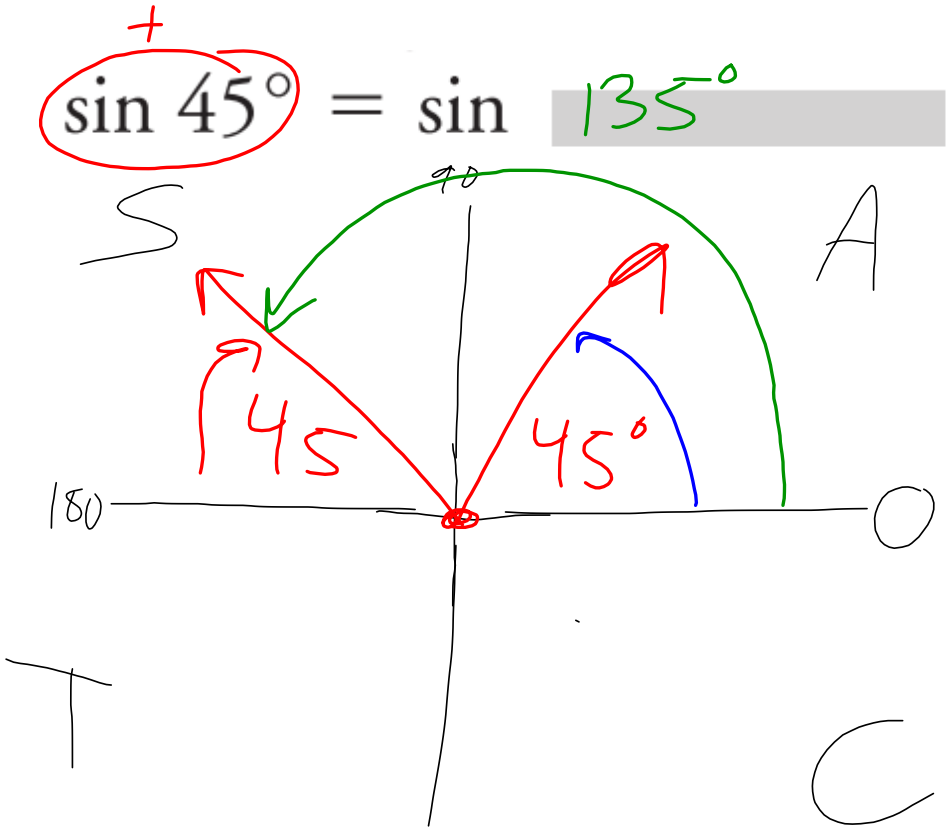
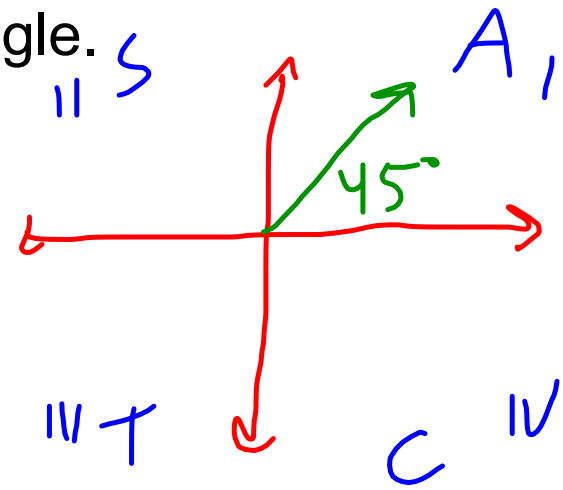
a) $\sin 45° = \sin 135°$



a) $\sin 45° = \sin$ [redacted]

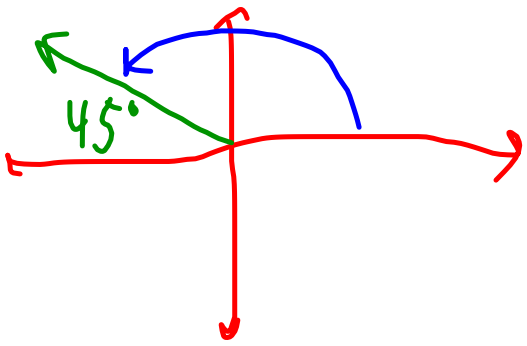
To solve this problem, first I draw the 45 degree angle.



Because the angle is in quadrant I, where All ratios are positive, I know that I need another angle where sin of the angle is positive.

Sine is also positive in quadrant II, so that's where my solution will be!

Now I just draw the related acute angle (45) in quadrant II.

