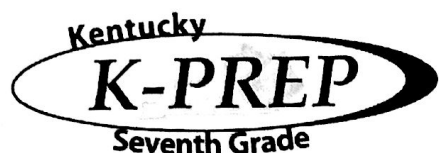


Chapter 9

Equations and Inequalities



This chapter covers the following KCAS 7 standards:

Expressions and Equations

7.EE.1, 7.EE.3, 7.EE.4

9.1 Two-Step Equations (DOK 2)

Rule 1: Put all the integers on one side of the equal sign.

This can be done by adding or subtracting the integers from both sides.

If the integer is positive, subtract the same integer from both sides of the equation.

If the integer is negative, add the same integer to both sides of the equation.

Rule 2: Divide or multiply both sides by the coefficient of the variable.

(Example: $3x$ is equal to $3 \times x$. Because this is multiplication, you must do the opposite. Divide both sides of the equation by 3 to isolate the number from the variable, x .)

Example 1: Solve $3x - 5 = 10$ for x .

$$\begin{array}{r} 3x - 5 = 10 \\ +5 \quad = +5 \\ \hline 3x \quad = 15 \end{array} \quad \text{First, add 5 to both sides.}$$

$$\frac{3x}{3} = \frac{15}{3} \quad \text{Next, divide both sides by 3 to get the answer.}$$

$$x = 5$$

To check, replace x with 5 in the original problem.

$$3(5) - 5 = 10$$

$$15 - 5 = 10$$

$x = 5$ makes this a true sentence.

Solve the following two step equations. Double check your answer by replacing the variable with your solution to see if this will make the sentence true. (DOK 2)

1. $2s + 5 = 9$

9. $5y + 9 = 79$

17. $110y + 10 = 340$

2. $7c + 6 = 13$

10. $7y + 7 = 14$

18. $6j - 6 = 18$

3. $3x + 2 = 14$

11. $4x + 4 = 8$

19. $20r + 3 = 103$

4. $2 + 5x = 12$

12. $4x - 4 = 8$

20. $x + 1 = 1$

5. $3k - 2 = 7$

13. $2w - 1 = 1$

21. $9y - 2 = 25$

6. $4r - 6 = 10$

14. $5w + 8 = 53$

22. $11x + 12 = 34$

7. $3n + 6 = 9$

15. $2x - 10 = 18$

23. $4b - 2 = 42$

8. $7x - 1 = 62$

16. $19m - 12 = 26$

24. $3x + 7 = 43$

9.2 Two-Step Equations with Rational Numbers (DOK 2)

The rules for solving two-step equations can be applied to solving two-step equations with rational numbers with only some minor changes:

Rule 1: Put all the rational numbers on one side of the equal sign.

This can be done by adding or subtracting the rational numbers from both sides.

If the rational number is positive, subtract the same rational number from both sides of the equation.

If the rational number is negative, add the same rational number to both sides of the equation.

Rule 2: Divide or multiply both sides by the coefficient of the variable.

(Example: $\frac{1}{3}x$ is equal to $\frac{1}{3} \times x$. Because this is multiplication, you must do the opposite to both sides of the equation to isolate the number from the variable, x . In other words, you must divide. Remember that dividing fractions is also the same as multiplying by the reciprocal.)

Example 2: Solve for x : $5x - 2 = 6.3$

Step 1: Add 2 to both sides of the equation:

$$\begin{array}{rcl} 5x & - & 2 & = & 6.3 \\ & & + & 2 & +2 \\ \hline 5x & & & = & 8.3 \end{array}$$

Step 2: Divide both sides of the equation by 5: $\frac{5x}{5} = \frac{8.3}{5}$

Answer: $x = 1.66$

9.2 Two-Step Equations with Rational Numbers (DOK 2)

Solve the following two step equations with rational numbers. Double check your answer by replacing the variable with your solution to see if this will make the sentence true. (DOK 2)

