Topics: Square root of a number

- The square root of **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 $\sqrt{25} = \pm 5$

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

- 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 on your own

1. $5x + 3 = 13 - 2x$

2. $(x - 2)(x + 2) = 3(x - 2)$

3. $|x + 7| = 10$

Problems

Review: $(a + b)(a - b) =$

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

   a) $(2 + 5x)(2 - 5x) =$

   b) $16 - x^2 =$

   c) *Find other numbers than multiplied by themselves give* $25, 9, 36 \dots$

2. Fill in the missing numbers

   a) $\sqrt{25} =$ $\sqrt{9} =$ $\sqrt{36} =$

   b) $\sqrt{5^2} =$ $\sqrt{3^2} =$ $\sqrt{6^2} =$ $\sqrt{-6^2} =$ $\sqrt{(-6)^2} =$

c) $4^2 =$ $\qquad$ $(-4)^2 =$ $\qquad$ $\sqrt{} = 4$ $\qquad$ $\sqrt{} = -4$ $\qquad$ $\sqrt{-16} =$

3. Use the properties of the square root, $\sqrt{ab} = \sqrt{a}\,\sqrt{b}$ and $\sqrt{a^2} = a$

   a) $\sqrt{36} =$

   b) $\sqrt{4+5} =$

   c) $\sqrt{100} =$

   d) $\sqrt{6^4} =$

   e) $\sqrt{2^2 2^8} =$

4. If Alice comes to the store with 27 dollars and buys 4 jumping ropes, she will have the same amount of money left as if she comes to the store with 42 dollars and buys 6 jumping ropes. What is the price of one jumping rope?

5. Science textbooks are 3 times more expensive than history textbooks. John can try to buy 5 science textbooks for his class but he will be 8 dollars short, or 12 history textbooks and have 8 dollars left. What is the price of one science and one history textbook? How much money does John have? Use variables for the unknown quantities and create equations.

6. Proof of the Pythagorean theorem: $a^2 + b^2 = c^2$
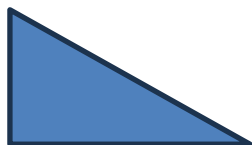
7. What is the size of the diagonal in a square with a side of 1 cm? In a square with a size of 10 cm?

8. If, in a right triangle, one leg has a length of 4 units and the hypotenuse has a length of 5 units, what is the other leg?

9. A right-angled isosceles triangle with sides of 10 centimeters and 10 centimeters is folded in half, as shown in the figure. How much longer is the perimeter of the unfolded triangle compared to the folded one?

10 cm   10 cm

Fold here
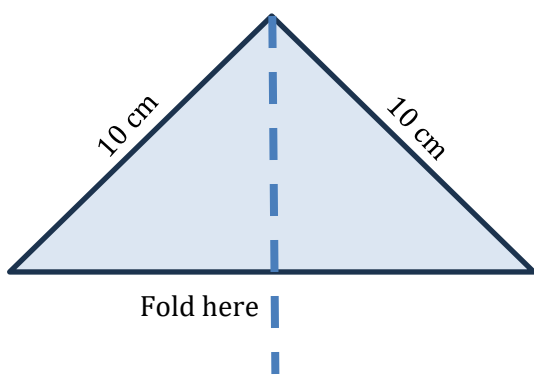
If time - work in groups.

10. 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?