



Question Bank

Math

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Ratios, Rates, Proportions, and Units (key)



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Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div><div></div><div></div><div></div></div>

ID: 3f5398a6

For a person m miles from a flash of lightning, the length of the time interval from the moment the person sees the lightning to the moment the person hears the thunder is k seconds. The ratio of m to k can be estimated to be 1 to 5. According to this estimate, the person is how many miles from a flash of lightning if the time interval is 25 seconds?

- A. 10
- B. 9
- C. 6
- D. 5

ID: 3f5398a6 Answer

Rationale

Choice D is correct. It's given that the ratio of m to k is estimated to be 1 to 5. Therefore, when $k = 25$, the relationship between these ratios can be expressed by the proportion $\frac{m}{25} = \frac{1}{5}$. Multiplying both sides of this equation by 25 yields $m = 5$.

Choices A, B, and C are incorrect and may result from calculation errors.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div> <div></div> <div></div> <div></div> </div>

ID: 000259aa

A group of monarch butterflies migrated from Chicago, Illinois, to Michoacán, Mexico, flying a total of 2,100 miles. It took a single butterfly in the group 120 days to travel this route one way. On average, how many miles did the butterfly travel per day?

- A. 0.057
- B. 0.729
- C. 17.5
- D. 24

ID: 000259aa Answer

Rationale

Choice C is correct. If the butterfly traveled 2,100 miles in 120 days, then it traveled, on average, $\frac{2,100 \text{ miles}}{120 \text{ days}} = 17.5$ miles per day.

Choice A is incorrect. This is approximately the average amount of time, in days, it took the butterfly to fly one mile: $\frac{120 \text{ days}}{2,100 \text{ miles}} = 0.057$ days per mile. Choice B is incorrect and may result from an arithmetic error.

Choice D is incorrect. This is the number of hours in a day rather than the number of miles flown per day.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div> <div></div> <div></div> <div></div> </div>

ID: 312ba47c

In a box of pens, the ratio of black pens to red pens is **8** to **1**. There are **40** black pens in the box. How many red pens are in the box?

- A. **5**
- B. **8**
- C. **40**
- D. **320**

ID: 312ba47c Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the ratio of black pens to red pens is **8** to **1**. Therefore, there are $\frac{1}{8}$ as many red pens as black pens in the box. It's also given that there are **40** black pens in the box. Therefore, the number of red pens is $\frac{1}{8}$ of the **40** black pens. Thus, the number of red pens is $40(\frac{1}{8})$, or **5**.

Choice B is incorrect. This is the number of black pens in the box for every red pen.

Choice C is incorrect. This is the number of black pens in the box.

Choice D is incorrect. This is the number of red pens in the box if the ratio of black pens to red pens is **1** to **8**.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div> <div></div> <div></div> <div></div> </div>

ID: 15617f62

The population density of Worthington is **290** people per square mile. Worthington has a population of **92,800** people. What is the area, in square miles, of Worthington?

- A. **102,400**
- B. **93,090**
- C. **320**
- D. **32**

ID: 15617f62 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that the population density of Worthington is **290** people per square mile and Worthington has a population of **92,800** people. Therefore, the area of Worthington is **92,800 people** $\left(\frac{1 \text{ square mile}}{290 \text{ people}}\right)$, which is equivalent to $\frac{92,800 \text{ square miles}}{290}$, or **320** square miles.

Choice A is incorrect and may result from conceptual or calculation errors.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy



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ID: be35c117

A wind turbine completes **900** revolutions in **50** minutes. At this rate, how many revolutions per minute does this turbine complete?

- A. **18**
- B. **850**
- C. **950**
- D. **1,400**

ID: be35c117 Answer

Correct Answer: A

Rationale

Choice A is correct. Dividing the number of revolutions by the number of minutes gives the number of revolutions the turbine completes per minute. It's given that the wind turbine completes **900** revolutions in **50** minutes. Therefore, at this rate, this turbine completes $\frac{900}{50}$, or **18**, revolutions per minute.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy



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ID: 3f236a64

x	y
1	4
3	12
5	20
40	k

In the table above, the ratio of y to x for each ordered pair is constant. What is the value of k ?

- A. 28
- B. 36
- C. 80
- D. 160

ID: 3f236a64 Answer

Correct Answer: D

Rationale

Choice D is correct. Since the ratio of y to x is constant for each ordered pair in the table, the first row can be used to determine that the ratio of y to x is 4 to 1. The proportion $\frac{4}{1} = \frac{k}{40}$ can be used to solve for k . Multiplying each side of the equation by 40 yields $160 = k$.

Choice A is incorrect. This is the value of y when the value of x is 7, not 40. Choice B is incorrect and may result from subtracting 4 from 40 instead of multiplying 40 by 4. Choice C is incorrect and may result from incorrectly setting up the proportion.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
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ID: 6310adbc

The ratio of t to u is 1 to 2, and $t = 10$.

What is the value of u ?

- A. 2
- B. 5
- C. 10
- D. 20

ID: 6310adbc Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the ratio of t to u is 1 to 2. Since $t = 10$, it follows that the ratio of 10 to u is also 1 to 2. The relationship between these ratios can be represented by the proportion $\frac{10}{u} = \frac{1}{2}$. Multiplying both sides of this equation by 2 and then by u yields $20 = u$.

