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Grade 7 Math
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Unit 5 Practice Problems

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Lesson 1

Problem 1

It was -5°C in Copenhagen and -12°C in Oslo. Which city was colder?

Solution

It was colder in Oslo because -12 is less than -5 .

Problem 2

1. A fish is 12 meters below the surface of the ocean. What is its elevation?
2. A sea bird is 28 meters above the surface of the ocean. What is its elevation?
3. If the bird is directly above the fish, how far apart are they?

Solution

1. -12 m
2. 28 m
3. 40 m

Problem 3

Compare using $>$, $=$, or $<$.

1. 3 _____ -3
2. 12 _____ 24
3. -12 _____ -24
4. 5 _____ $-(-5)$
5. 7.2 _____ 7
6. -7.2 _____ -7

7. -1.5 _____ $\frac{-3}{2}$

8. $\frac{-4}{5}$ _____ $\frac{-5}{4}$

9. $\frac{-3}{5}$ _____ $\frac{-6}{10}$

10. $\frac{-2}{3}$ _____ $\frac{1}{3}$

Solution

1. >

2. <

3. >

4. =

5. >

6. <

7. =

8. >

9. =

10. <

Problem 4

(from Unit 4, Lesson 7)

Han wants to buy a \$30 ticket to a game, but the pre-order tickets are sold out. He knows there will be more tickets sold the day of the game, with a markup of 200%. How much should Han expect to pay for the ticket if he buys it the day of the game?

Solution

\$90. A 100% increase of a \$30 ticket is an additional \$30, therefore a 200% increase of a \$30 ticket would be an additional \$60.

Problem 5

(from Unit 2, Lesson 1)

A type of green paint is made by mixing 2 cups of yellow with 3.5 cups of blue.

1. Find a mixture that will make the same shade of green but a smaller amount.
2. Find a mixture that will make the same shade of green but a larger amount.
3. Find a mixture that will make the different shade of green that is bluer.
4. Find a mixture that will make the different shade of green that is more yellow.

Solution

Answers vary. Sample response:

1. 1 cup of yellow and 1.75 cups of blue
2. 4 cups of yellow and 7 cups of blue
3. 2 cups of yellow and 4 cups of blue.
4. 2 cups of yellow and 2 cups of blue.

Lesson 2

Problem 1

1. The temperature is -2°C . If the temperature rises by 15°C , what is the new temperature?
2. At midnight the temperature is -6°C . At midday the temperature is 9°C . By how much did the temperature rise?

Solution

1. 13°C
2. 15°C

Problem 2

(from Unit 5, Lesson 1)

Complete each statement with a number that makes the statement true.

1. _____ $< 7^{\circ}\text{C}$
2. _____ $< -3^{\circ}\text{C}$
3. $-0.8^{\circ}\text{C} < \text{_____} < -0.1^{\circ}\text{C}$
4. _____ $> -2^{\circ}\text{C}$

Solution

Answers vary. Sample responses:

1. 5°C
2. -8°C
3. -0.7°C
4. 4°C

Problem 3

Draw a diagram to represent each of these situations. Then write an addition expression that represents the final temperature.

1. The temperature was 80°F and then fell 20°F .
2. The temperature was -13°F and then rose 9°F .
3. The temperature was -5°F and then fell 8°F .

Solution

Answers vary. Sample responses:

1. A number line diagram with an arrow that starts at 80, is 20 units long, and points to the left. $80 + (-20)$

2. A number line diagram with an arrow that starts at -13, is 9 units long, and points to the right. $-13 + 9$

3. A number line diagram with an arrow that starts at -5, is 8 units long, and points to the left. $-5 + (-8)$

Problem 4

(from Unit 2, Lesson 7)

Decide whether each table could represent a proportional relationship. If the relationship could be proportional, what would be the constant of proportionality?

1. The number of wheels on a group of buses.

number of buses	number of wheels	wheels per bus
5	30	
8	48	
10	60	
15	90	

2. The number of wheels on a train.

number of train cars	number of wheels	wheels per train car
20	184	
30	264	
40	344	
50	424	

Solution

1. It could be proportional. The constant of proportionality would be 6 wheels per bus.

2. It is not proportional. (Every train car does not necessarily have the same number of wheels.)

Problem 5

(from Unit 4, Lesson 7)

Noah was assigned to make 64 cookies for the bake sale. He made 125% of that number. 90% of the cookies he made were sold. How many of Noah's cookies were left after the bake sale?

Solution

8 cookies. He made 80 cookies, because $(1.25) \cdot 64 = 80$. 72 were sold, because $(0.9) \cdot 80 = 72$. Therefore 8 were left because $80 - 72 = 8$.

Lesson 3

Problem 1

(from Unit 2, Lesson 7)

Decide whether each table could represent a proportional relationship. If the relationship could be proportional, what would be the constant of proportionality?

1. Annie's Attic is giving away \$5 off coupons.

original price	sale price
\$15	\$10
\$25	\$20
\$35	\$30

2. Bettie's Boutique is having a 20% off sale.

original price	sale price
\$15	\$12
\$25	\$20
\$35	\$28

Solution

1. Not proportional.
2. Proportional. The constant of proportionality is 0.8 sale dollars per original dollar.

Problem 2

What is the final elevation if

1. A bird starts at 20 m and changes 16 m?
2. A butterfly starts at 20 m and changes -16 m?
3. A diver starts at 5 m and changes -16 m?
4. A whale starts at -9 m and changes 11 m?
5. A fish starts at -9 meters and changes -11 meters?

Solution

1. 36 m because $20 + 16 = 36$
2. 4 m because $20 + (-16) = 4$
3. -11 m because $5 + (-16) = -11$
4. 2 m because $-9 + 11 = 2$
5. -20 m because $-9 + (-11) = -20$

Problem 3

One of the particles in an atom is called an electron. It has a charge of -1. Another particle in an atom is a proton. It has charge of +1. The charge of an atom is the sum of the charges of the electrons and the protons. A carbon atom has an overall charge of 0, because it has 6 electrons and 6 protons and $-6 + 6 = 0$. Find the overall charge for the rest of the elements on the list.

	charge from electrons	charge from protons	overall charge
carbon	-6	+6	
neon	-10	+10	
oxide	-10	+8	
copper	-27	+29	
tin	-50	+50	

Solution

Carbon: $-6 + 6 = 0$

Neon: $-10 + 10 = 0$

Oxide: $-10 + 8 = -2$

Copper: $-27 + 29 = +2$

Tin: $-50 + 50 = 0$

Problem 4

(from Unit 4, Lesson 8)

Last week, the price, in dollars, of a gallon of gasoline was g . This week, the price of gasoline per gallon increased by 5%. Which expressions represent this week's price, in dollars, of a gallon of gasoline? Select **all** that apply.

