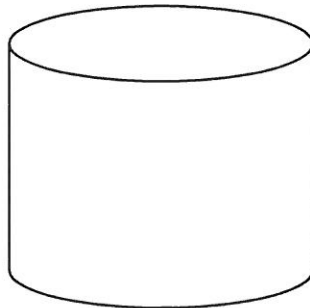


$$A = \pi r h_s$$
$$V = \frac{1}{3} Ah$$

Calculate the volume of the cone.

(6)

- 8.2. The solid (right) circular cylinder shown below has a radius of  $x$  cm and a perpendicular height of  $(20 - 4x)$  cm.



- 8.2.1. Show that the total surface area of the cylinder will be given by:  $(-6\pi x^2 + 40\pi x)$  cm<sup>2</sup>

(2)

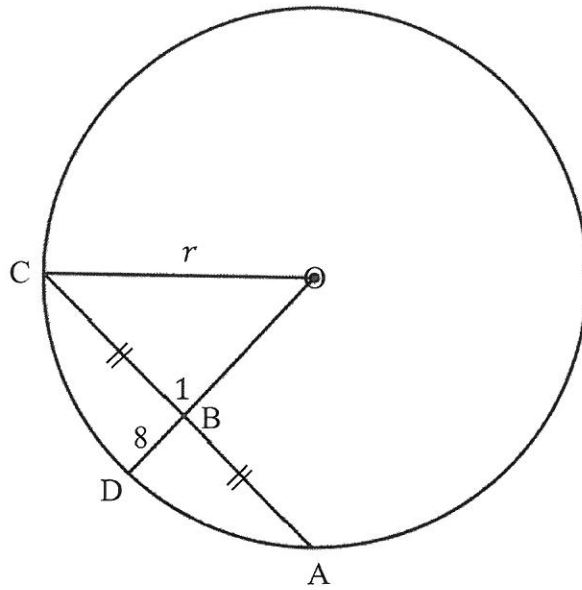
- 8.2.2. Now, determine the value of  $x$  for which the total surface area will be a maximum.

(2)

[10]

### QUESTION 9

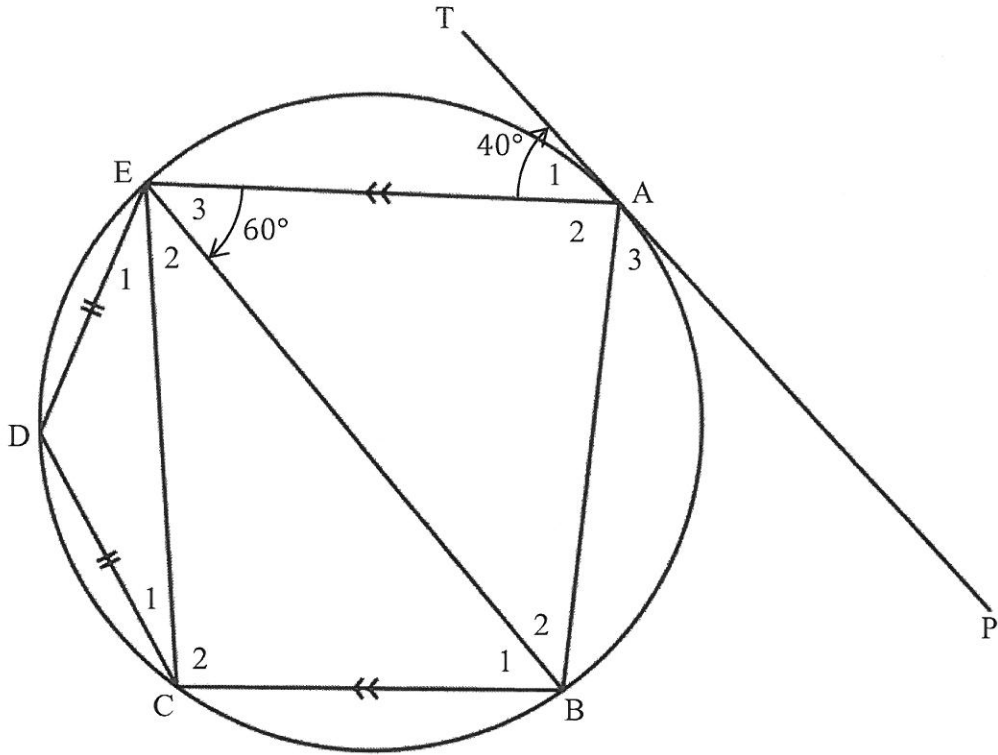
9. O is the centre of the circle.  $CB = BA = 12$ ,  $BD = 8$  and  $OC = r$ .



