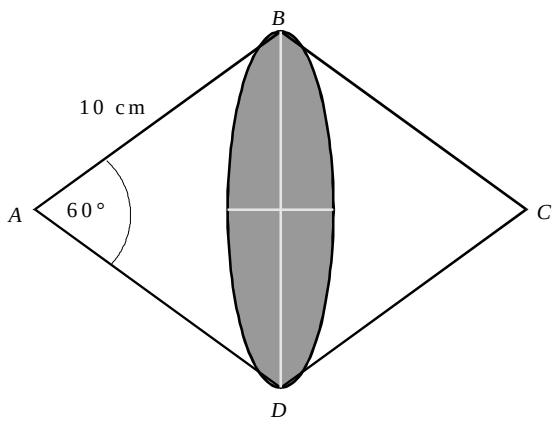
Verulam School

mixed SSM 3

63 min
52 marks

1. *ABCD* is a rhombus with side length 10 cm.



Angle *BAD* = 60°.

ABD is a sector of a circle with centre *A*.

CBD is a sector of a circle with centre *C*.

(a) Calculate the area of triangle *ABD*.

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Answer ..... cm^2

(2)

(b) Calculate the shaded area.

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Answer ..... cm^2

(3)

(Total 5 marks)

2. Assume the Earth to be a sphere of diameter 12 800 km to an accuracy of 3 significant figures.
Land covers 28.2% of the Earth's surface to an accuracy of 1 decimal place.
Calculate the lower bound of the area of land on the Earth's surface.
Give your answer in standard form to an appropriate degree of accuracy.

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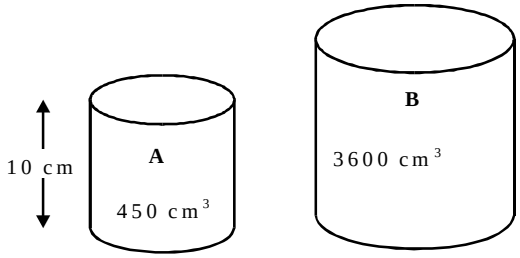
Answer ..... km^2

(Total 6 marks)

3. *A* and *B* are two similar cylinders.



The height of cylinder *A* is 10 cm and its volume is 450 cm^3.
The volume of cylinder *B* is 3600 cm^2.

Calculate the height of cylinder *B*.

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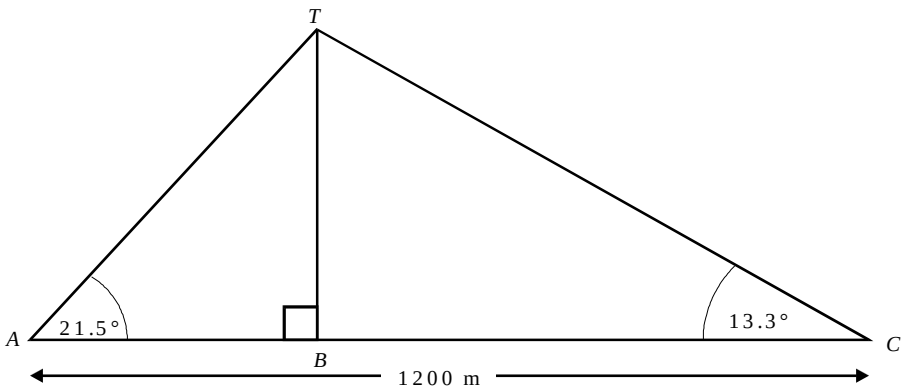
Answer ..... cm

(Total 3 marks)

4. *A*, *B* and *C* are three points which lie in a straight line on horizontal ground.
BT is a vertical tower.



The angle of elevation of *T* from *A* is 21.5°.
The angle of elevation of *T* from *C* is 13.3°.
AC = 1200 m.

Calculate the height of the tower.

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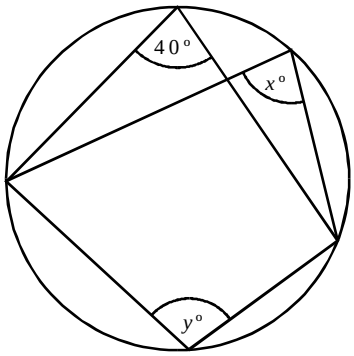
Answer ..... m

(Total 4 marks)

5.



