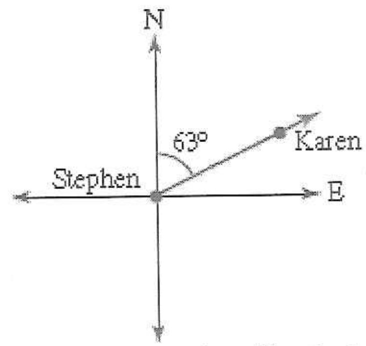
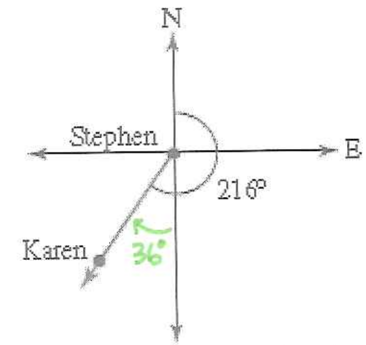
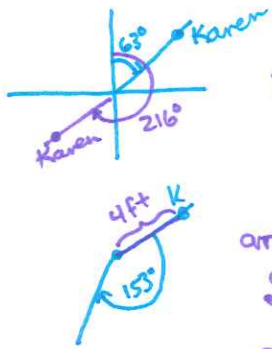
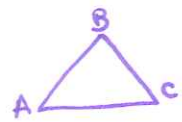
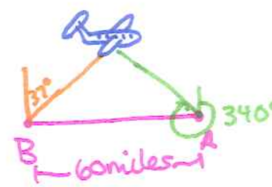
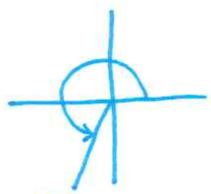
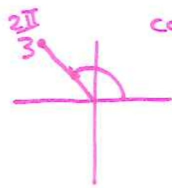
Target 5A: Describe and convert between radian and degree measure

DOK 1 Apply	DOK2 Analyze	DOK2 Analyze
Express 200° in radians. Express $\frac{7\pi}{18}$ in degrees.	 Using the diagram above, describe the bearing of Karen. Convert the angle to radians.	 Using the diagram above, describe the bearing of Karen. Convert the angle to radians.
$200°\left(\frac{\pi}{180°}\right) = \frac{20\cancel{0}\pi}{18\cancel{0}} = \boxed{\frac{10\pi}{9}}$ or $\boxed{3.491}$ $\frac{7\cancel{\pi}}{18} \cdot \frac{180°}{\cancel{\pi}} = 7(10) = \boxed{70°}$	Karen's bearing : $\boxed{N\ 63°\ E}$ $63°\left(\frac{\pi}{180°}\right) = \boxed{\frac{7\pi}{20}}$ or $\boxed{1.100}$	Karen's bearing : $216 - 180 = 36°$ $\boxed{S\ 36°\ W}$ $36°\left(\frac{\pi}{180°}\right) = \boxed{\frac{\pi}{5}}$ or $\boxed{0.628}$

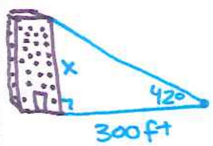
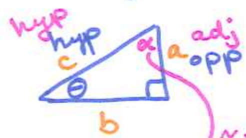
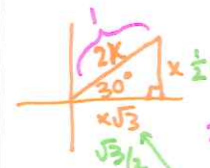
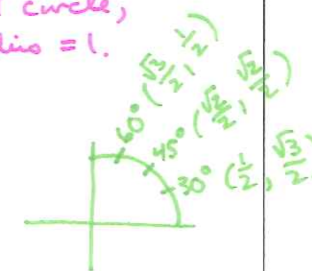
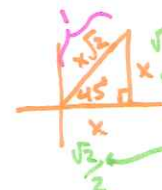
Target 5A: Describe and convert between radian and degree measure

