

ACT Math Practice Test 4

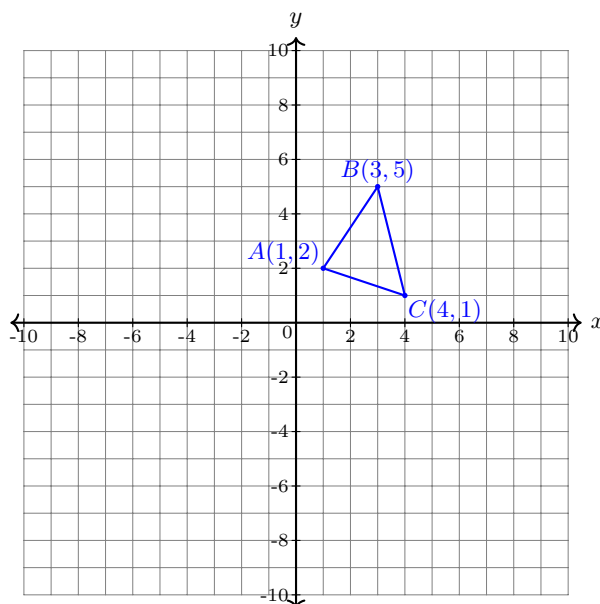
50 Minutes — 45 Questions

Choose the best answer for each question. A permitted calculator may be used. Figures are not necessarily drawn to scale.

- 1) A theater has 18 rows with 24 seats in each row. If $\frac{7}{8}$ of the seats are occupied, how many seats are empty?
- ☐ A. 54 ☐ C. 36
- ☐ B. 48 ☐ D. 63
- 2) A line passes through $(-2, 7)$ and $(4, -5)$. What is the y -intercept of the line?
- ☐ F. -2 ☐ H. 5
- ☐ G. 1 ☐ J. 3
- 3) A 13-foot ladder rests against a vertical wall. The bottom of the ladder is 5 feet from the wall. If θ is the angle the ladder makes with the ground, what is $\sin \theta$?
- ☐ A. $\frac{5}{13}$ ☐ C. $\frac{5}{12}$
- ☐ B. $\frac{12}{13}$ ☐ D. $\frac{12}{5}$
- 4) A jar contains 5 red marbles, 3 blue marbles, and 2 yellow marbles. One marble is selected at random. What is the probability that it is not blue?
- ☐ F. $\frac{3}{10}$ ☐ H. $\frac{1}{2}$
- ☐ G. $\frac{7}{10}$ ☐ J. $\frac{3}{5}$
- 5) Simplify: $\frac{8.4 \times 10^7}{2.1 \times 10^3}$
- ☐ A. 4×10^4 ☐ C. 6.3×10^4
- ☐ B. 4×10^{10} ☐ D. 6.3×10^{10}
- 6) A recipe uses $2\frac{1}{4}$ cups of flour to make 3 batches of muffins. How many cups of flour are needed to make 8 batches at the same rate?
- ☐ F. 5 ☐ H. $6\frac{1}{2}$
- ☐ G. 6 ☐ J. $8\frac{1}{4}$
- 7) What is the solution to $3(2x - 5) = 4x + 7$?
- ☐ A. -11 ☐ C. 7
- ☐ B. 1 ☐ D. 11
- 8) A rectangular garden has a perimeter of 46 feet. Its length is 15 feet. What is its area, in square feet?
- ☐ F. 105 ☐ H. 135
- ☐ G. 120 ☐ J. 150

