education

Department of Education
FREE STATE PROVINCE

GRADE 12

MATHEMATICS

MARCH TEST
2022



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This question paper consists of 7 pages, 3 diagram sheets and 1 information sheet.

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 7 questions.
2. Clearly show ALL calculations, diagrams, graphs, etc. that you have used to determine your answers.
3. Answers only will NOT necessarily be awarded full marks.
4. If necessary, round off answers to TWO decimal places, unless stated otherwise.
5. Diagrams are NOT necessarily drawn to scale.
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. The answer sheets for question 5, 6 and 7 are included in the question paper.
8. An information sheet with formulae is included at the end of the question paper.
9. Write neatly and legibly.

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QUESTION 1

1.1 Solve for x:

1.1.1 $x(x+6)=0$ (2)

1.1.2 $3x^2+8x=-2$ (correct tot TWO decimal places) (4)

1.1.3 $x^2-64\leq 0$ (3)

1.1.4 $\sqrt{x+5}+1=x$ (5)

1.2 Solve simultaneously for x and y in the following equations:

$6x+5xy-5y=8$ (6)

$x+y=2$

[20]

QUESTION 2

2.1 Consider the quadratic number pattern: -20 ; -9 ; 0 ; 7 ; ...

2.1.1 Determine the n^{th} term. (4)

2.1.2 Determine the position and the value of the term with the highest value. (3)

[7]

QUESTION 3

3.1 Given the following arithmetic sequence: 13 ; 8 ; 3 ; ...

3.1.1 Determine the value of the 50^{th} term. (3)

3.1.2 Calculate the sum of the first fifty terms. (2)

3.2 Prove that: $a+a+d+a+2d+...(\text{to } n \text{ terms})=\frac{n}{2}[2a+(n-1)d]$ (4)

3.3 Consider the geometric series: $3+m+\frac{m^2}{3}+\frac{m^3}{9}+...$

3.3.1 For which value(s) of m will the series converge? (3)

3.3.2 It is given that: $3+m+\frac{m^2}{3}+\frac{m^3}{9}+...=\frac{27}{7}$

Calculate the value of m (3)

3.4 Determine the value of n if:

$$\sum_{r=1}^{n} 5.2^{1-r}=\frac{630}{64}$$ (6)

[21]

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QUESTION 4

DO NOT USE A CALCULATOR FOR THIS QUESTION.

4.1 Given: $\tan\theta = \frac{3}{4}$; where $\theta \in [0^\circ; 90^\circ]$

With the use of a sketch and without the use of a calculator, calculate:

4.1.1 $\sin\theta$ (3)

4.1.2 $\cos^2(90^\circ - \theta) - 1$ (2)

4.1.3 $1 - \sin 2\theta$ (3)

4.2 Simplify completely:

$$\frac{\sin^2(90^\circ + \alpha) + \sin(180^\circ + \alpha)\sin(-\alpha)}{\sin 180^\circ - \tan 135^\circ}$$ (5)

4.3 Prove the following identity:

$$\sin 2\theta + \cos(2\theta - 90^\circ) = 4\sin\theta\cos\theta$$ (3)

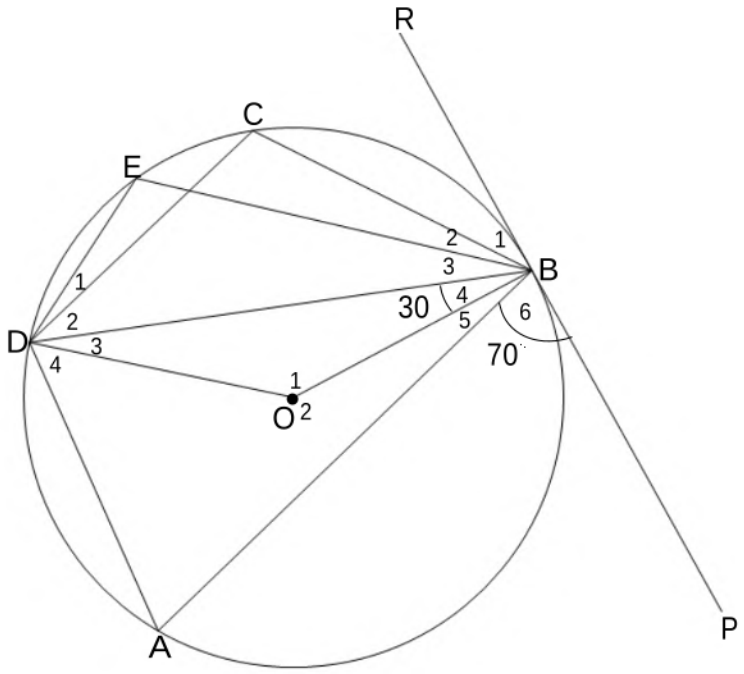
4.4 Solve for x if:

