Math: Question 1

Colors of Marbles in a Bag	
Color	Number
Red	8
Blue	10
Green	22
Total	40

The table shows the number of different colors of marbles in a bag. If a marble is chosen at random from the bag, what is the probability that the marble will be blue?

A. $\frac{30}{40}$

B. $\frac{22}{40}$

C. $\frac{18}{40}$

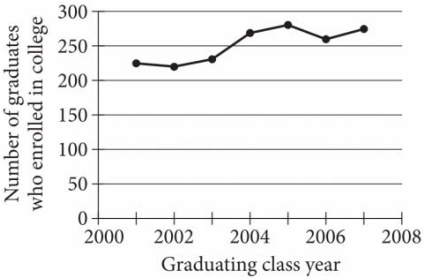
D. $\frac{10}{40}$

Choice D is correct. If a marble is chosen at random from the bag, the probability of choosing a marble of a certain color is the number of marbles of that color divided by the total number of marbles in the bag. Since there are 10 blue marbles in the bag, and there are 40 total marbles in the bag, the probability that the marble chosen will be blue is $\frac{10}{40}$.

Choices A, B, and C are incorrect. These represent the probability that the marble chosen won't be blue (choice A), will be green (choice B), and won't be green (choice C).

Question Difficulty: Easy

Math: Question 2



The line graph shows the number of graduates from the classes of 2001 through 2007 at a certain school who enrolled in college within 24 months of graduation. Of the following, which class had the fewest graduates who enrolled in college within 24 months of graduation?

A. 2002
B. 2004
C. 2005
D. 2007

Choice A is correct. The year with the fewest graduates who enrolled in college within 24 months of graduation is the point with the lowest value on the vertical axis. This occurs at 2002.

Choice B, C, and D are incorrect. The years 2004, 2005, and 2007 each had a greater number of graduates who enrolled in college within 24 months of graduation than did the year 2002.

Question Difficulty: Easy

Math: Question 3

The average weight of a blue whale is 125 tons. What is the average weight of a blue whale in pounds? (1 ton = 2,000 pounds)

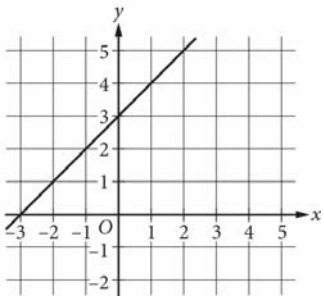
A. 0.0625
B. 16
C. 2,125
D. 250,000

Choice D is correct. It's given that the average weight of a blue whale is 125 tons and that 1 ton = 2,000 pounds. Let x represent the average weight of a blue whale, in pounds. The proportion $\frac{125}{x} = \frac{1}{2{,}000}$ can be used to solve for x. Multiplying both sides of this equation by x yields $125 = \frac{x}{2{,}000}$. Multiplying both sides of this equation by 2,000 yields $250{,}000 = x$. Therefore, the average weight of a blue whale is 250,000 pounds.

Choice A is incorrect and may result from dividing, instead of multiplying, 125 by 2,000. Choice B is incorrect and may result from dividing, instead of multiplying, 2,000 by 125. Choice C is incorrect and may result from adding, instead of multiplying, the given values.

Question Difficulty: Easy

Math: Question 4



What is the y-intercept of the given line graphed in the xy-plane?

A. $(0,1)$

B. $(0,3)$

C. $(0,-3)$

D. $(0,-1)$

Choice B is correct. The y-intercept of a line graphed in the xy-plane is the point at which the graph crosses the y-axis. The line that's graphed crosses the y-axis at $(0,3)$.

Choices A, C, and D are incorrect. The graph shown doesn't cross the y-axis at any of these points.

Question Difficulty: Easy

Math: Question 5

A large tank is filled with water at a rate of 70 cubic feet per hour. If it takes 9 hours to fill the tank, which of the following is closest to the volume, in cubic feet, of the water in the tank?

A. 8
B. 61
C. 79
D. 630

Choice D is correct. Since the tank is filled with water at a rate of 70 cubic feet per hour for 9 hours, the total volume of water in the tank is $(70)(9) = 630$ cubic feet.

Choices A, B, and C are incorrect. These may result from dividing 70 by 9 (choice A), subtracting 9 from 70 (choice B), or adding 9 to 70 (choice C), instead of multiplying 70 by 9.