1. $\frac{2}{3}x + 8 = 20$

2. $1.25x - 3.2 = 9.55$

3. $\frac{1}{4} + 1\frac{1}{2}x = \frac{3}{8}$

4. $0.25 + 1.11x = 5.8$

5. $\frac{1}{2}x + \frac{1}{2} = \frac{1}{2}$

6. $\frac{1}{2}x - \frac{1}{2} = \frac{1}{2}$

7. $9x - 6 = 7.5$

8. $3.3x + 9.8 = 19.04$

9. $\frac{2}{5} + \frac{3}{10}x = \frac{5}{9}$

10. $9.3 + 5.6x = 26.1$

11. $15.82x - 13.5 = 6.275$

12. $1\frac{1}{5}x + \frac{2}{3} = 1\frac{2}{3}$

13. $18x - 1\frac{5}{9} = -1$

14. $5.9x - 1.026 = 17.5$

15. $\frac{1}{8}x + \frac{3}{5} = 8\frac{3}{5}$

16. $0.2x - 5.6 = -3.2$

9.3 Combining Like Terms (DOK 1)

In algebra problems, separate **terms** by + and - signs. The expression $5x - 4 - 3x + 7$ has 4 terms: $5x$, 4 , $3x$, and 7 . Terms having the same variable can be combined (added or subtracted) to simplify the expression. $5x - 4 - 3x + 7$ simplifies to $2x + 3$.

$$\begin{array}{c}
 \swarrow \quad \searrow \quad \swarrow \quad \searrow \\
 5x - 4 - 3x + 7 = 2x + 3
 \end{array}$$

Simplify the following expressions.

1. $4x + 8x =$

8. $5 - 10t + 3 - 7t =$

15. $-d + 4 + 3d - 1 =$

2. $3y - 5y + 8 =$

9. $-2 + x - 4x + 8 =$

16. $-8 + 3h + 5 - h =$

3. $2 - 2x + 3 =$

10. $12b + 10 + 6b =$

17. $10x - 5x + 8 =$

4. $9a - 14 - a =$

11. $9h - h + 2 - 4 =$

18. $11 + 4z + z - 6 =$

5. $7w + 3w + 2 =$

12. $-3k + 8 - 4k =$

19. $11 + 7y - y - 2 =$

6. $-2x + x + 8x =$

13. $2a + 10a - 2 + a =$

20. $14p - 2 + p =$

7. $w - 4 + 5w =$

14. $2 + 9c - 12 =$

21. $15m + 2 - m + 3 =$

9.4 Removing Parentheses (DOK 2)

In this chapter, you will use the distributive property to remove parentheses in problems with a variable.

Example 3: $2(a + 6)$

You multiply 2 by each term inside the parentheses. $2 \times a = 2a$ and $2 \times 6 = 12$. The 12 is a positive number so use a plus sign between the terms in the answer.

$$2(a + 6) = 2a + 12$$

Example 4: $7(2b - 5)$ $7 \times 2b = 14b$ and $7 \times -5 = -35$

$$7(2b - 5) = 14b - 35$$

Example 5: $4(-5c + 2)$

The first term inside the parentheses could be negative. Multiply in exactly the same way as the examples above. $4 \times (-5c) = -20c$ and $4 \times 2 = 8$

$$4(-5c + 2) = -20c + 8$$

Remove the parentheses in the problems below. (DOK 2)

- | | | | |
|-----------------|------------------|------------------|-----------------|
| 1. $3(n + 2)$ | 7. $3(-4x + 8)$ | 13. $5(-3t + 1)$ | 19. $7(8 - 9v)$ |
| 2. $7(2g - 11)$ | 8. $8(4 + 7p)$ | 14. $4(4y + 3)$ | 20. $3(3c + 8)$ |
| 3. $2(6z - 2)$ | 9. $12(-4w - 4)$ | 15. $10(b + 5)$ | 21. $6(2x - 4)$ |
| 4. $7(-y - 3)$ | 10. $2(9x + 2)$ | 16. $6(2a + 7)$ | 22. $8(y + 6)$ |
| 5. $5(-3k + 9)$ | 11. $3(2 - y)$ | 17. $9(2b - 3)$ | 23. $2(7t + 5)$ |
| 6. $9(d - 4)$ | 12. $10(c - 7)$ | 18. $7(-9x - 8)$ | 24. $4(9 - g)$ |

The number in front of the parentheses can also be negative. Remove these parentheses the same way.

