NATIONAL SENIOR CERTIFICATE

GRADE 11

MATHEMATICS P1

NOVEMBER 2018

MARKS: 150

TIME: 3 hours

This question paper consists of 8 pages.

IMAT1

EASTERN CAPE

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of NINE questions.

2. Answer ALL the questions.

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

4. Clearly show ALL calculations, diagrams, graphs, etc. that you have used in determining your answers.

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

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

7. Round off answers to TWO decimal places, unless stated otherwise.

8. Diagrams are NOT necessarily drawn to scale.

9. Write neatly and legibly.

EASTERN CAPE

QUESTION 1

1.1   Solve for x in each of the following:

     1.1.1 $x(2x+1)=0$ (2)

     1.1.2 $5x^2+2x-6=0$ (correct to TWO decimal places)   (3)

     1.1.3 $2x^2-2 \geq 3x$ (4)

     1.1.4 $\sqrt{2x+5}-\dfrac{3}{\sqrt{2x+5}}=-2$ (6)

1.2   Solve for x and y simultaneously:

     $y+x=2$ and $x^2+3xy+8=0$ (6)

1.3   The roots of the equation $f(x)=0$ are $x=\dfrac{4\pm\sqrt{16-4m(-m+5)}}{2m}$

     Determine the values of m for which the roots will be non-real.   (4)

1.4   Show that the maximum value of $\sqrt{-x^2+4x+12}$ is 4.   (4)
                                                                 [29]

QUESTION 2

2.1   Simplify fully, WITHOUT using a calculator: $\dfrac{2^{x-3}-3.2^{x+1}}{2^{x-2}}$ (4)

2.2   Solve for x:

     2.2.1 $2-16x^{-\frac{3}{2}}=0$ (3)

     2.2.2 $4^x+8=9.2^x$ (4)

     2.2.3 $\sqrt[x]{9}=243$ (3)

2.3   Simplify fully:

     $\dfrac{\sqrt{p^2-q^2}\times(p+q)^{\frac{5}{2}}}{(p-q)^{\frac{1}{2}}}$ if $p \neq q$ (3)
                                                                [17]

QUESTION 3

3.1 Given the linear pattern: $7 ; 2 ; -3 ; \ldots$

    3.1.1 Determine the general term, T_n, of the linear pattern. (2)

    3.1.2 Calculate the value of T_{20}. (2)

    3.1.3 Which term in the pattern has a value of -138? (2)

3.2 $6 ; 2x+1$ and $3x-3$ are the first three terms of a linear pattern.

    Calculate the value of x. (3)

    [9]

QUESTION 4

The quadratic number pattern: $4 ; p ; 11 ; q ; 22 ; \ldots$ has a constant second difference of 1.

4.1 Show that $p = 7$ and $q = 16$. (3)

4.2 Determine the general term, T_n, of the quadratic pattern. (4)

4.3 Determine the value of n if $T_n = 232$. (4)

4.4 If the sum of two consecutive terms in the pattern is 1 227, calculate the difference between these two terms. (5)

    [16]

QUESTION 5

Given: $f(x) = \dfrac{4}{x-3} + 2$ and $g(x) = x + 2$

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

5.2 Determine the x-intercept of f. (3)

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

5.4 Sketch the graphs of f and g on the same system of axes. Show clearly ALL the intercepts with the axes and any asymptotes. (5)

5.5 Calculate the x-coordinates of the points of intersection of f and g. (4)

5.6 If $x < 3$, determine the values of x for which $\dfrac{4}{x-3} + 2 < x + 2$. (2)

5.7 The line $y = x - 1$ cuts f at P(1 ; 0) and Q. Write down the coordinates of Q. (3)

[21]

QUESTION 6

The diagram below shows the graphs of $f(x) = -(x-3)^2 + 25$ and $g(x) = 2\left(\dfrac{1}{2}\right)^{x+1} - 4$.