Not drawn accurately

(i) Write down the value of *x*.

Answer ..... degrees

(1)

(ii) Calculate the value of y.

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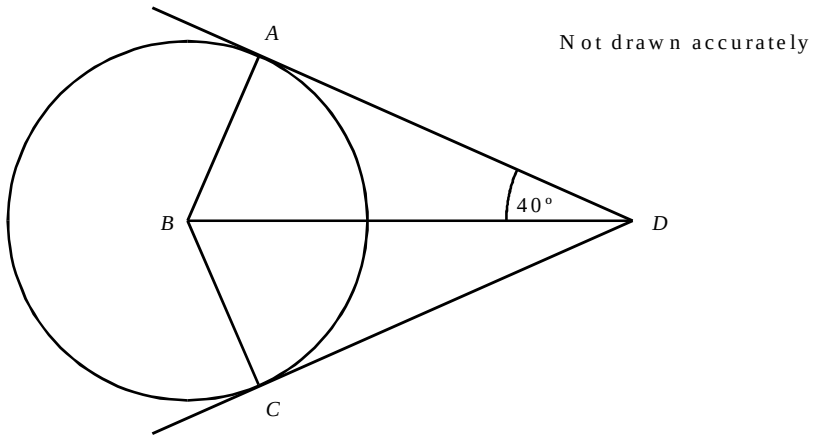
Answer ..... degrees

(1)

(b) A and C are points on the circumference of a circle centre B.
AD and CD are tangents.
Angle ADB = 40°.



Explain why angle ABC is 100°.

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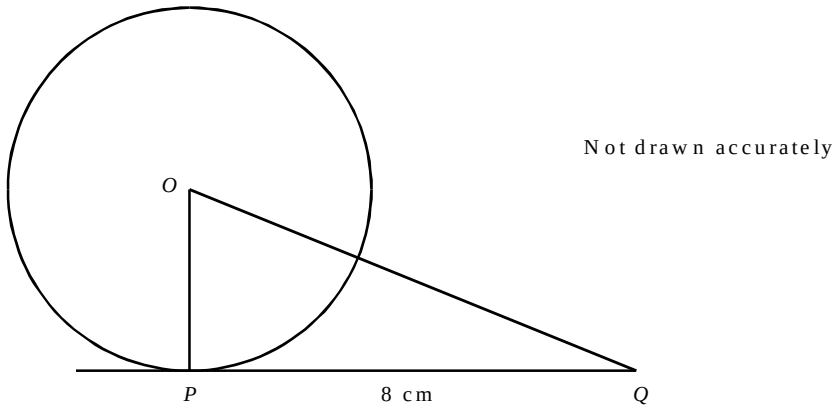
(2)

(c) *P* is a point on the circumference of a circle with centre *O*.
PQ is a tangent of length 8 cm.
The area of triangle *OPQ* is 24 cm^2.



Calculate the area of the circle.
Give your answer in terms of π.

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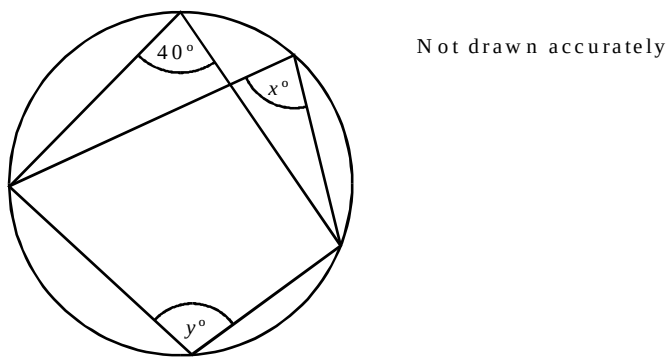
Answer ..... cm^2

(3)
(Total 7 marks)

6. (a)



(i) Write down the value of x.

Answer ..... degrees

(1)

(ii) Calculate the value of y.

