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

Hudson Park High School



GRADE 11  
MATHEMATICS  
NOVEMBER 2021 FINAL ASSESSMENT PAPER 1

Marks : 

150
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Time : 3 Hours Date : 26 November 2021  
Exam : PHL Moderator : SLT

**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. **NB** **START EACH QUESTION AT THE TOP OF A NEW PAGE. LEAVE 2 LINES OPEN BETWEEN EACH OF YOUR ANSWERS.**
4. **NB** **Fill in the details requested on the front of the question paper and hand in your submission in the following manner :**
  - Question paper (on top)
  - Answer pages in order (below).
  - Please do NOT staple question paper and answer scripts 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. Round off answers to 2 decimal places, where necessary, unless instructed otherwise.
8. If (Euclidean) Geometric statements are made, reasons must be stated appro

## QUESTION 1

1.1 Solve for  $x$  :

1.1.1  $2x(3 - x) = 0$  (2)

1.1.2  $5x^2 - 4x = 2$  (correct to TWO decimal places) (4)

1.1.3  $\sqrt{7 + 3x} + 2x = 0$  (4)

1.1.4  $x^2 - 2x - 15 \leq 0$  (3)

1.1.5  $3x^{-2} - 10 = 0$  (4)

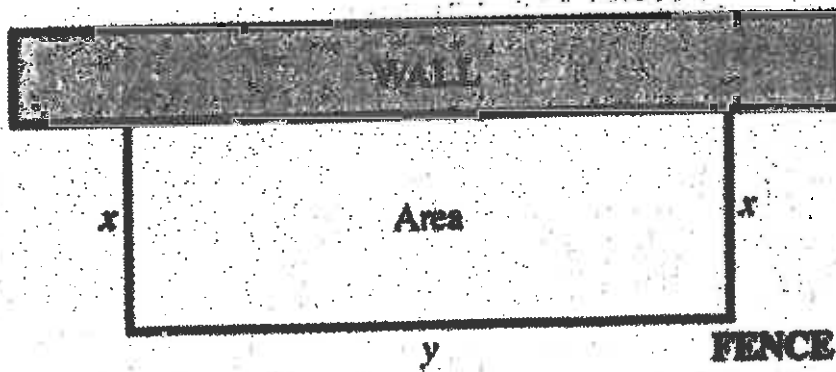
1.1.6  $3^{x+2} + 3^{2-x} = 82$  (5)

1.2 Solve for  $x$  and  $y$  simultaneously

$$4x^2 - 5xy = 3 - 6y \text{ and } x - 2y = 3 \quad (6)$$

1.3 For which values of  $x$  will  $\sqrt{x(5-x)} - 4$  be non-real? (5)

1.4 A rectangular area is enclosed between a wall and a U- shaped fence as shown below



The total length of the fence (not including the wall) is 60 m.

1.4.1 Determine an expression for  $y$  in terms of  $x$ . (1)

1.4.2 Show that the area between the wall and the fence is given by  $A = -2x^2 + 60x$  (1)

1.4.3 Determine the maximum possible area that can be enclosed between the wall and the fence. (2)

[37]

## QUESTION 2

**CALCULATORS MAY NOT BE USED IN THIS QUESTION.**

Simplify fully

2.1  $\sqrt{18} - \sqrt{50} - \sqrt{32}$  (3)

2.2  $\frac{3^{2n} - 9^{n+1}}{4 \cdot 9^n + 3^{2n}}$  (3)

2.3  $(0,125)^{\frac{2}{3}}$  (3)

2.4  $x^{\frac{2}{5}} (4x^{-\frac{2}{5}} - 8x^{\frac{5}{2}})$  (2)

2.5  $(\sqrt{3+a-2\sqrt{a}})^2 - (\sqrt{a}-1)^2$  (3)

[ 14 ]

## QUESTION 3

3.1 Given : 4; 7;10; 13; 16; .....

Determine the :

3.1.1 next term. (1)

3.1.2 general term ( $T_n$ ) . (2)

3.1.3 20<sup>th</sup> term. (1)

3.1.4 which term in the number pattern will be equal to 301. (2)

