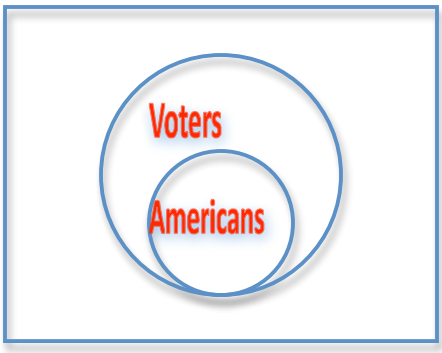
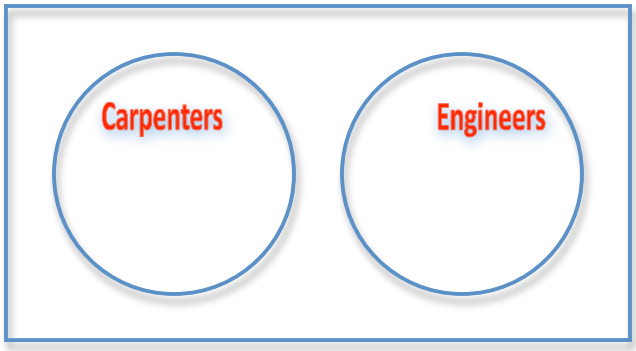
Quiz 3 VA TH

Directions: Read and follow ALL directions. **Do not copy off of others.** You may work together, but write up the answers in your own words and show your own work. **Write neatly! If I can't read it…IT'S WRONG!**

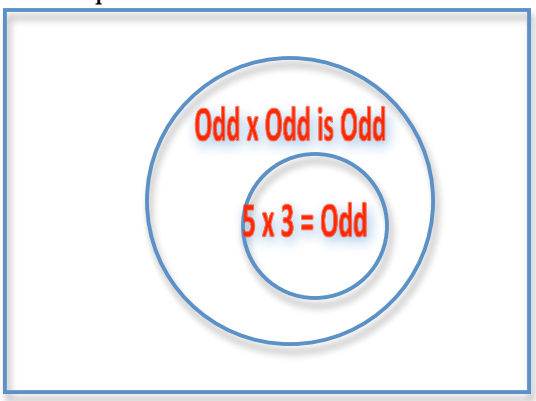
1. Draw Venn diagrams to represent the following relationships:
   a. All Americans are people who vote.



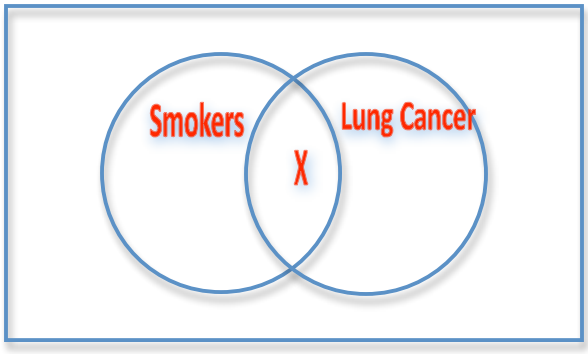
   b. No carpenters are engineers.



   c. If an odd number times an odd number is an odd number, then five times three equals an odd number.



d. Some smokers have lung cancer. (Some smokers are people who have lung cancer.)



The X marks the region claimed to have members.

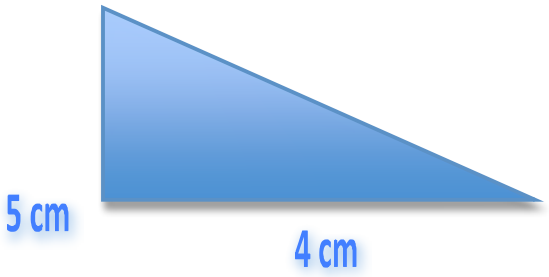
2. Consider the triangle below. Determine the length of the hypotenuse in **inches**. Round all answers to two decimal places. Explain how you arrived at your answer and what mathematical ideas you used.

We have $a^2 + b^2 = c^2$ by the Pythagorean Theorem. Thus, we have

$25cm^2 + 16cm^2 = 41cm^2$. So, taking the square root gives about 6.4 cm.

THIS IS NOT THE ANSWER! We need units of INCHES, so we convert:

$6.4cm \times \frac{.39in}{1cm} \approx 2.5in$. This is our answer, about 2.5 inches.



3. Gas mileage for vehicles varies based on driving conditions such as speed. Suppose your car averages 38 miles per gallon during highway driving at an average speed of 55 miles per hour, but gets only 32 miles per gallon on the highway if you drive at an average speed of 70 miles per hour. Answer the following:

a. What is the driving time for a 2500 mile trip if you drive at an average speed of 55 miles per hour? What is the driving time if you drive at an average speed of 70 miles per hour?

