For STUDENTS: Handout for Session #4

Welcome to our session in plane geometry! Today we will explore properties (like perimeter and area) of two-dimensional shapes: circles, triangles, trapezoids, rectangles and parallelograms, and explore how we can use these basic shapes to create composite figures that we have in real life.

Your will need materials in order to participate in all the hands-on fun we have planned for you. All students will be given new challenges and projects every session! Please make sure that you have these things ready for today:

For the entire Geometry Course – students will be using these materials *DURING* the live classes:

- Math journal, either lined or quadrille (print your own graph paper as needed)
- Pencils and eraser
- Protractor
- Compass (one with a set screw adjustment)
- Ruler (inches and cm) (here is Aurora's favorite)
- Calculator (here is the one Aurora uses during class)

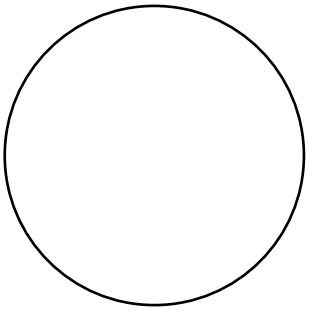
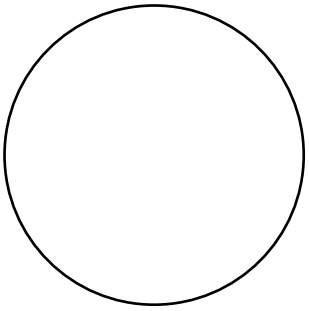
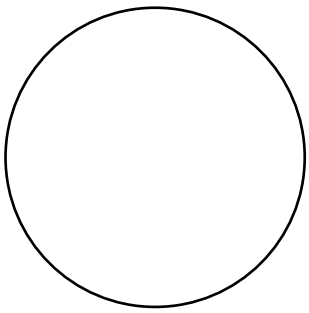
For the Projects (all levels) – students will be using these materials *AFTER* the live classes:

Session #4: Forest Ranger Lab

- Wood broom stick handle or long dowel (1" diameter, 3-4 feet long)
- Measuring tape
- Straw (paper or plastic)
- String
- Pushpins (tacks), 2
- Pennies or small coins (at least 10)

Session #4: Plane Geometry

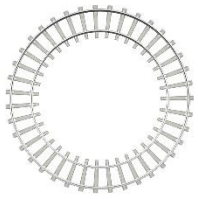
Today we will explore properties of circles by studying radius, diameter, circumference and area and finish with a special Math Challenge!

A **CIRCLE** is a round shape without corners or line segments.	A **DIAMETER** is any straight line passing through the center of the circle with endpoints *on* the circle. 
The **RADIUS** is measured from the center of a circle to any point on the circle. The radius is half of the diameter of the circle. 	The **CIRCUMFERENCE** is the distance measured *around* the entire circle. 

Investigating π: Circumference = 2 π r = π d

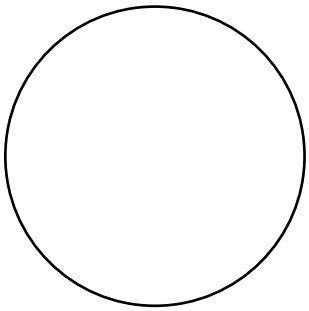
Object	Diameter or Radius	Circumference	$\frac{C}{d} = ?$
Dinner Plate	**9" diameter**	**28.75"**	
Running Track	**37m radius**	**232m**	
Car tire	**24" diameter**	**75 3/8"**	

How far does a train travel for each lap around a 12' track?

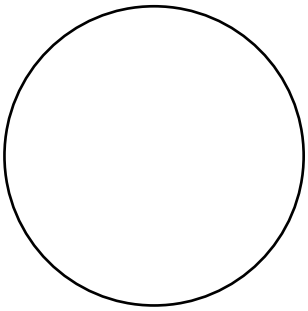


How many laps does the train need to complete in order to travel 500 feet?

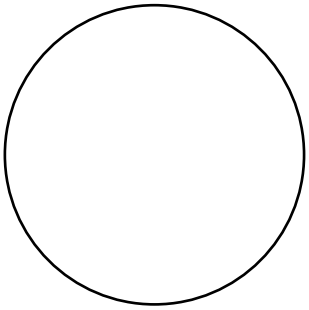
Area of a CIRCLE is the space enclosed by the circle.

