



Province of the  
**EASTERN CAPE**  
EDUCATION

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 11**

**NOVEMBER 2020**

**TECHNICAL MATHEMATICS P2  
(EXEMPLAR)**

**MARKS: 150**

**TIME: 3 hours**

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This question paper consists of 12 pages.

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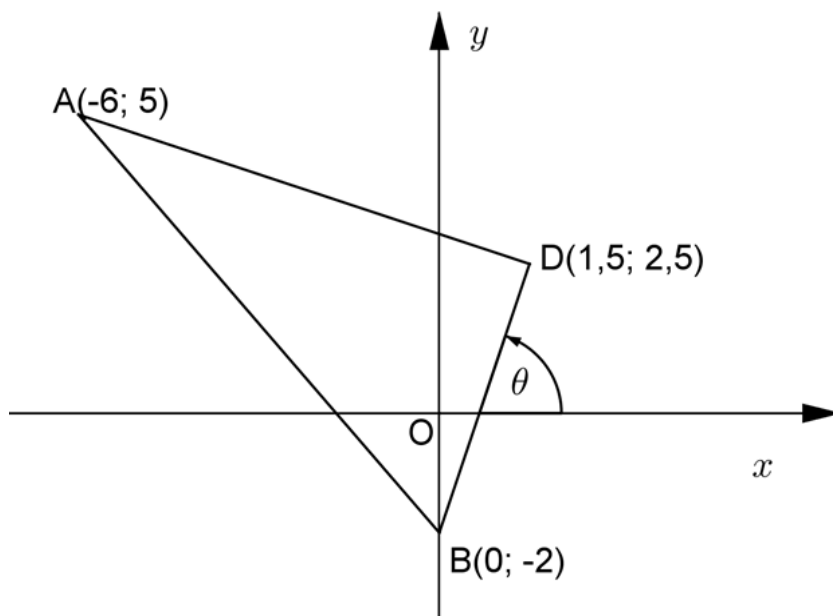
**INSTRUCTIONS AND INFORMATION**

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

In the diagram below,  $A(-6; 5)$ ,  $B(0; -2)$  and  $D(1,5; 2,5)$  are the vertices of  $\triangle ADB$ .  
The equation of  $BD$  is given by  $-3x + y = -2$ .



Determine:

- 1.1 The length of  $AB$  (3)
- 1.2 The gradient of  $AD$  (3)
- 1.3 The equation of the line that goes through  $A$  parallel to  $BD$  in the form  $y = \dots$  (4)
- 1.4 Show that  $AD \perp BD$  (2)
- 1.5 The coordinates of the midpoint of  $AB$  (3)
- 1.6 The size of  $\theta$  (rounded off to THREE decimal digits) (2)
- 1.7 If  $BC \parallel AD$ , what type of quadrilateral is formed by  $ACBD$ ? Provide a reason. (2)
- 1.8 The length of  $CD$  (1)
- 1.9 The coordinates of  $C$  (4)
- 1.10 The area of  $ACBD$  (4)

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**QUESTION 2**

- 2.1 If  $\hat{A} = 310^\circ$  and  $\hat{B} = 130,5^\circ$ , determine the following values, correct to ONE decimal digit:

$$2.1.1 \quad \tan 3B + \frac{1}{3} \cos \frac{A}{3} \quad (2)$$

$$2.1.2 \quad -\sec\left(\frac{A}{4} - 2B\right) \quad (2)$$

- 2.2 If  $\cot \theta = -\frac{12}{5}$  and  $\sin \theta > 0$ , determine the value of  $20\operatorname{cosec} \theta - 12\sec \theta$ , WITHOUT the use of a calculator. (5)

- 2.3 Simplify the following expression:

$$\frac{\sin(360^\circ - x) \sec(180^\circ + x)}{\tan(180^\circ - x) \operatorname{cosec}(360^\circ + x)} \quad (8)$$

- 2.4 Prove that:

$$\frac{1}{1 + \cot^2 x} + \frac{1}{1 + \tan^2 x} = 1 \quad (5)$$

- 2.5 Solve for  $x$  for  $x \in [0^\circ; 360^\circ]$ , correct to ONE decimal digit:

$$-\frac{2}{3} \sin x + 0,524 = 0 \quad (4)$$

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**QUESTION 3**

Given:  $f(x) = \cos(x - 45^\circ)$  and  $g(x) = -2\sin 2x$

- 3.1 Draw neat sketch graphs of the functions,  $f$  and  $g$ , on the same system of axes, for  $x \in [0^\circ; 360^\circ]$  using the grid provided in the SPECIAL ANSWER BOOK.

