Check Your Work – How Much Do You Know: Problem-Solving and Data Analysis

1. B

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: The percent of the contractor's fee on the quoted budget is $100\% - 20\% - 55\% - 10\% = 15\%$. You're told that the estimate for materials is \$5,200, which represents 20% of the total budget. Let x be the total amount of the budget in dollars. Then 20% of x is \$5,200, or $0.2x = 5{,}200$. Solve this equation for x:

$$0.2x = 5{,}200$$
$$x = 26{,}000$$

The total budget is \$26,000. The contractor's fee represents 15% of this amount, or $0.15 \times \$26{,}000 = \$3{,}900$, which means **(B)** is correct. You could also set up the proportion $\frac{15\%}{20\%} = \frac{x}{5{,}200}$ and solve for x.

2. D

Difficulty: Hard

Category: Problem-Solving and Data Analysis

Getting to the Answer: The key to answering this question is an accurate translation from English into math. Start by assigning a variable to what you're looking for. Let m be the number of months the customer has subscribed to the service. The first month costs a dollars and the remaining months $(m - 1)$ are charged at a rate of b dollars per month. So, the total charge for the subscription so far is $a + b(m - 1)$. Set this equal to the amount the customer has paid and solve for m. Note that you're not going to get a nice numerical answer because the question doesn't give you the actual rates:

$$a + b(m - 1) = 108.60$$
$$a + bm - b = 108.60$$
$$bm = 108.60 - a + b$$
$$m = \frac{108.60 - a + b}{b}$$

The expression for m matches the one in **(D)**.

3. C

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: You need to find the number of rainbow fish out of a total of 21 that will yield a 5:2 ratio of angelfish to rainbow fish.

Add the parts of the given ratio together to get the total number of parts: $2 + 5 = 7$, so the total number of fish will always be a multiple of 7. Divide the total number of fish Mikal wants by 7 to find the multiple that he'll use for his office tank: $\frac{21}{7} = 3$. Multiply the original ratio by 3 to get the actual numbers of fish. The question asks for rainbow fish, so $2(3) = 6$. **(C)** is correct.

4. 18.54 or 18.55

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: Use unit conversion to convert from miles to kilometers, which is the unit you need the answer in:

$$11.5 \text{ } \cancel{\text{miles}} \times \frac{1 \text{ kilometer}}{0.62 \text{ } \cancel{\text{miles}}} \approx 18.548 \text{ kilometers}$$

You may either truncate or round. Enter **18.54** or **18.55**.

5. D

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: When considering the validity of a study, always look for possible sources of bias. In other words, look for things that might skew the results in either direction. Only surveying high school athletes is likely to skew the results. The respondents are already interested in athletics and so are likely to respond more positively than the average shoe customer. Therefore, the data from the survey likely overestimates the number of people interested in the new product, making **(D)** the correct answer.

6. A

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: Convert 50% to a fraction $\left(\frac{1}{2}\right)$ and then approach logically—the final probability is $\frac{1}{3}$ of $\frac{3}{4}$ of $\frac{1}{2}$. When dealing with fractions, "of" means multiply. So the probability of randomly choosing a vehicle that is a car with an automatic transmission and a leather interior is $\frac{1}{\cancel{3}} \times \frac{\cancel{3}}{4} \times \frac{1}{2} = \frac{1}{8}$. **(A)** is correct.

7. B

Difficulty: Easy

Category: Statistics

Getting to the Answer: The mean of a set of numbers is the same as the average, which is the sum of the values divided by the number of values: Average $= \frac{\text{sum of values}}{\text{number of values}}$. Use the graph to find the sum of the GPA values, and then calculate the mean. Read the graph carefully—each grid line represents one student. There are 10 students who received a 4.0, 36 who received a 3.0, 28 with a 2.0, 8 with a 1.0, and 2 with a 0.0. You can save time by multiplying the frequency in each category by the GPA value. This calculation is called a weighted average. For example, instead of adding ten 4.0s together, just multiply 10 by 4. The sum of all the values, then, is $(10 \times 4) + (36 \times 3) + (28 \times 2) + (8 \times 1) + (2 \times 0) = 212$. Now, divide by the number of values, which is 84 students: $\frac{212}{84} \approx 2.523$, or about 2.5, which is **(B)**.

8. C

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: Eliminate (B) and (D) right away because range and standard deviation are measures of spread, not of center. The median is the middle number of a set, so if you want to describe half of the games as above a certain score, the median is perfect since it divides the data into two parts. **(C)** is correct.

9. A

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: The estimated increase in sales tax every year is represented by the slope of the line of best fit. Recall that slope is equal to $\frac{y_2 - y_1}{x_2 - x_1}$. Estimate any two points on the line, for instance (1920, 1.5) and (1960, 3.5), to approximate the slope. The slope is about $\frac{3.5 - 1.5}{1960 - 1920} = \frac{2}{40} = 0.05$. The unit of the sales tax in the graph is percent, so no conversion is needed. **(A)** is correct.

10. D

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: The data in the scatterplot can be modeled with a concave up curve (such as quadratic or exponential) that has an increasing positive slope. To visualize this, for every 5°C interval, draw a line of best fit through the data. The slopes of the lines of best fit are steeper at higher temperatures. Thus, at higher temperatures, the rate of increase of water vapor pressure every 5°C is greater than at lower temperatures. **(D)** is correct.

Check Your Work – Chapter 8

1. 10.34

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: To answer a question involving time and distance, use the rate (speed) formula Distance = rate × time.

In this case, you have a rate, 29 feet per second, and a distance, 300 feet. Plug these into the formula to solve for time:

300 feet = 29 feet per second × time. Now divide both sides by 29 to solve for time:

$$\frac{300 \text{ feet}}{29 \text{ feet per second}} \cong 10.34 \text{ seconds}$$

Since you can enter up to five characters for a positive student-produced response answer, enter **10.34**.

2. B

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: To answer a question that relates work to time, use the work rate formula Work = rate × time. In this case, the total amount of work to be performed is the total gallons of water to be transferred, 279 gallons.