- 9.1. Give the reason why  $\widehat{B}_1 = 90^\circ$ . (1)
- 9.2. Calculate the value of  $r$ . (2)
- [3]

**QUESTION 10**

10. TAP is a tangent to the circle at A.  $AE \parallel BC$  and  $DC = DE$ .  $\widehat{TAE} = 40^\circ$  and  $\widehat{AEB} = 60^\circ$



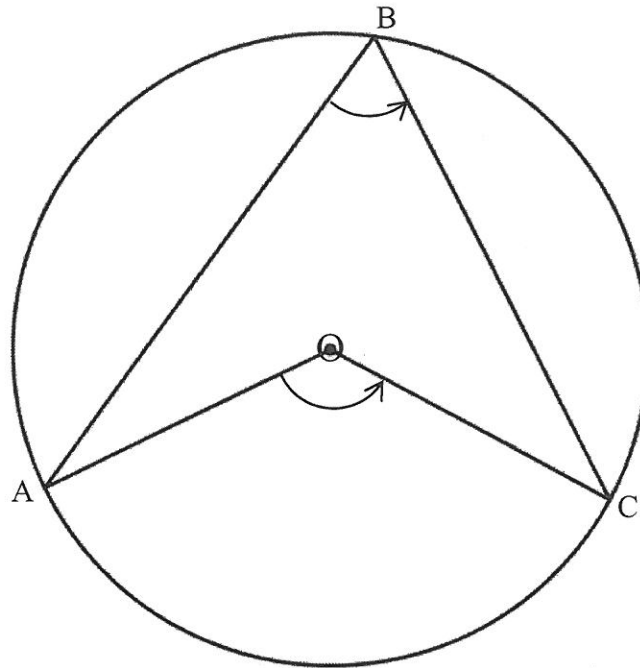
Determine

- 10.1.  $\widehat{B}_2$  (2)  
 10.2.  $\widehat{B}_1$  (2)  
 10.3.  $\widehat{D}$  (2)  
 10.4.  $\widehat{E}_1$  (2)

[ 8 ]

**QUESTION 11**

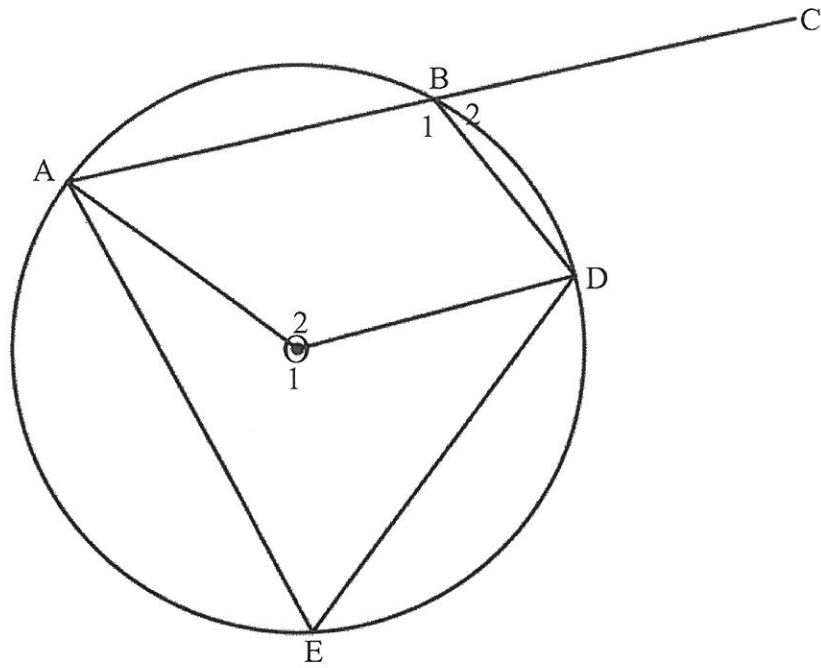
11.1. O is the centre of the circle.



