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Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 11

NOVEMBER 2024

MATHEMATICS P1

MARKS: 150

TIME: 3 hours



This question paper consists of 13 pages including an information sheet.

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of TEN questions.
2. Answer ALL the questions.
3. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answer.
4. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
5. Answers only will not necessarily be awarded full marks.
6. If necessary, round off answers to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. Number the answers correctly according to the numbering system used in this question paper.
9. An information sheet with formulae is included at the end of the question paper.
10. Write neatly and legibly.

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QUESTION 1

1.1 Solve for x:

1.1.1 $x^2 \quad 2x \quad 8 \quad 0$ (2)

1.1.2 $2x^2 \quad 3x \quad 7$ (answers correct to TWO decimal places) (4)

1.1.3 $(x \quad 1)(4 \quad x) \; ! \; 0;$ where $\in \quad \mathbb{N}$ (3)

1.2 Given: $\frac{14}{p} \quad p \quad 5$

1.2.1 Solve for p (3)

1.2.2 Hence, or otherwise, solve for x if $\frac{14}{\sqrt{x \quad 5}} \quad \sqrt{x \quad 5} \quad 5$ (4)

1.3 Solve for x and y simultaneously:

$3y \quad 1 \quad x$ and $x^2 \quad 2xy \quad y^2 \quad 7 \quad 0$ (6)

1.4 If $2x^{\,1} \quad x^{\,2} \quad 3$ and $x \quad 0$, determine, **without using a calculator**, the value of $2(6x \quad 1)^{\,1}$. (4)

[26]

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QUESTION 2

2.1 Simplify fully, **without using a calculator:**

$$\frac{\sqrt{32}\quad\sqrt{18}\quad 3\sqrt{3}}{\sqrt{108}\quad\sqrt{8}}$$ (4)

2.2 Solve for x:

2.2.1 $2x^{\frac{5}{2}}\quad 64$ (3)

2.2.2 $3.5^{x}\quad 5^{x\ 1}\quad 14$ (5)

2.3 Calculate a possible value for $a^2\quad b^2$, if it is given that a and b are rational numbers such that $\sqrt{a}\quad\sqrt{b}\quad\sqrt{9\quad\sqrt{56}}$. (5)

[17]

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QUESTION 3

3.1 Consider the linear number pattern: –5 ; –9 ; –13 ; …

3.1.1 Write down the next TWO terms of the pattern. (2)

3.1.2 Determine an expression for the n^{th} term of the pattern. (2)

3.1.3 Calculate the value of n for which T_n 141 . (2)

3.2 In a linear number pattern the first term is x and a common difference is 5 less than the first term.

Calculate the value of the first term if it is given that the sum of the first three terms of the linear number pattern is 63. (5)
[11]

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QUESTION 4

Given the number pattern 24; 10; 0; 6; ...

4.1 Show that the above number pattern is quadratic. (2)

4.2 Determine the n^{th} term of the quadratic number pattern in the form, $T_n = an^2 + bn + c$. (4)

4.3 Calculate the value of T_{52}. (2)

4.4 Determine the smallest value of the quadratic number pattern. (3)

4.5 Determine the value(s) of n for which the terms of the quadratic number pattern will be positive. (4)

[15]

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QUESTION 5

The lines $y \quad x \quad 4$ and $y \quad x \quad 2$ are the axes of symmetry of the function $f(x) \quad \frac{3}{x \quad p} \quad q$.

5.1 Show that $p \quad 3$ and $q \quad 1$. (4)

5.2 Calculate the x-intercept of f. (2)

5.3 Calculate the y-intercept of f. (2)

5.4 Sketch the graph of f. Clearly label all intercepts with the axes and asymptotes. (3)

5.5 Write down the domain of g if g is the reflection of f along the line $x \quad 0$. (3)

5.6 For which values of x will $x.f(x) \delta 0$? (3)

[17]

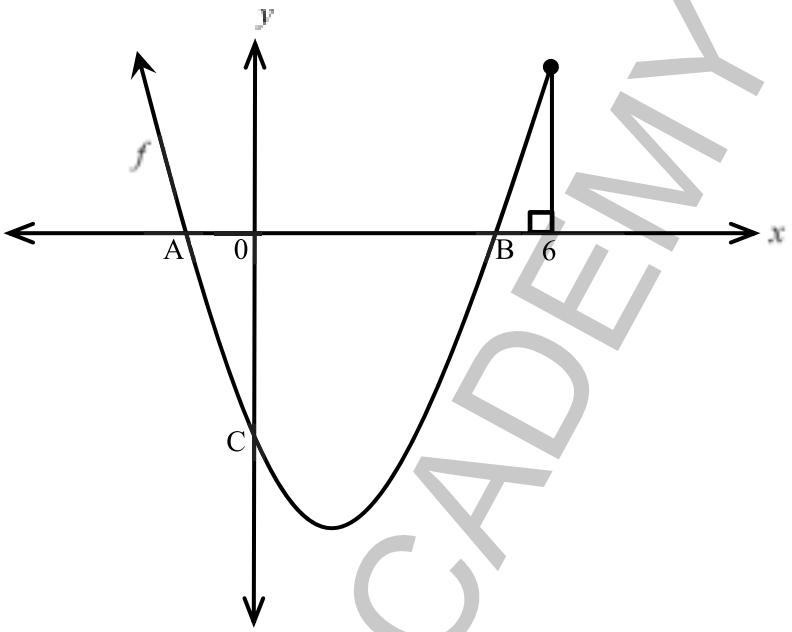
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QUESTION 6

