PRACTICE EXAM 11: ALEKS PPL SIMULATION

1. Simplify: $(2x^2 - 3x)(x + 4) - (x^2 + x)$.

A. $2x^3 + 4x^2 - 13x$

B. $2x^3 + 6x^2 - 13x$

C. $2x^3 + 5x^2 - 13x$

D. $2x^3 + 4x^2 - 12x$

2. The volume of a cube is 216 cm^3. What is the surface area?

A. 36 cm^2

B. 108 cm^2

C. 144 cm^2

D. 216 cm^2

3. Which of the following is the inverse of $y = 5x - 2$?

A. $y = x/5 + 2$

B. $y = (x - 2)/5$

C. $y = (x + 2)/5$

D. $y = 5(x + 2)$

4. Solve for x: $(x + 1)(x - 5) = 7$.

A. $x = 7$ or $x = -1$

B. $x = 6$ or $x = -2$

C. $x = 5$ or $x = -1$

D. $x = 4$ or $x = -3$

5. A plane flies 600 miles with the wind in 3 hours and returns the same distance against the wind in 4 hours. What is the speed of the plane in still air?

A. 175 mph

B. 100 mph

C. 125 mph

D. 150 mph

6. What is the period of the function $y = \sin(2x)$?

A. 2π

B. 4π

C. 2

D. π

7. Simplify: $(1 + \sqrt{2})^2 + (1 - \sqrt{2})^2$.

A. 4

B. $2\sqrt{2}$

C. 6

D. $4 - 2\sqrt{2}$

8. The product of two consecutive positive integers is 132. What is the larger of the two?

A. 12

B. 11

C. 13

D. 14

9. Evaluate: 4^(−1/2).

A. −2

B. 1/2

C. 2

D. −1/2

10. A bag contains 5 red, 4 blue, and 3 green marbles. What is the probability of drawing a red or blue marble?

A. 5/12

B. 1/3

C. 3/4

D. 2/3

11. Simplify: $\log(100x^3) - \log(x)$.

A. $\log(100) + 2\log(x)$

B. $2 + 2\log(x)$

C. $\log(100x^2)$

D. $\log(99x^2)$

12. A line passes through (2, 3) and is perpendicular to the line $4x - 2y = 5$. What is its equation?

A. $y = -(1/2)x - 4$

B. $y = 2x + 3$

C. $y = (1/2)x + 2$

D. $y = -(1/2)x + 4$

13. Solve: $x^2 + 6x - 2 = 0$. Leave your answer in simplest radical form.

A. $x = -3 \pm \sqrt{11}$

B. $x = 3 \pm \sqrt{11}$

C. $x = -3 \pm \sqrt{7}$

D. $x = -3 \pm \sqrt{13}$

14. In a right triangle, the ratio of legs is 3 : 4. If the hypotenuse is 25, what are the lengths of the legs?

A. 6 and 8

B. 12 and 16

C. 15 and 20

D. 9 and 12

15. Which is equivalent to $(\cos\theta - \sin\theta)(\cos\theta + \sin\theta)$?

A. 1

B. $\cos^2\theta - \sin^2\theta$

C. -1

D. $2\cos\theta$

16. The graph of $y = x^2$ is stretched vertically by a factor of 3 and shifted down 4. What is the new equation?

A. $y = (x - 3)^2 + 4$

B. $y = 3x^2 + 4$

C. $y = (x + 3)^2 - 4$

D. $y = 3x^2 - 4$

17. A spotlight casts a shadow 12 feet long when a 5-foot-tall person stands 8 feet from the base of the light. How tall is the spotlight?

A. 12.5 ft

B. 10 ft

C. 15 ft

D. 20 ft

18. Simplify: $(x^2 - x - 6)/(x^2 - 9)$, assuming $x \neq \pm 3$.

A. $(x - 2)/(x - 3)$

B. $(x + 2)/(x + 3)$

C. $(x + 2)/(x - 3)$

D. $(x - 2)/(x + 3)$

19. If $f(x) = 3^x$, what is $f(\log_3 27)$?

A. 3

B. 9

C. 81

D. 27

20. Solve: $|3 - 2x| < 5$.

A. $x < -1$ or $x > 4$

B. $-1 < x < 4$

C. $-4 < x < 1$

D. $1 < x < 4$

21. A rectangle has a perimeter of 30 units and an area of 56 square units. What is the length of its longer side?

A. 8

B. 7

C. 14

D. 10

22. Find the sum: $1 + 2 + 3 + ... + 100$.

A. 5,000

B. 5,050

C. 10,100

D. 4,950

23. Simplify: $(x^{(1/2)} \cdot x^{(1/3)})^6$.

A. x^2

B. x^3

C. $x^{(11)}$

D. x^5

24. What is the range of $f(x) = -2^x$?

A. $y < 0$

B. $y > 0$

C. all real numbers

D. $y \geq 0$

25. A bookshelf holds 24 books. If 2/3 of them are fiction and 1/4 of the fiction books are mysteries, how many mystery books are on the shelf?

