HILLCREST HIGH SCHOOL

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INTERNAL ASSESSMENT

GRADE 11

MATHEMATICS P1

NOVEMBER 2022

MARKS : **150** **TIME : 3 Hours**

NAME : _____

Circle or Highlight your teacher

ALBOROUGH	WOODROW (E)	VICTOR (M)	REUBEN

This question paper consists of 21 pages and 1 information sheet.

Question	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Total
Total	26	14	7	8	13	13	8	25	15	9	4	8	150
Mark													
Sign													

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of **12** questions and 21 pages.
2. Read the questions carefully.
3. Answer ALL the questions.
4. Number your answers exactly as the questions are numbered.
5. Clearly show ALL calculations, diagrams, graphs, etc. which you have used in determining your answers.
6. Answers only will NOT necessarily be awarded full marks.
7. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
8. If necessary, round off answers correct to TWO decimal places, unless stated otherwise.
9. Diagrams are NOT necessarily drawn to scale.
10. Write neatly and legibly.
11. An information sheet with formulae is included below.

INFORMATION SHEET: MATHEMATICS

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

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

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

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

In ΔABC: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

$a^2 = b^2 + c^2 - 2bc.\cos A$ $\quad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$\text{area } \Delta ABC = \frac{1}{2}ab.\sin C$ $\quad P(A) = \frac{n(A)}{n(S)}$

QUESTION 1

1.1 Solve for x:

1.1.1 $\frac{1}{2}x(2x-1)=0$ (2)

1.1.2 $3x^2-4x+5=11$ (Correct to TWO decimal places) (4)

1.1.3 $\sqrt{7-2x}+1=2x$ (5)

1.1.4 $-4x+2x^2\leq 0$ (3)

1.1.5 $2 \times 3^x = 162$ (2)

1.2 Solve the following equations simultaneously:

$$y = 2x - 5 \quad \text{and} \quad x^2 + xy - 2y^2 = 0$$ (6)

1.3 The volume of a box with a rectangular base is 3 072 cm^3. The lengths of the sides are x, $2x$, and $3x$ respectively. Calculate the length of the shortest side. (4)

[26]

QUESTION 2

2.1 Simplify the following, **without using a calculator**:

2.1.1 $\left(\frac{81}{16}\right)^{-\frac{1}{4}}$ (2)

2.1.2 $\frac{\left(\sqrt{3a}-1\right)\left(\sqrt{3a}+1\right)}{3a-x^0}$ (3)

2.1.3 $\sqrt{45}\left(\sqrt{100+25}-\sqrt{20}\right)$ (4)

2.2 Simplify: $\frac{8^{2n+1}.16^{1-n}}{4^{n+1}}$ (3)

2.3 WITHOUT solving, determine the nature of the roots of: $2x^2 - 4x + 3 = 0$ (2)

[14]

QUESTION 3

3.1 Rationalise the denominator and simplify fully: $\frac{2+\sqrt{3}}{2-\sqrt{3}}$ (3)

3.2 Solve for x if: $2^x = \frac{15.5^x - 5^x}{5.5^x + 2.5^x}$ (4)

[7]

QUESTION 4

Consider the following pattern of numbers: $-7\ ;\ -3\ ;\ 1\ ;\ 5\ ;\ ...$

4.1 Write down the next two numbers in the pattern. (1)

4.2 Determine a formula for the n^{th} term. (2)

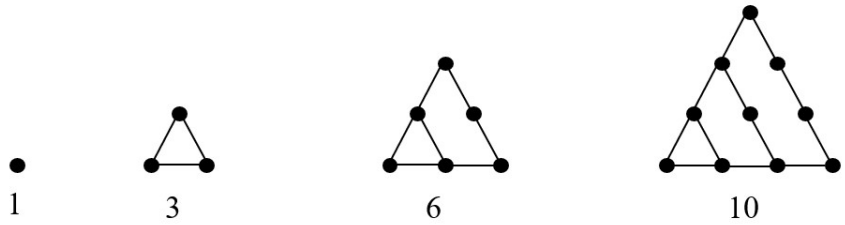
4.3 Determine the value of the 100^{th} term. (2)

