

Inequalities Day 2 Key

1. Ian needs to save at least \$85 for a new pair of basketball shoes. He has \$25 in his piggy bank and can save \$12 from his allowance each week. How many weeks will Ian need to save to earn at least \$85? Write and solve an inequality. Graph the solution.

$$\begin{aligned}
 w &= \# \text{ of weeks} \\
 25 + 12w &\geq 85 \\
 12w &\geq 60 \\
 w &\geq 5
 \end{aligned}$$



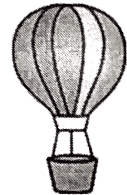
2. The temperature in the ice rink must stay below 50 degrees Fahrenheit. This morning the temperature was 71 degrees. The ice rink runs a cooling device that can decrease the temperature by 3.5 degrees every hour. How many hours will it take for the temperature to fall below 50 degrees? Write and solve an inequality. Graph the solution.

$$\begin{aligned}
 h &= \# \text{ of hours} \\
 71 - 3.5h &< 50 \\
 -3.5h &< -21 \\
 h &> 6
 \end{aligned}$$



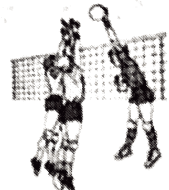
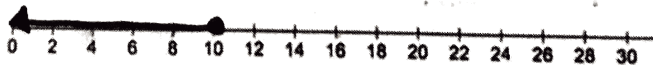
3. Zoe and her dad go on a hot air balloon ride over the weekend. In order to remain safe, they cannot exceed an elevation of 450 feet. If they start at an elevation of 120 feet and rise at a rate of 15 feet per minute, how many minutes can they continue to rise? Write and solve an inequality. Graph the solution.

$$\begin{aligned}
 m &= \# \text{ of minutes} \\
 120 + 15m &\leq 450 \\
 15m &\leq 330 \\
 m &\leq 22
 \end{aligned}$$



4. The volleyball team at Meigs raised \$350 to buy a new net and some volleyballs. The net costs \$180 and each ball costs \$17. If the team does not want to exceed the amount of money they raised, how many volleyballs can they buy? Write and solve an inequality. Graph the solution.

$$\begin{aligned}
 v &= \# \text{ of volleyballs} \\
 180 + 17v &\leq 350 \\
 17v &\leq 170 \\
 v &\leq 10
 \end{aligned}$$



5. Martha has gotten a 79 and a 90 on her two math quizzes so far. She also took one test, which counts triple (is worth the same as three quizzes), and got an 85. Martha has another quiz coming up. What does she need to get on this quiz if she wants to average at least an 87? Write and solve an inequality.

$$\frac{79 + 90 + 85 + 85 + 85 + x}{6} \geq 87$$

$$424 + x \geq 522$$

$$x \geq 98$$

6. **Explain the Error** Sven is trying to find the maximum amount of time he can spend practicing the five scales of piano music he is supposed to be working on. He has 60 minutes to practice piano and would like to spend at least 35 minutes playing songs instead of practicing scales. So, Sven sets up the following inequality, where t is the number of minutes he spends on each scale, and solves it.

$$\begin{aligned} 60 - 5t &\leq 35 \\ -5t &\leq -25 \\ t &\geq 5 \end{aligned}$$

incorrect sign

Sven has concluded that he should spend 5 minutes or more on each scale. Is this correct? If not, what mistake did he make? Then solve for the correct answer.

$$\begin{aligned} \text{It should be } 60 - 5t &\geq 35 \\ -5t &\geq -25 \\ t &\leq 5 \end{aligned}$$

He should spend 5 minutes or less on each scale.

7. Find the solution set of each inequality below, and then determine which inequalities have the same solution set as $\frac{1}{3}(-5x - 3) < 14$.

a. $\frac{1}{3}(5x + 3) > -14$

$$\frac{5}{3}x + 1 > -14$$

$$\frac{3}{5} \cdot \frac{5}{3}x > -15 \cdot \frac{3}{5}$$

$$x > -9 \quad \text{YES.}$$

$$-\frac{5}{3}x - 1 < 14$$

$$-\frac{3}{5} \cdot -\frac{5}{3}x < 15 \cdot \frac{-3}{5}$$

$$x > -9$$

b. $\frac{2}{5}(10x + 20) > 44$

$$4x + 8 > 44$$

$$4x > 36$$

$$x > 9 \quad \text{No.}$$

c. $-\frac{2}{5}(10x + 20) < -44$

$$-4x + -8 < -44$$

$$-4x < -36$$

$$x > 9 \quad \text{No.}$$

d. $-\frac{1}{3}(5x + 3) < 14$

$$-\frac{5}{3}x - 1 < 14$$

$$-\frac{3}{5} \cdot -\frac{5}{3}x < 15 \cdot \frac{-3}{5}$$

$$x > -9$$

YES.

Key

Elsa, the cafeteria manager, has to be careful with her spending and manages the cafeteria so that they can serve the best food at the lowest cost. To do this, Elsa keeps good records and analyzes all of her budgets.

1. Elsa's cafeteria has those cute little cartons of milk that are typical of school lunch. The milk supplier charges \$0.35 per carton of milk, in addition to a delivery charge of \$75. What is the maximum number of milk cartons that Elsa can buy if she has budgeted \$500 for milk?

a. Write and solve an inequality that models this situation.