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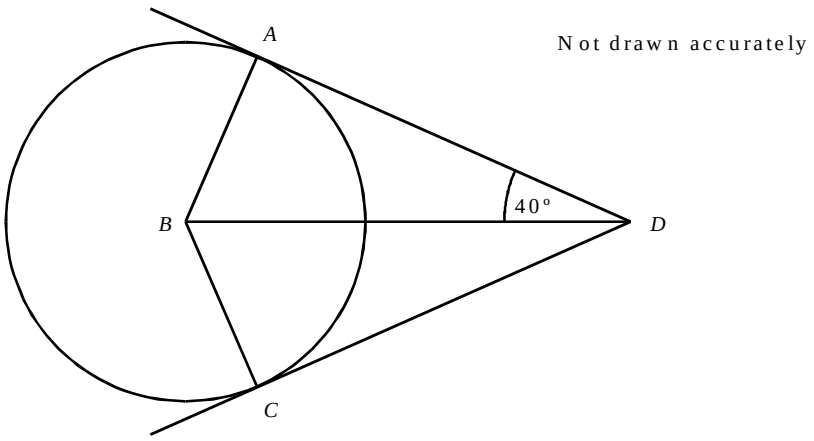
.....

Answer ..... degrees

(1)

(b) A and C are points on the circumference of a circle centre B.
AD and CD are tangents.
Angle ADB = 40°.



Explain why angle ABC is 100°.

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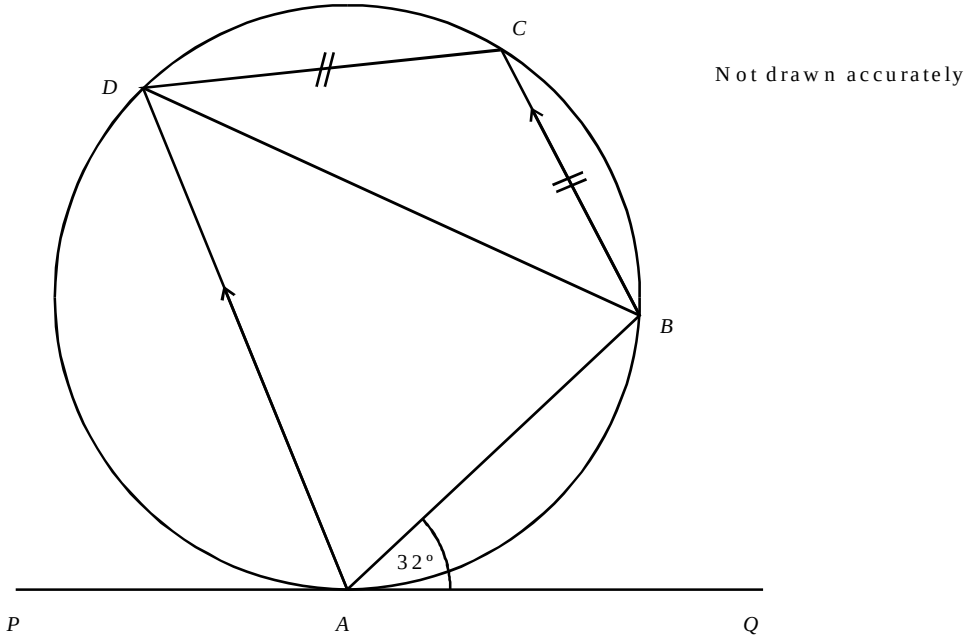
(2)

(c) *ABCD* is a cyclic quadrilateral.
PAQ is a tangent to the circle at *A*.
BC = *CD*.
AD is parallel to *BC*.
Angle *BAQ* = 32°.



Find the size of angle *BAD*.

You **must** show all your working.

