



Unit 7 Practice Problems

Lesson 1

Problem 1

1. Is a temperature of -11 degrees warmer or colder than a temperature of -15 degrees?
2. Is an elevation of -10 feet closer or farther from the surface of the ocean than an elevation of -8 feet?
3. It was 8 degrees at nightfall. The temperature dropped 10 degrees by midnight. What was the temperature at midnight?
4. A diver is 25 feet below sea level. After he swims up 15 feet toward the surface, what is his elevation?

Solution

1. Warmer
2. Farther
3. -2 degrees
4. -10 feet or 10 feet below sea level

Problem 2

1. A whale is at the surface of the ocean to breathe. What is the whale's elevation?
2. The whale swims down 300 feet to feed. What is the whale's elevation now?
3. The whale swims down 150 more feet more. What is the whale's elevation now?
4. Plot each of the three elevations as a point on a vertical number line. Label each point with its numeric value.

Solution

1. 0 . (Sea level is 0 feet above or below sea level.)
2. -300 feet. (The whale is 300 feet *below* sea level.)
3. -450 feet. (The whale was 300 feet *below* sea level, and now it is an additional 150 feet below sea level.)

4. A number line with 0, -300, and -450 marked.

Problem 3

(from Unit 6, Lesson 5)

Explain how to calculate a number that is equal to $\frac{2.1}{1.5}$.

Solution

Answers vary. Sample response: $\frac{2.1}{1.5}$ means $2.1 \div 1.5$. This can be done by long division. (The question doesn't require it, but the quotient is 1.4.)

Problem 4

(from Unit 6, Lesson 4)

Write an equation to represent each situation and then solve the equation.

1. Andre drinks 15 ounces of water, which is $\frac{3}{5}$ of a bottle. How much does the bottle hold? Use x for the number of ounces of water the bottle holds.
2. A bottle holds 15 ounces of water. Jada drank 8.5 ounces of water. How many ounces of water are left in the bottle? Use y for the number of ounces of water left in the bottle.
3. A bottle holds z ounces of water. A second bottle holds 16 ounces, which is $\frac{8}{5}$ times as much water. How much does the first bottle hold?

Solution

1. $\frac{3}{5}x = 15$. Solution: 25.
2. $y + 8.5 = 15$. Solution: 6.5.
3. $\frac{8}{5}z = 16$ Solution: 10. Equations equivalent to these are also acceptable.

Problem 5

(from Unit 4, Lesson 13)

A rectangle has an area of 24 square units and a side length of $2\frac{3}{4}$ units. Find the other side length of the rectangle. Show your reasoning.

Solution

$8\frac{1}{11}$. Sample reasoning: $24 \div \frac{11}{4} = 24 \cdot \frac{4}{11} = \frac{96}{11} = 8\frac{1}{11}$.

Lesson 2

Problem 1

For each number, name its opposite.

- | | |
|----------|-----------|
| 1. -5 | 4. 0.875 |
| 2. 28 | 5. 0 |
| 3. -10.4 | 6. -8,003 |

Solution

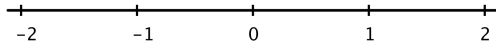
1. 5
2. -28
3. 10.4
4. -0.875

5. 0

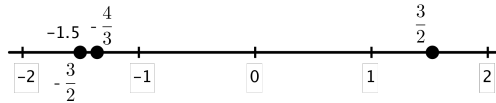
6. 8,003

Problem 2

Plot the numbers -1.5 , $\frac{3}{2}$, $-\frac{3}{2}$, and $-\frac{4}{3}$ on the number line. Label each point with its numeric value.



Solution

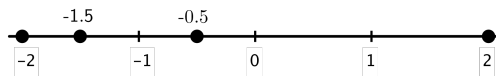


Problem 3

Plot the following points on a number line.

- -1.5
- the opposite of 0.5
- the opposite of -2
- -2

Solution



Problem 4

(from Unit 7, Lesson 1)

1. Represent each of these temperatures in degrees Fahrenheit with a positive or negative number.
 - a. 5 degrees above zero
 - b. 3 degrees below zero
 - c. 6 degrees above zero
 - d. $2\frac{3}{4}$ degrees below zero
2. Order the temperatures above from the coldest to the warmest.

Solution

1. 5, -3 , 6, $-2\frac{3}{4}$
2. -3 , $-2\frac{3}{4}$, 5, 6

Problem 5

(from Unit 6, Lesson 5)

Solve each equation.

1. $8x = \frac{2}{3}$
2. $1\frac{1}{2} = 2x$
3. $5x = \frac{2}{7}$

4. $\frac{1}{4}x = 5$

5. $\frac{1}{5} = \frac{2}{3}x$

Solution

1. $x = \frac{2}{24}$ (or equivalent)

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

3. $x = \frac{2}{35}$ (or equivalent)

4. $x = 20$

5. $x = \frac{3}{10}$ (or equivalent)

Problem 6

(from Unit 6, Lesson 5)

Write the solution to each equation as a fraction and as a decimal.

1. $2x = 3$

2. $5y = 3$

3. $0.3z = 0.009$

Solution

1. $x = \frac{3}{2}$ or $x = 1.5$

2. $y = \frac{3}{5}$ or $y = 0.6$

3. $z = \frac{0.009}{0.3}$ or $z = 0.03$ or $z = \frac{3}{100}$

Problem 7

(from Unit 3, Lesson 4)

There are 15.24 centimeters in 6 inches.

1. How many centimeters are in 1 foot?

2. How many centimeters are in 1 yard?

Solution

1. 30.48 centimeters

2. 91.44 centimeters

Lesson 3

Problem 1

Decide whether each inequality statement is true or false. Explain your reasoning.

1. $-5 > 2$

2. $3 > -8$

3. $-12 > -15$

4. $-12.5 > -12$

Solution

1. False, -5 is to the left of 2.
2. True, 3 is to the right of -8.
3. True, -12 is to the right of -15.
4. False, -12.5 is to the left of -12.

Problem 2

Here is a true statement: $-8.7 < -8.4$. Select **all** of the statements that are equivalent to $-8.7 < -8.4$.

- A. -8.7 is further to the right on the number line than -8.4.
- B. -8.7 is further to the left on the number line than -8.4.
- C. -8.7 is less than -8.4.
- D. -8.7 is greater than -8.4.
- E. -8.4 is less than -8.7.
- F. -8.4 is greater than -8.7.

Solution

B, C, F

Problem 3

(from Unit 7, Lesson 4)

The table shows five states and the lowest point in each state.

state	lowest elevation (feet)
California	-282
Colorado	3350
Louisiana	-8
New Mexico	2842
Wyoming	3099

Put the states in order by their lowest elevation, from least to greatest.

