Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 11

NOVEMBER 2020

MATHEMATICS P2 EXEMPLAR

MARKS: **150**

TIME: **3 hours**

This question paper consists of 10 pages and an answer book of 20 pages.

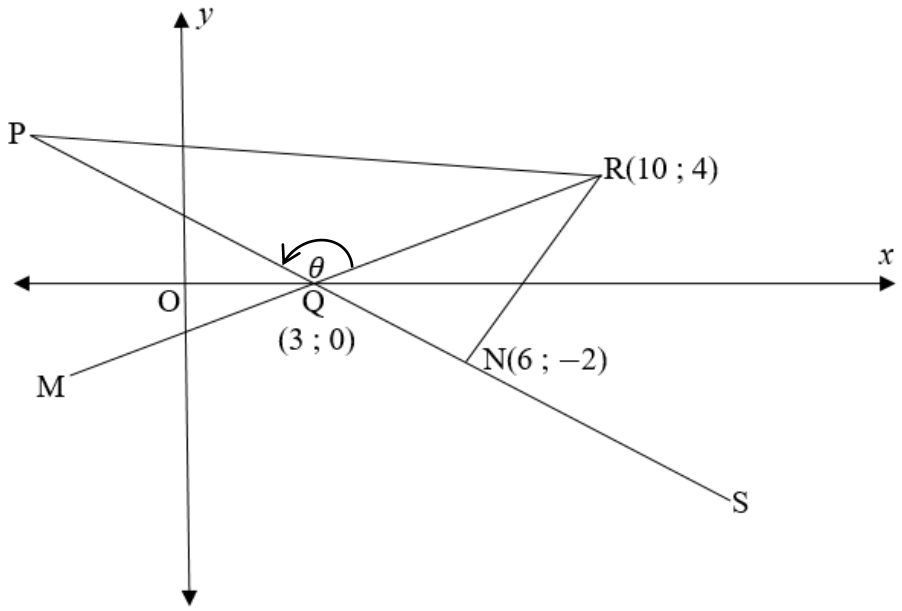
INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 9 questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
3. Clearly show ALL calculations, diagrams, graphs, etc. 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 answers to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. Write neatly and legibly.

QUESTION 1

In the diagram below, straight line PS is defined by $3y+2x=6$ and cuts the *x*-axis at Q(3; 0). MQR is a straight line which meets PR at R(10; 4). N(6; - 2) is a point on PS and RN is drawn. $P\hat{Q}R = \theta$.



1.1 Determine the gradient of PS. (2)

1.2 Calculate the inclination angle of MR. (4)

1.3 Determine the value of θ. (3)

1.4 Prove that $RN \perp PS$. (3)

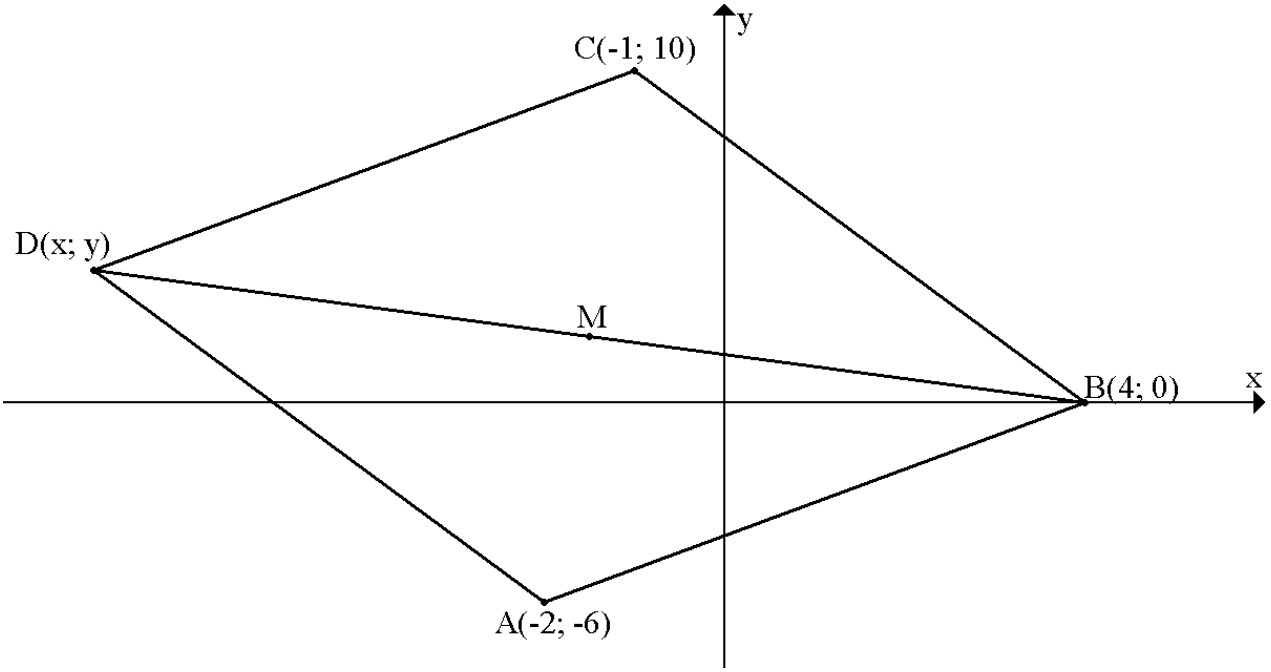
1.5 Calculate the area of ΔRQN. (6)

