



Province of the  
**EASTERN CAPE**  
EDUCATION

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 11**

**NOVEMBER 2015**

**MATHEMATICS P2**

**MARKS: 150**

**TIME: 3 hours**



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This question paper consists of 14 pages.

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**INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions.

1. This question paper consists of 12 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. Write neatly and legibly.

**QUESTION 1**

The following table represents the heights, in centimetres, of 120 boys in a school.

<b>HEIGHT (cm)</b>	<b>FREQUENCY</b>
$150 < x \leq 155$	4
$155 < x \leq 160$	22
$160 < x \leq 165$	56
$165 < x \leq 170$	32
$170 < x \leq 175$	6

- 1.1 Complete the cumulative frequency table in the SPECIAL ANSWER BOOK. (2)
- 1.2 Draw an ogive, using the diagram in the SPECIAL ANSWER BOOK, to represent the information in the table. (4)
- 1.3 Determine, using the ogive, the five number summary. (5)
- 1.4 If the distribution of the data is represented by means of a box whisker diagram, comment on the spread of the data. (1)
- [12]**

**QUESTION 2**

The following is a sample of weekly wages earned by ten people working for a small printing and design company.

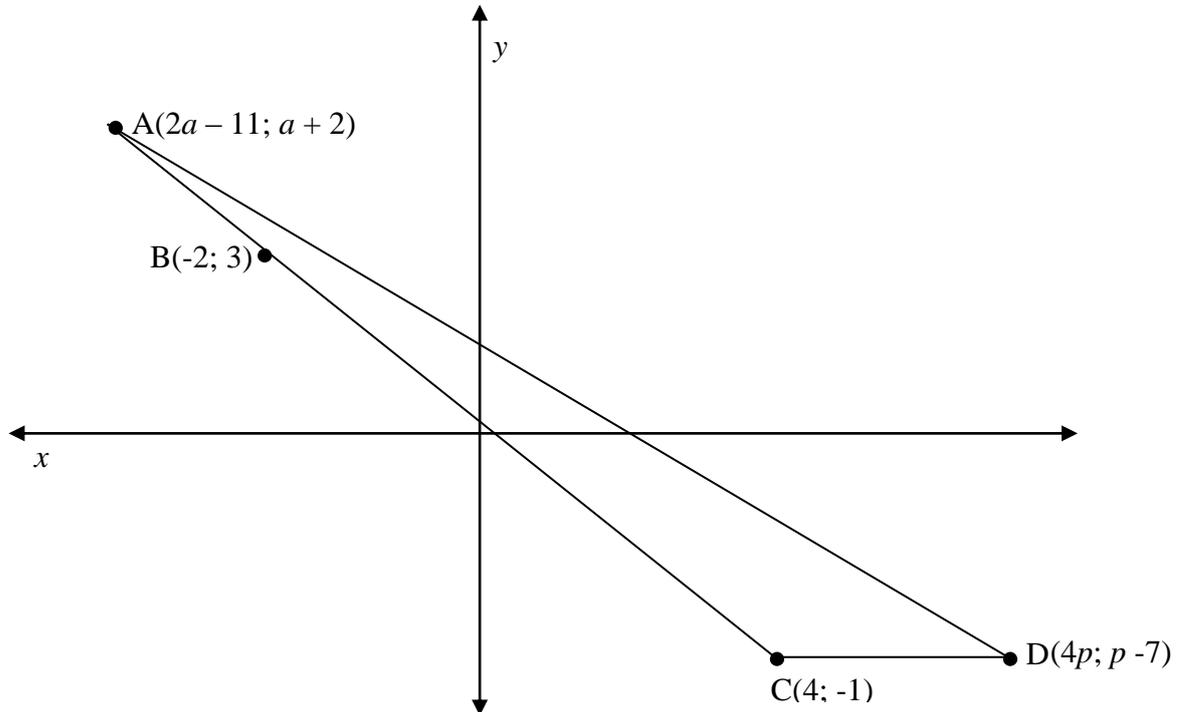
R2 250 R2 250 R3 000 R3 300 R3 300

R3 600 R3 900 R4 350 R4 350 R5 250

- 2.1 Calculate the mean weekly wage. (2)
- 2.2 Calculate the standard deviation of the weekly wage. (1)
- 2.3 Determine the percentage of workers which lie within ONE standard deviation of the mean. (4)
- [7]

## QUESTION 3

The points  $A(2a - 11; a + 2)$ ,  $C(4; -1)$  and  $D(4p; p - 7)$  are the vertices of  $\triangle ACD$  with  $B(-2; 3)$  on  $AC$ .



