

Question ID 410fb541

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	

ID: 410fb541

For a certain rectangular region, the ratio of its length to its width is **35** to **10**. If the width of the rectangular region increases by **7** units, how must the length change to maintain this ratio?

- A. It must decrease by **24.5** units.
- B. It must increase by **24.5** units.
- C. It must decrease by **7** units.
- D. It must increase by **7** units.

ID: 410fb541 Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the ratio of the rectangular region's length to its width is 35 to 10. This can be written as a proportion: $\frac{\text{length}}{\text{width}} = \frac{35}{10}$, or $\frac{l}{w} = \frac{35}{10}$. This proportion can be rewritten as $10l = 35w$, or $l = 3.5w$. If the width of the rectangular region increases by 7, then the length will increase by some number x in order to maintain this ratio. The value of x can be found by replacing l with $l + x$ and w with $w + 7$ in the equation, which gives $l + x = 3.5w + 7$. This equation can be rewritten using the distributive property as $l + x = 3.5w + 24.5$. Since $l = 3.5w$, the right-hand side of this equation can be rewritten by substituting l for $3.5w$, which gives $l + x = l + 24.5$, or $x = 24.5$. Therefore, if the width of the rectangular region increases by 7 units, the length must increase by 24.5 units in order to maintain the given ratio.

Choice A is incorrect. If the width of the rectangular region increases, the length must also increase, not decrease.

Choice C is incorrect. If the width of the rectangular region increases, the length must also increase, not decrease.

Choice D is incorrect. Since the ratio of the length to the width of the rectangular region is 35 to 10, if the width of the rectangular region increases by 7 units, the length would have to increase by a proportional amount, which would have to be greater than 7 units.

Question Difficulty: Hard

Question ID e041089e

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	

ID: e041089e

One side of a flat board has an area of **874** square inches. If a pressure of **19** pounds per square inch of area is exerted on this side of the board, what is the total force, in pounds, exerted on this side of the board?

ID: e041089e Answer

Correct Answer: 16606

Rationale

The correct answer is 16,606. It's given that one side of a flat board has an area of 874 square inches. If a pressure of 19 pounds per square inch of area is exerted on this side of the board, the total force exerted on this side of the board is $874 \text{ square inches} \frac{19 \text{ pounds}}{1 \text{ square inch}}$, or 16,606 pounds.

Question Difficulty: Hard

Question ID 0b5424c0

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	

ID: 0b5424c0

To study fluctuations in composition, samples of pumice were taken from **29** locations and cut in the shape of a cube. The length of the edge of one of these cubes is **3.000** centimeters. This cube has a density of **0.230** grams per cubic centimeter. What is the mass of this cube, in grams?

ID: 0b5424c0 Answer

Correct Answer: 6.21

Rationale

The correct answer is 6.21. It’s given that the samples of pumice were cut in the shape of a cube. It’s also given that the length of the edge of one of these cubes is 3.000 centimeters. Therefore, the volume of this cube is $3.000 \text{ centimeters}^3$, or 27 cubic centimeters. Since the density of this cube is 0.230 grams per cubic centimeter, it follows that the mass of this cube is $\frac{0.230 \text{ grams}}{1 \text{ cubic centimeter}} 27 \text{ cubic centimeters}$, or 6.21 grams.

Question Difficulty: Hard

Question ID 859d9971

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	

ID: 859d9971

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: 859d9971 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

Question ID 5deda8b0

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	

ID: 5deda8b0

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: 5deda8b0 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: Hard

Question ID 338eaa47

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	

ID: 338eaa47

A certain park has an area of **11,863,808** square yards. What is the area, in square miles, of this park? (**1 mile = 1,760 yards**)

- A. **1.96**
- B. **3.83**
- C. **3,444.39**
- D. **6,740.8**

ID: 338eaa47 Answer

Correct Answer: B

Rationale

Choice B is correct. Since 1 mile is equal to 1,760 yards, 1 square mile is equal to $1,760^2$, or 3,097,600, square yards. It’s given that the park has an area of 11,863,808 square yards. Therefore, the park has an area of 11,863,808 square yards $\frac{1 \text{ square mile}}{3,097,600 \text{ square yards}}$, or $\frac{11,863,808}{3,097,600}$ square miles. Thus, the area, in square miles, of the park is 3.83.

