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KWAZULU-NATAL PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 11

MATHEMATICS P2



COMMON TEST

JUNE 2023

MARKS: 100

TIME: 2 hours

This question paper consists of 8 pages and 4 DIAGRAM SHEETS.

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 6 questions.
2. Answer ALL the questions.
3. Number the answers correctly according to the numbering system used in this question paper.
4. Clearly show ALL calculations, diagrams, graphs, etc. which you have used in determining your answers.
5. Answers only will NOT necessarily be awarded full marks.
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. If necessary, round off answers correct to TWO decimal places, unless stated otherwise.
8. FOUR DIAGRAM SHEETS FOR QUESTION 1.1, QUESTION 1.2, QUESTION 3.2, QUESTION 4, QUESTION 5.1, QUESTION 5.2 AND QUESTION 6 are attached at the end of this QUESTION PAPER. Detach the DIAGRAM SHEETS and hand in together with your ANSWER BOOK.
9. Diagrams are NOT necessarily drawn to scale.
10. Write neatly and legibly.

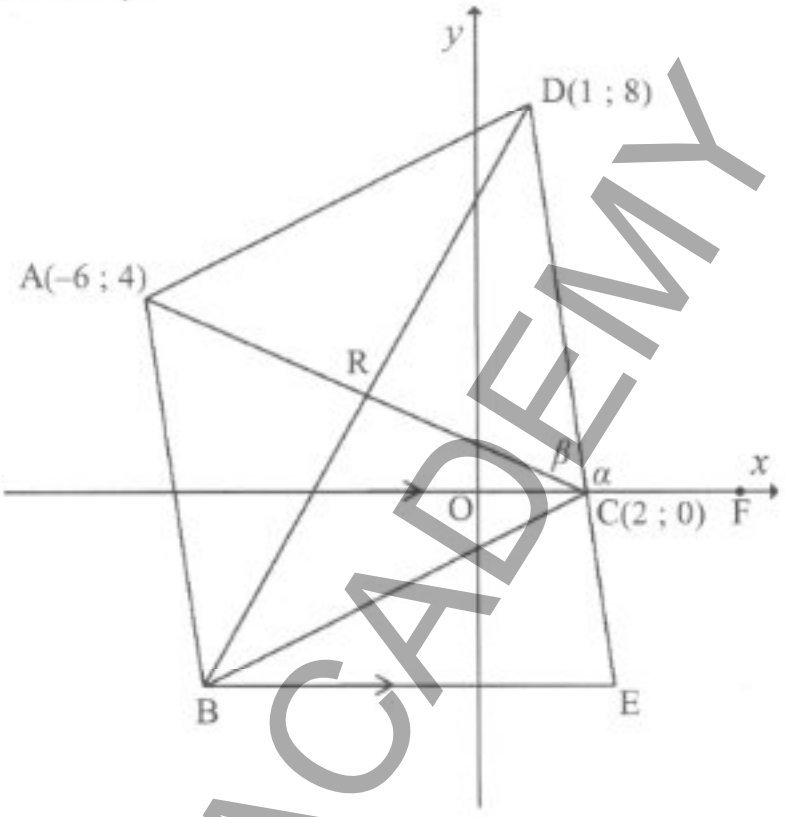
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QUESTION 1

1.1 In the diagram below, A$(-6\ ;\ 4)$, B, C$(2\ ;\ 0)$ and D$(1\ ;\ 8)$ are the vertices of parallelogram ABCD.
DC is extended to E, such that line BE will be parallel to the x-axis. F is a point on the x-axis.
The diagonals of ABCD intersect at R.
$D\hat{C}F = \alpha$ and $D\hat{C}R = \beta$.