Choice A is incorrect. This is the value of u when $t = 1$. Choice B is incorrect. This would be the value of u if the ratio of t to u were 2 to 1. Choice C is incorrect. This is the value of t , not u .

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
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ID: aeeaec96

How many yards are equivalent to **612** inches? (**1 yard = 36 inches**)

- A. **0.059**
- B. **17**
- C. **576**
- D. **22,032**

ID: aeeaec96 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that **1 yard = 36 inches**. Therefore, **612** inches is equivalent to **612 inches** $\left(\frac{1 \text{ yard}}{36 \text{ inches}}\right)$, which can be rewritten as $\frac{612 \text{ yards}}{36}$, or **17** yards.

Choice A is incorrect. This is the number of yards that are equivalent to **2.124** inches.

Choice C is incorrect. This is the number of yards that are equivalent to **20,736** inches.

Choice D is incorrect. This is the number of yards that are equivalent to **793,152** inches.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div><div></div><div></div><div></div></div>

ID: e9841407

Shaquan has 7 red cards and 28 blue cards. What is the ratio of red cards to blue cards that Shaquan has?

- A. 1 to 4
- B. 4 to 1
- C. 1 to 7
- D. 7 to 1

ID: e9841407 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that Shaquan has 7 red cards and 28 blue cards. Therefore, the ratio of red cards to blue cards that Shaquan has is 7 to 28. This ratio can be reduced by dividing both parts of the ratio by 7, which yields the ratio 1 to 4.

Choice B is incorrect. This is the ratio of blue cards to red cards that Shaquan has. Choice C is incorrect and may result from a calculation error when reducing the ratio. Choice D is incorrect. This may result from finding the ratio of blue cards to red cards, or 28 to 7, and then making a calculation error when reducing the ratio.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div><div></div><div></div><div></div></div>

ID: ba62b0b0

A kangaroo has a mass of **28** kilograms. What is the kangaroo's mass, in grams? (**1 kilogram = 1,000 grams**)

A. **28,000**

B. **1,028**

C. **972**

D. **784**

ID: ba62b0b0 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that a kangaroo has a mass of **28** kilograms and that **1** kilogram is equal to **1,000** grams. Therefore, the kangaroo's mass, in grams, is **28 kilograms** $\left(\frac{1,000 \text{ grams}}{1 \text{ kilogram}}\right)$, which is equivalent to **28,000** grams.

Choice B is incorrect and may result from conceptual or calculation errors.

Choice C is incorrect and may result from conceptual or calculation errors.

Choice D is incorrect and may result from conceptual or calculation errors.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div> <div></div> <div></div> <div></div> </div>

ID: 24ad9dcb

The weight of an object on Venus is approximately $\frac{9}{10}$ of its weight on Earth. The weight of an object on Jupiter is approximately $\frac{23}{10}$ of its weight on Earth. If an object weighs 100 pounds on Earth, approximately how many more pounds does it weigh on Jupiter than it weighs on Venus?

- A. 90
- B. 111
- C. 140
- D. 230

ID: 24ad9dcb Answer

Correct Answer: C

Rationale

Choice C is correct. The weight of an object on Venus is approximately $\frac{9}{10}$ of its weight on Earth. If an object weighs 100 pounds on Earth, then the object's weight on Venus is approximately $\frac{9}{10}(100) = 90$ pounds. The same object's weight on Jupiter is approximately $\frac{23}{10}$ of its weight on Earth; therefore, the object weighs approximately $\frac{23}{10}(100) = 230$ pounds on Jupiter. The difference between the object's weight on Jupiter and the object's weight on Venus is approximately $230 - 90 = 140$ pounds. Therefore, an object that weighs 100 pounds on Earth weighs 140 more pounds on Jupiter than it weighs on Venus.

Choice A is incorrect because it is the weight, in pounds, of the object on Venus. Choice B is incorrect because it is the weight, in pounds, of an object on Earth if it weighs 100 pounds on Venus. Choice D is incorrect because it is the weight, in pounds, of the object on Jupiter.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div><div></div><div></div><div></div></div>

ID: d0d9ede4

How many feet are equivalent to **34** yards? (**1 yard = 3 feet**)

ID: d0d9ede4 Answer

Correct Answer: 102

Rationale

The correct answer is **102**. It's given that **1** yard is equivalent to **3** feet. Therefore, **34** yards is equivalent to **(34 yards)** $\left(\frac{3 \text{ feet}}{1 \text{ yard}}\right)$, or **102** feet.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■ □ □

ID: 06a152cd

To make a bakery's signature chocolate muffins, a baker needs 2.5 ounces of chocolate for each muffin. How many pounds of chocolate are needed to make 48 signature chocolate muffins? (1 pound = 16 ounces)

- A. 7.5
- B. 10
- C. 50.5
- D. 120

ID: 06a152cd Answer

Correct Answer: A

Rationale

Choice A is correct. If 2.5 ounces of chocolate are needed for each muffin, then the number of ounces of chocolate needed to make 48 muffins is $48 \times 2.5 = 120$ ounces. Since 1 pound = 16 ounces, the number of pounds that is equivalent to 120 ounces is $\frac{120}{16} = 7.5$ pounds. Therefore, 7.5 pounds of chocolate are needed to make the 48 muffins.

