

Name and Surname :

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

Hudson Park High School



GRADE 11
MATHEMATICS

June Examination

Marks : 150

Date : 22 May 2023

Time : 3 hours

Examiner : SLT

Moderator(s) : PHL LBE VNT

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. **A blank space of at least two lines should be left after each answer.**
4. **Fill in the details requested on the front of this Question and Answer Book before you start answering any questions.**

Hand in your submission in the following manner :

(on top) **Answer Book**
(below) **Question Paper**

Please **do NOT STAPLE** your Answers 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. Answers must be written in blue or black ink, as distinctly as possible, on both sides of the page. An HB pencil (but not lighter eg. 2H) may be used for diagrams.
8. Round off answers to 2 decimal places, where necessary, unless instructed otherwise.
9. If (Euclidean) GEOMETRIC statements are made, REASONS must be stated appropriately.

QUESTION 1

1.1. Solve for x :

1.1.1. $2x^2 - 13x + 15 = 0$ (2)

1.1.2. $5x^2 - 2x - 8 = 0$ (correct to TWO decimal places) (3)

1.1.3. (a) $6 \leq x^2 + x$ (3)

(b) $x^3 + x^2 \leq 0$ (3)

1.1.4. $\sqrt{x+5} - 3 = x$ (4)

1.1.5. $\left(3x^{\frac{4}{3}} - 5\right)\left(3x^{\frac{3}{5}} + 4\right) = 0$ (5)

1.1.6. $2 \cdot 3^{2x} - 3^x - 6 = 0$ (5)

1.2. Solve for x and y :

1.2.1. $x^2 - 3xy + y^2 - 2x + 7y = 11$ and $2y - x = -3$ (6)

1.2.2. $\frac{3^{y+1}}{32} = \sqrt{96^x}$ (4)

1.3. If n is a positive integer, will $2 \cdot 5^n - 5^{n+1} + 5^{n+2}$ be an odd or even number ?
Justify your answer, showing all working out. (4)

[39]

QUESTION 2

CALCULATORS MAY NOT BE USED IN THIS QUESTION

2.1. Simplify fully :

2.1.1. $(1 + \sqrt{2} - \sqrt{18})(1 + 2\sqrt{2})$ (3)

2.1.2. $\frac{8}{\sqrt{2}-2}$ leaving your answer in the form $a + b\sqrt{c}$ where $a, b, c \in \mathbb{Z}$ (4)

2.2. If $3^x = 5$, evaluate 9^{x-1} . (3)

[10]

QUESTION 3

3.1. Determine the values of p and q if the roots of $x^2 + px + q = 0$ are both equal to 5. (4)

3.2. Given : $f(x) = 3x + k$ and $g(x) = x^2 - 2$
For which value(s) of k will f and g not intersect. (6)

3.3. Prove that the roots of $x(2ax - 1) = 2a + 1$ will be rational for all rational values of a . (4)

[14]

QUESTION 4

CALCULATORS MAY NOT BE USED IN THIS QUESTION

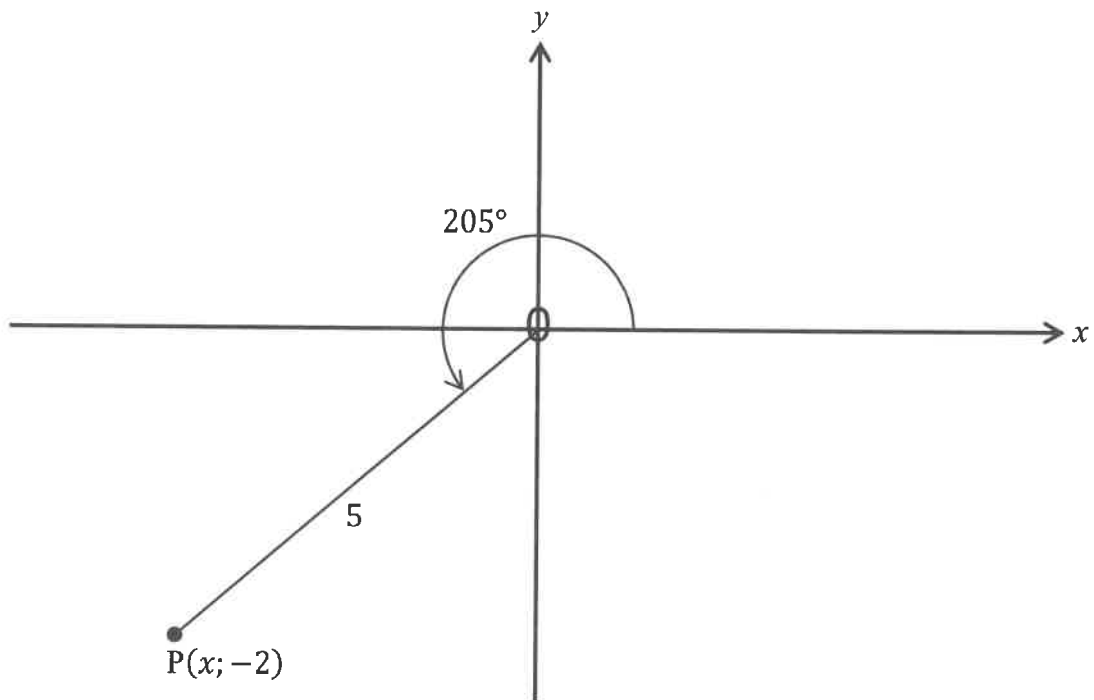
4.1. Given : $\cos 35^\circ = m$ where $0 < m < 1$.

