OGUN DIGICLASS

CLASS: SECONDARY SCHOOL

SUBJECT: MATHEMATICS

TOPIC: MENSURATION

OBJECTIVES

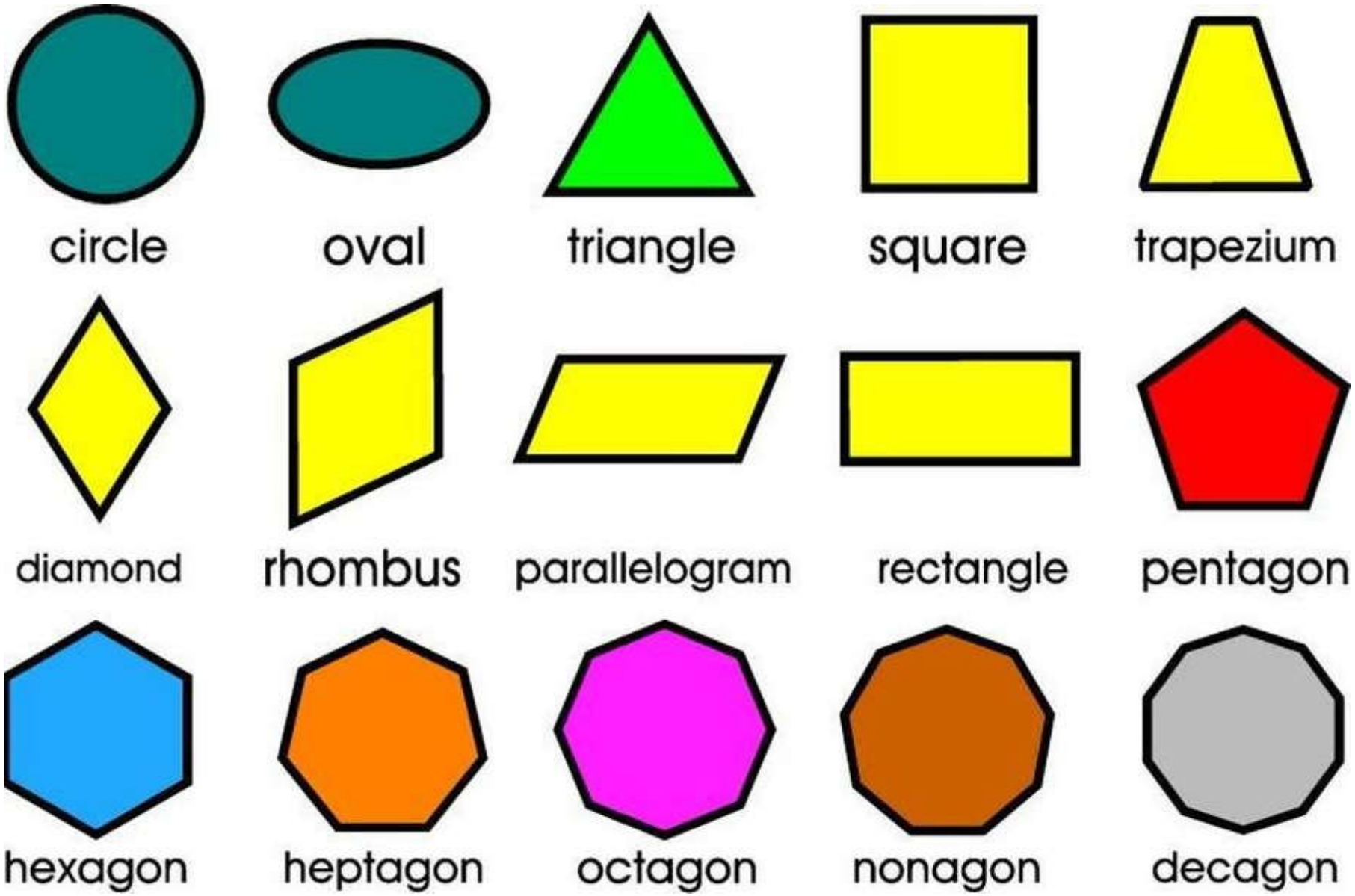
- Define mensuration and identity types of mensuration
- State properties of plane and solid mensuration
- Calculate the perimeter, area and volume of plane and solid mensuration

What is mensuration?

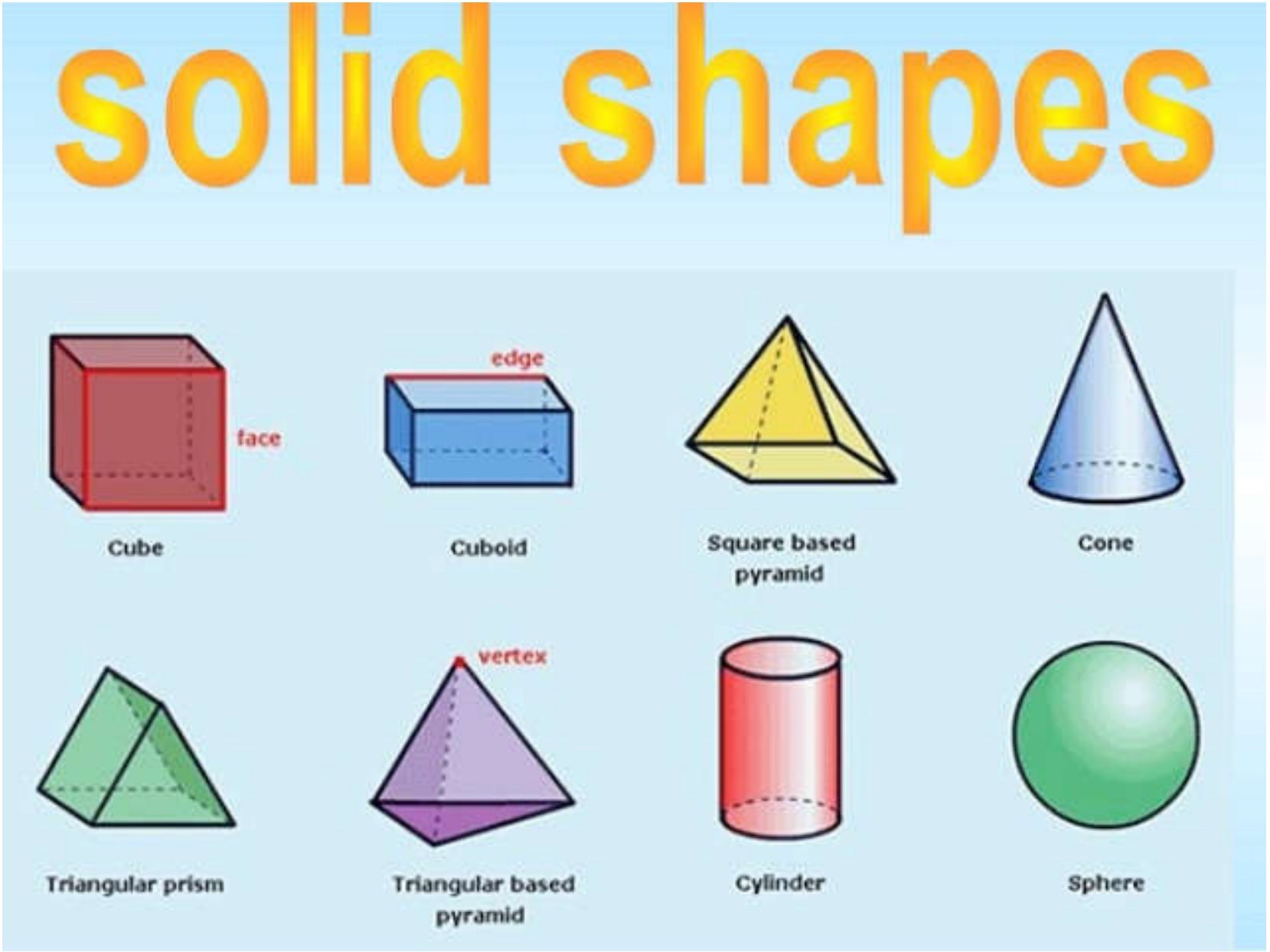
- It implies measurement.
- It is a mathematical operation involving measurement
- Geometry applied to the computation of lengths, areas, or volumes from given dimensions or angles.