Choice B is incorrect. If 10 pounds of chocolate were needed to make 48 muffins, then the total number of ounces of chocolate needed would be $10 \times 16 = 160$ ounces. The number of ounces of chocolate per muffin would then be $\frac{160}{48} = 3.33$ ounces per muffin, not 2.5 ounces per muffin. Choices C and D are also incorrect.

Following the same procedures as used to test choice B gives 16.8 ounces per muffin for choice C and 40 ounces per muffin for choice D, not 2.5 ounces per muffin. Therefore, 50.5 and 120 pounds cannot be the number of pounds needed to make 48 signature chocolate muffins.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div><div></div><div></div><div></div></div>

ID: 3ac09984

Marta has 7,500 pesos she will convert to US dollars using a currency exchange service. At this time, the currency exchange rate is 1 peso = 0.075 US dollars. The exchange service will charge Marta a 2% fee on the converted US dollar amount. How many US dollars will Marta receive from the currency exchange after the 2% fee is applied?

- A. \$551.25
- B. \$562.50
- C. \$5,625.00
- D. \$98,000.00

ID: 3ac09984 Answer

Correct Answer: A

Rationale

Choice A is correct. At the exchange rate of 1 peso = 0.075 US dollars, 7,500 pesos would be converted to $7,500 \times 0.075 = \$562.50$. However, since Maria pays a 2% fee on the converted US dollar amount, she receives only (100 – 2)%, or 98%, of the converted US dollars, and $562.50 \times 0.98 = \$551.25$.

Choice B is incorrect. This is the number of US dollars Maria would receive if the exchange service did not charge a 2% fee. Choice C is incorrect and may result from a decimal point error made when calculating the conversion to US dollars and from not assessing the 2% fee. Choice D is incorrect and may result from reversing the units of the exchange rate.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div><div></div><div></div><div></div></div>

ID: 99550621

Makayla is planning an event in a 5,400-square-foot room. If there should be at least 8 square feet per person, what is the maximum number of people that could attend this event?

- A. 588
- B. 675
- C. 15,274
- D. 43,200

ID: 99550621 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the event will be in a 5,400-square-foot room and that there should be at least 8 square feet per person. The maximum number of people that could attend the event can be found by dividing the total square feet in the room by the minimum number of square feet needed per person, which gives $\frac{5,400}{8} = 675$.

Choices A and C are incorrect and may result from conceptual or computational errors. Choice D is incorrect and may result from multiplying, rather than dividing, 5,400 by 8.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div><div></div><div></div><div></div></div>

ID: 808f7d6c

If $t = 4u$, which of the following is equivalent to $2t$?

- A. $8u$
- B. $2u$
- C. u
- D. $\frac{1}{2}u$

ID: 808f7d6c Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that $t = 4u$. Multiplying both sides of this equation by 2 yields $2t = 2(4u)$, or $2t = 8u$.

Choice B is incorrect and may result from dividing, instead of multiplying, the right-hand side of the equation by 2. Choices C and D are incorrect and may result from calculation errors.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div><div></div><div></div><div></div></div>

ID: 4347a032

How many teaspoons are equivalent to **44** tablespoons? (**3 teaspoons = 1 tablespoon**)

- A. **47**
- B. **88**
- C. **132**
- D. **176**

ID: 4347a032 Answer

Correct Answer: C

Rationale

Choice C is correct. It's given that **3** teaspoons is equivalent to **1** tablespoon. Therefore, **44** tablespoons is equivalent to **(44 tablespoons)** $\left(\frac{3 \text{ teaspoons}}{1 \text{ tablespoon}}\right)$, or **132** teaspoons.

Choice A is incorrect. This is equivalent to approximately **15.66** tablespoons, not **44** tablespoons.

Choice B is incorrect. This is equivalent to approximately **29.33** tablespoons, not **44** tablespoons.

Choice D is incorrect. This is equivalent to approximately **58.66** tablespoons, not **44** tablespoons.

Question Difficulty: Easy



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div> <div></div> <div></div> <div></div> </div>

ID: d28c29e1

The International Space Station orbits Earth at an average speed of 4.76 miles per second. What is the space station’s average speed in miles per hour?

- A. 285.6
- B. 571.2
- C. 856.8
- D. 17,136.0

ID: d28c29e1 Answer

Correct Answer: D

Rationale

Choice D is correct. Since 1 minute = 60 seconds and 1 hour = 60 minutes, it follows that 1 hour = (60)(60), or 3,600 seconds. Using this conversion factor, the space station’s average speed of 4.76 miles per second is equal to an average speed of $\frac{4.76 \text{ miles}}{\text{second}} \times \frac{3,600 \text{ seconds}}{\text{hour}} = \frac{17,136 \text{ miles}}{\text{hour}}$, or 17,136 miles per hour.

