

ACT Math Practice Test 6

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 hiker is at an elevation of 240 feet below sea level. She climbs 85 feet and then descends 30 feet. What is her final elevation relative to sea level?
- ☐ A. -185 feet ☐ C. -155 feet
- ☐ B. -215 feet ☐ D. -325 feet
- 2) Solve $4(3x - 2) + 5 = 2x + 27$.
- ☐ F. $x = 2$ ☐ H. $x = 3$
- ☐ G. $x = 4$ ☐ J. $x = 5$
- 3) In a right triangle, the hypotenuse is 25 and one leg is 7. An acute angle θ is between that leg and the hypotenuse. What is $\cos \theta$?
- ☐ A. $\frac{7}{25}$ ☐ C. $\frac{7}{24}$
- ☐ B. $\frac{24}{25}$ ☐ D. $\frac{24}{7}$
- 4) What is the median of the data set 4, 7, 9, 12, 16, 18, 23?
- ☐ F. 9 ☐ H. 13
- ☐ G. 12 ☐ J. 89
- 5) What is the value of $\frac{2^3 \cdot 2^5}{2^4}$?
- ☐ A. 16 ☐ C. 32
- ☐ B. 4 ☐ D. 8
- 6) A tank contains 2.5 gallons of water. If 1 gallon equals 4 quarts, how many quarts of water are in the tank?
- ☐ F. 10 ☐ H. 6
- ☐ G. 8 ☐ J. 12
- 7) Solve $3x + 4 \leq 19$.
- ☐ A. $x \geq \frac{15}{4}$ ☐ C. $x \leq 5$
- ☐ B. $x \geq 5$ ☐ D. $x \leq \frac{15}{4}$
- 8) If $f(x) = 2x^2 - 3x + 1$, what is $f(-2)$?
- ☐ F. 9 ☐ H. 3
- ☐ G. 7 ☐ J. 15

- 9) A trapezoid has parallel sides of lengths 7 and 13 centimeters and a height of 5 centimeters. What is its area?
- ☐ A. 65 cm^2 ☐ C. 100 cm^2
☐ B. 35 cm^2 ☐ D. 50 cm^2
- 10) A quiz score of 70 occurred twice, a score of 80 occurred three times, and a score of 90 occurred once. What was the mean score?
- ☐ F. $78\frac{1}{3}$ ☐ H. 82
☐ G. $83\frac{1}{3}$ ☐ J. 80
- 11) A bicycle costs \$120. Its price increases by 15%. What is the new price?
- ☐ A. \$135 ☐ C. \$140
☐ B. \$102 ☐ D. \$138
- 12) If $A = \begin{bmatrix} 2 & 1 \\ -1 & 3 \end{bmatrix}$, what is $3A$?
- ☐ F. $\begin{bmatrix} 6 & 3 \\ -3 & 9 \end{bmatrix}$ ☐ H. $\begin{bmatrix} 6 & 1 \\ -1 & 9 \end{bmatrix}$
☐ G. $\begin{bmatrix} 5 & 4 \\ 2 & 6 \end{bmatrix}$ ☐ J. $\begin{bmatrix} 2 & 3 \\ -3 & 3 \end{bmatrix}$
- 13) Which expression is equivalent to $x^2 + 11x + 24$?
- ☐ A. $(x + 2)(x + 12)$ ☐ C. $(x + 3)(x + 8)$
☐ B. $(x - 3)(x - 8)$ ☐ D. $(x + 4)(x + 6)$
- 14) A geometric sequence begins 5, 15, 45, ... What is its fifth term?
- ☐ F. 135 ☐ H. 675
☐ G. 225 ☐ J. 405
- 15) A cube has an edge length of 5 centimeters. What is its volume?
- ☐ A. 25 cubic centimeters ☐ C. 75 cubic centimeters
☐ B. 125 cubic centimeters ☐ D. 150 cubic centimeters
- 16) A fair number cube is rolled once. What is the probability of rolling a number greater than 4?
- ☐ F. $\frac{2}{3}$ ☐ H. $\frac{1}{6}$
☐ G. $\frac{1}{3}$ ☐ J. $\frac{1}{2}$
- 17) A printer produces 84 pages in 7 minutes at a steady rate. How many pages will it produce in 12 minutes?
- ☐ A. 96 ☐ C. 126
☐ B. 168 ☐ D. 144
- 18) Solve $\frac{2x+1}{3} - \frac{x-4}{2} = 5$.
- ☐ F. 18 ☐ H. 15
☐ G. 16 ☐ J. 14

