MATH 5e: Class Work 17

Topics: Square root of a number

- The square root of $\boldsymbol{a}$ is a number whose square is equal to a. For example, the square root of 25 is 5 because $5^2 = 25$ and -5 because $(-5)^2 = 25$. Then, the square root of 25 is $\sqrt{\mathbf{25}} = \pm\mathbf{5}$

  Notation: the square root of a number, $\boldsymbol{a}$, is commonly denoted as $\sqrt{\boldsymbol{a}}$.

- Use the power rules; similarly to $(ab)^n = a^n b^n$, $\sqrt{ab} = \sqrt{a}\sqrt{b}$.
  For example, $\sqrt{36} = \sqrt{9 \times 4} = \sqrt{9} \times \sqrt{4} = 3 \times 2 = 6$. And we also know that $\sqrt{36} = 6$.

- Theorem (Pythagorean theorem). In a right triangle with legs (sides) a, b and hypotenuse c, one has:

$$a^2 + b^2 = c^2$$
$$c = \sqrt{a^2 + b^2}$$

Do it on your own

Review: $a^m a^n = a^{m+n}$ and $a^{m+n} = a^m a^n$
$(ab)^n = a^n b^n$ and $a^n b^n = (ab)^n$
$(a^m)^n = a^{m \times n}$

1. Using the formula above, simplify the expression in a). Present the expression in b) as a product

   a) $3^5 = 3^2 \times \_\_$

   b) $6^2 = (\quad \times \quad)^2 = \quad \times 2$

   c) $(2^3)^2\, 6^{-2} 3^2 =$

Problems

2. Work with pawers, review

   a) Express 64 as a power with base 2

   b) Express 45 as a power with base 5, then as a product of powers with base 5 and 3

   c) Express 120 as a product of powers with different bases

MATH 5e: Class Work 17

3. Calculating square root using the relation that $\sqrt{a^2} = |a|$ and that $\sqrt{ab} = \sqrt{a}\sqrt{b}$, write the number under the square root as a power raised to 2. Present the answer in the simplest form possible.

   a) **Example:** $\sqrt{50} = \sqrt{2 \cdot 25} = \sqrt{2 \cdot 5^2} = \sqrt{2} \cdot \sqrt{5^2} = 5\sqrt{2}$

   b) $\sqrt{45} =$

   c) $\sqrt{2^3 \cdot 3^2} =$

   d) $\sqrt{6^5 \cdot 3^7} =$

4. Calculating square root using the relation that $(\sqrt{a})^2 = \sqrt{a}\sqrt{a} = \sqrt{aa} = \sqrt{a^2} = |a|$

   a) $(\sqrt{5})^2 =$ $(\sqrt{3})^2 =$

   b) $(\sqrt{4})^3 =$ $(\sqrt{11})^3 =$

   c) $(\sqrt{13})^4 =$

5. Try on your own

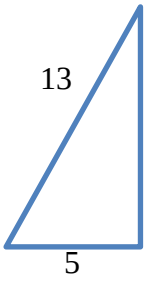
   a) $\frac{\sqrt{6}}{\sqrt{3}} =$

   b) $\frac{\sqrt{24}}{(\sqrt{6})^3} =$

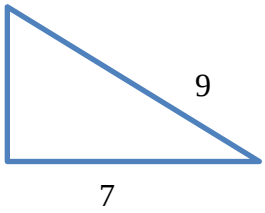
6. Rational and irrational numbers
   a) Give examples of decimal numbers that can be written as a fraction.
   b) Are there numbers that cannot be written as fractions?

7. Susan comes to the store to buy oil and vinegar for a salad dressing for her huge party. A bottle of oil is 4 times as expensive as a bottle of vinegar. If Susan decides to buy 2 bottles of oil and 3 bottles of vinegar, she will have 8 dollars left. If she decides to buy 4 bottles of oil and 2 bottles of vinegar, she will need 6 more dollars. How much money will she have left if she buys 1 bottle of oil and 1 bottle of vinegar?

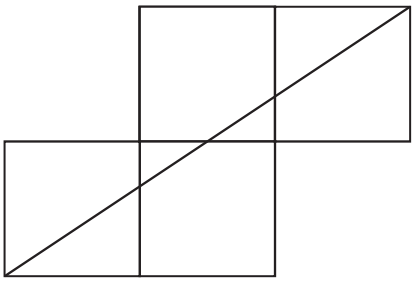
8. What is the area of the following triangles
   a)



   b)



9. The figure is made of 4 equal squares. What is the length of the diagonal?



10. In a right triangle, one side has a length of 5 units and the other of 6 units. What are the possibilities for the length of the 3rd side? Be careful; you do not know if any of these sides is the hypothenuse.