- A. $g + 0.05$
- B. $g + 0.05g$
- C. $1.05g$
- D. $0.05g$
- E. $(1 + 0.05)g$

Solution

B, C, E

Problem 5

Add.

1. $14.7 + 28.9$

2. $-9.2 + 4.4$

3. $-81.4 + (-12)$

4. $51.8 + (-0.8)$

Solution

1. 43.6

2. -4.8

3. -93.4

4. 51

Lesson 4

Problem 1

(from Unit 2, Lesson 8)

Decide whether or not each equation represents a proportional relationship.

1. Volume measured in cups (c) vs. the same volume measured in ounces (z): $c = \frac{1}{8}z$

2. Area of a square (A) vs. the side length of the square (s): $A = s^2$

3. Perimeter of an equilateral triangle (P) vs. the side length of the triangle (s): $3s = P$

4. Length (L) vs. width (w) for a rectangle whose area is 60 square units: $L = \frac{60}{w}$

Solution

1. yes

2. no

3. yes

4. no

Problem 2

1. Clare has \$54 in her bank account. A store credits her account with a \$10 refund. How much does she now have in the bank?

2. Mai owes the bank \$60. She gets \$85 for her birthday and deposits it into her account. How much does she now have in the bank?

3. Tyler is overdrawn at the bank by \$180. His brother has \$70 more than him. How much money does Tyler's brother have?
4. Andre has \$37 in his bank account and writes a check for \$87. After the check has been cashed, what will the bank balance show?

Solution

1. \$64 because $54 + 10 = 64$
2. \$25 because $-60 + 85 = 25$
3. -\$110 because $-180 + 70 = -110$
4. -\$50 because $37 - 87 = -50$

Problem 3

(from Unit 4, Lesson 8)

Last week, it rained x inches. This week, the amount of rain decreased by 5%. Which expressions represent the amount of rain that fell this week? Select **all** that apply.

- A. $g - 0.05$
- B. $g - 0.05g$
- C. $0.95g$
- D. $0.05g$
- E. $(1 - 0.05)g$

Solution

B, C, E

Problem 4

The table shows five transactions and the resulting account balance in a bank account, except some numbers are missing. Fill in the missing numbers.

	transaction amount	account balance
transaction 1	200	200
transaction 2	-147	53
transaction 3	90	
transaction 4	-229	
transaction 5		0

Solution

transaction amount	account balance
200	200
-147	53
90	143
-229	-86
86	0

Problem 5

(from Unit 5, Lesson 3)

Add.

1. $5\frac{3}{4} + (-\frac{1}{4})$

2. $-\frac{2}{3} + \frac{1}{6}$

3. $-\frac{8}{5} + (-\frac{3}{4})$

Solution

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

2. $-\frac{3}{6}$ or $-\frac{1}{2}$

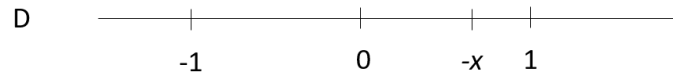
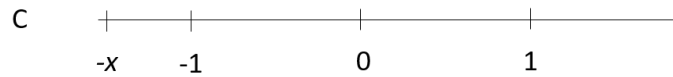
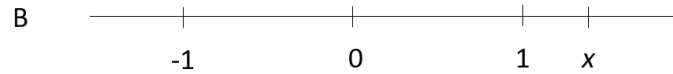
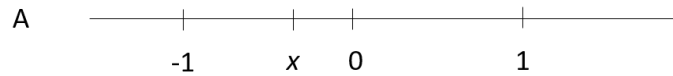
3. $\frac{-47}{20}$

Problem 6

(from Unit 5, Lesson 1)

In each diagram, x represents a different value. For each diagram,

1. What is something that is *definitely* true about the value of x ?
2. What is something that *could be* true about the value of x ?



Solution

Answers vary. Sample responses:

Diagram A:

1. The value of x is definitely negative. The value of x is definitely greater than $-\frac{1}{2}$ and less than 0, since x is closer to 0 than it is to -1.
2. The value of x could be $-\frac{1}{3}$ or -0.4; these values are negative and between 0 and $-\frac{1}{2}$.

Diagram B:

1. The value of x is definitely positive. The value of x is definitely between 1 and 2, since x is a little greater than 1.
2. The value of x could be 1.4 or $1\frac{1}{3}$; these values are positive and between 1 and 1.5.

Diagram C:

1. The value of x is definitely positive, because $-x$ is negative (for example, $-(-1.5) = 1.5$). The value of x is definitely between 1 and 2, since the distance of $-x$ from 0 is a little greater than 1.
2. The value of x could be $1\frac{1}{2}$ or 1.4; these values are halfway (or a little less than halfway) between 1 and 2.

Diagram D:

1. The value of x is definitely negative. The value of x is definitely less than $-\frac{1}{2}$ and greater than -1 , since $-x$ is farther away from 0 than it is from 1.
2. The value of x could be -0.7 or $-\frac{2}{3}$; these values are between 0 and -1 but closer to -1 .

Lesson 5

Problem 1

Write each subtraction equation as an addition equation.

1. $a - 9 = 6$

2. $p - 20 = -30$

3. $z - (-12) = 15$

4. $x - (-7) = -10$

Solution

1. $a = 6 + 9$ (or $a = 9 + 6$)

2. $p = -30 + 20$ (or $p = 20 + -30$)

3. $z = 15 + (-12)$ (or $z = (-12) + 15$)

4. $x = -10 + (-7)$ (or $x = -7 + (-10)$)

Problem 2

Find each difference. If you get stuck, consider drawing a number line diagram.

1. $9 - 4$

2. $4 - 9$

3. $9 - (-4)$

4. $-9 - (-4)$

5. $-9 - 4$

6. $4 - (-9)$

7. $-4 - (-9)$

8. $-4 - 9$

Solution

1. 5

2. -5

3. 13

4. -5

5. -13

6. 13

7. 5

8. -13

Problem 3

(from Unit 4, Lesson 10)

A restaurant bill is \$59 and you pay \$72. What percentage gratuity did you pay?

Solution

22%, because $13 \div 59 \approx 0.22$.

Problem 4

Find the solution to each equation mentally.

1. $30 + a = 40$

2. $500 + b = 200$

3. $-1 + c = -2$

4. $d + 3,567 = 0$

Solution

1. $a = 10$

2. $b = -300$

3. $c = -1$

4. $d = -3,567$

Problem 5

(from Unit 2, Lesson 3)

One kilogram is 2.2 pounds. Complete the tables. What is the interpretation of the constant of proportionality in each case?

1.

pounds	kilograms
2.2	1
11	
5.5	
1	

_____ kilogram per pound

2.

kilograms	pounds
1	2.2
7	
30	
0.5	

_____ pounds per kilogram

Solution

Complete the tables. What is the interpretation of the constant of proportionality in each case?

