

Name:

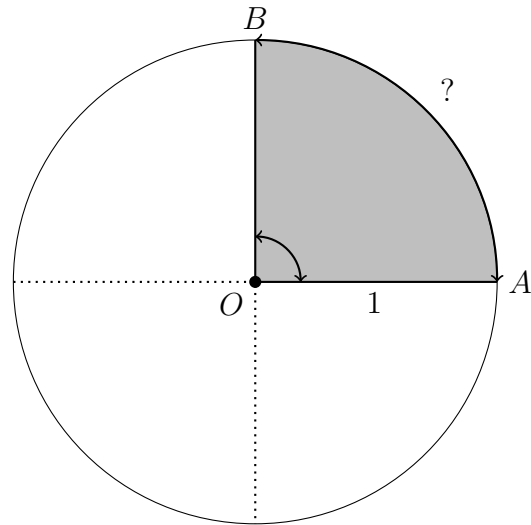
### 11.1 Extension: Radian measure

1. A *unit* circle with a radius  $r = 1$  is divided in quarters. One sector,  $AOB$ , is shaded as shown.

- (a) Find the circumference in terms of  $\pi$ .  
 ( $C = 2\pi r$ )

- (b) Write down  $m\angle AOB$  in *degrees*.

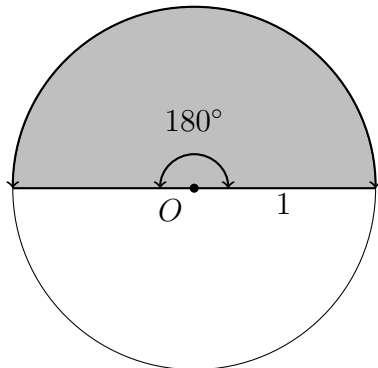
- (c) Find the *length* of the arc  $\widehat{AB}$  in terms of  $\pi$ .



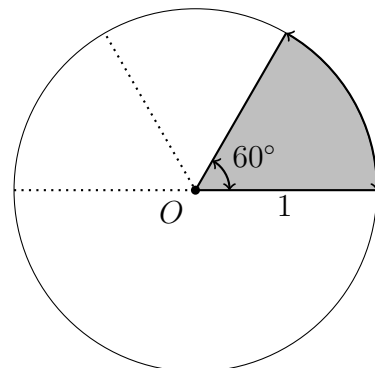
2. The length of the arc of a unit circle is a measure of the central angle called *radians*. The circumference of the full circle is  $2\pi = 360^\circ$ .

Mark each angle with its radian measure.

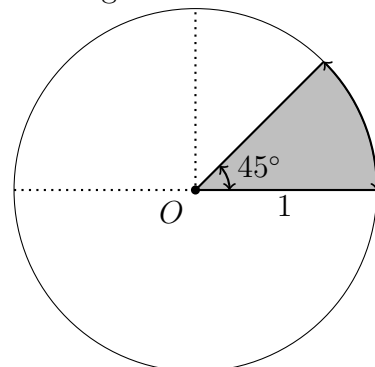
- (a) One half of a circle  $180^\circ$



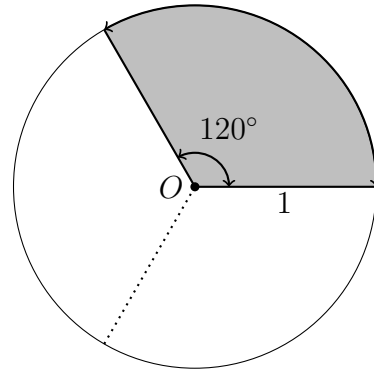
- (b) One sixth of the circle  $60^\circ$



- (c) One eighth of the circle  $45^\circ$



(d) One third of a circle  $120^\circ$



3. Algebra view of *radians* to *degrees* using the formula  $2\pi = 360^\circ$  or  $\pi = 180^\circ$ .

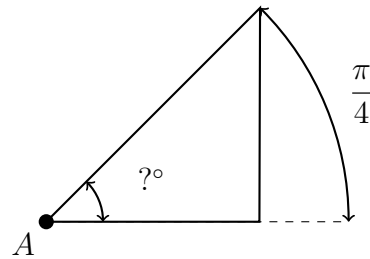
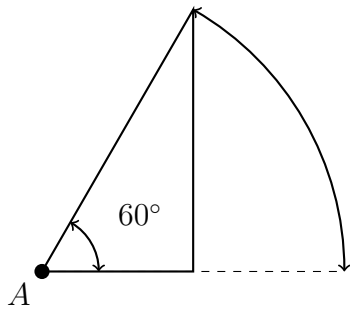
Apply the appropriate formula.

