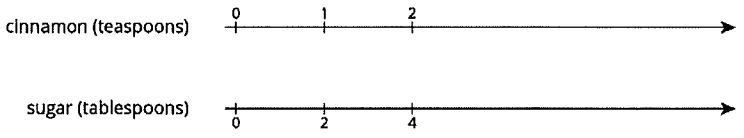
Answers vary. There are many possible pairs of base and height lengths to make an area of 24 square units.

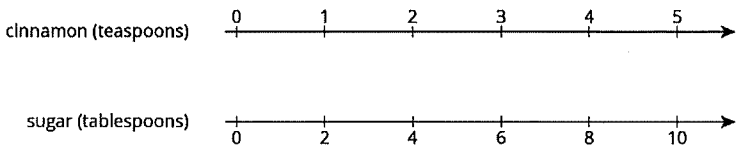
Lesson 7

Problem 1

A recipe for cinnamon rolls uses 2 tablespoons of sugar per teaspoon of cinnamon for the filling. Complete the double number line diagram to show the amount of cinnamon and sugar in 3, 4, and 5 batches.

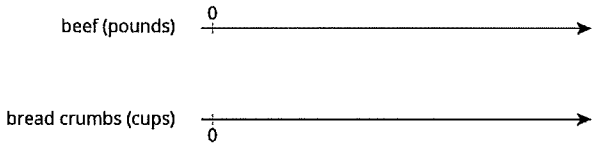


Solution



Problem 2

One batch of meatloaf contains 2 pounds of beef and $\frac{1}{2}$ cup of bread crumbs. Complete the double number line diagram to show the amounts of beef and bread crumbs needed for 1, 2, 3, and 4 batches of meatloaf.



Solution

1 batch: 2 pounds of beef, $\frac{1}{2}$ cup of bread crumbs. 2 batches: 4 pounds of beef, 1 cup of bread crumbs. 3 batches: 6 pounds of beef, $1\frac{1}{2}$ cups of bread crumbs. On a double number line, the top line is labeled 2, 4, 6, 8 and the bottom line is labeled $\frac{1}{2}$, 1, $1\frac{1}{2}$, 2.

Problem 3

A recipe for tropical fruit punch says, "Combine 4 cups of pineapple juice with 5 cups of orange juice."

1. Create a double number showing the amount of each type of juice in 1, 2, 3, 4, and 5 batches of the recipe.
2. If 12 cups of pineapple juice are used with 20 cups of orange juice, will the recipe taste the same? Explain your reasoning.
3. The recipe also calls for $\frac{1}{3}$ cup of lime juice for every 5 cups of orange juice. Add a line to your diagram to represent the amount of lime juice in different batches of tropical fruit punch.

Solution

1. Answers vary. A correct double number line will have equally spaced tick marks. A line labeled "cups of pineapple juice" is labeled 0, 4, 8, 12, 16, 20 and a line labeled "cups of orange juice" is labeled 0, 5, 10, 15, 20, 25.
2. No, it will not taste the same. 12 cups of pineapple juice should be mixed with 15 cups of orange juice.
3. A line labeled "cups of lime juice" is labeled $\frac{1}{3}, \frac{2}{3}, 1, 1\frac{1}{3}, 1\frac{2}{3}$.

Problem 4

(from Unit 2, Lesson 4)
One batch of pink paint uses 2 cups of red paint and 7 cups of white paint. Mai made a large amount of pink paint using 14 cups of red paint.

1. How many batches of pink paint did she make?
2. How many cups of white paint did she use?

Solution

1. 7 batches (because 14 is $7 \cdot 2$)
2. 49 cups (because $7 \cdot 7 = 49$)

Problem 5

(from Unit 2, Lesson 5)

1. Find three different ratios that are equivalent to the ratio $3 : 11$.
2. Explain why your ratios are equivalent.

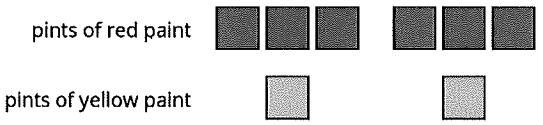
Solution

1. Answers vary. Sample response: $6 : 22$, $9 : 33$, $12 : 44$.
2. Answers vary. Sample response: These ratios come from $3 : 11$ by multiplying both numbers in the ratio by 2, 3, and 4 respectively.