- 9) A school district wants to estimate how many students bring lunch from home. It surveys the first 40 students who enter the cafeteria. Which is the main concern with this method?
- ☐ A. The sample may leave out students who do not eat in the cafeteria.
- ☐ B. The sample is too large to represent the district.
- ☐ C. The survey measures a numerical quantity instead of a category.
- ☐ D. The students are selected randomly from every grade.
- 10) Carlos deposits \$2,500 in a savings account that earns 3% simple interest per year. How much interest will he earn after 4 years?
- ☐ F. \$250
- ☐ G. \$275
- ☐ H. \$325
- ☐ J. \$300
- 11) Which pair of points has a slope of $\frac{3}{4}$?
- ☐ A. (0,0) and (3,4)
- ☐ B. (2,1) and (6,4)
- ☐ C. (3,2) and (7,6)
- ☐ D. (4,3) and (8,7)
- 12) A parallelogram has an area of 98 square centimeters and a base of 14 centimeters. What is the perpendicular distance between its parallel bases?
- ☐ F. 5 centimeters
- ☐ G. 7 centimeters
- ☐ H. 8 centimeters
- ☐ J. 14 centimeters
- 13) Simplify: $3\sqrt{32} - 2\sqrt{8} + \sqrt{50}$
- ☐ A. $11\sqrt{2}$
- ☐ B. $12\sqrt{2}$
- ☐ C. $13\sqrt{2}$
- ☐ D. $14\sqrt{2}$
- 14) The mean of six numbers is 14. Five of the numbers have a sum of 62. What is the sixth number?
- ☐ F. 18
- ☐ G. 20
- ☐ H. 24
- ☐ J. 22
- 15) A savings model is $S(t) = 200(1.04)^t$. What percent increase does the model show each year?
- ☐ A. 104 percent
- ☐ B. 4 percent
- ☐ C. 0.4 percent
- ☐ D. 200 percent
- 16) Let $M = \begin{bmatrix} 1 & 3 \\ -2 & 4 \end{bmatrix}$ and $N = \begin{bmatrix} 4 & 0 \\ 1 & -1 \end{bmatrix}$. What is $2M - N$?
- ☐ F. $\begin{bmatrix} -2 & 6 \\ -5 & 9 \end{bmatrix}$
- ☐ G. $\begin{bmatrix} 6 & 6 \\ -3 & 7 \end{bmatrix}$
- ☐ H. $\begin{bmatrix} -2 & 3 \\ -5 & 8 \end{bmatrix}$
- ☐ J. $\begin{bmatrix} 2 & 6 \\ -3 & 9 \end{bmatrix}$

- 17) Triangle ABC has vertices $A(1, 2)$, $B(3, 5)$, and $C(4, 1)$. If the triangle is translated 2 units left and 3 units down, what are the coordinates of A' ?



- ☐ A. $(-1, -1)$
☐ C. $(-1, 5)$
☐ B. $(3, 5)$
☐ D. $(3, -1)$

- 18) For the piecewise function:

$$f(x) = \begin{cases} x^2 & \text{if } x < 0 \\ 2x + 1 & \text{if } x \geq 0 \end{cases}$$

Find $f(-3) + f(4)$.

- ☐ F. 16
 ☐ H. 20
☐ G. 18
 ☐ J. 22
- 19) The table shows the total amount of money Emma has saved over time.

Time (months)	1	3	5	7
Money Saved (dollars)	120	360	600	840

What is the rate of change in dollars per month?

- ☐ A. \$100 per month
 ☐ C. \$120 per month
☐ B. \$110 per month
 ☐ D. \$130 per month
- 20) Which equation represents an absolute value graph with vertex $(-2, -4)$ that opens downward and has arms twice as steep as $y = |x|$?

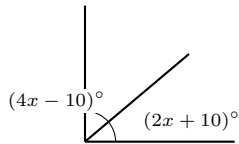
- ☐ F. $y = 2|x - 2| - 4$
☐ H. $y = -2|x + 2| - 4$
☐ G. $y = 2|x + 2| + 4$
☐ J. $y = -\frac{1}{2}|x + 2| - 4$
- 21) The table shows values of a linear function.

x	-1	2	5
y	7	-2	-11

Which equation represents the function?

