

ACT Math Practice Test 5

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 hiking trail is 7.2 kilometers long. Using $1 \text{ mile} = 1.6 \text{ kilometers}$, how many miles long is the trail?
- ☐ A. 4.2 ☐ C. 5.6
- ☐ B. 4.5 ☐ D. 11.52
- 2) Solve for x : $4(2x - 3) + 5 = 3x + 20$.
- ☐ F. 3 ☐ H. 7
- ☐ G. 9 ☐ J. $\frac{27}{5}$
- 3) A one-to-one function passes through the point $(2, 7)$. If you reflect its graph over the line $y = x$, what point must lie on the inverse function's graph?
- ☐ A. $(7, 2)$ ☐ C. $(2, 7)$
- ☐ B. $(-2, -7)$ ☐ D. $(7, 7)$
- 4) A square has an area of 25 units². If the square is dilated by a scale factor of 3, what is the area of the dilated square?
- ☐ F. 225 units² ☐ H. 150 units²
- ☐ G. 75 units² ☐ J. 50 units²
- 5) In a poll, 60% of respondents favor a proposal. The poll reports a margin of error of 4 percentage points. Which interval is the reported range of plausible support?
- ☐ A. 60% to 64% ☐ C. 56% to 64%
- ☐ B. 57.6% to 62.4% ☐ D. 4% to 60%
- 6) A store sold approximately 3×10^6 items in the second quarter. This is 30% of its annual sales. Approximately how many items did the store sell for the full year?
- ☐ F. 9×10^5 ☐ H. 1×10^7
- ☐ G. 9×10^6 ☐ J. 1×10^8
- 7) A car uses 12 gallons of gasoline to travel 336 miles. At the same rate, how many miles can it travel on 9 gallons?
- ☐ A. 252 ☐ C. 324
- ☐ B. 280 ☐ D. 378

8) Which expression is equivalent to $x^2 + 7x + 12$?

☐ F. $(x + 2)(x + 6)$

☐ H. $(x - 3)(x - 4)$

☐ G. $(x + 3)(x + 4)$

☐ J. $(x + 1)(x + 12)$

9) Function f is shown in the table. Which function is parallel to f ?

x	0	2	4
$f(x)$	1	7	13

☐ A. $g(x) = -3x + 2$

☐ C. $g(x) = \frac{1}{3}x + 1$

☐ B. $g(x) = 3x - 5$

☐ D. $g(x) = -\frac{1}{3}x - 5$

10) Three interior angles of a quadrilateral measure 78° , 96° , and 112° . What is the measure of the fourth interior angle?

☐ F. 64°

☐ H. 74°

☐ G. 84°

☐ J. 106°

11) An integer is selected at random from 1 through 20, inclusive. What is the probability that the selected integer is prime?

☐ A. $\frac{3}{5}$

☐ C. $\frac{7}{10}$

☐ B. $\frac{1}{2}$

☐ D. $\frac{2}{5}$

12) A recipe uses 2.5 cups of flour to make 20 muffins. At the same rate, how many cups of flour are needed to make 56 muffins?

☐ F. 5.6

☐ H. 8.4

☐ G. 6.5

☐ J. 7

13) Which property is illustrated by the equation $5(x + 3) = 5x + 15$?

☐ A. Identity Property

☐ C. Commutative Property

☐ B. Associative Property

☐ D. Distributive Property

14) A sequence is defined by $a_n = 3n^2 - 2$ for positive integers n . What is $a_4 + a_6$?

☐ F. 152

☐ H. 142

☐ G. 120

☐ J. 166

15) A circle has a diameter of 14 units. What is its circumference?

☐ A. 7π

☐ C. 28π

☐ B. 14π

☐ D. 196π

16) Simplify $\sqrt{98}$ completely, leaving no perfect-square factor under the radical.

☐ F. $14\sqrt{7}$

☐ H. $\sqrt{49 \times 2}$

☐ G. $2\sqrt{7}$

☐ J. $7\sqrt{2}$

17) What is the range of the data set 18, 24, 25, 31, 42?

☐ A. 25

☐ C. 24

☐ B. 18

☐ D. 42

- 18) A phone battery starts at 92%. It loses 7 percentage points each hour, and then a background app uses an extra 6 percentage points. Which equation models when the battery reaches 50%, and how many hours is that?