$.35m + 75 \leq 500$
 $.35m \leq 425$
 $m \leq 1214.28...$
 $m \leq 1214$

of
M = milk cartons

b. Describe in words the quantities that would work in this situation.

1214 cartons or less can be purchased with \$500

c. Write your answer as an inequality (keep the context in mind).

$m \leq 1214$
 $0 \leq m \leq 1214$

2. Students love to put ranch dressing on everything, so Elsa needs to keep plenty in stock. The students eat about 2.25 gallons of ranch each day! Elsa started the school year with 130 gallons of ranch dressing. She needs to have at least 20 gallons left when she reorders to have enough in stock until the new order comes. For how many days will her ranch dressing supply last before she needs to reorder?

a. Write and solve an inequality that models this situation

$130 - 2.25d \geq 20$
 $-2.25d \geq -110$
 $d \leq 48.88...$
 $d \leq 48$

switch the sign!

d = # of days

b. Describe in words the quantities that would work in this situation.

she needs to reorder in 48 days or less

c. Write your answer as an inequality (keep the context in mind).

$d \leq 48$
 $0 \leq d \leq 48$

3. The prices on many of the cafeteria foods change during the year. Elsa finds that she has ordered veggie burgers four times and paid \$78, \$72, \$87, and \$90 on the orders. To stay within her budget, Elsa needs to be sure that the average order of veggie burgers is not more than \$82. How much can she spend on the fifth order to keep the average order within her budget?

a. Write and solve an inequality that models this situation.

x = veggie burger cost

$\frac{78 + 72 + 87 + 90 + x}{5} \leq 82$
 $78 + 72 + 87 + 90 + x \leq 410$
 $327 + x \leq 410$
 $x \leq 83$

b. Describe in words the quantities that would work in this situation.

she needs to spend \$83 or less to keep the average less than or equal to \$82

c. Write your answer as an inequality (keep the context in mind).

$x \leq 83$
 $0 \leq x \leq 83$

4. Elsa can purchase ready-made pizzas for \$14.50 each. If she makes them in the cafeteria, she can spend \$44.20 on ingredients and \$6.25 per pizza on labor. For how many pizzas is it cheaper for the cafeteria to make the pizzas themselves rather than buy them ready-made?

a. Write and solve an inequality that models this situation.

$p = \# \text{ of pizzas}$

$$14.50p > 44.20 + 6.25p$$

$$8.25p > 44.20$$

$$p > 5.35 \dots \quad p > 5$$

b. Describe in words the quantities that would work in this situation.

if they make more than 5 pizzas they should make them in the cafeteria to save money

c. Write your answer as an inequality (keep the context in mind).

$p > 5 \text{ or } p \geq 6$

5. Elsa is comparing prices between two different suppliers of fresh lettuce. Val's Veggies charges \$250 for delivery plus \$1.50 per bag of lettuce. Sally's Salads charges \$100 for delivery plus \$4.00 per bag of lettuce. How many bags of lettuce must be purchased for Val's Veggies to be the cheaper option?

a. Write and solve an inequality that models this situation.

$b = \# \text{ of bags of lettuce}$

$$\begin{array}{l} \text{Val's veggies} \quad \text{Sally's Salads} \\ 250 + 1.50b < 100 + 4b \\ 150 + 1.50b < 4b \\ 150 < 2.50b \\ 60 < b \end{array} \rightarrow b > 60$$

b. Describe in words the quantities that would work in this situation.

more than sixty bags of lettuce must be purchased for Val's Veggies to be the better option

c. Write your answer as an inequality (keep the context in mind).

$b > 60$

6. Each student that buys school lunch pays \$2.75. The cafeteria typically brings in between \$1168.75 and \$1438.25. How many students does the cafeteria usually serve?

a. Write and solve an inequality that models this situation.

$s = \# \text{ of students}$

$$1168.75 < 2.75s < 1438.25$$

$$425 < s < 523$$

b. Describe in words the quantities that would work in this situation.

the cafeteria serves between 425 + 523 students

c. Write your answer as an inequality (keep the context in mind).

$425 < s < 523$

Compound Inequalities

When two simple inequalities are combined into one statement by the words AND or OR, the result is called a **compound inequality**.

Translate these phrases into "math language." Graph the solution.

- All real numbers greater than 2 AND less than 6

$$2 < x < 6$$



- All real numbers greater than or equal to 2 AND less than or equal to 6

$$2 \leq x \leq 6$$



- All real numbers less than 2 OR greater than 6

$$x < 2 \text{ OR } x > 6$$



- All real numbers less than or equal to 2 OR greater than or equal to 6

$$x \leq 2 \text{ OR } x \geq 6$$



- All numbers between 8 and 16

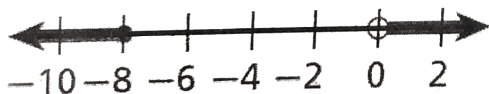
$$8 < x < 16$$



- All numbers between 8 and 16 inclusive

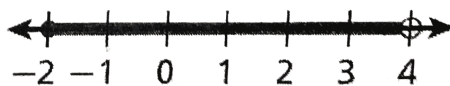


Write the compound inequality shown by each graph.



$$x \leq -8 \text{ OR } x > 0$$

$$-8 \geq x \quad 0 < x$$



$$-2 \leq x < 4$$

~~$$4 > x \geq -2$$~~

