Surface Area and Volume of Prisms

Surface Area is the sum of all the faces of a 3-D figure.

- The surface of a rectangular prisms is six rectangular faces.
- Surface area is measured in units squared: Exp. in. 2 or square inches.
- Example of problems asking for Surface Area: cover, paint, wrap

Volume is the area of the base times the height of a rectangular prism.

- The volume of a rectangular prism is the area of a base rectangle times the height.
- Volume is measured in units cubed: Exp. in. 3 or cubic inches
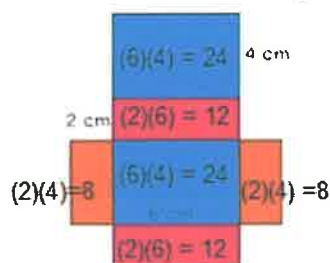- Example problems asking for Volume: fill, contain, hold, stuffing, in/inside
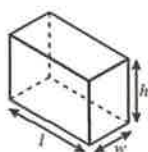
Formula	$V = lwh$ $S.A. = 2lw + 2lh + 2wh$	**Abbreviations** 	Area	A
		Circumference	C
		Perimeter	p
		Surface Area	$S.A.$
		Volume	V

Surface Area

$(6)(4) = 24$ 4 cm

2 cm $(2)(6) = 12$

$(6)(4) = 24$ $(2)(4) = 8$

$(2)(4) = 8$

$(2)(6) = 12$

Find the area of each face:

Top or Bottom: 6 X 4 = 24
Front or Back: 2 X 6 = 12
Either side: 2 X 4 = 8

Add the area of all 6 faces:

24 + 24 + 12 + 12 + 8 + 8 = 88

SA = 88 cm²

Height 3 m
6 m
4 m
Length
Width
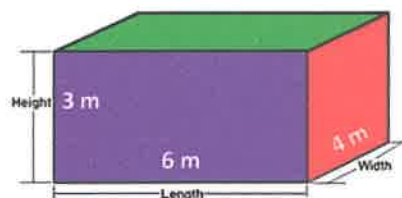
SA = 2lw + 2lh + 2wh
SA= 2(6)(4) + 2(6)(3) + 2(4)(3)
SA = 48 + 36 + 24
SA= 108 m²

Volume

unit cube 1 1 1
4 units
3 units
5 units
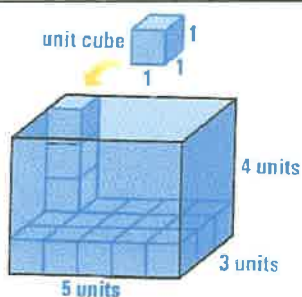
l = 5 units

w = 3 units

h = 4 units

V = lwh

V = (5)(3)(4)

V = 60 units³

POPCORN   11 in
8 in   4 in

l = 8 in

w = 4 in
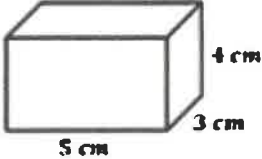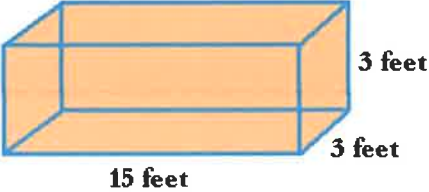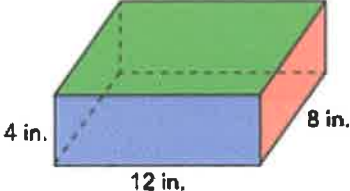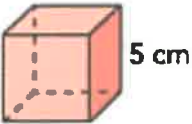
h = 11 in

V= lwh

V = (8)(4)(11)

V = 352 in³

Calculate the Surface area of the rectangular Prisms below

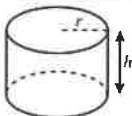| Question	Measurements	Formula Show all work
 4 cm 3 cm 5 cm	l = w = h =	SA = 2lw + 2lh + 2wh
 3 feet 3 feet 15 feet		
 4 in. 8 in. 12 in.		
 5 cm		
 40 cm 5 cm 30 cm		
Find the surface area of a rectangular prism that has a length of 8 inches, a width of 3 inches, and a height of 6 inches.		
A box that is 15 inches wide, 25 inches high, and 2 inches thick is to be wrapped in gift paper. How many square inches of gift paper are needed?		

