Unit 6 Practice Problems

Lesson 1

Problem 1

Here is an equation: $x + 4 = 17$

1. Draw a tape diagram to represent the equation.
2. Which part of the diagram shows the quantity x? What about 4? What about 17?
3. How does the diagram show that $x + 4$ has the same value as 17?

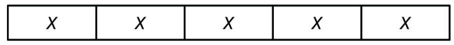
Solution

1. A tape diagram showing one part labeled x and another labeled 4 and a total of 17.
2. The rectangle labeled x represents the quantity x, and the rectangle labeled 4 represents the quantity 4. The big rectangle (the combination of the two smaller ones) represents 17.

3. The large rectangle is labeled 17, but it is also obtained by joining the two smaller rectangles labeled x and 4.

Problem 2

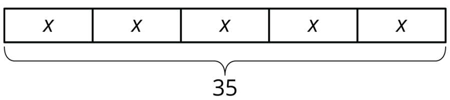
Diego is trying to find the value of x in $5x = 35$. He draws this diagram but is not certain how to proceed.



1. Complete the tape diagram so it represents the equation $5x = 35$.

2. Find the value of x.

Solution

1. 

2. $x = 7$

Problem 3

For each equation, draw a tape diagram and find the unknown value.

1. $x + 9 = 16$

2. $4x = 28$

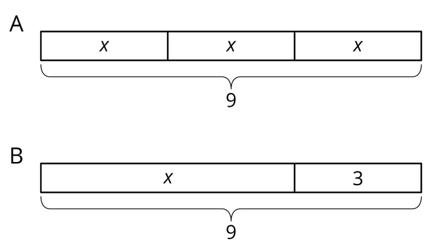
Solution

1. A tape diagram showing one part labeled 9 and another labeled x and a total of 16. The solution is 7.

2. A tape diagram showing 4 groups labeled x and a total of 28. The solution is 7.

Problem 4

Match each equation to one of the two tape diagrams.



1. $x + 3 = 9$
2. $3x = 9$
3. $9 = 3x$
4. $3 + x = 9$
5. $x = 9 - 3$
6. $x = 9 \div 3$
7. $x + x + x = 9$

Solution

1. B

2. A

3. A

4. B

5. B
6. A
7. A

Problem 5

(from Unit 5, Lesson 13)
A shopper paid \$2.52 for 4.5 pounds of potatoes, \$7.75 for 2.5 pounds of broccoli, and \$2.45 for 2.5 pounds of pears. What is the unit price of each item she bought? Show your reasoning.

Solution

Potatoes cost \$0.56 per pound, broccoli costs \$3.10 per pound, and pears costs \$0.98 per pound. Reasoning varies. Sample reasoning:

- $2.52 \div 4.5 = 252 \div 450$, which equals 0.56.
- $7.75 \div 2.5 = 775 \div 250$, which equals 3.1 or 3.10.
- $2.45 \div 2.5 = 245 \div 250$, which equals 0.98.

Problem 6

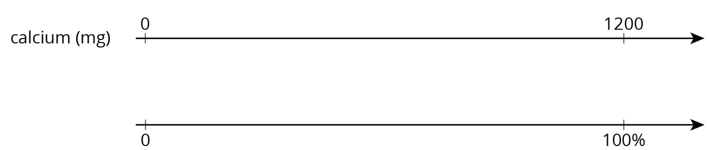
(from Unit 3, Lesson 14)
A sports drink bottle contains 16.9 fluid ounces. Andre drank 80% of the bottle. How many fluid ounces did Andre drink? Show your reasoning.

Solution

13.52 fluid ounces ($0.8 \cdot 16.9 = 13.52$)

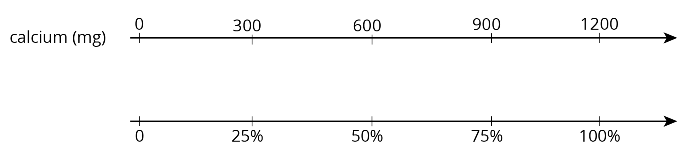
Problem 7

(from Unit 3, Lesson 11)
The daily recommended allowance of calcium for a sixth grader is 1,200 mg. One cup of milk has 25% of the recommended daily allowance of calcium. How many milligrams of calcium are in a cup of milk? If you get stuck, consider using the double number line.



Solution

300 mg. Sample reasoning using double number line:



Lesson 2

Problem 1

Select **all** the true equations.

A. $5 + 0 = 0$

B. $15 \cdot 0 = 0$

C. $1.4 + 2.7 = 4.1$

D. $\frac{2}{3} \cdot \frac{5}{9} = \frac{7}{12}$

E. $4\frac{2}{3} = 5 - \frac{1}{3}$

Solution

B, C, E

Problem 2

Mai's water bottle had 24 ounces in it. After she drank x ounces of water, there were 10 ounces left. Select **all** the equations that represent this situation.

A. $24 \div 10 = x$

B. $24 + 10 = x$

C. $24 - 10 = x$

D. $x + 10 = 24$

E. $10x = 24$

Solution

C, D

Problem 3

Priya has 5 pencils, each x inches in length. When she lines up the pencils end to end, they measure 34.5 inches. Select **all** the equations that represent this situation.

A. $5 + x = 34.5$

B. $5x = 34.5$

C. $34.5 \div 5 = x$

D. $34.5 - 5 = x$

E. $x = (34.5) \cdot 5$

Solution

B, C

Problem 4

Match each equation with a solution from the list of values.

A. $2a = 4.6$

B. $b + 2 = 4.6$

C. $c \div 2 = 4.6$

D. $d - 2 = 4.6$

E. $e + \frac{3}{8} = 2$

F. $\frac{1}{8}f = 3$

G. $g \div \frac{8}{5} = 1$

1. $\frac{8}{5}$
2. $1\frac{5}{8}$
3. 2.3
4. 2.6

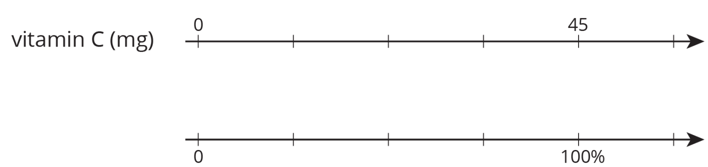
5. 6.6
6. 9.2
7. 24

Solution

A. 3
B. 4
C. 6
D. 5
E. 2
F. 7
G. 1

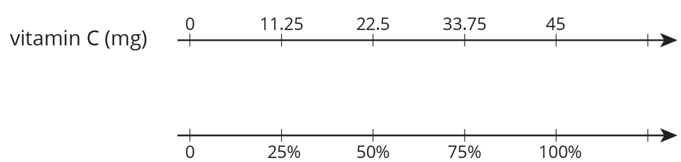
Problem 5

(from Unit 3, Lesson 11)
The daily recommended allowance of vitamin C for a sixth grader is 45 mg. 1 orange has about 75% of the recommended daily allowance of vitamin C. How many milligrams are in 1 orange? If you get stuck, consider using the double number line.



Solution

33.75 mg. Sample reasoning using double number line diagram:



Problem 6

(from Unit 3, Lesson 12)
There are 90 kids in the band. 20% of the kids own their own instruments, and the rest rent them.

1. How many kids own their own instruments?
2. How many kids rent instruments?
3. What percentage of kids rent their instruments?

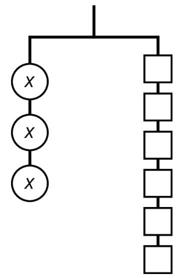
Solution

1. 18 kids $(90 \cdot 0.2 = 18)$
2. 72 kids $(90 - 18 = 72)$
3. 80% $(100 - 20 = 80)$

Lesson 3

Problem 1

Select **all** the equations that represent the hanger.