2500 miles x 1 hour/55 miles is about 45 hours at 55 mph
2500 miles x 1 hour/70 miles is about 35.7 hours at 70 mph

b. Take gasoline prices to be $3.50 per gallon. What is the cost for gasoline on this 2500 mile trip if you average 55 miles per hour? How about the cost if you average 70 miles per hour?

At 55 mph, your car get 38 mpg. So, we find
2500 miles x 1 gallon / 38 miles = 65.8 gallons used.
So, at 55 mph, you'll pay $3.50 per gallon x 65.8 gallons = $230

At 70 mph, your car gets 32 mpg. So,
2500 miles x 1 gallon/32 miles = 78.13 gallons.
So, you use MORE fuel at 70mph than you do at 55 mph.
Hence: $3.50 x 78.13 gallons costs about $273.44

4. You are planning to purchase a new home. Using the discussion on page 139 – 142 as a guide (this was also covered in class), answer the following questions.
   a. Home A has a price tag of $220,000. Home B costs $190,000.
      i. Using home A as the reference value, determine the absolute and relative differences between the two choices. Write the relative difference using a percent.
         Abs. diff = $190,000 - $220,000 = -$30,000
         Rel. diff = -$30,000/$220,000 = -13.63%
      ii. Using home B as the reference value, determine the absolute and relative differences between the two choices. Write the relative difference using a percent.
         Abs. diff = $30,000
         Rel.diff = $30,000/$190,000, which is about 16%
   b. Explain what the absolute and relative differences are saying in part i. In other words, describe in a paragraph what the answers mean.
      The absolute difference in part a tells you home B costs $30,000 LESS than home A (IE, home B costs $30,000 less when compared to home A.) The absolute difference in part b tells you home A costs $30,000 MORE than home B (IE, home A costs $30,000 more when compared to home B.)

      The relative differences say the same things, but using percentages. So, part a tells you home B costs about 13.63% less than home A. Likewise, part b tells you home A costs about 16% more than home B.

5. Do the following statements make sense? Explain why or why not.
   a. Jacob is 120% shorter than Tom.

Absolutely not. Jacob would have negative height here.

b. Since the start of the recession, the cost of homes has fallen by 100%.
No way, unless homes are given away for free. That's what this says!

c. The cost of electronic devices has increased by 50%, that's an increase of 150%!
The first part is OK, but the second part is a problem. This is only an increase of 50%, not 150%. An increase of 150% implies that the cost has doubled, plus an additional 50%.

d. An F-16C is 130% slower than an F-22A.
No, this makes no sense. If the F-16C is 130% slower than the F-22A, then the F-16C would have negative speed.

e. A Boeing 747 is 130% faster than a Learjet 28.
Yes, this is possible.

6. Given the following conversion factors and information, compute the approximate distance in miles from the Earth to Proxima Centauri, the nearest star to our planet (excluding the sun.) SHOW ALL WORK!
Distance from Earth to Proxima Centauri: 4.37 light-years (ly)
Note: A light-year is the distance light travels in one year.
Light travels at a speed of 186 thousand miles per second.

HINTS: Use a calculator. Round all your numbers to three significant digits to make things easier. You'll want to use scientific notation in this problem since the numbers will be VERY LARGE. When done, you should find Proxima Centauri is somewhere between 22 trillion miles and 28 trillion miles distant from Earth.

First, this is NOT a possible exam question. However, it is doable. Here's how:

First, determine how far light travels in 1 year.

$$\frac{186{,}000\,miles}{\sec} \times \frac{3600\sec}{1hr} \times \frac{24\,hr}{1day} \times \frac{365\,days}{1year} \approx \frac{5.866 \times 10^{12}\,miles}{year}$$

That's 5.866 trillion miles in one year. (This is the size of a light year)

The final step: Proxima Centauri is 4.37 light years away. The previous computation tells us that:

$5.886 \times 10^{12}\,miles = 1$ light year

So we have

$4.37 \text{ light years} \times 5.886 \times 10^{12} \approx 25.634 \text{ trillion miles } \left(25.634 \times 10^{12} miles\right)$

7. Using your answer in problem 6, determine how long it would take in years for you to reach Proxima Centauri if flying non-stop in a 747 traveling at 500 miles per hour.

Determine how far this jet would travel in 1 year:

$\frac{500 miles}{hr} \times \frac{24 hr}{1 day} \times \frac{365 day}{1 year} = \frac{4{,}380{,}000 miles}{year}$ So, this jet will cover 4,380,000 miles in one year. How long will it take to cover the 4.37 light years? Simply divide this number into the final answer for problem six:

$25.634 \times 10^{12} miles \times \frac{1 year}{4{,}380{,}000 miles} \approx 5{,}853{,}000 years$, or about 5.8 million years.