PRACTICE EXAM 22: ALEKS PPL SIMULATION

1. A train covers 360 miles in 4.5 hours. What is its average speed?

A. 72 mph

B. 85 mph

C. 80 mph

D. 90 mph

2. Simplify: $(x + 5)(x - 5) - x^2$.

A. -25

B. 25

C. 0

D. $x^2 - 25$

3. Solve: $-3(x + 2) = 9$.

A. $x = 1$

B. $x = 3$

C. $x = 9$

D. $x = -5$

4. What is the surface area of a cube with side length 5?

A. 25

B. 150

C. 75

D. 125

5. If 2^x = 1/8, what is x?

A. −3

B. 3

C. −1/3

D. 1/3

6. A circle has a radius of 4. What is its area? (Leave in terms of π.)

A. 16

B. 4π

C. 8π

D. 16π

7. Simplify: $x^5 \cdot x^{-2} \cdot x^{-1}$.

A. x^7

B. x^8

C. x^2

D. x^{-2}

8. Solve: $x^2 = 49$.

A. $x = 49$ only

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

C. $x = \pm 49$

D. $x = 7$ only

9. A function passes through (1, 5) and has slope 2. What is the equation in slope-intercept form?

A. $y = 2x + 5$

B. $y = 2x - 3$

C. $y = 2x + 7$

D. $y = 2x + 3$

10. What is log(1)?

A. 0

B. 1

C. 10

D. Undefined

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

A. $1/(x + 3)^2$

B. $1/(x + 3)$

C. $(x + 3)$

D. 1

12. A pentagon has all sides measuring 6 cm. What is its perimeter?

A. 24 cm

B. 36 cm

C. 48 cm

D. 30 cm

13. What is the domain of $f(x) = \sqrt{(x - 2)}$?

A. $x \geq 2$

B. $x > 2$

C. $x \leq 2$

D. $x < 2$

14. A rectangle with length 8 and width w has area 56. What is w?

A. 6.5

B. 8

C. 7

D. 7.5

15. Evaluate: $3^2 + 2(4 - 1)$.

A. 13

B. 15

C. 18

D. 20

16. A line has slope 0. The line is:

A. Horizontal

B. Vertical

C. Diagonal

D. Undefined

17. Simplify: $(3x^2y)^2 \cdot (2xy^3)$.

A. $18x^4y^5$

B. $6x^5y^5$

C. $9x^5y^5$

D. $18x^5y^5$

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

A. $x = 2$

B. $x = -2$

C. $x = -8$

D. $x = 8$

19. A triangle has sides 9, 12, 15. Is it a right triangle?

A. Yes ($9^2 + 12^2 = 15^2$)

B. No, sides not Pythagorean

C. No, 15 is not the longest side

D. Yes, because it is equilateral

20. What is cos(90°)?

A. 1

B. 0

C. −1

D. √2/2

21. Simplify: $(x^2 - 1)/(x - 1)$, assuming $x \neq 1$.

A. 1

B. $x - 1$

C. $x + 1$

D. $x + 1$ (duplicate concern)

21. Simplify: $(x^2 - 1)/(x - 1)$, assuming $x \neq 1$.

A. 1

B. $x^2 - 1$

C. $x - 1$

D. $x + 1$

22. A bag has 4 red and 6 blue marbles. What is the probability of drawing a red marble?

A. 2/5

B. 1/2

C. 3/5

D. 3/10

23. What is the midpoint of (0, 0) and (8, 6)?

A. (8, 6)

B. (4, 3)

C. (2, 3)

D. (4, 6)

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

A. 1

B. 3

C. 2

D. 4

25. A sphere has radius 3. What is its surface area? (Use π.)

A. 12π

B. 18π

C. 27π

D. 36π

26. Solve: $\sqrt{(x + 1)} = 4$.

A. $x = 15$

B. $x = 16$

C. $x = 17$

D. $x = 9$

27. What is the value of $\sin(30°) + \cos(60°)$?

A. 1/2

B. 1

C. $\sqrt{3}/2$

D. $\sqrt{2}$

28. A rectangular box has dimensions $2 \times 3 \times 6$. What is its volume?

A. 18

B. 72

C. 22

D. 36

29. Simplify: $\log(xy) - \log(x)$.

A. $\log(x)$

B. $\log(xy)$

C. $\log(y)$

D. $\log(y/x)$

30. Solve: $3(2x - 1) = 9$.

A. $x = 2$

B. $x = 1$

C. $x = 4$

D. $x = 3$

PRACTICE EXAM 22: ANSWER KEY AND EXPLANATIONS

1. C — 80 mph, calculated by dividing total distance by total time. Average speed equals distance divided by time when both are measured over the same interval: 360 miles ÷ 4.5 hours = 80 mph. Rate problems always require consistent units and use this basic distance-rate-time relationship to produce the correct average speed.