- 19) What is the slope of the line through $(-3, 8)$ and $(5, -4)$?
- ☐ A. $-\frac{3}{2}$ ☐ C. $\frac{3}{2}$
☐ B. $-\frac{2}{3}$ ☐ D. $\frac{2}{3}$
- 20) Point $P(-6, 2)$ is reflected across the y -axis. What are the coordinates of its image?
- ☐ F. $(2, -6)$ ☐ H. $(6, -2)$
☐ G. $(-6, -2)$ ☐ J. $(6, 2)$
- 21) Among 30 students, 18 take art and 14 take music; 7 take both. If one student is chosen at random, what is the probability the student takes neither class?
- ☐ A. $\frac{7}{30}$ ☐ C. $\frac{1}{6}$
☐ B. $\frac{5}{6}$ ☐ D. $\frac{1}{3}$
- 22) A tank gains water at 7.5 gallons per minute for 8 minutes. It then loses water at 3 gallons per minute for 2 minutes. By how many gallons has the amount of water increased overall?
- ☐ F. 42 ☐ H. 60
☐ G. 66 ☐ J. 54
- 23) Simplify $\sqrt{72a^4b^3}$, assuming $a \geq 0$ and $b \geq 0$.
- ☐ A. $6a^2b\sqrt{2b}$ ☐ C. $6a^2b\sqrt{b}$
☐ B. $6a^2b^2\sqrt{2b}$ ☐ D. $12a^2b\sqrt{2b}$
- 24) Solve $|2x - 5| = 9$.
- ☐ F. $x = 7$ or $x = -2$ ☐ H. $x = -7$ or $x = 2$
☐ G. $x = 2$ or $x = 7$ ☐ J. $x = 7$ only
- 25) For $f(x) = x^2 + 3x$, what is the average rate of change of f from $x = -2$ to $x = 4$?
- ☐ A. 3 ☐ C. 5
☐ B. 4 ☐ D. 6
- 26) Using the median-of-halves method, find the interquartile range of the ordered data set 4, 7, 9, 13, 16, 18, 24, 31.
- ☐ F. 11 ☐ H. 13
☐ G. 12 ☐ J. 15
- 27) A rectangular storage box has interior dimensions of 6 inches by 8 inches by 15 inches. What is the length of the longest straight rod that can fit entirely inside the box?
- ☐ A. 15 inches ☐ C. $5\sqrt{13}$ inches
☐ B. 17 inches ☐ D. 29 inches
- 28) A function is defined by $f(x) = 3x + 1$ when $x < 2$ and $f(x) = x^2 - 4$ when $x \geq 2$. What is $f(-1) + f(3)$?
- ☐ F. -3 ☐ H. 5
☐ G. 3 ☐ J. 7

