PRACTICE EXAM 8: ALEKS PPL SIMULATION

1. Simplify: $-3^2 + (-3)^2$.

A. 0

B. 18

C. −18

D. 9

2. A triangle has vertices at (1, 2), (5, 2), and (5, 6). What is its area?

A. 4

B. 6

C. 8

D. 16

3. Solve: $(x + 3)/(x - 2) = 2$, assuming $x \neq 2$.

A. $x = 3$

B. $x = 7$

C. $x = 5$

D. $x = 2$

4. Which expression equals $\sec^2\theta - \tan^2\theta$?

A. 1

B. 0

C. $\sin^2\theta$

D. $\cos^2\theta$

5. A circular pizza has a radius of 7 inches. If it is cut into 8 equal slices, what is the area of each slice? (Use $\pi \approx 3.14$.)

A. 24.5 in^2

B. 153.86 in^2

C. 12.25 in^2

D. 19.23 in^2

6. Solve: $3x - 2(x - 5) = 4x + 1$.

A. $x = 2$

B. $x = 3$

C. $x = 4$

D. $x = 5$

7. If a number is increased by 20% and the result is then decreased by 20%, what is the net change?

A. 0%

B. 20% increase

C. 4% decrease

D. 4% increase

8. Simplify: $x/(x + 1) + 1/(x + 1)$, assuming $x \neq -1$.

A. $x + 1$

B. $x/(x + 1)^2$

C. $(x + 1)^2$

D. 1

9. What is the solution to $|x + 2| = 5$?

A. $x = 3$ only

B. $x = 3$ or $x = -7$

C. $x = 5$ or $x = -5$

D. $x = -3$ or $x = 7$

10. A line has x-intercept (4, 0) and y-intercept (0, −6). What is its equation in slope-intercept form?

A. $y = (3/2)x - 6$

B. $y = -(3/2)x + 6$

C. $y = (2/3)x - 6$

D. $y = (3/2)x + 6$

11. Find the vertex of $f(x) = -x^2 + 6x - 5$.

A. (3, −4)

B. (6, −5)

C. (−3, 4)

D. (3, 4)

12. If $f(x) = 1/x$, what is $f(f(4))$?

A. 1/4

B. 4

C. 1

D. 16

13. Factor completely: $9x^2 - 30x + 25$.

A. $(3x - 5)^2$

B. $(3x + 5)^2$

C. $(3x - 5)(3x + 5)$

D. $(9x - 5)(x - 5)$

14. The length of a rectangle is 5 cm more than its width. If the perimeter is 38 cm, what is the length?

A. 7 cm

B. 10 cm

C. 12 cm

D. 14 cm

15. Convert $5\pi/3$ radians to degrees.

A. 60°

B. 120°

C. 240°

D. 300°

16. Simplify: $(2 - \sqrt{5})(2 + \sqrt{5})$.

A. −1

B. 9

C. 1

D. −5

17. Solve: $\log_3(x) + \log_3(2) = 2$.

A. x = 3

B. x = 9/2

C. x = 6

D. x = 18

18. A car rental costs $40 per day plus $0.25 per mile. If a customer's total bill for one day is $75, how many miles did they drive?

A. 100 miles

B. 120 miles

C. 150 miles

D. 140 miles

19. If $f(x) = 2x^2 + 3x - 5$, what is $f(-1)$?

A. 4

B. 0

C. −6

D. −10

20. The sum of a two-digit number's digits is 11. If the tens digit is twice the units digit minus 1, what is the tens digit?

A. 5

B. 7

C. 8

D. 3

21. Simplify: $(8x^6y^{-2})^{(1/3)}$.

A. $2x^2/y^{(2/3)}$

B. $2x^3/y^2$

C. $2x^2y^{(2/3)}$

D. $8x^2/y^{(2/3)}$

22. A triangle is similar to another with a scale factor of 3:5. If the area of the smaller triangle is 36 cm^2, what is the area of the larger triangle?

A. 60 cm^2

B. 90 cm^2

C. 72 cm^2

D. 100 cm^2

23. Solve the inequality: $4 - 3x \leq 13$.

A. $x \leq -3$

B. $x \leq 3$

C. $x \geq -3$

D. $x \geq 3$

24. A train travels at a speed of 60 mph for the first 2 hours, then 80 mph for the next hour. What is its average speed for the entire trip?

