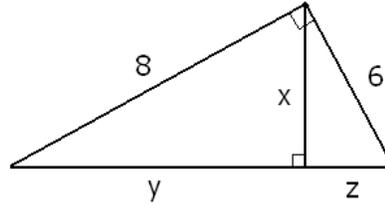
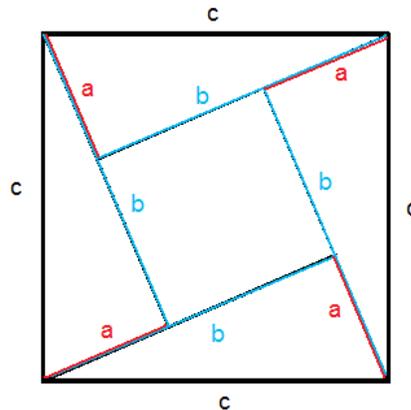


- Solve each of the following inequalities.
 - $(x + 3)(x - 8) > 0$
 - $\frac{x + 3}{x - 8} > 0$
- Suppose that a is a number such that $\frac{1}{a^7} + a^7 = 5$. Find the exact value of $\frac{1}{a^{14}} + a^{14}$. (Hint: you do not need to find the value of a .)
- Find the last digit of the number 7^{207} . (Hint: if you do not know it for a large number, try 1, 2, 3, 4, ... and the idea will come!)
- Simplify $2^n + 2^n$. (Hint: if you do not know in general, try $n = 1, 2, 3, 4, \dots$, and the idea will come!)
- Solve each of the following word problems, using either an equation or a system of equations.
 - A farmer has some chickens and cows. One day he was asked: "*How many chickens and how many cows do you have?*" His answer was: "*All together, there are 73 heads and 188 legs*". How many chickens and how many cows does the farmer have?
 - A total of \$ 20 000 is to be invested in bonds and stocks. If the amount invested in bonds is to be \$ 4500 more than the amount invested in stocks, how much money is invested in each category?
 - Sally worked 50 hours last week and made \$495 for the week. For every hour worked over 40 her job pays time and a half. What is Sally's regular hourly pay rate?
- An object is moving along a vertical line. The height of the object (measured in meters) is a function of time, measured in seconds. This function is given as $h(t) = -5t^2 + 30t + 200$. Find the average velocity of the object between
 - $t = 0$ s and $t = 2$ s
 - $t = 3$ s and $t = 5$ s
 - $t = 4$ s and $t = 9$ s
- An object is moving along a vertical line. The height of the object (measured in meters) is a function of time, measured in seconds. This function is given as $h(t) = -8t + 120$. Find the average velocity of the object between
 - $t = 0$ s and $t = 2$ s
 - $t = 3$ s and $t = 5$ s
 - $t = 4$ s and $t = 9$ s
- Find an equation of the straight line that passes through the points $(3, -1)$ and $(1, 5)$.
- A straight line passes through points $(a, 0)$ and $(0, b)$, where $a, b \neq 0$. Prove that the line has the following equation:
$$bx + ay = ab$$
- Banks X and Y offer slightly different business checking accounts. Bank X charges \$ 10 per month for the account and then 12 cents for every check cashed. Bank Y charges \$ 14 per month for the account and 10 cents for every check cashed.
 - Which deal is better if we cash 85 checks per month? Explain your answer.
 - Which deal is better if we cash 300 checks per month? Explain your answer.
 - If we cash n checks in a month, the two offers are identical. Find the value of n .
- Find the point(s) where the graphs of $y = 4x - x^2 + 5$ and $y = 6x + 2$ intersect each other.
- A 6.1 ft tall person is standing 43.8 ft away from a street light that is 28 ft tall. How long is his shadow?

13. The picture below shows a right triangle. Find x , y , and z .



14. A bus travels between cities A and B. The distance between these cities is 60 miles. It takes the bus 2 hours to get from A to B. On its way back, the traveling time was only 1.5 hours. Find the average speed of the bus for
- the trip from A to B
 - the trip from B to A
 - for the roundtrip.
15. A bus travels between cities A and B. From A to B, the bus has an average speed of v_1 . On its way back, the average speed is v_2 . Express the average speed of the bus in terms of v_1 and v_2 .
16. True or false? Prove or show a counter-example for each of the following statements
- For every rational numbers x and y , the sum $x + y$ is also rational.
 - For every rational numbers x and y , the product xy is also rational.
 - For every irrational numbers x and y , the sum $x + y$ is also irrational.
 - For every irrational numbers x and y , the product xy is also irrational.
17. Let a , b , and c be sides of a right triangle, with c being the longest. The picture shown below depicts four identical copies of this right triangle.
- Find the area of the square in terms of its side.
 - Find the area of the square as the sum of five areas: the four triangles and the rectangle in the middle.



18. What is the smallest value that the expression $x^2 - 12x + 37$ can take? Verify your answer.

19. The arithmetic and geometric means. Suppose that a and b are positive numbers. Prove that $\sqrt{ab} \leq \frac{a+b}{2}$ and the equality holds if and only if $a = b$.
20. The geometric and harmonic means. Suppose that a and b are positive numbers. Prove that $\frac{2ab}{a+b} \leq \sqrt{ab}$ and the equality holds if and only if $a = b$.
21. Find the equation of the set of all points in the plane that are 5 units away from the point $(2, -1)$.
22. Find the equation of the set of all points whose distance from the point $\left(0, \frac{1}{4}\right)$ is equal to the distance from the straight line $y = -\frac{1}{4}$.