- ☐ A. $y = 3x + 4$
☐ C. $y = -3x - 4$
☐ B. $y = -3x + 4$
☐ D. $y = 3x - 4$

- 22) A function is modeled by $f(x) = a(2)^x$. If a increases from 3 to 6, what happens to the graph?
- ☐ F. The graph has a larger initial value. ☐ H. The horizontal asymptote changes to $y = 6$.
- ☐ G. The graph changes from growth to decay. ☐ J. The base becomes 6.
- 23) Two angles are complementary. One angle measures $(2x + 10)^\circ$ and the other measures $(4x - 10)^\circ$. What is the measure of the larger angle?



- ☐ A. 40° ☐ C. 50°
- ☐ B. 45° ☐ D. 55°
- 24) A function f satisfies $f(x + 2) = 3x - 1$ for every real number x . What is $f(5)$?
- ☐ F. 5 ☐ H. 8
- ☐ G. 6 ☐ J. 11
- 25) A game pays 8 points with probability 0.2 and costs 2 points with probability 0.8. What is the expected change in a player's score for one game?
- ☐ A. -0.8 points ☐ C. 6 points
- ☐ B. 1.2 points ☐ D. 0 points
- 26) For $f(x) = x^2 - 4$ with domain $\{-2, -1, 0, 1, 2\}$, what is the range?
- ☐ F. $\{-4, -3, 0\}$ ☐ H. $\{-4, 0, 4\}$
- ☐ G. $\{-4, -3, 1\}$ ☐ J. $\{-3, 0, 1\}$
- 27) What is the value of $\frac{81^{3/4}}{27^{2/3}}$?
- ☐ A. 1 ☐ C. 9
- ☐ B. 2 ☐ D. 3
- 28) Let $f(x) = 4^{x+1}$ and $g(x) = 8^{2x-1}$. For what value of x is $f(x) = g(x)$?
- ☐ F. 1 ☐ H. $\frac{5}{4}$
- ☐ G. $\frac{3}{2}$ ☐ J. 2
- 29) A manufacturing plant accepts a batch if its defect rate is no greater than 0.0025. One shift produced 50 defective items. If the defect rate is modeled by $\frac{50}{x}$, where x is the total number of items, what batch size corresponds exactly to the threshold?
- ☐ A. 20,000 ☐ C. 30,000
- ☐ B. 25,000 ☐ D. 35,000
- 30) Which interval contains all real solutions of $|3x - 4| \leq 11$?
- ☐ F. $\left[-\frac{7}{3}, 5\right]$ ☐ H. $\left[-5, \frac{7}{3}\right]$
- ☐ G. $\left(-\infty, -\frac{7}{3}\right] \cup [5, \infty)$ ☐ J. $\left[-\frac{5}{3}, \frac{7}{3}\right]$