Determine the following, in terms of m :

4.1.1. $\cos 215^\circ$ (2)

4.1.2. $\tan 55^\circ$ (3)

4.2. In the diagram, $OP = 5$ and $P(x; -2)$.



4.2.1. Calculate the value of x . (1)

4.2.2. Determine :

(a) $\sin 385^\circ$ (2)

(b) $\cos 65^\circ$ (2)

4.3. Simplify fully :

4.3.1. $\frac{\cos 111^\circ}{\sin 159^\circ}$ (3)

4.3.2. $\tan^2 330^\circ$ (3)

[16]

QUESTION 5

5.1. Prove the following identity : $\frac{1}{1 - \sin x} - \frac{1}{1 + \sin x} = \frac{2 \tan x}{\cos x}$ (5)

5.2. Factorise fully : $9\sin^2 x - 7 \sin x \cos x - 3$ (3)

5.3. Simplify fully : $\frac{\sin(-x-1710^\circ) - \cos(180^\circ+x)}{\cos(-x) - 3 \sin(270^\circ+x)}$ (5)

5.4. Given : $2 \cos x + \sqrt{3} = 0$

5.4.1. Determine the general solution of the given equation. (2)

5.4.2. Hence, determine the solutions of the given equation in the interval where $x \in [-360^\circ; 180^\circ]$. (1)

5.5. Solve for x :

5.5.1. $\cos x = 1$ (1)

5.5.2. $\sin 4x = 0$ (2)

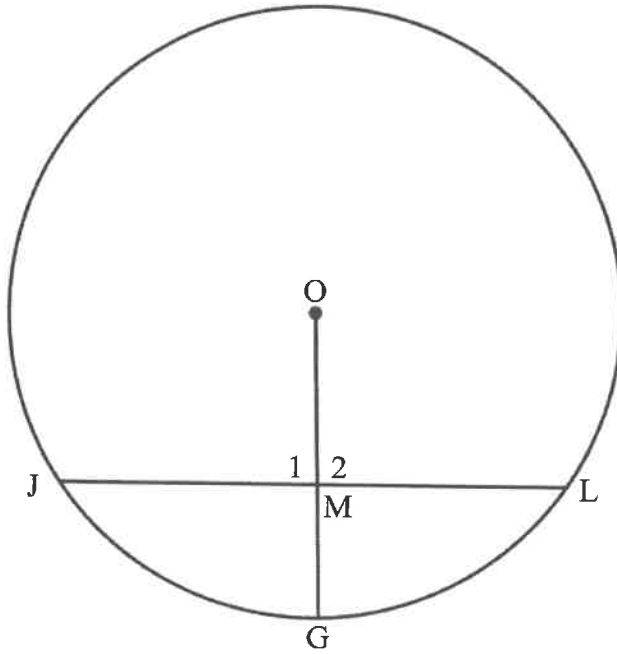
5.5.3. $3 \sin x - 4 \cos x = 0$ (3)

5.5.4. $\sin 2x + \cos(x - 10^\circ) = 0$ (4)