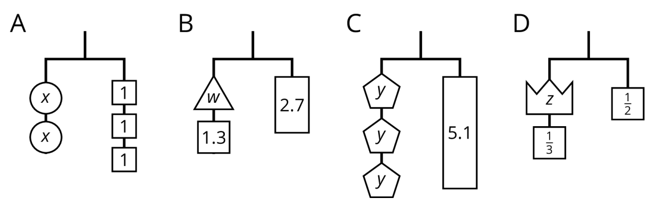
A. $x + x + x = 1 + 1 + 1 + 1 + 1 + 1$
B. $x \cdot x \cdot x = 6$
C. $3x = 6$
D. $x + 3 = 6$
E. $x \cdot x \cdot x = 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1$

Solution

A, C

Problem 2

Write an equation to represent each hanger.



Solution

A. $2x = 3$ (or equivalent)

B. $w + 1.3 = 2.7$ (or equivalent)

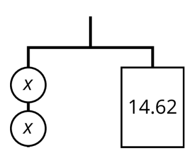
C. $3y = 5.1$ (or equivalent)

D. $z + \frac{1}{3} = \frac{1}{2}$ (or equivalent)

Problem 3

1. Write an equation to represent the hanger.

2. Explain how to reason with the hanger to find the value of x.



3. Explain how to reason with the equation to find the value of x.

Solution

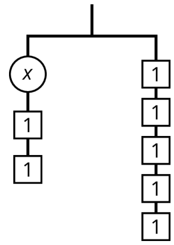
1. $2x = 14.62$

2. Each x can be grouped with half of the other side, so that means x is half of 14.62 or 7.31.

3. 14.62 is twice x, so x must be 7.31, since $2 \cdot (7.31) = 14.62$.

Problem 4

Andre says that x is 7 because he can move the two 1s with the x to the other side.



Do you agree with Andre? Explain your reasoning.

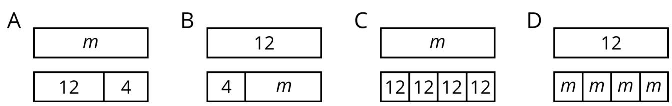
Solution

Andre is not correct. Each 1 on the left balances with a 1 on the right. So taking away the two 1s on the left only leaves the hanger balanced if two 1s are removed on the right. This leaves x on the left and three 1s on the right, so $x = 3$.

Problem 5

(from Unit 6, Lesson 1)
Match each equation to one of the diagrams.

1. $12 - m = 4$
2. $12 = 4m$
3. $m - 4 = 12$
4. $\frac{m}{4} = 12$



Solution

1. B

2. D

3. A

4. C

Problem 6

(from Unit 4, Lesson 13)
The area of a rectangle is 14 square units. It has side lengths a and b. Given the following values for a, find b.

1. $a = 2\frac{1}{3}$

2. $a = 4\frac{1}{5}$

3. $a = \frac{7}{6}$

Solution

1. $b = 6$ $(14 \div 2\frac{1}{3} = 14 \div \frac{7}{3}$, and $14 \cdot \frac{3}{7} = 6)$

2. $b = 3\frac{1}{3}$ $(14 \div 4\frac{1}{5} = 14 \div \frac{21}{5}$, and $14 \cdot \frac{21}{5} = 3\frac{1}{3})$

3. $b = 12$ $(14 \div \frac{7}{6} = 14 \cdot \frac{6}{7} = 12)$

Problem 7

(from Unit 3, Lesson 11)
Lin needs to save up $20 for a new game. How much money does she have if she has saved the following percentages of her goal. Explain your reasoning.

1. 25%

2. 75%

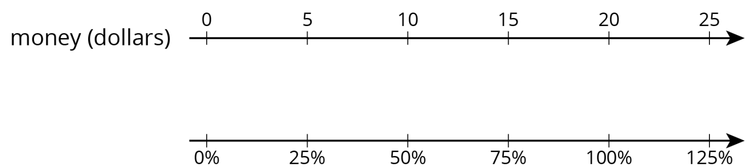
3. 125%

Solution

1. $5

2. $15

3. $25. Reasoning varies. Sample reasoning:



Lesson 4

Problem 1

Select **all** the equations that describe each situation and then find the solution.

1. Kiran's backpack weighs 3 pounds less than Clare's backpack. Clare's backpack weighs 14 pounds. How much does Kiran's backpack weigh?

   a. $x + 3 = 14$

   b. $3x = 14$

   c. $x = 14 - 3$

   d. $x = 14 \div 3$

2. Each notebook contains 60 sheets of paper. Andre has 5 notebooks. How many sheets of paper do Andre's notebooks contain?

   a. $y = 60 \div 5$

   b. $y = 5 \cdot 60$

   c. $\frac{y}{5} = 60$

   d. $5y = 60$

Solution

1. a,c; x = 11$, 11 pounds

2. b,c; y = 300$, 300 sheets

Problem 2

Solve each equation.

1. $2x = 5$

2. $y + 1.8 = 14.7$

3. $6 = \frac{1}{2}z$

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

5. $2.5t = 10$

Solution

1. $x = \frac{5}{2}$ (or equivalent)

2. $y = 12.9$

3. $z = 12$

4. $w = 2\frac{3}{4}$ (or equivalent)

5. $t = 4$

Problem 3

(from Unit 6, Lesson 1)
For each equation, draw a tape diagram that represents the equation.

1. $3x = 18$

2. $3 + x = 18$

3. $17 - 6 = x$

Solution

1. A tape diagram showing 3 groups labeled x and a total of 18.

2. A tape diagram showing one part labeled 3 and another labeled x and a total of 18.

3. A tape diagram showing one part labeled 6 and another labeled x and a total of 17.

Problem 4

(from Unit 5, Lesson 8)
Find each product.

1. $(21.2) \cdot (0.02)$

2. $(2.05) \cdot (0.004)$

Solution

1. 0.424

2. 0.0082

Problem 5

(from Unit 3, Lesson 13)
For a science experiment, students need to find 25% of 60 grams. Jada says, "I can find this by calculating $\frac{1}{4}$ of 60." Andre says, "25% of 60 means $\frac{25}{100} \cdot 60$." Lin says both of their methods work. Do you agree with Lin? Explain your reasoning.

Solution

Answers vary. Sample response: Yes, I agree with Lin. Andre is right that 25% of a number means $\frac{25}{100}$ of that number. Jada is also right because $\frac{25}{100} = \frac{1}{4}$.

Lesson 5

Problem 1

Select **all** the expressions that equal $\frac{3.15}{0.45}$.

A. $(3.15) \cdot (0.45)$
B. $(3.15) \div (0.45)$
C. $(3.15) \cdot \frac{1}{0.45}$
D. $(3.15) \div \frac{45}{100}$

E. $(3.15) \cdot \frac{100}{45}$
F. $\frac{0.45}{3.15}$

Solution

B, C, D, E

Problem 2

Which expressions are solutions to the equation $\frac{3}{4}x = 15$? Select **all** that apply.

A. $\frac{15}{\frac{3}{4}}$
B. $\frac{15}{\frac{4}{3}}$
C. $\frac{4}{3} \cdot 15$
D. $\frac{3}{4} \cdot 15$
E. $15 \div \frac{3}{4}$

Solution

A, C, E

Problem 3

Solve each equation.

1. $4x = 32$

2. $4 = 32x$

3. $10x = 26$

4. $26 = 100x$

Solution

1. $x = 8$

2. $x = \frac{1}{8}$

3. $x = 2.6$ (or equivalent)

4. $x = 0.26$ (or equivalent)

Problem 4

For each equation, write a story problem represented by the equation. For each equation, state what quantity x represents. If you get stuck, draw a diagram.

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

$1.5x = 6$

Solution

Answers vary. Sample response:

1. Jada ran for 2 miles. Elena ran for $\frac{3}{4}$ of a mile. How much further did Jada run than Elena? x represents the difference between the distance of Jada's run and Elena's run.