- 31) The data set is 6, 7, 8, 10, 12, 15, 19, 20. What is the interquartile range?
- ☐ A. 7.5 ☐ C. 9
- ☐ B. 8 ☐ D. 9.5
- 32) A sector of a circle has radius 6 inches and a central angle of 120° . What is the length of the arc that bounds the sector?
- ☐ F. 2π inches ☐ H. 6π inches
- ☐ G. 4π inches ☐ J. 8π inches
- 33) On a map, 1.5 centimeters represents 2 kilometers. A route measures 6.75 centimeters on the map, and two-thirds of the actual route is paved. How many kilometers of the route are unpaved?
- ☐ A. 2 ☐ C. 4.5
- ☐ B. 3 ☐ D. 6
- 34) Which point satisfies both inequalities $y \leq -x + 6$ and $y > x - 2$?
- ☐ F. (2, 3) ☐ H. (1, -1)
- ☐ G. (4, 4) ☐ J. (5, 2)
- 35) A school survey found that 72 students take Spanish, 58 take French, and 41 take German. Of these students, 29 take both Spanish and French, 22 take both Spanish and German, and 18 take both French and German. These pair counts include students taking all three languages; 10 students take all three. If 120 students were surveyed, how many take none of these languages?
- ☐ A. 10 ☐ C. 16
- ☐ B. 12 ☐ D. 8
- 36) For $x \neq -2$ and $x \neq 2$, which value of x satisfies
- $$\frac{x+1}{x-2} + \frac{x-4}{x+2} = 2?$$
- ☐ F. -2 ☐ H. 8
- ☐ G. 2 ☐ J. 6
- 37) What is the domain of $f(x) = \frac{\sqrt{5-x}}{x-2}$?
- ☐ A. $(-\infty, 5]$ ☐ C. $[2, 5]$
- ☐ B. $(-\infty, 2) \cup (2, 5]$ ☐ D. $(-\infty, 2) \cup (2, \infty)$
- 38) The vertices of a triangle are $(-2, 1)$, $(4, 0)$, and $(5, 5)$. What is the area of the triangle, in square units?
- ☐ F. 12 ☐ H. 17
- ☐ G. 15.5 ☐ J. 31
- 39) A warehouse employee earns \$18 per hour for the first 40 hours worked in a week and \$27 per hour for each additional hour. In one week, the employee works 46 hours. A deduction equal to 5% of gross pay is withheld. What is the employee's pay after this deduction?
- ☐ A. \$837.90 ☐ C. \$882.00
- ☐ B. \$840.00 ☐ D. \$927.00
- 40) What is the value of $\frac{3-4i}{1+2i}$, where $i^2 = -1$?
- ☐ F. $-1-2i$ ☐ H. $1-2i$
- ☐ G. $-1+2i$ ☐ J. $1+2i$

- 41) If $x^2 - 5x + 3 = 0$, what is the value of $x^2 + \frac{9}{x^2}$?
- ☐ A. 13 ☐ C. 19
- ☐ B. 16 ☐ D. 25
- 42) Let $f(x) = x^2 + 4x - 5$ for $x \geq -2$. What is $f^{-1}(4)$?
- ☐ F. $2 - \sqrt{13}$ ☐ H. $-2 + \sqrt{13}$
- ☐ G. $-2 - \sqrt{13}$ ☐ J. $2 + \sqrt{13}$
- 43) A right triangular prism is 8 centimeters long. Each triangular base has side lengths 13, 13, and 10 centimeters, with altitude 12 centimeters to the side of length 10. What is the total surface area of the prism?
- ☐ A. 288 square centimeters ☐ C. 408 square centimeters
- ☐ B. 348 square centimeters ☐ D. 468 square centimeters
- 44) A bag contains 4 red, 3 blue, and 2 green tiles. Two tiles are selected at random without replacement. What is the probability that the two tiles are the same color?
- ☐ F. $\frac{5}{18}$ ☐ H. $\frac{7}{18}$
- ☐ G. $\frac{1}{3}$ ☐ J. $\frac{4}{9}$
- 45) A parking garage charges no fee for the first 2 hours. For the next 2 hours, it charges \$3.60 per 15-minute interval or part of an interval. After 4 hours, the rate is \$2.40 per 15-minute interval or part. How much does a driver pay for a stay of 5 hours 8 minutes?
- ☐ A. \$38.40 ☐ C. \$40.80
- ☐ B. \$39.60 ☐ D. \$42.00

Scratch work

Answer Key and Explanations

1. A Standard: ACT Math: Integrating Essential Skills

First find the total number of seats: $18(24) = 432$. If $\frac{7}{8}$ are occupied, then the remaining fraction is $1 - \frac{7}{8} = \frac{1}{8}$. One eighth of 432 is $432 \div 8 = 54$, so 54 seats are empty.

2. J Standard: ACT Math: Algebra

First find the slope: $m = \frac{-5 - 7}{4 - (-2)} = \frac{-12}{6} = -2$. Write the line as $y = -2x + b$ and use either point. With $(-2, 7)$, $7 = -2(-2) + b = 4 + b$, so $b = 3$. The y-intercept is the value of y when $x = 0$, which is 3.