A complication in this question is the presence of two pumps. Since they're working together, it's necessary to combine their rates. The question specifies that pump A's rate is 3 gallons per minute, and pump B's rate is twice that, or 6 gallons per minute. Therefore, their combined rate is 3 gpm + 6 gpm = 9 gpm. Plug in the total work and the rate to the $W = RT$ formula and then solve for time:

279 gallons = 9 gallons per minute × time. Divide both sides by 9 gpm to solve for time:

$$\frac{279 \text{ gallons}}{9 \text{ gpm}} = \text{time}$$

$$31 \text{ minutes} = \text{time}$$

Choice **(B)** is correct.

3. C

Difficulty: Hard

Category: Problem-Solving and Data Analysis

Getting to the Answer: When a trip has multiple legs at different speeds, you'll need to use the average speed formula:

$$\text{Average Speed} = \frac{\text{total distance}}{\text{total time}}$$

The question presents the two legs of the trip by providing distances and speeds for each leg, so you'll need to use the rate formula to calculate the time of each leg. For the first leg:

$$900 \text{ miles} = 300 \text{ mph} \times t_1$$

$$\frac{900 \text{ miles}}{300 \text{ mph}} = t_1$$

$$3 \text{ hours} = t_1$$

For the second leg:

$$500 \text{ miles} = 250 \text{ mph} \times t_2$$

$$\frac{500 \text{ miles}}{250 \text{ mph}} = t_2$$

$$2 \text{ hours} = t_2$$

Now plug in the times and distances into the average speed formula:

$$\frac{\text{total distance}}{\text{total time}} = \frac{900 \text{ mi} + 500 \text{ mi}}{3 \text{ hrs} + 2 \text{ hrs}} = \frac{1{,}400 \text{ mi}}{5 \text{ hrs}} = 280 \text{ mph}$$

Thus, the average speed is 280 miles per hour, so **(C)** is correct.

4. D

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: This question involves two separate rates: the number of kilometers the asteroid travels per hour and the number of kilometers traveled per rotation.

First, find the distance that the asteroid travels while it rotates 12 times. If it travels 600,000 km during one rotation, it must travel the following distance for 12 rotations: 600,000 km × 12 = 7,200,000 km.

To find how many hours it took to travel this distance (and rotate 12 times), use Distance = rate × time, with 30,000 kph (kilometers per hour) as the rate.

$$7{,}200{,}000 \text{ km} = 30{,}000 \text{ kph} \times \text{time}$$

$$\frac{7{,}200{,}000 \text{ km}}{30{,}000 \text{ kph}} = \text{time}$$

$$240 \text{ hours} = \text{time}$$

This means **(D)** is correct.

5. C

Difficulty: Hard

Category: Problem-Solving and Data Analysis

Getting to the Answer: You're given the total distance of a trip as well as the start and end times of the trip. You're also given the speed of a car for the first 1.5 hours of the trip. You need to find the average speed of the car for the remaining trip time.

First, determine how far the car travels during the initial 1.5 hours using the formula $D = RT$: $D = 40$ mph $\times$ 1.5 hours $= 60$ miles.

From this, you can determine the remaining distance of the trip: 270 miles $-$ 60 miles $=$ 210 miles. Since the entire trip lasts from noon to 5:00 p.m., you know the entire trip time is 5 hours. You've accounted for the first 1.5 hours, so the rest of the trip lasts 5 hours $-$ 1.5 hours $=$ 3.5 hours.

Therefore, you know the car takes 3.5 hours to cover the remaining 210 miles of the trip. Use the $D = RT$ formula to find the speed over this part of the trip: 210 miles $= R \times$ 3.5 hours, so $R = 60$ miles per hour. Thus, **(C)** is correct.

6. B

Difficulty: Hard

Category: Problem-Solving and Data Analysis

Getting to the Answer: First, use Work $=$ rate $\times$ time to determine the rate that each of the brothers can clean the room.

Tavish: $1 \text{ room} = \text{rate} \times 2 \text{ hours}$

$$\text{rate} = \frac{1 \text{ room}}{2 \text{ hours}}$$

Tavish's brother: $1 \text{ room} = \text{rate} \times 4 \text{ hours}$

$$\text{rate} = \frac{1 \text{ room}}{4 \text{ hours}}$$

Rates simply add, so to clean 1 room together use their combined rate in Work $=$ rate $\times$ time.

$$1 = \left(\frac{1}{2} + \frac{1}{4}\right) \times \text{time}$$

$$1 = \left(\frac{3}{4}\right) \times \text{time}$$

$$\frac{4}{3} = \text{time}$$

Therefore, **(B)** is correct.

7. 60

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: The questions asks for the time needed to do a certain amount of work. You can use the $W = RT$ formula here, where W is the work to be done. In this case, that's to fill a 2,100-gallon pond, so $W = 2{,}100$ gallons.

To solve for T, time, you'll also need to fill the rate into the formula. The complication here is that the pond is both draining and being filled at the same time, so you need to determine the net rate at which the pond is being filled. It's being filled at a rate of 55 gallons per hour while simultaneously being drained at a rate of 20 gallons per hour, so the net fill rate is 55 gallons per hour $-$ 20 gallons per hour $=$ 35 gallons per hour. Thus, R is 35 gph.

Filling in $W = RT$, you get 2,100 gallons $=$ 35 gph $\times$ number of hours. Now solve for time:

$$\frac{2{,}100 \text{ gallons}}{35 \text{ gallons per hour}} = 60 \text{ hours}$$

Enter **60**.

8. C

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: Since you need to determine the difference in the time it takes the two cyclists to travel 24 miles, figure out the time it takes for each and then calculate the difference.

Cyclist A: 24 miles $=$ 6 mph $\times$ time, so

$$\frac{24 \text{ miles}}{6 \text{ mph}} = 4 \text{ hours}$$

Cyclist B: 24 miles $=$ 8 mph $\times$ time, so

$$\frac{24 \text{ miles}}{8 \text{ mph}} = 3 \text{ hours}$$

4 hours $-$ 3 hours $=$ 1 hour. Therefore, **(C)** is correct.

9. 12

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: To answer a question that says "directly proportional," set two ratios equal to each other and solve for the missing amount. Be sure to match the units in the numerators and in the denominators on both sides of the proportion.

Let t equal the number of topics the teachers can cover in a 60-minute period. Set up a proportion and solve for t:

$$\frac{9 \text{ topics}}{45 \text{ minutes}} = \frac{t \text{ topics}}{60 \text{ minutes}}$$
$$9(60) = 45(t)$$
$$540 = 45t$$
$$12 = t$$

Enter **12**.