Solution

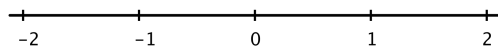
California, Louisiana, New Mexico, Wyoming, Colorado

Problem 4

(from Unit 7, Lesson 2)

Plot each of the following numbers on the number line. Label each point with its numeric value.

0.4, -1.5, $-1\frac{7}{10}$, $-\frac{11}{10}$



Solution

A correct solution has four points plotted in the following order from left to right: $-1\frac{7}{10}$, -1.5, $-\frac{11}{10}$ (between -2 and -1), 0.4 (between 0 and 1).

Problem 5

(from Unit 6, Lesson 6)

Each lap around the track is 400 meters.

1. How many meters does someone run if they run:

2 laps?	5 laps?	x laps?
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2. If Noah ran 14 laps, how many meters did he run?
3. If Noah ran 7,600 meters, how many laps did he run?

Solution

1. 800 meters ($400 \cdot 2 = 800$), 2,000 meters ($400 \cdot 5 = 2,000$), 400x meters or equivalent
2. 5,600 ($400 \cdot 14 = 5,600$)
3. 19 ($7600 \div 400 = 19$)

Problem 6

(from Unit 3, Lesson 16)

A stadium can seat 16,000 people at full capacity.

1. If there are 13,920 people in the stadium, what percentage of the capacity is filled? Explain or show your reasoning.
2. What percentage of the capacity is not filled?

Solution

1. 87% is filled, because $13,920 \div 16,000 = 0.87$.
2. 13% remains, because $100 - 87 = 13$.

Lesson 4

Problem 1

Select **all** of the numbers that are *greater than* -5.

- A. 1.3
- B. -6
- C. -12
- D. $\frac{1}{7}$
- E. -1
- F. -4

Solution

A, D, E, F

Problem 2

Order these numbers from least to greatest: $\frac{1}{2}$, 0, 1, $-1\frac{1}{2}$, $-\frac{1}{2}$, -1

Solution

$-1\frac{1}{2}$, -1, $-\frac{1}{2}$, 0, $\frac{1}{2}$, 1

Problem 3

Here are the boiling points of certain elements in degrees Celsius:

- Argon: -185.8
- Chlorine: -34
- Fluorine: -188.1

- Hydrogen: -252.87
- Krypton: -153.2

List the elements from least to greatest boiling points.

Solution

Hydrogen, fluorine, argon, krypton, chlorine

Problem 4

(from Unit 7, Lesson 2)

Explain why zero is considered its own opposite.

Solution

Answer vary. Sample response: Opposites are equally distant from 0. Since 0 is the only number that is 0 units from 0, it has to be its own opposite. $0 + 0 = 0$.

Problem 5

(from Unit 6, Lesson 9)

Explain how to make these calculations mentally.

1. $99 + 54$
2. $244 - 99$
3. $99 \cdot 6$
4. $99 \cdot 15$

Solution

Answers vary. Sample responses:

1. 153; this is one less than $100 + 54 = 154$.
2. 145; this is one more than $244 - 100 = 144$.
3. 594; this is one 6 short of 100 sixes or 600.
4. 1485; this is one 15 short of 100 fifteens or 1500.

Problem 6

(from Unit 4, Lesson 11)

Find the quotients.

1. $\frac{1}{2} \div 2$
2. $2 \div 2$
3. $\frac{1}{2} \div \frac{1}{2}$
4. $\frac{38}{79} \div \frac{38}{79}$

Solution

1. $\frac{1}{4}$
2. 1
3. 1
4. 1

Problem 7

(from Unit 3, Lesson 4)

Over several months, the weight of a baby measured in pounds doubles. Does its weight measured in kilograms also double? Explain.

Solution

Yes. Explanations vary. Sample explanation: The weight itself doubles, so any measurement of the weight using the same units will also double. We can also see that by saying if the weight is x pounds, then double that weight would be $2x$ pounds. The weight in kilograms will be $x \div 2.2$, and the double weight will be $(2x) \div 2.2$ or $2(x \div 2.2)$, which is also double.

Lesson 5

Problem 1

Write a positive or negative number to represent each change in the high temperature.

1. Tuesday's high temperature was 4 degrees less than Monday's high temperature.
2. Wednesday's high temperature was 3.5 degrees less than Tuesday's high temperature.
3. Thursday's high temperature was 6.5 degrees more than Wednesday's high temperature.
4. Friday's high temperature was 2 degrees less than Thursday's high temperature.

Solution

1. -4
2. -3.5
3. +6.5 or 6.5
4. -2

Problem 2

Decide which of the following quantities can be represented by a positive number and which can be represented by a negative number. Give an example of a quantity with the opposite sign in the same situation.

1. Tyler's puppy gained 5 pounds.
2. The aquarium leaked 2 gallons of water.
3. Andre received a gift of \$10.
4. Kiran gave a gift of \$10.
5. A climber descended 550 feet.

Solution

Answers vary. Sample responses:

1. Positive. Tyler's puppy lost 5 pounds.
2. Negative. 2 gallons of water was added to the aquarium.

3. Positive. Andre gave a gift of \$10.
4. Negative. Kiran received a gift of \$10.
5. Negative. A climber ascended 550 feet.

Problem 3

Make up a situation where a quantity is changing.

1. Explain what it means to have a negative change.
2. Explain what it means to have a positive change.
3. Give an example of each.

Solution

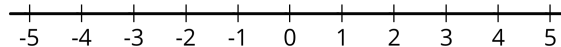
Answers vary. Sample response: They were selling candy at the concession stand.

1. When they sell candy, the change is negative.
2. When they get more candy to sell, the change is positive.
3. For example, in one hour the number of packages of candy changed by -5 because they sold 5, and in the next hour it changed by 20 because they got 20 more to sell.

Problem 4

(from Unit 7, Lesson 2)

1. On the number line, label the points that are 4 units away from 0.
2. If you fold the number line so that a vertical crease goes through 0, the points you label would match up. Explain why this happens.
3. On the number line, label the points that are $\frac{5}{2}$ units from 0. What is the distance between these points?



Solution

1. On the number line, -4 and 4 should be labeled.
2. The two points match up because they are opposites; they are the same distance from 0.
3. 2.5 and -2.5 should be labeled. The distance between them is 5 units, because each one is 2.5 units away from 0.

Problem 5

(from Unit 6, Lesson 12)

Evaluate each expression.

1. $2^3 \cdot 3$
2. $\frac{4^2}{2}$
3. 3^1
4. $6^2 \div 4$
5. $2^3 - 2$
6. $10^2 + 5^2$

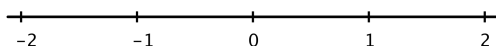
Solution

- 1. 24
- 2. 8
- 3. 3
- 4. 9
- 5. 6
- 6. 125

Lesson 6

Problem 1

On the number line, plot and label all numbers with an absolute value of $\frac{3}{2}$.