3. B Standard: ACT Math: Geometry

The wall, ground, and ladder form a right triangle. The ladder is the hypotenuse, so the height on the wall is $\sqrt{13^2 - 5^2} = \sqrt{144} = 12$ feet. Sine is opposite over hypotenuse, giving $\sin \theta = 12/13$.

4. G Standard: ACT Math: Statistics & Probability

There are $5 + 3 + 2 = 10$ marbles altogether. Seven are not blue: the 5 red marbles and 2 yellow marbles. So the probability of selecting a marble that is not blue is $\frac{7}{10}$. This is also the complement of selecting blue, whose probability is $\frac{3}{10}$.

5. A Standard: ACT Math: Number & Quantity

Divide the coefficients and subtract the exponents: $8.4/2.1 = 4$ and $10^7/10^3 = 10^4$. The quotient is therefore 4×10^4 . As a quick check, $4 \times 10^4 = 40,000$, and $84,000,000/2,100$ is also 40,000.

6. G Standard: ACT Math: Integrating Essential Skills

Convert $2\frac{1}{4}$ to $\frac{9}{4}$ cups. Each batch needs $\frac{9}{4} \div 3 = \frac{3}{4}$ cup of flour. For 8 batches, multiply that rate by 8: $8\left(\frac{3}{4}\right) = 6$. The recipe calls for 6 cups of flour.

7. D Standard: ACT Math: Algebra

Distribute the 3 first: $6x - 15 = 4x + 7$. Subtract $4x$ from both sides to collect the variable terms, giving $2x - 15 = 7$. Add 15 to get $2x = 22$, so $x = 11$. Substitution gives $3(22 - 5) = 51$ and $4(11) + 7 = 51$, which confirms the solution.

8. G Standard: ACT Math: Geometry

For a rectangle, $2(L + W) = 46$, so $L + W = 23$. With length 15 feet, the width is $23 - 15 = 8$ feet. The area is length times width: $15(8) = 120$ square feet.

9. A Standard: ACT Math: Statistics & Probability

The district wants information about all students, but the survey reaches only students who enter the cafeteria. Students who bring lunch from home may be less likely to be in that group, so the sample could miss many of the very students the district needs to count. The main issue is undercoverage, which can bias the estimate. A larger sample would not fix that selection problem.

10. J Standard: ACT Math: Integrating Essential Skills

Simple interest adds the same amount each year. The account earns $0.03(2,500) = \$75$ per year, so over 4 years the interest is $4(75) = \$300$. The principal is not added to the answer because the question asks only how much interest Carlos earns.

11. B Standard: ACT Math: Algebra

Slope is vertical change divided by horizontal change. For choice B, the points change from $(2, 1)$ to $(6, 4)$, so $m = (4 - 1)/(6 - 2) = 3/4$. The other pairs give slopes $4/3$, 1, and 1, so only choice B has the requested slope.

12. G Standard: ACT Math: Geometry

For a parallelogram, area equals base times perpendicular height. Let h be the distance between the parallel bases. Then $98 = 14h$, so dividing by 14 gives $h = 7$ centimeters. This distance is the altitude; a slanted side would not be used in the area formula.

13. C Standard: ACT Math: Number & Quantity

Pull out the largest perfect-square factor from each radical: $\sqrt{32} = 4\sqrt{2}$, $\sqrt{8} = 2\sqrt{2}$, and $\sqrt{50} = 5\sqrt{2}$. After keeping the coefficients in the original expression, it becomes $12\sqrt{2} - 4\sqrt{2} + 5\sqrt{2} = 13\sqrt{2}$.

14. J Standard: ACT Math: Statistics & Probability

A mean of 14 for six numbers means their total sum is $6(14) = 84$. The five known numbers add to 62, so the remaining number must be $84 - 62 = 22$. Adding 22 brings the total to 84, which gives the stated mean.