Choice A is incorrect. This is the space station’s average speed in miles per minute. Choice B is incorrect. This is double the space station’s average speed in miles per minute, or the number of miles the space station travels on average in 2 minutes. Choice C is incorrect. This is triple the space station’s average speed in miles per minute, or the number of miles the space station travels on average in 3 minutes.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■ ■ □

ID: b4912cc5

The population density of Iceland, in people per square kilometer of land area, increased from 2.5 in 1990 to 3.3 in 2014. During this time period, the land area of Iceland was 100,250 square kilometers. By how many people did Iceland's population increase from 1990 to 2014?

- A. 330,825
- B. 132,330
- C. 125,312
- D. 80,200

ID: b4912cc5 Answer

Correct Answer: D

Rationale

Choice D is correct. The increase in Iceland's population can be found by multiplying the increase in population density, in people per square kilometer, by the area, in square kilometers. It's given that the population density of Iceland was 2.5 people per square kilometer in 1990 and 3.3 people per square kilometer in 2014. The increase in population density can be found by subtracting 2.5 from 3.3, which yields 0.8. It's given that the land area of Iceland was 100,250 square kilometers. Thus, the increase in population is $0.8(100,250)$, or 80,200.

Alternate approach: It's given that the population density of Iceland, in people per square kilometer of land area, in 1990 was 2.5. Since the land area of Iceland was 100,250 square kilometers, it follows that the population of Iceland in 1990 was $2.5(100,250)$, or 250,625. Similarly, the population of Iceland in 2014 was $3.3(100,250)$, or 330,825. The population increase is the difference in the population from 1990 to 2014, or $330,825 - 250,625$, which yields 80,200. Therefore, Iceland's population increased by 80,200 from 1990 to 2014.

Choice A is incorrect. This is the population of Iceland in 2014. Choice B is incorrect and may result from dividing 3.3 by 2.5, instead of subtracting 2.5 from 3.3. Choice C is incorrect and may result from dividing the population of Iceland in 1990 by 2.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div> <div></div> <div></div> <div></div> </div>

ID: 8e528129

Pure beeswax has a density of 0.555 ounce per cubic inch. An online company sells pure beeswax at a price of \$8.00 per ounce. What is the selling price, in dollars per cubic inch, for pure beeswax purchased from this company?

ID: 8e528129 Answer

Rationale

The correct answer is 4.44. The selling price, in dollars per cubic inch, is found by multiplying the density, in ounces per cubic inch, by the unit price, in dollars per ounce: $\left(\frac{0.555 \text{ ounce}}{1 \text{ cubic inch}}\right)\left(\frac{\$8.00}{1 \text{ ounce}}\right)$ yields $\frac{\$4.44}{1 \text{ cubic inch}}$. Thus, the selling price, in dollars per cubic inch, is 4.44.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■ ■ □

ID: fea831fc

On April 18, 1775, Paul Revere set off on his midnight ride from Charlestown to Lexington. If he had ridden straight to Lexington without stopping, he would have traveled 11 miles in 26 minutes. In such a ride, what would the average speed of his horse have been, to the nearest tenth of a mile per hour?

ID: fea831fc Answer

Rationale

The correct answer is 25.4. The average speed is the total distance divided by the total time. The total distance is 11 miles and the total time is 26 minutes. Thus, the average speed is $\frac{11}{26}$ miles per minute. The question asks for the average speed in miles per hour, and there are 60 minutes in an hour; converting miles per minute to miles per hour gives the following:

$$\begin{aligned}\text{Average speed} &= \frac{11 \text{ miles}}{26 \text{ minutes}} \times \frac{60 \text{ minutes}}{1 \text{ hour}} \\ &= \frac{660}{26} \text{ miles per hour}\end{aligned}$$

$$\approx 25.38 \text{ miles per hour}$$

Therefore, to the nearest tenth of a mile per hour, the average speed of Paul Revere's ride would have been 25.4 miles per hour. Note that 25.4 and $127/5$ are examples of ways to enter a correct answer.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
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ID: 181cc4d6

Rectangle A has length 15 and width w . Rectangle B has length 20 and the same length-to-width ratio as rectangle A. What is the width of rectangle B in terms of w ?

A. $\frac{4}{3}w$

B. $w + 5$

C. $\frac{3}{4}w$

D. $w - 5$

ID: 181cc4d6 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that rectangle A has length 15 and width w . Therefore, the length-to-width ratio of rectangle A is 15 to w . It's also given that rectangle B has length 20 and the same length-to-width ratio as

rectangle A. Let x represent the width of rectangle B. The proportion $\frac{15}{w} = \frac{20}{x}$ can be used to solve for x in

terms of w . Multiplying both sides of this equation by x yields $\frac{15x}{w} = 20$, and then multiplying both sides of

this equation by w yields $15x = 20w$. Dividing both sides of this equation by 15 yields $x = \frac{20w}{15}$. Simplifying

this fraction yields $x = \frac{4}{3}w$.

Choices B and D are incorrect and may result from interpreting the difference in the lengths of rectangle A and rectangle B as equivalent to the difference in the widths of rectangle A and rectangle B. Choice C is incorrect and may result from using a length-to-width ratio of w to 15, instead of 15 to w .

Question Difficulty: Medium



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SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div><div></div><div></div><div></div></div>

ID: 445dd032

Tanya earns \$13.50 per hour at her part-time job. When she works z hours, she earns **13.50 z** dollars. Which of the following expressions gives the amount, in dollars, Tanya will earn if she works **3 z** hours?