$$20^{\sin x} + 20^{\sin x + 1} = 420 \text{ for } -360^\circ \leq x \leq 360^\circ$$ (5)

[21]

QUESTION 5

5.1 In the diagram below ABCD is a cyclic quadrilateral. RBP is a tangent to the circle with centre O. $B_4 = 30^\circ$ and $B_6 = 70^\circ$.



Determine with reasons the size of each of the following angles:

5.1.1 O_1 (2)

5.1.2 $\hat{A}$ (2)

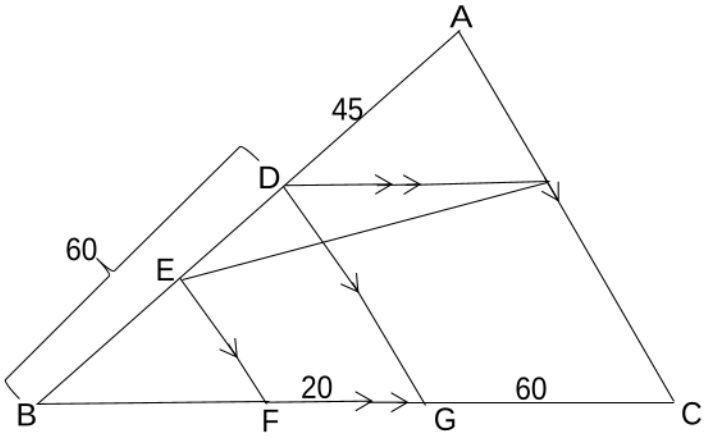
5.1.3 $\hat{C}$ (2)

5.1.4 ADB (2)

[8]

QUESTION 6

In the following diagram $AD = 45$, $BD = 60$, $GC = 60$ and $FG = 20$. $ABC = 30^\circ$.



Determine the size of

6.1 BF (4)

6.2 DE (3)

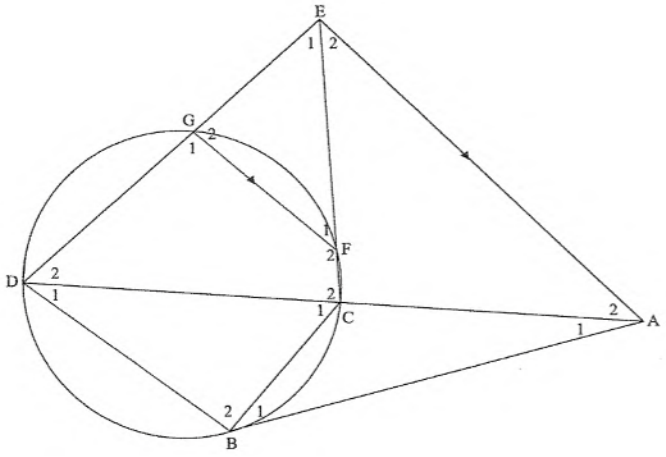
6.3 Calculate the area of ΔABC (4)

[11]

QUESTION 7

In the diagram, DGFC is a cyclic quadrilateral and AB is a tangent to the circle at B.

Chords DB and BC are drawn. DG produced and CF produced meet in E and DC is produced to A. EA ∥ GF



7.1 Give a reason why $B_1=D_1$ (1)

7.2 Prove $\triangle ABC|||\Delta ADB$ (3)

7.3 Prove $E_2=D_2$ (4)

7.4 Prove $AE=\sqrt{AD\times AC}$ (4)

[12]

TOTAL: 100