

Name and Surname :

Grade/Class : 10/..... **Mathematics Teacher** :

Hudson Park High School



GRADE 10
MATHEMATICS
NOVEMBER PAPER 1

Marks : 100

Date : 03 November 2023

Time : 2 hours

Examiner(s) : CYT LBE SLT PHL

Moderator(s) : SNC SBL 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.**
Start each QUESTION at the top of a new side of a page.
4. **Fill in the details requested on the front of this Question before you start answering any questions.**

Hand in your submission in the following manner :

(on top) **Answers (on lined paper)**
(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 (Start at the top of a new side of a page)

1.1. CALCULATORS MAY NOT BE USED IN THIS QUESTION

1.1.1. If $x = \{1; 2; 3; 4; 5\}$ determine the value(s) of x for which $\sqrt{\frac{9}{4-x}}$ will be:

(a) Non – Real (1)

(b) \mathbb{Q}' (1)

(c) Undefined (1)

1.1.2 Between which two consecutive integers does $\sqrt{54}$ lie ? Show all working out. (2)

1.1.3 Convert $1,4\dot{6}$ into an improper fraction showing all of your working out. (3)

1.2. Multiply out and simplify as far as possible :

1.2.1. $\left(2 + \frac{x}{3}\right)^2$ (1)

1.2.2. $(a^x - b^y)(a^x + b^y)$ (1)

1.3. Simplify fully : $\frac{3^x}{3^{x+1} - 3^{x-1}}$ (2)

1.4 If $x + \frac{1}{x} = 7$, determine the numerical value of $x^2 + \frac{1}{x^2}$. (2)

1.5. Factorise fully:

1.5.1. $\frac{1}{2}x^2 - 8y^2$ (2)

1.5.2. $7x^2 + 19xy - 6y^2$ (2)

1.6. Simplify fully : $\frac{x^3-27}{2x^2-11x+15} \div \frac{x^2+3x+9}{5-2x}$ (5)

1.7. Solve for x :

1.7.1. $x^{\frac{2}{3}} = 25$ (2)

1.7.2. $3 \cdot 2^{x+3} = \frac{1}{7}$ (3)

1.8. Given: $-3 \leq -x - \frac{1}{2} < 7$ (where $x \in \mathbb{R}$)

1.8.1. Solve for x . (2)

1.8.2. Write your answer to QUESTION 1.8.1. in interval notation. (1)

[31]

QUESTION 2 (Start at the top of a new side of a page)

2.1.1. Given the following linear number pattern : $6; 2; -2; \dots; -294$

- (a) Determine the general term of the number pattern. Simplify your answer. (2)
- (b) How many terms are in this number pattern ? (2)

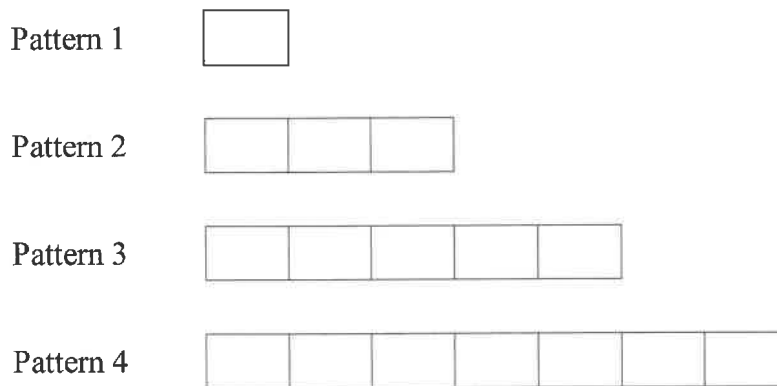
2.1.2. Now, consider the sequence : $30; 6; 30; 2; 30; -2; \dots$

For this sequence, determine the following terms :

- (a) T_{99} (1)
- (b) T_{100} (2)