- A. **3(13.50 z)**
- B. $3 + 13.50z$
- C. $3z + 13.50z$
- D. $13.50(z + 3)$

ID: 445dd032 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that when Tanya works z hours, she earns **13.50 z** dollars. Since her hourly rate is constant, if she works 3 times as many hours, or **3 z** hours, she will earn 3 times as many dollars, or **3(13.50 z)**.

Choice B is incorrect. This expression represents adding 3 dollars to the **13.50 z** dollars Tanya will earn.

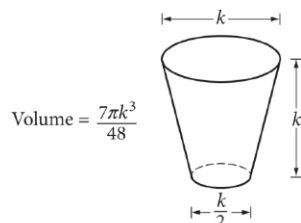
Choice C is incorrect. This expression can be rewritten as **16.50 z** , which implies that Tanya earns \$16.50 per hour, not \$13.50. Choice D is incorrect. This expression adds 3 to the number of hours Tanya works, rather than multiplying the hours she works by 3.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div> <div></div> <div></div> <div></div> </div>

ID: 939c46d1



The glass pictured above can hold a maximum volume of 473 cubic centimeters, which is approximately 16 fluid ounces. Jenny has a pitcher that contains 1 gallon of water. How many times could Jenny completely fill the glass with 1 gallon of water? (1 gallon = 128 fluid ounces)

- A. 16
- B. 8
- C. 4
- D. 3

ID: 939c46d1 Answer

Correct Answer: B

Rationale

Choice B is correct. It is given that the volume of the glass is approximately 16 fluid ounces. If Jenny has 1 gallon of water, which is 128 fluid ounces, she could fill the glass $\frac{128}{16} = 8$ times.

Choice A is incorrect because Jenny would need 16×16 fluid ounces = 256 fluid ounces, or 2 gallons, of water to fill the glass 16 times. Choice C is incorrect because Jenny would need only 4×16 fluid ounces = 64 fluid ounces of water to fill the glass 4 times. Choice D is incorrect because Jenny would need only 3×16 fluid ounces = 48 fluid ounces to fill the glass 3 times.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div><div></div><div></div><div></div></div>

ID: e21d10a7

One of a planet's moons orbits the planet every **252** days. A second moon orbits the planet every **287** days. How many more days does it take the second moon to orbit the planet **29** times than it takes the first moon to orbit the planet **29** times?

ID: e21d10a7 Answer

Correct Answer: 1015

Rationale

The correct answer is **1,015**. It's given that the first moon orbits the planet every **252** days. Therefore, it takes the first moon **252(29)**, or **7,308**, days to orbit the planet **29** times. It's also given that the second moon orbits the planet every **287** days. Therefore, it takes the second moon **287(29)**, or **8,323**, days to orbit the planet **29** times. Since it takes the first moon **7,308** days and the second moon **8,323** days, it takes the second moon **8,323 – 7,308**, or **1,015**, more days than it takes the first moon to orbit the planet **29** times.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div> <div></div> <div></div> <div></div> </div>

ID: 8917ce38

Which of the following speeds is equivalent to 90 kilometers per hour? (1 kilometer = 1,000 meters)

- A. 25 meters per second
- B. 32 meters per second
- C. 250 meters per second
- D. 324 meters per second

ID: 8917ce38 Answer

Correct Answer: A

Rationale

Choice A is correct. Since 1 kilometer is equal to 1,000 meters, it follows that 90 kilometers is equal to $90(1,000) = 90,000$ meters. Since 1 hour is equal to 60 minutes and 1 minute is equal to 60 seconds, it follows that 1 hour is equal to $60(60) = 3,600$ seconds. Now $\frac{90 \text{ kilometers}}{1 \text{ hour}}$ is equal to $\frac{90,000 \text{ meters}}{3,600 \text{ seconds}}$, which reduces to $\frac{25 \text{ meters}}{1 \text{ second}}$ or 25 meters per second.

Choices B, C, and D are incorrect and may result from conceptual or calculation errors.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div> <div></div> <div></div> <div></div> </div>

ID: ec787383

A distance of **61** furlongs is equivalent to how many feet? (**1 furlong = 220 yards** and **1 yard = 3 feet**)

ID: ec787383 Answer

Correct Answer: 40260

Rationale

The correct answer is **40,260**. It's given that **1 furlong = 220 yards** and **1 yard = 3 feet**. It follows that a distance of **61** furlongs is equivalent to $(61 \text{ furlongs}) \left(\frac{220 \text{ yards}}{1 \text{ furlong}} \right) \left(\frac{3 \text{ feet}}{1 \text{ yard}} \right)$, or **40,260** feet.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div><div></div><div></div><div></div></div>

ID: 7e6c745f

Food	Protein	Cost
1 large egg	6 grams	\$0.36
1 cup of milk	8 grams	\$0.24

The table above shows the amount of protein in two foods and the cost of each food. Based on the table, what is the ratio of the cost per gram of protein in a large egg to the cost per gram of protein in a cup of milk?