Prove the THEOREM which states that  $\widehat{AOC} = 2\widehat{ABC}$

(5)

11.2. O is the centre of the circle.  $\widehat{O}_1 = 3x + 65^\circ$  and  $\widehat{B}_2 = 2x - 10^\circ$ .



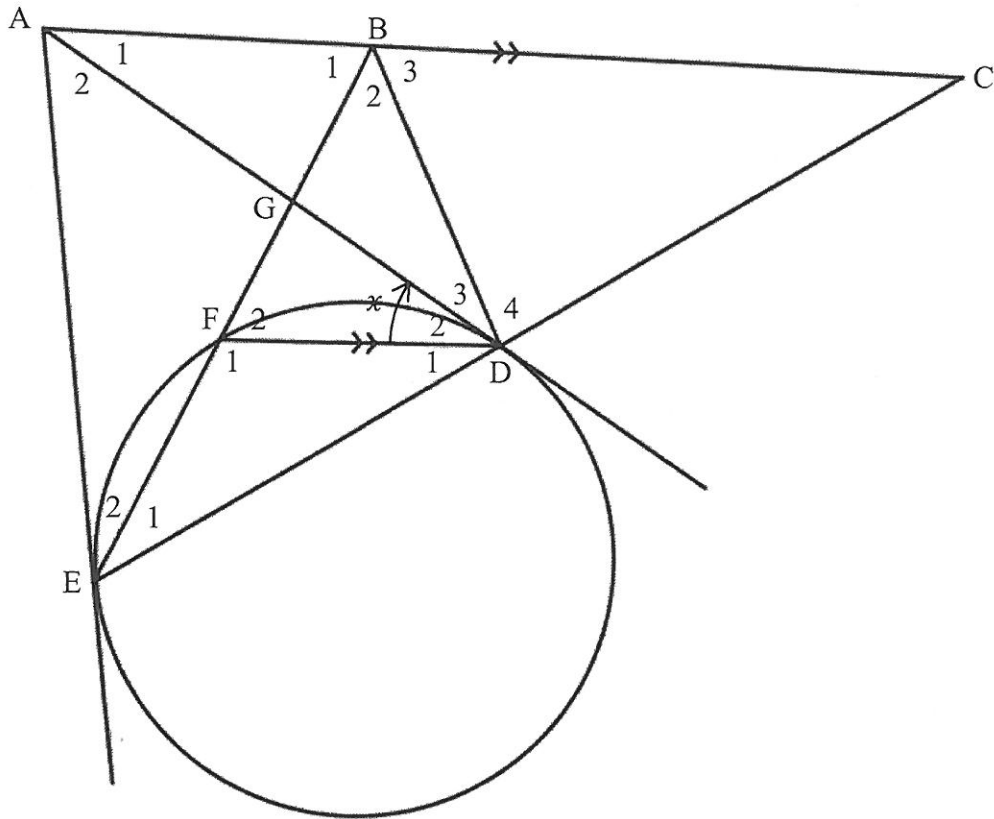
Calculate the value of  $x$ .

(4)

[9]

QUESTION 12

12. In the figure, AD and AE are tangents.  $AC \parallel FD$ . Let  $\widehat{D}_2 = x$



12.1. Prove that ABDE is a cyclic quadrilateral. (4)

12.2. If it is now further given that  $EF = DF$ , prove that :

12.2.1.  $AE = CD$  (5)

12.2.2. ABC is a tangent to the circle passing through points B, F and D. (5)

[14]

TOTAL	150
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