☐ F. $92 - 7h + 6 = 50$; $h = \frac{48}{7}$

☐ H. $92 + 7h - 6 = 50$; $h = \frac{-36}{7}$

☐ G. $92 - 7h - 6 = 50$; $h = \frac{36}{7}$

☐ J. $92 - 6h - 7 = 50$; $h = \frac{35}{6}$

- 19) Solve $(x - 2)(x + 3) = x + 8$.

☐ A. $x = \pm\sqrt{14}$

☐ C. $x = \pm 14$

☐ B. $x = \sqrt{14}$ only

☐ D. $x = 14$ only

- 20) The domain of a function f is $[-3, 5]$, and its range is $[-1, 4]$. Define $g(x) = f(x - 2) + 1$. What are the domain and range of g ?

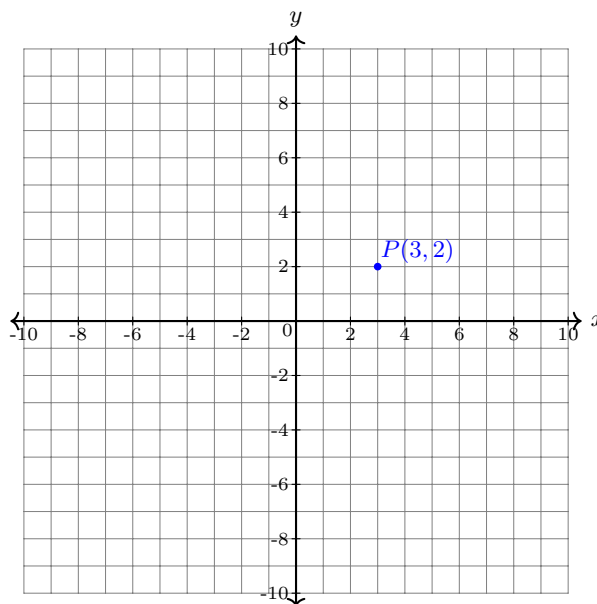
☐ F. Domain $[-5, 3]$, range $[-2, 3]$

☐ H. Domain $[-1, 7]$, range $[0, 5]$

☐ G. Domain $[-3, 5]$, range $[0, 5]$

☐ J. Domain $[-1, 7]$, range $[-2, 3]$

- 21) Point P is located at $(3, 2)$. It is first reflected over the x -axis, then translated 4 units left. What are the final coordinates?



☐ A. $(-1, 2)$

☐ C. $(7, -2)$

☐ B. $(-1, -2)$

☐ D. $(3, -6)$

- 22) Store A sells 3.5 pounds of rice for \$8.40. Store B sells 5 pounds for \$11.25. At which store is the price per pound lower, and how much less would 7 pounds cost there than at the other store?

☐ F. Store B; \$1.05

☐ H. Store B; \$0.15

☐ G. Store A; \$0.15

☐ J. Store A; \$1.05

- 23) In a class of 28 students, 8 play soccer and 6 are in band. No student does both. What is the probability that a randomly selected student plays soccer or is in band?

☐ A. $\frac{2}{7}$

☐ C. $\frac{4}{7}$

☐ B. $\frac{3}{4}$

☐ D. $\frac{1}{2}$

24) For $a \neq 0$, what is the value of $\frac{3^4 a^{-2}}{3^2 a^{-2}}$?

☐ F. 1

☐ H. 9

☐ G. 3

☐ J. 27

25) Solve the inequality $5 - 2(3x - 1) \geq 17$.

☐ A. $x \leq \frac{5}{3}$

☐ C. $x \geq \frac{5}{3}$

☐ B. $x \geq -\frac{5}{3}$

☐ D. $x \leq -\frac{5}{3}$

26) If $3 \cdot 2^x - 5 = 19$, what is the value of x ?

☐ F. 2

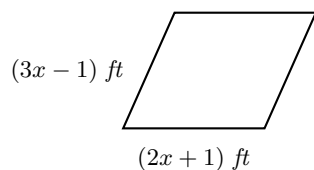
☐ H. 4

☐ G. 8

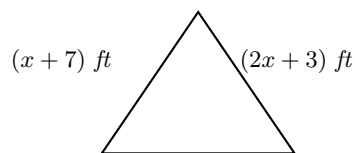
☐ J. 3

27) A playground has a parallelogram-shaped section and a triangular section. The side lengths in feet are shown in the diagram.

The perimeter of the parallelogram equals the perimeter of the triangle. What is the value of x ?