4.4 Is it possible for one of the terms to have a value of 512? Show all working to support your answer. (3)

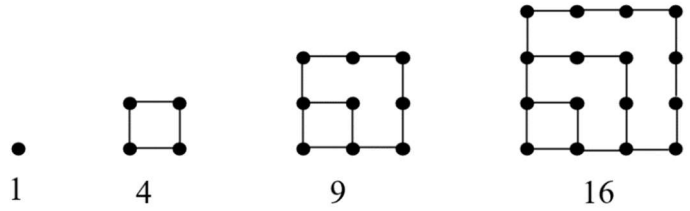
[8]

QUESTION 5

Consider the triangular numbers shown below:



Now consider the square numbers:



5.1 Show that both the triangular and square numbers form a quadratic sequence. (3)

5.2 Determine the general term for the triangular numbers. (4)

5.3 Is 105 a number in the triangular number sequence? Show the necessary calculations to support your answer. (4)

5.4 Using the above patterns as hints, write down the 3rd pentagonal number. (2)

[13]

QUESTION 6

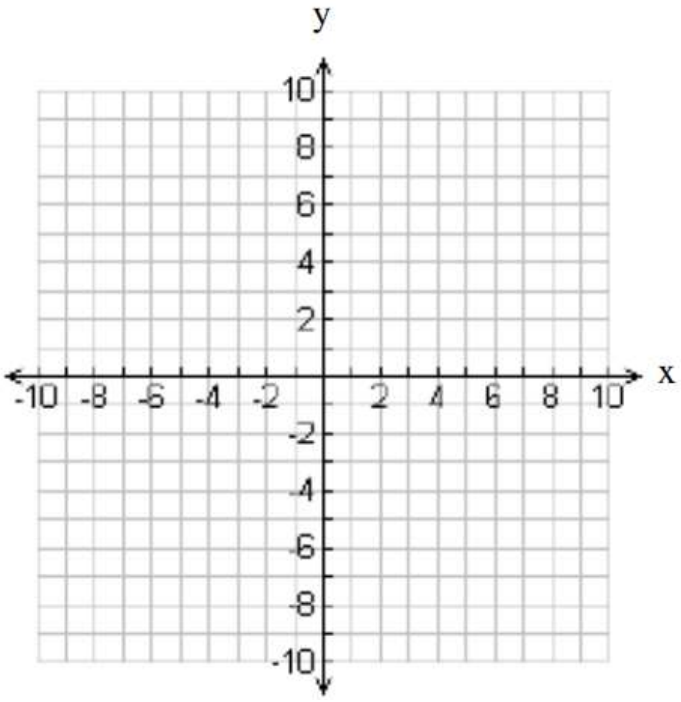
Given: $f(x) = \dfrac{-4}{x-1} - 2$

6.1 Write down the equations of the asymptotes of f. (2)

6.2 Determine the y-intercept of f. (1)

6.3 Determine the x-intercept of f. (2)

6.4 Sketch the graph of f. Show clearly ALL the intercepts with the axes and the asymptotes. (3)



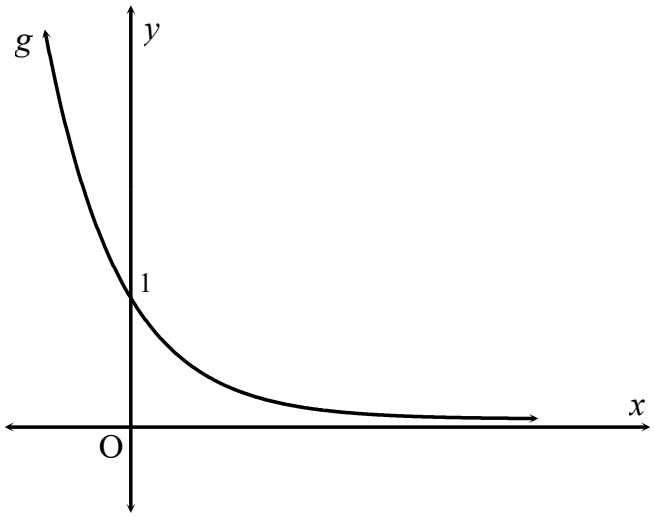
6.5 Determine the equation of the axis of symmetry of f, which will intersect the graph of f. (3)

6.6 The graph of f is reflected about the x-axis to obtain the graph of h. Write down the range of h. (2)

[13]

QUESTION 7

The diagram below shows the graph of $g(x)=\left(\frac{1}{3}\right)^x$.