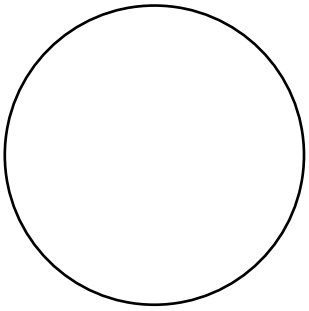
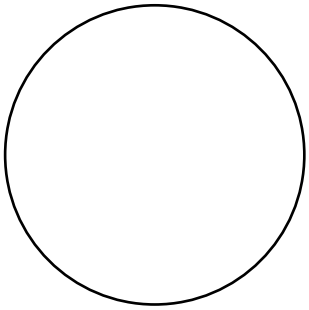
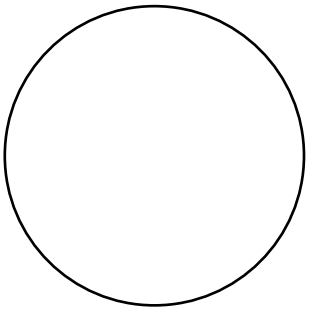
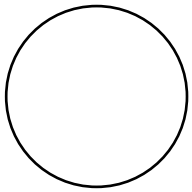


Area of a 4” radius circle:



A tree trunk measure 11” around. What is the diameter of the tree? Cross-sectional area if you were to use it as a seat?

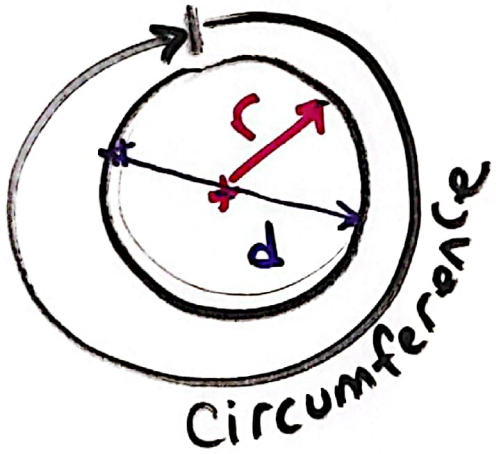


Find the radius of this circle: 	Find the area of this circle: 
Find the diameter of this circle: 	Find the circumference of this circle: 

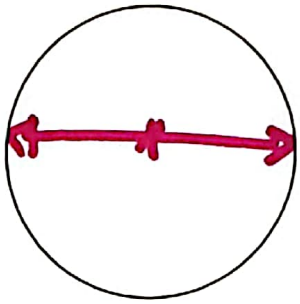
Session #4: Plane Geometry : Circles!

Today we will explore properties of several different 2D shapes like circles, ~~rectangles, trapezoids~~, ~~squares, parallelograms~~, and learn how to combine them in to composite shapes and finish with a special Math Challenge!

A **CIRCLE** is a round shape without corners or line segments.



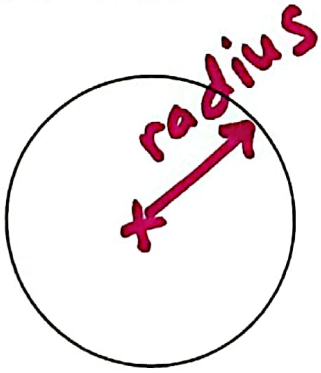
A **DIAMETER** is any straight line passing through the center of the circle with endpoints *on* the circle.



diameter

$d = 2r$

The **RADIUS** is measured from the center of a circle to any point on the circle. The radius is half of the diameter of the circle.

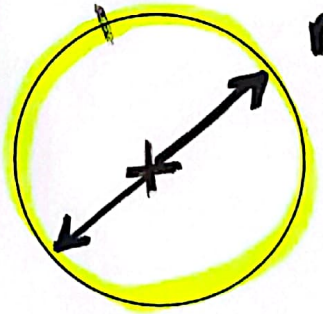


$r = \frac{d}{2}$

The **CIRCUMFERENCE** is the distance measured *around* the entire circle.

