STUFF IN 3D OBJECTS

AREA

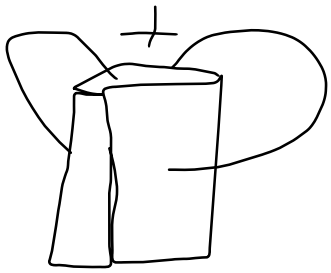
- It's the amount of the region occupied by the surface of any object
- In a 3D object, the area is called **surface area**
- It's measured in square units
- It has two types
  - **Total surface area**
  - **Lateral surface area**

TOTAL SURFACE AREA (T.A)

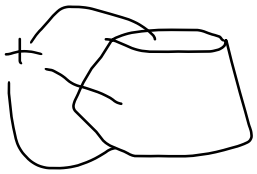
It refers to the the whole area of something including the base or bases and curved part

It can be calculated in two ways

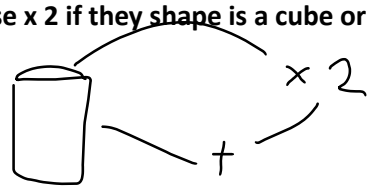
1-calculate the area of all faces and sum em up together



2-calculate the lateral area and add it to the bases

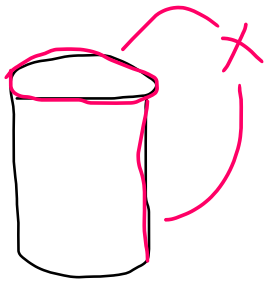


3-calculate the lateral area and add it to **base x 2 if they shape is a cube or a cylinder**



CURVED/LATERAL SURFACE AREA (L.A)

Area of the thing without the base

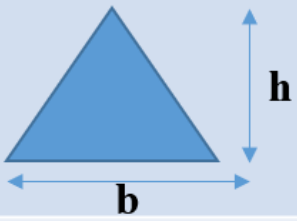
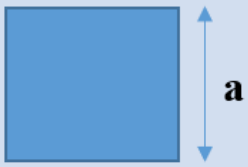
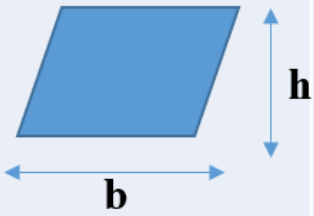
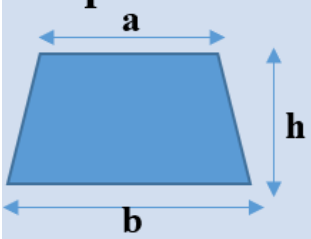
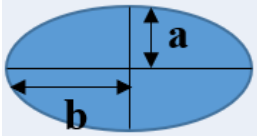
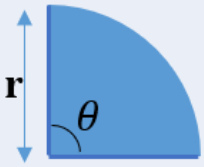


It can be calculated by multiplying the perimeter "محيط" with the height of the shape

NOTES

- ❑ **2-dimensional shapes (2-D) have only T.A and perimeter**
- ❑ **3- dimensional shapes (3-D) have T.A , L.A and Volume.**

Areas of shit

Shape	Formula	Shape	Formula
Triangle 	$Area = {}^{1}/_{2}\, b \times h$ $b = base$ $h = height$	**Square** 	$Area = a^2$ $a = length\ of\ side$
Rectangle 	$Area = h \times w$ $h = height$ $w = width$	**Parallelogram** 	$Area = b \times h$ $b = base$ $h = vertical\ height$
Trapezoid 	$Area = {}^{1}/_{2}\,(a+b) \times h$ $h = vertical\ height$ $a\ and\ b\ are\ the\ parallel\ sides$	**Circle** 	$Area = \pi r^2$ $r = radius$
Ellipse 	$Area = \pi ab$ $a = half\ of\ minor\ axis$ $b = half\ of\ major\ axis$	**Sector** 	$Area = {}^{1}/_{2}\, r^2\theta$ $r = radius$ $\theta = angle\ in\ radians$

