Unit 3

Introduction to Geometry

Topic A: Perimeter, area, and volume

- Perimeter of plane figures
- Circle
- Perimeter
- Perimeters of irregular / composite shapes

Topic B: Area

- Areas of quadrilaterals and circles
- Arears of irregular / composite shapes

Topic C: Volume

- Volume of solids

Topic D: Surface and lateral area

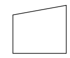
- Surface and lateral area – rectangular solids
- Surface and lateral area – cylinders, cones and spheres

Unit 3 Summary

Unit 3 Self - test

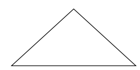
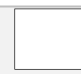
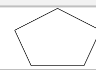
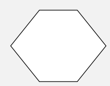
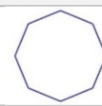
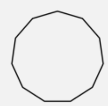
Topic A: Perimeter, Area, and Volume

Perimeter of Plane Figures

Polygon: a closed figure made up of three or more line segments. 

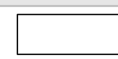
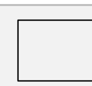
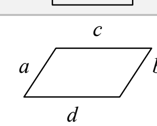
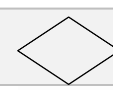
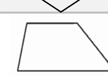
Regular polygon: a polygon that has all angles equal and all sides equal.

Classify regular polygons):

Number of sides	Name of polygon	Figure
3	Triangle	
4	Quadrilateral	
5	Pentagon	
6	Hexagon	
8	Octagon	
10	Decagon	

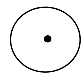
Quadrilateral: a four-sided polygon.

Classify quadrilaterals:

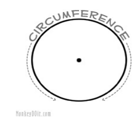
Name of quadrilateral	Definition	Figure
Rectangle	A four-sided figure that has four right angles (90^0).	
Square	A four-sided figure that has four equal sides and four right angles.	
Parallelogram	A four-sided figure that has opposite sides parallel (//) and equal. (a // b, c // d; $a = b$, $c = d$)	
Rhombus (diamond)	A four-sided figure that has four equal sides, but no right angle.	
Trapezoid	A four-sided figure that has one pair of parallel sides.	

Circle

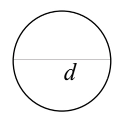
Circle: a round shape bounded by a curved line that is always the same distance from the center.



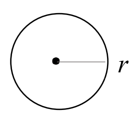
Circumference (*C*): the line bounding the edge of a circle.



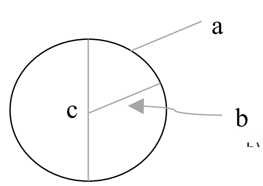
Diameter (*d*): a straight line between any two points on the circle through the center of the circle.



Radius (*r*): a straight line between any point on the circle to the center of the circle (half of the diameter, $r = \frac{1}{2}d$ (or $d = 2r$).



Example: Identify the parts of a circle (what is a, b and c?).



a. Circumference b. Radius c. Diameter

Example:

1) Find the radius of a circle with a diameter of 12 meters.

$d = 12$ m , $r = \frac{1}{2}d = \frac{1}{2} \cdot 12 \text{ m} = \boxed{6 \text{ m}}$

2) If the radius of a circle is 15 meters, what is the diameter of this circle?

$d = 2r = 2 \cdot 15\ m = \boxed{30 \text{ m}}$

Perimeter

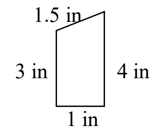
Perimeter (*P*): the total length of the outer boundary of a figure.

Find the perimeter: add together the length of each side.

Example: To find the perimeter (P) of the following figure, add the lengths of all 4 sides.

P = 3 in + 1 in + 4 in + 1.5 in

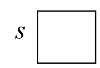
= $\boxed{9.5 \text{ in}}$



The perimeter of any regular (equal sided) polygon: the number of sides (n) times the length of any side (s) of that polygon. $P = ns$

Example: The perimeter (P) of a square is $P = 4\ s$

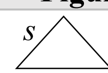
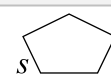
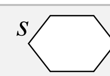
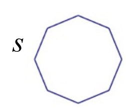
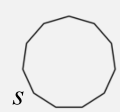
4 sides



Units of perimeter: the meter (m), centimeter (cm), foot (ft), inch (in), yard (yd), etc.

(The same units as length.)

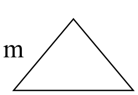
The perimeter of regular polygons: s – the length of the side

Name of the figure	Perimeter ($P = ns$)	Figure
Equilateral triangle (A triangle with three equal sides.)	$P = 3\ s$	
Square	$P = 4\ s$	
Pentagon	$P = 5\ s$	
Hexagon	$P = 6\ s$	
Octagon	$P = 8\ s$	
Decagon	$P = 10\ s$	

Example:

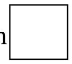
1) What is the perimeter (P) of the following triangle?

