Question ID c9fb15ad

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

ID: c9fb15ad

3.1

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

Question ID 3638f413

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

ID: 3638f413

3.2

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

Question ID 3f775bbf

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

ID: 3f775bbf

3.3

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

Question ID 8637294f

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

ID: 8637294f

3.4

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

Question ID 7d721177

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

ID: 7d721177

3.5

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 $\left(\text{kg/m}^3\right)$, 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 20b69297

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

ID: 20b69297

3.6

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

Question ID 5154615f

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

ID: 5154615f

3.7

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: 5154615f 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