

5.4 Hard as Nails

A Practice Understanding Task



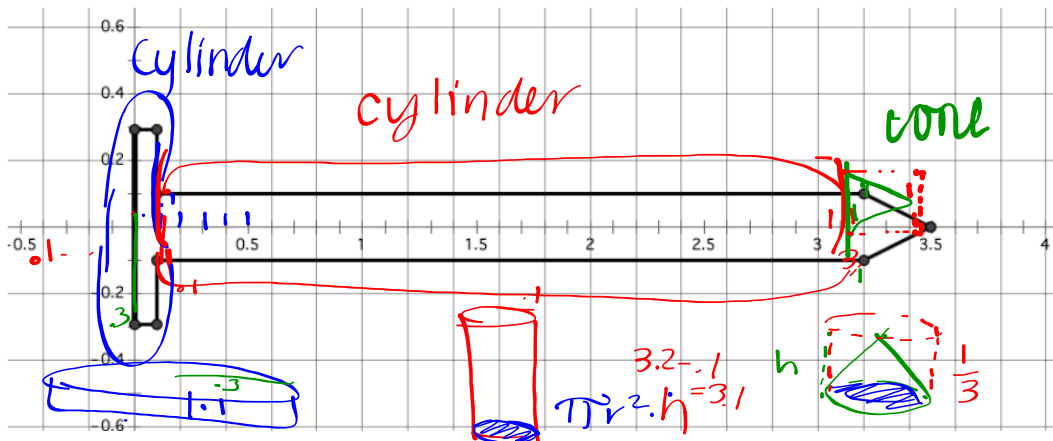
Tatiana is helping her father purchase supplies for a deck he is building in their back yard. Based on her measurements for the area of the deck, she has determined that they will need to purchase 24 decking planks. These planks will be attached to the framing joists with 16d nails. (Tatiana thinks it is strange that these nails are referred to as "16 penny nails" and wonders where that way of naming nails comes from. After doing some research she has found that in the late 1700s in England the size of a nail was designated by the price of purchasing one hundred nails of that size. She doubts that her dad will be able to buy one hundred 16d nails for 16 pennies.)

Begin Task 1.

Nails are sold by the pound at the local hardware store, so Tatiana needs to figure out how many pounds of 16d nails to tell her father to buy. She has gathered the following information.

- The deck requires 24 decking planks $\times 216$
- Each plank requires 9 nails to attach it to the framing joists
- 16d nails are made of steel that has a density of 4.65 oz/in³
- There are 16 ounces in a pound

Tatiana has also found the following drawing of a cross section of a 16d nail. She knows she can use this drawing to help her find the volume of the nail, treating it as a solid of revolution. (Note: The scale on the x- and y-axis is in inches.)



1. Devise a plan for finding the volume of the nail based on the given drawing. Describe your plan in words, and then show the computations that support your work.

$$V_{\text{total}} = \pi r^2 h + \pi r^2 h + \frac{1}{3} \pi r^2 h$$

$$= \pi (0.3)^2 \cdot 0.1 + \pi (0.1)^2 (3.1) + \frac{1}{3} \pi (0.1)^2 (0.3)$$

$$= 0.0283 + 0.0974 + 0.0031$$

$$V_{\text{total}} = 0.1288 \text{ in}^3$$

2. Devise a plan for finding the number of pound of 16d nails Tatiana's father should buy. Describe your plan in words, and then show the computations that support your work.

Nails needed: $24 \times 9 = 216$ nails

Weight of one nail: $\text{Volume} \times \text{density}$

Total weight of 216 nails: $0.1288 \text{ in}^3 \times 4.65 \frac{\text{oz}}{\text{in}^3} = 59892 \text{ oz}$

Total weight in pounds: $59892 \text{ oz} \times \frac{1 \text{ lb}}{16 \text{ oz}} = 3743.25 \text{ lbs}$

Total weight in pounds = 8.08 lbs

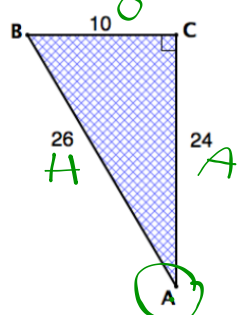
Ready

Topic: Finding the trigonometric ratios in a triangle

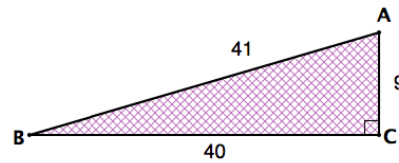
Use the given measures on the triangles to write the indicated trig value. Write them as a fraction. Then write them as a decimal rounded to thousandths place.



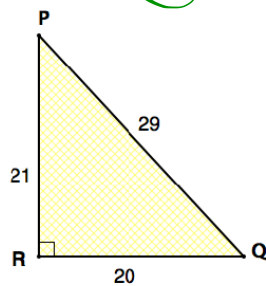
1. $\sin A = \frac{10}{26}$
 $\cos A = \frac{24}{26}$
 $\tan A = \frac{10}{24}$



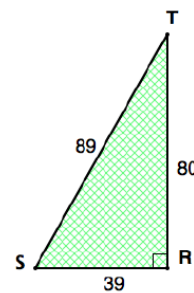
2. $\sin B =$
 $\cos B =$
 $\tan B =$



3. $\sin P =$
 $\cos P =$
 $\tan P =$



4. $\sin S =$
 $\cos S =$
 $\tan S =$



5. Which trigonometric ratio is **exact**, the fraction or the decimal?

Explain.