Example 6:

$$-2(b - 4)$$

First, multiply $-2 \times b = -2b$

Second, multiply $-2 \times -4 = 8$

Copy the two products. The second product is a positive number, so put a plus sign between the terms in the answer.

$$-2(b - 4) = -2b + 8$$

Remove the parentheses in the following problems. (DOK 2)

- | | | | |
|------------------|-------------------|--------------------|--------------------|
| 1. $-2(x + 3)$ | 7. $-5(-z + 3)$ | 13. $-7(7b - 11)$ | 19. $-4(-2t - 7)$ |
| 2. $-4(2 - y)$ | 8. $-2(7p + 9)$ | 14. $-9(-5t - 12)$ | 20. $-8(7z - 8)$ |
| 3. $-9(2b - 5)$ | 9. $-6(t - 2)$ | 15. $-8(-v + 20)$ | 21. $-36(y - 2)$ |
| 4. $-3(8c + 4)$ | 10. $-18(2w + 5)$ | 16. $-5(-x - 4)$ | 22. $-200(a + 2)$ |
| 5. $-10(-w - 7)$ | 11. $-4(9 - 8p)$ | 17. $-12(4y + 7)$ | 23. $-4(-x - 9)$ |
| 6. $-2(4x - 3)$ | 12. $-3(-k - 4)$ | 18. $-3(-c + 8)$ | 24. $-20(-2b + 2)$ |

9.5 Solving Two-Step Algebra Word Problems (DOK 2)

Just like solving any word problem, the key is to READ CAREFULLY.

Example 7: A taxi costs a flat rate of \$3.00 and then an additional \$0.75 per mile. Let d equal the miles traveled. Find the miles traveled, d , for a total fare of \$14.25.

Step 1: Find what is known and unknown.
 Known: \$3.00 is part of the fare; \$0.75 per mile is part of the fare; \$14.25 is the total fare.
 Unknown: The number of miles traveled, d .

Step 2: Set up the equation and solve.

$$\begin{array}{rcl}
 \$3.00 + \$0.75d & = & \$14.25 \\
 - \$3.00 & = & - \$3.00 \\
 \hline
 & & \frac{0.75d}{0.75} = \frac{\$11.25}{0.75} \\
 & & d = 15
 \end{array}$$

Subtract \$3.00 from both sides.
Divide both sides by 0.75.

Answer: 15 miles were traveled.

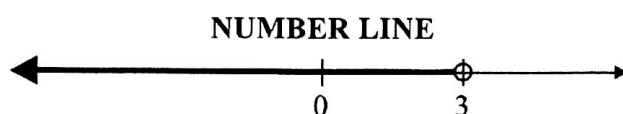
Solve the two-step equation word problems. (DOK 2)

- Mrs. Beasley bought a number of juice boxes at a cost of \$0.30 each and a bag of chips that cost \$1.19. The total cost of her purchases was \$2.99. Write an equation and solve to find out how many juice boxes Mrs. Beasley bought.
- Cathy had saved \$335.00. She spent \$15.00 each week to pay for guitar lessons. She now has \$155.00. Write an equation and solve to find out how many weekly lessons Cathy had.
- Paula sold 45 packages of wrapping paper for the fall fund-raiser. This is three less than twice the number of packages that she sold last year. Write and solve an equation to find how many packages Paula sold last year.
- Movie tickets for two children cost \$24 minus \$12. Find the cost of a child's ticket.
- The Mogul Runners Ski Club planned a trip to Park City. Of the total number of members, 11 signed up to go. If this is 25% of the club, how many total members does the ski club have?
- Five children in the Woods family have decided to purchase an anniversary gift for their parents. They estimate the price of the gift to be \$250. If they divide the cost of the gift evenly among them, how much does each of the children have to pay?

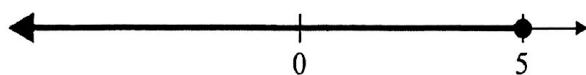
9.6 Graphing Inequalities (DOK 2)

An inequality is a sentence that contains a $<$, $>$, \leq , or \geq sign. Look at the following graphs of inequalities on a number line. Graphing an inequality shows all the numbers that make the inequality true.