10. C

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: Think about how your answer should look. A person weighs *less* on the Moon, so that person should weigh *more* on Earth. This means your answer must be greater than 29, so you can eliminate (A) right away.

Now, set up a proportion:

$$\frac{0.166 \text{ lb on Moon}}{1 \text{ lb on Earth}} = \frac{29 \text{ lb on Moon}}{p \text{ lb on Earth}}$$
$$0.166p = 29(1)$$
$$p \approx 174.7$$

The person weighs about 175 pounds on Earth. Choice **(C)** is correct.

11. B

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: This is a typical proportion question. Let n equal the total number of parts made. Set up a proportion and solve for n. Be sure to match the number of defective parts in the numerators and the total manufactured parts in the denominators on both sides of the proportion:

$$\frac{6}{3{,}500} = \frac{27}{n}$$
$$6n = 27(3{,}500)$$
$$6n = 94{,}500$$
$$n = 15{,}750$$

This means **(B)** is correct.

12. 42

Difficulty: Hard

Category: Problem-Solving and Data Analysis

Getting to the Answer: This question has two unknowns: you don't know the starting number of either first-year students or second-year students. To solve for two unknowns, you need two equations. Let f represent the original number of first-year students in the auditorium and s represent the original number of second-year students. The starting ratio is $\frac{f}{s} = \frac{3}{10}$. Cross-multiplying yields $10f = 3s$. This is your first equation.

Set up a second equation to represent the adjusted number of first-year students and second-year students:

$$\frac{f + 270}{s + 120} = \frac{6}{5}$$
$$5(f + 270) = 6(s + 120)$$
$$5f + 1{,}350 = 6s + 720$$

You've determined from the first ratio that $10f = 3s$, and if you multiply this equation by 2, you get $20f = 6s$. Now substitute $20f$ for $6s$ in the above equation:

$$5f + 1{,}350 = 20f + 720$$
$$630 = 15f$$
$$42 = f$$

There were 42 first-year students in the auditorium to start, so enter **42**.

13. D

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: Use the known time of 5.5 minutes it takes Reyna to travel 1 mile to calculate the distance she can cover in 90 minutes. Let d be the unknown distance and then set up a proportion to solve for d:

$$\begin{aligned}\frac{1}{5.5} &= \frac{d}{90}\\ 90 &= 5.5d\\ \frac{90}{5.5} &= d\\ d &\approx 16\end{aligned}$$

Therefore, **(D)** is correct.

14. A

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: Since the answer choices are expressed as $\frac{y}{x} =$ and $\frac{y-x}{x} =$, cross-multiply the proportion and rewrite it to get an expression that matches the form of one of the answer choices. Solve for $\frac{y}{x}$:

$$\begin{aligned}\frac{x+y}{x} &= \frac{4}{9}\\ 9(x+y) &= 4x\\ 9x+9y &= 4x\\ 9y &= -5x\\ \frac{y}{x} &= -\frac{5}{9}\end{aligned}$$

This matches **(A)**.

15. C

Difficulty: Hard

Category: Problem-Solving and Data Analysis

Getting to the Answer: The ratio of physicists to total attendees is the number of physicists divided by the number of all attendees. Suppose x new physicists arrive at the symposium. The new number of physicists will be $123 + x$, and the new number of all attendees will be the original physicists (123) + biologists (270) + the newcomer physicists (x). The ratio of the first number over the second equals 2 to 5, so set up a proportion and solve for x:

$$\begin{aligned}\frac{123+x}{123+270+x} &= \frac{2}{5}\\ \frac{123+x}{393+x} &= \frac{2}{5}\\ 5(123+x) &= 2(393+x)\\ 615+5x &= 786+2x\\ 3x &= 171\\ x &= 57\end{aligned}$$

Therefore, **(C)** is correct.

16. A

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: Map out your route from starting units to ending units, being mindful of the fact that the question deals with units of volume (cubic units). The starting quantity is in ft^3, and the desired quantity is in m^3. The only conversion factor you need is 1 m ≈ 3.28 ft, but you'll need to use it three times because ft^3 is really ft × ft × ft. Setting up your equation to get to m^3, you get:

$$700\ ft^3 \times \frac{1\ m}{3.28\ ft} \times \frac{1\ m}{3.28\ ft} \times \frac{1\ m}{3.28\ ft} = \frac{700}{(3.28)^3} m^3 \approx 19.84\ m^3$$

This matches **(A)**.

17. A

Difficulty: Hard

Category: Problem-Solving and Data Analysis

Getting to the Answer: Whenever multiple rates are given, pay very careful attention to the units. Starting with the number of pages the reporter typed, set up your conversion ratios so that equivalent units cancel. Be sure that your final units match those in the answer choices:

$$25\ \cancel{\text{pages}} \times \frac{675\ \cancel{\text{words}}}{1\ \cancel{\text{page}}} \times \frac{1\ \cancel{\text{second}}}{3.75\ \cancel{\text{words}}} \times \frac{1\ \cancel{\text{minute}}}{60\ \cancel{\text{seconds}}} \times \frac{1\ \text{hour}}{60\ \cancel{\text{minutes}}} = 1.25\ \text{hours}$$

Because 1.25 hours is not an answer choice, convert 0.25 to minutes: 0.25 hours × 60 minutes per hour = 15 minutes. Therefore, **(A)** is the correct answer.

18. A

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: The 450°F oven cooks $4.5 - 3 = 1.5$ more pounds per hour than the 350°F oven. The question asks for the difference in ounces after 10 minutes, so start there when setting up the conversion ratios:

$$10 \text{ min} \times \frac{1 \text{ hr}}{60 \text{ min}} \times \frac{1.5 \text{ lb}}{1 \text{ hr}} \times \frac{16 \text{ oz}}{1 \text{ lb}} = 4 \text{ oz}$$

Choice **(A)** is correct.

19. 50

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: Starting with the prescribed dosage, set up your conversion ratios so that you get drips per minute:

$$\frac{800 \text{ mL}}{8 \text{ hours}} \times \frac{30 \text{ drips}}{1 \text{ mL}} \times \frac{1 \text{ hour}}{60 \text{ minutes}} = 50 \frac{\text{drips}}{\text{minute}}$$

Enter **50**.