Problem 6

(from Unit 2, Lesson 2)

Here is a diagram that represents the pints of red and yellow paint in a mixture.



Select **all** statements that accurately describe the diagram.

A. The ratio of yellow paint to red paint is 2 to 6.
B. For every 3 pints of red paint, there is 1 pint of yellow paint.
C. For every pint of yellow paint, there are 3 pints of red paint.
D. For every pint of yellow paint there are 6 pints of red paint.
E. The ratio of red paint to yellow paint is $6 : 2$.

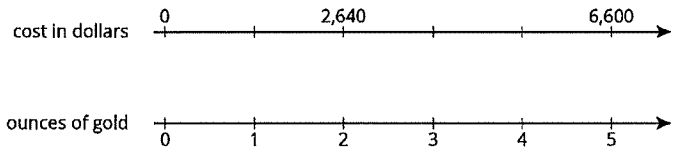
Solution

A, B, C, E

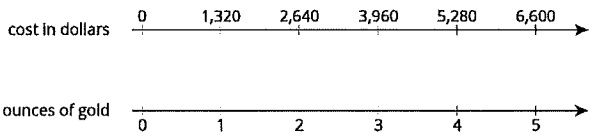
Lesson 8

Problem 1

In 2016, the cost of 2 ounces of pure gold was $2,640. Complete the double number line to show the cost for 1, 3, and 4 ounces of gold.

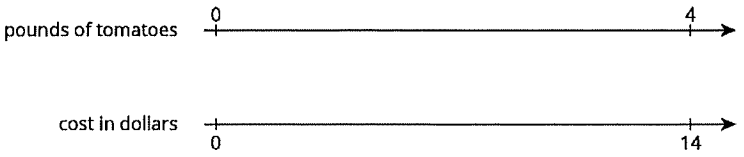


Solution

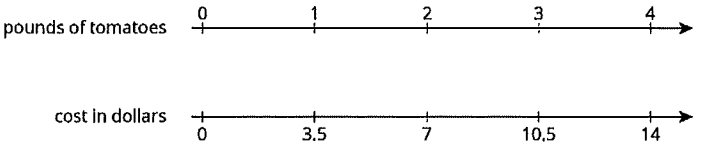


Problem 2

The double number line shows that 4 pounds of tomatoes cost $14. Draw tick marks and write labels to show the prices of 1, 2, and 3 pounds of tomatoes.



Solution



Problem 3

4 movie tickets cost $48. At this rate, what is the cost of:

1. 5 movie tickets?
2. 11 movie tickets?

Solution

1. $60 (1 ticket costs $12 because $48 \div 4 = 12$. 5 tickets cost $60 because $5 \cdot 12 = 60$.)
2. $132 (because $11 \cdot 12 = 132$)

Problem 4

Priya bought these items at the grocery store. Find each unit price.

1. 12 eggs for $3. How much is the cost per egg?
2. 3 pounds of peanuts for $7.50. How much is the cost per pound?
3. 4 rolls of toilet paper for $2. How much is the cost per roll?
4. 10 apples for $3.50. How much is the cost per apple?

Solution

1. 25 cents or $0.25
2. $2.50
3. 50 cents or $0.50
4. 35 cents or $0.35

Problem 5

(from Unit 2, Lesson 3)
Clare made a smoothie with 1 cup of yogurt, 3 tablespoons of peanut butter, 2 teaspoons of chocolate syrup, and 2 cups of crushed ice.

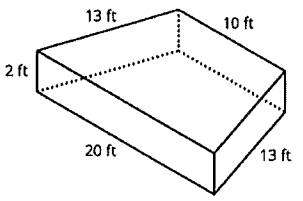
1. Kiran tried to double this recipe. He used 2 cups of yogurt, 6 tablespoons of peanut butter, 5 teaspoons of chocolate syrup, and 4 cups of crushed ice. He didn't think it tasted right. Describe how the flavor of Kiran's recipe compares to Clare's recipe.
2. How should Kiran change the quantities that he used so that his smoothie tastes just like Clare's?