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

Choice C is incorrect. This is the square root of the area of the park in square yards, not the area of the park in square miles.

Choice D is incorrect and may result from converting 11,863,808 yards to miles, rather than converting 11,863,808 square yards to square miles.

Question Difficulty: Hard

Question ID 12ee6d83

Assessment	Test	Domain	Skill	Difficulty
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ID: 12ee6d83

A certain town has an area of **4.36** square miles. What is the area, in square yards, of this town? (**1 mile = 1,760 yards**)

- A. **404**
- B. **7,674**
- C. **710,459**
- D. **13,505,536**

ID: 12ee6d83 Answer

Correct Answer: D

Rationale

Choice D is correct. Since the number of yards in 1 mile is 1,760, the number of square yards in 1 square mile is $(1,760) (1,760) = 3,097,600$. Therefore, if the area of the town is 4.36 square miles, it is $4.36 (3,097,600) = 13,505,536$, in square yards.

Choice A is incorrect and may result from dividing the number of yards in a mile by the square mileage of the town.

Choice B is incorrect and may result from multiplying the number of yards in a mile by the square mileage of the town.

Choice C is incorrect and may result from dividing the number of square yards in a square mile by the square mileage of the town.

Question Difficulty: Hard

Question ID 66db54cd

Assessment	Test	Domain	Skill	Difficulty
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ID: 66db54cd

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

ID: 66db54cd 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 $\frac{1 \text{ tablespoon}}{3 \text{ teaspoons}}$, 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: Hard

Question ID 48a06fda

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	

ID: 48a06fda

Objects R and S each travel at a constant speed. The speed of object R is half the speed of object S. Object R travels a distance of $4x$ inches in y seconds. Which expression represents the time, in seconds, it takes object S to travel a distance of $24x$ inches?

- A. $12y$
- B. $3y$
- C. $16y$
- D. $6y$

ID: 48a06fda Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that object R travels a distance of $4x$ inches in y seconds. This speed can be written as $\frac{4x \text{ inches}}{y \text{ seconds}}$. It's given that the speed of object R is half the speed of object S. It follows that the speed of object S is twice the speed of object R, which is $2 \frac{4x \text{ inches}}{y \text{ seconds}}$, or $\frac{8x \text{ inches}}{y \text{ seconds}}$. Let n represent the time, in seconds, it takes object S to travel a distance of $24x$ inches. The value of n can be found by solving the equation $\frac{8x \text{ inches}}{y \text{ seconds}} = \frac{24x \text{ inches}}{n \text{ seconds}}$, which can be written as $\frac{8x}{y} = \frac{24x}{n}$. Multiplying each side of this equation by ny yields $8xn = 24xy$. Dividing each side of this equation by $8x$ yields $n = 3y$. Therefore, the expression $3y$ represents the time, in seconds, it takes object S to travel a distance of $24x$ inches.

Choice A is incorrect. This expression represents the time, in seconds, it would take object S to travel a distance of $24x$ inches if the speed of object R were twice, not half, the speed of object S.

Choice C is incorrect. This expression represents the time, in seconds, it takes object S to travel a distance of $128x$ inches, not $24x$ inches.

Choice D is incorrect. This expression represents the time, in seconds, it takes object R, not object S, to travel a distance of $24x$ inches.

Question Difficulty: Hard

Question ID 0563ce88

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	

ID: 0563ce88

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

ID: 0563ce88 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 $4\frac{a}{b} = 6.7$. 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 $\frac{a}{b}\frac{1}{n} = 26.8$. Substituting 1.675 for $\frac{a}{b}$ in this equation yields $1.675\frac{1}{n} = 26.8$, 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

Question ID b1f33dbf

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	

ID: b1f33dbf

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: b1f33dbf 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 25229, 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 28729, 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: Hard

Question ID 00f86169

Assessment	Test	Domain	Skill	Difficulty
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ID: 00f86169

At a particular track meet, the ratio of coaches to athletes is **1** to **26**. If there are x coaches at the track meet, which of the following expressions represents the number of athletes at the track meet?