[26]

QUESTION 6

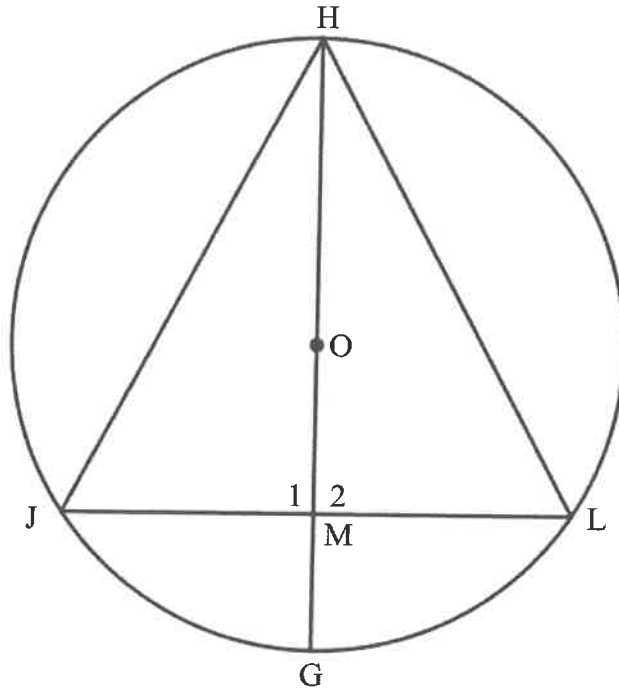
6.1. O is the centre of the circle. $JM = ML$.



Prove the theorem which states that : $\widehat{M}_1 = \widehat{M}_2 = 90^\circ$.

(6)

- 6.2. O is the centre of the circle. HG bisects JL. $JM = 12$, $HJ = 12\sqrt{5}$, $MG = 6$ and $OM = x$.



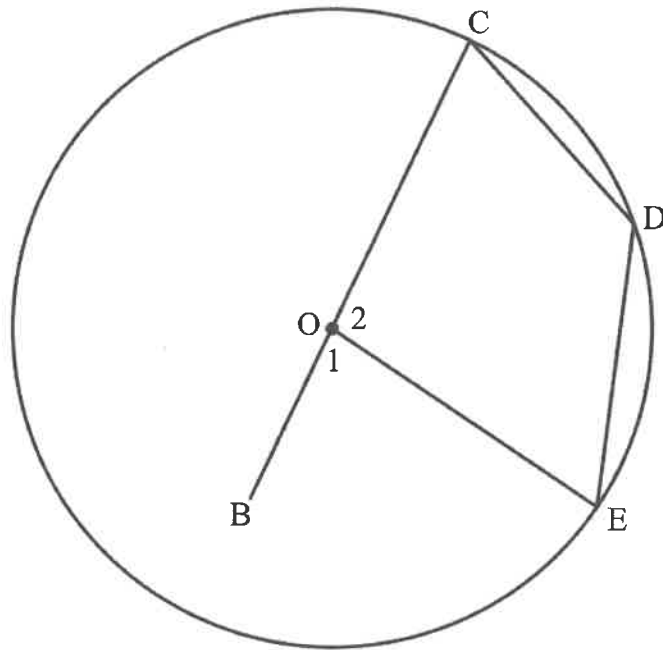
6.2.1. Express HM in terms of x . (2)

6.2.2. Calculate the length of the radius of the circle. (5)

[13]

QUESTION 7

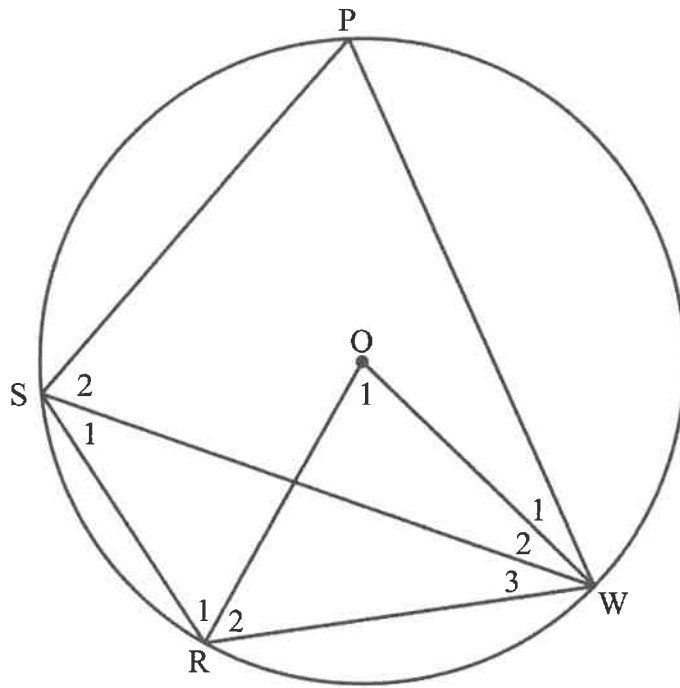
7.1. O is the centre of the circle. $\widehat{O}_1 = 70^\circ$.