TYPES OF MENSURATION

PLANE MENSURATION



SOLID MENSURATION



LIFE EXAMPLES OF MENSURATION







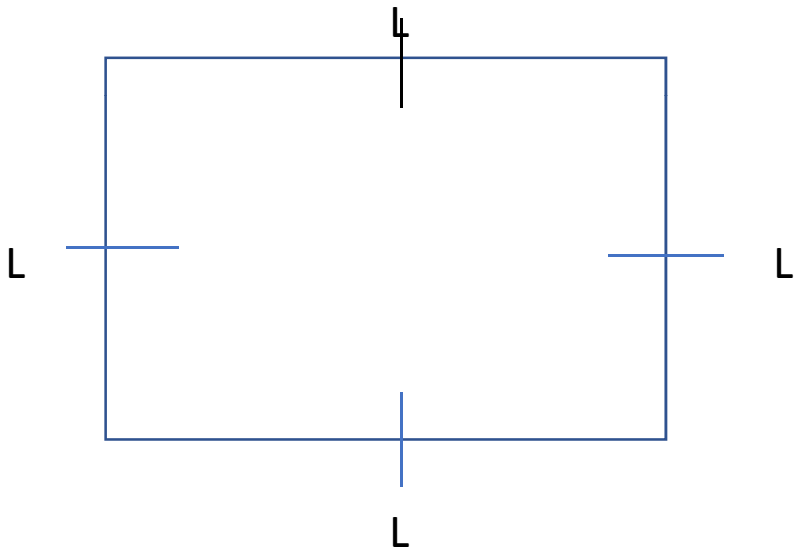

3-Dimensional Geometric Shapes

Name	We See…	It looks like a….
Cone	. Circle Base . A Point . Curve to connect	
Cube	. 6 square faces . 8 vertices (corners)	
Cylinder	. 2 circle bases . Big curve wrapped around	
Sphere	. No flat areas . A ball	
Pyramid	. 4 square base . 4 triangle faces	
Rectangular Prism	. 2 sqare faces . 4 rectangle faces	

PERIMETER AND AREA OF PLANE MENSURATION

The **perimeter** is the distance around the object.

SQUARE



- Has four equal side
- Opposite sides are equal and parallel
- All angles are right angles

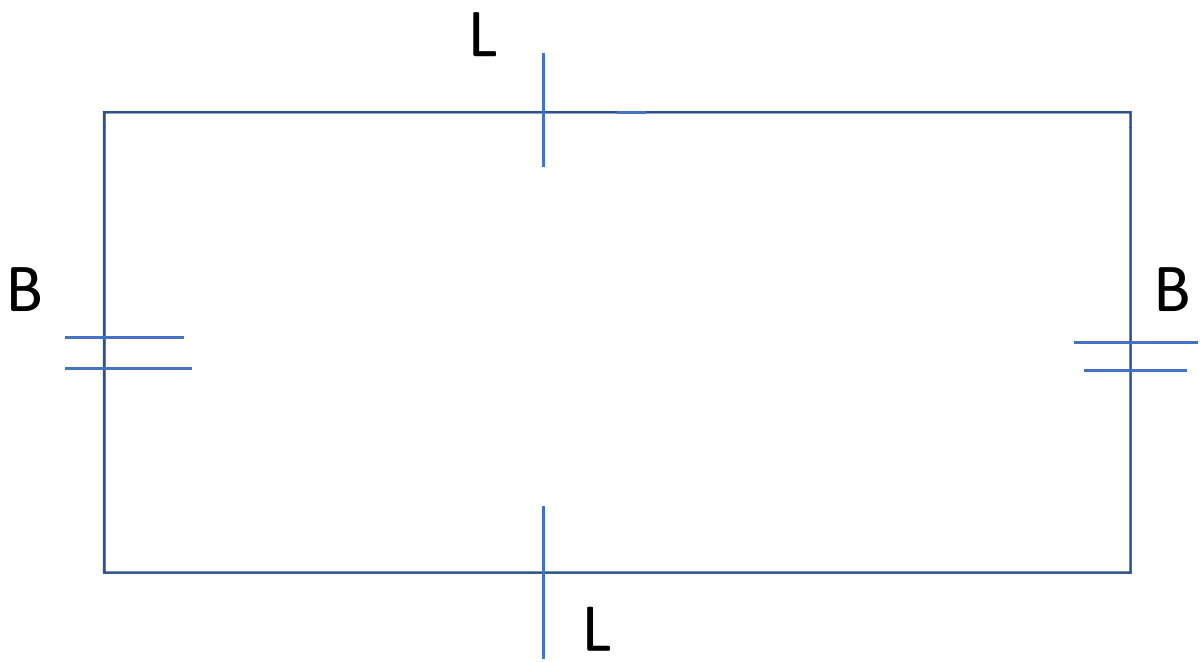
PERIMETER OF SQUARE = L+ L+L+L = 4L

AREA = L X L = L^2

For **example**, your house has a fenced yard.

The **perimeter** is the length of the fence. If the yard is 50 ft × 50 ft your fence is 200 ft long.

RECTANGLE



→ Opposite sides are equal

→ opposite sides are parallel

→ All angles are right angles

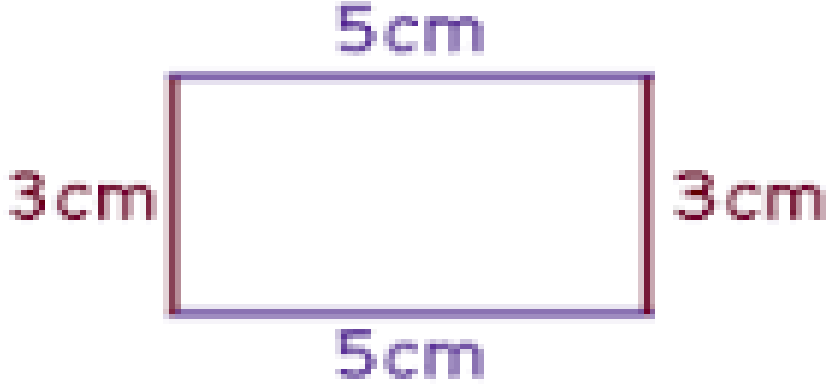
PERIMETER OF RECTANGLE = L + L + B + B = 2L + 2B

= 2(L + B)

AREA = L X B

RECTANGLE

Find the Perimeter



length = 5cm
width = 3cm

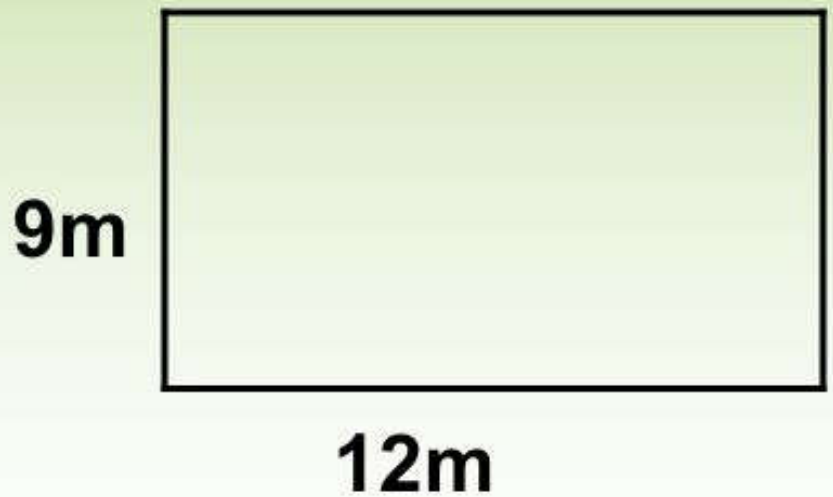
P = 5cm + 3cm + 5cm + 3cm = 16cm

Formula: $P = 2l + 2w$

$P = 2(5cm) + 2(3cm)$

$P = 10cm + 6cm$

Example 3: Find the perimeter and area of the following rectangle.