Parallelogram



Triangle

☐ A. $\frac{10}{3}$

☐ C. $\frac{8}{3}$

☐ B. 4

☐ D. 5

28) A jacket is marked \$80. It is discounted by 25%, and then an 8% sales tax is applied to the discounted price. What is the final price?

☐ F. \$60.00

☐ H. \$64.80

☐ G. \$68.40

☐ J. \$66.00

29) The table shows quiz scores and their frequencies. What is the mean score?

Score	70	80	90
Frequency	2	3	5

☐ A. 83

☐ C. 80

☐ B. 82

☐ D. 85

30) If $(x + a)(x + 4)$ is equivalent to $x^2 + 9x + b$ for every real number x , what is the value of $a + b$?

☐ F. 14

☐ H. 25

☐ G. 20

☐ J. 45

- 31) The table shows the relationship between distance traveled and fuel consumed on a car trip:

Distance (miles)	50	200
Fuel (gallons)	2	8

What is the linear function relating fuel f to distance d ? Then, using this function, how many gallons will the car consume after traveling 350 miles?

- ☐ A. $f(d) = 0.02d + 1$; 8 gallons
 ☐ C. $f(d) = 0.03d$; 10.5 gallons
☐ B. $f(d) = 0.04d$; 14 gallons
 ☐ D. $f(d) = 0.05d$; 17.5 gallons
- 32) What is the distance between the points $(-2, 1)$ and $(4, 9)$ in the coordinate plane?
- ☐ F. 8
 ☐ H. 12
☐ G. 10
 ☐ J. 14
- 33) A rectangular patio measures 18 feet by 24 feet. A 6-foot-by-8-foot garden in the middle will not be tiled. The tiles are sold in boxes that each cover 20 square feet. To allow for cuts, a contractor orders 8% more tile than the area to be tiled requires. If a box costs 34 dollars, what is the total cost of the boxes needed?
- ☐ A. \$714
 ☐ C. \$748
☐ B. \$680
 ☐ D. \$782
- 34) Simplify $\sqrt{98x^6y^3}$, assuming all variables are nonnegative.
- ☐ F. $14x^3\sqrt{y}$
☐ H. $7x^3\sqrt{2y}$
☐ G. $7x^3y\sqrt{2y}$
☐ J. $7x^6y\sqrt{2y}$
- 35) A group has 5 women and 3 men. Three people are selected at random without replacement. What is the probability that at least 2 of the selected people are women?
- ☐ A. $\frac{5}{7}$
☐ C. $\frac{3}{7}$
☐ B. $\frac{5}{8}$
☐ D. $\frac{6}{7}$
- 36) A construction kit has metal and plastic pieces in a ratio of 5 : 3. After 8 metal pieces are added and 4 plastic pieces are removed, the ratio becomes 2 : 1. How many pieces were in the kit originally?
- ☐ F. 128
 ☐ H. 160
☐ G. 96
 ☐ J. 64
- 37) The graph of $f(x) = -3x^2 + 12x - 5$ models a profit function in hundreds of dollars, where x is the number of price increases. What is the maximum value of $f(x)$, and at what value of x does it occur?
- ☐ A. Maximum value -5 at $x = 0$
☐ C. Minimum value 7 at $x = 2$
☐ B. Maximum value 7 at $x = 2$
☐ D. Maximum value 12 at $x = 2$
- 38) The endpoints of a diameter of a circle are $A(-4, 7)$ and $B(8, -1)$. Which equation represents the circle?
- ☐ F. $(x + 2)^2 + (y - 3)^2 = 52$
☐ H. $(x - 2)^2 + (y - 3)^2 = 13$
☐ G. $(x - 2)^2 + (y + 3)^2 = 52$
☐ J. $(x - 2)^2 + (y - 3)^2 = 52$
- 39) The two roots of $x^2 + 4x - 1 = 0$ are r and s . What is the value of $r^2 + s^2$?
- ☐ A. 14
 ☐ C. 16
☐ B. 18
 ☐ D. 20

