AchieveMath

Student Book

Volume 2

Name:

Catapult Learning™

Unit 4:

Expressions

Catapult Learning™

Catapult Learning™

Catapult Learning, LLC
1-800-841-8730

www.catapultlearning.com

Printed in the United States of America.

Ultimate Gamer

Use **tape diagrams** and expressions to model the problems. Answer the questions.

1. Shonda and Jamal play a video game called *Ahoy, Pirates!* The number of treasure points Shonda collects in the game is 5 more than the number Jamal collects.

a. Underline the phrase that describes Shonda's points.

b. Compare Shonda's points (s) and Jamal's points (j) using a tape diagram.

c. What is the expression for the treasure points Shonda collects, using j?

_____

d. How did you decide which operation to use in your expression?

_____

2. In *Ahoy, Pirates!* players can earn bonus points. Jamal has $^1/_3$ of the bonus points Shonda has.

a. Underline the phrase that describes Jamal's bonus points.

b. Show Jamal's points using a tape diagram and the variable s for Shonda's points.

c. What is the expression for Jamal's bonus points, using s? _____

d. How did you decide which operations to use in your expression? _____

_____

3. When they play *Ahoy, Pirates!* again, Jamal's bonus points are 5 more than twice Shonda's bonus points.

a. Underline the phrase that describes Jamal's bonus points.

b. Show Jamal's points using a tape diagram and the variable s for Shonda's points.

c. What is the expression for Jamal's bonus points, using s? _____

d. How did you decide which operations to use in your expression? _____

_____

Translate Expressions

Review the example problem. Then write an expression to represent each of the phrases.

Example

Write a mathematical expression to represent the following phrase: **1** more than half of ***g***

Step 1

Underline words or phrases that describe the operation(s) to include.

1 more than half of ***g***

The phrase *more than* tells us to add.

The phrase *half of* tells us to multiply by ½.

Step 2

Identify the terms in the expression.

1 is a constant.
g is a variable.

Step 3

Decide if there are coefficients. Coefficients tell us to multiply.

Since we must multiply *g* by ½, ½ is a coefficient.

Step 4

Use operations to write a mathematical expression that describes the relationship between the terms.

1 more than half of ***g***

$1 + \frac{1}{2}g$

1. 3 fewer than *g* Expression: _____

2. 3 more than *k* Expression: _____

3. 2 more than 5 times *s* Expression: _____

4. 5 less than *f* Expression: _____

5. Twice *b* added to 4 Expression: _____

6. The sum of 2 and half of *w* Expression: _____

7. *r* decreased by 8 Expression: _____

8. The quotient of half of *t* and 6 Expression: _____

Lesson 25 Exit Ticket

Part 1: Draw a tape diagram to model the real-world problem. Then write an expression to represent the tape diagram.

1. Diana and her brother Travis love to play the video game *Airshow Acrobats*—and they always keep track of the score! The last time they played, Diana's score, d, was 4 times greater than Travis' score, t, plus 5.

Expression for Diana's score, using t: _____

Part 2: Write a mathematical expression to represent each phrase.

2. The total of 3 times p and 5

Expression: _____

3. q less than 6

Expression: _____

4. The difference of half of t and 4

Expression: _____

5. 2 greater than c

Expression: _____

Extra Practice: How Many Pets?

Match each expression to the phrase it represents.

$d - 4$	the difference between 4 and a number of dogs
$4 - d$	4 greater than 4 times a number of dogs
$4 + d$	4 fewer than a number of dogs
$4d + 4$	the sum of 4 and a number of dogs

Match each problem to the tape diagram that represents it.

Yesterday, Dr. Silva treated a number of cats, c. Today, Dr. Silva treated 4 fewer cats than she treated yesterday.

Cats treated today	
4	c

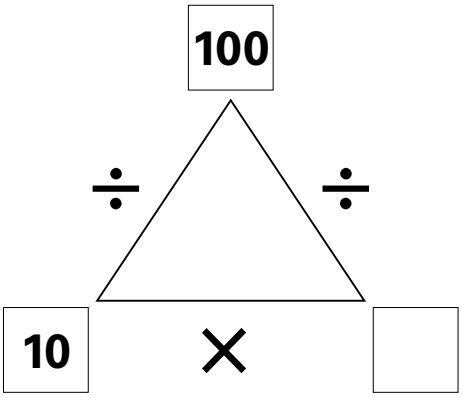
Yesterday, Dr. Silva treated a number of cats, c. Today, Dr. Silva treated 4 more cats than she treated yesterday.

Cats treated today				
4	c	c	c	c

Yesterday, Dr. Silva treated a number of cats, c. Today, she treated 4 more than 4 times as many cats as she treated yesterday.

c	
4	Cats treated today

Number Triangles

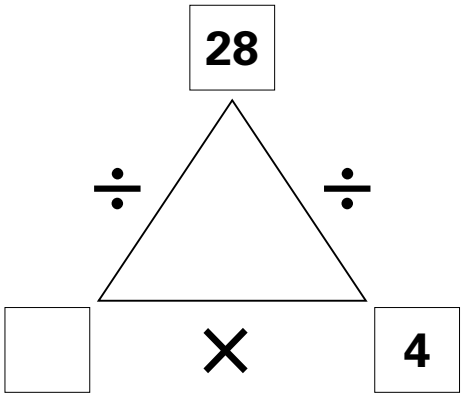


Equation with a variable:

_____ × _____ = _____

Equation with a number:

_____ × _____ = _____

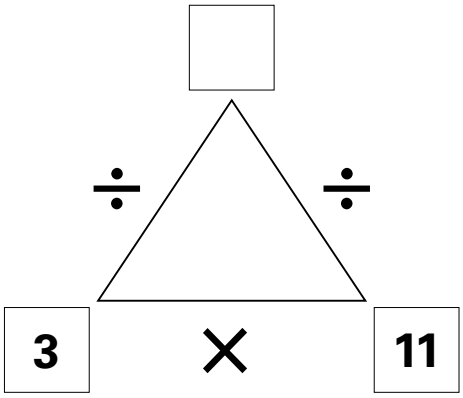


Equation with a variable:

_____ × _____ = _____

Equation with a number:

_____ × _____ = _____

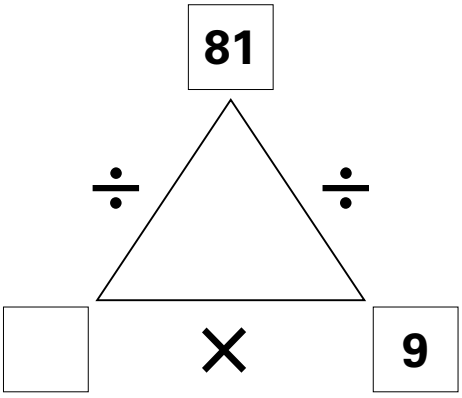


Equation with a variable:

_____ × _____ = _____

Equation with a number:

_____ × _____ = _____

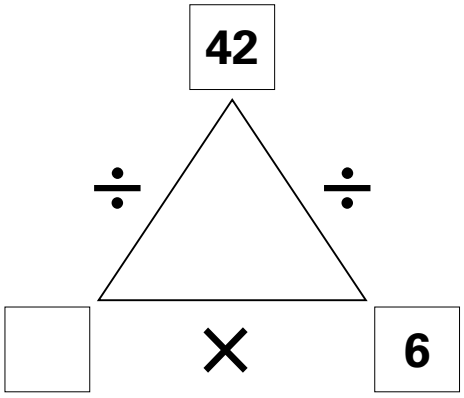


Equation with a variable:

_____ × _____ = _____

Equation with a number:

_____ × _____ = _____

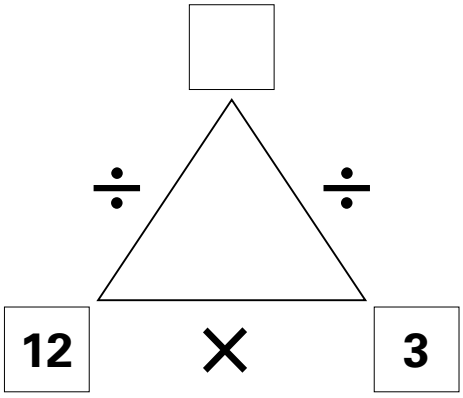


Equation with a variable:

_____ × _____ = _____

Equation with a number:

_____ × _____ = _____



Equation with a variable:

_____ × _____ = _____

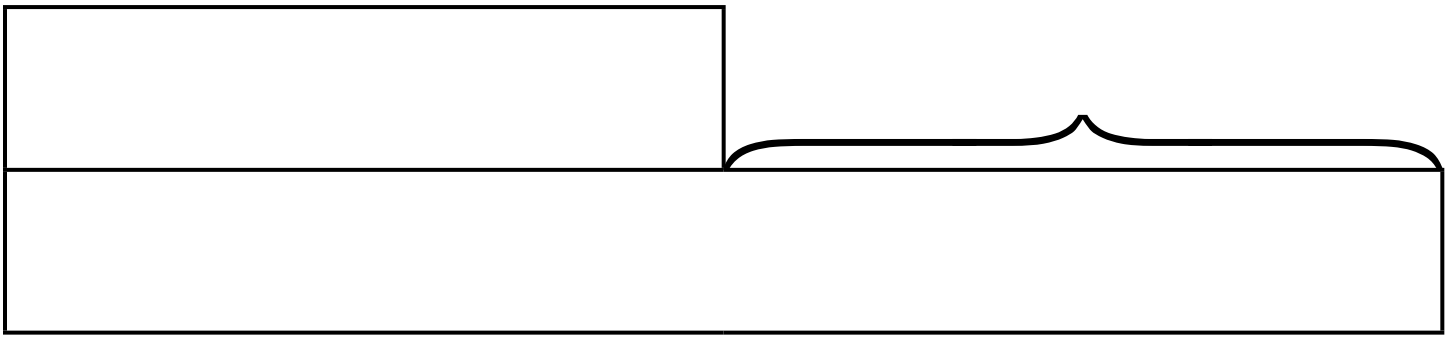
Equation with a number:

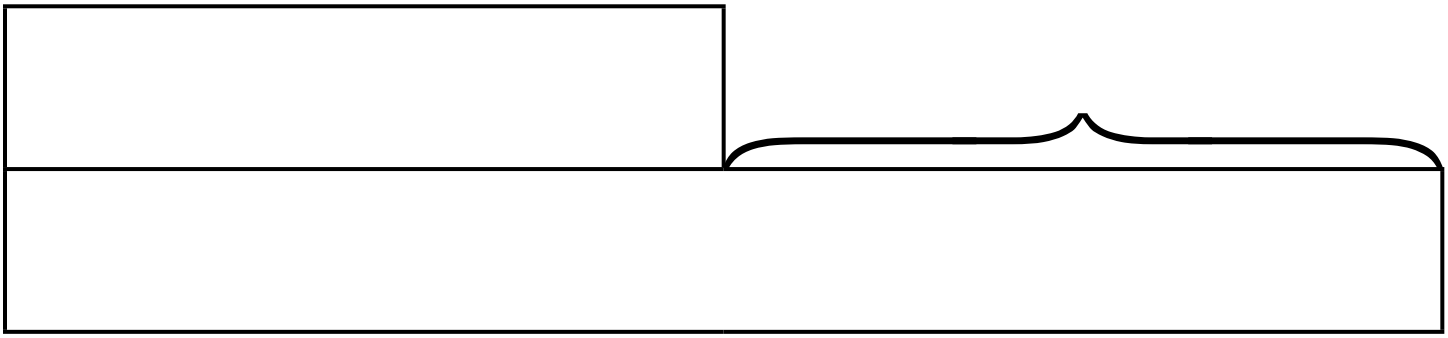
_____ × _____ = _____

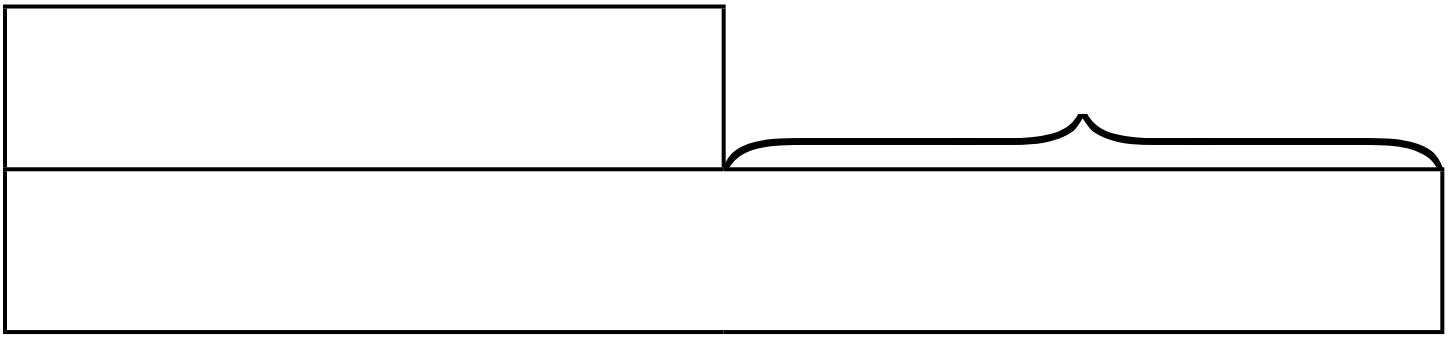
Tape Diagrams

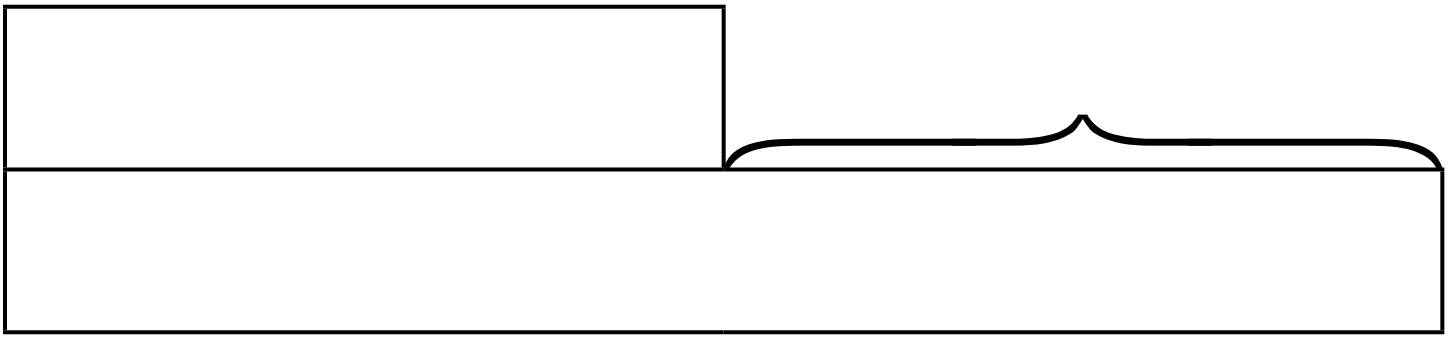
Tape Diagrams

Comparison Tape Diagrams









Expression Express

Use the words from the word bank to write 12 phrases with a number and a variable. Then move your paper down the Expression Express to translate the phrases written by your classmates into mathematical expressions.

Word Bank

less than	more than	half of	quotient of
difference	twice	times	decreased by
plus	minus	sum of	increased by

Phrase	Expression

Pay Day

Draw a **tape diagram** to model each problem. Use words and numbers to describe the whole and parts in the tape diagram. Then answer the questions.

1. DeShawn earns $5 for each hour he babysits his younger brother. Also, DeShawn's parents give him $8 each week for his allowance. How can you model the total amount of money DeShawn should get this week?

a. What does the problem ask you to model? Are you representing the whole or a part?

_____

_____

b. Write an expression with a variable to represent the situation. _____

c. Use substitution to evaluate the expression if DeShawn babysits for 6 hours this week. What is the total amount of money DeShawn should get this week?

_____

2. DeShawn's older sister Eriyonna works at a home goods store. Each week, she earns $150. Her paycheck also includes a $10 commission for every piece of large furniture she sells. How much is Eriyonna's paycheck?

a. What does the problem ask you to find? Are you finding the whole or a part?

_____

_____

b. Write an expression with a variable to represent the situation. _____

c. Use substitution to evaluate the expression if Eriyonna sold 5 pieces of large furniture this week. What is the total amount of Eriyonna's paycheck this week?

_____

Evaluate

Review the example problem. Then evaluate the expressions.

Example

Evaluate the expression $10 + 2s$ for $s =$ **12**.

Step 1

Identify the terms in the expression.

The term 10 is a constant.
The term $2s$ includes a coefficient and a variable.

Step 2

Substitute the given value for the variable and rewrite the expression.

$10 + 2($**12**$)$

Step 3

Simplify terms as necessary and write a new expression.

$2($**12**$) = 24$ $10 + 24$

Step 4

Solve.

$10 + 24 = 34$

1. Evaluate each expression for $\boldsymbol{c = 5}$.

$4c - 3$ _____

$37 + c$ _____

$12 - 2c$ _____

2. Evaluate each expression for $\boldsymbol{p = 2}$.

$80 \div 8p$ _____

$5p \times 20$ _____

$9p \div p$ _____

3. Evaluate each expression for $\boldsymbol{r = 8}$.

$76 - 2r$ _____

$3r + 53$ _____

$4 \times 4r$ _____

4. Evaluate each expression for $\boldsymbol{a = 4}$.

$10a - 4$ _____

$12a \times 5$ _____

$9 \times 1a$ _____

5. Evaluate $\boldsymbol{87 - 3h}$ for . . .

$h = 11$ _____

$h = 12$ _____

$h = 7$ _____

6. Evaluate $\boldsymbol{2n \div 4}$ for . . .

$n = 2$ _____

$n = 6$ _____

$n = 36$ _____

Lesson 26 Exit Ticket

Part 1: Draw a tape diagram to model each problem. Use words and numbers to describe the whole and parts in the tape diagram. Then answer the questions.

1. Erik's cell phone plan charges a $10 monthly fee and $4 for each gigabyte of data he uses.

a. Write an expression using a variable to model the total monthly cost of Erik's phone.

_____

b. In September, Erik uses 2 gigabytes of data. What is his total monthly cost for September?

Show your work. _____

Erik's total cost in September is _____ dollars.

Part 2: Substitute the given values of d to evaluate the expression.

$4 \times 2d$

2. $d = 7$ _____

3. $d = 9$ _____

4. $d = 4$ _____

Extra Practice: Pizza Time

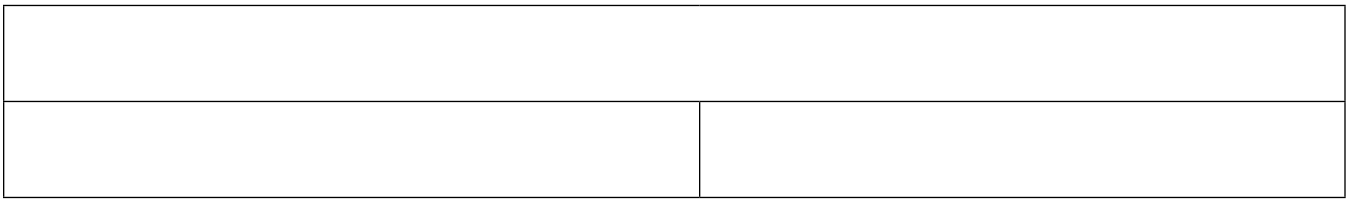
Jackson and Mr. Fortunato decide they both need a break, so they decide to order pizza! Use the information and menu to answer the questions.

Build Your Own Pizza

Size	Cheese Pizza	Meat Toppings (each)	Veggie Toppings (each)
Single Serving	$5.00	$0.85	$0.75
Medium	$10.00	$1.50	$1.00
Large	$16.00	$2.00	$1.50

1. Mr. Fortunato wants a medium pizza with some veggie toppings.

a. Model this dining request with a tape diagram. Use *v* for the number of veggie toppings.



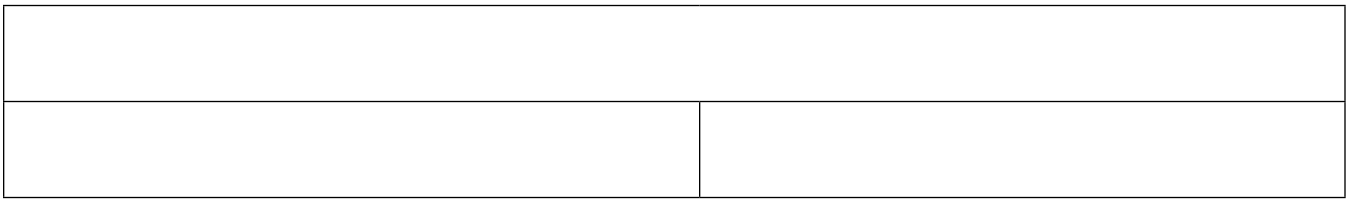
b. Write an expression to represent Mr. Fortunato's request. _____

c. How much would Mr. Fortunato's pizza cost if he got mushrooms and peppers? Show your work. _____

Mr. Fortunato's pizza would cost _____.

2. Jackson wants a large pizza with a few meat toppings.

a. Model this with a tape diagram. Use *m* for the number of meat toppings.



b. Write an expression to represent Jackson's request. _____

c. How much would Jackson's pizza cost if he got pepperoni, sausage, and salami? Show your work. _____

Jackson's pizza would cost _____.

Tape Diagrams

Tape Diagrams

Math Bee

Draw tape diagrams to model the expressions. Circle your response.

1. Model $7 + 5x + 2 + x + 3x$ with a tape diagram. Is it equal to $9 + 9x$?

$7 + 5x + 2 + x + 3x$ and $9 + 9x$ are equal. Yes No

2. Model $4 + 3u + 25 + 3u + 4u$ with a tape diagram. Is it equal to $32 + 7u$?

$4 + 3u + 25 + 3u + 4u$ and $32 + 7u$ are equal. Yes No

3. Model $11d + 10 + 6d + 1d + 6$ with a tape diagram. Is it equal to $18d + 16$?

$11d + 10 + 6d + 1d + 6$ and $18d + 16$ are equal. Yes No

Round Two

Review the example problem. Then simplify the expressions by grouping like terms and write an equivalent expression. Show your work.

Example

In Round Two of the Math Bee, each student works through a set of problems. The students with the top 5 scores go on to the next round. One of the problems in the set asks students to write an expression that is equivalent to $\mathbf{8 + 3mx + 4m + 2 - 2mx}$. How can Josie simplify this expression?

Step 1

Identify the like terms.

The constants **8** and **2** are like terms.

The terms $\mathbf{3mx}$ and $\mathbf{2mx}$ are like terms because they have the same variables, *mx*.

$\mathbf{4m}$ has no other like terms in the expression.

Step 2

Rewrite the expression to group the like terms.

$\mathbf{8 + 3mx + 4m + 2 - 2mx = (8 + 2) + (3mx - 2mx) + (4m)}$

Step 3

Simplify the expression by combining like terms.

$\mathbf{(8 + 2) + (3mx - 2mx) + (4m)} = 10 + \mathbf{(3mx - 2mx) + (4m)}$

$= 10 + mx + \mathbf{(4m)}$

$\mathbf{(8 + 2) + (3mx - 2mx) + (4m)} = 10 + mx + 4m$

1. $7p + 4 + p + 2 - 5p =$ _____

_____

2. $5 + 5k + 2k + 2 + 1 =$ _____

_____

3. $9ab + 7 - 2ab + 8 =$ _____

_____

4. $4xy + 11 + 4yz - 6 - 2x =$ _____

_____

5. $yz + 5zy + 14 - 6 =$ _____

_____

6. $7 + 12a + 8 - 4 + 12ab =$ _____

_____

Lesson 27 Exit Ticket

Part 1: Draw tape diagrams to model the expressions. Circle your response.

1. Model $4w + 1 + 5w + 8 + w$ with a tape diagram. Is it equal to $9w + 9$?

$4w + 1 + 5w + 8 + w$ and $9w + 9$ are equal. Yes No

2. Model $2 + 7a + 5 + 3a + 2a$ with a tape diagram. Is it equal to $7 + 12a$?

$2 + 7a + 5 + 3a + 2a$ and $7 + 12a$ are equal. Yes No

Part 2: Simplify the expressions by grouping like terms and then write an equivalent expression. Show your work.

3. $8 + 6v + 3v + 5 - 2v =$ _____

4. $2 + 2a + 2ab - 2ba + 2 =$ _____

Extra Practice: Game Show Madness

The challenges below are from the game show *Ten Digits!* Complete them to find out how you would do as a contestant.

1. One of the challenges on *Ten Digits!* is to see who can group like terms together fastest. Sort the terms below by placing each under the like term in the chart.

Terms				
$6x$	23	$3x$	$5n$	$20n$
x	$16x$	$n(2 + 4)$	$3(15 - 10)$	

$3n$	16	$5x$

2. Milos has to press buttons on a huge screen to connect the equivalent equations. It's nerve-wracking because the audience is watching. Draw a line to connect the equivalent equations.

$f + 6f + 5 - 2f + 4f$	$2f + 12$
$3f + 3 - f + 4f + 2$	$9f + 5$
$5 + 8f + 6 - 6f + 1$	$6f + 5$
$4 + 2f + 5f + 2 - 3f$	$4f + 6$
$10f + 9 - 5 + 6f + 3$	$8 + 4f$
$12 - 5 + 2f + 1 + 2f$	$16f + 7$

Basketball Practice

Read each problem and answer the questions.

1. The expression $15 + 24x$ represents the total cost for Alyssa's basketball team to rent a court at Rebel Gym for a whole season of practice.

a. What is the greatest common factor of 15 and 24? _____

b. How can you draw a tape diagram to show this information?

$15 + 24x$

c. Is the equation $15 + 24x = 3(5 + 8x)$ true? How do you know? _____

_____

_____

2. The expression $4(12 + 3x)$ represents the total cost for Alyssa's basketball team to rent a court at Molly's Fitness for a whole season of practice.

a. How can you use the distributive property to write $4(12 + 3x)$ as the sum of two products?

_____

b. How can you draw a tape diagram to model the expression you wrote?

$4(12) + 4(3x)$

c. Is the equation $4(12 + 3x) = 48 + 12x$ true? How do you know?_____

_____

_____

New Jerseys

Review the example problem. Then use the distributive property to write an equivalent expression.

Example

Steph needs to order jerseys for the team. The jerseys cost $**8** each, and there is a shipping fee of $**10**. Steph says that **8*j*** + **10** represents the total cost of the jerseys. Factor out the greatest common factor to write an equivalent expression.

Step 1

Find the greatest common factor (GCF) of **8** and **10**.

The factors of **8** are 1, 2, 4, and 8. The factors of **10** are 1, 2, 5, and 10. The GCF is 2.

Step 2

Rewrite each addend as a factor of the GCF:

8*j* + **10** = 2(4*j*) + 2(5)

Step 3

Write the expression as the product of the two addends and the common factor.

8*j* + **10** = 2(4*j*) + 2(5) = 2(4*j* + 5)

For the sale price, represented by **4**(***j*** + **4**), distribute the common factor to write an equivalent expression.

Step 1

Multiply the factor by the first addend.

4 × ***j*** = 4*j*

Step 2

Multiply the factor by the second addend.

4 × **4** = 16

Step 3

Write the expression as the sum of the two products.