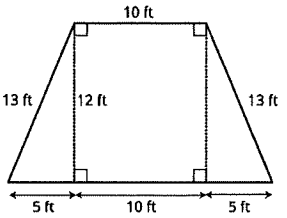
Solution

1. Kiran's smoothie would be more chocolatey than Clare's. All ingredients are doubled, but there is an extra teaspoon of chocolate syrup in his smoothie.
2. Answers vary. Sample response: he should use 4 teaspoons of chocolate syrup instead of 5.

Problem 6

(from Unit 1, Lesson 15)
A drama club is building a wooden stage in the shape of a trapezoidal prism. The height of the stage is 2 feet. Some measurements of the stage are shown here.





What is the area of all the faces of the stage, excluding the bottom? Show your reasoning. If you get stuck, consider drawing a net of the prism.

Solution

292 square feet. Sample reasoning: The trapezoidal face is 180 square feet since $(12 \cdot 10) + 2(\frac{1}{2} \cdot 12 \cdot 5) = 120 + 60 = 180$. The side faces are $2(13 \cdot 2) + (10 \cdot 2) + (20 \cdot 2)$ or 112 square feet.

Lesson 9

Problem 1

Han ran 10 meters in 2.7 seconds. Priya ran 10 meters in 2.4 seconds.

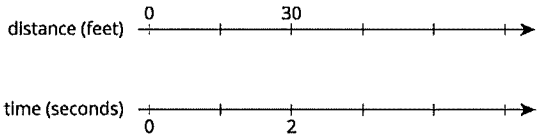
1. Who ran faster? Explain how you know.
2. At this rate, how long would it take each person to run 50 meters? Explain or show your reasoning.

Solution

1. Priya ran faster. Sample explanation: Priya ran the same distance (10 meters) in *less* time than Han. This means she was running faster.
2. At this rate, it would take Han13.5 seconds to run 50 meters. Since 50 meters is 5 times 10 meters, the time it would take is 5 times 2.7 seconds. It would take Priya 12 seconds, which is 5 times 2.4 seconds, to run 50 meters.

Problem 2

A scooter travels 30 feet in 2 seconds at a constant speed.



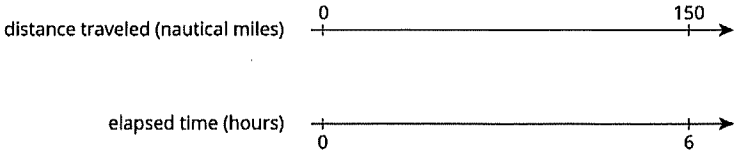
1. What is the speed of the scooter in feet per second?
2. Complete the double number line to show the distance the scooter travels after 1, 3, 4, and 5 seconds.
3. A skateboard travels 55 feet in 4 seconds. Is the skateboard going faster, slower, or the same speed as the scooter?

Solution

1. 15 feet per second
2. Distance: 0, 15, 30, 45, 60, 75. Time: 0, 1, 2, 3, 4, 5.
3. Slower. The scooter travels 60 feet in 4 seconds, so it is going faster than the skateboard, which travels 55 feet in 4 seconds.

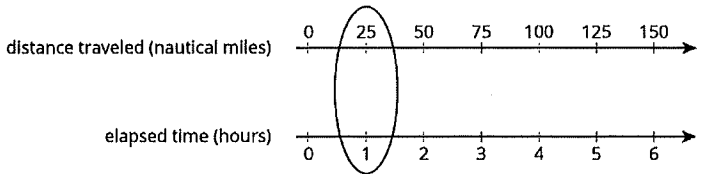
Problem 3

A cargo ship traveled 150 nautical miles in 6 hours at a constant speed. How far did the cargo ship travel in one hour?



Solution

The ship travels 25 nautical miles in 1 hour. Possible strategy:



Problem 4

(from Unit 2, Lesson 3)
A recipe for pasta dough says, "Use 150 grams of flour per large egg."

1. How much flour is needed if 6 large eggs are used?

2. How many eggs are needed if 450 grams of flour are used?

Solution

1. 900 grams

2. 3 eggs

Problem 5

(from Unit 2, Lesson 8)
The grocery store is having a sale on frozen vegetables. 4 bags are being sold for $11.96. At this rate, what is the cost of:

1. 1 bag

2. 9 bags

Solution

1. $2.99

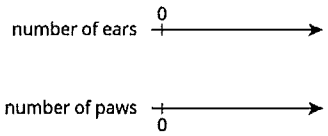
2. $26.91

Problem 6

(from Unit 2, Lesson 7)
A pet owner has 5 cats. Each cat has 2 ears and 4 paws.

