Teacher Packet

i-Ready®

Grade 7 Mathematics

Teacher At-Home Activity Packet

The At-Home Activity Packet includes 19 sets of practice problems that align to important math concepts that have likely been taught this year.

Since pace varies from classroom to classroom, feel free to select the pages that align with the topics your students have covered.

The At-Home Activity Packet includes instructions to the parent and can be printed and sent home.

This At-Home Activity Packet—Teacher Guide includes all the same practice sets as the Student version with the answers provided for your reference.

See the Grade 7 Math concepts covered in this packet!

Grade 7 Math concepts covered in this packet

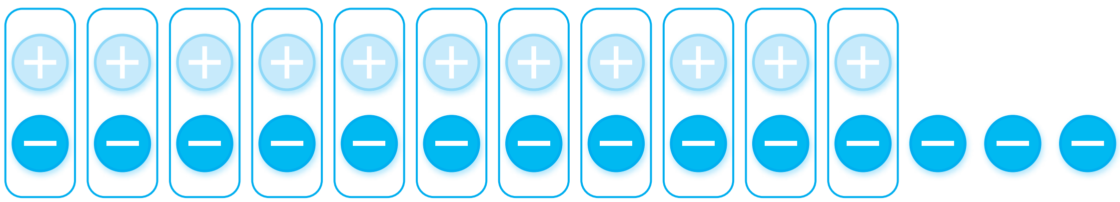
Understanding Addition with Negative Integers

1 Between the time Iko woke up and lunchtime, the temperature rose by 11°. Then by the time he went to bed, the temperature dropped by 14 °.

Write an addition expression for the temperature relative to when Iko woke up.

11 + (−14)

Draw a model using integer chips and circle the zero pairs.



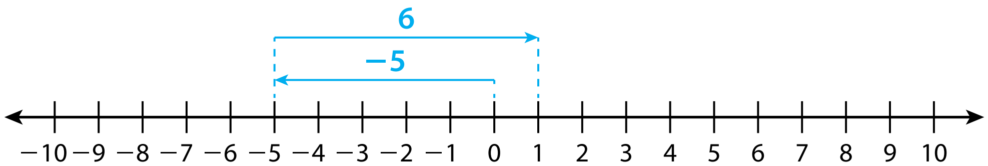
What is the value of the remaining integer chips after the zero pairs are removed?

−3

What is the net change in the temperature relative to when Iko woke up?

−3°, or a loss of 3°

2 Complete the number line model to find (−5) + 6.



(−5) + 6 = **1**

How would the number line model be different if you wanted to find (−5) + (−6)?

Possible answer: I would start the same way, by drawing an arrow from 0 to −5. Then I would draw an arrow from −5 to −11 to show adding −6.

Understanding Addition with Negative Integers *continued*

➤ **For problems 3–5, consider the sum $4 + (-8)$.**

3. Explain how you can use a number line to find the sum.

   Possible answer: I can draw a number line with the first arrow pointing left from 0 to 4, then draw an arrow 8 units to the left from 4 to -4. The arrow ends at -4, so the sum is -4.

4. Explain how you can use chips to determine the sum.

   Possible answer: I can use 4 positive chips and 8 negative chips. I can group zero pairs, then count the remaining chips. There are 4 negative chips remaining, so the sum is -4.

5. Does it matter what order you add the numbers in the problem? Explain how chips and number lines support your answer.

   No; Possible answer: On the number line, I can draw an arrow from 0 to -8, then draw an arrow from -8 to -4. Using the chips, I could use 8 negative chips and then 4 positive chips. I will make the same number of zero pairs, and there will still be 4 negative chips remaining.

6. Write an addition expression that has a value of -8.

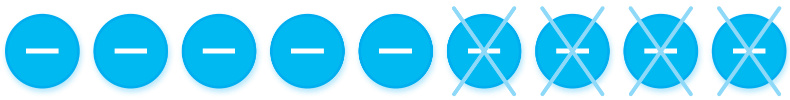
   Possible answer: $5 + (-13)$

Understanding Subtraction with Negative Integers

1. Mary takes 9 grapes from Rohin and then decides to give 4 back.

   Write a subtraction problem to describe how many grapes Rohin has. **$-9 - (-4)$**

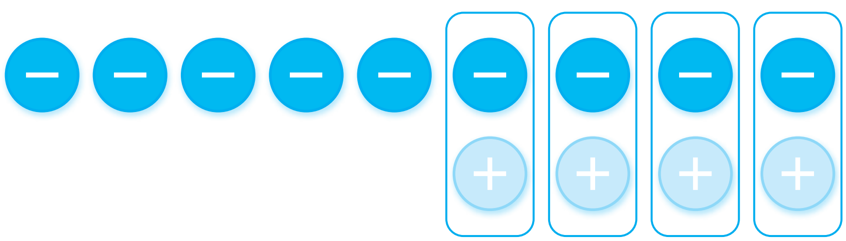
   Draw a model for the subtraction problem using integer chips.



   How many negative integer chips did you cross out? **4**

   Write the subtraction as addition. **$-9 + 4$**

   Draw a model for the addition problem using integer chips.