$s = 3.5$ m

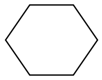


$P = 3\ s = (3)\ (3.5\text{ m}) = \boxed{10.5\text{ m}}$

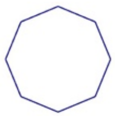
2) What is the perimeter (P) of the following square?

s = 2.3cm  $P = 4\text{ s} = 4\text{ (2.3 cm)} = \boxed{9.2\text{ cm}}$

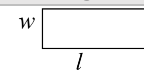
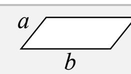
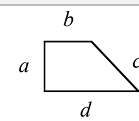
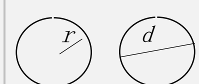
3) What is the perimeter (P) of the following hexagon?

s = 5ft  $P = 6\ s = (6)\ (5\text{ ft}) = \boxed{30\text{ ft}}$

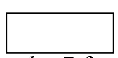
4) What is the perimeter (P) of the following octagon?

$s = \frac{3}{4}$ yd  $P = 8\text{ s} = 8 \cdot \frac{3}{4}\text{ yd} = \boxed{6\text{ yd}}$

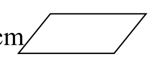
The perimeter of some basic geometric shapes:

Name of the figure	Perimeter formula	Figure
Rectangle	$P = 2\ w + 2\ l$ (w – width, l – length)	
Parallelogram	$P = 2\ a + 2\ b$ (a and b – the length of the sides)	
Trapezoid	$P = a + b + c + d$	
Circle (The perimeter of the circle is its circumference C)	$C = \pi d$ or $C = 2\pi r$ ($\pi \approx 3.14$) π (pi) is the ratio of circle's circumference C to its diameter d, that is approximately 3.14. ($\pi = \frac{\text{Circumference}}{\text{diameter}} = \frac{C}{d} \approx 3.14159265359 \ldots$)	

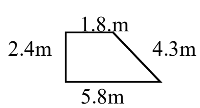
Example: What is the perimeter (P) of the following polygons?

1) w = 5ft  l = 7 ft

$P = 2\ w + 2\ l = 2\ (5\text{ ft}) + 2\ (7\text{ ft}) = \boxed{24\text{ ft}}$

2) a = 3.4cm  b = 5.2cm

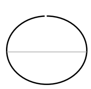
$P = 2a + 2b = 2\ (3.4\text{ cm}) + 2\ (5.2\text{ cm}) = \boxed{17.2\text{ cm}}$

3) 

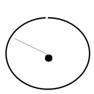
$P = a + b + c + d$

$= 2.4\text{ m} + 1.8\text{m} + 4.3\text{ m} + 5.8\text{m} = \boxed{14.3\text{m}}$

Example: What are the circumferences (C) of the circles shown below?

1)  d=5cm

$C = \pi d \approx (3.14)(5\text{cm}) = \boxed{15.7\text{ cm}}$

2) 

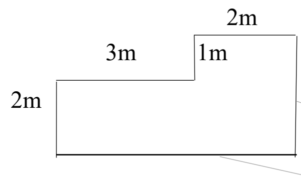
r =2.8cm

$C = 2\pi r \approx 2(3.14)(2.8\text{cm}) \approx \boxed{17.58\text{ cm}}$

Perimeters of Irregular / Composite Shapes

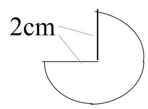
Example: What are the perimeters (P) of the following figures?

1)



P = 2m + 3m + 1m + 2m + (3m + 2m) + (1m + 2m) = $\boxed{16\text{ m}}$

2)



P is equal to $\frac{3}{4}$ of the circumference of the circle ($C = 2\pi r$) and two sides with 2m.

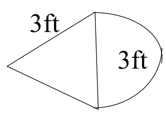
$$P = (2\text{cm} + 2\text{cm}) + \frac{3}{4}\,(2\pi r)$$

$$= 4\text{ cm} + \frac{3}{4}\,(2\pi \cdot 2\text{cm}).$$

r = 2cm

$$\approx \boxed{13.42\text{ cm}}$$

3)



P is equal to $\frac{1}{2}$ of the circumference of the circle and two sides with 3ft.

$$P = (3\,ft + 3ft) + \frac{1}{2}\,(\pi d)$$

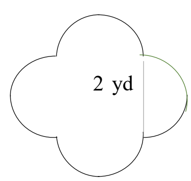
$C = \pi d$

$$= 6\text{ ft} + \frac{1}{2}\,(\pi \cdot 3\text{ ft})$$

d = 3ft (An equilateral triangle.)

