



Province of the  
**EASTERN CAPE**  
EDUCATION

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 11**

**NOVEMBER 2018**

**TECHNICAL MATHEMATICS P2**

**MARKS: 150**

**TIME: 3 hours**



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This question paper consists of 14 pages and an answer book.

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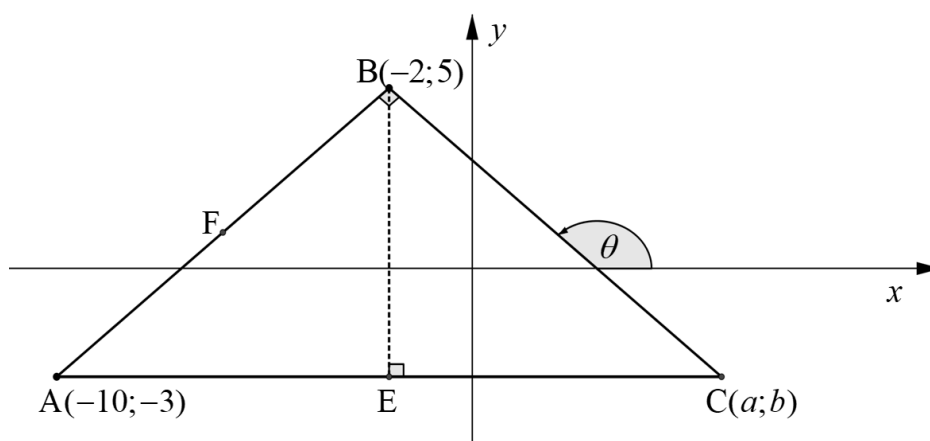
**INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions.

1. This question paper consists of 10 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 picture below shows a pitch roof and the diagram below it represents this picture in a Cartesian plane.  $A(-10;-3)$ ,  $B(-2;5)$  and  $C(a;b)$  are the vertices of  $\triangle ABC$  in a Cartesian plane with  $\hat{B} = 90^\circ$ , the highest point of the roof. It is further given that  $AC$  is parallel to the  $x$ -axis and  $E$  is the midpoint of  $AC$  with  $BE \perp AC$ .

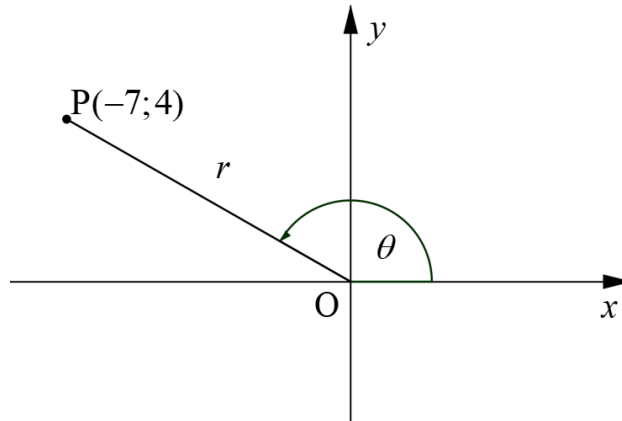


- 1.1 Calculate the distance between A and B. Leave your answer in SURD form. (3)
- 1.2 Calculate the angle of inclination,  $\theta$ . (6)
- 1.3 Show that  $AB = BC$  (3)
- 1.4 Calculate the coordinates of C. (4)
- 1.5 Determine the equation of EF, if EF is perpendicular to AB. (3)
- 1.6 Hence, determine the length of EF. (3)
- 1.7 Calculate the area of  $\triangle ABC$ . (3)

**[25]**

**QUESTION 2**

In the diagram below,  $P(-7; 4)$  is a point on the Cartesian plane such that  $OP = r$  and the angle between the  $x$ -axis and  $OP$  is  $\theta$ .



