

Two-Way Tables (Conditional Probability)

- The table below shows the results of a survey of 100 high school students regarding their favorite subject and their grade level.

	Math	English	Total
9th Grade	18	22	40
10th Grade	32	28	60
Total	50	50	100

If a 10th-grade student is chosen at random, what is the probability that the student's favorite subject is Math?

Solution:

The question asks for a conditional probability: the probability that the favorite subject is Math, *given* that the student is in the 10th grade.

Identify the total number of 10th graders (the denominator): 60.

Identify how many of those 10th graders prefer Math (the numerator): 32.

Calculate the probability:

$$P = \frac{32}{60}$$

Simplify the fraction by dividing by 4:

$$\frac{32 \div 4}{60 \div 4} = \frac{8}{15}$$

Final Answer: 8/15

- The table below shows survey results from 200 high school students asked about their exercise habits and whether they prefer morning or evening study sessions.

	Morning	Evening	Total
Exercises Daily	54	36	90
Does Not Exercise Daily	46	64	110
Total	100	100	200

A student is chosen at random from those who prefer morning study sessions. What is the probability that the student exercises daily?

- A. $\frac{27}{100}$
- B. $\frac{54}{200}$
- C. $\frac{54}{100}$
- D. $\frac{90}{200}$

Solution

This is a conditional probability question. We are restricted to the column of morning students only (total = 100).

$$P(\text{Exercises Daily} \mid \text{Morning}) = \frac{\text{Exercises Daily AND Morning}}{\text{Total Morning}} = \frac{54}{100}$$

Answer: C) $\frac{54}{100}$

Scatterplots and Lines of Best Fit

• A researcher collected data on the number of hours spent studying, x , and the test score, y , for a group of students. The line of best fit for the data is given by the equation $y = 7.5x + 42$. Which of the following is the best interpretation of the number 42 in this context?

- (A) The increase in test score for every additional hour studied.
- (B) The predicted test score for a student who studied for 0 hours.
- (C) The maximum possible test score on the exam.
- (D) The average number of hours studied by all students.

Solution:

The equation is in the form $y = mx + b$, where m is the slope and b is the y -intercept.

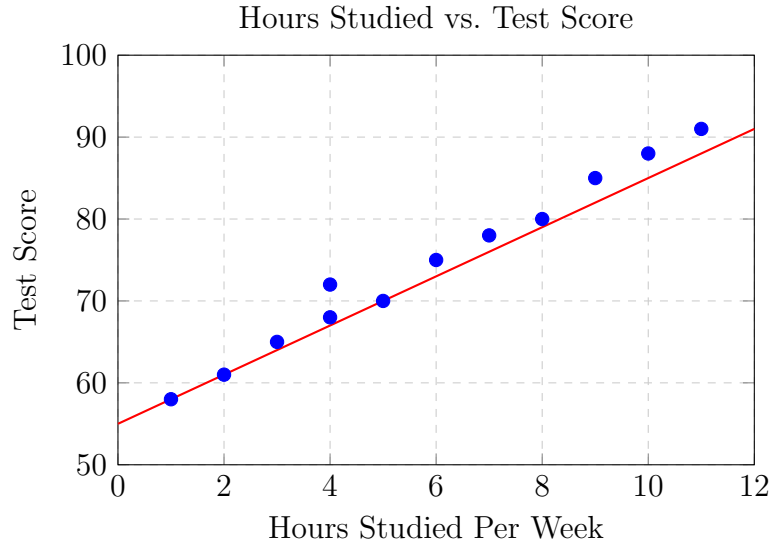
The number 42 is the y -intercept (b).

The y -intercept represents the value of y when $x = 0$.

Since x represents "hours studied" and y represents "test score," 42 represents the predicted score when hours studied is 0.

Final Answer: (B)

- The scatterplot below shows the relationship between the number of hours studied per week and the score on a standardized test for 12 students. A line of best fit has been drawn.



The equation of the line of best fit is $y = 4x + 55$, where x is the number of hours studied per week and y is the predicted test score. According to this model, what is the predicted test score for a student who studies 8 hours per week?

