basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL
SENIOR CERTIFICATE

GRADE 11

MARKS: 150

TIME: 3 hours

This question paper consists of 9 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

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

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

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

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

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

6.   Diagrams are NOT necessarily drawn to scale.

7.   Write neatly and legibly.

QUESTION 1

1.1   Solve for x:

    1.1.1 $(x+2)(3x-7)=0$ (2)

    1.1.2 $x^2-5x=2$ (Correct to TWO decimal places) (4)

    1.1.3 $\sqrt{x-3}-4=5$ (4)

    1.1.4 $2x^2-7x-4 \geq 0$ (4)

1.2   Solve the following equations simultaneously:

$$x=2y+1$$
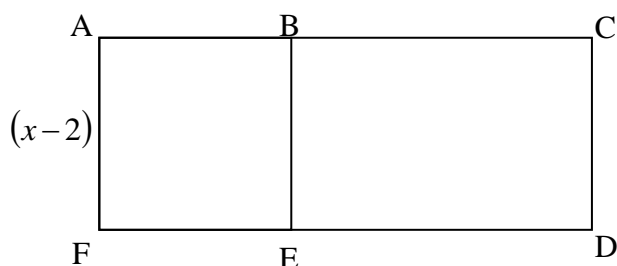$$x^2-2y+3xy=6$$ (6)

[20]

QUESTION 2

2.1   Simplify the following fully: $\dfrac{3^{x+1}-3^{x-1}}{2.3^x}$ (3)

2.2   Solve for x: $\sqrt{(x-2)^{-3}}=64$ (4)

2.3   Rewrite the following expression as a power of x: $\dfrac{x\sqrt{x\sqrt{x\sqrt{x}}}}{\sqrt[8]{x^7}}$ (4)

[11]

QUESTION 3

ACDF is a rectangle with an area of $\left(x^2+2x-8\right)$ cm². B is a point on AC and E is a point on FD such that ABEF is a square with sides of length $(x-2)$ cm each.

Calculate the length of ED. **[5]**

QUESTION 4

Consider the following quadratic number pattern: $-7 \; ; \; 0 \; ; \; 9 \; ; \; 20 \; ; \; \ldots$

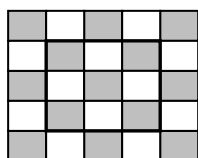4.1   Show that the general term of the quadratic number pattern is given by $T_n = n^2 + 4n - 12$.   (4)

4.2   Which term of the quadratic pattern is equal to 128?   (4)

4.3   Determine the general term of the first differences.   (3)

4.4   Between which TWO terms of the quadratic pattern will the first difference be 599?   (3)
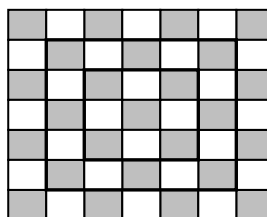
[14]

QUESTION 5

Grey and white squares are arranged into patterns as indicated below.

Pattern 1   Pattern 2   Pattern 3

	Pattern 1	Pattern 2	Pattern 3
Number of grey squares	5	13	25

The number of grey squares in the nth pattern is given by $T_n = 2n^2 + 2n + 1$.

5.1   How many white squares will be in the FOURTH pattern?   (2)

5.2   Determine the number of white squares in the 157th pattern.   (3)

5.3   Calculate the largest value of n for which the pattern will have less than 613 grey squares.   (4)

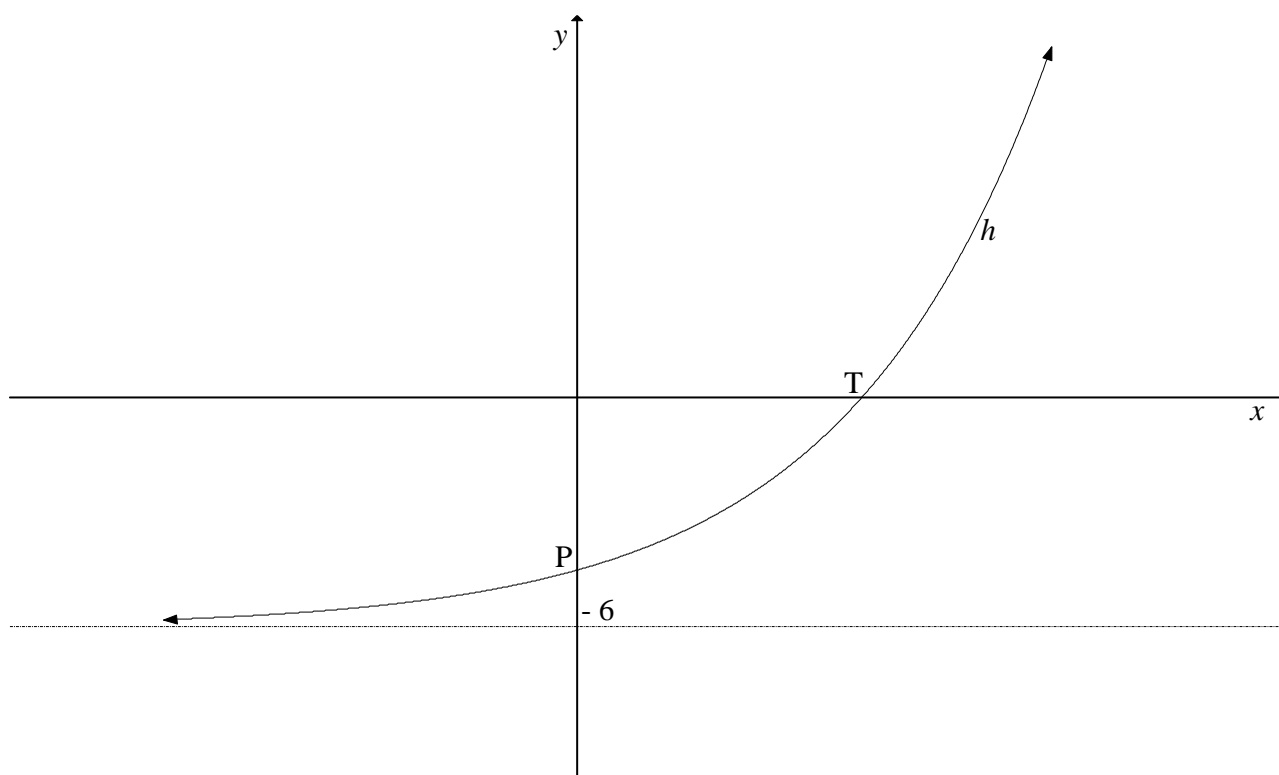5.4   Show that the TOTAL number of squares in the nth pattern is always an odd number.   (3)

