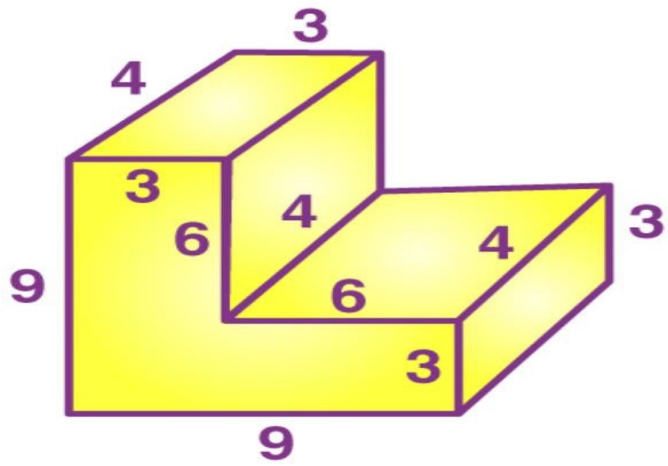
## EXERCISE 21B

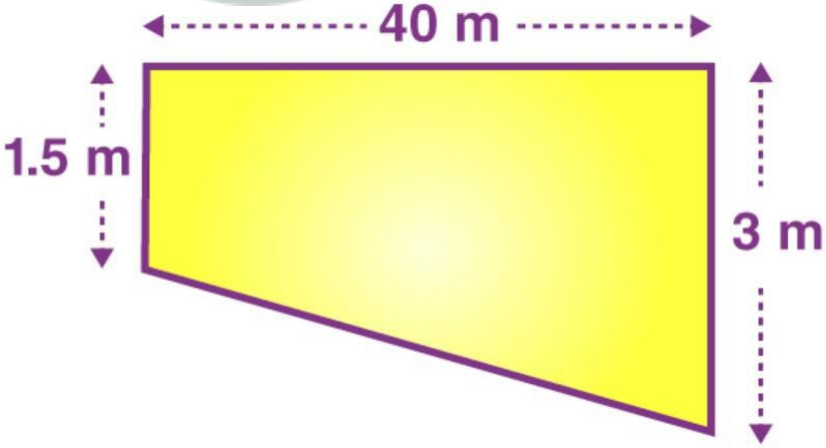
**1. The following figure shows a solid uniform cross-section. Find the volume of the solid. All measurements are in centimetres. Assume that all angles in the figures are right angles.**




**Solution:**

We can divide the figure into two cuboids of dimensions 6 cm, 4 cm, 3 cm and 9 cm respectively.
So the volume of solid = $9 \times 4 \times 3 + 6 \times 4 \times 3$
$= 108 + 72$
$= 180\ cm^3$

**2. A swimming pool is 40 m long and 15 m wide. Its shallow and deep ends are 1.5 m and 3 m deep respectively. If the bottom of the pool slopes uniformly, find the amount of water in litres required to fill the pool.**




**Solution:**

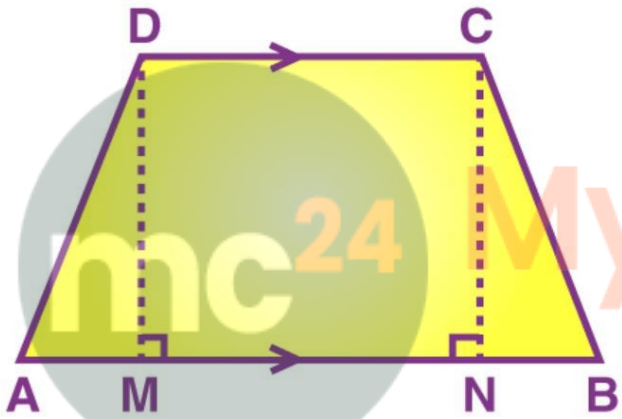
We know that
Area of cross section of the solid = $\frac{1}{2}(1.5 + 3) \times 40\ cm^2$
By further calculation
$= \frac{1}{2} \times 4.5 \times 40\ cm^2$

$= 90\ cm^2$

Here
Volume of solid = Area of cross section × length
$= 90 \times 15\ cm^3$
$= 1350\ cm^3$

We know that,
$1\ cm^3 = 1000$ lt
So $1350\ cm^3 = 1350000$ litres

**3. The cross-section of a tunnel perpendicular to its length is a trapezium ABCD as show in the following figure; also given that:**
**AM = BN; AB = 7 m; CD = 5 m. The height of the tunnel is 2.4 m. The tunnel is 40 m long.**
**Calculate:**




**(i) The cost of painting the internal surface of the tunnel (excluding the floor) at the rate of Rs. 5 per $m^2$ (sq. metre).**
**(ii) The cost of paving the floor at the rate of Rs. 18 per $m^2$.**
**Solution:**

It is given that
AB = 7 m, CD = 5 m and AM = BN
Height = 2.4 m
Length = 40 m

(i) We know that
AM = BN = (7 – 5)/2 = 2/2 = 1m

In △ ADM,
Using Pythagoras Theorem
$AD^2 = AM^2 + DM^2$
Substituting the values
$AD^2 = 1^2 + 2.4^2$
$AD^2 = 1 + 5.76$

$AD^2 = 6.76$
$AD^2 = 2.6^2$
AD = 2.6 m
Here
Perimeter of the cross section of the tunnel = 7 + 2.6 + 2.6 + 5 = 17.2 m
Length = 40 m

So the internal surface area of the tunnel (except floor) = 17.2 × 40 – 40 × 7
By further calculation
= 688 – 280
= 408 $m^2$
Rate of paining = Rs. 5 per $m^2$
So the total cost of painting = 5 × 408 = Rs. 2040

(ii) We know that
Area of floor of tunnel = l × b
= 40 × 7
= 280 $m^2$
Rate of cost of paving = Rs. 18 per $m^2$
So the total cost of painting = 280 × 18 = Rs. 5040

**4. Water is discharged from a pipe of cross-section area 3.2 $cm^2$ at the speed of 5 m/s. Calculate the volume of water discharged:**
**(i) In $cm^3$ per sec.**
**(ii) In litres per minute.**
**Solution:**
(i) Rate of speed = 5 m/s = 500 cm/s
Volume of water flowing per sec = 3.2 × 500 = 1600 $cm^3$

(ii) Volume of water flowing per min = 1600 × 60 = 96000 $cm^3$
We know that 1000 $cm^3$ = 1 litre
So the volume of water flowing per min = 96000/1000 = 96 litres

**5. A hose-pipe of cross-section area 2 $cm^2$ delivers 1500 litres of water in 5 minutes. What is the speed of water in m/s through the pipe?**
**Solution:**
Volume of water flowing in 1 sec = (1500 × 1000)/ (5 × 60) = 5000 $cm^3$

We know that
Volume of water flowing = Area of cross section × speed of water
5000 $cm^3/s$ = 2 $cm^2$ × speed of water
So we get
Speed of water = 5000/2 cm/s
= 2500 cm/s
= 25 m/s