



LIMPOPO

PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 11

MATHEMATICS P1

NOVEMBER 2019

MARKS: 150

TIME: 3 hours

This question paper consists of 9 pages, an answersheet and an information sheet

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 9 questions.
2. Answer ALL questions.
3. Answer **Questions 5.2.1 and Question 7** on the **DIAGRAM SHEET PROVIDED**
4. Answer correctly according to the numbering system used in this question paper.
5. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answer.
6. Answers only will not necessarily be awarded full marks.
7. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
8. If necessary, round off your answers to TWO decimal places, unless stated otherwise.
9. Diagrams are NOT necessarily drawn to scale.
10. Write neatly and legibly.

QUESTION 11.1 Solve for x :

1.1.1 $5x^2 - 33x - 14 = 0$ (2)

1.1.2 $x^2 + 7x + 4 = 0$ (answer correct to TWO decimal places) (3)

1.2 Given: $\sqrt{8-x} = x-2$ 1.2.1 Without solving the equation, show that the solution above will lie in the interval $2 \leq x \leq 8$. (3)

1.2.2 Solve the equation. (5)

1.2.3 Hence or otherwise, solve x if $-\sqrt{8-x} = x-2$. (2)1.3 Solve for x if $x^2 + 2x \geq 15$ (4)1.4 Solve for x and y in the given equations:

$2^y = 32^x$ and $y = x^2 - 2x - 18$ (6)

1.5 The solution of a quadratic equation is: $x = \frac{4 \pm \sqrt{7+3p}}{2}$ where $p \in R$.Determine the values of p so that:

1.5.1 The equation has equal roots (2)

1.5.2 The equation has non-real roots. (2)

[29]

QUESTION 2

2.1 Simplify without the use of a calculator:

$$2.1.1 \quad \frac{\sqrt{98} + \sqrt{8}}{\sqrt{50}} \quad (4)$$

$$2.1.2 \quad \frac{5^{x+3} - 3 \cdot 5^{x+2}}{5^{x+1}} \quad (4)$$

2.2 Solve for x without the use of a calculator:

$$2.2.1 \quad \sqrt{(x-3)^{-3}} = 27 \quad (4)$$

$$2.2.2 \quad 4^x - 3 \cdot 2^x = 40 \quad (4)$$

[16]**QUESTION 3**

During the 2019 Cricket World Cup the South African Captain Faf du Plessis hit a ball with all his might. After the ball left his bat, the height of the ball in metres was expressed by the equation $h(x) = -x^2 + 4x$ after x seconds.

Calculate the maximum height of the ball? (4)

[4]**QUESTION 4**

4.1 Consider the following number pattern: 4; 9; 14; ...

4.1.1 Write down the next two terms of the pattern. (2)4.1.2 Determine the expression for the n^{th} term of the pattern. (2)4.1.3 Determine if 1099 is a term of the number pattern? (3)

4.2 Consider the following quadratic number pattern: 6; 10; 18; ...

4.2.1 Write down the following two terms of the pattern. (2)

4.2.2 Determine the equation of the general term in the form:
 $T_n = an^2 + bn + c$ (4)

4.2.3 Calculate the value of T_{12} (2)

4.2.4 What term of the pattern will have a value of 766? (4)

4.3 A certain number pattern has the following properties:

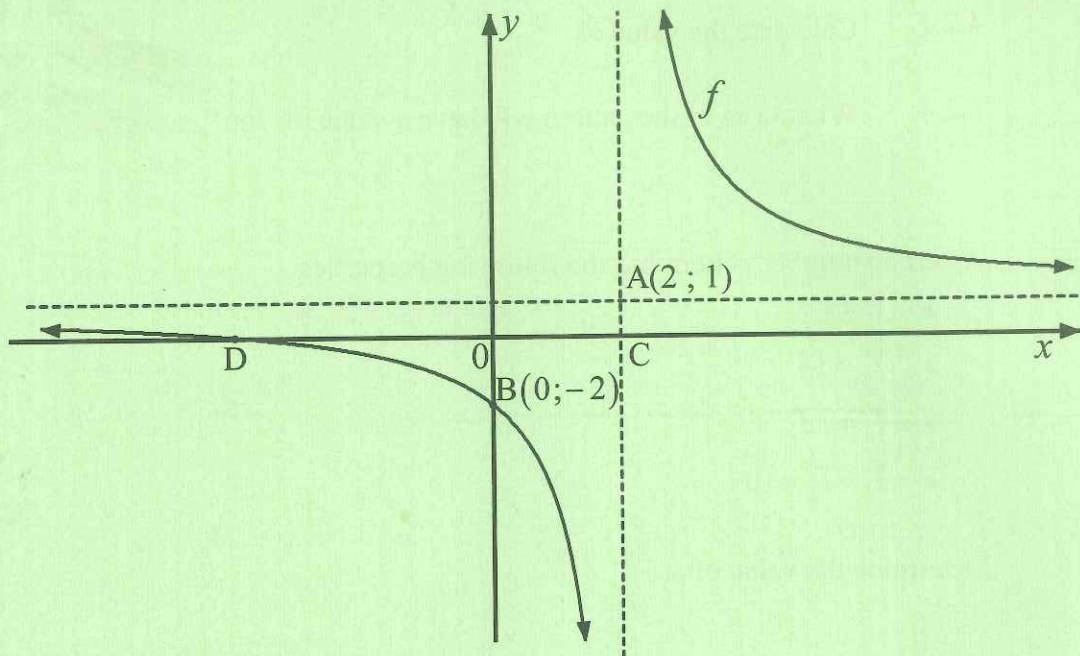
- $T_1 = k$
- $T_2 = 14$
- $T_4 = 7 T_1$
- $T_3 - T_2 = 10$ (5)