20. 0.252, .2520, or .2521

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: The question provides the growth rate, in meters, over a 50-year period. You need to convert this to a rate of centimeters per day. Set up your conversion ratios to make the unwanted units cancel:

$$\frac{46 \text{ meters}}{50 \text{ years}} \times \frac{100 \text{ centimeters}}{1 \text{ meter}} \times \frac{1 \text{ year}}{365 \text{ days}} \approx 0.25205 \frac{\text{centimeters}}{\text{day}}$$

You may enter up to five characters for positive numbers, and since both truncating and rounding are acceptable, **0.252, .2520,** and **.2521** are all acceptable numbers to enter.

21. A

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: The question asks for the combined number of runners and weight lifters who were injured. Calculate the number from each group who were injured and then add the numbers together:

$$3\% \times 300 = 0.03 \times 300 = 9$$
$$6\% \times 250 = 0.06 \times 250 = 15$$
$$9 + 15 = 24$$

Therefore, **(A)** is correct.

22. 3

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Strategic Advice: First find the total number of attendees. Then calculate the difference in the actual number of juniors and seniors.

Getting to the Answer: The question gives you the percentage of sophomores, juniors, and seniors attending the event, as well as the actual number of teachers. Add up all of the percentages to find the total percent of the attendees who are *not* teachers: $15\% + 30\% + 25\% = 70\%$. Therefore, the 18 teachers account for $100\% - 70\% = 30\%$ of the attendees.

You can solve for the total number of attendees (the whole) by creating an equation relating the percent (30%) and the part (18). Say the total number of attendees is t:

$$0.30t = 18$$
$$t = \frac{18}{0.30}$$
$$t = 60$$

Thus, the total number of attendees is 60. Juniors are 30% of this number and seniors are 25%, so the difference between juniors and seniors is $30\% - 25\% = 5\%$. Now calculate 5% of the total: $0.05 \times 60 = 3$. Thus, there are 3 more juniors than seniors at the event. Alternatively, the number of juniors is $60 \times 0.30 = 18$ and the number of seniors is $60 \times 0.25 = 15$. Subtract the number of seniors from the number of juniors: $18 - 15 = 3$. Either way you choose, enter **3**.

23. B

Difficulty: Hard

Category: Problem-Solving and Data Analysis

Getting to the Answer: The question gives you the amount of 15% mixture and the desired concentration (20%) that the painter wants to achieve by adding an unknown quantity of 40% mixture.

Let x represent the unknown number of gallons of the 40% mixture that the painter needs to add. Then use the formula $\text{Part} = \frac{\text{percent}}{100\%} \times \text{whole}$ to determine the part of each mixture that is blue pigment. The amount of blue pigment in the 15% mixture is 0.15×20 and the amount of blue pigment in the 40% mixture is $0.40x$. Set the sum of these two amounts equal to the amount of blue pigment in the 20% mixture, which is $0.2 \times (20 + x)$, and solve for x.

$$\begin{aligned} 0.15(20) + 0.40x &= 0.20(20 + x) \\ 3 + 0.40x &= 4 + 0.20x \\ 0.20x &= 1 \\ x &= 5 \end{aligned}$$

Thus, the painter needs to add 5 gallons of the 40% mixture to achieve the desired 20% concentration of blue pigment. **(B)** is correct.

24. D

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: You need to find the price of a share of the stock on October 1. You know that the price of a share was \$75 on August 1 and that on September 1 the price was \$10 higher than it was on August 1. Thus, on September 1, it was $\$75 + \$10 = \$85$.

The question also states that the September 1 price is 80% of the October 1 price. Set up an equation where p represents the October 1 price:

$$\begin{aligned} 0.8p &= \$85 \\ p &= \frac{\$85}{0.8} \\ p &= \$106.25 \end{aligned}$$

The question asks for the price to the nearest dollar, so **(D)** is correct.

25. 18

Difficulty: Hard

Category: Problem-Solving and Data Analysis

Getting to the Answer: Be sure to read the question carefully. The question tells you that x is 60% *less* than the sum of y and z, not 60% of the sum. Translate English to math and write a system of equations:

$$\begin{aligned} x + y + z &= 63 \\ x &= (y + z) - 0.6(y + z) \end{aligned}$$

Solve the second equation for $y + z$ in terms of x.

$$\begin{aligned} x &= 0.4(y + z) \\ \frac{1}{0.4}x &= y + z \\ 2.5x &= y + z \end{aligned}$$

Then substitute $2.5x$ for $y + z$ in the first equation.

$$\begin{aligned} x + 2.5x &= 63 \\ 3.5x &= 63 \\ x &= 18 \end{aligned}$$

Enter **18**.

26. C

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: The formula for percent increase or decrease is $\frac{\text{actual change}}{\text{original amount}} \times 100\%$. Since the price per ticket started at \$35 and ended up at \$49, that's $\frac{49 - 35}{35} \times 100\% = 40\%$.

Therefore, **(C)** is correct.

27. C

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: The formula for percent increase or decrease is $\frac{\text{actual change}}{\text{original amount}} \times 100\%$. In this case, that's $\frac{1{,}572 - 1{,}494}{1{,}494} \times 100\% \approx 5.2\%$. Therefore, **(C)** is correct.

If you chose (B), you likely divided by the new amount, \$1,572, instead of the original amount, \$1,494.

28. B

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: The question asks for a percent decrease in the number of coins from the larger jar to the smaller one. The formula for percent decrease is $\frac{\text{actual change}}{\text{original amount}} \times 100\%$. Jar *X* has 75 coins and jar *Y* has 54 coins. The phrase "less than" means that you're calculating percent decrease from a starting value of 75 coins. In other words, 75 is the "original amount." The calculation is $\frac{75 - 54}{75} \times 100\% = \frac{21}{75} \times 100\% = 28\%$. Therefore, **(B)** is correct.

29. D

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Strategic Advice: Begin by calculating the number of seniors. Then figure out what percent greater this number is than the number of sophomores.

Getting to the Answer: The number of seniors is 75% greater than the number of juniors, so there are $80 + (0.75 \times 80)$, or $1.75 \times 80 = 140$ seniors.

The formula for percent increase is $\frac{\text{actual change}}{\text{original amount}} \times 100\%$. In this case, the actual change is the number of seniors minus the number of sophomores, $140 - 50$. The question asks for a percent greater than the number of sophomores, so the original amount is the number of sophomores, or 50: $\frac{140 - 50}{50} \times 100\% = \frac{90}{50} \times 100\% = 180\%$.