Determine the values of the following:

- 2.1  $r$ , correct to the nearest integer. (2)
- 2.2  $\operatorname{cosec} \theta$  (1)
- 2.3  $\sec^2 \theta - \cot^2 \theta$  (4)
- 2.4  $\theta$ , correct to ONE decimal digit. (3)

**[10]**

**QUESTION 3**

3.1 Solve for  $\theta$  if:

$$\operatorname{cosec}(\theta - 30^\circ) = 1,57, \text{ if } \theta \in [0^\circ; 360^\circ] \quad (5)$$

3.2 Simplify the following to a single trigonometric ratio:

$$\frac{\sin(180^\circ - x) \cdot \operatorname{cosec}(360^\circ - x) \cdot \tan(180^\circ + x)}{\sec(360^\circ - x)} \quad (7)$$

3.3 Prove that:

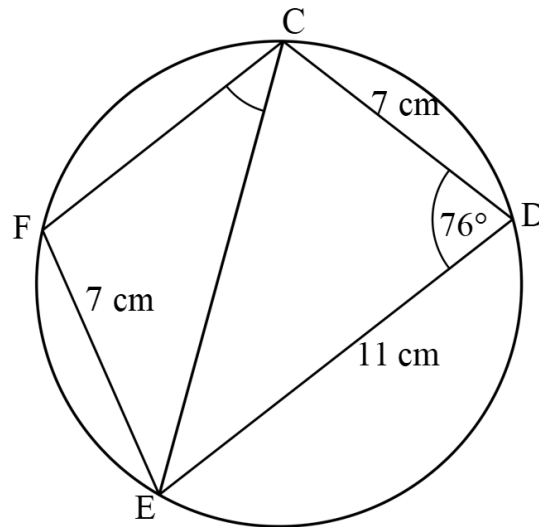
$$\frac{\tan x \cdot \operatorname{cosec} x}{\tan x + \cot x} = \sin x \quad (6)$$

**[18]**

**QUESTION 4**

In the figure below, CDEF is a cyclic quadrilateral.

$\hat{D} = 76^\circ$ ,  $CD = FE = 7$  cm and  $DE = 11$  cm.



Determine the following correct to ONE decimal digit:

4.1 The length of CE (4)

4.2  $\hat{FCE}$  (5)

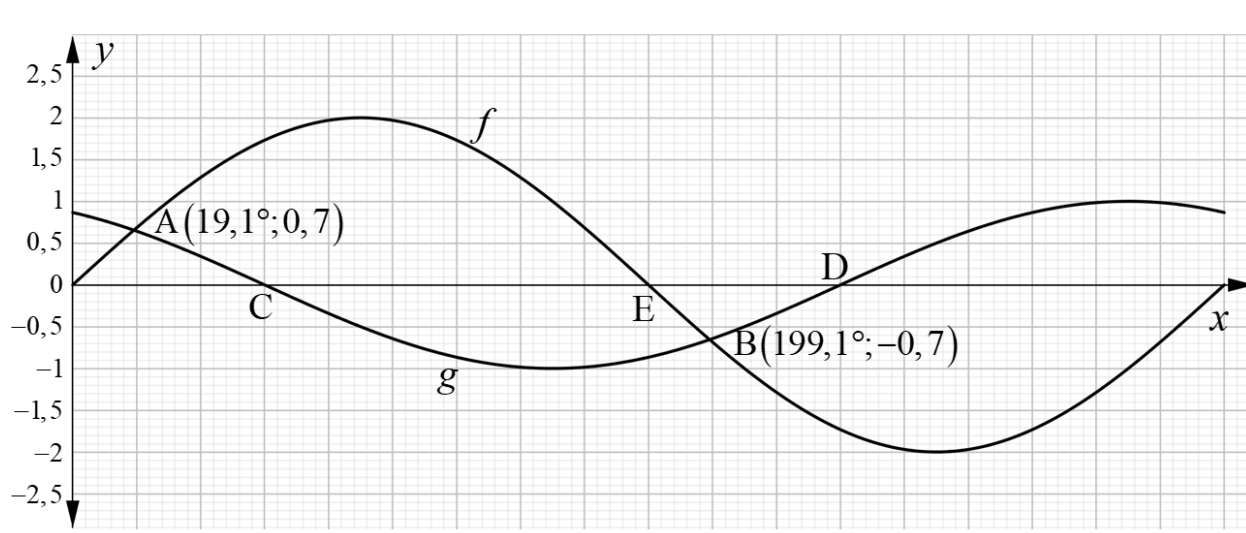
4.3 Area of  $\triangle CFE$  (4)

**[13]**

**QUESTION 5**

Given:  $f(x) = 2\sin x$  and  $g(x) = \cos(x + 30^\circ)$ ,  $x \in [0^\circ; 360^\circ]$

Study the given graphs below and answer the questions that follows.



