

Ch 15: Measuring Angles

Goal: Radians, Degrees, what is π , area and arc length of a wedge

Before we start, a check in on chapter 14...

Entry Task: Problem 2 from Ch 14 HW (algebra challenge)

Find the linear-to-linear function whose graph passes through the points (1, 1), (6, 2), and (30, 5).

- Do you know how to start this?
- Do you have a solving strategy?
- Can you do it in exact form?
- If the problem asks for the horizontal asymptote, can you find it?

Ch. 15 Angles

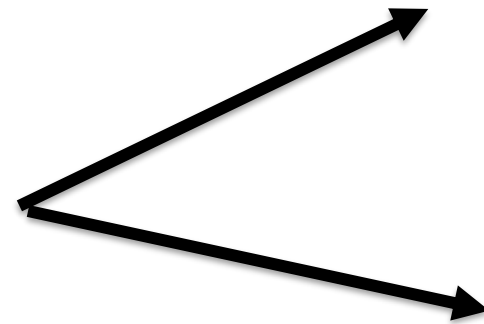
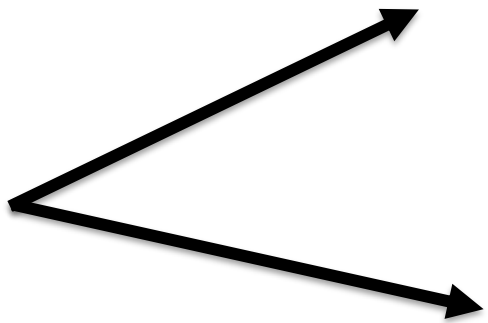
Motivation

Imaging Olaf it waking around a circular track.

- How do we describe the “angle” he forms?
- How far has he traveled based on that “angle”?
- What is the area of the wedge based on that “angle”?

Definition

An *angle* is the union of an initial ray and a terminal ray (you must specify which is which).



Standard Position

Given a coordinate system, standard position refers to...

1. Origin is the “vertex”
2. Positive x-axis is the initial ray
3. Positive angle $\Leftrightarrow$ counterclockwise

Negative angle $\Leftrightarrow$ clockwise

Two methods for measuring (degree and radian)

Degree Method

Take a circle, great it into 360 equal slices

$$1 \text{ slice} = 1 \text{ degree} = 1^\circ$$

Examples: Draw several examples of degrees...

Note: If we need even finer slices, we cut up a degree into “minutes” and “seconds” as follows:

$$1 \text{ degree} = 60 \text{ minutes} = 60'$$

$$1 \text{ minute} = 60 \text{ seconds} = 60''$$

Example: What is $7^\circ 13' 44''$ in degrees?

Arc Length and Degrees

An *arc* is the edge of a circle that is swept out by an angle.

Key observations

- Length around entire circle = circumference =
- Length of arc = “fraction of circle” · “circumference”



- Area of the entire circle =
- Area of a wedge = “fraction of circle” · “area”

General Formula

For a wedge of a circle of radius r made by angle θ degrees?

Arc Length =

Wedge Area =

Example: A circle has radius 10, find the arc length and area...
...for a 90° angle.

...for a 30° angle.

Radian Method

Q: How can we change the number of slices to make the arc length formula as “nice” as possible?

A:

General Formula

For a wedge of a circle of radius r made by angle θ radians?