Solution

Points $\frac{3}{2}$ and $-\frac{3}{2}$, $1\frac{1}{2}$ and $-1\frac{1}{2}$, or 1.5 and -1.5 should be plotted.

Problem 2

The temperature at dawn is 6°C away from 0. Select **all** the temperatures that are possible.

- A. -12°C
- B. -6°C
- C. 0°C
- D. 6°C
- E. 12°C

Solution

B, D

Problem 3

(from Unit 7, Lesson 7)

Put these numbers in order, from least to greatest.

$|-2.7|$ 0 1.3 $|-1|$ 2

Solution

0 $|-1|$ 1.3 2 $|-2.7|$

Problem 4

(from Unit 6, Lesson 16)

Elena donates some money to charity whenever she earns money as a babysitter. The table shows how much money, d , she donates for different amounts of money, m , that she earns.

d	4.44	1.80	3.12	3.60	2.16
m	37	15	26	30	18

- 1. What percent of her income does Elena donate to charity? Explain or show your work.

2. Which quantity, m or d , would be the better choice for the dependent variable in an equation describing the relationship between m and d ? Explain your reasoning.
3. Use your choice from the second question to write an equation that relates m and d .

Solution

1. Elena donates 12% of her income to charity. Sample reasoning: We want to know what percent of 30 is 3.6, so we can write $30p = 3.6$. To solve this, divide 3.6 by 30, which is 0.12. So 12% of 30 is 3.6.
2. Answers vary. Sample response: Since the amount of the donation depends on how much money she earns, d would be better as the dependent variable. If she wants to donate a certain amount and needs to figure out how much she needs to earn to achieve that donation, then m would be better as the dependent variable.
3. $d = .12m$ or equivalent $m = \frac{100}{12}d$ or $m = d \div .12$ or equivalent

Problem 5

(from Unit 6, Lesson 12)

How many times larger is the first number in the pair than the second?

1. 3^4 is _____ times larger than 3^3 .
2. 5^3 is _____ times larger than 5^2 .
3. 7^{10} is _____ times larger than 7^8 .
4. 17^6 is _____ times larger than 17^4 .
5. 5^{10} is _____ times larger than 5^4 .

Solution

1. 3
2. 5
3. 7^2 or 49
4. 17^2 or 289
5. 5^6 or 15,625

Problem 6

(from Unit 5, Lesson 11)

Lin's family needs to travel 325 miles to reach her grandmother's house.

1. At 26 miles, what percentage of the trip's distance have they completed?
2. How far have they traveled when they have completed 72% of the trip's distance?
3. At 377 miles, what percentage of the trip's distance have they completed?

Solution

1. 8% of the trip, because $26 \div 325 = 0.08$.
2. 234 miles, because $0.72 \cdot 325 = 234$.
3. 116% of the trip, because $377 \div 325 = 1.16$.

Lesson 7

Problem 1

In the context of elevation, what would $|-7|$ feet mean?

Solution

The vertical distance between the point at -7 feet and sea level (0 feet).

Problem 2

Match the the statements written in English with the mathematical statements.

- | | |
|--|------------------|
| A. The number -4 is a distance of 4 units away from 0 on the number line. | 1. $ -63 > 4$ |
| B. The number -63 is more than 4 units away from 0 on the number line. | 2. $-63 < 4$ |
| C. The number 4 is greater than the number -4. | 3. $ -63 > 4 $ |
| D. The numbers 4 and -4 are the same distance away from 0 on the number line. | 4. $ -4 = 4$ |
| E. The number -63 is less than the number 4. | 5. $4 > -4$ |
| F. The number -63 is further away from 0 than the number 4 on the number line. | 6. $ 4 = -4 $ |

Solution

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

Problem 3

Compare each pair of expressions using $>$, $<$, or $=$.

- | | |
|-------------------------|--------------------------|
| 1. -32 _____ 15 | 5. 2 _____ -17 |
| 2. $ -32 $ _____ $ 15 $ | 6. 2 _____ $ -17 $ |
| 3. 5 _____ -5 | 7. $ -27 $ _____ $ -45 $ |
| 4. $ 5 $ _____ $ -5 $ | 8. $ -27 $ _____ -45 |

Solution

- 1. $-32 < 15$ because 15 is further right on the number line.
- 2. $|-32| > |15|$ because -32 is further from zero than 15.
- 3. $5 > -5$ because 5 is further right on the number line than -5.
- 4. $|5| = |-5|$, because 5 and -5 are the same distance away from zero.

5. $2 > -17$ because 2 is further right on the number line than -17.
6. $2 < |-17|$ because -17 is more than 2 units away from zero.
7. $|-27| < |-45|$ because -45 is further from zero than -27.
8. $|-27| > -45$ because $27 > -45$.

Problem 4

(from Unit 7, Lesson 5)

Mai received and spent money in the following ways last month. For each example, write a signed number to represent the change in money from her perspective.

1. Her grandmother gave her \$25 in a birthday card.
2. She earned \$14 dollars babysitting.
3. She spent \$10 on a ticket to the concert.
4. She donated \$3 to a local charity
5. She got \$2 interest on money that was in her savings account.

Solution

1. +25 or 25
2. +14 or 14
3. -10
4. -3
5. + 2 or 2

Problem 5

(from Unit 7, Lesson 1)

Here are the lowest temperatures recorded in the last 2 centuries for some US cities. Temperatures are in degrees Fahrenheit.

- Death Valley, CA was -45 in January of 1937.
- Danbury, CT was -37 in February of 1943.
- Monticello, FL was -2 in February of 1899.
- East Saint Louis, IL was -36 in January of 1999.
- Greenville, GA was -17 in January of 1940.

1. Which of these states has the lowest record temperature?
2. Which state has a lower record temperature, FL or GA?
3. Which state has a lower record temperature, CT or IL?
4. How many more degrees colder is the record temperature for GA than for FL?

Solution

1. CA
2. GA
3. CT
4. 15 degrees

Problem 6

(from Unit 5, Lesson 13)

Find the quotients.

1. $0.024 \div 0.015$
2. $0.24 \div 0.015$
3. $0.024 \div 0.15$
4. $24 \div 15$

Solution

1. 1.4
2. 14
3. 0.14
4. 1.4

Lesson 8

Problem 1

At the book sale, all books cost less than \$5.

1. What is the most expensive a book could be?
2. Write an inequality to represent costs of books at the sale.
3. Draw a number line to represent the inequality.

