11-21-25 MTH 111

1.4 Triangles - Definition, Classification, Interactives and Examples
1.5 Quadrilaterals - Definition, Types, Properties, Interactives and Examples
1.6 Area or Perimeter of Triangles and Quadrilaterals
1.7 The Pythagoras Theorem (Pythagorean Theorem) - Formula, Proof, Interactives and Examples

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1.8 Circles - Definition, Formulae, Interactives and Examples
1.9 Composite Shapes (Composite Figures) - Definition, Formulae, Interactives and Examples
1.10 Volume of Solids - Definition, Formulae, Interactives and Examples
1.11 Surface Area - Nets, Definition, Formulae, Interactives and Examples

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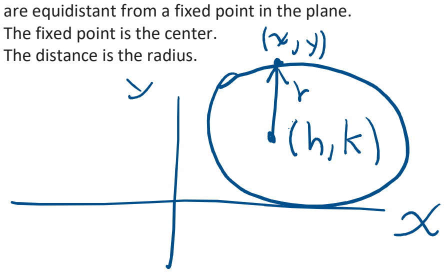
1.8
Memorize
Definition: A circle is the set of all points in the plane that are equidistant from a fixed point in the plane.
The fixed point is the center.
The distance is the radius.



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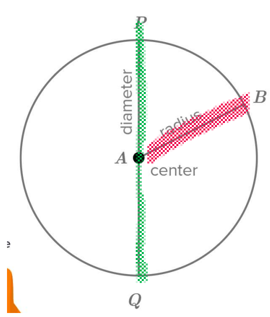
distance $((x,y),(h,k))$

$= r = \sqrt{(x-h)^2 + (y-k)^2}$

$\Rightarrow \boxed{(x-h)^2 + (y-k)^2 = r^2}$

equation of a circle with center (h,k) and radius r

memorize



Memorize

The perimeter of a circle is called its **circumference**. The ratio between the circumference and diameter of any circle is π or "pi," is a Greek letter that stands for an irrational number approximately equal to 3.14. Because π is the ratio between the circumference and the diameter, the circumference of a circle is equal to the diameter times π.

$C = \pi d$

$\pi = \frac{C}{d}$

$\pi \approx 3.14159$

to the diameter times π.

$C = \pi d$

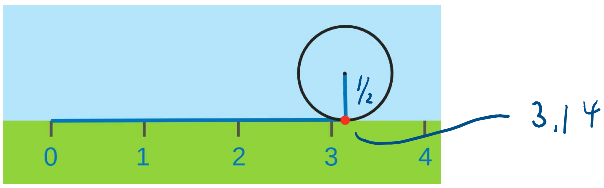
$\pi = \frac{C}{d}$

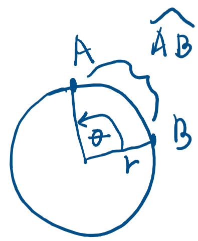
$C = 2\pi r$

$\pi \approx 3.14159$

$r = \frac{1}{2}$

$\Rightarrow C = 2\pi r = 2\pi\left(\frac{1}{2}\right) = \pi$





Memorize

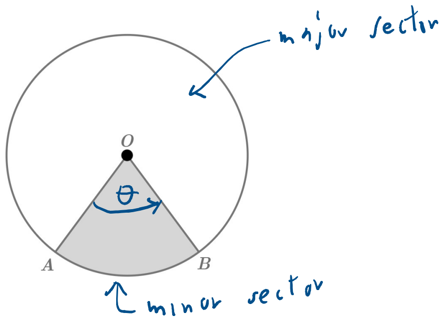
Let A = area of circle with radius r

$A = \pi r^2$

$$\frac{\text{arc measure}}{360^\circ} = \frac{\text{arc length}}{\text{circumference}}$$

$$\frac{\theta}{360^\circ} = \frac{\overset{\frown}{AB}}{2\pi r}$$

$$\text{arc length} = \frac{\text{central angle}}{360^\circ} \cdot \text{circumference}$$



$$\frac{\text{area of sector}}{\text{area of whole circle}} = \frac{\text{central angle } \theta}{360^\circ} = \frac{\text{arc length}}{\text{circumference}} = \frac{\overset{\frown}{AB}}{2\pi r}$$

$$\text{area of sector} = \frac{\text{central angle}}{360^\circ} \cdot \text{area of whole circle}$$

The perimeter of the sector is the sum of the lengths of the two radii and the arc. Each radius is 4 in. The arc is $\frac{1}{4}$ of the circumference of the full circle.

