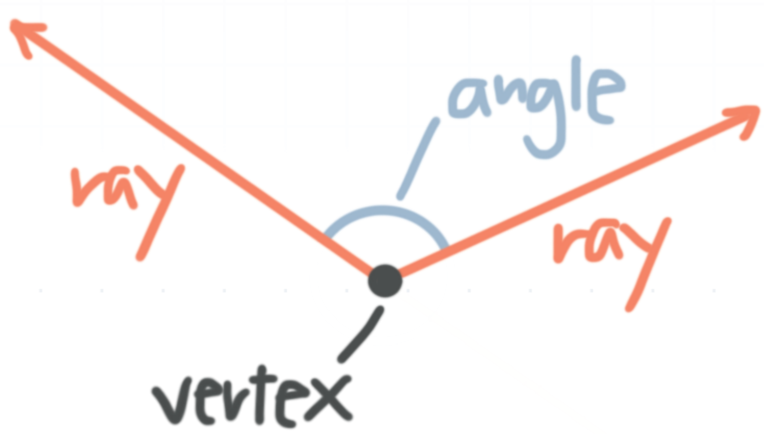
Naming angles

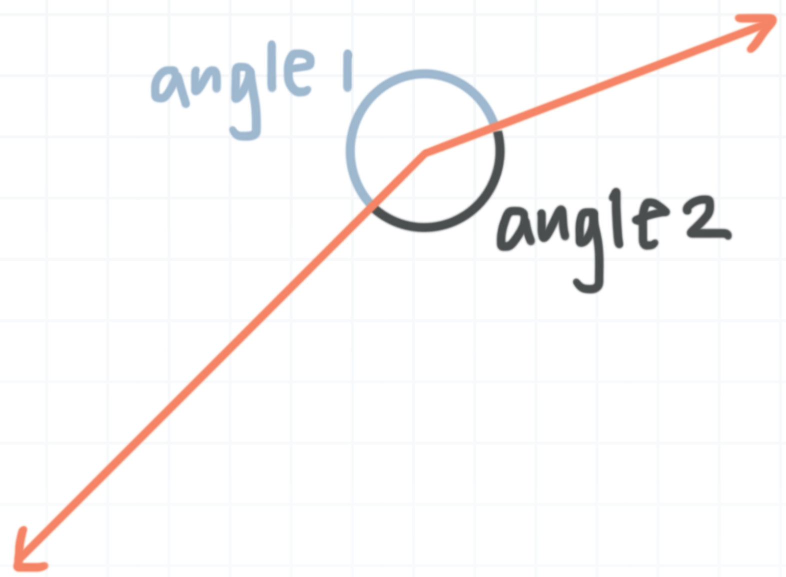
We can think about an angle as a wedge, like a piece of pie. Each side of an angle is bounded by a **ray**, which is a line that's infinitely long in only one direction. So a ray has an endpoint on one end, and goes off infinitely on the other end.

Building an angle

We get an **angle** when we put two rays together, with their endpoints at the same spot. That becomes the corner of the angle, which is the **vertex** of the angle.



Notice that every angle has an interior area, but that there's also the area outside the angle. When we cut a pie, we have the area of the piece we cut, but we also still have the area of the rest of the pie.



In other words, an angle is really just a section of a complete circle. In the figure above, angle 1 and angle 2 add together to form a full circle.

Types of angles

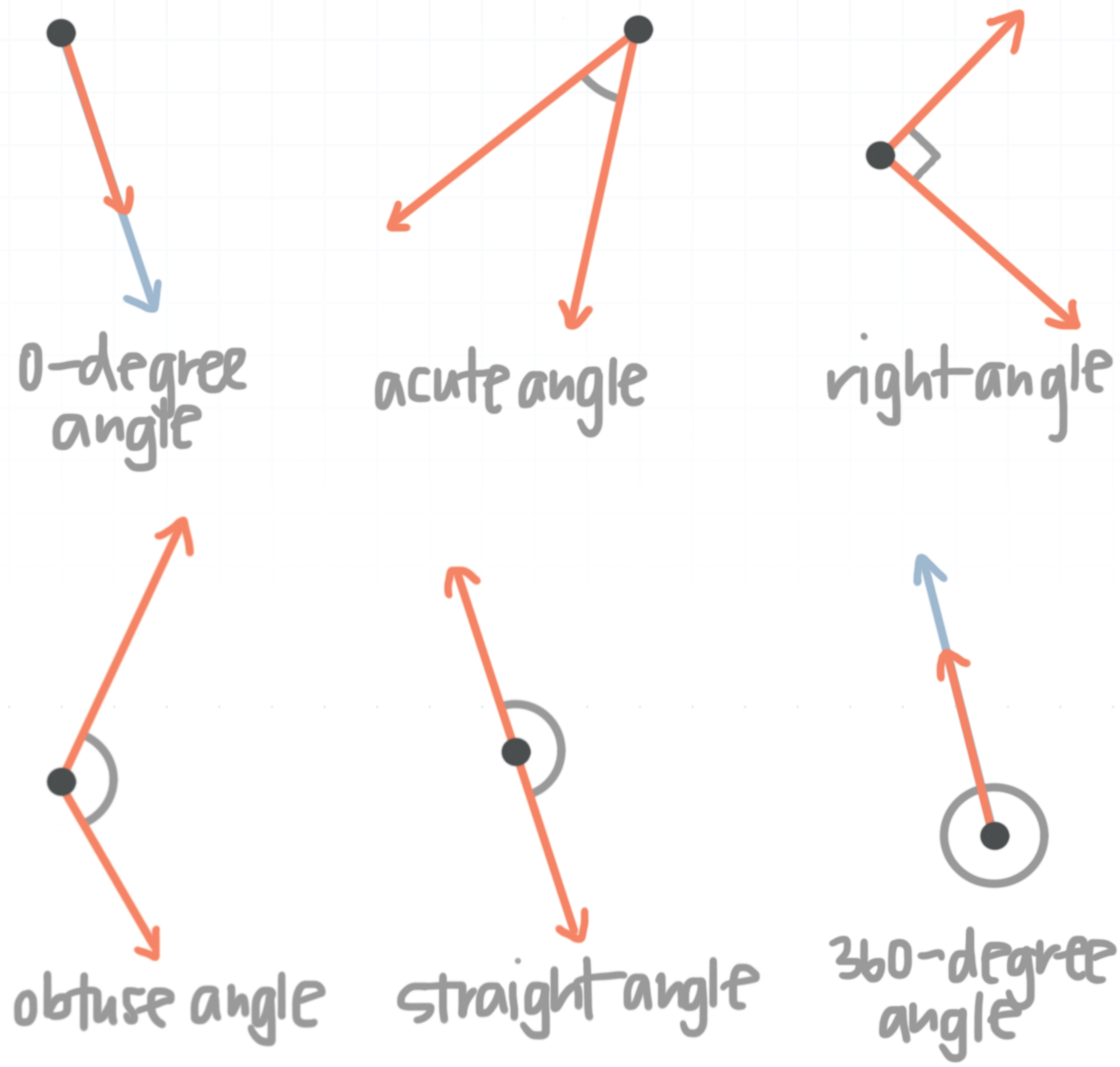
There are different systems to measure angles. The ones we'll typically use are degrees and radians, and we'll talk about both systems in much more depth later on. For now, we just want to know that a complete circle is made of 360 degrees, which we write as 360°, or of 2π radians, which we write as 2π. Remember that π is a constant; it's equivalent to about $\pi \approx 3.14$.

