

2. 6 adults. The portion of the double number line at 6 adults and 72 children is circled.

Problem 5

(from Unit 2, Lesson 10)

While playing basketball, Jada's heart rate goes up to 160 beats per minute. While jogging, her heart beats 25 times in 10 seconds. Assuming her heart beats at a constant rate while jogging, which of these activities resulted in a higher heart rate? Explain your reasoning.

Solution

Playing basketball. Sample explanation: 25 times in 10 seconds means 150 heartbeats per minute ($25 \cdot 6 = 150$). 150 beats per minute is lower than 160 beats per minute, so Jada's heart rate is lower when she goes jogging than when she plays basketball.

Problem 6

(from Unit 2, Lesson 8)

A shopper bought the following items at the farmer's market:

- 6 ears of corn for \$1.80. What was the cost per ear?
- 12 apples for \$2.88. What was the cost per apple?
- 5 tomatoes for \$3.10. What was the cost per tomato?

Solution

- \$0.30
- \$0.24
- \$0.62

Lesson 12

Problem 1

Priya collected 2,400 grams of pennies in a fundraiser. Each penny has a mass of 2.5 grams. How much money did Priya raise? If you get stuck, consider using the table.

number of pennies	mass in grams
1	2.5
	2,400

Solution

\$9.60. Possible strategy:

number of pennies	mass in grams
1	2.5
1,000	2,500
4	10
40	100
960	2,400

Problem 2

Kiran reads 5 pages in 20 minutes. He spends the same amount of time per page. How long will it take him to read 11 pages? If you get stuck, consider using the table.

time in minutes	number of pages
20	5
	1
	11

Solution

44 minutes

time in minutes	number of pages
20	5
4	1
44	11

Problem 3

Mai is making personal pizzas. For 4 pizzas, she uses 10 ounces of cheese.

number of pizzas	ounces of cheese
4	10

a. How much cheese does Mai use per pizza?

b. At this rate, how much cheese will she need to make 15 pizzas?

Solution

Mai uses 2.5 ounces of cheese per pizza, because $10 \div 4 = 2.5$. She will need 37.5 ounces of cheese for 15 pizzas, because $2.5 \cdot 15 = 37.5$.

Problem 4

Clare is paid \$90 for 5 hours of work. At this rate, how many seconds does it take for her to earn 25 cents?

Solution

Clare earns 25 cents every 50 seconds. She earns \$18 per hour, and an hour has 3,600 seconds. \$18 is 72 quarters, and $3,600 \div 72 = 50$.

Problem 5

(from Unit 2, Lesson 10)

A car that travels 20 miles in $\frac{1}{2}$ hour at constant speed is traveling at the same speed as a car that travels 30 miles in $\frac{3}{4}$ hour at a constant speed. Explain or show why.

Solution

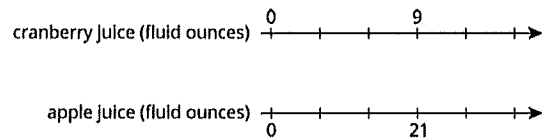
Answers vary. Sample responses:

- Both cars go 10 miles in $\frac{1}{4}$ of an hour so they are traveling at the same speed.
- In 1 hour, both cars travel 40 miles so they are both traveling at the same speed.

Problem 6

(from Unit 2, Lesson 6)

Lin makes her favorite juice blend by mixing cranberry juice with apple juice in the ratio shown on the double number line. Complete the diagram to show smaller and larger batches that would taste the same as Lin's favorite blend.



Solution

Cranberry (cups): 0, 3, 6, 9, 12, 15. Apple (cups): 0, 7, 14, 21, 28, 35

Problem 7

(from Unit 2, Lesson 5)

Each of these is a pair of equivalent ratios. For each pair, explain why they are equivalent ratios or draw a representation that shows why they are equivalent ratios.

1. 600 : 450 and 60 : 45
2. 60 : 45 and 4 : 3
3. 600 : 450 and 4 : 3

Solution

Answers vary. Sample response:

1. $60 \cdot 10 = 600$ and $45 \cdot 10 = 450$.
2. Multiplying 4 and 3 by 15 gives 60 and 45.
3. Multiply 4 by 150 to get 600 and multiply 3 by 150 to get 450. Or use problems 4 and 5 together: problem 4 shows that 600 : 450 is equivalent to 60 : 45 and problem 5 shows that 60 : 45 is equivalent to 4 : 3. This means that 600 : 450 is equivalent to 4 : 3.