A. 65 mph

B. ≈ 66.67 mph

C. 70 mph

D. 72 mph

25. What is the exact value of tan(60°)?

A. $\sqrt{3}$

B. $1/\sqrt{3}$

C. 1

D. $\sqrt{3}/2$

26. Simplify: $(x^2 - 9)/(x^2 + 6x + 9)$, where $x \neq -3$.

A. 1

B. $(x - 3)/(x + 3)$

C. $(x + 3)/(x - 3)$

D. $(x - 3)(x + 3)$

27. A standard die is rolled twice. What is the probability that both rolls show a 4?

A. 1/6

B. 1/12

C. 2/6

D. 1/36

28. The equation $2x^2 + kx + 8 = 0$ has one repeated real solution. What is the value of k (positive value)?

A. 4

B. 6

C. 8

D. 16

29. Solve for x: $\sqrt{(2x + 3)} = x$.

A. $x = 3$

B. $x = -1$

C. $x = 3$ or $x = -1$

D. $x = 1$

30. A 30-60-90 triangle has a hypotenuse of length 10. What is the length of the shorter leg?

A. $10\sqrt{3}$

B. $10/\sqrt{3}$

C. 5

D. $5\sqrt{3}$

PRACTICE EXAM 8: ANSWER KEY AND EXPLANATIONS

1. A — The expression -3^2 applies the exponent to 3 first (giving 9), then negates: −9. The expression $(-3)^2$ squares −3 to give +9. Sum: $-9 + 9 = 0$. Parentheses determine whether the negative is part of the base — this is the single most common sign error in algebra.

2. C — The triangle has a horizontal leg from (1, 2) to (5, 2) of length 4, and a vertical leg from (5, 2) to (5, 6) of length 4. Area = (1/2)(4)(4) = 8. Coordinate triangles with horizontal and vertical legs are right triangles.

3. B — Multiply both sides by $(x - 2)$: $x + 3 = 2(x - 2) = 2x - 4$. Subtract x: $3 = x - 4$, giving $x = 7$. Verify $x \neq 2$ is satisfied. Always check rational equation solutions against the excluded values.

4. A — The Pythagorean identity $\sec^2\theta = \tan^2\theta + 1$ rearranges to $\sec^2\theta - \tan^2\theta = 1$. This holds for every angle where both functions are defined. One of the three fundamental Pythagorean identities.

5. D — Total pizza area = $\pi r^2 = 3.14 \times 49 = 153.86$ in². Divide by 8 slices: $153.86 \div 8 \approx 19.23$ in² per slice. Division of area among equal parts always uses direct division by the number of parts.

6. B — Distribute: $3x - 2x + 10 = 4x + 1$, giving $x + 10 = 4x + 1$. Subtract x and 1: $9 = 3x$, so $x = 3$. Always distribute first, then combine like terms on each side before moving variables.

7. C — Let original be 100. After 20% increase: 120. After 20% decrease from 120: $120 \times 0.80 = 96$. Net change = $96 - 100 = -4$, a 4% decrease. Sequential percent changes don't cancel because they apply to different bases.

8. D — Both fractions share the denominator $(x + 1)$, so combine numerators: $(x + 1)/(x + 1) = 1$ (for $x \neq -1$). Identical numerator and denominator always simplify to 1, provided the value isn't excluded from the domain.

9. B — Split into two cases: $x + 2 = 5$ or $x + 2 = -5$. Solve each: $x = 3$ or $x = -7$. Every absolute value equation of form |expression| = k (with $k > 0$) has exactly two solutions. Never forget the second case.

10. A — Slope = $(-6 - 0)/(0 - 4) = -6/-4 = 3/2$. Using the y-intercept (0, −6) directly in slope-intercept form: $y = (3/2)x - 6$. Slope from intercepts is rise over run between the two intercept points.

11. D — x-coordinate of vertex: $-b/(2a) = -6/(2\cdot -1) = 3$. Substitute: $f(3) = -9 + 18 - 5 = 4$. Vertex: (3, 4). The parabola opens downward ($a < 0$), so the vertex is a maximum.

12. B — Evaluate inner function: $f(4) = 1/4$. Then evaluate $f(1/4) = 1/(1/4) = 4$. The reciprocal function is its own inverse — applying it twice returns the original input.

13. A — Check for perfect square trinomial: $9x^2 = (3x)^2$, $25 = 5^2$, and $-30x = -2(3x)(5)$. ✓ Factored form: $(3x - 5)^2$. Perfect square trinomials have a middle term equal to ±2 times the product of the square roots of the first and last terms.

