

Equations & Inequalities Unit Study Guide

$$\begin{array}{r}
 1. \quad -3x - 11 > 46 \\
 \quad \quad +11 \quad +11 \\
 \hline
 -3x > 57 \\
 \quad \quad -3 \quad -3 \\
 \hline
 \boxed{x < -19}
 \end{array}$$

← remember, invisible 1 in front of x

$$\begin{array}{r}
 2. \quad 10 - x \leq 35 \\
 \quad \quad -10 \quad -10 \\
 \hline
 -x \leq 25 \\
 \quad \quad -1 \quad -1 \\
 \hline
 \boxed{x \geq -25}
 \end{array}$$

$$\begin{array}{r}
 3. \quad \frac{x}{2} - 8 \geq 18 \\
 \quad \quad +8 \quad +8 \\
 \hline
 \frac{x}{2} \geq 26 \quad (2) \\
 \hline
 \boxed{x \geq 52}
 \end{array}$$

$$\begin{array}{r}
 4. \quad 30 < 2x - 6 \\
 \quad \quad +6 \quad +6 \\
 \hline
 36 < 2x \\
 \quad \quad 2 \quad 2 \\
 \hline
 18 < x \\
 \hline
 \boxed{x > 18}
 \end{array}$$

$$\begin{array}{r}
 5. \quad 1.5x + 12 < 18 \\
 \quad \quad -12 \quad -12 \\
 \hline
 1.5x < 6 \\
 \quad \quad 1.5 \quad 1.5 \\
 \hline
 1.5 \sqrt{6} \\
 15 \overline{) 60} \\
 \underline{45} \\
 15 \\
 \underline{15} \\
 0
 \end{array}$$

$\boxed{x < 4}$

$$\begin{array}{r}
 6. \quad 16 \geq 6 + \frac{x}{2} \\
 \quad \quad -6 \quad -6 \\
 \hline
 10 \geq \frac{x}{2} \quad (2) \\
 \hline
 20 \geq x \\
 \hline
 \boxed{x \leq 20}
 \end{array}$$

7. Jasmine has a budget of \$600.00 to spend on home renovations. She will spend \$175.00 on a new sink and countertops. The countertops cost \$35 per square foot. Write an inequality that represents the maximum number of square feet Jasmine can purchase.

Variable: C = sq. ft of counters

600 = total
 175 = one time fee
 35 = rate of change

Inequality: 35c + 175 ≤ 600

8. Hayden earns \$9.50 per hour as a lifeguard. He earns a bonus of \$50.00 for taking a training course. Write an inequality to represent how many hours must he work to earn at least \$300.00.

Variable: h = # of hours worked

300 = total
 50 = one time fee
 9.50 = rate of change

Inequality: 9.5h + 50 ≥ 300

9. An online music service charges a \$12.00 registration fee plus \$1.50 for each song downloaded. If Mary Beth has a gift card with \$60.00, then write an equation to represent how many songs she can download if she uses the full gift card amount.

Variable: $d = \#$ of downloaded songs

$60 = \text{total}$
 $12 = \text{one time fee}$
 $1.5 = \text{rate of change}$

Equation: $1.5d + 12 = 60$

Solve the inequality. Then graph it on the number line.

10. $7x + 22 \geq 15$
 $\frac{7x + 22}{-22 \quad -22} \geq \frac{15}{-22 \quad -22}$
 $\frac{7x}{7} \geq \frac{-7}{7}$
 $x \geq -1$

11. $-8x - 10 > -26$
 $\frac{-8x - 10}{+10 \quad +10} > \frac{-26}{+10 \quad +10}$
 $\frac{-8x}{-8} > \frac{-16}{-8}$
 $x < 2$

12. $12x + 12 \leq 72$
 $\frac{12x + 12}{-12 \quad -12} \leq \frac{72}{-12 \quad -12}$
 $\frac{12x}{12} \leq \frac{60}{12}$
 $x \leq 5$



13. A 15-passenger van is rented for a family vacation. The van rental is \$60.00 per day, plus a \$145.00 insurance fee. How many days can the van be rented if they want to spend no more than \$625.00 on the van rental? Write and solve an inequality.