- 3.1 If points A, B and C are collinear, find the value of  $a$ . (4)
- 3.2 Determine the equation of the line AC. (3)
- 3.3 Hence, determine the co-ordinates of midpoint M of AB. (3)
- 3.4 Determine the value of  $p$  if CD is parallel to the  $x$ -axis. (3)

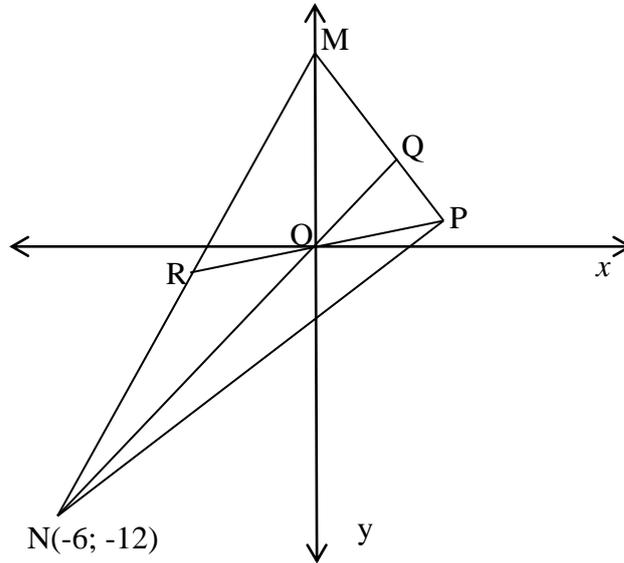
[13]

## QUESTION 4

In the diagram, M, N and P are vertices of  $\triangle MNP$ , with  $N(-6; -12)$ .

M is a point on the  $y$ -axis. The equation of the line MN is  $3x - y + 6 = 0$ .

$MR = NR$  and  $NQ \perp MP$ . PR and NQ intersect at the origin O.

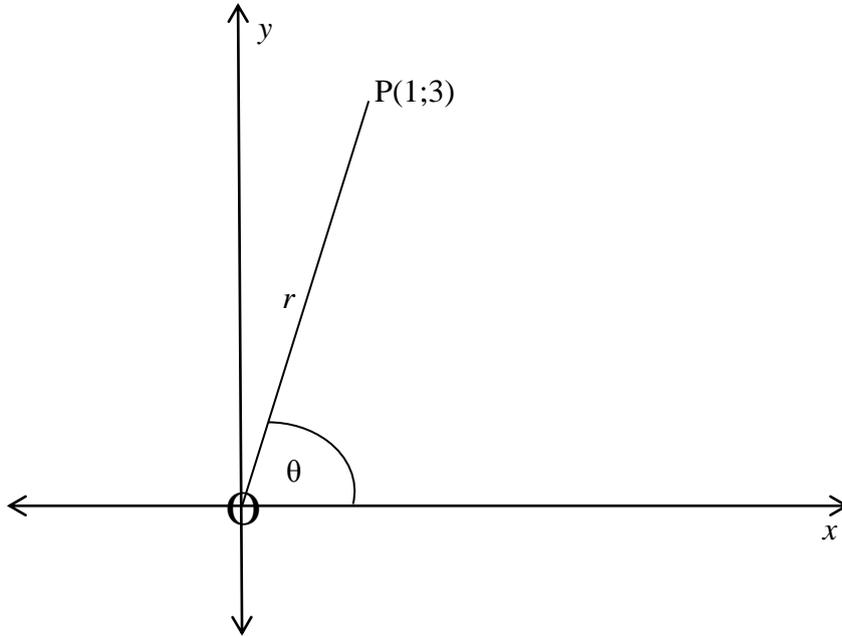


- 4.1 Calculate the gradient of NQ. (1)
- 4.2 Calculate the gradient of MP. (1)
- 4.3 Calculate the angle of inclination of MP. (3)
- 4.4 Hence, determine the equation of the line MP. (4)
- 4.5 Hence, determine the coordinates of P. (4)
- 4.6 Determine the co-ordinates of R. (3)

[16]

## QUESTION 5

- 5.1 In the diagram below,  $P(1;3)$  is a point on the Cartesian plane,  $OP = r$  and  $\widehat{XOP} = \theta$ .