4(***j*** + **4**) = 4*j* + 16

1. $9j + 12 =$ _____

2. $12j + 48 =$ _____

3. $8 + 32j =$ _____

4. $2 + 62j =$ _____

5. $6j + 15 =$ _____

6. $3j + 21 =$ _____

7. $8 + 12j =$ _____

8. $10j + 75 =$ _____

9. $7(3j + 7) =$ _____

10. $5(8j + 2) =$ _____

11. $12j(8 + 11) =$ _____

12. $3(6 + 7j) =$ _____

13. $2(8j + 9) =$ _____

14. $8(7 + 10j) =$ _____

15. $2j(12 + 10) =$ _____

16. $8(9j + 2) =$ _____

Lesson 28 Exit Ticket

Part 1: For each expression, use the distributive property to write an equivalent expression.

1. $6(2 + 8h) =$ _____

2. $5(4r + 7) =$ _____

3. $36 + 12m =$ _____

4. $9(5b) + 9(3) =$ _____

5. $7(4z + 1) =$ _____

6. $20 + 12d =$ _____

Part 2: Read each problem and answer the questions.

7. The expression $4n + 14$ represents the total cost to print the players' numbers on their jerseys.

a. Draw a tape diagram to represent the expression.

b. Does the expression $2(2n + 7)$ also represent the total cost? Explain.

_____

_____

_____

8. The expression $5(3 + 2n)$ represents the total cost to print the players' last names on their jerseys.

a. Draw a tape diagram to represent the expression.

$5(3 + 2n)$

b. Does the expression $15 + 10n$ also represent the total cost? Explain.

_____

_____

_____

Extra Practice: Distributive Property Practice

Part 1: Match the equivalent expressions.

$6(3r + 8)$	$6(8r + 3)$
$6(8r) + 6(3)$	$3(8r + 6)$
$3(6r + 8)$	$6(3r) + 6(8)$
$3(8r) + 3(6)$	$3(6r) + 3(8)$

Part 2: Use factoring or distribution to write an equivalent expression.

1. $100k + 5 =$ _____ **2.** $5(k + 6) =$ _____

3. $10 + 4k =$ _____ **4.** $10k(11 + 12) =$ _____

5. $12k + 9 =$ _____ **6.** $4(3k + 9) =$ _____

7. $6 + 33k =$ _____ **8.** $5(1 + 2k) =$ _____

9. $14k + 8 =$ _____ **10.** $7(12k + 9) =$ _____

Part 3: Is $2(5 + 7g) = 10 + 14g$ a true statement? Draw a tape diagram to model the expressions and explain how you know.

$2(5 + 7g)$

Walking for Dollars

Part 1: Write three expressions that represent each tape diagram.

1. Rose is going on the band trip with Phi. She is collecting donations for the walk-a-thon too. The diagram shows the donations Rose has collected.

total donations				
8	6d	3d	7	3d

_____ _____ _____

2. Akela collects donations too. The tape diagram shows the donations Akela has collected.

total donations			
5m	1	11	7m

_____ _____ _____

Part 2: Determine whether each pair of expressions is equivalent. Circle your response.

3. $12m - 4$ and $2 - 3m$

equivalent/not equivalent

4. $12(4b + 10)$ and $48b + 120$

equivalent/not equivalent

5. $33c + 55$ and $11(3 + 5c)$

equivalent/not equivalent

6. $5(m + 2 + 3m)$ and $20m + 10$

equivalent/not equivalent

7. $6m + m + 3 + m + 1$ and $4(2m + 1)$

equivalent/not equivalent

8. $10m + 12m + 5 - 5m + 13$ and $9(3m + 4)$

equivalent/not equivalent

Eyes on the Prize

Review the example problem. Then write two equivalent expressions for each given expression.

Example

There is a contest with a prize for the student who collects the most money for the walk-a-thon. The expression **$7m + 16 + 15m + 2m + 14$** represents the donations Moira collected. What are two other expressions Moira can use to calculate her donations?

Step 1

Group like terms. **$7m + 16 + 15m + 2m + 14 = \underline{(7m + 15m + 2m) + (16 + 14)}$**

Step 2

Combine like terms. (**$7m + 15m + 2m$**) + (**$16 + 14$**) = $\underline{24m + 30}$

Step 3

If possible, find the greatest common factor for addends. Then factor it out.

The greatest common factor is 6. $24m + 30 = \underline{6(4m) + 6(5)} = \underline{6(4m + 5)}$

Step 4

Each underlined expression is equivalent.

$\underline{\mathbf{7m + 16 + 15m + 2m + 14}} = (\mathbf{7m + 15m + 2m}) + (\mathbf{16 + 14}) = \underline{24m + 30} = \underline{6(4m) + 6(5)} = \underline{6(4m + 5)}$

1. $8(7 + 8d) =$ _____ = _____

2. $5a + 12 - 9 + 4a =$ _____ = _____

3. $5 + 10 + 28b - 3b =$ _____ = _____

4. $7c + 8 - 3c + 7 + 1 =$ _____ = _____

5. $32g + 16 =$ _____ = _____

6. $7d + 8 - 6 + 9d + 6 =$ _____ = _____

7. $45g + 9 =$ _____ = _____

8. $17hk - 5kh + 2 + 4 + 2 =$ _____ = _____

9. $4m + 4 + 7m + 4 + 3m =$ _____ = _____

10. $9(2e + 7) =$ _____ = _____

Lesson 29 Exit Ticket

Part 1: Write an equivalent expression for each given expression.

1. $8m + 9 - 3m - 4 =$ _____

2. $5m + 5 =$ _____

3. $11 + 10m + 10 - 6m + 12m =$ _____

4. $6(3m + 8) =$ _____

Part 2: Determine whether each pair of expressions is equivalent. Circle your response.

5. $7m + 10 - 2m - 8 + 9$ and $3(5m + 27)$

equivalent/not equivalent

6. $5m + 2m + 35 + 11m + 13$ and $2(9m + 11)$

equivalent/not equivalent

7. $4(4x + 9)$ and $8x + 36$

equivalent/not equivalent

Extra Practice: Born to Run

Part 1: Match the equivalent expressions.

1.

$5n - n + 3 + 5$	$5n + 7 + 7n + 9$
$6 + 2n + 4 + 5n + 3n$	$4(n + 2)$
$4(3n + 4)$	$5n + 8 + n + 10$
$6(n + 3)$	$10(n + 1)$

Part 2: For each expression, combine like terms to write an equivalent expression. Then use the distributive property to write another equivalent expression.

3. $20x + 6 - 10x + 12$

_____

_____

4. $12 + 8x + 5 + 10 + 4x$

_____

_____

5. $7x + 7 + 3x + 8$

_____

_____

6. $22 + 15x + 8 + 15 + 21x$

_____

_____

7. $50 + 21x + 11x + 6$

_____

_____

8. $18x + 3 - 12x + 5 + 12x$

_____

_____

Expression Match Cards

$3 + 9x - 7x - 1 + 8x$	$9x + 3$
$10x + 1$	$11x + 121$
$10x + 2$	$3(3x + 1)$
$4(4x + 5)$	$4 - 3 + 5x + 7 - 3x + 1$
$11(x + 11)$	$10x + 4 - 1x - 3 + 3x$
$16x + 20$	$2x + 9$

Free Flow Aquarium

Model the problems with **linking cubes** and answer the questions.

1. When Jonah's mom gets back to the shop, she asks him to add 2^4 more bags of gravel to the display.

a. How many linking cubes are in a model of 2^4? _____

b. What multiplication expression is equivalent to 2^4? _____

c. How many bags of gravel does Jonah needs to add to the display? Show your multiplication.

_____

Jonah needs to add _____ bags to the display.

2. Jonah wants to model 3^2, because he wants to see if this is different from 2^3.

a. How many linking cubes are in a model of 3^2? _____

b. What multiplication expression is equivalent to 3^2? _____

c. What is 3^2? Show your multiplication work.

_____ 3^2 = _____

3. A big display requires 4^3 bags of gravel.

a. How many linking cubes are in a model of 4^3? _____

b. What multiplication expression is equivalent to 4^3? _____

c. How many bags of gravel are required for this display? Show your multiplication work.

_____

The display requires _____ bags of gravel.

New Fish

Review the example problem. Then, read the problems and answer the questions.

Example

The aquarium sells tropical fish. On a busy Saturday, Jonah's mom tells him to get **6** fish ready for delivery. Then she changes her mind and says to prepare **6** times that many fish. Then she says to multiply the order by **6** again! How can you write an exponential expression to model how many fish Jonah needs to prepare?

Step 1

Identify the multiplication expression.

The multiplication equation is $\mathbf{6} \times \mathbf{6} \times \mathbf{6}$.

Step 2

Identify the number that is being multiplied. This is the base.

6 is being multiplied, so 6 is the base.

Step 3

Identify how many times the base is the factor. This is the exponent.

6 is a factor 3 times, so 3 is the exponent.

Step 4

Using the base and the exponent, rewrite the multiplication equation as an exponential expression.

$\mathbf{6} \times \mathbf{6} \times \mathbf{6} = \mathbf{6^3}$

1. Last month, Jonah's dad bought $5 \times 5 \times 5 \times 5$ new tropical fish for the shop. How can you write this as an exponential expression?

What is the number being multiplied? _____

How many times is it a factor? _____

What exponential expression models the multiplication? _____

2. Rewrite each multiplication expression as an exponential expression.

$5 \times 5 \times 5 \times 5 \times 5 \times 5 =$ _____

$3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 =$ _____

$8 \times 8 \times 8 \times 8 \times 8 =$ _____

$9 \times 9 =$ _____

$2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 =$ _____

$12 \times 12 \times 12 \times 12 =$ _____

3. Rewrite each exponential expression as a multiplication expression.

$1^9 =$ _____

$8^3 =$ _____

$10^4 =$ _____

$6^8 =$ _____

$7^2 =$ _____

$4^7 =$ _____

Lesson 30 Exit Ticket

Part 1: Use **linking cubes** to evaluate the exponential expression.

1. Model 4^2 using linking cubes.

4^2 = _____ cubes

Part 2: Read each problem. Evaluate the exponential expression using multiplication. Show your work.

2. 8^3 = _____

_____

3. 2^6 = _____

_____

Part 3: Rewrite each multiplication expression as an exponential expression.

4. $3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$ = _____

5. $5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5$ = _____

Extra Practice: Expressing Exponents

Part 1: Model the following expressions with **linking cubes**. Then complete each equation.

1. 2^3 = _____

2. 4^2 = _____

3. 3^2 = _____

4. 2^4 = _____

5. 4^3 = _____

6. 2^5 = _____

7. 3^3 = _____

8. 5^2 = _____

Part 2: Use the numbers and expressions in the box to complete the equations.

3	$8 \times 8 \times 8$	9	7
625	5^2	8×8	216

9. 8^3 = _____ = 512

10. 4 ___ $= 4 \times 4 \times 4 = 64$

11. $6^3 = 6 \times 6 \times 6$ = _____

12. _____ $= 5 \times 5 = 25$

13. 8^2 = _____ = 64

14. 2 ___ $= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 128$

15. $5^4 = 5 \times 5 \times 5 \times 5$ = _____

16. _____$^3 = 9 \times 9 \times 9 = 729$

Part 3: Write an equivalent exponential expression for each multiplication expression.

17. $12 \times 12 \times 12$ = _____

18. $6 \times 6 \times 6 \times 6 \times 6 \times 6 \times 6$ = _____

19. $5 \times 5 \times 5 \times 5 \times 5$ = _____

20. $3 \times 3 \times 3 \times 3 \times 3 \times 3$ = _____

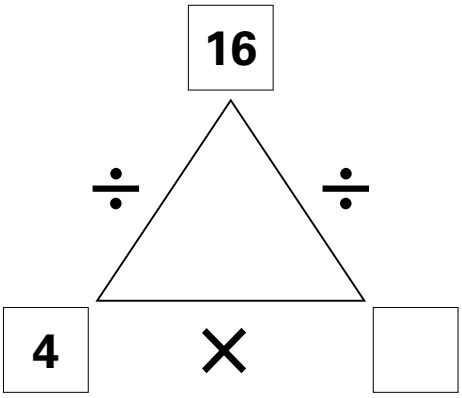
21. $10 \times 10 \times 10 \times 10$ = _____

22. $2 \times 2 \times 2 \times 2 \times 2$ = _____

23. $4 \times 4 \times 4 \times 4 \times 4 \times 4$ = _____

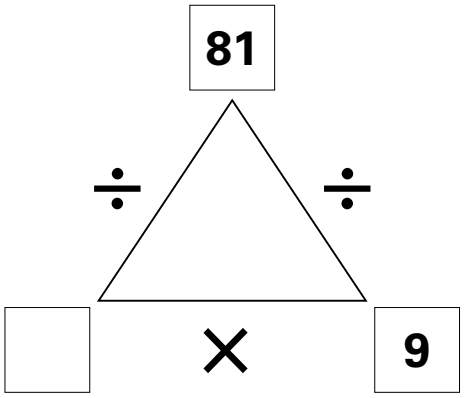
24. $8 \times 8 \times 8 \times 8$ = _____

Number Triangles



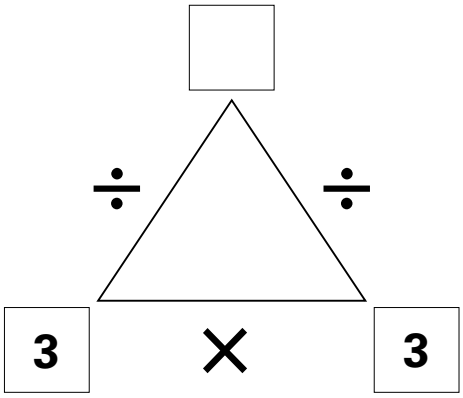
Complete one equation:

_____ × _____ = _____



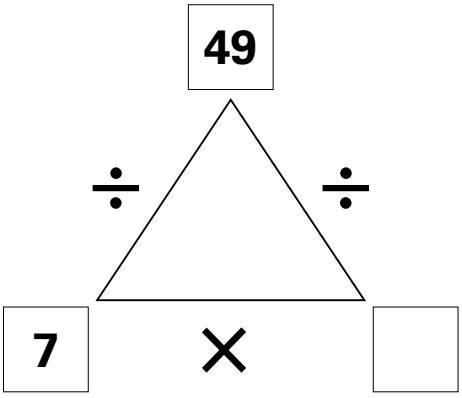
Complete one equation:

_____ × _____ = _____



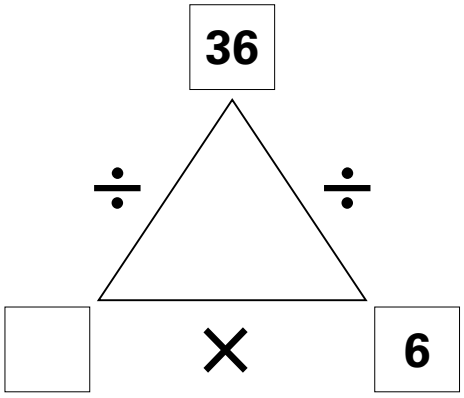
Complete one equation:

_____ × _____ = _____



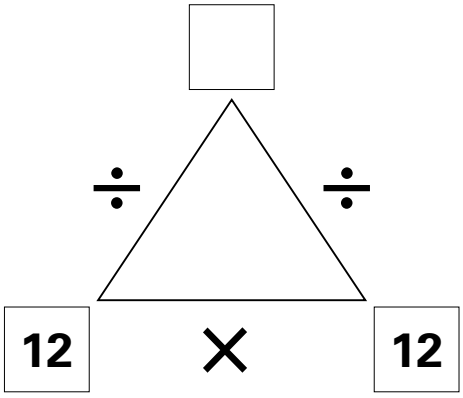
Complete one equation:

_____ × _____ = _____



Complete one equation:

_____ × _____ = _____



Complete one equation:

_____ × _____ = _____

Apple Order

Part 1: Use the table to show the steps to find the total.

1. The expression $(5 - 2) + 3 \times 2^2$ represents the number of apple pies Emile makes.

Steps	Reasons
$(5 - 2) + 3 \times 2^2$	
$= 3 + 3 \times 2^2$	parentheses
=	exponents
=	multiplication and division, left to right
=	addition and subtraction, left to right

Emile makes _____ apple pies.

Part 2: Simplify each expression. Show your work.

2. $6 \div (2 + 1) + 4^2 =$ _____

3. $4 + 5 \times 8 \div 10 - 2 =$ _____

4. $1 + 12 - 10 \div 5 =$ _____

5. $12 + 2^8 \div (1 + 15) =$ _____

Part 3: Use complete sentences to answer the question.

6. What does PEMDAS stand for? When do we use it?_____

_____

_____

_____

_____

Apples for Emile

Review the example problem. Then, evaluate each expression using the order of operations. Show your work.

Example

Emile uses apples to make applesauce. The expression $9 + 5^2 - 6 \div 6$ represents the number of cups of applesauce Emile makes. How many cups of applesauce does he make?

Step 1

Use the order of operations. Remember PEMDAS.

Parentheses
Exponents
Multiplication
Division
Addition
Subtraction

Step 2

Check for **parentheses**. There are no parentheses, so move on to evaluate the **exponent**.

$9 + \mathbf{5^2} - 6 \div 6 = 9 + \mathbf{25} - 6 \div 6$

Step 3

Next, **multiply** and **divide** in order from left to right.

$= 9 + 25 - \mathbf{6} \div \mathbf{6}$
$= 9 + 25 - \mathbf{1}$

Step 4

Last, **add** and **subtract** in order from left to right.

$= \mathbf{9} + \mathbf{25} - 1$
$= \mathbf{34} - \mathbf{1}$
$= 33$

Emile makes 33 cups of applesauce.

1. $3 \times 7 - 10 + 8 \div 8 =$ _____

2. $5 + 3 \times 2^2 - 7 =$ _____

3. $6 \times 7 \div 7 - 2^2 + 3 =$ _____

4. $9 \times (8 - 6) + 4 =$ _____

Lesson 31 Exit Ticket

Part 1: Use the table to show the steps to find the total.

1. The expression $6^2 - 4 \times (2 + 3) \div 2$ represents the number of gallons of apple cider Emile makes. How many gallons of cider does he make?

Steps	Reasons
$6^2 - 4 \times (2 + 3) \div 2$	
=	

Emile makes _____ gallons of apple cider.

Part 2: Simplify each expression. Show your work.

2. $5^2 + (7 - 4) \times 6 =$ _____

3. $3^2 \times 2^2 + 4 \times 5 =$ _____

Part 3: Use complete sentences to answer the question.

4. Penina is helping a friend with math homework. Her friend does not know about PEMDAS. How can Penina explain what PEMDAS means and in what situations her friend should use it?

Extra Practice: PEMDAS

Part 1: Use the words and phrases in the box to complete the paragraph. You may need to use some words or phrases more than once.

addition	in parentheses	right	multiplication
division	expression	subtraction	
exponents	order of operations	left	

The letters PEMDAS represent the _____. When we are simplifying an _____ with more than one operation, PEMDAS tells us the order in which we should do them. First, do anything that is _____. Next, evaluate the _____. After that, do all the _____ and _____, in order from _____ to _____. Lastly, do all the _____ and _____, in order from _____ to _____.

Part 2: Simplify the expressions to solve. Show your work.

1. $3 + (9 - 2) \times 2^2 =$ _____

2. $(3 + 9) - 2 \times 2^2 =$ _____

3. $10 - 2 \times 7 \div 2 =$ _____

4. $2 \times 3 + 5^2 - (8 + 1) =$ _____

5. $4^2 - 6 + (9 - 2) =$ _____

6. $12 \div 3 + 5 \times (6 - 2) =$ _____

Scrambled Operations Cards

$8 + (5 - 2) \times 4 - 3^2$	$8 + 3 \times 4 - 3^2$
$8 + 3 \times 4 - 9$	$20 - 9$
$8 + 12 + 9$	11
$6 \times 10^2 - 30 \div (8 + 2)$	$600 - 30 \div 10$
$6 \times 100 - 30 \div 10$	597
$600 - 3$	$6 \times 10^2 - 30 \div 10$

Assessment

Unit 4 Assessment

1. Artemis's score was 50 points less than Casey's score. Use a variable to write an expression that describes Artemis's score.

Artemis's score = _____

2. Nico signs up for a downloading service. The service costs $10 each month, and it costs $2 for each app you download.

a. Write an expression to model the total monthly cost of the downloading service.

_____

b. In May, Nico downloads 3 apps. What is his total cost for May? Show your work.

Nico's total cost for May is _____.

3. What is the value of the expression $5t + 3$ when $t = 7$? Show your work.

$5t + 3$ when $t = 7$ is _____.

4. Is the equation true or false? Show the work you do to decide.

$6 + 6k + 3k + 3 + 2 = 18k + 2$

The equation is _____.

5. Combine like terms to write an equivalent expression. Complete a tape diagram to show your work.

$6n + 5 + 2n + 3 + 3n =$ _____

6. Use the greatest common factor and the distributive property of multiplication to rewrite the expression $20 + 8r$.

Expression: _____

7. The expression $8b + 12$ represents the total cost of a box of baseballs. Does the expression $4(2b + 3)$ also represent the total cost? Explain.

_____

_____

8. Show the steps you would use to determine whether the equation is true.

$6m + 7 + 9m + 5m + 8 = 5(4m + 15)$

Is the equation true? _____

9. Complete the table.

Exponential Expression	Multiplication Expression	Value
2^5		32
	$3 \times 3 \times 3 \times 3$	
5^3		
	7×7	

10. Simplify the expression. Show your work.

$5^2 - 3 \times (10 + 2) \div 6 =$ _____

Unit 4 Cumulative Review

1. Write a mathematical expression to complete the equation.

3 more than 3 times 8 = _____

2. Evaluate the exponential expression by writing it in standard form.

3^4 = _____

3. Use the distributive property to find the sum of 32 + 24. Then write a multiplication equation using the distributive property to show the sum.

Multiplication equation: _____

4. Divide. You can use the tape diagram to help.

$\frac{4}{5} \div \frac{8}{20}$ = ____

5. Group like terms to write an equivalent expression.

$10a + 3 + 3a + 10 - a =$ _____

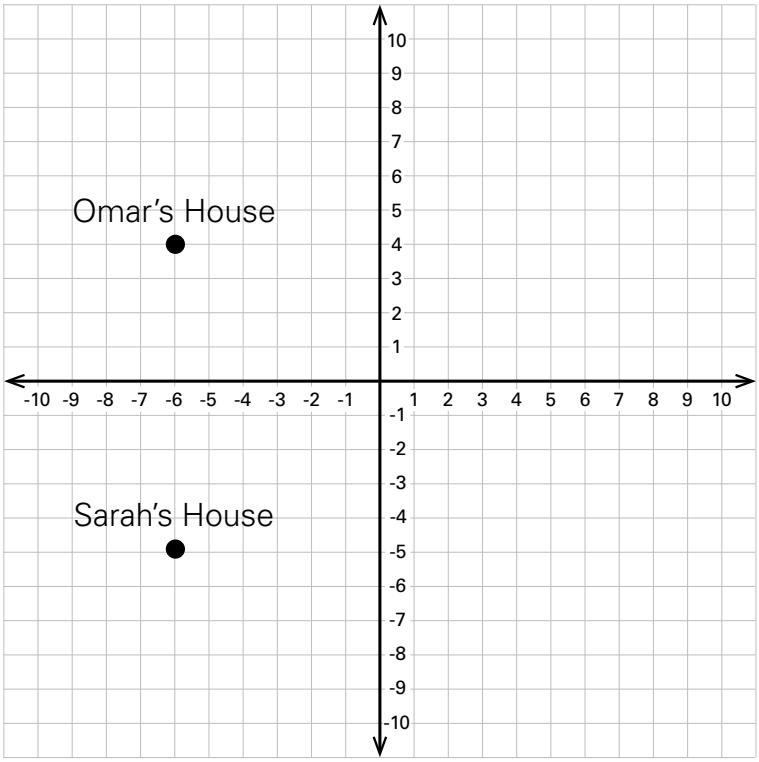
6. Multiply.

$0.3 \times 0.5 =$ _____

7. Subtract.

$\frac{4}{5} - \frac{2}{3} =$ ____

8. The map shows the locations of Omar's house and Sarah's house.



What is the distance on the map between Omar's house and Sarah's house?

_____

9. Veronica and Gianni go to a café for lunch. Veronica's meal costs $6.85. Gianni's meal costs $6.70. What is the total cost of both meals? Show your work.

The total cost of both meals is _____ dollars.

10. Draw a tape diagram that represents 8/2. Then, fill in the blanks to complete the equation.

$\frac{8}{2} = \_\_\_\_ \div \_\_\_\_$

11. Brooke and Erin are each downloading the same video to their phones. Erin has downloaded 5/6 of the video. Brooke has downloaded 7/9 of the video. How much more of the video has Erin downloaded? Show your work.

Erin has downloaded _____ more of the video than Brooke has downloaded.

12. Multiply. Show your work.

$0.12 \times 0.7 =$ _____

13. Add. Show your work.

$1\frac{1}{4} + 2\frac{2}{5} =$ _____

14. Add. Show your work.

$\frac{5}{8} + \frac{1}{12} =$ _____

15. The temperature is 4 below 0.

a. What integer represents the temperature? _____

b. Is this integer positive or negative? _____

c. Is this integer to the right or left of zero on a horizontal number line? _____

Unit 5:

Ratios and Unit Rates

Catapult Learning™

Dinner Can Make a Difference

Use **linking cubes** to model the ratios. Then answer the questions.

1. Morena and Tyler get a large bag of spice mix to use when the Community Care team cooks the fish for the fundraising dinner. The mix's ratio of **ounces of garlic** to **ounces of ginger** is 5 to 8.

a. Circle the choices below that represent the ratio of **garlic** to **ginger** in the spice mix.

$\frac{8}{5}$ 5:8 5 to 8

8 to 5 $\frac{5}{8}$ 8:5

b. Complete the sentence to describe the spice mix.

There are _____ ounces of garlic and _____ ounces of ginger for every _____ ounces total of spice mix.

c. What is the ratio of **ginger** to **garlic** in the spice mix? Write the ratio in 3 ways.

_____ _____ _____

d. Morena says that for every 5 **ounces of ginger** in the spice mix there are 8 **ounces of garlic**. Is Morena's statement correct? Explain.

_____

_____

e. Does the bag of spice mix that Morena and Tyler bought contain more garlic or more ginger? How do you know?

_____

_____

2. Another spice mix has 4 **teaspoons of celery salt** for every 1 **teaspoon of allspice**.

a. Circle the choices below that represent the ratio of **allspice** to **celery salt** in the spice mix.

$\frac{4}{1}$ 4:1 1 to 4

4 to 1 $\frac{1}{4}$ 1:4

Take a Seat

Read the problems. Use **linking cubes** to model the ratios and then answer the questions.

1. The Oak Shadows Diner has two sizes of tables. The ratio of the number of **small tables** to **large tables** is 3 to 1.

a. Write the ratio of **large tables** to **small tables** in three different ways.

_____ _____ _____

b. What is the relationship between the numbers of **small** and **large tables** in the diner?

_____

c. Does the diner have more large tables or more small tables? How do you know?

_____

2. Kylie is a dishwasher at the diner. She knows the diner has a 3 to 4 ratio of **spoons** to **forks**.

a. Write the ratio of **spoons** to **forks** in three different ways.

_____ _____ _____

b. Is the ratio of **spoons** to **forks** equivalent to the ratio of **forks** to **spoons**? Explain.

_____

c. Kylie has to wash all the spoons and forks when the diner closes for the night. Does she wash more spoons or more forks? Explain.

_____

3. Last night, the diner sold **fried chicken plates** and **barbecue plates** in a ratio of 7 to 2.

a. Write the ratio of **barbecue plates** to **fried chicken plates** in three different ways.

_____ _____ _____

b. What is the relationship between the numbers of **barbecue plates** and **fried chicken plates** that the diner sold?

_____

Lesson 33 Exit Ticket

Part 1: Mrs. Jones is opening a restaurant. The ratio of **tables** to **chairs** in her main dining room is 1 to 4.