Question Difficulty: Medium

Math: Question 6

A city has 50 city council members. A reporter polled a random sample of 20 city council members and found that 6 of those polled supported a specific bill. Based on the sample, which of the following is the best estimate of the number of city council members in the city who support the bill?

A. 6
B. 9
C. 15
D. 30

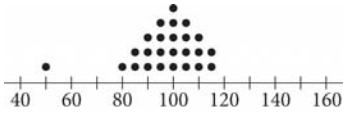
Choice C is correct. Because a random sample of the city council was polled, the proportion of the sample who supported the bill is expected to be approximately equal to the proportion of the total city council who supports the bill. Since 6 of the 20 polled, or 30%, supported the bill, it can be estimated that 50×0.3, or 15, city council members support the bill.

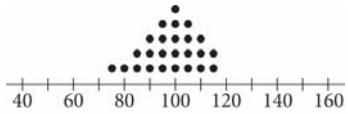
Choice A is incorrect. This is the number of city council members in the sample who supported the bill. Choice B is incorrect and may result from a computational error. Choice D is incorrect. This is the number of city council members in the sample of city council members who were not polled.

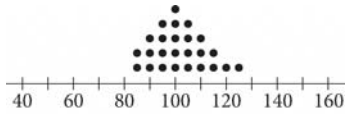
Question Difficulty: Medium

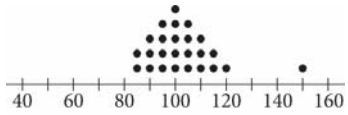
Math: Question 7

Each of the data sets represented by the following dot plots has a median of 100. Which data set has the smallest mean?

A. 

B. 

C. 

D. 

Choice A is correct. The mean of a data set is found by dividing the sum of all the values in the data set by the number of values in the data set. Since each data set has the same number of values, the data set with the smallest sum of the values will have the smallest mean. The values in the four data sets are nearly identical, but the data set in choice A has more values on the left-hand side of the number line. Since these values are smaller than any of the values in the other three data sets, the data set in choice A has the smallest sum of the values. Thus, the data set in choice A has the smallest mean.

Choices B, C, and D are incorrect because for the values that aren't identical across all four data sets, the values in choice A's data set are the smallest.

Question Difficulty: Medium

Math: Question 8

$$x + y = 20$$
$$2(x + y) + 3y = 85$$

If (x, y) is the solution to the given system of equations, what is the value of y ?

A. 10
B. 15
C. 60
D. 65

Choice B is correct. Substituting 20 for $x + y$ in the second equation in the system yields $2(20) + 3y = 85$, or $40 + 3y = 85$. Subtracting 40 from both sides of this equation yields $3y = 45$. Dividing both sides of this equation by 3 yields $y = 15$.

Choice A is incorrect. If $y = 10$, then $x = 10$ since $x + y = 20$. However, substituting 10 for both x and y in the second equation yields $70 = 85$, which is a false statement. Choice C is incorrect. If $y = 60$, then $x = -40$ since $x + y = 20$. However, substituting these values for x and y in the second equation yields $220 = 85$, which is a false statement. Choice D is incorrect. If $y = 65$, then $x = -45$ since $x + y = 20$. However, substituting these values for x and y in the second equation yields $235 = 85$, which is a false statement.

Question Difficulty: Medium

Math: Question 9

Owen has already read 200 pages of a book that has y pages. On average, Owen reads about 40 pages per hour. If it will take Owen x hours to read the remaining pages of the book at this rate, which of the following equations models the relationship between x and y ?

A. $y = 40x - 200$

B. $y = 40x + 200$

C. $y = 200x - 40$

D. $y = 200x + 40$

Choice B is correct. It's given that Owen will read 40 pages per hour for x hours, so the number of remaining pages that he will read during this time is represented by $40x$. It's also given that he has already read 200 pages. The sum of the number of remaining pages and the number of pages that he has already read will equal the total number of pages in the book, y. Therefore, the equation $y = 40x + 200$ models the relationship between x and y.

Choice A is incorrect and may result from taking the difference, rather than the sum, of the remaining pages and the pages Owen has already read. Choices C and D are incorrect and may result from using the number of pages Owen has already read as the rate at which he will read the remaining pages.

Question Difficulty: Medium

Math: Question 10

$(x-5)(x+8)$

Which of the following is equivalent to the given expression?