1.6 Calculate the *y*-intercept of MR. (4)

[22]

QUESTION 2

ABCD is a parallelogram with A(-2; -6), B(4; 0), C(-1; 0) and D(x ; y) as shown below.



2.1 Calculate the length of BC. (2)

2.2 Determine the gradient of AB. (2)

2.3 Determine the equation of CD. (3)

2.4 Determine the coordinates of M, the midpoint of BD. (3)

2.5 Hence or otherwise, determine the values of x and y. (3)

[13]

QUESTION 3

3.1 If $12\tan B - 5 = 0$ and $90° \le B \le 360°$, determine the value of $\sin B + \cos B$ with the aid of a sketch. (5)

3.2 If $\sin 43° = p$, determine the values of the following in terms of *p*, without a calculator.

3.2.1 $\cos 133°$ (2)

3.2.2 $\tan(-43°)$ (3)

3.3 Simplify each of the following fully, WITHOUT using a calculator:

3.3.1 $\dfrac{\sin(90° - x)}{\sin(360° - x)} \div \tan(x - 180°)$ (5)

3.3.2 $\dfrac{\tan 205°.\cos 315°.\sin 135°}{\sin 210°.\cos 150°.\tan 25°}$ (7)

[22]

QUESTION 4

4.1 Prove that:

$$\frac{\sin\theta - \cos\theta.\sin\theta}{\cos\theta - (1 - \sin^2\theta)} = \tan\theta$$ (4)

4.2 Determine the general solution of $2\sin x\cos x - \cos^2 x = 0$ (6)

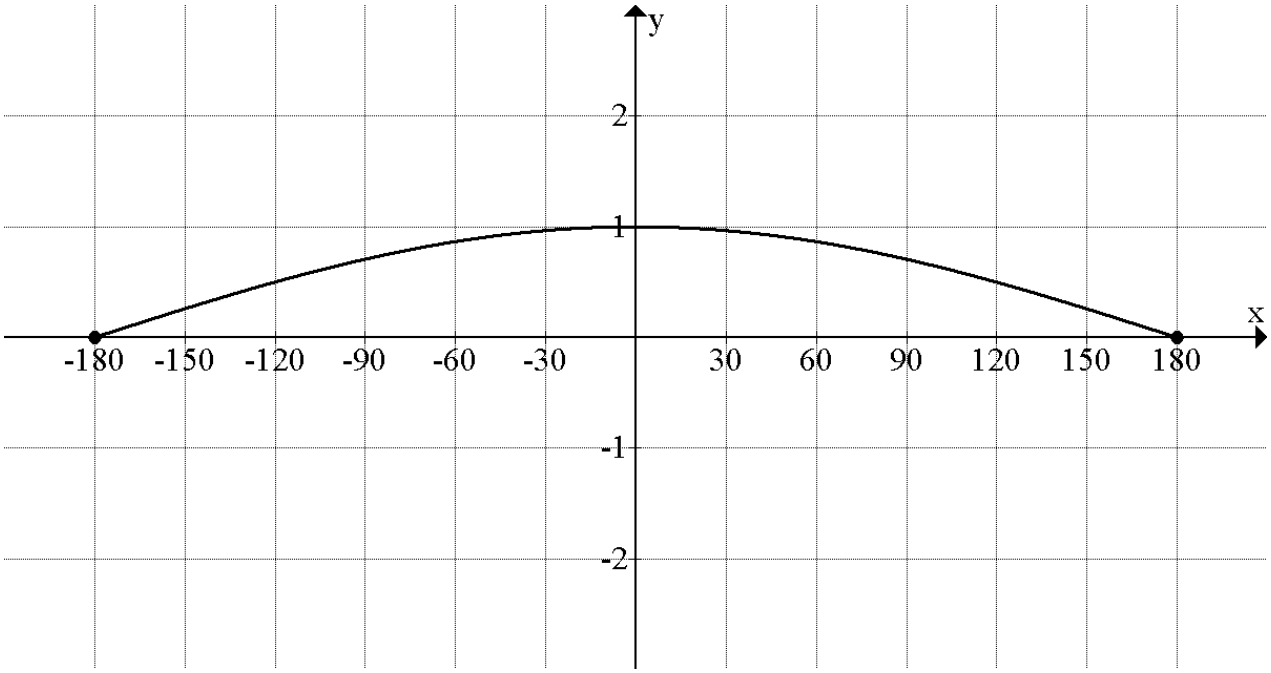
4.3 Solve for α if : $2.\sqrt{\sin\alpha} = 1$, where $\alpha \in [0°; 360°]$ (3)

