

Study Guide: Solving Equations and Inequalities

Please complete this study guide and submit it when you take your test. If you have questions, please make sure you ask me before December 14!!

Solving Equations

- Your goal in solving equations is to get x to equal a number. This is often called “**isolating the variable.**”
- You can use number properties (**like distributive and associative properties**) to simplify terms on one side of the equal sign if possible.
- You can also **combine like terms** on each side of your equation.
- Use **if-then moves to modify BOTH SIDES** of the equation to create 1's or 0's in order to isolate the variable.

Special Tips for Solving Word Problems

- **READ** the problem **VERY CAREFULLY**. Convert each important part of the problem from words to symbols before piecing it all together.
- Identify **WHAT** you are trying to solve. This will usually be your variable. This is usually a part of the question in a word problem.
- **LOOK FOR KEY WORDS** like “is” or “equal” and figure out what terms go on the left side of the equal sign, and what terms go on the right side of the equal sign.
Example: Half of a number plus 4 **IS** the same as twice the sum of that number 1.
- In many cases, **DRAWING A PICTURE** will help immensely!
Example: Three paintings are 18 inches in width and need to be evenly spaced on a wall that is 10 feet long. How much room is there going to be in between each painting?
- When you arrive at an answer always ask yourself: **DOES THIS MAKE SENSE??**

Solving and Graphing Inequalities

When solving inequalities, if you are multiplying or dividing by a negative number (to make a 1 in order to isolate the variable), **you need to REVERSE the inequality sign.**

Example:

$500 - 20x \leq 200$	Original Problem
$500 - 20x - 500 \leq 200 - 500$	Subtract 500 from each side of the equation.
$-20x \leq -300$	Simplify
$-20x \div (-20) \leq -300 \div (-20)$	Divide both sides by -20
$x \geq 15$	Simplify AND reverse the inequality sign because you divided by a negative number!

Tips for setting up your inequality statements:

- Read the problem very carefully and create expressions that go on either side of the inequality.
- Phrases like “at most”, “no more than”, or “the maximum” usually mean the inequality symbol will be **less than or equal** (\leq).
- Phrases like “at least”, “no less than”, or “the minimum” usually mean the inequality symbol will be **greater than or equal to** (\geq).
- Many inequality problems can deal with ‘profit.’ Remember that profit is the money that you actually keep AFTER you earn revenue (from selling products) AND pay for your expense (like supplies or rent).

When graphing inequalities...

- Use rays to indicate that there are many solutions to a particular problem.
- Use an **open circle** when the starting point of your solution **IS NOT** a part of the solution set. This is associated with $<$ and $>$.
- Use a **closed circle** when the starting point of your solution **IS** a part of the solution set. This is associated with \leq and \geq .
- Your arrow should go to the **right** when all solutions are **greater than** (or greater than or equal to) the starting point.
- Your arrow should go to the **left** when the all solutions are **less than** (or less than or equal to) the starting point.

The Problem Set

Erika is hanging her little sister's artwork in her room on a 10 foot wall. She has 4 drawings, each of them are 15 inches wide. You want the artwork on the wall so that the distance from the edge of each drawing to the nearest edge of the wall is the same as the distance between drawings. What is that distance?

Since there are 4 drawings, there are 5 spaces all together—and so, we want to know how to create 5 equal spaces. 10 feet is equal to 120 inches, so we can create an equation. I would also draw a picture, but have issues doing that in an answer key like this. Since each drawing is 15 inches and we have 4 of them.

$$5x + 4(15) = 120$$

$$5x + 60 = 120$$

$$5x = 60$$

$$x = 12$$

there needs to be 12 inches between each drawing.

Three consecutive numbers are added together so that the first number plus 3 times the second plus 6 times the third number equal 115. What are the numbers?

Consecutive means in a row...so,

Let x = the first number

$x + 1$ = the second number

$x + 2$ = the third number

$$x + 3(x + 1) + 6(x + 2) = 115$$

$$x + 3x + 3 + 6x + 12 = 115$$

$$(x + 3x + 6x) + (3 + 12) = 115$$

$$10x + 15 = 115$$

$$10x = 100$$

$$x = 10$$

the three numbers are 10, 11, and 12

The largest side of a triangle is 3 more than twice the smallest side. The third side is 8 more than the smallest side. Find the lengths of each side if the perimeter is 33.

Let x = the smallest side
 Let $2x + 3$ = the largest side
 Let $x + 8$ = the third side

$$x + 2x + 3 + x + 8 = 33$$

$$(x + 2x + x) + (3 + 8) = 33$$

$$4x + 11 = 33$$

$$4x = 22$$

$$\frac{4x}{4} = \frac{22}{4}$$

$$x = 5.5$$

The three sides are 5.5, 14, and 13.5.

On a recent trip to Staples, Mr. Rogove bought individual glue sticks for his daughter's class of 25 students. While in line, he picked up a diet coke and a bag of chocolate covered pretzels. The food/drink cost \$4.50. If the total bill came to \$23.25 (before tax), how much was each glue stick?

Let g = the price of glue sticks

$$25g + 4.50 = 23.25$$

$$25g = 18.75$$

$$\frac{25g}{25} = \frac{18.75}{25}$$

$$g = 0.75$$

Each glue stick was \$0.75.

Jessica and Esther were doing Black Friday shopping at Hollister. Jessica bought 2 pairs of identical jeans (but different colors) and 5 tee shirts that each cost \$9.50. Her total bill was \$101. How much were each pair of jeans?

