Name and Surname : ....

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

Hudson Park High School

GRADE 11

MATHEMATICS

June Examination Paper 1

Term 2

Marks : 100

Date : 03 June 2025

Time : 2 hour

Examiner : PHL

Moderator(s) : SLT VNT VPT

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.**
   Start each Question at the top of new page.

4. **Fill in the details requested on the front of this Question Paper, before you start answering any questions.**

   Hand in your submission in the following manner :

   (on top) **Answers (on lined paper, stapled together)**
   (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 $3x^2 = 5x$ (3)

1.1.2 $3x^2 - 2x - 6 = 0$ (correct to 2 decimal places). (3)

1.1.3 $2\sqrt{x+6} + 2 = x$ (4)

1.1.4 $-x^2 > 2x - 15$ (4)

1.1.5 $2^{x+4} + 2^x = 8704$ (3)

1.1.6 $3x^2 - 7 = 0$ (3)

1.1.7 $\frac{6^{2x}}{9^x} = \sqrt[3]{4}$ (4)

1.2 Solve for x and y simultaneously $3^{x+y} = 27$ and $x^2 + y^2 = 17$. (7)

1.3 Given: $a^2 - 5ab + 4b^2 = 0$ solve for a in terms of b. (3)

1.4 Given: A= $(1-a)$ and B = $(1+a)(1+a^2)(1+a^4)...(1+a^{512})$.

Determine the value of A×B (product of A and B) in terms of a. (3)

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QUESTION 2

2.1 Without solving the equation $x(2x-5) + 2 = 0$, discuss the nature of its roots. (3)

2.2 If -5 is a root of the equation $x^2 + px = 40$, determine the value of p and hence the other root. (3)

2.3

2.3.1 Show that $x^2 + 2kx = -9k - 4x$ can be written as $x^2 + x(2k+4) + 9k = 0$ (1)

2.3.2 For which value(s) k will the equation have real roots. (4)

2.4 Given: $x - 1 = \frac{2}{mx}$

Show that the roots of the equation will equal to $\frac{m \pm \sqrt{m^2+8m}}{2m}$ (2)

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QUESTION 3

3 Simplify fully, **WITHOUT THE USE OF CALCULATOR.**

3.1 $27^{\frac{2}{3}}.81^{\frac{1}{2}}$ (3)

3.2 $\frac{64^{\frac{-2}{3}}.\sqrt{8}}{\sqrt[7]{128}.\ \sqrt{98}}$ (3)

3.3 $\frac{3^{x-1}.3^{2x}-3^{3x}}{27^{x}-3^{3x+2}}$ (4)

3.4 Given that: $10^x = m$, prove that $\frac{15.5^{x-1}+5^{x+1}}{2^{-x}} = 8m$ (4)

3.5 Determine: $\frac{1}{\sqrt{1}+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+\frac{1}{\sqrt{3}+\sqrt{4}}+.\ .\ .+\frac{1}{\sqrt{99}+\sqrt{100}}$ (3)

[17]

QUESTION 4

4.1 Consider the two linear sequences below

Sequence A: 4; 11; 18; 25; . . .

Sequence B: 11; 7; 3; -1; . . .

The sum of the n^{th} term of sequence A and the n^{th} term of sequence B is given by u_n.

4.1.1 Write down the value of the next two terms of of sequence A. (1)

4.1.2 Determine the n^{th} term of

a) sequence A (1)

b) sequence B (1)

4.1.3 Show algebraically that $u_{n+1} = u_n + 3$ (3)

4.2 Given the quadratic sequence: 2; 5; 12; 23; . . .; 1277 determine the:

4.2.1 general term (T_n) of the quadratic sequence. (4)

4.2.2 number of terms in the pattern. (3)

4.3 A quadratic number pattern has a constant second difference of 5.
The first two terms are equal. The sum of the first three terms is 14.
Find the values of the first three terms of the quadratic pattern. (4)