4.4 If *x* and *y* are acute angles such that $\tan\left(\dfrac{x+y}{2}\right) = 1$ and $\cos(x - y) = \dfrac{\sqrt{3}}{2}$, find the values of *x* and *y*. (5)

[18]

QUESTION 5

Sketched below is a graph of $f(x)=\cos\left(\frac{x}{2}\right)$, where $x\in[-180°;180°]$.



5.1 For $f(x)$, write down the:

5.1.1 Range (2)

5.1.2 Period (1)

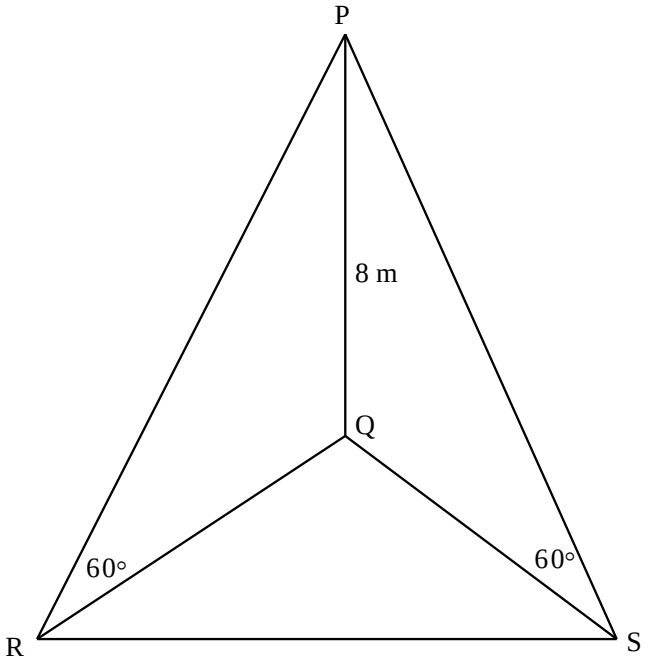
5.2 Draw a graph of $g(x)=\sin(x-30°)$ for $x\in[-180°;180°]$ on the axes provided in the ANSWER BOOK. Clearly show all intercepts with the axes, turning point, starting and ending points. (4)

5.3 For which values of $x\in[-180°;180°]$, is $f(x).g(x)\geq 0$? (3)

[10]

QUESTION 6

A pole, 8 m tall, is held in a vertical position by two steel cables of equal length. In the sketch, PQ is the pole and PS and PR are the steel cables. The angle of elevation of the top of the pole from the anchor points R and S is $60°$ in both cases.



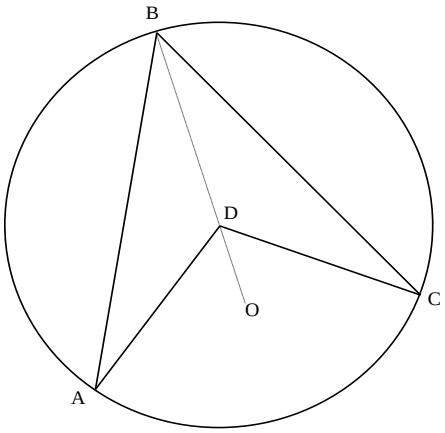
6.1 Determine the length of cable PS. Leave your answer in simplified surd form. (3)