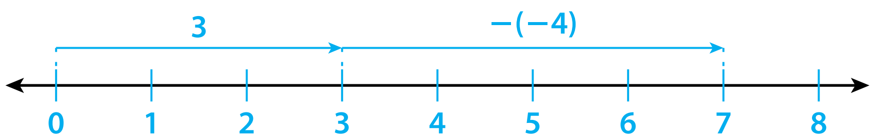
   How do the two integer chip models show that $-9 - (-4)$ is the same as $-9 + 4$?

   They both show that when you start with -9, you can take away -4 or add 4. In each model, you get rid of 4 negative integer chips and you have 5 negative integer chips left.

   What is the change in the number of grapes Rohin has? **-5**

Understanding Subtraction with Negative Integers *continued*

2 Jin is 3 floors above ground level in a hotel. Leila is on a parking level of the hotel that is 4 floors below ground level. How many floors apart are they? Draw a number line model to show $3 - (-4)$.



What is $3 - (-4)$? **7**

What is the meaning of this answer in the context of the problem?

Jin and Leila are 7 floors apart.

Rewrite $3 - (-4)$ as an addition problem. $\mathbf{3 + 4 = 7}$

3 The variables *a* and *b* represent positive numbers. When you find the difference $a - (-b)$, do you expect the result to be less than or greater than *a*? What if *a* is negative and *b* is positive? Explain.

Possible answer: Whether *a* is positive or negative, I can write $a - (-b)$ as $a + b$, so I am always adding a positive value to *a*. The difference will always be greater than *a*.

Understanding Multiplication with Negative Integers

➤ **Practice multiplying negative integers.**

1 Find each product. Then describe any patterns you notice.

$3 \cdot (-7) =$ **−21**

$2 \cdot (-7) =$ **−14**

$1 \cdot (-7) =$ **−7**

$0 \cdot (-7) =$ **0**

$(-1) \cdot (-7) =$ **7**

$(-2) \cdot (-7) =$ **14**

$(-3) \cdot (-7) =$ **21**

Possible answer: The product of a positive number and a negative number is always negative, and the product of two negative numbers is always positive.

2 Solve each problem. Explain how you determined the sign of the products.

$(-3)(9) =$ **−27**

$(-8)(-5) =$ **40**

$(-5)(-6) =$ **30**

$(-1)(2)(-6) =$ **12**

$(-2)(-4)(-7) =$ **−56**

$(-3)(-4)(-3)(-1) =$ **36**

Possible answer: The product of two negative numbers is positive. The product of a positive number and a negative number is negative. The product of three negative numbers is negative because the product of the first two factors is positive. That positive factor is then multiplied by a negative number, resulting in a negative product. The product of four negative numbers is positive because the product of each pair of negative factors is positive and then the product of two positive numbers is positive.

Understanding Multiplication with Negative Integers *continued*

3 Use the distributive property to show why the product $(-6)(-3)$ is positive. The first step is done for you.

$$(-6)(-3) + (-6)(3) = (-6)[(-3) + 3]$$

$$(-6)(-3) + (-6)(3) = (-6)(0)$$

$$(-6)(-3) + (-6)(3) = 0$$

$$(-6)(-3) + (-18) = 0$$

$$(-6)(-3) = 18$$

4 Mark's work to simplify $(-3)(-5)(-2)$ is shown. Explain his error and show how to find the correct product.

$$(-3)(-5)(-2) = (-15)(-2) = 30$$

Possible answer: The product of two negative numbers is positive, so $(-3)(-5) = 15$. The problem $(-3)(-5)(-2)$ can be rewritten as $(15)(-2)$ instead of $(-15)(-2)$. The product of a positive number and a negative number is negative, so $(15)(-2) = -30$.

Adding and Subtracting Positive and Negative Fractions and Decimals

➤ **Estimate each problem to check if the student's answer is reasonable. If not, cross out the answer and write the correct answer. Show your work.**

Problems	Student Answers
1. $1.3 - (-2.5)$	$\cancel{-1.2}$ 3.8 Possible estimate: $1 - (-3) = 1 + 3$ $= 4$ $1.3 - (-2.5) = 1.3 + 2.5$ $= 3.8$
2. $-3\frac{1}{6} + 6\frac{2}{3}$	$\cancel{-3\frac{1}{2}}$ $3\frac{1}{2}$ Possible estimate: $-3 + 7 = 4$ $-3\frac{1}{6} + 6\frac{2}{3} = 3\frac{1}{2}$
3. $-4.2 - (-2.9)$	-1.3 Possible estimate: $-4 - (-3) = -4 + 3$ $= -1$
4. $3\frac{1}{5} - 2\frac{1}{2} + 2\frac{3}{5}$	$\cancel{-3\frac{1}{3}}$ $3\frac{3}{10}$ Possible estimate: $3 - 3 + 3 = 0 + 3$ $= 3$ $3\frac{1}{5} - 2\frac{1}{2} + 2\frac{3}{5} = 3\frac{3}{10}$