Let j = cost of jeans

$$2j + 5(9.50) = 101$$

$$2j + 47.50 = 101$$

$$2j = 53.50$$

$$\frac{2j}{2} = \frac{53.50}{2}$$

$$j = 26.75$$

Each pair of jeans cost \$26.75

In the World's Strongest Man, contestants lift 5 huge stones to show off their strength. Each stone is 45 pounds heavier than the previous stone. If the total weight of the 5 stones is 1,950 pounds, how much does the heaviest stone weigh?

Let x = the weight of the first stone

$$x + x + 45 + x + 90 + x + 135 + x + 180 = 1950$$

$$5x + 450 = 1950$$

$$5x = 1500$$

$$\frac{5x}{5} = \frac{1500}{5}$$

$$x = 300$$

The heaviest stone is 480 pounds

John is 6 times as old as Jane currently. In 3 years the sum of their ages will be 55. How old are they today?

Let $x = \text{Jane's age currently}$.

$$x + 3 + 6x + 3 = 55$$

$$7x + 6 = 55$$

$$7x = 49$$

$$\frac{7x}{7} = \frac{49}{7}$$

$$x = 7$$

Jane is 7 and John is 42.

Annie spends a fair amount of time in the morning getting ready for school. She spends half her time picking out her clothes and getting dressed. One third of her time is spent in the shower, and she spends 12 minutes eating breakfast. How many minutes does it take Annie to get ready for school?

Let $x = \text{the amount of time it takes Annie to get ready}$

$$\frac{1}{2}x + \frac{1}{3}x + 12 = x$$

$$\frac{5}{6}x + 12 = x$$

$$\frac{1}{6}x = 12$$

$$x = 72$$

It takes Annie 72 minutes to get ready.

**This is a challenging problem, and it's very unlikely that a problem like this will be on our test!

Mr. Rogove decided to buy a deck of cards AND notebooks for each of the 12 members of the bridge club. Each notebook was \$1.75 and overall, Mr. Rogove spent \$51. How much did each deck of cards cost?

Let $c = \text{cost for a deck of cards}$

$$12(c + 1.75) = 51$$

$$12c + 21 = 51$$

$$12c = 30$$

$$c = 2.50$$

Each deck of cards cost \$2.50

On second thought, Mr. Rogove decided to buy each of the 12 bridge players a deck of cards (different price from the deck in the previous problem) and he hosted a pizza party for the club. The pizza party cost Mr. Rogove \$65 and overall, he spent \$104. How much did each deck of cards cost?

Let $c = \text{cost for a deck of cards}$

$$12c + 65 = 104$$

$$12c = 39$$

$$c = 3.25$$

Each deck of cards costs \$3.25.

<p>A rectangle has a length of $x + 2$ and a width of $5\frac{1}{2}$ inches. The area is 44 square inches. Write an equation and find the length of the rectangle. (HINT: draw a picture!!)</p> <p>Area is length times width.</p> $5.5(x + 2) = 44$ $5.5x + 11 = 44$ $5.5x = 33$ $x = 6$ <p>The length of the rectangle is 8 inches.</p>	<p>A different rectangle has a length of $x + 6$ and a width of $7\frac{1}{3}$ inches. The area is $62\frac{1}{3}$ square inches. Write an equation and find the length of the rectangle. (HINT: draw a picture!!)</p> <p>(Area is still length times width)</p> $7\frac{1}{3}(x + 6) = 62\frac{1}{3}$ $\frac{22}{3}x + 44 = 62\frac{1}{3}$ $\frac{22}{3}x = \frac{55}{3}$ $x = \frac{55}{22}$ $x = 2\frac{1}{2}$ <p>The length of the rectangle is $8\frac{1}{2}$ inches.</p>
<p>Golfand charges a ball rental fee of 4.75 and then 1.50 for each round of miniature golf. If Trevor has \$20, how many rounds can he play at most?</p> <p>Let g = the number of rounds of golf played</p> $4.75 + 1.50g \leq 20$ $1.50g \leq 15.25$ $g \leq 10.16$ <p>At most, Trevor can play 10 rounds of golf if he has \$20.00</p>	<p>Alison has \$850 in her bank account. Every week, she withdraws \$16 to pay for her dogwalker. What is the maximum number of weeks that Alison could have her dog walked and still maintain \$275 in her bank account?</p> <p>Let w = the number of weeks</p> $850 - 16w \geq 275$ $-16w \geq -575$ $w \leq 35.9375$ <p>At most, Alison can have her dog walked for 35 weeks before her balance dips below \$275. 00</p> <p>**Remember, when dividing by negative number, flip the inequality!!</p>

NAME: _____

Math 7.1

Tran/ Rogove

Date: _____

At most, Christian can spend \$75 on sandwiches and chips for a picnic. He already bought chips for \$9, and will buy sandwiches that cost \$4.50 each. Write and solve an inequality to show how many sandwiches he can buy.

Let s = the number of sandwiches Christian buys.

$$9 + 4.50s \leq 75.00$$

$$4.50s \leq 66.00$$

$$s \leq 14.\bar{6}$$

At most, Christian can buy 14 sandwiches for the picnic.

Max earned \$7.55 per hour plus an additional \$100 in tips waiting tables on Saturday. He earned at least \$160 in all. What is the minimum number of hours that Max worked on Saturday?

Let x = the number of hours Max worked

$$7.55x + 100 \geq 160$$

$$7.55x \geq 60$$

$$x \geq 7.94 \dots$$

Max had to work at least 8 hours to make \$160 with tips and salary.