Clearly show ALL critical points. (6)

- 3.2 Write down the range of  $g$ . (2)

- 3.3 Write down the period of  $g$ . (1)

- 3.4 Use your graphs to answer the following:

For which values(s) of  $x$  is:

3.4.1  $f(x) - g(x) = 1$  (1)

3.4.2  $g(x) - f(x) = -3$  (1)

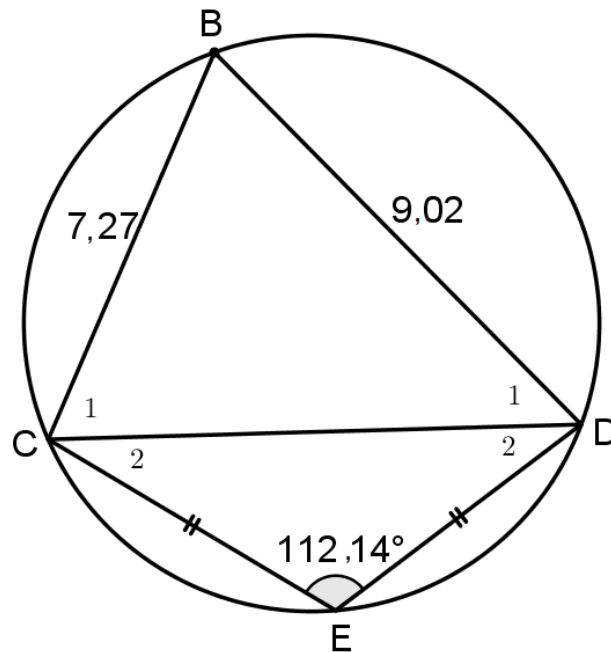
3.4.3  $f(x) \leq 0$  (2)

3.4.4  $f(x)g(x) \geq 0$  for  $x \in [0^\circ; 180^\circ]$  (2)

**[15]**

**QUESTION 4**

In the diagram below, BCED is a cyclic quadrilateral with  $\hat{E} = 112,14^\circ$ ,  $BC = 7,27$  units,  $BD = 9,02$  units and  $CE = ED$ .



Calculate to TWO decimal places:

- 4.1 The area of  $\triangle BCD$  (4)
- 4.2 The length of  $CD$  (4)
- 4.3 The length of  $CE$  (4)

