CHALLENGE DAY! Name: Answer Key

If A(-3, 6) is rotated 80° cw around the origin, find the coordinates of image to the nearest hundredths.

$d^2 = 3^2 + 6^2$
$d^2 = 9 + 36$
$d = \sqrt{45}$

$\tan(\theta) = \frac{3}{6}$

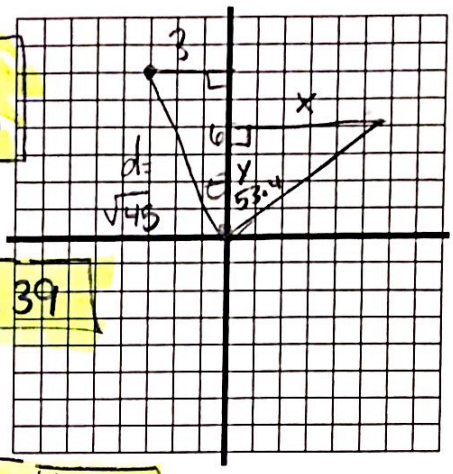
$\theta = 26.56505$

$80 - \theta = 53.4349$
(26.565)

$\sin(53.43) = \frac{x}{\sqrt{45}}$ (ANS) → $x = 5.39$

$\cos(53.43) = \frac{y}{\sqrt{45}}$ (ANS) → $y = 4.00$

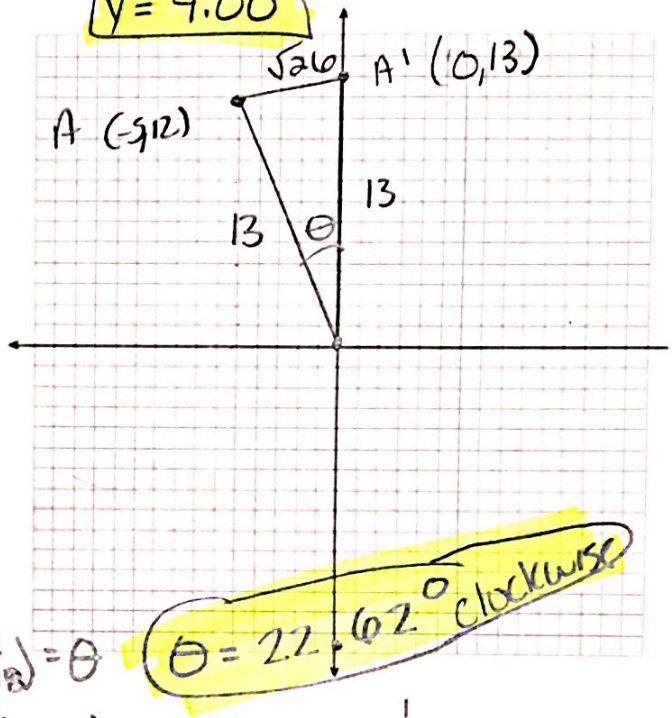
Coordinates (5.39, 4.00)



If A(-5, 12) is rotated about the origin to A'(12, 5), what is the angle of rotation to the nearest hundredth of a degree?

A'(0, 13)

$AA' = \sqrt{(-5-0)^2 + (12-13)^2}$
$\sqrt{(-5)^2 + (1)^2} = \sqrt{25+1} = \sqrt{26}$

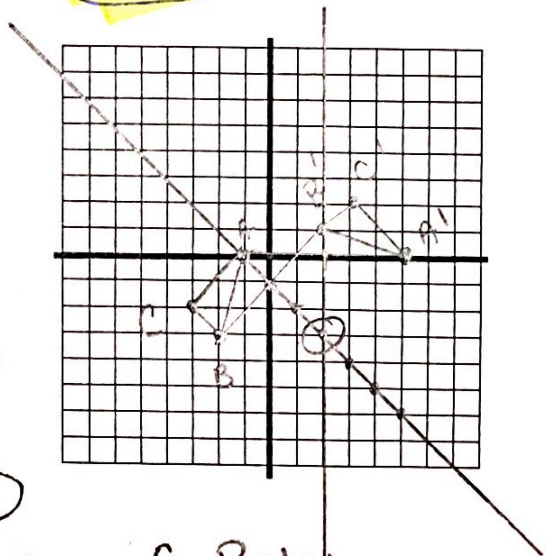


Law of Cosines

$(\sqrt{26})^2 = 13^2 + 13^2 - 2(13)(13)\cos\theta$
$26 = 169 + 169 - 338\cos\theta$
$-338 \quad -169 \quad -169$
$\frac{-312}{-338} = \frac{-338\cos\theta}{-338}$
$\cos\theta = \frac{312}{338}$
$\cos^{-1}\left(\frac{312}{338}\right) = \theta$

$\theta = 22.62^\circ$ clockwise

If ΔABC, A(-1, 0), B(-2, -3), and C(-3, -2), is rotated to A'(5, 0), B'(2, 1), and C'(3, 2). Find the center of rotation.



