Question ID 0f1d42fd

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

ID: 0f1d42fd

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: 0f1d42fd 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 $\left(\text{kg/m}^3\right)$, and a sample of this type of wood has a mass of $345\ \text{kg}$. 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 7989c1bb

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

ID: 7989c1bb

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

A. 404

B. $7{,}674$

C. $710{,}459$

D. $13{,}505{,}536$

ID: 7989c1bb 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 ea2c91c1

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

ID: ea2c91c1

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 $4{,}640\ \text{volts} \cdot \text{meters}$, what is the electric flux, in $\text{volts} \cdot \text{meters}$, of the electric field through the larger square?

ID: ea2c91c1 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 $4{,}640\ \text{volts} \cdot \text{meters}$. 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 $29.00(10x) = 4{,}640$, 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 $9(16)$, or 144, square meters. Since the area of the larger square is 144 square meters, the electric flux, in $\text{volts} \cdot \text{meters}$, 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 $(144\ \text{square meters})\left(\frac{29.00\ \text{volts}}{\text{meter}}\right)$, or $4{,}176\ \text{volts} \cdot \text{meters}$.

Question Difficulty: Hard

Question ID 424cddc9

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

ID: 424cddc9

To study the moisture content in a group of trees, samples from the trunk of each tree were taken from 25 trees and cut in the shape of a cube. The length of the edge of one of these cubes is 2.00 centimeters. If this cube has a mass of 2.56 grams, what is the density of this cube, in grams per cubic centimeter?

ID: 424cddc9 Answer

Correct Answer: 0.32, 8/25

Rationale

The correct answer is $.32$. The volume of a cube is given by the formula $V = s^3$, where s is the length of an edge of the cube. It's given that each edge of the cube has a length of 2.00 centimeters. Substituting 2.00 centimeters for s in the formula $V = s^3$ yields $V = (2.00 \text{ centimeters})^3$, or $V = 8.00$ cubic centimeters. It's given that the cube has a mass of 2.56 grams. Dividing the mass, in grams, of the cube by the volume, in cubic centimeters, of the cube gives its density, in grams per cubic centimeters. Therefore, the density of the cube is $\frac{2.56 \text{ grams}}{8.00 \text{ cubic centimeters}}$, or $.32$ grams per cubic centimeter. Note that .32 and 8/25 are examples of ways to enter a correct answer.

Question Difficulty: Hard

Question ID 6963dfb3

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

ID: 6963dfb3

A landscaper uses a hose that puts $88x$ ounces of water in a bucket in $5y$ minutes. Which expression represents the number of ounces of water the hose puts in the bucket in $9y$ minutes at this rate?

A. $\frac{9x}{440}$

B. $\frac{440x}{9}$

C. $\frac{5x}{792}$

D. $\frac{792x}{5}$

ID: 6963dfb3 Answer

Correct Answer: D

Rationale

Choice D is correct. It's given that a hose puts $88x$ ounces of water in a bucket in $5y$ minutes. Therefore, the rate at which the hose puts water in the bucket, in ounces per minute, can be represented by the expression $\frac{88x}{5y}$. Let w represent the number of ounces of water the hose puts in the bucket in $9y$ minutes at this rate. It follows that the rate at which the hose puts water in the bucket, in ounces per minute, can be represented by the expression $\frac{w}{9y}$. The expressions $\frac{88x}{5y}$ and $\frac{w}{9y}$ represent the same rate, so it follows that $\frac{88x}{5y} = \frac{w}{9y}$. Multiplying both sides of this equation by $9y$ yields $\frac{792xy}{5y} = w$, or $\frac{792x}{5} = w$. Therefore, the number of ounces of water the hose puts in the bucket in $9y$ minutes can be represented by the expression $\frac{792x}{5}$.