Lesson 13

Problem 1

The double number line shows how much water and how much lemonade powder to mix to make different amounts of lemonade.



Make a table that represents the same situation.

Solution

water (cups)	lemonade powder (scoops)
0	0
2	1.5
4	3
6	4.5

Problem 2

A bread recipe uses 3 tablespoons of olive oil for every 2 cloves of crushed garlic.

- Complete the table to show different-sized batches of bread that taste the same as the recipe.
- Draw a double number line that represents the same situation.
- Which representation do you think works better in this situation? Explain why.

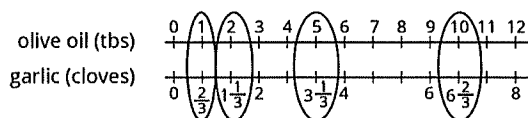
olive oil (tablespoons)	crushed garlic (cloves)
3	2
1	
2	
5	
10	

Solution

1.

olive oil (tablespoons)	crushed garlic (cloves)
3	2
1	$\frac{2}{3}$
2	$1\frac{1}{3}$
5	$3\frac{1}{3}$
10	$6\frac{2}{3}$

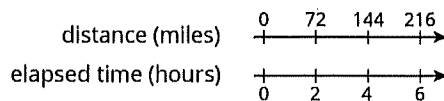
2.



- Answers vary. Sample response: The table is more convenient because the rows of the table can be listed in any order and without worrying about placing numbers accurately on the number line.

Problem 3

Clare travels at a constant speed, as shown on the double number line.



At this rate, how far does she travel in each of these intervals of time? Explain or show your reasoning. If you get stuck, consider using a table.

1. 1 hour
2. 3 hours
3. 6.5 hours

Solution

Explanations vary. Sample responses:

1. 36 miles. 1 hour is half of 2 hours, so half of 72 is 36. She traveled 36 miles in 1 hour.
2. 108 miles. Since the rate is 36 miles per hour, to find her distance in 3 hours, multiply 36 by 3. She traveled 108 miles in 3 hours.
3. 234 miles. Multiply the rate by 6.5. She traveled 234 miles in 6.5 hours.

distance (miles)	elapsed time (hours)
72	2
36	1
108	3
234	6.5

Problem 4

(from Unit 2, Lesson 9)

Lin and Diego travel in cars on the highway at constant speeds. In each case, decide who was traveling faster and explain how you know.

1. During the first half hour, Lin travels 23 miles while Diego travels 25 miles.
2. After stopping for lunch, they travel at different speeds. To travel the next 60 miles, it takes Lin 65 minutes and it takes Diego 70 minutes.

Solution

Explanations vary. Sample response:

1. Diego traveled faster because he covered more distance than Lin in the same amount of time.
2. Lin traveled faster because she covered the same distance as Diego but in less time.

Problem 5

(from Unit 2, Lesson 3)

A sports drink recipe calls for $\frac{5}{3}$ tablespoons of powdered drink mix for every 12 ounces of water. How many batches can you make with 5 tablespoons of drink mix and 36 ounces of water? Explain your reasoning.

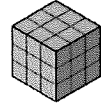
Solution

3 batches. Each batch has $\frac{5}{3}$ tablespoons of drink mix, so 3 batches will have 5 tablespoons of drink mix, since $3 \cdot \frac{5}{3} = 5$. Similarly, we can make 3 batches with 36 ounces of water, since $3 \cdot 12 = 36$.

Problem 6

(from Unit 1, Lesson 18)

In this cube, each small square has side length 1 unit.



1. What is the surface area of this cube?
2. What is the volume of this cube?

Solution

1. 54 square units
2. 27 cubic units

Lesson 14**Problem 1**

A chef is making pickles. He needs 15 gallons of vinegar. The store sells 2 gallons of vinegar for \$3.00 and allows customers to buy any amount of vinegar. Decide whether each of the following ratios correctly represents the price of vinegar.

1. 4 gallons to \$3.00
2. 1 gallon to \$1.50
3. 30 gallons to \$45.00
4. \$2.00 to 30 gallons
5. \$1.00 to $\frac{2}{3}$ gallon

Solution

1. No. (The ratio is not equivalent; 4 gallons of vinegar would cost \$6).
2. Yes.
3. Yes.
4. No. (The ratio is not equivalent; 2 gallons of vinegar cost \$3, and \$30 would buy 20 gallons).
5. Yes.

Problem 2

A caterer needs to buy 21 pounds of pasta to cater a wedding. At a local store, 8 pounds of pasta cost \$12. How much will the caterer pay for the pasta there?

