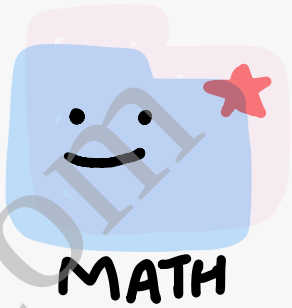
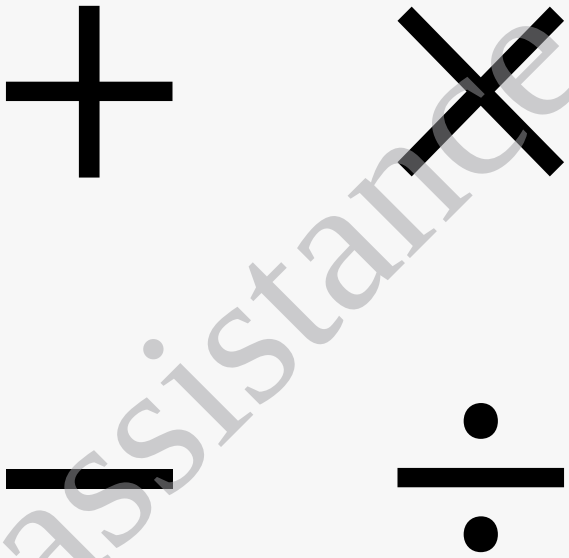
Volume And Surface Area
Ex. 15.3





Ex 15.3

1. Length of tank, $l = 65$ cm
Width of tank, $b = 28$ cm
Height of tank, $h = 42$ cm
Volume of water required to fill up the tank $= lbh$
$= 65 \times 28 \times 42$
$= 76440 \text{ cm}^3$
$= \frac{76440}{1000} \text{ l} \quad [\because 1 \text{ l} = 1000 \text{ cm}^3]$
$= 76.44 \text{ l}$

2. Let the length of one side of cube $= a$ cm
Total surface area of cube $= 150 \text{ cm}^2$
or $6a^2 = 150$
or $a^2 = \frac{\cancel{150}\ 25}{\cancel{6}\ 1}$
or $a^2 = 25$
or $a = \sqrt{25}$
or $a = 5$ cm
Volume of cube $= a^3$
$= 5^3$
$= 125 \text{ cm}^3$

3. Let the length of one side of cube $= a$ cm
Area of face of cube $= 256 \text{ cm}^2$
or $a^2 = 256$
or $a = \sqrt{256}$
or $a = \sqrt{\underline{2\times2}\times\underline{2\times2}\times\underline{2\times2}\times\underline{2\times2}}$
or $a = 2\times2\times2\times2$

or $a = 16$ cm

Volume of cube $= a^3$

$= 16^3$

$= 4096 \text{ cm}^3$

4. Let length of metal block Y $= l$ cm

Volume of metal block X $= 12 \times 8 \times 4 \text{ cm}^3$

Volume of metal block Y $= l \times 2 \times 1 \text{ cm}^3$

Volume of block Y = Volume of block X

or $l \times 2 \times 1 = 12 \times 8 \times 4$

or $l = \frac{12 \times 8 \times 4}{2 \times 1}$

or $l = 192$ cm

∴ Length of metal block Y $= 192$ cm

Total surface area of block X

$= 2(12 \times 8 + 8 \times 4 + 4 \times 12)$

$= 2(96 + 32 + 48)$

$= 2 \times 176$

$= 352 \text{ cm}^2$

Total surface area of block Y

$= 2(192 \times 2 + 2 \times 1 + 1 \times 192)$

$= 2(384 + 2 + 192)$

$= 2 \times 578$

$= 1156 \text{ cm}^2$

Ratio of surface areas $= 352 : 1156$

$= \frac{352}{1156}\ \frac{88}{289}$

$= 88 : 289$

5. Base radius of cylindrical disc, $R = 28$ cm
Height of cylindrical disc, $H = 7$ cm
Base radius of cylindrical block, $r = 14$ cm
Length of cylindrical block, $h = ?$
Volume of cylindrical block = Volume of cylindrical disk

or $\pi r^2 h = \pi R^2 H$

or $14 \times 14 \times h = 28 \times 28 \times 7$

or $h = \frac{28^2 \times 28^2 \times 7}{{}_1 14 \times 14_1}$

or $h = 28$ cm

$\therefore$ Length of cylindrical block = 28 cm

Ratio of total surface area of the cylindrical disc to that of the block

$= 2\pi R(H+R) : 2\pi r(h+r)$

$= \frac{2\pi R(H+R)}{2\pi r(h+r)}$

$= \frac{{}^2 28(7+28)}{{}_1 14(28+14)}$

$= \frac{{}^1 2 \times 35}{42_6 3}\ 5$

$= 5:3$

6. External radius of pipe, $R = \frac{12}{2} = 6$ cm

Internal radius of pipe, $r = \frac{10}{2} = 5$ cm

Length of pipe, $h = 15$ cm

Volume of material used in making the pipe = external volume − internal volume

$= \pi R^2 h - \pi r^2 h$

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

$= \frac{22}{7} \times 15 (6^2 - 5^2)$

$= \frac{330}{7} \times (6+5)(6-5) \quad [\because a^2 - b^2 = (a+b)(a-b)]$

$= \frac{330}{7} \times 11 \times 1$

$= \frac{3630}{7}$

$\approx 518.57 \text{ cm}^2$

Total surface area

= inner surface area + outer surface area + area of two rings

$= 2\pi rh + 2\pi Rh + 2(\pi R^2 - \pi r^2)$

$= 2\pi rh + 2\pi Rh + 2\pi (R^2 - r^2)$

$= 2\pi [rh + Rh + (R^2 - r^2)]$

$= 2\pi [rh + Rh + (R+r)(R-r)] \quad [\because a^2 - b^2 = (a+b)(a-b)]$

$= 2 \times \frac{22}{7} [5 \times 15 + 6 \times 15 + (6+5)(6-5)]$

$= \frac{44}{7} (75 + 90 + 11)$

$= \frac{44}{7} \times 176$

$= \frac{7744}{7} \approx 1106.29 \text{ cm}^2$

7. Let the radius of first cylinder, $R = 4x$ units
Radius of second cylinder, $r = 5x$ units
Let the height of first cylinder, $H = 7y$ units
Height of second cylinder, $h = 6y$ units
Ratio of lateral surface areas

$$= 2\pi RH : 2\pi rh$$

$$= \frac{2\pi \times 4x \times 7y}{2\pi \times 5x \times 6y}$$

$$= \frac{4 \times 7}{5 \times 6}$$

$$= \frac{14}{15}$$

$$= 14 : 15$$

8. Volume of wooden sheet $= 40 \times 10 \times 2\ cm^3$
Volume of wooden block $= 120 \times 30 \times 6\ cm^3$

$$\text{No. of sheets} = \frac{\text{volume of block}}{\text{volume of sheet}}$$

$$= \frac{120 \times 30 \times 6}{40 \times 10 \times 2}$$

$$= 27$$