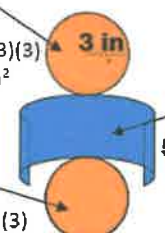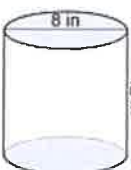# Surface Area and Volume of Cylinders

Surface Area is the sum of all the faces of a 3-D figure.
- The surface of a cylinder is two congruent circles and a rectangle.
- Surface area is measured in units squared: Exp. in. 2 or square inches.
- Example of problems asking for Surface Area: cover, paint, wrap

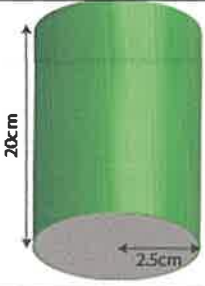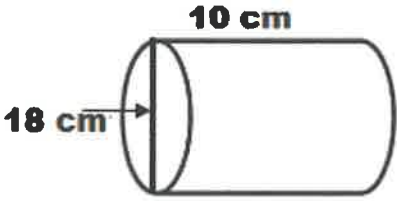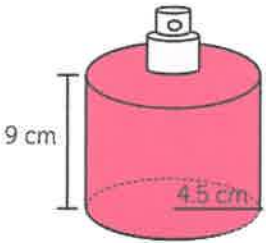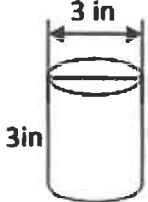**Volume** is the area of the base times the height of a rectangular prism and cylinder.
- The volume of a cylinder is the area of the circle times the height.
- Volume is measured in units cubed: Exp. in. 3 or cubic inches
- Example problems asking for Volume: fill, contain, hold, stuffing, in/inside

Formula	$V = \pi r^2 h$ $S.A. = 2\pi r^2 + 2\pi rh$	**Pi** $\pi \approx 3.14$ $\pi \approx \dfrac{22}{7}$	**Abbreviations**	
			Area	A
			Circumference	C
			Perimeter	P
			Surface Area	$S.A.$
			Volume	V
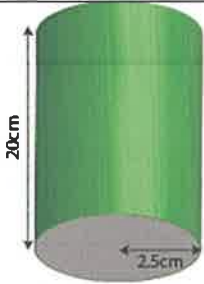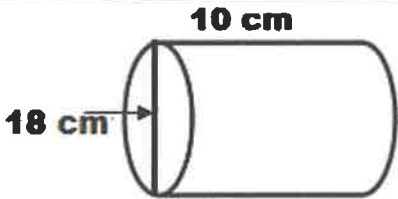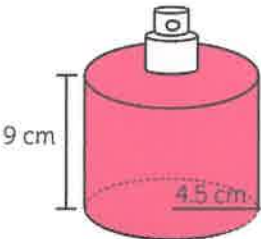
Surface Area

$A = \pi r^2$
$A = \pi(r)(r)$
$A = (3.14)(3)(3)$
$A = 28.26 \text{ in}^2$ **3 in**

$A = 2\pi rh$
$A = 2(3.14)(3)(5)$
5 in $A = 94.20 \text{ in}^2$

$A = \pi r^2$
$A = \pi(r)(r)$
$A = (3.14)(3)(3)$
$A = 28.26 \text{ in}^2$

SA = 28.26 + 28.26 + 94.20
SA = 150.72 in²

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8 in   12 in

d = 8
r = 8 ÷ 2
r = 4

SA = 2πr² + 2πrh
SA = 2(3.14)(4)(4) + 2(3.14)(4)(12)

SA = 100.48 in² + 301.44 in²
SA = 401.92 in²

Volume

Radius = 4 in
Height = 5 in
COFFEE

V = πr²h
V = (3.14)(4)(5)
V = 62.80 in³

6 cm
SODA   **12 cm**

d = 6
r = d ÷ 2
r = 3
V = πr²h
$V = \left(\dfrac{22}{7}\right)(3)(12)$
V ≈ 13.14 cm³

Calculate the Surface area of the cylinders below

Question	Measurements	Formula Show all work
 20cm 2.5cm	r = h =	SA = 2πr² + 2πrh
10 cm **18 cm** → 		
8 cm 10 cm		
9 cm 4.5 cm		
├ 2 ┤ 6		
How much metal was used to make this can of soup? 3 in 3in 		

Calculate the Volume of the cylinders below

Question	Measurements	Formula Show all work
20cm 2.5cm	r = h =	V = πr²h
10 cm 18 cm		
8 cm 10 cm		
9 cm 4.5 cm		
2 6		
Water flows at 2 feet per second through a pipe with a diameter of 8 inches. A cylindrical tank with a diameter of 15 feet and a height of 6 feet collects the water. What is the capacity of the tank?		

Surface area and volume Word Problems

1. You are trying to choose between 2 fish tanks. The dimensions of the tanks are listed below. Which tank is the largest?