$P_R = 2l + 2w$

$P_R = 2(12m) + 2(9m)$

$P_R = 24m + 18m$

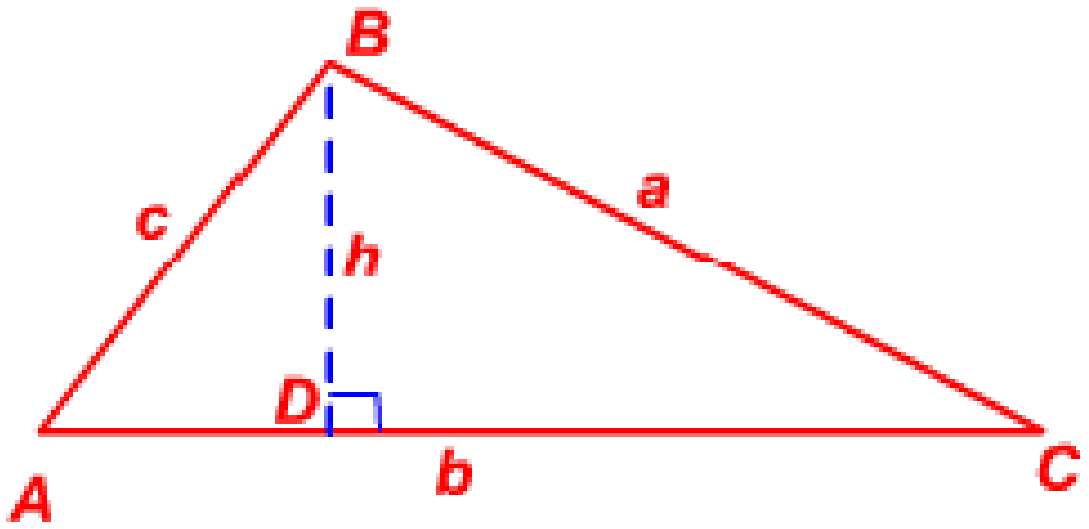
$P_R = 42m$

$A_R = l \times w$

$A_R = 12m \times 9m$

$A_R = 108m^2$

TRIANGLE



PERIMETER = A + B + C

AREA = $\frac{1}{2}$(BASE X HEIGHT)

TRIANGLE

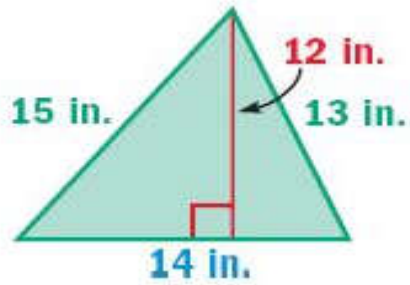
EXAMPLE 1 **Finding Area and Perimeter of a Triangle**

Find the area and perimeter of the triangle.

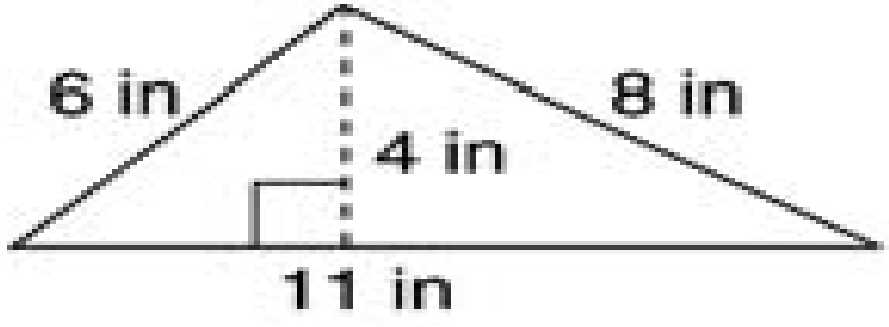
$$A = \frac{1}{2}bh \qquad P = a + b + c$$

$$= \frac{1}{2}(14)(12) \qquad = 13 + 14 + 15$$

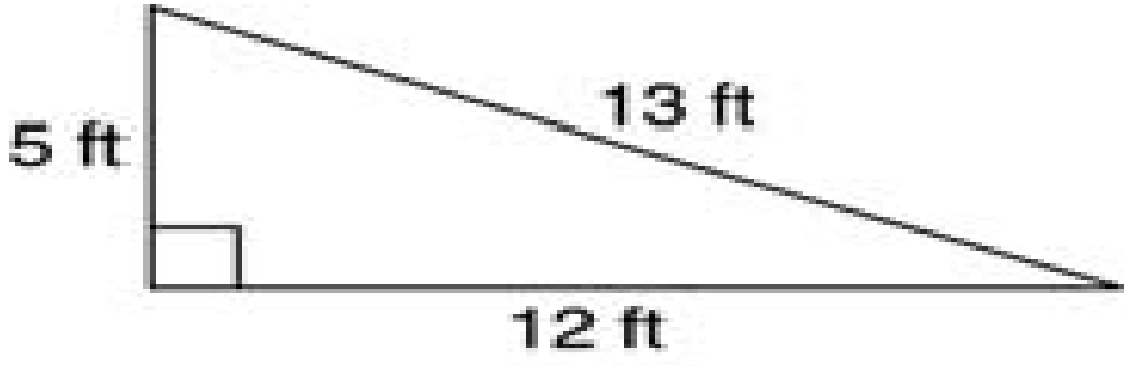
$$= 84 \text{ in.}^2 \qquad = 42 \text{ in.}$$



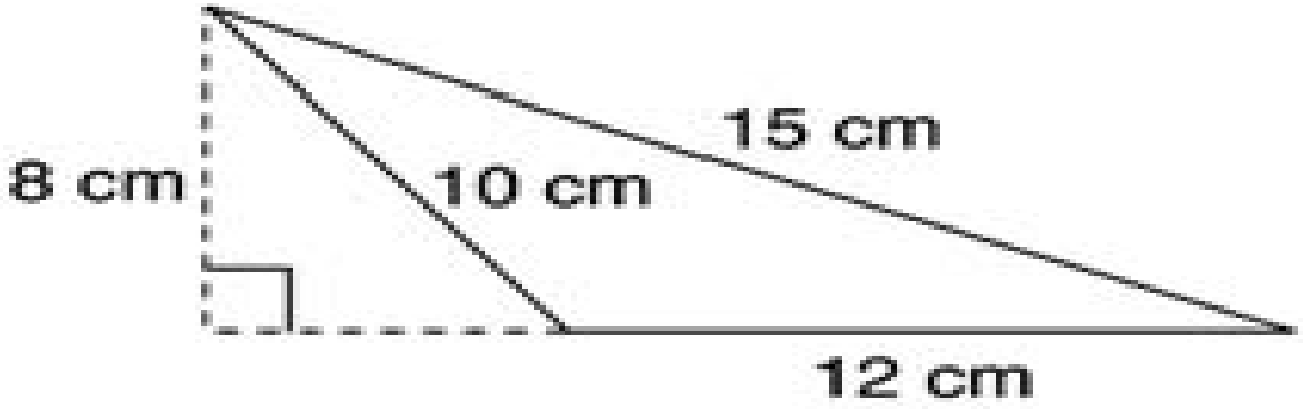
LET'S TRY THIS



(a)

