Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 11

NOVEMBER 2022

MATHEMATICS P1

MARKS: **150**

TIME: **3 hours**

This question paper consists of 8 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of TEN questions. Answer ALL the questions.

2. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answers.

3. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.

4. Answers only will not necessarily be awarded full marks.

5. If necessary, round off answers to TWO decimal places, unless stated otherwise.

6. Diagrams are NOT necessarily drawn to scale.

7. Number the answers correctly according to the numbering system used in this question paper.

8. Write neatly and legibly.

QUESTION 1

1.1 Solve for x:

1.1.1 $x^2+5x-6=0$ (3)

1.1.2 $5x^2+x-3=0$ (correct to 2 decimal places) (3)

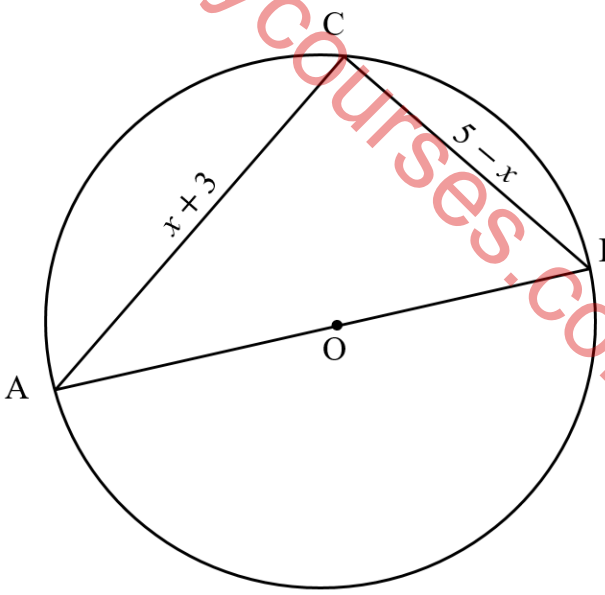
1.1.3 $(2x-1)(x+3)\geq -3$ (5)

1.1.4 $\sqrt{x}-\sqrt{x-5}=1$ (4)

1.2 Solve for x and y simultaneously if:

$2x-y=1$ and $y^2-xy=x+7$ (6)

1.3 The diagram below shows a circle with centre O, that passes through the vertices of ΔABC.
AB is the diameter, $AC=(x+3)$ units and $BC=(5-x)$ units.



Calculate the value of x that will make AB, the diameter, a minimum length. (5)
[26]

QUESTION 2

2.1 Simplify:

$$\frac{2^{2x}-4^{x+1}}{4^{x}+2^{2x-1}}$$ (4)

2.2 Solve for x:

2.2.1 $3x^{\frac{3}{2}} = 81$ (3)

2.2.2 $2^{x}+5=3.2^{1-x}$ (5)

2.3 Given: $\frac{1+\sqrt{2}}{3+2\sqrt{2}} = \sqrt{a}+b.$

Determine the values of a and b, WITHOUT using a calculator. (5)
[17]

QUESTION 3

3.1 Given the linear pattern: -2 ; 3 ; 8; …

3.1.1 Determine the formula for the n^{th} term of the pattern. (2)

3.1.2 Calculate the value of T_{18}. (2)

3.1.3 Which term in the pattern has a value of 473? (2)

3.2 In a linear pattern, $T_{11} = -19$ and $T_{23} = 65$. Determine the number of negative terms in the pattern. (5)
[11]

QUESTION 4

Given the quadratic pattern: 204 ; 176 ; 150 ; 126 ; ...

4.1 Determine the next two terms of the pattern. (2)

4.2 Determine T_n, the general term of the pattern, in the form $T_n = an^2 + bn + c$. (4)

4.3 Determine the value(s) of n if $T_n = 36$. (4)

4.4 Calculate ALL the negative terms in the pattern. (5)
[15]

QUESTION 5

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

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

5.2 Determine the coordinates of the x- and y-intercepts of f. (3)

5.3 Draw a neat sketch of f, clearly indicating all intercepts with the axes and any asymptotes. (4)

5.4 Write down the equation of the axis of symmetry of f that has a negative gradient. (2)

5.5 The graph of $g(x)=ax+b$ is drawn parallel to the line of symmetry of f with a negative gradient. Determine the values of a and b given that g passes through the point $(5;-2)$. (3)