2. 1.5 times the amount a bucket holds makes 6 gallons. How many gallons does the bucket hold? x represents the volume in gallons that the bucket holds.

Problem 5

(from Unit 3, Lesson 13)

Write as many mathematical expressions or equations as you can about the image. Include a fraction, a decimal number, or a percentage in each.

Solution

Answers vary. Possible responses: $\frac{1}{5} \cdot 250,000 = 50,000$, 20% of $250,000$ is $50,000$, or $(0.2) \cdot 250,000 = 50,000$.

Problem 6

(from Unit 3, Lesson 12)
In a lilac paint mixture, 40% of the mixture is white paint, 20% is blue, and the rest is red. There are 4 cups of blue paint used in a batch of lilac paint.

1. How many cups of white paint are used?
2. How many cups of red paint are used?
3. How many cups of lilac paint will this batch yield?

If you get stuck, consider using a tape diagram.

Solution

1. 8

2. 8

3. 20

Problem 7

(from Unit 1, Lesson 9)
Triangle P has a base of 12 inches and a corresponding height of 8 inches. Triangle Q has a base of 15 inches and a corresponding height of 6.5 inches. Which triangle has a greater area? Show your reasoning.

Solution

Triangle Q has a larger area. The area of Triangle P is $\frac{1}{2} \cdot 12 \cdot 8$ or 48 square inches. The area of Triangle Q is $\frac{1}{2} \cdot 15 \cdot (6.5)$ or 97.5 square inches.

Lesson 6

Problem 1

Instructions for a craft project say that the length of a piece of red ribbon should be 7 inches less than the length of a piece of blue ribbon.

1. How long is the red ribbon if the length of the blue ribbon is:

   10 inches?
   27 inches?
   x inches?

2. How long is the blue ribbon if the red ribbon is 12 inches?

Solution

1. 3 inches $(10 - 3 = 7)$, 20 inches $(27 - 7 = 20)$, $x - 7$ inches

2. 19 inches $(12 + 7 = 19)$

Problem 2

Tyler has 3 times as many books as Mai.

1. How many books does Mai have if Tyler has:

   15 books?
   21 books?
   x books?

2. Tyler has 18 books. How many books does Mai have?

Solution

1. 5 books ($15 \div 3 = 5$), 7 books ($21 \div 3 = 7$), $\frac{x}{3}$ books

2. 6 books ($18 \div 3 = 6$)

Problem 3

A bottle holds 24 ounces of water. It has x ounces of water in it.

1. What does $24 - x$ represent in this situation?

2. Write a question about this situation that has $24 - x$ for the answer.

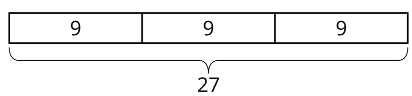
Solution

1. The amount of water that has been removed from the bottle.

2. Answers vary. Sample response: How many ounces of water did Jada drink from the full bottle if there are x ounces left?

Problem 4

(from Unit 6, Lesson 1)
Write an equation represented by this tape diagram that uses each of the following operations.



1. addition

2. subtraction

3. multiplication

4. division

Solution

Answers vary. Sample responses:

1. $9 + 9 + 9 = 27$

2. $27 - 9 = 9 + 9$

3. $3 \cdot 9 = 27$

4. $27 \div 3 = 9$

Problem 5

(from Unit 6, Lesson 4)
Select **all** the equations that describe each situation and then find the solution.

1. Han's house is 450 meters from school. Lin's house is 135 meters closer to school. How far is Lin's house from school?

$z = 450 + 135$
$z = 450 - 135$
$z - 135 = 450$
$z + 135 = 450$

2. Tyler's playlist has 36 songs. Noah's playlist has one quarter as many songs as Tyler's playlist. How many songs are on Noah's playlist?

   $w = 4 \cdot 36$
   $w = 36 \div 4$
   $4w = 36$
   $\frac{w}{4} = 36$

Solution

1. $z = 450 - 135, z + 135 = 450; y = 315$

2. $w = 36 \div 4, 4w = 36; w = 9$

Problem 6

(from Unit 3, Lesson 12)
You had \$50. You spent 10% of the money on clothes, 20% on games, and the rest on books. How much money was spent on books?

Solution

\$35 Reasoning varies. Sample reasoning: \$5 was spent on books, because $50 \cdot 0.1 = 5$. \$10 was spend on games, because $50 \cdot 0.2 = 10$. \$15 is the combined amount spent on books and games. That leaves \$35, because $50 - 15 = 35$.

Problem 7

(from Unit 3, Lesson 14)
A trash bin has a capacity of 50 gallons. What percentage of its capacity is each of the following? Show your reasoning.

1. 5 gallons

2. 30 gallons

3. 45 gallons

4. 100 gallons

Solution

1. 5 gallons is 10% of 50 gallons, because $5 \div 50 = 0.1$.

2. 30 gallons is 60% of 50 gallons, because $30 \div 50 = 0.6$.

3. 45 gallons is 90% of 50 gallons, because $45 \div 50 = 0.9$.

4. 100 gallons is 200% of 50 gallons, because $100 \div 50 = 2$.

Lesson 7

Problem 1

A crew has paved $\frac{3}{4}$ of a mile of road. If they have completed 50% of the work, how long is the road they are paving?

Solution

$1\frac{1}{2}$ miles because $\frac{3}{4}$ is half (or 50%) of $\frac{6}{4}$ or $1\frac{1}{2}$.

Problem 2

40% of x is 35.

1. Write an equation that shows the relationship of 40%, x, and 35.

2. Use your equation to find x. Show your reasoning.

Solution

1. $0.4x = 35$

2. $x = 87.5$ $(35 \div 0.4 = 87.5)$

Problem 3

Priya has completed 9 exam questions. This is 60% of the questions on the exam.

1. Write an equation representing this situation. Explain the meaning of any variables you use.

2. How many questions are on the exam? Show your reasoning.

Solution

1. Answers vary. Sample responses: $9 = \frac{60}{100}$ or $9 = 0.6q$ where q is the number of questions on the exam.

2. 15 because $9 \div (0.6) = 15$.

Problem 4

Answer each question. Show your reasoning.

1. 20% of a is 11. What is a?

2. 75% of b is 12. What is b?

3. 80% of c is 20. What is c?

4. 200% of d is 18. What is d?

Solution

1. 55

2. 16

3. 25

4. 9

Sample reasoning for "75% of b is 12":

- Using an equation: $\frac{75}{100}b = 12$, so $b = 12 \div \frac{75}{100}$, so $b = 12 \cdot \frac{100}{75}$, so $b = 16$.

- Using a table. To get from the first row to the second row, divide 75 and 12 each by 3. To get from the second to the third row, multiply the 25 and 4 each by 4.

percentage	number
75	12
25	4
100	16

Problem 5

(from Unit 6, Lesson 2)
For the equation $2n - 3 = 7$

1. What is the variable?

2. What is the coefficient of the variable?

3. Which of these is the solution to the equation? 2, 3, 5, 7, n

Solution

1. n
2. 2
3. 5

Problem 6

(from Unit 6, Lesson 2)
Which of these is a solution to the equation $\frac{1}{8} = \frac{2}{5} \cdot x$?

A. $\frac{2}{40}$
B. $\frac{5}{16}$
C. $\frac{11}{40}$
D. $\frac{17}{40}$

Solution

B

Problem 7

(from Unit 5, Lesson 13)
Find the quotients.