Thus, **(D)** is correct.

30. C

Difficulty: Hard

Category: Problem-Solving and Data Analysis

Strategic Advice: When presented with a two-part percent change scenario, you cannot simply add the two percents. Instead, you have to calculate the second percent change based on the adjusted value that results from the first percent change.

Getting to the Answer: The price of the phone goes through two different changes: an initial decrease of 36% and a second reduction of 25% from that depreciated cost. Because you don't know *y*, the original price of the phone, you can pick a number to make calculations easier.

Usually, the best number to pick when calculating the percent change of an unknown value is 100, so assume that the initial price of the phone was \$100 (the numbers don't have to be realistic, just easy to work with). Now, calculate the resulting value after the first decrease: 36% of \$100 is $0.36 \times \$100 = \$36$, so the new value of the phone will be $\$100 - \$36 = \$64$.

Next, calculate the change in price after an additional 25% is taken off of the current value of \$64: 25% of \$64 is $0.25 \times \$64 = \$16$, so the final price will be $\$64 - \$16 = \$48$. (Note you could have also calculated the new price by subtracting the percent discount from 100 percent: $100\% - 25\% = 75\%$, so $0.75 \times \$64 = \$48$.)

The formula for percent change is $\frac{\text{actual change}}{\text{original amount}} \times 100\%$. Use the starting price of \$100 and the final price of \$48: $\frac{100 - 48}{100} \times 100\% = \frac{52}{100} \times 100\% = 52\%$.

Thus, **(C)** is correct.

31. C

Difficulty: Hard

Category: Problem-Solving and Data Analysis

Getting to the Answer: First, find the number of viewers for Season 2, Episode 2. The number of viewers for this episode is 15% lower than the number for Episode 1 (1.8 million), which is $1.8 - 0.15(1.8) = 1.53$ million. Divide this number by the average number of Season 1 viewers (2.4 million) to get the percentage. The number of viewers of Season 2, Episode 2, is $\frac{1.53}{2.4} \times 100\% = 63.75\%$ of the average number of Season 1 viewers. **(C)** is correct.

Check Your Work – Chapter 9

1. B

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: The trickiest part of this question is understanding what is being asked. You need to find the shop that had the most Tuesday sales as a fraction of its own total sales, so the only rows that matter are "Tuesday" and "Total." For each shop, divide the number of books it sold on Tuesday by the total number of books it sold all week. Use your calculator to speed up this step.

$$\text{Bob's Bookshop: } \frac{\text{Tuesday total}}{\text{weekly total}} = \frac{8}{53} \approx 0.1509$$

$$\text{Clara's Bookshop: } \frac{\text{Tuesday total}}{\text{weekly total}} = \frac{13}{55} \approx 0.2364$$

$$\text{Derek's Bookshop: } \frac{\text{Tuesday total}}{\text{weekly total}} = \frac{15}{66} \approx 0.2273$$

$$\text{Evelyn's Bookshop: } \frac{\text{Tuesday total}}{\text{weekly total}} = \frac{13}{58} \approx 0.2241$$

The greatest fraction belongs to Clara's Bookshop, so **(B)** is correct.

2. C

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: The table indicates that 27.8% of participants who got the drug experienced severe side effects, as did 6.2% of participants who got the placebo. Add these percentages together: $27.8\% + 6.2\% = 34\%$ of participants had severe side effects. Therefore, 34% of $400 = 0.34 \times 400 = 136$ participants who had severe side effects. The table indicates that 27.8% of the 400 participants were given the drug and sustained severe side effects, which equates to $0.278 \times 400 \approx 111$ participants. So, 111 out of the 136 participants who had severe side effects were given the drug:

$$\frac{111}{136} \times 100\% = 81.6\%$$

This is approximately 82%. Choice **(C)** is correct.

3. B

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: The question asks only about participants who were outside a healthy weight range, so focus on this row: 38 out of the 74 participants who were outside a healthy weight range ate breakfast one or fewer times per week. This expressed as a percent is $\frac{38}{74} \times 100\% \approx 0.5135 \times 100\% = 51.35\%$, which is closest to **(B)**.

4. 300

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: Read the graph carefully, including the key at the bottom indicating that each bar represents 15 minutes. The paragraph identifies stage 3 as deep sleep, and the question asks how much time was spent in *non*-deep sleep. There are 12 bars that represent stage 3, which means the person spent $12 \times 15 = 180$ minutes in deep sleep. The study was for 8 hours, or 480 minutes, so the person spent $480 - 180 = 300$ minutes in non-deep sleep. Enter **300**.

5. D

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: Compare each statement to the line graph one at a time, eliminating true statements as you work. Start with (A): at every reading after 20 hours, Strain 1 has a higher OD600 level than Strain 2, so this statement is true. Eliminate (A). Choice (B) states that Strain 2's growth rate (slope) overtook Strain 1's at hour 50, which is consistent with the line graph; eliminate it. It looks as though (C) requires time-consuming calculations, so skip it for now. Choice (D) states that Strain 1's growth rate was greater than Strain 2's over the entire period. This statement contradicts what you already confirmed in (B), which makes **(D)** false and, therefore, correct. There's no need to check (C).

6. C

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Strategic Advice: The median is the middle value when all of the values are in numerical order, so find the total number of values in the set and determine which one is the middle value.

Getting to the Answer: The total number of people who were surveyed in country B is 250. Since it is an even set of values, the median will be the average of the 125th and 126th values. To get to those values, add the number of citizens who speak one or two languages: $70 + 50 = 120$. Keep going because this group does not include the 125th and 126th values. Add the citizens who speak three languages: $120 + 50 = 170$. This means that the 125th and 126th values are both 3, so the median is 3. **(C)** is correct.

7. B

Difficulty: Hard

Category: Problem-Solving and Data Analysis

Getting to the Answer: Since the average of x and 5 is c, $c = \frac{x+5}{2}$. Similarly, $d = \frac{3x+3}{2}$. To find the average of c and d in terms of x, substitute $\frac{x+5}{2}$ for c and $\frac{3x+3}{2}$ for d into $\frac{c+d}{2}$. This gives $\frac{\frac{x+5}{2}+\frac{3x+3}{2}}{2}$, which simplifies to $\frac{\frac{4x+8}{2}}{2} = \frac{4x+8}{4} = x+2$. Choice **(B)** is correct.