DOK3 Analyze	DOK3 Understand	DOK4 Understand
Using the two drawings to the left, Karen is 4 feet from Stephen. How far did Karen move if she rotates from her 1st location to her 2nd location?	Can the radian measure of all three angles in a triangle be integers? Explain your thinking with supporting work.	Control Tower A is 60 miles east of control tower B. At a certain time an airplane is at a navigational angle of 340° from tower A and 37° from tower B. Describe why knowing this information would be useful.
 $216° - 63° = 153°$ arc length $S = r\Theta$ ← Θ in radians $\Theta = 153°$ $= 153\left(\frac{\pi}{180}\right)$ $= 2.670$ ↑ store in calc. $S = 4(2.670)$ $S = 10.681$ ft $\boxed{\text{Karen moved } 10.681 \text{ ft}}$	 In a Δ, all $\angle$s sum up to 180°. $180° = \pi$ radians so, can $\angle A + \angle B + \angle C = \pi$ if $\angle A, \angle B, \& \angle C$ are integers? Integers are whole #s (positive/negative) So, Can 3 integers add up to π? No! $\therefore$, the 3 $\angle$s of Δ if measured in radians can't be integers.	 This information could be used to find out how far the plane is from Tower A or from Tower B, or how high the plane is from the ground.

Target 5B/C/D: Generate Unit Circle from Special Right Triangles; Evaluate Trig Functions & Expressions Using Unit Circle; Use Reference Angles to Evaluate Trig Ratios Given Specific Constraints

DOK 1 Remember	DOK 1 Apply	DOK2 Translate
Identify the coordinates of the point on the terminal side of $\frac{4\pi}{3}$.	For $\theta = \frac{2\pi}{3}$, evaluate $\sec\theta$ and $\tan\theta$.	Given $\sec\theta = \frac{13}{5}$ and $\sin\theta < 0$, find $\tan\theta$. $13 \leftarrow$ hyp $5 \leftarrow$ adj $\hookrightarrow$ sine is negative
 $\frac{4\pi}{3}$ $\boxed{\left(-\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)}$	 $\frac{2\pi}{3}$ coordinates: $\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$ $\cos\theta \uparrow$ $\nwarrow \sin\theta$ $\sec\theta = \frac{1}{\cos\theta}$ $\sec\frac{2\pi}{3} = \frac{1}{-1/2}$ ~~sec~~ $\sec\frac{2\pi}{3} = \boxed{-2}$ $\tan\theta = \frac{y}{x}$ or $\frac{\sin\theta}{\cos\theta}$ $\tan\frac{2\pi}{3} = \frac{\sqrt{3}/2}{-1/2}$ $= \frac{\sqrt{3}}{2} \cdot -\frac{2}{1}$ $\tan\frac{2\pi}{3} = \boxed{-\sqrt{3}}$	$\sec\theta = \frac{1}{\cos\theta} = \frac{hyp}{adj}$ $\cos\theta = \frac{adj}{hyp}$  hyp 13, -12 opp, 5 adj, θ (5, 12, 13) ... ☺ $5^2 + a^2 = 13^2$ $25 + a^2 = 169$ $a^2 = 144$ $a = 12$ need -12 b/c sin must be negative $\tan\theta = \frac{opp}{adj}$ $= \boxed{\frac{-12}{5}}$

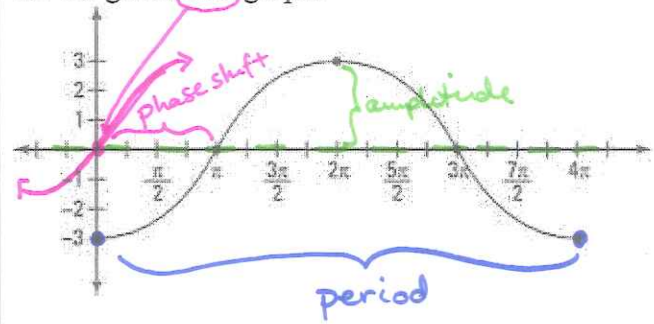
Target 5B/C/D: Generate Unit Circle from Special Right Triangles; Evaluate Trig Functions & Expressions Using Unit Circle; Use Reference Angles to Evaluate Trig Ratios Given Specific Constraints