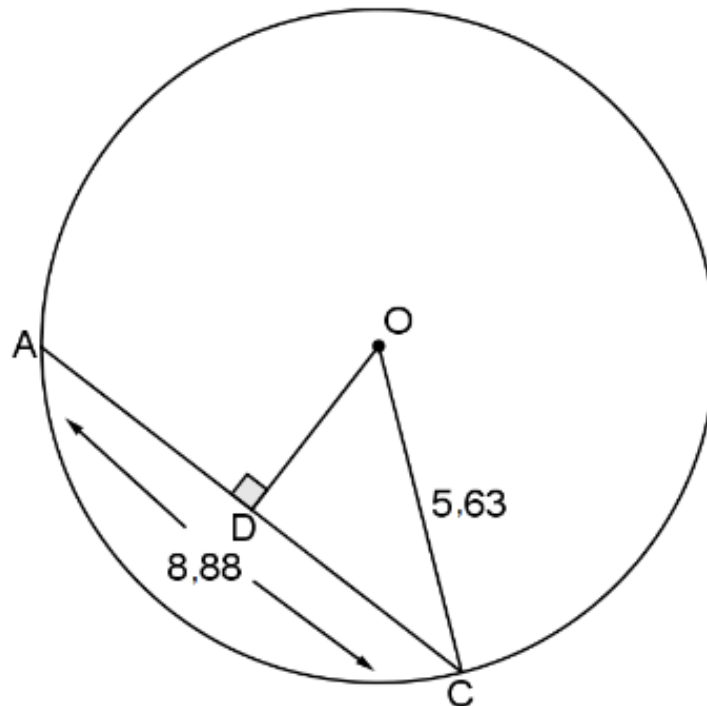
**[12]**

**QUESTION 5**

5.1 Complete the following statement:

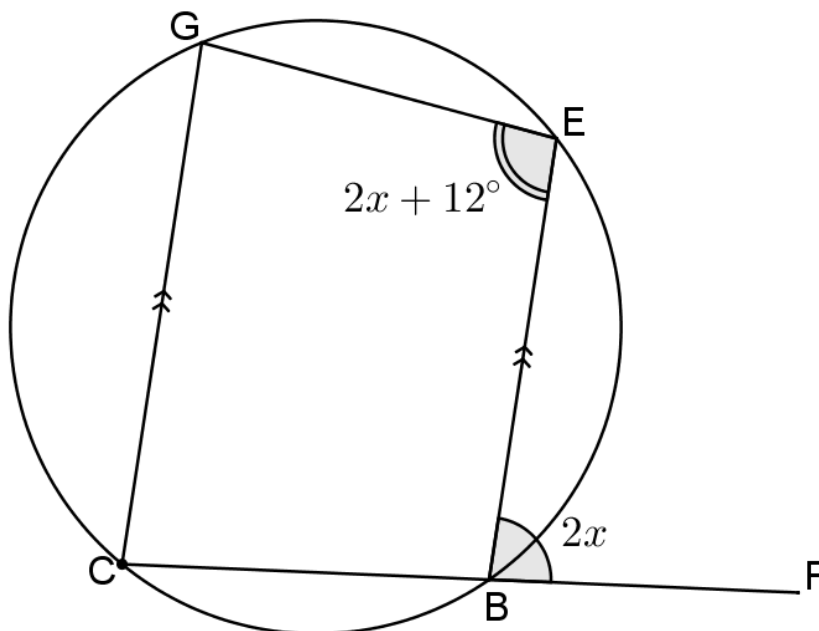
*The ... of a chord passes through the centre of a circle.* (1)

5.2 In the diagram below, O is the centre of the circle with  $OC = 5,63$  units,  $AC = 8,88$  units and  $OD \perp AC$ .



Determine the length of OD, with reasons. (5)

5.3 In the diagram below, BCGE is a cyclic quadrilateral with  $CG \parallel BE$ ,  $\hat{EBF} = 2x$  and  $\hat{E} = 2x + 12^\circ$ .



Determine the size of  $\hat{E}$ , with reasons. (7)

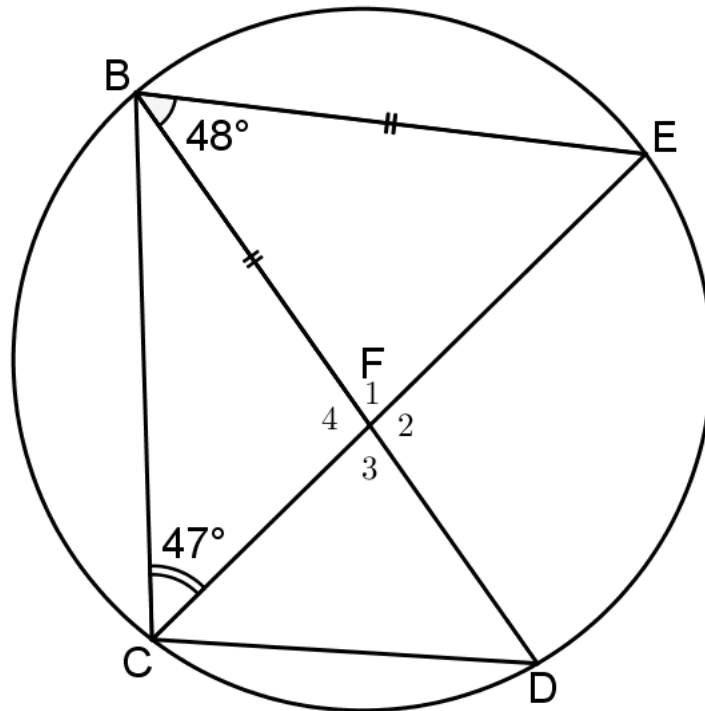
**[13]**

**QUESTION 6**

6.1 Complete the following statement:

*Angles subtended by a chord of the circle, on the same side of the chord, ...* (1)