Solution

1. \$4.99
2. Answer varies. Sample response: If p is the price of a book, then $p < 5$.
3. The number line has an open circle and an arrow drawn to the left starting with 5.

Problem 2

Kiran started his homework *before* 7:00 p.m. and finished his homework *after* 8:00 p.m. Let h represent the number of hours Kiran worked on his homework.

Decide if each statement it is definitely true, definitely not true, or possibly true. Explain your reasoning.

1. $h > 1$
2. $h > 2$
3. $h < 1$
4. $h < 2$

Solution

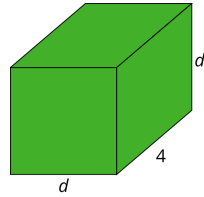
1. Definitely true. Kiran worked from 7:00 until 8:00 and some additional time.
2. Possibly true. It is true if Kiran started his homework at 6:15 and stopped at 8:30. It could also be false if Kiran started his work at 6:45 and finished at 8:15.

3. Definitely false. $h > 1$ is true.
4. Possibly true. $h > 2$ might be true, but it might also be false.

Problem 3

(from Unit 6, Lesson 14)

Consider a rectangular prism with length 4 and width and height d .



1. Find an expression for the volume of the prism in terms of d .
2. Compute the volume of the prism when $d = 1$, when $d = 2$, and when $d = \frac{1}{2}$.

Solution

1. $4d^2$
2. When $d = 1$, the volume is 4. When $d = 2$, the volume is 16. When $d = \frac{1}{2}$, the volume is 1.

Problem 4

(from Unit 7, Lesson 7)

Match the mathematical statements with the statements written in English. All of these statements are true.

- | | |
|--------------------|--|
| A. $ -12 > -15$ | 1. The number -15 is further away from 0 than the number -12 on the number line. |
| B. $-15 < -12$ | 2. The number -12 is a distance of 12 units away from 0 on the number line. |
| C. $ -15 > -12 $ | 3. The distance between -12 and 0 on the number line is greater than -15. |
| D. $ -12 = 12$ | 4. The numbers 12 and -12 are the same distance away from 0 on the number line. |
| E. $12 > -12$ | 5. The number -15 is less than the number -12. |
| F. $ 12 = -12 $ | 6. The number 12 is greater than the number -12. |

Solution

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

Problem 5

(from Unit 6, Lesson 11)

Here are five sums. Use the distributive property to write each sum as a product with two factors.

1. $2a + 7a$

4. $r + r + r + r$

2. $5z - 10$

5. $2x - \frac{1}{2}$

3. $c - 2c^2$

Solution

Answers vary. For examples:

1. $(2 + 7)a$ or $9a$

2. $5(z - 2)$

3. $c(1 - 2c)$

4. $(1 + 1 + 1 + 1)r$ or $4r$

5. $2(x - \frac{1}{4})$ or $\frac{1}{2}(4x - 1)$

Lesson 9

Problem 1

1. Select **all** numbers that are solutions to the inequality $k > 5$.
 - a. 4
 - b. 5
 - c. 6
 - d. 5.2
 - e. 5.01
 - f. 0.5
2. Draw a number line to represent this inequality.

Solution

1. 6, 5.2, 5.01
2. The number line should show an open circle above the number 5 and an arrow pointing to the right.

Problem 2

A sign on the road says: "Speed limit, 60 mph."

1. Let s be the speed of a car. Write an inequality that matches the information on the sign.
2. Draw a number line to represent the solutions to the inequality.
3. Could 60 be a value of s ? Explain your reasoning.

Solution

1. $s < 60$ or $s = 60$, or equivalent
2. The number line should show a closed circle at 60 and an arrow pointing to the left.
3. Yes, 60 is the limit.

Problem 3

One day in Boston, MA, the high temperature was 60 degrees Fahrenheit, and the low temperature was 52 degrees.

1. Write one or more inequalities to describe the temperatures T that are between the high and low temperature on that day.
2. Show the possible temperatures on a number line.

Solution

1. $52 < T$ and $T < 60$ or equivalent
2. A graph showing empty circles at 52 and 60 and all of the numbers between.

Problem 4

(from Unit 7, Lesson 7)
Select **all** the true statements.

- A. $-5 < |-5|$
- B. $|-6| < -5$
- C. $|-6| < 3$
- D. $4 < |-7|$
- E. $|-7| < |-8|$

Solution

A, D, E

Problem 5

(from Unit 6, Lesson 15)
Match each equation to its solution.

- A. $x^4 = 81$
 - B. $x^2 = 100$
 - C. $x^3 = 64$
 - D. $x^5 = 32$
- 1. 2
 - 2. 3
 - 3. 4
 - 4. 10

Solution

- A: 2
- B: 4
- C: 3
- D: 1

Problem 6

(from Unit 3, Lesson 14)

1. The price of a cell phone is usually \$250. Elena's mom buys one of these cell phones for \$150. What percentage of the usual price did she pay?
2. Elena's dad buys another type of cell phone that also usually sells for \$250. He pays 75% of the usual price. How much did he pay?

Solution

1. 60%
2. \$187.50

Sample reasoning:

number	percentage
250	100
10	4
150	60
62.5	25
187.5	75

Lesson 10

Problem 1

There is a closed carton of eggs in Mai's refrigerator. The carton contains e eggs and it can hold 12 eggs.

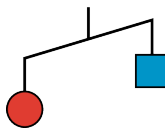
1. What does the inequality $e < 12$ mean in this context?
2. What does the inequality $e > 0$ mean in this context?
3. What are some possible values of e that will make both $e < 12$ and $e > 0$ true?

Solution

1. There are *fewer* than 12 eggs in the carton; the carton is not full.
2. There are *more* than 0 eggs in the carton; the carton is not empty.
3. There could be as few as 1 egg or as many as 11 eggs in the carton: any whole number of eggs from 1 up to 11.

Problem 2

Here is a diagram of an unbalanced hanger.



1. Write an inequality to represent the relationship of the weights. Use s to represent the weight of the square in grams and c to represent the weight of the circle in grams.

2. One red circle weighs 12 grams. Write an inequality to represent the weight of one blue square.
3. Could 0 be a value of s ? Explain your reasoning.

Solution

1. $s < c$
2. $s < 12$
3. No, 0 could not be a value of s because the square represents an object. It must have some weight, even if it is very small.

Problem 3

Tyler has more than \$10. Elena has more money than Tyler. Mai has more money than Elena. Let t be the amount of money that Tyler has, let e be the amount of money that Elena has, and let m be the amount of money that Mai has. Select **all** statements that are true:

- A. $t < j$
- B. $m > 10$
- C. $e > 10$
- D. $t > 10$
- E. $e > m$
- F. $t < e$

Solution

A, B, C, F

Problem 4

(from Unit 7, Lesson 8)

1. Jada is taller than Diego. Diego is 54 inches tall (4 feet, 6 inches). Write an inequality that compares Jada's height in inches, j , to Diego's height.
2. Jada is shorter than Elena. Elena is 5 feet tall. Write an inequality that compares Jada's height in inches, j , to Elena's height.