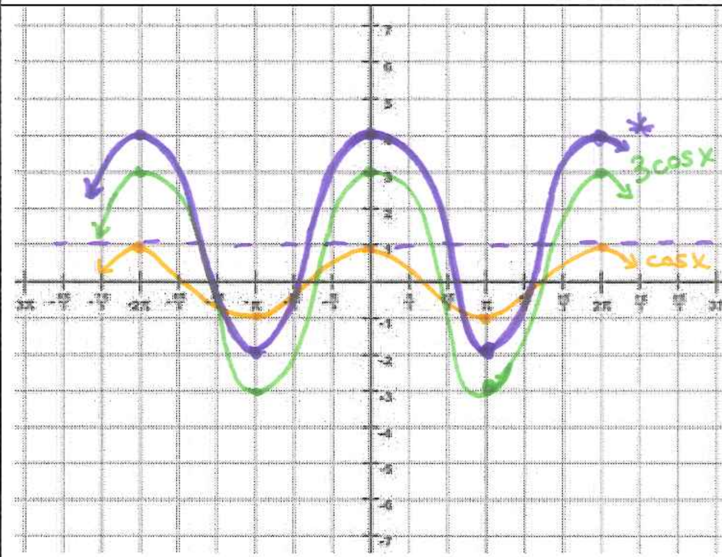
DOK3 Apply	DOK4 Evaluate	DOK4 Understand
From a point 300 ft along a horizontal line from the base of a building, the angle of elevation to the top of the building is 42°. How tall is the building?	Explain why the sine of an acute angle is equal to the cosine of its complement. ↳ ∠ + its complement add up to 90°	Show how special right triangles are used to generate the unit circle.
 $\tan 42° = \frac{x}{300}$ $300\tan 42° = x$ $270.121 = x$ $\boxed{\text{The building is 270.121 ft tall.}}$	Draw a right △.  $\alpha + \theta = 90°$ so, $\alpha = 90 - \theta$ (an ∠ and it's complement add up to 90) $\sin\theta = \frac{opp}{hyp} = \frac{a}{c}$ equal $\cos\alpha = \frac{adj}{hyp} = \frac{a}{c}$ ∴ sine of acute angle is equal to cosine of its complement	 In unit circle, radius = 1. $2x = 1$ $x = \frac{1}{2}$   $x\sqrt{2} = 1$ $x = \frac{1}{\sqrt{2}}$ $x = \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$ $x = \frac{\sqrt{2}}{2}$  $2x = 1$ $x = \frac{1}{2}$

Target 5E: Rigid and Non-Rigid Transformations of Sinusoids

<table>
<tr><th>DOK 1 Apply</th><th>DOK2 Apply</th><th>DOK2 Apply</th></tr>
<tr>
<td>Identify the amplitude and period for:

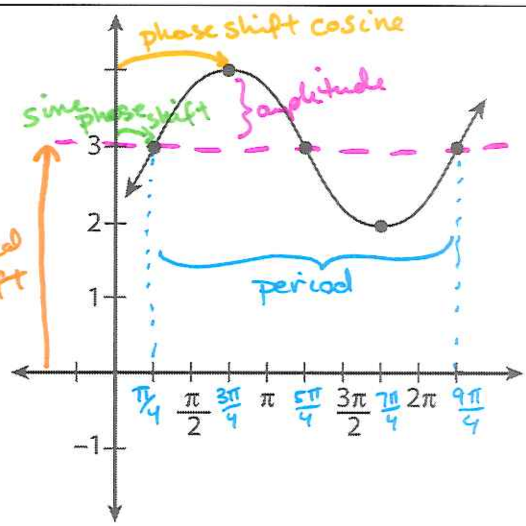
$y = 4\sin 6x$</td>
<td>Sketch two full periods of the graph of the function:

$f(x) = \underbrace{3}_{\text{amplitude } 3}\cos x \underbrace{+ 1}_{\text{vertical shift up } 1}.$</td>
<td>Identify the amplitude, period, and the phase shift for the given sine graph.
</td>
</tr>
<tr>
<td>amplitude $= |a|$
$= \boxed{4}$

period $= \frac{2\pi}{|b|}$
$= \frac{2\pi}{6}$
$= \boxed{\frac{\pi}{3}}$</td>
<td>
* final graph
$f(x) = 3\cos x + 1$</td>
<td>$\boxed{\text{amplitude} = 3}$
$\boxed{\text{period} = 4\pi}$
$\boxed{\text{phase shift} = \pi \text{ to the right}}$</td>
</tr>
</table>

Target 5E: Rigid and Non-Rigid Transformations of Sinusoids

DOK3 Understand



Write two different functions for the given graph.

amplitude = 1 , so $a = 1$

period $= \frac{9\pi}{4} - \frac{\pi}{4} = \frac{8\pi}{4} = 2\pi$

$\frac{2\pi}{b} = 2\pi$

$2\pi = 2\pi b$

so, $1 = b$

vertical shift = 3 up, so, $d = 3$

phase shift for sine $= \frac{\pi}{4}$ right

$\frac{c}{b} = \frac{\pi}{4}$

$c/1 = \pi/4$

$c = \pi/4$

phase shift cosine $= \frac{3\pi}{4}$ right

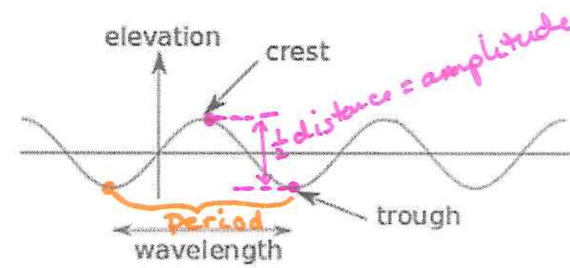
$\frac{c}{1} = \frac{3\pi}{4}$

$c = \frac{3\pi}{4}$

① $\boxed{y = \sin(x - \pi/4) + 3}$

② $\boxed{y = \cos\left(x - \frac{3\pi}{4}\right) + 3}$

DOK4 Understand



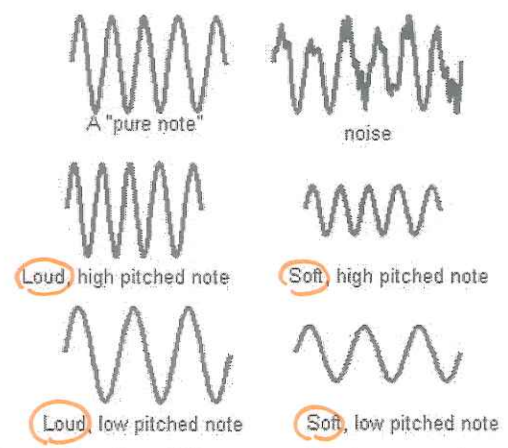
A tsunami wave can be modeled by a sine curve. Describe the terminology used for a tsunami wave in terms of the terminology used for sinusoidal curves.

The wavelength of a tsunami is the period of a sinusoidal curve

Half the vertical distance from the crest to the trough is the amplitude of a sinusoidal curve.

$\left(\frac{1}{2}(\text{crest} - \text{trough}) = \text{amplitude}\right)$

DOK4 Understand



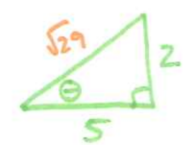
Describe the differences in the sound waves of notes shown above in terms of the terminology used for sinusoidal curves.

Loud notes have greater amplitudes than soft notes.