2.2. Given the linear number pattern : $3x + 1; 2x; 3x - 7; \dots$
Calculate the value of x . (2)

2.3. Consider the following arrangement of blocks :

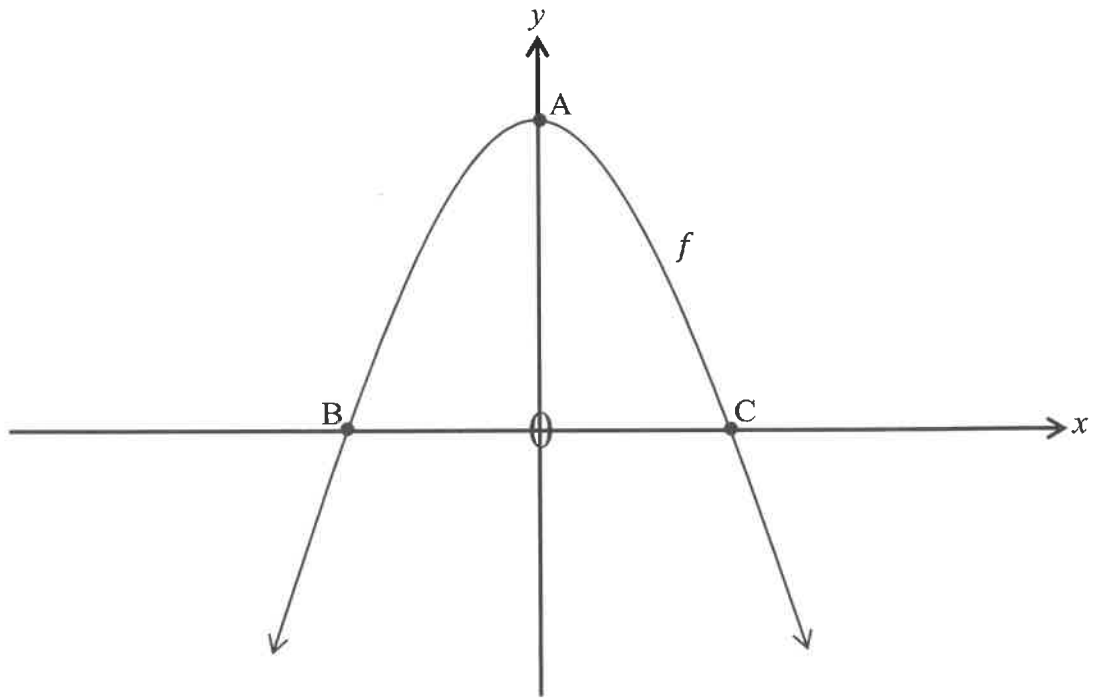


- 2.3.1. How many blocks will there be in Pattern 30 ? (2)
- 2.3.2. How many blocks are there in total for :
 - (a) Patterns 1 to 4 ? (1)
 - (b) Patterns 1 to 30 ? (2)

[14]

QUESTION 3 (Start at the top of a new side of a page)

3. The graph of $f(x) = -3x^2 + 8$ is shown below :



- 3.1. State the range of f . (1)
- 3.2. Calculate the distance from B to C. (2)
- 3.3. Write down the equation of the axis of symmetry of f . (1)
- 3.4. What is the maximum value of $2^{f(x)}$? (1)
- 3.5. Write down the value(s) of x for which f is an increasing function. (1)
- 3.6. Determine the equation of h , the reflection of f in the x -axis, in y -form. (1)

[7]

QUESTION 4 (Start at the top of a new side of a page)

4.1. On separate sets of axes, sketch the graphs of :

4.1.1. $3x + 4y = 0$ (3)

4.1.2. $y = -2^x + 8$ (4)