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1.1.1 Calculate the gradient of DC. (2)

1.1.2 Calculate the equation of DE in the form $y = mx + c$. (2)

1.1.3 Calculate the coordinates of R. (2)

1.1.4 Write down the coordinates of B. (2)

1.1.5 Calculate the length of BE. (4)

1.1.6 Prove that ABCD is a rhombus. (4)

1.1.7 Calculate the size of:

(a) angle α (2)

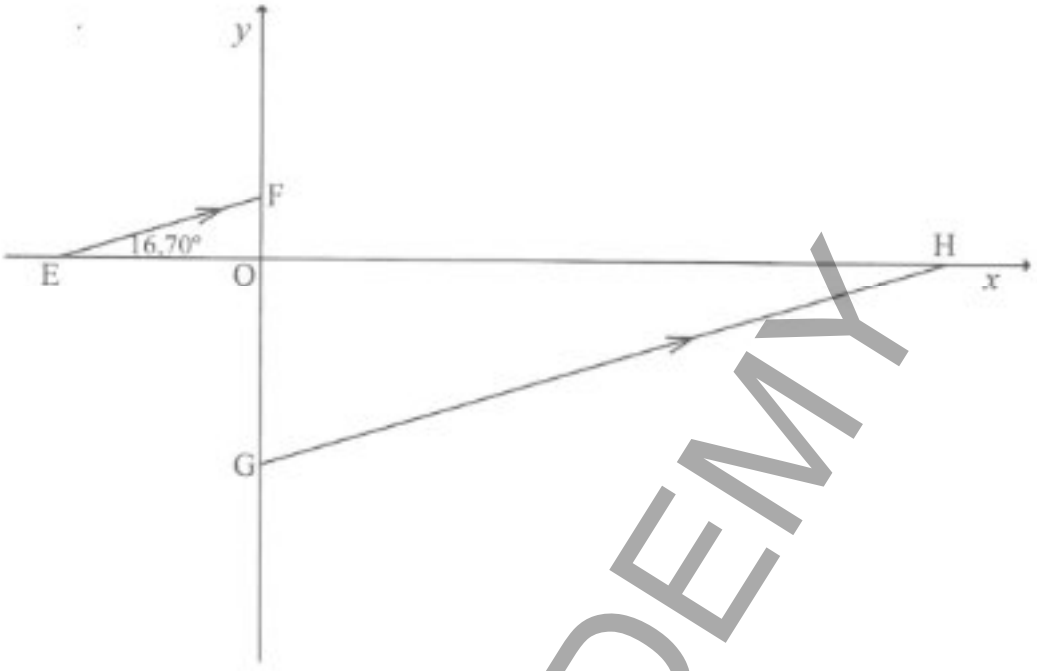
(a) angle β (3)

1.1.8 Calculate the area of ΔBEC. (3)

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1.2 In the diagram below, E and H are points on the x-axis and F and G are points on the y-axis, such that EF || GH. The equation of EF is $y = mx + 1,2$ and $F\hat{E}O = 16,70°$.



1.2.1 Calculate the value of m. (1)

1.2.2 If EO = OG, calculate the coordinates of H. (5)

[30]

QUESTION 2

2.1 Given: $\sin 25° = k$. **Without using a calculator**, determine each of the following in terms of k:

2.1.1 $\cos 25°$ (3)

2.1.2 $\sin 205°$ (2)

2.1.3 $\tan 385°$ (2)

2.2 Prove the identity: $\dfrac{-\tan x}{\cos x} + \dfrac{1}{\sin x \cos^2 x} = \dfrac{1}{\sin x}$ (4)

2.3 Calculate the value of the following expression:

$$\frac{\sqrt{3}\sin x \sin^2 58° - \sqrt{3}\sin^2 212°.\cos(x + 90°)}{\tan 120°.\sin x}$$ (7)

[18]