- 40) Let $x = \sqrt{3} + \sqrt{2}$. What is the value of $x^2 + \frac{1}{x^2}$?
- ☐ F. 8 ☐ H. 10
- ☐ G. 14 ☐ J. 12
- 41) Solve $\frac{2}{x-1} + \frac{3}{x+1} = 1$.
- ☐ A. $x = 1$ or $x = 5$ ☐ C. $x = 0$ only
- ☐ B. $x = -1$ or $x = 5$ ☐ D. $x = 0$ or $x = 5$
- 42) For $f(x) = \frac{2x^2 + 3x - 2}{x^2 - 4}$, which statement correctly identifies its vertical asymptote and the coordinates of its hole?
- ☐ F. Asymptote $x = 2$; hole $(-2, \frac{5}{4})$ ☐ H. Asymptote $x = 2$; hole $(-2, 2)$
- ☐ G. Asymptote $x = -2$; hole $(2, \frac{5}{4})$ ☐ J. Asymptotes $x = 2$ and $x = -2$; no hole
- 43) A 30° - 60° - 90° triangle has perimeter $21 + 7\sqrt{3}$ units. What is the area of the triangle?
- ☐ A. $\frac{147}{2}$ ☐ C. $\frac{49\sqrt{3}}{2}$
- ☐ B. $49\sqrt{3}$ ☐ D. $98\sqrt{3}$
- 44) A data set has mean 12 and standard deviation 3. Each value x is replaced by $y = 4 - 2x$. What are the new mean and standard deviation?
- ☐ F. Mean 28, standard deviation 6 ☐ H. Mean -20 , standard deviation 6
- ☐ G. Mean -20 , standard deviation 3 ☐ J. Mean -16 , standard deviation 6
- 45) A car travels 120 miles at an average speed of x miles per hour, then travels another 120 miles at an average speed of $(x + 20)$ miles per hour. The total driving time is 5 hours. What is x ?
- ☐ A. 50 ☐ C. 45
- ☐ B. 30 ☐ D. 40

Scratch work

Answer Key and Explanations

1. B Standard: ACT Math: Integrating Essential Skills

To change kilometers to miles, divide by the number of kilometers in one mile: $7.2 \div 1.6 = 4.5$. The trail is therefore 4.5 miles long. You can check the conversion by going backward: 4.5 miles at 1.6 kilometers per mile gives 7.2 kilometers.

2. J Standard: ACT Math: Algebra

First clear the parentheses, since that is where the equation's signs can get slippery: $4(2x - 3) + 5 = 3x + 20$ becomes $8x - 7 = 3x + 20$. Subtract $3x$ from both sides, then add 7, leaving $5x = 27$. Dividing by 5 gives $x = \frac{27}{5}$. Substitution confirms both sides equal $\frac{181}{5}$.

3. A Standard: ACT Math: Functions

A reflection across $y = x$ trades each point's horizontal and vertical coordinates. The original graph contains (2, 7), so its reflected graph contains (7, 2). That coordinate swap defines inverse functions, and the one-to-one condition ensures the inverse is a function.

4. F Standard: ACT Math: Geometry

A dilation stretches every side by 3, but area counts two dimensions, so it grows by $3^2 = 9$. The original square covers 25 square units. Multiplying by 9 gives 225 square units for the enlarged square.

5. C Standard: ACT Math: Statistics & Probability

A margin of error of 4 percentage points means the reported interval extends 4 points in each direction from the estimate. Subtract to get the lower end, $60\% - 4\% = 56\%$, and add to get the upper end, $60\% + 4\% = 64\%$. So the interval runs from 56 percent to 64 percent.

6. H Standard: ACT Math: Number & Quantity

Let x represent annual sales. The second quarter's 3×10^6 items make up 30% of that total, so $0.30x = 3 \times 10^6$. Divide by 0.30 to get $x = 10^7$. A quick size check fits: the full year must be more than the second quarter alone.

7. A Standard: ACT Math: Integrating Essential Skills

Keep the fuel rate fixed, as the question instructs. Dividing 336 miles by 12 gallons gives 28 miles per gallon. With 9 gallons, the same rate yields $9(28) = 252$ miles. The units cancel cleanly: gallons times miles per gallon leaves miles.

8. G Standard: ACT Math: Algebra

To factor a trinomial of the form $x^2 + bx + c$, find two numbers whose sum is b and whose product is c . Here the numbers must add to 7 and multiply to 12, so they are 3 and 4. Thus $x^2 + 7x + 12 = (x + 3)(x + 4)$.

9. B Standard: ACT Math: Functions

From the table, f increases by 6 when x increases by 2, so the slope is 3. A parallel function must also have slope 3. The function $g(x) = 3x - 5$ has slope 3, so it is parallel to f .