A. 2

B. 3

C. 4

D. 6

26. Solve: e^x = 10. (Round to two decimal places.)

A. $x \approx 2.72$

B. $x \approx 2.30$

C. $x \approx 3.32$

D. $x \approx 1.00$

27. The sides of a triangle are 7, 24, and 25. What is the area of the triangle?

A. 60

B. 120

C. 168

D. 84

28. Simplify: $(x - y)^3 - (x + y)^3$.

A. $-6x^2y - 2y^3$

B. $-2y^3$

C. $-6x^2y$

D. $6x^2y + 2y^3$

29. If $\log_2(8) + \log_2(x) = 5$, what is x?

A. 2

B. 3

C. 4

D. 8

30. A circle has equation $x^2 + y^2 - 4x + 6y + 9 = 0$. What is the radius?

A. 1

B. 2

C. 3

D. 4

PRACTICE EXAM 11: ANSWER KEY AND EXPLANATIONS

1. A — Expand $(2x^2 - 3x)(x + 4)$: $2x^3 + 8x^2 - 3x^2 - 12x = 2x^3 + 5x^2 - 12x$. Subtract $(x^2 + x)$: $2x^3 + 5x^2 - 12x - x^2 - x = 2x^3 + 4x^2 - 13x$. Always distribute through parentheses completely before combining like terms.

2. D — Side length from volume: $s = \sqrt[3]{216} = 6$ cm. Surface area $= 6s^2 = 6(36) = 216$ cm². A cube's six faces each contribute s^2 to the total surface area. Find side length first from any given measurement before applying the surface area formula.

3. C — Swap x and y: $x = 5y - 2$. Solve for y: $5y = x + 2$, so $y = (x + 2)/5$. The inverse undoes the original operations in reverse order — here, addition before division.

4. B — Expand: $x^2 - 4x - 5 = 7$, giving $x^2 - 4x - 12 = 0$. Factor: $(x - 6)(x + 2) = 0$, so $x = 6$ or $x = -2$. Always move all terms to one side before factoring; setting a product equal to a nonzero value does not allow direct application of the zero product property.

5. A — Let p = plane speed and w = wind speed. With wind: $p + w = 600/3 = 200$. Against wind: $p - w = 600/4 = 150$. Add the equations: $2p = 350$, so $p = 175$ mph. Upstream/downstream and with-wind/against-wind problems always reduce to this standard elimination setup.

6. D — The period of $\sin(bx)$ is $2\pi/b$. For $\sin(2x)$, period $= 2\pi/2 = \pi$. Doubling the coefficient of x halves the period. Frequency and period are inversely related for sinusoidal functions.

7. C — Expand each: $(1 + \sqrt{2})^2 = 1 + 2\sqrt{2} + 2 = 3 + 2\sqrt{2}$; $(1 - \sqrt{2})^2 = 1 - 2\sqrt{2} + 2 = 3 - 2\sqrt{2}$. Add: 6. The cross terms $2\sqrt{2}$ and $-2\sqrt{2}$ cancel when summed.

8. A — Let n and n + 1 be consecutive integers. Equation: $n(n + 1) = 132$, giving $n^2 + n - 132 = 0$. Factor: $(n - 11)(n + 12) = 0$. Positive solution: $n = 11$, so larger = 12. Always reject the negative solution in positive-integer problems.

9. B — Apply the rational exponent: $4^{(-1/2)} = 1/4^{(1/2)} = 1/\sqrt{4} = 1/2$. A negative exponent indicates the reciprocal, and a fractional exponent signals a root. Never let the negative sign confuse you into a negative result.

10. C — Total marbles: 12. Red or blue = 5 + 4 = 9. Probability = 9/12 = 3/4. "Or" probabilities for mutually exclusive events add the individual probabilities; red and blue cannot occur simultaneously for a single marble.

11. B — Apply the quotient law: $\log(100x^3/x) = \log(100x^2)$. Apply the product law: $\log(100) + \log(x^2) = 2 + 2\log(x)$, since $\log(100) = 2$. Simplifying logs requires applying all three laws in combination.

12. D — Slope of the given line (rewriting): $y = 2x - 5/2$, so slope = 2. Perpendicular slope = $-1/2$. Using point-slope with (2, 3): $y - 3 = -(1/2)(x - 2)$, giving $y = -(1/2)x + 1 + 3 = -(1/2)x + 4$. Always flip the fraction AND change the sign for perpendicular slopes.