6.2 Determine the distance between R and S, if $R\hat{Q}S = 100°$. Give your answer correct to TWO decimal digits. (7)

[10]

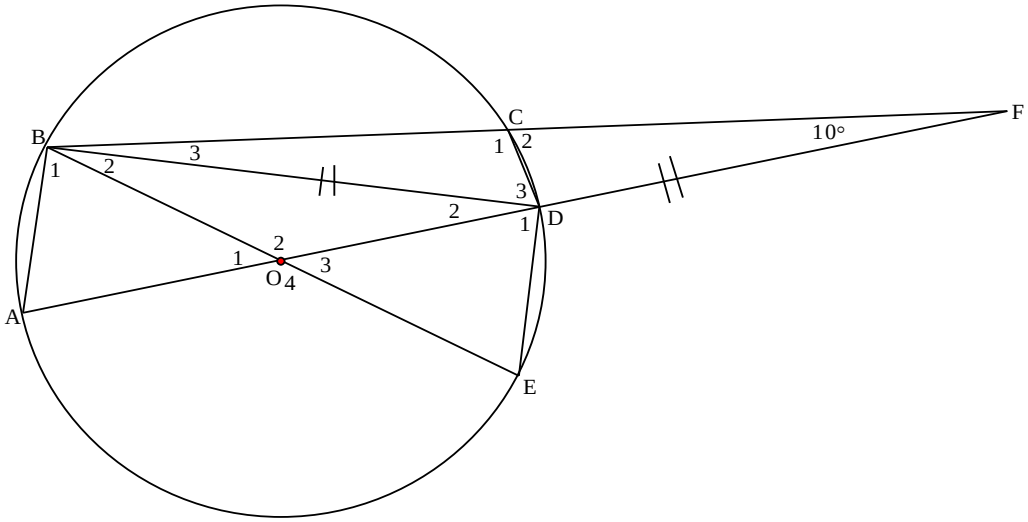
QUESTION 7

7.1 In the diagram below, D is the centre of circle ABC with radius BD produced to O.



Use the diagram to prove the theorem that states $A\hat{D}C = 2 \times A\hat{B}C$. (5)

7.2 In the figure, O is the centre of circle ABCDE. DB = DF. AODF, BOE and BCF are straight lines. $C\hat{F}D = 10°$.



Calculate, giving reasons, the size of the following angles:

7.2.1 $\hat{D}_2$ (3)

7.2.2 $\hat{A}$ (4)

7.2.3 $\hat{O}_2$ (2)

7.2.4 $\hat{C}_1$ (2)

7.2.5 $\hat{E}$ (2)

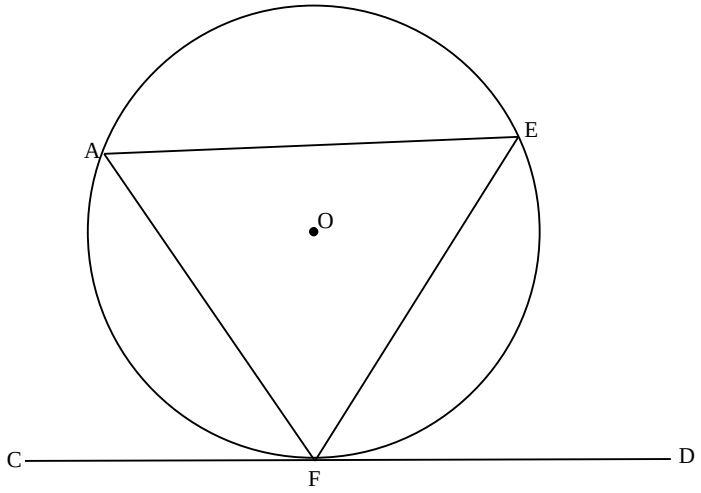
7.2.6 $\hat{C}_2$ (2)

7.2.7 $\hat{O}_3$ (2)

[22]