$$\approx \boxed{10.71\text{ ft}}$$

4)



$$P = 4 \cdot \frac{1}{2}\,(\pi d)$$

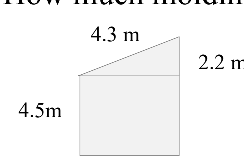
P is the circumference of 4 half circles.

$$= 4 \cdot \frac{1}{2}\,(\pi \cdot 2\text{ yd})$$

$C = \pi d$, d = 2 yd

$$\approx \boxed{12.57\text{ yd}}$$

Example: Damon is renovating his living room that is the shape indicated in the diagram below. He wishes to put molding around the base of the walls of the living room. How much molding does he need?



$$P = 3(4.5\text{m}) + 2.2\text{m} + 4.3\text{ m} = \boxed{20\text{ m}}$$

Topic B: Area

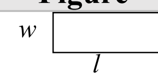
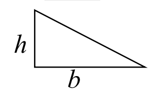
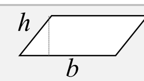
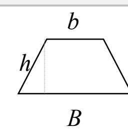
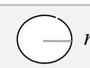
Areas of Quadrilaterals and Circles

Area (A): the size of the outermost surface of a shape (space within its boundaries).

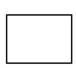
Units of area: the units of measurement of area are always expressed as square units.

Such as square meter (m^2), square centimeter (cm^2), square foot (ft^2), square inch (in^2), square yard (yd^2), etc.

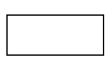
Areas of some basic geometric shapes:

Name of the figure	Area formula (A)	Figure
Rectangle	$A = wl$ (w – width, h – height)	
Square	$A = s^2$ (s – the length of the side)	
Triangle	$A = \frac{1}{2}bh$ (b - base, h – height)	
Parallelogram	$A = bh$ (b - base, h - height)	
Trapezoid	$A = \frac{1}{2}h(b + B)$ (b-upper base, B-lower base, h- height)	
Circle	$A = \pi r^2$ (r - radius, $\pi \approx 3.14$)	

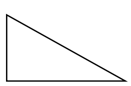
Example: What are the areas (A) of the following figures?

1) 3.8m 

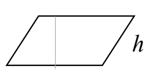
$A = s^2 = (3.8\text{ m})\,(3.8\text{ m}) = \boxed{14.44\text{ m}^2}$ $\quad$ $m \cdot m = m^2$

2) $\frac{2}{3}$ cm  $\frac{3}{4}$ cm

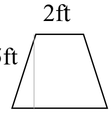
$A = w\,l = (\frac{2}{3}\text{ cm})\,(\frac{3}{4}\text{ cm}) = \boxed{\frac{1}{2}\text{ cm}^2}$ $\quad$ $cm \cdot cm = cm^2$

3) 4.2yd  5.3yd

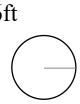
$A = \frac{1}{2}\,bh = \frac{1}{2}\,(5.3\text{ yd})(4.2\text{ yd}) = \boxed{11.13\text{ yd}^2}$

4)  $h = \frac{1}{4}$in, $\frac{2}{5}$ in

$A = bh = (\frac{2}{5}\text{ in})\,(\frac{1}{4}\text{ in}) = \boxed{\frac{1}{10}\text{ in}^2}$

5) 2ft, h = 5ft  6ft

$A = \frac{1}{2}\,h\,(b + B) = \frac{1}{2}\,5ft\,(2\text{ft} + 6\text{ft}) = \boxed{20\text{ ft}^2}$

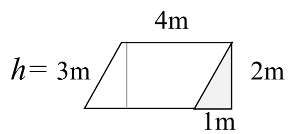
6) r = 0.25cm 

$A = \pi\,r^2 \approx (3.14)\,(0.25\text{cm})^2 \approx \boxed{0.2\text{ cm}^2}$

Areas of Irregular / Composite Shapes

Example: Find the areas (A) of the following figures.

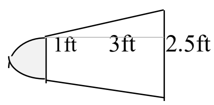
1)



Total area = Area of parallelogram + Area of triangle

$$\boldsymbol{A} = (bh) + (\frac{1}{2}bh) = (3m)(4m) + \frac{1}{2}(1m)(2m) = 12m^2 + 1m^2 = 13m^2$$

2)

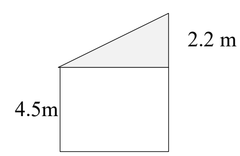


Total area = Area of trapezoid + Area of ($\frac{1}{2}$) circle

(d = 1ft, $r = \frac{1}{2}d = 0.5$ ft)

$$\text{A} = [\frac{1}{2}h(b+B)] + (\frac{1}{2}\pi r^2) = [\frac{1}{2}(3\text{ ft})(1\text{ ft} + 2.5\text{ ft}) + \frac{1}{2}(3.14)(0.5\text{ ft})^2 \approx 5.64\text{ ft}^2$$

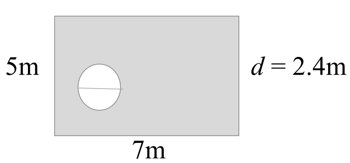
Example: Damon is renovating his living room that is the shape indicated in the diagram below. He wishes to purchase new flooring. How much does he need to order to cover the entire living room floor?