A. $x^2-3x+40$

B. $x^2+3x-40$

C. $x^2-40x+3$

D. $x^2+40x-3$

Choice B is correct. Using the distributive property of multiplication, $(x-5)(x+8)$ can be rewritten as $x^2+8x-5x-40$. Combining like terms yields $x^2+3x-40$.

Choices A, C, and D are incorrect and may result from errors when using the distributive property of multiplication to rewrite the given expression.

Question Difficulty: Medium

Math: Question 11

Of the 8 planets in our solar system, 4 are considered rocky. If a student randomly selects 1 of those 8 planets as a topic for a report, what is the probability that the selected planet will be rocky?

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

B. $\frac{1}{4}$

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

D. 2

Choice C is correct. If one of these planets is selected at random, the probability that the selected planet will be rocky is calculated by dividing the number of planets that are considered rocky by the total number of planets. It's given that 4 of the 8 total planets are considered rocky. Therefore, the probability that the selected planet will be rocky is $\frac{4}{8}$, which is equivalent to $\frac{1}{2}$.

Choices A and B are incorrect. These represent the probability if 1 of the 8 planets was considered rocky (choice A) and if 2 of the 8 planets were considered rocky (choice B). Choice D is incorrect and may result from dividing the total number of planets by the number of planets that are considered rocky.

Question Difficulty: Medium

Math: Question 12

The density of the metal platinum is approximately 21.46 grams per cubic centimeter (g/cm^3).

What is the approximate mass, in grams, of a bar of platinum with a volume of $100.00\ cm^3$?

$\left(\text{density} = \frac{\text{mass}}{\text{volume}}\right)$

A. 21,460.00
B. 2,146.00
C. 214.60
D. 21.46

Choice B is correct. It's given that density is equal to mass divided by volume and that the density of platinum is $21.46\ g/cm^3$. Let m represent the mass, in grams, of the bar of platinum. The equation $21.46 = \frac{m}{100.00}$ can be used to determine the value of m. Multiplying each side of this equation by 100 yields $2{,}146.00 = m$.

Choice A is incorrect and may result from multiplying 21.46 by 1,000.00 instead of by 100.00. Choice C is incorrect and may result from multiplying 21.46 by 10.00 instead of by 100.00. Choice D is incorrect. This is the density of platinum.

Question Difficulty: Medium

Math: Question 13

Data set A: 72, 73, 73, 76, 76
Data set B: 61, 64, 74, 85, x

Data set A and data set B each contain 5 numbers. If the mean of data set A is equal to the mean of data set B, what is the value of x ?

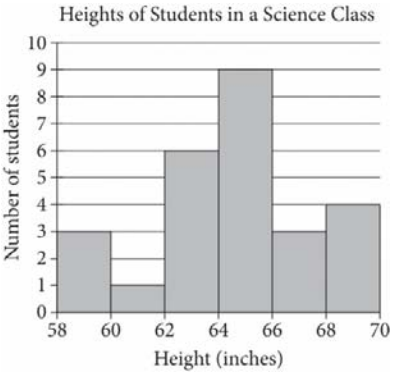
A. 77
B. 85
C. 86
D. 95

Choice C is correct. The mean of a data set is found by dividing the sum of the values in the data set by the number of values in the data set. Therefore, the mean of data set A is $\frac{72+73+73+76+76}{5}$, which simplifies to 74. The mean of data set B is represented by the equation $\frac{61+64+74+85+x}{5}$, or $\frac{284+x}{5}$. It's given that the mean of data set A is equal to the mean of data set B. Therefore, the equation $74=\frac{284+x}{5}$ can be used to solve for x. Multiplying both sides of this equation by 5 yields $370=284+x$. Subtracting 284 from both sides of this equation yields $86=x$.

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

Question Difficulty: Medium

Math: Question 14



The histogram shows the distribution of height, in inches, of 26 students in a science class. Which of the following could be the median height of the students in the class?

A. 59 inches
B. 61 inches
C. 63 inches
D. 65 inches

Choice D is correct. The median height of the students in the class is found by ordering the heights from least to greatest and determining the height in the middle. Since there is an even number of heights in the data set, there are two heights in the middle: the 13th and the 14th largest heights. The first bar contains the first 3 heights, the second bar contains the 4th height, the third bar contains the 5th through 10th heights, and the fourth bar contains the 11th through 19th heights. Since the 13th and 14th largest heights are in the bar that represents heights that are at least 64 inches but less than 66 inches, the median could be at least 64 inches but less than 66 inches. The only choice that meets this requirement is 65 inches.