Determine the value of k .

[24]

QUESTION 5

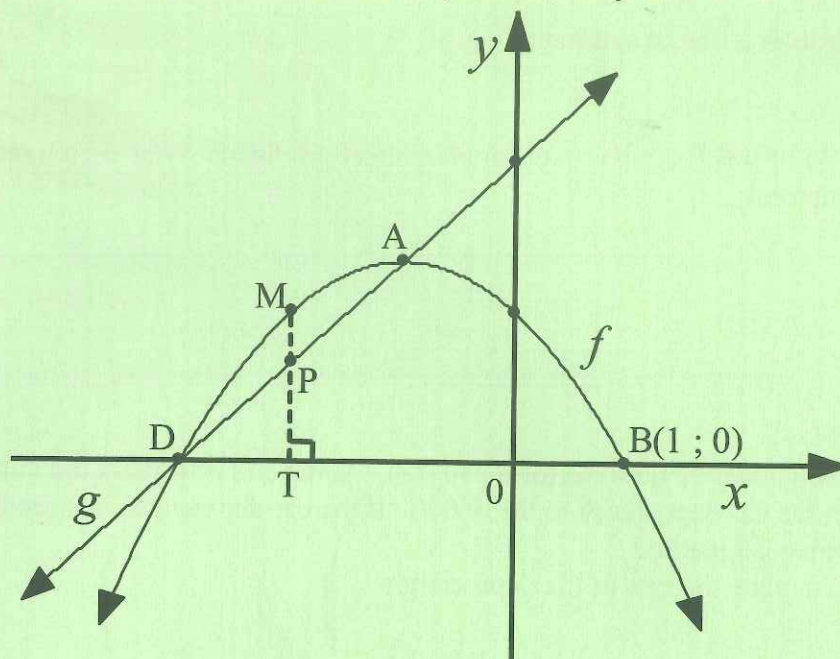
- 5.1 In the diagram below $f(x) = \frac{k}{x-p} + q$ where $A(2;1)$ is the point of intersection of the asymptotes of f and $B(0;-2)$ is the y -intercept.



- 5.1.1 Write down the equations of the asymptotes of f . (2)
- 5.1.2 Determine the equation of f . (3)
- 5.1.3 Write down the domain of f . (1)
- 5.1.4 Calculate the coordinates of D. (4)
- 5.1.5 Calculate the equation of the function $h(x) = ax^2 + bx + c$ which goes through the point B, C and D, where C and D are the x -intercepts of h . (5)
- 5.2 Given the graph of g defined by the equation: $g(x) = 2^{x+2}$
- 5.2.1 Draw a neat sketch of g on the answer sheet provided. Show the asymptote and intercept with the axis. (3)
- 5.2.2 Determine the equation of $g(x-3)$. (2)
- [20]

QUESTION 6

The graph of $f(x) = -x^2 + bx + c$ and the straight line g are sketched below. A and D are points of intersection of f and g . Point A is the turningpoint of f . Points D and $B(1; 0)$ are the x -intercepts of f . The axis of symmetry of f is $x = -1$.



- 6.1 Write the coordinates of D. (1)
- 6.2 Show that $b = -2$ and $c = 3$ (4)
- 6.3 Determine : (4)
- 6.3.1 the range of f . (2)
- 6.3.2 the equation of g in the form $y = mx + c$ (3)
- 6.4 For which values of x is : (4)
- $$x \cdot f(x) > 0$$
- 6.5 For which values of k will $f(x) = k$ have non-real roots? (3)
- 6.6 T is a point on the x -axis and M is a point on f such that $TM \perp x$ -axis. TM intersects g at P. Calculate the maximum length of PM. (4)

[21]

QUESTION 7

The function f defined by $f(x) = \frac{a}{x+p} + q$ has the following properties:

- The domain: $x \in R; x \neq 3$
- $y = -x + 4$ is a line of symmetry.
- $a > 0$

Draw a neat graph of this function on the answer sheet provided. Your sketch must include the asymptotes.