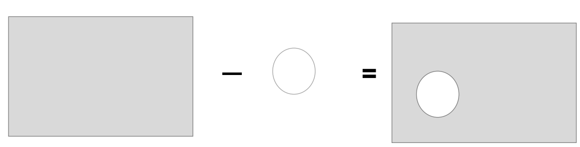


Total area = Area of square + Area of triangle

$$A = S^2 + \frac{1}{2}bh = (4.5\text{ m})^2 + \frac{1}{2}(4.5\text{ m})(2.2\text{m}) = \boxed{25.2\text{ m}^2}$$

Example: William built a wooden deck at the back of his home. It is shown in the following diagram. He decides to insert a circular hot tub that has a diameter of 2.4 m. Calculate the area of the remaining exposed wooded floor of the deck.





Shaded area = Area of rectangle − Area of circle

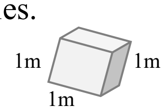
(d = 2.4m, $r = \frac{1}{2}d = 1.2$m)

$$A = (wl) - (\pi r^2) = (5\text{m})(7\text{m}) - (3.14)(1.2\text{m})^2 \approx \boxed{30.48\text{ m}^2}$$

Topic C: Volume

Volume of Solids

Volume (*V*): the amount of space a solid object (three-dimensional) occupies.

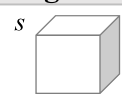
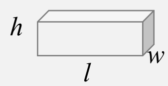
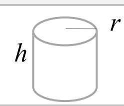
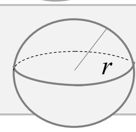
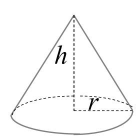
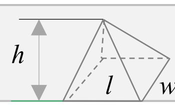


Example: the volume of a can of food is the amount of food inside.

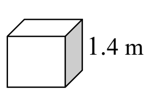
Units of volume: the units of measurement of volume are always expressed as cubic units.

Such as the cubic meter (m^3), cubic centimeter (cm^3), cubic foot (ft^3), cubic inch (in^3), cubic yard (yd^3), etc.

Volumes of basic geometric shapes:

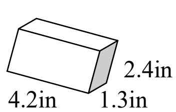
Name	Figure	Volume formula (V)
Cube		$V = s^3$ (*s* – the length of the side)
Rectangular solid		$V = w\,l\,h$ (*w* – width, *l* – length, *h* - height)
Cylinder		$V = \pi r^2 h$ (*r* - radius, *h* – height, $\pi \approx 3.14$)
Sphere		$V = \frac{4}{3}\pi r^3$ (*r*- radius)
Cone		$V = \frac{1}{3}\pi r^2 h$ (*r* - radius, *h* - height)
Pyramid		$V = \frac{1}{3} wlh$ (*w* – width, *l* – length, *h* - height)

Example: Find the volumes (*V*) of the following figures.

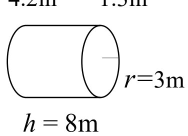
1) 

$V = s^3 = (1.4\text{ m})\,(1.4\text{ m})\,(1.4\text{ m})$

$= (1.4\text{ m})^3 = \boxed{2.744\text{ m}^3}$ $\qquad \text{m}\cdot\text{m}\cdot\text{m} = \text{m}^3$

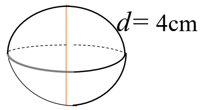
2) 

$V = w\,l\,h = (4.2\text{in})\,(1.3\text{in})\,(2.4\text{in}) \approx \boxed{13.1\text{ in}^3}$ $\qquad \text{in}\cdot\text{in}\cdot\text{in} = \text{in}^3$

3) 

$V = \pi\, r^2 h = \pi(3m)^2(8m) \approx \boxed{226.2\text{ m}^3}$

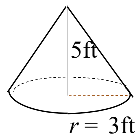
4)



$V = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(2\text{cm})^3 \approx \boxed{33.51\text{ cm}^3}$

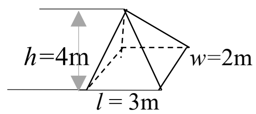
($d = 4$ cm, $r = \frac{1}{2}d = 2$ cm)

5)



$V = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(3\text{ft})^2(5\text{ft}) \approx \boxed{47.1\text{ ft}^3}$

6)

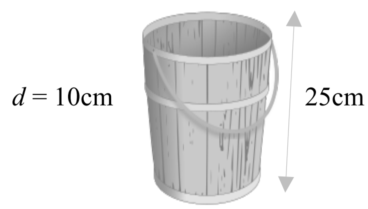


$V = \frac{1}{3}wlh = \frac{1}{3}(2\text{m})(3\text{m})(4\text{m}) = \boxed{8\text{ m}^3}$

7) Determine the amount of water that will fill the following bucket.