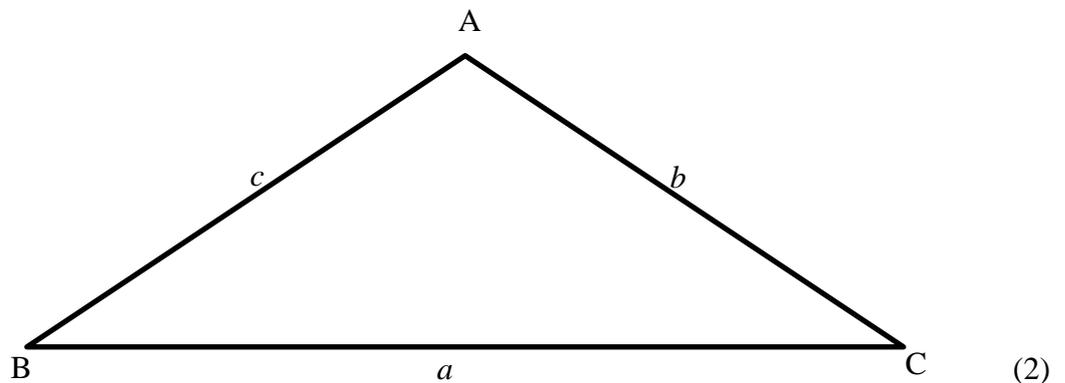
- 5.1.1 Make use of the diagram to calculate the value of  $\theta$ . (2)
- 5.1.2 Calculate the length of  $OP$ . Leave the answer in surd form. (2)
- 5.1.3 Determine the values of the following, **without using a calculator**:
- (a)  $\sin \theta$  (1)
- (b)  $\cos (180^\circ + \theta)$  (2)
- 5.2 Determine the general solutions of:  

$$2\cos^2 x + 5\sin x = 4$$
 (6)
- 5.3 Simplify:  $\frac{\cos(90^\circ - x) \cdot \sin(-x)}{\cos^2(180^\circ + x)}$  (5)
- 5.4 Prove that:  $\frac{\sin x}{1 + \cos x} + \frac{1 + \cos x}{\sin x} = \frac{2}{\sin x}$  (5)

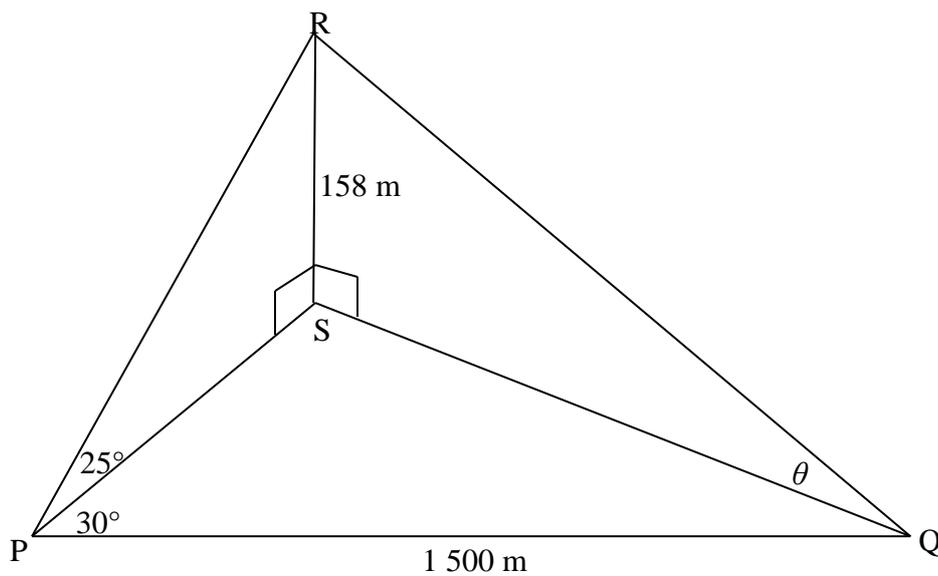
[23]

## QUESTION 6

6.1 COMPLETE: In  $\triangle ABC$   $b^2 = \dots + \dots - \dots$



6.2 In the diagram below, PQ is a straight line 1 500 m long. RS is a vertical tower 158 m high with P, Q and S points in the same horizontal plane. The angles of elevation of R from P and Q are  $25^\circ$  and  $\theta$ .  $\widehat{SPQ} = 30^\circ$ .