Adding and Subtracting Positive and Negative Fractions and Decimals *continued*

Problems	Student Answers
5 $5.9 - 7.3 - 10.2$	~~11.6~~ -11.6 **Possible estimate:** $6 - 7 - 10 = -1 - 10$ $= -11$ $5.9 - 7.3 - 10.2 = -11.6$
6 $-5\frac{5}{6} - \left(-2\frac{1}{3}\right) + 5\frac{1}{6}$	$1\frac{2}{3}$ **Possible estimate:** $-6 - (-2) + 4 = -6 + 2 + 5$ $= -4 + 5$ $= 1$
7 $11.5 - 5.4 - 4.7$	~~-1.4~~ 1.4 **Possible estimate:** $12 - 5 - 5 = 7 - 5$ $= 2$ $11.5 - 5.4 - 4.7 = 1.4$
8 $-11\frac{1}{8} - 12\frac{1}{4} - \left(-21\frac{1}{2}\right)$	~~$2\frac{1}{8}$~~ $-1\frac{7}{8}$ **Possible estimate:** $-11 - 12 - (-22) = -11 - 12 + 22$ $= -23 + 22$ $= -1$ $-11\frac{1}{8} - 12\frac{1}{4} - \left(-21\frac{1}{2}\right) = -1\frac{7}{8}$

9 How does estimating an addition or subtraction problem help you know if an answer is reasonable?

Possible answer: I can use the estimate to determine if the correct answer is positive or negative. I can also determine if the estimate and the given answer are close.

Multiplying Negative Rational Numbers

➤ **Find the product of the rational numbers. The answers are mixed up at the bottom of the page. Cross out the answers as you complete the problems.**

1. $2 \times -\frac{7}{4}$ **$-3\frac{1}{2}$**

2. $-\frac{1}{3} \times -\frac{6}{5}$ **$\frac{2}{5}$**

3. $\frac{2}{5} \times -\frac{3}{4}$ **$-\frac{3}{10}$**

4. $-2\frac{1}{3} \times \frac{5}{4}$ **$-2\frac{11}{12}$**

5. $-\frac{3}{7} \times -1\frac{2}{3}$ **$\frac{5}{7}$**

6. $-3\frac{5}{7} \times -2\frac{1}{2}$ **$9\frac{2}{7}$**

7. $0.75 \times -\frac{4}{3}$ **-1**

8. $-0.2 \times -\frac{2}{5}$ **$\frac{2}{25}$ or 0.08**

9. $-0.35 \times -1\frac{3}{7}$ **$\frac{1}{2}$ or 0.5**

10. $2.5 \times -3\frac{4}{5}$ **$-9\frac{1}{2}$ or -9.5**

11. 0.2×-0.45 **-0.09**

12. -0.25×-1.4 **0.35**

13. -2.3×6.8 **-15.64**

14. $-3.9 \times 5\frac{5}{9}$ **$-21\frac{2}{3}$ or $21.\overline{6}$**

15. $-4.2 \times -6\frac{2}{7}$ **$26\frac{2}{5}$ or 26.4**

Answers

$-21\frac{2}{3}$	-15.64	$-9\frac{1}{2}$	$-3\frac{1}{2}$	$-2\frac{11}{12}$
-1	$-\frac{3}{10}$	-0.09	$\frac{2}{25}$	0.35
$\frac{2}{5}$	$\frac{1}{2}$	$\frac{5}{7}$	$9\frac{2}{7}$	$26\frac{2}{5}$

Dividing Negative Rational Numbers

➤ **Find each quotient.**

1. $-5 \div \frac{5}{7}$

   -7

2. $-\frac{8}{9} \div \frac{2}{3}$

   $-1\frac{1}{3}$

3. $\frac{3}{10} \div -\frac{6}{7}$

   $-\frac{7}{20}$

4. $-2\frac{3}{4} \div 11$

   $-\frac{1}{4}$

5. $-4\frac{2}{7} \div -\frac{15}{16}$

   $4\frac{4}{7}$

6. $-1\frac{4}{7} \div -3\frac{2}{3}$

   $\frac{3}{7}$

7. $-8 \div 6.4$

   -1.25

8. $-\frac{3}{2} \div 0.5$

   -3

9. $-3\frac{1}{3} \div 1.2$

   $-2\frac{7}{9}$

10. $9.28 \div -3.2$

    -2.9

11. $0.056 \div -0.004$

    -14

12. $-0.28 \div 0.07$

    -4

13. Explain the steps you used to solve problem 11.

    Possible explanation: I changed the expression to $56 \div -4$ by multiplying the dividend and the divisor by 1,000.

Writing Rational Numbers as Repeating Decimals

➤ **Write each number as a repeating decimal.**

1. $\frac{1}{9}$

   $0.\overline{1}$

2. $-\frac{2}{11}$

   $-0.\overline{18}$

3. $\frac{7}{11}$

   $0.\overline{63}$

4. $\frac{1}{3}$

   $0.\overline{3}$

5. $2\frac{4}{9}$

   $2.\overline{4}$

6. $-\frac{13}{6}$

   $-2.1\overline{6}$

7. $-1\frac{5}{6}$

   $-1.8\overline{3}$

8. $\frac{13}{99}$

   $0.\overline{13}$

9. When the denominator of a proper fraction is 99, what do you notice about the repeating digit(s) in its decimal form?

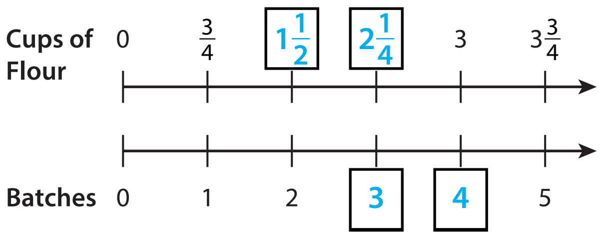
   Possible answer: The numerator tells the repeating digits.