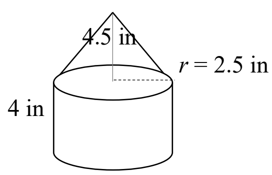
$V = \pi r^2 h = \pi(5)^2(25\text{cm}) \approx \boxed{1963.5\text{ cm}^3}$

($d = 10$ cm, $r = \frac{1}{2}d = 5$ cm)



Volume of composite shapes

Example: Find the volume (V) of the following figure.

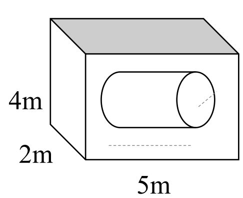


Total volume = <u>Volume of the cylinder</u> + <u>Volume of the cone</u>

$$V = (\pi r^2 h) + (\tfrac{1}{3}\pi r^2 h) = [\pi(2.5\text{ in})^2(4\text{ in})] + [\tfrac{1}{3}\pi\,(2.5\text{ in})^2(4.5\text{ in})]$$

$$= \boxed{107.99\text{ in}^3}$$

Example: Find the volumes (V) of the following figure (a rectangular solid with a cylinder removed from inside).



(Cylinder: $h = 4$m, $r = 1$m)

Unknown volume = <u>Volume of the rectangular solid</u> − <u>Volume of the cylinder</u>

$$V = (wlh) - (\pi r^2 h) = [(2\text{m})(5\text{m})(4\text{m})] - [\pi(1\text{m})^2(4\text{m})] \approx \boxed{27.43\text{ m}^3}$$

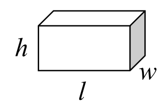
Topic D: Surface and Lateral Area

Surface and Lateral Area
− Rectangular Solids

Surface area (SA): the total area on the surface of a solid object (a three-dimensional object).

Lateral area (LA): the surface area of a solid object excluding its top and bottom.

Lateral area (LA) of a rectangular solid: the sum of the surface areas of the four sides excluding its top and bottom.



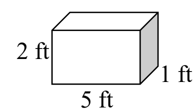
LA of a rectangular solid = front side + back side + 2 sides

$= 2\,(l\,h) + 2\,(wh)$

The front and back sides. The left and right sides.

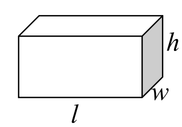
(w – width, l – length, h - height)

Example: Determine the lateral area (LA) of the rectangular solid.



$$\begin{aligned} LA &= 2(5\text{ft} \cdot 2\text{ft}) + 2(1\text{ft} \cdot 2\text{ft}) \\ &= 20\text{ ft}^2 + 4\text{ ft}^2 \\ &= \boxed{24\text{ ft}^2} \end{aligned}$$

Surface area (SA) of a rectangular solid: the sum of the areas of the top, bottom and the four sides.



SA of a rectangular solid = top area + bottom area + 4 sides

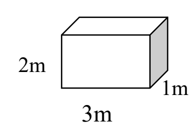
$= (l\,w) + (l\,w) + 2(lh) + 2(wh)$

$= 2\,(l\,w) + 2(lh) + 2(wh)$

(w – width, l – length, h - height)

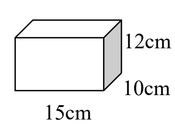
The top & bottom. The front and back sides. The left and right sides.

Example: Determine the SA of the rectangular solid.



$$\begin{aligned} SA &= 2\,(3\text{m} \cdot 1\text{m}) + 2(3\text{m} \cdot 2\text{m}) + 2(1\text{m} \cdot 2\text{m}) \\ &= 6\text{m}^2 + 12\text{m}^2 + 4\text{m}^2 = \boxed{22\text{m}^2} \end{aligned}$$

Example: How many square centimeters of glass are needed to make a fish tank which is 15 cm long by 10 cm wide by 12 cm high if the top is left open?



$$A = 2\,(15\text{cm} \cdot 12\text{m}) + 2(12\text{cm} \cdot 10\text{cm}) + (15\text{cm} \cdot 10\text{cm}) = \boxed{750\text{ cm}^2}$$

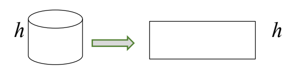
The front and back sides. The left and right sides. The bottom part.

