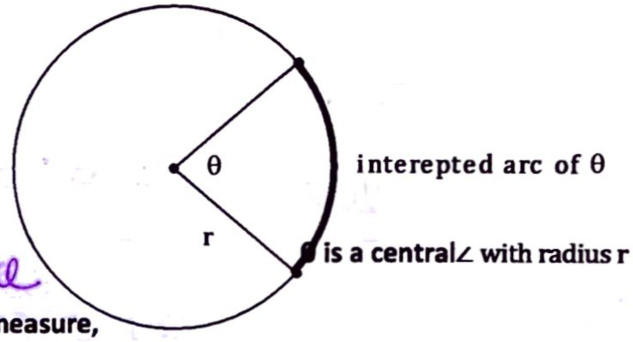
Together

What is a degree? ***The basic unit for measuring an angle***

So, what does it mean to say θ has a measure of 1° ?
Since the intercepted arc of a central angle is equal to the measure of the central angle, what does this say about the measure of the intercepted arc of θ?
What part if the circle does the arc represent?

A fraction of the circumference



In Geometry, we measure angles and arcs using degree measure, but in more advanced math courses we use radian measure.

What is a radian? What does it mean to say θ has a radian measure of 1^r ?

DON'T CUT ⊙ OUT!

1. Select 3 pipe cleaners, each a different color. Pick up 1 pair of scissors, 1 ruler and tape.

2. Fold the circle in half. Crease the fold line so that it can be clearly seen. Fold the circle again into quarters. Crease the fold lines. Mark the center and draw the radius with a ruler. Using the ruler, measure the radius to the nearest tenth of a mm and record below. find center! cm = rad.

3. Take a pipe cleaner and lay it down on the radius so that one end aligns with an endpoint. Carefully bend the pipe cleaner at the other end so that you form a segment that has the same length as the radius. Carefully cut the segment off at the bend with scissors. ***Accuracy is very important!***

4. Beginning at the endpoint of the radius on the circle tape the pipe cleaner directly over the circle. ***Again, be as accurate as possible!***

5. Draw another radius to the other endpoint of the pipe cleaner and record a "1" by that endpoint outside the circle. Label this angle, θ, at the vertex.

6. Repeat steps 3 through 4 using a different color pipe cleaner than the preceding one. Make sure the endpoints of each pipe cleaner touch. ***Accuracy!!***

alt. colors

7. Continue like this until you cannot fit another complete radius onto the circle. Continue to draw the radii to the endpoints each time, but do not label any other angles as θ. After the second radius is taped down, record "2" and so on by the endpoint of the pipe cleaner.

8. The next step is up to you. You must find the length of the remaining part of the circle that is not covered with pipe cleaner. Discuss how you might do this with your partners. Is "trial and error" the best approach? Could we use the ruler somehow? Or use a similar bending technique with the pipe cleaner? The remaining part may look straight, but is it? Make sure you determine and record the length of the remaining piece of pipe cleaner below before you glue it down.

Radius = ___5___ **mm** **Length of last pipe cleaner segment glued down** ________**mm**

To the nearest hundredth, calculate the ratio of the length of the last segment to the radius? $\frac{\text{seg.}}{\text{radius}} = .28$

How many radii would it take to cover half of the circle? 3 +

We know that 360° = 2π = one revolution. 3 + your #

What is the approximate value of 2π to the nearest hundredth? 6.28 of π? 3.14

Is there a correlation here? Explain. yes # radii @ half circle is almost π!

Move, as a group, to join forces with another group. Compare your answers to the previous questions.
If a group joined you whose circle was 10 times bigger than either of yours, would their results be different? No!
30 times bigger? Why or why not? size of ⊙ doesn't matter $C = 2\pi r$

The measure of your first angle, θ, is said to have a radian measure equal to 1^r (read *one radian*).

Why do you think this is? angle of rotation (intercepted arc) = length of 1 radius

If angle β is twice the radian measure of θ, what is the radian measure of β? 2 ^{r}
(*Hint: Trace and angle in your circle whose measure is twice that of* θ)

If angle α is 5 times the radian measure of θ, what is the radian measure of α? 5 ^{r}

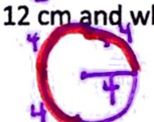
Label the last and smallest angle ϕ. What is the radian measure of ϕ? .14 (actual)

Why? it is a fraction of the radius

5 radii = 5 radians

Given a central angle where the length of its intercepted arc is five time the length of its radius, what is the radian measure of the angle? 5 radians

Given an angle whose intercepted arc has a length of a 12 cm and whose radius is 4, what is the radian measure the angle? 3^r $\frac{12}{4}$



radius of 4 = 1 radian

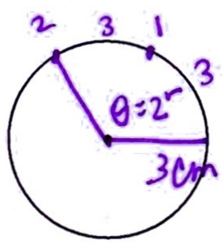
What does it mean if an angle has a measure of 5.2 radians ? 1.6 radians? 4.7 radians?

intercepted arc length > 5 radii int. arc length 1.6 radii

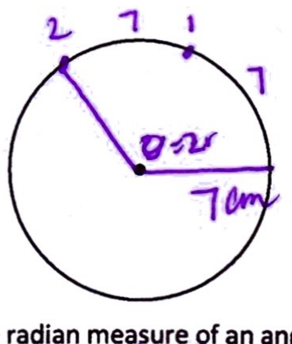
radian = arc length / radius

Two circles with radii of 3cm and 7cm respectively each have angles with measure of 2 radians .