[12]

QUESTION 6

Given: $f(x) = \dfrac{8}{x-2} + 3$

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

6.2   Calculate the x- and y-intercepts of f.   (3)

6.3   Sketch the graph of f. Show clearly the intercepts with the axes and the asymptotes.   (3)

6.4   If $y = x + k$ is an equation of the line of symmetry of f, calculate the value of k.   (2)
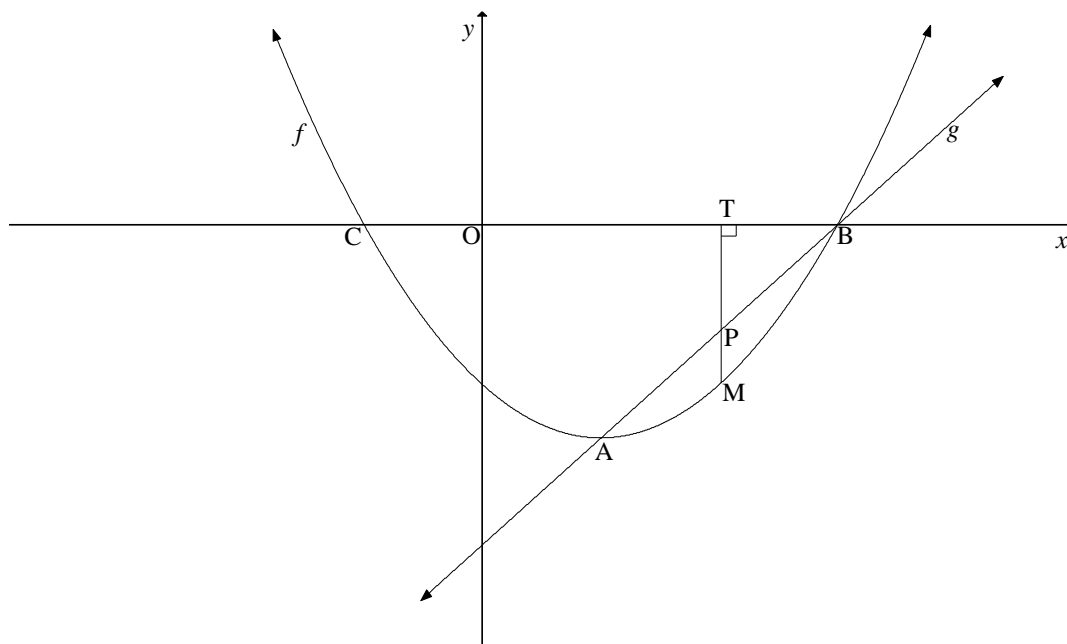
                                                                                                                [10]

QUESTION 7

Given: $h(x) = a.2^{x-1} + q$. The line $y = -6$ is an asymptote to the graph of h. P is the y-intercept of h and T is the x-intercept of h.

7.1   Write down the value of q.   (1)

7.2   If the graph of h passes through the point $\left(-1; -5\dfrac{1}{4}\right)$, calculate the value of a.   (4)

7.3   Calculate the average gradient between the x-intercept and the y-intercept of h.   (5)

7.4   Determine the equation of p if $p(x) = h(x-2)$ in the form $p(x) = a.2^{x-1} + q$.   (2)

                                                                                                                [12]

QUESTION 8

The graph of $f(x) = x^2 + bx + c$ and the straight line g are sketched below. A and B are the points of intersection of f and g. A is also the turning point of f. The graph of f intersects the x-axis at B(3 ; 0) and C. The axis of symmetry of f is $x = 1$.