Surface and Lateral Area
– Cylinders, Cones and Spheres

Cylinders

- Lateral area (LA) of a cylinder: the area of the the rectangular side that wraps around the cylinder's side (the rectangular side folded around).

  $\boxed{\text{LA of a cylinder} = \pi dh \quad \text{or} \quad 2\pi rh}$



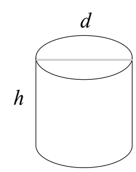
  - Imagine a fruit can that is cut down the side and rolled flat.

  - Recall: the circumference of a circle $C = \pi d$ or $2\pi r$ (r – radius, d – diameter)

- Surface area (SA) of a cylinder: the sum of the surface areas of the top, bottom and the side (the lateral area).

  SA of a cylinder = <u>top area + bottom area</u> + LA of a cylinder

  $\boxed{\text{SA of a cylinder} = 2(\pi r^2) + \pi dh}$



  Recall: the area of a circle: $A = \pi r^2$

  (r – radius, d – diameter, h - height)

Example: Determine the lateral area and surface area of the following cylinder.

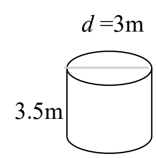
$\text{LA} = \pi dh = \pi\,(3\text{m})(3.5\text{m}) \approx \boxed{32.99\ \text{m}^2}$

$\text{SA} = 2(\pi r^2) + \pi dh$

$= 2[\pi\,(1.5\ \text{m})^2] + 32.99\ \text{m}^2$ $\qquad d = 3\text{m},\ \ r = \frac{1}{2}d = 1.5\text{m}$

$\approx 14.137\ \text{m}^2 + 32.99\ \text{m}^2$

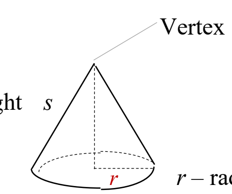
$\approx \boxed{47.13\ \text{m}^2}$



Cones

- Lateral area of a cone:

  $\boxed{\text{LA of a cone} = (\pi)\,(\text{radius})\,(\text{slant height}) = \pi rs}$



  Slant height (s): the height from the vertex to a point on the circle base.

  (r – radius, s – slant height)

- Surface area (SA) of a cone:

SA of a cone = LA of a cone + area of the circular base (a circle)

$\boxed{\text{SA of a cone} = \pi rs + \pi r^2}$ s - slant height, r - radius

Example: Determine the lateral area and total area of a cone whose diameter is 2m and slant height is 4m.

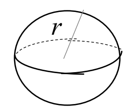
$$\text{LA} = \pi rs = \pi\,(1\text{m})(4\text{m}) \approx \boxed{12.57 \text{ m}^2} \qquad d = 2\text{m}, \quad r = \tfrac{1}{2}d = 1\text{m}$$

$$\text{SA} = \pi rs + \pi r^2 = 12.57 \text{ m}^2 + \pi\,(1m)^2 \approx \boxed{15.71 \text{ m}^2}$$

Spheres

Surface area (SA) of a sphere:

$\boxed{\text{SA of a sphere} = 4\pi r^2}$ r - radius



Example: Determine the surface area of a sphere whose radius is 4.5cm.

$$\text{SA} = 4\pi r^2 = 4\pi\,(4.5\text{cm})^2 \approx \boxed{254.47 \text{ cm}^2}$$

Example: Mary wishes to paint 5 balls with green paint. The diameter of each ball is 18 cm. What area should Mary tell the paint store she needs to cover?

$$\text{SA} = 4\pi r^2 = 4\pi\,(9\text{cm})^2 \approx \boxed{1017.88 \text{ cm}^2}$$ (The surface area of one ball)

$d = 18$ cm, $r = \frac{1}{2}d = 9$ cm

$$5\,(\text{SA}) = 5\,(1017.88 \text{ cm}^2) = \boxed{5089.4 \text{ cm}^2}$$ (The surface area of 5 balls)

Surface and lateral area summary:

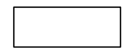
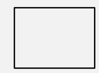
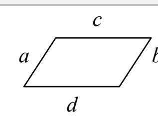
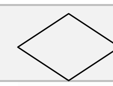
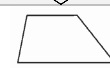
Figure	Lateral area (LA)	Surface area (SA)
Rectangular Solid	Front side + back side + 2 sides $2(l\,h) + 2(wh)$	Top area + bottom area + 4 sides $(l\,w) + (l\,w) + 2(lh) + 2(wh)$
Cylinder	πdh or $2\pi rh$	$2(\pi r^2) + \pi dh$
Cone	πrs	$\pi rs + \pi r^2$
Sphere		$4\pi r^2$

There is no difference between lateral area and surface area in a sphere.