$$r = d \times \frac{\pi}{180}$$

$$d = r \times \frac{180}{\pi}$$

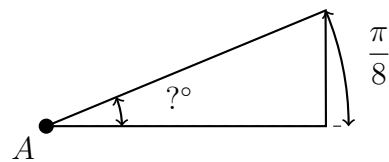
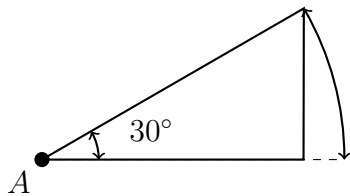
(a)  $60^\circ = ?$  radians

(c)  $\frac{\pi}{4} = ?$  degrees



(b)  $30^\circ = ?$  radians

(d)  $\frac{\pi}{8} = ?$  degrees



Name:

4. Do Now: Convert each set of units. One inch =  $\frac{1}{12}$  foot or one foot = 12 inches.

(a) How many feet are 30 inches?

(b) How many inches are 8.25 feet?

Example Greek letters are  $\pi$ ,  $\theta$ ,  $\alpha$ ,  $\Delta$ ,  $\beta$ ,  $\sigma$ ,  $\Sigma$ ,  $\epsilon$

5. Practice: Convert between units.

General method: if  $A = B$  multiply by  $\frac{A}{B}$  or  $\frac{B}{A}$ . For example,  $\pi$  radians = 180 degrees  
so

$$r = d \times \frac{\pi}{180} \text{ and } d = r \times \frac{180}{\pi}$$

(a)  $40^\circ = ?$  radians

(e) 1 euro = 1.21 dollars

20 euro =

(b)  $\frac{\pi}{7} = ?$  degrees

(f) 100 dollars =

(c) 1 foot = 12 inches

3.5 feet =

(g) 1 mile = 5,280 feet

10,000 feet =

(d) 54 inches =

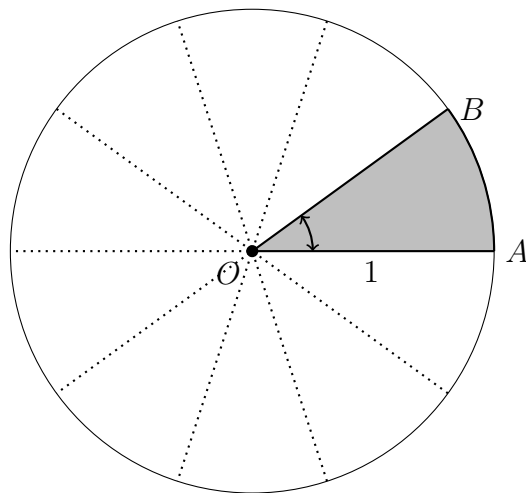
(h)  $\frac{1}{2}$  mile =

6. The shaded sector of the unit circle is *one tenth* of the whole circle, as shown.

(a) Write down the circumference in terms of  $\pi$ . ( $C = 2\pi r$ )

(b) Find  $m\angle AOB$  in *degrees*.

(c) Find  $m\angle AOB$  in *radians*.



7. Convert equivalent angle measures between *radians* and *degrees* ( $2\pi = 360^\circ$ ,  $\pi = 180^\circ$ ).

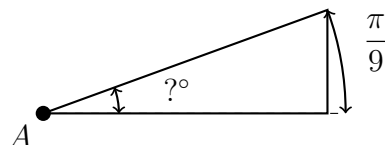
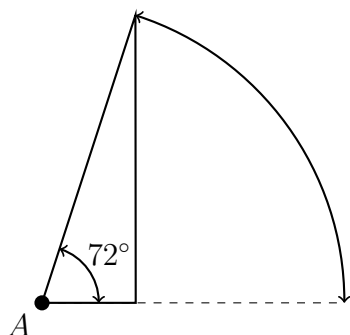
Apply the appropriate formula.