1. Complete the double number line to show the numbers of ears and paws for 1, 2, 3, 4, and 5 cats.

2. If there are 3 cats in the room, what is the ratio of ears to paws?



3. If there are 4 cats in the room, what is the ratio of paws to ears?

4. If all 5 cats are in the room, how many more paws are there than ears?

Solution

1. Ears: 2, 4, 6, 8, 10; Paws: 4, 8, 12, 16, 20

2. 6 : 12

3. 16 : 8

4. 10

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. $5 : 1$ and $15 : 3$
2. $25 : 5$ and $10 : 2$
3. $198 : 1{,}287$ and $2 : 13$

Solution

Answers vary. Sample response:

1. Multiplying the numbers in the first ratio by 3 gives the numbers in the second ratio.
2. Multiplying the numbers in the second ratio by 10 gives the numbers in the first ratio.
3. Multiply 2 by 99 (or $100 - 1$), to get 198 (or $200 - 2$), and multiply 13 by 99, to get 1,287 ($1,300 - 13$).

Lesson 10

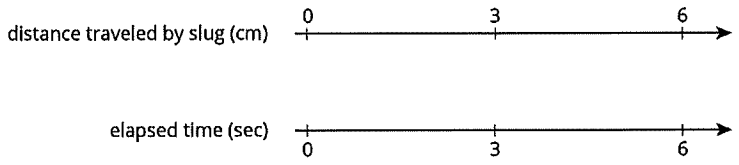
Problem 1

A slug travels 3 centimeters in 3 seconds. A snail travels 6 centimeters in 6 seconds. Both travel at constant speeds. Mai says, "The snail was traveling faster because it went a greater distance." Do you agree with Mai? Explain or show your reasoning.

Solution

Answers vary. Sample responses:

- I disagree. The slug and the snail are both traveling 1 centimeter per second. They are traveling at the same speed.
- I disagree. The double number line for the slug shows that in 6 seconds it also travels 6 centimeters.



Problem 2

If you blend 2 scoops of chocolate ice cream with 1 cup of milk, you get a milkshake with a stronger chocolate flavor than if you blended 3 scoops of chocolate ice cream with 2 cups of milk. Explain or show why.

Solution

Answers vary. Sample responses:

- 3 scoops of chocolate ice cream with 2 cups of milk is 1.5 scoops of chocolate ice cream per cup of milk. This is less chocolate ice cream per cup of milk than in the first mixture (2 scoops of chocolate ice cream per cup of milk), so the first mixture has stronger chocolate flavor.
- 2 scoops of chocolate ice cream with 1 cup of milk will taste the same as 4 scoops of chocolate ice cream with 2 cups of milk. This mixture has an extra scoop of chocolate ice cream so will taste more chocolatey than 3 scoops of chocolate ice cream and 2 cups of milk.

Problem 3

There are 2 mixtures of light purple paint.

- Mixture A is made with 5 cups of purple paint and 2 cups of white paint.
- Mixture B is made with 15 cups of purple paint and 8 cups of white paint.

Which mixture is a lighter shade of purple? Explain your reasoning.

Solution

Mixture B is lighter. Explanations vary. Sample responses:

- Mixture A contains 2.5 cups of purple paint per cup of white paint. Mixture B contains only 1.875 cups of purple paint per cup of white paint. Less purple paint for the same amount of white paint will result in a lighter shade of purple.
- The ratio of purple paint to white paint in Mixture A is $5 : 2$. The ratio of purple paint to white paint in Mixture B is $15 : 8$. The amount of purple paint in Mixture B is 3 times the amount of Mixture A, but the amount of white paint in B is 4 times the amount of A.

Problem 4

Tulip bulbs are on sale at store A, at 5 for $11.00, and the regular price at store B is 6 for $13. Is each store pricing tulip bulbs at the same rate? Explain how you know.

