PRACTICE EXAM 12: ALEKS PPL SIMULATION

1. A square and an equilateral triangle have equal perimeters. If one side of the square is 9 cm, what is the length of one side of the triangle?

A. 9 cm

B. 6 cm

C. 12 cm

D. 18 cm

2. Simplify: $(x^2 - 16)/(x + 4) \cdot (x - 1)/(x - 4)$, assuming $x \neq \pm 4$.

A. $x - 1$

B. $x - 1$ (duplicate; redraft)

Clean redraft:

2. Simplify: $(x^2 - 16)/(x + 4) \cdot (x - 1)/(x - 4)$, assuming $x \neq \pm 4$.

A. $x + 1$

B. $x - 1$

C. $(x + 4)(x - 1)$

D. $(x - 4)(x - 1)$

3. The graph of $y = x^2$ is shifted right 5 units and reflected across the x-axis. What is the new equation?

A. $y = -(x - 5)^2$

B. $y = (x + 5)^2$

C. $y = -(x + 5)^2$

D. $y = (x - 5)^2 - 1$

4. Solve: $\log(x) - \log(3) = 2$.

A. $x = 5$

B. $x = 100$

C. $x = 103$

D. $x = 300$

5. A right triangle has an acute angle of 60°, and the side adjacent to that angle is 5. What is the side opposite the angle?

A. 5

B. $5\sqrt{3}$

C. 10

D. $10\sqrt{3}$

6. Find the value of k if the line $3x - ky = 7$ has a slope of 3/2.

A. 3

B. 3/2

C. 2

D. -2

7. Simplify: $(x^5)^{-2} \cdot x^7$.

A. x^{-3}

B. x^3

C. x^{-12}

D. x^{12}

8. A box has dimensions $2 \times 3 \times 5$. What is the length of its space diagonal?

A. 10

B. $\sqrt{30}$

C. $4\sqrt{2}$

D. $\sqrt{38}$

9. Which of the following is the correct factorization of $x^3 + 8$?

A. $(x + 2)(x^2 + 2x + 4)$

B. $(x - 2)(x^2 - 2x + 4)$

C. $(x + 2)(x^2 - 2x + 4)$

D. $(x + 2)^3$

10. Solve: $\sqrt{(3x - 2)} = \sqrt{(x + 6)}$.

A. $x = 2$

B. $x = 4$

C. $x = 6$

D. $x = 8$

11. The temperature is 68°F. What is this in Celsius? (Use $C = 5/9(F - 32)$.)

A. 20°C

B. 22°C

C. 36°C

D. 100°C

12. Find the sum of the first 10 positive even integers.

A. 90

B. 100

C. 110

D. 120

13. Evaluate: $\sin^2(30°) + \cos^2(30°)$.

A. 1/4

B. $\sqrt{3}/2$

C. 3/4

D. 1

14. A parabola has vertex $(2, -3)$ and passes through $(4, 5)$. What is its equation in vertex form?

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

B. $y = 2(x - 2)^2 - 3$

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

D. $y = (x + 2)^2 + 3$

15. Solve for x: $(x - 2)^2 = -4$.

A. No real solution

B. $x = 0$ or $x = 4$

C. $x = 2 \pm 2i$

D. $x = \pm 2$

16. A 12-sided fair die is rolled once. What is the probability of rolling a number divisible by 3?

A. 1/6

B. 1/4

C. 1/2

D. 1/3

17. Simplify: $(x^4 - y^4)/(x^2 + y^2)$, assuming $x^2 \neq -y^2$.

A. $x^2 + y^2$

B. $x^4 - y^2$

C. $x^2 - y^2$

D. $(x + y)(x - y)^2$

18. Which of the following is the equation of a horizontal asymptote of $f(x) = (2x + 3)/(x - 4)$?

A. $y = 4$

B. $y = 2$

C. $x = 4$

D. $y = -4$

19. A bag contains 6 red and 4 blue balls. Two balls are drawn without replacement. What is the probability both are red?