13. A — Apply the quadratic formula: $x = [-6 \pm \sqrt{(36 + 8)}]/2 = [-6 \pm \sqrt{44}]/2 = [-6 \pm 2\sqrt{11}]/2 = -3 \pm \sqrt{11}$. Always simplify radicals before dividing the entire numerator by the denominator.

14. C — Let legs be 3k and 4k. By the Pythagorean theorem: $9k^2 + 16k^2 = 625$, giving $25k^2 = 625$ and $k = 5$. Legs: 15 and 20. Proportional right triangles always scale the standard ratios — (15, 20, 25) is just 5× the (3, 4, 5) triple.

15. B — Apply the difference of squares pattern $(a - b)(a + b) = a^2 - b^2$: $\cos^2\theta - \sin^2\theta$. This is also equal to $\cos(2\theta)$ by the double-angle identity, though that identity is not required to answer the question.

16. D — Vertical stretch by 3 multiplies the output: $3x^2$. Shift down 4 subtracts 4 from the output: $3x^2 - 4$. Combined: $y = 3x^2 - 4$. Vertical transformations apply directly to the function; horizontal ones apply to the input.

17. A — Similar triangles give the spotlight-to-shadow-tip distance 18 + 12 = 30 feet, with the person 12 feet from the shadow tip. Ratio: $h/5 = 30/12$, so $h = 150/12 = 12.5$ ft. Similar triangles always compare corresponding heights and bases proportionally.

18. C — Factor numerator: $x^2 - x - 6 = (x - 3)(x + 2)$. Factor denominator: $x^2 - 9 = (x - 3)(x + 3)$. Cancel $(x - 3)$: result is $(x + 2)/(x + 3)$. Always factor both numerator and denominator completely before canceling.

19. D — Let $y = \log_3 27 = 3$ (since $3^3 = 27$). Then $f(y) = 3^3 = 27$. The exponential and logarithmic functions are inverses: $3^{(\log_3 x)} = x$, so $f(\log_3 27) = 27$ directly.

20. B — "Less than" absolute value becomes compound AND: $-5 < 3 - 2x < 5$. Subtract 3: $-8 < -2x < 2$. Divide by −2 and flip both inequalities: $4 > x > -1$, or $-1 < x < 4$. Dividing compound inequalities by a negative flips both signs.

21. A — Let length = l and width = w. Perimeter: $2l + 2w = 30$, so $l + w = 15$. Area: $lw = 56$. From perimeter, $w = 15 - l$. Substitute: $l(15 - l) = 56$, giving $l^2 - 15l + 56 = 0$. Factor: $(l - 7)(l - 8) = 0$. Longer side is 8.

22. B — Use the formula for sum of first n positive integers: $n(n + 1)/2$. For $n = 100$: $100(101)/2 = 5050$. This formula, attributed to Gauss, sums any arithmetic sequence starting at 1 with common difference 1.

23. D — Inside the parentheses, add exponents with the same base: $x^{(1/2 + 1/3)} = x^{(5/6)}$. Then raise to the 6th power: $x^{(5/6 \cdot 6)} = x^5$. Rational exponent rules apply identically to integer exponents.

24. A — The function 2^x is always positive. Multiplying by −1 makes it always negative. So the range is $y < 0$. Reflection across the x-axis flips the sign of every output.

25. C — Fiction books: (2/3)(24) = 16. Mysteries: (1/4)(16) = 4. Sequential fractional operations multiply their effects — always apply one fraction at a time to the current quantity.

26. B — Take the natural log of both sides: $x = \ln(10) \approx 2.30$. The natural log is the inverse of e^x; applying ln undoes the exponential function. Round only at the final step.

27. D — The (7, 24, 25) triple is a right triangle. Area = (1/2)(legs) = (1/2)(7)(24) = 84. Always test whether three side lengths form a Pythagorean triple before computing area — if so, the triangle is right, and the two legs give the area directly.

28. A — Expand: $(x - y)^3 = x^3 - 3x^2y + 3xy^2 - y^3$; $(x + y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$. Subtract: $(x^3 - 3x^2y + 3xy^2 - y^3) - (x^3 + 3x^2y + 3xy^2 + y^3) = -6x^2y - 2y^3$. The cube expansion pattern with alternating signs must be applied carefully.

29. C — Apply the product law: $\log_2(8x) = 5$, giving $8x = 2^5 = 32$ and $x = 4$. Converting the sum of logs to a single log using the product law, then switching to exponential form, isolates the variable.

30. B — Complete the square on x and y: $(x^2 - 4x) + (y^2 + 6y) = -9$. Add 4 and 9 to both sides: $(x - 2)^2 + (y + 3)^2 = 4$. Standard form reveals $r^2 = 4$, so $r = 2$. Always compute $(b/2)^2$ for each variable when converting from general to standard circle form.