Unit 3:   Summary

Introduction to Geometry

Classify quadrilaterals (four-sided shapes):

Name of quadrilateral	Definition	Figure
Rectangle	A four-sided figure that has four right angles (90^0).	
Square	A four-sided figure that has four equal sides and four right angles.	
Parallelogram	A four-sided figure that has opposite sides parallel (//) and equal. ($a \mathbin{//} b$, $c \mathbin{//} d$; $a = b$, $c = d$)	
Rhombus (diamond)	A four-sided figure that has four equal sides, but no right angle.	
Trapezoid	A four-sided figure that has one pair of parallel sides.	

Terms of geometry:

Term	Definition
Perimeter (P)	The total length of the outer boundary of a shape.
Circumference (C)	The line bounding the edge of a circle.
Diameter (d)	A straight line between any two points on the circle through the center of the circle.
Radius (r)	A straight line between any point on the circle to the center of the circle (half of the diameter, $r = \frac{1}{2}d$ or $d = 2r$).
Area (A)	The size of the outermost surface of a shape.
Volume (V)	The amount of space a solid object (3D) occupied.
Surface area (SA)	The total area on the surface of a solid object (a 3D object).
Lateral area (LA)	The surface area of a solid object excluding its top and bottom.

Units of perimeter: the meter (m), centimeter (cm), foot (ft or'), inch (in or"), yard (yd), etc.
The same units as length.

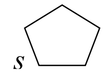
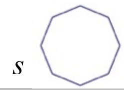
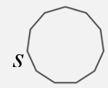
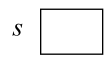
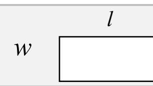
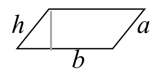
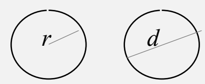
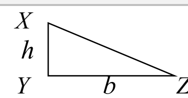
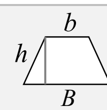
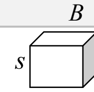
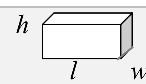
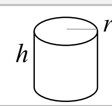
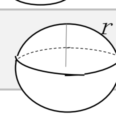
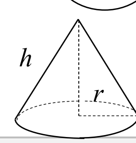
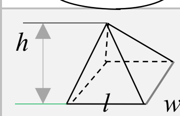
Units of area: the units of measurement of area are always expressed as square units.

Units of volume: the units of measurement of volume are always expressed as cubic units.

Surface and lateral area summary:

Figure	Lateral area (LA)	Surface area (SA)
Rectangular Solid	Front side + back side + 2 sides $2(l\,h) + 2(wh)$	Top area + bottom area + 4 sides $(l\,w) + (l\,w) + 2(lh) + 2(wh)$
Cylinder	πdh or $2\pi rh$	$2(\pi r^2) + \pi dh$
Cone	πrs	$\pi rs + \pi r^2$
Sphere		$4\pi r^2$

Geometry formulas: s – side, P – perimeter, C – Circumference, A – area, V – volume

Name of the figure	Formula	Figure
Equilateral triangle	$P = 3s$	
Pentagon	$P = 5s$	
Hexagon	$P = 6s$	
Octagon	$P = 8s$	
Decagon	$P = 10s$	
Square	$P = 4s$ $A = s^2$	
Rectangle	$P = 2w + 2l$ $A = wl$	
Parallelogram	$P = 2a + 2b$ $A = bh$	
Circle	$C = \pi d = 2\pi r$ $A = \pi r^2$	
Triangle	$< X + < Y + < Z = 180^0$ $A = \frac{1}{2}bh$	
Trapezoid	$A = \frac{1}{2}h(b + B)$	
Cube	$V = s^3$	
Rectangular solid	$V = w\,l\,h$	
Cylinder	$V = \pi r^2 h$	
Sphere	$V = \frac{4}{3}\pi r^3$	
Cone	$V = \frac{1}{3}\pi r^2 h$	
Pyramid	$V = \frac{1}{3}wlh$	

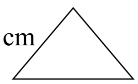
Unit 3: Self - Test

Introduction to Geometry

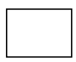
Topic A

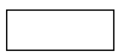
1. Find the radius of a circle with a diameter of 42 centimeters.