Choices A, B, and C are incorrect and may result from misinterpreting the median of a histogram.

Question Difficulty: Medium

Math: Question 15

The number of countries in each continent in 2014 is shown in the table below.

Continent	Number of countries
Africa	54
Asia	44
Europe	47
North America	23
Oceania and Australia	14
South America	12

What percentage, to the nearest tenth, of the countries are in North America?

A. 11.9
B. 13.5
C. 18.0
D. 23.0

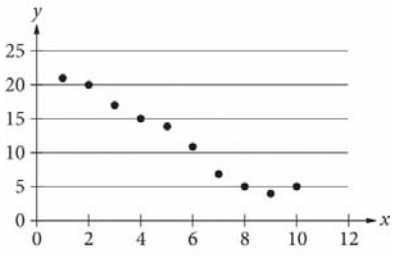
Choice A is correct. The percentage of the countries that are in North America is found by dividing the number of countries in North America by the total number of countries in the table and multiplying by 100. From the table, the total number of countries is $54+44+47+23+14+12=194$, and the number of countries in North America is 23. Therefore, the percentage of the countries that are in North America is $\left(\frac{23}{194}\right)(100)$, which is equivalent to 11.856, or 11.9 when rounded to the nearest tenth.

Choice B is incorrect and may result from dividing 23 by $194-23$ instead of dividing 23 by 194.

Choice C is incorrect and may result from calculating the percentage of the countries that are in North America and South America. Choice D is incorrect. This is the number of countries that are in North America.

Question Difficulty: Hard

Math: Question 16



Which of the following could be an equation of a line of best fit for the data shown in the scatterplot?

A. $y = -2x + 23$

B. $y = -\frac{1}{2}x + 23$

C. $y = \frac{1}{2}x + 23$

D. $y = 2x + 23$

Choice A is correct. The equation for a line of best fit for the given data can be written as $y = mx + b$, where m is the slope of the line and b is the y-coordinate of the y-intercept. The data in the scatterplot have a negative association, so the line of best fit for the data will have a negative slope. Only choices A and B have negative slopes, so the correct choice must be one of these. The equation $y = -2x + 23$ has a y-intercept of $(0,23)$ and an x-intercept of $(11.5,0)$. The equation $y = -\frac{1}{2}x + 23$ has a y-intercept of $(0,23)$ and an x-intercept of $(46,0)$. When comparing these to the given data, it's clear that the line represented by the equation $y = -2x + 23$ is a better fit.

Choice B is incorrect. This equation represents a line of best fit with a slope of $-\frac{1}{2}$, not -2.

Choice C and D are incorrect because the slope of each of these lines is positive. These equations represent lines of best fit with a positive association, not a negative association.

Question Difficulty: Hard

Math: Question 17

Questions 17-19 refer to the following information.

The given functions model the number of homes, in thousands, in Arkansas and North Dakota with access to a telephone, where x is the number of years after 1965 and $0 \le x \le 35$.

Arkansas: $A(x) = 25.0x + 61.0$

North Dakota: $D(x) = 2.5x + 149.5$

According to the model, which of the following is the predicted number of homes, in thousands, with access to a telephone in Arkansas in 1990?

A. 50
B. 69
C. 686
D. 741

Choice C is correct. It's given that the function $A(x) = 25.0x + 61.0$ models the number of homes, in thousands, in Arkansas with access to a telephone x years after 1965. Since x is the number of years after 1965, in this context $x = 1990 - 1965$, or $x = 25$ years after 1965. The predicted number of homes, in thousands, with access to a telephone in Arkansas in 1990 is $A(25)$. Therefore, $A(25) = 25.0(25) + 61.0$, which yields $A(25) = 686$ thousand homes.

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

Question Difficulty: Medium

Math: Question 18

Questions 17-19 refer to the following information.

The given functions model the number of homes, in thousands, in Arkansas and North Dakota with access to a telephone, where x is the number of years after 1965 and $0 \le x \le 35$.

Arkansas: $A(x) = 25.0x + 61.0$

North Dakota: $D(x) = 2.5x + 149.5$

In the function for North Dakota, which of the following is the best interpretation of the number 149.5 in this context?

A. For the year 1965, the model predicts 149.5 thousand homes in North Dakota had access to a telephone.

B. For the year 2000, the model predicts 149.5 thousand homes in North Dakota had access to a telephone.

C. Between 1965 and 2000, the predicted number of homes with access to a telephone in North Dakota increased by a total of 149.5 thousand.