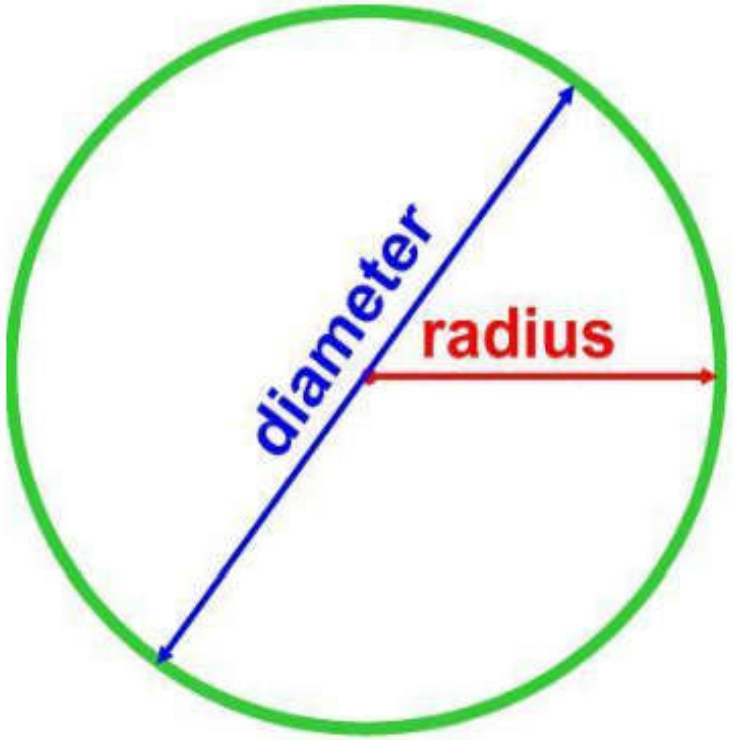


(b)



(c)

CIRCLE



Area of a circle
$= \pi \times \text{radius}^2$

Circumference of a circle $= \pi \times$ **diameter**

remember that the
diameter = 2 x radius

CIRCLE

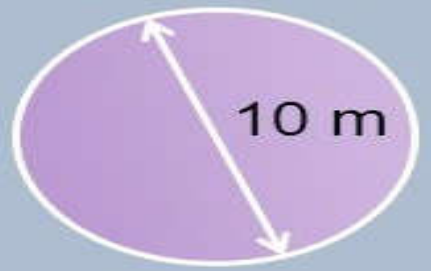
The area of a circle

Use $\pi = 3.14$ to find the area of the following circles:

$A = \pi r^2$

$= 3.14 \times 2^2$

$= \mathbf{12.56\ cm^2}$



$A = \pi r^2$

$= 3.14 \times 5^2$

$= \mathbf{78.5\ m^2}$

$A = \pi r^2$

$= 3.14 \times 23^2$

$= \mathbf{1661.06\ mm^2}$

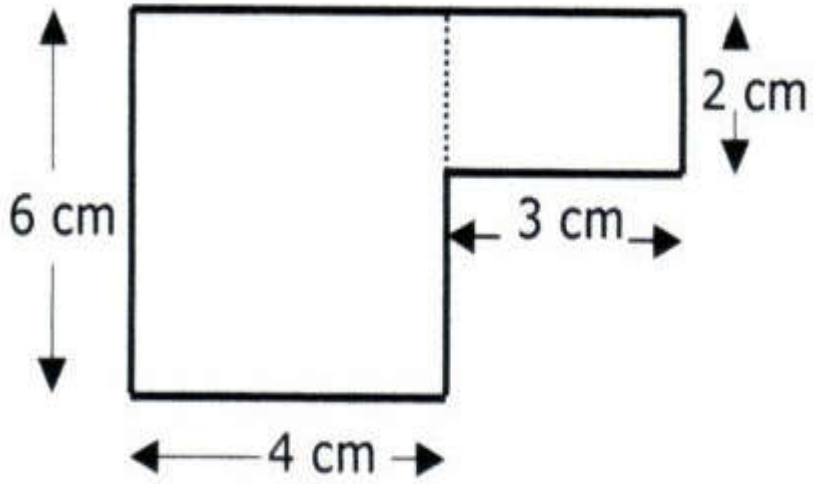
$A = \pi r^2$

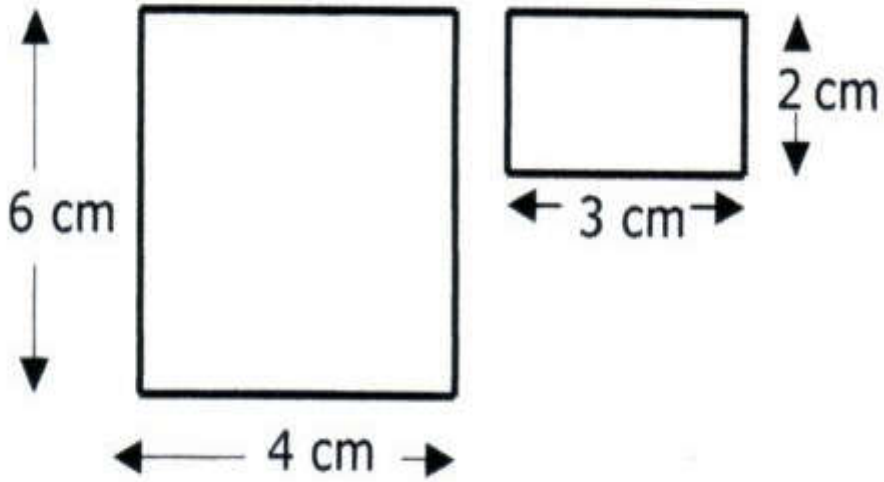
$= 3.14 \times 39^2$

$= \mathbf{4775.94\ cm^2}$

PERIMETER AND AREA OF IRREGULAR SHAPES

The area of this shape → EQUALS → the area of these two





The perimeter of this shape = 2(6 + 4) + 2(2 + 3)

= 2(10) + 2(5)

= 20 + 10

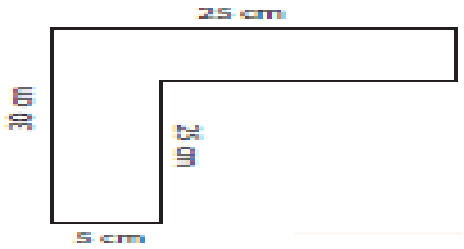
= 30 cm

The area of this shape = (6 x 4) + (2 x 3)
= 24 + 6
= 30 cm^2

LET'S TRY THIS

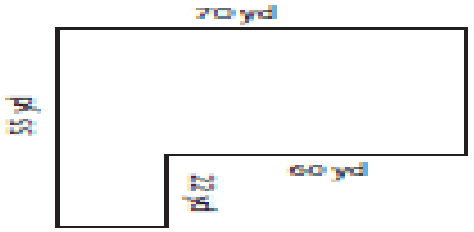
Find the area and perimeter of each shape.

1)



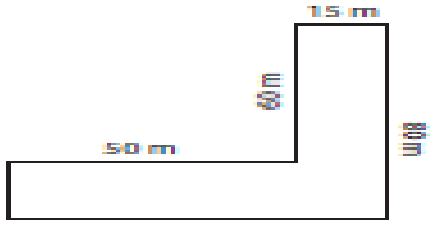
Area: _____
Perimeter: _____

2)



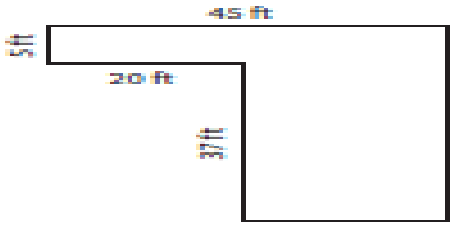
Area: _____
Perimeter: _____

3)



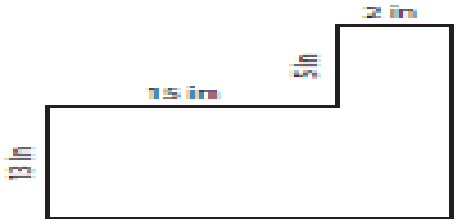
Area: _____
Perimeter: _____

4)



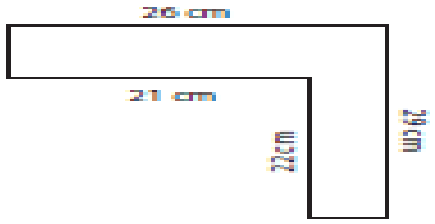
Area: _____
Perimeter: _____

5)



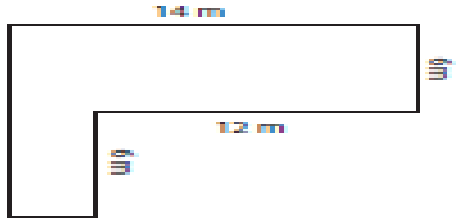
Area: _____
Perimeter: _____

6)