Graph f cuts the x-axis at A and C, the y-axis at E and has a turning point at D.
Graph g cuts the x-axis at A and the y-axis at B.
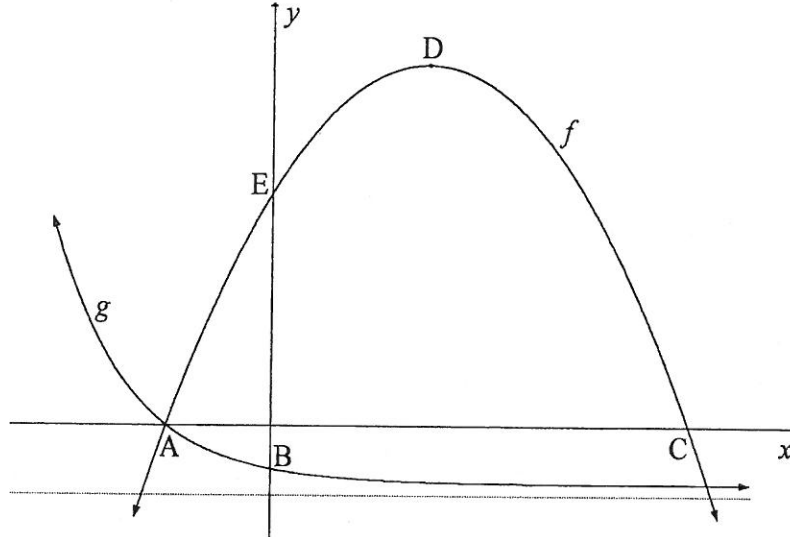
6.1   Write down the equation of the asymptote of g.   (1)

6.2   Write down the coordinates of D.   (2)

6.3   Write down the range of f.   (1)

6.4   Calculate the length of EB.   (4)

6.5   Determine the values of x for which f is decreasing.   (2)

6.6   Calculate the average gradient between points A and B.   (5)

6.7   Graph t is obtained by reflecting g about the x-axis. Write down the range of t.   (2)

6.8   If $p(x) = f(x) + 2$, write down the coordinates of the turning point of p.   (2)

6.9   Determine the value of k for which the straight line $y = 2x + k$ will be a tangent
        to f.   (4)

                                                                                       [23]

QUESTION 7

7.1   Calculate the effective interest rate per annum if an investment earns interest at a rate of 11,5% p.a., compounded monthly.   (3)

7.2   Karabo bought a computer for R4 700. The value of the computer depreciated at a rate of 18% p.a. Using the reducing-balance method, calculate the book value of the computer 4 years after it was bought.   (3)

7.3   Nhlanhla made an initial deposit of R20 000 into an investment account that paid interest at the rate of 7,2% p.a., compounded quarterly. After 2 years the interest rate changed to 7,8% p.a., compounded monthly. Four years after his initial deposit, Nhlanhla withdrew R2 500 from his investment.

   7.3.1   Calculate how much Nhlanhla had in this investment account 2 years after the initial deposit was made.   (3)

   7.3.2   How much will the investment be worth 7 years after the initial deposit was made?   (4)

                                                                                                [13]

QUESTION 8

A bag contains 6 red balls, 8 green balls and an unknown number of yellow balls. The probability of randomly choosing a green ball from the bag is 25%.

8.1   Show that there are 32 balls in the bag.   (1)

8.2   A ball is drawn from the bag, the colour is recorded and it is not returned to the bag. Thereafter another ball is drawn from the bag, the colour is recorded and it is also not returned to the bag.

        Draw a tree diagram to represent ALL the possible ways in which the two balls could have been drawn from the bag. Show the probabilities associated with EACH branch, as well as the outcomes.   (4)

8.3   Calculate the probability that the two balls drawn from the bag will have the same colour.   (4)

                                                                                                [9]

QUESTION 9

9.1   On a flight, passengers could choose between a vegetarian snack and a chicken snack. The snacks selected by the passengers were recorded. The results are shown in the table below.

SNACK	MALE	FEMALE	TOTAL
Vegetarian	12	20	32
Chicken	55	63	118
TOTAL	67	83	150

Was the choice of snack on this flight independent of gender? Motivate your answer with the necessary calculations.   (5)

9.2   For any two events, A and B, it is given that P(A and B) = 0,12, P(A or B) = 0,83 and P(B) = 4 P(A).

   9.2.1   Are events A and B mutually exclusive? Justify your answer.   (2)

   9.2.2   Calculate P(B).   (4)

   9.2.3   Calculate P(not A).   (2)

   [13]

TOTAL: 150