15. B Standard: ACT Math: Integrating Essential Skills

The multiplier 1.04 is $1 + 0.04$. The 1 represents keeping the full previous balance, and the extra 0.04 represents a 4% increase. Thus the balance grows by 4% each year; 1.04 is the growth factor, not the percent increase itself.

16. F Standard: ACT Math: Number & Quantity

First double every entry of M : $2M = \begin{bmatrix} 2 & 6 \\ -4 & 8 \end{bmatrix}$. Then subtract the matching entries of N , giving $\begin{bmatrix} 2 - 4 & 6 - 0 \\ -4 - 1 & 8 - (-1) \end{bmatrix} = \begin{bmatrix} -2 & 6 \\ -5 & 9 \end{bmatrix}$. Be careful with the lower-right entry: subtracting -1 adds 1.

17. A Standard: ACT Math: Geometry

A translation 2 units left subtracts 2 from the x -coordinate, and a translation 3 units down subtracts 3 from the y -coordinate. Starting with $A(1, 2)$ gives $A' = (1 - 2, 2 - 3) = (-1, -1)$. Apply both changes to the original point; the other vertices are not needed.

18. G Standard: ACT Math: Functions

The input -3 satisfies the first condition, $x < 0$, so use x^2 : $f(-3) = 9$. The input 4 satisfies $x \geq 0$, so use $2x + 1$: $f(4) = 9$. Add the two function values to get $9 + 9 = 18$.

19. C Standard: ACT Math: Integrating Essential Skills

The rate of change is the slope. Using $(1, 120)$ and $(3, 360)$: $m = \frac{360-120}{3-1} = \frac{240}{2} = 120$. Using $(5, 600)$ and $(7, 840)$: $m = \frac{840-600}{7-5} = \frac{240}{2} = 120$. Because the rate is constant, the relationship is linear. Emma saves \$120 per month.

20. H Standard: ACT Math: Algebra

In vertex form $y = a|x - h| + k$, the vertex is (h, k) . A vertex at $(-2, -4)$ means the expression inside is $|x + 2|$ and the outside shift is -4 . Opening downward requires a negative value of a , and arms twice as steep means $|a| = 2$. The equation is $y = -2|x + 2| - 4$, choice H.

21. B Standard: ACT Math: Functions

From $x = -1$ to $x = 2$, x increases by 3 while y decreases by 9, so the slope is -3 . Use $y = -3x + b$ with the point $(2, -2)$: $-2 = -3(2) + b$, so $b = 4$. The equation is $y = -3x + 4$.

22. F Standard: ACT Math: Functions

In $f(x) = a(2)^x$, the parameter a is the value of the function when $x = 0$. Increasing a from 3 to 6 changes the initial value from 3 to 6. The base stays 2, so the graph still shows growth.

23. C Standard: ACT Math: Geometry

Complementary angles sum to 90° : $(2x + 10) + (4x - 10) = 90 \implies 6x = 90 \implies x = 15$. The angles are $2(15) + 10 = 40^\circ$ and $4(15) - 10 = 50^\circ$. The larger angle is 50° .

24. H Standard: ACT Math: Functions

To make the input on the left equal 5, set $x + 2 = 5$, which gives $x = 3$. Substitute 3 into the right side: $f(5) = 3(3) - 1 = 8$. The variable in the formula labels the input $x + 2$, so it must be 3 here.

25. D Standard: ACT Math: Statistics & Probability

Expected change is the probability-weighted average of the possible outcomes. The gain contributes $0.2(8) = 1.6$ points, and the loss contributes $0.8(-2) = -1.6$ points. Their sum is 0, so over many plays the average change per game is zero.

26. F Standard: ACT Math: Functions

Evaluate for each domain value: $f(-2) = 0$, $f(-1) = -3$, $f(0) = -4$, $f(1) = -3$, $f(2) = 0$. The range consists of the unique output values, so the range is $\{-4, -3, 0\}$.