Arc Length =

Wedge Area =

Radian Basics

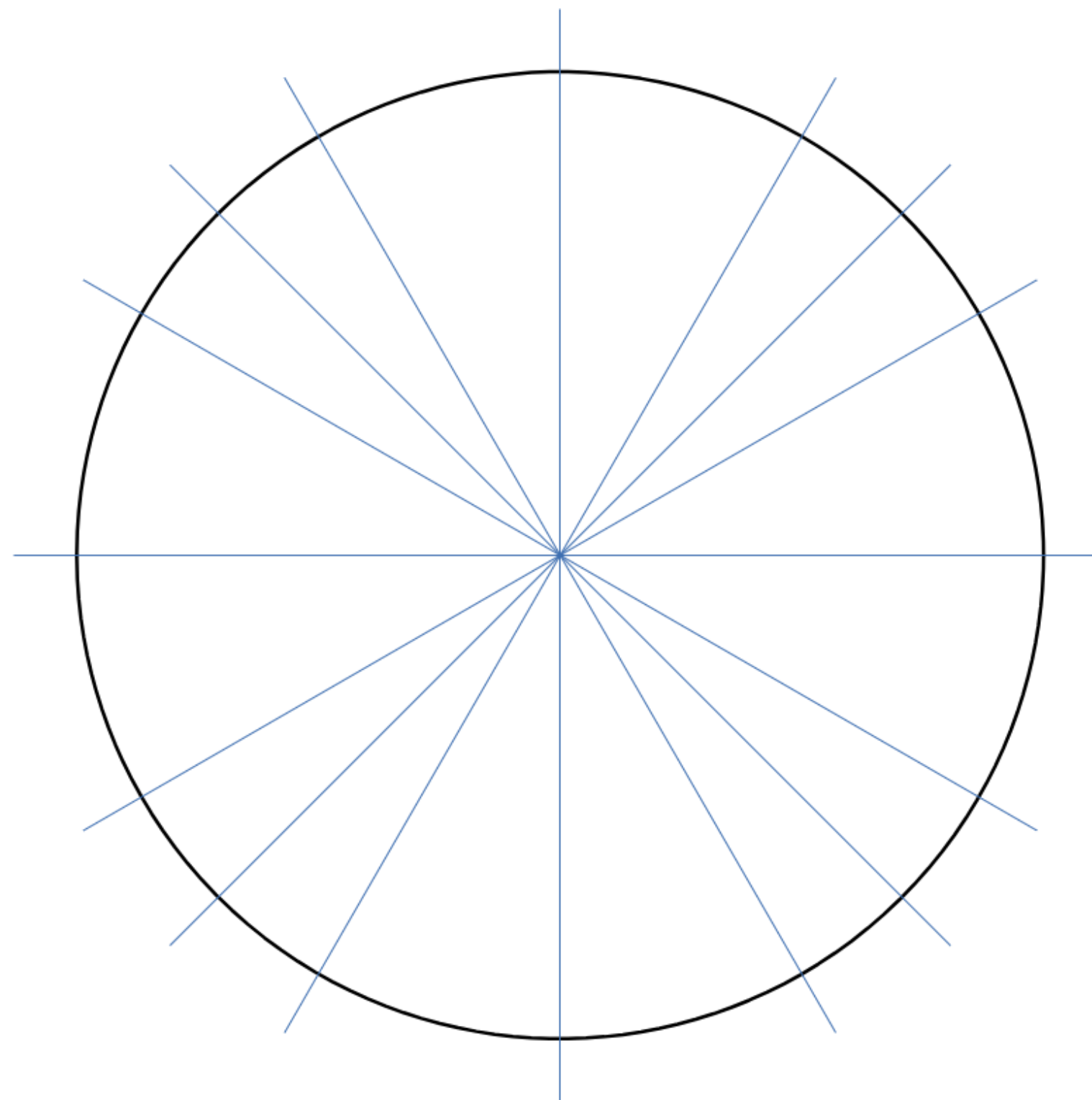
$$2\pi \text{ radians} = 360 \text{ degrees}$$

$$\pi \text{ radians} = 180 \text{ degrees}$$

You can use this as a conversion.

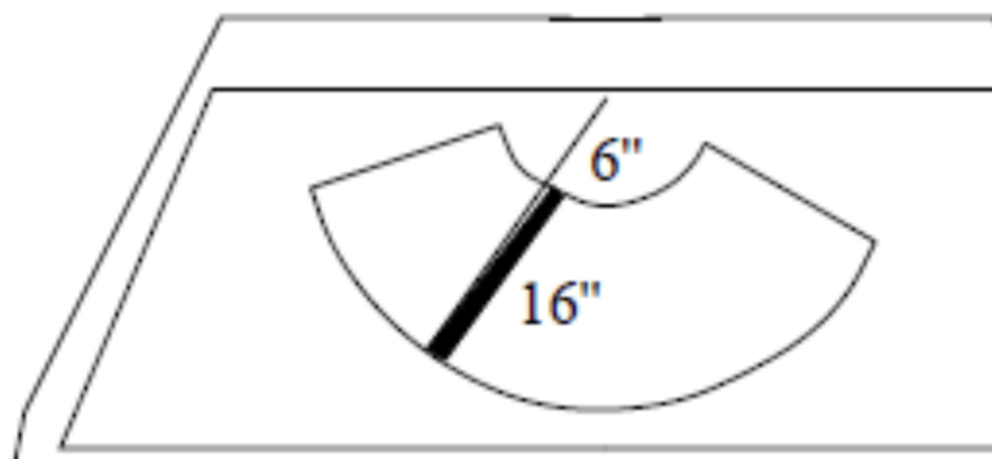
It will be vital for your success in future quarter to know by memory the angles you get when you subdivide quarters of the circle into half and thirds.

In other words, can you fill in the following angles in standard position in degrees and radians?



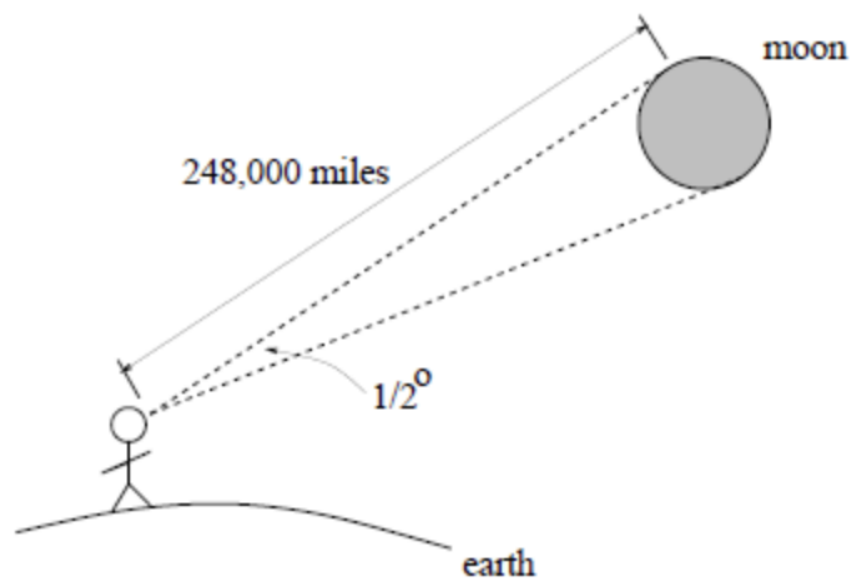
Homework notes: Here are screenshots of some of the HW