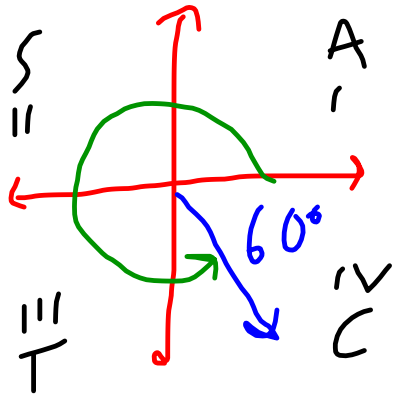


To determine the measure of the angle, I go to 180 and then dial back by 45. Or 180 - 45 = 135

$\therefore \sin 45 = \sin 135$

b) $\cos$ [redacted] $= -\cos(-60°)$

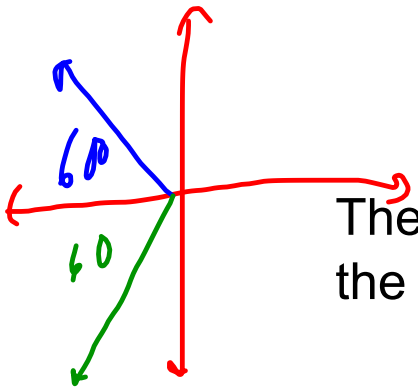
To solve this problem, once again, I start by sketching the angle. To sketch a negative angle, start at the positive x-axis and move in the opposite direction (clockwise)



-60° is the same as 300° and is in quadrant IV

In quadrant 4, cos is positive, so the negative will be negative!

This means that we are trying to find cases where cos is negative. This happens in quadrants II and III. Now we can draw our angles (in quadrants 2 and 3), knowing that they have a related acute angle of 60°



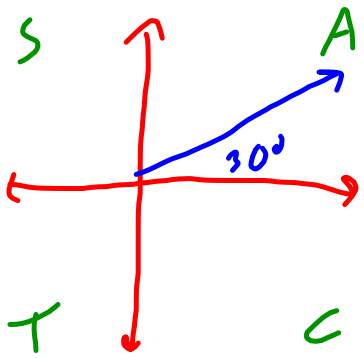
The blue angle is (180-60) = 120° and the green angle is (180+60) = 240°

$\therefore \cos 120 = -\cos(-60)$ and

$\cos 240 = -\cos(-60)$

c) $\tan 30^\circ = \tan$ [redacted]

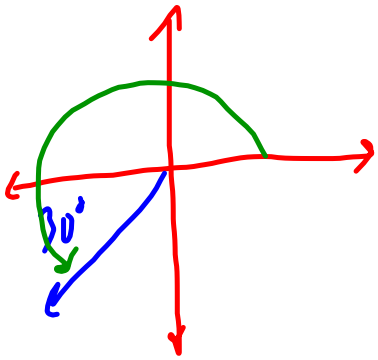
As always, start by sketching the angle.



We are in quadrant I, and we know that tan is positive in quadrant 1.

Therefore, the equivalent tan ratio will be in quadrant 3, where tan is also positive.

The related acute angle will be 30.

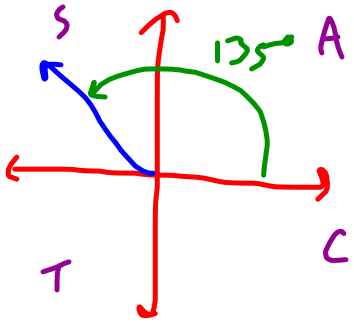


So, our angle is 180+30 = 210°

$\therefore \tan 30^\circ = \tan 210^\circ$

d) $\tan 135° = -\tan$ [redacted]

Draw the angle first and determine the sign (+ or -) on tan 135



tan is negative in quadrant II

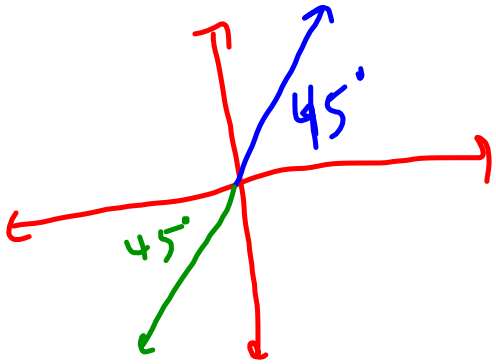
Determine the related acute angle.

In this case, take 180 and subtract 135.

Related acute angle is 45°

Next, I break down the right side. I need the whole thing to be negative. Because there is a negative sign at the beginning, our value of tan must be positive.

This happens in quadrants 1 and 3, where the related acute angle is 45°.



The blue angle is 45°

The green angle is 180 + 45 = 225

$\therefore \tan 135 = -\tan 45$

$\tan 135 = -\tan 225$