$$r = d \times \frac{\pi}{180}$$

$$d = r \times \frac{180}{\pi}$$

(a)  $72^\circ = ?$  radians  
Express in terms of  $\pi$

(b)  $\frac{\pi}{9} = ?$  degrees



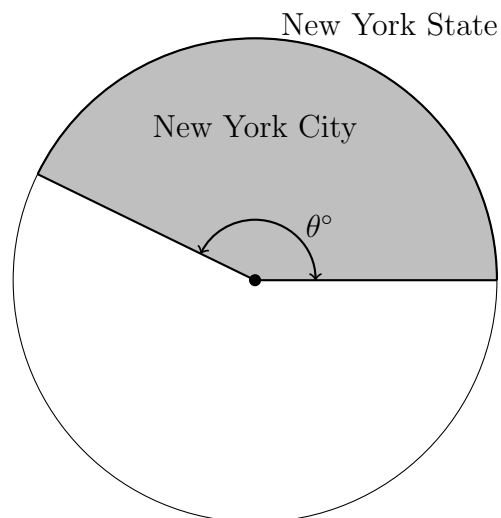
Name:

8. Lesson: *Pie charts* represent proportions using sector areas and central angles.

Population of NY City is 8,340,000  
 Population of NY State is 19,500,000

- (a) Find the fraction of New Yorkers,  $x$ , who reside in NYC as a percentage.

- (b) Find the central angle of the shaded area,  $\theta = x \times 360^\circ$



9. Practice: Convert between *radians* to *degrees* knowing  $2\pi = 360^\circ$  or  $\pi = 180^\circ$ .

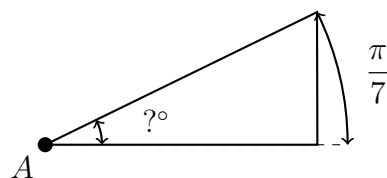
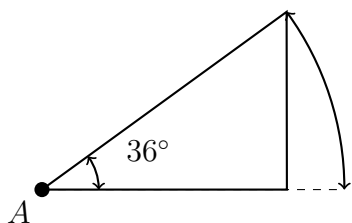
Apply the appropriate formula. Leave radians in terms of  $\pi$ .

$$r = d \times \frac{\pi}{180}$$

$$d = r \times \frac{180}{\pi}$$

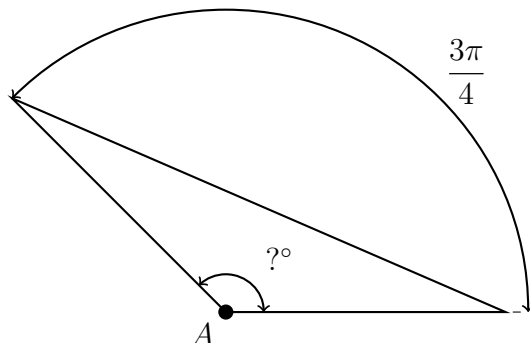
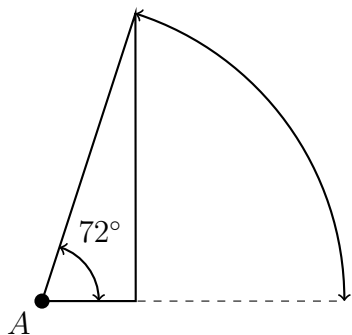
- (a)  $36^\circ = ?$  radians

- (c)  $\frac{\pi}{7} = ?$  degrees



- (b)  $72^\circ = ?$  radians

- (d)  $\frac{3\pi}{4} = ?$  degrees



10. Convert between units.

General method: if  $A = B$  multiply by  $\frac{A}{B}$  or  $\frac{B}{A}$ . For example,  $\pi$  radians = 180 degrees, therefore

$$r = d \times \frac{\pi}{180} \text{ and } d = r \times \frac{180}{\pi}$$

(a)  $135^\circ = ?$  radians

(c) 1 mile = 5,280 feet

14,520 feet =

(b)  $\frac{3\pi}{5} = ?$  degrees

(d)  $\frac{1}{4}$  mile =

11. Convert units of *radians* and *degrees* ( $2\pi = 360^\circ$ ,  $\pi = 180^\circ$ ).

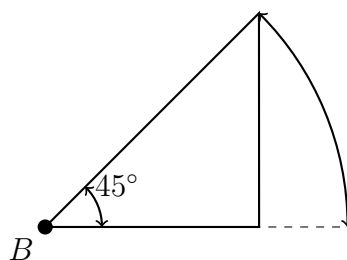
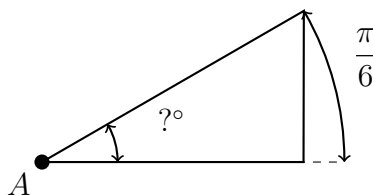
Apply the appropriate formula.