2. A — −25, resulting from the cancellation of squared terms in the difference of squares pattern. $(x + 5)(x - 5)$ expands to $x^2 - 25$; subtracting x^2 leaves only the constant −25. This illustrates the fundamental identity $(a + b)(a - b) = a^2 - b^2$, which constantly appears in algebraic simplification and radical rationalization on the ALEKS assessment.

3. D — $x = -5$, found by dividing both sides by −3 and then subtracting 2 from both sides. Distribute first if preferred: $-3x - 6 = 9$, giving $-3x = 15$ and $x = -5$. Always reverse the operations in the opposite order they were performed — here, division before subtraction — to isolate the variable cleanly.

4. B — 150, derived by applying the cube surface area formula $SA = 6s^2$. With side length 5, $SA = 6(25) = 150$ square units. A cube has six congruent square faces, each contributing s^2 to the total surface. This formula differs from volume (s^3) and rectangular prism surface area (which involves different edge lengths).

5. A — $x = -3$, because 1/8 can be rewritten as 2^{-3}, matching the base of 2. When bases match on both sides of an exponential equation, the exponents must be equal, so $x = -3$. Negative exponents always indicate reciprocals, and recognizing $1/2^n$ as 2^{-n} is critical for solving exponential equations without logarithms.

6. D — 16π, obtained by substituting $r = 4$ into the area formula πr^2. Area of a circle $= \pi(4)^2 = 16\pi$ square units. Always square the radius before multiplying by π. Keeping π symbolic preserves precision and is often preferred on the ALEKS assessment unless a decimal answer is requested.

7. C — x^2, produced by adding the three exponents using the product rule. Add: $5 + (-2) + (-1) = 2$, so $x^5 \cdot x^{-2} \cdot x^{-1} = x^2$. The product rule for exponents always adds exponents when multiplying like bases, and negative exponents are treated exactly like positive ones during addition.

8. B — $x = 7$ or $x = -7$, because taking the square root of both sides yields ±7. The equation $x^2 = 49$ has two solutions, both the positive and negative square root of 49. Always include both the positive and negative roots when using the square root method — dropping the negative solution loses half the answer and is a preventable error on the ALEKS.

9. D — $y = 2x + 3$, found using point-slope form and simplifying. Start with $y - 5 = 2(x - 1)$; distribute the slope: $y - 5 = 2x - 2$; add 5: $y = 2x + 3$. Point-slope form is the cleanest way to derive a line's equation when given a point and a slope. Always simplify to slope-intercept form for clear presentation.

10. A — 0, because log(1) always equals 0 regardless of the logarithm base. The definition $\log_b(1) = 0$ follows from the fact that $b^0 = 1$ for any base b. This identity is critical for simplification and equation-solving. The x-intercept of every logarithmic function occurs at $x = 1$.

11. B — $1/(x + 3)$, obtained by factoring the denominator as a perfect square and canceling one common factor. Denominator: $x^2 + 6x + 9 = (x + 3)^2$. So $(x + 3)/(x + 3)^2$ simplifies to $1/(x + 3)$. Always factor denominators completely before attempting cancellation — only factors connected by multiplication can be canceled.

12. D — 30 cm, calculated by multiplying the number of sides by the length of each side. A regular pentagon has 5 equal sides, so perimeter = $5 \times 6 = 30$ cm. Any regular polygon's perimeter equals the number of sides times the side length, making this a fundamental formula for equilateral shapes.

13. A — $x \geq 2$, determined by the requirement that the radicand be non-negative. The expression under a square root must satisfy $x - 2 \geq 0$, which gives $x \geq 2$. Domain restrictions for radicals always come from ensuring the radicand stays zero or positive in the real number system. At $x = 2$, the function equals zero — a valid output.

14. C — $w = 7$, derived from the rectangle area formula $A = lw$. Substituting: $8w = 56$, so $w = 7$. Dividing by the known length isolates the unknown width. Always verify by recomputing: $8 \times 7 = 56$. ✓

15. B — 15, found by applying PEMDAS in correct order: exponents first, then multiplication, then addition. $3^2 = 9$; $(4 - 1) = 3$; $2(3) = 6$; $9 + 6 = 15$. Always evaluate parentheses first when present, then exponents, then the remaining operations.