   For example, $\frac{28}{99} = 0.\overline{28}$.

Understanding Proportional Relationships

➤ **Read and solve the problems. Show your work.**

1. Josie is making pizza dough. Complete the double number line by filling in the missing values. Then write an equation that models the relationship between the total cups of flour, *c*, and number of batches, *n*. Show your work.



$c = \frac{3}{4}n$

2. Lilli bought each of her friends a pair of colorful socks that cost $5.50. Complete the table to show how much Lilli paid to buy different numbers of socks. Then write an equation that shows the total cost, *c*, for *p* pairs of socks.

Cost	$5.50	$11.00	$16.50	$22.00	$27.50
Pairs of socks	1	2	3	4	5

$c = 5.5p$

3. Explain how using a table is similar to using a double number line and how it is different.

Possible answer:

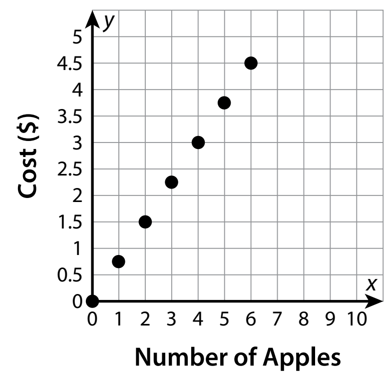
Double number lines and tables both show corresponding values in a proportional relationship. The ratios formed by corresponding values are always equivalent in both a table and a double number line. A double number line usually starts at 0 and increases incrementally. A table does not necessarily start at 0 and may not increase incrementally.

4. Mrs. Lopez types at a constant rate. The constant of proportionality for the relationship between the number of words she types, *w*, and the number of minutes she types, *m*, is 38. Write an equation to show this relationship.

$w = 38m$

Interpreting Graphs of Proportional Relationships

➤ **The graph shows the cost of apples at a local market. Use the graph to answer problems 1–3.**



1. What is the cost of 1 apple and of 3 apples? How do you know?

   Possible answer: One apple costs \$0.75, and 3 apples cost \$2.25. The points (1, 0.75) and (3, 2.25) are on the graph. The x-coordinate of 1 corresponds to the y-coordinate of 0.75, and the x-coordinate of 3 corresponds to the y-coordinate of 2.25.

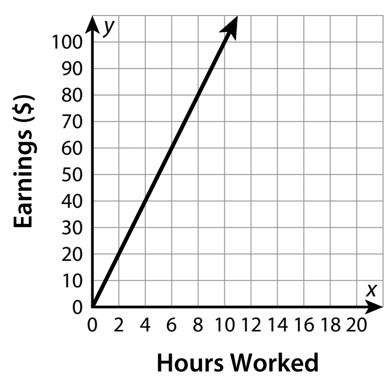
2. What does the point (0, 0) represent in this context?

   Possible answer: (0, 0) means that 0 apples cost \$0.00.

3. What does the point (2, 1.5) represent in this context?

   Possible answer: The cost of 2 apples is \$1.50.

➤ **The graph shows Manuela's earnings for the number of hours she spends tutoring. Use the graph to answer problems 4 and 5.**



4. How much does Manuela earn for each hour of tutoring? Explain.

   Possible answer:

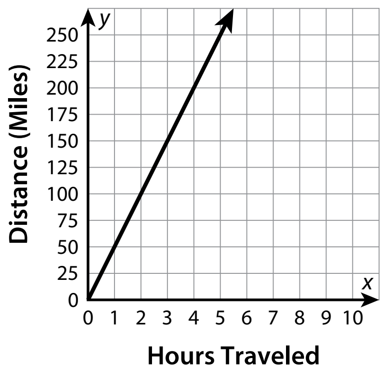
   \$10 per hour; Possible explanation: The graph goes through the point (1, 10). The y-coordinate associated with the x-coordinate of 1 is the constant of proportionality.

5. Write an equation that shows the relationship between Manuela's earnings, y, and hours, x.

   $y = 10x$

Interpreting Graphs of Proportional Relationships *continued*

➤ **The graph shows the distance Jason's family traveled on a recent road trip. Use the graph to answer problems 6–8.**

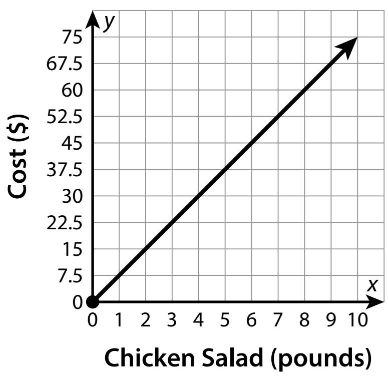


6. What is the constant of proportionality? Explain how you know.
   50; Possible explanation: The point (1, 50) is on the graph. The *y*-coordinate associated with the *x*-coordinate of 1 is the constant of proportionality.

7. Identify and interpret one other point on the graph.
   Possible answer: The point (2, 100) means that Jason's family traveled 100 miles in 2 hours.