1. $0.009 \div 0.001$
2. $0.009 \div 0.002$
3. $0.0045 \div 0.001$
4. $0.0045 \div 0.002$

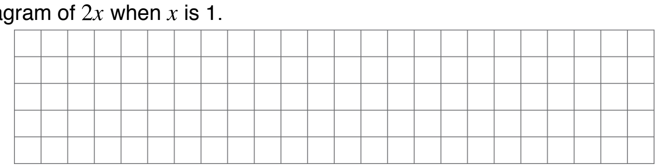
Solution

1. 9
2. 4.5
3. 4.5
4. 2.25

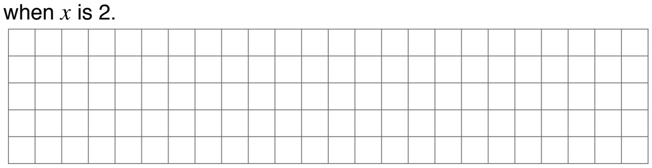
Lesson 8

Problem 1

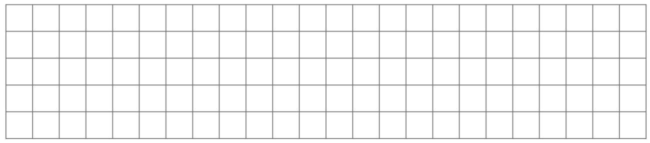
1. Draw a diagram of $x + 3$ and a diagram of $2x$ when x is 1.



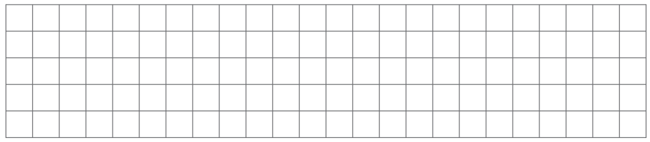
2. Draw a diagram of $x + 3$ and of $2x$ when x is 2.



3. Draw a diagram of $x + 3$ and of $2x$ when x is 3.



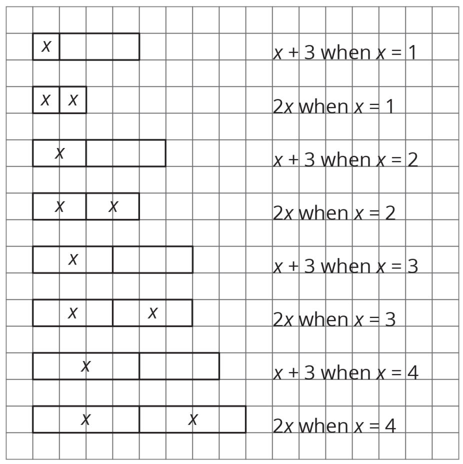
4. Draw a diagram of $x + 3$ and of $2x$ when x is 4.



5. When are $x + 3$ and $2x$ equal? When are they not equal? Use your diagrams to explain.

Solution

1 through 4



5. When $x = 3$ both expressions are 6. When x is less than 3, $3x$ is less than $x + 3$ and when x is larger than 3, $3x$ becomes larger than $x + 3$.

Problem 2

1. Do $4x$ and $15 + x$ have the same value when x is 5?

2. Are $4x$ and $15 + x$ equivalent expressions? Explain your reasoning.

Solution

1. Yes, they both have the value of 20.

2. No. Equivalent expressions have the same value no matter what number is used in place of the variable. Reasoning varies. Sample reasoning For example, when x is 1, $4x$ has the value 4 but $15 + x$ has the value 16.

Problem 3

1. Check that $2b + b$ and $3b$ have the same value when b is 1, 2, and 3.

2. Do $2b + b$ and $3b$ have the same value for all values of b? Explain your reasoning.

3. Are $2b + b$ and $3b$ equivalent expressions?

Solution

1. When $b = 1$, they both take the value 3, when $b = 2$ they are both 6, and when $b = 3$ they both have the value 9.

2. Yes, $2b + b$ is the same as $3b$. Both can be written as $b + b + b$.

3. Yes, for any value of b, both $2b + b$ and $3b$ give 3 times the value of b.

Problem 4

(from Unit 6, Lesson 7)
80% of x is equal to 100.

1. Write an equation that shows the relationship of 80%, x, and 100.

2. Use your equation to find x.

Solution

1. $0.8x = 100$

2. $x = 125$

Problem 5

(from Unit 6, Lesson 5)
For each story problem, write an equation to represent the problem and then solve the equation. Be sure to explain the meaning of any variables you use.

1. Jada's dog was $5\frac{1}{2}$ inches tall when it was a puppy. Now her dog is $14\frac{1}{2}$ inches taller than that. How tall is Jada's dog now?

2. Lin picked $9\frac{3}{4}$ pounds of apples, which was 3 times the weight of the apples Andre picked. How many pounds of apples did Andre pick?

Solution

1. $t - 14\frac{1}{2} = 5\frac{1}{2}$ or equivalent, where t represents the height of Jada's dog now. Jada's dog is 20 inches tall.

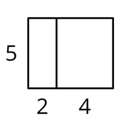
2. $9\frac{3}{4} = 3p$ or equivalent, where p represents the weight in pounds of the apples Andre picked. Andre picked $3\frac{1}{4}$ pounds of apples.

Lesson 9

Problem 1

Select **all** the expressions that represent the area of the large, outer rectangle.

A. $5(2+4)$
B. $5 \cdot 2 + 4$
C. $5 \cdot 2 + 5 \cdot 4$
D. $5 \cdot 2 \cdot 4$
E. $5 + 2 + 4$
F. $5 \cdot 6$



Solution

A, C, F

Problem 2

Draw and label diagrams that show these two methods for calculating $19 \cdot 50$.

1. First find $10 \cdot 50$ and then add $9 \cdot 50$.

2. First find $20 \cdot 50$ and then take away 50.

Solution

1. A 19-by-50 rectangle partitioned into two rectangles with dimensions 10 by 50 and 9 by 50.

2. A 20-by-50 rectangle partitioned into a 1 by 50 and a 19 by 50. Shading or arrows indicate that the 19-by-50 rectangle is the one we want.

Problem 3

Complete each calculation using the distributive property.

1.

$$98 \cdot 24$$

$$(100 - 2) \cdot 24$$

$$\ldots$$

2.

$$21 \cdot 15$$

$$(20 + 1) \cdot 15$$

$$\ldots$$

3.

$$0.51 \cdot 40$$

$$(0.5 + 0.01) \cdot 40$$

$$\ldots$$

Solution

1. $(100 - 2) \cdot 24 = 2500 - 50 = 2450.$
2. $(20 + 1) \cdot 15 = 300 + 20 = 320.$
3. $(0.5 + 0.01) \cdot 40 = 20 + 0.4 = 20.4.$

Problem 4

A group of 8 friends go to the movies. A bag of popcorn costs $2.99. How much will it cost to get one bag of popcorn for each friend? Explain how you can calculate this amount mentally.

Solution

$23.92. Reasoning varies. Sample reasoning: If the bags of popcorn were $3 each, then this would be $24 ($8 \cdot 3$). But $2.99 = 3 - 0.01$. So one cent has to be subtracted for each of the 8 bags of popcorn. That leaves $23.92.

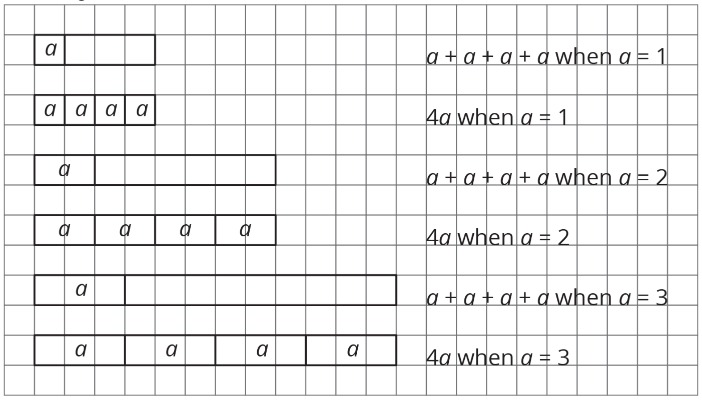
Problem 5

(from Unit 6, Lesson 8)

1. On graph paper, draw diagrams of $a + a + a + a$ and $4a$ when a is 1, 2, and 3. What do you notice?
2. Do $a + a + a + a$ and $4a$ have the same value for any value of a? Explain how you know.

