FORMULAS

In this unit you will you will review perimeter, circumference, area, surface area, and volume. You will also examine Venn diagrams, polygons, and lots of formulas.

Perimeter, Circumference, Area

Formulas

Venn Diagrams

Perimeter, Circumference, and Area

Perimeter – Perimeter is the total length around a figure.

Circumference – Circumference is the total length around a circle.

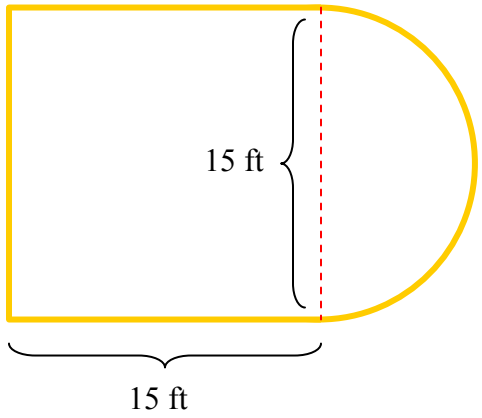
Area – Area is the coverage in the interior of a figure.

Polygon – A polygon is a closed shape made up of sequential line segments that meet at endpoints and do not overlap.

Regular Polygon – A regular polygon is a polygon with all sides the same length.

Perimeter and circumference are lengths and measured in regular units like centimeters (cm), inches (in), or feet (ft). Area is coverage and measured in square units like square centimeter (cm^2), square inch (in^2), or square ft (ft^2).

Example 1: Find the length around the given figure. Round the answer to the nearest tenth.



a.) Find the perimeter of the polygonal part of the shape (three sides of a square). $15+15+15=45$

b.) Find the circumference of the curved part of the shape (semi-circle). $C=2\pi r$

$C=2(3.14)(7.5)$

* Note: the diameter measures 15 feet, thus the radius (half the diameter) measures 7.5 feet.

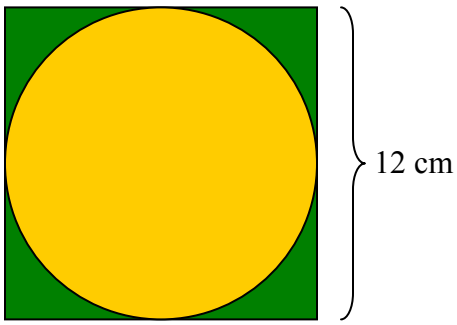
$C=47.1$

c.) Find the length of the semi-circle (half of a circle). $\frac{1}{2}C=\frac{1}{2}(47.1)=23.55$

d.) Find the sum of the two lengths. $45+23.55=68.55$

The distance around the figure is 68.6 ft.

Example 2: What is the area of the shaded portion of the figure, outside the circle but within the square (the green area)?



a.) Find the area of the square.

$A = s^2$

$A = 12^2$

$A = 144$

b.) Find the area of the circle.

*Note: diameter = 12; radius = 6

$A = \pi r^2$

$A = (3.14)(6^2)$

$A = (3.14)(36)$

$A = 113.04$

c.) Find the difference between the two areas.

$A = 144 - 113.04$

$A = 30.96$

The area of the shaded portion of the figure, outside the circle but within the square, is 30.96 square centimeters (cm^2).

Shown below are other formulas that you may use to find perimeter and area.

Area Formulas

Rectangle, Parallelogram	$A = bh$
Square	$A = s^2$
Triangle	$A = \frac{1}{2}bh$
Trapezoid	$A = \frac{1}{2}h(b_1 + b_2)$
Circle	$A = \pi\ r^2$

Perimeter Formulas

Rectangle, Parallelogram	$P = 2l + 2w$
Square	$P = 4s$
Polygon	$P =$ sum of all sides
Regular Polygon with *n* sides	$P = n \times$ (length of one side)
Circle (Circumference)	$C = \pi\ d$ or C = 2 π r

Common Formulas

Surface area – Surface area is the total area of all the faces and/or curved surfaces of a three-dimensional shape.

Volume – Volume is the capacity that a three-dimensional shape.

Type	Formula	Variables
Simple interest	$I = prt$	I = Interest, p = principal, r = rate, t = time
Rate	$D = rt$	D= distance, r = rate, t = time
Volume of rectangular prism	$V = lwh$	V = Volume, l = length, w = width, h = height
Surface area of rectangular prism	$S = 2lw + 2lh + 2wh$	S = Surface Area, l = length, w = width, h = height
Volume of a cube	$v = e^3$	V = volume, e = edge
Surface area of a cube	$S = 6e^2$	S = Surface area, e= edge
Volume of a cylinder	$V = \pi r^2 h$	V = volume, r = radius, h = height
Surface area of a cylinder	$S = 2\pi r^2 + 2\pi rh$	S = surface area, r = radius, h = height
Volume of a sphere	$V = \frac{4}{3}\pi r^3$	V = volume, r = radius
Surface area of a sphere	$S = 4\pi r^2$	S = surface area, r = radius
Temperature	$F = \frac{9}{5}C + 32$	F = Fahrenheit, C = Celsius
Temperature	$C = \frac{5}{9}(F - 32)$	C = Celsius, F = Fahrenheit

Now, we will examine how some of these formulas are used to solve problems.

Example 1: Solve the volume formula of a rectangular prism for *w* (width).

$V = lwh$

$V = (lw)h$

$\frac{V}{lw} = h$ Divide both sides by (lw).

The width of a rectangular prism is equal to the volume divided by the product of the length and the height.

Example 2: Convert for 100˚C to Fahrenheit temperature.

$F = \frac{9}{5}C + 32$

$F = \frac{9}{5}(100) + 32$ Substitute 100 for C.

$F = 180 + 32$ Multiply.

$F = 212$ Simplify.

100˚C = 212˚F

Did you notice that 212 degrees Fahrenheit, the boiling point of water, is equal to 100 degrees Celsius?

Example 3: Find the length of the edge of a cube that has a surface area of 600 square centimeters.

$S = 6e^2$	
$600 = 6e^2$	Substitute 600 for S.
$100 = e^2$	Divide by 6.
$\sqrt{100} = \sqrt{e^2}$	Take the square root of both sides of the equation.
$10 = e$	Simplify.

The length of edge of a cube with a surface area of 600 square centimeters is 10 cm.

Venn Diagrams

Venn Diagram – A Venn diagram is a diagram using circles to represent sets.

Set – A set is a collection of objects or elements.

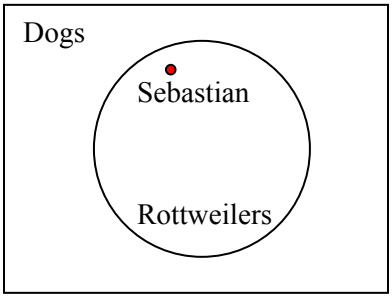
Subset – A subset is a set which is included within another set.

Element – An element is a member of a set.

Venn Diagrams are used to show the relationship between a set of objects, its subsets, and elements.

In the Venn Diagram shown below, the rectangle represents "all dogs". The circle represents "all Rottweilers" and the red point represents Sebastian. Sebastian is a dog and also a Rottweiler.

Another way to discuss the relationship shown in the Venn Diagram is to say that Sebastian is a member (or element) of the set of Rottweilers which is a subset of the set of Dogs.



Example: Write a true conditional statement (if-then) based on the Venn diagram.

If Sebastian is a Rottweiler, then he is a dog.

Rationale: If Sebastian is a Rottweiler, and Rottweilers are a subset of the set of dogs, then Sebastian must be a dog.