

Trig ratios in four quadrants

Teacher Notes

Introduction

The aim of this activity is to allow students to discover the various relationships between sine, cosine and tangents for angles between 0° and 360° , including that the sine of an angle is equal to the cosine of its complement.

For example,

$$\sin 35^\circ = \cos 55^\circ$$

$$\sin 150^\circ = \sin 30^\circ,$$

$$\cos 135^\circ = -\cos 45^\circ,$$

$$\tan 280^\circ = -\tan 80^\circ.$$

The activity makes use of the **CAST** diagram. This is a way of remembering whether the sine, cosine and tangent are positive for angles in the four quadrants.

For angles in the first quadrant,

In the second quadrant, only the

In the third quadrant, only the

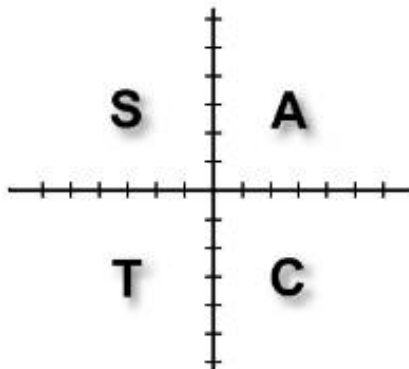
In the fourth quadrant, only the

All the trig functions are positive.

Sine is positive.

Tangent is positive.

Cosine is positive.



Resources

There is a TI-Nspire document entitled FourQuadrants.tns for use with this activity.

Skills required

Pupils should...

- Be able to move between pages of a tns file.
- Be able to grab and move points.
- Use the scratchpad to calculate.
- Be familiar with using a slider.

The activity

Students need to download and open the tns file, FourQuadrants.tns

Problem 1

The document starts with an introduction of the four quadrants.

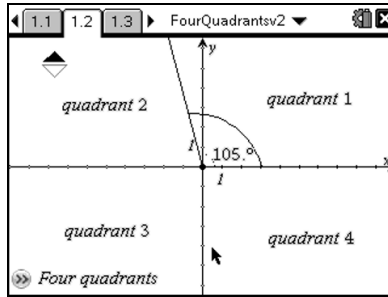
Students are asked to use the slider to change the angle values and make comments.

1.1 1.2 1.3 FourQuadrantsv2

Trig ratios in the four quadrants.

Use the slider on the next page to change the value of the angles.

Make a note of what you notice in your jotter and on page 1.3.



1.1 1.2 1.3 FourQuadrantsv2

Complete this sentence. The angles in the **first** quadrant lie between ° and °.

The angles in the **second** quadrant lie between ° and °.

The angles in the **third** quadrant lie between ° and °.

The angles in the **fourth** quadrant lie between ° and °.

Problem 2

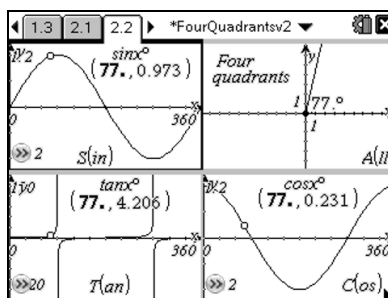
Students are able to change the displayed angle by grabbing and moving any the empty circles. They should note what happens to the values of the trig functions shown and are asked to make a comment for each quadrant, which can then be used as a basis for class discussions.

1.2 1.3 2.1 *FourQuadrantsv2

Move the empty circles and watch what happens to the values of the sin, cos and tan of the angles.

For each quadrant make at least 1 comment on page 2.3, and in your jotter.

We will discuss these ideas.



2.1 2.2 2.3 *FourQuadrantsv2

s_{inx}	A_{ll}
t_{anx}	c_{osx}

Problem 3

Students are given a set of twelve questions, in multiple-choice format, to consolidate their understanding of related angles.

2.2 2.3 3.1 *FourQuadrantsv2

Answer the following twelve questions.

Use the diagrams on pages 2.2 and 2.3 first, then you can check your answer on the scratchpad, if necessary.

When you are confident try it without using the diagrams.

2.3 3.1 3.2 *FourQuadrantsv2

sin 50° =

- cos 50°
- tan 50°
- sin 130°
- cos 40°
- sin 310°
- sin 230°

3.11 3.12 3.13 *FourQuadrantsv2

sin 15° =

- sin 195°
- cos 75°
- sin 165°
- cos 345°
- cos 75°
- sin 345°