10. H Standard: ACT Math: Geometry

A quadrilateral's four interior angles have a total of 360° . Add the three measures given in the question, $78^\circ + 96^\circ + 112^\circ = 286^\circ$. The fourth angle supplies the difference, so it measures $360^\circ - 286^\circ = 74^\circ$.

11. D Standard: ACT Math: Statistics & Probability

There are eight primes from 1 through 20: 2, 3, 5, 7, 11, 13, 17, and 19. Since each of the 20 integers is equally likely, the probability is $\frac{8}{20} = \frac{2}{5}$. Notice that 1 is excluded because a prime must have exactly two positive factors.

12. J Standard: ACT Math: Integrating Essential Skills

Find the amount for one muffin first: $2.5 \div 20 = 0.125$ cup. For 56 muffins, multiply 0.125 by 56 to get 7 cups. You can also see that 56 is 2.8 times 20, so the flour amount must be $2.8(2.5) = 7$ cups.

13. D Standard: ACT Math: Algebra

The factor 5 multiplies each term inside the parentheses: $5(x + 3) = 5x + 15$. That is the distributive property. The other properties describe changing order, regrouping, or adding a zero or multiplying by one, so they do not match this equation.

14. F Standard: ACT Math: Functions

Use the sequence rule twice, once for each requested index. For $n = 4$, it gives $a_4 = 3(4^2) - 2 = 46$. For $n = 6$, it gives $a_6 = 3(6^2) - 2 = 106$. Add those two terms only after evaluating them: $46 + 106 = 152$.

15. B Standard: ACT Math: Geometry

Circumference is the distance around the circle, and it can be found directly from the diameter with $C = \pi d$. Here $d = 14$, so $C = 14\pi$ units. There is no need to halve the diameter first unless you choose the equivalent formula $C = 2\pi r$.

16. J Standard: ACT Math: Number & Quantity

Factor the number inside the radical: $98 = 2 \cdot 49 = 2 \cdot 7^2$. The perfect square 7^2 comes out of the radical as 7, leaving $\sqrt{2}$, so the simplified expression is $7\sqrt{2}$. Squaring it returns 98, which checks the simplification.

17. C Standard: ACT Math: Statistics & Probability

Range measures the full spread from the smallest observation to the largest. In this list, the minimum is 18 and the maximum is 42. Subtracting gives $42 - 18 = 24$, so the data set has a range of 24.

18. G Standard: ACT Math: Integrating Essential Skills

The battery starts at 92, loses $7h$ over h hours, and loses another 6 from the app, so the equation is $92 - 7h - 6 = 50$. Combine constants to get $86 - 7h = 50$, so $36 = 7h$ and $h = \frac{36}{7}$. Check: $92 - 7\left(\frac{36}{7}\right) - 6 = 50$, so choice G matches the situation.

19. A Standard: ACT Math: Algebra

Expand the left side first: $(x - 2)(x + 3) = x^2 + x - 6$. Setting it equal to $x + 8$ and moving everything to one side gives $x^2 - 14 = 0$. Thus $x^2 = 14$, so the two solutions are $x = \sqrt{14}$ and $x = -\sqrt{14}$.

20. H Standard: ACT Math: Functions

For $g(x) = f(x - 2) + 1$ to be defined, the input $x - 2$ must stay in f 's domain, $[-3, 5]$. Solving $-3 \leq x - 2 \leq 5$ gives the new domain $[-1, 7]$. The outside +1 raises each output by one, changing the range from $[-1, 4]$ to $[0, 5]$.

21. B Standard: ACT Math: Geometry

Start with $(3, 2)$. Reflecting across the x -axis changes only the sign of the vertical coordinate, giving $(3, -2)$. The translation four units left then subtracts 4 from the horizontal coordinate, so the image is $(3 - 4, -2) = (-1, -2)$.

22. F Standard: ACT Math: Integrating Essential Skills

Divide each price by its weight. Store A charges $8.40 \div 3.5 = \$2.40$ per pound, while Store B charges $11.25 \div 5 = \$2.25$ per pound. B saves \$0.15 on each pound. Across 7 pounds, that difference totals $7(\$0.15) = \1.05 .

23. D Standard: ACT Math: Statistics & Probability

Because the question says no student belongs to both groups, the two counts do not overlap. Add them to find the favorable outcomes: $8 + 6 = 14$. Out of 28 students, the probability is $\frac{14}{28}$, which reduces to $\frac{1}{2}$.