Solution

1. $j > 54$
2. $j < 60$

Problem 5

(from Unit 7, Lesson 3)

Which is greater, $\frac{-9}{20}$ or -0.5 ? Explain how you know. If you get stuck, consider plotting the numbers on a number line.

Solution

$\frac{-9}{20}$ is larger. Explanations vary. Sample explanation: $\frac{-9}{20} = -0.45$, and this is to the right of -0.5 on the number line. So, $\frac{-9}{20}$ is larger.

Problem 6

(from Unit 6, Lesson 13)

Select **all** the expressions that are equivalent to $(\frac{1}{2})^3$.

- A. $\frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2}$
- B. $\frac{1}{2^3}$
- C. $(\frac{1}{3})^2$
- D. $\frac{1}{6}$
- E. $\frac{1}{8}$

Solution

A, B, E

Lesson 11

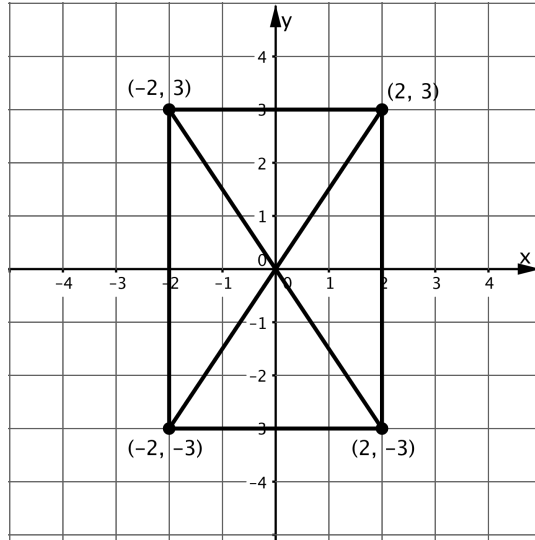
Problem 1

1. Graph these points in a coordinate plane: $(-2, 3)$, $(2, 3)$, $(-2, -3)$, $(2, -3)$.

2. Connect all of the points. Describe the figure.

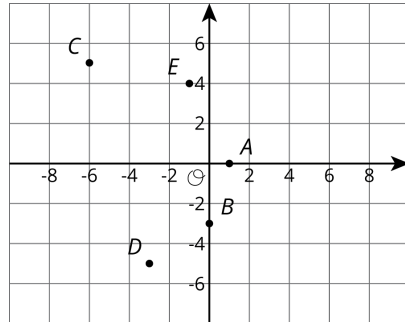
Solution

1. The points $A = (-2, 3)$, $B = (2, 3)$, $C = (-2, -3)$, $D = (2, -3)$ are shown on a coordinate plane with segments between them.
2. Graph



Problem 2

Write the coordinates of each point.



Solution

$A = (1, 0)$, $B = (0, -3)$, $C = (-6, 5)$, $D = (-3, -5)$, $E = (-1, 4)$

Problem 3

These three points form a horizontal line: $(-3.5, 4)$, $(0, 4)$, and $(6.2, 4)$. Name two additional points that fall on this line.

Solution

Answers vary. Any answer that has a y-coordinate of 4 is on the line.

Problem 4

(from Unit 7, Lesson 2)

One night, it is 24°C warmer in Tucson than it was in Minneapolis. If the temperatures in Tucson and Minneapolis are opposites, what is the temperature in Tucson?

- A. -24°C
- B. -12°C

C. 12°C

D. 24°C

Solution

C

Problem 5

(from Unit 6, Lesson 16)

Noah is helping his band sell boxes of chocolate to fund a field trip. Each box contains 20 bars and each bar sells for \$1.50.

1. Complete the table for values of m .

boxes sold (b)	money collected (m)
1	
2	
3	
4	
5	
6	
7	
8	

2. Write an equation for the amount of money, m , that will be collected if b boxes of chocolate bars are sold. Which is the independent variable and which is the dependent variable in your equation?
3. Write an equation for the number of boxes, b , that were sold if m dollars were collected. Which is the independent variable and which is the dependent variable in your equation?

Solution

1. Values for m : 30, 60, 90, 120, 150, 180, 210, 240
2. $m = 30b$, b is independent, m is dependent
3. $b = \frac{m}{30}$, m is independent, b is dependent

Problem 6

(from Unit 2, Lesson 9)

Lin ran 29 meters in 10 seconds. She ran at a constant speed.

1. How far did Lin run every second?
2. At this rate, how far can she run in 1 minute?

Solution

1. 2.9 meters every second, because $29 \div 10 = 2.9$.
2. 174 meters, because $(2.9) \cdot 60 = 174$.

Lesson 12

Problem 1

Draw and label an appropriate pair of axes and plot the points.

$(\frac{1}{5}, \frac{4}{5})$

$$\left(-\frac{3}{5}, \frac{2}{5}\right)$$

$$\left(-1\frac{1}{5}, -\frac{4}{5}\right)$$

$$\left(\frac{1}{5}, -\frac{3}{5}\right)$$

Solution

Answers vary. Check student work to ensure they made reasonable choices about axes and scale that allowed them to clearly plot all the points.

Problem 2

Diego was asked to plot these points: $(-50, 0)$, $(150, 100)$, $(200, -100)$, $(350, 50)$, $(-250, 0)$. What interval could he use for each axis? Explain your reasoning.

Solution

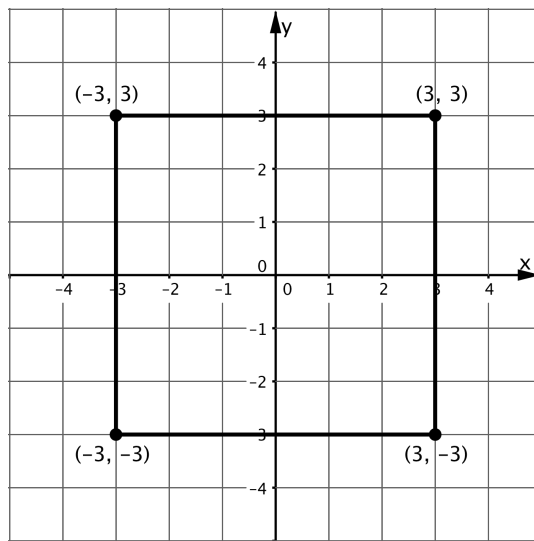
Answers vary. Sample response: Use an interval of 50, because all the coordinates involve points that are greater than 50 and multiples of 50.