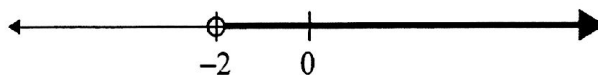
$x < 3$ is read " x is less than 3" since it is $<$ and not \leq .



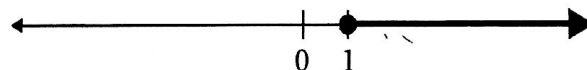
$x \leq 5$ is read " x is less than or equal to 5" since the inequality is \leq . The endpoint is filled in. The graph uses a **closed** circle because the number 5 is included in the graph.



$x > -2$ is read " x is greater than -2 ."

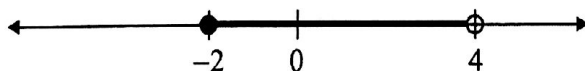


$x \geq 1$ is read " x is greater than or equal to 1."

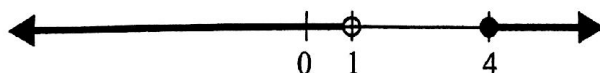


There can be more than one inequality sign. These are called **compound inequalities**. For example:

$-2 \leq x < 4$ is read " -2 is less than or equal to x and x is less than 4."

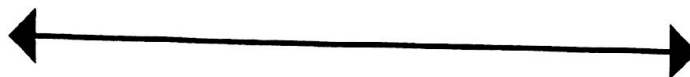


$x < 1$ or $x \geq 4$ is read " x is less than 1 or x is greater than or equal to 4."



Graph the solution sets of the following inequalities. (DOK 2)

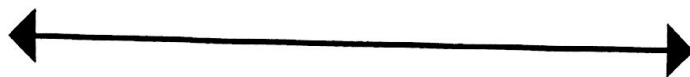
1. $x > 8$



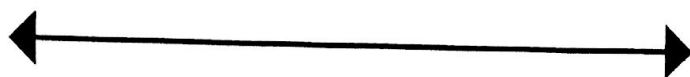
2. $x \leq 5$



3. $-5 < x < 1$



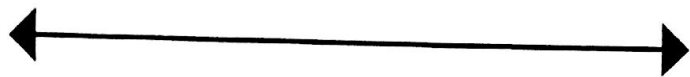
4. $x > 7$



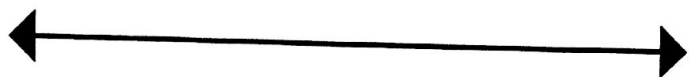
5. $1 \leq x < 4$



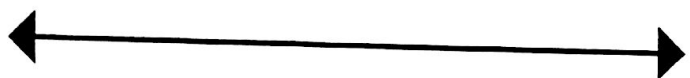
6. $x < -2$ or $x > 1$



7. $x \geq 10$



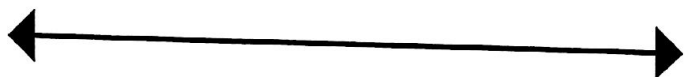
8. $x < 4$



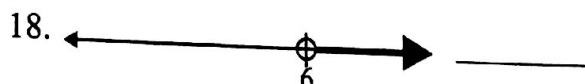
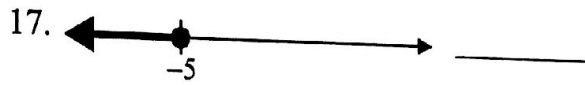
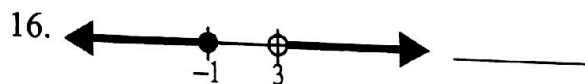
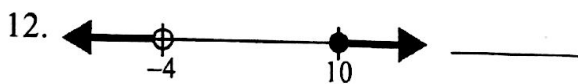
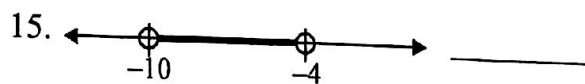
9. $x \leq 3$ or $x \geq 5$



10. $x < -1$ or $x > 1$



Give the inequality represented by each of the following number lines. (DOK 2)



9.7 Solving Inequalities by Addition and Subtraction (DOK 2)

Solving inequalities is similar to solving equations.