16. A — Horizontal, because a slope of 0 means y remains constant as x changes. Zero slope produces a flat line parallel to the x-axis with equation y = constant. Vertical lines have undefined slope (not zero). Recognizing the four slope types is essential for quickly identifying line behavior on the ALEKS.

17. D — $18x^5y^5$, obtained by squaring the first factor and multiplying by the second. $(3x^2y)^2 = 9x^4y^2$. Multiply by $2xy^3$: $9x^4y^2 \cdot 2xy^3 = 18x^{(4+1)} y^{(2+3)} = 18x^5y^5$. Always apply outer exponents before multiplying factors — this is a two-step procedure.

18. C — $x = -8$, obtained by distributing and then solving the resulting linear equation. $2x - 3x - 3 = 5 \rightarrow -x - 3 = 5 \rightarrow -x = 8 \rightarrow x = -8$. Always distribute through parentheses before combining like terms, and reverse the sign when dividing by a negative to isolate x.

19. A — Yes, because $9^2 + 12^2 = 15^2$, confirming the Pythagorean theorem. Calculation: $81 + 144 = 225 = 15^2$. The (9, 12, 15) triple is a multiple of the (3, 4, 5) triple. Recognizing Pythagorean triples eliminates the need for full calculation and is a time-saving skill on the ALEKS.

20. B — 0, because $\cos(90°) = 0$ from the unit-circle definition. The terminal side of a 90° angle lies along the positive y-axis, where the x-coordinate is 0. Cosine is always the x-coordinate on the unit circle, and memorizing the four quadrantal angle values is essential.

21. D — $x + 1$, obtained by factoring the numerator as a difference of squares and canceling. Numerator: $x^2 - 1 = (x + 1)(x - 1)$. Cancel $(x - 1)$: result is $x + 1$. Difference of squares is one of the most frequently tested factoring patterns on the ALEKS — recognize it instantly.

22. A — 2/5, derived by dividing favorable outcomes by total outcomes. Total marbles: $4 + 6 = 10$. Red marbles: 4. Probability $= 4/10 = 2/5$. Always simplify probability fractions to their lowest terms. Probability is always a number between 0 and 1.

23. B — (4, 3), calculated by averaging the x-coordinates and the y-coordinates separately. Midpoint $= ((0 + 8)/2, (0 + 6)/2) = (4, 3)$. The midpoint formula averages both coordinates independently — addition, not subtraction, distinguishes it from the distance formula.

24. C — 2, found by evaluating each function at $x = 2$ and subtracting. $f(2) = 2(2) - 1 = 3$; $g(2) = 2 + 3 = 5$. $(g - f)(2) = 5 - 3 = 2$. The order of operations matters: always evaluate each function individually before combining, and follow the sign convention of the operation carefully.

25. D — 36π, obtained by applying the sphere surface area formula $4\pi r^2$. With radius 3: $4\pi(9) = 36\pi$ square units. Squaring the radius before multiplying by 4π is the correct order. Surface area of a sphere uses the coefficient 4, while volume uses $(4/3)\pi r^3$ — distinguish between them.

26. A — $x = 15$, found by squaring both sides and then isolating x. $\sqrt{(x + 1)} = 4$ squares to $x + 1 = 16$, giving $x = 15$. Always verify radical-equation solutions in the original: $\sqrt{16} = 4$. ✓ Squaring can introduce extraneous solutions, so the check is non-negotiable.

27. B — 1, because $\sin(30°) = 1/2$ and $\cos(60°) = 1/2$, summing to 1. These are memorized unit-circle values at two of the standard first-quadrant angles. Cofunction identity confirms: $\sin(30°) = \cos(60°)$. Recognizing complementary sine-cosine relationships speeds up trig computation significantly.

28. D — 36, produced by multiplying all three dimensions of the rectangular box. Volume = length × width × height $= 2 \times 3 \times 6 = 36$ cubic units. Volume of a rectangular prism always equals the product of its three edge lengths, measured in cubic units.

29. C — $\log(y)$, obtained by applying the quotient law of logarithms. $\log(xy) - \log(x) = \log(xy/x) = \log(y)$. The x in the numerator and denominator cancels before the logarithm is applied. Always use the quotient law to collapse a difference of logs into a single log before further simplification.

30. A — $x = 2$, found by distributing the 3 and then isolating x. $6x - 3 = 9 \rightarrow 6x = 12 \rightarrow x = 2$. Always distribute through parentheses before adding or subtracting constants across the equation. Verify by substitution: $3(2(2) - 1) = 3(3) = 9$. ✓