Calculate \widehat{D} .

(3)

7.2. O is the centre of the circle, $PS = SW = WP$ and $\widehat{S}_1 = 25^\circ$.

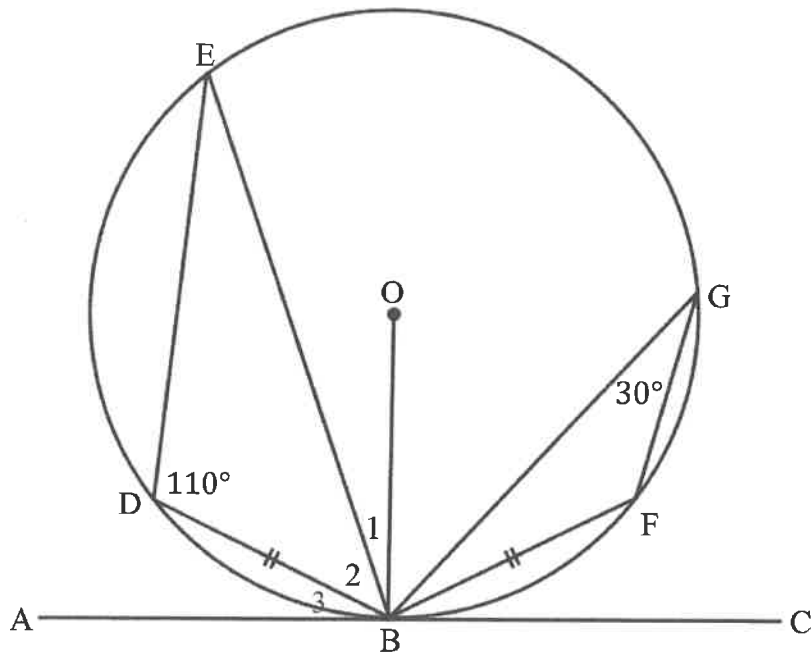


Determine :

7.2.1. \widehat{O}_1 (2)

7.2.2. \widehat{R}_1 (6)

- 7.3. O is the centre of the circle. ABC is a tangent to the circle at B. $DB = BF$, $\widehat{G} = 30^\circ$ and $\widehat{D} = 110^\circ$



Calculate :

7.3.1. \widehat{B}_3 (4)