6.2 In the diagram below  $\hat{EBF} = 48^\circ$ ,  $\hat{FCB} = 47^\circ$  and  $BF = BE$ .

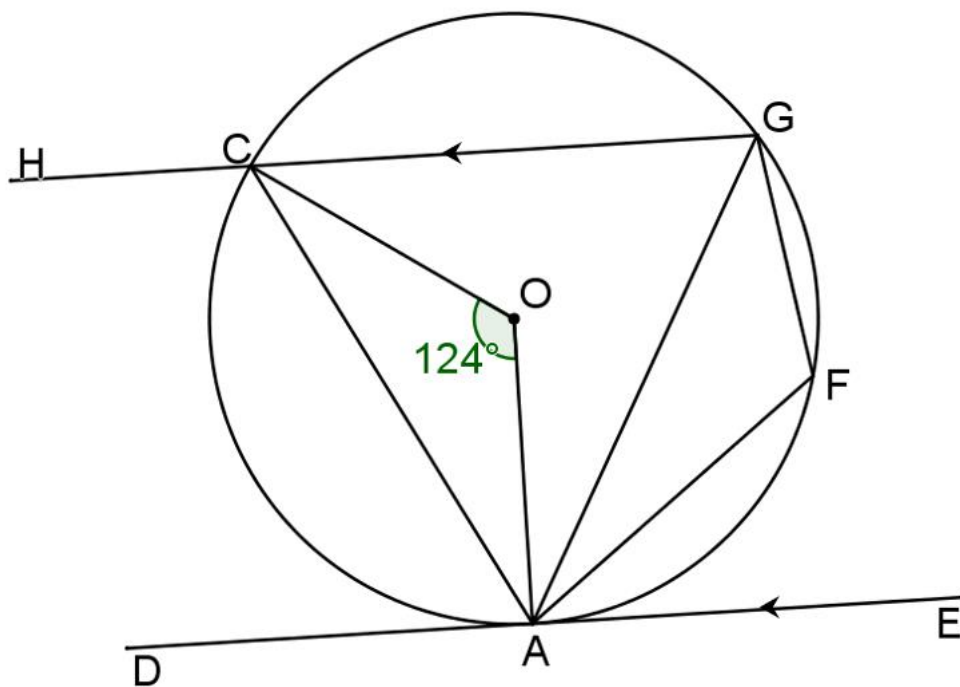


6.2.1 Determine, with reasons, the size of  $\hat{FDC}$ . (4)

6.2.2 Hence, prove with reasons, that  $CF = CD$ . (2)

6.2.3 Determine, stating reasons, whether CE is a diameter of the circle. (2)

- 6.3 In the diagram below, DAE is a tangent to the circle with centre O. CAFG is a cyclic quadrilateral with  $CG \parallel DAE$ , GC is extended to H and  $\angle COA = 124^\circ$ .



Determine, with reasons, the size of the following:

- |       |              |     |
|-------|--------------|-----|
| 6.3.1 | $\angle CGA$ | (2) |
| 6.3.2 | $\angle DAC$ | (2) |
| 6.3.3 | $\angle ACO$ | (2) |
| 6.3.4 | $\angle F$   | (3) |
| 6.3.5 | $\angle GAO$ | (4) |

