

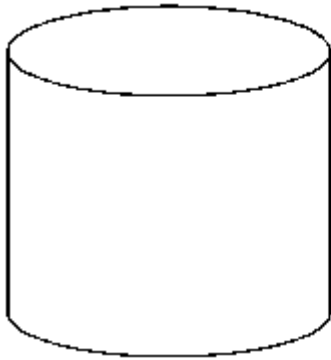
Mixed shape and space

Qu 1) The diagram shows a hollow cylinder and a solid sphere.

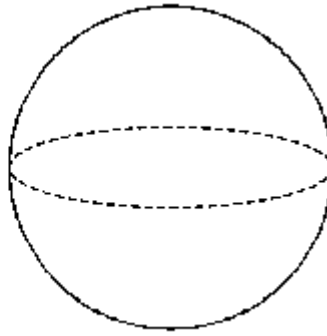
The radius of the cylinder = 3 cm

The radius of the sphere = 3 cm

The height of the cylinder = 6 cm

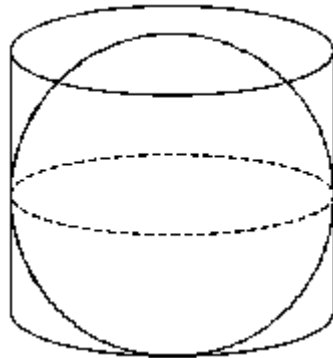


accurately



Not drawn

The sphere just fits inside the cylinder as shown.



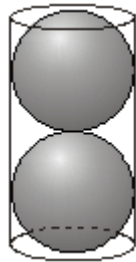
Not drawn accurately

Work out the volume of the space left inside the cylinder.

Give your answer in terms of π as simply as possible.

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Qu 2) Two spheres of radius 5 cm just fit inside a tube.



Calculate the volume inside the tube not filled by the spheres.

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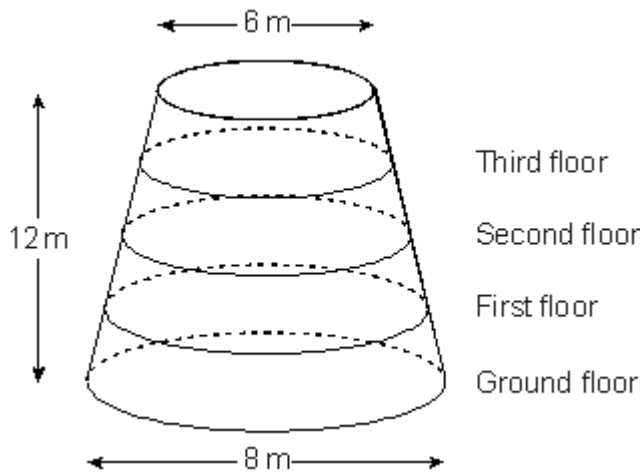
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Qu 3) An old windmill is the shape of a truncated cone.
 The mill is 12 metres high and has 4 floors, equally spaced.
 The diameter of the ground floor is 8 metres and the diameter of the roof is 6 metres.



Not drawn accurately

The mill is for sale.
 This is the advert.

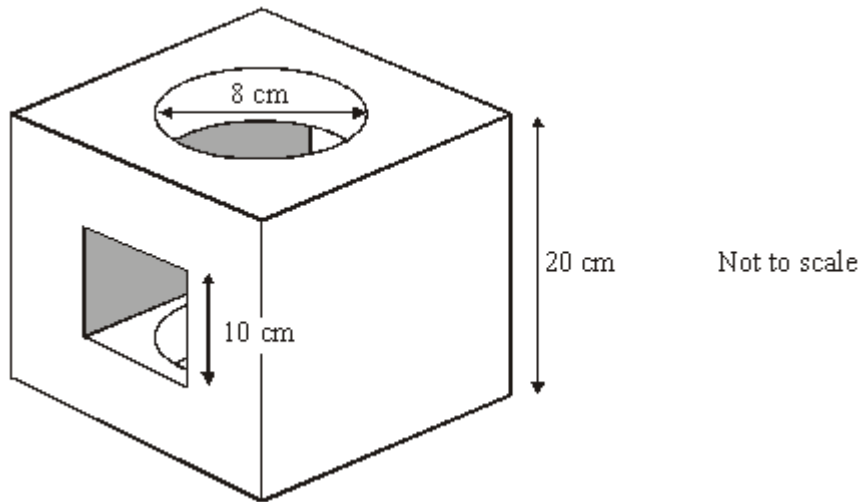
**DEVELOPMENT OPPORTUNITY
 OLD MILL FOR SALE
 Over 150 square metres of floor space**