1.

pounds	kilograms
2.2	1
11	5
5.5	2.5
1	0.45

0.45 kilogram per pound

2.

kilograms	pounds
1	2.2
7	15.4
30	66
0.5	1.1

2.2 pounds per kilogram

Lesson 6

Problem 1

Write a sentence to answer each question:

1. How much warmer is 82 than 40?
2. How much warmer is 82 than -40?

Solution

Answers vary. Possible responses:

1. 82 is 42 degrees warmer than 40.
2. 82 is 122 degrees warmer than -40.

Problem 2

(from Unit 2, Lesson 8)

A company produces screens of different sizes. Based on the table, could there be a relationship between the number of pixels and the area of the screen? If so, write an equation representing the relationship. If not, explain your reasoning.

square inches of screen	number of pixels
6	31,104
72	373,248
105	544,320
300	1,555,200

Solution

It is a proportional relationship which can be represented as $p = 5,184 \cdot a$ where p represents the number of pixels and a is the area of the screen in square inches.

Problem 3

1. What is the difference in height between 30 m up a cliff and 87 m up a cliff? What is the distance between these positions?
2. What is the difference in height between an albatross flying at 100 m above the surface of the ocean and a shark swimming 30 m below the surface? What is the distance between them if the shark is right below the albatross?

Solution

1. The difference in height is -57 m, because $30 - 87 = -57$. The distance is 57 m, because $|-57| = 57$.
2. The difference in height is 130 m, because $100 - (-30) = 130$. The distance is 130 m, because $|130| = 130$.

Problem 4

Find each difference.

1. $(-5) - 6$
2. $35 - (-8)$
3. $\frac{2}{5} - \frac{3}{5}$
4. $-4\frac{3}{8} - (-1\frac{1}{4})$

Solution

1. -11

2. 43

3. $-\frac{1}{5}$

4. $-3\frac{1}{8}$

Problem 5

(from Unit 4, Lesson 10)

A family goes to a restaurant. When the bill comes, this is printed at the bottom of it:

Gratuity Guide For Your Convenience:

15% would be \$4.89

18% would be \$5.87

20% would be \$6.52

How much was the price of the meal? Explain your reasoning.

Solution

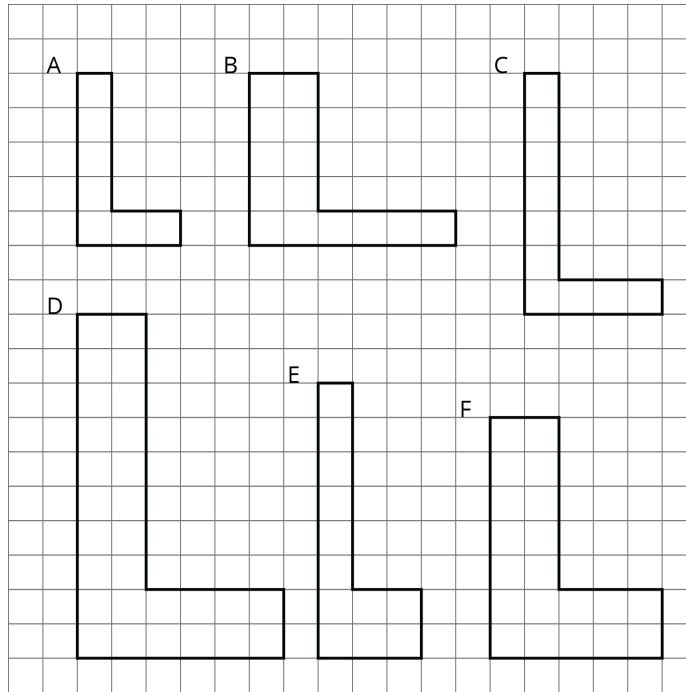
The bill was close to \$32.60. We can't tell the exact amount because the suggested dollar amounts have been rounded to the hundredths place.

$4.89 \div 0.15 = 32.60$, $5.87 \div 0.18 = 32.61$, and $6.52 \div 0.2 = 32.60$. The first and third quotients are exact while the middle quotient is rounded to the nearest hundredth.

Problem 6

(from Unit 1, Lesson 2)

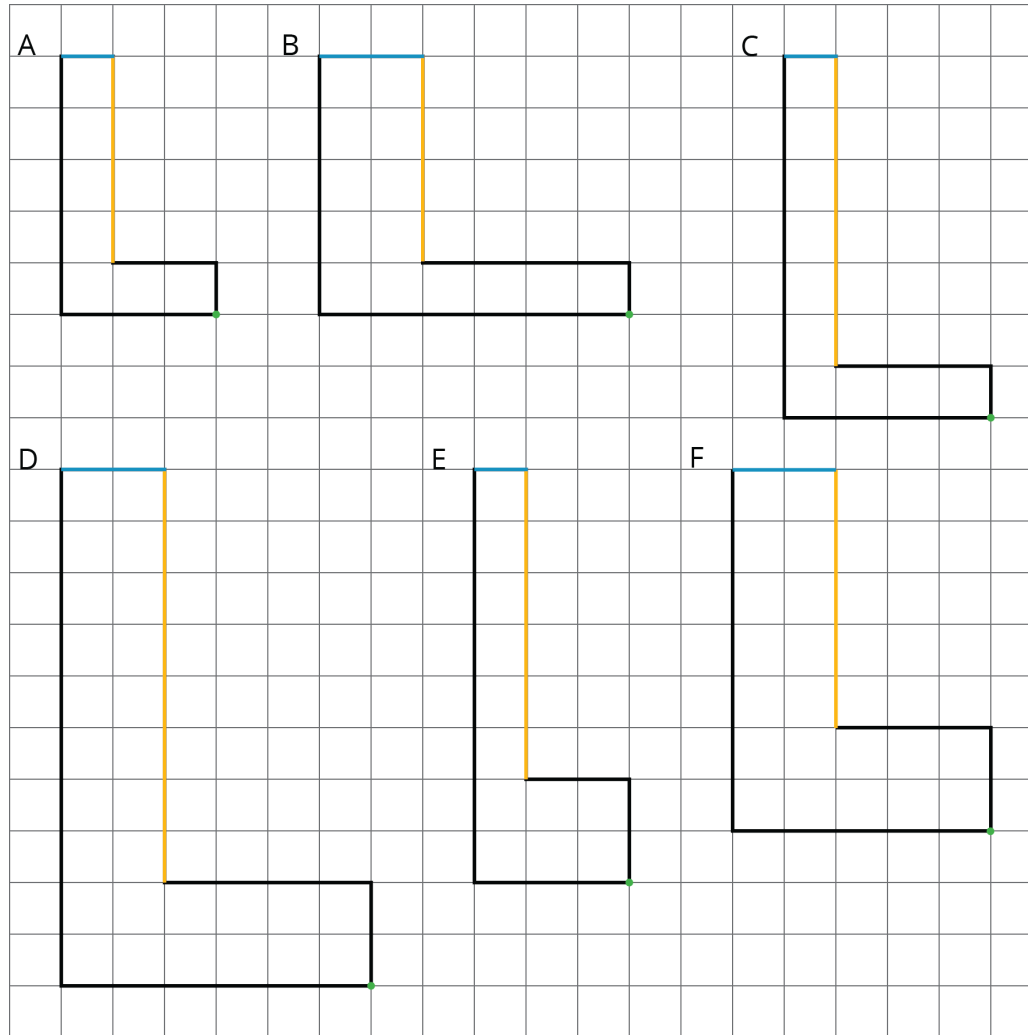
Which is a scaled copy of Polygon A? Identify a pair of corresponding sides and a pair of corresponding angles. Compare the areas of the scaled copies.