8. B

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: Consider the definitions of mean and standard deviation: mean is a measure of center, while standard deviation is a measure of spread. The closer the data points for a given snowboarder are to the mean, the more consistent that snowboarder's performance. Since consistency is measured by standard deviation, you can eliminate (A) and (D). Greater consistency means lower standard deviation (and vice versa); the only choice that reflects this—and correctly represents the data in the table—is **(B)**.

9. C

Difficulty: Hard

Category: Problem-Solving and Data Analysis

Getting to the Answer: You'll have to determine the values of all three measurements before you can place them in ascending order. The *mode* is 3 because there are 18 cars of that age, which is the most of any age. The total number of cars is $3 + 5 + 18 + 17 + 11 + 6 + 2 = 62$. Since this is an even number, the *median* age will be the average of the 31st and 32nd values. The are $3 + 5 + 18 = 26$ cars that are 1, 2, and 3 years old and 17 that are 4 years old. Thus, the 27th through 43rd ($26 + 17 = 43$) values are 4, and that is the median.

To find the *mean*, multiply each value by its frequency, add up those values, and divide by 62. So, $1 \times 3 = 3$, $2 \times 5 = 10$, $3 \times 18 = 54$, $4 \times 17 = 68$, $5 \times 11 = 55$, $6 \times 6 = 36$, $7 \times 2 = 14$, and $3 + 10 + 54 + 68 + 55 + 36 + 14 = 240$. Divide 240 by 62 to get approximately 3.87. The ascending order of the three values is mode (3), mean (3.87), and median (4), so **(C)** is correct.

10. 7

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: Understanding how averages and sums are connected is the key to answering a question like this. Recall the formula, $\text{average} = \frac{\text{sum of terms}}{\text{number of terms}}$. If the average of 12 numbers is 4, then the sum of the 12 numbers must be $4 \times 12 = 48$. Use the dot plot to find the total number of credit card applicants Amara obtained. Then, subtract this number from 48. Each x on the dot plot represents one day, and it is placed in the column that shows the number of applicants for that day. Amara has already obtained $1 + 3(2) + 2(3) + 4 + 5 + 2(6) + 7 = 41$ applicants, so she needs to obtain $48 - 41 = 7$ applicants on the 12th day. Enter **7**.

11. C

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: There are 65 data points, so the median will be the middle data point, or the 33rd data point once the data are listed in order. Count the

number of data points from the end. There are 10 households with 1 person and 18 households with 2 persons, which adds up to 28 households. Since there are 15 households with 3 persons, the 33rd household will fall in that group. Therefore, the median household size is 3 persons. Finally, add up the number of households with more than 3 persons: $12 + 8 + 2 = 22$. **(C)** is correct.

12. C

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: The margin of error corresponds to the amount of random sampling error and is the interval in which a population likely falls. Thus, the smaller the margin of error, the more confidence the results of the sample population reflect the larger population. If the sample data estimates 87% with a margin of error of 5%, the percentage of college students who eat out at least once a week will fall in the interval $87\% \pm 5\%$; that is, between 82% and 92%. **(C)** is correct.

13. A

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: Any sample used to determine a general opinion needs to be representative and unbiased. The railroad company fails to meet that requirement by surveying only people who commute to work and who would probably benefit from the station. This leaves out a large portion of the population who may not share the commuters' opinion. The use of a biased sample group makes the survey unreliable and not representative. Choice **(A)** is correct.

14. A

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: As long as a sample is representative (without bias and relatively large), the mean and median of the sample data will be the same as the expected mean and median of the population from which the sample was taken. Since the question tells you that the sample is random and representative, the mean of the sample equals the estimated mean of the general population. Choice **(A)** is the correct answer.

15. C

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: As the customers were selected at random, it is reasonable to assume that the survey results will be representative of what is true for customers in general. However, the data provided refers only to people who bought dinnerware. Thus, an inference can be drawn only about dinnerware returns and nothing else. Since 80% of surveyed customers returned dinnerware items because of damage, it is reasonable to infer that this statistic will be similar for all customers who return dinnerware. Choice **(C)** is correct.

Choices (A) and (D) incorrectly generalize from dinnerware to all the products in the store. You have no information about any other products, so you cannot draw conclusions about all the products in the store. Choice (B) also goes outside the scope of the question. While the 80% indicated in the question may seem like a high percentage, other products may be even more likely to be damaged. There is no way to know.

16. C

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: To make a reliable inference from a survey, the survey sample needs to be unbiased and relatively large. In this case, the miniature golf course owner surveyed only children who played at that course. Thus, any inference drawn from the data must be about children at this golf course only and cannot be generalized to the entire population. Since 60% of the surveyed children prefer a red golf ball, it is reasonable to infer that a similar percentage of total children at that golf course would prefer red golf balls. Thus, **(C)** is correct.

17. B

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: To make a reliable inference from a survey, the survey sample needs to be unbiased and relatively large. Here, the survey responses are drawn only from people who happen to be watching this particular television show and those who have

the ability to send text messages. Therefore, it may not represent the preferences of the entire state's population. **(B)** is correct.

Choice (A) is incorrect because Issue Y is never mentioned in the question. Choice (C) is irrelevant. Choice (D) misinterprets the percent by mistakenly applying it to accuracy rather than the raw number of votes.

18. C

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: The number of desired outcomes is 392 (bearings marked defective that are actually defective). The number of total possible outcomes is 560 (all the bearings that are marked defective). Thus, the probability that a bearing marked defective is in fact defective is $\frac{392}{560} \times 100\% = 0.70 \times 100\% =$ 70%. **(C)** is correct.

19. D

Difficulty: Hard

Category: Problem-Solving and Data Analysis

Getting to the Answer: The probability that one randomly selected salmon from those that were tested would have a dangerous level of mercury is equal to the number of salmon that had dangerous mercury levels divided by the total number of salmon that were tested.

$$\frac{\text{\# salmon with dangerous mercury levels}}{\text{\# of salmon tested}}$$

This means you need only two numbers to answer this question. One of those numbers is in the second table—6 salmon had dangerous mercury levels. Finding the other number is the tricky part. Use information from the question stem and the first table. The biologist tested 5% of the total number of each species of fish, and 25% of the 6,000 fish are salmon. So, the biologist tested 5% of 25% of 6,000 fish. Multiply to find that $0.05 \times 0.25 \times 6{,}000 = 75$ salmon were tested. This means the probability is $\frac{6}{75} = 0.08$, which matches **(D)**.