A. 1/3

B. 3/5

C. 2/5

D. 1/2

20. Solve: $4^x \cdot 2^{(x + 1)} = 128$.

A. $x = 1$

B. $x = 3/2$

C. $x = 3$

D. $x = 2$

21. The midpoint of segment AB is (3, 4). If A is (1, 2), what are the coordinates of B?

A. (2, 3)

B. (5, 6)

C. (4, 6)

D. (7, 8)

22. Simplify: $\cos(180° - \theta)$.

A. $\cos \theta$

B. $\sin \theta$

C. $-\sin \theta$

D. $-\cos \theta$

23. What is the equation of a line with x-intercept 6 and y-intercept -4?

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

B. $y = -(2/3)x + 4$

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

D. $y = (2/3)x + 4$

24. A cylinder's volume is 400π cm³ and its radius is 5 cm. What is its height?

A. 8 cm

B. 12 cm

C. 16 cm

D. 20 cm

25. Simplify: $(2x - 1)/(x + 3) - (x - 4)/(x + 3)$, assuming $x \neq -3$.

A. $x/(x + 3)$

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

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

D. 1

26. The surface area of a sphere is 100π square inches. What is its volume?

A. $500\pi/3$ in³

B. $400\pi/3$ in³

C. 250π in³

D. 100π in³

27. An investor deposits $5,000 at 4% annual interest compounded continuously. How much will be in the account after 5 years? (Use $e \approx 2.718$; round to nearest dollar.)

A. $5,500

B. $6,107

C. $6,500

D. $7,100

28. If $f(x) = x^2$ and $g(x) = 2x + 1$, what is $g(f(3))$?

A. 13

B. 14

C. 16

D. 19

29. Solve: $5/x + 2 = 7$, assuming $x \neq 0$.

A. $x = 1/2$

B. $x = 5/7$

C. $x = 1$

D. $x = 2$

30. A square's area is $x^2 + 10x + 25$. What is the length of one side?

A. $x + 5$

B. $x + 25$

C. $x^2 + 5$

D. $x – 5$

PRACTICE EXAM 12: ANSWER KEY AND EXPLANATIONS

1. C — Perimeter of the square: 4(9) = 36 cm. An equilateral triangle has three equal sides, so each side = 36/3 = 12 cm. Equal perimeters across different polygons always require dividing the total perimeter by the number of sides.

2. B — Factor $x^2 - 16 = (x + 4)(x - 4)$. The expression becomes $[(x + 4)(x - 4)/(x + 4)] \cdot [(x - 1)/(x - 4)] = (x - 4)(x - 1)/(x - 4) = x - 1$. Cancel common factors systematically across all numerators and denominators.

3. A — Horizontal shift right by 5 replaces x with $(x - 5)$: $y = (x - 5)^2$. Reflection across the x-axis negates the entire output: $y = -(x - 5)^2$. The order of transformations does not change the final result when they act on different parts of the function.

4. D — Apply the quotient law: $\log(x/3) = 2$, so $x/3 = 10^2 = 100$, giving $x = 300$. Always condense logs to a single expression before converting to exponential form.

5. B — In a 30-60-90 triangle, the side opposite the 60° angle is $\sqrt{3}$ times the side opposite the 30° angle (the adjacent side here when 60° is the angle). Opposite to 60° = $5\sqrt{3}$. Memorize the 30-60-90 ratio ($1 : \sqrt{3} : 2$) for rapid evaluation.

6. C — Rewrite in slope-intercept form: $-ky = -3x + 7$, giving $y = (3/k)x - 7/k$. Slope = $3/k = 3/2$, so $k = 2$. Setting the isolated slope coefficient equal to the given slope solves for the unknown parameter directly.

7. A — Apply the power rule: $(x^5)^{-2} = x^{-10}$. Then multiply by x^7: $x^{-10} \cdot x^7 = x^{(-10+7)} = x^{-3}$. Always apply power rules before product rules when simplifying nested exponent expressions.

8. D — Space diagonal of a rectangular box = $\sqrt{(l^2 + w^2 + h^2)}$. Substitute: $\sqrt{(4 + 9 + 25)} = \sqrt{38}$. The space diagonal extends the 2D Pythagorean theorem into three dimensions by including all three edge lengths.

9. C — $x^3 + 8$ is a sum of cubes: $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$ with $a = x$, $b = 2$, giving $(x + 2)(x^2 - 2x + 4)$. The middle term of the quadratic factor is negative when the original expression is a sum of cubes — the signs alternate.

10. B — Square both sides: $3x - 2 = x + 6$. Solve: $2x = 8$, giving $x = 4$. Check: $\sqrt{10} = \sqrt{10}$ ✓. Always verify radical equation solutions in the original to rule out extraneous values.

11. A — Substitute F = 68: C = (5/9)(68 − 32) = (5/9)(36) = 20°C. Unit conversion formulas must be applied in the correct order — always compute inside parentheses first.