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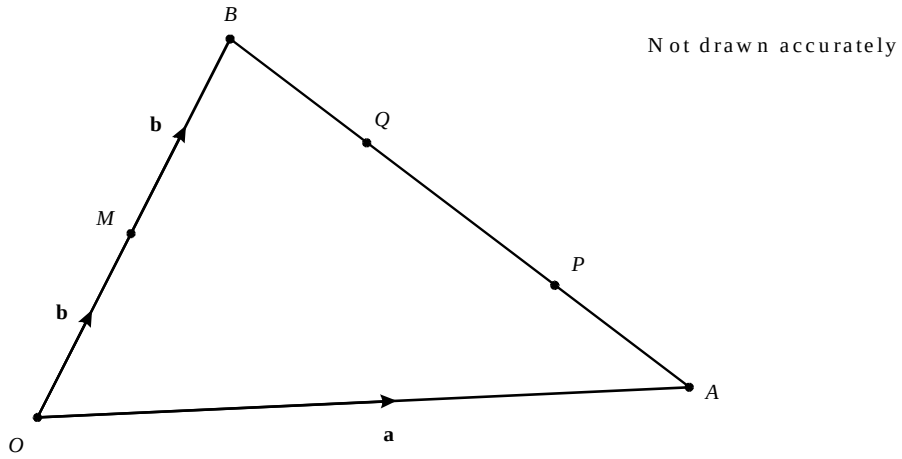
Answer Angle *BAD* = ... degrees

(5)
(Total 9 marks)

7.



OAB is a triangle where *M* is the mid-point of *OB*.

P and *Q* are points on *AB* such that *AP* = *PQ* = *QB*.

$\overrightarrow{OA}$ = **a** and $\overrightarrow{OB}$ = 2**b**

(a) Find, in terms of **a** and **b,** expressions for

(i) $\overrightarrow{BA}$

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Answer .....

(1)

(ii) $\overrightarrow{MQ}$

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Answer .....

(2)

(iii) $\overrightarrow{OP}$

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Answer .....

(2)

(b) What can you deduce about quadrilateral *OMQP*?
Give a reason for your answer.

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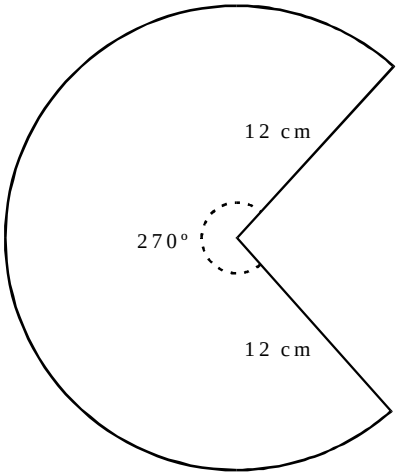
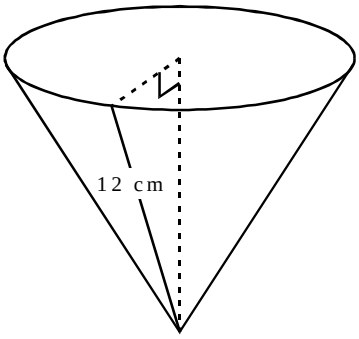
(2)
(Total 7 marks)

8. A firm makes cone shaped containers out of card.
The card is in the shape of a sector of a circle of radius 12 cm.
The angle of the sector is 270°.
The straight edges are brought together to make the cone.





(a) Find the arc length of the card used to make the cone.
Give your answer in terms of π.

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Answer ..... cm

(2)

(b) Calculate the radius of the base of the cone.