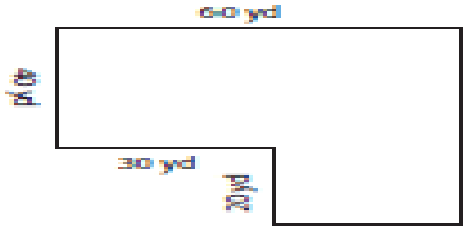
Area: _____
Perimeter: _____

7)



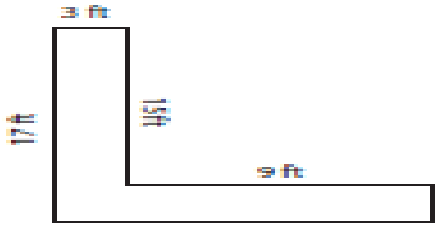
Area: _____
Perimeter: _____

8)



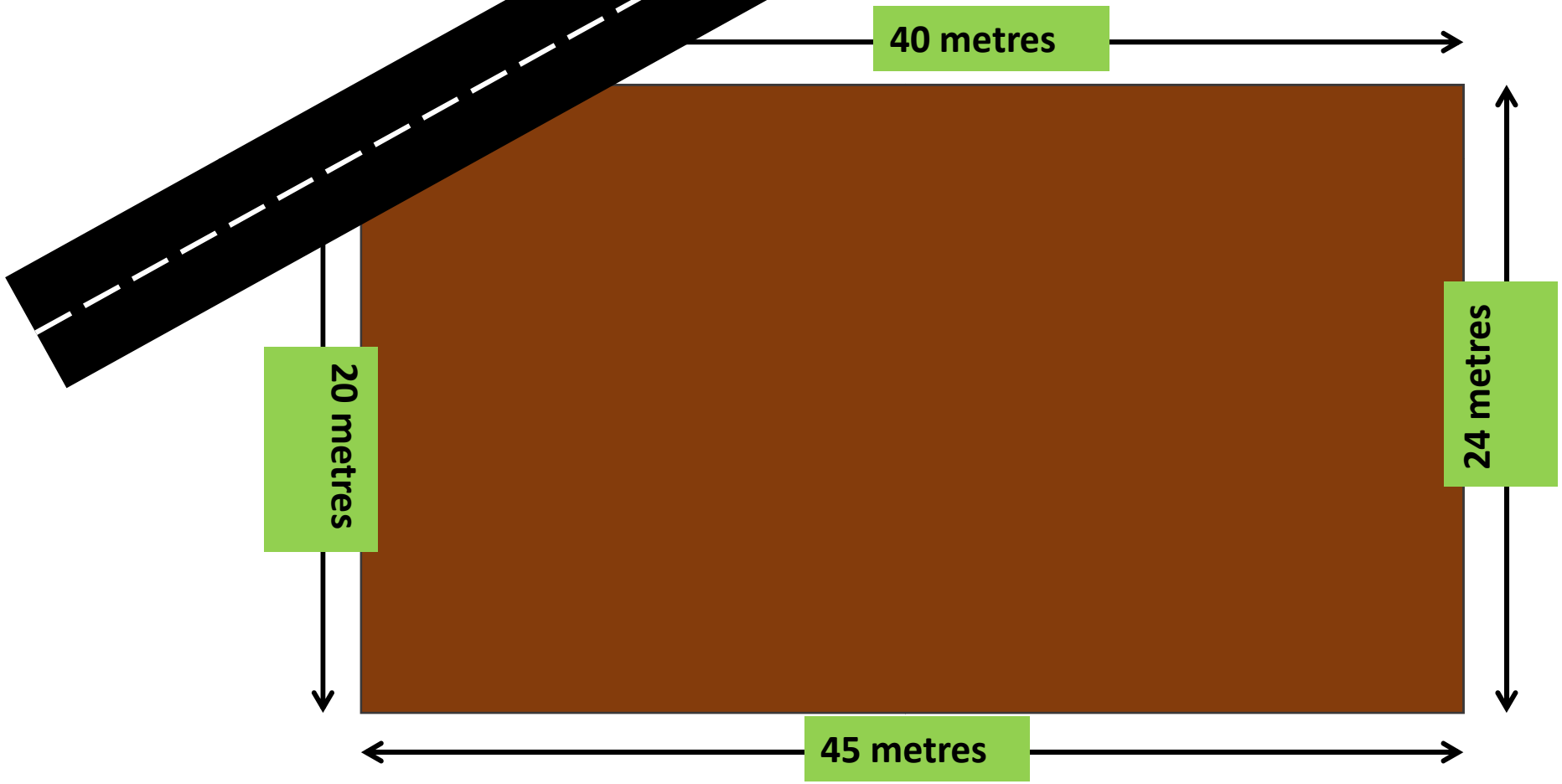
Area: _____
Perimeter: _____

9)