24. H Standard: ACT Math: Number & Quantity

When powers with the same base are divided, subtract their exponents. The powers of 3 become $3^{4-2} = 3^2$, while the powers of a become $a^{-2-(-2)} = a^0 = 1$. The condition $a \neq 0$ makes the original expression defined. The value is therefore 9.

25. D Standard: ACT Math: Algebra

Distribute the -2 to both terms inside the parentheses, giving $7 - 6x \geq 17$. Subtract 7 to get $-6x \geq 10$. Dividing by -6 reverses the inequality because a negative number changes the order on the number line. The solution is $x \leq -\frac{5}{3}$.

26. J Standard: ACT Math: Functions

Add 5 to both sides, then divide by 3, to isolate the power: $2^x = 8$. Rewrite 8 as 2^3 . Since the bases now match, the exponents must match as well, giving $x = 3$. Substituting checks it: $3(8) - 5 = 19$.

27. A Standard: ACT Math: Geometry

The parallelogram has two sides of each length, so its perimeter is $2(2x + 1) + 2(3x - 1) = 10x$. The triangle's sides add to $7x + 10$. Set these equal, as the perimeters are the same: $10x = 7x + 10$, which gives $x = \frac{10}{3}$.

28. H Standard: ACT Math: Integrating Essential Skills

A 25% discount means the customer pays 75% of the \$80 marked price, or $0.75(80) = \$60$. The 8% tax applies to that reduced price, so the final amount is $1.08(60) = \$64.80$. Applying tax to the original price would use the wrong base.

29. A Standard: ACT Math: Statistics & Probability

Use a weighted mean because each score occurs a different number of times. The total score is $70(2) + 80(3) + 90(5) = 140 + 240 + 450 = 830$. The total number of quizzes is $2 + 3 + 5 = 10$. Divide to get $830 \div 10 = 83$, so the mean score is 83.

30. H Standard: ACT Math: Algebra

Expanding the left side gives $x^2 + (a + 4)x + 4a$. For the two expressions to be equal for every x , their corresponding coefficients must match. From the coefficient of x , $a + 4 = 9$, so $a = 5$. The constant term then gives $b = 4a = 20$, and $a + b = 5 + 20 = 25$.

31. B Standard: ACT Math: Functions

The table gives two points on the relationship: $(50, 2)$ and $(200, 8)$, where distance is the input and fuel is the output. Fuel use changes by $8 - 2 = 6$ gallons while distance changes by $200 - 50 = 150$ miles, so the rate is $6/150 = 0.04$ gallon per mile. Since $2/50$ is also 0.04, the relationship passes through the origin and is $f(d) = 0.04d$. For 350 miles, $f(350) = 0.04(350) = 14$ gallons.

32. G Standard: ACT Math: Geometry

The horizontal separation is $4 - (-2) = 6$ units, and the vertical separation is $9 - 1 = 8$ units. Treat these as the legs of a right triangle between the points. The distance is its hypotenuse, $\sqrt{6^2 + 8^2} = \sqrt{100} = 10$ units.

33. A Standard: ACT Math: Integrating Essential Skills

The patio area is $18(24) = 432$ square feet, and the garden area is $6(8) = 48$, leaving $432 - 48 = 384$ square feet to tile. The 8% allowance raises the amount to $1.08(384) = 414.72$ square feet. Since each box covers 20 square feet, $414.72/20 = 20.736$ boxes are needed. The contractor must buy 21 whole boxes. At 34 dollars per box, the total is $21(34) = 714$ dollars.

34. G Standard: ACT Math: Number & Quantity

Break the radicand into perfect-square factors: $98x^6y^3 = 49x^6y^2(2y)$. Taking square roots of the perfect squares gives $7x^3y$, with $\sqrt{2y}$ remaining. The variables are nonnegative, so no absolute-value signs are needed. The simplified form is $7x^3y\sqrt{2y}$.

35. A Standard: ACT Math: Statistics & Probability

There are $\binom{8}{3} = 56$ equally likely groups of three. A favorable group has either two women and one man, counted by $\binom{5}{2}\binom{3}{1} = 30$, or three women, counted by $\binom{5}{3} = 10$. Thus the probability is $\frac{30+10}{56} = \frac{5}{7}$.

36. F Standard: ACT Math: Integrating Essential Skills

Let the original amounts be $5k$ metal pieces and $3k$ plastic pieces. The changed ratio gives $\frac{5k+8}{3k-4} = 2$. Cross-multiplying, $5k + 8 = 6k - 8$, so $k = 16$. The original total was $5k + 3k = 8k = 128$ pieces. The denominator is positive at this value, as the situation requires.