7.1 Write down the domain of g. (1)

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_____

7.2 Write down the equation of the asymptote of g. (1)

_____

_____

7.3 Write down the equation of $h(x)$ if $h(x)=g(x-2)$. (2)

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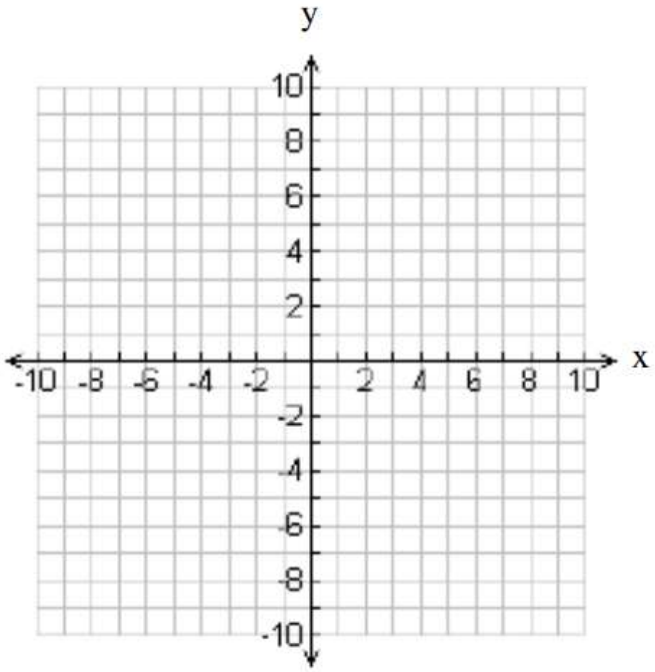
7.4 Sketch the graph of $g(x-2)$. Show clearly ALL the intercepts with the axes and one additional point. (3)



7.5 Write down the equation of f, the reflection of g about the y-axis. (1)

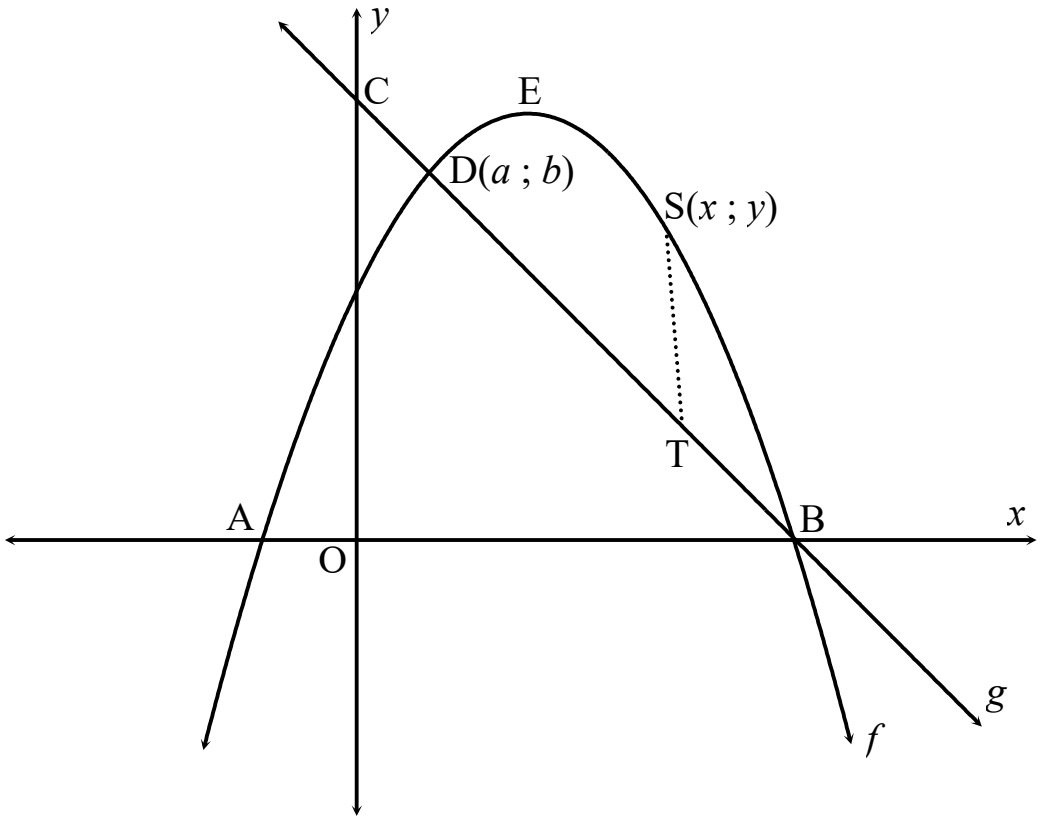
_____

_____

[8]

QUESTION 8

Sketched below are the graphs of $f(x) = -x^2 + 7x + 8$ and $g(x) = -3x + 24$.
f and g intersect at B and D. A and B are the x-intercepts of f and C is the y-intercept of g. E is the coordinate of the turning point of f.