Example 8: Solve and graph the solution set for $x - 2 \leq 5$.

Step 1: Add 2 to both sides of the inequality so the variable will be by itself.

$$\begin{array}{r} x - 2 \leq 5 \\ +2 \quad +2 \\ \hline x \leq 7 \end{array}$$

Step 2: Graph the solution set for the inequality.



Solve and graph the solution set for the following inequalities. (DOK 2)

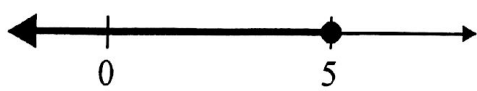
- | | | | |
|---------------------|-----------------------|----------------------|-----------------------|
| 1. $x + 5 > 3$ | \longleftrightarrow | 11. $x - 6 < -2$ | \longleftrightarrow |
| 2. $x - 10 < 5$ | \longleftrightarrow | 12. $x + 7 \geq 4$ | \longleftrightarrow |
| 3. $x - 2 \leq 1$ | \longleftrightarrow | 13. $14 + x \leq 8$ | \longleftrightarrow |
| 4. $9 + x \geq 7$ | \longleftrightarrow | 14. $x - 8 > 24$ | \longleftrightarrow |
| 5. $x - 4 > -2$ | \longleftrightarrow | 15. $x + 1 \leq 12$ | \longleftrightarrow |
| 6. $x + 11 \leq 20$ | \longleftrightarrow | 16. $11 + x \geq 11$ | \longleftrightarrow |
| 7. $x - 3 < -12$ | \longleftrightarrow | 17. $x - 3 < 17$ | \longleftrightarrow |
| 8. $x + 6 \geq -3$ | \longleftrightarrow | 18. $x + 9 > -4$ | \longleftrightarrow |
| 9. $x + 12 \leq 8$ | \longleftrightarrow | 19. $x + 6 \leq 14$ | \longleftrightarrow |
| 10. $15 + x > 5$ | \longleftrightarrow | 20. $x - 8 \geq 19$ | \longleftrightarrow |

9.8 Solving Inequalities by Multiplication and Division (DOK 2)

If you multiply or divide both sides of an inequality by a **positive** number, the inequality symbol stays the same. However, if you multiply or divide both sides of an inequality by a **negative** number, you must **reverse the direction of the inequality symbol**.

Example 9: Solve and graph the solution set for $4x \leq 20$.

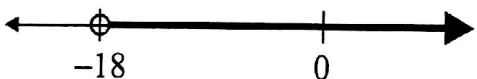
Step 1: Divide both sides of the inequality by 4. $\frac{4x}{4} \leq \frac{20}{4}$

Step 2: Graph the solution. $x \leq 5$ 

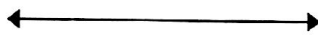


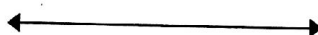

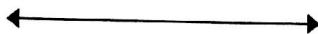
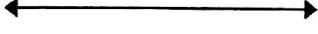
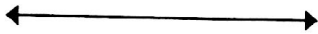


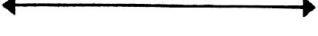

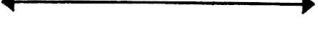
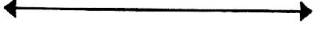
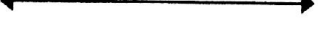
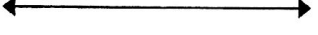
Example 10: Solve and graph the solution set for $6 > -\frac{x}{3}$.