$\frac{1}{3}$ more accurate $.3333333333$

6. My calculator tells me that $\frac{\sqrt{2}}{2} = 0.7071067812$. Is one value more accurate than the other?

Explain.

Name _____

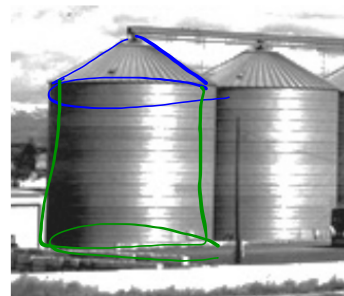
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Set

Topic: Applications of volume, weight, and density

7. The figure at the right is of 2 grain, storage silos. The diameter of each measures 24 feet and the height of the cylinder measures 51 feet. The height of the cone adds an additional 12 feet. Find the total volume of one silo.

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8. How many bushels of grain will each silo be able to store, if a bushel is 1.244 cubic feet? (Assume it can be filled to the top.)

$$\frac{V_{\text{total}}}{V_{\text{bushel}}} = \# \text{ of bushels}$$

$$\underline{\hspace{2cm}} =$$

9. Density relates to the degree of compactness of a substance. A cubic inch of gold weighs a great deal more than a cubic inch of wood because gold is more dense than wood. The density of grains also varies. Use the information below to calculate how many tons of each grain can be stored in one silo. (1 ton = 2000 lbs.)

$$1 \text{ bushel of oats weighs } 32 \text{ pounds} = \# \text{ of bushels (\#s)} \times \text{weight of this grain} = \text{total weight in Silo} \times \frac{1 \text{ ton}}{2000 \text{ lbs}}$$

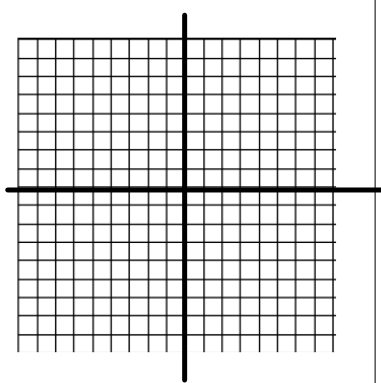
1 bushel of barley weighs 48 pounds

1 bushel of wheat weighs 60 pounds

10. A $\frac{3}{4}$ -ton pickup has the capacity to haul a little more than 1500 lbs. If the hauling bed of the pickup measures 4 ft. by 6.5 ft. by 2 ft., can a $\frac{3}{4}$ -ton pickup safely haul a full (level) load of oats, barley, or wheat? Justify your answer for each type of grain.

<p>11. Equation: $f(x) = (x - 2)(x + 3)$</p>	<p>Graph:</p>
<p>What I know about this function: <i>Quadratic</i> <i>Parabola</i> <i>positive, open</i></p> <p>End behavior: <i>as $x \rightarrow -\infty$, $f(x) \rightarrow +\infty$</i> <i>as $x \rightarrow \infty$, $f(x) \rightarrow +\infty$</i></p>	<p><i>2 -3 ~ x²</i> <i>pass pass</i></p> <p><i>x y</i> <i>-2 4</i> <i>-1 1</i> <i>0 (-2)(3) = -6</i> <i>1 -1</i> <i>2 0</i></p>

<p>12. Equation: $g(x) = x^2 + 6x + 9$</p>	<p>Graph:</p>
<p>What I know about this function:</p> <p>End behavior: <i>as $x \rightarrow -\infty$, $g(x) \rightarrow \text{---}$</i> <i>as $x \rightarrow \infty$, $g(x) \rightarrow \text{---}$</i></p>	<p><i>boothle or pass?</i></p> <p><i>(x+3)(x+3) = (x+3)²</i></p> <p><i>x y</i> <i>-2 1</i> <i>-1 0</i> <i>0 0</i> <i>1 1</i> <i>2 4</i></p>

<p>13. Equation $y = -x^2 - 4$</p> <p>What I know about this function:</p> <p>End behavior:</p> <p>as $x \rightarrow -\infty$, $y \rightarrow \underline{\hspace{2cm}}$ as $x \rightarrow \infty$, $y \rightarrow \underline{\hspace{2cm}}$</p>	<p>Graph:</p> 
<p>14. Equation: $h(x) = 2(x - 5) + 3$</p> <p>What I know about this function:</p> <p>End behavior:</p> <p>as $x \rightarrow -\infty$, $h(x) \rightarrow \underline{\hspace{2cm}}$ as $x \rightarrow \infty$, $h(x) \rightarrow \underline{\hspace{2cm}}$</p>	<p>Graph:</p> 