

# Exploring Trigonometric Ratios for Angles Greater than $90^\circ$ on the iPads

\*Using two fingers, center the y-axis and line up your file so “Principal angle = ...” is at the top of the screen.

Note: All angles are in **standard position** (vertex at the origin, initial arm on positive x-axis)

## Part 1

Touch and move the point at the end of the terminal arm.

Watch the values of the ‘**principal angle**’ and the ‘**related acute angle**’ as you move this point.

1. Describe the relationship between the principal angle and the related acute angle when the end of the terminal arm is in
  - a. Quadrant I
  - b. Quadrant II
  - c. Quadrant III
  - d. Quadrant IV
2. How is the principal angle determined? Where is it measured from?
3. How is the related acute angle determined? Where is it measured from?

## Part 2

Click the “Show **Sine** Measurements” button and, again, move the point at the end of the terminal arm.

1. What do you notice about the sine of the principal angle and the sine of the related acute angle?
  
2. In what quadrant(s) is the sine of the principal angle
  - a. Positive?
  
  - b. Negative?

Click the “Show **Cosine** Measurements” button and, again, move the point at the end of the terminal arm.

1. What do you notice about the cosine of the principal angle and the cosine of the related acute angle?
  
2. In what quadrant(s) is the cosine of the principal angle
  - a. Positive?
  
  - b. Negative?

Click the “Show **Tangent** Measurements” button and, again, move the point at the end of the terminal arm.

1. What do you notice about the tangent of the principal angle and the tangent of the related acute angle?
  
2. In what quadrant(s) is the tangent of the principal angle
  - a. Positive?
  
  - b. Negative?

There is a rule / *mnemonic* in trigonometry known as **The CAST Rule**. Based on your investigation on this page, what do you think the rule is used for?

### Part 3

Click the “Show Negative Angles” button and, again, move the point at the end of the terminal arm.

1. How is the value of a negative angle determined? Where is it measured from?

### Part 4

Complete the table below assuming that  $\theta$  is an acute angle in standard position.

Terminal arm in Quadrant I
Principal angles are between: $0^\circ$ and $90^\circ$
The principal angle can be expressed as $\theta$ $\sin \theta = \sin \theta$ $\cos \theta = \cos \theta$ $\tan \theta = \tan \theta$

Terminal arm in Quadrant II
Principal angles are between: _____ and _____
The principal angle can be expressed as $180^\circ - \theta$ $\sin(180^\circ - \theta) = \sin \theta$ $\cos(180^\circ - \theta) = -\cos \theta$ $\tan(180^\circ - \theta) = -\tan \theta$

Terminal arm in Quadrant III
Principal angles are between: _____ and _____
The principal angle can be expressed as $\text{_____}$ $\sin(\text{_____}) = \text{_____}$ $\cos(\text{_____}) = \text{_____}$ $\tan(\text{_____}) = \text{_____}$

Terminal arm in Quadrant IV
Principal angles are between: _____ and _____
The principal angle can be expressed as $\text{_____}$ $\sin(\text{_____}) = \text{_____}$ $\cos(\text{_____}) = \text{_____}$ $\tan(\text{_____}) = \text{_____}$