- 6.2.1 Determine the length of PS. (3)
- 6.2.2 Determine the length of SQ. (3)
- 6.2.3 Hence, find the value of  $\theta$ . (3)
- 6.2.4 Determine the area of  $\triangle SPQ$ . (4)

[15]

**QUESTION 7**

Given:  $f(x) = \frac{1}{2}\tan x$  and  $g(x) = \sin 2x$

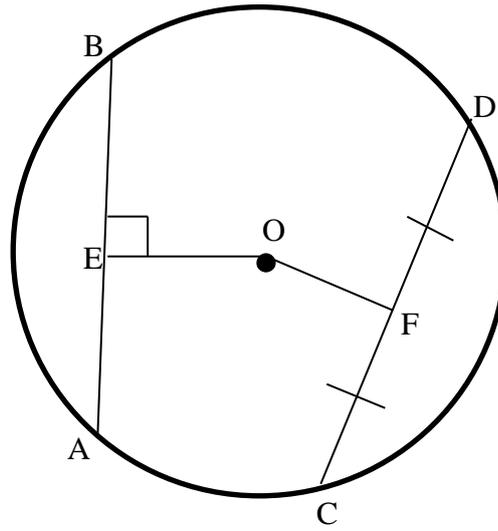
- 7.1 Draw the graph of  $f$  and  $g$  for  $x \in [-90^\circ ; 180^\circ]$  in the SPECIAL ANSWER BOOK. Show all the turning points and intercepts with the axes. Clearly show the asymptotes using dotted lines. (6)
- 7.2 Determine the values of  $x$ , for  $x \in [-90^\circ ; 180^\circ]$ , for which  $f(x) > g(x)$ . (6)
- 7.3 Write down the period of  $g(2x)$ . (1)

**[13]**

**GIVE REASONS FOR YOUR STATEMENTS AND CALCULATIONS IN QUESTIONS 8, 9, 10 AND 11.**

**QUESTION 8**

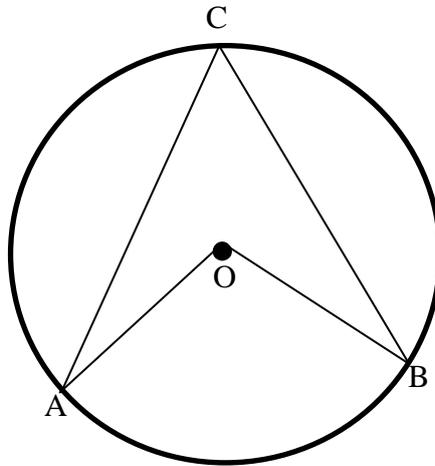
- 8.1 Complete: The line drawn from the centre of the circle perpendicular to the chord ... (1)
- 8.2 In the figure below, AB and CD are chords of the circle with centre O.  $OE \perp AB$ .  $CF = FD$ .  $OE = 4$  cm,  $OF = 3$  cm and  $CD = 8$  cm.



- 8.2.1 Calculate the length of OD. (3)
- 8.2.2 Hence calculate the length of AB. (4)
- [8]**