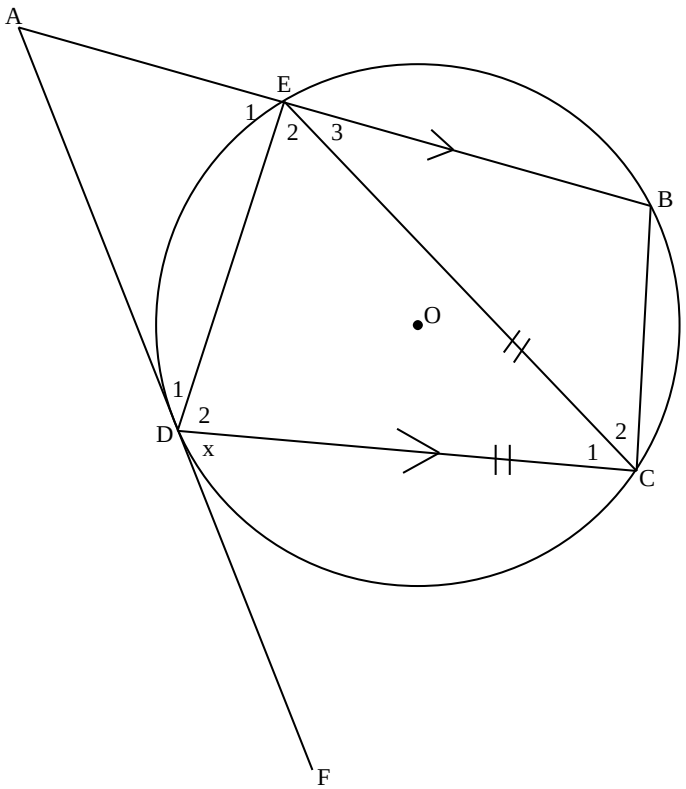
QUESTION 8

8.1 In the diagram below, O is the centre of circle AEF with CFD a tangent at F.



Use the diagram to prove the theorem which states that $E\hat{F}D = \hat{A}$. (5)

8.2 In the diagram below, ADF is a tangent to the circle with points E, B, C and D on the circumference of the circle. AB || DC and EC = DC.



8.2.1 If $C\hat{D}F = x$, name with reasons, FIVE other angles equal to *x*. (10)

8.2.2 Prove that ABCD is a parallelogram. (4)

[19]

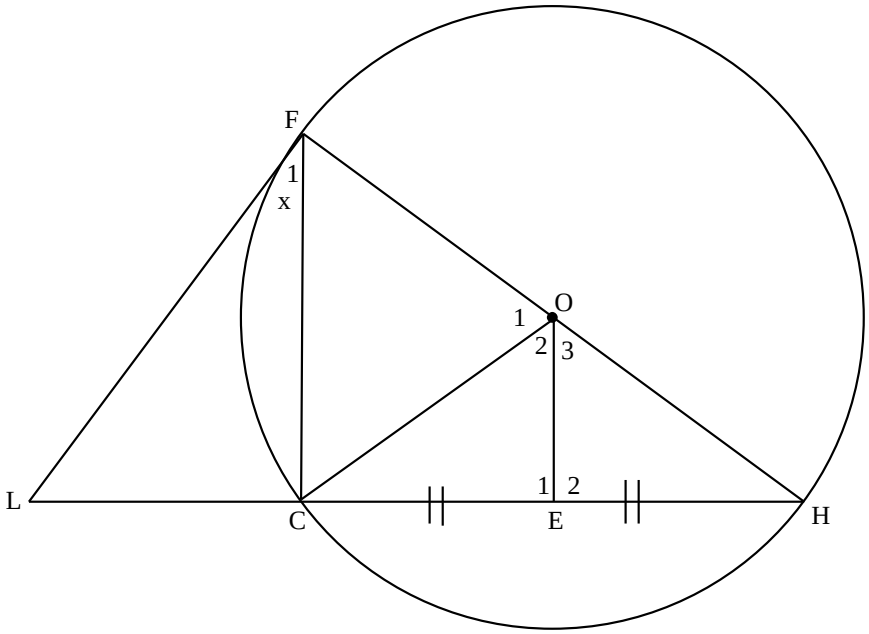
QUESTION 9

9.1 Complete the following theorem statements:

9.1.1 The line drawn from the centre of a circle to the midpoint of a chord is … (1)

9.1.2 The exterior angle of a cyclic quadrilateral is equal to the … (1)

9.2 In the diagram, FH is a diameter of the circle FCH with centre O. FC is a chord and LCH is a secant. LF is a tangent to the circle at F. E is a point on CH such that CE = HE.



9.2.1 Prove that FC || OE. (5)

9.2.2 Prove that OFLE is a cyclic quadrilateral. (3)

9.2.3 If $\hat{F}_1 = x$, express $\hat{O}_1$ with reasons in terms of *x*. (4)

[14]

TOTAL: 150