1. Write a ratio for the given information about the cost of pasta.
2. Would it be more helpful to write an equivalent ratio with 1 pound of pasta as one of the numbers, or with \$1 as one of the numbers? Explain your reasoning, and then write that equivalent ratio.
3. Find the answer and explain or show your reasoning.

Solution

1. Answers vary. Sample responses: \$12 for every 8 pounds; \$12 to 8 pounds; 8 pounds to \$12.

2. Answers vary. Sample response: Finding 1 pound would be easier and more helpful. The cost of 1 pound can be easily found by dividing \$12 by 8 and the result (the unit rate) can be multiplied by 21. The ratio is \$1.50 to 1 pound.
3. \$31.50. Possible reasonings: $21 \cdot (1.50) = 31.50$.

pasta (pounds)	cost (dollars)
8	12
1	1.50
21	31.50

Problem 3

Lin is reading a 47-page book. She read the first 20 pages in 35 minutes.

1. If she continues to read at the same rate, will she be able to complete this book in under 1 hour?
2. If so, how much time will she have left? If not, how much more time is needed? Explain or show your reasoning.

Solution

No, it will take Lin 82.25 minutes to finish her book. Possible strategies:

1. Using a table:

number of pages	times in minutes
20	35
1	1.75 (or equivalent)
47	82.25 (or equivalent)

Additional 22.25 or $22\frac{1}{4}$ minutes (or 22 minutes and 15 seconds) are needed.

2. 40 pages will take 70 minutes, which is already more than an hour, so Lin can not finish the 47-page book in an hour.

Problem 4

Diego can type 140 words in 4 minutes.

1. At this rate, how long will it take him to type 385 words?
2. How many words can he type in 15 minutes?

If you get stuck, consider creating a table.

Solution

Answers vary. Sample response:

number of words	number of minutes
140	4
1	$\frac{1}{35}$
385	11
35	1
525	15

- It will take 11 minutes to type 385 words.
- He can type 525 words in 15 minutes.

Problem 5

(from Unit 2, Lesson 10)

A train that travels 30 miles in $\frac{1}{3}$ hour at a constant speed is going faster than a train that travels 20 miles in $\frac{1}{2}$ hour at a constant speed. Explain or show why.

Solution

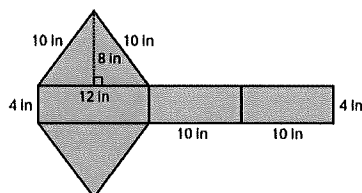
Answers vary. Sample responses:

- In 1 hour, the first train will travel 90 miles, while the second train only travels 40 miles. The first train is going faster.
- The train traveling 30 miles in $\frac{1}{3}$ of an hour takes $\frac{1}{9}$ of an hour to go 10 miles. The train traveling 20 miles in $\frac{1}{2}$ of an hour takes $\frac{1}{4}$ of an hour to go 10 miles. This means that the first train is traveling faster.

Problem 6

(from Unit 1, Lesson 14)

Find the surface area of the polyhedron that can be assembled from this net. Show your reasoning.



Solution

224 square inches. Reasoning varies. Sample reasoning: The three rectangular faces have areas 48, 40, and 40 square inches. Each triangle has a base of 12 inches and a height of 8 inches, so each triangle has an area of 48 square inches. $48 + 40 + 40 + 2(48) = 224$.

Lesson 15

Problem 1

Here is a tape diagram representing the ratio of red paint to yellow paint in a mixture of orange paint.

- What is the ratio of yellow paint to red paint?

cups of red paint	3	3	3
cups of yellow paint	3	3	

- How many total cups of orange

paint will this mixture yield?

Solution

- 2 : 3 (or equivalent)
- 15 cups

Problem 2

At the kennel, the ratio of cats to dogs is 4 : 5. There are 27 animals in all. Here is a tape diagram representing this ratio.



- What is the value of each small rectangle?
- How many dogs are at the kennel?
- How many cats are at the kennel?

Solution

- Each unit is 3, because $4 + 5 = 9$ and $27 \div 9 = 3$.
- There are 15 dogs, because $3 \cdot 5 = 15$.
- There are 12 cats, because $3 \cdot 4 = 12$.

Problem 3

Last month, there were 4 sunny days for every rainy day. If there were 30 days in the month, how many days were rainy? Explain your reasoning. If you get stuck, consider using a tape diagram.

Solution

There were 6 rainy days, because $4 + 1 = 5$, so there are 5 units total. $30 \div 5 = 6$, so each unit is worth 6.