Problem 3

1. Name 4 points that would form a square with the origin at its center.
2. Graph these points to check if they form a square.

Solution

Answers vary. Sample response: $A = (3, 3)$, $B = (3, -3)$, $C = (-3, 3)$, $D = (-3, -3)$



Problem 4

(from Unit 7, Lesson 5)

Which of the following changes would you represent using a negative number? Explain what a positive number would represent in that situation.

1. A loss of 4 points
2. A gain of 50 yards
3. A loss of \$10
4. An elevation above sea level

Solution

Answers vary. Sample response:

1 and 3 can be represented with negative numbers. A loss of 4 points is -4, but if any points are gained, the value becomes positive. A loss of \$10 is -10, but if any money is earned, the value becomes positive.

Problem 5

(from Unit 6, Lesson 16)

Jada is buying notebooks for school. The cost of each notebook is \$1.75.

1. Write an equation that shows the cost of Jada's notebooks, c , in terms of the number of notebooks, n , that she buys.
2. Which of the following could be points on the graph of your equation?
(1.75, 1) (2, 3.50) (5, 8.75) (17.50, 10) (9, 15.35)

Solution

1. $c = 1.75n$
2. b and c

Problem 6

(from Unit 5, Lesson 13)

A corn field has an area of 28.6 acres. It requires about 15,000,000 gallons of water. About how many gallons of water per acre is that?

- A. 5,000
- B. 50,000
- C. 500,000
- D. 5,000,000

Solution

C. $(15,000,000 \div 28.6)$ has a value that is closest to 500,000

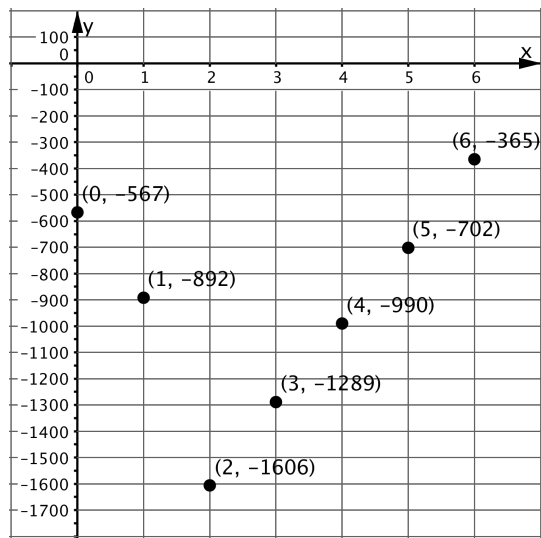
Lesson 13

Problem 1

The elevation of a submarine is shown in the table. Draw and label coordinate axes with an appropriate scale and plot the points.

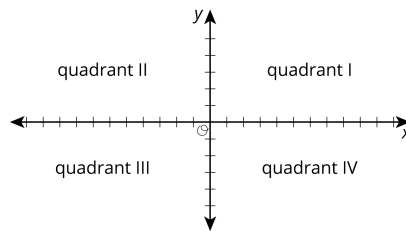
time after noon (hours)	elevation (meters)
0	-567
1	-892
2	-1,606
3	-1,289
4	-990
5	-702
6	-365

Solution



Problem 2

The x -axis represents the number of hours before or after noon, and the y -axis represents the temperature in degrees Celsius.



1. At 9 a.m., it was below freezing. In what quadrant would this point be plotted?
2. At 11 a.m., it was 10°C . In what quadrant would this point be plotted?
3. Choose another time and temperature. Then tell the quadrant where the point should be plotted.
4. What does the point $(0, 0)$ represent in this context?

Solution

1. Quadrant III
2. Quadrant II
3. Answers vary. Sample response: At 11 p.m., the temperature was -5°C . This point would be plotted in Quadrant IV.
4. A point at $(0, 0)$ would represent a freezing temperature (0°C) at noon.

Problem 3

(from Unit 7, Lesson 8)

The inequalities $h > 42$ and $h < 60$ represent the height requirements for an amusement park ride, where h represents a person's height in inches.

Write a sentence or draw a sign or that describes these rules as clearly as possible.

Solution

Answers vary. Sample response: To ride, a person must be more than 3 feet 6 inches tall, and no taller than 5 feet.

Problem 4

(from Unit 6, Lesson 4)

Solve each equation.

1. $3a = 12$

2. $b + 3.3 = 8.9$

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

4. $5\frac{1}{2} = d + \frac{1}{4}$

5. $2e = 6.4$

Solution

1. $a = 4$

2. $b = 5.6$

3. $c = 4$

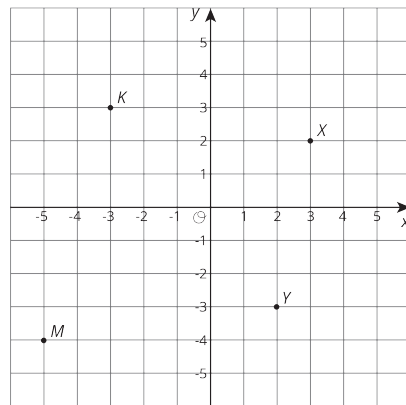
4. $d = 5\frac{1}{4}$

5. $e = 3.2$

Lesson 14

Problem 1

Here are 4 points on a coordinate plane.



1. Label each point with its coordinates.
2. Plot a point that is 3 units from point K . Label it P .
3. Plot a point that is 2 units from point M . Label it W .

Solution

1. $X = (3, 2)$, $Y = (2, -2)$, $K = (-3, 3)$, $M = (-5, -4)$

2. Answers vary. Sample responses: $(0, 3)$ or $(-3, 6)$

3. Answers vary. Sample responses: $(-3, -4)$ or $(-5, -2)$

Problem 2

Each set of points are connected to form a line segment. What is the length of each?

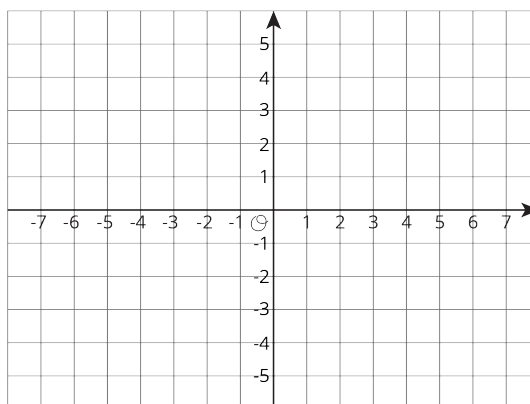
1. $A = (3, 5)$ and $B = (3, 6)$
2. $C = (-2, -3)$ and $D = (-2, -6)$
3. $E = (-3, 1)$ and $F = (-3, -1)$

Solution

1. 1 unit
2. 3 units
3. 2 units

Problem 3

On the coordinate plane, plot four points that are each 3 units away from point $P = (-2, -1)$. Write the coordinates of each point.