Solution

Polygon D is a scaled copy of Polygon A. This is true because all of the side lengths are doubled. The area of Polygon D is 4 times the area of Polygon A.

Answers vary. Sample markings:



Lesson 7

Problem 1

(from Unit 4, Lesson 10)

Tyler orders a meal that costs \$15.

1. If the tax rate is 6.6%, how much will the sales tax be on Tyler's meal?
2. Tyler also wants to leave a tip for the server. How much do you think he should pay in all? Explain your reasoning.

Solution

1. \$0.99 because $15 \cdot 0.066 = 0.99$
2. Answers vary. Sample response: I think Tyler should pay \$19 in all, because that would cover his meal, the sales tax, and a 20% tip for the server.

Problem 2

(from Unit 2, Lesson 3)

In a video game, a character is healed at a constant rate as long as they are standing in a certain circle. Complete the table.

time in circle (seconds)	health gained (points)
4	100
10	
3	
	1,000

Solution

seconds in circle	health gained
4	100
10	250
3	75
40	1,000

Problem 3

(from Unit 5, Lesson 6)

1. How much higher is 500 than 400 m?
2. How much higher is 500 than -400 m?
3. What is the change in elevation from 8,500 m to 3,400 m?

4. What is the change in elevation between 8,500 m and -300 m?

5. How much higher is -200 m than 450 m?

Solution

1. 100 m, because $400 + 100 = 500$

2. 900 m, because $-400 + 900 = 500$

3. -5,100 m, because $8,500 + (-5,100) = 3,400$

4. -8,800 m, because $8,500 + (-8,800) = -300$

5. -650 m, because $450 + (-650) = -200$

Problem 4

The table shows four transactions and the resulting account balance in a bank account, except some numbers are missing. Fill in the missing numbers.

	transaction amount	account balance
transaction 1	360	360
transaction 2	-22.50	337.50
transaction 3		182.35
transaction 4		-41.40

Solution

transaction amount	account balance
360	360
-22.50	337.50
-155.15	182.35
-223.75	-41.40

Problem 5

The *departure from the average* is the difference between the actual amount of rain and the average amount of rain for a given month.

The historical average for rainfall in Albuquerque, NM for June, July, and August is shown in the table.

June	July	August
0.67	1.5	1.57

1. Last June only 0.17 inches of rain fell all month. What is the difference between the average rainfall and the actual rainfall for last June?
2. The departure from the average rainfall last July was -0.36 inches. How much rain fell last July?
3. How much rain would have to fall in August so that the total amount of rain equals the average rainfall for these three months? What would the departure from the average be in August in that situation?

Solution

1. 0.5 inches. $0.67 - 0.17 = 0.50$
2. 1.14 inches. The departure from average was negative, the actual rainfall needed to be 0.36 inches less than the average rainfall.
3. 2.43 inches; 0.86 inches. The departure from the average in June was -0.5 and for July was -0.36, so for those two months it was $-0.5 + (-0.36) = -0.86$. So it will have to rain 0.86 more inches in August than usual to make that up and the departure from the average will be 0.86. $0.86 + 1.57 = 2.43$.

Lesson 8

Problem 1

A number line can represent positions that are north and south of a truck stop on a highway. Decide whether you want positive positions to be north or south of the truck stop. Then plot the following positions on a number line.

1. The truck stop
2. 5 miles north of the truck stop
3. 3.5 miles south of the truck stop

Solution

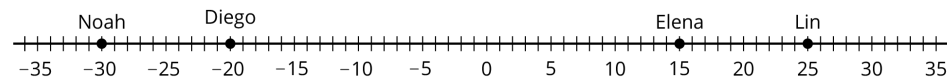
Either choice is fine as long as students are consistent in the next part.

Problem 2

1. How could you distinguish between traveling west at 5 miles per hour and traveling east at 5 miles per hour without using the words “east” and “west”?
2. Four people are cycling. They each start at the same point. (0 represents their starting point.) Plot their finish points after five seconds of cycling on a number line.
 - o Lin cycles at 5 meters per second
 - o Diego cycles at -4 meters per second
 - o Elena cycles at 3 meters per second
 - o Noah cycles at -6 meters per second

Solution

1. By giving the velocities opposite signs.
- 2.



Problem 3

(from Unit 5, Lesson 6)

Find the value of each expression.

$$16.2 + -8.4$$

$$\frac{2}{5} - \frac{3}{5}$$

$$-9.2 + -7$$

$$\left(-4\frac{3}{8}\right) - \left(-1\frac{1}{4}\right)$$

Solution

1. 7.8

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

3. -16.2

4. $-3\frac{1}{8}$

Problem 4

(from Unit 4, Lesson 10)

A shopper bought a watermelon, a pack of napkins, and some paper plates. In his state, there is no tax on food. The tax rate on non-food items is 5%. The total for the three items he bought was \$8.25 before tax, and he paid \$0.19 in tax. How much did the watermelon cost?

Solution

\$4.45. The non-food items cost $0.19 \div 0.05 = 3.8$. The watermelon cost $8.25 - 3.8 = 4.45$.

Problem 5

(from Unit 5, Lesson 5)

For each equation, write two more equations using the same numbers that express the same relationship in a different way.

1. $3 + 2 = 5$

2. $7.1 + 3.4 = 10.5$

3. $15 - 8 = 7$

4. $\frac{3}{2} + \frac{9}{5} = \frac{33}{10}$

Solution

For each question, students should have 2 of the 3 equations listed.