27. D Standard: ACT Math: Number & Quantity

Write both bases as powers of 3: $81 = 3^4$ and $27 = 3^3$. Then $81^{3/4} = (3^4)^{3/4} = 3^3 = 27$, while $27^{2/3} = (3^3)^{2/3} = 3^2 = 9$. The quotient is $27/9 = 3$.

28. H Standard: ACT Math: Functions

Rewrite both sides using base 2: $4^{x+1} = 2^{2x+2}$ and $8^{2x-1} = 2^{6x-3}$. Since the bases are now equal and are not 1, the exponents must match. Solve $2x + 2 = 6x - 3$: subtract $2x$ and add 3 to get $5 = 4x$, so $x = \frac{5}{4}$.

29. A Standard: ACT Math: Integrating Essential Skills

The threshold equation is $\frac{50}{x} = 0.0025$. Multiply by x and divide by 0.0025 to get $x = 50/0.0025 = 20,000$. Since 0.0025 is one four-hundredth, 50 defective items are exactly 0.0025 of a 20,000-item batch. The batch size is 20,000.

30. F Standard: ACT Math: Algebra

An absolute value of at most 11 means the expression inside it must lie between -11 and 11 : $-11 \leq 3x - 4 \leq 11$. Add 4 to all three parts to get $-7 \leq 3x \leq 15$. Dividing by 3 keeps both inequality signs pointed the same way, so $-\frac{7}{3} \leq x \leq 5$. Both endpoints work because the original inequality includes equality.

31. D Standard: ACT Math: Statistics & Probability

There are eight values, so split the ordered data into two halves. The lower half is 6, 7, 8, 10, giving $Q_1 = \frac{7+8}{2} = 7.5$. The upper half is 12, 15, 19, 20, giving $Q_3 = \frac{15+19}{2} = 17$. The interquartile range is $17 - 7.5 = 9.5$.

32. G Standard: ACT Math: Geometry

The full circumference of a circle with radius 6 is $2\pi(6) = 12\pi$ inches. A 120° sector is $120/360 = 1/3$ of the circle, so its arc is one third of the full circumference: $12\pi/3 = 4\pi$ inches.

33. B Standard: ACT Math: Integrating Essential Skills

The actual route is $6.75 \div 1.5 = 4.5$ scale units, and each unit represents 2 kilometers, so its length is $4.5(2) = 9$ kilometers. If two-thirds is paved, one-third is unpaved. The unpaved part is $\frac{1}{3}(9) = 3$ kilometers.

34. F Standard: ACT Math: Algebra

The first inequality requires $y \leq -x + 6$, and the second requires $y > x - 2$. For $(2, 3)$, the first right-hand side is $-2 + 6 = 4$, so $3 \leq 4$. The second right-hand side is $2 - 2 = 0$, so $3 > 0$. The point satisfies both inequalities.

35. D Standard: ACT Math: Statistics & Probability

Use inclusion-exclusion so students in two groups are subtracted once, then add back those in all three groups because they were subtracted too many times. The number taking at least one language is $72 + 58 + 41 - 29 - 22 - 18 + 10 = 112$. Subtract from the 120 surveyed: $120 - 112 = 8$ students take none.

36. J Standard: ACT Math: Algebra

Multiply both sides by $(x - 2)(x + 2)$, which is nonzero under the stated restrictions. This gives $(x + 1)(x + 2) + (x - 4)(x - 2) = 2(x^2 - 4)$. Expanding the left side gives $2x^2 - 3x + 10$, while the right side is $2x^2 - 8$. Cancel $2x^2$ and solve $-3x + 10 = -8$, so $x = 6$. It is not one of the excluded values, and substituting it into the original equation verifies the equality.