- A. 77
- B. 83
- C. 87
- D. 91

Solution

Substitute $x = 8$ into the line of best fit equation:

$$y = 4(8) + 55 = 32 + 55 = 87$$

Answer: C) 87

Interpreting Bar Charts

- A bar chart (not shown) displays the number of laptops sold at an electronics store over four months: January (200), February (150), March (250), and April (300). What percentage of the total laptops sold during these four months were sold in April?

Solution:

Calculate the total number of laptops sold:

$$200 + 150 + 250 + 300 = 900$$

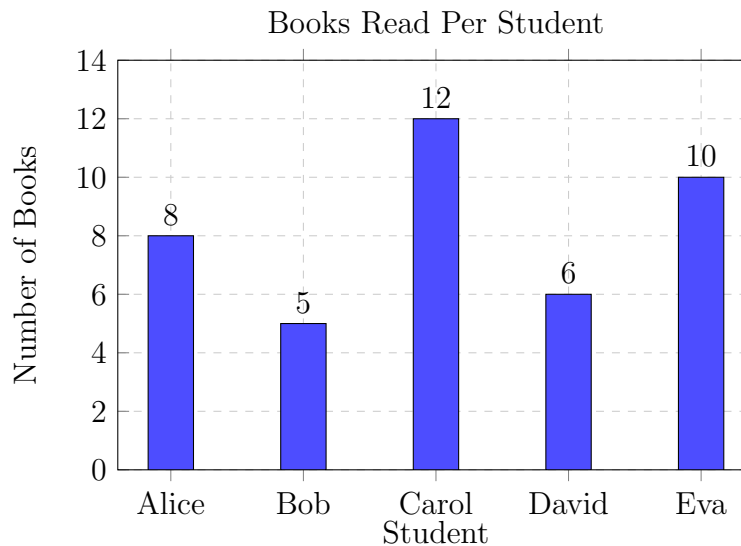
Identify the number of laptops sold in April: 300. Calculate the percentage:

$$\text{Percent} = \frac{300}{900} \times 100\%$$

$$\text{Percent} = \frac{1}{3} \times 100\% \approx 33.3\%$$

Final Answer: 33.3% (or 1/3)

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- The bar chart below shows the number of books read by five students during a semester.



Based on the bar chart, how many more books did Carol read than the average number of books read by all five students?

- A. 3.8
- B. 4.2
- C. 4.8
- D. 5.2

Solution

Find the total books read:

$$8 + 5 + 12 + 6 + 10 = 41$$

Find the average:

$$\bar{x} = \frac{41}{5} = 8.2$$

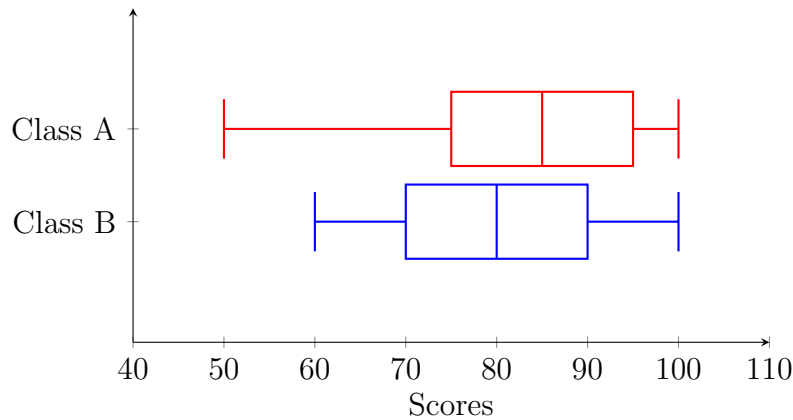
Find how many more Carol read than the average:

$$12 - 8.2 = 3.8$$

Answer: A) 3.8

Box Plots (Comparing Distributions)

- Two classes took the same math quiz. The box plots of their scores are summarized below:



- Class A:** Min = 50, $Q_1 = 70$, Median = 80, $Q_3 = 90$, Max = 100
- Class B:** Min = 60, $Q_1 = 75$, Median = 85, $Q_3 = 95$, Max = 100

Which of the following statements must be true based on the box plots?