- 29) Solve $x^2 - 5x - 24 = 0$.
- ☐ A. $x = 6$ or $x = -4$ ☐ C. $x = 3$ or $x = -8$
☐ B. $x = 8$ only ☐ D. $x = 8$ or $x = -3$
- 30) Two similar triangles have corresponding side lengths in the ratio 3 : 5. The smaller triangle has area 27 square units. What is the area of the larger triangle?
- ☐ F. 125 ☐ H. 45
☐ G. 75 ☐ J. 60
- 31) A set of values has mean 18. Each value x is changed to $y = 3x + 4$. What is the mean of the new values?
- ☐ A. 58 ☐ C. 54
☐ B. 66 ☐ D. 60
- 32) An arithmetic sequence has first term 11 and common difference -4 . What is its 12th term?
- ☐ F. -33 ☐ H. -44
☐ G. -29 ☐ J. -37
- 33) A price increases by 12% and later decreases by 12% of its new price. What is the net percentage change from the original price?
- ☐ A. No change ☐ C. A 1.44% decrease
☐ B. A 12% decrease ☐ D. A 2.4% decrease
- 34) For an acute angle θ , $\tan \theta = \frac{5}{12}$. What is $\sin \theta$?
- ☐ F. $\frac{12}{13}$ ☐ H. $\frac{12}{5}$
☐ G. $\frac{5}{12}$ ☐ J. $\frac{5}{13}$
- 35) When $p(x) = x^3 + ax^2 - 4x + 6$ is divided by $x - 2$, the remainder is 10. What is a ?
- ☐ A. -1 ☐ C. -3
☐ B. 3 ☐ D. 1
- 36) Let $f(u) = \frac{u+1}{u-2}$ and $g(x) = \frac{3x-2}{x+1}$. For what value of x is $f(g(x)) = 3$?
- ☐ F. -4 ☐ H. 11
☐ G. 3 ☐ J. -11
- 37) A school club has 32 senior members and 40 junior members. Of the seniors, 22 play an instrument; of the juniors, 18 play an instrument. If a member who plays an instrument is chosen at random, what is the probability that member is a senior?
- ☐ A. $\frac{11}{36}$ ☐ C. $\frac{9}{20}$
☐ B. $\frac{11}{20}$ ☐ D. $\frac{11}{18}$
- 38) What is the value of $\frac{16^{3/4} \cdot 8^{2/3}}{4^{1/2}}$?
- ☐ F. 12 ☐ H. 8
☐ G. 16 ☐ J. 32

- 39) An amount starts at 800 and is multiplied by the same factor each hour. After 2 hours it is 500. According to this model, what is the amount after 4 hours?
- ☐ A. 250 ☐ C. 400
- ☐ B. 312.5 ☐ D. 375
- 40) A rectangle has a perimeter of 34 units. Its length is increased by 4 units and its width is decreased by 2 units. The new rectangle has the same area as the original. What is the original area?
- ☐ F. 60 square units ☐ H. 77 square units
- ☐ G. 70 square units ☐ J. 84 square units
- 41) Quadrilateral $ABCD$ is inscribed in a circle. If $m\angle A = 3x + 8$ and $m\angle C = 5x - 4$, what are x and $m\angle A$?
- ☐ A. $x = 20$, $m\angle A = 68^\circ$ ☐ C. $x = 24$, $m\angle A = 80^\circ$
- ☐ B. $x = 22$, $m\angle A = 74^\circ$ ☐ D. $x = 28$, $m\angle A = 92^\circ$
- 42) What is the area of the triangle with vertices $(1, 1)$, $(7, 4)$, and $(3, 10)$?
- ☐ F. 12 ☐ H. 36
- ☐ G. 24 ☐ J. 48
- 43) Plan A charges a \$28 fee plus \$0.06 per printed page. Plan B charges a \$16 fee plus \$0.10 per page. What is the least whole number of pages for which Plan A costs less than Plan B?
- ☐ A. 299 ☐ C. 301
- ☐ B. 300 ☐ D. 320
- 44) A machine produces 1,875 parts per hour for 4.8 hours. If 6% of the parts are defective, how many full boxes of 36 acceptable parts can be packed?
- ☐ F. 225 ☐ H. 235
- ☐ G. 250 ☐ J. 240
- 45) Simplify $\sqrt{7 + 4\sqrt{3}}$.
- ☐ A. $4 + \sqrt{3}$ ☐ C. $2 + \sqrt{3}$
- ☐ B. $\sqrt{7} + 2\sqrt{3}$ ☐ D. $2 - \sqrt{3}$

Scratch work

Answer Key and Explanations

1. A Standard: ACT Math: Integrating Essential Skills

Represent below sea level by a negative number: -240 . Climbing adds 85, giving -155 ; descending 30 more gives -185 . The hiker is still below sea level, at 185 feet below it.

2. H Standard: ACT Math: Algebra

Distribute before moving the variable terms: $4(3x - 2) + 5 = 2x + 27$ becomes $12x - 3 = 2x + 27$. Subtract $2x$ to get $10x = 30$, then divide by 10 to find $x = 3$. Substitution gives 33 on both sides, which confirms the solution.

3. A Standard: ACT Math: Geometry

Cosine is adjacent over hypotenuse. The leg of length 7 touches θ and is not the hypotenuse, so it is the adjacent leg. Therefore, $\cos \theta = 7/25$. The other leg is $\sqrt{25^2 - 7^2} = 24$, but it is opposite the angle and is not needed.