Step 1: Multiply both sides by -3 and **reverse the direction of the inequality symbol**.

$$(-3) \times 6 < \frac{x}{3} \times -3$$

Step 2: Graph the solution. $-18 < x$
 $x > -18$ 

Solve and graph the following inequalities. (DOK 2)

- | | | | |
|--------------------------|---|-----------------------------|---|
| 1. $\frac{x}{5} > 4$ |  | 9. $9x \leq 54$ |  |
| 2. $2x \leq 24$ |  | 10. $\frac{x}{8} > 1$ |  |
| 3. $-6x \geq 36$ |  | 11. $-\frac{x}{9} \leq 3$ |  |
| 4. $\frac{x}{10} > -2$ |  | 12. $-4x < -12$ |  |
| 5. $-\frac{x}{4} > 8$ |  | 13. $-\frac{x}{2} \geq -20$ |  |
| 6. $-7x \leq -49$ |  | 14. $10x \leq 30$ |  |
| 7. $-3x > 18$ |  | 15. $\frac{x}{12} > -4$ |  |
| 8. $-\frac{x}{7} \geq 9$ |  | 16. $-6x < 24$ |  |

9.9 Two-Step Inequalities (DOK 2)

Remember that adding and subtracting with inequalities follow the same rules as equations. When you multiply or divide both sides of an inequality by the same positive number, the rules are also the same as for equations. However, when you multiply or divide both sides of an inequality by a **negative** number, you must **reverse** the inequality symbol.

Example 11:

$$\begin{aligned} -x &> 4 \\ (-1)(-x) &< (-1)(4) \\ x &< -4 \end{aligned}$$

Example 12:

$$\begin{aligned} -4x &< 2 \\ \frac{-4x}{-4} &> \frac{2}{-4} \\ x &> -\frac{1}{2} \end{aligned}$$

Reverse the symbol when you multiply or divide by a negative number.

When solving multi-step inequalities, first add and subtract to isolate the term with the variable. Then multiply and divide.

Example 13:

$$-2x - 8 > 1$$

Step 1: Add 8 to both sides.

$$-2x - 8 + 8 > 1 + 8$$

$$-2x > 9$$

Step 2: Divide by -2 . Remember to change the direction of the inequality sign.

$$\frac{-2x}{-2} < \frac{9}{-2}$$

Answer: $x < -\frac{9}{2}$

Chapter 9 Equations and Inequalities

Solve each of the following inequalities. (DOK 2)

1. $8 - 3x \leq 1$

7. $3x - 7 \geq 2$

13. $5x + 3 \leq -2$

19. $-3x + 2 > 8$

2. $2x - 4 \geq 2$

8. $6x - 3 \leq 4$

14. $3y - 4 > 6$

20. $\frac{y}{3} - 2 \geq 5$

3. $\frac{1}{4}b - 3 > 5$

9. $3(a - 2) > -2$

15. $3 - 2y \leq -25$

21. $6 + 8c < -2$

4. $8 + 3y > -4$

10. $-\frac{2x}{6} \leq 4$

16. $-4c + 8 \leq 10$

22. $4 - \frac{a}{2} > 3$

5. $5a + 5 < -6$

11. $9b + 5 < 8$

17. $-\frac{1}{3}x + 5 > 9$

23. $6 + 4b \leq -3$

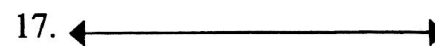
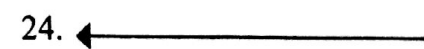
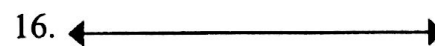
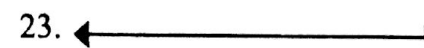
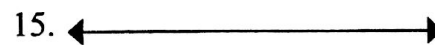
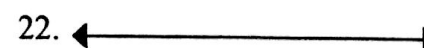
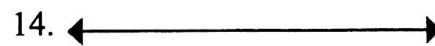
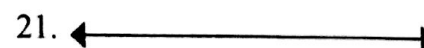
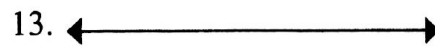
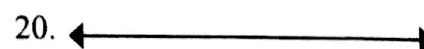
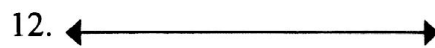
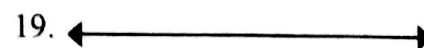
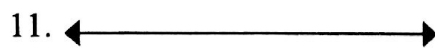
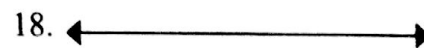
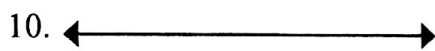
6. $-\frac{x}{3} > 18$