1. $5 - 3 = 2$; $5 - 2 = 3$; $2 + 3 = 5$

2. $10.5 - 3.4 = 7.1$; $10.5 - 7.1 = 3.4$; $3.4 + 7.1 = 10.5$

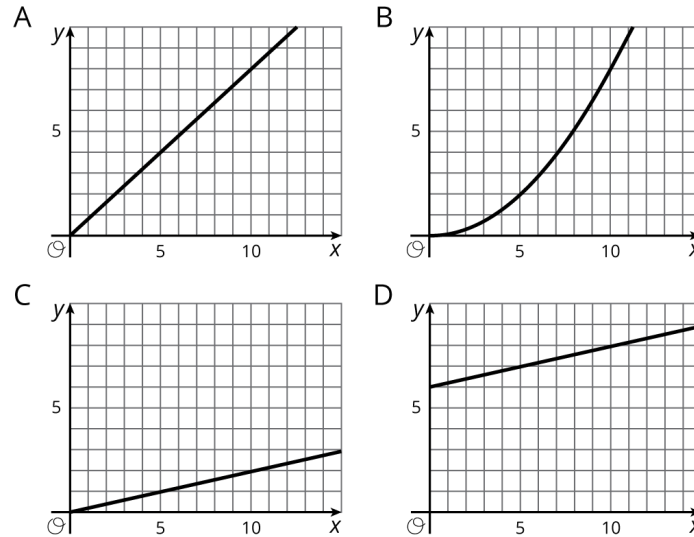
3. $15 - 7 = 8$; $8 + 7 = 15$; $7 + 8 = 15$

4. $\frac{33}{10} - \frac{3}{2} = \frac{9}{5}$; $\frac{33}{10} - \frac{9}{5} = \frac{3}{2}$; $\frac{9}{5} + \frac{3}{2} = \frac{33}{10}$

Problem 6

(from Unit 2, Lesson 10)

Which graphs could not represent a proportional relationship? Explain how you decided.



Solution

B and D are graphs that do not represent proportional relationships. B is not a straight line and D does not go through the origin.

Lesson 9

Problem 1

Fill in the missing numbers in these equations

1. $(-2) \cdot (-4.5) = ?$

2. $(-8.7) \cdot (-10) = ?$

3. $(-7) \cdot ? = 14$

4. $? \cdot (-10) = 90$

Solution

1. $(-2) \cdot (-4.5) = 9$

2. $(-8.7) \cdot (-10) = 87$

3. $(-7) \cdot (-2) = 14$

4. $(-9) \cdot (-10) = 90$

Problem 2

A weather station on the top of a mountain reports that the temperature is currently 0°C and has been falling at a constant rate of 3°C per hour. Find each temperature. Explain or show your reasoning.

If it continues fall at this rate, what will the temperature be:

1. in 2 hours?

2. in 5 hours?

3. in half an hour?

What was the temperature:

4. 1 hour ago?

5. 3 hours ago?

6. 4.5 hours ago?

Solution

1. The temperature will be:

a. -6°C , because $-3 \cdot 2 = -6$

b. -15°C , because $-3 \cdot 5 = -15$

c. -1.5°C , because $-3 \cdot 0.5 = -1.5$

2. The temperature was:

a. 3°C , because $-3 \cdot (-1) = 3$

b. 9°C , because $-3 \cdot (-3) = 9$

c. 13.5°C , because $-3 \cdot (-4.5) = 13.5$

Problem 3

Find the value of each expression.

1. $\frac{1}{4} \cdot (-12)$

2. $(-\frac{1}{3}) \cdot 39$

3. $(-\frac{4}{5}) \cdot (-75)$

4. $(-\frac{2}{5}) \cdot (-\frac{3}{4})$

5. $\frac{8}{3} \cdot (-42)$

Solution

1. -3

2. -13

3. 60

4. $\frac{3}{10}$

5. -112

Problem 4

(from Unit 4, Lesson 2)

To make a specific hair dye, a hair stylist uses a ratio of $1\frac{1}{8}$ oz of red tone, $\frac{3}{4}$ oz of gray tone, and $\frac{5}{8}$ oz of brown tone.

1. If the stylist needs to make 20 oz of dye, how much of each dye color is needed?
2. If the stylist needs to make 100 oz of dye, how much of each dye color is needed?

Solution

1. 9 oz red, 6 oz gray, and 5 oz brown. The given amounts of dye make $2\frac{1}{2}$ oz so each quantity needs to be multiplied by 8 to get 20 oz.
2. 45 oz red, 30 oz gray, and 25 oz brown. 100 oz is 5 batches of 20 oz.

Problem 5

(from Unit 5, Lesson 7)

1. Here are the vertices of rectangle *FROG*: $(-2, 5)$, $(-2, 1)$, $(6, 5)$, $(6, 1)$. Find the perimeter of this rectangle. If you get stuck, try plotting the points on a coordinate plane.
2. Find the area of the rectangle *FROG*.
3. Here are the coordinates of rectangle *PLAY*: $(-11, 20)$, $(-11, -3)$, $(-1, 20)$, $(-1, -3)$. Find the perimeter and area of this rectangle. See if you can figure out its side lengths without plotting the points.

Solution

1. 24 units. The short side of the rectangle has length 4 units, because $5 - 1 = 4$. The long side has length 8 units, because $6 - (-2) = 8$. The perimeter is 24 units, because $4 + 4 + 8 + 8 = 24$.
2. 32 square units, because $8 \cdot 4 = 32$
3. The perimeter is 66 units and the area is 230 square units. The short side has length 10 units, because $-1 - (-11) = 10$. The long side has length 23 units, because $20 - (-3) = 23$. The perimeter is 66 units, because $2(10 + 23) = 66$.

Lesson 10

Problem 1

Evaluate each expression:

1. $-12 \cdot \frac{1}{3}$

2. $-12 \cdot \left(-\frac{1}{3}\right)$

3. $12 \cdot \left(-\frac{5}{4}\right)$

4. $-12 \cdot \left(-\frac{5}{4}\right)$

Solution

1. -4

2. 4

3. -15

4. 15

Problem 2

Evaluate each expression:

1. $(-1) \cdot 2 \cdot 3$

2. $(-1) \cdot (-2) \cdot 3$

3. $(-1) \cdot (-2) \cdot (-3)$

Solution

1. -6

2. 6

3. -6

Problem 3

(from Unit 5, Lesson 1)

Order each set of numbers from least to greatest.

1. 4, 8, -2, -6, 0

2. -5, -5.2, 5.5, $-5\frac{1}{2}$, $\frac{-5}{2}$

Solution

1. -6, -2, 0, 4, 8

2. $-5\frac{1}{2}$, -5.2, -5, $\frac{-5}{2}$, 5.5

Problem 4

(from Unit 5, Lesson 3)

$$30 + -30 = 0.$$

1. Write another sum of two numbers that equals 0.
2. Write a sum of three numbers that equals 0.
3. Write a sum of four numbers that equals 0, none of which are opposites.

Solution

Answers vary. Sample response:

1. $-589 + 589$

2. $-589 + 500 + 89$

3. $-589 + 500 + 90 + (-1)$

Problem 5

(from Unit 5, Lesson 6)

A submarine is searching for underwater features. It is accompanied by a small aircraft and an underwater robotic vehicle.

At one time the aircraft is 200 m above the surface, the submarine is 55 m below the surface, and the underwater robotic vehicle is 227 m below the surface.

1. What is the difference in height between the submarine and the aircraft?

2. What is the distance between the underwater robotic vehicle and the submarine?

Solution

We have to assume they are all directly above or below each other to answer the question.