8. Write an equation that models the distance, *d*, traveled in *t* hours.
   $d = 50t$

➤ **The graph shows the cost per pound of chicken salad. Use the graph to answer problems 9 and 10.**

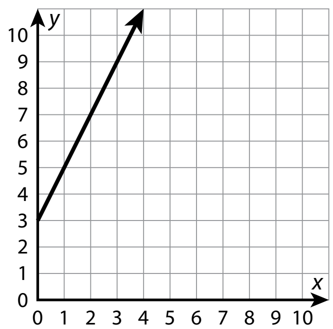


9. Randy claims that he can purchase 3.5 pounds of chicken salad for \$23.50. Is he correct? Explain.
   No; Possible explanation: According to the graph, 3.5 corresponds to the point halfway between 22.5 and 30, and 23.5 is not halfway.

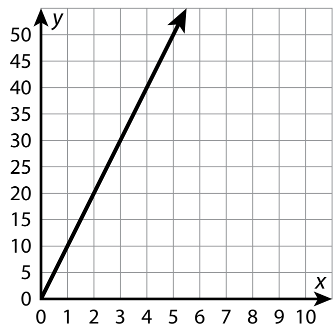
10. Explain how you can determine how much chicken salad may be purchased for \$52.50.
    Possible answer: You can find the *x*-coordinate that corresponds with the *y*-value of 52.5 on the graph.

Recognizing Graphs of Proportional Relationships

➤ **Circle all the problems with graphs that do NOT represent a proportional relationship. For the problems that are circled, explain why the graphs do not represent a proportional relationship.**

1


The graph does not go through the origin.

2


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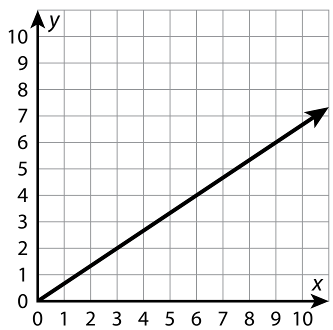

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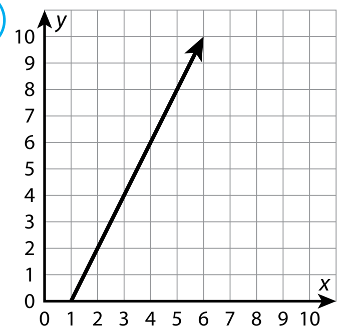
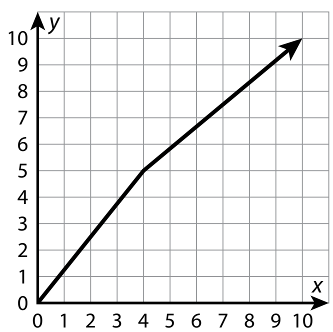


The graph does not go through the origin.

5


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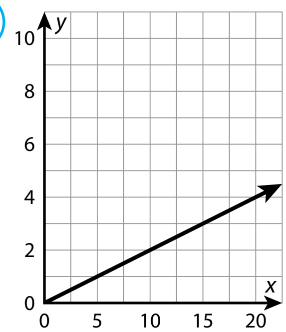
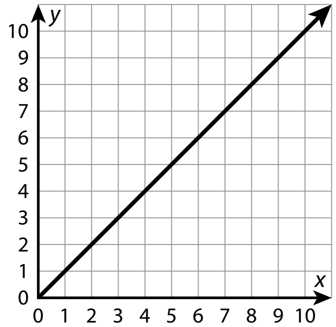


The *x*-values do not change as the *y*-values increase.

Recognizing Graphs of Proportional Relationships *continued*

7



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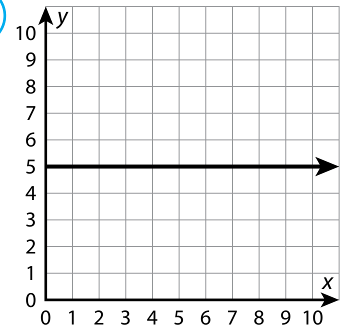
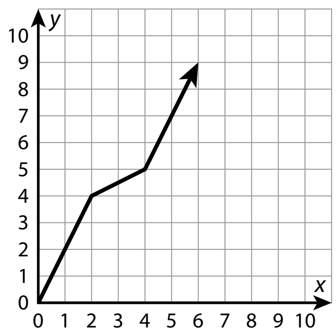


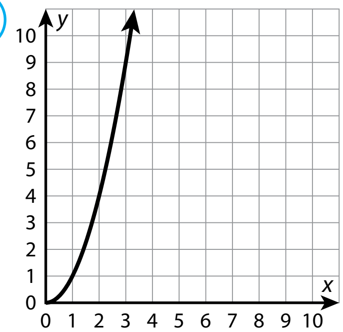
The *y*-values do not change as the *x*-values increase.

9



The graph is not a straight line.

10



The graph is not a straight line.

11 Without analyzing specific points on a graph, explain how you know whether a graph shows a proportional relationship.

Possible answer: The graph of a proportional relationship is a straight line that passes through the origin, with all points on the line representing equivalent ratios.

Solving Multi-Step Ratio Problems

➤ **Solve each problem.**

1. At The Green House of Salad, you get a \$1 coupon for every 3 salads you buy. What is the least number of salads you could buy to get \$10 in coupons?

   30 salads

2. Kim orders catering from Midtown Diner for \$35. She spends \$5 on a large order of potato salad and the rest on turkey sandwiches. Each sandwich is \$2.50. How many sandwiches does Kim buy?