20. B

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Strategic Advice: Recognizing which value goes in the denominator, whether it is the grand total or the total of a subgroup, is essential for probability questions that are based on data in a table.

Getting to the Answer: The question indicates that the random selection is from all the engineers, or the grand total of 768. The specific engineer to be selected is a mechanical engineer who prefers autonomous vehicles, and the table indicates that there are 245 such engineers. Therefore, the probability of selecting a mechanical engineer who prefers autonomous vehicles from all the engineers is $\frac{245}{768}$, which is approximately 0.319. **(B)** is correct.

Note that the incorrect answer choices often reflect common misunderstandings and simple table-reading errors. For example, (C) and (D) both use the wrong total, and (A) is the probability of choosing an electrical engineer who prefers autonomous vehicles.

21. A

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Strategic Advice: Be on the lookout for "at least" language. It will usually require adding data from multiple rows or columns.

Getting to the Answer: The probability of choosing an employee with "at least" 8 paid vacation days who is salaried is the number of salaried employees with 8 or more paid vacation days divided by the total number of employees with 8 or more paid vacation days.

$$\frac{\text{\# salaried employees with 8 or more paid vacation days}}{\text{total \# employees with 8 or more paid vacation days}}$$

Find the number of salaried employees with 8 or more paid vacation days by adding the salaried employees with 8–14 paid vacation days, 27, and the salaried employees with 15–30 paid vacation days, 65. That means there are 27 + 65, or 92, salaried employees with 8 or more paid vacation days. The total number of employees with 8 or more paid vacation days is 210 (the total number of employees with 8–14 paid vacation days) plus 103 (the total number of employees with 15–30 paid vacation days), or 313. The probability is $\frac{92}{313}$. **(A)** is correct.

22. A

Difficulty: Hard

Category: Problem-Solving and Data Analysis

Strategic Advice: If totals and the relationships between the data are the only information provided, write out a system of equations.

Getting to the Answer: The question gives the relationships between unknown values in the table, so you may want to draw this table out on your scratch paper and fill it in accordingly. For large eggs, let l be the number that is brown. There are 6 times as many large eggs that are white, so that is $6l$. Similarly, for jumbo eggs, let j be the number of jumbo brown eggs. Because the farm produces five times as many jumbo eggs that are white, fill in that blank with $5j$:

Egg production by size and color		
Egg Type	**Brown**	**White**
Large	l	$6l$
Jumbo	j	$5j$
Total	750	3,880

Write a system of equations based on the brown and white columns:

$$l + j = 750$$
$$6l + 5j = 3{,}880$$

Solve the first equation for j and substitute the result into the second equation to solve for l:

$$j = 750 - l$$
$$6l + 5(750 - l) = 3{,}880$$
$$6l + 3{,}750 - 5l = 3{,}880$$
$$l = 130$$

Therefore, there are 130 large brown eggs. The total number of brown eggs is 750. Thus, the probability of a brown egg selected at random being large is $\frac{130}{750}$, or approximately 0.173. **(A)** is correct. Notice that there is no need to actually calculate j or the other values in the table to answer this question.

Check Your Work – Chapter 10

1. A

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: Examine the graph, paying careful attention to units and labels. The average rate of change is the same as the slope of the line of best fit. The data is decreasing (going down from left to right), so eliminate (C) and (D). To choose between (A) and (B), find the slope of the line of best fit using the slope formula, $m = \frac{y_2 - y_1}{x_2 - x_1}$, and any two points that lie on (or very close to) the line. Using the two points (5, 14) and (10, 8), the average rate of change is about $\frac{8 - 14}{10 - 5} = \frac{-6}{5} = -1.2$, which matches **(A)**.

2. A

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: The question asks for a rate of change, which means you'll need the slope of the line of best fit. Pick a pair of points to use in the slope formula, such as (1998, 20) and (2012, 90):

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{90 - 20}{2012 - 1998} = \frac{70}{14} = 5$$

Choice **(A)** is correct.

3. 18

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: Because the *y*-value of the graph when $x = 3{,}400$ is not shown, this question requires a mathematical solution; extending the line of best fit will not provide an accurate enough answer. The equation of the model is given as $y = -\frac{1}{200}x + 35$. Miles over recommended servicing are graphed along the *x*-axis, so substitute 3,400 for *x* to find the answer:

$$y = -\frac{1}{200}(3{,}400) + 35 = -17 + 35 = 18$$

Enter **18**.

4. 2

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: Examine the graph, including the axis labels and numbering. Each vertical grid line represents 5 eggs, so look to see how many data points are more than a complete grid space away from the line of best fit. Only 2 data points meet this requirement—the first data point at about 3 weeks and the one between 30 and 35 weeks, making **2** the correct answer. Enter **2**.

5. A

Difficulty: Medium

Category: Problem-Solving and Data Analysis.

Getting to the Answer: First, find the slope of the line of best fit using the slope formula, $m = \frac{y_2 - y_1}{x_2 - x_1}$, and any two points that lie on the line. Using the two points (17.0, 3.0) and (20.0, 5.0), the slope is $\frac{5.0 - 3.0}{20.0 - 17.0} = \frac{2}{3}$. Eliminate (C) and (D). The *y*-intercept is when *x* is 0. According to the scatterplot, *y* is 3 when *x* is 17, not when *x* is 0, so eliminate (B). **(A)** is correct.

You can determine the exact *y*-intercept by plugging one of the points into the slope-intercept form:

$$5 = \frac{2}{3}(20) + b$$
$$\frac{15}{3} = \frac{40}{3} + b$$
$$-\frac{25}{3} = b$$

6. C

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: The equation given is that of a line in standard form, so *a* represents the slope. Since *a* is negative, you are looking for data that is linear and decreasing or falling from left to right. You can eliminate (A), which is a parabola, and (D), an exponential curve. You can also eliminate (B) because it is increasing (rising from left to right) instead of decreasing (falling from left to right). **(C)** is correct.

7. A

Difficulty: Easy

Getting to the Answer: When an exponential equation is written in the form $y = x_0(1 + r)x$, the value of x_0 gives the y-intercept of the equation's graph. To answer this question, you need to think about what the y-intercept would represent in the context described.