1. 255 m

2. 172 m

Problem 6

(from Unit 5, Lesson 8)

1. Clare is cycling at a speed of 12 miles per hour. If she starts at a position chosen as zero, what will her position be after 45 minutes?

2. Han is cycling at a speed of -8 miles per hour; if he starts at the same zero point, what will his position be after 45 minutes?

3. What will the distance between them be after 45 minutes?

Solution

1. 8 miles ($12 \cdot 0.75 = 8$)

2. -6 miles ($-8 \cdot 0.75 = -6$)

3. 14 miles

Problem 7

(from Unit 5, Lesson 9)

Fill in the missing numbers in these equations

1. $(-7) \cdot ? = -14$

2. $? \cdot 3 = -15$

3. $? \cdot 4 = 32$

4. $-49 \cdot 3 = ?$

Solution

1. $(-7) \cdot 2 = -14$

2. $(-5) \cdot 3 = -15$

3. $8 \cdot 4 = 32$

4. $(-49) \cdot 3 = -147$

Lesson 11

Problem 1

Find the quotients:

$24 \div -6$

$-15 \div 0.3$

$-4 \div -20$

Solution

-4, -50, 0.2

Problem 2

Find the quotients.

1. $\frac{2}{5} \div \frac{3}{4}$

2. $\frac{9}{4} \div \frac{-3}{4}$

3. $\frac{-5}{7} \div \frac{-1}{3}$

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

Solution

1. $\frac{8}{15}$

2. -3

3. $\frac{15}{7}$

4. -10

Problem 3

Is the solution positive or negative?

1. $2 \cdot x = 6$

2. $-2 \cdot x = 6.1$

3. $2.9 \cdot x = -6.04$

4. $-2.473 \cdot x = -6.859$

Solution

1. Positive

2. Negative

3. Negative

4. Positive

Problem 4

Find the solution mentally.

1. $3 \cdot (-4) = a$

2. $b \cdot (-3) = -12$

3. $(-12) \cdot c = 12$

4. $d \cdot 24 = -12$

Solution

1. $a = -12$

2. $b = 4$

3. $c = -1$

4. $d = \frac{-1}{2}$

Problem 5

(from Unit 4, Lesson 2)

In order to make a specific shade of green paint, a painter mixes $1\frac{1}{2}$ quarts of blue paint, 2 cups of green paint, and $\frac{1}{2}$ gallon of white paint. How much of each color is needed to make 100 cups of this shade of green paint?

Solution

Blue: $37\frac{1}{2}$ cups, green: $12\frac{1}{2}$ cups, white: 50 cups. There are 4 cups in a quart so $1\frac{1}{2}$ quarts is 6 cups. There are 16 cups in a gallon so $\frac{1}{2}$ gallons is 8 cups. So the ratio of cups of blue to cups of green to cups of white is 6 to 2 to 8 or, equivalently, 3 to 1 to 4. $3 + 1 + 4 = 8$. $100 \div 8 = 12.5$ So, the painter needs 37.5 cups of blue because $3 \cdot (12.5) = 37.5$. The painter needs 12.5 cups of green because $1 \cdot (12.5) = 12.5$. And the painter needs 50 cups of white because $4 \cdot (12.5) = 50$.

Problem 6

(from Unit 5, Lesson 3)

Here is a list of the highest and lowest elevation on each continent.

	highest point (m)	lowest point (m)
Europe	4,810	-28
Asia	8,848	-427
Africa	5,895	-155
Australia	4,884	-15
North America	6,198	-86
South America	6,960	-105
Antarctica	4,892	-50

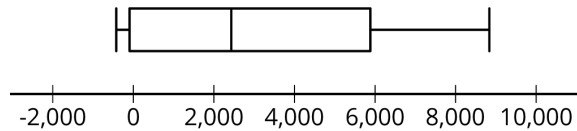
1. Which continent has the largest difference in elevation? The smallest?
2. Make a display (dot plot, box plot, or histogram) of the data set and explain why you chose that type of display to represent this data set.

Solution

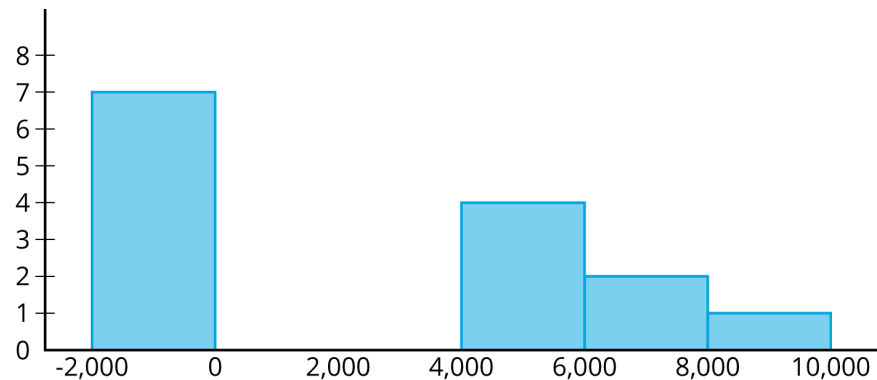
1. Asia has the largest difference in elevation. $8,848 - (-427) = 9,275$. Europe has the smallest difference in elevation. $4,810 - (-28) = 4,838$

2. Answers vary. Possible solutions:

- o Box plot:



- o Histogram:



I chose to make a histogram because it can show the gap in the middle of the data better than a box plot can. Also, this data set would be hard to see on a dot plot because some of the elevations are very close to each other, but none of them are exactly the same.

Lesson 12

Problem 1

(from Unit 4, Lesson 3)

1. A cookie recipe uses 3 cups of flour to make 15 cookies. How many cookies can you make with this recipe with 4 cups of flour? (Assume you have enough of the other ingredients.)
2. A teacher uses 36 centimeters of tape to hang up 9 student projects. At that rate, how much tape would the teacher need to hang up 10 student projects?

Solution

1. 20 cookies; based on the information one can determine that 1 cup of flour makes 5 cookies, so 4 cups of flour will make 20 cookies.
2. 40 centimeters; based on the information one can determine that 4 centimeters of tape will hang up 1 student project, so the teacher would need 40 centimeters of tape to hang 10 student projects.

Problem 2

(from Unit 5, Lesson 11)

Evaluate each expression. When the answer is not a whole number, write your answer as a fraction.

1. $-4 \cdot -6$
2. $-24 \cdot \frac{-7}{6}$
3. $4 \div -6$
4. $\frac{4}{3} \div -24$

Solution

1. 24
2. 28

3. $\frac{-2}{3}$ (or equivalent)

4. $\frac{-1}{18}$ (or equivalent)

Problem 3

Some boats were traveling up and down a river. A satellite recorded the movements of several boats.