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

ID: 7e6c745f Answer

Correct Answer: D

Rationale

Choice D is correct. The cost per gram of protein in 1 large egg is $\$0.36 \div 6 = \0.06 . The cost per gram of protein in 1 cup of milk is $\$0.24 \div 8 = \0.03 . It follows that the ratio of the cost per gram of protein in a large egg to the cost per gram of protein in a cup of milk is 0.06:0.03, which can be rewritten as 2:1.

Choice A is incorrect and may result from finding the ratio of the cost per gram of protein in a cup of milk to the cost per gram of protein in a large egg (the reciprocal of the ratio specified in the question). Choices B and C are incorrect and may result from incorrectly calculating the unit rates or from errors made when simplifying the ratio.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div> <div></div> <div></div> <div></div> </div>

ID: 873d2838

The population density of Cedar County is **230** people per square mile. The county has a population of **85,100** people. What is the area, in square miles, of Cedar County?

ID: 873d2838 Answer

Correct Answer: 370

Rationale

The correct answer is **370**. It’s given that the population density of Cedar County is **230** people per square mile and the county has a population of **85,100** people. Based on the population density, it follows that the area of Cedar County is $(85,100 \text{ people})\left(\frac{1 \text{ square mile}}{230 \text{ people}}\right)$, or **370** square miles.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div> <div></div> <div></div> <div></div> </div>

ID: 73ddfdac

A distance of **112** furlongs is equivalent to how many feet? (**1 furlong = 220 yards** and **1 yard = 3 feet**)

ID: 73ddfdac Answer

Correct Answer: 73920

Rationale

The correct answer is **73,920**. It's given that **1 furlong = 220 yards** and **1 yard = 3 feet**. It follows that a distance of **112** furlongs is equivalent to $(112 \text{ furlongs}) \left(\frac{220 \text{ yards}}{1 \text{ furlong}} \right) \left(\frac{3 \text{ feet}}{1 \text{ yard}} \right)$, or **73,920** feet.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div> <div></div> <div></div> <div></div> </div>

ID: 61b87506

For the values j and k , the ratio of j to k is 11 to 12. If j is multiplied by 17, what is k multiplied by in order to maintain the same ratio?

ID: 61b87506 Answer

Correct Answer: 17

Rationale

The correct answer is 17. If one value is multiplied by a number, then the other value must be multiplied by the same number in order to maintain the same ratio. It's given that j is multiplied by 17. Therefore, in order to maintain the same ratio, k must also be multiplied by 17.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div> <div></div> <div></div> <div></div> </div>

ID: eb672707

How many tablespoons are equivalent to **14** teaspoons? (**3 teaspoons = 1 tablespoon**)

ID: eb672707 Answer

Correct Answer: 14/3, 4.666, 4.667

Rationale

The correct answer is $\frac{14}{3}$. It's given that **3** teaspoons is equivalent to **1** tablespoon. Therefore, **14** teaspoons is equivalent to **(14 teaspoons)** $\left(\frac{1 \text{ tablespoon}}{3 \text{ teaspoons}}\right)$, or $\frac{14}{3}$ tablespoons. Note that 14/3, 4.666, and 4.667 are examples of ways to enter a correct answer.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div> <div></div> <div></div> <div></div> </div>

ID: cb4894f9

A triathlon is a multisport race consisting of three different legs. A triathlon participant completed the cycling leg with an average speed of **19.700** miles per hour. What was the average speed, in yards per hour, of the participant during the cycling leg? (**1 mile = 1,760 yards**)

ID: cb4894f9 Answer

Correct Answer: 34672

Rationale

The correct answer is **34,672**. It's given that **1 mile = 1,760 yards**. It follows that an average speed of **19.700** miles per hour is equivalent to $\left(\frac{19.700 \text{ miles}}{1 \text{ hour}}\right)\left(\frac{1,760 \text{ yards}}{1 \text{ mile}}\right)$, or **34,672** yards per hour.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div><div></div><div></div><div></div></div>

ID: 1180401d

The total area of a coastal city is 92.1 square miles, of which 11.3 square miles is water. If the city had a population of 621,000 people in the year 2010, which of the following is closest to the population density, in people per square mile of land area, of the city at that time?

- A. 6,740
- B. 7,690
- C. 55,000
- D. 76,000

ID: 1180401d Answer

Correct Answer: B

Rationale

Choice B is correct. The land area of the coastal city can be found by subtracting the area of the water from the total area of the coastal city; that is, $92.1 - 11.3 = 80.8$ square miles. The population density is the population

divided by the land area, or $\frac{621,000}{80.8} = 7,686$, which is closest to 7,690 people per square mile.

Choice A is incorrect and may be the result of dividing the population by the total area, instead of the land area. Choice C is incorrect and may be the result of dividing the population by the area of water. Choice D is incorrect and may be the result of making a computational error with the decimal place.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div><div></div><div></div><div></div></div>

ID: f6cbb04a

$$d = 55t$$

The equation above can be used to calculate the distance d , in miles, traveled by a car moving at a speed of 55 miles per hour over a period of t hours. For any positive constant k , the distance the car would have traveled after $9k$ hours is how many times the distance the car would have traveled after $3k$ hours?