12. C — First 10 positive even integers: 2, 4, 6, ..., 20. Sum = 2(1 + 2 + ... + 10) = 2 × 55 = 110. The sum of the first n even integers equals n(n + 1).

13. D — By the fundamental Pythagorean identity, $\sin^2\theta + \cos^2\theta = 1$ for any angle θ. This identity holds at 30° and every other angle in the unit circle — no further computation is needed.

14. B — Vertex form: $y = a(x - 2)^2 - 3$. Use the point (4, 5): $5 = a(2)^2 - 3$, giving $4a = 8$ and $a = 2$. So $y = 2(x - 2)^2 - 3$. Always substitute a known point into vertex form to solve for the leading coefficient.

15. A — $(x - 2)^2$ must be non-negative for any real x. Since the right side is −4 (negative), no real value of x satisfies the equation. No real solution. Complex solutions ($2 \pm 2i$) exist but are not among the real-solution options.

16. D — Numbers 1 to 12 divisible by 3: 3, 6, 9, 12 → 4 favorable. Probability = 4/12 = 1/3. Always identify the multiples of the divisor within the range before forming the probability ratio.

17. C — Factor as a difference of squares twice: $x^4 - y^4 = (x^2 + y^2)(x^2 - y^2)$. Cancel $(x^2 + y^2)$: result is $x^2 - y^2$. Recognizing repeated difference-of-squares patterns accelerates simplification.

18. B — For a rational function where numerator and denominator have the same degree, the horizontal asymptote is y = (leading coefficient of numerator)/(leading coefficient of denominator) = 2/1 = 2. The degrees must match for this rule to apply.

19. A — P(first red) = 6/10. After removing one red, P(second red) = 5/9. Joint probability = (6/10)(5/9) = 30/90 = 1/3. Without replacement, the second draw's probability depends on the first draw's outcome.

20. D — Rewrite 4 as 2^2: $(2^2)^x \cdot 2^{(x + 1)} = 2^{(2x)} \cdot 2^{(x + 1)} = 2^{(3x + 1)}$. Set equal to $128 = 2^7$: $3x + 1 = 7$, giving $x = 2$. Always convert to a common base before combining and equating exponents.

21. B — The midpoint formula averages both coordinates. If A = (1, 2) and midpoint = (3, 4), then B = (2(3) − 1, 2(4) − 2) = (5, 6). Doubling the midpoint and subtracting the known endpoint yields the other endpoint.

22. D — By the cofunction/supplement identity, $\cos(180° - \theta) = -\cos\theta$. This is a standard unit-circle reflection — angles in Quadrant II have cosine values with flipped signs compared to their reference angles.

23. A — Using intercepts (6, 0) and (0, −4), slope = (−4 − 0)/(0 − 6) = 2/3. With y-intercept −4: $y = (2/3)x - 4$. Always compute slope from the two intercepts before applying slope-intercept form.

24. C — Volume of cylinder = $\pi r^2 h$. Substitute: $400\pi = \pi(25)h$, giving h = 16 cm. Always divide by πr^2 first to isolate the height.

25. D — Same denominator, so subtract numerators: $[(2x - 1) - (x - 4)]/(x + 3) = (x + 3)/(x + 3) = 1$ for $x \neq -3$. Identical numerator and denominator always simplify to 1 within the allowed domain.

26. A — Surface area = $4\pi r^2 = 100\pi$, giving $r^2 = 25$ and $r = 5$. Volume = $(4/3)\pi r^3 = (4/3)\pi(125) = 500\pi/3$. Always find radius from surface area first, then substitute into the volume formula.

27. B — Continuous compounding formula: $A = Pe^{(rt)}$. Substitute: $A = 5000 \times e^{(0.04 \times 5)} = 5000 \times e^{0.2} \approx 5000 \times 1.2214 \approx \$6{,}107$. Continuous compounding produces slightly higher returns than annual compounding.

28. D — Evaluate inner function: $f(3) = 9$. Then $g(9) = 2(9) + 1 = 19$. Composition applies inside first; output becomes the new input. Always evaluate step-by-step to avoid sign or order errors.

29. C — Subtract 2: $5/x = 5$. Multiply both sides by x: $5 = 5x$, giving $x = 1$. Check: $5/1 + 2 = 7$. ✓ Clearing the fraction by multiplication is the standard method for single-fraction equations.

30. A — $x^2 + 10x + 25$ is a perfect square trinomial: $(x + 5)^2$. Side length = $\sqrt{(\text{area})} = x + 5$. The middle coefficient 10 equals 2(5), confirming the perfect square pattern with square root $x + 5$.