4. G Standard: ACT Math: Statistics & Probability

The values are already in increasing order, and there are seven of them. With an odd number of observations, the median is the single middle value, in position $(7 + 1) \div 2 = 4$. The fourth value is 12.

5. A Standard: ACT Math: Number & Quantity

For powers with the same base, multiplication adds exponents and division subtracts them. The exponent is therefore $3+5-4 = 4$, leaving 2^4 . Evaluating gives 16. This rule works here because every factor has the same base, 2.

6. F Standard: ACT Math: Integrating Essential Skills

Use the stated conversion factor: 2.5 gallons times 4 quarts per gallon equals 10 quarts. The gallon units cancel, leaving quarts. A quick estimate also fits because two and a half groups of four make ten.

7. C Standard: ACT Math: Algebra

Subtract 4 from both sides to get $3x \leq 15$. Dividing by positive 3 keeps the inequality direction the same, so $x \leq 5$. Any number at most 5 makes the original left side no greater than 19.

8. J Standard: ACT Math: Functions

Substitute -2 everywhere x appears: $f(-2) = 2(-2)^2 - 3(-2) + 1$. The squared term is 4, so the expression becomes $8+6+1 = 15$. The negative input must be squared before the coefficient is applied.

9. D Standard: ACT Math: Geometry

The trapezoid area formula is $A = \frac{1}{2}(b_1 + b_2)h$. The average of the two parallel sides is $(7 + 13) \div 2 = 10$ centimeters. Multiplying that average by the 5-centimeter height gives an area of 50 square centimeters.

10. F Standard: ACT Math: Statistics & Probability

Multiply each score by its frequency: $70(2) + 80(3) + 90(1) = 470$ total points across 6 quizzes. Divide by 6 to get $470 \div 6 = 78\frac{1}{3}$. The mean is a little above 78 because the two lower scores balance the single 90.

11. D Standard: ACT Math: Integrating Essential Skills

A 15% increase adds $0.15(120) = \$18$ to the original \$120 price. The new price is $120 + 18 = \$138$. You can also multiply by 1.15, since the full new price is 100% plus 15% of the original.

12. F Standard: ACT Math: Number & Quantity

Scalar multiplication means multiplying every entry by 3. Thus the entries become $3(2) = 6$, $3(1) = 3$, $3(-1) = -3$, and $3(3) = 9$, so $3A = \begin{bmatrix} 6 & 3 \\ -3 & 9 \end{bmatrix}$. The scalar changes each entry; it does not change the size of the matrix.

13. C Standard: ACT Math: Algebra

Look for two numbers whose product is 24 and whose sum is 11. The pair 3 and 8 works, so $x^2 + 11x + 24 = (x + 3)(x + 8)$. Multiplying the factors confirms the middle term is $11x$.

14. J Standard: ACT Math: Functions

Each term is 3 times the preceding term. Continuing gives 5, 15, 45, 135, 405, so the fifth term is 405. The constant ratio is 3; adding 10 each time would make an arithmetic sequence instead.

15. B Standard: ACT Math: Geometry

A cube has three equal dimensions, so multiply the edge length three times: $V = 5(5)(5) = 125$. The volume is 125 cubic centimeters. Squaring 5 would give the area of one face, not the space inside the cube.

16. G Standard: ACT Math: Statistics & Probability

Only 5 and 6 are greater than 4, so 2 of the cube's 6 equally likely faces are favorable. The probability is $\frac{2}{6}$, which reduces to $\frac{1}{3}$. Counting 4 as favorable would answer a different question, because it asks for a number greater than 4.

17. D Standard: ACT Math: Integrating Essential Skills

Divide to find the rate: $84 \div 7 = 12$ pages per minute. At that pace, 12 minutes produces $12(12) = 144$ pages. The units make sense because pages per minute times minutes leaves pages.

18. G Standard: ACT Math: Algebra

Multiply every term by the least common denominator, 6: $2(2x + 1) - 3(x - 4) = 30$. Expanding gives $4x + 2 - 3x + 12 = 30$, so $x + 14 = 30$ and $x = 16$. Substituting 16 gives $11 - 6 = 5$, which checks in the original equation.