Problem 4

(from Unit 2, Lesson 12)

Noah entered a 100-mile bike race. He knows he can ride 32 miles in 160 minutes. At this rate, how long will it take him to finish the race? Use each table to find the answer. Next, explain which table you think works better in finding the answer.

Table A:

distance (miles)	elapsed time (minutes)
32	160
1	
100	

Table B:

distance (miles)	elapsed time (minutes)
32	160
96	
4	
100	

Solution

He will finish the race in 500 minutes (or equivalent).

Table A:

distance (miles)	elapsed time (minutes)
32	160
1	5
100	500

Table B:

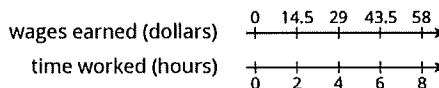
distance (miles)	elapsed time (minutes)
32	160
96	480
4	20
100	500

Answers vary. Sample response: The first table is more efficient, but they both work in getting the answer.

Problem 5

(from Unit 2, Lesson 13)

A cashier worked an 8-hour day, and earned \$58.00. The double number line shows the amount she earned for working different numbers of hours. For each question, explain your reasoning.



- How much does the cashier earn per hour?
- How much does the cashier earn if she works 3 hours?

Solution

- \$7.25 per hour. Possible reasoning: $14.5 \div 2 = 7.25$
- \$21.75. Possible reasoning: $(7.25) \cdot 3 = 21.75$

Problem 6

(from Unit 2, Lesson 10)

A grocery store sells bags of oranges in two different sizes.

- The 3-pound bags of oranges cost \$4.
- The 8-pound bags of oranges for \$9.

Which oranges cost less per pound? Explain or show your reasoning.

Solution

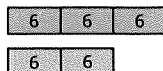
The 8-pound bags cost less per pound. Possible strategies:

- Compare the cost for 24 pounds of oranges for both types of bags. 24 pounds cost \$32 when sold in 3-pound bags. 24 pounds cost \$27 when sold in 8-pound bags.
- Compare how much can be bought for the same amount of money. \$36 can buy 27 pounds of oranges in 3-pound bags, or it can buy 32 pounds in 8-pound bags.

Lesson 16

Problem 1

Describe a situation that could be represented with this tape diagram.



Solution

Answers vary. Sample response: There are 30 people at a movie. The ratio of teenagers to adults is 3 to 2. There are 18 teenagers and 12 adults.

Problem 2

There are some nickels, dimes, and quarters in a large piggy bank. For every 2 nickels there are 3 dimes. For every 2 dimes there are 5 quarters. There are 500 coins total.

- How many nickels, dimes, and quarters are in the piggy bank? Explain your reasoning.
- How much are the coins in the piggy bank worth?

Solution

- 80 nickels, 120 dimes, 300 quarters. Possible strategies:
 - For every 2 nickels there are 3 dimes, so for every 4 nickels there are 6 dimes. For every 2 dimes there are 5 quarters, so for every 6 dimes there are 15 quarters. The ratio of nickels to dimes to quarters is 4 to 6 to 15, a total of 25 coins in the group. There are 500 coins, which means 20 groups of coins, since $500 \div 25 = 20$. There are 80 nickels ($20 \cdot 4 = 80$), 120 dimes ($20 \cdot 6 = 120$), and 300 quarters ($20 \cdot 15 = 300$).
 - Using a table:

nickles	dimes	quarters	total
4	6	15	25
16	24	60	100
80	120	300	500

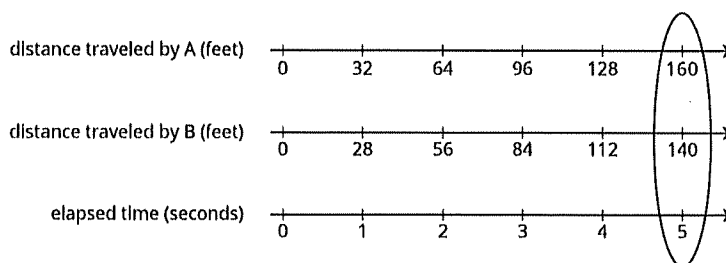
- \$91. The nickels are worth \$4, the dimes are worth \$12, and the quarters are worth \$75, making a total of \$91.

Problem 3

Two horses start a race at the same time. Horse A gallops at a steady rate of 32 feet per second and Horse B gallops at a steady rate of 28 feet per second. After 5 seconds, how much farther will Horse A have traveled? Explain or show your reasoning.

Solution

Horse A will have traveled 20 feet farther. Possible reasoning:



$$160 - 140 = 20$$