   12 sandwiches

3. Molly and Liza are exercising. Molly does 10 push-ups at the same time as Liza does 15 push-ups. When Molly does 40 push-ups, how many push-ups does Liza do?

   60 push-ups

4. A shark swims at a speed of 25 miles per hour. The shark rests after 40 miles. How long, in minutes, does the shark swim before resting?

   96 minutes

5. Ali and Janet are selling gifts at a local craft show. For every bar of soap that Ali sells, she earns \$5. For every mug that Janet sells, she earns twice as much as Ali. Ali sells 5 bars of soap, and Janet sells 7 mugs. How much money did they make altogether?

   \$95

6. Ted is making trail mix for a party. He mixes $1\frac{1}{2}$ cups of nuts, $\frac{1}{4}$ cup of raisins, and $\frac{1}{4}$ cup of pretzels. How many cups of pretzels does Ted need to make 15 cups of trail mix?

   $1\frac{7}{8}$ cups of pretzels

7. The ratio of chaperones to students on a field trip is 2 : 7. There are 14 chaperones on the field trip. In all, how many chaperones and students are there?

   63 students and chaperones

8. Dayren is driving to visit family. She drives at an average of 65 miles per hour. She drives 227.5 miles before lunch and then 97.5 miles after lunch. How many hours did she spend driving?

   5 hours

Solving Problems Involving Multiple Percents

➤ **Solve each problem.**

1. A chair's regular price is $349. It is on clearance for 30% off, and a customer uses a 15% off coupon after that. What is the final cost of the chair before sales tax?

   $207.66

2. A calculator is listed for $110 and is on clearance for 35% off. Sales tax is 7%. What is the cost of the calculator?

   $76.51

3. Cara started working for $9 per hour. She earns a 4% raise every year. What is her hourly wage after three years?

   $10.12 per hour

4. A factory manufactures a metal piece in 32 minutes. New technology allowed the factory to cut that time by 8%. Then another improvement cut the time by 5%. How long does it take to manufacture the piece now? Round your answer to the nearest minute.

   28 minutes

5. An apartment costs $875 per month to rent. The owner raises the price by 20% and then gives a discount of 8% to renters who sign an 18-month lease. How much less do renters who sign an 18-month lease pay per month to rent the apartment?

   $84 less

Solving Problems Involving Multiple Percents *continued*

6. Damon buys lumber worth \$562. He gets a 20% contractor's discount. The sales tax is 6%. His credit card gives him 2% off. How much does he pay?

   \$467.04

7. Cindy is shopping for a television. The original price is \$612. Store A has the television on clearance for 30% off. Store B has it on clearance for 25% off, and Cindy has a 10% off coupon to use at Store B. At which store will she pay less? How much less?

   Store B; \$15.30 less

8. John goes to a restaurant and has a bill of \$32.57. He uses a 10% off coupon on the cost of the meal. The tax is 8%. He leaves a tip of 18% on the amount before the coupon or tax is applied. How much does he spend?

   \$37.52

9. Explain which situation will give you the best price: a discount of 15% and then 10% off that amount, a discount of 10% and then 15% off that amount, or a discount of 25%.

   a discount of 25%; Possible explanation: Applying a 15% off discount and a 10% off discount in either order results in the same final amount because of the commutative property of multiplication. This final amount is more than when a 25% off discount is applied.

Solving Problems Involving Percent Change

➤ **Find the percent change and tell whether it is a percent increase or a percent decrease.**

1. Original amount: 20
   End amount: 15

   25% decrease

2. Original amount: 30
   End amount: 45

   50% increase

3. Original amount: 625
   End amount: 550

   12% decrease

4. Original amount: 320
   End amount: 112

   65% decrease

5. Original amount: 165
   End amount: 222.75

   35% increase

6. Original amount: 326
   End amount: 423.80

   30% increase

7. Original amount: 27
   End amount: 38.61

   43% increase

8. Original amount: 60
   End amount: 70.02

   16.7% increase

9. How do you know when a situation involves a percent increase or a percent decrease?

   Possible answer: When the end amount is greater than the original amount, there is a percent increase. When the end amount is less than the original amount, there is a percent decrease.

Solving Problems Involving Percent Error

➤ **Solve each problem. Round to the nearest hundredth of a percent if needed.**

1. Mrs. Rowan allotted 30 minutes at the beginning of class for her students to complete an exam. The last student took 42 minutes to complete the exam. What is Mrs. Rowan's percent error?

   40%

2. Harper needs to mail an envelope. She weighs it at home as 10.4 ounces. When she gets to the post office, the clerk weighs it at 9.6 ounces. What is the percent error in the weight of the envelope?

   7.69%

3. An airline ticket states that the flight takes 2 hours and 45 minutes. The flight time is actually 2 hours and 54 minutes. What is the percent error in the flight time?

   5.45%

4. Luna buys a shirt that costs \$15.65. She gives the cashier \$20 and receives \$3.25 in change. What is the percent error in the amount of change she was given?

   25.29%

5. Judy thinks there will be 325 people at the county fair on Friday, while Atticus thinks there will be 600 people. On Friday, 452 people attend the fair. Who is closer in their estimate? What is the difference between the percent errors?

   Judy is closer by about 4.64%.

6. Sussex County received 43 inches of rainfall this year. The percent error in the local meteorologist's rainfall prediction was about 18.02%. What are two possible values for the meteorologist's prediction?