Sketched below is the graph of $f(x)$ x^2 $4x$ 5 for x ϕ ;6≅
A and B are the x-intercepts and C the y-intercept of f.



6.1 Determine the value of $f(6)$. (1)

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

6.3 Hence, calculate the length of AB. (1)

6.4 Write down the equation of g in the form $g(x)$ ax^2 bx c, if it is given that g x is obtained by shifting f x two units to the right and five units up. (3)

6.5 Suppose h is a tangent, to the curve f at a certain point, with a gradient of 2. Calculate the y-intercept of h. (5)

6.6 For which values of k will $f(x)$ k 0 have just one real root? (3)

[16]

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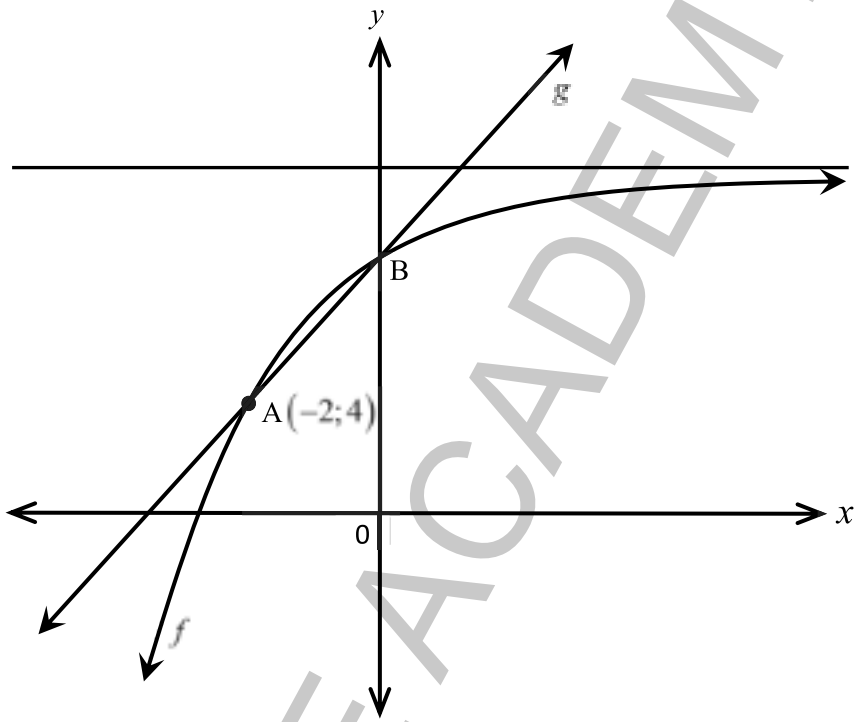
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QUESTION 7

The graphs of $f(x)$ b^{x} 8 and $g(x)$ $\frac{3}{2}x$ 7 are drawn below.

A(2;4) and B are points of intersection of f and g. B is the y-intercept of both graphs f and g.



7.1 Write down the coordinates of B. (1)

7.2 Show that b $\frac{1}{2}$. (2)

7.3 Write down the average gradient of f between A and B. (2)

7.4 Write down the equation of the asymptote of f. (1)

7.5 Calculate the vertical distance between f and g at x 1. (3)

7.6 Describe the transformation of f to h if $h(x)$ ♣1 ♦ ♥2 x ÷ ≠ 5. (2)

7.7 For which values of x is $f(x)$ τ $g(x)$? (2)

[13]

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QUESTION 8

8.1 A Google Chromebook costs R14 500 and depreciates by 13% p.a. compounded annually calculated on the reducing-balance method.

Calculate what a Google Chromebook will be worth after exactly 5 years. (3)

8.2 Koza deposits R15 000 into a bank account for a period of 10 years. The interest rate for the first four years is 6% per annum compounded monthly. For the next six years, the interest rate changes to 10% per annum compounded semi-annually.