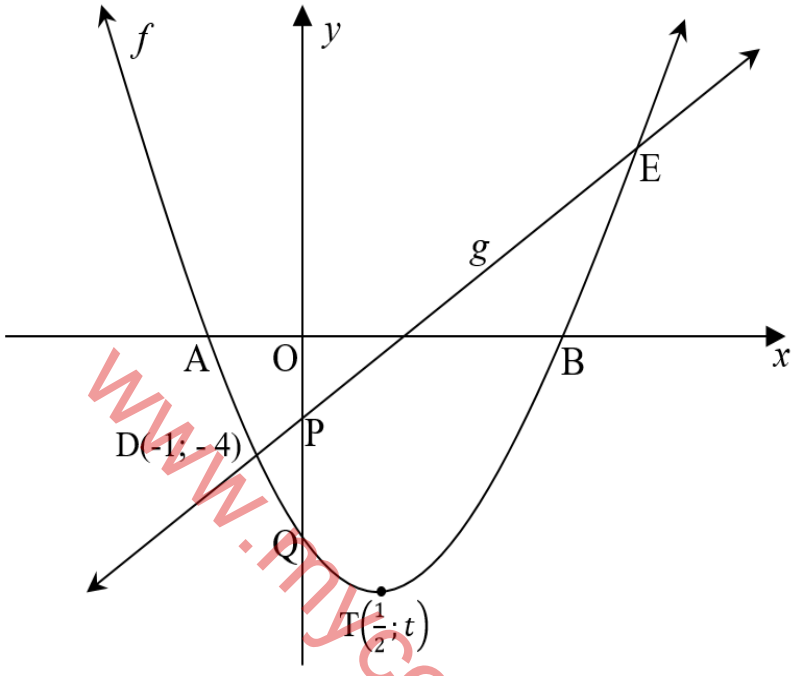
5.6 Determine the distance between the points of intersection of f and g. Leave your answer in surd form. (5)

5.7 Determine the equation of h, if $h(x)=-f(x+3)$. (2)

[21]

QUESTION 6

The diagram below shows the graphs of $f(x)=ax^2+bx+c$ and $g(x)=2x-2$. The graphs intersect at $D(-1;-4)$ and E. f cuts the x-axis at A and B, the y-axis at Q and has a turning point at $T\left(\frac{1}{2};t\right)$. g cuts the y-axis at P.



6.1 Given that $PQ=4$ units, show that $a=1$, $b=-1$ and $c=-6$. (5)

6.2 Determine the value of t. (3)

6.3 Determine the coordinates of A and B. (3)

6.4 Determine the coordinates of E, the other point of intersection of f and g. (4)

6.5 Write down the range of f. (2)

6.6 Determine the values of x for which $f(x).g(x)\leq 0$. (2)

[19]

QUESTION 7

The point $R(-3;9)$ lies on the graph of $f(x)=a^x+1$.

7.1 Determine the value of a. (3)

7.2 A new function g is obtained when f is reflected about its asymptote. Write down the equation of g. (2)

[5]

QUESTION 8

8.1 The interest rate on an investment is x % per annum compounded monthly.
Calculate the value of x given that the corresponding effective interest rate is 9,92%. (3)

8.2 A printer's value depreciates according to the reducing balance method, over a period of 7 years at a rate of 12% p.a., to R28 607,30. Calculate, to the nearest rand, the original price for the printer. (3)

8.3 Pratham made an initial deposit of R32 000 into an investment account that paid interest at 8,6% p.a. compounded monthly. Another deposit of R23 000 was made 3 years later. The interest rate changed to 10,5% p.a. compounded quarterly 4 years after the initial deposit.

8.3.1 How much was in Pratham's investment account at the end of 4 years? (5)

8.3.2 At the end of 6 years since he started his investment, Pratham decided to use all his balance as a deposit for a car that cost R220 000 and borrow the rest from a bank.

How much did he need to borrow? (4)
[15]

QUESTION 9

9.1 Two events A and B are such that:

- P(A) = 0,35
- P(A or B) = 0,75

Determine P(B) if:

9.1.1 A and B are mutually exclusive (3)

9.1.2 A and B are independent (4)

9.2 130 learners were asked about their favourite social media platforms. They chose from Facebook (F), WhatsApp (W) and Instagram (I). The results are shown below:

- 63 learners like Facebook
- 81 learners like WhatsApp
- 37 learners like Instagram
- 18 learners like Facebook and WhatsApp but not Instagram
- 12 learners like WhatsApp and Instagram but not Facebook
- *x* learners like Instagram and Facebook but not WhatsApp
- *x* learners like Instagram only
- *y* learners like WhatsApp only
- 11 learners like all three
- 8 learners did not like any of the social media platforms

9.2.1 Represent the above information on a Venn diagram. (4)

9.2.2 Determine the values of *x* and *y*. (3)

9.2.3 Calculate the probability that a learner chosen at random likes only ONE social medium platform from the three mentioned above. (2)

[16]

QUESTION 10

The probability that Lwandi chooses to do Mathematics in Grade 10 is 65%. If he does not choose Mathematics, the probability that he attains a distinction in Accounting is 20% but if he chooses Mathematics, the probability of achieving a distinction in Accounting is 60%.

Calculate the probability that Lwandi attains a distinction in Accounting. **[5]**

TOTAL: 150

INFORMATION SHEET: MATHEMATICS

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

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

$$T_n = a + (n-1)d \qquad S_n = \frac{n}{2}\left(2a + (n-1)d\right)$$

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

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

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

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

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

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

In ΔABC:

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

$$a^2 = b^2 + c^2 - 2bc.\cos A$$

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

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

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

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

$$\bar{x} = \frac{\sum x}{n} \qquad \sigma^2 = \frac{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)} \qquad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

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