AREA OF SQUARE WITH THE DIAGNALS = ½ diagonal^2

AREA OF ANY POLYGON -> $\frac{n}{4} x^2 \cot\left(\frac{\pi}{n}\right)$

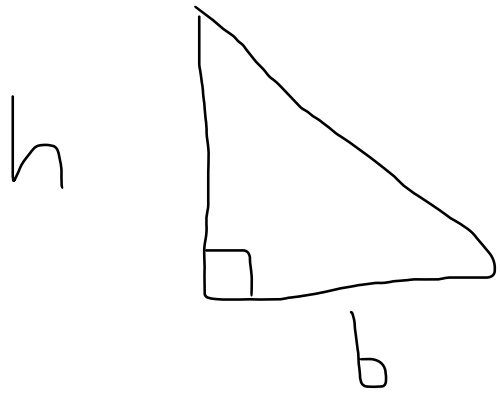
Where n -> number of sides

X -> length of side

AREA OF TRAINGLE

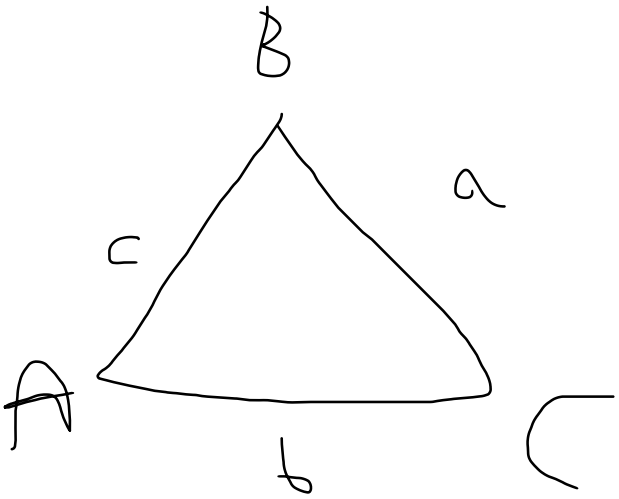
IF TRIANGLE IS RIGHT

Area = ½ base * height



ELSE

½×a×b×sin(C)



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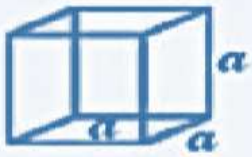
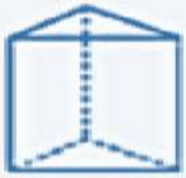
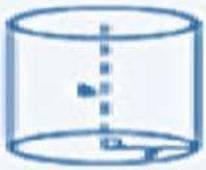
Volumes of shit

TOTAL AND LATERAL SURFACE AREA FOR 3D SHAPES

Figure		Lateral/Curved Surface Area	Total Surface Area Units	Units
Cuboid		$2h(l+b)$	$2(lb+bh+hl)$	$l = Length$ $b = Bradth$ $h = Height$
Cube		$4a^2$	$6a^2$	$a = Side$
Right Prism		$Perimeter\ of\ base \times height$	$Lateral\ Surface\ Area + 2(area\ of\ one\ end)$	
Right Circular Cylinder		$2\pi rh$	$2\pi r(r+h)$	$r = Radius$ $h = Height$
Right Pyramid		$^1/_2\,(perimeter\ of\ base \times Slant\ height)$	$Latral\ Surface\ Area + Area\ of\ the\ base$	
Right Circular Cone		πrl	$\pi r(l+r)$	$l = Length$ $r = Radius$
Sphere (solid)		$4\pi r^2$	$4\pi r^2$	$r = Radius$
Hemisphere(solid)		$2\pi r^2$	$3\pi r^2$	$r = Radius$

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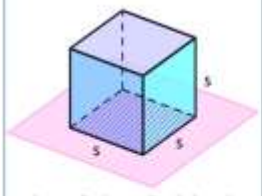
VOLUME

- It's the amount of space an object takes
- It is for 3D SHAPES ONLY
- It is measured in cubic units

In simple stuff, it can be measured by multiplying the base area with the height

There are some volumes of different shapes

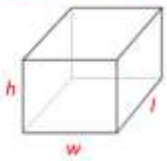
Volume of Cube



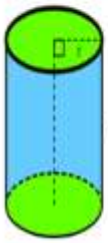
Volume of cube with side lengths s

$V = s \times s \times s = s^3$

Volume of Cuboid



$V = lwh$



Volume of a Cylinder

$\pi r^2 h$

Volume of Cone

$\frac{1}{3}\pi r^2 h$

Volume of pyramid

Volume of Pyramid

$v = {}^1/_3\, bh$

Where b = the area of the base

Volume of a Sphere

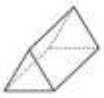
Volume of a sphere

$v = {}^3/_4\, \pi r^3$

Where $\pi = 3.14$

r = radius

Triangular Prism



$v = {}^1/_2 \times b \times h \times H$

or

$v = {}^1/_2\, bhH$

The volume of the prism is area of the base multiply by the height.

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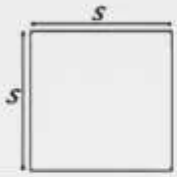
Basic formulae