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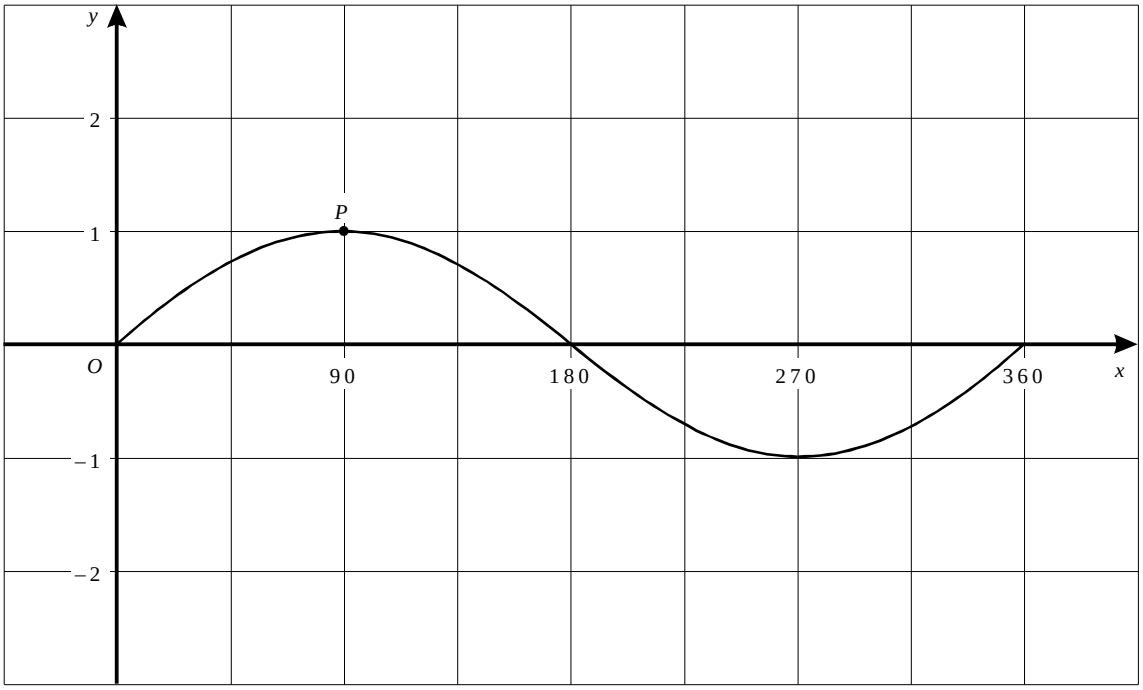
Answer ..... cm

(2)

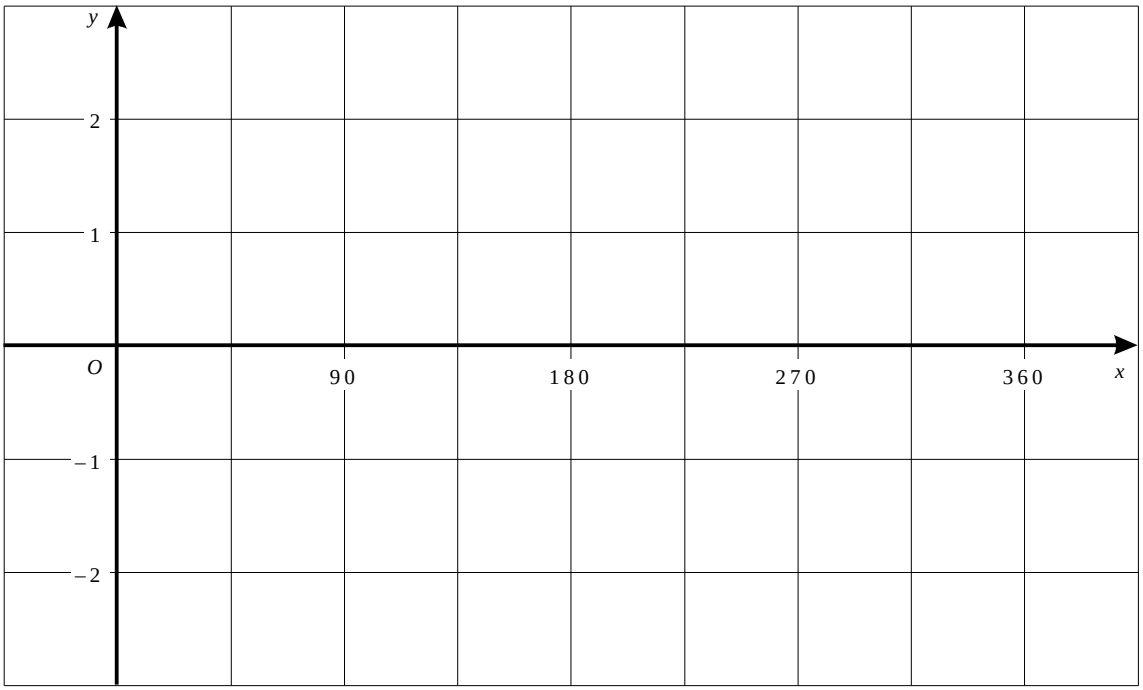
(Total 4 marks)

9. The graph of $y = \sin x$ for $0° \leq x \leq 360°$ is shown on the grid below.
The point $P(90, 1)$ lies on the curve.