D. Between 1965 and 2000, the predicted number of homes with access to a telephone in North Dakota increased by 149.5 thousand each year.

Choice A is correct. Since it's given that x is the number of years after 1965, it follows that $x = 0$ corresponds to the year 1965 and that $D(0)$ is the predicted number of homes, in thousands, in North Dakota with access to a telephone in 1965. Substituting 0 for x in the function $D(x) = 2.5x + 149.5$ yields $D(0) = 2.5(0) + 149.5$, or $D(0) = 149.5$. Therefore, for the year 1965, the model predicts 149.5 thousand homes in North Dakota had access to a telephone.

Choice B is incorrect. The year 2000 is represented in the model by $x = 35$. $D(35) = 237.0$, not 149.5. Therefore, the model predicts that the number of homes in North Dakota with access to a telephone in the year 2000 is 237.0 thousand, not 149.5 thousand. Choice C is incorrect. The years 1965 and 2000 are represented in the model by $x = 0$ and $x = 35$, respectively. The increase in the predicted number of homes, in thousands, in North Dakota with access to a telephone between 2000 and 1965 is $D(35) - D(0)$, or 87.5. Therefore, this increase is 87.5 thousand, not 149.5 thousand. Choice D is incorrect. The years 1965 and 2000 are represented in the model by $x = 0$ and $x = 35$, respectively. The yearly increase in the predicted number of homes, in thousands, in North Dakota with access to a telephone between 2000 and 1965 is $\frac{D(35) - D(0)}{35}$, or 2.5. Therefore, the yearly increase is 2.5 thousand, not 149.5 thousand.

Question Difficulty: Hard

Math: Question 19

Questions 17-19 refer to the following information.

The given functions model the number of homes, in thousands, in Arkansas and North Dakota with access to a telephone, where x is the number of years after 1965 and $0 \le x \le 35$.

Arkansas: $A(x) = 25.0x + 61.0$

North Dakota: $D(x) = 2.5x + 149.5$

Based on the model, which of the following is the best estimate for the number of years after 1965 that the number of homes with access to a telephone is the same for Arkansas and North Dakota?

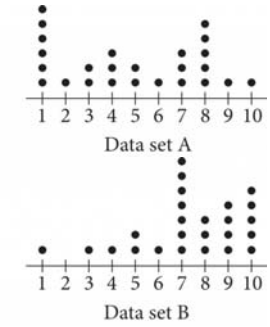
A. 161
B. 159
C. 8
D. 4

Choice D is correct. The number of homes with access to a telephone is the same for Arkansas and North Dakota when $A(x) = D(x)$, which gives $25.0x + 61.0 = 2.5x + 149.5$. Subtracting $2.5x$ from both sides of the equation yields $22.5x + 61.0 = 149.5$. Subtracting 61.0 from both sides of the equation yields $22.5x = 88.5$. Dividing both sides of the equation by 22.5 yields $x = 3.9\overline{3}$, which rounds to 4. Therefore, the number of homes with access to a telephone in Arkansas and North Dakota was the same 4 years after 1965.

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

Question Difficulty: Hard

Math: Question 20



The dot plots show the distributions of two data sets that have 25 data values each. Which of the following statements is true about the range of data set A and the range of data set B?

A. The range of data set A is less than the range of data set B.
B. The range of data set B is less than the range of data set A.
C. The range of data set A is equal to the range of data set B.
D. There is not enough information to compare the ranges of the two data sets.

Choice C is correct. The range of a data set is calculated by subtracting the smallest value in the data set from the largest value in the data set. For both data sets A and B, the smallest value in the data set is 1, and the largest value in the data set is 10. Therefore, each data set has a range of $10-1=9$. Thus, the range of data set A is equal to the range of data set B.

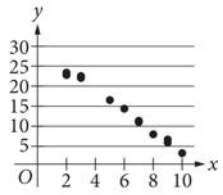
Choices A, B, and D are incorrect and may result from misinterpreting the ranges of the data sets.

Question Difficulty: Hard

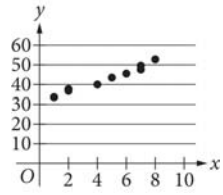
Math: Question 21

The equation $y = 30 - 2.5x$ best models the relationship shown in which of the following scatterplots?

