GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

GAUTENG DEPARTMENT OF EDUCATION

PROVINCIAL EXAMINATION

NOVEMBER 2021

GRADE 11

MATHEMATICS
(PAPER 1)

TIME: 3 hours

MARKS: 150

9 pages

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. This question paper consists of 10 questions.
3. Answer the questions according to the instructions of each question.
4. Clearly show ALL calculations, diagrams, graphs, et cetera, which you used in determining the answers.
5. Answers only will NOT necessarily be awarded full marks.
6. Use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. If necessary, answers should be rounded-off to TWO decimal places, unless stated otherwise.
8. Diagrams are NOT necessarily drawn to scale.
9. Number the questions correctly according to the numbering system used in the question paper.
10. Write neatly and legibly.

QUESTION 1

1.1 Given: $P = \frac{(x+2)(2x-1)}{(3-x)}$

Determine value(s) of x for which P is:

1.1.1 Equal to zero (2)

1.1.2 Undefined (1)

1.2 Solve for x:

1.2.1 $2x^2 - 3x - 4 = 0$ (correct to TWO decimal places) (3)

1.2.2 $(2x+3)(3-x) > 4$ (5)

1.2.3 $\sqrt{x+2} + x = 4$ (5)

1.2.4 $2^{2x+1} - 3(2^{2x-1}) + 4^x = 12$ (4)

1.3 Given: $f(x) = x^2 + 8x + 16$

1.3.1 Calculate $f(2)$. (1)

1.3.2 Determine values of x for which $f(x) > 0$. (3)

1.4 Solve for x and y :

$y - 2x + 1 = 0$ and $xy = 2y + x^2 + 3x - 10$ (6)

1.5 For any real value of p, prove that the roots of:

$(xp)^2 + 3 = 2x(p - x)$ are non-real. (4)

[34]

QUESTION 2

2.1 Simplify WITHOUT the use of a calculator.

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

2.1.2 $\frac{9^x + 3^{2x+1}}{18^x.2^{-x}}$ (3)

2.1.3 $\sqrt{10 - 3^{2x}} = 3^x - 2$ (5)

2.2 Verify, WITHOUT using a calculator, that:

$3\sqrt{2a} - 2\sqrt{3a} = \sqrt{30a - 12\sqrt{6}a}$ (4)

[14]

QUESTION 3

3.1 The table below indicates the minimum number of matches required to construct a triangle.

Number of triangles	1	2	3	4	5
Number of matches	3	5	7	**A**	**B**

3.1.1 Write down the numerical values of **A** and **B**. (2)

3.1.2 Determine a formula to represent the general term T_n of the pattern. (2)

3.1.3 How many matches are required to create 100 triangles? (2)

3.1.4 How many triangles can be made with 305 matches? (2)

3.2 The first 3 terms of a linear number pattern are:

$2x^2 + 5x + 5$; $2x^2 + 5x + 2$ and $3x^2 + 4x - 3$

Determine the possible value(s) of x. (4)

[12]

QUESTION 4

The first four terms of a quadratic number pattern are:

$$-1 \ ; \ x \ ; \ 3 \ ; \ x+8 \ldots$$

4.1 Calculate the value(s) of x. (4)

4.2 Show that the n^{th} term of the pattern can be written as $T_n = (n-1)^2 - 1$. (6)

4.3 Calculate the value of the 65th term of the pattern. (2)

4.4 What is the value of the FIRST term of the pattern that is greater than 9 800? (4)

[16]

QUESTION 5

5.1 A school purchased a printer for R250 000.

- The printer depreciates at 10% p.a. on a reducing balance method.
- The printer will be replaced after 5 years.
- The inflation rate during this period is 8% per annum.

5.1.1 Calculate the book value of the printer at the end of the 5 year period. (2)

5.1.2 Calculate the cost of a similar printer when the 5 year period expires. (2)

5.1.3 The school sells the used printer for 95% of its book value.

Calculate the amount of money that must be saved in order to have enough money to replace the printer in 5 years. (2)

5.2 A company has an investment account with Bank A which offers an effective interest rate of 12% per annum.

A competitor bank, Bank B, offers an interest rate of 11,5% p.a, compounded monthly.

5.2.1 Determine which bank offers the best interest rate. (3)

5.2.2 The company will invest with the bank offering the best interest rate.

The company invests money into a lump sum account that will accrue to R280 000 in 5 years.

After 2 years, the company experiences difficulty and withdraws R50 000 from the account.

Determine the minimum amount of money they would have to invest which would have accrued to R280 000. (5)

[14]

QUESTION 6

Given : $f(x)=\frac{3}{x+2}-1$

6.1 Calculate the value of k if $(k\ ;\ 2)$ is a point on f. (2)

6.2 Write down the equations of the horizontal and vertical asymptotes of f. (2)

6.3 Calculate the coordinates of the y-intercept of f. (1)

6.4 Calculate the coordinates of the x-intercept of f. (2)

6.5 Sketch the graph of f, clearly showing the asymptotes and the intercepts with the axes. (3)

6.6 ONE of the axes of symmetry of f has a negative gradient.

Determine the equation of this axis of symmetry. (2)

6.7 Determine the value(s) of x for which $\frac{3}{x+2}-1>-x-3$. (1)

6.8 The graph of f is transformed by a reflection over the x-axis followed by a translation 4 units in the positive x-direction.