12. $4x - 9 \leq 9$

18. $\frac{1}{6}y - 3 \leq 2$

24. $-\frac{1}{3}x + 2 > 4$

Graph the answers from problems 10–24 above on the number lines below. (DOK 2)



9.10 Solving Inequality Word Problems (DOK 2)

Write an inequality for the word problems below, then solve. (DOK 2)

1. Jacob weighs 50 pounds more than his younger brother, Jared. Jared weighs 46 pounds. Let x represent Jacob's weight. How much does Jacob weigh?
2. Alice is 16 years old. If you add together Alice's age and her cousin Emily's age, x , together, you will get more than 31 years. How old is Emily?
3. Maria scored more than 4 times as many points as Jennifer, who scored 6 points. How many points, x , did Maria score?
4. This month's sales of \$85,000 are greater than $\frac{1}{2}$ of the sales of March, represented by the letter s . What was March's sales?
5. The Furry Friends Animal Shelter had less than 27 dogs at the beginning of the month. At the end of the month, they had 14 dogs. Let x represent how many dogs were adopted. How many dogs were adopted? (Assume they did not take in any extra dogs.)
6. Pine City (x) is less than or equal to 20 miles from Sun Valley, depending on the route you take. How many miles is Pine City from Sun Valley?
7. Molly's age, x , plus Betty's age, 11, is less than 23. What is Molly's age?
8. There is more than twice as much rain in November, x , as there is in August, which had 4 inches. How much rain was in November?
9. Mark had to read more than 200 pages in 5 days. How many pages, x , must Mark read each day to complete the assignment?
10. If the temperature, x , goes up 6 degrees, it will be hotter than 100 degrees. What is the temperature outside?

9.11 Going Deeper into Equations (DOK 3)

Read the problems, write an equation to fit the problem, combine like terms, and solve. Show your work for each step. (DOK 3)

1. Abby bought 4 times as many music downloads as her brother, Andy, bought on Saturday. Andy bought x music downloads. Their sister Anna bought 2 times as many music downloads as her brother. Their father bought 3 times as many plus 2 music downloads as his son. Their mother bought 1 less music download as her son. In all, Abby and her family bought 23 music downloads. How many music downloads did each person buy?
2. The Drake family spent the day at the beach digging for clams. Aaron found x clams. His sister, Molly, found 2 times as many clams minus 3 than Aaron found. Skyler found 4 clams less than Molly. Mr. Drake found 2 times plus 3 as many clams as Aaron. Mrs. Drake found 2 times as many clams as Molly. The Drake family found 64 clams in all. How many clams did each family member find?
3. Maddox has 4 ants left in his ant farm. Ant Enna moved x bread crumbs to the nest. Ant Body moved twice as many less 2 bread crumbs than Ant Enna to the nest. Ant Cee moved three times as many bread crumbs to the nest as Ant Body. Ant Mable moved three times plus 3 bread crumbs as Ant Enna. The ants moved 55 bread crumbs in all. How many bread crumbs did each ant move to the nest?
4. A new package has 30 cookies in it. Elwood took x number of cookies, James took $\frac{1}{2}$ as many as Elwood, Arthur took twice as many as Elwood, and Phillip took $\frac{3}{4}$ as many as Arthur. That emptied the package. How many cookies did each boy get?
5. A factory is doing end-of-year inventory. Hank, Frank, Patrick, and Brent are counting the remaining model #LG3039 in the four boxes left on the shelves. Hank counted x number in his box. Frank counted 4 times as many less 10 in his box. Patrick counted twice as many as Frank in his box. And Brent counted 3 times plus 5 as many as Hank. They counted a total of 87 model #LG3039. How many did each man count?
6. Three friends are in a friendly race to finish their math homework. Madison has x number of problems left to do. Bella has double less 3 as many problems as Madison has left to do. Emily has 7 less than 2 times the number of problems as Madison has left to do. The three girls have 10 problems left to do. How many problems does each girl have left to do?
7. Four friends timed how long it took to do their homework. Jasper took x number of minutes. Hannah took 3 times as long less 8 minutes than Jasper. Mark took 2 times plus 5 minutes as Jasper took to do his homework. Olivia took 2 times plus 9 minutes as Jasper to do her homework. In all, the friends spent 78 minutes doing their homework. How long did it take each friend to do their homework?