Is the claim about floor space justified?
 You **must** show your working.

Qu 4) A solid cube has a square hole cut through horizontally and a circular hole cut through vertically.

Both holes are cut centrally in the appropriate faces.

The dimensions of the cube and the holes are as shown in the diagram.



Calculate the volume remaining after the holes have been cut.

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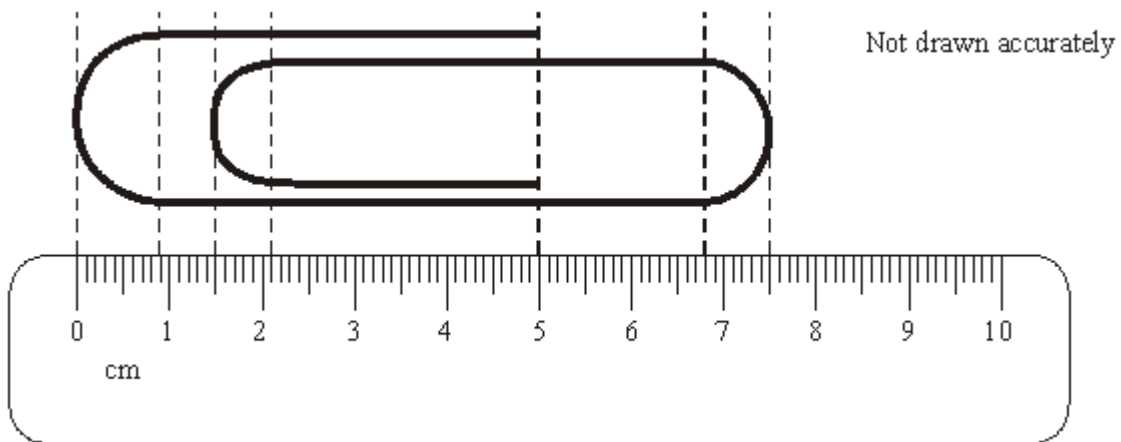
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Qu 5) A giant paper clip is placed alongside a centimetre ruler. The curved ends are semicircles.



Calculate the length of wire used to make the clip.

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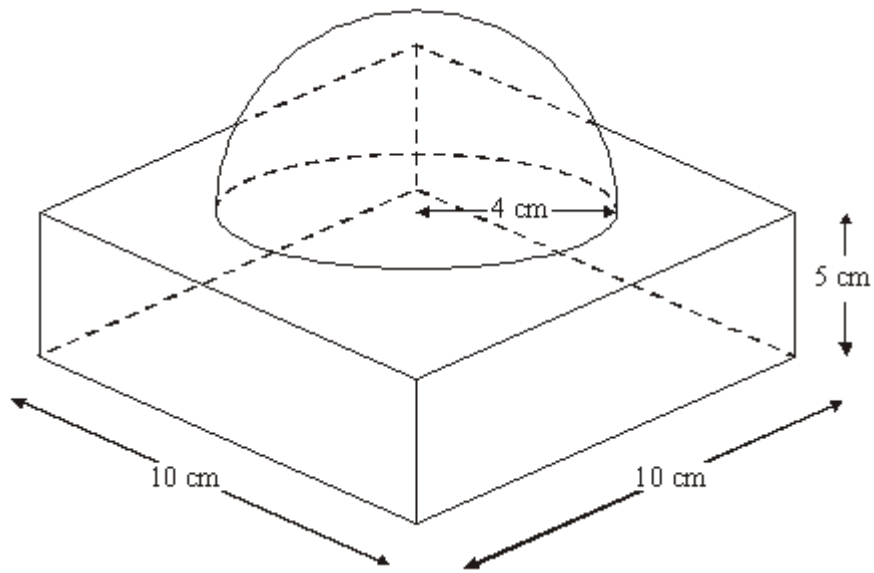
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Qu 6) A marble paperweight consists of a cuboid and a hemisphere as shown in the diagram.
The hemisphere has a radius of 4 cm.