$$d = r \times \frac{180}{\pi}$$

$$r = d \times \frac{\pi}{180}$$

(a)  $m\angle A = \frac{\pi}{6} = ?$  degrees

(b)  $m\angle B = 45^\circ = ?$  radians  
(in terms of  $\pi$ )



12. Convert units of *radians* and *degrees* ( $2\pi = 360^\circ$ ,  $\pi = 180^\circ$ ).

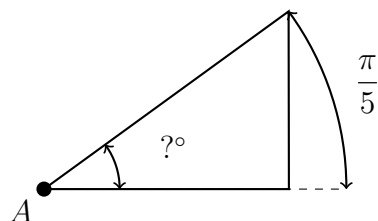
Apply the appropriate formula.

$$d = r \times \frac{180}{\pi}$$

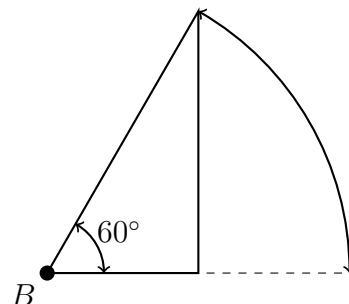
$$r = d \times \frac{\pi}{180}$$

(a)  $m\angle A = \frac{\pi}{5} = ?$  degrees

Name:



- (b)  $m\angle B = 60^\circ = ?$  radians  
 (in terms of  $\pi$ )



13. Convert units of *radians* and *degrees* ( $2\pi = 360^\circ$ ,  $\pi = 180^\circ$ ).

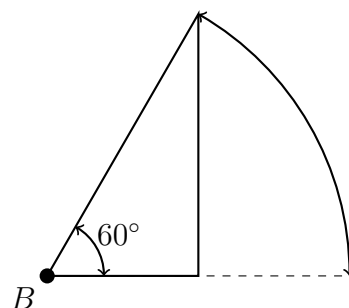
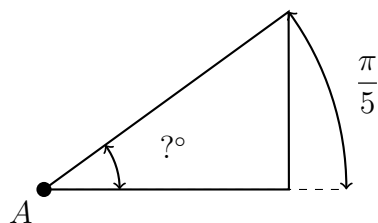
Apply the appropriate formula.

$$d = r \times \frac{180}{\pi}$$

$$r = d \times \frac{\pi}{180}$$

- (a)  $m\angle A = \frac{\pi}{5} = ?$  degrees

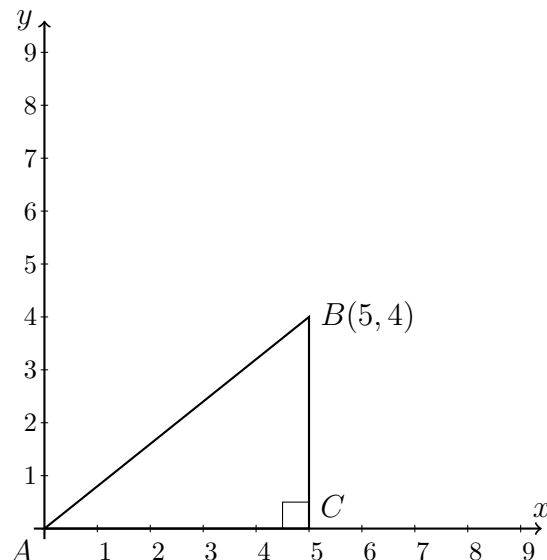
- (b)  $m\angle B = 60^\circ = ?$  radians  
 (in terms of  $\pi$ )



14. Right  $\triangle ABC$  is drawn in *standard position* with vertex  $A$  on the origin and right  $\angle C$  on the  $x$ -axis, as shown.

- (a) Find the length of the hypotenuse  $AB$  using the Pythagorean Theorem  $a^2 + b^2 = c^2$ . (leave as a radical)

- (b) Find the slope of the line segment  $\overline{AB}$  as a decimal.



15. Right  $\triangle ABC$  is drawn in *standard position* with vertex  $A$  on the origin and right  $\angle C$  on the  $x$ -axis, as shown.

- (a) Find the length of the hypotenuse  $AB$  using the Pythagorean Theorem  $a^2 + b^2 = c^2$ . (leave as a radical)

- (b) Find the slope of the line segment  $\overline{AB}$  as a decimal.