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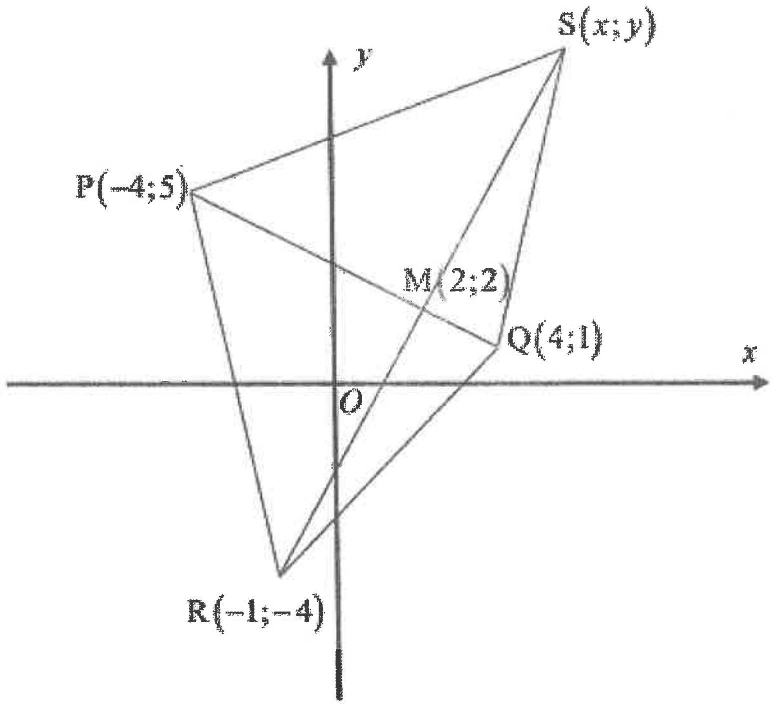
QUESTION 5

5 In the diagram below P(−4;5), Q(4; 1) and R(−1; −4) are vertices of a triangle in the Cartesian plane with M on PQ. M(2; 2) is the midpoint of straight line RS.



Determine the:

5.1	gradient of PQ.	(2)
5.2	coordinates of S.	(2)
5.3	inclination of SR.	(3)
5.4	5.4.1 Show that $P\widehat{M}S = 90°$.	(3)
	5.4.2 Determine the area of ΔPRS.	(4)
5.5	Prove that ΔQRS is isosceles.	(2)

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TOTAL 100

5. INFORMATION SHEET

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$A = P(1+ni)$ $\quad A = P(1-ni)$ $\quad A = P(1-i)^n$ $\quad A = P(1+i)^n$

$T_n = a + (n-1)d$ $\quad S_n = \frac{n}{2}[2a + (n-1)d]$

$T_n = ar^{n-1}$ $\quad S_n = \frac{a(r^n - 1)}{r-1}$; $r \neq 1$ $\quad S_\infty = \frac{a}{1-r}$; $-1 < r < 1$

$F = \frac{x[(1+i)^n - 1]}{i}$ $\quad P = \frac{x[1-(1+i)^{-n}]}{i}$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $\quad M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$

$y = mx + c$ $\quad y - y_1 = m(x - x_1)$ $\quad m = \frac{y_2 - y_1}{x_2 - x_1}$ $\quad m = \tan\theta$

$(x-a)^2 + (y-b)^2 = r^2$

In ΔABC: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ $\quad a^2 = b^2 + c^2 - 2bc.\cos A$ $\quad area\ \Delta ABC = \frac{1}{2}ab.\sin C$

$\sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta$ $\quad \sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$

$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta$ $\quad \cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases}$$

$\sin 2\alpha = 2\sin\alpha.\cos\alpha$

$\bar{x} = \frac{\sum x}{n}$ $\quad \sigma^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n}$

$P(A) = \frac{n(A)}{n(S)}$ $\quad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$\hat{y} = a + bx$ $\quad b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$