Solution

Answers vary. Sample response: $A = (-5, -1)$, $B = (1, -1)$, $C = (-2, 2)$, $D = (-2, -4)$. (Students are unlikely to come up with other possible solutions at this stage.)

Problem 4

(from Unit 6, Lesson 16)

Noah's recipe for sparkling orange juice uses 4 liters of orange juice and 5 liters of soda water.

1. Noah prepares large batches of sparkling orange juice for school parties. He usually knows the total number of liters, t , that he needs to prepare. Write an equation that shows how Noah can find s , the number of liters of soda water, if he knows t .
2. Sometimes the school purchases a certain number, j , of liters of orange juice and Noah needs to figure out how much sparkling orange juice he can make. Write an equation that Noah can use to find t if he knows j .

Solution

1. $s = \frac{5}{9}t$
2. $t = \frac{9}{4}j$

Problem 5

(from Unit 3, Lesson 4)

For a suitcase to be checked on a flight (instead of carried by hand), it can weigh at most 50 pounds. Andre's suitcase weighs 23 kilograms. Can Andre check his suitcase? Explain or show your reasoning. (Note: 10 kilograms \approx 22 pounds)

Solution

No, Andre will not be able to check his suitcase if they are strict about following the rule. Possible explanation:

1 kg weighs 2.2 pounds, so 23 kg weighs $(2.2) \cdot 23 = 50.6$ pounds.

weight (kilograms)	weight (pounds)
10	22
20	44
1	2.2
3	6.6
23	50.6

Lesson 15

Problem 1

The coordinates of a rectangle are $(3, 0)$, $(3, -5)$, $(-4, 0)$ and $(-4, -5)$

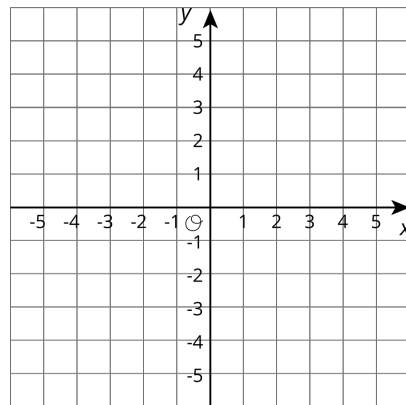
1. What is the length and width of this rectangle?
2. What is the perimeter of the rectangle?
3. What is the area of the rectangle?

Solution

1. The length is 7 units and the width is 5 units.
2. The perimeter is 24 units, because $7 + 7 + 5 + 5 = 24$.
3. The area is 35 square units, because $7 \cdot 5 = 35$.

Problem 2

Draw a square with one vertex on the origin $(-3, 5)$ and a perimeter of 20.

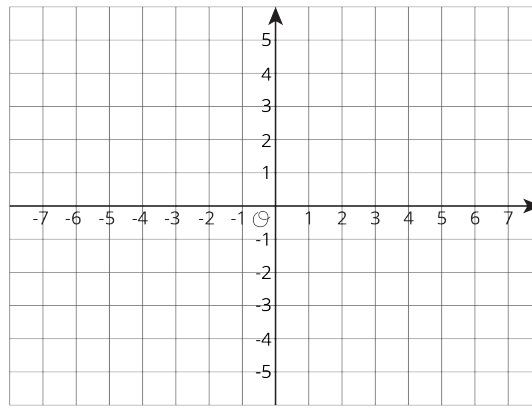


Solution

Answers vary. Sample response: The coordinates of each point are $(-3, 5)$, $(-3, 0)$, $(1, 5)$, $(1, 0)$.

Problem 3

1. Plot and connect the following points to form a polygon.
 $(-3, 2)$, $(2, 2)$, $(2, -4)$, $(-1, -4)$, $(-1, -2)$, $(-3, -2)$, $(-3, 2)$



2. Find the perimeter of the polygon.

Solution

1. The plotted polygon is a hexagon.
2. 24 units. (Going in the same order as the points listed, the sides of the polygon have lengths 5, 6, 3, 2, 4, and 4 units.)

Problem 4

(from Unit 6, Lesson 4)

For each situation, select **all** the equations that represent it. Choose one equation and solve it.

1. Jada’s cat weighs 3.45 kg. Andre’s cat weighs 1.2 kg more than Jada’s cat. How much does Andre’s cat weigh?

$$x = 3.45 + 1.2 \quad x = 3.45 - 1.2 \quad x + 1.2 = 3.45 \quad x - 1.2 = 3.45$$

2. Apples cost \$1.60 per pound at the farmer’s market. They cost 1.5 times as much at the grocery store. How much do the apples cost per pound at the grocery store?

$$y = (1.5) \cdot (1.60) \quad y = 1.60 \div 1.5 \quad (1.5)y = 1.60 \quad \frac{y}{1.5} = 1.60$$

Solution

1. $x = 3.45 + 1.2, x - 1.2 = 3.45; x = 4.65$

2. $y = 1.5 \cdot 1.60, \frac{y}{1.5} = 1.60$

Lesson 16

Problem 1

A teacher is making gift bags. Each bag is to be filled with pencils and stickers. The teacher has 24 pencils and 36 stickers to use. Each bag will have the same number of each item, with no items left over.

For example, she could make 2 bags with 12 pencils and 18 stickers each.

What are the other possibilities? Explain or show your reasoning.

Solution

3 bags with 8 pencils and 12 stickers ($3 \cdot 8 = 24$ and $3 \cdot 12 = 36$)

4 bags with 6 pencils and 9 stickers ($4 \cdot 6 = 24$ and $4 \cdot 9 = 36$)

6 bags with 4 pencils and 6 stickers ($6 \cdot 4 = 24$ and $6 \cdot 6 = 36$)

12 bags with 2 pencils and 3 stickers ($12 \cdot 2 = 24$ and $12 \cdot 3 = 36$)

Problem 2

1. List all the factors of 42.
2. What is the greatest common factor of 42 and 15?
3. What is the greatest common factor of 42 and 50?

Solution

1. 1, 2, 3, 6, 7, 14, 21, 42
2. 3
3. 2

Problem 3

A school chorus has 90 sixth-grade students and 75 seventh-grade students. The music director wants to make groups of performers, with the same combination of sixth- and seventh-grade students in each group. She wants to form as many groups as possible.

1. What is the largest number of groups that could be formed? Explain or show your reasoning.
2. If that many groups are formed, how many students of each grade level would be in each group?