5.1 Write down the coordinates of C, D and E. (3)

5.2 Write down the amplitude of  $f$  (1)

5.3 Determine the values of  $x$  for which:

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

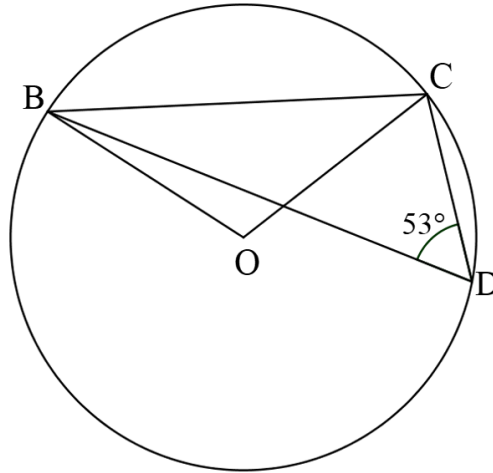
5.3.2  $f(x) \cdot g(x) < 0$  (4)

**[10]**

Give reasons for ALL your statements in QUESTION 6 and 7.

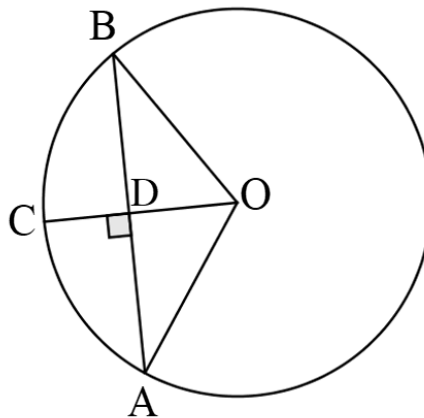
### QUESTION 6

- 6.1 In the figure below, O is the centre of the circle BCD with  $\hat{BDC} = 53^\circ$ .



Determine, with reasons, the size of  $\hat{BCO}$ . (5)

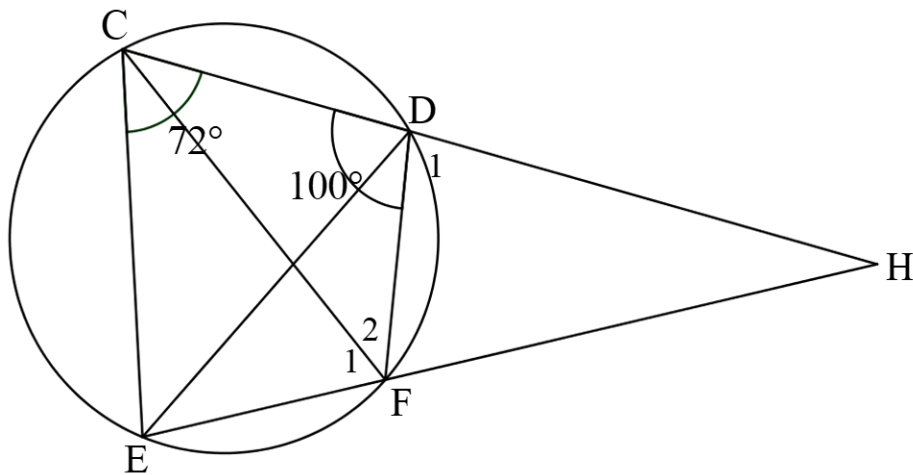
- 6.2 In the diagram below AB is the chord of the circle with centre O. The perpendicular from the centre intersect the chord at D and the circle at C.  $AB = 60$  units;  $CO = 40$  units.



Calculate, with reasons, the length of DO, to the nearest integer. (5)



- 6.3 In the diagram below, circle CDFE is given with straight lines CDH and EFH meeting at H. FC bisects  $\angle ECH$ , with  $\angle ECH = 72^\circ$  and  $\angle CDF = 100^\circ$ .