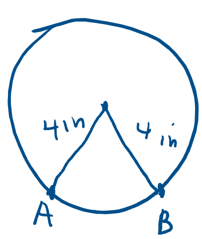
$$Perimeter_{sector} = length\ of\ the\ arc + 2 \times radius = \overset{\frown}{AB} + 8\text{ in}$$

$$Perimeter_{sector} = \frac{2\pi r}{4} + 2r$$

$$Perimeter_{sector} = \frac{2\pi(4)}{4} + 2(4)$$

$$Perimeter_{sector} = 2\pi + 8\ in \approx 14.3\text{ in}$$

2*Pi+8=14.28318530717959



Memorize

Summary

- A **circle** is a simple closed curve, with a set of all points at a constant distance from a fixed (center) point.
- The **radius** (r) of a circle is the distance from the center point to any point on the circle.
- The **diameter** (d) of a circle is the distance across the circle through the center point, and it is twice the radius.
- The **circumference** (C) of a circle is its perimeter, and it is equal to the diameter times π.
- The **area of a circle** can be calculated using the formula $A = \pi r^2$, where A is the area and r is the radius.
- The **arc** of a circle is a portion of the circumference of a circle
- The **arc length** is equal to the central angle divided by 360° times the circumference.
- The **sector** of a circle is a wedge shaped region bounded by an arc of the circle and the two radii to the endpoints of the arc.
- The area of a sector is equal to the central angle divided by 360° times the area of the whole circle.

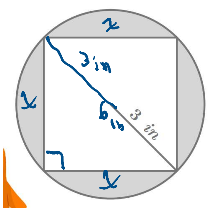
1.9

Memorize

A composite shape or a composite figure is a two-dimensional figure made up of basic two-dimensional shapes such as triangles, rectangles, circles, semi-circles, etc.

A square is inscribed inside a circle. Find the total area of the shaded regions of the circle below. What method for finding the area makes the most sense in this case? Why?

Additive or subtractive?



radius r: circle $A = \pi r^2$

side x: square $A = x^2$

Give exact answer. Then, convert to decimal, rounded to nearest hundredth.

Bonus quiz 3

We don't know a formula for the area of the shaded regions shown. Therefore, the additive method won't work.

Let A_{circle} = area of circle $= \pi r^2 = \pi (3\text{ in})^2$

$= \boxed{9\pi \text{ in}^2}$

A_{square} = area of square

$= x^2$ if x = side

$x^2 + x^2 = (6\text{ in})^2$

$2x^2 = 36 \text{ in}^2$

$\boxed{x^2 = 18 \text{ in}^2}$

Area of shaded region $= A_{circle} - A_{square}$

$= 9\pi \text{ in}^2 - 18 \text{ in}^2$

$= \boxed{(9\pi - 18)\text{ in}^2 \approx 10.27 \text{ in}^2}$

9*Pi-18=10.27433388230814

Memorize

Summary

- A **composite shape** is a two-dimensional figure made up of basic two-dimensional shapes such as triangles, rectangles, circles, semi-circles, etc.
- To find the perimeter of a composite figure, add the lengths of the sides.
- The Additive Areas Method for finding the area of a composite shape involves finding the individual areas of each piece of the composite shape and summing them up.
- The Subtractive Areas Method involves finding the area of a larger shape and subtracting the areas of the pieces not included in the composite shape.

1.10

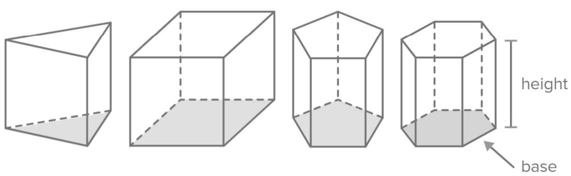
Memorize

The **volume** of a solid is the measure of how much space an object takes up. It is measured by the number of **unit cube**s it takes to fill up the solid.