3.2 The first, third and fifth terms of a linear number pattern are

$$x - 1; 2x - 3; x + 6$$

3.2.1 Determine the value of  $x$ , showing that it will be  $\frac{11}{2}$ . (3)

3.2.2 Calculate the second term of the sequence. (2)

[11]

#### QUESTION 4

- 4.1 Given the quadratic number pattern: 25; 48; 69; 88; .....
- 4.1.1 Determine the expression for  $T_n$ , the general term of the number pattern. (4)
- 4.1.2 The sum of two consecutive terms in the given number pattern is  $-21503$ . Calculate the positions, in the number pattern, of these two terms. (5)
- 4.2 Given are the first three first differences of a quadratic sequence:  
2; 6; 10; ...  
Determine an expression for  $T_n$ , the general term of the quadratic sequence, if it is also known that for the quadratic sequence  $T_{73} = 10363$ . (4)

[13]

#### QUESTION 5

- 5 Given  $f(x) = \frac{a}{x-1} + 3$ , where  $a \in \mathbb{Z}$
- 5.1 Write down the equations of asymptotes of  $f$ . (2)
- 5.2 Determine the  $x$  and  $y$  intercepts in terms of  $a$ . (3)
- 5.3 Given that  $a = -1$ , draw a neatsketch of  $f$ , clearly showing all the asymptotes and intercepts with the axes. (4)
- 5.4 The the graph of  $f(x)$  is shifted 3 units horizontally to the left and 2 units vertically downwards. Write down the new equation of  $f$  in terms of  $a$  and in  $y - form$ . (2)

[11]