Chapter 9 Review

Solve each of the following equations. (DOK 2)

1. $3a - 8 = 16$

4. $\frac{c}{12} - 3 = 4$

6. $\frac{b+9}{8} = -4$

2. $-16 + 2w = 54$

5. $\frac{y-7}{3} = 2$

3. $6 + \frac{x}{3} = -2$

Solve. (DOK 2)

7. $6d - 10 = 14$

8. $-16x - 34 = 14$

9. $10w - 2 = -22$

Solve each of the following equations and inequalities. (DOK 2)

10. $3b - 12 = -20$

16. $2x + 5 \geq 4$

22. $-\frac{3}{4}x \leq 12$

11. $17x + 15 = -16$

17. $8x + 10 = 12$

23. $6x + 3 \geq -6$

12. $43c - 32 = -35$

18. $4x + 12 < -14$

24. $n + 20 = -40$

13. $-3x - 6 = -15$

19. $-3x + 4 < -8$

14. $4b - 6 = -5$

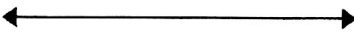
20. $8x + 2 > 0$

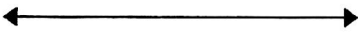
25. $\frac{t}{3} + 2 > 7$

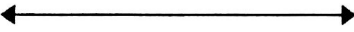
15. $2a - 7 = -26$

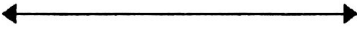
21. $-\frac{y}{3} > 12$

Graph the solution sets of the following inequalities. (DOK 2)

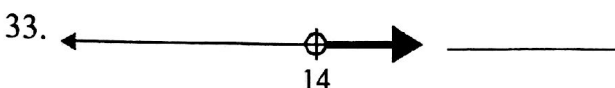
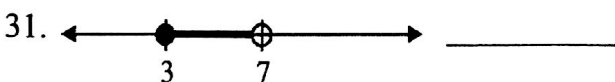
26. $x \leq -5$ 

27. $x > 12$ 

28. $x < -4$ 

29. $x \geq 8$ 

Give the inequality represented by each of the following number lines. (DOK 2)



Simplify the following expressions by combining like terms. (DOK 1)

34. $-4a + 14 + 7a - 9$

35. $7 + 3z - 8 - 3z$

36. $-5 - 7x - 3 - 7x$

Simplify the following expression by removing parentheses. (DOK 2)

37. $2(-4x + 5)$

39. $4(8 - 6b)$

41. $-2(4c - 2)$

38. $15(2y + 3)$

40. $-5(-4 + 3a)$

42. $-3(7y - 4)$

Solve the inequality word problems. (DOK 2)

43. Mrs. Watson is 28 years older than her youngest daughter Sarah's age, x . Mrs. Watson is less than 54 years old. How old is Sarah?

44. Mr. Andrews paid less than 50 cents more per gallon of gas, x , this week than last week, when he paid \$2.50 per gallon. How much was gas this week?

45. Jim takes great pride in decorating his club's float for the homecoming parade for his high school. With the \$5,000 he has to spend, Jim bought 5,000 carnations at \$0.25 each, 4,000 tulips at \$0.50 each, and 300 irises at \$0.90 each. Write an inequality which describes how many roses, r , Jim can buy if roses cost \$0.80 each.

Read the problems, write an equation to fit the problem, combine like terms, and solve. Show your work for each step. (DOK 3)

46. Don collected x number of agates (a kind of rock) on the shores of Lake Superior on his summer vacation. His brother, Bryan, collected twice less 9 agates than Don. Their sister Ann collected 3 times plus 2 agates than Don. Their father collected twice as many agates as Ann. In all, they collected 981 agates. How many agates did each family member find?

47. A class is collecting aluminum cans to earn money to help pay for a trip to the astronomy museum. Ethan collected x number of cans. Mike collected 4 times minus 7 cans than Ethan. Dana collected 3 times plus 10 cans than Ethan. Alexis collected twice plus 17 cans than Ethan. In all the four students collected 420 cans. How many cans did each of the four students collect?