1. A motor boat traveled -3.4 miles per hour for 0.75 hours. How far did it go?
2. A tugboat traveled -1.5 miles in 0.3 hours. What was its velocity?
3. What do you think that negative distances and velocities could mean in this situation?

Solution

1. -2.55 miles; $-3.4 \cdot 0.75 = -2.55$
2. -5 miles per hour; $-1.5 \div 0.3 = -5$
3. Someone had to choose one direction to be positive and the other to be negative. Positive distances could mean distances in the positive direction and negative distances mean distances in the other direction. Positive velocities could mean it was moving in the positive direction and negative velocities mean it was moving in the negative direction.

Problem 4

Describe a situation where each of the following quantities might be useful.

1. -20 gallons per hour
2. -10 feet per minute
3. -0.1 kilograms per second

Solution

Answers vary. Sample responses:

1. Water leaking out of a tank

2. An airplane descending
3. Gravel being emptied out of a truck

Problem 5

A submarine is only allowed to change its depth by rising toward the surface in 60-meter stages. It starts off at -340 meters.

1. At what depth is it after:
 - a. 1 stage
 - b. 2 stages
 - c. 4 stages
2. How many stages will it take to return to the surface?

Solution

1.
 - a. -280 m; $-340 + 60 = -280$
 - b. -220 m; $-340 + 120 = -220$
 - c. -100m; $-340 + 240 = -100$
2. 6 stages of change. $340 \div 60 = 5.7$ so the submarine would need 6 stages

Lesson 13

Problem 1

(from Unit 4, Lesson 3)

1. A coffee maker's directions say to use 2 tablespoons of ground coffee for every 6 ounces of water. How much coffee should you use for 33 ounces of water?
2. A runner is running a 10 km race. It takes her 17.5 minutes to reach the 2.5 km mark. At that rate, how long will it take her to run the whole race?

Solution

1. 11 tablespoons; from the information, one can determine that 1 tablespoon of coffee will be used for every 3 ounces of water, therefore for 33 ounces of water one would need 11 tablespoons of coffee.
2. 70 minutes; from the information, one can determine that it would take the runner 7 minutes to run 1 km, therefore it would take the runner 70 minutes to run 10 km.

Problem 2

(from Unit 4, Lesson 10)

The price of an ice cream cone is \$3.25, but it costs \$3.51 with tax. What is the sales tax rate?

Solution

1. 8% (Any answer between 7.85% and 8.15% is acceptable.)

Problem 3

Find the value of each expression.

1. $-22 + 5$
2. $-22 - (-5)$
3. $(-22)(-5)$
4. $(-22) \div 5$

Solution

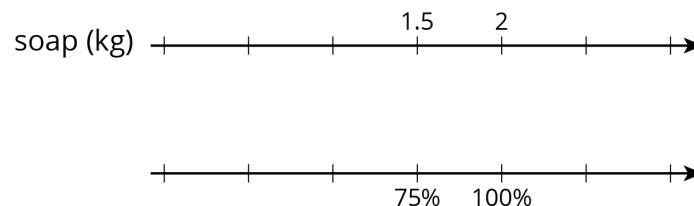
1. -17
2. -17
3. 110
4. -4.4

Problem 4

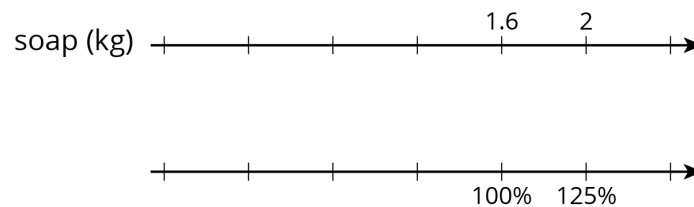
(from Unit 4, Lesson 7)

Two students are both working on the same problem: A box of laundry soap has 25% more soap in its new box. The new box holds 2 kg. How much soap did the old box hold?

- Here is how Jada set up her double number line.



- Here is how Lin set up her double number line.



Do you agree with either of them? Explain or show your reasoning.

Solution

Answers vary. Sample response: I agree with Lin. The soap in the old box represents 100% and the new box now holds 125% which is 2 kg.

Problem 5

The value of x is $\frac{-1}{4}$. Order these expressions from least to greatest:

$$x$$

$$1 - x$$

$$x - 1$$

$$-1 \div x$$

Solution

$x - 1$, x , $1 - x$, $-1 \div x$.

The expressions' values are $\frac{-5}{4}$, $\frac{-1}{4}$, $\frac{5}{4}$, and 4.

Problem 6

Here are four expressions that have the value $\frac{-1}{2}$:

$$\frac{-1}{4} + (\frac{-1}{4})$$

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

$$-2 \cdot \frac{1}{4}$$

$$-1 \div 2$$

Write five expressions: a sum, a difference, a product, a quotient, and one that involves at least two operations that have the value $\frac{-3}{4}$.

Solution

Answers vary. Sample response: $\frac{-1}{4} + (\frac{-1}{2})$, $\frac{1}{4} - 1$, $-3 \cdot \frac{1}{4}$, $-3 \div 4$, $1 \div 4 - 1$

Lesson 14

Problem 1

(from Unit 4, Lesson 11)

A furniture store pays a wholesale price for a mattress. Then, the store marks up the retail price to 150% of the wholesale price. Later, they put the mattress on sale for 50% off of the retail price. A customer just bought the mattress on sale and paid \$1,200.

1. What was the retail price of the mattress, before the discount?
2. What was the wholesale price, before the markup?

Solution

1. \$2,400, because $1,200 \div 0.5 = 2,400$.
2. \$1,600, because $2,400 \div 1.5 = 1,600$.

Problem 2

The table shows transactions in a checking account.

January
-38.50
126.30
429.40
-265.00

February
250.00
-135.20
35.50
-62.30

March
-14.00
99.90
-82.70
-1.50

April
-86.80
-570.00
100.00
-280.10

1. Find the total of the transactions for each month.

2. Find the mean total for the four months.

Solution

1. January: 252.20; February: 88; March 1.70; April: -836.90

2. -123.75, because $[252.20 + 88 + 1.70 + (-836.9)] \div 4 = -123.75$

Problem 3

A bank charges a service fee of \$7.50 per month for a checking account.

A bank account has \$85.00. If no money is deposited or withdrawn except the service charge, how many months until the account balance is negative?

Solution

12, because $85 \div 7.50 = 11\frac{1}{3}$ which means it will take 12 months to have a negative balance in the account

Problem 4

A large aquarium of water is being filled with a hose. Due to a problem, the sensor does not start working until some time into the filling process. The sensor starts its recording at the time zero minutes. The sensor initially detects the tank has 225 liters of water in it.

1. The hose fills the aquarium at a constant rate of 15 liters per minute. What will the sensor read at the time 5 minutes?

2. Later, someone wants to use the data to find the amount of water at times before the sensor started. What should the sensor have read at the time -7 minutes?