1. Use **linking cubes** to model the ratio.

2. Write the ratio of the number of **tables** to **chairs** in the main dining room three different ways.

_____ _____ _____

3. If 4 **chairs** are set up in the main dining room, how many **tables** would be set up? _____

Part 2: The ratio of the number of **cooks** Ms. Jones hires to the number of **servers** she hires is 4 to 5.

4. Use **linking cubes** to model the ratio.

5. Write the ratio of the number of **servers** Ms. Jones hires to the number of **cooks** she hires in three different ways.

_____ _____ _____

6. Does Ms. Jones hire more **cooks** or **servers**? How do you know?

_____

_____

Extra Practice: Recipe Ratios

Read the recipe below. Use **linking cubes** to model the ratios. Then, circle *true* or *false* to label each statement. If the statement is false, rewrite it to make it true.

Mediterranean Salad Dressing

30 teaspoons of olive oil
4 teaspoons of minced garlic
12 teaspoons of lemon juice
3 teaspoons of salt
5 teaspoons of pepper

Put all ingredients in a jar with a tight-fitting lid. Shake well.

1. The ratio of teaspoons of **salt** to **pepper** can be written as 3 to 5, 3:5, or $\frac{3}{5}$.

True / False _____

2. The ratio of teaspoons of **lemon juice** to **garlic** can be written as 4 to 12, 4:12, or $\frac{4}{12}$.

True / False _____

3. The ratio of teaspoons of **lemon juice** to **olive oil** can be written as 12 to 30, 12:30, or $\frac{12}{30}$.

True / False _____

4. To model the ratio of teaspoons of **pepper** to **garlic**, you need to link 5 cubes of one color and 4 cubes of another color.

True / False _____

5. To model the ratio of teaspoons of **olive oil** to **garlic**, you need a total of 30 cubes.

True / False _____

6. For every 30 teaspoons of **olive oil** in the dressing, there are 5 teaspoons of **pepper**.

True / False _____

7. For every 4 teaspoons of **salt** in the dressing, there are 3 teaspoons of **garlic**.

True / False _____

Laundry Night

Read the problems. Then answer the questions.

1. Ivan does a load of laundry. For every 6 **socks** in this load, there is 1 **towel**.

a. What is the ratio of **towels** to **socks**? Write the ratio 3 ways.

_____ _____ _____

b. Draw a picture to represent the ratio of **towels** to **socks**.

2. Ivan's dad also does a load of laundry. The sketch shows the **towels** and **pants** that he washes.

a. What is the ratio of **pants** to **towels**? Write the ratio 3 ways.

_____ _____ _____

b. Draw a tape diagram to represent the ratio of **pants** to **towels**.

3. The tape diagram shows the ratio of **shirts** to **pants** in a load of laundry that Ivan's sister Magda did last week.

Shirts				
Pants				

a. What is the ratio of **shirts** to **pants**? Write the ratio 3 ways.

_____ _____ _____

b. What does the ratio 4:3 represent in this situation?

_____

Bland to Grand

Review the example problem. Then answer the questions.

Example

Magda paints the white walls of her room pale green. For every **3** pints of green paint, she mixes in **1** pint of white paint to get the pale green color that she wants. What is the ratio of green paint to white paint?

Step 1

Identify the two quantities in the problem.

3 pints of green paint
1 pint of white paint

Step 2

Identify the ratio you are looking for. Write it three ways.

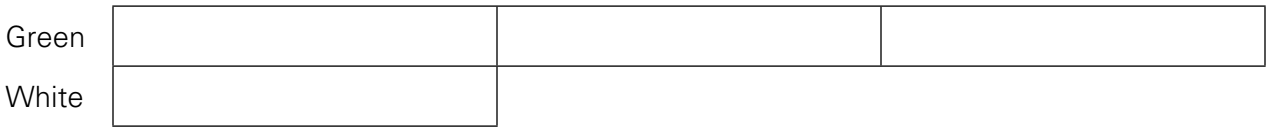
The ratio of green to white paint is **3** to **1**, **3:1**, or **$\frac{3}{1}$.**

Step 3

Identify the ratio you are looking for. Write it three ways.

The ratio of green to white paint is 3 to 1, 3:1, or $\frac{3}{1}$.

3:1 Ratio of Green to White Paint



1. Magda plans to paint her desk and chair too. She mixes 2 pints of red paint for every 5 pints of yellow paint to get just the right shade of orange. What is the ratio of **yellow paint** to **red paint**?

a. Draw a tape diagram to model the ratio.

b. Write the ratio three ways.

_____ _____ _____

2. The tape diagram shows the ratio of **shirts** to **pants** in the load of laundry Magda must do after she finishes painting. What is the ratio of **shirts** to **pants**? Write the ratio three ways.

_____ _____ _____

Lesson 34 Exit Ticket

Read the problems and answer the questions.

1. Ivan and Magda go to a family reunion at Lake Evercrest. Their uncle took this picture of the family.

a. What is the ratio of **people in the picture who do not have glasses** to **people who do have glasses**? Write the ratio three ways.

_____ _____ _____

2. The family brings lots of chips to the reunion. For every 8 **jars of salsa**, there are 5 **bags of chips**.

a. What is the ratio of **bags of chips** to **jars of salsa**? Write the ratio three ways.

_____ _____ _____

b. Draw a picture to represent the ratio of **bags of chips** to **jars of salsa**.

3. There are lots of fun things to do at the reunion. While 5 people go **kayaking on the lake**, 4 people go over to the picnic tables to **work on family scrapbooks**.

a. Draw a tape diagram to represent the ratio of **kayakers** to **scrapbookers**.

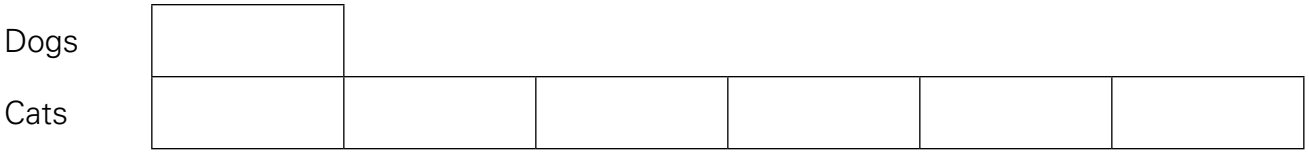
b. What is the ratio of **scrapbookers** to **kayakers**? Write the ratio three ways.

_____ _____ _____

Extra Practice: Ratio Practice

Part 1: Complete each sentence by writing a ratio in three ways.

1.



The ratio of **dogs** to **cats** is _____, _____, or _____.

2.

The ratio of **tables** to **chairs** is _____, _____, or _____.

3.

The ratio of **children** to **adults** is _____, _____, or _____.

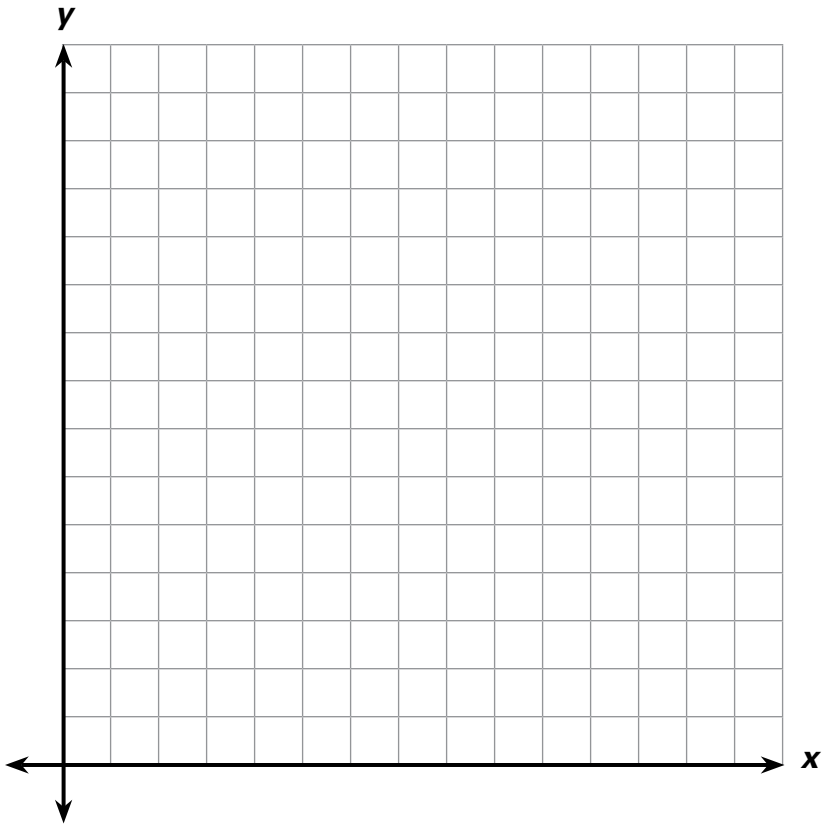
Part 2: Draw a tape diagram to model each ratio.

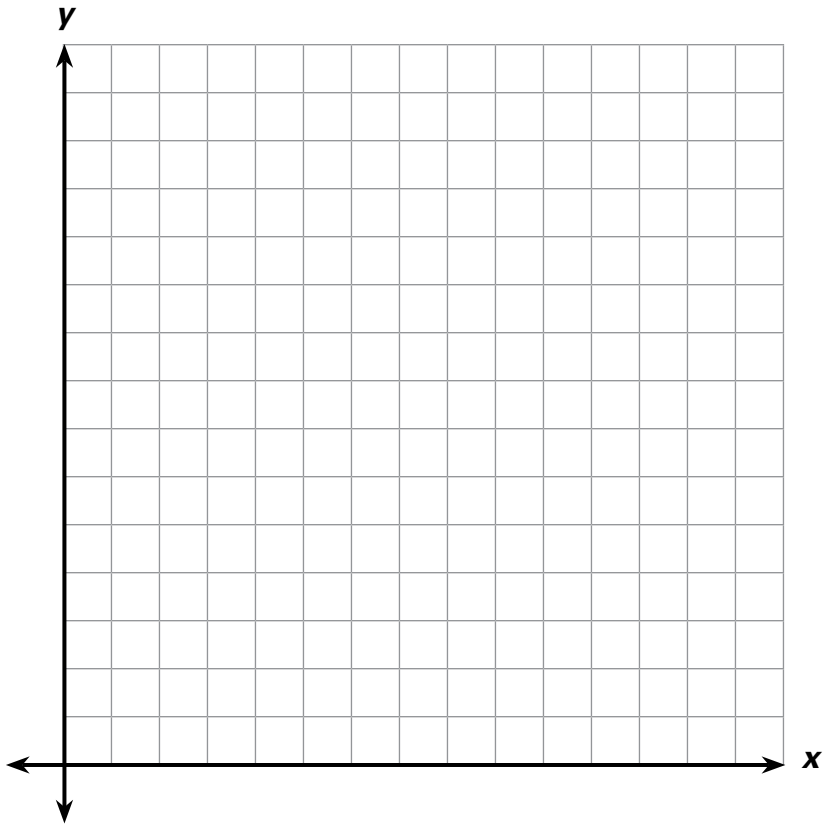
4. For every 4 **circles** in a wallpaper pattern, there are 9 **squares**.

5. In Clarissa's family, there is a 1:4 ratio of **cars** to **people**.

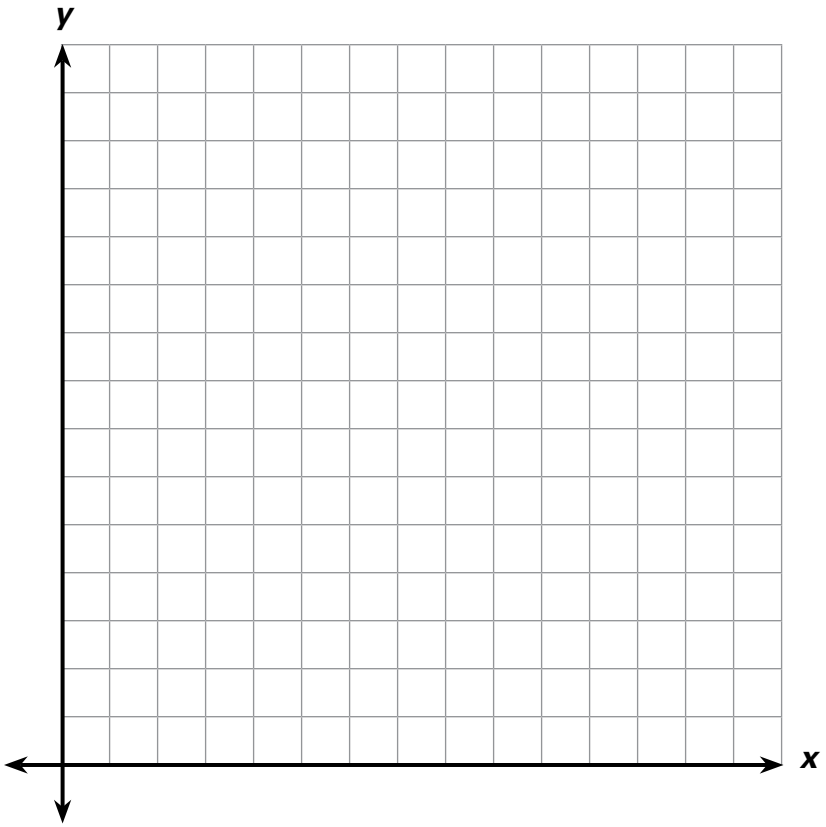
6. There are 8 **sunflowers** for every 5 **daisies** in Henry's garden.

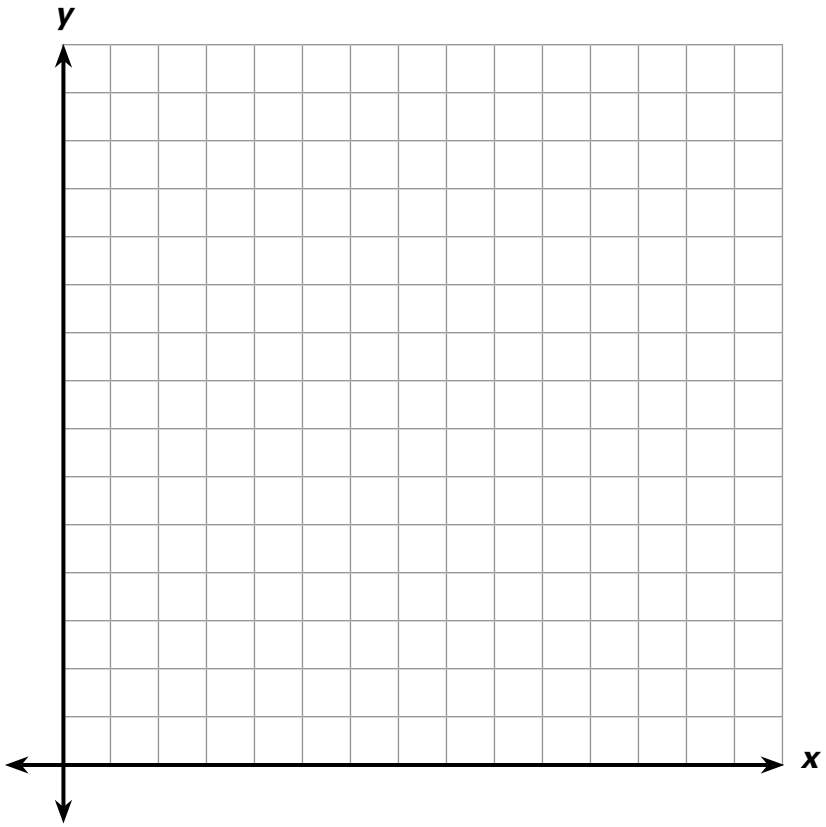
Coordinate Planes (First Quadrant)





Coordinate Planes (First Quadrant)





Picture This Noun Cards

pencil	hat	spoon
hand	whale	sweater
box	brain	goat
apple	frog	shoe

Get Ready to Party!

Read the problems. Write the ratio, then use a **double number line** to find three equivalent ratios.

Alicia is helping organize the wedding dinner. The menu for the dinner is spaghetti and meatballs, Italian bread, green salad, and pie for dessert.

1. For every 5 people who come to dinner, Alicia will need 1 head of lettuce for the salad.

Ratio of people to salad: _____

Three equivalent ratios: _____ _____ _____

2. For every 7 people who come to dinner, Alicia will need 3 loaves of Italian bread.

Ratio of loaves to people: _____

Three equivalent ratios: _____ _____ _____

3. For every plate of spaghetti, Alicia needs 4 meatballs.

Ratio of plates to meatballs: _____

Three equivalent ratios: _____ _____ _____

4. Alicia will need 2 pies for every 9 people who come to the dinner.

Ratio of pies to people: _____

Three equivalent ratios: _____ _____ _____

Time to Dance

Review the example problem. Then draw a **ratio table** to find equivalent fractions.

Example

I want to play slow and fast dance songs at the wedding. For every **10** fast songs, I will play **3** slow songs. I need to keep track of the type of songs as I play them, so I'm playing the correct ratio. How can I do that?

Step 1

Identify the ratio.

The ratio of fast to slow songs is **10:3.**

Step 2

Title the columns in a ratio table appropriately and fill in the information for the ratio.

Fast Songs	Slow Songs	Slow:Fast
10	**3**	**10:3**

Step 3

State the arithmetic rules that describe the pattern.

As the number of fast songs increases by **10**, the number of slow songs increases by **3**.

Fast songs = +**10** Slow songs = +**3**

Step 4

Use the pattern to extend the ratio table to find equivalent ratios.

The ratios 20:6, 30:9, and 40:12 are equivalent to **10:3**.

Fast Songs	Slow Songs	Slow:Fast
10	**3**	**10:3**
20	6	20:6
30	9	30:9
40	12	40:12

1. For every 6 adults on the dance floor, there are 5 kids.

Ratio of adults to kids: _____

Three equivalent ratios: _____ _____ _____

2. For every 2 dancers, there are 3 square feet of dance floor.

Ratio of square feet to dancers: _____

Three equivalent ratios: _____ _____ _____

Lesson 35 Exit Ticket

Part 1: Use a **double number line** to find three equivalent ratios for the given ratio.

1. 3 to 1 _____ _____ _____

2. 5:3 _____ _____ _____

Part 2: Complete the ratio tables to find three equivalent ratios for the given ratio. Write the equivalent ratios on the lines.

3. 9 to 11

Quantity 1	Quantity 2	Ratio

Three equivalent ratios: _____ _____ _____

4. $\frac{6}{7}$

Quantity 1	Quantity 2	Ratio

Three equivalent ratios: _____ _____ _____

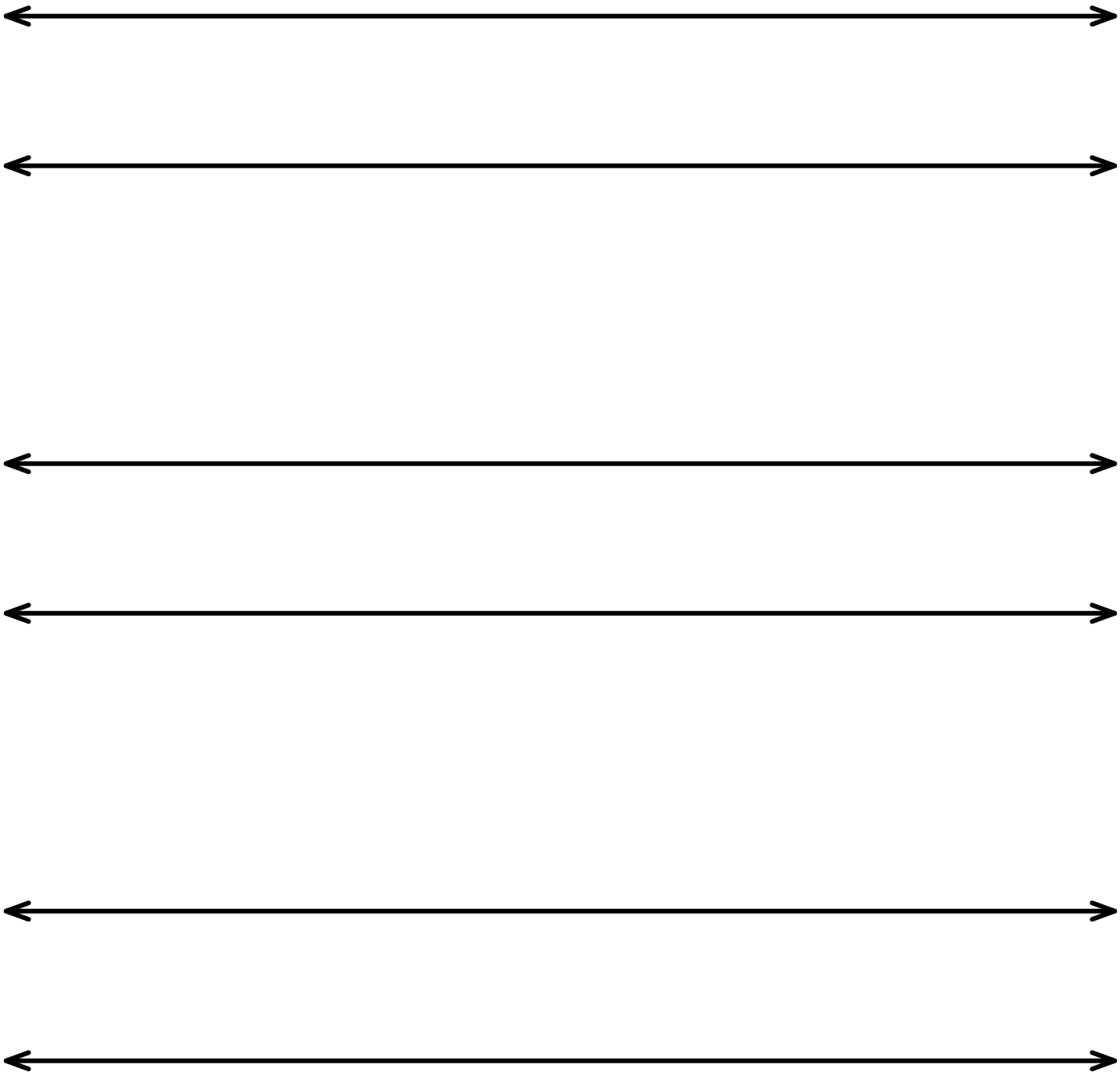
Extra Practice: Mysterious Picture

Use a **ratio table** or **double number line** to find equivalent ratios. Color equivalent ratios according to the color key to reveal the hidden picture.

1:4	4:16	5:20	6:1	24:4	12:2	36:6	54:9	42:7	48:8	7:28	9:36	7:28
8:32	20:16	15:12	10:40	60:10	18:3	4:6	30:5	36:6	2:8	5:4	30:24	3:12
4:16	30:70	9:21	45:36	3:12	18:3	8:12	6:1	1:4	35:28	3:7	15:35	6:24
9:36	24:56	8:42	40:32	7:28	32:72	2:3	12:27	8:32	50:40	21:49	27:63	10:40
2:8	6:14	12:28	10:8	27:63	4:9	12:18	20:45	9:21	25:20	3:7	15:35	5:20
3:12	25:20	15:12	10:8	24:56	36:81	18:27	24:54	18:42	30:24	45:36	35:28	1:4
30:5	2:8	40:32	50:40	21:49	28:63	14:21	40:90	30:70	5:4	20:16	6:24	54:9
42:7	48:8	9:36	25:20	7:28	8:18	16:24	16:36	8:32	15:12	10:40	60:10	24:4
12:2	24:4	18:3	4:16	5:20	12:27	20:30	16:36	2:8	4:16	6:1	36:6	54:9
42:7	1:4	6:24	5:4	9:36	4:9	6:9	24:54	7:28	30:24	8:32	10:40	48:8
3:12	45:36	35:28	40:32	6:14	36:81	10:15	28:63	12:28	50:40	10:8	20:16	5:20
5:20	21:49	9:21	45:36	3:12	32:72	12:18	40:90	1:4	15:12	3:7	15:35	6:24
9:36	27:63	18:42	5:4	7:28	60:10	4:6	12:2	8:32	25:20	24:56	30:70	10:40
2:8	40:32	30:24	4:16	30:5	48:8	2:3	18:3	6:1	9:36	35:28	50:40	3:12
1:4	5:20	8:32	54:9	36:6	42:7	60:10	12:2	24:4	30:5	6:24	7:28	10:40

Color Key		
Red 1:4	Orange 2:3	Yellow 3:7
Green 4:9	Blue 5:4	White 6:1

Double Number Lines



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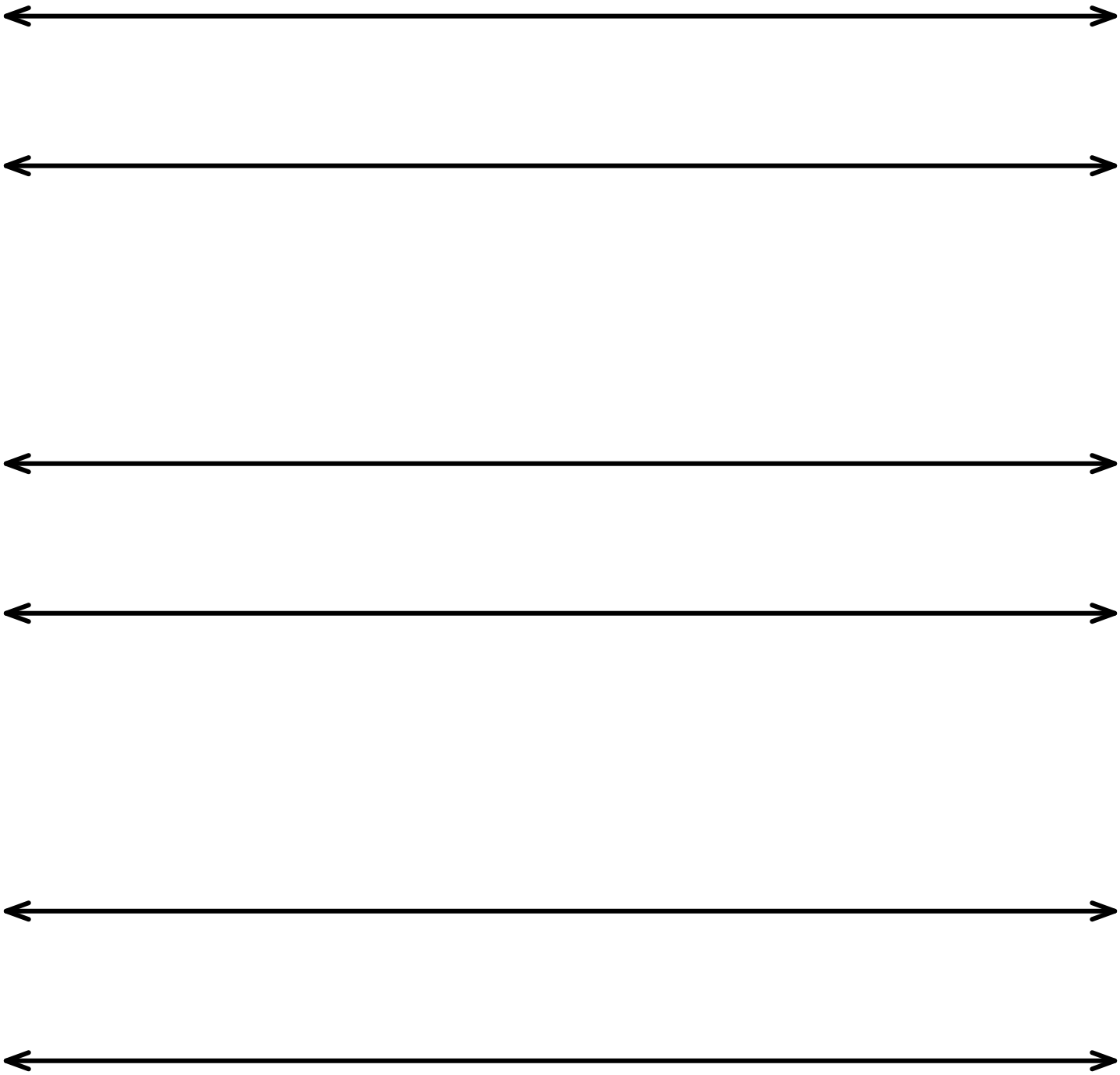