The rear window wiper blade on a station wagon has a length of 16 inches. The wiper blade is mounted on a 22 inch arm, 6 inches from the pivot point.



Astronomical measurements are often made by computing the small angle formed by the extremities of a distant object and using the arc length to approximate the chord. In the picture below, the full moon is shown to form an angle of $\frac{1}{2}^\circ$ when the distance indicated is 248,000 miles. Estimate the diameter of the moon using this method. (Round your answer to two decimal places.)

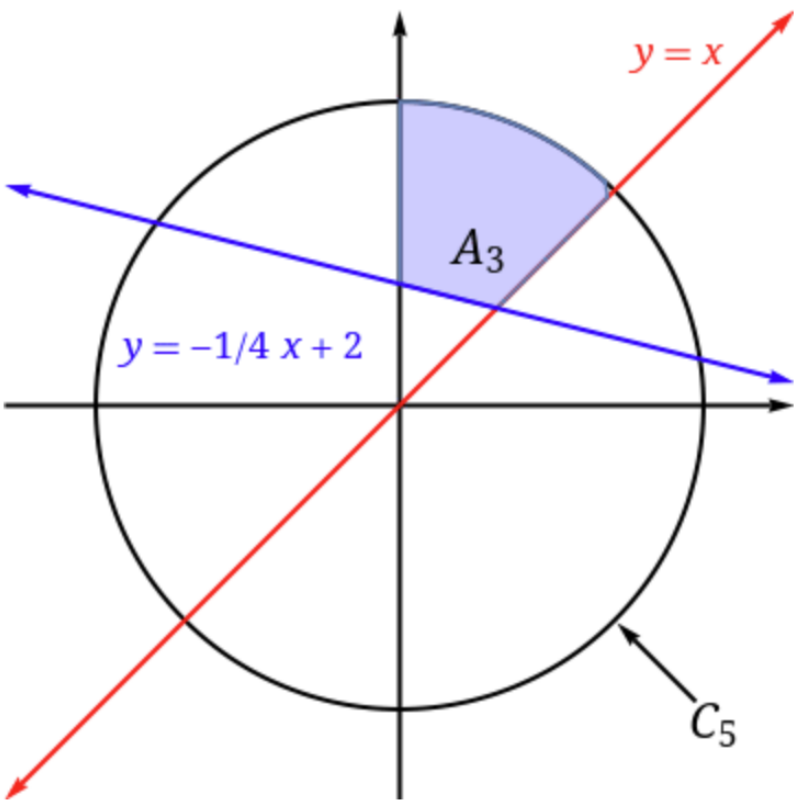
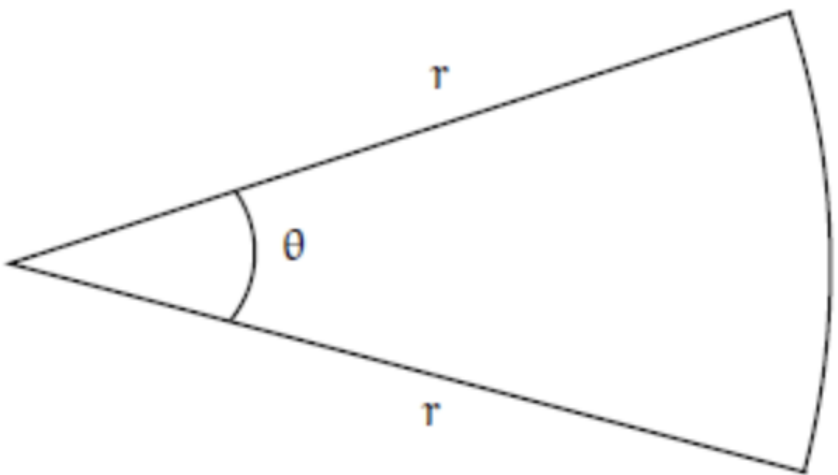
mi



Matilda is planning a walk around the perimeter of Wedge Park, which is shaped like a circular wedge, as shown below. The walk around the park is 2.9 miles, and the park has an area of 0.25 square miles.

If θ is less than 90 degrees, what is the value of the radius, r ? (Round your answer to two decimal places.)

mi



$A_3 =$ in²