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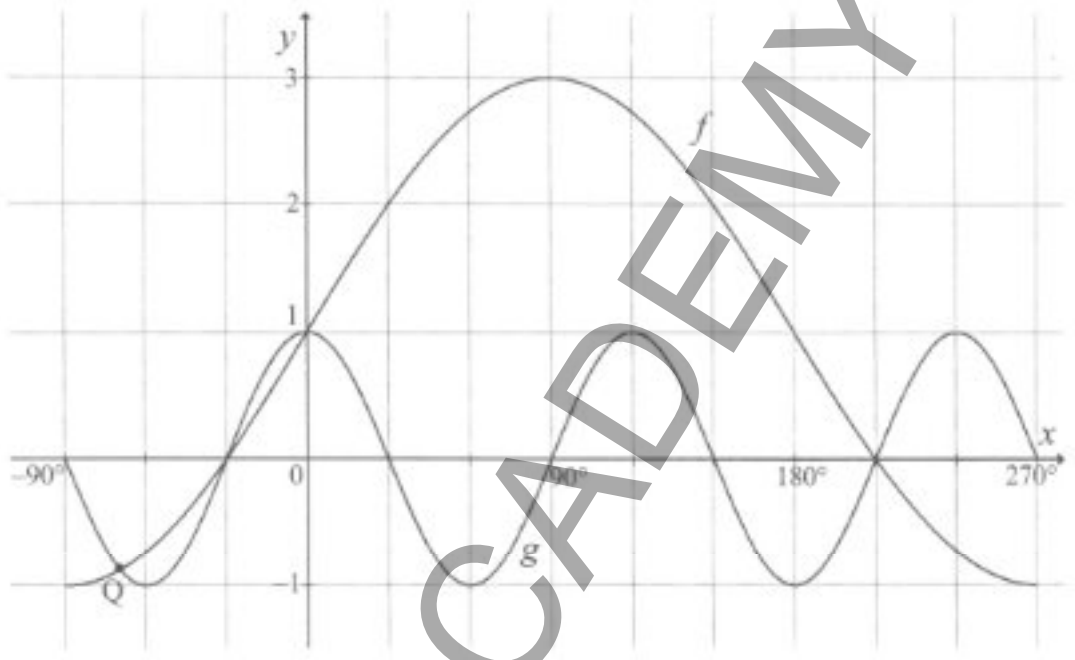
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QUESTION 3

3.1 Determine the general solution of the following equation:

$2\cos^2 x - 7\cos x - 2\sin^2 x = 0$ (7)

3.2 The graphs of $f(x) = 2\sin x + 1$ and $g(x) = a\cos bx$ are sketched below for $x \in [-90^\circ; 270^\circ]$. $Q\left(-68{,}91^\circ; -\frac{\sqrt{3}}{2}\right)$ is a point of intersection of f and g.



3.2.1 Write down the values of a and b. (2)

3.2.2 Write down the amplitude of f. (1)

3.2.3 Write down the period of g. (1)

3.2.4 For which value(s) of x will $f(x) \geq g(x)$, in the interval $x \in [-90^\circ; 0^\circ]$? (2)

3.2.5 Graph h is formed by shifting graph f 90° to the left and reflecting it in the x-axis. Determine the equation of h. (2)

3.2.6 For which values of k will $2\sin x = k$ have no real roots? (2)

[17]

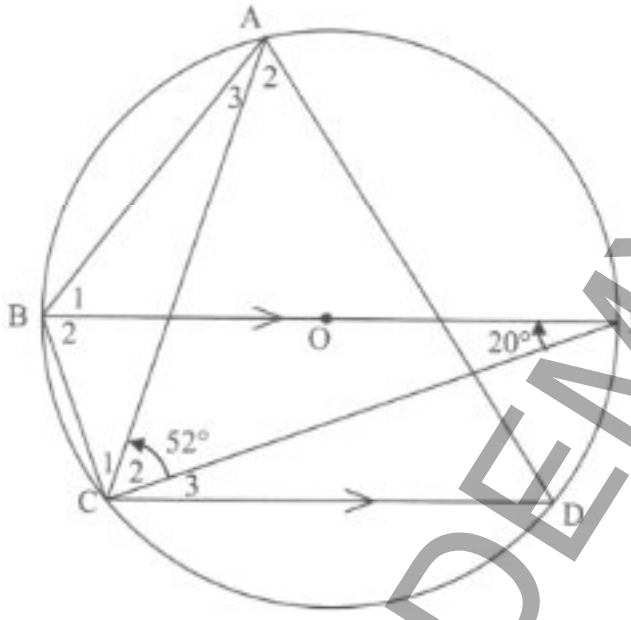
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QUESTION 4

In the diagram below, O is the centre of the circle. Chord CD is parallel to diameter BE. A is a point on the circle, and AB, BC, AC, CE and AD are drawn. $\hat{C}_2 = 52^\circ$ and $\hat{E} = 20^\circ$.