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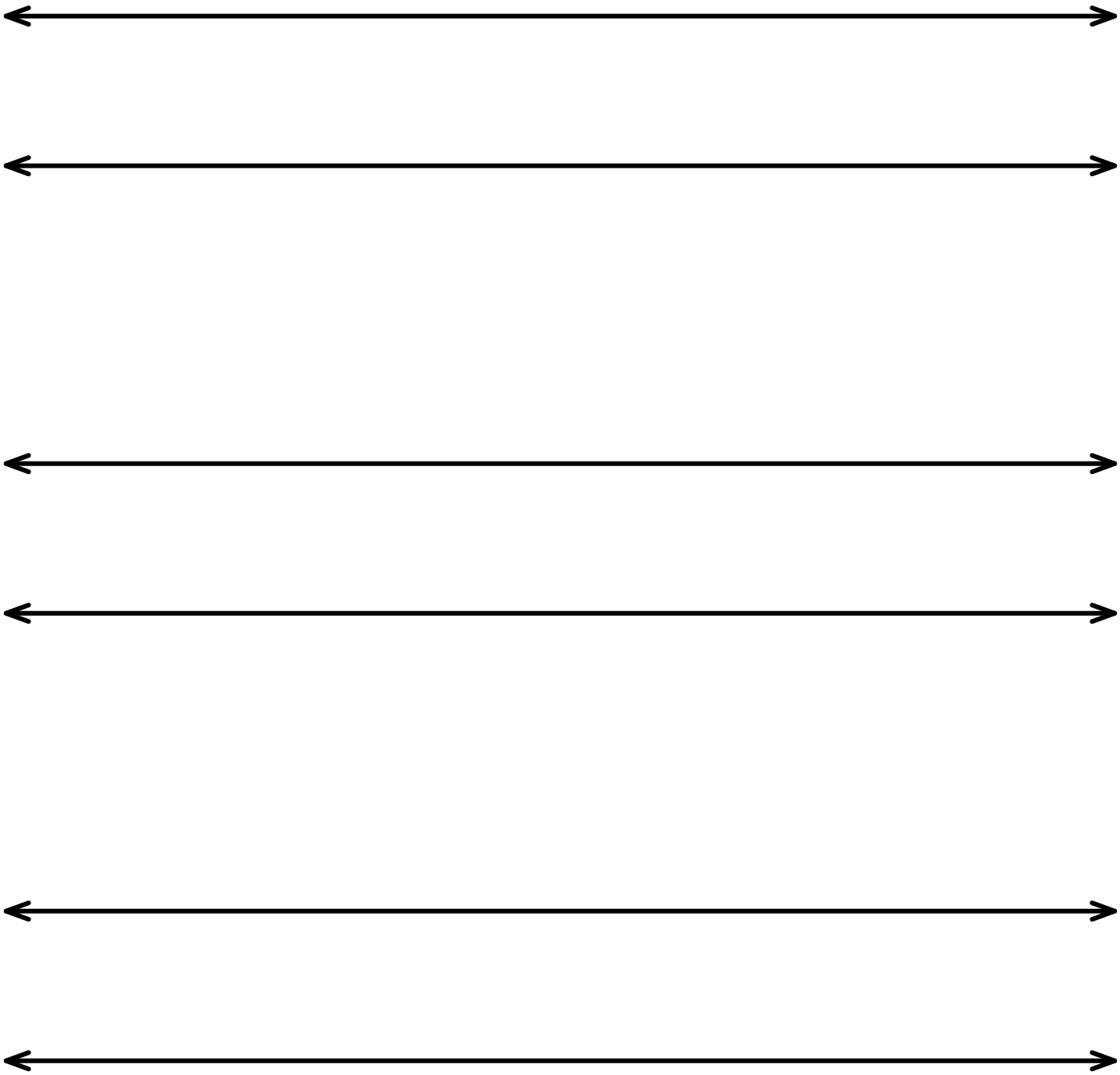


Wedding Ratio Chart

Number of Tables	For every 2 tables (○), there are 5 people (|)	Number of People	Ratio of Tables to People
2 (+2)	○○ |||||	5 (+5)	2:5
4 (+2)	○○○○ |||||||||	10 (+5)	4:10
6 (+2)	○○○○○ ||||||||||||||	15 (+5)	6:15
8 (+2)	○○○○○○○○ ||||||||||||||||||	20 (+5)	8:20
10 (+2)	○○○○○○○○○○ ||||||||||||||||||||||	25 (+5)	10:25
12 (+2)	○○○○○○○○○○○○ ||||||||||||||||||||||||||	30 (+5)	12:30
14 (+2)	○○○○○○○○○○○○○○ |||||||||||||||||||||||||||||||	35 (+5)	14:35
16	○○○○○○○○○○○○○○○○ ||||||||||||||||||||||||||||||||||	40	16:40

Teacher of the Year

Use any tool or strategy to find equivalent fractions to solve the problems.

1. Last year, when Ms. Riley was Teacher of the Year, the student council bought her a bouquet of 28 flowers. It had 2 yellow flowers for every 5 purple flowers. How many of each color flower were in the bouquet?

The bouquet had _____ yellow and _____ purple flowers.

2. When Mr. Kelso, the florist, finds out the bouquet is for a teacher, he tells Janelle that he will include 3 free flowers for every 4 flowers she pays for. If she pays for 36 flowers, how many free flowers will she get?

She will get _____ free flowers.

3. Janelle decides to check to see what another florists offer. John Jones Flowers offers bouquets with 3 yellow flowers for every 2 purple flowers. How many yellow flowers will be in the bouquet if Janelle wants 18 purple flowers?

The bouquet will have _____ yellow flowers.

4. Janelle is curious and asks Mr. Jones how many of each kind of flowers he sells. Mr. Jones says that roses are the most popular. He sells 40 roses for every 3 lilies. That does seem like a lot. How many roses does Mr. Kelso sell if he sells 45 lilies?

Mr. Kelso sells _____ roses for every 45 lilies.

Bunches of Balloons

Review the example problem. Then read the questions and find equivalent ratios to solve.

Example

The student council members decorate the gym with balloons for the Teacher of the Year assembly. They buy a box of balloons to blow up. The box has **3** yellow balloons for every **8** purple balloons. If there are **15** yellow balloons, how many balloons are in the box?

Step 1

Identify the ratio. The ratio of yellow to purple balloons is **3:8**.

Step 2

Identify the number pattern for each quantity.

For every **3** yellow, there are **8** purple. Every time I add **3**, I add **8**. The number pattern for yellow is +**3**, and the number pattern for purple is +**8**.

Step 3

Make and extend a ratio table to find equivalent ratios.

Yellow	Purple	Total Balloons
3	**8**	11
6	16	22
9	24	33
12	32	44
15	40	55

Step 4

Use equivalent ratios to answer the question.

The ratio **3:8** is equivalent to **15**:40. If there are **15** yellow balloons in the box, then there are 40 purple balloons. The total number of balloons is **15** + 40 = 55.

1. The student council buys a second box of balloons. This box has 8 green balloons for every 5 orange. If there are 32 green balloons in the box, how many orange balloons are there?

The are _____ orange balloons in the box.

2. Jackson discovers another box of balloons at the back of a supply closet. This box has 66 balloons, with 5 red balloons for every 6 blue. How many of the balloons are red?

The box has _____ red balloons.

3. Gemma blows up balloons fast. For every 2 balloons Oliver blows up, Gemma blows up 7. If Oliver blows up 10 balloons, how many balloons do Gemma and Oliver blow up together?

Gemma and Oliver blow up _____ balloons together.

Lesson 36 Exit Ticket

Use any tool or strategy to find equivalent fractions to solve the problems. Show your work.

1. Anwar buys a bag of beads. There are 4 red beads for every 5 black beads. If there are 35 black beads in the bag, what is the total number of beads?

The total number of beads is _____.

2. Anwar's brother Omar also buys a bag of beads. The bag has 4 green beads for every 7 yellow beads. If there are 56 yellow beads in the bag, how many green beads are there?

There are _____ green beads.

3. Naomi plans to make a bracelet that has 5 blue beads for every 7 white beads. If she uses 20 blue beads in the bracelet, how many white beads does she need to make the bracelet?

She needs _____ white beads.

Extra Practice: True or False

Use any tool or strategy to find equivalent fractions. Then label each statement True or False. If the statement is false, correct the statement.

1. _____ Coach Jansen brings 3 volleyballs to practice for every 2 players that she expects will be at practice. Today, she brings 18 volleyballs to practice, so she must be expecting 12 players to be there.

2. _____ Martin designs a bracelet to have 3 red beads for every 4 blue beads. If Martin uses 12 red beads, he will use a total of 21 beads.

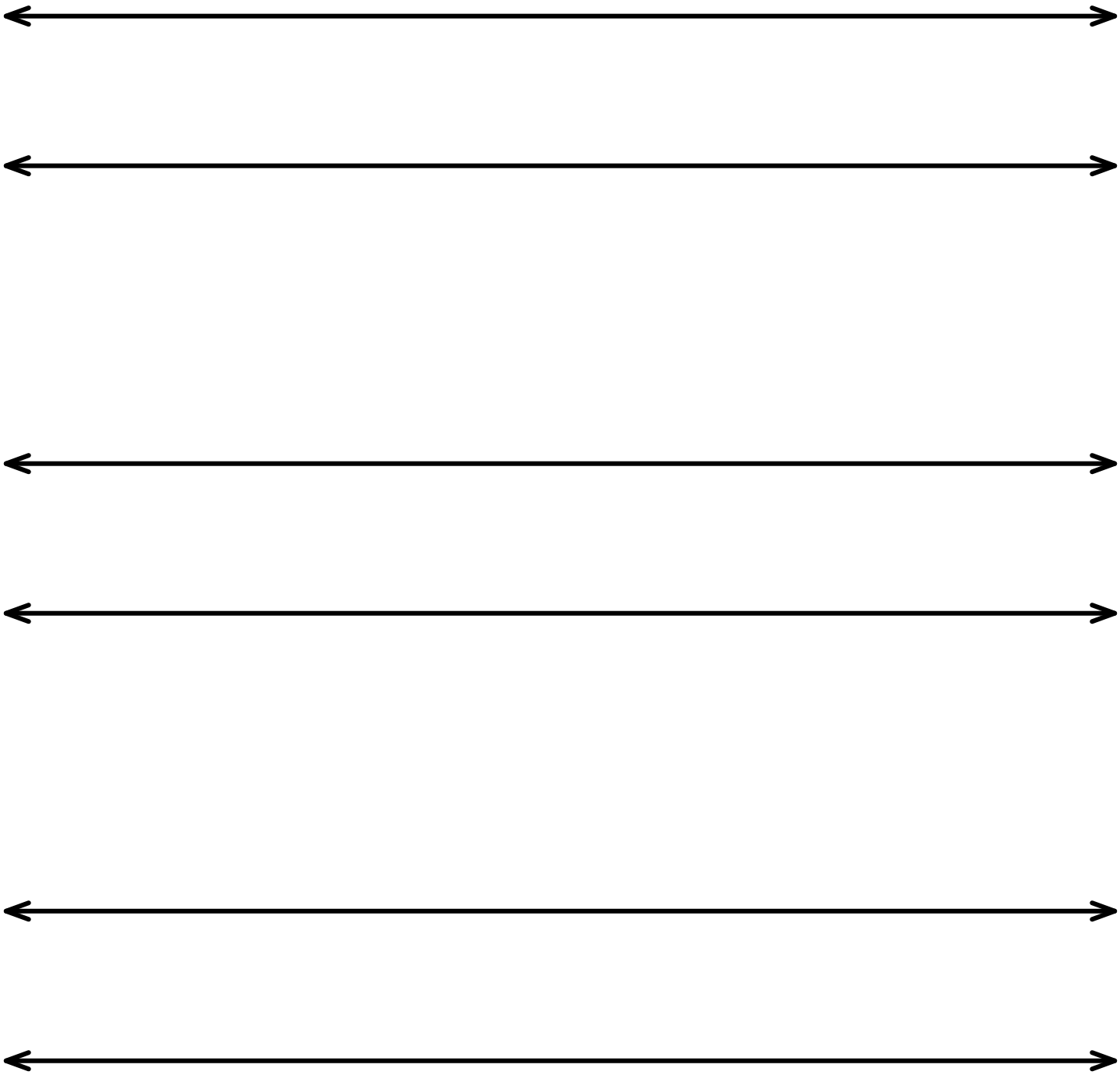
3. _____ When Iliana makes tacos, she uses 2 ounces of garlic for every 5 ounces of cumin. To make a big batch of tacos, Iliana uses 15 ounces of cumin and a total of 21 ounces of garlic and cumin together.

4. _____ Nan puts a total of 48 chocolate and vanilla cupcakes into 6 boxes. Each box has the same number of cupcakes. If each box has 3 vanilla cupcakes, the ratio of chocolate to vanilla cupcakes in each box is 3:5.

5. _____ In the cash register at ADG Grocery there are five $10 bills for every eight $20 bills. There are twenty-four $20 bills in the cash register, so the total value of the $10 bills and $20 bills is $600.

6. _____ When Clarice makes apple cider, she uses 4 green apples for every 9 red apples. If she uses a total of 52 apples, she must have used 36 red apples.

Double Number Lines



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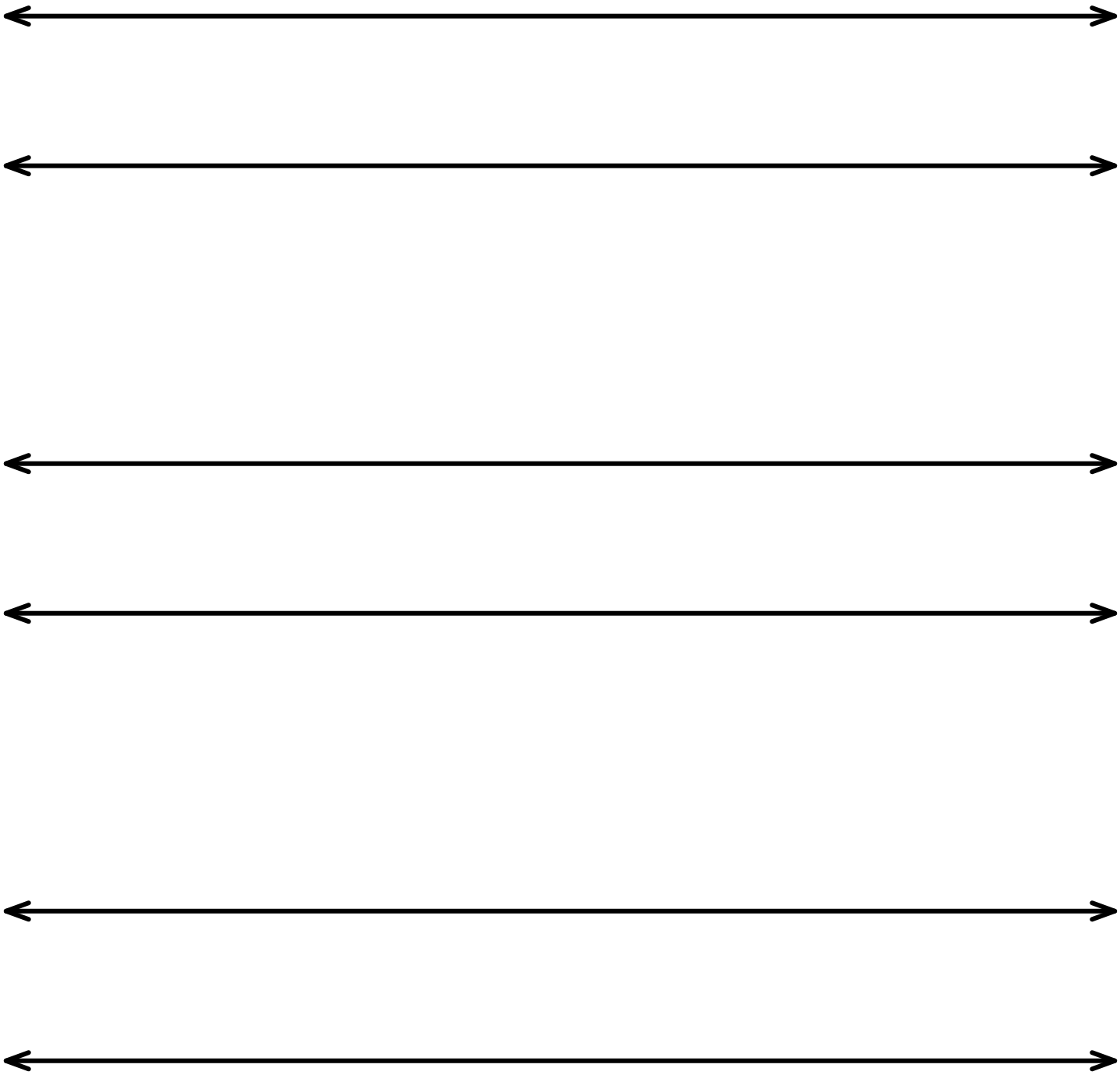


At the Craft Fair

Read each problem. Write the rates in the form $\frac{a}{b}$. Model each rate with **base-10 blocks**. Use the model to find the unit rate and answer the questions.

1. Sergio has the booth next to Monique at the craft fair. In 3 hours, Sergio sells 39 stained-glass ornaments.

a. What is the rate of the ornaments Sergio sells to the hours he's at the craft fair?

_____

b. What is the unit rate per hour? _____

c. How is the unit rate of sales related to the ratio of total sales to hours?

_____

_____

_____

2. Usually, Sergio can make 85 of his stained-glass ornaments in 5 days.

a. What is the rate of the ornaments Sergio can make to the days he spends making them?

_____

b. What is the unit rate per day? _____

c. How is the unit rate of ornaments made related to the ratio of total ornaments made to hours?

_____

_____

_____

3. Sergio also sells his ornaments on a website. Last week, he sold 12 ornaments on his website and earned $156.

a. What is the rate of his earnings to ornaments sold? _____

b. What is the unit rate per ornament? _____

c. How is the unit rate of price related to the ratio of ornaments sold to total sales?

_____

_____

Makers Gonna Make

Read each statement about two makers and the supplies they use. For each statement, make a model with **base-10 blocks** to find the unit rate. Then complete the table. The first problem has been done for you.

Statement	Unit Rate
1. Suki has 48 metal snaps, which is enough for her to make 12 purses. How many snaps does she put on each purse?	$\frac{4 \text{ snaps}}{1 \text{ purse}}$
2. Suki needs 9 spools of waxed thread to make 45 purses. How many purses can she make with 1 spool?	
3. Suki buys 8 yards of leather at a cost of $104. How much does the leather cost per yard?	
4. To make 7 purses, Suki spends 105 hours working in her studio. How long does she spend on each purse?	
5. Mario uses 100 silver beads to make 5 of his best-selling bracelets. How many beads does he use per bracelet?	
6. Mario can make 8 necklaces from 96 feet of jewelry wire. How much wire does he use for each necklace?	

Lesson 37 Exit Ticket

Read each problem. Write the rate in the form $\frac{a}{b}$. Model each rate with **base-10 blocks**. Use the model to find the unit rate and answer the questions.

1. Paolo uses 175 ounces of glaze to paint 7 ceramic sculptures. What is the rate of ounces of glaze to the number of sculptures?

_____

2. What is the unit rate per sculpture? _____

3. How is the unit rate of ounces related to the ratio of total ounces to sculptures?

_____

_____

_____

4. Last month, Mim sold 114 posters during 6 hours at a craft fair. What is the rate of the number of posters Mim sold to the number of hours she was at the craft fair?

_____

5. What is the unit rate per hour? _____

6. How is the unit rate of posters sold related to the ratio of total posters to total hours?

_____

_____

_____

Extra Practice: Rate Match

Model each rate with **base-10 blocks** to find the unit rate. For each table, match the statements to the appropriate unit rates.

Statement	Unit Rate
Georgia earns $128 for 8 hours of work.	$18 per hour
Ron works 10 hours and earns $150.	$16 per hour
Marcus earned $162 by working 9 hours.	$17 per hour
For 6 hours of work, Luna earned $102.	$15 per hour

Statement	Unit Rate
Keiko can make 264 buttons in 3 hours.	117 buttons per hour
Lou takes 7 hours to make 168 buttons.	35 buttons per hour
In 6 hours, Travis can make 210 buttons.	24 buttons per hour
To make 234 buttons, Artie needs 2 hours.	88 buttons per hour

Statement	Unit Rate
Jessa uses 198 yards of yarn to make 9 dolls.	27 yards of yarn per doll
Rosa can make 8 dolls with 192 yards of yarn.	22 yards of yarn per doll
It took Sanjay 138 yards of yarn to make 6 dolls.	24 yards of yarn per doll
For 4 dolls, Paul needs 108 yards of yarn.	23 yards of yarn per doll

Snow Motion

Read the problems. Use a **tape diagram** to find the unit rate.

1. Sometimes, Uma pays her younger brother Ivar to help her shovel snow. Today, Uma paid Ivar $18 for 4 hours of work.

a. Draw a tape diagram to model the rate of dollars per hour of work.

b. Based on your diagram, what is Ivar's unit rate per hour? _____

2. Uma charges her customers $25 for 4 hours of shoveling snow.

a. Draw a tape diagram to model the rate of dollars per hour of work.

b. Based on your diagram, what is Uma's unit rate per hour? _____

3. Uma's friend Aisha has started a hot-cocoa delivery service. For $15, she will bring 4 large mugs of cocoa to a customer's home.

a. Draw a tape diagram to model the rate of dollars per mug.

b. Based on your diagram, what is Aisha's unit rate per mug? _____

4. Today, Aisha delivered 6 mugs of cocoa to a customer for $21. Write equivalent ratios and use division to find her unit rate per mug.

The unit rate per mug is _____ dollars.

Ice Time

Review the example problem. Then, use equivalent ratios to find the unit rates. Show your work.

Example

Aisha loves to go ice-skating. She pays **$27** for **3** hours of skating time at her local rink. What is the unit rate per hour?

Step 1

Write the given rate and the unknown unit rate with the units in the same order.

27 dollars to **3** hours x dollars per 1 hour

Step 2

Write an equation to show that the given rate is equivalent to the unknown unit rate:

$$\frac{\mathbf{27}}{\mathbf{3}} = \frac{x}{1}$$

Step 3

Solve for x. This tells the unit rate.

$$\frac{\mathbf{27}}{\mathbf{3}} = \frac{x}{1}$$

$$\frac{\mathbf{27}}{\mathbf{3}} \div \frac{\mathbf{3}}{\mathbf{3}} = \frac{9}{1} = \frac{x}{1}$$

$9 = x$ The unit rate is $9 per hour.

1. The skating rink charges $17 to rent ice skates for 5 hours. What is the unit rate of the skate rental per hour?

The unit rate is _____ per hour.

2. Ivar has a coupon for the skating rink. With his coupon, he pays $8.50 to skate for 2 hours. What is the unit rate to skate per hour?

The unit rate is _____ per hour.

3. The skating rink uses a machine to smooth out the ice 36 times over the course of a 12-hour day. How many times do they smooth the ice each hour?

The unit rate is _____ per hour.

4. Groups can rent out the ice skating rink for private parties. The rate is $150 for 3 hours. What is the rate per hour?

The unit rate is _____ per hour.

Lesson 38 Exit Ticket

Read the problems and answer the questions. Show your work.

The ice-skating rink has an annual Speed Skate race. Each year has a different racecourse. The table shows the results of the winners from the past 4 years.

Year	Skater	Distance (meters)	Time (minutes)
2015	Luis	720	4
2016	Priya	600	3
2017	Rachel	975	5
2018	Juwon	555	3

1. What was Luís's unit rate per minute? Draw a tape diagram to find your answer.

Luis's unit rate is _____ meters per minute.

2. What was Priya's unit rate per minute? Use equivalent rates and division to find your answer.

Priya's unit rate is _____ meters per minute.

3. What was Rachel's unit rate per minute? Use equivalent rates and division to find your answer.

Rachel's unit rate is _____ meters per minute.

4. What was Juwon's unit rate per minute? Use equivalent ratios and division to find your answer.

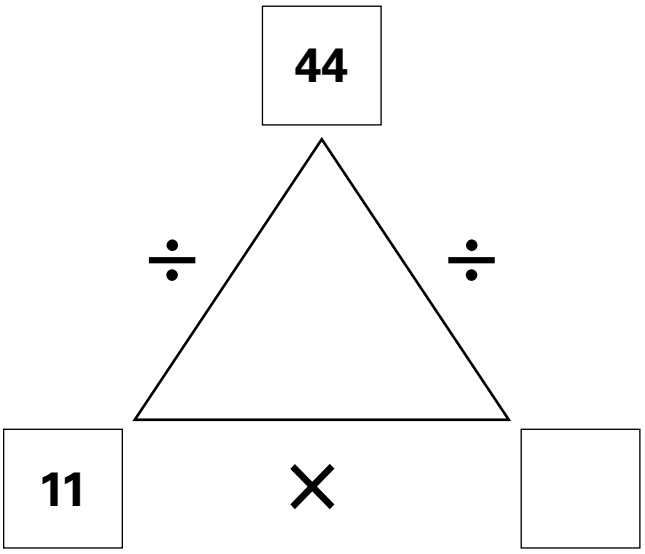
Juwon's unit rate is _____ meters per minute.

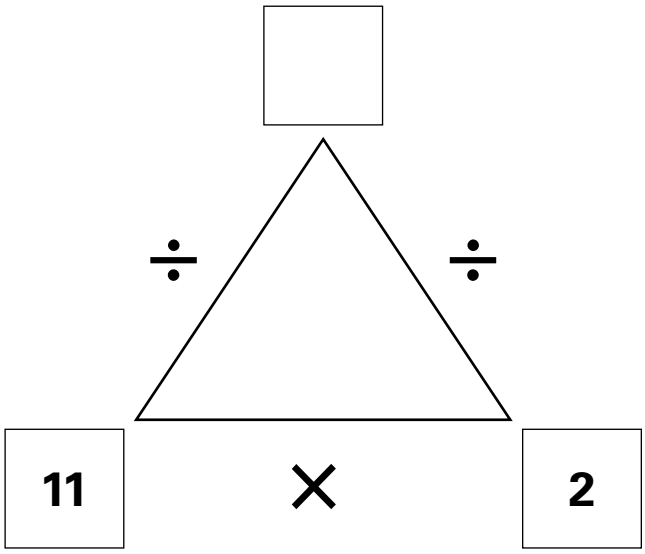
Extra Practice: Grocery Shopping

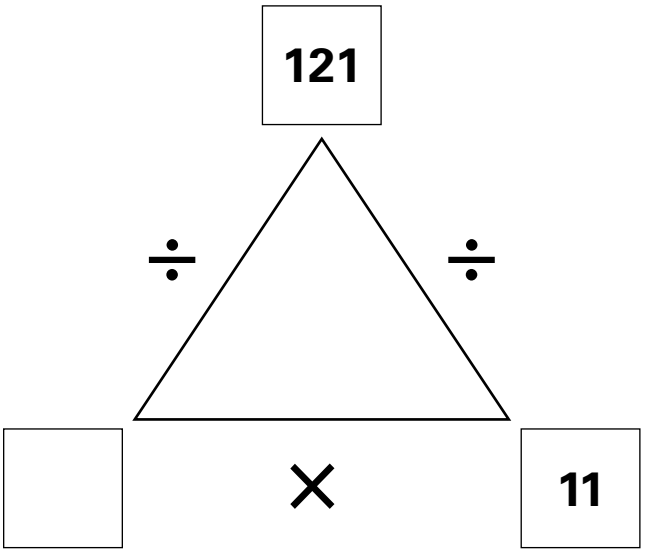
Find the unit price for each item. Use division to solve. You can draw a tape diagram to help.