   35.25 inches, 50.75 inches

Expanding Expressions

➤ **Expand each expression and combine like terms if possible.**

1. $4(x - 2)$

   $4x - 8$

2. $-3(x + 7)$

   $-3x - 21$

3. $-4(-x - 8)$

   $4x + 32$

4. $\frac{1}{3}(x - 9)$

   $\frac{1}{3}x - 3$

5. $-\frac{1}{4}(x + 16)$

   $-\frac{1}{4}x - 4$

6. $-\frac{1}{5}(-x - 35)$

   $\frac{1}{5}x + 7$

7. $\frac{2}{3}(x + 18 - 2x)$

   $-\frac{2}{3}x + 12$

8. $\frac{3}{4}(16x - 27 - 1)$

   $12x - 21$

9. $-12\left(\frac{5}{6}x - 5\right) + 2x$

   $-8x + 60$

➤ **Determine which expressions, if any, are equivalent. Show your work.**

10. $4(x - 3)$ | $6x - 2(x - 3)$ | $x + 3(x - 2) - 6$

$4(x - 3)$	$6x - 2(x - 3)$	$x + 3(x - 2) - 6$
$4x - 12$	$6x - 2x + 6$	$x + 3x - 6 - 6$
	$4x + 6$	$4x - 12$

$4(x - 3)$ and $x + 3(x - 2) - 6$ are equivalent expressions.

Expanding Expressions *continued*

11. $\frac{1}{3}(9x + 16 + 2) + 2x$ $\quad$ $7x + 14 - 2(x + 4)$ $\quad$ $x - 3 + 7(x + 3) - 3x - 12$

$\frac{1}{3}(9x + 16 + 2) + 2x$

$\frac{1}{3}(9x + 18) + 2x$

$3x + 6 + 2x$

$5x + 6$

$7x + 14 - 2(x + 4)$

$7x + 14 - 2x - 8$

$5x + 6$

$x - 3 + 7(x + 3) - 3x - 12$

$x - 3 + 7x + 21 - 3x - 12$

$5x + 6$

All three expressions are equivalent.

12. Use two different methods to expand $\frac{1}{4}(x + 2x + 16 - 8)$.

Possible answer:

Method 1: $\frac{1}{4}(x + 2x + 16 - 8)$

$\frac{1}{4}(3x + 8)$

$\frac{3}{4}x + 2$

Method 2: $\frac{1}{4}(x + 2x + 16 - 8)$

$\frac{1}{4}x + \frac{1}{2}x + 4 - 2$

$\frac{3}{4}x + 2$

Factoring Expressions

➤ **Factor each expression.**

1. $8a + 16$

   $8(a + 2)$

2. $12x - 20$

   $4(3x - 5)$

3. $-6a + 18$

   $-6(a - 3)$

4. $-14w - 21$

   $-7(2w + 3)$

5. $8a - 12b + 28$

   $4(2a - 3b + 7)$

6. $-6x + 15y - 24$

   $-3(2x - 5y + 8)$

7. $2a + 3 + 7a$

   $3(3a + 1)$

8. $-2x - 8x + 20$

   $-10(x - 2)$

9. $5y + 10 - 25y$

   $-10(2y - 1)$

10. Simplify $(4x + 7) - (-3x - 9) + 9x - 28$. Then rewrite in factored form, if possible. Show your work.

    $4x + 7 + 3x + 9 + 9x - 28$

    $16x - 12$

    $4(4x - 3)$

Factoring Expressions *continued*

11 Determine which of the following expressions are equivalent. Show your work.

- $\frac{1}{6}(x - 3)$
- $\frac{1}{4}x - \frac{3}{5} - \frac{1}{12}x + \frac{1}{10}$
- $\frac{1}{18}x + \frac{1}{9}x - \frac{1}{2}$

Possible work:

$\frac{1}{4}x - \frac{6}{10} - \frac{1}{12}x + \frac{1}{10}$

$\frac{6}{24}x - \frac{6}{10} - \frac{2}{24}x + \frac{1}{10}$

$\frac{4}{24}x - \frac{5}{10}$

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

$\frac{1}{6}(x - 3)$

$\frac{1}{18}x + \frac{1}{9}x - \frac{1}{2}$

$\frac{1}{18}x + \frac{2}{18}x - \frac{1}{2}$

$\frac{3}{18}x - \frac{1}{2}$

$\frac{1}{6}(x - 3)$

All three expressions are equivalent.

12 Explain a different method you could use to solve problem 11.

Possible answer: I could have expanded $\frac{1}{6}(x - 3)$ into $\frac{1}{6}x - \frac{1}{2}$ in the first expression. Then I could combine like terms in the second and third expressions and skip the factoring step, to show that all three expressions are equivalent to $\frac{1}{6}x - \frac{1}{2}$.

Understanding Representing a Situation with Different Expressions

➤ **Complete the problems by rewriting algebraic expressions.**

1. Goby fish and shrimp naturally live close together. A pet store is selling bags of goby fish and shrimp to aquarium hobbyists. Each goby fish costs \$15, and each shrimp costs \$10. Each bag has an equal number of goby fish and shrimp.

   a. The pet store models the cost per bag with the expression $x(15 + 10)$. Explain what the expression represents.