Calculate the volume of the paperweight.

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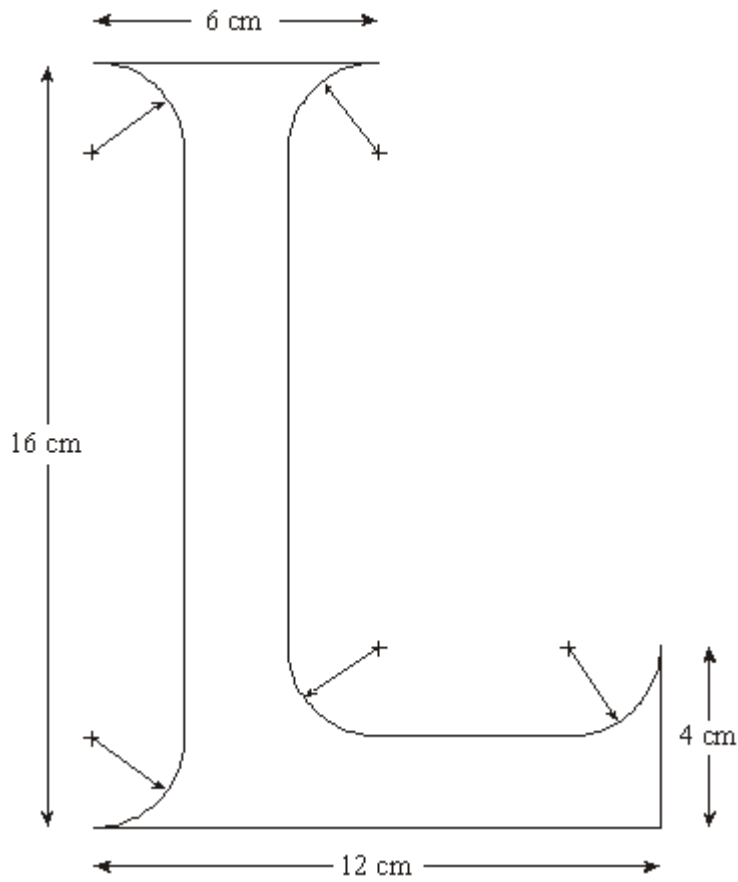
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Qu 7) A sign maker designs a letter L.
 All arcs are quarter circles of radius 2 cm.



Not drawn accurately

Calculate the area of the L.

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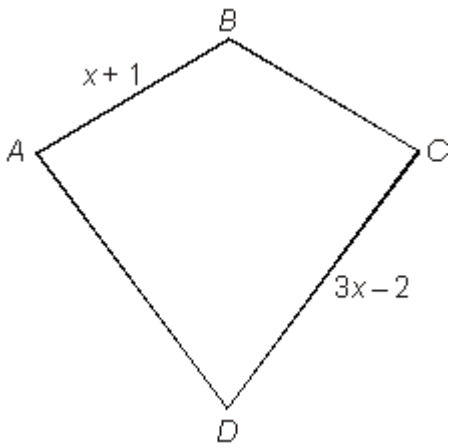
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Qu 8) The diagram shows a kite $ABCD$.
 $AB = x + 1$ and $CD = 3x - 2$