Solution

1. 15 groups. The greatest common factor of 75 and 90 is 15.
2. 6 sixth-grade students and 5 seventh-grade students ($6 \cdot 15 = 90$ and $5 \cdot 15 = 75$)

Problem 4

(from Unit 7, Lesson 13)

Here are some bank transactions from a bank account last week. Which transactions represent negative values?

Monday: \$650 paycheck deposited

Tuesday: \$40 withdrawal from the ATM at the gas pump

Wednesday: \$20 credit for returned merchandise

Thursday: \$125 deducted for cell phone charges

Friday: \$45 check written to pay for book order

Saturday: \$80 withdrawal for weekend spending money

Sunday: \$10 cash-back reward deposited from a credit card company

Solution

Tuesday, Thursday, Friday, and Saturday

Problem 5

(from Unit 4, Lesson 11)

Find the quotients.

1. $\frac{1}{7} \div \frac{1}{8}$
2. $\frac{12}{5} \div \frac{6}{5}$

3. $\frac{1}{10} \div 10$

4. $\frac{9}{10} \div \frac{10}{9}$

Solution

1. $\frac{8}{7}$

2. 2

3. $\frac{1}{100}$

4. $\frac{81}{100}$

Problem 6

(from Unit 2, Lesson 9)

An elephant can travel at a constant speed of 25 miles per hour, while a giraffe can travel at a constant speed of 16 miles in $\frac{1}{2}$ hour.

1. Which animal runs faster? Explain your reasoning.
2. How far can each animal run in 3 hours?

Solution

1. The giraffe is faster, because it covers more distance in the same amount of time.
2. The elephant can run 75 miles ($25 \cdot 3 = 75$), and the giraffe can run 96 miles ($16 \cdot 3 \cdot 2 = 96$).

Lesson 17

Problem 1

1. A green light blinks every 4 seconds and a yellow light blinks every 5 seconds. When will both lights blink at the same time?
2. A red light blinks every 12 seconds and a blue light blinks every 9 seconds. When will both lights blink at the same time?
3. Explain how to determine when 2 lights blink together.

Solution

1. 20, 40, 60, 80, 100. . . seconds, because these are common multiples of 4 and 5.
2. 36, 72, 108 . . . seconds, because these are common multiples of 15 and 9.
3. Answers vary. Sample response: They blink together every common multiple.

Problem 2

1. List all multiples of 10 up to 100.
2. List all multiples of 15 up to 100.
3. What is the least common multiple of 10 and 15?

Solution

1. 10, 20, 30, 40, 50, 60, 70, 80, 90, 100
2. 15, 30, 45, 60, 75, 90

Problem 3

Cups are sold in packages of 8. Napkins are sold in packages of 12.

1. What is the fewest number of packages of cups and the fewest number of packages of napkins that can be purchased so there will be the same number of cups as napkins?
2. How many sets of plates and napkins will there be?

Solution

1. 3 packages of cups ($3 \cdot 8 = 24$) and 2 packages of napkins ($2 \cdot 12 = 24$)
2. 24 sets

Problem 4

(from Unit 7, Lesson 14)

Rectangle ABCD is drawn on a coordinate plane. $A = (-6, 9)$ and $B = (5, 9)$.

What could be the locations of points C and D?

Solution

Answers vary. Sample responses: C could be $(-6, -9)$ and D could be $(5, -9)$, or C could be $(-6, 18)$, and D could be $(5, 18)$.

Problem 5

(from Unit 3, Lesson 14)

A school wants to raise \$2,500 to support its music program.

1. If it has met 20% of its goal so far, how much money has it raised?
2. If it raises 175% of its goal, how much money will the music program receive? Show your reasoning.

Solution

1. \$500 ($2,500 \cdot 0.2 = 500$)
2. \$4,375 ($2,500 \cdot 1.75 = 4,375$)

Lesson 18**Problem 1**

Mai, Clare, and Noah are making signs to advertise the school dance. It takes Mai 6 minutes to complete a sign, it takes Clare 8 minutes to complete a sign, and it takes Noah 5 minutes to complete a sign. They keep working at the same rate for a half hour.

1. Will Mai and Clare complete a sign at the same time? Explain your reasoning.
2. Will Mai and Noah complete a sign at the same time? Explain your reasoning.
3. Will Clare and Noah complete a sign at the same time? Explain your reasoning.
4. Will all three students complete a sign at the same time? Explain your reasoning.

Solution

1. Answers vary. Sample response: Yes, they will both finish at 24 minutes, because 24 is a common multiple of 6 and 8.
2. Answers vary. Sample response: Yes, they will both finish at 30 minutes, because 30 is a common multiple of 6 and 5.
3. Answers vary. Sample response: No. The first common multiple of 8 and 5 is 40, and 40 minutes is longer than a half hour.
4. Answers vary. Sample response: No. If Clare and Noah will not finish together, then all three won't, either.

Problem 2

(from Unit 7, Lesson 16)

Diego has 48 chocolate chip cookies, 64 vanilla cookies, and 100 raisin cookies for a bake sale. He wants to make bags that have all three cookie flavors and the same number of each flavor per bag.

1. How many bags can he make without having any cookies left over?
2. Find the another solution to this problem.

Solution

(The two solutions could swap places.)

1. 4 bags with 12 chocolate chip cookies, 16 vanilla cookies, and 25 raisin cookies.
2. 2 bags with 24 chocolate chip cookies, 32 vanilla cookies, and 50 raisin cookies.

Problem 3

1. Find the product of 12 and 8.
2. Find the greatest common factor of 12 and 8.
3. Find the least common multiple of 12 and 8.
4. Find the product of the greatest common factor and the least common multiple of 12 and 8.
5. What do you notice about the answers to question 1 and question 4?
6. Choose 2 other numbers and repeat steps 1-5. Do you get the same results?

Solution

1. $12 \cdot 8 = 96$
2. 4 is the greatest common factor.
3. 24 is the least common multiple.
4. $4 \cdot 24 = 96$.
5. The answers are the same.
6. Answers vary. Yes, the results are the same.

Problem 4

(from Unit 7, Lesson 11)

1. Given the point $(5.5, -7)$, name a second point so that the two points form a vertical segment.
2. Given the point $(3, 3.5)$, name a second point so that the two points form a horizontal segment.

Solution

1. Answers vary. Any answer that has an x -coordinate of 5.5 will form a vertical segment.
2. Answers vary. Any answer that has a y -coordinate of 3.5 will form a horizontal segment.

Problem 5

(from Unit 6, Lesson 9)

Find the value of each expression mentally.

1. $\frac{1}{2} \cdot 37 - \frac{1}{2} \cdot 7$
2. $3.5 \cdot 40 + 3.5 \cdot 60$
3. $999 \cdot 5$

Solution

1. 15
2. 350
3. 4995