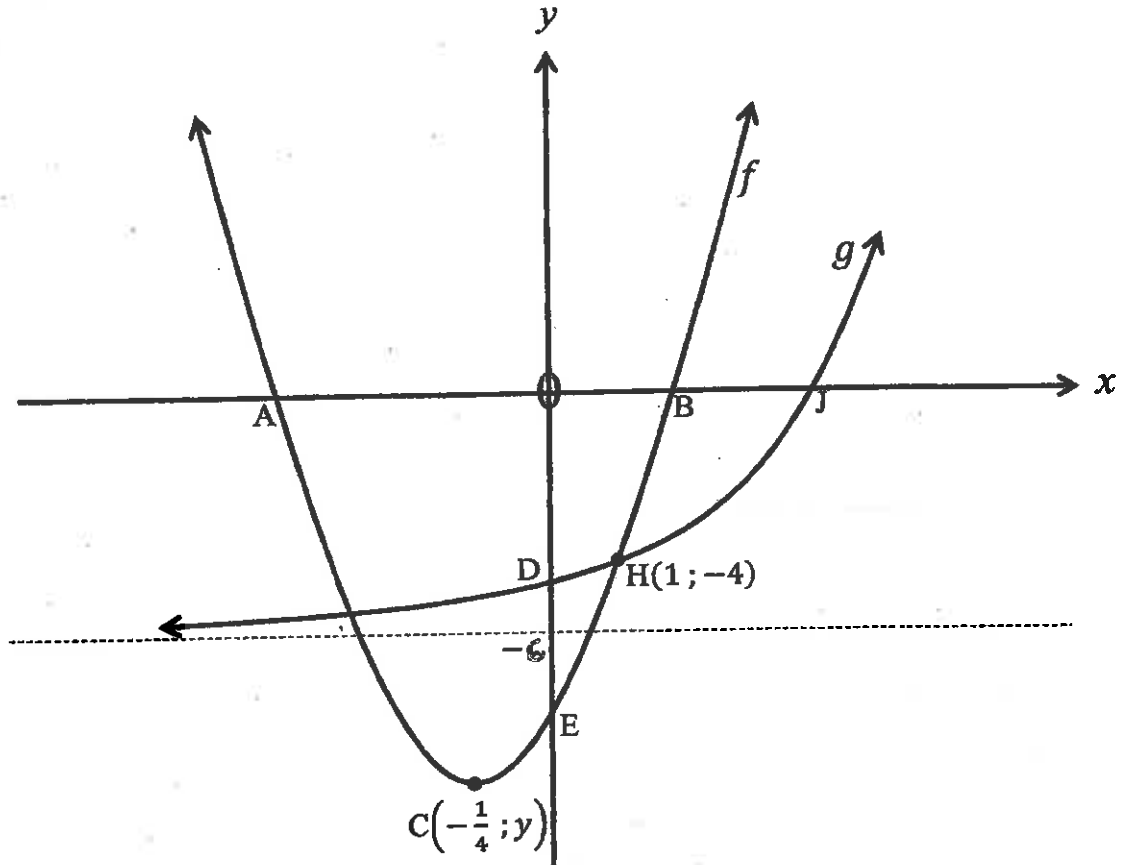
#### QUESTION 6

- 6 Determine the equation of a quadratic function  $f$ , if it is given that :
- Range of  $f$  is  $y \leq 8$
  - Axis of symmetry of  $f$  is  $x = -1$
  - The  $y - intercept$  of  $f$  is  $y = 6$
- Leave the answer in the form  $y = ax^2 + bx + c$ . (4)

### QUESTION 7

The diagram below shows the graphs of  $f(x) = ax^2 + bx + c$  and  $g(x) = b^x + q$ .

A and B are the  $x$ -intercepts, E is the  $y$ -intercept and  $C(-\frac{1}{4}; y)$  is the turning point of  $f$ . J is the  $x$ -intercept and D is the  $y$ -intercept of  $g$ .  $y = -6$  is the equation of the asymptote of  $g$ .  $H(1; -4)$  is one of the points of intersection of  $f$  and  $g$ .

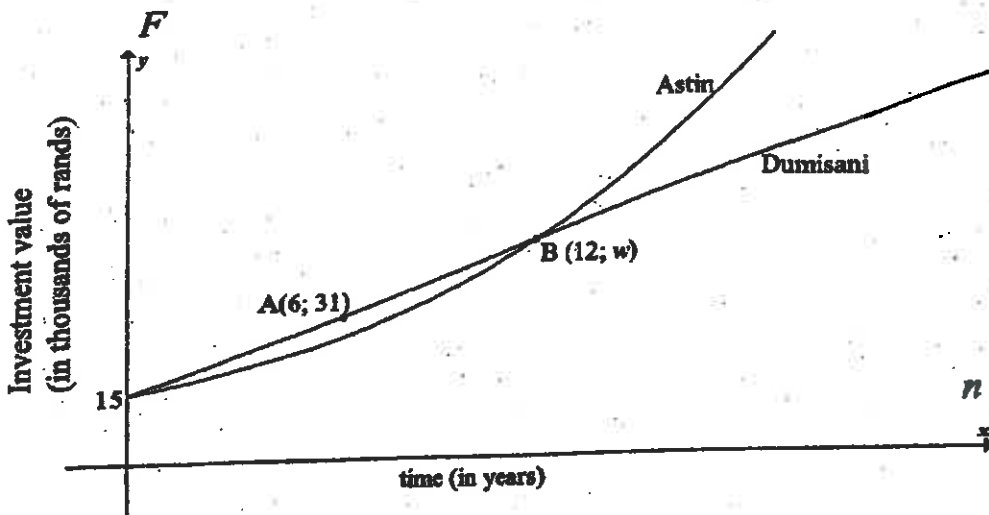


- 7.1 Write down the value of  $q$ . (1)
- 7.2 Determine the coordinates of D. (1)
- 7.3 Calculate the values of  $a$ ,  $b$  and  $c$  showing that they will be  
 $a = 4$ ,  $b = 2$  and  $c = -10$  (4)
- 7.4 Use the graph of  $g$  to :
- 7.4.1 calculate the coordinates of J. (3)
- 7.4.2 solve for  $x$  for which  $x \cdot g(x) \geq 0$  (2)
- 7.5 For which value(s) of  $k$  will  $4x^2 + 2x = -k$  have 2 distinct  
 negative real roots. (2)
- 7.6 Calculate the value(s) of  $m$  if  $y = mx - 14$  is a tangent to  $f$ . (5)

[18]

## QUESTION 8

- 8.1 The graph below represents the growth of two investments, one belonging to Dumisani and the other to Astin. Both investments earn interest annually (only).