Calculate, with reasons:

6.3.1  $\angle FCD$  (1)

6.3.2  $\angle DEF$  (2)

6.3.3  $\angle CED$  (2)

6.3.4  $\angle DFH$  (2)

6.3.5  $\angle CHE$  (2)

**[19]**

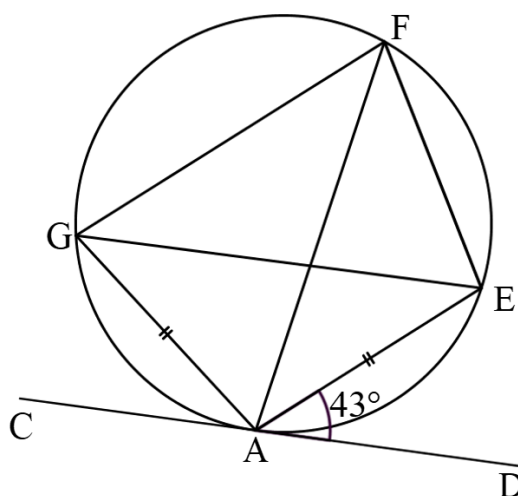
### QUESTION 7

7.1 Complete the following theorem statements:

7.1.1 Angle in the semi-circle ... (1)

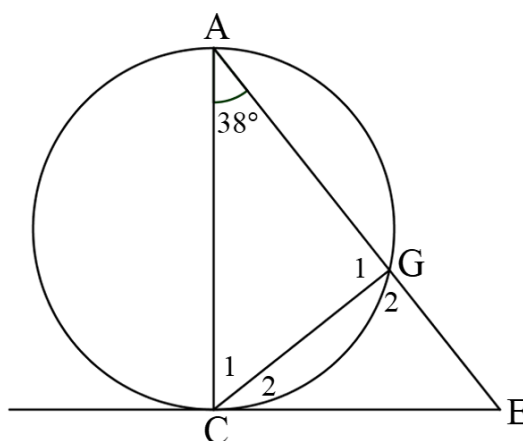
7.1.2 Angle between a tangent to a circle and a chord from the point of contact is equal to ... (1)

7.2 In the diagram below, CAD is a tangent to the circle AGFE.  $GA = AE$  and  $\hat{DAE} = 43^\circ$



Name, with reasons, FIVE other angles equal to  $43^\circ$ . (10)

7.3 In the diagram below, CE is a tangent and AC is the diameter of circle ACG.



Calculate, with reasons:

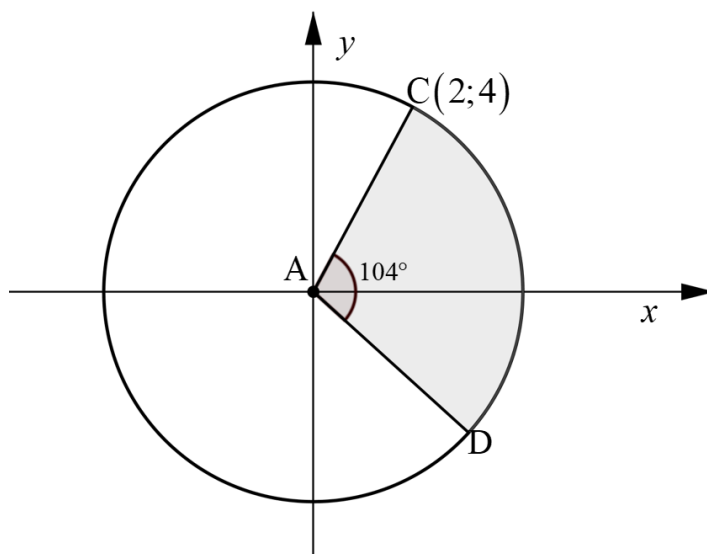
7.3.1  $\hat{ACG}$  (3)

7.3.3  $\hat{E}$  (3)

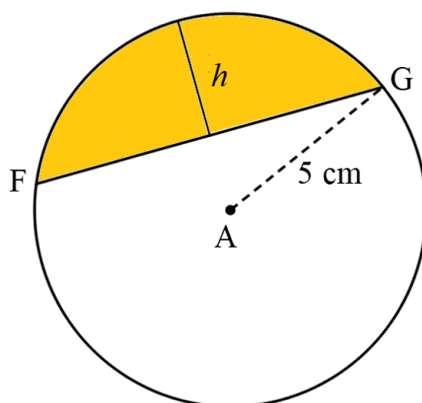
[18]

**QUESTION 8**

- 8.1 The diagram below shows a circle with centre A. Points C and D are on the circumference and  $\widehat{CAD} = 104^\circ$ .