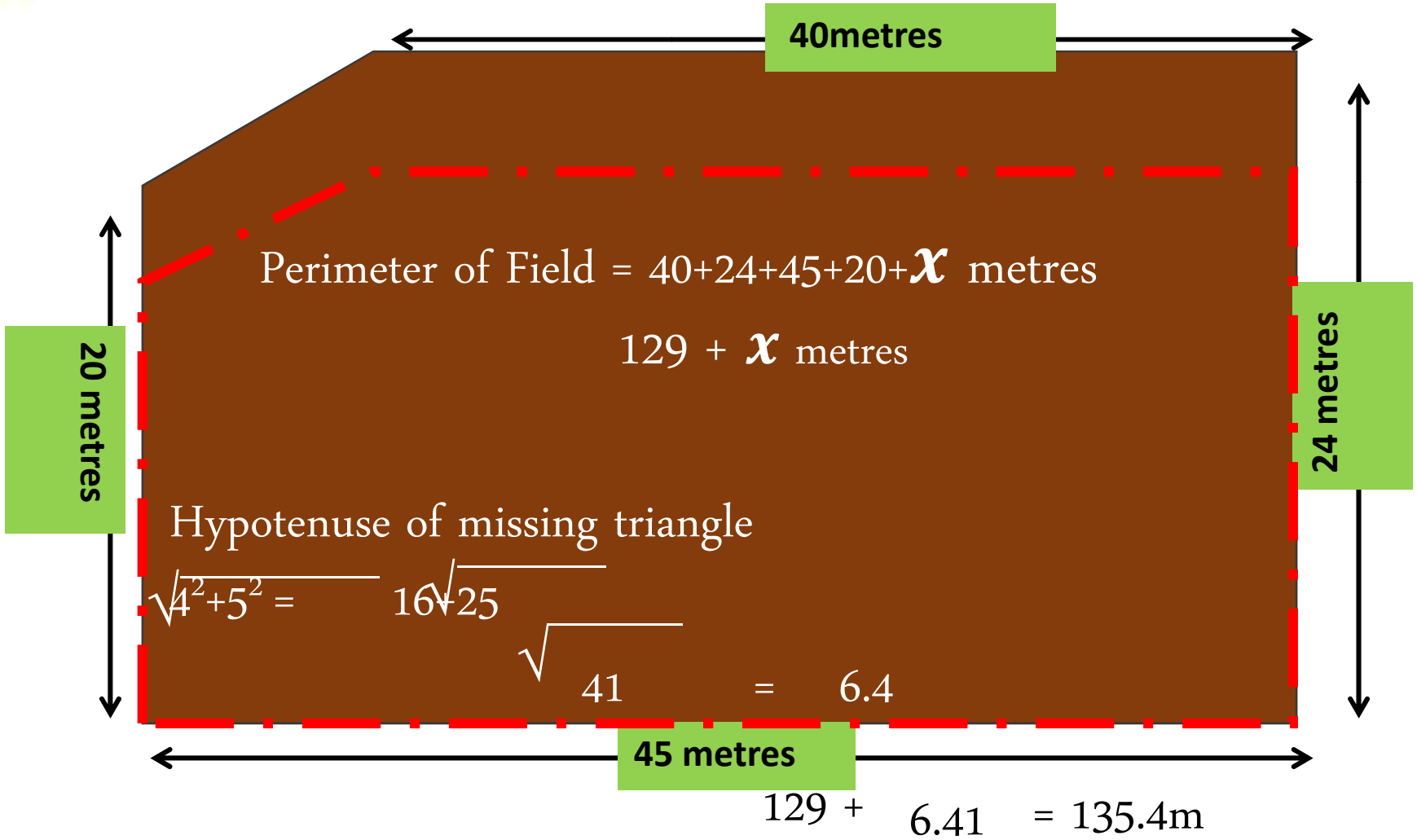


Area: _____
Perimeter: _____

Mr Adebayo bought a field



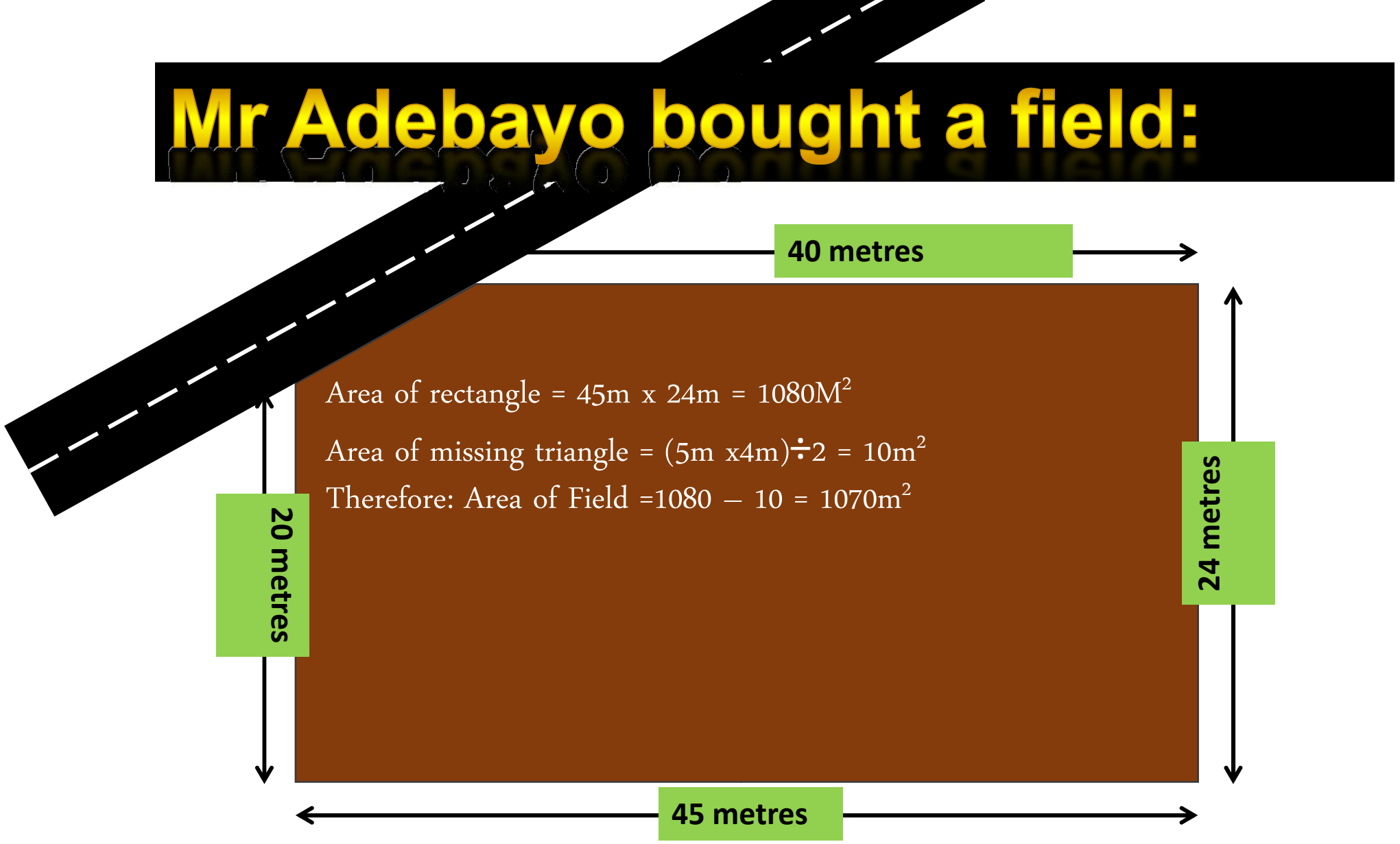
He wanted to build a fence around it...



Area of Field = $1070m^2$

Perimeter of Field= 135.4m

Mr Adebayo bought a field:



Area of Field = $1070m^2$

CLASSWORK

WASSCE PAST QUESTION

The diagram below is a rectangle. If the perimeter is 36m, find the area of the rectangle.

SOLUTION 1

$$\text{PERIMETER} = 2(L + B)$$

$$= 2[(2x + 5) + (x + 1)]$$

$$= 2(2x + 5 + x + 1)$$

$$= 2(3x + 6) = 6x + 12$$

$$6x+12 = 36$$

Collect the like term

$$6x = 36-12$$

$$6x = 24$$

$$x = 4$$

$$L= 2x + 5,\ B = x + 1$$

$$L=13m \text{ and } B = 5m$$

Therefore, Area = $13m \times 5m = 65m^2$

WASSCE 2001

The sides of a rectangular floor are xm and $(x + 7)$m. the diagonal is $(x + 8)$m,

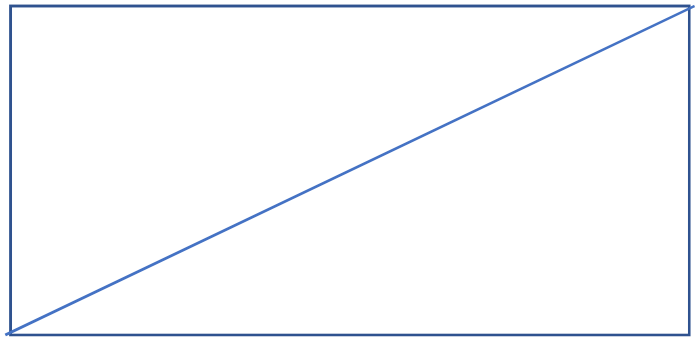
Calculate, in metre.

(a)The value of x ;

(b)The area of the floor

SOLUTION 2

Using Pythagoras theorem to find the missing side



$$(hyp)^2 = (Opp)^2 + (Adj)^2$$

$$(x + 8)^2 = (x + 7)^2 + (x)^2$$

$$(x + 8)^2 = (x + 7)^2 + (x)^2$$

$$(x + 8)(x + 8) = (x + 7)(x + 7) + x^2$$

$$x^2 - 2x - 15 = 0$$

$$x = -3 \text{ or } 5$$

Therefore, $x = 5m$

$$\text{Area} = (x + 7) \times 5m$$

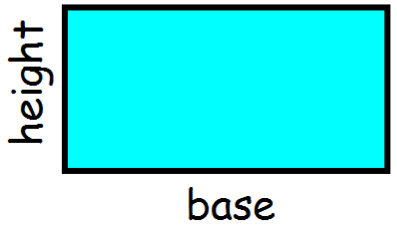
$$= (5 + 7) \times 5m$$

$$= 12 \times 5m = 60m$$

Therefore , Area = 60m

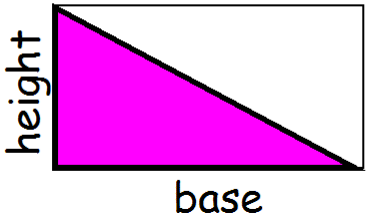
SUMMARY ON PLANE MENSURATION

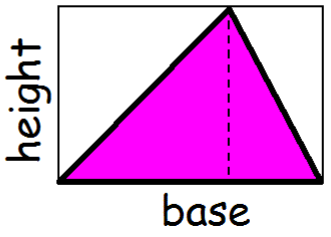
rectangle



Area = base x height

a **triangle** is half the area of a rectangle





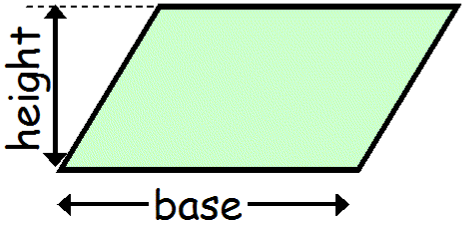
$$\text{Area} = \frac{\text{base} \times \text{height}}{2}$$