Memorize

Volume of a Prism

A prism is a solid with two congruent **polygon bases** that are parallel and **connected by rectangles**. Prisms are named by their **base shape**.

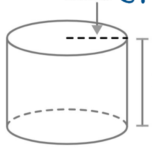


$$V_{\text{prism}} = A_{\text{base}} \cdot h$$

right, circular

Volume of a Cylinder

A cylinder is a three-dimensional solid consisting of two congruent, parallel, circular sides (the **bases**), joined by a **curved surface**.



=r

=h

Area = (area of base)(height)

$\pi r^2 \quad h$

surface area = area of curved surface + 2(area of base)

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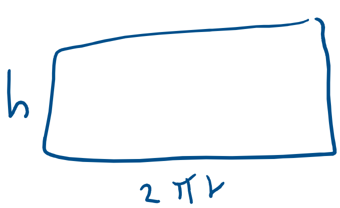


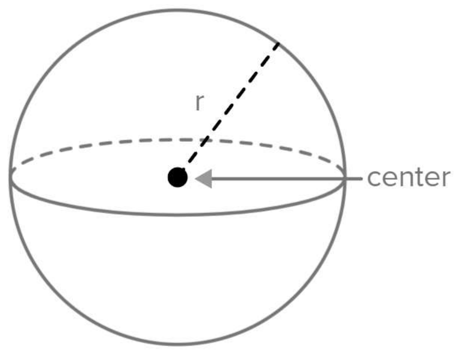
unroll the cylinder

$= 2\pi r h + 2\pi r^2$

Volume of a Sphere

memorize definition

A sphere is the set of all points in space **equidistant** from a **center point**. The distance from the center point to the sphere is called the **radius**.



The volume of a sphere relies on its radius.

$$V_{\text{sphere}} = \frac{4}{3}\pi r^3$$

supplied

1.11

memorize

In geometry, a **net** is a 2-dimensional shape that can be folded to form a 3-dimensional shape or a solid. In other words, a net is a drawing made when the surface of a 3-dimensional figure is laid out flat, showing each face and edge of the figure in 2-dimensions.

Convert 75 inches (in) into millimeters (mm)
Given 1 inch = 2.54 centimeters. (cm)
Carry the units throughout your calculation.

$$75\,in = (75\,\cancel{in})\left(\frac{2.54\,\cancel{cm}}{1\,\cancel{in}}\right)\left(\frac{10\,mm}{1\,\cancel{cm}}\right) = \boxed{1{,}905\,mm}$$

75*2.54*10=1,905

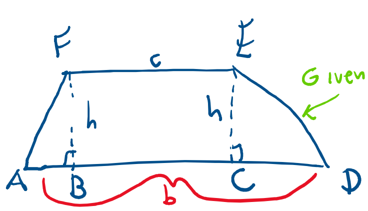
$100\,cm = 1\,m$

$1000\,mm = 1\,m$

$\Rightarrow 100\,cm = 1000\,mm$

$1\,cm = \frac{1000}{100}\,mm$

$1\,cm = 10\,mm$



Given d, we can find the missing sides and calculate the area

What information about the sides must you be given in order to calculate the area of the parallelogram?

A B b C D

What information about the sides must you be given in order to calculate the area of the parallelogram?

Let A = area of parallelogram

A = △ ABF + △ CDE + BCEF
triangle triangle rectangle

$A = \left(\frac{1}{2}\right)(\overline{AB})h + \left(\frac{1}{2}\right)(\overline{CD})h + hc$

$\overline{AB} + \overline{CD} = b - c$

Think about this

Given the linear equation

$y = 8x - 3$

$y = mx + b$

m = slope

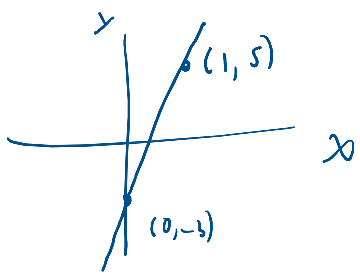
b = y-intercept

Find slope of line

y-intercept of the line

slope = 8

y-intercept = -3 or the point (0, -3)



Let $x = 1$

$\Rightarrow y = (8)(1) - 3$

$= 8 - 3$

$= 5$