**NATIONAL
SENIOR CERTIFICATE**

GRADE 10

NOVEMBER 2020

TECHNICAL MATHEMATICS P2

MARKS: 100

TIME: 2 hours

This question paper consists of 10 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of EIGHT questions.

2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.

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

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

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

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

7. Diagrams are not necessarily drawn to scale.

8. Write neatly and legibly.

QUESTION 1

The diagram below has vertices ABCD with $E(1;0)$. The equation of BC is
$2x = 6y - 12$ and the equation of BD is $2 = y + 2x$.
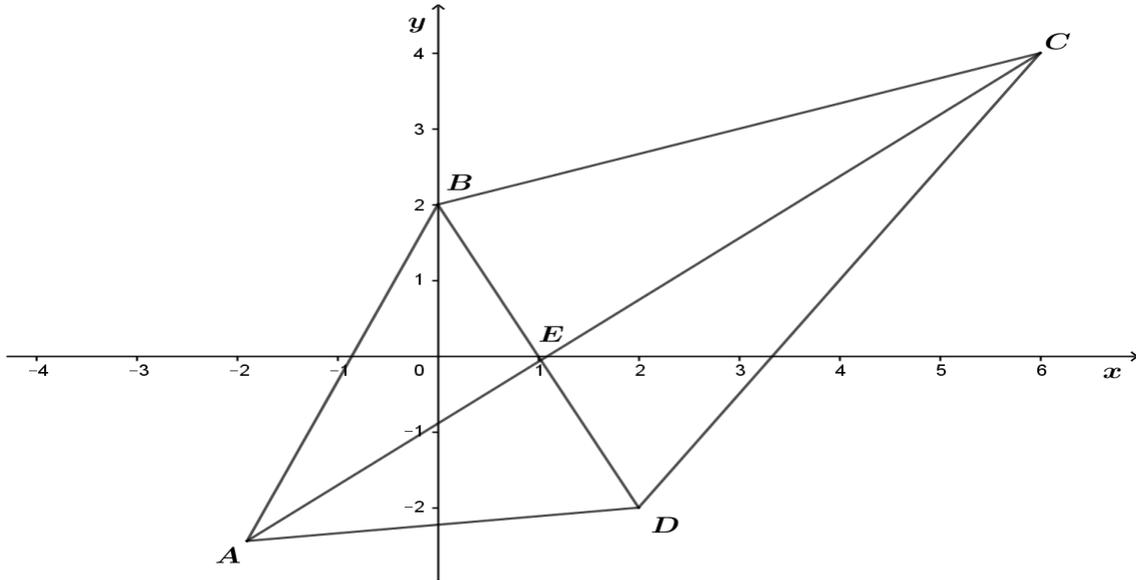
1.1   Write down the coordinates of B and C.   (2)

1.2   Write down the gradient of AC.   (1)

1.3   Determine whether $AB \perp BD$ (3)

1.4   Calculate the length of BD.   (3)

1.5   If the *y*-coordinate of F a point on BC is 6, calculate the *x*-coordinate of F.   (2)

1.6   Determine the equation of the line that passes through E and S (the midpoint of BC).   (5)
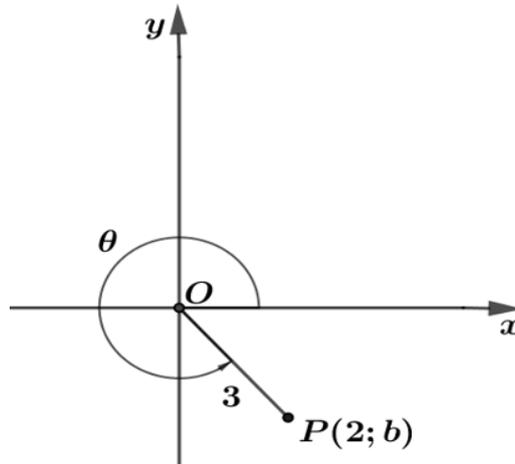
[16]

QUESTION 2

2.1 If $\beta = 13,4°$ and $\alpha = 23,5°$. Use a calculator to evaluate:

    2.1.1 $tan^2\beta + sin\alpha$ (2)