On both of the grids that follow, sketch the graph of the transformed function.
In both cases write down the coordinates of the transformed point P.

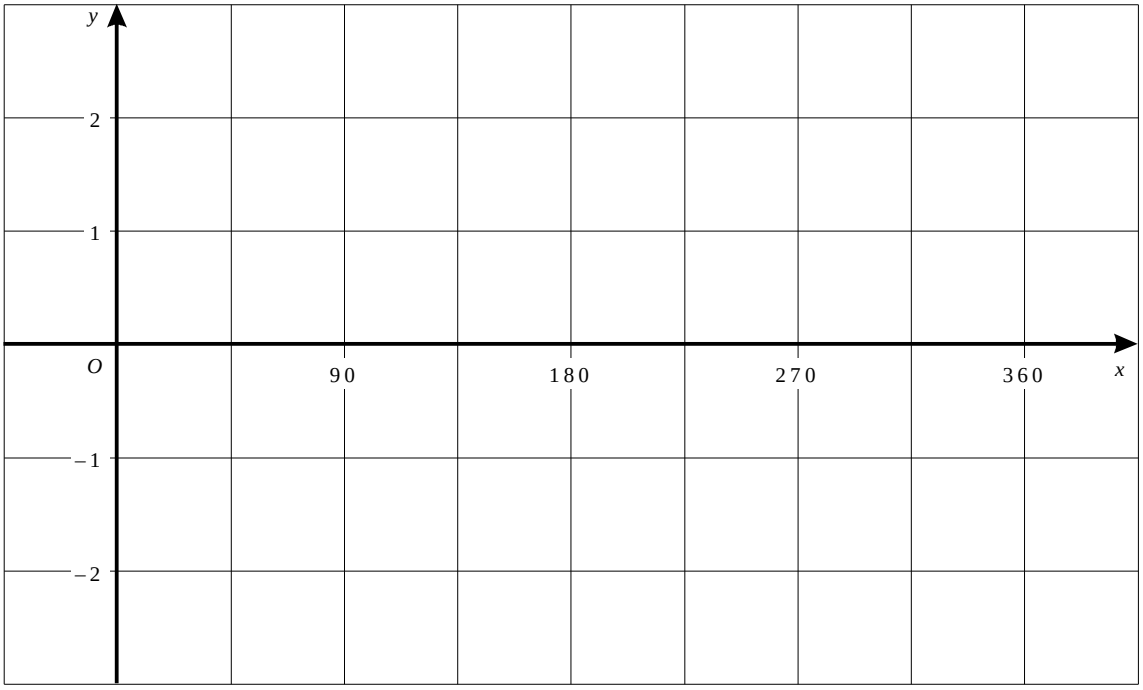
(a) $y = \sin(x - 45)$



P (....., ...)

(2)

(b) $y = 2\sin x$

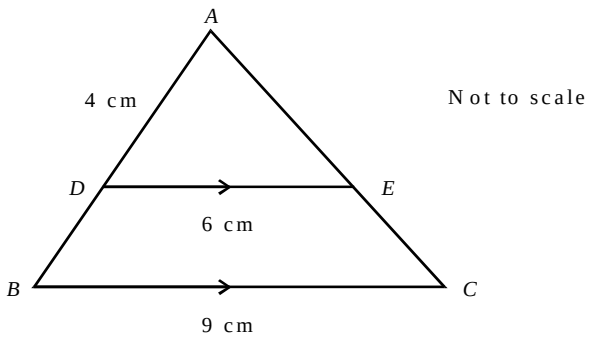


P (....., ...)

(2)

(Total 4 marks)

10. Triangles *ADE* and *ABC* are similar.
DE is parallel to *BC*.
AD = 4 cm, *DE* = 6 cm and *BC* = 9 cm.



Calculate the length of *BD*.

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Answer ..... cm

(Total 3 marks)