We usually use the Greek letter θ (theta) for the measure of an angle, but we can also use α, β, γ, or any other variable.

So let's take a moment to think about the 360° of a full circle. A full circle is always $\theta = 360^\circ$, which means a quarter circle is $\theta = 360^\circ/4 = 90^\circ$, and 90° angles are called **right angles**. A half circle is $\theta = 360^\circ/2 = 180^\circ$, and 180° angles are called **straight angles**.

Any angle that's less than a quarter circle, or $0^\circ < \theta < 90^\circ$, is an **acute angle**, and any angle that's greater than a quarter circle but less than a half circle, or $90^\circ < \theta < 180^\circ$, is an **obtuse angle**. Angles which are more than 180° but less than 360° are **reflex angles**.

When the rays of the angle overlap (there's no area in between the rays), then the angle is $\theta = 0^\circ$.



In this figure we've drawn the angles in order from smallest measure to largest measure, and we can also summarize them that way in a table:

Angle in degree	**Angle name**
$\theta = 0^\circ$	0° or zero angle
$0^\circ < \theta < 90^\circ$	Acute angle
$\theta = 90^\circ$	Right angle
$90^\circ < \theta < 180^\circ$	Obtuse angle
$\theta = 180^\circ$	Straight angle
$\theta = 360^\circ$	360° or complete angle

We can do the same thing in radians. As we go further in math, we'll actually use radians more often than degrees. It's really common to see radian angles given in terms of π, like $\pi/3$, $3\pi/2$, or 1.6π. Here's the same chart for radian angles as the one we made for degree angles.

Angle in radians	**Angle name**
$\theta = 0$	0 or zero angle
$0 < \theta < \pi/2$	Acute angle
$\theta = \pi/2$	Right angle
$\pi/2 < \theta < \pi$	Obtuse angle
$\theta = \pi$	Straight angle
$\theta = 2\pi$	2π or complete angle

It's a little easier to see the relationship in degree angles, because we can see that 180 is half of 360, and that 90 is one quarter of 360.

But the same math applies to radian angles. Half of 2π is

$$\frac{1}{2}(2\pi) = \frac{2\pi}{2} = \pi$$

so $\theta = \pi$ is the straight angle. And a quarter of 2π is

$$\frac{1}{4}(2\pi) = \frac{2\pi}{4} = \frac{\pi}{2}$$

so $\theta = \pi/2$ is a right angle.

Let's look at an example where we classify a few angles.

Example

Name each kind of angle.

1. $\theta = 37^\circ$

2. $\theta = 3\pi/4$

3. $\theta = 90^\circ$

4. $\theta = \pi$

Because the angle $\theta = 37^\circ$ is between 0° and 90°, it's an acute angle measured in degrees.

Because the angle $\theta = 3\pi/4$ is between $\pi/2$ and π, it's an obtuse angle measured in radians.

The angle $\theta = 90^\circ$ is a right angle measured in degrees.

And the angle $\theta = \pi$ is a straight angle measured in radians.

Radian angles aren't always defined in terms of π. For instance, we might encounter an angle of 4.0 radians. When this is the case, we can always convert the angle into one in terms of π.

To convert 4.0, we'll divide 4.0 by $\pi \approx 3.14$, which gives us about 1.27, so $4.0 \approx 1.27\pi$. Therefore, 4.0 radians and 1.27π are equivalent angles.