Not drawn accurately

(a) Show that, in terms of x , the perimeter of the kite is $8x - 2$

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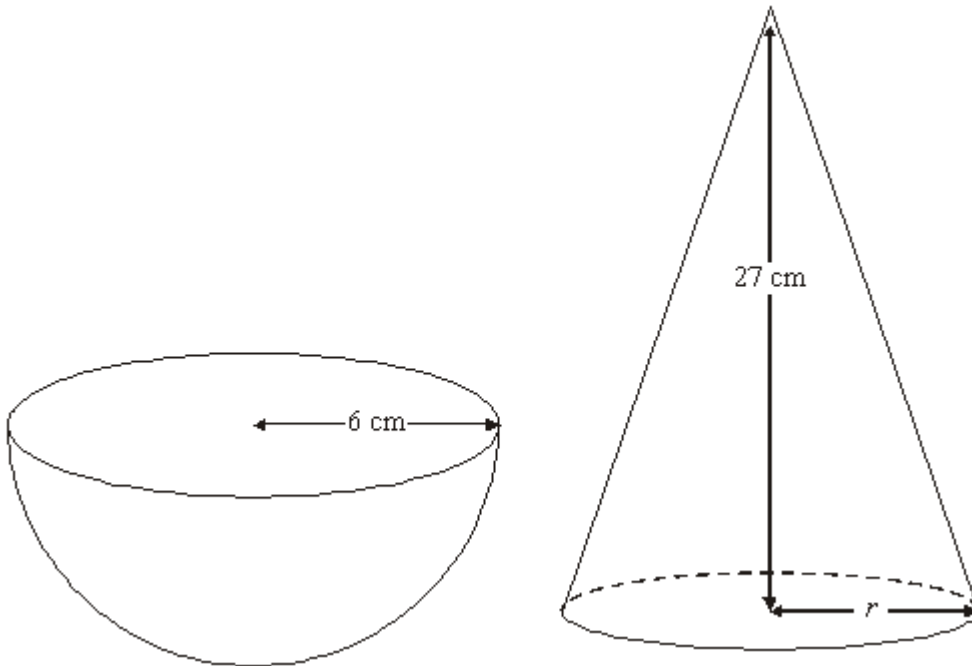
(1)

(b) The perimeter of the kite is 16 cm.

Write down and solve an equation to work out the value of x .

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Qu 9) A hemispherical bowl of radius 6 cm has the same volume as a cone of perpendicular height 27 cm.



Calculate the base radius, r , of the cone.

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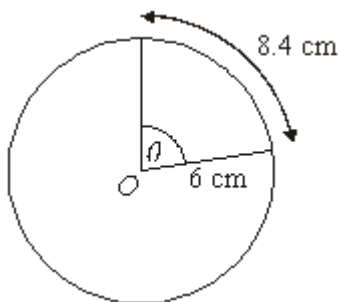
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Qu 10) (a) A circle has a radius of 6 cm.
A sector has an arc length of 8.4 cm.
The angle at the centre of the sector is θ .



Not drawn accurately

Calculate the value of θ .

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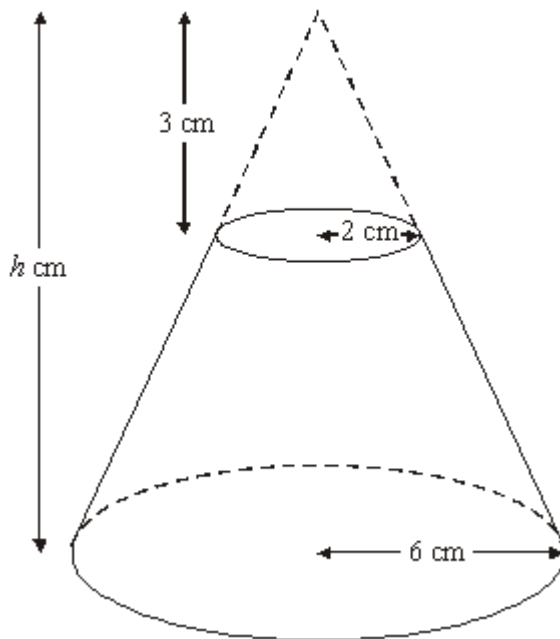
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Answer degrees

(3)

- (b) A cone has base radius 6 cm and height h cm.
 A smaller cone of base radius 2 cm and height 3 cm is cut from the top.
 The remaining frustum has dimensions as shown.