SQUARE

$P = 4s$

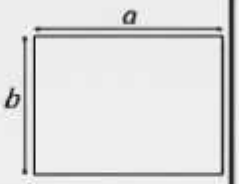
$A = s^2$



RECTANGLE

$P = 2a + 2b$

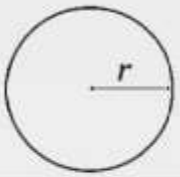
$A = ab$



CIRCLE

$P = 2\pi r$

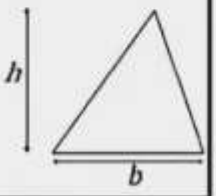
$A = \pi r^2$



TRIANGLE

$P = a + b + c$

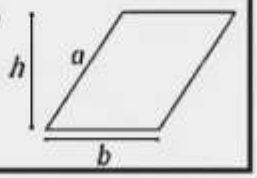
$A = \frac{1}{2}bh$



PARALLELOGRAM

$P = 2a + 2b$

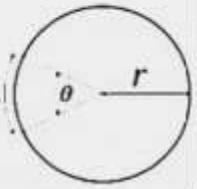
$A = bh$



CIRCULAR SECTOR

$L = \pi r \frac{\theta}{180^\circ}$

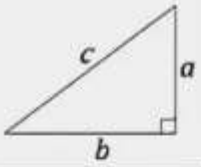
$A = \pi r^2 \frac{\theta}{360^\circ}$



PYTHAGOREAN THEOREM

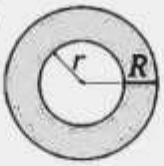
$a^2 + b^2 = c^2$

$c = \sqrt{a^2 + b^2}$



CIRCULAR RING

$A = \pi(R^2 - r^2)$



SPHERE

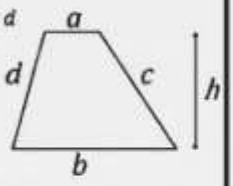
$S = 4\pi r^2$

$V = \frac{4\pi r^3}{3}$

TRAPEZOID

$P = a + b + c + d$

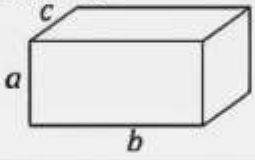
$A = h\frac{a+b}{2}$



RECTANGULAR BOX

$A = 2ab + 2ac + 2bc$

$V = abc$

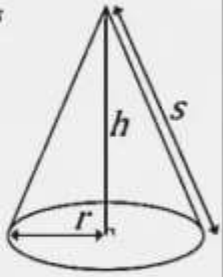


RIGHT CIRCULAR CONE

$A = \pi r^2 + \pi rs$

$s = \sqrt{r^2 + h^2}$

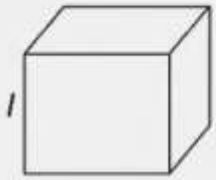
$V = \frac{1}{3}\pi r^2 h$



CUBE

$A = 6l^2$

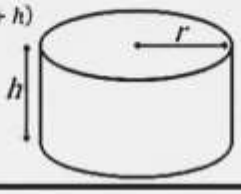
$V = l^3$



CYLINDER

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

$V = \pi r^2 h$



The lateral area - total area - volume of a right cone :

If (r) is the radius of the cone base , (L) is the cone drawer, (h) is the height, then :

- The lateral surface area (L.S.A.) of the right cone = π L r
- The total surface area (T.S.A.) of the right cone = π r (L + r)
- Volume of the right cone = $\frac{1}{3}\pi r^2 h$

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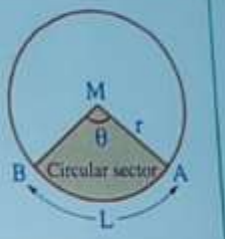
The circular sector is a part of the surface of a circle bounded by two radii and an arc of the circle.

* Area of the circular sector = $\frac{1}{2}$ L r

(where L is the length of the arc of the sector)

* Area of the circular sector = $\frac{1}{2}\ \theta^{rad}\ r^2$ (where θ^{rad} is the radian measure of the sector angle)



* Area of the circular sector = $\frac{X^\circ}{360^\circ} \times \pi\ r^2 = \frac{X^\circ}{360^\circ} \times$ area of the circle

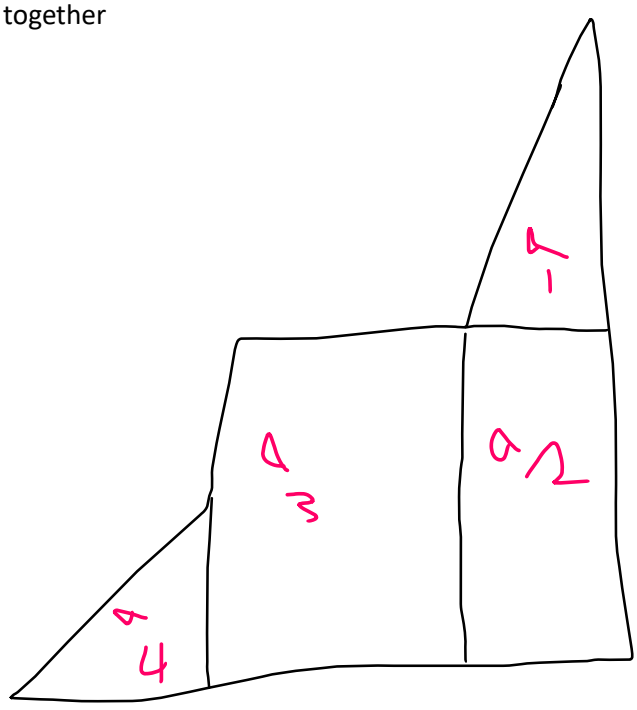
(where X° is degree measure of the sector angle)

* Perimeter of the sector = 2 r + L length unit.

COMPOSITE FIGURES

It's a shape/figure that can be sliced into multiple other basic figures

The area of it is calculated by slicing it and taking the area of each basic figure (slice) then adding them together



$A_{+} = a_1 + \ldots + a_F$

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