- A. 3
- B. 6
- C. $3k$
- D. $6k$

ID: f6cbb04a Answer

Correct Answer: A

Rationale

Choice A is correct. Since the distance is equal to the amount of time multiplied by a constant, the given equation $d = 55t$ represents a proportional relationship between distance and time in this situation. Since $9k = 3 \cdot 3k$, the time when $t = 9k$ hours is 3 times the time when $t = 3k$ hours. Therefore, the distance traveled after $9k$ hours is 3 times the distance after $3k$ hours.

Choices B and D are incorrect and may result from interpreting the proportional relationship between time and distance as additive rather than multiplicative. Choice C is incorrect and may result from an arithmetic error.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	<div> <div></div> <div></div> <div></div> </div>

ID: 89c39d77

A competition consisted of four different events. One participant completed the first event with an average speed of **20.300** miles per hour. What was this average speed, in yards per hour? (**1 mile = 1,760 yards**)

ID: 89c39d77 Answer

Correct Answer: 35728

Rationale

The correct answer is **35,728**. It's given that **1 mile = 1,760 yards**. It follows that an average speed of **20.300** miles per hour is equivalent to $\left(\frac{20.300 \text{ miles}}{1 \text{ hour}}\right)\left(\frac{1,760 \text{ yards}}{1 \text{ mile}}\right)$, or **35,728** yards per hour.

Question Difficulty: Medium



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■ ■ ■

ID: c9fb15ad

Species of tree	Growth factor
Red maple	4.5
River birch	3.5
Cottonwood	2.0
Black walnut	4.5
White birch	5.0
American elm	4.0
Pin oak	3.0
Shagbark hickory	7.5

One method of calculating the approximate age, in years, of a tree of a particular species is to multiply the diameter of the tree, in inches, by a constant called the growth factor for that species. The table above gives the growth factors for eight species of trees. If a white birch tree and a pin oak tree each now have a diameter of 1 foot, which of the following will be closest to the difference, in inches, of their diameters 10 years from now? (1 foot = 12 inches)

- A. 1.0
- B. 1.2
- C. 1.3
- D. 1.4

ID: c9fb15ad Answer

Correct Answer: C

Rationale

Choice C is correct. According to the given information, multiplying a tree species' growth factor by the tree's diameter is a method to approximate the age of the tree. A white birch with a diameter of 12 inches (or 1 foot) has a given growth factor of 5 and is approximately 60 years old. A pin oak with a diameter of 12 inches (or 1 foot) has a given growth factor of 3 and is approximately 36 years old. The diameters of the two trees 10 years from now can be found by dividing each tree's age in 10 years, 70 years, and 46 years, by its respective growth factor. This yields 14 inches and $15\frac{1}{3}$ inches. The difference between $15\frac{1}{3}$ and 14 is $1\frac{1}{3}$, or approximately 1.3 inches.

Alternate approach: Since a white birch has a growth factor of 5, the age increases at a rate of 5 years per inch or, equivalently, the diameter increases at a rate of $\frac{1}{5}$ of an inch per year. Likewise, the pin oak has a growth factor of 3, so its diameter increases at a rate of $\frac{1}{3}$ of an inch per year. Thus, the pin oak grows $\frac{2}{15}$ of an inch per year more than the white birch. In 10 years it will grow $\left(\frac{2}{15}\right)10 = \frac{4}{3}$ of an inch more, which is approximately 1.3 inches.

Choices A, B, and D are incorrect and a result of incorrectly calculating the diameters of the two trees in 10 years.

Question Difficulty: Hard



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■ ■ ■

ID: 3638f413

Jeremy deposited x dollars in his investment account on January 1, 2001. The amount of money in the account doubled each year until Jeremy had 480 dollars in his investment account on January 1, 2005. What is the value of x ?

ID: 3638f413 Answer

Rationale

The correct answer is 30. The situation can be represented by the equation $x(2^4) = 480$, where the 2 represents the fact that the amount of money in the account doubled each year and the 4 represents the fact that there are 4 years between January 1, 2001, and January 1, 2005. Simplifying $x(2^4) = 480$ gives $16x = 480$. Therefore, $x = 30$.

Question Difficulty: Hard



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■ ■ ■

ID: 3f775bbf

State	Power capacity			
	Low	Medium	High	Total
Texas	4	2	3	9
California	1	0	1	2
Oregon	1	0	1	2
Indiana	0	2	0	2
Colorado	1	1	0	2
Iowa	2	0	0	2
Oklahoma	1	0	0	1
Total	10	5	5	20

The table shows the distribution, by location and power capacity (maximum rate of power generation) of the twenty largest wind projects in the United States in 2013. The total power capacity of the nine wind projects located in Texas was 4,952 megawatts (MW), and the total power capacity of the twenty wind projects was 11,037 MW in 2013. The amount of energy produced in one hour at a rate of one megawatt is one megawatt-hour. If each of the nine Texas wind projects in 2013 had operated continuously for 24 hours at the maximum rate of power generation, approximately how many megawatt-hours of energy would the nine projects have produced?

- A. 200
- B. 5,000
- C. 11,000
- D. 120,000

ID: 3f775bbf Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that the total power capacity of the nine wind projects in Texas was 4,952 megawatts. Therefore, if all nine Texas projects operated continuously for 1 hour, the amount of energy produced would be 4,952 megawatt-hours. It follows that, if all nine Texas projects operated continuously for 24 hours, the amount of energy produced, in megawatt-hours, would be $(4,952)(24) = 118,848$, which is closest to 120,000.