$d = 3' = 36''$

$r = \frac{d}{2} = 18''$



$C = 2\pi r$

$C = \pi d$

$C = \pi(36'') = 113''$

Investigating π: Circumference = 2 π r = π d

Object	Diameter or Radius	Circumference	$\frac{C}{d} = ?$
Dinner Plate	9" diameter	28.75"	3.19
Running Track	37m radius	232m	$\frac{C}{d} = \frac{232}{37 \cdot 2} = 3.14$
Car tire	24" diameter	75 3/8"	3.14

$$\pi = \frac{C}{d} \sim 3.14$$

How far does a train travel for each lap around a 12' track? dia

$C = 2\pi r$

$C = \pi d$

$C = (3.14)(12')$

$C = 37.7 ft$

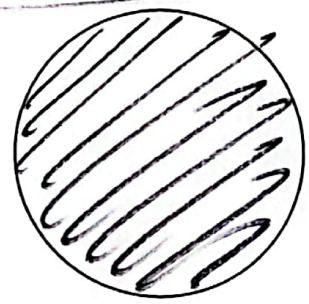
How many laps does the train need to complete in order to travel 500 feet?

$$\frac{500 ft}{37.7 \frac{ft}{lap}} = 13.26 \text{ laps}$$

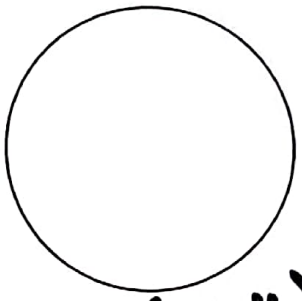
$\sim$ 13 ¼ laps

Area of a CIRCLE is the space enclosed by the circle.

$$A = \pi r^2 = \frac{\pi d^2}{4}$$



Area of a 4" radius circle:



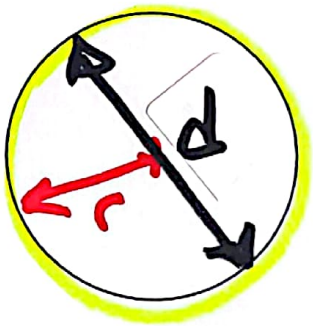
$$A = \pi (4")^2$$

$$A = 50.24\ in^2$$

A tree trunk measure 11" around. What is the diameter of the tree? Cross-sectional area if you were to use it as a seat?

$$C = 11"$$

$$C = 2\pi r \qquad \frac{C}{\pi} = \frac{\pi d}{\pi}$$

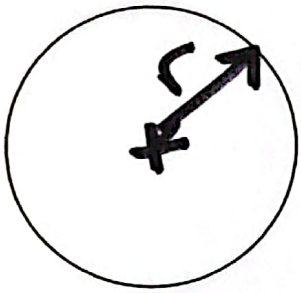


$$d = \frac{C}{\pi} = \frac{11"}{3.14} \Rightarrow d = 3.5"$$

$$r = \frac{d}{2} = \frac{3.5"}{2} = 1.75"\ \text{radius}$$

$$A = \pi r^2 = (3.14)(1.75\ in)^2 = 9.6\ in^2$$

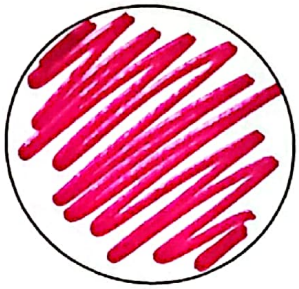
Find the radius of this circle:



$r = 0.75$ in

$r = 1.9$ cm

Find the area of this circle:

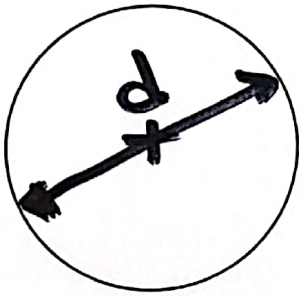


$A = \pi r^2$

$A = 1.77 \text{ in}^2$

$A = 11.3 \text{ cm}^2$

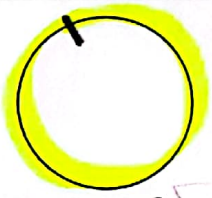
Find the diameter of this circle:



$d = 1.5$ in

$d = 3.8$ cm

Find the ~~radius~~ circumf. of this circle:



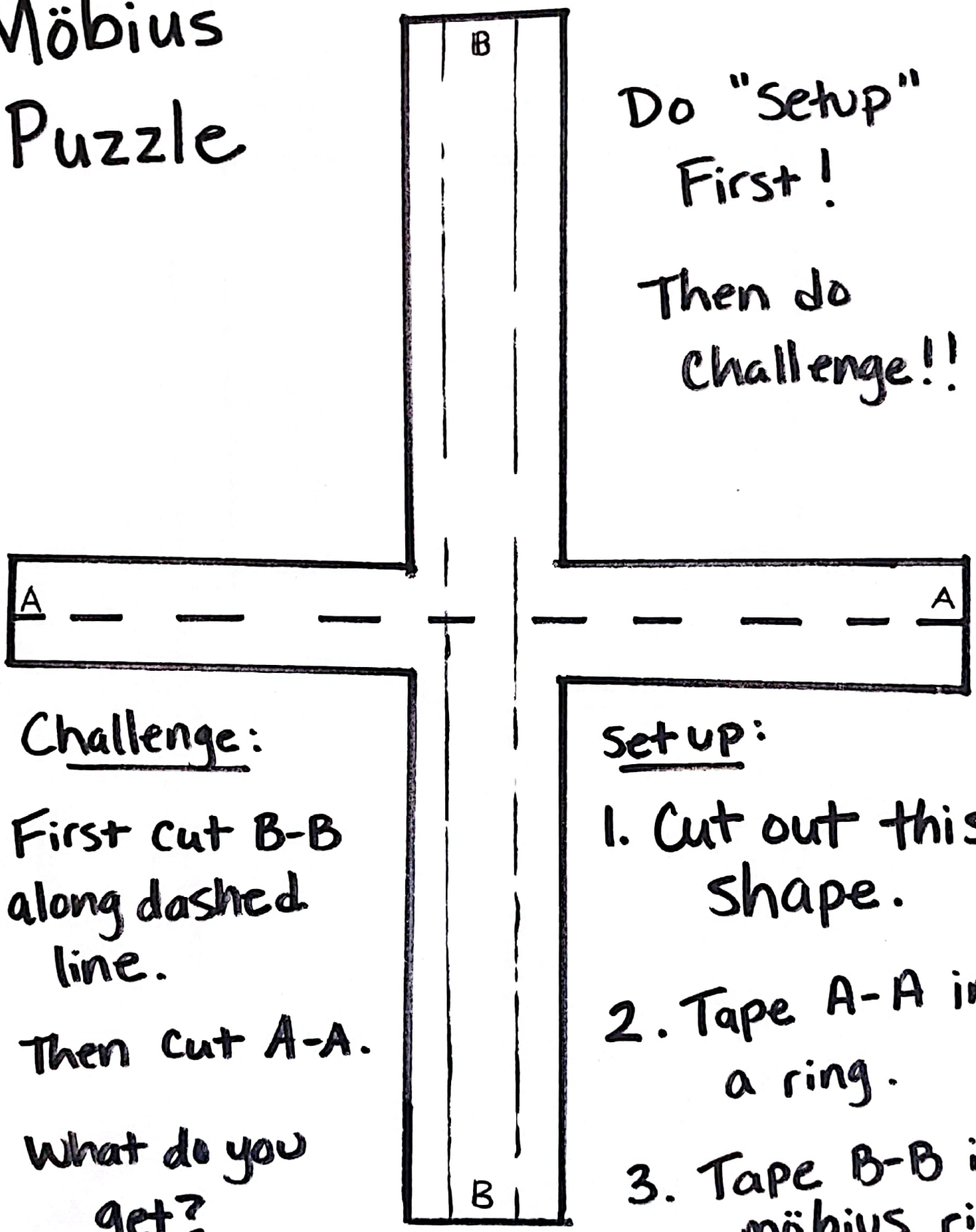
$r = 1.2\text{cm} = \frac{7}{16}$ in

$d = 2.4\text{cm} = \frac{7}{8}$ in

$C = 2\pi r = 7.5$ cm

$C = 2\pi r = 2.75''$

Möbius Puzzle



Do "Setup" First!

Then do Challenge!!

Challenge:

First cut B-B along dashed line.

Then cut A-A.

What do you get?

Setup:

1. Cut out this shape.
2. Tape A-A into a ring.
3. Tape B-B into möbius ring.

Supercharged Science + Math