8.1 Determine the coordinates of A and B. (4)

8.2 Calculate a , the x-coordinate of D. (4)

8.3 Calculate the coordinates of E , the turning point of f. (4)

8.4 Write down the domain and range of f. (4)

8.5 S(x ; y) is a point on the graph of f, where $a \leq x \leq 8$. ST is drawn parallel to the y-axis with T on the graph of g. Determine the length of ST in terms if x. (3)

8.6 Calculate the maximum length of ST. (3)

8.7 For which values of x is $f(x).g(x) < 0$ (2)

8.8 Determine the values of x for which f is decreasing. (1)

[25]

QUESTION 9

9.1 An amount of money is invested and after 10 years (interest compounded annually), its value is exactly doubled. Calculate the interest rate paid. (3)

9.2 Sarah invests R85 000. She is quoted a nominal interest rate of 8,2% per annum compounded monthly.

9.2.1 Calculate the effective interest rate per annum correct to THREE decimal places. (3)

9.2.2 Calculate the value of Sarah's investment if she invested the money for 10 years. (3)

9.3 Hannah opens a savings account. She deposits R6 000 immediately and a further R8 000 five years later. Two years after the deposit of R8 000 she withdraws R12 000.

Interest is calculated at 9% p.a. compounded annually for the first 2 years and 8,5% p.a. compounded quarterly thereafter.

9.3.1 Calculate how much Hannah had in her savings account 1 year after the initial deposit was made. (2)

9.3.2 How much will the investment be worth 10 years after the initial deposit was made? (4)

[15]

QUESTION 10

A total of 300 boys from two different schools, X and Y, are questioned about their winter sport. The results are summarized in the table below:

SPORT	SCHOOL X	SCHOOL Y	TOTAL
Rugby	***a***	50	100
Soccer	30	***b***	***c***
Hockey	20	***d***	30
None	***e***	10	110
TOTAL	200	***f***	300

10.1 Calculate the values of the letters marked a to f. (6)

10.2 Is a boy's preference for playing sport independent of the school he attends? Support your answer with calculations. (3)

[9]

QUESTION 11

The probability that event A will occur is 0,3 and the probability that event B will occur is 0,4. The probability that A or B will occur is 0,6.

11.1 What is the probability that A and B will occur. (2)

_____

_____

_____

_____

11.2 Are the events mutually exclusive? Give a reason for your answer. (2)

_____

_____

_____

_____

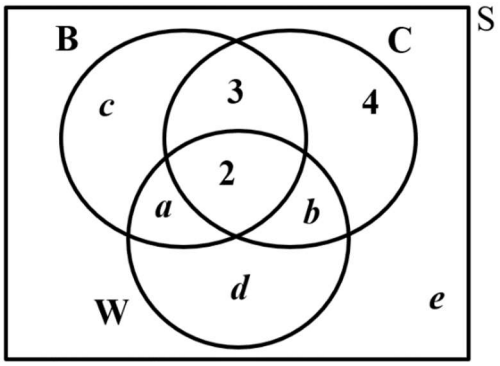
[4]

QUESTION 12

A group of 33 learners was surveyed at a school. The following information from the survey is given:

- 2 learners play basketball, cricket and water-polo
- 5 learners play basketball and cricket
- 7 learners play basketball and water-polo
- 6 learners play cricket and water-polo
- A total of 18 learners play basketball
- A total of 12 learners play water-polo
- 4 learners play cricket only

A Venn Diagram representing the survey results is given below.



12.1 Use the information provided to determine the values of ***a, b, c, d*** and ***e.*** (5)

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_____

12.2 How many of these learners do not play any of the sports on the survey? (1)

_____

12.3 Write down the probability that a learner selected at random from this sample plays basketball ONLY. (1)

_____

12.4 Determine the probability that a learner selected at random from this sample plays basketball and cricket. (1)

_____

[8]

TOTAL 150