19. A Standard: ACT Math: Functions

Slope is change in y divided by change in x : $\frac{-4-8}{5-(-3)} = \frac{-12}{8} = -\frac{3}{2}$. The line falls as x increases, so the negative sign also fits the points.

20. J Standard: ACT Math: Geometry

Reflecting across the y -axis changes the sign of the x -coordinate and leaves the y -coordinate unchanged. Thus $(-6, 2)$ becomes $(6, 2)$. The image stays the same distance from the axis on the opposite side.

21. C Standard: ACT Math: Statistics & Probability

First count students taking at least one class: $18 + 14 - 7 = 25$. The 7 students in both classes were counted twice, so subtract them once. That leaves $30 - 25 = 5$ students in neither class, and the probability is $\frac{5}{30} = \frac{1}{6}$.

22. J Standard: ACT Math: Integrating Essential Skills

During the first 8 minutes, the tank gains $7.5(8) = 60$ gallons. In the next 2 minutes it loses $3(2) = 6$ gallons, so subtract that amount: $60 - 6 = 54$. The overall increase is 54 gallons.

23. A Standard: ACT Math: Number & Quantity

Factor out perfect squares: $72a^4b^3 = 36a^4b^2(2b)$. Their square roots are 6, a^2 , and b , leaving $\sqrt{2b}$. The nonnegative assumptions let the variables leave the radical without absolute-value bars.

24. F Standard: ACT Math: Algebra

An absolute value of 9 means the expression inside can be 9 or -9 . Solve $2x - 5 = 9$ to get $x = 7$, and solve $2x - 5 = -9$ to get $x = -2$. Both values make the original absolute value equal 9.

25. C Standard: ACT Math: Functions

Evaluate the function at the endpoints: $f(4) = 16 + 12 = 28$ and $f(-2) = 4 - 6 = -2$. The output increases by $28 - (-2) = 30$ while the input increases by $4 - (-2) = 6$. Their quotient, $30/6 = 5$, is the average rate of change.

26. H Standard: ACT Math: Statistics & Probability

Split the ordered values into the lower half 4, 7, 9, 13 and upper half 16, 18, 24, 31. Their medians are $Q_1 = (7 + 9)/2 = 8$ and $Q_3 = (18 + 24)/2 = 21$. Subtract to get the interquartile range: $21 - 8 = 13$.

27. C Standard: ACT Math: Geometry

The rod runs along the space diagonal of the box. First find the diagonal across the 6-by-8 base: $\sqrt{6^2 + 8^2} = 10$ inches. That diagonal and the 15-inch edge form a right triangle with the rod as its hypotenuse, so the rod length is $\sqrt{10^2 + 15^2} = \sqrt{325} = 5\sqrt{13}$ inches.

28. G Standard: ACT Math: Functions

Since $-1 < 2$, use the first rule: $f(-1) = 3(-1) + 1 = -2$. Since $3 \geq 2$, use the second rule: $f(3) = 3^2 - 4 = 5$. Adding the two values gives $-2 + 5 = 3$.

29. D Standard: ACT Math: Algebra

Find two numbers whose product is -24 and whose sum is -5 : -8 and 3 . Thus $x^2 - 5x - 24 = (x - 8)(x + 3)$. Setting each factor equal to zero gives $x = 8$ or $x = -3$.

30. G Standard: ACT Math: Geometry

Areas scale by the square of the side-length factor. The larger-to-smaller scale factor is $\frac{5}{3}$, so the area factor is $(\frac{5}{3})^2 = \frac{25}{9}$. Multiply 27 by $\frac{25}{9}$ to get 75 square units.

31. A Standard: ACT Math: Statistics & Probability

Averages respond to the same linear rule as each data value. Multiplying every value by 3 multiplies the mean by 3, and then adding 4 raises the mean by 4. The new mean is $3(18) + 4 = 58$.

32. F Standard: ACT Math: Functions

From the first term to the 12th term there are 11 equal steps. Each step subtracts 4, so $a_{12} = 11 + 11(-4) = 11 - 44 = -33$. Using 12 steps would incorrectly count one extra change.

33. C Standard: ACT Math: Integrating Essential Skills

Use 100 as the original price. After a 12% increase it is 112. The decrease is 12% of 112, or 13.44, leaving 98.56. That is 1.44 less than the original 100, so the net change is a 1.44% decrease.