    2.1.2 $\dfrac{2}{cos\ \alpha + cot\beta}$ (2)

2.2 In the Cartesian plane below, the point $P(2; b)$ and the angle θ are shown.

Determine the following and write your answer as a single fraction:

    2.2.1 $\sin\theta$ (5)

    2.2.2 $\cos\theta + \tan\theta$ (3)

    2.2.3 $\dfrac{\sec\theta}{1 + \cos ec\theta}$ (3)

2.3 Solve for x :

    If: $\dfrac{\frac{1}{3}\tan(x + 20°)}{5} = \cot 23,1°$ $x \in \left[0°, ﹣u°\right]$.   (3)

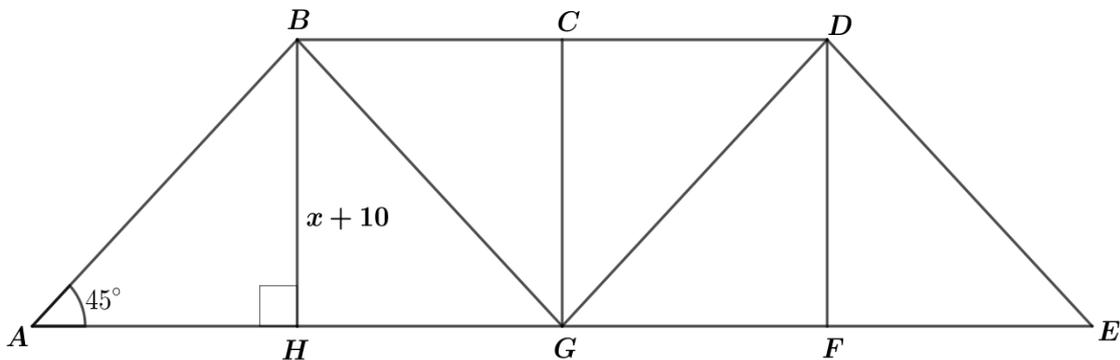   **[18]**

QUESTION 3

As the chief engineer of Makmunya Construction (Pty) Ltd. You have been asked to construct a bridge for a local village in the Eastern Cape. Below is the picture of the bridge that the company must come up with.

You were given the cross-section below to work with.

3.1   What is the height of the bridge?   (1)

3.2   Calculate the length of the bridge AE in-terms of x.   (1)

    3.3.1   If $AE = 80m$, determine the numerical value of x.   (2)

    3.3.2   Hence or otherwise, calculate the length of DE.   (2)

    3.3.3   Calculate the area of $ABDE$.   (3)

[9]

QUESTION 4
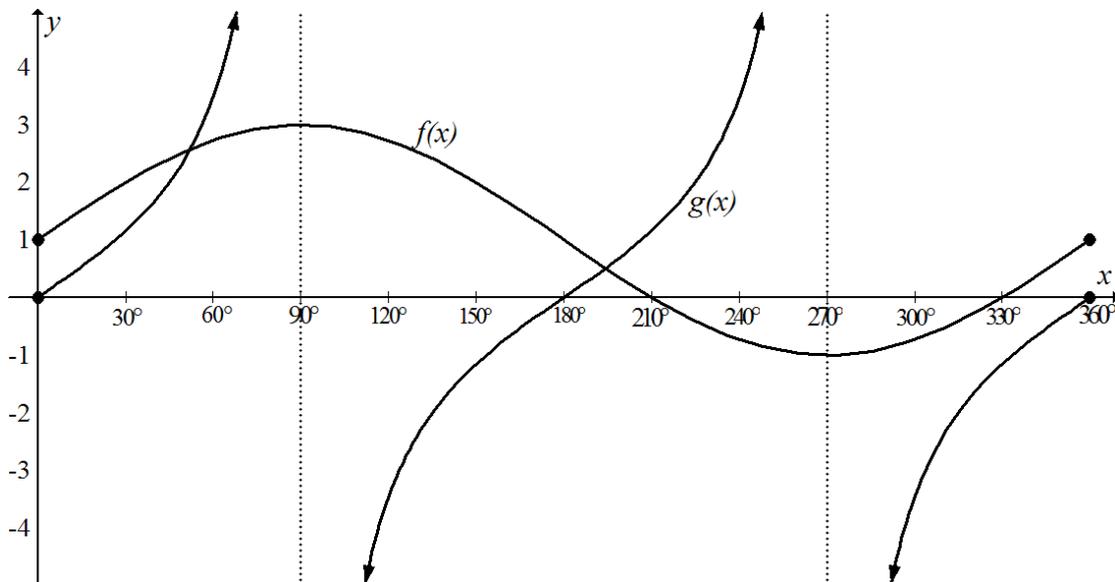
4.1 Consider the function $y = 3cosx$

