Student PIN (4 digits): _____

Algebra Concepts Inventory

Instructions:

- Choose the best answer.
- Circle the letter which corresponds to your choice.
- You have 30 minutes to complete all the questions.
- If you don't know the answer to a question, skip it and come back to it later.
- The letters a, b, c, d, x, y all represent real numbers, not complex or imaginary numbers.
- **Your score on this test has no effect on your grade!**

1. If $ax = xa$ then $xa = ax$
   - A. always
   - B. sometimes
   - C. never
2. If $a < b$ then for any x, $ax < bx$.
   - A. always
   - B. sometimes
   - C. never
3. $a(bc) = (ab)c$
   - A. always
   - B. sometimes
   - C. never
4. $a + (-a) = 0$
   - A. always
   - B. sometimes
   - C. never
5. If $|x| < 4$ then
   - A. $x < 4$
   - B. $x > -4$
   - C. $x > 4$ OR $x < -4$
   - D. $x > -4$ OR $x < 4$
   - E. none of the above
6. $ab = ba$
   - A. always
   - B. sometimes
   - C. never
7. If $a \neq 0$, $a\left(\frac{1}{a}\right) = 1$
   - A. always
   - B. sometimes
   - C. never
8. $a - b = b - a$

A. always

B. sometimes

C. never

9. Suppose a and b are both positive. Is a/b less than 1?

A. yes, because it's a fraction

B. if $a < b$ it is

C. if $b < a$ it is

D. impossible to determine because we don't know what the numbers a and b are

10. $a + b = b + a$

A. always

B. sometimes

C. never

11. If $b \neq 0$ and $d \neq 0$, then $\dfrac{a}{b} + \dfrac{c}{d} = \dfrac{ad + bc}{bd}$

A. always

B. sometimes

C. never

12. Suppose $a \neq 1$, then $\dfrac{a + b}{a + c} = \dfrac{1 + b}{1 + c}$

A. always

B. sometimes

C. never

13. $(a + b)^2 =$

A. $a^2 + 2ab + b^2$

B. $a^2 + ab + b^2$

C. $a^2 + b^2$

D. $(a + b)(a - b)$

E. none of the above

14. $(x + y)(a + b) =$

A. $xa + yb$

B. $xb + ya$

C. $xa + xb + ya + yb$

D. $xa + 2xyab + yb$

E. none of the above

15. If $(x-a)(x-b)=0$ then
    A. $x=a$
    B. $x=b$
    C. $x=a$ OR $x=b$
    D. $x=a$ AND $x=b$
    E. none of the above

16. Suppose A, B, C are sets and that $f : A \to B$ and $g : B \to C$ are both invertible functions, then $(f \circ g)^{-1} =$
    A. $f \circ g^{-1}$
    B. $g \circ f^{-1}$
    C. $f^{-1} \circ g^{-1}$
    D. $g^{-1} \circ f^{-1}$
    E. none of the above

17. If $a=c$, then the solution of the equation $ax+b=cx+d$ contains
    A. exactly one point
    B. no points
    C. infinitely many points
    D. either B or C

18. The equation $ax^2+bx+c=0$ may have
    A. no real solutions
    B. exactly one real solution
    C. exactly two real solutions
    D. more than two real solutions
    E. either A, B, or C, but not D

19. The equation $ax^3+bx^2+cx+d=0$ is guaranteed to have
    A. no real solutions
    B. at least one real solution
    C. at least two real solutions
    D. at least three real solutions
    E. more than three real solutions

20. If $y=ax+b$ is the equation of a line, then the point $(0,b)$ lies on the graph of the line

A. always

B. sometimes

C. never

21. If $y = ax + b$ is the equation of a line, which point is guaranteed to lie on its graph?

A. $(-b/a, 0)$

B. $(a/b, 0)$

C. $(0, -b/a)$

D. $(0, a/b)$

E. none of the above

22. Given that the perimeter of a square is 120 feet, what is its area?

A. $120 ft^2$

B. $360 ft^2$

C. $480 ft^2$

D. $900 ft^2$

E. none of the above

23. Given that the perimeter of a rectangle is 120 feet, what is the possible range for its area, A in square feet?

A. $0 \leq A \leq 360$

B. $0 \leq A \leq 900$

C. $120 \leq A \leq 480$

D. $120 \leq A \leq 720$

E. there is insufficient information to determine the answer