Solution

1. See diagram



2. Yes, $4a$ can be rewritten as $a + a + a + a$, and this is true for any value of a. This can also be shown with a tape diagram.

Problem 6

(from Unit 6, Lesson 7)
120% of x is equal to 78.

1. Write an equation that shows the relationship of 120%, x, and 78.

2. Use your equation to find x. Show your reasoning.

Solution

1. $1.2x = 78$

2. $x = 65$ $(78 \div 1.2 = 65)$

Problem 7

(from Unit 6, Lesson 6)
Kiran's aunt is 17 years older than Kiran.

1. How old will Kiran's aunt be when Kiran is:
   15 years old?
   30 years old?
   x years old?

2. How old will Kiran be when his aunt is 60 years old?

Solution

1. 32 years old $(156 + 17 = 32)$, 47 years old $(30 + 17 = 47)$, $x + 17$ years old.

2. 43 years old $(60 - 17 = 43)$.

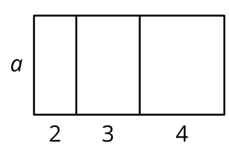
Lesson 10

Problem 1

Here is a rectangle.

1. Explain why the area of the large rectangle is $2a + 3a + 4a$.

2. Explain why the area of the large rectangle is $(2 + 3 + 4)a$.



Solution

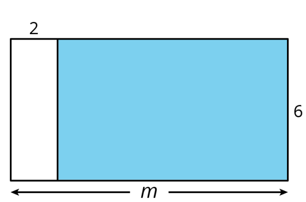
1. The large rectangle is made up of three smaller rectangles whose areas are $2a$, $3a$, and $4a$.

2. The large rectangle has height a and length $2 + 3 + 4$, so its area is $(2 + 3 + 4)a$.

Problem 2

Is the area of the shaded rectangle $6(2 - m)$ or $6(m - 2)$?

Explain how you know.



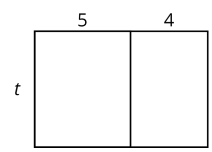
Solution

$6(m-2)$. The width of the shaded rectangle is 6. The length is what is left over if 2 is removed from m, so $m-2$. So the area of the rectangle is $6(m-2)$.

Problem 3

Choose the expressions that do *not* represent the total area of the rectangle. Select **all** that apply.

A. $5t+4t$
B. $t+5+4$
C. $9t$
D. $4 \cdot 5 \cdot t$
E. $t(5+4)$



Solution

B,D

Problem 4

(from Unit 6, Lesson 9)
Evaluate each expression mentally.

1. $35 \cdot 91 - 35 \cdot 89$
2. $22 \cdot 87 + 22 \cdot 13$
3. $\frac{9}{11} \cdot \frac{7}{10} - \frac{9}{11} \cdot \frac{3}{10}$

Solution

1. 70, Sample reasoning: $35 \cdot 91 - 35 \cdot 89 = 35 \cdot (91 - 89) = 35 \cdot 2 = 70$)
2. 2,200, Sample reasoning: $22 \cdot 87 + 22 \cdot 13 = 22 \cdot (87 + 13) = 22 \cdot 100 = 2,200$
3. $\frac{36}{110}$, Sample reasoning: $\frac{9}{11} \cdot \frac{7}{10} - \frac{9}{11} \cdot \frac{3}{10} = \frac{9}{11}\left(\frac{7}{10} - \frac{3}{10}\right) = \frac{9}{11} \cdot \frac{4}{10} = \frac{36}{110}$

Problem 5

(from Unit 6, Lesson 8)
Select **all** the expressions that are equivalent to $4b$.

A. $b+b+b+b$
B. $b+4$
C. $2b+2b$
D. $b \cdot b \cdot b \cdot b$
E. $b \div \frac{1}{4}$

Solution

A, C, E

Problem 6

(from Unit 6, Lesson 4)
Solve each equation. Show your reasoning.

1. $111 = 14g$
2. $13.65 = h + 4.88$

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

4. $\frac{2}{5}m = \frac{17}{4}$

5. $5.16 = 4n$

Solution

1. $g = \frac{111}{14}$ (or equivalent)

2. $h = 8.77$

3. $k = 4\frac{19}{24}$ (or equivalent)

4. $m = \frac{85}{8}$ (or equivalent)

5. $n = 1.29$ (or equivalent)

Problem 7

(from Unit 6, Lesson 2)
Andre ran $5\frac{1}{2}$ laps of a track in 8 minutes at a constant speed. It took Andre x minutes to run each lap. Select **all** the equations that represent this situation.

A. $\left(5\frac{1}{2}\right)x = 8$
B. $5\frac{1}{2} + x = 8$
C. $5\frac{1}{2} - x = 8$
D. $5\frac{1}{2} \div x = 8$
E. $x = 8 \div \left(5\frac{1}{2}\right)$
F. $x = \left(5\frac{1}{2}\right) \div 8$

Solution

A, E

Lesson 11

Problem 1

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

1. $4(x + 2)$

2. $(6 + 8) \cdot x$

3. $4(2x + 3)$

4. $6(x + y + z)$

Solution

1. $4x + 4 \cdot 2$

2. $6x + 8x$

3. $8x + 4 \cdot 3$

4. $6x + 6y + 6z$

Expressions that are equivalent to these are also acceptable, for example, $4x + 8$ for the first one.

Problem 2

Priya rewrites the expression $8y - 24$ as $8(y - 3)$. Han rewrites $8y - 24$ as $2(4y - 12)$. Are Priya's and Han's expressions each equivalent to $8y - 24$? Explain your reasoning.

Solution

Yes, the distributive property shows that each expression is equivalent to $8y - 24$.

Problem 3

Select **all** the expressions that are equivalent to $16x + 36$.

A. $16(x + 20)$
B. $x(16 + 36)$
C. $4(4x + 9)$
D. $2(8x + 18)$
E. $2(8x + 36)$

Solution

C, D

Problem 4

The area of a rectangle is $30 + 12x$. List at least 3 possibilities for the length and width of the rectangle.

Solution

Answers vary. Sample responses:

	Length	Width
3	$10 + 4x$	3
6	$5 + 2x$	6
2	$15 + 6x$	2
$\frac{1}{2}$	$60 + 24x$	$\frac{1}{2}$
12	$3 + 1.2x$	10

Problem 5

(from Unit 6, Lesson 8)
Select **all** the expressions that are equivalent to $\frac{1}{2}z$.

A. $z + z$

B. $z \div 2$

C. $z \cdot z$

D. $\frac{1}{4}z + \frac{1}{4}z$

E. $2z$

Solution

B, D

Problem 6

(from Unit 6, Lesson 6)

1. What is the perimeter of a square with side length:

   3 cm
   7 cm
   s cm

2. If the perimeter of a square is 360 cm, what is its side length?

3. What is the area of a square with side length:

   3 cm
   7 cm
   s cm

4. If the area of a square is 121 cm^2, what is its side length?

Solution

1. 12 cm $(3 \cdot 4 = 12)$, 28 cm$(7 \cdot 4 = 28)$, $4s$ cm

2. 90 cm $(360 \div 4 = 90)$

3. 9 cm^2 $(3 \cdot 3 = 9)$, 49 $\text{cm}^2$$(7 \cdot 7 = 49)$, s^2 cm^2

4. 11 cm $(11 \cdot 11 = 121)$

Problem 7

(from Unit 6, Lesson 5)
Solve each equation.