Calculate, with reasons, the size of the following angles:

4.1 $\hat{C}_1$ (3)

4.2 $\hat{C}_3$ (1)

4.3 $B\hat{A}D$ (2)

4.4 $\hat{A}_2$ (2)

[8]

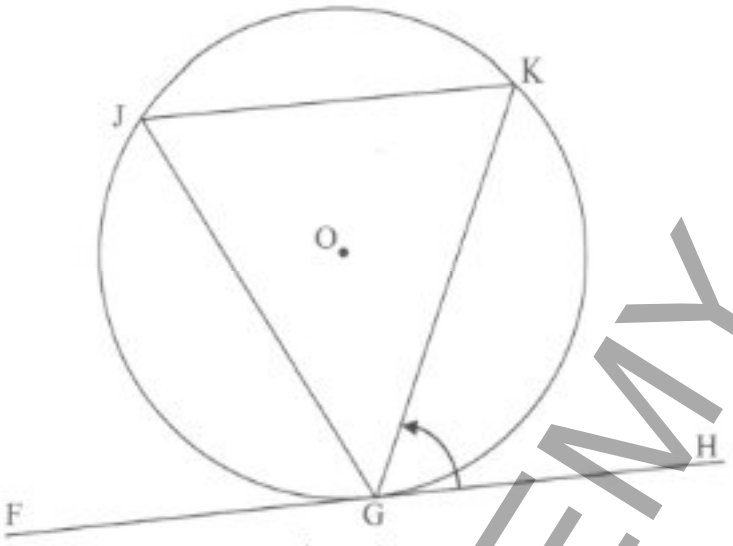
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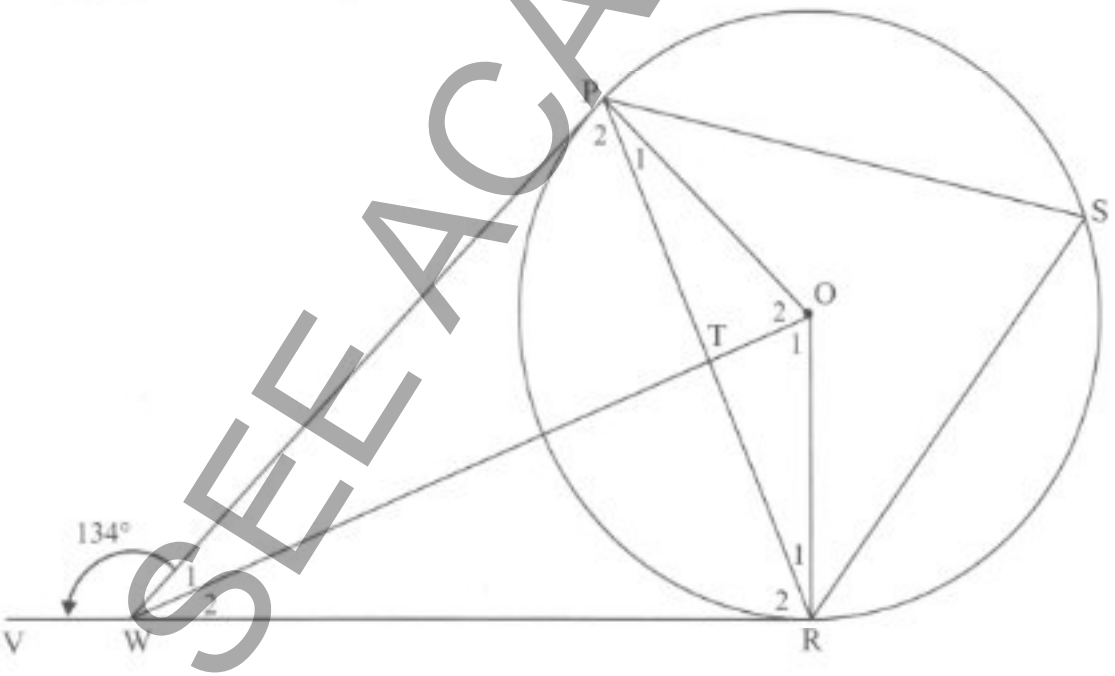
QUESTION 5