37. B Standard: ACT Math: Functions

The expression under the square root must be nonnegative, so $5 - x \geq 0$ and therefore $x \leq 5$. The denominator cannot be zero, which excludes $x = 2$. Combining those conditions keeps every real number at or below 5 except 2, giving $(-\infty, 2) \cup (2, 5]$. The endpoint 5 is allowed because its square root is defined and its denominator is nonzero.

38. G Standard: ACT Math: Geometry

Place the three points inside the rectangle from $x = -2$ to $x = 5$ and from $y = 0$ to $y = 5$. That rectangle has area $7(5) = 35$. The three corner regions outside the triangle are right triangles: their areas are $\frac{1}{2}(6)(1) = 3$, $\frac{1}{2}(1)(5) = 2.5$, and $\frac{1}{2}(7)(4) = 14$. Subtract them from the rectangle: $35 - 3 - 2.5 - 14 = 15.5$ square units.

39. A Standard: ACT Math: Integrating Essential Skills

Separate the 46 hours into 40 regular hours and 6 overtime hours. Regular pay is $40(\$18) = \720 , and overtime pay is $6(\$27) = \162 , since the overtime rate is already given. Gross pay is $\$720 + \$162 = \$882$. The 5% deduction is $0.05(\$882) = \44.10 , so the employee takes home $\$882 - \$44.10 = \$837.90$.

40. F Standard: ACT Math: Number & Quantity

Multiply the numerator and denominator by the conjugate of $1 + 2i$, which is $1 - 2i$. The denominator becomes $(1 + 2i)(1 - 2i) = 1 - (2i)^2 = 5$. The numerator is $(3 - 4i)(1 - 2i) = 3 - 6i - 4i + 8i^2 = -5 - 10i$, since $i^2 = -1$. Dividing by 5 gives $-1 - 2i$.

41. C Standard: ACT Math: Algebra

Because the constant term is 3, x cannot be 0, so divide the given equation by x : $x - 5 + \frac{3}{x} = 0$, which means $x + \frac{3}{x} = 5$.

Square both sides: $x^2 + 6 + \frac{9}{x^2} = 25$. Subtract 6 to get the requested value, $x^2 + \frac{9}{x^2} = 19$.

42. H Standard: ACT Math: Functions

The value $f^{-1}(4)$ is the input x in the stated domain that makes $f(x) = 4$. Solve $x^2 + 4x - 5 = 4$, so $x^2 + 4x - 9 = 0$. Completing the square gives $(x + 2)^2 = 13$, hence $x = -2 \pm \sqrt{13}$. The domain requires $x \geq -2$, so the valid value is $-2 + \sqrt{13}$.

43. C Standard: ACT Math: Geometry

Each triangular base has area $\frac{1}{2}(10)(12) = 60$ square centimeters, so the two bases contribute 120. The three rectangular side faces have a combined area equal to the triangle's perimeter times the prism length: $(13 + 13 + 10)(8) = 36(8) = 288$. Add the bases and the lateral faces: $120 + 288 = 408$ square centimeters.

44. F Standard: ACT Math: Statistics & Probability

There are $\binom{9}{2} = 36$ equally likely pairs of tiles. A same-color pair can be two red, two blue, or two green. Those possibilities number $\binom{4}{2} + \binom{3}{2} + \binom{2}{2} = 6 + 3 + 1 = 10$. The probability is therefore $\frac{10}{36} = \frac{5}{18}$. The denominator uses 9 tiles because there are 4+3+2 in the bag.

45. C Standard: ACT Math: Integrating Essential Skills

The first 2 hours are free. The driver then uses the full next 2-hour tier, which contains eight 15-minute intervals and costs $8(\$3.60) = \28.80 . The remaining time is 1 hour 8 minutes, or 68 minutes. That spans four full 15-minute intervals and part of a fifth, so this tier costs $5(\$2.40) = \12.00 . The total charge is $\$28.80 + \$12.00 = \$40.80$.