A to A'

$MP = \left(\frac{-1+5}{2}, \frac{0+0}{2}\right)$
$MP = (2, 0)$
$m = \frac{0-0}{5-1} = 0$
$\perp m$ = undefined
Equation
$x = 2$

B to B'

$MP = \left(\frac{2+-2}{2}, \frac{1+-3}{2}\right)$
$(0, -1)$
$m = \frac{-3-1}{-2-2} = \frac{-4}{-4} = 1$
$\perp m = -1$
Equation
$y + 1 = -1(x - 0)$
$y + 1 = -1x - 1$
$y = -1x - 1$

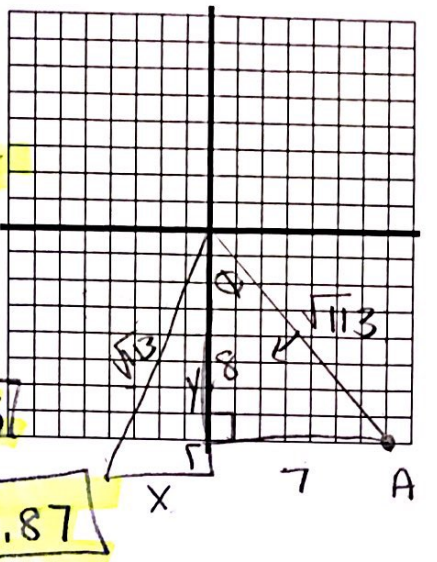
System

$\begin{cases} x = 2 \\ y = -1x - 1 \end{cases}$
$y = -1(2) - 1$
$y = -2 - 1$
$y = -3$

Center of Rotation
(2, -3)

Extra Homework Problems:

If A(7, -8) is rotated 63° ~~ccw~~ cw around the origin, find the coordinates of image to the nearest hundredths.



$\tan\theta = \frac{7}{8} = 41.18592517$

Coordinates
(3.95, -9.87)

$63 - 41.18592517$

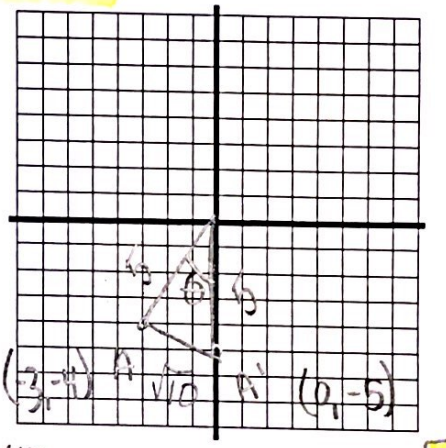
21.81407483

$d = \sqrt{113}$

$\sin(21.814_{ANS}) = \frac{x}{\sqrt{113}}$ $x = 3.95$

$\cos(21.814_{ANS}) = \frac{y}{\sqrt{113}}$ $y = 9.87$

If A(-3, -4) is rotated about the origin to A'(0,- 5), what is the angle of rotation to the nearest hundredth of a degree?



$A \text{ to } A' = \sqrt{(-3-0)^2 + (-4+5)^2}$

$= \sqrt{(-3)^2 + (1)^2} = \sqrt{9+1} = \sqrt{10}$

Law of Cosines

$(\sqrt{10})^2 = 5^2 + 5^2 - 2(5)(5)\cos\theta$

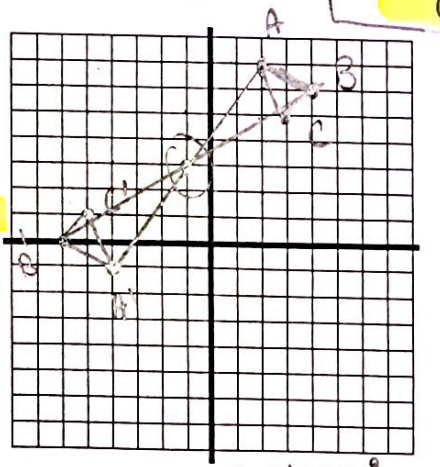
$10 = 25 + 25 - 50\cos\theta$

$-50 \quad -50$

$\frac{-40}{-50} = \frac{-50\cos\theta}{-50}$ $\cos\theta = \frac{40}{50}$ $\cos^{-1}\left(\frac{40}{50}\right) = \theta$ $\theta = 36.87$ CCW

If ΔABC, A(2, 7), B(4, 6), and C(3, 5), is rotated to A'(-4, -1), B'(-6, 0), and C'(-5, -1). Find the center of rotation.

A'(-4, -1)



Center of Rotation = (-1, 3)

A to A'

$MP = \left(\frac{2+-4}{2}, \frac{7+-1}{2}\right)$

$(-1, 3)$

$m = \frac{-1-7}{-4-2} = \frac{-8}{-6} = \frac{4}{3}$

$\perp m = \frac{-3}{4}$

$y - 3 = -\frac{3}{4}(x+1)$

$y - 3 = -\frac{3}{4}x - \frac{3}{4}$

$+3 \quad +3$

$y = -\frac{3}{4}x + \frac{9}{4}$

B to B'

$MP = \left(\frac{4+-6}{2}, \frac{6+0}{2}\right)$

$MP\ (-1, 3)$

$m = \frac{0-6}{-6-4} = \frac{-6}{-10} = \frac{3}{5}$

$\perp m = \frac{-5}{3}$

$y - 3 = \frac{-5}{3}(x+1)$

$y - 3 = \frac{-5}{3}x - \frac{5}{3}$

$+3 \quad +3$

$y = -\frac{5}{3}x + \frac{4}{3}$

System:

$-\frac{3}{4}x + \frac{9}{4} = -\frac{5}{3}x + \frac{4}{3}$

$+\frac{5}{3}x \quad -\frac{9}{4} \quad +\frac{5}{3}x \quad -\frac{9}{4}$

$\frac{12}{11}, \frac{11}{12}x = \frac{-11}{12} \cdot \frac{12}{11}$

$x = -1$

$y = 3$