5.1 In the diagram below, FGH is a tangent to the circle with centre O at G. J and K are points on the circle.



Prove the theorem which states that $H\hat{G}K = \hat{J}$. (5)

5.2 In the diagram below, O is the centre of circle PRS. WP and WR are tangents to the circle at P and R respectively. PO, OR, PR and OW are drawn. OW intersects PR at T. RW is extended to V. $V\hat{W}P = 134^\circ$.



5.2.1 Prove that PWRO is a cyclic quadrilateral. (3)

5.2.2 Give a reason why $\hat{W}_1 = \hat{W}_2$. (2)

5.2.3 Calculate the size of $\hat{S}$. (4)

[14]

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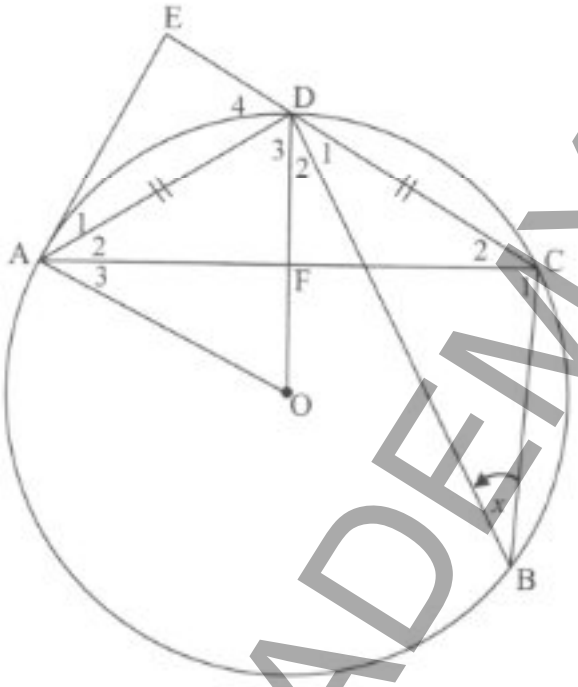
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QUESTION 6

In the diagram, O is the centre of the circle and A, B, C and D are points on the circle such that AD = CD. The tangent to the circle at A meets CD produced at E. OD intersects AC at F.

Let $\hat{B} = x$.



6.1 Give a reason why $\hat{A}_2 = x$. (1)

6.2 Prove that DA bisects $E\hat{A}F$. (4)

6.3 Prove that EA is a tangent to the circle that passes through A, O and F. (4)

6.4 Prove that AF = FC. (4)

[13]