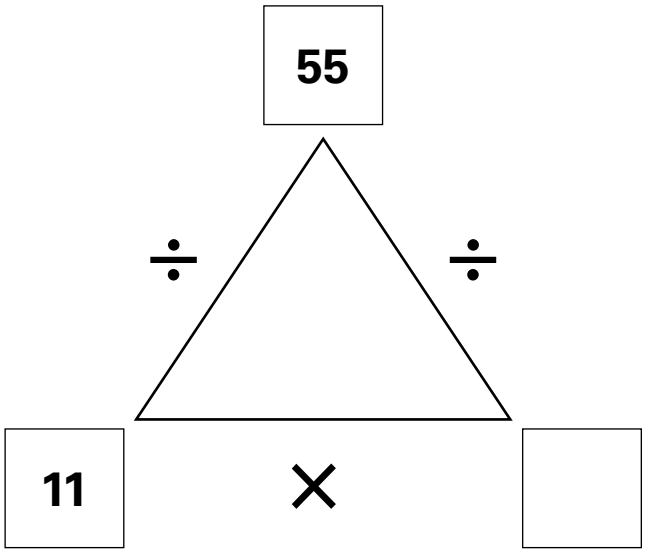
Granny Smith apples: 5 apples for $9	Navel oranges: 8 oranges for $10
Unit price: _____ per apple	Unit price: _____ per orange
Wheat crackers: $4 for 8 ounces	Multigrain crackers: $3 for 10 ounces
Unit price: _____ per ounce	Unit price: _____ per ounce
Popcorn: 6 bags for $9	Lentils: 4 bags for $7
Unit price: _____ per bag	Unit price: _____ per bag
Orange juice: $9 for 4 quarts	Apple juice: $5 for 2 quarts
Unit price: _____ per quart	Unit price: _____ per quart

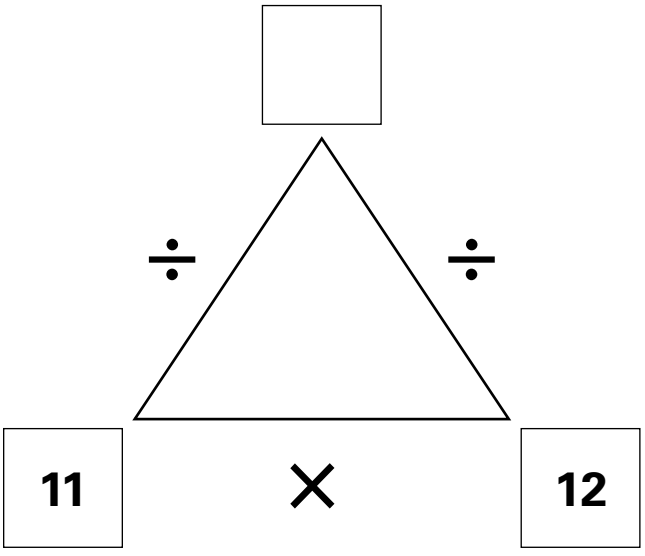
Number Triangles

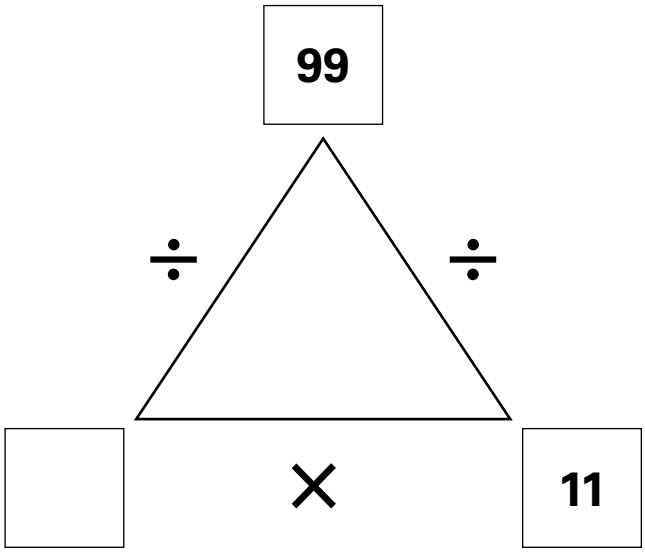












Unit Rate Tape Diagrams

Unit Rate Tape Diagrams

Are We There Yet?

Read the problems. Then, answer the questions. Show your work by drawing **tape diagrams** to find the unit rates and using **double number lines** to find equivalent rates.

1. The bus driver decides to take a different route to get home from the soccer tournament. In the first 3 hours, the bus traveled 159 miles.

a. What is the unit rate in miles per hour? _____

b. At this rate, how many miles will the bus travel in 5 hours? _____

2. Some of the soccer players' parents rent a large van and a small van for their tournament travel. In the first 2 hours of the trip home, the small van traveled 124 miles. In the first 3 hours of the trip home, the large van traveled 180 miles. Each van drives the whole trip at a constant speed.

a. What is the unit rate of speed for the small van? _____

b. What is the unit rate of speed for the large van? _____

c. How many miles will the small van travel in 4 hours? _____

d. How many miles will the large van travel in 4 hours? _____

e. If they left the tournament at the same time, which van will get back first? Explain.

_____

_____

3. When they get back from the tournament, the team stops at a restaurant for a celebratory meal. The restaurant manager says he offers a winning team special: 32 burritos for $224. There are only 23 players on the team, and they have $172 dollars to spend on burritos.

a. What is the unit rate per burrito for the manager's winning team special? _____

b. At this rate, what is the cost of 23 burritos? _____

c. Does the team have enough money to buy 23 burritos at the manager's winning team special rate? _____

Bicycle Tour

Review the example problem. Then, read the problems and answer the questions. Show your work by drawing using **tape diagrams** and finding equivalent ratios.

Example

Rita's aunt takes her on a bicycle trip. The first day, they ride **3** hours and go **42** kilometers. They have **13** hours of bike riding ahead of them. If they ride at the same unit rate of speed as they did on the first day, how far will they ride after another **13** hours?

Step 1

Identify the two ratios represented by the problem. Use a variable for the missing quantity.

$$\frac{\textbf{42} \text{ kilometers}}{\textbf{3} \text{ hours}} = \frac{k \text{ kilometers}}{\textbf{13} \text{ hours}}$$

Step 2

Model the unit rate using a tape diagram. Divide the number of hours to find the unit rate of kilometers per hour.

42 kilometers		
3 hours		
14 kilometers	14 kilometers	14 kilometers

The unit rate is 14 kilometers per hour.

Step 3

Use the unit rate to set up an equation with the ratio with a missing quantity.

$$\frac{14}{1} = \frac{k}{\textbf{13}}$$

Step 4

Find the factor that makes the unit rate equal to the ratio. Multiply by the factor to find the missing quantity.

$$\frac{14}{1} = \frac{k}{\textbf{13}} \qquad \frac{14}{1} \times \frac{\textbf{13}}{\textbf{13}} = \frac{182}{\textbf{13}}$$

$k = 182$ They will ride 182 more kilometers.

1. On the second day, Rita and her aunt rode for 2 hours and went 42 kilometers. On the third day, they rode at the same rate as the second day for 4 hours. How many kilometers did they ride on the third day?

On the third day, they rode _____ kilometers.

2. On the last day of the trip, they rode 91 kilometers at a constant rate for 7 hours. How many kilometers did they ride during the first 3 hours?

In 3 hours, they rode _____ kilometers.

Lesson 39 Exit Ticket

Answer the questions using the tools and strategies indicated.

Robert has 2 pet hamsters. He likes to set up different racecourses for them to run along and see how long they take to reach the finish line. The chart shows some of the results.

Name	Distance (meters)	Time (minutes)
Scurry	70	5
Scamper	52	4

1. What is the unit rate in meters per minute for each hamster? Use a tape diagram to show your work.

a. Scurry's unit rate _____

b. Scamper's unit rate _____

2. How far can each hamster run in 9 minutes? Show your work using equations or a double number line.

a. Scurry can run _____ meters in 9 minutes.

b. Scamper can run _____ meters in 9 minutes.

3. Which hamster could complete a 120-meter racecourse in less than 9 minutes? _____

Extra Practice: Hobbies

Part 1: Match the equivalent rates.

$\frac{104 \text{ miles}}{8 \text{ hours}}$	$\frac{112 \text{ miles}}{4 \text{ hours}}$
$\frac{196 \text{ miles}}{7 \text{ hours}}$	$\frac{176 \text{ miles}}{4 \text{ hours}}$
$\frac{306 \text{ miles}}{9 \text{ hours}}$	$\frac{170 \text{ miles}}{5 \text{ hours}}$
$\frac{132 \text{ miles}}{3 \text{ hours}}$	$\frac{364 \text{ miles}}{7 \text{ hours}}$
$\frac{208 \text{ miles}}{4 \text{ hours}}$	$\frac{117 \text{ miles}}{9 \text{ hours}}$

Part 2: Read the problem. Then, answer the questions. Use **tape diagrams** or **double number lines** to help you solve.

1. Vince gets *Animate* magazine every month and practices drawing the characters he sees. Last year, Vince bought the magazine at a bookstore each month and spent $38.70 for 9 issues of the magazine. This year, he buys a subscription that offers 10 issues for $39.00.

a. Which is the better deal: the bookstore or the subscription? _____

b. How do you know? _____

_____

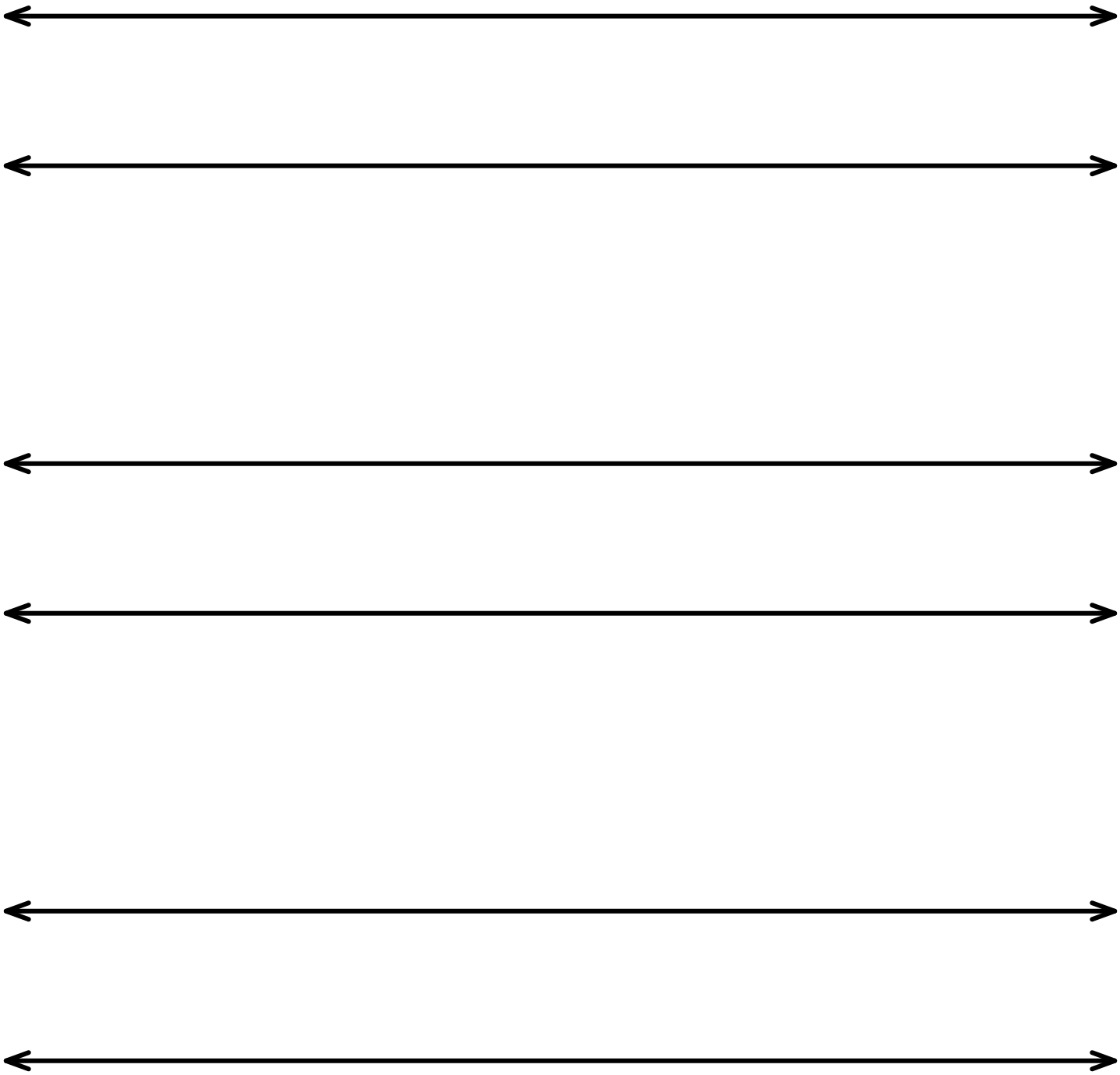
_____

c. How much money does Vince save on the cost of 12 issues at the lower rate? Explain how you found your answer. _____

_____

_____

Double Number Lines



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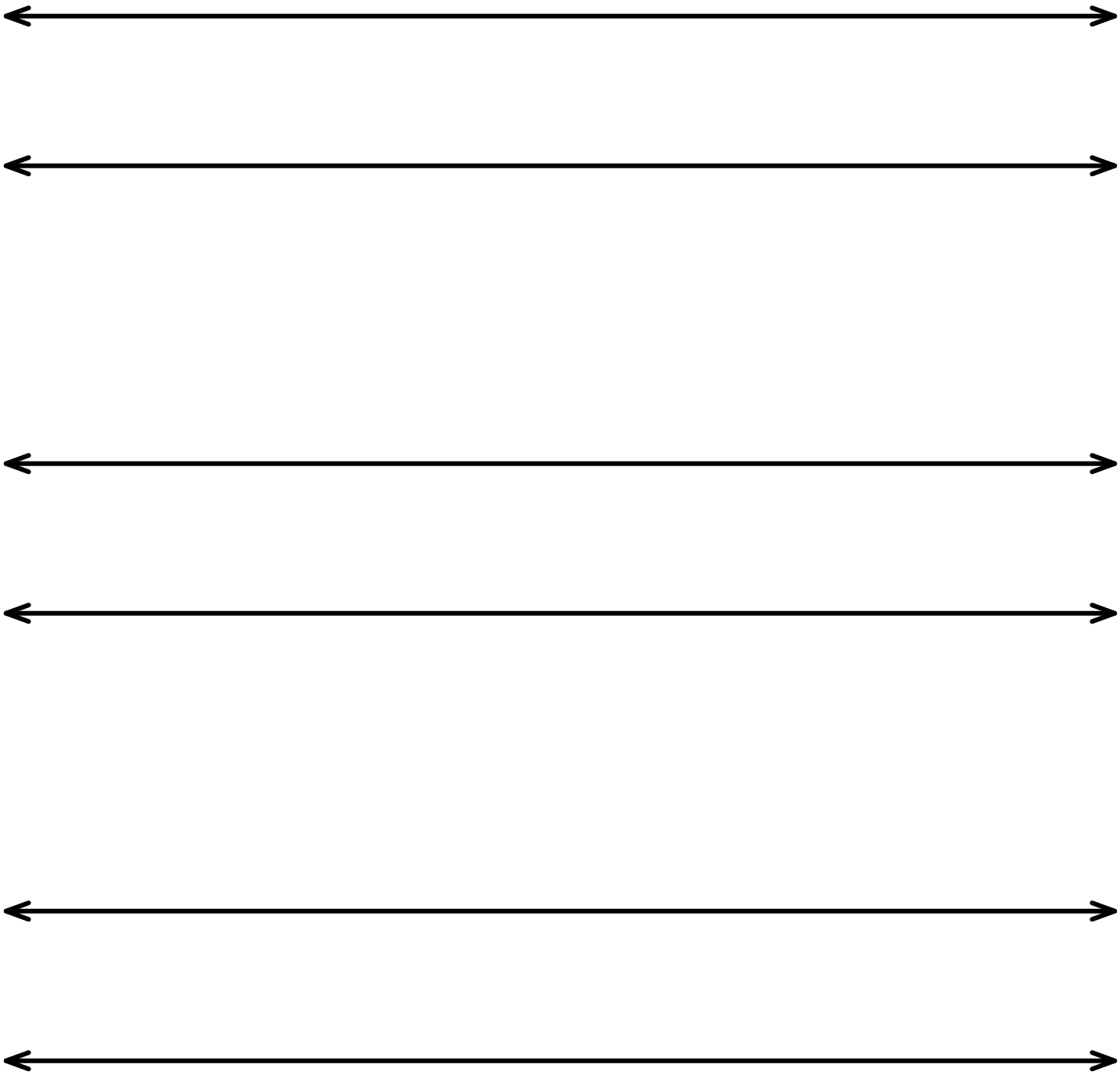

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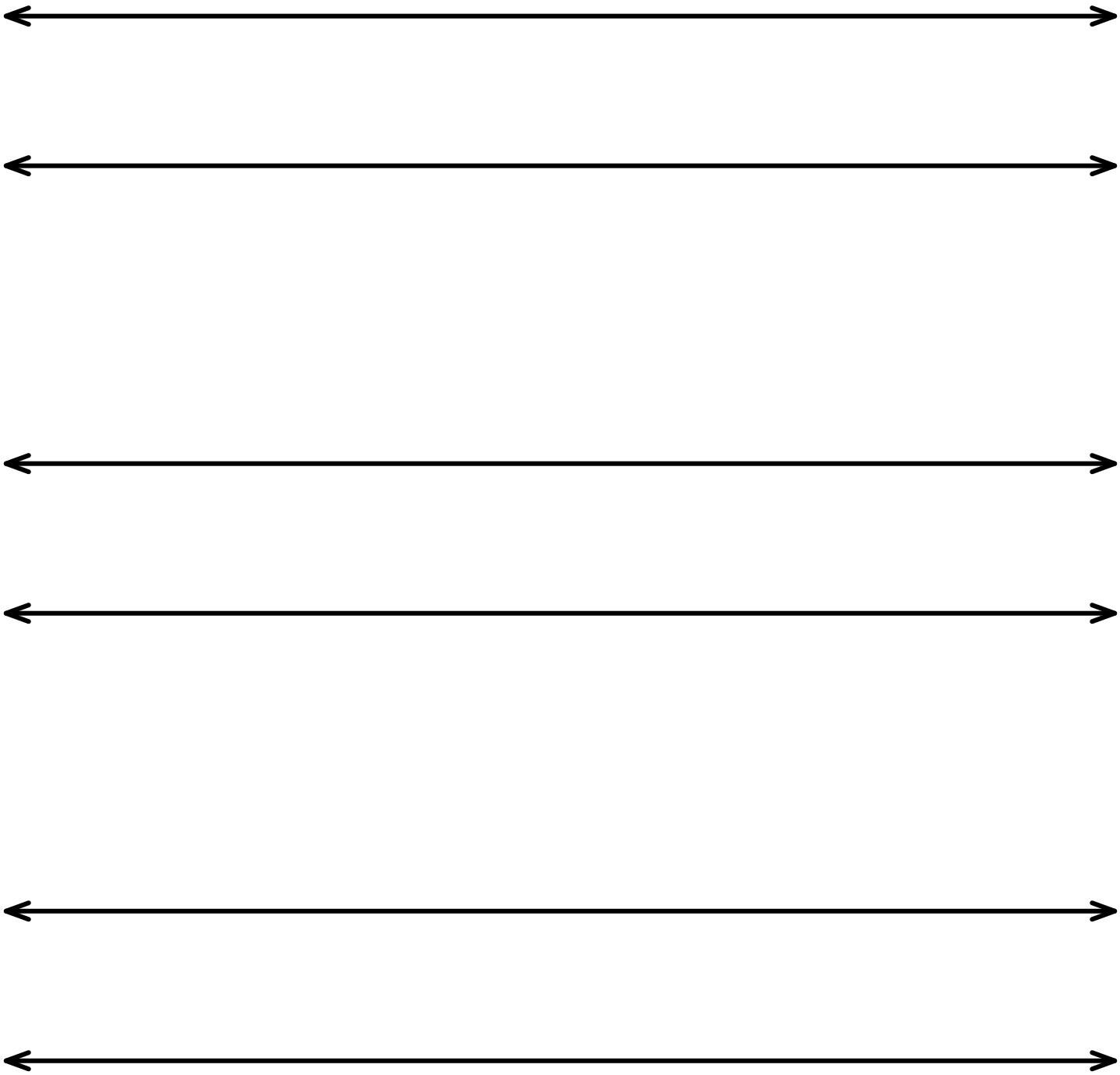

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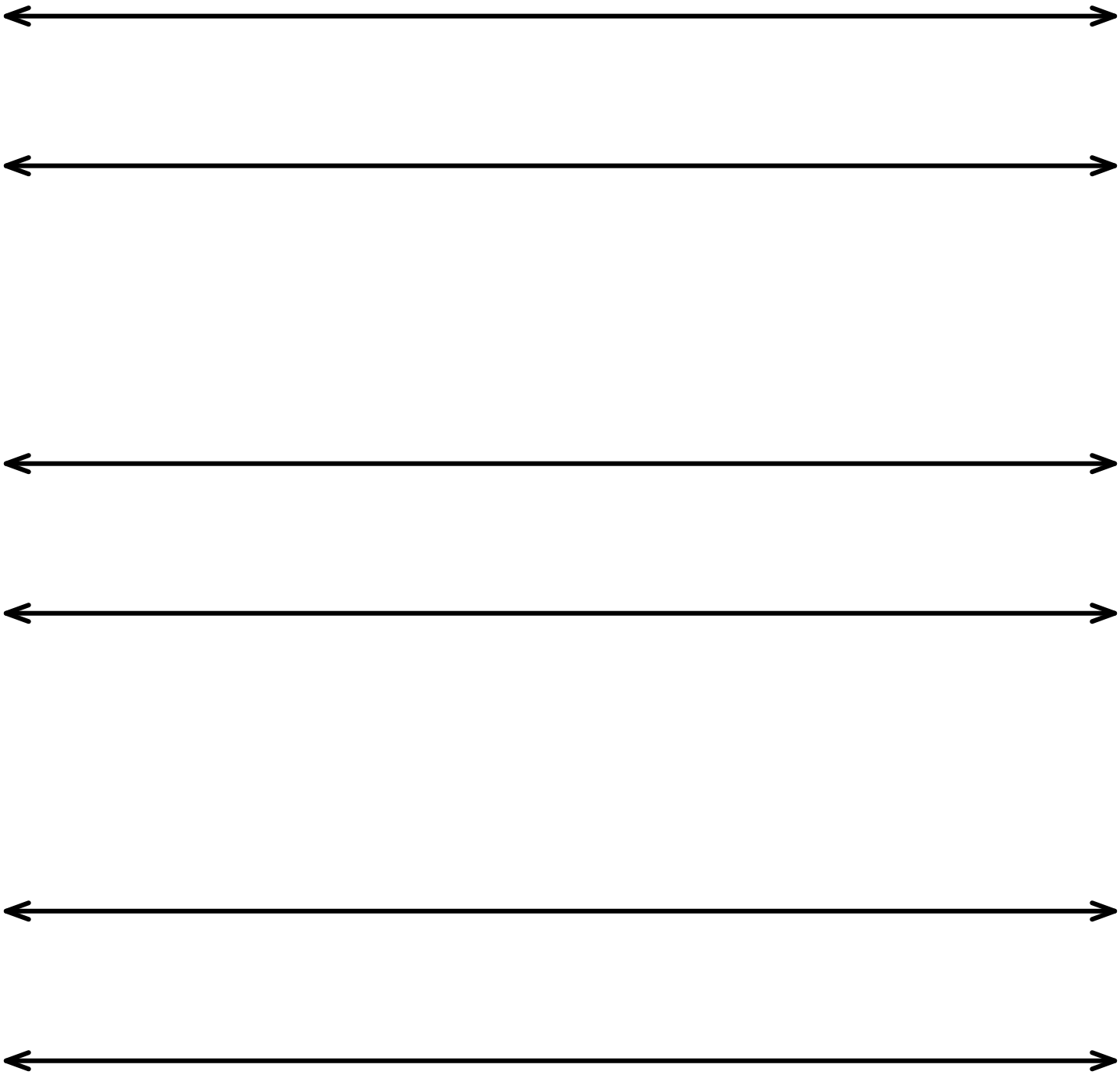


Enough for Everyone

Part 1: Use the given unit rates to multiply and complete the unit conversion.

1. There are 2 cups in 1 pint _____ cups = 20 pints

2. There are 3 teaspoons in 1 tablespoon. _____ teaspoons = 18 tablespoons

3. There are 128 fluid ounces in 1 gallon. _____ fluid ounces = 4 gallons

4. There are 1,760 yards in 1 mile. _____ yards = 5 miles

Part 2. Read the problems. Then, answer the questions. Show your work on a **double number line**.

5. The Kitchen Table restaurant buys potatoes in 15-pound bags. Chef Micah knows that there are 16 ounces of potatoes in 1 pound. How many ounces of boiled potatoes will one bag of potatoes make?

One 15-pound bag of potatoes will make _____ ounces of boiled potatoes.

6. The counter tops in the kitchen need to be replaced. The total countertop is 300 inches long. Granite countertop comes in 8-yard pieces. There are 36 inches in 1 yard. How many inches of countertop will there be from one piece of granite?

One 8-yard piece of granite countertop is _____ inches of long.

7. Jordan is a server at the Kitchen Table. She makes 24 quarts of iced tea at the beginning of her shift. She knows there are 32 fluid ounces in 1 quart. How many fluid ounces of iced tea does 24 quarts make?

14 quarts of iced tea is _____ fluid ounces.

Time After Time

Review the example problem. Then, read the problems and answer the questions. Show your work.

Example

Idina works with Jordan as a server at the Kitchen Table restaurant. They each work **7**-hour shifts. Idina says at the end of her shift that she has worked 500 minutes. Jordan knows there are **60** minutes in **1** hour, and she thinks that Idina's number is too high. Which person is correct?

Step 1

Identify the conversion rate.

I need to convert hours to minutes.

The conversion rate is $\frac{\textbf{60} \text{ minutes}}{\textbf{1} \text{ hour}}$.

Step 2

Identify the ratio with the unknown quantity.

I need to find out how many minutes are in **7** hours.

The ratio of minutes to hours is $\frac{x \text{ minutes}}{\textbf{7} \text{ hours}}$.

Step 3

Write an equation showing that the ratios are equal.

$$\frac{\textbf{60} \text{ minutes}}{\textbf{1} \text{ hour}} = \frac{x \text{ minutes}}{\textbf{7} \text{ hours}}$$

Step 4

Use multiplication to find the value of x.

$$\frac{\textbf{60}}{\textbf{1}} = \frac{x}{\textbf{7}} \qquad \frac{\textbf{60}}{\textbf{1}} \times \frac{\textbf{7}}{\textbf{7}} = \frac{420}{7}$$

7 hours = 420 minutes. Jordan is correct.