   Possible answer: The expression $(15 + 10)$ shows the cost of one fish and the cost of one shrimp. The variable x represents the number of fish and the number of shrimp in each bag. The sum of the two costs is multiplied by the number of fish and shrimp in each bag.

   b. What other expression can you use to model the cost? Explain what the expression represents.

   Possible answer: $25x$; The expression shows the total cost for a bag that contains x fish and shrimp.

2. Ms. Ghandi runs 1 mile each morning and 1 mile each evening. She also does 10 push-ups each morning and each evening.

   a. Ms. Ghandi writes the two expressions $2(m + 10p)$ and $2m + 20p$. Explain how each expression represents how much she exercises.

   Possible answer: $2(m + 10p)$ shows that she runs 1 mile and does 10 push-ups two times a day. $2m + 20p$ shows that she runs 2 miles and does 20 push-ups each day.

   b. Ms. Ghandi wants to determine how much she will exercise this week. Write an expression to model this situation. Explain your expression.

   Possible answer: $7(2m + 20p)$; $2m + 20p$ is the amount of exercise that she does in 1 day. Multiply that expression by 7 to find the amount of exercise she does in 7 days.

3. Write two expressions for the perimeter of a square. Explain what information is in one of your expressions that is not in the other.

   Possible answer: $4x + 20$ and $4(x + 5)$; $4(x + 5)$ lets you see that the side length of the side of the square is $x + 5$.

Writing and Solving Equations with Two or More Addends

➤ **Solve each equation. The answers are mixed up at the bottom of the page. Cross out the answers as you complete the problems.**

1. $8x + 15 = 63$

   $x = 6$

2. $9x - 13 = 23$

   $x = 4$

3. $135 = 2x + 25$

   $x = 55$

4. $33 = 32x - 31$

   $x = 2$

5. $12x - 16 = 68$

   $x = 7$

6. $7x + 115 = 136$

   $x = 3$

7. $82 = 4x + 14$

   $x = 17$

8. $2x - 56 = 34$

   $x = 45$

9. $3x - 4\frac{1}{2} = -19\frac{1}{2}$

   $x = -5$

10. $10 = -\frac{1}{4}x + 12$

    $x = 8$

11. $6x + 4.59 = 11.19$

    $x = 1.1$

12. $25.68 = 2x - 6.32$

    $x = 16$

Answers

$x = 1.1$	$x = 45$	$x = -5$	$x = 6$
$x = 7$	$x = 16$	$x = 4$	$x = 55$
$x = 17$	$x = 8$	$x = 2$	$x = 3$

Writing and Solving Inequalities

➤ **Write and solve an inequality to answer each question.**

1. Tetsuo has 50 arcade tokens. Each arcade game at RetroRama costs 4 tokens. How many games can Tetsuo play?

$$4t \leq 50$$
$$t \leq 12.5$$

Tetsuo can play 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, or 12 games.

2. Kimberly has $120 to spend at the bookstore. Kimberly buys a hardcover book for $36, as well as some gift cards for her family and friends. Each gift card is $15. How many gift cards can Kimberly buy?

$$15g + 36 \leq 120$$
$$15g \leq 84$$
$$g \leq 5.6$$

Kimberly can buy 0, 1, 2, 3, 4, or 5 gift cards.

3. Kwame has a budget of $720 for his college class. He buys a laptop for $330 and wants to use the rest to buy computer programs. Each program costs $60. How many programs can Kwame purchase?

$$60p + 330 \leq 720$$
$$60p \leq 390$$
$$p \leq 6.5$$

Kwame can buy 0, 1, 2, 3, 4, 5, or 6 computer programs.

4. A farmer ties 4 bags on his mule. If the mule can carry up to 200 lb and each bag weighs 30 lb, how many more bags can the mule carry?

$$4(30) + 30b \leq 200$$
$$120 + 30b \leq 200$$
$$30b \leq 80$$
$$b \leq 2.\overline{6}$$

The mule can carry 0, 1, or 2 more bags.

Writing and Solving Inequalities *continued*

5 Helga signs up to coach hockey. She wants to make at least \$775 during the season. She gets \$200 at the start of the season and \$50 for each practice session she has. How many practice sessions does Helga need to have this season?

$50p + 200 \geq 775$

$50p \geq 575$

$p \geq 11.5$

Helga needs to have at least 12 practice sessions.

6 Logan has a budget of \$400 to have family pictures taken. There is a sitting fee of \$38. Prints cost \$25 per page. How many pages of prints can Logan order?

$25p + 38 \leq 400$

$25p \leq 362$

$p \leq 14.48$

Logan can order 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, or 14 pages of prints.

7 At TopLine's 50th anniversary celebration, managers and assistants earn custom-engraved plaques in recognition of their outstanding performance. TopLine purchased a total of 81 plaques for the event. The company gives 25 plaques to the managers and at least 2 plaques to each assistant. What is the maximum number of assistants at the event?

$2a + 25 \leq 81$

$2a \leq 56$

$a \leq 28$

The maximum number of assistants at the event is 28.

8 A cartoonist has 150 pieces of original artwork to give to his publishers and some fans who won his online contest. He plans to send 30 drawings to his publishers. He is sending at least 3 pieces of artwork to each contest winner. How many contest winners could there be?

$3c + 30 \leq 150$

$3c \leq 120$

$c \leq 40$

There could be up to 40 contest winners.