- A. $\frac{x}{26}$
- B. **$26x$**
- C. $x + 26$
- D. $\frac{26}{x}$

ID: 00f86169 Answer

Correct Answer: B

Rationale

Choice B is correct. It’s given that at a particular track meet, the ratio of coaches to athletes is 1 to 26. If one number in a ratio is multiplied by a value, the other number must be multiplied by the same value in order to maintain the same ratio. If there are x coaches at the track meet, multiplying both numbers in the ratio by x yields $1x$ to $26x$, or x to $26x$. Therefore, the expression $26x$ represents the number of athletes at the track meet.

Choice A 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: Hard

Question ID 3a8ffcf3

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	

ID: 3a8ffcf3

If $\frac{x}{y} = 4$ and $\frac{24x}{ny} = 4$, what is the value of n ?

ID: 3a8ffcf3 Answer

Correct Answer: 24

Rationale

The correct answer is 24. The equation $\frac{24x}{ny} = 4$ can be rewritten as $\frac{24}{n} \frac{x}{y} = 4$. It's given that $\frac{x}{y} = 4$. Substituting 4 for $\frac{x}{y}$ in the equation $\frac{24}{n} \frac{x}{y} = 4$ yields $\frac{24}{n} 4 = 4$. Multiplying both sides of this equation by n yields $244 = 4n$. Dividing both sides of this equation by 4 yields $24 = n$. Therefore, the value of n is 24.

Question Difficulty: Hard

Question ID 177bca79

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	

ID: 177bca79

A sample of oak has a density of **807** kilograms per cubic meter. The sample is in the shape of a cube, where each edge has a length of **0.90** meters. To the nearest whole number, what is the mass, in kilograms, of this sample?

- A. **588**
- B. **726**
- C. **897**
- D. **1,107**

ID: 177bca79 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that the sample is in the shape of a cube with edge lengths of 0.9 meters. Therefore, the volume of the sample is 0.90^3 , or 0.729, cubic meters. It's also given that the sample has a density of 807 kilograms per 1 cubic meter. Therefore, the mass of this sample is $0.729 \text{ cubic meters} \times \frac{807 \text{ kilograms}}{1 \text{ cubic meter}}$, or 588.303 kilograms. Rounding this mass to the nearest whole number gives 588 kilograms. Therefore, to the nearest whole number, the mass, in kilograms, of this sample is 588.

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: Hard

Question ID cf16b539

Assessment	Test	Domain	Skill	Difficulty
PSAT/NMSQT & PSAT 10	Math	Problem-Solving and Data Analysis	Ratios, rates, proportional relationships, and units	

ID: cf16b539

For an electric field passing through a flat surface perpendicular to it, the electric flux of the electric field through the surface is the product of the electric field’s strength and the area of the surface. A certain flat surface consists of two adjacent squares, where the side length, in meters, of the larger square is **3** times the side length, in meters, of the smaller square. An electric field with strength **29.00** volts per meter passes uniformly through this surface, which is perpendicular to the electric field. If the total electric flux of the electric field through this surface is **4,640 volts · meters**, what is the electric flux, in **volts · meters**, of the electric field through the larger square?

ID: cf16b539 Answer

Correct Answer: 4176

Rationale

The correct answer is 4,176. It’s given that the side length of the larger square is 3 times the side length of the smaller square. This means that the area of the larger square is 3^2 , or 9, times the area of the smaller square. If the area of the smaller square is represented by x , then the area of the larger square can be represented by $9x$. Therefore, the flat surface of the two adjacent squares has a total area of $x + 9x$, or $10x$. It’s given that an electric field with strength 29.00 volts per meter passes uniformly through this surface and the total electric flux of the electric field through this surface is 4,640 volts · meters. Since it’s given that the electric flux is the product of the electric field’s strength and the area of the surface, the equation $29.0010x = 4,640$, or $290x = 4,640$, can be used to represent this situation. Dividing each side of this equation by 290 yields $x = 16$. Substituting 16 for x in the expression for the area of the larger square, $9x$, yields 916, or 144, square meters. Since the area of the larger square is 144 square meters, the electric flux, in volts · meters, of the electric field through the larger square can be determined by multiplying the area of the larger square by the strength of the electric field. Thus, the electric flux is $144 \text{ square meters} \frac{29.00 \text{ volts}}{\text{meter}}$, or 4,176 volts · meters.

Question Difficulty: Hard