     4.1.1   Make a neat sketch of $y = 3cosx$ for $0° \leq x \leq 360°$ on the diagram sheet provided in the answer book. Clearly indicate on your sketch the intercepts with the axes.   (4)

     4.1.2   (i)   What is the amplitude of y?   (1)

              (ii)   Write down the range of y .   (2)

     4.1.3   The graph of y is moved 3 steps downwards. Write down the new equation as $p(x) = \cdots$ (1)

4.2 The graph of $f(x) = bsinx + 1$ and $g(x) = 2tanx$
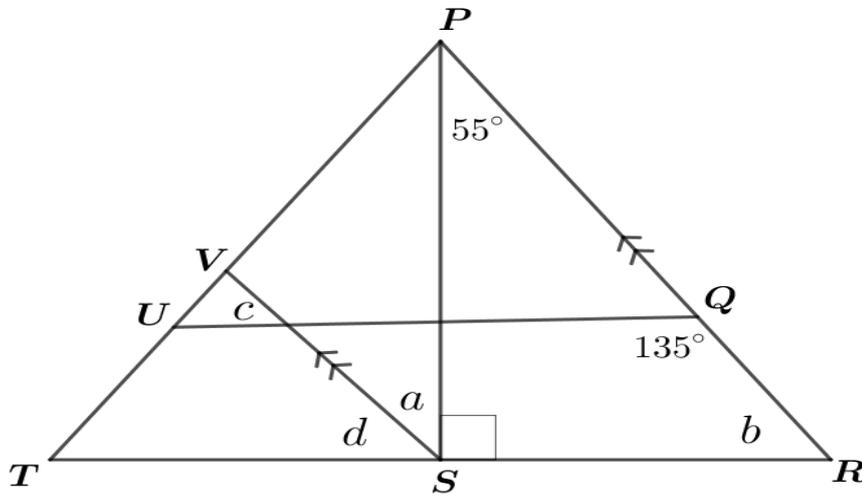

     4.2.1   Write down the value of b .   (1)

     4.2.2   Write down the period of g .   (1)

     4.2.3   For which value(s) of x will $f(x) > g(x)$?   (3)
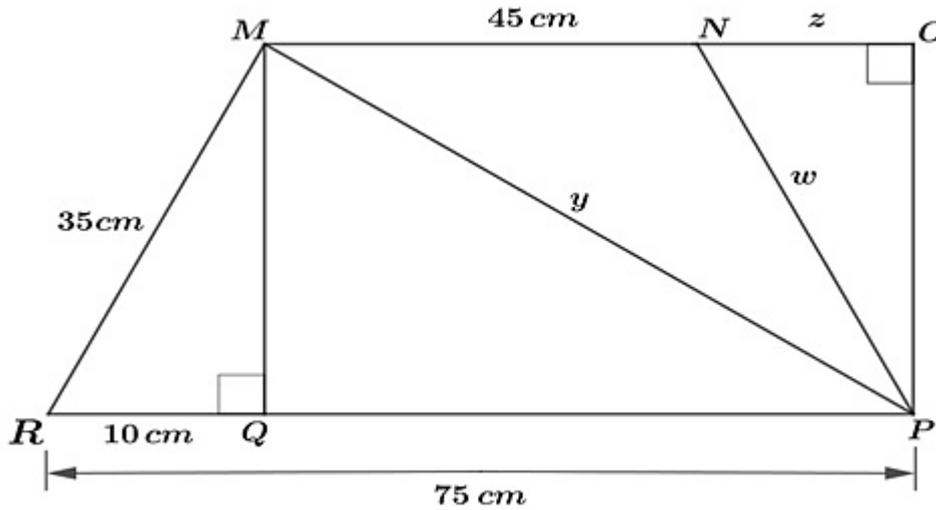
                                                                   [13]

QUESTION 5

In the diagram below PRT is a triangle with RP∥SV . Q is a point on PR; V and U are on
PT. S is on RT such that PS ⊥ TR .