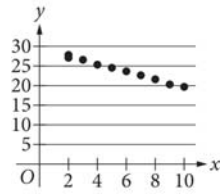
A.



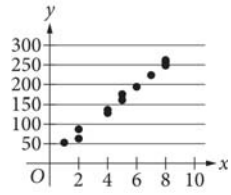
B.



C.



D.



Choice A is correct. The given equation is in the form $y = a + bx$, where a is the y-coordinate of the y-intercept and b is the slope of the line. Thus, the graph of $y = 30 - 2.5x$ has a slope of -2.5 and a y-intercept of $(0,30)$. This implies that a linear model $y = 30 - 2.5x$ should represent data that have y-values that get close to 30 as x gets close to 0; that have decreasing y-values as the values of x increase; and that have y-values close to $y = 30 - 2.5(10)$, or $30 - 25 = 5$, as x gets close to 10. Of the options, only the data in choice A satisfy these three conditions.

Choices B and D are incorrect. The data in these scatterplots have y-values that increase as the value of x increases, so the best linear models for the relationships in these scatterplots have a positive slope. Choice C is incorrect. The model $y = 30 - 2.5x$ predicts that y has a value of about 5 when $x = 10$, but the data in this scatterplot have y-values that get close to 20, not 5, for $x = 10$.

Question Difficulty: Hard

Math: Question 22

If $x-1=5$, what is the value of $8x-8$?

The correct answer is 40. Multiplying both sides of $x-1=5$ by 8 yields $8(x-1)=5(8)$, or $8x-8=40$.

Question Difficulty: Medium

Math: Question 23

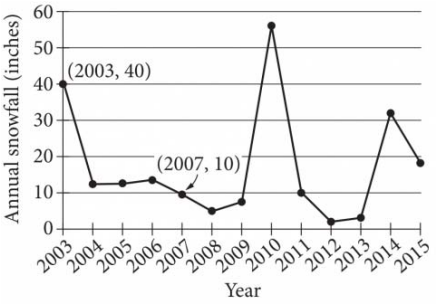
In the xy-plane, line n passes through point $(0,0)$ and has a slope of 4. If line n also passes through point $(3,a)$, what is the value of a ?

The correct answer is 12. The slope-intercept form of a line is $y = mx + b$, where m is the slope of the line and b is the y-coordinate of the y-intercept of the line. It's given that the line has a slope of 4 and passes through the point $(0,0)$. Therefore, $m = 4$ and $b = 0$, so the equation of the line is $y = 4x$. The given point $(3,a)$ is on line n; thus, the ordered pair $(3,a)$ is a solution to the equation of the line. The values $x = 3$ and $y = a$ can be substituted in the equation $y = 4x$, which gives $a = 4(3)$, or $a = 12$.

Question Difficulty: Hard

Math: Question 24

Questions 24 and 25 refer to the following information.



The line graph shows the total amount of snow, in inches, recorded each year in Washington, DC, from 2003 to 2015.

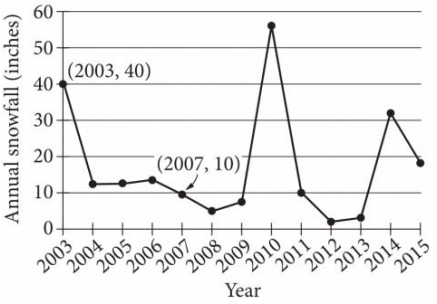
For how many of the years shown in the graph was the total number of inches of snow recorded in Washington, DC, greater than 30 inches?

The correct answer is 3. The total number of inches of snow recorded in Washington, DC, was greater than 30 inches in 2003, 2010, and 2014, or 3 years.

Question Difficulty: Medium

Math: Question 25

Questions 24 and 25 refer to the following information.



The line graph shows the total amount of snow, in inches, recorded each year in Washington, DC, from 2003 to 2015.

If $p\%$ is the percent decrease in the annual snowfall from 2003 to 2007, what is the value of p ?

The correct answer is 75. The percent decrease between two values is found by dividing the difference between the two values by the original value and multiplying by 100. The line graph shows that the annual snowfall in 2003 was 40 inches, and the annual snowfall in 2007 was 10 inches. Therefore, the percent decrease in the annual snowfall from 2003 to 2007 is $\left(\frac{40-10}{40}\right)(100)$, or 75. It's given that this is equivalent to $p\%$, so the value of p is 75.

Question Difficulty: Hard