Solution

No. Explanations vary. Sample response: At store A, 30 bulbs would cost $66, but at store B, 30 bulbs would cost $65.

Problem 5

(from Unit 2, Lesson 9)
A plane travels at a constant speed. It takes 6 hours to travel 3,360 miles.

1. What is the plane's speed in miles per hour?
2. At this rate, how many miles can it travel in 10 hours?

Solution

1. 560 because $3,360 \div 6 = 560$.
2. In 10 hours, it can travel 5,600 miles because $10 \cdot 560 = 5,600$.

Problem 6

(from Unit 2, Lesson 8)
A pound of ground beef costs $5. At this rate, what is the cost of:

1. 3 pounds?
2. $\frac{1}{2}$ pound?
3. $\frac{1}{4}$ pound?
4. $\frac{3}{4}$ pound?
5. $3\frac{3}{4}$ pounds?

Solution

1. $15 (because $5 \cdot 3 = 15$)
2. $2.50 (because $\frac{1}{2} \cdot 5 = 2\frac{1}{2}$)
3. $1.25 (because $\frac{1}{4} \cdot 5 = 1\frac{1}{4}$)
4. $3.75 (three times the cost of $\frac{1}{4}$ pound)
5. $18.75 (the total cost of 3 pounds and $\frac{3}{4}$ pound)

Problem 7

(from Unit 2, Lesson 7)
In a triple batch of a spice mix, there are 6 teaspoons of garlic powder and 15 teaspoons of salt. Answer the following questions about the mix. If you get stuck, create a double number line.

1. How much garlic powder is used with 5 teaspoons of salt?
2. How much salt is used with 8 teaspoons of garlic powder?

3. If there are 14 teaspoons of spice mix, how much salt is in it?

4. How much more salt is there than garlic powder if 6 teaspoons of garlic powder are used?

Solution

1. 2 teaspoons

2. 20 teaspoons

3. 10 teaspoons

4. 9 teaspoons

Lesson 11

Problem 1

Complete the table to show the amounts of yellow and red paint needed for different-sized batches of the same shade of orange paint.

yellow paint (quarts)	red paint (quarts)
5	6

Explain how you know that these amounts of yellow paint and red paint will make the same shade of orange as the mixture in the first row of the table.

Solution

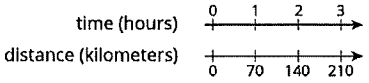
Answers vary. Sample response:

yellow paint (quarts)	red paint (quarts)
5	6
$\frac{5}{4}$	$\frac{3}{2}$ or equivalent
$\frac{5}{2}$	3 or equivalent
$\frac{15}{4}$	$\frac{9}{2}$ or equivalent

Each row is a multiple of the first row.

Problem 2

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



How far does the car travel in 14 hours? Explain or show your reasoning.

Solution

980 kilometers. Possible strategy: Make a table because there isn't enough room to continue the double number line that far.

time (hours)	distance (kilometers)
1	70
2	140
3	210
14	980

Problem 3

The olive trees in an orchard produce 3,000 pounds of olives a year. It takes 20 pounds of olives to make 3 liters of olive oil. How many liters of olive oil can this orchard produce in a year? If you get stuck, consider using the table.

olives (pounds)	olive oil (liters)
20	3
100	
3,000	

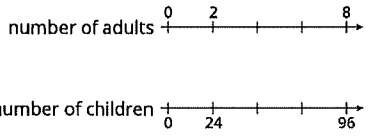
Solution

The orchard produces 450 liters of olive oil per year. Possible strategy:

olives (pounds)	olive oil (liters)
20	3
100	15
3,000	450

Problem 4

(from Unit 2, Lesson 6)
At a school recess, there needs to be a ratio of 2 adults for every 24 children on the playground. The double number line represents the number of adults and children on the playground at recess.



1. Label each remaining tick mark with its value.

2. How many adults are needed if there are 72 children? Circle your answer on the double number line.

Solution

1. Adults: 0, 2, 4, 6, 8. Children: 0, 24, 48, 72, 96.

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:

1. 6 ears of corn for $1.80. What was the cost per ear?

2. 12 apples for $2.88. What was the cost per apple?

3. 5 tomatoes for $3.10. What was the cost per tomato?

Solution

1. $0.30
2. $0.24
3. $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.