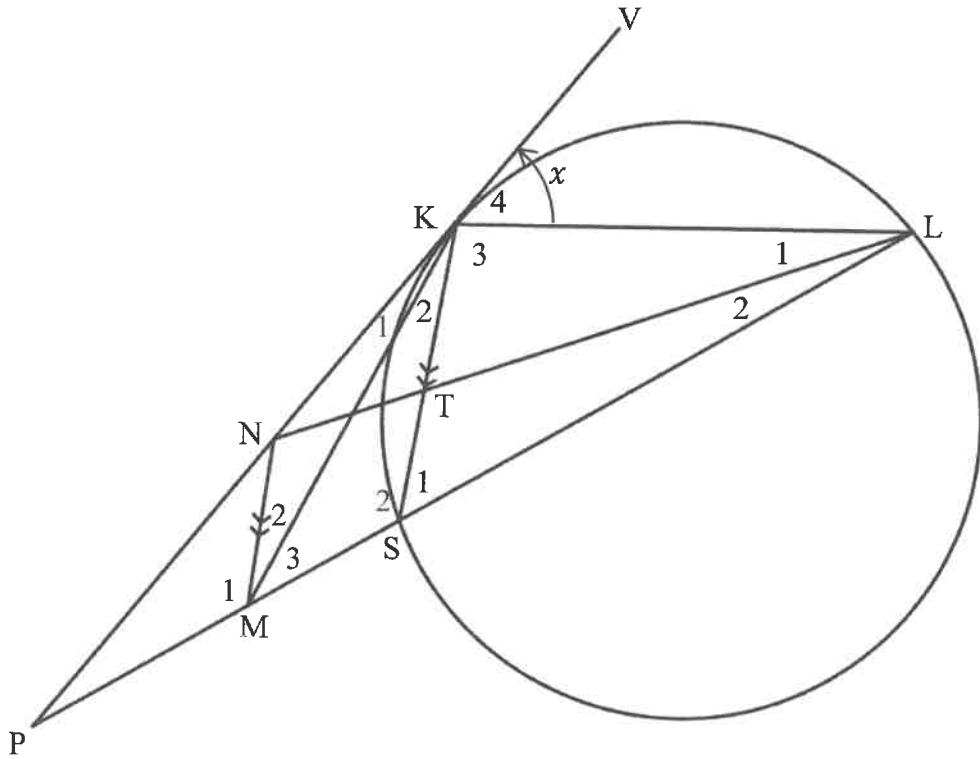
7.3.2. \widehat{B}_1 (3)

[18]

QUESTION 8

8.1. Complete : The angle between the tangent to a circle and a chord drawn from the point of contact is equal to an angle in the (2)

8.2. PK is a tangent to the circle and $MN \parallel SK$. Let $\widehat{K}_4 = x$.



Prove that :

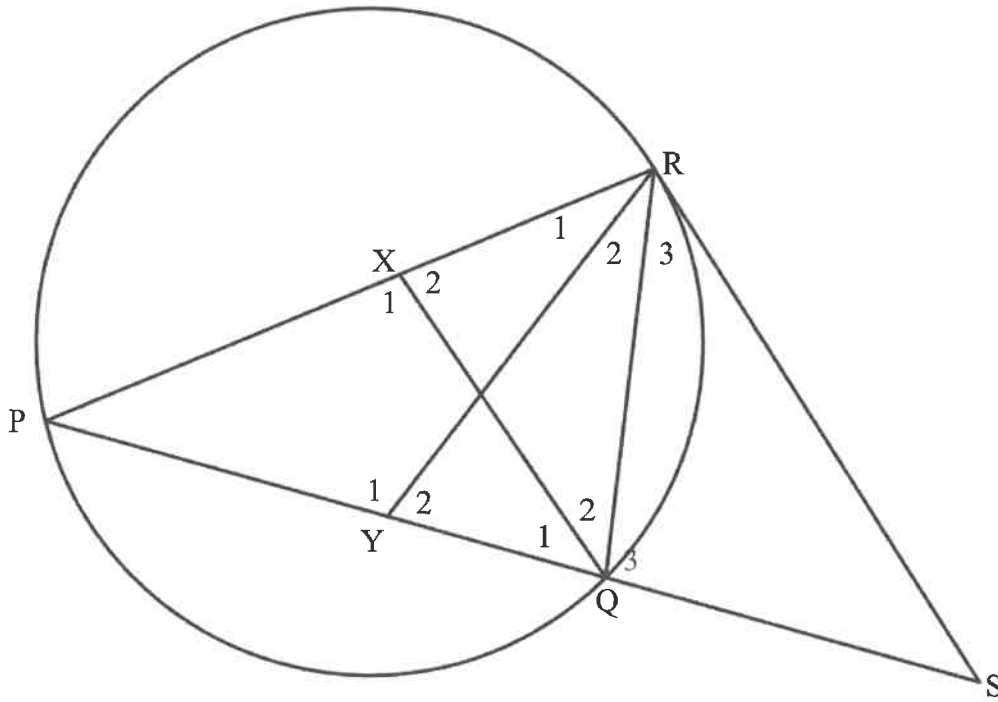
8.2.1. KLMN is a cyclic quadrilateral. (5)

8.2.2. $\widehat{L}_1 = \widehat{K}_2$. (3)

[10]

QUESTION 9

9. YR bisects \widehat{PRQ} and $SR = SY$.



Prove that SR is a tangent to the circle at R.

[4]

TOTAL	150
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