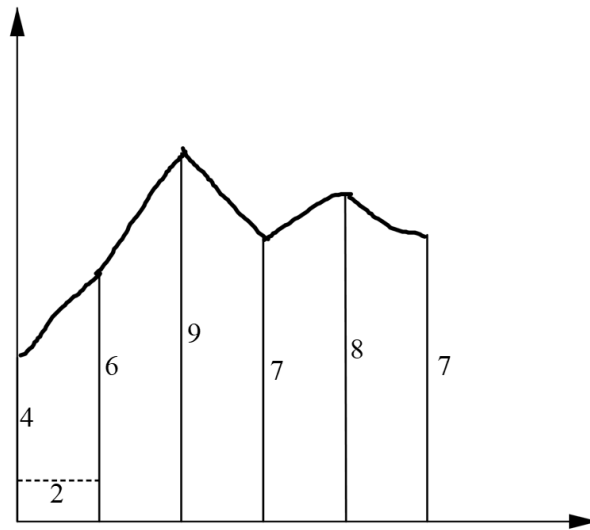


- 8.1.1 Determine the equation of the circle. (3)
- 8.1.2 Convert  $\widehat{CAD}$  to radians. (2)
- 8.1.3 Calculate the length of the arc CD. (3)
- 8.1.4 Calculate the area of the sector ACD. (3)
- 8.2 In the diagram below, the shaded segment has a height,  $h$ . The length of the chord,  $FG = 9,18$  cm.



Calculate the height of the segment, where the relationship between the segment, diameter and the length of the chord is given by  $4h^2 - 4dh + x^2 = 0$ . (6)

- 8.3 The figure below shows an irregular figure, divided into 5 equal parts, 2 cm apart. The ordinates are 4 cm, 6 cm, 9 cm, 7 cm, 8 cm and 7 cm.



Calculate the area of the figure using the mid-ordinate rule.

(4)  
[21]

**QUESTION 9**

A point on the rim of a wheel of diameter 10 meter moves with a linear speed of 45 m/s.



Calculate:

9.1 the rotational frequency in r/s. (4)

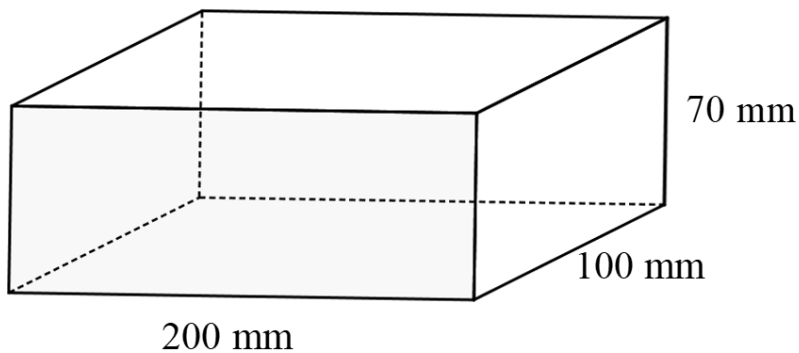
9.2 the angular velocity. (3)

[7]

## QUESTION 10

Area = $2lh + 2bh + 2bl$	Volume = $lbh$
Area = $2\pi r^2 + 2\pi rh$	Volume = $\pi r^2 h$
Area = $\pi r^2 + \pi rl$ $= \pi r^2 + \pi r\sqrt{h^2 + r^2}$	Volume = $\frac{1}{3}\pi r^2 h$
Area = $4\pi r^2$	Volume = $\frac{4}{3}\pi r^3$

Consider the prism below, with measurements 200 mm long, 100 mm wide and 70 mm high.



10.1 Calculate the surface area of this prism. (3)

10.2 A sphere has a surface area of  $48\pi \text{ cm}^2$ . Calculate the volume of the sphere. (6)  
[9]

**TOTAL: 150**