8.1   Write down the coordinates of C.   (1)

8.2   Determine the equation of f in the form $y = x^2 + bx + c$.   (3)

8.3   Determine the range of f.   (2)

8.4   Calculate the equation of g in the form $y = mx + c$.   (3)

8.5   For which values of x will:

         8.5.1 $f(x) \geq 0$ (2)

         8.5.2 $\dfrac{f(x)}{g(x)} > 0$ (2)

         8.5.3 $x.f(x) > 0$ (2)

8.6   For what values of p will $x^2 - 2x = p$ have non-real roots?   (2)

8.7   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]
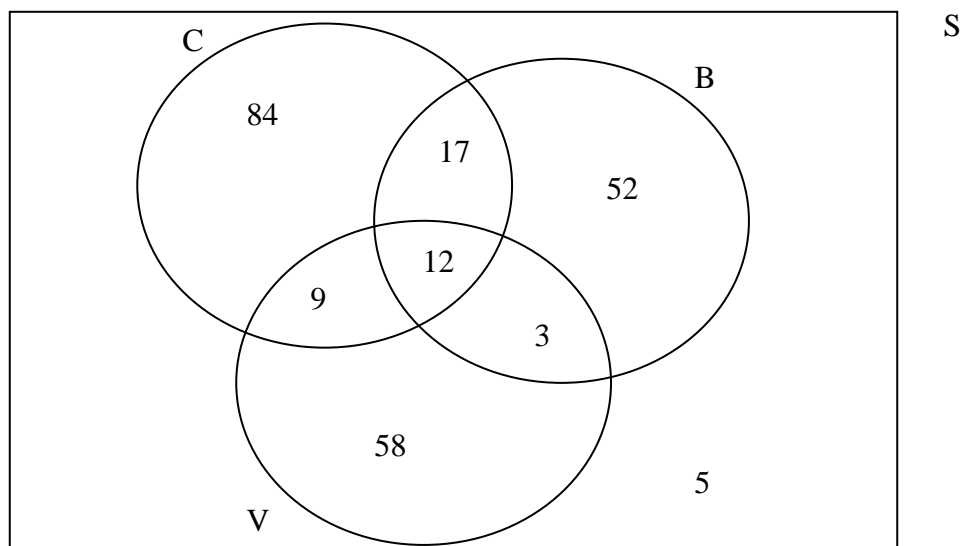
QUESTION 9

9.1   A tractor bought for R120 000 depreciates to R11 090,41 after 12 years by using
        the reducing balance method. Calculate the rate of depreciation per annum. (The rate
        was fixed over the 12 years.)   (4)

9.2   Calculate the effective interest rate if interest is 9,8% p.a., compounded monthly.   (3)

9.3   Mrs Pillay invested R80 000 in an account which offers the following:

        • 7,5 % p.a., compounded quarterly, for the first 4 years and thereafter
        • 9,2% p.a., compounded monthly, for the next 3 years

        Calculate the total amount of money that will be in the account at the end of 7 years
        if no further transactions happen on the account.   (4)

9.4   Exactly 8 years ago Tashil invested R30 000 in an account earning 6,5% per
        annum, compounded monthly.

        9.4.1   How much will he receive if he withdrew his money today?   (3)

        9.4.2   Tashil withdrew R10 000 three years after making the initial deposit and
                  re-invested R10 000 five years after making the initial deposit.

                  Calculate the difference between the final amount Tashil will now receive
                  after eight years and the amount he would have received had there not
                  been any transactions on the account after the initial deposit.   (7)
                                                                                                   [21]

QUESTION 10

A survey was carried out with 240 customers who bought food from a fastfood outlet on a particular day. The outlet sells cheese burgers (C), bacon burgers (B) and vegetarian burgers (V). The Venn diagram below shows the number of customers who bought different types of burgers on the day.

10.1   How many customers did NOT buy burgers on the day?   (1)

10.2   Are events B and C mutually exclusive? Give a reason for your answer.   (2)

10.3   If a customer from this group is selected at random, determine the probability that he/she:

          10.3.1   Bought only a vegetarian burger   (1)

          10.3.2   Bought a cheese burger and a bacon burger   (1)

          10.3.3   Did not buy a cheese burger   (3)

          10.3.4   Bought a bacon burger or a vegetarian burger   (4)
                                                                                          [12]

QUESTION 11

Given: P(A) = 0,12
          P(B) = 0,35
          P(A or B) = 0,428

Determine whether events A and B are independent or not. Show ALL relevant calculations used in determining the answer.   **[4]**

QUESTION 12

Paballo has a bag containing 80 marbles that are either green, yellow or red in colour. $\frac{3}{5}$ of the marbles are green and 10% of the marbles are yellow. Paballo picks TWO marbles out of the bag, one at a time and without replacing the first one.

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

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

12.3   What is the probability that Paballo will choose a GREEN and a YELLOW marble?   (3)

[8]

TOTAL: 150