1. Idina's best friend is Sanjay. It is exactly 3 weeks until they will celebrate Sanjay's birthday with dinner at The Kitchen Table. They know that there are 168 hours in 1 week. How many hours do Sanjay and Idina have to wait?

Sanjay and Idina have to wait _____ hours.

2. When it is exactly 4 days until Sanjay's birthday, he wants Idina to figure out how many minutes they have left to wait. Idina knows there are 1,440 minutes in 1 day. How many minutes are in 4 days?

There are _____ minutes in 4 days.

Lesson 40 Exit Ticket

Part 1: Use the given unit rates to multiply and complete the unit conversion. Show your work using equivalent rates.

1. There are 6 teaspoons in 1 fluid ounce. _____ teaspoons = 30 fluid ounces

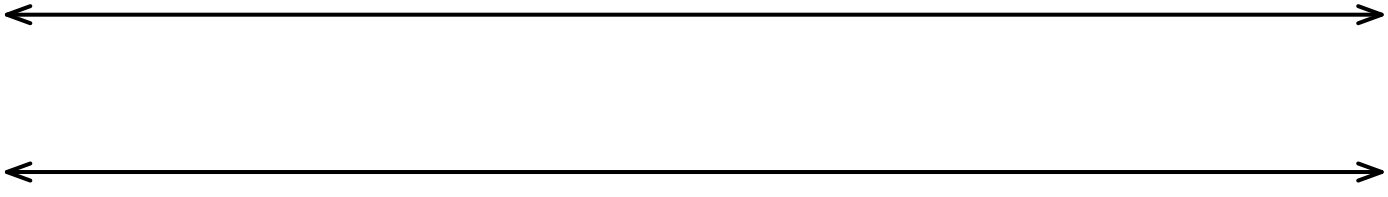
2. There are 16 ounces in 1 pound. _____ ounces = 18 pounds

3. There are 60 seconds in 1 minute. _____ seconds = 40 minutes

4. There are 3 feet in 1 yard. _____ feet = 13 yards

Part 2: Read the problems. Then, answer the questions. Show your work on a **double number line.**

5. There are 12 pounds of chicken in the refrigerator at the Kitchen Table restaurant. Chef Micah knows that there are 16 ounces of chicken in 1 pound. How many ounces of baked chicken can Micah make?



Micah can make _____ ounces of chicken from 12 pounds.

Extra Practice: Conversion Practice

Part 1: Match the equivalent measurements.

6 cups	3 feet
36 inches	3 gallons
9 feet	3 pints
12 quarts	3 fluid ounces
18 teaspoons	3 yards

Part 2: Choose the units from the box to complete each sentence. Some units will not be used. Show your work.

cups	gallons	hours	inches
pints	pounds	seconds	feet

1. There are 32 fluid ounces in 4 _____.

2. There are 80 ounces in 5 _____.

3. 96 _____ is equivalent to 8 feet.

4. 12 _____ is equivalent to 4 yards.

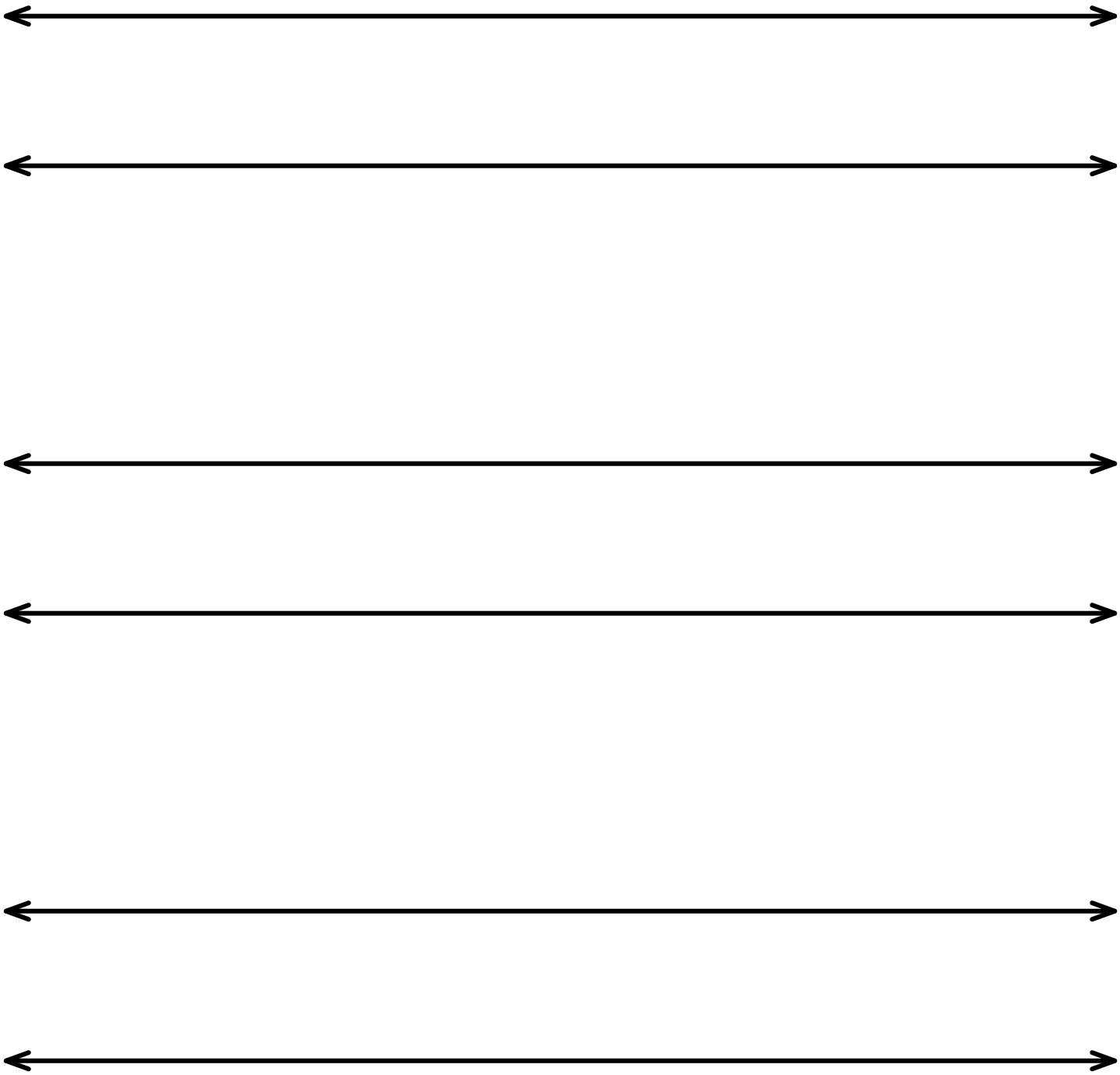
5. There are 2,700 _____ in 45 minutes.

6. There are 28 _____ in 14 quarts.

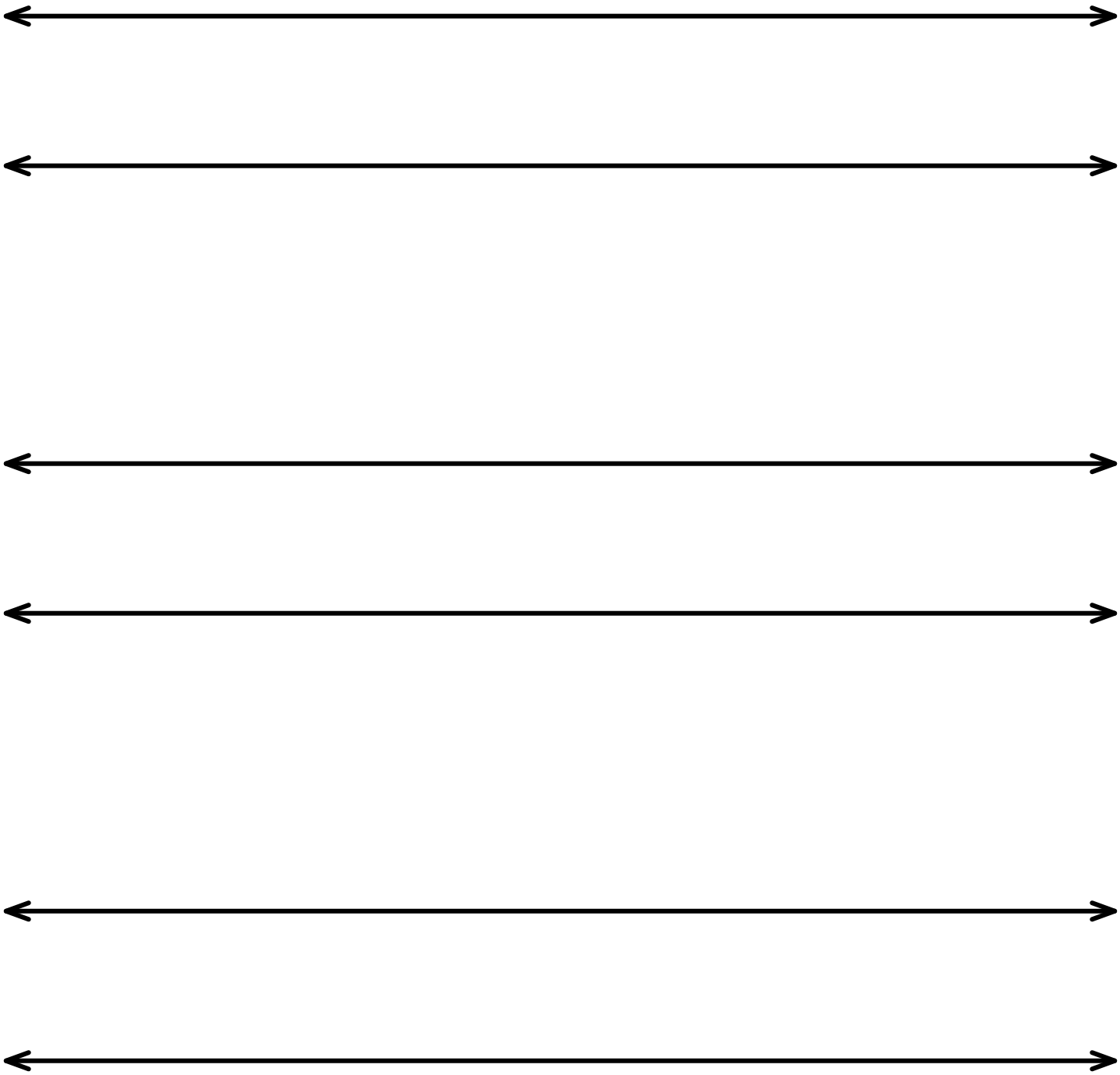
Conversion Rates

Volume	Weight/Mass	Time
1 tablespoon = 3 teaspoons 1 fluid ounce = 6 teaspoons 1 cup = 8 fluid ounces = 48 teaspoons 1 pint = 16 fluid ounces = 32 tablespoons = 2 cups 1 quart = 32 fluid ounces = 4 cups = 2 pints 1 gallon = 128 fluid ounces = 16 cups = 8 pints = 4 quarts	1 pound = 16 ounces 1 ton = 2,000 pounds **Length** 1 foot = 12 inches 1 yard = 36 inches = 3 feet 1 miles = 5,280 feet = 1,760 yards	1 minute = 60 seconds 1 hour = 3,600 seconds = 60 minutes 1 day = 24 hours = 1,440 minutes 1 week = 7 days = 168 hours 1 year = 365 days

Double Number Lines



Double Number Lines



Assessment

Unit 5 Assessment

1. Mary's Bookstore sells 3 hardcover books for every 8 paperback books it sells.

a. Draw a tape diagram to represent the number of hardcover books sold to paperback books.

b. Write the ratio of hardcover books to paperback books three different ways:

_____ _____ _____

2. Catriona makes balloon bunches to decorate for a party. Each bunch will have 1 gold balloon for every 5 blue balloons. Complete the ratio table to show how many gold balloons for different numbers of blue balloons.

Number of Blue Balloons	Number of Gold Balloons	Ratio of Gold to Blue
5	1	
10		

3. Waris buys a bag of marbles. There are 3 white marbles for every 5 red marbles. If there are 12 white marbles in the bag, how many red marbles are in the bag? Show your work on the double number line.

The bag has _____ red marbles.

4. Coach Duke brings 3 basketballs to practice for every 4 players she expects will be at practice. How many players is Coach Duke expecting to be at practice if she brings 18 basketballs? Use multiplication to solve.

Coach Duke expects _____ players to be at practice.

5. The Juice Stop sells 4 small glasses of orange juice for every 7 large glasses of orange juice. If they sell 21 large glasses of orange juice, what is the total number of glasses they sell? Make a ratio table to represent the glasses and show your work.

Large Glasses	Small Glasses	Total Glasses

They sell _____ glasses in total.

6. Freya spends several days on a bicycle trip. In a total of 21 hours of bicycling, she goes 147 miles. What is her unit rate in miles per hour? Use equivalent rates and show your work.

Freya's unit rate is _____ miles per hour.

7. It takes Morgan 4 hours to paint Mr. Brown's shed. Mr. Brown pays Morgan $70. What is Morgan's unit rate of earnings per hour? Draw a tape diagram to find Morgan's hourly rate.

Morgan's unit rate is _____ dollars per hour.

8. Tessa runs 4 miles in 36 minutes.

a. What is Tessa's unit rate per mile? Show your work. _____

b. At this rate, how many minutes will it take Tessa to run 5 miles? _____

9. Brian can type 268 words in 4 minutes. Bill can type 360 words in 5 minutes. Who can type faster? Show your work.

Brian can type _____ words per minute.

Bill can type _____ words per minute.

_____ can type faster.

10. Dalia makes 16 quarts of tortilla soup for a neighborhood party. She knows there are 4 cups in 1 quart. How many 1-cup servings did Dalia make? Use equations to show your work.

Dalia made _____ 1-cup servings.

Unit 5 Cumulative Review

1. Deandra is sewing new robes for her choir. It takes her 4 hours to sew 12 robes. At this rate, how many hours will Deandra need to sew 24 robes?

_____ hours

2. Divide.

$4.62 \div 3 =$ _____

3. Name 3 ratios that are equivalent to the ratio 5:2. _____ _____ _____

4. Add. Show your work.

$\frac{2}{3} + \frac{2}{9} =$ _____

5. Simplify the expression to complete the equation. Show your work.

$5 + (4^2 - 3) \times 2 =$ _____

6. Subtract. Show your work.

$\frac{1}{2} - \frac{3}{8} =$ _____

7. Ms. Bethel is ordering books for her classroom. Each book costs $12 and the publisher charges $20 for shipping. Ms. Bethel knows that the expression $12b + 20$ represents the total cost to order b books. Her friend Mr. Roth says that the expression $4(3b + 5)$ also represents the total cost of the order. Is Mr. Roth's statement correct? Show your work and circle your response.

Mr. Roth is correct/incorrect.

8. Tia and Tony are working on a group report. Tia has written 1⅓ pages of the report and Tony has written 2¾ pages of the report. What is the total number of pages that Tia and Tony have written? Show your work.

Tia and Tony have written _____ pages of the report.

9. Divide. Show your work.

$\frac{5}{8} \div \frac{2}{3} =$ _____

10. Ray brings 5/8 of a pie to the potluck. Katie brings 3/4 of a pie. How much pie is at the potluck all together? Show your work.

There are _____ pies at the potluck.

11. A rectangular rug is 3.4 meters long and 1.2 meters wide. What is the area of the rug in square meters?

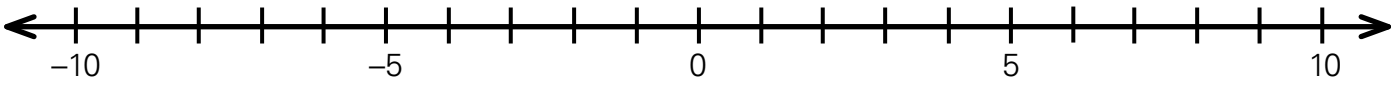
_____ square meters

12. Simplify the expression to complete the equation. Show your work.

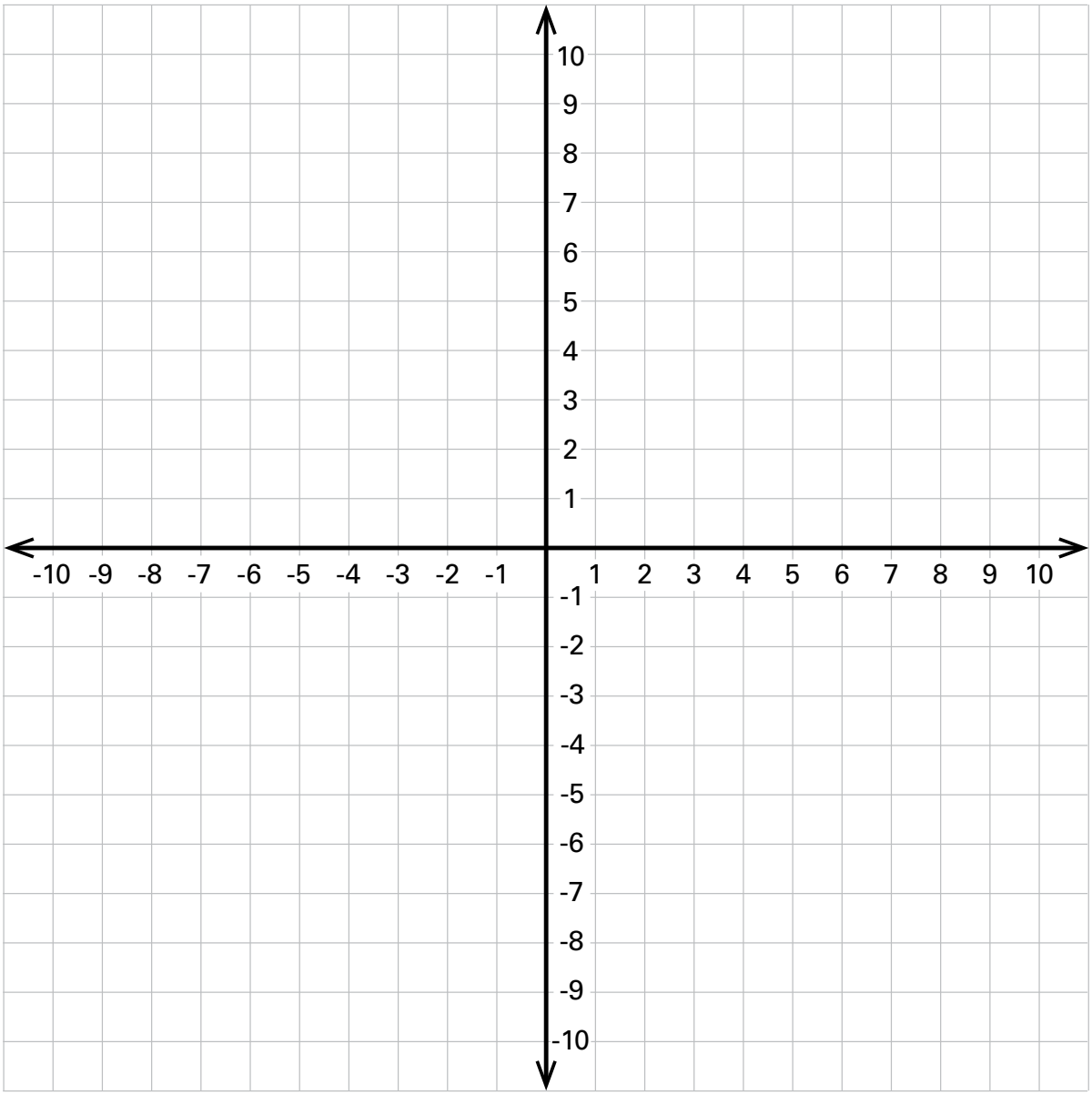
$4(9 - 3) + 2[13 - (5)(2)] =$ _____

13. What is the least common multiple of 4 and 14? _____

14. The band True Turtles begins their final sound check 9 minutes before their concert is supposed to start. Plot a point at the integer on the number line below that represents the time of the final sound check.



15. Graph these ordered pairs on the coordinate grid below: (4, 5), (0, –3), (–1, 2), (–4, –5).



Unit 6:

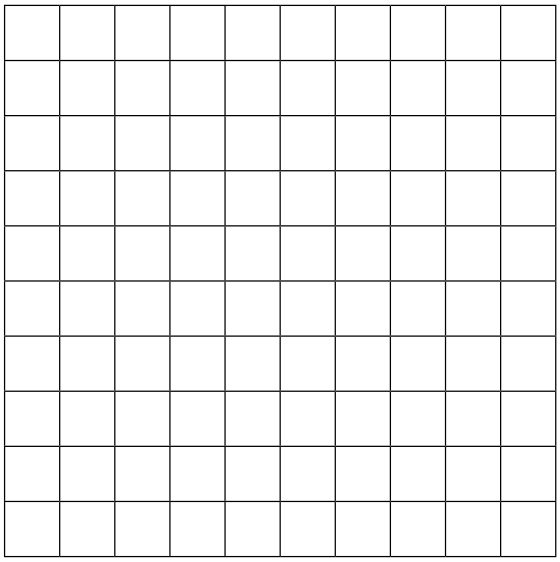
Percents

Catapult Learning™

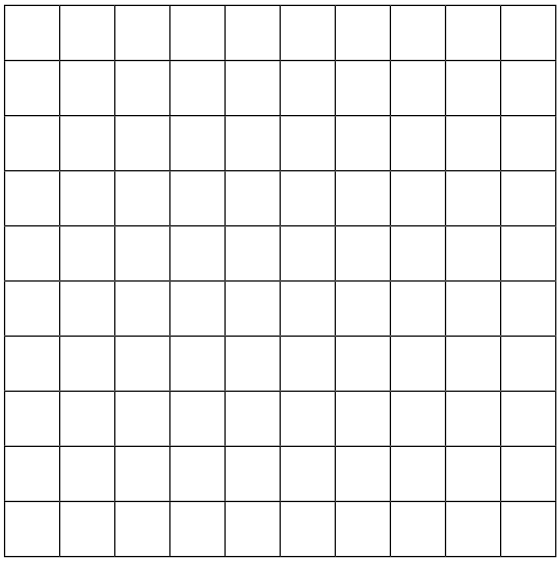
All the News

David and Sela have written other articles for the Ridgeway Middle School newspaper. Complete the model to represent the percent in each headline.

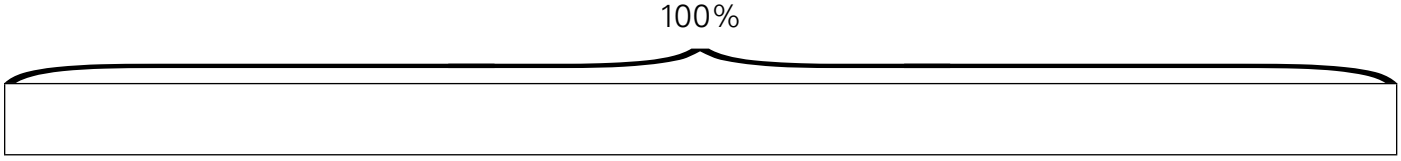
1. "School Reduces Electricity Use by 17%"



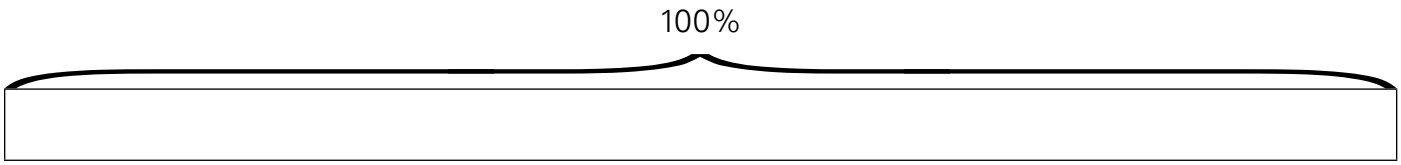
2. "20% of Students Play Sports"



3. "30% of Students Participate in Art Show"



4. "Library Use Increases 80%"



Sports Report

Review the example problem. Then model the percent.

Example

Talia writes about sports for the Ridgeway Middle School newspaper. Yesterday, the pitcher on the baseball team struck out **25**% of the other team's batters. How can Talia model **25**% for her article about the game?

Method 1: Use a hundred grid to model **25**%.

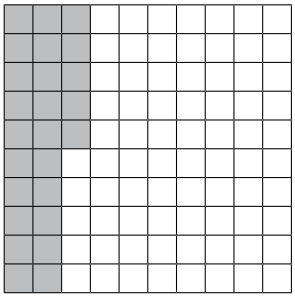
Step 1

Describe **25**% as a ratio per 100.

25% is **25** out of 100.

Step 2

Shade 25 squares on the hundred grid.

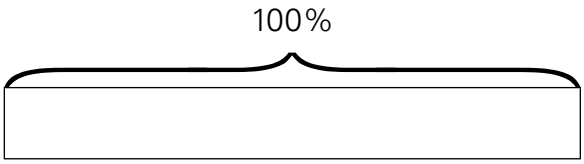


$$\mathbf{25}\% = \frac{\mathbf{25}}{100}$$

Method 2: Use a tape diagram to model **25**%.

Step 1

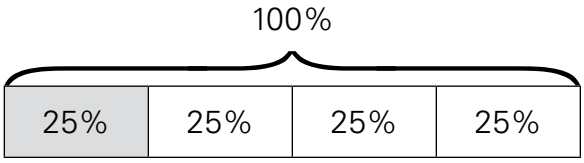
Set a tape diagram whole as 100%.



Step 2

Decide how many parts you need to represent **25**%.

Since 100 ÷ 4 = **25**, divide the bottom tape into 4 parts. Shade 1 part to represent **25**%.



1. Model each percent with a hundred grid.

81%	38%
73%	60%
24%	95%
51%	49%

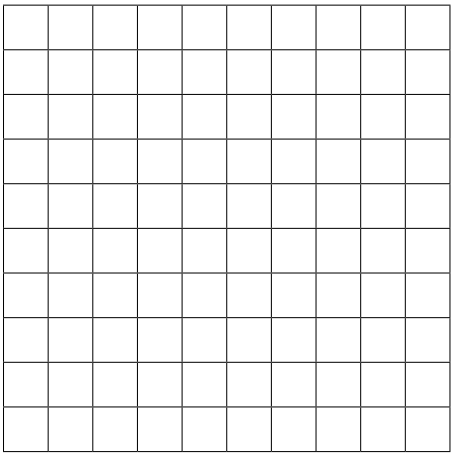
2. Model each percent with a tape diagram.

5%	30%
10%	40%
20%	45%
50%	65%

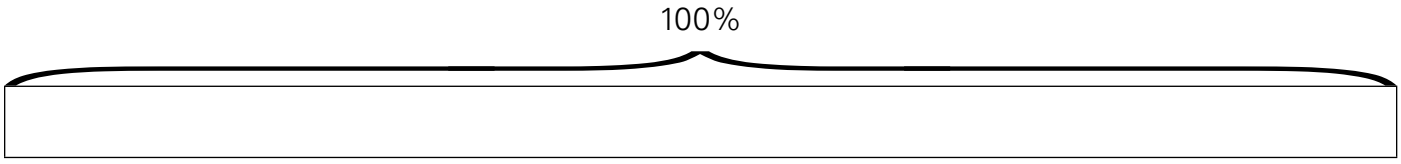
Lesson 42 Exit Ticket

Complete each model to represent the percent in each headline from the Ridgeway Middle School newspaper.