AREA

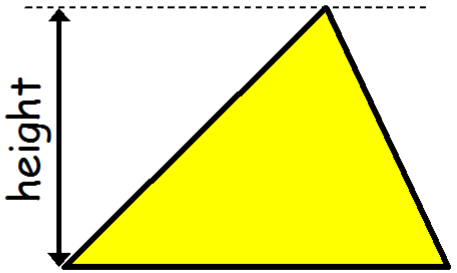
Always use the

perpendicular height

parallelogram

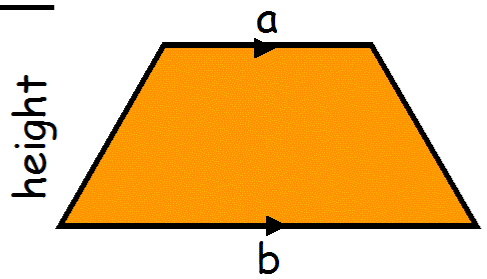


Area = base x height

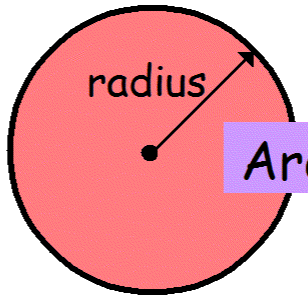


trapezium

$$\text{Area} = \frac{(a + b) \times h}{2}$$



circle

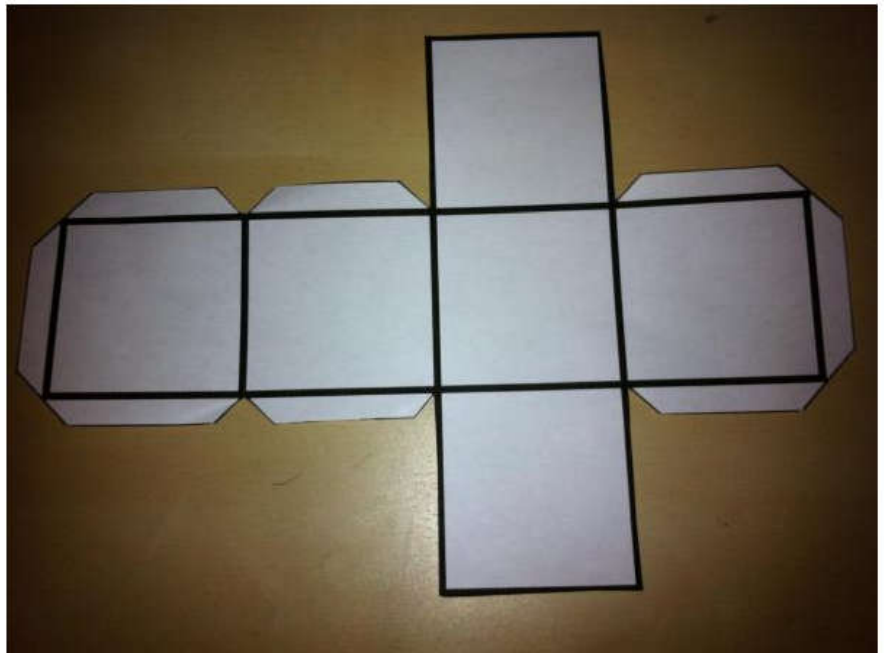


$$\text{Area} = \pi r^2$$

NET OF A SOLID MENSURATION

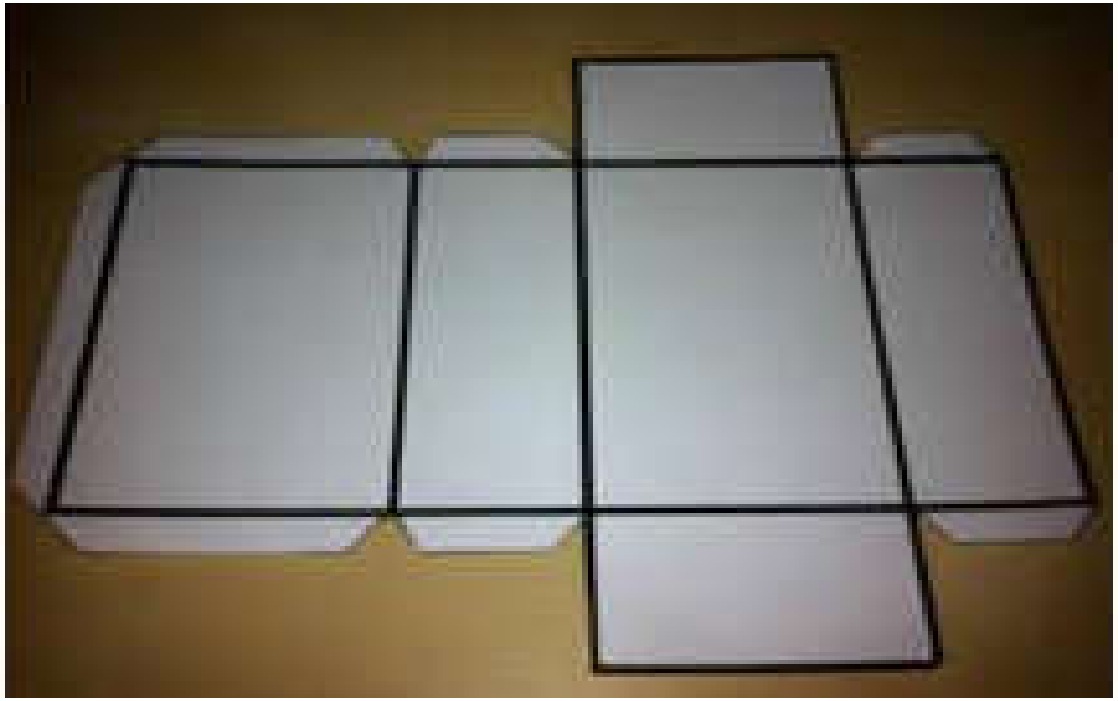
CUBE

A cube has six faces of equal dimension. This means that it has length, breadth (width) and height all of which are equal to each other



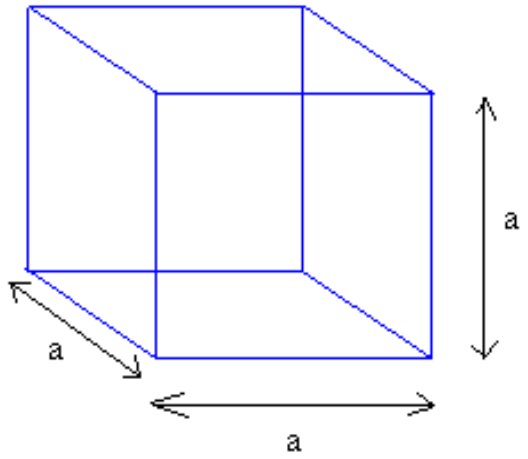
CUBOID

A Cuboids is a solid shape with rectangular base and side. It has six rectangular faces if all sides are closed



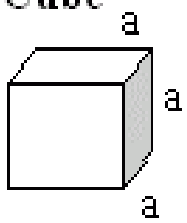
EXAMPLE ON CUBE

$V_{cube} = a^3 = a \times a \times a$



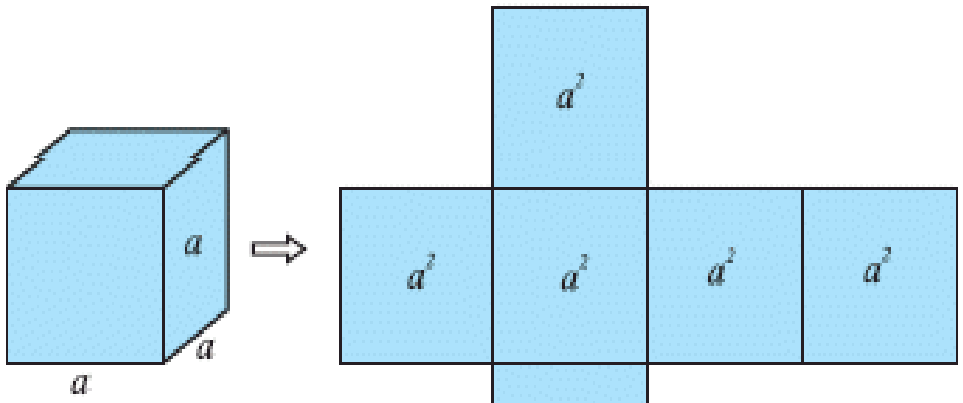
where a is the edge of the cube.