37. B Standard: ACT Math: Functions

When the leading coefficient is negative, the parabola opens downward, so the vertex is a maximum. Find the x -coordinate using the formula: $x = -\frac{b}{2a} = -\frac{12}{2(-3)} = \frac{12}{6} = 2$. Then evaluate: $f(2) = -3(4) + 12(2) - 5 = -12 + 24 - 5 = 7$. At $x = 0$, the model gives a loss of 5 hundred dollars, so profit can be negative here. After two price increases, it reaches its maximum, 7 hundred dollars or 700. The other choices confuse the vertex maximum with the y -intercept or with the coefficient of x .

38. J Standard: ACT Math: Geometry

The center is the midpoint of the diameter: $((-4 + 8)/2, (7 + (-1))/2) = (2, 3)$. From the center to either endpoint, the horizontal change is 6 and the vertical change is 4, so the radius squared is $6^2 + 4^2 = 52$. A circle with center (h, k) and radius squared r^2 has equation $(x - h)^2 + (y - k)^2 = r^2$, giving $(x - 2)^2 + (y - 3)^2 = 52$.

39. B Standard: ACT Math: Algebra

For $x^2 + 4x - 1 = 0$, the sum of the roots is $r + s = -4$, and their product is $rs = -1$. Use $r^2 + s^2 = (r + s)^2 - 2rs$ to combine these values: $16 - 2(-1) = 18$. This identity gives the requested sum without finding either root separately.

40. H Standard: ACT Math: Number & Quantity

First square $x = \sqrt{3} + \sqrt{2}$: the cross terms give $x^2 = 5 + 2\sqrt{6}$. To find the reciprocal, use $\frac{1}{x} = \sqrt{3} - \sqrt{2}$, since $(\sqrt{3} + \sqrt{2})(\sqrt{3} - \sqrt{2}) = 1$. Squaring yields $\frac{1}{x^2} = 5 - 2\sqrt{6}$. Adding the two expressions cancels the radicals and leaves 10.

41. D Standard: ACT Math: Algebra

The original denominators rule out $x = 1$ and $x = -1$. Multiply both sides by $(x - 1)(x + 1)$ to clear the fractions, producing $2(x + 1) + 3(x - 1) = x^2 - 1$. Rearranging gives $x(x - 5) = 0$, so $x = 0$ or $x = 5$. Both values obey the restrictions and work in the original equation.

42. F Standard: ACT Math: Functions

Factor numerator and denominator: $f(x) = \frac{(2x-1)(x+2)}{(x-2)(x+2)}$. The factor $x + 2$ cancels for $x \neq -2$, so $x = -2$ is a hole, not an asymptote. The reduced expression $(2x - 1)/(x - 2)$ has a vertical asymptote at $x = 2$. Substituting $x = -2$ into the reduced expression gives $(-5)/(-4) = 5/4$, so the hole is $(-2, 5/4)$.

43. C Standard: ACT Math: Geometry

Write the side lengths of a 30° - 60° - 90° triangle as s , $s\sqrt{3}$, and $2s$. Their sum is $s(3 + \sqrt{3})$. Since $21 + 7\sqrt{3} = 7(3 + \sqrt{3})$, the short leg is $s = 7$ and the longer leg is $7\sqrt{3}$. The area is half their product: $\frac{1}{2}(7)(7\sqrt{3}) = \frac{49\sqrt{3}}{2}$ square units.

44. H Standard: ACT Math: Statistics & Probability

The mean changes by the same rule as the data values: $4 - 2(12) = -20$. Adding or subtracting a constant does not change standard deviation, while multiplying every value by -2 multiplies the standard deviation by $|-2| = 2$. The new standard deviation is $2(3) = 6$.

45. D Standard: ACT Math: Integrating Essential Skills

Time equals distance divided by speed, so the two parts of the trip take $120/x$ and $120/(x + 20)$ hours. Set their sum equal to 5. Multiplying by $x(x + 20)$ gives $120(x + 20) + 120x = 5x(x + 20)$, or $x^2 - 28x - 480 = 0$. Factoring gives $(x - 40)(x + 12) = 0$. Speed must be positive, so $x = 40$ miles per hour. Then the second leg takes 2 hours and the first takes 3, confirming the five-hour total.