- (A) The range of scores in Class A is greater than the range of scores in Class B.
- (B) The interquartile range (IQR) of Class A is equal to the IQR of Class B.
- (C) At least 50% of students in Class B scored 85 or higher.
- (D) There were more students in Class B than in Class A.

Solution:

Let's evaluate the options:

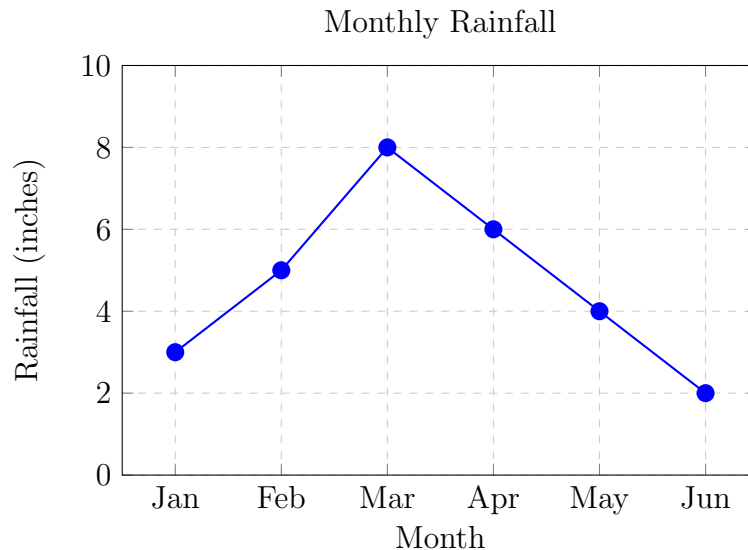
- (A) Range of A = $100 - 60 = 40$. Range of B = $100 - 50 = 50$. A is not greater than B.
- (B) IQR of A = $90 - 70 = 20$. IQR of B = $95 - 75 = 20$. This is true.
- (C) The median of Class B is 85. By definition, 50% of the data is at or above the median. This is also true.
- (D) Box plots do not show the total number of data points (n).

Note: In SAT questions of this type, usually only one is correct. If B and C both seem correct, re-read carefully. Both are statistically sound here, but (C) is a standard interpretation of the median line.

Final Answer: (C) (or B depending on specific test phrasing)

Line Graphs and Rates of Change

- The line graph below shows the monthly rainfall (in inches) for a city over a 6-month period.



Based on the line graph, between which two consecutive months did rainfall decrease by the greatest amount?

- February to March
- March to April
- April to May
- May to June

Solution

Calculate the change between each pair of consecutive months:

Months	From	To	Change
Jan → Feb	3	5	+2 (increase)
Feb → Mar	5	8	+3 (increase)
Mar → Apr	8	6	-2
Apr → May	6	4	-2
May → Jun	4	2	-2

All three decreasing intervals show a drop of 2 inches. The question asks for the greatest single decrease among the answer choices listed. March to April shows the first occurrence of the maximum 2-inch drop, and it follows the peak month (March).

Answer: B) March to April

Multi-Step Table Interpretation

- The table below shows the number of items sold and the revenue generated by three products at a store in one week.

Product	Units Sold	Total Revenue (\$)
<i>Widget A</i>	40	320
<i>Widget B</i>	25	375
<i>Widget C</i>	60	540
Total	125	1,235

Which product has the highest price per unit, and what is that price?

- A. Widget A at \$8.00
- B. Widget B at \$15.00
- C. Widget C at \$9.00
- D. Widget B at \$12.00

Solution

Compute the price per unit for each product:

$$\text{Widget A: } \frac{\$320}{40} = \$8.00 \text{ per unit}$$

$$\text{Widget B: } \frac{\$375}{25} = \$15.00 \text{ per unit}$$

$$\text{Widget C: } \frac{\$540}{60} = \$9.00 \text{ per unit}$$

Widget B has the highest price per unit at \$15.00.

Answer: B) Widget B at \$15.00

Problems adapted from the College Board SAT Question Bank and released SAT practice tests.