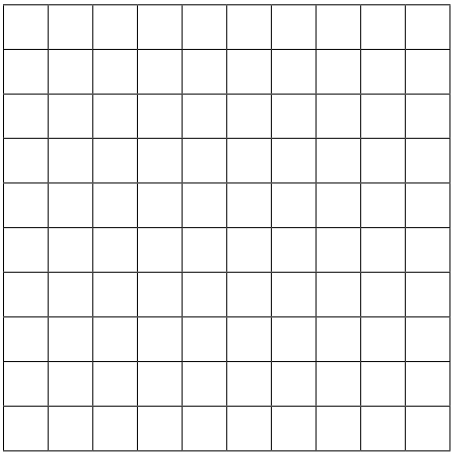
1. "Field Day Has 99% Participation"



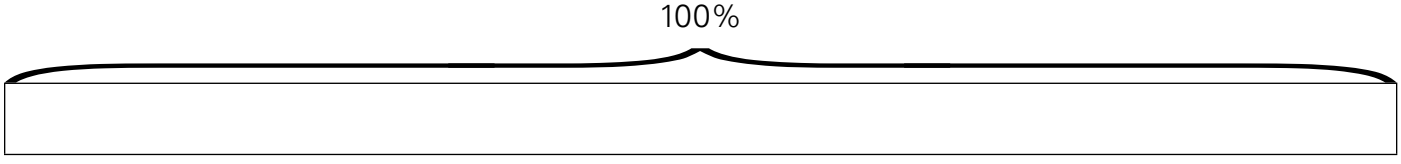
2. "Local Store Offers 70% Off School Supplies"



3. "Basketball Team Wins 63% of Games"



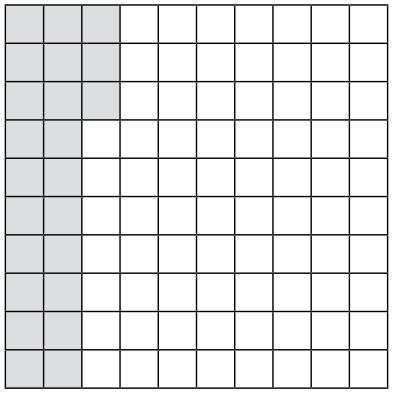
4. "90% of Students Vote for More Recess"



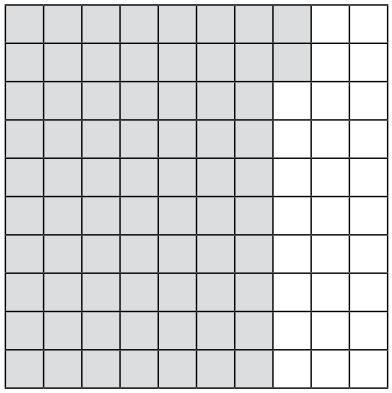
Extra Practice: Identify Percent

For each model, write the percent that the model represents.

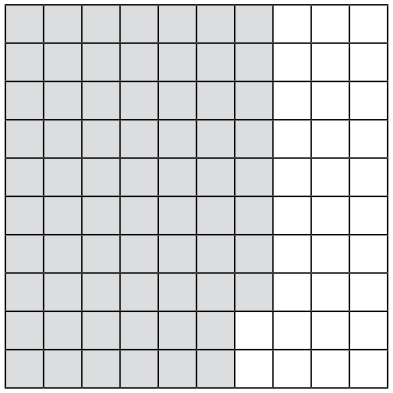
1. _____%



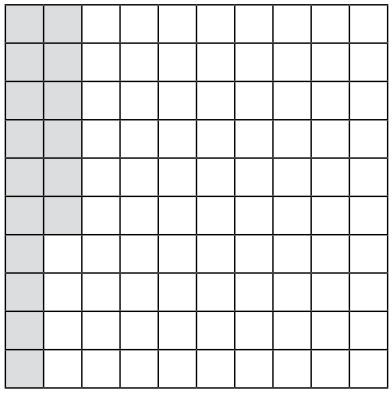
2. _____%



3. _____%



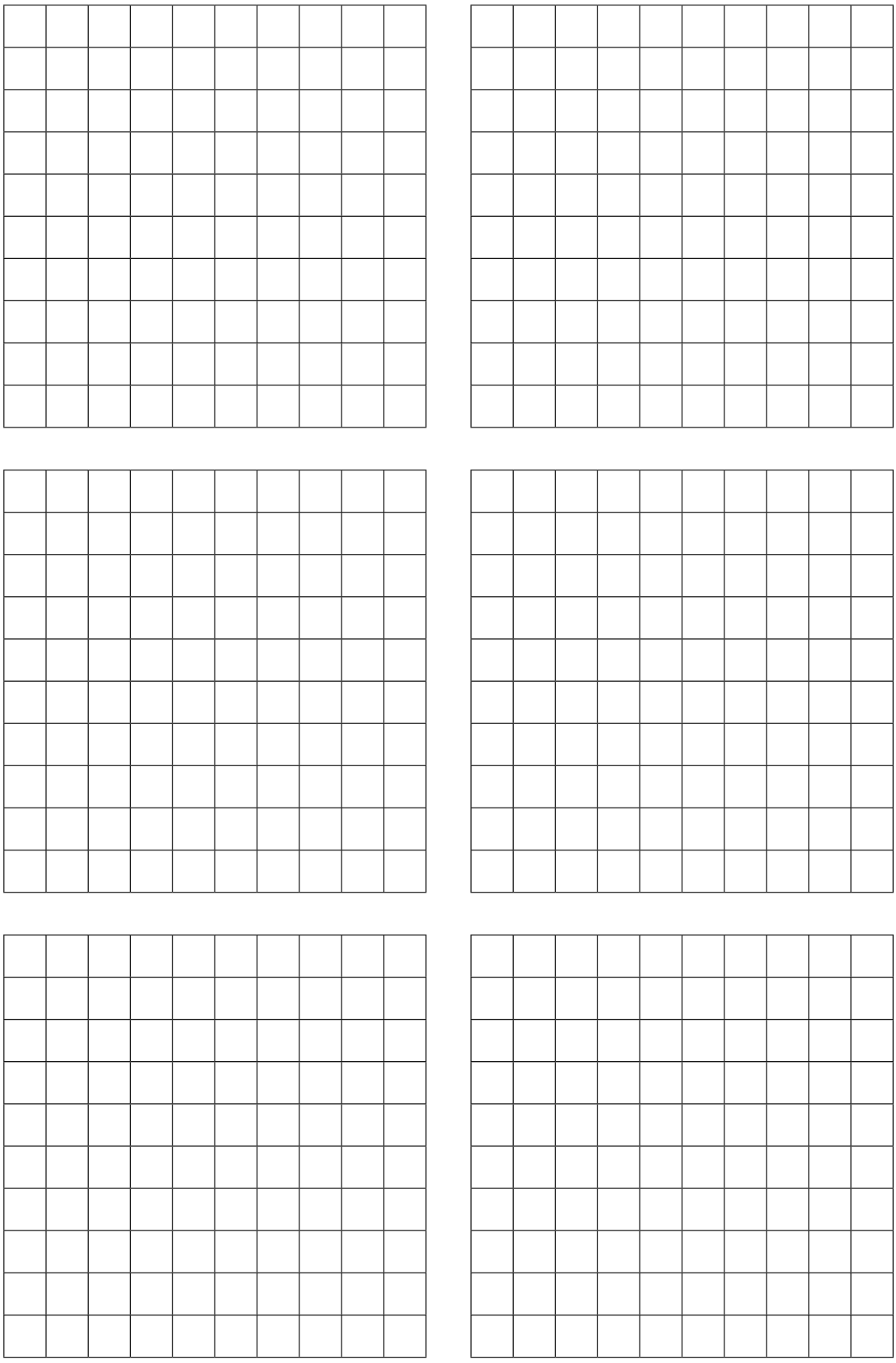
4. _____%



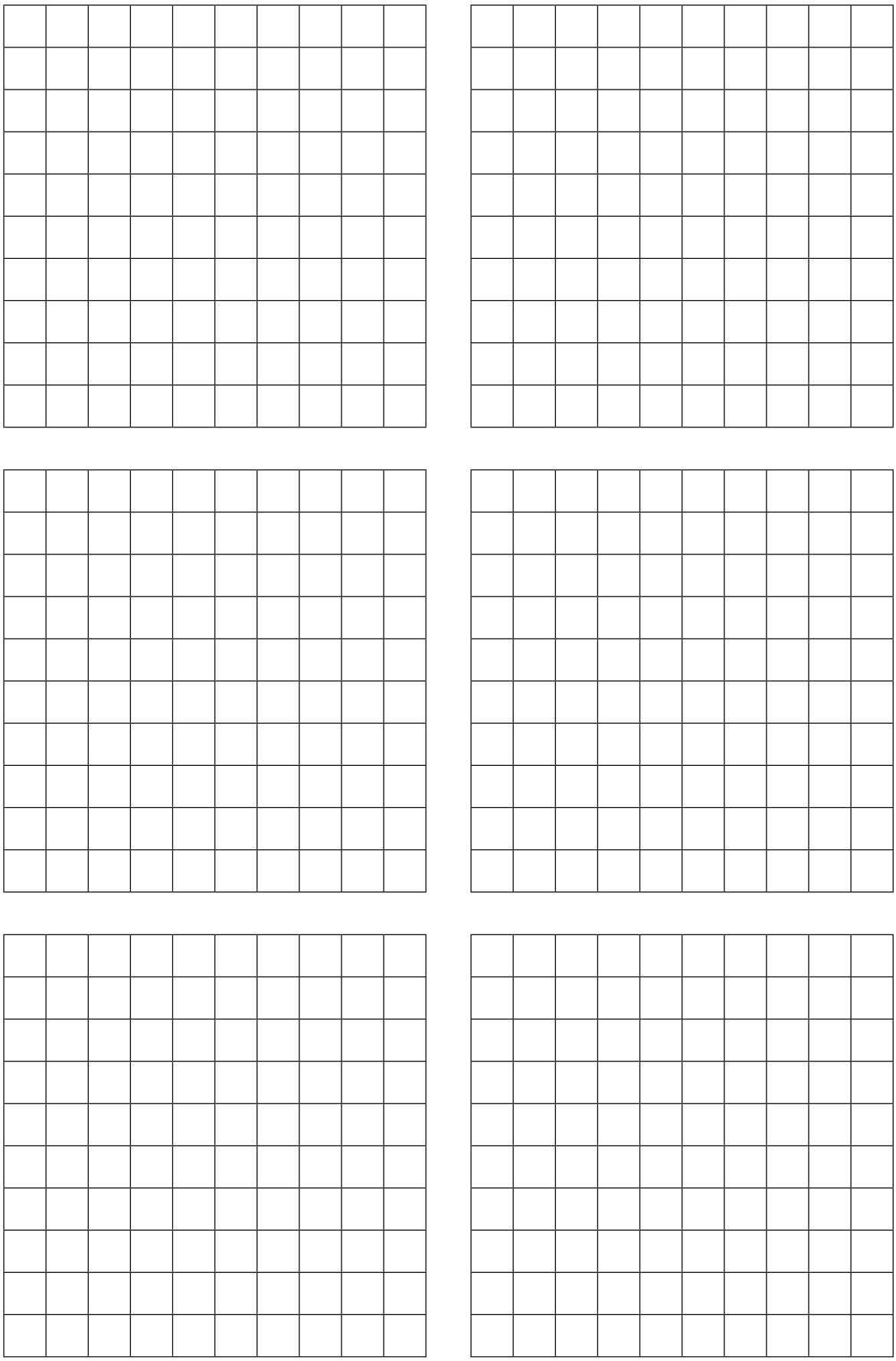
5. _____%

6. _____%

Hundred Grids



Hundred Grids



Science Fair Surprises

Read each statement. Use **double number lines** to find the equivalent percent. Check your work using equivalent ratios and multiplication.

1. One of the judges told Marquon that $\frac{3}{5}$ of the students who entered the county science fair are sixth graders. What percent are sixth graders?

_____% of students who entered the County Science Fair are sixth graders.

Use equivalent ratios and multiplication to check your work.

2. When Marquon looked at other students' experiments, he saw that only 1 out of every 10 experiments was about chemistry. How many experiments were about chemistry?

_____% of the experiments are about chemistry.

Use equivalent ratios and multiplication to check your work.

3. Marquon earns 40 out of a possible 50 points for his science experiment. What percent does he score in the science fair?

He scores _____% in the science fair.

Use equivalent ratios and multiplication to check your work.

4. 7 out of 10 students in the science fair earn a ribbon. What percent of students in the science fair earn a ribbon?

_____% of students in the science fair earn a ribbon.

Use equivalent ratios and multiplication to check your work.

Choosing Champions

Review the example problem. Then use equivalent ratios and multiplication to find the percent. Show your work.

Example

All the judges vote to choose the County Science Fair Grand Champion. This year, **8** of the **10** judges vote for Rochelle, who has an experiment about ocean waves. What percent of the judges vote for Rochelle? Use equivalent ratios to find the percent.

Step 1

Identify the ratio given in the problem and write it as a fraction.

8 out of **10** judges vote for Rochelle.

The ratio is $\frac{\mathbf{8}}{\mathbf{10}}$.

Step 2

A percent is a quantity out of 100. Set up a ratio showing the given ratio is equal to x out of 100.

$\frac{\mathbf{8}}{\mathbf{10}} = \frac{x}{100}$

Step 3

Determine what factor to multiply the denominator by to equal 100. Multiply the numerator by the same factor.

$\frac{\mathbf{8}}{\mathbf{10}} \times \frac{10}{10} = \frac{80}{100}$ $\quad x = 80$

Step 4

The value of x equals the percent.

8 out of **10** = 80%.

1. 3 out of 4 sixth-grade judges vote for Marquon as the sixth-grade champion.

3 out of 4 = _____%.

2. 4 out of 5 seventh-grade judges vote for Ella as seventh-grade champion.

4 out of 5 = _____%.

3. 2 out of 10 eighth-grade judges vote for Jonathan as the eighth-grade champion.

2 out of 10 = _____%.

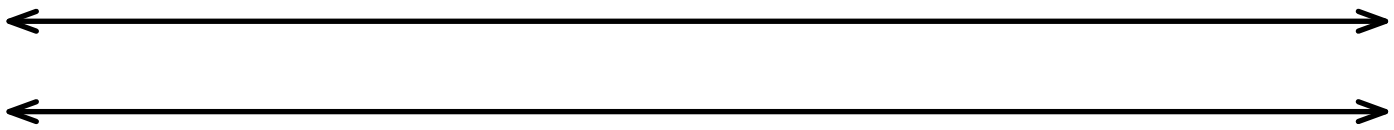
4. 1 out of 2 ninth-grade judges vote for Ashley as the ninth-grade champion.

1 out of 2 = _____%.

Lesson 43 Exit Ticket

Part 1: Use the double number lines to find the equivalent percent.

1. 1 out of 5 = _____%



2. 3 out of 4 = _____%

Part 2: Use equivalent ratios and multiplication to find the equivalent percent. Show your work.

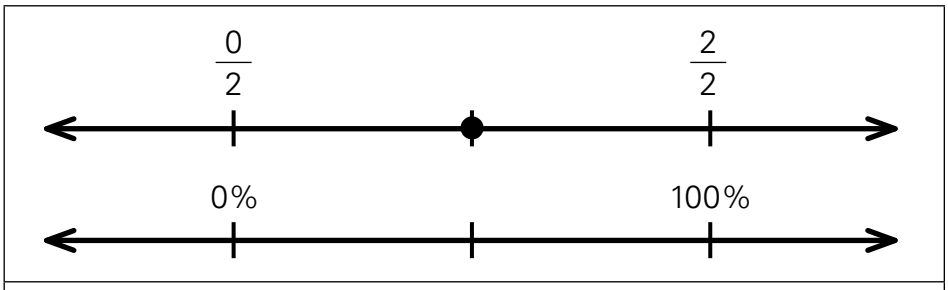
3. 2 out of 4 = _____%

4. 4 out of 10 = _____%

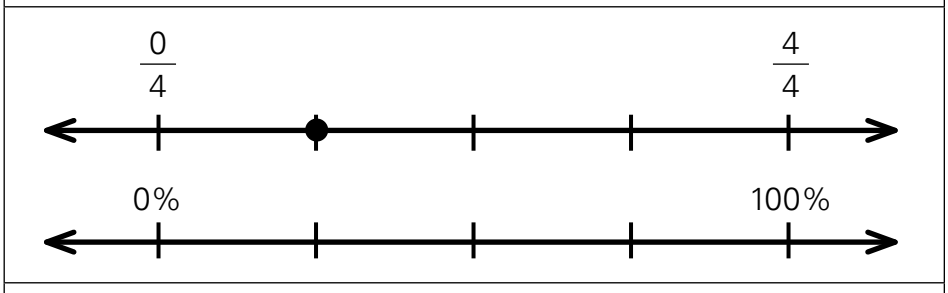
Extra Practice: Model Match

Shade each number line according to the color indicated by the sentence that matches it.

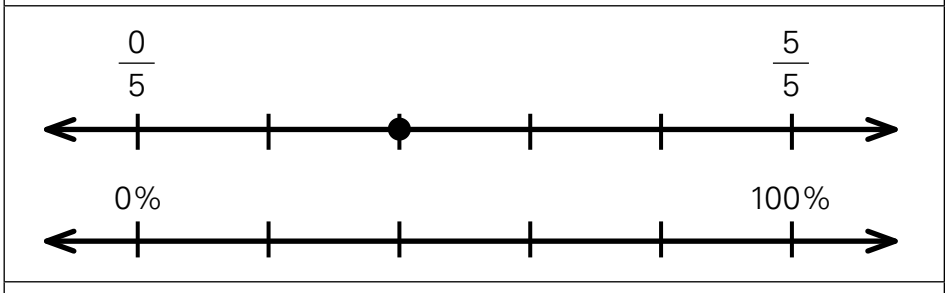
Red: $\frac{4}{5}$ is equivalent to 80%.



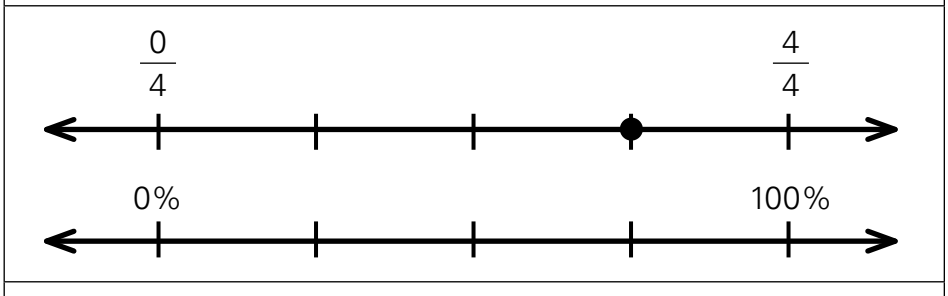
Orange: $\frac{3}{4}$ is equivalent to 75%.



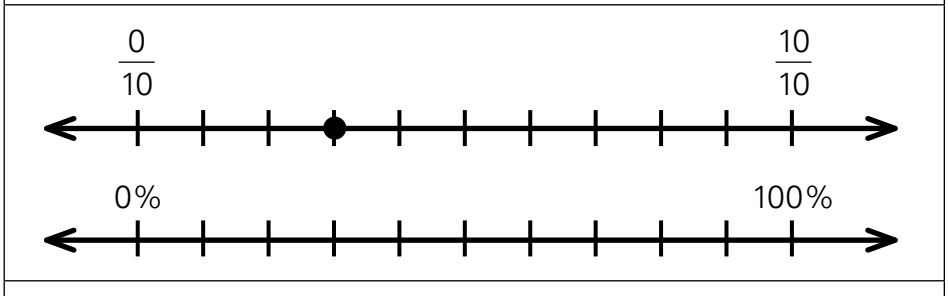
Yellow: $\frac{1}{2}$ is equivalent to 50%.



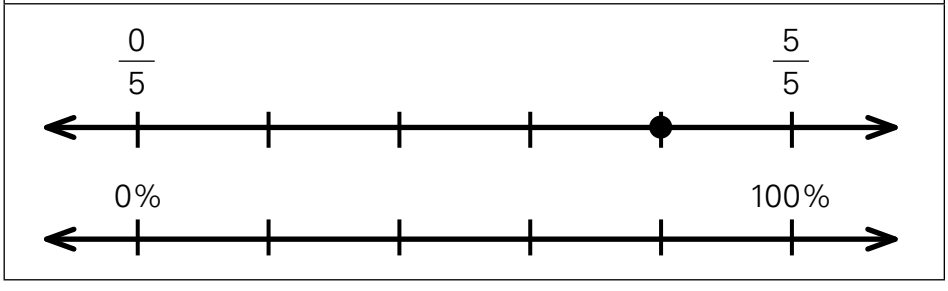
Green: $\frac{2}{5}$ is equivalent to 40%.



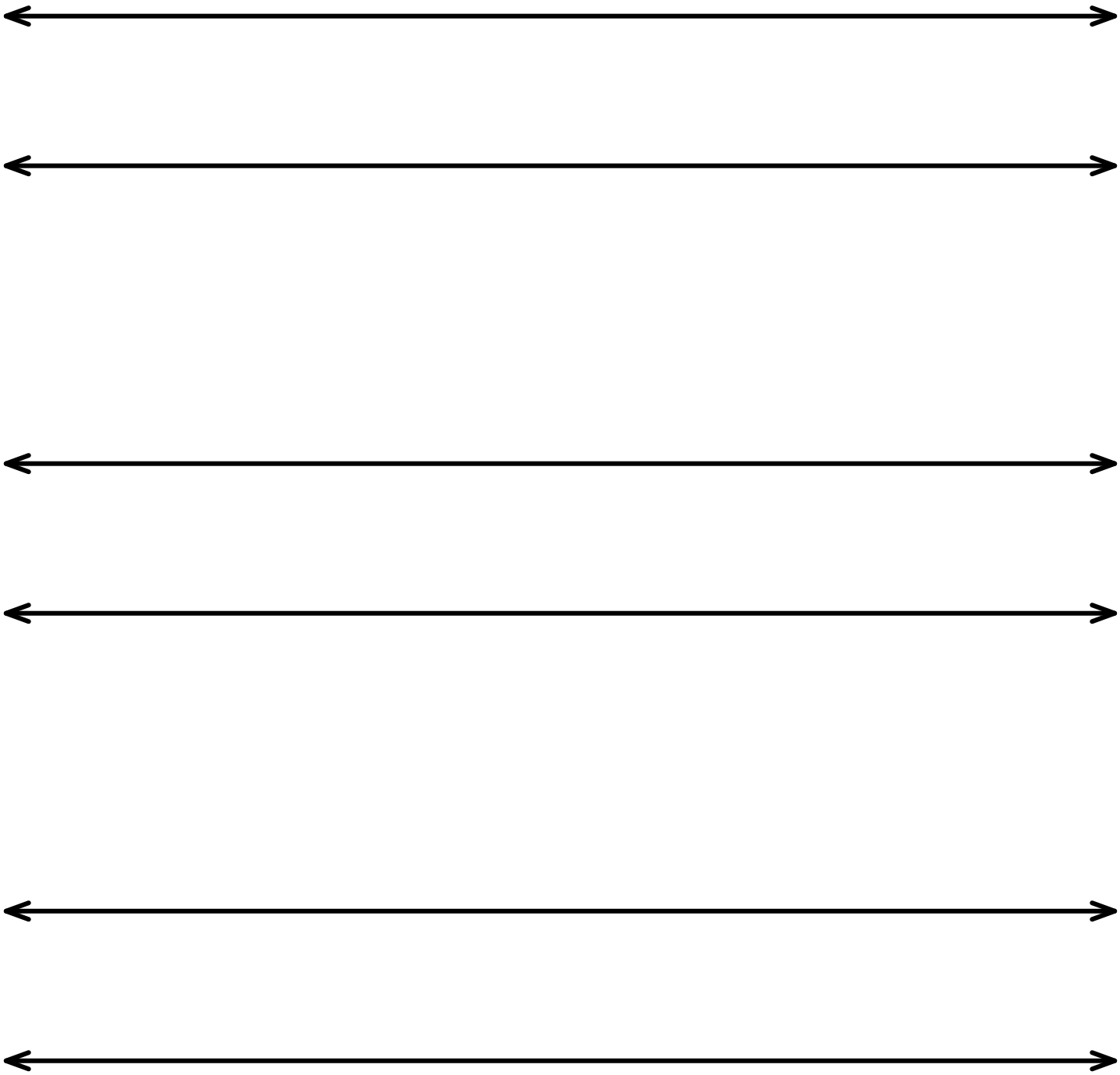
Blue: $\frac{1}{4}$ is equivalent to 25%.



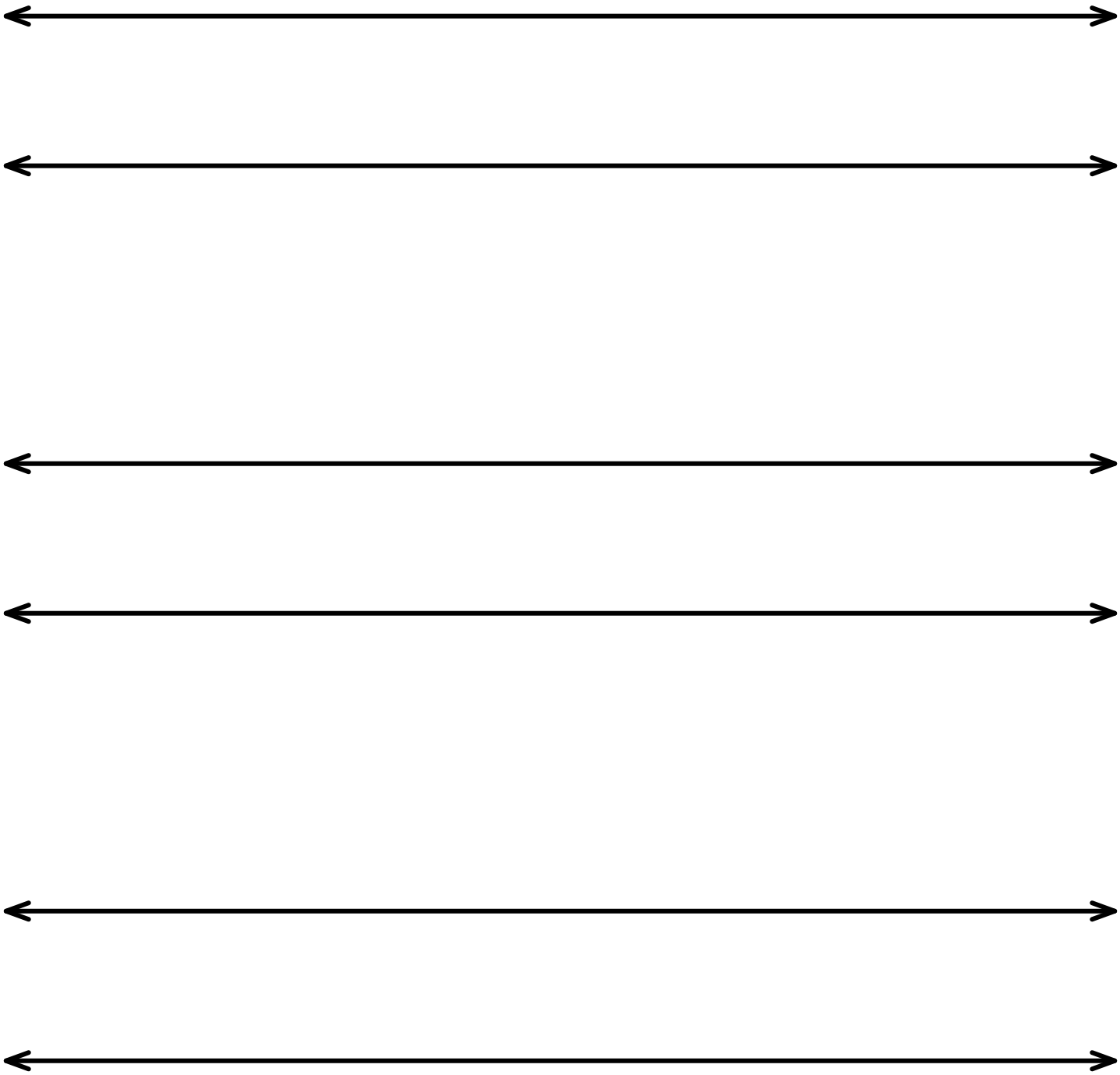
Purple: $\frac{3}{10}$ is equivalent to 30%.