2. What is the perimeter (P) of the following triangle?

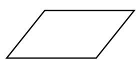
s = 4.7 cm 

3. What is the perimeter (P) of the following polygons?

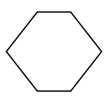
a) s = 1.4 in 

b) w = 2.3 ft 

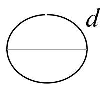
l = 3.2 ft

c) a = 7.2 cm 

b = 10.4 cm

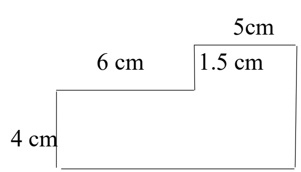
d) $s = \frac{3}{19}$ yd 

4. What is the circumferences (C) of the circle shown below?

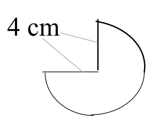
 d = 2.5 in

5. What are the perimeters (P) of the following figures?

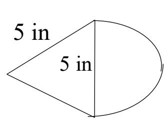
a)



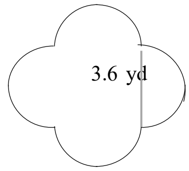
b)



c)



d)



6. A flower bed in the shape of a parallelogram has sides of 5.5 inches and 3.4 inches. What is its perimeter?

7. The floor of a rectangular room measures 5.2 m by 4.3 m. The doorway is 1 m wide. Baseboard is to be installed around the perimeter of the room, except in the doorway. What length of baseboard needs to be purchased?

8. Tom's rectangular yard is 10 meters wide and 15 meters long.

a. If Tom wants to fence the whole lot, how many meters of fencing would Tom has to buy?

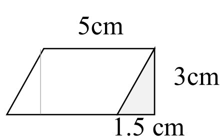
b. If the fencing cost $15 per meter, estimate the cost of fencing the yard.

9. A rectangular swimming pool is 8 m long and 4 m wide. It is surrounded by concrete deck 1.5 m wide on all sides. Find the outside perimeter of the deck.

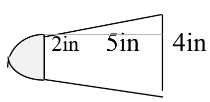
Topic B

10. Find the areas of the following figures.

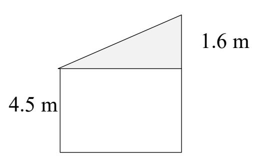
a)



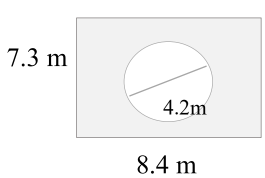
b)



c)



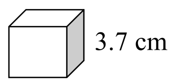
11. Find the area (A) of the shaded area in the following figure.

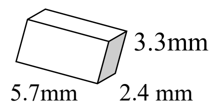


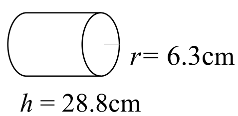
12. A rectangular lawn measuring 24 m by 18 m has 3 circular flowerbeds cut from it. If the circular flowerbeds each have a diameter of 8 m, find the area of the grass remaining.

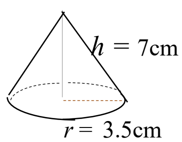
Topic C

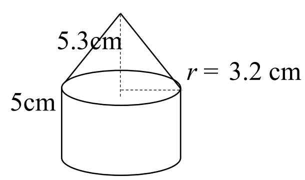
13. Find the volumes (V) of the following figures.

a) 

b) 

c) 

d) 

e) 

14. A snowman is made of three balls of snow. One has a diameter of 28 cm, one of 18 cm, and one of 8 cm. What volume of snow does the snowman contain?

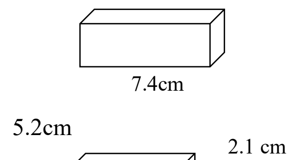
15. A conveyor belt unloading salt from a ship makes a conical pile 18 m high with a base diameter of 8 m. What is the volume of the salt in the pile?

16. A spherical balloon is filled with water and has a diameter of 30 cm. If the water was poured out into an empty tin can measuring 24 cm across and 28 cm high, would the water all fit?

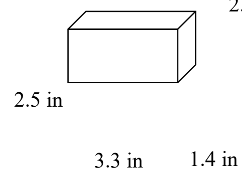
17. The height of a cylindrical pail is 26 cm and the radius of the base is 10 cm. A ball with radius 6 cm is dropped in the pail. Find the volume of the region inside the pail but outside of the ball.

Topic D

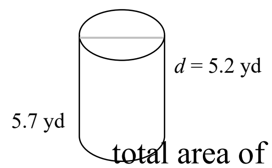
18. Determine the LA of the rectangular solid.



19. Determine the SA of the rectangular solid.



20. Determine the lateral area and surface area of the following cylinder.



21. Determine the lateral area and total area of a cone whose diameter is 6.4 cm and slant height is 7.3 cm.

22. Determine the SA of a sphere whose diameter is 1.8 m.

23. A toy box measures 0.7 m long by 0.6 m wide and is 0.5 m high. What is the total area of plywood needed to build the box if it has no top?

24. A greenhouse is semi-cylindrical in shape. If a clear vinyl is used to cover the greenhouse (including the ends), how much vinyl is needed?