TOTAL: 100

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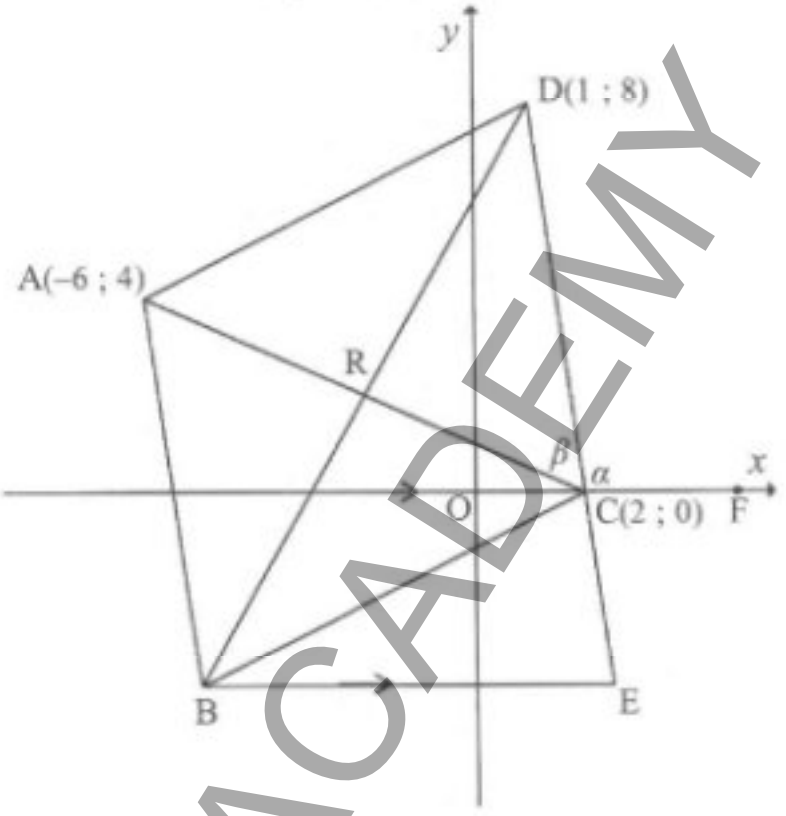
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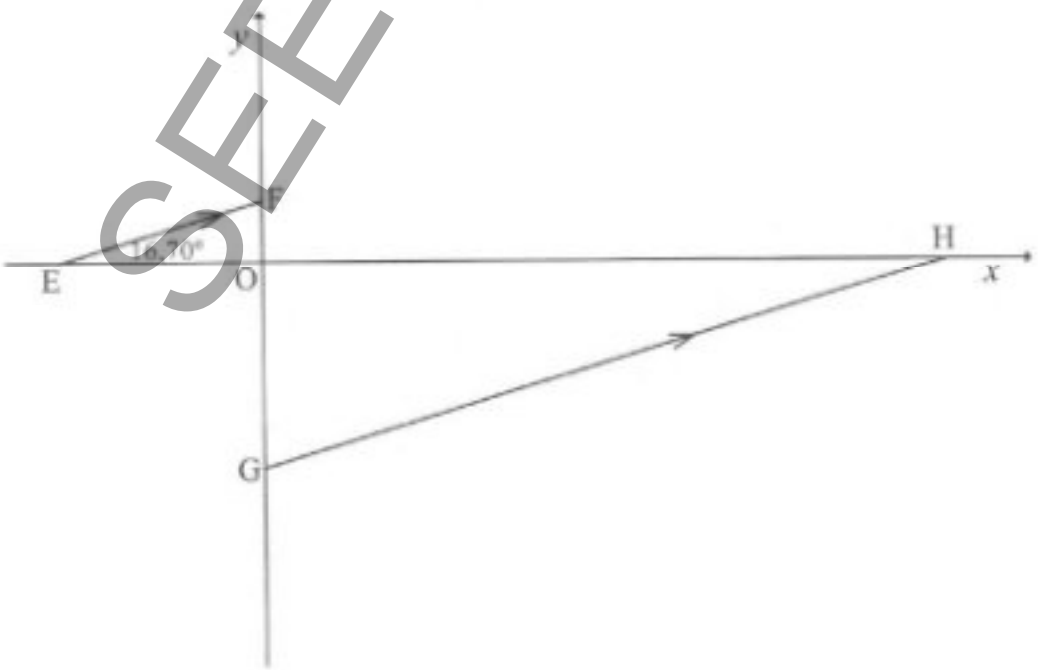
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DIAGRAM SHEET 1