14. C — Let w = width; length = w + 5. Perimeter: $2w + 2(w + 5) = 38$, giving $4w + 10 = 38$ and $w = 7$. Length = 7 + 5 = 12 cm. Always define the simpler variable first and express the other in terms of it.

15. D — Multiply by $180/\pi$: $(5\pi/3)(180/\pi) = 5(60) = 300°$. The π cancels cleanly, leaving integer arithmetic. Memorize $\pi/3 = 60°$ as a core reference value for quick conversion.

16. C — Apply the difference of squares pattern $(a - b)(a + b) = a^2 - b^2$: $2^2 - (\sqrt{5})^2 = 4 - 5 = -1$. Conjugate pairs always eliminate the radical cleanly, producing a rational result.

17. B — Apply the product law: $\log_3(2x) = 2$, so $2x = 3^2 = 9$, giving $x = 9/2$. Always condense logarithm sums using the product law before converting to exponential form.

18. D — Equation: $40 + 0.25m = 75$, where m is miles. Subtract 40: $0.25m = 35$. Divide by 0.25: $m = 140$. Fixed-cost-plus-variable-rate problems always separate the fixed charge from the per-unit charge.

19. C — $f(-1) = 2(-1)^2 + 3(-1) - 5 = 2(1) - 3 - 5 = 2 - 3 - 5 = -6$. Squaring the negative one produces positive one; always wrap negative substitutions in parentheses to prevent sign errors.

20. B — Let u = units digit; tens = 2u − 1. Sum: $(2u - 1) + u = 11$, giving $3u = 12$ and $u = 4$. Tens = $2(4) - 1 = 7$. Always define both digits in terms of one variable before writing the equation.

21. A — Apply the power to each factor: $8^{(1/3)} = 2$; $(x^6)^{(1/3)} = x^2$; $(y^{-2})^{(1/3)} = y^{(-2/3)} = 1/y^{(2/3)}$. Result: $2x^2/y^{(2/3)}$. Multiplying rational exponents follows the same rules as integer exponents.

22. D — Area ratio equals the square of the scale factor: $(3/5)^2 = 9/25$. If $36/x = 9/25$, then $9x = 900$ and $x = 100$ cm². Scale factors apply linearly to length but are squared for area and cubed for volume.

23. C — Subtract 4: $-3x \le 9$. Divide by −3 and flip the inequality: $x \ge -3$. Dividing by a negative reverses the inequality direction. This is the single most tested rule in inequality problems.

24. B — Total distance = 60(2) + 80(1) = 120 + 80 = 200 miles. Total time = 3 hours. Average speed = 200/3 ≈ 66.67 mph. Average speed is never the arithmetic mean of rates — it is total distance divided by total time.

25. A — $\tan(60°) = \sqrt{3}$ is a memorized unit-circle value. The ratio $\sin(60°)/\cos(60°) = (\sqrt{3}/2)/(1/2) = \sqrt{3}$ confirms this. The five standard first-quadrant angles should be memorized for every trigonometric function.

26. B — Factor numerator (difference of squares): $(x - 3)(x + 3)$. Factor denominator (perfect square trinomial): $(x + 3)^2$. Cancel one $(x + 3)$: result is $(x - 3)/(x + 3)$. Always factor completely before attempting cancellation.

27. D — Each roll has probability 1/6. Independent events multiply: $(1/6)(1/6) = 1/36$. Use multiplication for "AND" probabilities when events are independent, and addition for "OR" probabilities of mutually exclusive events.

28. C — For one repeated solution, the discriminant equals zero: $b^2 - 4ac = 0$. Substitute: $k^2 - 4(2)(8) = 0$, giving $k^2 = 64$ and $k = \pm 8$. The positive value is 8. The discriminant determines whether roots are distinct, repeated, or complex.

29. A — Square both sides: $2x + 3 = x^2$. Rearrange: $x^2 - 2x - 3 = 0$. Factor: $(x - 3)(x + 1) = 0$, giving $x = 3$ or $x = -1$. Check both: $x = 3$ gives $\sqrt{9} = 3$ ✓; $x = -1$ gives $\sqrt{1} = -1$, which is false. Reject $x = -1$. Final: $x = 3$. Always check radical equation solutions.

30. C — In a 30-60-90 triangle, the ratio of sides is $1 : \sqrt{3} : 2$. If the hypotenuse ($2x$ in the ratio) is 10, then $x = 5$. The shorter leg (opposite the 30° angle) has length 5. Memorize the 30-60-90 ratio for rapid triangle problem-solving.