$60d + 145 \leq 625$
 $\frac{60d + 145}{-145 \quad +145} \leq \frac{625}{-145 \quad +145}$

$\frac{60d}{60} \leq \frac{480}{60}$

$d \leq 8$

Inequality: $60d + 145 \leq 625$

Solution: $d \leq 8$

$60 = \text{rate of change}$
 $145 = 1 \text{ time fee}$
 $625 = \text{total}$
 $\leq \text{no more than}$

Circle the possible solutions for #14 & 15:

14. $3x - 2 \leq 13$ (0, 1, 5, 7, 10)

$\frac{3x - 2}{+2 \quad +2} \leq \frac{13}{+2 \quad +2}$
 $\frac{3x}{3} \leq \frac{15}{3}$

$x \leq 5$

15. $72 > \frac{x}{4} + 50$ (-5, 0, 6, 8, 100)

$\frac{72}{-50 \quad -50} > \frac{\frac{x}{4} + 50}{-50 \quad -50}$
 $(4) 22 > \frac{x}{4} (4)$

$88 > x$

$x < 88$

Write and solve an equation for #16 and #17.

16. Jennifer bought ^{3.75 milk} 3 cartons of milk for \$1.25 each and 6 donuts. The total cost was \$6.90. Write and solve an equation to determine the cost of each donut.

$$\begin{array}{r} 6d + 3.75 = 6.90 \\ -3.75 \quad -3.75 \\ \hline 6d = 3.15 \\ \frac{6d}{6} = \frac{3.15}{6} \\ d = 0.525 \end{array}$$

Equation: $6d + 3.75 = 6.90$

Solution: $d = 0.525$ or 0.53

17. Jason purchased 8 trees for his yard. He also had to buy some additional gardening supplies which cost \$84. The total cost of the trees and gardening supplies was \$260. What was the cost of each tree?

$$\begin{array}{r} 8t + 84 = 260 \\ -84 \quad -84 \\ \hline 8t = 176 \\ \frac{8t}{8} = \frac{176}{8} \\ t = 22 \end{array}$$

Equation: $8t + 84 = 260$

Solution: $t = 22$

18. Felix joins a gym so he can play basketball. The gym charges a \$20 annual fee, plus \$15 per month. Felix prepays by writing a check for \$185. Write an equation that can be used to find m , the number of months that Felix prepaid for. Then, solve the equation.

$$\begin{array}{r} 15m + 20 = 185 \\ -20 \quad -20 \\ \hline 15m = 165 \\ \frac{15m}{15} = \frac{165}{15} \\ m = 11 \end{array}$$

Equation: $15m + 20 = 185$

Solution: $m = 11$

19. $\frac{x}{4} + 5 = 25$

$$\cancel{(4)} \frac{x}{4} = 20 \cancel{(4)}$$

$$x = 80$$

20. $-6x - 10 = 20$

$$\begin{array}{r} -6x - 10 = 20 \\ +10 \quad +10 \\ \hline -6x = 30 \\ \frac{-6x}{-6} = \frac{30}{-6} \\ x = -5 \end{array}$$

$$x = -5$$

21. $-5x + 9 = 24$

$$\begin{array}{r} -5x + 9 = 24 \\ -9 \quad -9 \\ \hline -5x = 15 \\ \frac{-5x}{-5} = \frac{15}{-5} \\ x = -3 \end{array}$$

$$x = -3$$

22. $\frac{x}{2} - 7 = -10$

$$\cancel{(2)} \frac{x}{2} = -3 \cancel{(2)}$$

$$x = -6$$

23. $20x - 17 = 33$

$$\begin{array}{r} 20x - 17 = 33 \\ +17 \quad +17 \\ \hline 20x = 50 \\ \frac{20x}{20} = \frac{50}{20} \\ x = 2.5 \end{array}$$

$$x = 2.5$$

24. $27 = 3w - 15$

$$\begin{array}{r} 27 = 3w - 15 \\ +15 \quad +15 \\ \hline 42 = 3w \\ \frac{42}{3} = \frac{3w}{3} \\ 14 = w \end{array}$$

$$14 = w$$