34. J Standard: ACT Math: Geometry

The tangent ratio is opposite over adjacent, so use legs of 5 and 12 in a right triangle. The Pythagorean theorem gives hypotenuse $\sqrt{5^2 + 12^2} = 13$. Sine is opposite over hypotenuse, so $\sin \theta = 5/13$.

35. D Standard: ACT Math: Algebra

By the remainder theorem, dividing by $x - 2$ leaves remainder $p(2)$. Substitute 2: $p(2) = 8 + 4a - 8 + 6 = 4a + 6$. Set this equal to the given remainder 10, then solve $4a + 6 = 10$ to get $a = 1$.

36. J Standard: ACT Math: Functions

Substitute $g(x)$ into f : $f(g(x)) = \frac{(3x-2)/(x+1)+1}{(3x-2)/(x+1)-2} = \frac{4x-1}{x-4}$, with $x \neq -1, 4$. Set this equal to 3: $4x - 1 = 3x - 12$, so $x = -11$. This value is allowed in the original functions.

37. B Standard: ACT Math: Statistics & Probability

The condition limits the selection to members who play an instrument. There are $22 + 18 = 40$ such members, and 22 are seniors. The requested probability is $22/40 = 11/20$. Dividing by all 72 club members would answer a different question.

38. G Standard: ACT Math: Number & Quantity

For a rational exponent, the denominator gives the root and the numerator gives the power. Thus $16^{3/4} = (\sqrt[4]{16})^3 = 8$, $8^{2/3} = (\sqrt[3]{8})^2 = 4$, and $4^{1/2} = 2$. The quotient is $8(4) \div 2 = 16$.

39. B Standard: ACT Math: Functions

Over the first two hours, the amount is multiplied by $500/800 = 5/8$. The same two-hour interval occurs once more between hour 2 and hour 4, so multiply 500 by $5/8$: $500(5/8) = 312.5$.

40. G Standard: ACT Math: Algebra

Let the original length be L and width be W . The perimeter gives $L + W = 17$. Equal areas mean $(L + 4)(W - 2) = LW$; expanding and canceling LW gives $L = 2W - 4$. Substitute into the first equation: $3W - 4 = 17$, so $W = 7$ and $L = 10$. The original area is $10(7) = 70$ square units. The changed dimensions, 14 and 5, also multiply to 70.

41. B Standard: ACT Math: Geometry

Opposite angles in a cyclic quadrilateral are supplementary, so $(3x + 8) + (5x - 4) = 180$. This gives $8x + 4 = 180$, hence $x = 22$. Substituting into angle A gives $3(22) + 8 = 74^\circ$. The opposite angle is 106° , and the two add to 180° .

42. G Standard: ACT Math: Geometry

Put a rectangle around the triangle using $x = 1$ and $x = 7$ for its sides and $y = 1$ and $y = 10$ for its top and bottom. Its area is $6(9) = 54$. The three corner pieces outside the triangle are right triangles with areas 9, 12, and 9, totaling 30. Subtract: $54 - 30 = 24$ square units.

43. C Standard: ACT Math: Integrating Essential Skills

Write the costs as $28 + 0.06p$ and $16 + 0.10p$. Plan A is cheaper when $28 + 0.06p < 16 + 0.10p$, which simplifies to $12 < 0.04p$, or $p > 300$. At 300 pages the costs are equal, so the least whole number that makes Plan A cheaper is 301.

44. H Standard: ACT Math: Integrating Essential Skills

The machine makes $1,875(4.8) = 9,000$ parts. Six percent are defective, so 94% are usable: $0.94(9,000) = 8,460$. Divide by 36 parts per box: $8,460 \div 36 = 235$. Thus the machine can fill 235 boxes.

45. C Standard: ACT Math: Number & Quantity

Look for a square of the form $(a + b\sqrt{3})^2 = a^2 + 3b^2 + 2ab\sqrt{3}$. The terms 7 and $4\sqrt{3}$ match $a = 2$ and $b = 1$, since $(2 + \sqrt{3})^2 = 7 + 4\sqrt{3}$. The principal square root is positive, so the result is $2 + \sqrt{3}$.