- 8.1.1 What is the value of both initial investments. (1)
- 8.1.2 Does Dumisani's investment earn simple or compound interest? (1)
- 8.1.3 Determine the interest rate on Dumisani's investment. (2)
- 8.1.4 Hence, or otherwise, calculate the interest rate on Astin's investment. (4)
- 8.2 Calculate the effective interest rate per annum if an investment earns 8,5% interest per annum compounded half yearly. (2)
- 8.3 A company bought a new machine for R500 000. The machine depreciates according to the reducing balance method at a yearly rate of 12,8% per annum. After  $n$  years the machine has a book value of R331 527. Calculate the value of  $n$ . (3)
- 8.4 Mrs PHL takes out a loan of R550 000 in order to finance her business. After four years she expands her business and borrows a further R560 000. Three years after this she pays off the debt in one payment. The interest rate of the loan was 18% per annum compounded quarterly. Determine how much she owed. (4)

[17]

## QUESTION 9

9.1 The probability of events A and B occurring are denoted by  $P(A)$  and  $P(B)$  respectively

For two events A and B it is given that :

- $P(B') = 0,28$
- $P(B) = 3 P(A)$
- $P(A \text{ or } B) = 0,96$

Determine:

9.1.1  $P(B)$  (2)

9.1.2  $P(A)$  (2)

9.1.3 whether A and B are mutually exclusive or not. Justify your answer. (3)

9.2 A survey was conducted among 100 boys and 60 girls to determine how many of them watched television during the examination period. Their responses were shown in the partially completed table below.

	Watched TV during exams.	Did not watch TV during exams	Totals
Male	80	$a$	
Female	48	12	
Total	$b$	32	160

9.2.1 Calculate the values of  $a$  and  $b$ . (2)

9.2.2 If a learner who participated in this survey is chosen at random, what is the probability that the learner :

(a) Watched TV in the period during which exams were written? (2)

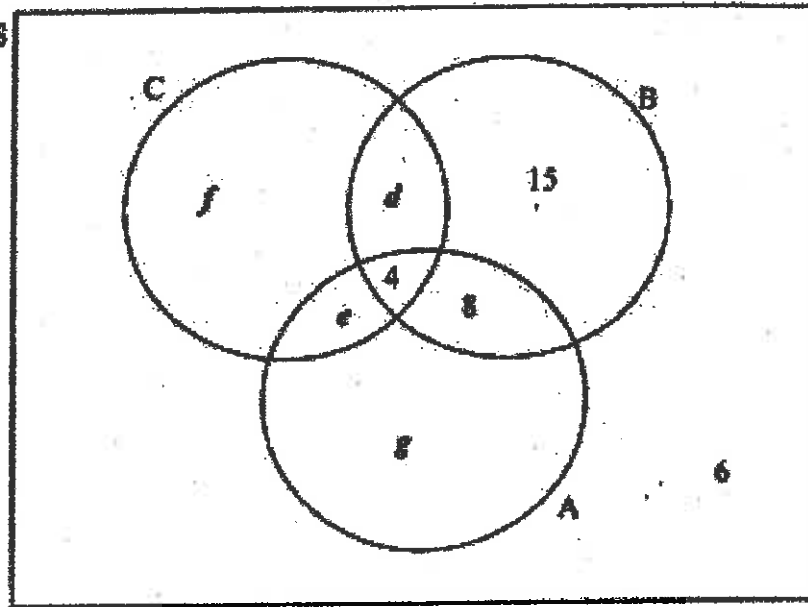
(b) Is a male and watched TV during the examination period? (1)

9.2.3 Are the events of "being a male" and "watched TV during exams" dependent or independent events? (4)

9.3 54 Countries were surveyed about the methods they use to measure an alcohol level in a person. Data is summarised below.

- 4 countries uses all the three methods
- 9 use methods B and C
- 8 use methods A and C
- 21 use method A
- 32 use method B
- 20 use method C
- 6 use none of these methods.

Below is a partially completed Venn diagram representing the above information.



9.3.1 Using the given information and the Venn diagram determine the values of

$d$ ,  $e$ ,  $f$  and  $g$ . State your answers clearly.

(4)

9.3.2 For randomly selected country, calculate:

(a)  $P(A \text{ and } B \text{ and } C)$ .

(1)

(b)  $P(C \text{ only})$ .

(1)

(c)  $P(A \text{ and } B, \text{ but not } C)$ .

(1)

(d)  $P(A \cap C')$ .

(1)

(e)  $P(\text{that a country uses exactly two methods})$ .

(1)

[25]

TOTAL 150