Solution

1. 300 litres ($225 + 15 \cdot 5 = 300$)

2. 120 litres ($225 + 15 \cdot (-7) = 120$)

Problem 5

(from Unit 4, Lesson 10)

1. A restaurant bill is \$21. You leave a 15% tip. How much do you pay including the tip?

2. Which of the following represents the amount a customer pays including the tip of 15% if the bill was b dollars? Select **all** that apply.

- A. $0.15b$
- B. $15b$
- C. $b + 0.15b$
- D. $1.15b$
- E. $1.015b$
- F. $b + \frac{15}{100}b$
- G. $b + 0.15$

Solution

- 1. \$24.15
- 2. C, D, F

Lesson 15

Problem 1

Solve.

- 1. $\frac{2}{5}t = 6$
- 2. $-4.5 = a - 8$
- 3. $\frac{1}{2} + p = -3$
- 4. $12 = x \cdot 3$
- 5. $-12 = -3y$

Solution

- 1. $t = 15$
- 2. $a = 3.5$
- 3. $p = -3\frac{1}{2}$

4. $x = 4$

5. $y = 4$

Problem 2

(from Unit 5, Lesson 13)

Evaluate each expression if x is $\frac{2}{5}$, y is -4 , and z is -0.2 .

1. $x + y$

2. $2x - z$

3. $x + y + z$

4. $y \cdot x$

Solution

1. $-3\frac{3}{5}$ (or equivalent)

2. 1

3. -3.8 (or equivalent)

4. $\frac{-8}{5}$ (or equivalent)

Problem 3

Match each equation to a step that will help solve the equation.

A. $5x = 0.4$

B. $\frac{x}{5} = 8$

C. $3 = \frac{-x}{5}$

D. $7 = -5x$

1. Multiply each side by 5.
2. Multiply each side by -5.
3. Multiply each side by $\frac{1}{5}$.
4. Multiply each side by $\frac{-1}{5}$.

Solution

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

Problem 4

1. Write an equation where a number is added to a variable, and a solution is -8.
2. Write an equation where a number is multiplied by a variable, and a solution is $\frac{-4}{5}$.

Solution

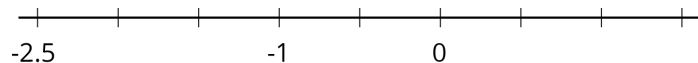
Answers vary. Sample responses:

1. $x + 2 = -6$
2. $-5x = 4$

Problem 5

(from Unit 5, Lesson 8)

The markings on the number line are evenly spaced. Label the other markings on the number line.



Solution

-2.5, -2, -1.5, -1, -0.5, 0, 0.5, 1, 1.5

Problem 6

(from Unit 5, Lesson 12)

In 2012, James Cameron descended to the bottom of Challenger Deep in the Marianas Trench; the deepest point in the ocean. The vessel he rode in was called DeepSea Challenger.

Challenger Deep is 35,814 feet deep at its lowest point

1. DeepSea Challenger's descent was a change in depth of (-4) feet per second. We can use the equation $y = -4x$ to model this relationship, where y is the depth and x is the time in seconds that have passed. How many seconds does this model suggest it would take for DeepSea Challenger to reach the bottom?
2. To end the mission DeepSea Challenger made a one-hour ascent to the surface. How many seconds is this?
3. The ascent can be modeled by a different proportional relationship $y = kx$. What is the value of k in this case?

Solution

1. 8,953.5 seconds, because $-35,814 \div -4 = 8,953.5$
2. 3,600 seconds, because $60 \cdot 60 = 3,600$
3. It took 3,600 seconds to go 35,814 feet up. This means the proportional relationship is $y = \frac{35814}{3600}x$.

Lesson 16

Problem 1

Match each situation to one of the equations.

- A. A whale was diving at a rate of 2 meters per second. How long will it take for the whale to get from the surface of the ocean to an elevation of -12 meters at that rate?

B. A swimmer dove below the surface of the ocean. After 2 minutes, she was 12 meters below the surface. At what rate was she diving?

C. The temperature was -12 degrees Celsius and rose to 2 degrees Celsius. What was the change in temperature?

D. The temperature was 2 degrees Celsius and fell to -12 degrees Celsius. What was the change in temperature?

1. $-12 + x = 2$

2. $2 + x = -12$

3. $-2x = -12$

4. $2x = -12$

Solution

A. 3

B. 4

C. 1

D. 2

Problem 2

Starting at noon, the temperature dropped steadily at a rate of 0.8 degrees Celsius every hour.

For each of these situations, write and solve an equation and describe what your variable represents.

1. How many hours did it take for the temperature to decrease by 4.4 degrees Celsius?

2. If the temperature after the 4.4 degree drop was -2.5 degrees Celsius, what was the temperature at noon?

Solution

1. $-0.8h = -4.4$, where h is the number of hours it took for the temperature to decrease. Solve the equation by multiplying each side by $\frac{-1}{0.8}$. It took $5\frac{1}{2}$ hours for the temperature to drop 4.4 degrees Celsius.

2. $T - 4.4 = -2.5$, where T is the temperature at noon. The temperature at noon was 1.9 degrees Celsius.

Problem 3

(from Unit 4, Lesson 3)

Kiran mixes $\frac{3}{4}$ cups of raisins, 1 cup peanuts, and $\frac{1}{2}$ cups of chocolate chips to make trail mix. How much of each ingredient would he need to make 10 cups of trail mix? Explain your reasoning.

Solution

The ingredients listed will make $2\frac{1}{4}$ cups of trail mix. So to get 10 cups of trail mix, multiply each amount by $10 \div 2\frac{1}{4} = \frac{40}{9}$. Kiran will need $\frac{30}{9}$ cups of raisins, $\frac{40}{9}$ cups of peanuts, and $\frac{20}{9}$ cups of chocolate chips.

Problem 4

(from Unit 5, Lesson 6)

Find the value of each expression.

1. $12 + (-10)$

2. $(-5) - 6$

3. $(-42) + 17$

4. $35 - (-8)$

5. $(-4\frac{1}{2}) + 3$

Solution

1. 2

2. -11

3. -25

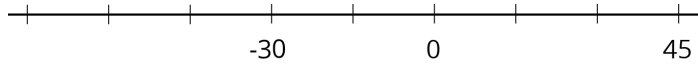
4. 43

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

Problem 5

(from Unit 5, Lesson 8)

The markings on the number line are evenly spaced. Label the other markings on the number line.



Solution

-75, -60, -45, -30, -15, 0, 15, 30, 45

Problem 6

Kiran drinks 6.4 oz of milk each morning. How many days does it take him to finish a 32 oz container of milk?

1. Write and solve an equation for the situation.
2. What does the variable represent?

Solution

1. $6.4n = 32$. The solution is $n = 5$.
2. The variable n represents the number of days it takes Kiran to finish the container of milk.

