GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

PROVINCIAL EXAMINATION

NOVEMBER 2023

GRADE 10

MATHEMATICS

PAPER 1

TIME: **2 hours**

MARKS: **100**

7 pages + an information sheet

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. This question paper consists of SIX questions.
3. Present your answers according to the instructions of each question.
4. Clearly show ALL calculations, diagrams, graphs et cetera which were 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. Where 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 Determine, **without the use of a calculator**, between which TWO integers $\sqrt{112}$ lies. (2)

1.2 Simplify fully:

1.2.1 $(x-1+x^2)(3-x)$ (3)

1.2.2 $\frac{x+1}{2}-\frac{1-x}{17}+\frac{7}{34}$ (3)

1.2.3 $4^{x+3}.8^{1-x}.2^{x-9}$ (3)

1.3 Factorise the following expressions fully:

1.3.1 $x^3 - 10x^2 + 21x$ (2)

1.3.2 $x^2 - z^2 + x + z$ (3)

1.4 Solve for x:

1.4.1 $(x - 3)(2 - x) = -2x$ (4)

1.4.2 $3^{3x-1} = 27^x - 18$ (4)

15 Solve for x where $x \in R$.

$-3 \leq \frac{2x-1}{3} < -1$ (3)

1.6 The sum of 3 consecutive integers is 39.

Determine, with the use of an equation, the three numbers. (3)

1.7 Solve simultaneously for x and k if:

$2x + 4k = 20$

$7x + 3k = 19$ (4)

[34]

QUESTION 2

Jamie bought a small business for R250 000. The business generated R1 000 in the 1st month and then generated a monthly income of R3 000 thereafter. Each month the money is deposited directly into an account so that his savings grow over time. (No interest is added.)

Commented [JdV1]: I inserted this sentence so that learners don't get confused with financial math

2.1 Complete the table below:

Month	Bank balance
1	R1 000
2	**(a)**
3	**(b)**
4	R10 000

(2)

2.2 How much money will there be in Jamie's account after *n* months? (2)

2.3 How long will it take Jamie to break-even (i.e. to get his initial investment back)? Give your answer in years. (4)

2.4 How many months (from the date of purchase) will it take Jamie to make a profit of R30 000? Give your answer in years and months. (2)

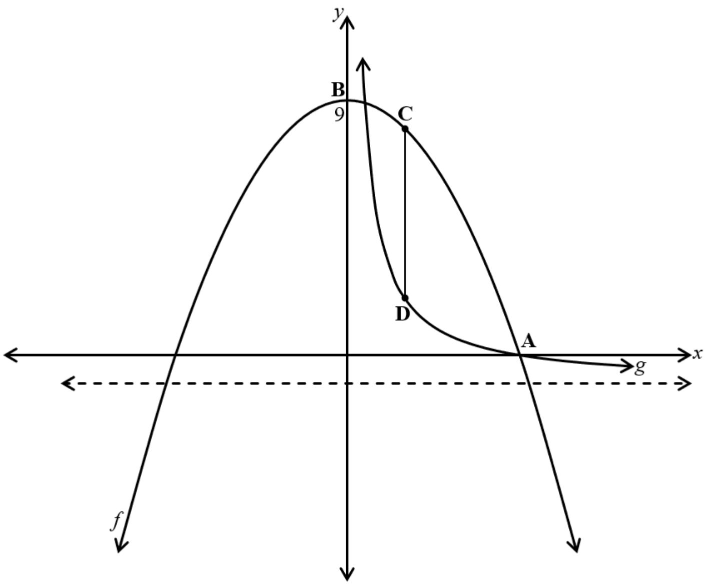
Commented [JdV2]: Put the above sentence here.

[10]

QUESTION 3

The graphs of $f(x) = ax^2 + q$ and $g(x) = \frac{3}{x} - 1$; $x > 0$ are drawn below.

A is the x-intercept and point of intersection of both graphs. B(0 ; 9) is the turning point of f and CD is a vertical line.



3.1 Write down the:

3.1.1 Range of f (1)

3.1.2 Domain of g (1)

3.1.3 Equation of the horizontal asymptote of g (1)

3.1.4 Value(s) of x such that f is decreasing (1)

3.2 Determine the values of a and q. (4)

3.3 If $h(x) = -f(x) - 3$, write down the:

3.3.1 Equation of h (2)

3.3.2 Coordinates of the turning point of h (1)

3.4 Write down the equation of the line of symmetry of g, which has a positive gradient. (2)

3.5 Calculate the length of CD if the equation of line CD is $x = 1$. (4)

3.6 Determine the value(s) of x such that $f(x) > x + 3$. (4)
[21]

QUESTION 4

Consider the exponential function: $t(x) = 2.2^{-x} - 4$

4.1 Write down the range of t. (1)

4.2 Calculate the:

4.2.1 x-intercept of t (2)

4.2.2 y-intercept of t (1)

4.3 Sketch the graph of t on a system of axes. Show clearly all intercepts with the axes and the asymptote. (3)

4.4 Describe the transformation of t to h, if $h(x) = 2.2^{x}$. (2)
[9]

QUESTION 5

Study the advertisement below.

Buy an iPhoneXX for only
R229 per month.
You have 24 months to pay.
No deposit is required.

5.1 Calculate the total amount to be paid over a period of 24 months. (2)

5.2 The monthly installment, quoted in the advertisement, is calculated on a hire purchase agreement which charges interest at 7,5% p.a. of the cash price of the cellphone.

Show that the price of the cellphone is R4 779,13. (2)

5.3 Calculate the total interest paid over a 24 month period if the cellphone is bought using this hire purchase agreement. (2)

5.4 The cost of the cellphone is subject to inflation and increases to a cash price of R5 100,00 after 2 years. Calculate the annual inflation rate as a percentage. (3)

5.5 The same cellphone is sold for £250 on amazon.uk.

Using the following exchange rate and calculate the price of the cellphone in rand on amazon.uk.

£1 : R 22,32

(2)
[11]

QUESTION 6

6.1 In a random experiment, A and B are two different events.

Suppose P(A) = 0,4, P(B) = k.

6.1.1 If P(A or B) = 0,6, for which value of k is A and B mutually exclusive? (2)

6.1.2 For which value of k is A and B complementary events? (2)

6.2 In a class of 60 learners, 8 learners take History(H), 41 learners take Mathematics(M) and 16 learners take neither of these two subjects.

6.2.1 Calculate the number of learners that do both History and Mathematics. (2)

6.2.2 Draw a Venn diagram to illustrate the above information. (4)

6.2.3 Determine:

(a) The probability of a learner taking History only (1)
(b) The probability that a learner does not take Mathematics (2)

6.2.4 The probability that a Mathematics learner is also a Science learner is 0,927.

Determine the number of learners that take Science. (2)
[15]

TOTAL: 100

END

Commented [JdV3]: Good question

INFORMATION SHEET

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

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

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

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

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

$f'(x) = \lim\limits_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$

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

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

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

In ΔABC: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$ $\quad$ $a^2 = b^2 + c^2 - 2bc.\cos A$

area $\Delta ABC = \dfrac{1}{2} ab.\sin C$

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

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

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

$\bar{x} = \dfrac{\sum fx}{n}$ $\quad$ $\sigma^2 = \dfrac{\sum\limits_{i=1}^{n}(x_i - \bar{x})^2}{n}$

$P(A) = \dfrac{n(A)}{n(S)}$ $\quad$ P(A or B) = P(A) + P(B) – P(A and B)

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