Double Number Lines



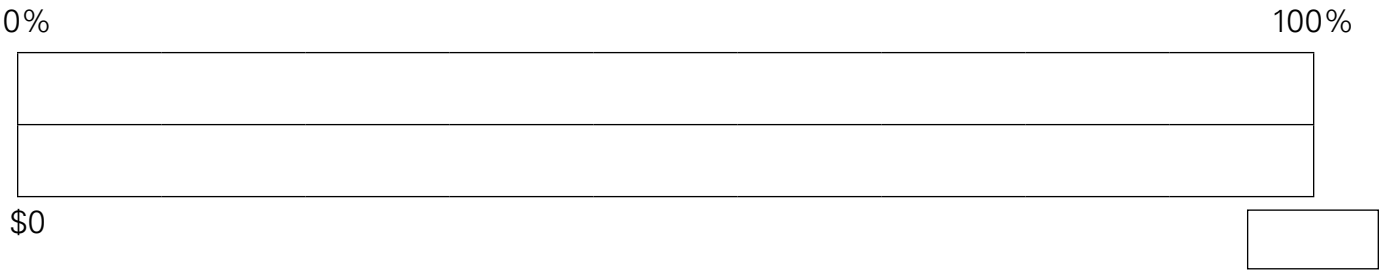
Double Number Lines



The Treasurer's Report

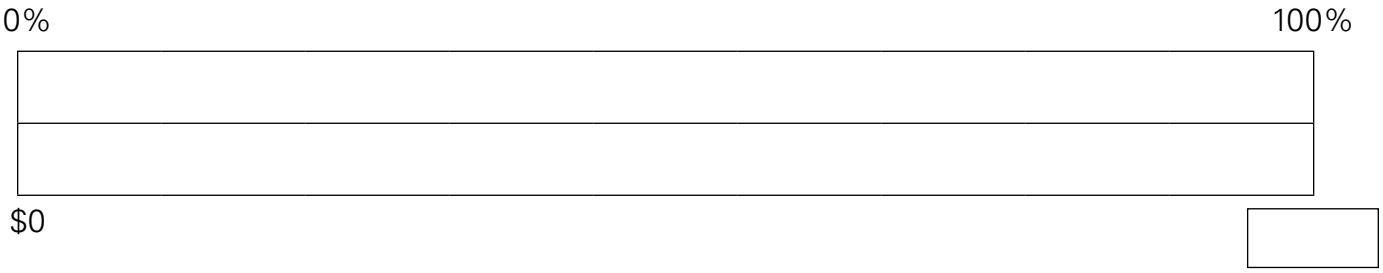
Part 1: Use the tape diagrams to find the number that equals the given percent.

1. The student council spends 10% of $700 on a prize for the winner of the Read-A-Thon. How much money did the council spend on the prize?



The council spent $ _____ on the prize for the Read-A-Thon.

2. The council spends 50% of $20 on a gift card for the teacher of the week. How much money did the council spend on the gift card?



The council spent $ _____ on the gift card.

Part 2: Use equivalent ratios to find the number that equals the given percent. Show your work.

3. The student council spends 60% of $5 on a joke gift for the school principal. How much money does the council spend on the gift?

The council spent $ _____ on the joke gift.

Time to Celebrate

Review the example problem. Use equivalent ratios to find the number that equals the given percent.

Example

There are **200** sixth graders at Drashner Middle School, and **90**% of them go to a school party at the end of the year. How many sixth graders go to the party?

Step 1

Set up the given percent as a ratio of 100.

$\mathbf{90}\% = \frac{\mathbf{90}}{100}$

Step 2

Write an equation showing that the percent is equal to a ratio with the given whole as the denominator.

$\frac{\mathbf{90}}{100} = \frac{n}{\mathbf{200}}$

Step 3

Multiply or divide the percent ratio to make it equivalent to the second ratio.

$\frac{\mathbf{90}}{100} \times \frac{2}{2} = \frac{180}{\mathbf{200}}$ $\quad 180 = n$

Step 4

The value of n is the missing part.

$180 = n$

180 sixth graders go to the party.

1. 75% of the 500 students in the Read-A-Thon went to the party. How many went to the party?

_____ Read-A-Thon students went to the party.

2. 80% of each ticket sold goes to charity. Each ticket costs $25. How many dollars for each ticket goes to charity?

$ _____ from each ticket sale goes to charity.

3. 15% of the 800 people at the party are chaperones. How many chaperones are at the party?

_____ chaperones are at the party.

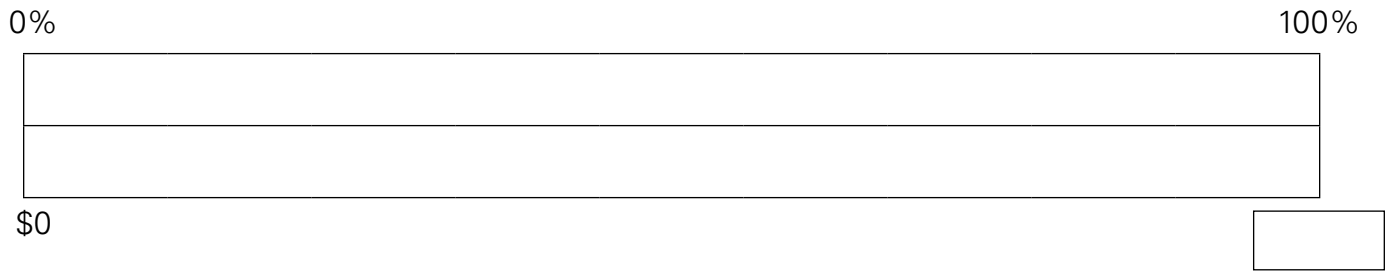
4. Sophia makes punch at the party. The punch is 60% fruit juice. There are 20 gallons of punch. How many gallons of fruit juice did Sophia use?

Sophia uses _____ gallons of fruit juice.

Lesson 44 Exit Ticket

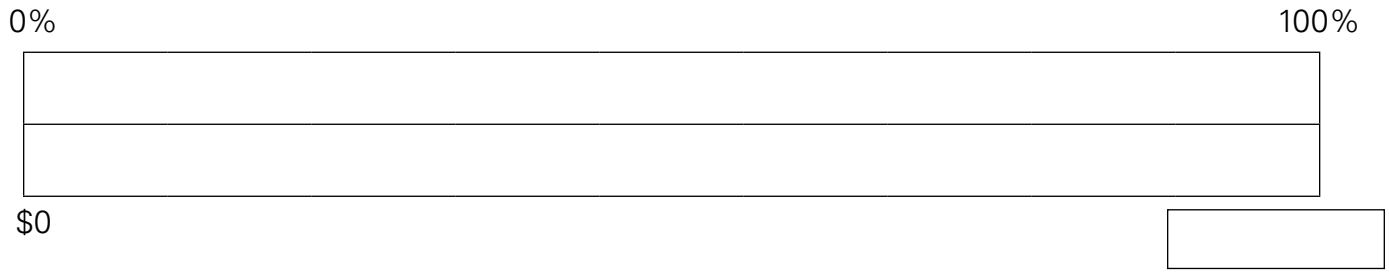
Part 1: Use the tape diagrams to find the number that equals the given percent.

1. The drama club earns $740 from ticket sales for its upcoming play. The club spends 25% of the money on printing the programs. How much money does it spend on programs?



The club spends $ _____ on the programs.

2. The club members worked on the play for 35 hours. Of that time, 40% was spent on building the scenery. How many hours did they work on scenery?



The club members spent _____ hours building scenery for the play.

Part 2: Use equivalent ratios to find the number that equals the given percent.

3. 70% of teachers go see the play, and there are 50 teachers. How many teachers go to the play?

_____ teachers go to the play.

4. Lila, the president of the drama club, announces that 30% of students bought a ticket for the school play. There are 1,200 students. How many bought a ticket?

_____ students bought tickets for the play.

Extra Practice: Tape Diagram Practice

Use the tape diagrams to find the number that equals the given percent.

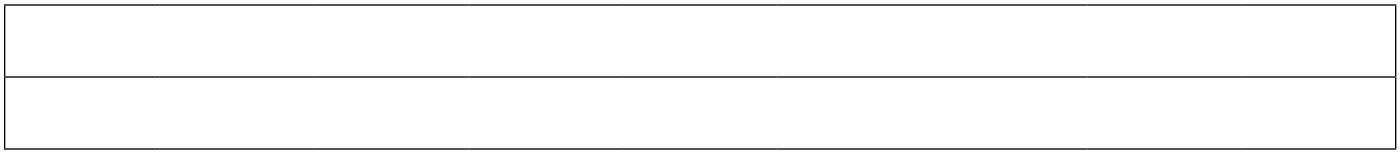
1. 50% of 76 is _____.

2. 90% of 200 is _____.

3. 10% of 20 is _____.

4. 40% of 300 is _____.

5. 60% of 700 is _____.



Tape Diagrams

Tape Diagrams

Percent Bingo Cards

Number Bank							
3	6	7	9	12	13	14	15
16	18	20	24	32	47	60	93
121	164	174	176	208	294	520	729

		FREE		

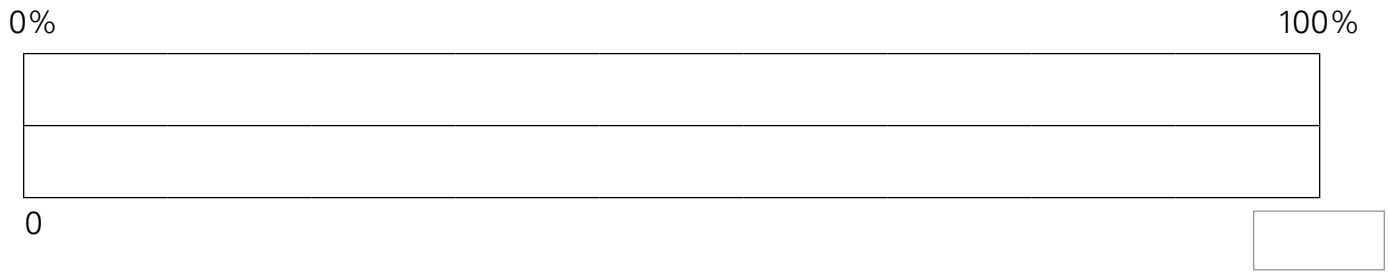
Percent Bingo Calling Card

30% of 50	15% of 400	48% of 25	22% of 800	70% of 20	80% of 20
58% of 300	36% of 50	42% of 700	52% of 25	65% of 800	64% of 50
96% of 25	4% of 500	15% of 20	21% of 600	94% of 50	3% of 200
82% of 200	81% of 900	28% of 25	31% of 300	45% of 20	52% of 400

Music Festival

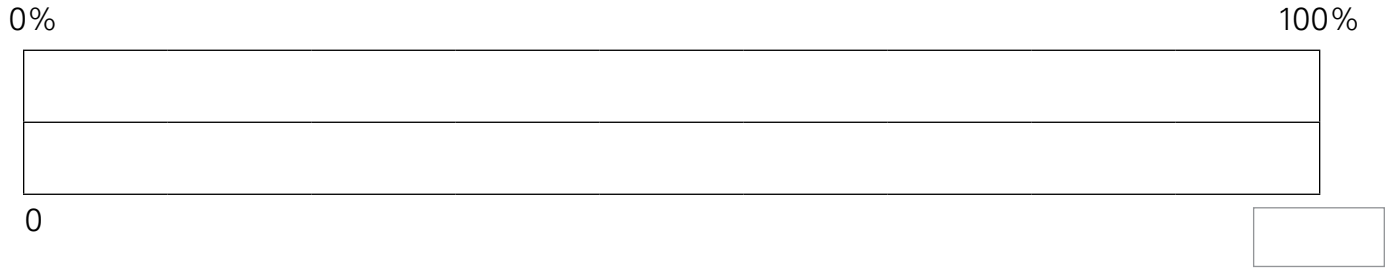
Part 1: Use the tape diagrams to find the whole.

1. 12 orchestras, or 30% of all the orchestras at the festival, are from small-town middle schools. What is the total number of orchestras at the festival?



There are _____ orchestras at the festival.

2. The Jensonville Middle School orchestra has 8 violin players. Violin players make up 25% of the students in that orchestra. How many students are in the Jensonville Middle School orchestra?



There are _____ students in the Jensonville Middle School orchestra.

Part 2: Use equivalent ratios to find the whole.

3. 60% of the festival audience are parents of the student musicians. There are 600 parents in the audience. What is the total number of people in the audience?

The total number of people in the audience at the music festival is _____.

Brass and Strings

Review the example problem. Then find the whole using equivalent ratios.

Example

Sixth graders make up **40**% of the students in the Timms orchestra. There are **14** sixth graders in the orchestra. What is the total number of students in the orchestra?

Step 1

Write the percent as a ratio.

$$\mathbf{40}\% = \frac{\mathbf{40}}{100}$$

Step 2

Show that the percent ratio is equal to the known part out of the unknown whole. Use a variable to represent the whole.

$$\frac{\mathbf{40}}{100} = \frac{\mathbf{14}}{n}$$

Step 3

If possible, simplify the percent ratio to make the calculation simpler. Then rewrite the equation.

$$\frac{\mathbf{40}}{100} \div \frac{20}{20} = \frac{2}{5} \qquad \frac{2}{5} = \frac{\mathbf{14}}{n}$$

Step 4

Multiply both parts of the percent ratio by a factor to make the ratios equivalent.

$$\frac{2}{5} = \frac{\mathbf{14}}{n} \qquad \frac{2}{5} \times \frac{7}{7} = \frac{\mathbf{14}}{35}$$

$35 = n$ There are 35 students in the Timms orchestra.

1. The Ranger orchestra has 18 brass players, which is 75% of the students in the orchestra. How many students are in the orchestra?

There are _____ students in the orchestra.

2. 70% of the Millton Academy orchestra, or 21 students, are in marching band. How many musicians are in the orchestra?

There are _____ musicians in the orchestra.

3. The 3 trumpeters in the Portage brass section are 15% of the section. How many students are in the brass section?

There are _____ students in the brass section.

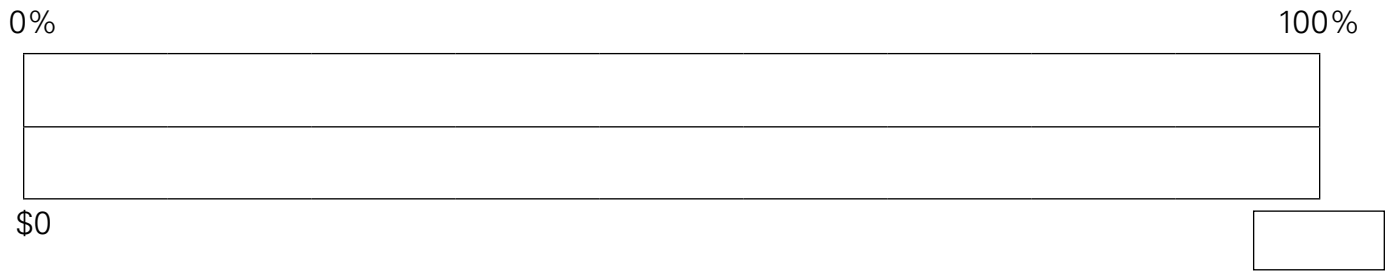
4. The 5 bass players in the Gary string section are 20% of the section. How many students are in the string section?

There are _____ students in the string section.

Lesson 45 Exit Ticket

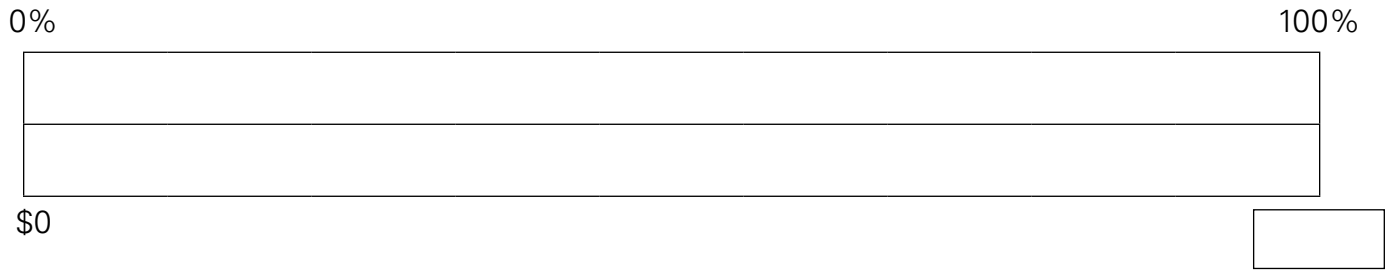
Part 1: Use the tape diagrams to find the whole.

1. Kami pays $150 for a new winter coat on sale. That price is 75% of the original price. What was the original price of the coat?



The original price of Kami's coat was $ _____.

2. Lola and her friends go out to dinner. They have a coupon for 40% off the price of their dinner. They save $16. What was the original cost of the dinner?



The original cost of the dinner was $ _____.

Part 2: Use equivalent ratios to find the whole.

3. Nikita's family gets a new couch. They paid $300 and bought the couch at a 60% of the original price. What was the original price of the couch?

The original price of the couch was $ _____.

4. Bryan buys a shirt at a 30%-off sale. He saves $6 off the original price. What was the original price of the shirt?

The original price of the shirt was $_____.

Extra Practice: Percent of *What?*

Use equivalent ratios to find the missing whole.

1. 600 is 75% of _____.

2. 420 is 60% of _____.

3. 180 is 90% of _____.

4. 630 is 70% of _____.

5. 60 is 10% of _____.

6. 130 is 25% of _____.

7. 120 is 40% of _____.

8. 55 is 20% of _____.

Tape Diagrams

Tape Diagrams

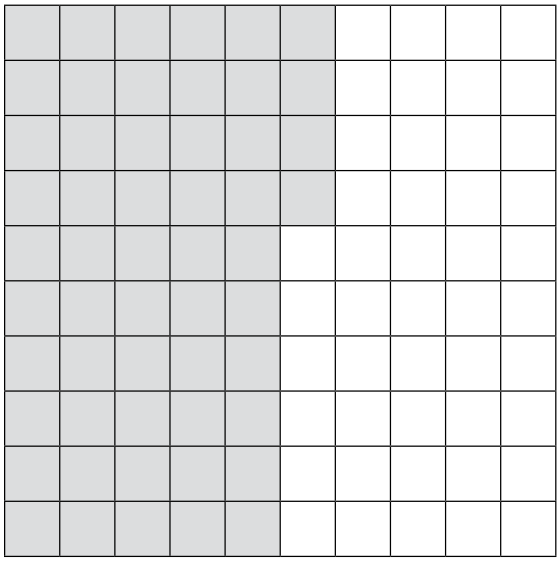
Assessment

Unit 6 Assessment

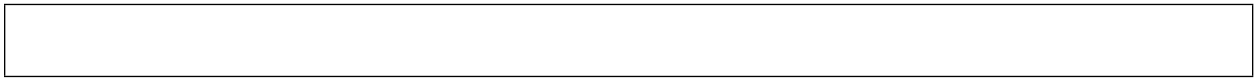
1. What percent does the shaded part of the model represent? _____%

Explain how you know. _____

_____



2. Use the tape diagram to represent 75%.



3. Use the double number line to find the equivalent percent.

$\frac{1}{5}$ = _____ %

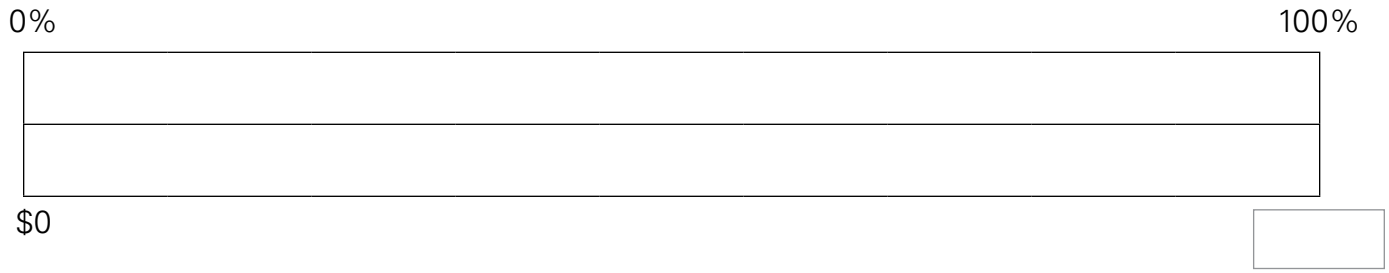
4. Kiara babysat on 4 of the past 8 days. Use equivalent ratios to find the percent of days she worked.

Kiara babysat _____ % of the days.

5. Dan correctly answers 7 out of the 10 questions on his math quiz. Use equivalent ratios to find the percent of his answers that are correct. Show your work.

Dan answers _____ % of the questions correctly.

6. There are 250 sixth graders at Wilson Middle School. The science teacher took 40% of the sixth graders on a field trip to a planetarium. Draw a tape diagram to find how many sixth graders went on the field trip.



_____ sixth graders went on the field trip.

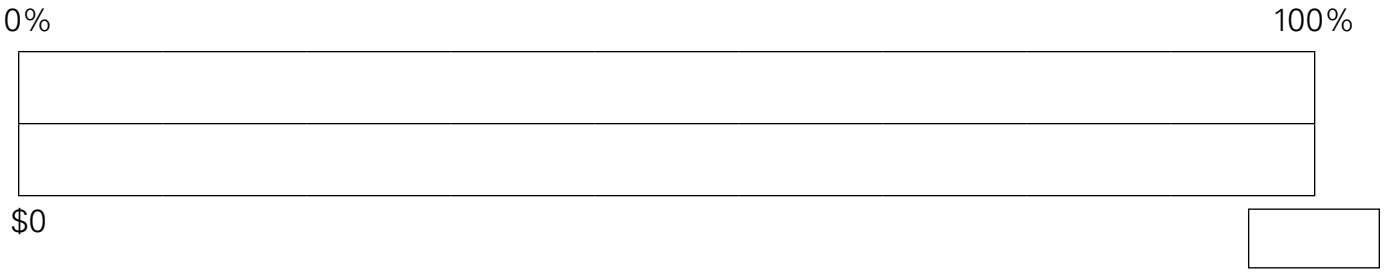
7. Use equivalent ratios to find the missing part.

90% of 30 is _____.

8. The Alvarez family buys a computer. The total cost including tax is $640. If 10% of the total cost is the sales tax, how much was the sales tax in dollars? Show your work using equivalent ratios.

The sales tax was _____ dollars.

9. Teo buys a pair of boots during a 25%-off sale and saves $30 off the original price. Use the tape diagram to find the original price of the boots.



The original price of the boots was _____ dollars.

10. Ari buys a season pass to a water park. He has a coupon for 60% off the price of the pass, and he saves $135. Use equivalent ratios to find the original price of the pass.

The original price of the pass was _____ dollars.

Unit 6 Cumulative Review

1. D'Andre receives $50 as a birthday gift from his aunt. He decides to save 40% of the money. How much money does D'Andre save?

D'Andre saves _____ dollars.

2. Use opposites to simplify the expression to complete the equation.

–(–9) = _____

3. Jennifer uses 5 gallons of water on a camping trip. There are 16 cups in 1 gallon. How many cups of water does she use?

Jennifer uses _____ cups.

4. Complete the equation.

11 – (2 × 4) = _____

5. Evalise decides to cook her family's favorite dinner, red beans and rice. The recipe says to use 2 cups of red beans for every 3 cups of rice. If Evalise uses 6 cups of red beans, how many cups of rice does she use to make dinner?

Evalise uses _____ cups of rice.

Explain how you know.

_____

_____

_____

6. Martine has $\frac{7}{8}$ of a bag of dog chow at the beginning of the week. Martine's dog Ranger eats $\frac{1}{2}$ of the dog chow during the week. How much of the bag of dog chow is left at the end of the week?

_____ of a bag is left at the end of the week.

7. Write the exponent in standard form.

5^3 = _____

8. Add.

$6\ \frac{4}{5} + 3\ \frac{1}{2} =$ _____

9. Circle the equivalent expression.

$b + 7 + 3b + 8b - 1 = ?$

a. $6(2b + 1)$

b. $17b$

c. $11(b + 6)$

d. $(7)(3b) + (8)(b)$

10. Subtract.

$\frac{3}{4} - \frac{2}{3} =$ _____

11. A full jar of jam contains 8 ¾ ounces. Each serving of toast should have 1 ¾ ounces of jam. How many servings of toast can be made with a full jar?

_____ servings of toast can be made with a full jar.

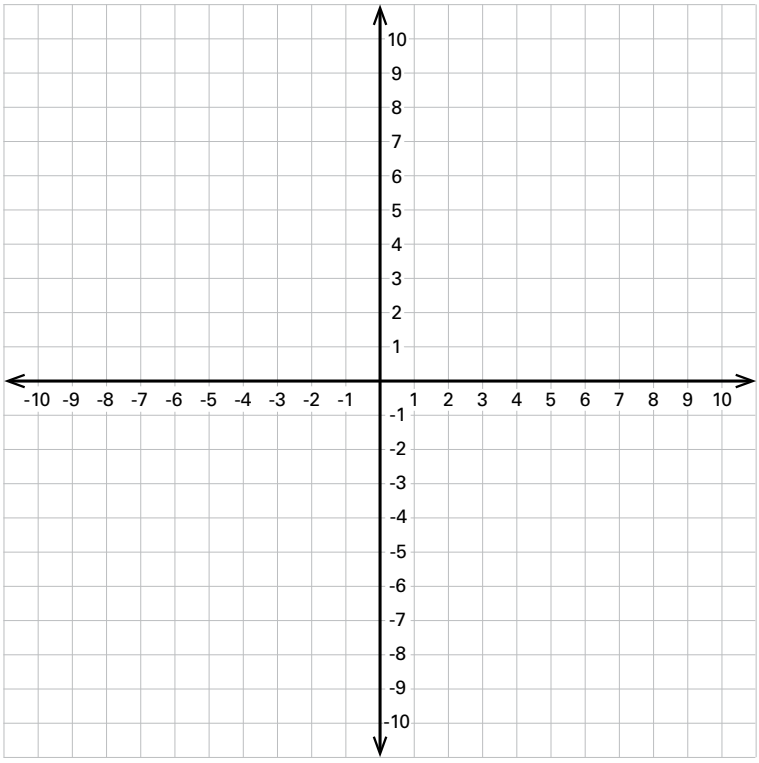
12. Add.

$\frac{2}{5} + \frac{8}{15} =$ _____

13. Divide.

8.4 ÷ 7 = _____

14. Plot (4, –6) and its reflection over the *x*-axis on the coordinate plane.



What are the coordinates of the reflection of (4, –6) over the *x*-axis? _____

15. What is the greatest common factor of 36 and 42?

The greatest common factor of 36 and 42 is _____.