QUESTION 1.1



QUESTION 1.2



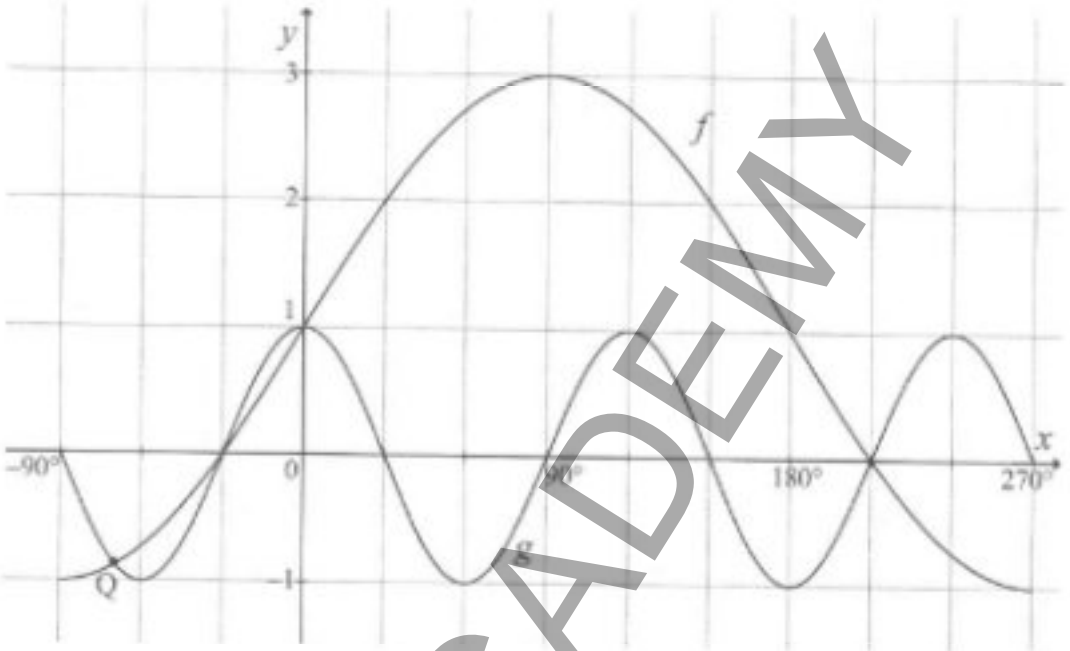
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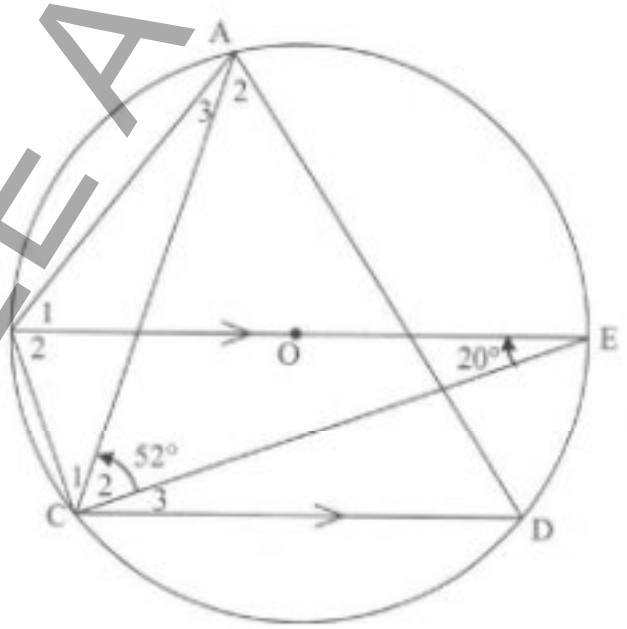
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DIAGRAM SHEET 2