Choice A is incorrect. This is approximately the amount of energy produced for the nine projects divided by 24 hours. Choice B is incorrect. This is approximately the amount of energy produced for the nine projects. Choice C is incorrect. This is approximately the given amount of energy produced for all twenty projects in the table.

Question Difficulty: Hard



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■ ■ ■

ID: 8637294f

If $\frac{4a}{b} = 6.7$ and $\frac{a}{bn} = 26.8$, what is the value of n ?

ID: 8637294f Answer

Correct Answer: .0625, 1/16

Rationale

The correct answer is **.0625**. It's given that $\frac{4a}{b} = 6.7$ and $\frac{a}{bn} = 26.8$. The equation $\frac{4a}{b} = 6.7$ can be rewritten as $(4)\left(\frac{a}{b}\right) = 6.7$. Dividing both sides of this equation by 4 yields $\frac{a}{b} = 1.675$. The equation $\frac{a}{bn} = 26.8$ can be rewritten as $\left(\frac{a}{b}\right)\left(\frac{1}{n}\right) = 26.8$. Substituting **1.675** for $\frac{a}{b}$ in this equation yields $(1.675)\left(\frac{1}{n}\right) = 26.8$, or $\frac{1.675}{n} = 26.8$. Multiplying both sides of this equation by n yields **1.675** = **26.8n**. Dividing both sides of this equation by **26.8** yields $n = 0.0625$. Therefore, the value of n is **0.0625**. Note that .0625, 0.062, 0.063, and 1/16 are examples of ways to enter a correct answer.

Question Difficulty: Hard



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■ ■ ■

ID: 7d721177

The density of a certain type of wood is **353** kilograms per cubic meter. A sample of this type of wood is in the shape of a cube and has a mass of **345** kilograms. To the nearest hundredth of a meter, what is the length of one edge of this sample?

- A. **0.98**
- B. **0.99**
- C. **1.01**
- D. **1.02**

ID: 7d721177 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the density of a certain type of wood is **353** kilograms per cubic meter (kg/m^3), and a sample of this type of wood has a mass of **345 kg**. Let x represent the volume, in m^3 , of the sample. It follows that the relationship between the density, mass, and volume of this sample can be written as $\frac{353 \text{ kg}}{1 \text{ m}^3} = \frac{345 \text{ kg}}{x \text{ m}^3}$, or $353 = \frac{345}{x}$. Multiplying both sides of this equation by x yields $353x = 345$. Dividing both sides of this equation by **353** yields $x = \frac{345}{353}$. Therefore, the volume of this sample is $\frac{345}{353} \text{ m}^3$. Since it's given that the sample of this type of wood is a cube, it follows that the length of one edge of this sample can be found using the volume formula for a cube, $V = s^3$, where V represents the volume, in m^3 , and s represents the length, in m, of one edge of the cube. Substituting $\frac{345}{353}$ for V in this formula yields $\frac{345}{353} = s^3$. Taking the cube root of both sides of this equation yields $\sqrt[3]{\frac{345}{353}} = s$, or $s \approx 0.99$. Therefore, the length of one edge of this sample to the nearest hundredth of a meter is **0.99**.

Choices A, C, and D are incorrect and may result from conceptual or calculation errors.

Question Difficulty: Hard



Assessment	Test	Domain	Skill	Difficulty
SAT	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	■ ■ ■

ID: 20b69297

Anita created a batch of green paint by mixing 2 ounces of blue paint with 3 ounces of yellow paint. She must mix a second batch using the same ratio of blue and yellow paint as the first batch. If she uses 5 ounces of blue paint for the second batch, how much yellow paint should Anita use?

- A. Exactly 5 ounces
- B. 3 ounces more than the amount of yellow paint used in the first batch
- C. 1.5 times the amount of yellow paint used in the first batch
- D. 1.5 times the amount of blue paint used in the second batch

ID: 20b69297 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that Anita used a ratio of 2 ounces of blue paint to 3 ounces of yellow paint for the first batch. For any batch of paint that uses the same ratio, the amount of yellow paint used will be $\frac{3}{2}$, or 1.5, times the amount of blue paint used in the batch. Therefore, the amount of yellow paint Anita will use in the second batch will be 1.5 times the amount of blue paint used in the second batch.

Alternate approach: It's given that Anita used a ratio of 2 ounces of blue paint to 3 ounces of yellow paint for the first batch and that she will use 5 ounces of blue paint for the second batch. A proportion can be set up to solve for x, the amount of yellow paint she will use for the second batch: $\frac{2}{3} = \frac{5}{x}$. Multiplying both sides of this equation by 3 yields $2 = \frac{15}{x}$, and multiplying both sides of this equation by x yields $2x = 15$. Dividing both sides of this equation by 2 yields $x = 7.5$. Since Anita will use 7.5 ounces of yellow paint for the second batch, this is $\frac{7.5}{5} = 1.5$ times the amount of blue paint (5 ounces) used in the second batch.

Choices A, B, and C are incorrect and may result from incorrectly interpreting the ratio of blue paint to yellow paint used.

Question Difficulty: Hard