5.1   Determine, giving reasons, the value of the angle $a, b, c,$ and d .   (8)

5.2   Suppose it is given that UQ∥TR , do you agree? Justify your answer.   (2)

[10]

QUESTION 6

In the diagram below $MOPR$ is trapezium with $MR = 35, RQ = 10, RP = 75,$
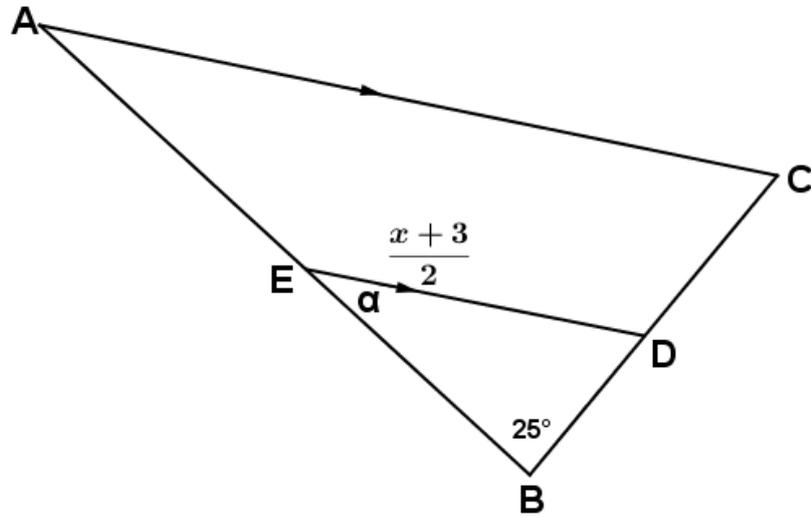$MN = 45, MP = y, NP = w$ and $NO = z$. The diagram is not drawn to scale.

6.1   What is the name of the shape $MOPQ$? (1)

6.2   Calculate, giving reason, the value of:

    6.2.1 y (4)

    6.2.2 z (2)

    6.2.3 w (3)

6.3   Show that $\Delta MPQ \equiv \Delta MOP$. (3)

[13]

QUESTION 7

In $\triangle ABC$, $AC\|DC$, $D\hat{B}E = 25°$ and $B\hat{E}D = \alpha$ and ED is drawn such that $AE = EB$ and $BD = DC$. The diagram is not drawn to scale.

7.1   7.1.1 Calculate AC in terms of x .   (2)

        7.1.2 If $x = 7$, determine the value of AC.   (1)

7.2   Calculate the value of angle $B\hat{A}C$.   (3)

7.3   Show that $\triangle DBE\|\|\triangle ABC$.   (3)

                                                    [9]

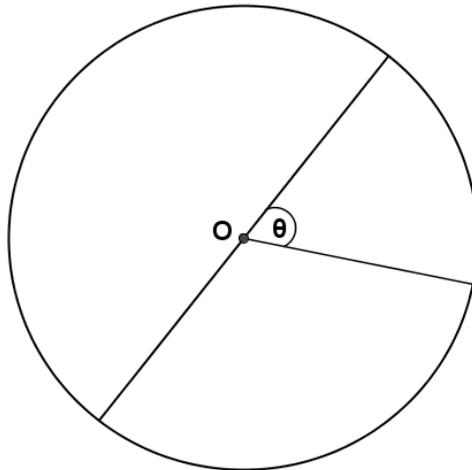**QUESTION 8**

8.1   Convert the following:

    8.1.1   307,5° to degrees-minutes-seconds (3)

    8.1.2   79°39′18″ to degrees (3)

8.2   A circle below has a diameter of 75 *m*, central angle *θ* and an arc of length 250 *m*.

    Calculate the numerical value of the central angle *θ*. (3)

8.3   Simplify the following, without using a calculator and leave your answer in degrees.

$$\frac{3\pi}{7} + 13\pi - 23.5°$$

(3)

[12]

TOTAL   100