8.2.1 Convert the nominal rates to annual effective rates. (Answers correct to FOUR decimal places) (4)

8.2.2 Hence, use the effective rates or otherwise, calculate the future value of the savings at the end of the ten-year period. (4)

8.2.3 The interest rate for the first 4 years remains at 6% p.a. compounded monthly. For the next 2 years the interest rate is x% p.a. compounded quarterly. For the last 4 years the interest rate is x% p.a. compounded semi-annually.

If Koza receives R48 897,03 at the end of the 10-year period, determine the interest rate for the last 6 years, i.e. the value of x. (5)

[16]

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QUESTION 9

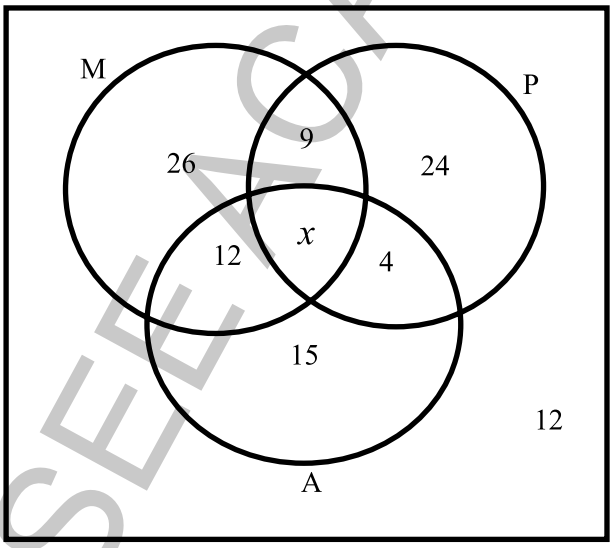
9.1 A certain company uses a camera detector system to detect trespassers. Two independent cameras, A and B are installed, one at the front main gate and the other one at the back of the building. If someone trespasses, the probability that the person will be detected by camera A is 0,5 and the probability that the person will be detected by camera B is 0,6.

9.1.1 If there is a trespasser, what is the probability that the trespasser will be detected by at least one camera? (3)

9.1.2 Determine the probability that the trespasser will not be detected. (2)

9.2 At a certain high school, a survey was carried out on 110 learners, about their subject choices. The Venn diagram shows the results of the survey in terms of:

- ξ Mathematics (M)
- ξ Physical Sciences (P)
- ξ Accounting (A)



9.2.1 Show that $x \quad 8$. (2)

9.2.2 Calculate the probability that a learner chosen at random does only one of the three subjects. (2)

9.2.3 Calculate the probability that a learner chosen at random does Mathematics and Accounting, but not Physical Sciences. (2)

[11]

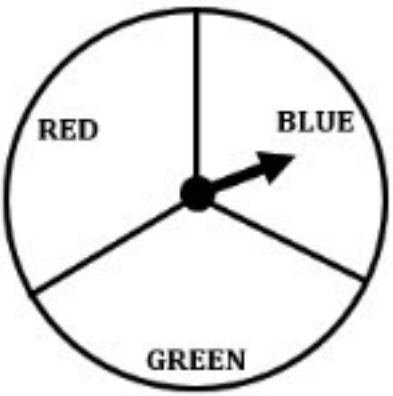
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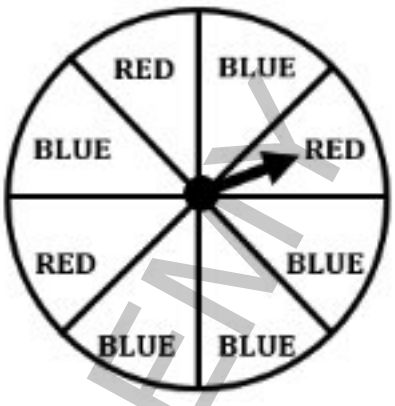
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QUESTION 10

Bennie has two fair spinners. (Circles are divided into 3 and 8 equal parts, respectively)



SPINNER 1



SPINNER 2

Bennie is going to spin both spinners. What is the probability that it lands on the same colour after spinning each spinner once? **[8]**

TOTAL: 150

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INFORMATION SHEET: MATHEMATICS

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

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

$T_n = a + (n-1)d$ $S_n = \frac{n}{2}[2a + (n-1)d]$

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

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

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

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

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

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

In $\triangle ABC$: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ $a^2 = b^2 + c^2 - 2bc.\cos A$ area $\triangle ABC = \frac{1}{2}ab.\sin C$

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

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

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

$\bar{x} = \frac{\sum x}{n}$ $\sigma^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n}$ $P(A) = \frac{n(A)}{n(S)}$

$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ $\hat{y} = a + bx$ $b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$

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