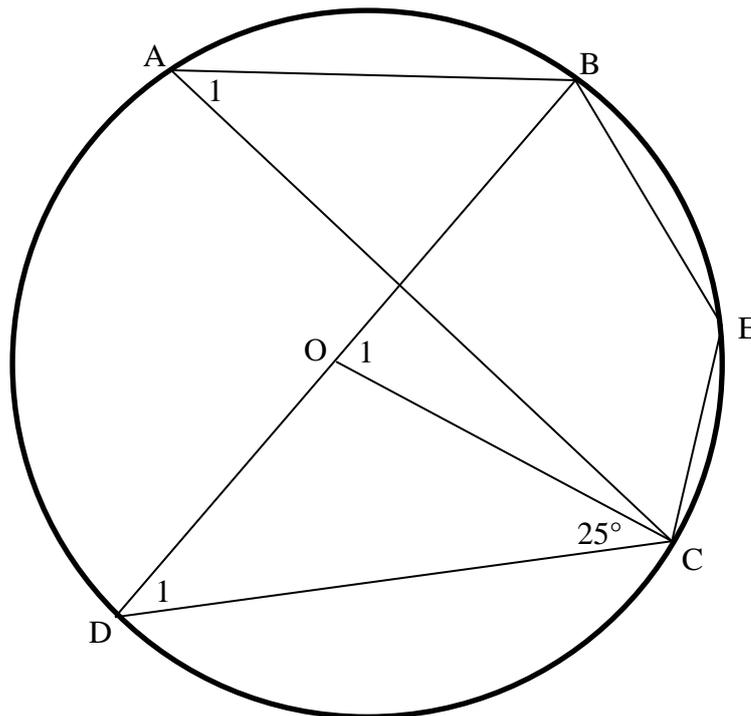
**QUESTION 9**

9.1 In the diagram O is the centre of the circle and ABC are points on the circle. Use the diagram in your SPECIAL ANSWER BOOK to prove that:  $\widehat{AOB} = 2\widehat{ACB}$ .



(6)

9.2 In the figure below,  $\widehat{DCO} = 25^\circ$  and O is the centre of the circle. A, B, E C and D are points on the circumference. Calculate, giving reasons, the sizes of:



9.2.1  $\widehat{D}_1$  (2)

9.2.2  $\widehat{O}_1$  (2)

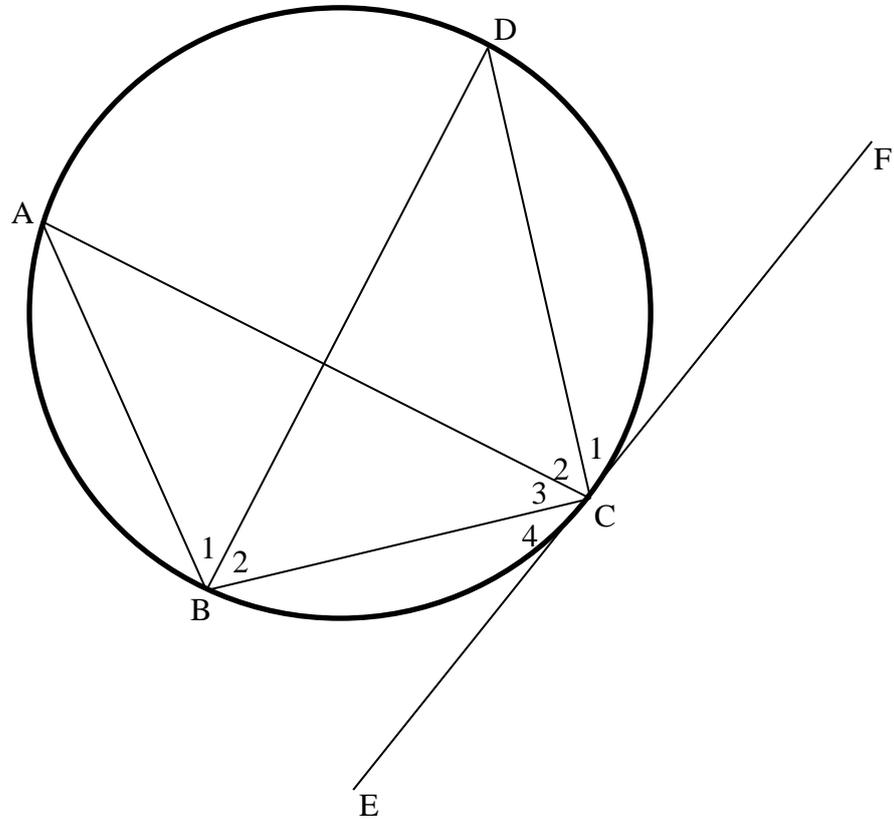
9.2.3  $\widehat{A}_1$  (2)

9.2.4  $\widehat{E}$  (2)

[14]

## QUESTION 10

A, B, C and D are points on the circumference of the circle in the diagram below. ECF is a tangent at C,  $B_1 = B_2$ .