Not drawn accurately

Calculate the volume of the frustum.

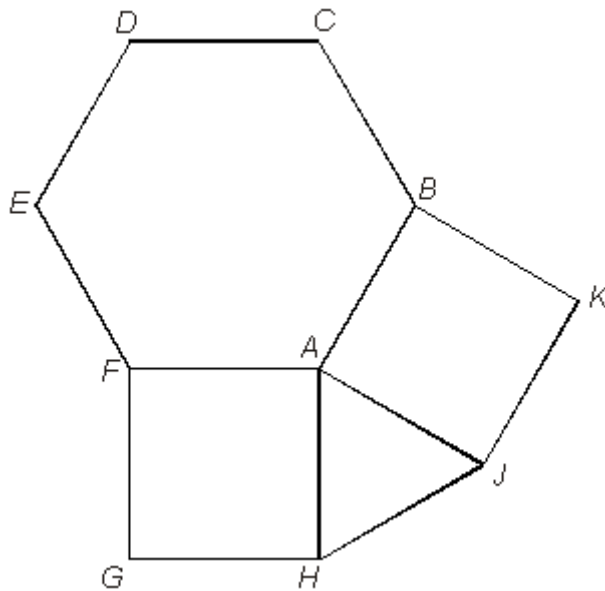
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Qu 11) $ABCDEF$ is a regular hexagon.

$AFGH$ and $AJKB$ are squares.



Not drawn accurately

Show that triangle AHJ is equilateral.

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(Total 4 marks)

Qu 12)

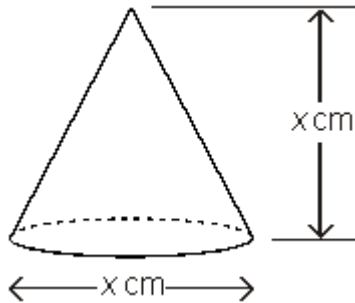
The diagram shows a cone.

The diameter of the base of the cone is x cm.

The height_ of the cone is also x cm.

The volume of the cone is V cm³.

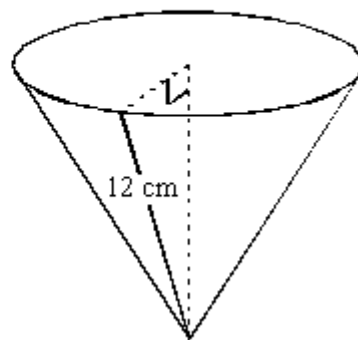
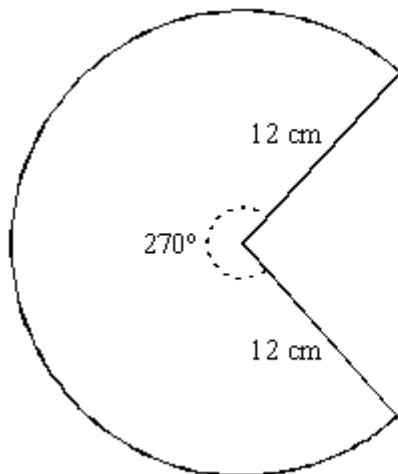
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Find a formula for x in terms of V and π .

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Qu 13) 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.