Whenever time is involved in a relationship that is modeled by an equation or a graph, it is almost always the independent variable and therefore graphed on the x-axis. Therefore, for this question, population would be graphed on the y-axis, so x_0 most likely represents the population when the time elapsed was zero, or in other words, in the year that Adriana was born, making **(A)** correct.

8. C

Difficulty: Medium

Getting to the Answer: "Correlation" simply means relationship. The word "weak" refers to the strength of the relationship (how close the data lies to the line of best fit), which has no effect on slope. Be careful not to confuse slope and strength. The fact that a data set shows a weak correlation does not give you any information about the magnitude of the slope. This means you can eliminate (A) and (B). In a weak correlation, the data points will loosely follow the line of best fit, which makes **(C)** the correct answer. (D) describes a strong correlation.

9. B

Difficulty: Easy

Getting to the Answer: A curve of best fit for the scatterplot would show that the measured height of the water decreases over time, but the curve becomes less steep over time, too. Since the flow changes as the height of the water changes, (A) is incorrect. Because the curve of best fit becomes less steep as the height of the water decreases, it follows that the flow rate decreases as the height of the water decreases. **(B)** is correct. (D) is incorrect because the height of the water decreases (though at an ever slower rate) as time progresses, so there is a relationship between the height of the water and time. (C) is incorrect because a downward-sloping curve with a flattening slope is represented by an exponential model, not a quadratic model.

Check Your Work – How Much Have You Learned: Problem-Solving and Data Analysis

1. A

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: The percent of the budget spent on the decorations is $100\% - 35\% - 40\% - 15\% = 10\%$. You're told that the cost of the venue is \$5,950, which represents 35% of the total budget. Let x be the total amount of the budget in dollars. Then 35% of x is \$5,950, or $0.35x = 5{,}950$. Solve this equation for x:

$$0.35x = 5{,}950$$
$$x = 17{,}000$$

The total budget is \$17,000. Decorations represent 10% of this amount, or $0.10 \times \$17{,}000 = \$1{,}700$, which means **(A)** is correct. You could also set up the proportion $\frac{10\%}{35\%} = \frac{x}{5{,}950}$ and solve for x.

2. C

Difficulty: Hard

Category: Problem-Solving and Data Analysis

Getting to the Answer: Let m be the number of months Ayesha will subscribe to the service. Since the first two months are half-off, the first two months cost $2 \times 0.5e$ dollars. The remaining months $(m - 2)$ are charged at a rate of e dollars per month. So, the total charge for the subscription so far is $e + e(m - 2)$. Set this equal to \$100 and solve for m:

$$e + e(m - 2) = 100$$
$$e + em - 2e = 100$$
$$em - e = 100$$
$$m = \frac{100 + e}{e}$$

The expression for m matches the one in **(C)**.

3. B

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: You need to find the number of washing machines out of a total of 42 washers and dryers that will yield a 4:3 ratio of washers to dryers.

Add the parts of the given ratio together to get the total number of parts: $4 + 3 = 7$, so the total number of washers and dryers will always be a multiple of 7. Divide the total number of washers and dryers at the second location by 7 to find the multiple that the laundromat has at the second location: $\frac{42}{7} = 6$. Multiply the original ratio by 6 to get the actual number of washers: $4(6) = 24$. **(B)** is correct.

4. 1.92

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: Use unit conversion to convert from cups to liters, which is the unit you want the answer in:

$$8 \text{ cups} \times \frac{0.24 \text{ liter}}{1 \text{ cup}} = 1.92 \text{ liters}$$

Enter **1.92**.

5. A

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: When considering the validity of a study, always look for possible sources of bias. In other words, look for things that might skew the results in either direction. Because the survey only sampled car owners who had pets, the results of the survey are likely skewed. The respondents of pet owners with cars are likely to respond more positively than the average car owner to seat covers. Therefore, the data from the survey likely overestimates the number of car owners interested in seat covers, making **(A)** the correct answer.

6. A

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: Convert 10% to a fraction $\left(\frac{1}{10}\right)$ and then approach logically—the final probability is $\frac{1}{10}$ of $\frac{2}{3}$ of $\frac{3}{5}$. When dealing with fractions, "of" means multiply. So, the probability of randomly choosing a skater who is a teenager wearing a hat and gloves is $\frac{1}{5\cancel{10}} \times \frac{\cancel{2}}{\cancel{3}} \times \frac{\cancel{3}}{5} = \frac{1}{25}$. **(A)** is correct.

7. B

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: There are $5 + 10 + 5 + 8 + 2 = 30$ tables with students, so the median will be the average of the 15th and 16th groups. The 15th table falls under 2 students per table since $5 + 10 = 15$, and the 16th table falls under 3 students per table. Thus, the median, which is the average of the 15th and 16th groups, is $\frac{2+3}{2} = \frac{5}{2} = 2.5$. Choice **(B)** is correct.

8. D

Difficulty: Easy

Category: Problem-Solving and Data Analysis

Getting to the Answer: Both range and standard deviation are measures of spread, while mean and median are a measure of center. Eliminate (A) and (C). The range tells you the maximum value minus the minimum value but not the distribution. Thus, standard deviation should be used to determine a player's skill. **(D)** is correct. The distribution over a broader region indicates a low-skilled darts player (high standard deviation), while a good darts player will have shots closely clustered around the bullseye (low standard deviation).

9. A

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: The estimated yearly increase in the average closing price of lumber is represented by the slope of the line of best fit. Recall that the slope is equal to $\frac{y_2 - y_1}{x_2 - x_1}$. Estimate any two points on the line, for instance (2012, 2) and (2022, 7), to approximate the slope. The slope is about $\frac{7-2}{2022-2012} = \frac{5}{10} = 0.5$. The estimated yearly increase in the average closing price of lumber is \$0.50. **(A)** is correct.

10. C

Difficulty: Medium

Category: Problem-Solving and Data Analysis

Getting to the Answer: The data in the scatterplot can be modeled with a concave up curve (such as quadratic or exponential) that has a decreasing negative slope. The rate of decrease is not constant. Eliminate (A) and (B). To visualize this, for every 50,000 miles, draw a line of best fit through the data. The slopes of the lines of best fit are steeper at lower mileage. Thus, at lower mileage, the rate of decrease in the resale value of a car every 50,000 is greater than at higher mileage. **(C)** is correct.