(3)

[3]

QUESTION 8

- 8.1 Jaco bought a new car for R250 000. At the end of 6 years the value of the car depreciates to R150 000. If the car depreciates in a reducing balanced method
Calculate the rate of the depreciation.

(3)

- 8.2 Calculate the effective interest rate p.a. if the nominal rate is 8,9% p.a., compounded monthly.

(3)

- 8.3 Mary opened an investment account and deposited R35 000. The account earns an interest of 8% per annum compounded half yearly for the first 18 months and after that 6,5% per annum compounded monthly.
How much money will be in Mary's account exactly 5 years after the initial deposit?

(5)

- 8.4 Donald deposited R15 000 into his new savings account at a rate of 16% p.a. compounded monthly. Exactly 3 years after his initial deposit he deposited an additional amount of R10 000 into the same account. Exactly 5 years after his initial amount was deposited he withdrew an amount of R8 000 from the account.

How much money will Donald have in his savings account exactly 7 years after his initial deposit?

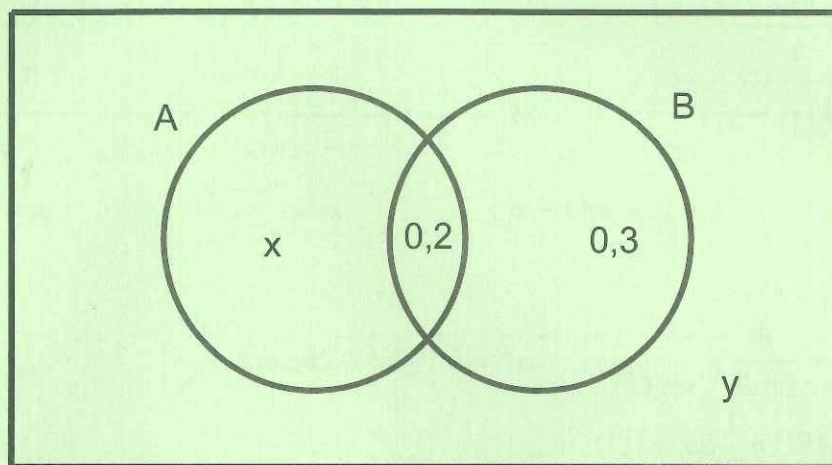
(5)

[16]

QUESTION 99.1 Given: $P(A) = 0,2$

$$P(B) = 0,5$$

$$P(A \text{ and } B) = 0,1$$

9.1.1 Are the events A and B mutually exclusive? Give reasons for your answers. (2)9.1.2 Are the events A and B independent? Give reasons for your answers. (3)9.2 The Venn-diagram below shows the probabilities of two independent events A and B .Determine the values of x and y . Show all calculations. (4)9.3 Kobus has a bag with 60 marbles, each of which is green, blue or red in color. $\frac{2}{5}$ of the marbles are green and 15% of the marbles are blue.

Kobus picks TWO marbles out of the bag, one at a time and without putting the first one back.

9.3.1 How many red marbles are there in the bag? (2)

9.3.2 Draw a tree diagram to represent the situation above. (3)

9.3.3 What is the probability that Kobus will pick a BLUE and GREEN marble. (round off your answers to **THREE** decimal places) (3)

[17]

TOTAL: [150]

Information Sheet Mathematics

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

$$A = P(1 + ni)$$

$$A = P(1 - ni)$$

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

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

$$\sum_{i=1}^n 1 = n$$

$$\sum_{i=1}^n i = \frac{n(n+1)}{2}$$

$$T_n = a + (n-1)d$$

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

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(r^n - 1)}{r - 1}; \quad r \neq 1$$

$$S_\infty = \frac{a}{1 - r}; \quad -1 < r < 1$$

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

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

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

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

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

$$\text{In } \triangle ABC: \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

$$\text{area } \triangle ABC = \frac{1}{2} ab \sin C$$

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

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

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

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

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

$$\sin 2\alpha = 2 \sin \alpha \cos \alpha$$

$$(x; y) \rightarrow (x \cos \theta + y \sin \theta; y \cos \theta - x \sin \theta)$$

$$(x; y) \rightarrow (x \cos \theta - y \sin \theta; y \cos \theta + x \sin \theta)$$

$$\bar{x} = \frac{\sum fx}{n}$$

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

$$P(A) = \frac{n(A)}{n(S)}$$

$$P(A \text{ of } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx$$

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$