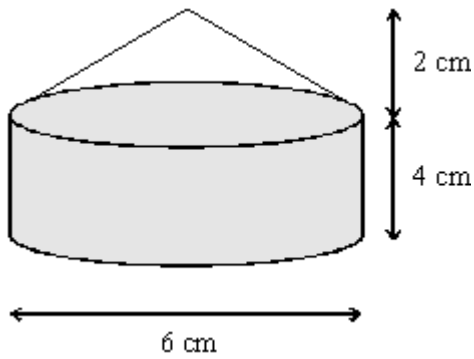
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Answer cm

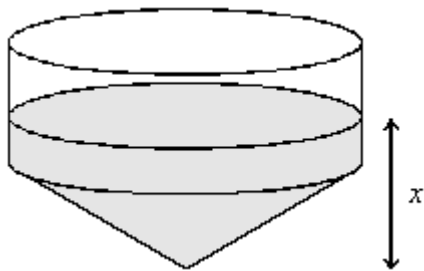
(2)

(Total 4 marks)

Qu 14) A thin-walled glass paperweight consists of a hollow cylinder with a hollow cone on top as shown.
The paperweight contains just enough sand to fill the cylinder.



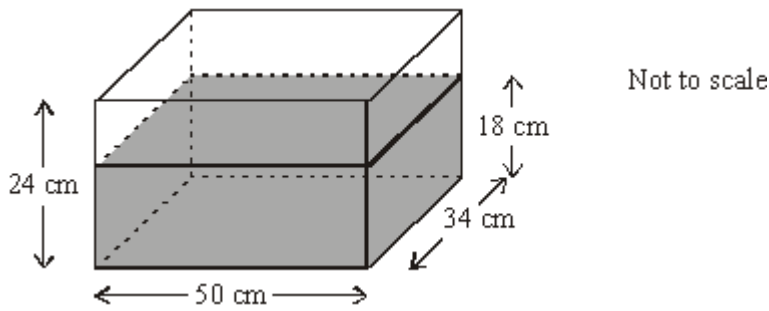
The paperweight is now turned upside down.



Calculate the depth of the sand, (marked x in the diagram).

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Qu 15) A water tank is 50 cm long, 34 cm wide and 24 cm high. It contains water to a depth of 18 cm.

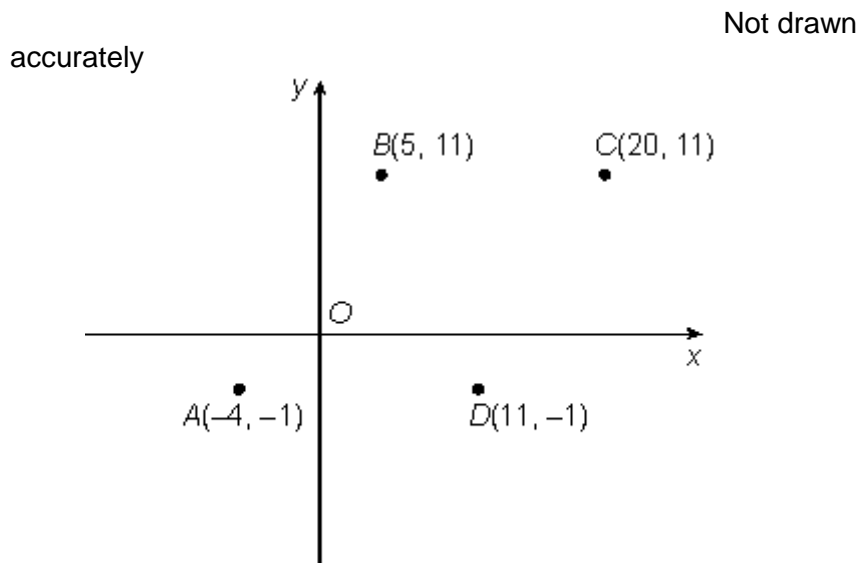


Four identical spheres are placed in the tank and are fully submerged. The water level rises by 4.5 cm.

Calculate the radius of the spheres.

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Qu 16) Four points, $A(-4, -1)$, $B(5, 11)$, $C(20, 11)$ and $D(11, -1)$ are joined to form a quadrilateral.



Prove by calculation that $ABCD$ is a rhombus (Hint, find the lengths of the four sides using Pythagoras)

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