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

Question Difficulty: Hard

Question ID c6ad6232

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

ID: c6ad6232

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: c6ad6232 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 $2\left(\frac{4x \text{ inches}}{y \text{ seconds}}\right)$, 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 00048e15

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

ID: 00048e15

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

ID: 00048e15 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

Question ID 335fc7f5

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

ID: 335fc7f5

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

A. 1.96

B. 3.83

C. $3{,}444.39$

D. $6{,}740.8$

ID: 335fc7f5 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 $(11{,}863{,}808 \text{ square yards})\left(\frac{1 \text{ square mile}}{3{,}097{,}600 \text{ square yards}}\right)$, 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 03c75a33

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

ID: 03c75a33

The area of a rectangular region is increasing at a rate of 250 square feet per hour. Which of the following is closest to this rate in square meters per minute? $(\text{Use } 1 \text{ meter} = 3.28 \text{ feet.})$

A. 0.39

B. 1.27

C. 13.67

D. 23.24

ID: 03c75a33 Answer

Correct Answer: A

Rationale

Choice A is correct. It's given that $1 \text{ meter} = 3.28 \text{ feet}$. It follows that $1^2 \text{ square meter} = 3.28^2 \text{ square feet}$, or $1 \text{ square meter} = 10.7584 \text{ square feet}$. Since $1 \text{ hour} = 60 \text{ minutes}$, it follows that 250 square feet per hour is equivalent to $\left(\frac{250 \text{ square feet}}{1 \text{ hour}}\right)\left(\frac{1 \text{ square meter}}{10.7584 \text{ square feet}}\right)\left(\frac{1 \text{ hour}}{60 \text{ minutes}}\right)$, or $\frac{250 \text{ square meters}}{645.504 \text{ minutes}}$, which is approximately 0.3873 square meters per minute. Of the given choices, 0.39 is closest to 0.3873.

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 56effdcf

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

ID: 56effdcf

The speed of a vehicle is increasing at a rate of 7.3 meters per second squared. What is this rate, in **miles per minute squared**, rounded to the nearest tenth? $(\text{Use } 1 \text{ mile} = 1{,}609 \text{ meters.})$

A. 0.3

B. 16.3

C. 195.8

D. 220.4

ID: 56effdcf Answer

Correct Answer: B

Rationale

Choice B is correct. It's given that the speed of a vehicle is increasing at a rate of 7.3 meters per second squared. It's given to use $1 \text{ mile} = 1{,}609 \text{ meters}$. There are 60 seconds in 1 minute; therefore, 60^2 or $3{,}600$ seconds squared is equal to 1 minute squared. It follows that the rate of 7.3 meters per second squared is equivalent to $\left(\frac{7.3 \text{ meters}}{1 \text{ second squared}}\right)\left(\frac{1 \text{ mile}}{1{,}609 \text{ meters}}\right)\left(\frac{3{,}600 \text{ seconds squared}}{1 \text{ minute squared}}\right)$, or approximately $16.33 \text{ miles per minute squared}$. The rate, $\text{in miles per minute squared}$, rounded to the nearest tenth is 16.3.

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 68c9e1f7

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

ID: 68c9e1f7

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: 68c9e1f7 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 $0.729 \text{ cubic meters} \left(\frac{807 \text{ kilograms}}{1 \text{ cubic meter}} \right)$, 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 0035c393

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

ID: 0035c393

The density of a certain solid substance is 813 kilograms per cubic meter. A sample of this substance is in the shape of a cube, where each edge has a length of 0.60 meters. To the nearest whole number, what is the mass, in kilograms, of this sample?

A. 176

B. 488

C. $1{,}355$

D. $3{,}764$

ID: 0035c393 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 0.60 meters. Therefore, the volume of the sample is 0.60^3, or 0.216, cubic meters. It's also given that the sample has a density of 813 kilograms per 1 cubic meter. Therefore, the mass of this sample is $(0.216 \text{ cubic meters})\left(\frac{813 \text{ kilograms}}{1 \text{ cubic meter}}\right)$, or 175.608 kilograms. Rounding this mass to the nearest whole number gives 176 kilograms. Therefore, to the nearest whole number, the mass, in kilograms, of this sample is 176.

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 63b7be29

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

ID: 63b7be29

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: 63b7be29 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 $\left(\frac{0.230 \text{ grams}}{1 \text{ cubic centimeter}}\right)(27 \text{ cubic centimeters})$, or 6.21 grams.

Question Difficulty: Hard