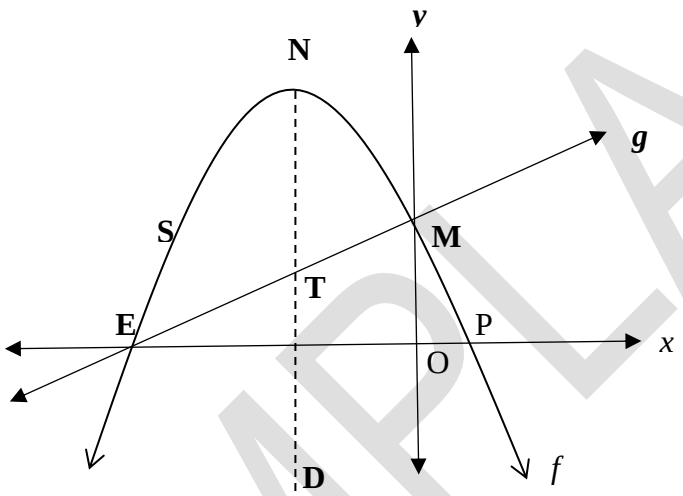
Determine the equation of this graph, in its simplest form. (3)

[16]

QUESTION 7

The graphs of $f(x) = -x^2 - 4x + 5$ and $g(x) = x + q$ are sketched below and display the following essential properties:

- Points E and P are the *x*-intercepts of f
- Point M is the *y*-intercept and point N is the turning point of f
- The dotted line ND is the axis of symmetry of f
- The graphs of f and g intersect at points E and M respectively
- Point T is the point of intersection of g with the axis of symmetry of f
- Points S and M are symmetrical with respect to the axis of symmetry of f



7.1 Write down the value of q. (Note to examiner: q NOT in GRAPH) (1)

7.2 Calculate the length of line segment **EP**. (3)

7.3 Determine the coordinates of point **N**. (2)

7.4 Determine the equation of a straight line *h* which is perpendicular to ***g***, passing through point **N**. (3)

7.5 Calculate the average gradient between points **M** and **N**. (2)

7.6 Calculate the length of line **NT**. (3)

7.7 Determine the coordinates of point **S**. (3)

7.8 For which value(s) of ***x*** will:

7.8.1 $f(x) - g(x) = 0$ (2)

7.8.2 $f(x).g(x) < 0$ (1)

[20]

QUESTION 8

Consider die function: $f(x) = 3.2^x - 6$

8.1 Calculate the coordinates of the *y*-intercept of the graph of f. (1)

8.2 Calculate the coordinates of the *x*-intercept of the graph of f. (2)

8.3 Sketch the graph of f. Clearly show ALL asymptotes and intercepts with the axes. (3)

8.4 Write down the range of f. (1)
[7]

QUESTION 9

A sports director at a school analysed data to determine how many learners play sports and what the gender of each learner is. The data is represented in the table below.

	Does not play sport	**Plays sport**	**Total**
Male	51	69	120
Female	49	67	116
Total	100	136	236

9.1 Determine the probability that a learner, selected at random is:

9.1.1 Male (2)

9.1.2 Female and plays sport (2)

9.2 Are the events 'Male' and 'Does not play sport' mutually exclusive events?

Use the values in the table to justify your answer. (2)

9.3 Are the events 'Male' and 'Does not play sport' independent events?

Show ALL calculations to support your answer. (4)
[10]

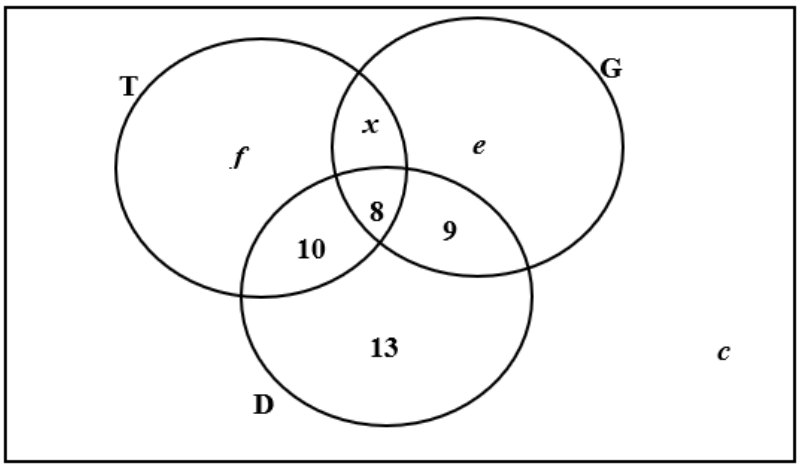
QUESTION 10

A survey regarding the most read magazine(s) was conducted among 84 high school girls. Three magazines, namely Glamour (G), Drum (D) and Teen Vogue (T) were used for the survey.

The results were as follows:

- 41 read Teen Vogue (T)
- 34 read Glamour (G)
- 40 read Drum (D)
- 18 read Teen Vogue and Drum
- 8 read all three magazines
- 75 read at least one of the magazines
- (G and D) = 17

The Venn diagram below demonstrates the above information.



10.1 Write down the value of c. (1)

10.2 Express f in terms of x. (2)

10.3 If $e = 17 - x$, determine the numerical value of x. (4)

[7]

TOTAL: 150

END