1. $10 = 4y$

2. $5y = 17.5$

3. $1.036 = 10y$

4. $0.6y = 1.8$

5. $15 = 0.1y$

Solution

1. $y = 2.5$

2. $y = 3.5$

3. $y = 0.1036$

4. $y = 3$

5. $y = 150$

Lesson 12

Problem 1

Select **all** expressions that are equivalent to 64.

A. 2^6
B. 2^8
C. 4^3
D. 8^2
E. 16^4
F. 32^2

Solution

A, C, D

Problem 2

Select **all** the expressions that equal 3^4.

A. 7

B. 4^3
C. 12
D. 81
E. 64
F. 9^2

Solution

D, F

Problem 3

4^5 is equal to 1,024. Evaluate the following expressions.

1. 4^6
2. 4^4
3. $4^3 \cdot 4^2$

Solution

1. $4^6 = 4^5 \cdot 4 = 1,024 \cdot 4 = 4096$
2. $4^4 = 4^5 \div 4 = 1,024 \div 4 = 256$
3. $4^3 \cdot 4^2 = 4^5 = 1024$

Problem 4

$6^3 = 216$. Using exponents, write three more expressions whose value is 216.

Solution

Answers vary. Sample responses: $6^2 \cdot 6$, $\frac{6^4}{6}$, $2^3 \cdot 3^3$

Problem 5

(from Unit 6, Lesson 11)
Find two different ways to rewrite $3xy + 6yz$ using the distributive property.

Solution

Answers vary. Sample responses: $3(xy + 2yz)$, $3y(x + 2z)$, $y(3x + 6z)$.

Problem 6

(from Unit 6, Lesson 5)
Solve each equation.

1. $a - 2.01 = 5.5$
2. $b + 2.01 = 5.5$
3. $10c = 13.71$
4. $100d = 13.71$

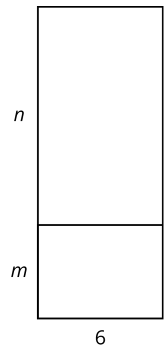
Solution

1. $a = 7.51$
2. $b = 3.49$
3. $c = 1.371$
4. $d = 0.1371$

Problem 7

(from Unit 6, Lesson 10)
Which expressions represent the total area of the large rectangle? Select **all** that apply.

A. $6(m+n)$
B. $6n+m$
C. $6n+6m$
D. $6mn$
E. $(n+m)6$



Solution

A, C, E

Problem 8

(from Unit 3, Lesson 16)
Is each statement true or false? Explain your reasoning.

1. $\frac{45}{100} \cdot 72 = \frac{45}{72} \cdot 100$

2. 16% of 250 is equal to 250% of 16

Solution

1. False. Sample reasoning: The left side equals $45 \cdot \frac{72}{100}$ and the right side equals $45 \cdot \frac{100}{72}$. The left side is less than 45 and the right side is greater then 45.

2. True. Sample reasoning: 16% of 250 equals $\frac{16}{100} \cdot 250$. 250% of 16 is $\frac{250}{100} \cdot 16$. Each of these is equal to $\frac{16 \cdot 250}{100}$

Lesson 13

Problem 1

Select **all** expressions that are equal to $3 \cdot 3 \cdot 3 \cdot 3 \cdot 3$.

A. $3 \cdot 5$
B. 3^5
C. $3^4 \cdot 3$
D. $5 \cdot 3$
E. 5^3

Solution

B, C

Problem 2

Noah starts with 0 and then adds the number 5 four times. Diego starts with 1 and then multiplies by the number 5 four times. For each expression, decide whether it is equal to Noah's result, Diego's result, or neither.

1. $4 \cdot 5$

2. $4 + 5$

3. 4^5

4. 5^4

Solution

1. Noah's

2. Neither

3. Neither

4. Diego's

Problem 3

Decide whether each equation is true or false, and explain how you know.

1. $9 \cdot 9 \cdot 3 = 3^5$

2. $7 + 7 + 7 = 3 + 3 + 3 + 3 + 3 + 3 + 3$

3. $\frac{1}{7} \cdot \frac{1}{7} \cdot \frac{1}{7} = \frac{3}{7}$

4. $4^1 = 4 \cdot 1$

5. $6 + 6 + 6 = 6^3$

Solution

1. True. Explanations vary. Sample explanation: The expression on the left is equivalent to $(3 \cdot 3) \cdot (3 \cdot 3) \cdot 3 = 3^5$.

2. True. Explanations vary. Sample explanation: Both sides of the equation are ways of writing $3 \cdot 7$.

3. False. $\frac{1}{7} \cdot \frac{1}{7} \cdot \frac{1}{7} = \frac{1}{7^3}$ or $\frac{1}{343}$ which does not equal $\frac{3}{7}$.

4. True. Both sides equal 4.

5. False. $6^3 = 216$, but $6 + 6 + 6 = 18$.

Problem 4

1. What is the area of a square with side lengths of $\frac{3}{5}$ units?

2. What is the side length of a square with area $\frac{1}{16}$ square units?

3. What is the volume of a cube with edge lengths of $\frac{2}{3}$ units?

4. What is the edge length of a cube with volume $\frac{27}{64}$ cubic units?

Solution

1. $\frac{9}{25}$ square units ($\frac{3}{5} \cdot \frac{3}{5} = \frac{9}{25}$)

2. $\frac{1}{4}$ units ($\frac{1}{4} \cdot \frac{1}{4} = \frac{1}{16}$)

3. $\frac{8}{27}$ cubic units ($\frac{2}{3} \cdot \frac{2}{3} \cdot \frac{2}{3} = \frac{8}{27}$)

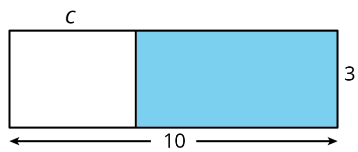
4. $\frac{3}{4}$ units ($\frac{3}{4} \cdot \frac{3}{4} \cdot \frac{3}{4} = \frac{27}{64}$)

Problem 5

(from Unit 6, Lesson 10)

Select **all** the expressions that represent the area of the shaded rectangle.

A. $3(10 - c)$
B. $3(c - 10)$
C. $10(c - 3)$
D. $10(3 - c)$
E. $30 - 3c$
F. $30 - 10c$



Solution

A, E

Problem 6

(from Unit 5, Lesson 13)
A ticket at a movie theater costs $8.50. One night, the theater had $29,886 in ticket sales.

1. Estimate about how many tickets the theater sold. Explain your reasoning.
2. How many tickets did the theater sell? Explain your reasoning.

Solution

1. About 3,000. Reasoning varies. Sample reasoning: If there were $30,000 in sales and the tickets were $10 each, then it would be 3000. The actual tickets are less than $10 (while $30,000 is very close to the total sales), so the actual answer should be more than 3000.
2. 3,516. Reasoning varies. Sample reasoning: The number of tickets sold is $29{,}886 \div 8.5$, and this is 3,516.

Problem 7

(from Unit 4, Lesson 12)
A fence is being built around a rectangular garden that is $8\frac{1}{2}$ feet by $6\frac{1}{3}$ feet. Fencing comes in panels. Each panel is $\frac{2}{3}$ of a foot wide. How many panels are needed? Explain or show your reasoning.

Solution

Answers vary. Possible solution (not reusing panel pieces): 46 panels. For the sides of length $8\frac{1}{2}$ feet, Jada needs $8\frac{1}{2} \div \frac{2}{3}$ panels. This is $\frac{51}{4} = 12\frac{3}{4}$ so these will use 13 panels of fencing. The other two sides each use $6\frac{1}{3} \div \frac{2}{3}$ panels of fencing, which is $9\frac{1}{2}$. This is 10 panels each. Possible solution (reusing panel pieces): 45 panels. The sides of length $8\frac{1}{2}$ feet each use $12\frac{3}{4}$ panels of fencing, for a total of $25\frac{1}{2}$. The other two sides each use $9\frac{1}{2}$ pieces of fencing for a total of 19 panels. Jada needs $44\frac{1}{2}$ panels, which means she needs 45 whole panels.