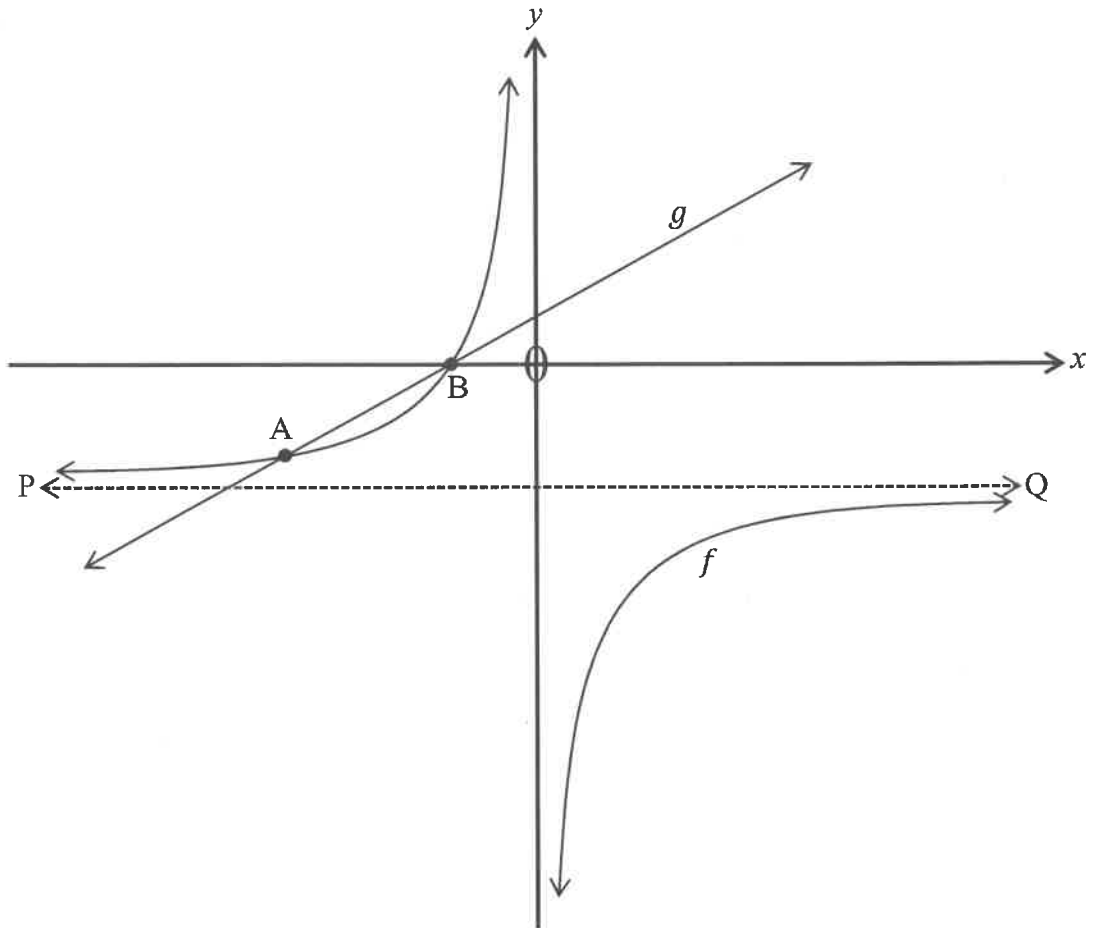
clearly showing ALL relevant details on the sketch.

4.2. If $A(-4; 33)$ is a point on the graph of $f(x) = 8b^x - 7\frac{1}{2}$, calculate the value of b , showing all working out. (4)

[11]

QUESTION 5 (Start at the top of a new side of a page)

5. The graphs of $f(x) = \frac{k}{x} + q$ and $g(x) = mx + c$ are shown below. The two graphs intersect at $A(-4; -3)$ and $B(-2; 0)$. PQ is the horizontal asymptote of f .