Tank 1
L – 30 cm.
W – 20 cm.
H – 15 cm.

Tank 2
L – 50 cm.
W – 10 cm.
H – 10 cm.
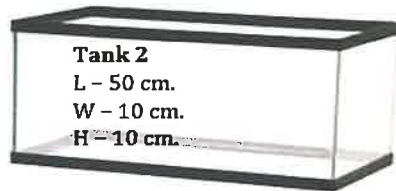
2. Shahmeen bought her best friend a poster for a present and wants to wrap it up for her as a surprise. Shahmeen rolls the poster up in a cylinder and has just enough wrapping paper to cover the poster and the ends of the cylinder without the wrapping paper overlapping. How much wrapping paper does Shahmeen have if the cylinder is 60 cm long and has a radius of 2 cm?
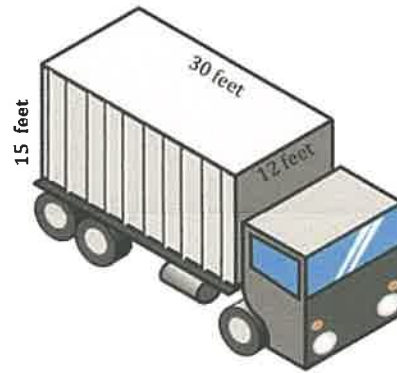
60 cm

2 cm
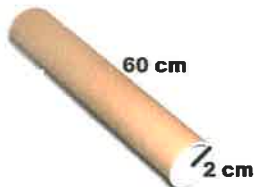
3. What is the capacity of the truck?

30 feet

15 feet

12 feet

4. Samir's family has decided to purchase an above ground cylindrical swimming pool for his backyard. The best space that they have for a pool measures 360 cm across. The tallest pool that they can buy is 120 cm high. What is the volume of the largest pool that they can buy? Give your answer in cubic centimeters (cm3)

360 cm

120 cm

5. How much material is need to build the claw machine shown below?

6 feet

2 feet   3 feet

6. What is the capacity of the washing machine?

5 feet   5 feet

6 feet

7. Mike wants to put as much juice as possible in his cup. His cup is 7 inches tall and has a 4 inch diameter. How much juice can Mike pour in his cup?

4 in

7 in

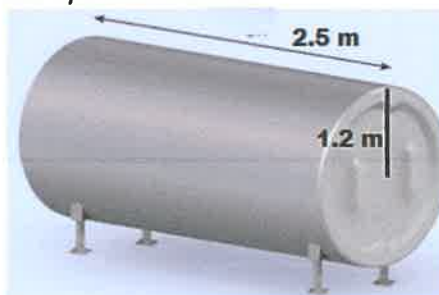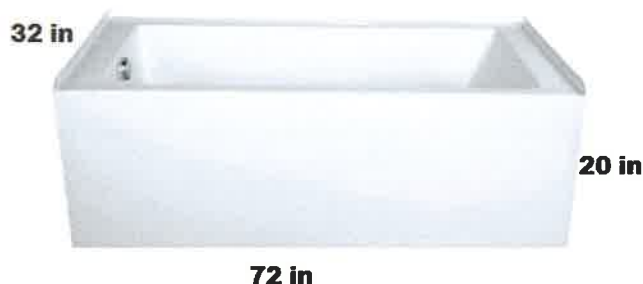|	
1. Kevin needs to buy some wood to build a box 12 inches long, 8 inches wide, and 10 inches high. How much wood is needed to build the box?	2. Jenny just bought a new laundry basket in the shape of a cylinder. The basket is 43 cm tall and it has a diameter of 33 cm. What's the capacity of the laundry basket in cubic centimeters? 43 cm 33 cm
3. Suppose Kia wants to paint a bird box below. How much surface does Kia have to paint if she paints all six faces of the bird box? 20 cm 12 cm 30 cm	4. A metal company makes cylindrical tanks. How many square meters of metal is needed to create the cylinder below? 2.5 m 1.2 m
5. Alexia's bathroom has a tub in the shape of a rectangular prism with a length of 72 inches, a width of 32 inches, and a height of 20 inches. How many cubic inches of water can it hold? 32 in 20 in 72 in	6. Oscar is making a play block for his baby sister by gluing fabric over the entire surface of a foam block. How much fabric will Oscar need? 2.3 in 2.5 in 6.1 in

7. A company has to decide which juice container is most cost effective based the container that uses the least amount of material to make. Both containers hold the same capacity. Which container should the company choose?

5 cm
9.55 cm
5 cm
10 cm
15 cm