Lesson 14

Problem 1

Lin says, “I took the number 8, and then multiplied it by the square of 3.” Select **all** expressions that equal Lin’s answer.

A. $8 \cdot 3^2$
B. $(8 \cdot 3)^2$
C. $8 \cdot 2^3$
D. $3^2 \cdot 8$
E. 24^2
F. 72

Solution

A, D, F

Problem 2

Evaluate each expression.

1. $7 + 2^3$
2. $9 \cdot 3^1$
3. $20 - 2^4$
4. $2 \cdot 6^2$
5. $8 \cdot (\frac{1}{2})^2$
6. $\frac{1}{3} \cdot 3^3$
7. $(\frac{1}{5} \cdot 5)^5$

Solution

1. 15
2. 27
3. 4
4. 72
5. 2
6. 9
7. 1

Problem 3

Andre says, "I multiplied 4 by 5, then cubed the result." Select **all** expressions that equal Andre's answer.

A. $4 \cdot 5^3$
B. $(4 \cdot 5)^3$
C. $(4 \cdot 5)^2$
D. $5^3 \cdot 4$
E. 20^3
F. 500
G. 8,000

Solution

B, E, G

Problem 4

Han has 10 cubes, each 5 inches on a side.

1. Find the total volume of Han's cubes. Express your answer as an expression using an exponent.
2. Find the total surface area of Han's cubes. Express your answer as an expression using an exponent.

Solution

1. $10 \cdot 5^3$ in^3
2. $10 \cdot 6 \cdot 5^2$ in^2 or $60 \cdot 5^2$ in^2

Problem 5

(from Unit 6, Lesson 13)
Priya says that $\frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} = \frac{4}{3}$. Do you agree with Priya? Explain or show your reasoning.

Solution

Answers vary. Sample response: I disagree with Priya. $\frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3}$ is really $(\frac{1}{3})^4$, or $\frac{1}{81}$.

Problem 6

(from Unit 6, Lesson 7)
Answer each question. Show your reasoning.

1. 125% of e is 30. What is e?

2. 35% of f is 14. What is f?

Solution

1. 24. $\frac{125}{100} \cdot e = 30$, so $e = 30 \div \frac{125}{100}$, so $e = 30 \cdot \frac{100}{125}$.

2. 40. $(0.35) \cdot f = 14$, so $f = 14 \div 0.35$.

Problem 7

(from Unit 6, Lesson 5)
Which expressions are solutions to the equation $2.4y = 13.75$? Select **all** that apply.

A. $13.75 - 1.4$
B. $13.75 \cdot 2.4$
C. $13.75 \div 2.4$
D. $\frac{13.75}{2.4}$
E. $2.4 \div 13.75$

Solution

C, D

Problem 8

(from Unit 5, Lesson 7)
Jada explains how she finds $15 \cdot 23$:

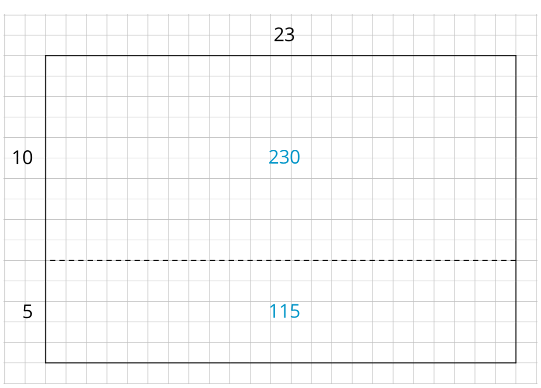
"I know that ten 23s is 230, so five 23s will be half of 230, which is 115. 15 is 10 plus 5, so $15 \cdot 23$ is 230 plus 115, which is 345."

1. Do you agree with Jada? Explain.

2. Draw a 15 by 23 rectangle. Partition the rectangle into two rectangles and label them to show Jada's reasoning.

Solution

1. Yes, Jada is calculating $15 \cdot 23$ by writing it as $(10 + 5) \cdot 23$ (using the distributive property). To find $5 \cdot 23$, she thinks of 5 as $\frac{10}{2}$. So Jada needs to multiply 23 by 10 (which gives her 230) and add half of this product (which is 115) to find the value of $(10 + 5) \cdot 23$.

2. 

Lesson 15

Problem 1

Evaluate the following expressions if $x = 3$.

1. 2^x
2. x^2
3. 1^x
4. x^1
5. $\left(\frac{1}{2}\right)^x$

Solution

1. 8
2. 9
3. 1
4. 3
5. $\frac{1}{8}$

Problem 2

Evaluate each expression for the given value of x.

1. $2 + x^3$, x is 3
2. x^2, x is $\frac{1}{2}$
3. $3x^2$, x is 5
4. $100 - x^2$, x is 6

Solution

1. 29
2. $\frac{1}{4}$
3. 75
4. 64

Problem 3

Decide if the expressions have the same value. If not, determine which expression has the larger value.

1. 2^3 and 3^2
2. 1^{31} and 31^1
3. 4^2 and 2^4
4. $\left(\frac{1}{2}\right)^3$ and $\left(\frac{1}{3}\right)^2$

Solution

1. Not equal. 3^2 has the larger value, because $2^3 = 8$ and $3^2 = 9$.
2. Not equal. 31^1 has the larger value, because $1^{31} = 1$ and $31^1 = 31$.
3. Equal. They both have 16 as their value.

4. $\left(\frac{1}{2}\right)^3$, because $\left(\frac{1}{2}\right)^3 = \frac{1}{8}$ and $\left(\frac{1}{3}\right)^2 = \frac{1}{9}$ and $\frac{1}{8} > \frac{1}{9}$.

Problem 4

Match each equation to its solution.

A. $7 + x^2 = 16$

B. $5 - x^2 = 1$

C. $2 \cdot 2^3 = 2^x$

D. $\frac{3^4}{3^x} = 27$

1. $x = 4$

2. $x = 1$

3. $x = 2$

4. $x = 3$

Solution

A. $x = 3$

B. $x = 2$

C. $x = 4$

D. $x = 1$

Problem 5

(from Unit 6, Lesson 6)
An adult pass at the amusement park costs 1.6 times as much as a child's pass.

1. How many dollars does an adult pass cost if a child's pass costs:

   \$5?
   \$10?
   w

2. A child's pass costs \$15. How many dollars does an adult pass cost?

Solution

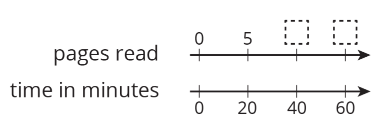
1. 8 dollars $(1.6 \cdot 5 = 8)$, 16 dollars, $(1.6 \cdot 10 = 16)$, $1.6w$ dollars

2. 24 dollars $(1.6 \cdot 15 = 24)$

Problem 6

(from Unit 2, Lesson 14)
Jada reads 5 pages every 20 minutes. At this rate, how many pages can she read in 1 hour?

1. Use a double number line to find the answer.



2. Use a table to find the answer.

pages read	time in minutes
5	20

3. Explain which strategy you thinks works better in finding the answer.

Solution

1. 15 pages. The missing labels should be 10 and 15.