- 5.1. Calculate the values of k and q , showing that they will be -12 and -6 respectively. (4)
- 5.2. For f , write down the
- 5.2.1. domain (1)
- 5.2.2. equation of the axis of symmetry that has a negative gradient. (1)
- 5.3. f is reflected in the line PQ to become h . Determine the equation of h in y -form. You may leave your answer in terms of k and q or the values from (5.1). (1)
- 5.4. Use the graphs to solve for x , showing ALL relevant working out :
- 5.4.1. $g(x) \geq 0$ (1)
- 5.4.2. $g - f \geq 0$ (2)
- 5.4.3. $mx^2 + cx \leq 0$ (2)

[12]

QUESTION 6 (Start at the top of a new side of a page)

6.1. Asavela wants to buy a laptop at the value of R21 000 from Tech City.

The deal involves a hire purchase agreement from Tech City that has the following terms and conditions :

- 10 % cash deposit
- Interest of 18 % p.a.
- A monthly insurance fee of R 345,00
- Monthly repayments over 3 years

Calculate Asavela's monthly repayments.

(5)

6.2. Thando invests his inheritance of R250 000 into an investment account which pays interest of 6,7% per annum compounded monthly.

After 2 years he withdraws R120 000 in order pay for a car.

How much money will Thando have in his investment account 5 years after his initial investment of R 250 000 ?

(4)

[9]

QUESTION 7 (Start at the top of a new side of a page)

7.1 For two events A and B, it is given that :

- $P(A) = 0,38$
- $P(B') = 0,55$
- $P(A \text{ or } B) = 0,66$

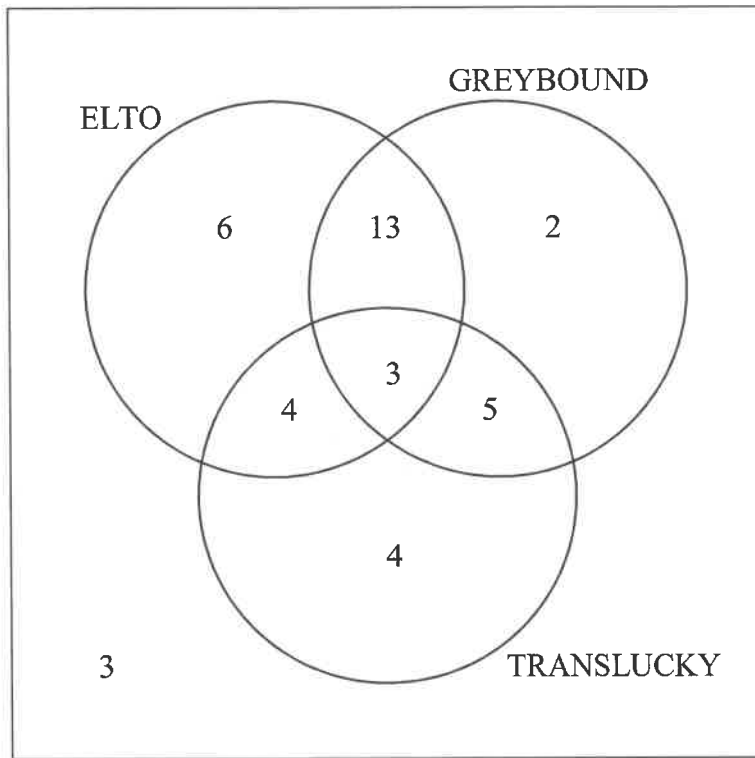
7.1.1 Calculate the following probabilities :

- (a) $P(B)$ (2)
- (b) $P(A \text{ and } B)$ (2)
- (c) $P(B \text{ only})$ (2)

7.1.2 Are events A and B mutually exclusive ? Justify your answer. (2)

7.2 A group of 40 people was asked which bus company they liked to travel with : Elto, Greybound or Translucky. The following Venn diagram represents their responses.

$$u = 40$$



How many people liked travelling with :

- 7.2.1 all three bus companies ? (1)
- 7.2.2 Translucky and Elto ? (1)
- 7.2.3 Greybound or Translucky ? (1)
- 7.2.4 only one of the bus companies ? (2)
- 7.2.5 Elto and Greybound, but not Translucky ? (1)

7.3 Calculate the probability that a randomly chosen person liked to travel with at least two of the bus companies ? (2)

[16]

TOTAL	100
--------------	------------