QUESTION 3.2



QUESTION 4



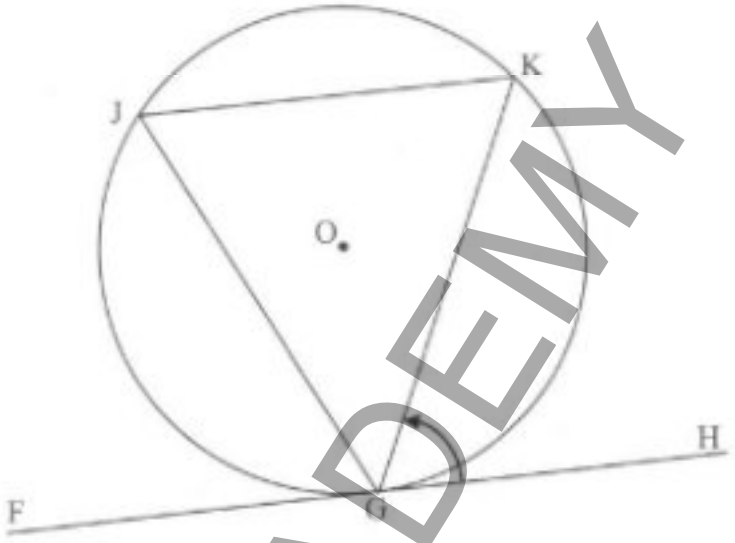
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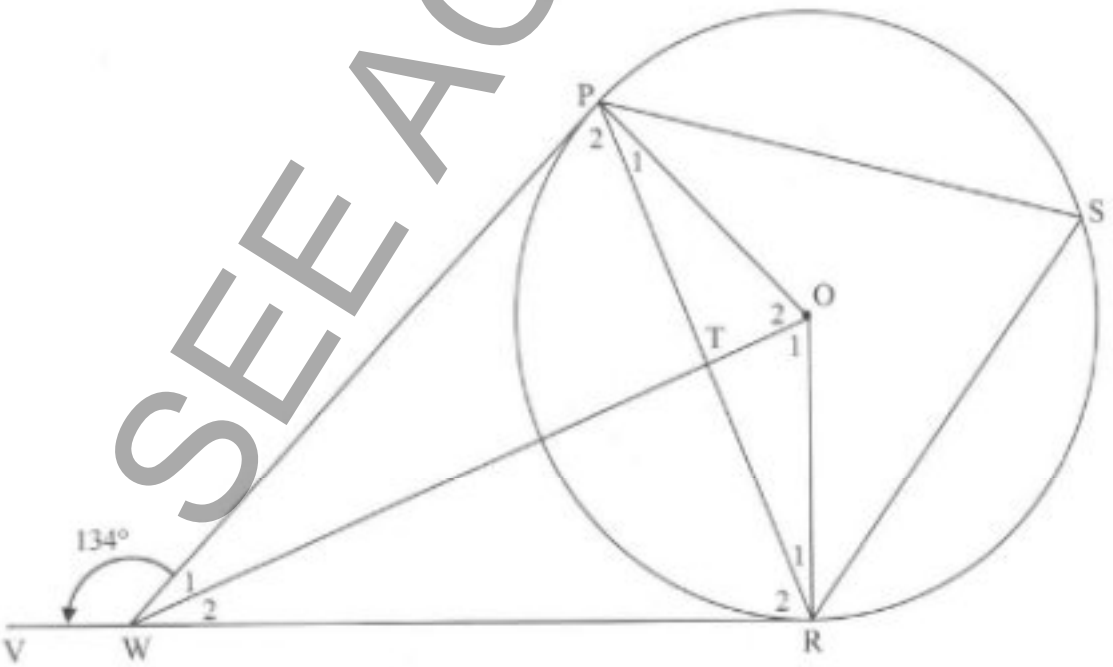
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DIAGRAM SHEET 3

QUESTION 5.1



QUESTION 5.2



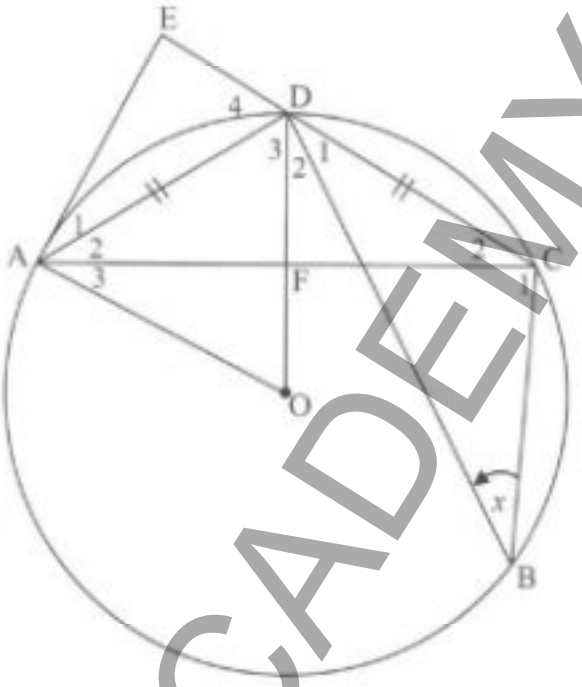
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DIAGRAM SHEET 4

QUESTION 6



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