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## QUESTION 7

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

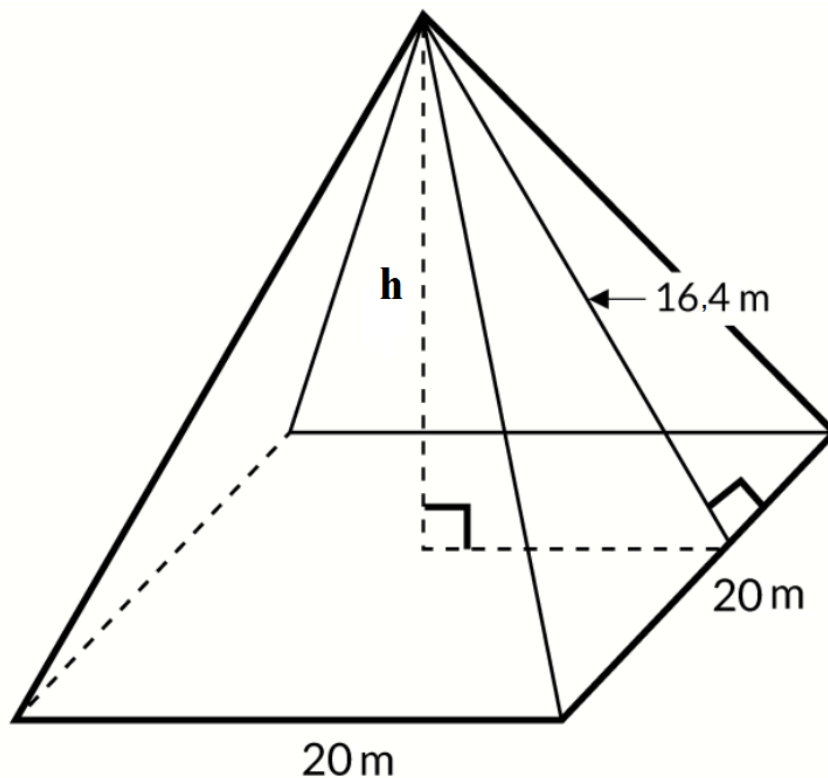
- 7.1 If the surface area of a cylinder is  $56\pi \text{ m}^2$  and the circular base has a diameter of 8 meters, determine the height of the cylinder. (4)
- 7.2 A tin can is 11 cm tall and has a diameter of 7,5 cm.



How many square millimetres of paper, to the nearest whole number, will it take to make a label for the can? (Hint: wrapping excludes the top and bottom) (4)

- 7.3 The radius of a cone is 5 cm. The height is 8 cm.
- 7.3.1 Determine the volume of the cone. (3)
- 7.3.2 Suppose the radius of the cone is doubled and the height remains the same. What is the volume of the new cone? (1)
- 7.3.3 What is the ratio of the volume of the new cone to the volume of the original cone? (2)

- 7.4 The figure below is a diagram of a pyramid with a square base, with sides 20 m and the slant height of 16,4 m.



- 7.4.1 Determine the height,  $h$ , of the pyramid, to the nearest metre. (3)
- 7.4.2 Hence, determine the volume of the pyramid. (3)
- 7.5 A cube with sides 60 mm, made from lead, is melted. Out of this melted lead a sphere is casted.

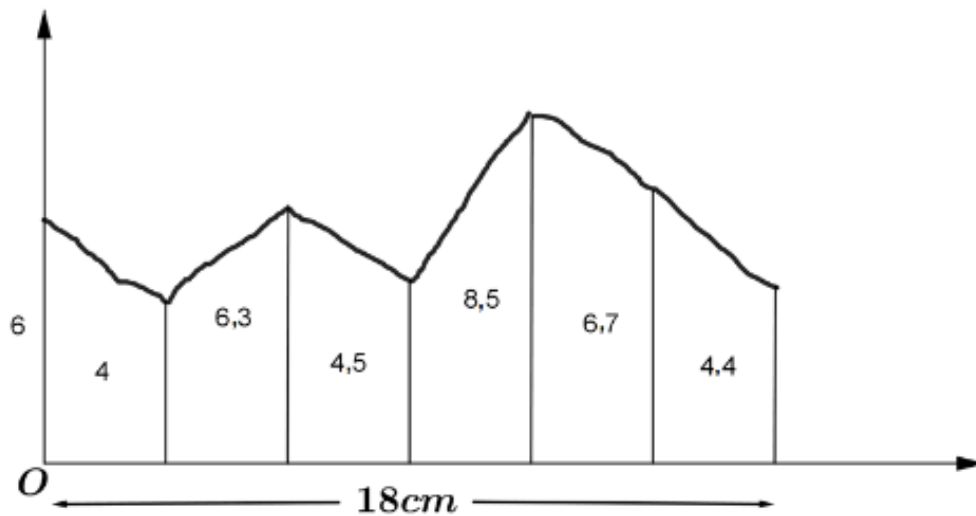
Calculate:

- 7.5.1 The volume of the sphere (2)
- 7.5.2 The radius of the sphere (5)

[27]

**QUESTION 8**

The diagram below describes an irregular figure. All measurements are in cm.



Determine the area of the irregular figure by using the mid-ordinate rule. Give your answer in  $\text{mm}^2$ .

(7)

[7]

**TOTAL: 150**