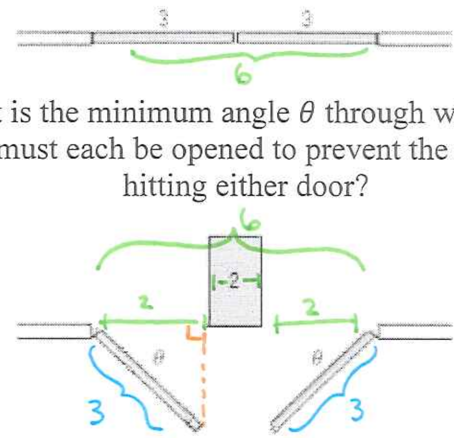
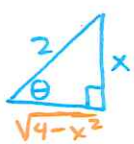
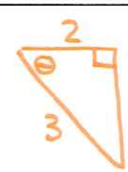
High-pitched notes have shorter periods than low-pitched notes.

A "pure note" is sinusoidal while noise is not sinusoidal.

Target 5F: Evaluate Inverse and Composite Trigonometric Functions and Expressions Using the Unit Circle

DOK 1 Apply	DOK2 Understand	DOK2 Understand
Evaluate, in radians, $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$ and $\arcsin\left(\frac{\sqrt{2}}{2}\right)$.	Using a calculator, evaluate $\cos^{-1}(0.32)$, in degrees. Explain what your answer means.	Evaluate $\sin\left(\underbrace{arctan\left(\frac{2}{5}\right)}_{\theta}\right)$ opp adj
$\cos^{-1}\left(\frac{\sqrt{3}}{2}\right) = \boxed{\frac{\pi}{6}}$ $\arcsin\left(\frac{\sqrt{2}}{2}\right) = \boxed{\frac{\pi}{4}}$	$\cos^{-1}(.32) = \boxed{71.337^\circ}$ This means the cosine of $71.337°$ is 0.32.	 $5^2+2^2=c^2$ $25+4=c^2$ $29=c^2$ $\sqrt{29}=c$ $\sin(\underbrace{\arctan(\tfrac{2}{5})}_{})$ $\frac{opp}{hyp} \rightarrow \sin(\theta)$ $\boxed{\frac{2}{\sqrt{29}}}$

Target 5F: Evaluate Inverse and Composite Trigonometric Functions and Expressions Using the Unit Circle

DOK3 Understand	DOK3 Apply	DOK4 Analyze
Evaluate $\cos\left(\underbrace{arcsin\left(\frac{x}{2}\right)}_{\theta}\right)$. opp hyp	 What is the minimum angle θ through which the doors must each be opened to prevent the cart from hitting either door?	Explain why for all real numbers x $\sin(\sin^{-1} x) = x$ is ~~true~~ false.
 $x^2 + a^2 = 2^2$ $x^2 + a^2 = 4$ $a^2 = 4 - x^2$ $a = \sqrt{4-x^2}$ $\cos(\underbrace{\arcsin(\frac{x}{2})})$ $\cos(\theta)$ $\frac{adj}{hyp}$ $\boxed{\frac{\sqrt{4-x^2}}{2}}$	 $\cos\theta = \frac{2}{3}$ $\cancel{\cos^{-1}}(\cancel{\cos}\,\theta) = \cos^{-1}(\frac{2}{3})$ $\theta = \cos^{-1}(\frac{2}{3})$ $\theta = 48.190°$ The minimum angle the doors must be opened is 48.190°	If $x = \frac{1}{2}$, $\sin(\sin^{-1}(\frac{1}{2}))$ $\sin(\pi/6)$ $\frac{1}{2}$ example. but, if $x > 1$ or $x \leq -1$, then if $x = 2$, $\sin(\underbrace{\sin^{-1}(2)}_{\text{undefined}})$ $\therefore$, $\sin(\sin^{-1}(x)) \neq x$ So, $\sin(\sin^{-1} x) = x$ is only true when $-1 \leq x \leq 1$