What is the length of the intercepted arc in the smaller circle? 6cm The larger circle? 14cm



6 = l



arc length = θ · radius

in radians

Describe the relationship that exists in every circle between the radian measure of an angle, the length of its intercepted arc and the length of the radius. l r

Finally, explain to me what a radian is. a unit of measurement of an angle when the angle intercepts an arc whose length is equal to the radius of the circle.

$l = \theta \cdot r$ radius

angle in radians

WHAT IS A RADIAN?

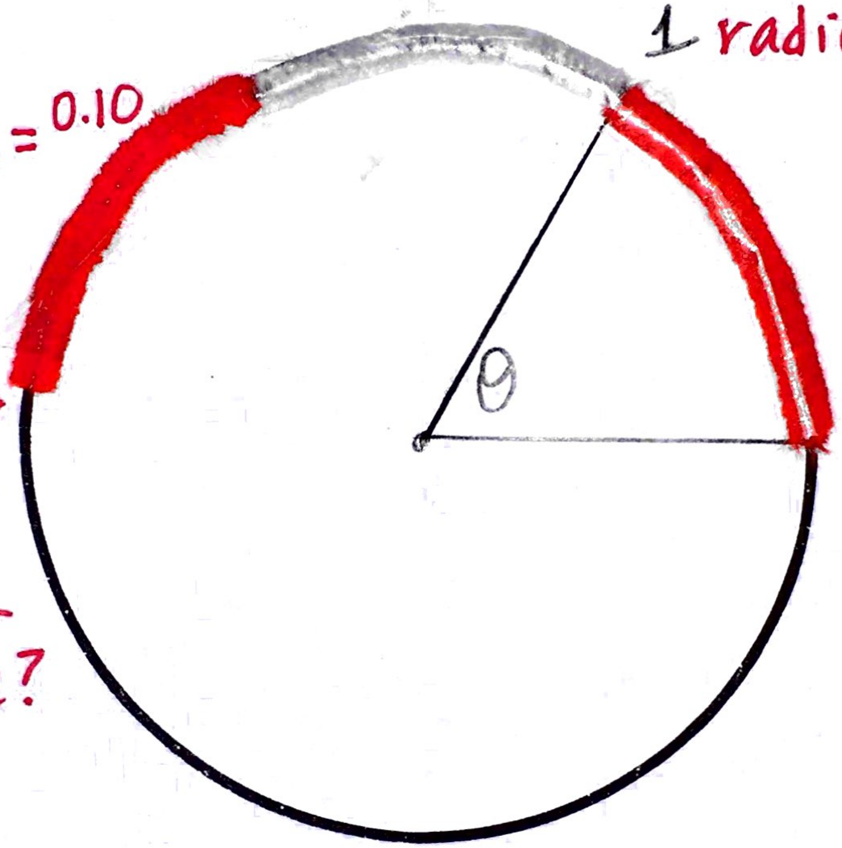
Length of radius = 5 cm

1

1 radian

$$\frac{\text{leftover segment}}{\text{radius}} = \frac{.5}{5} = 0.10$$

.5cm



How many radii cover your circle?

$\frac{1}{2} \odot = 3.1$

$\odot = 6.2$

RADIAN: A unit of measure for an angle when the angle intercepts an arc whose length is equal to the radius of the circle.

Math 3 Name______________________

Radians and Degrees

D→R $\times \frac{\pi}{180}$

Convert each degree measure into radians. Leave answer in terms of pi and as a fraction in simplest form.

1) 675° $\frac{15\pi}{4}$

2) 150° $\frac{5\pi}{6}$

3) 390° $\frac{13\pi}{6}$

4) 265° $\frac{53\pi}{36}$

5) 30° $\frac{\pi}{6}$

6) 195° $\frac{13\pi}{12}$

7) 225° $\frac{5\pi}{4}$

8) 155° $\frac{31\pi}{36}$

9) 300° $\frac{5\pi}{3}$

10) 765° $\frac{17\pi}{4}$

11) 130° $\frac{13\pi}{18}$

12) 805° $\frac{161\pi}{36}$

Convert each radian measure into degrees. R→D $\times \frac{180}{\pi}$

13) $\frac{49\pi}{12}$ 735°

14) $\frac{127\pi}{36}$ 635°

15) $\frac{85\pi}{36}$ 425°

16) $\frac{\pi}{9}$ 20°

17) $\frac{\pi}{4}$ 45°

18) $\frac{41\pi}{12}$ 615°

19) $\frac{17\pi}{6}$ 510°

20) $\frac{29\pi}{6}$ 870°

21) $\frac{\pi}{3}$ 60°

22) $\frac{4\pi}{3}$ 240°

23) $\frac{19\pi}{12}$ 285°

24) 2π 360°

25) $\frac{4\pi}{9}$ 80°

26) $\frac{67\pi}{12}$ 1005°