10.1 If  $B_1 = x$ , find, with reasons, TWO other angles equal to  $x$ . (4)

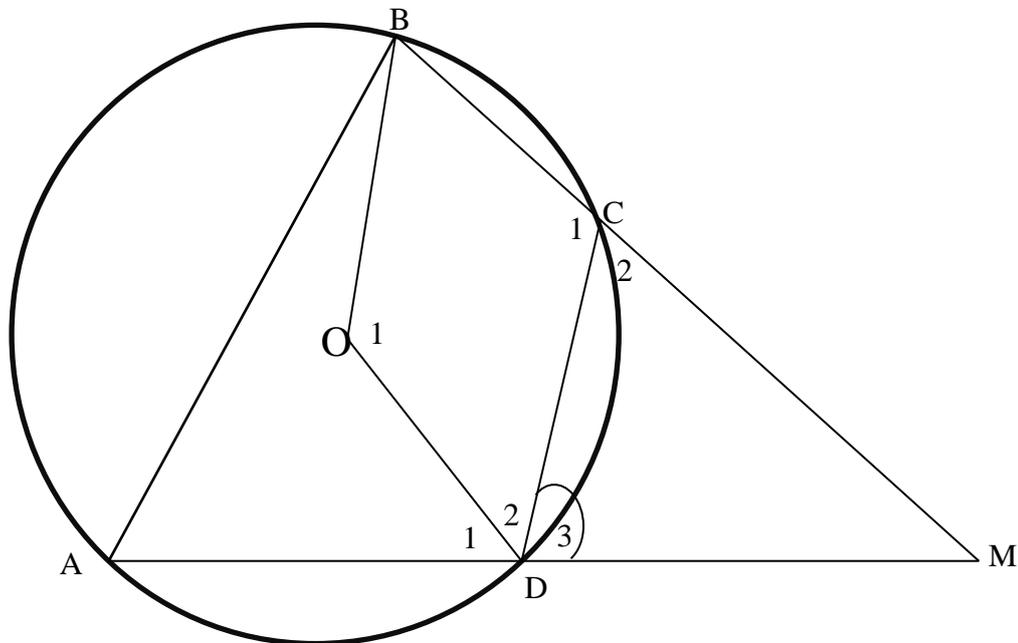
10.2 Hence, show that DC bisects  $\widehat{ACF}$ . (2)

[6]

## QUESTION 11

11.1 Complete: Opposite angles of a cyclic quadrilateral ... (1)

11.2 In the figure, ABCD is a cyclic quadrilateral.  $AB \parallel DC$  in circle with centre O. BC and AD produced meet at M.  $\widehat{D}_3 = x$



11.2.1 Show that  $MC = MD$ . (5)

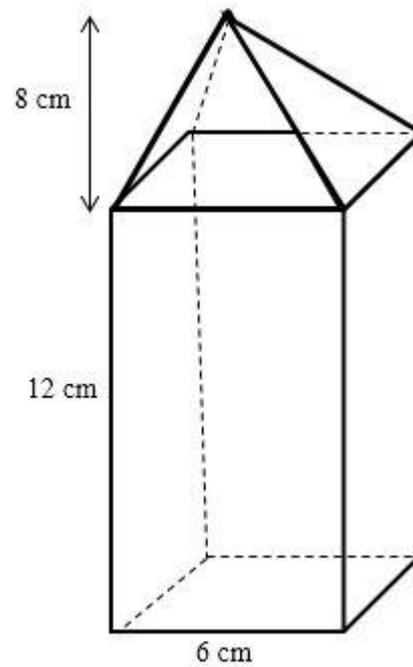
11.2.2 If  $\widehat{D}_3 = x$ , determine the value of  $\widehat{M}$ , in terms of  $x$ . (2)

11.2.3 Hence, show that BODM is a cyclic quadrilateral. (3)

[11]

**QUESTION 12**

The solid in the diagram is made up of a right prism with square base, and a right pyramid on top of the prism. The length of the prism is 12 cm, the side of the base is 6 cm and the height of the pyramid is 8 cm.



- 12.1 Calculate the slant height of the triangular face of the pyramid. (3)
- 12.2 Calculate the area of one of the triangular faces. (3)
- 12.3 Calculate the total surface area of the solid. (5)

$$TSA = \text{area of slanted faces} + \text{area of right prism}$$

**TOTAL: [11] 150**