2. Answers vary. Sample responses:

pages read	time in minutes
5	20
0.25	1
15	60

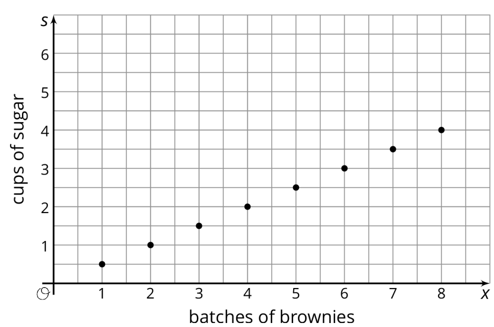
pages read	time in minutes
5	20
10	40
15	60

3. Answers vary. Sample response: The table is more efficient, because I can skip values.

Lesson 16

Problem 1

Here is a graph that shows some values for the number of cups of sugar, s, required to make x batches of brownies.



1. Complete the table so that the pair of numbers in each column represents the coordinates of a point on the graph.

x	1	2	3	4	5	6	7
s							

2. What does the point $(8, 4)$ mean in terms of the amount of sugar and number of batches of brownies?

3. Write an equation that shows the amount of sugar in terms of the number of batches.

Solution

1.

x	1	2	3	4	5	6	7
s	$\frac{1}{2}$	1	$\frac{3}{2}$	2	$\frac{5}{2}$	3	$\frac{7}{2}$

2. To make 8 batches of brownies, you need 4 cups of sugar.

3. $s = \frac{1}{2}x$

Problem 2

Each serving of a certain fruit snack contains 90 calories.

1. Han wants to know how many calories he gets from the fruit snacks. Write an equation that shows the number of calories, c, in terms of the number of servings, n.

2. Tyler needs some extra calories each day during his sports season. He wants to know how many servings he can have each day if all the extra calories come from the fruit snack. Write an equation that shows the number of servings, n, in terms of the number of calories, c.

Solution

1. $c = 90n$

2. $n = \frac{c}{90}$ or $n = c \div 90$

Problem 3

Kiran shops for books during a 20% off sale.

1. What percent of the original price of a book does Kiran pay during the sale?

2. Complete the table to show how much Kiran pays for books during the sale.

3. Write an equation that relates the sale price, s, to the original price p.

4. On graph paper, create a graph showing the relationship between the sale price and the original price by plotting the points from the table.

original price in dollars (s)	sale price in dollars (p)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

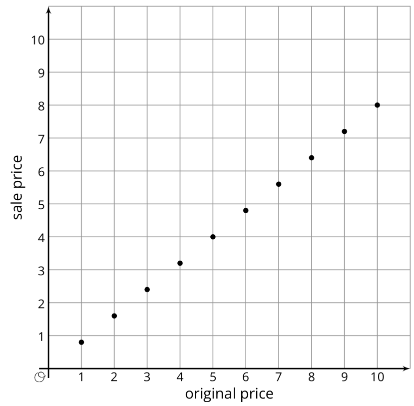
Solution

1. 80%

2. Sale prices: 0.80, 1.60, 2.40, 3.20, 4.00, 4.80, 5.60, 6.40, 7.20, 8.00

3. $s = 0.8p$

4.



Lesson 17

Problem 1

A car is traveling down a road at a constant speed of 50 miles per hour.

1. Complete the table with the amounts of time it takes the car to travel certain distances, or the distances traveled for certain amounts of time.

2. Write an equation that represents the distance traveled by the car, d, for an amount of time, t.

3. In your equation, which is the dependent variable and which is the independent variable?

time (hours)	distance (miles)
2	
1.5	
t	
	50
	300
	d

Solution

time (hours)	distance (miles)
2	100
1.5	75
t	$50t$
1	50
6	300
$\frac{1}{50}d$	d

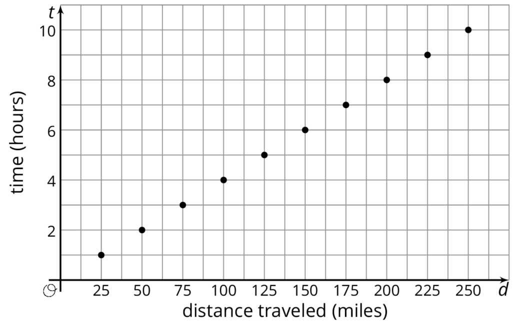
1. see table

2. $d = 50t$

3. t is the independent variable and d is the dependent variable.

Problem 2

The graph represents the amount of time in hours it takes a ship to travel various distances in miles.



1. Write the coordinates of one of point on the graph. What does the point represent?
2. What is the speed of the ship in miles per hour?
3. Write an equation that relates the time, t, it takes to travel a given distance, d.

Solution

1. Answers vary. Sample response: $(75, 3)$. This point represents that the ship travels 75 miles in 3 hours.
2. 25 miles per hour
3. $d = 25t$ or $t = \frac{d}{25}$

Problem 3

(from Unit 6, Lesson 15)
Find a solution to each equation in the list that follows (not all numbers will be used):

1. $2^x = 8$
2. $2^x = 2$
3. $x^2 = 100$
4. $x^2 = \frac{1}{100}$
5. $x^1 = 7$
6. $2^x \cdot 2^3 = 2^7$
7. $\frac{2^x}{2^3} = 2^5$

List:

$\frac{1}{10}$

$\frac{1}{3}$

1

2

3

4

5

7

8

10

16

Solution

1. 3
2. 1
3. 10
4. $\frac{1}{10}$
5. 7
6. 4
7. 8

Problem 4

(from Unit 6, Lesson 11)
Select **all** the expressions that are equivalent to $5x + 30x - 15x$.

A. $5(x + 6x - 3x)$

B. $(5 + 30 - 15) \cdot x$

C. $x(5 + 30x - 15x)$

D. $5x(1 + 6 - 3)$

E. $5(x + 30x - 15x)$

Solution

A, B, D

Lesson 18

Problem 1

Elena is designing a logo in the shape of a parallelogram. She wants the logo to have an area of 12 square inches. She draws bases of different lengths and tries to compute the height for each.

1. Write an equation Elena can use to find the height, h, for each value of the base, b.
2. Use your equation to find the height of a parallelogram with base 1.5 inches.

Solution

1. $h = \frac{12}{b}$
2. 8 inches

Problem 2

Han is planning to ride his bike 24 miles.

1. If he rides at a rate of 3 miles per hour, how long will it take?

   At 4 miles per hour?

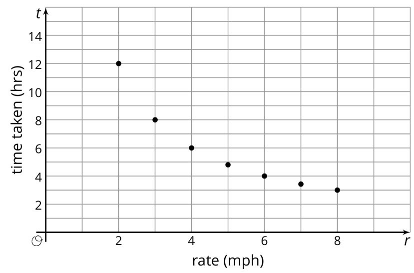
   At 6 miles per hour?
2. Write an equation that Han can use to find t, the time it will take to ride 24 miles, if his rate in miles per hour is represented by r.
3. On graph paper, draw a graph that shows t in terms of r for a 24-mile ride.

Solution

1. 8 hours, 6 hours, 4 hours

2. $t = 24 \div r$ or $t = \frac{24}{r}$.

3.



Problem 3

The graph of the equation $V = 10s^3$ contains the points $(2, 80)$ and $(4, 640)$.

1. Create a story that is represented by this graph.

2. What do the points mean in the context of your story?

Solution

Answers vary. Sample response: Lin and Jada each build a tower of 10 cubes. Lin's cubes have edge length 2 and Jada's have edge length 4. They use the equation $V = 10s^3$ to compute the volume of their towers.

Problem 4

You find a brass bottle that looks really old. When you rub some dirt off of the bottle, a genie appears! The genie offers you a reward. You must choose one:

- $50,000; or

- A magical $1 coin. The coin will turn into two coins on the first day. The two coins will turn into four coins on the second day. The four coins will double to 8 coins on the third day. The genie explains the doubling will continue for 28 days.

1. Write an equation that shows the number of coins, n, in terms of the day, d.

2. Create a table that shows the number of coins for each day for the first 15 days.

3. Create a graph for days 7 through 12 that shows how the number of coins grows with each day.

Solution

1. $n = 2^d$