Cube



$\text{Surface Area} = 6a^2$

$\text{Lateral Surface Area} = 4a^2$



EXAMPLE CONT..

The side of a cube is 5cm. Find its total surface area.

Solution:

Total surface area of cube = $6a^2$.

Where **a** is side.

Given that **a** = 5cm.

Total surface area of cube = 6×5^2

$= 6 \times 25$

$= 150cm^2$

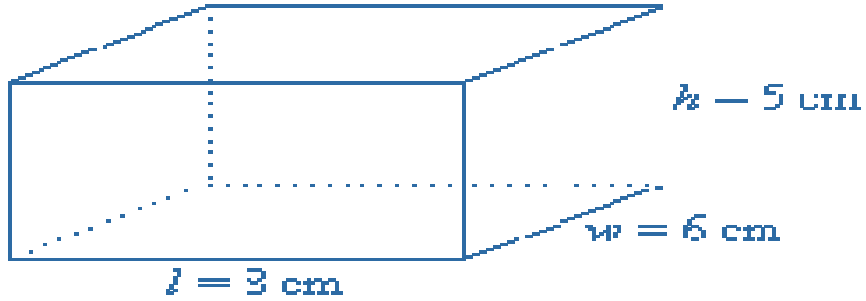
$V_{cube} = 5^3$

$V_{cube} = 5cm \times 5cm \times 5cm$

$V_{cube} = 125\ cm^3$

EXAMPLE ON CUBOID

Find the total surface area of a cuboid with dimensions 8 cm by 6 cm by 5 cm.



$$
\begin{aligned}
TSA &= 2(lw + wh + hl) \\
&= 2(8\times6 + 6\times5 + 5\times8) \\
&= 2(48 + 30 + 40) \\
&= 2(118) \\
&= 236
\end{aligned}
$$

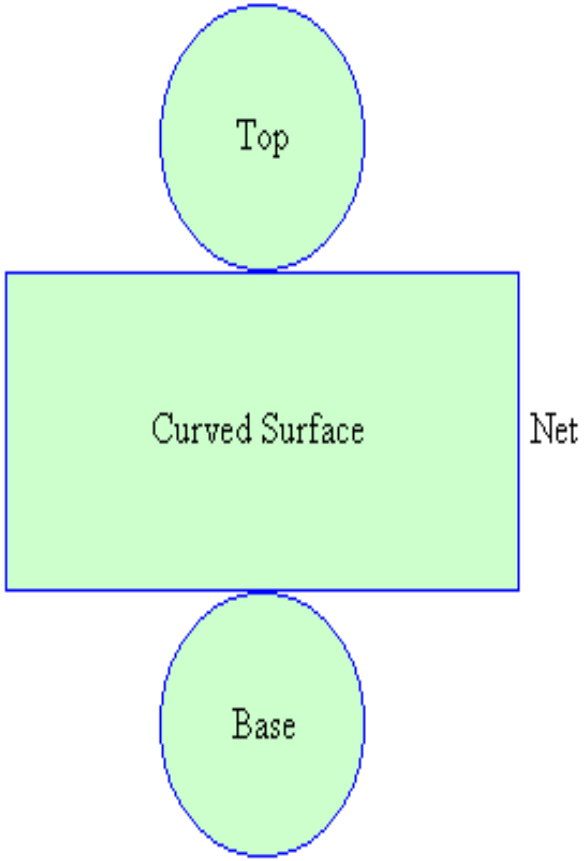
So, the total surface area is $148\ cm^2$.

V_{cuboid} = L x W x H

V_{cuboid} = 8cm x 6cm x 5cm

V_{cuboid} = $240cm^3$

CYLINDER



A cylinder is prism whose cross-section is a circle

a) Curved surface Area

=Base circumference x Height

$=2\pi rh$ square unit

a) Total Surface Area

= Areas of all the faces

I. When both top are closed

= area of base + area of top + curved surface area

$=\pi r^2 + \pi r^2 + 2\pi rh$

$=2\pi r^2 + 2\pi rh$

$=2\pi r(r + h)$ square unit

II. When one top is opened

=Area of base + Curved Surface Area

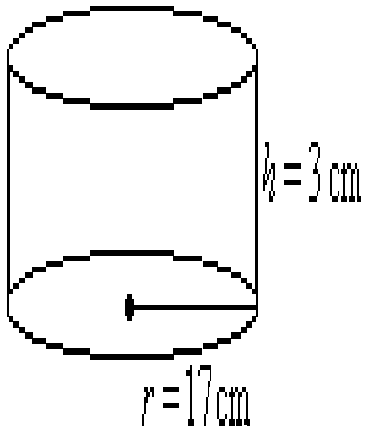
$= \pi r^2 + 2\pi rh$

$=\pi r(r + 2h)$ square units

EXAMPLE ON CYLINDER

Find the total surface area of a cylindrical tin of radius 17 cm and height 3 cm.

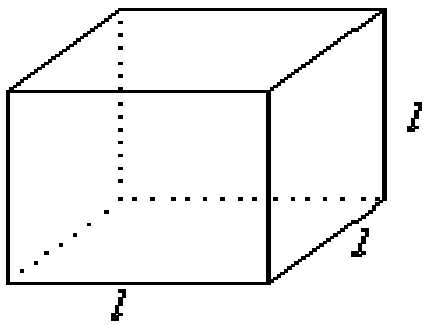
$$TSA = 2\pi r(r+h)$$
$$= 2\times 3.142\times 17(17+3) \qquad \{BODMAS\}$$
$$= 2\times 3.142\times 17\times 20$$
$$= 2136.56$$



So, the total surface area is $2136.56\ cm^2$.

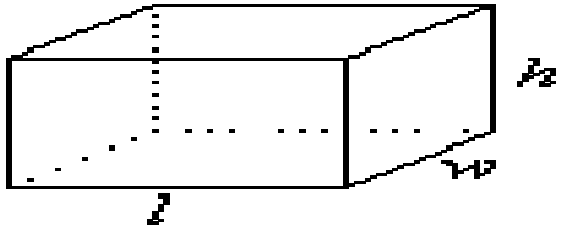
SUMMARY

Cube



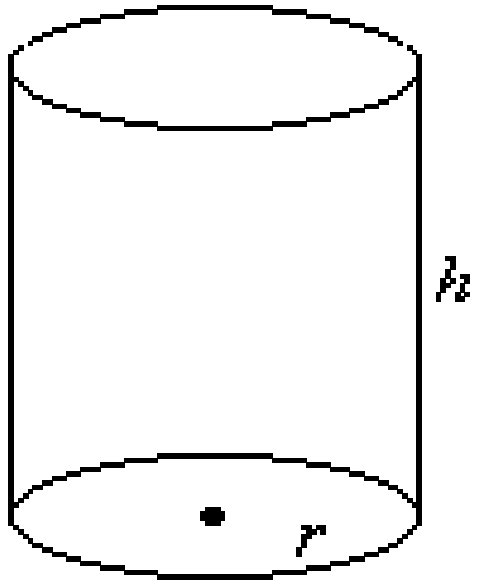
$$TSA = 6l^2$$

Cuboid



$$TSA = 2(lw + wh + hl)$$

Cylinder



$$CSA = 2\pi rh$$

$$TSA = 2\pi r(r + h)$$