SAT Math Sample Paper 08

MATHEMATICS SECTION PATTERN

- **Total Questions:** 44 Questions (22 per Module)
- **Time:** 70 Minutes Total (35 Minutes per Module)
- **Content:** Algebra, Advanced Math, Problem-Solving, Geometry/Trig.
- **Formats:** Multiple Choice and Student-Produced Response.

Module 1

1. A technician charges a base fee of \$40 plus \$60 per hour of work. If the technician worked h hours and charged a total of \$250, what is the value of h?

2. Which of the following is equivalent to $3x(x+4)+2(x+4)$?

(A) $(3x+2)(x+4)$
(B) $(3x+4)(x+2)$
(C) $3x^2+8$
(D) $5x+12$

3. The function f is defined by $f(x)=\frac{1}{2}x-7$. What is the x-intercept of the graph of f in the xy-plane?

(A) $(0,-7)$
(B) $(7,0)$
(C) $(14,0)$
(D) $(-14,0)$

4. If $x+y=10$ and $2x-y=8$, what is the value of x?

5. A rectangular garden has a perimeter of 48 feet. If the length is 4 feet longer than the width, what is the width of the garden in feet?

(A) 10
(B) 12
(C) 14
(D) 20

6. If $\sqrt{x+11}=5$, what is the value of x?

7. The population of a bacteria culture doubles every 4 hours. If the initial population is 200, which expression gives the population after t hours?

(A) $200(2)^{4t}$
(B) $200(2)^{t/4}$
(C) $200+2^{t/4}$
(D) $200(4)^{t}$

8. In a group of 40 students, 30% are in the band. If 8 more students who are NOT in the band join the group, what percentage of the total group is now in the band?

9. Which of the following equations represents a line that is parallel to $y=\frac{2}{3}x+5$ and passes through $(0,-2)$?

(A) $y = -\frac{3}{2}x - 2$
(B) $y = \frac{2}{3}x - 2$
(C) $y = \frac{3}{2}x + 2$
(D) $y = \frac{2}{3}x + 2$

10. If $|2x - 5| = 11$, and $x < 0$, what is the value of x?

11. A data set consists of 10 values with a mean of 25. If a new value of 47 is added to the set, what is the new mean?

(A) 26
(B) 27
(C) 28
(D) 30

12. A right triangle has a hypotenuse of 17 and one leg of 15. What is the length of the other leg?

13. If $\tan\theta = 1$ for an acute angle θ, what is the value of $\cos\theta$?

(A) 0.5
(B) 0.707
(C) 0.866
(D) 1

14. If $x^2 - 10x + c = 0$ has exactly one real solution, what is the value of c?

15. Which of the following is a factor of $x^2 + 2x - 24$?

(A) $x - 4$
(B) $x + 4$
(C) $x - 6$
(D) $x + 12$

16. A circle has an area of 64π. What is the circumference of the circle?

(A) 8π
(B) 16π
(C) 32π
(D) 64π

17. If $f(x) = x^2 - 3x$, what is the value of $f(x - 2)$?

18. The average of 5, 10, 15, 20, and k is 15. What is the value of k?

(A) 15
(B) 20
(C) 25
(D) 30

19. If $3^{2x} = 81$, what is the value of x?

20. A cylinder has a radius of 3 and a height of 5. What is the volume of the cylinder in terms of π?

(A) 15π
(B) 30π
(C) 45π
(D) 75π

21. What is the sum of the solutions to $(x-4)(x+9)=0$?

22. If $\sin(x^\circ)=\cos(52^\circ)$, what is the value of x?

(A) 38
(B) 52
(C) 90
(D) 128

Module 2

23. The function h is defined by $h(x) = ax^2 + 10$. If $h(2) = 22$, what is the value of $h(3)$?

(A) 31
(B) 37
(C) 46
(D) 54

24. A system of equations is given by $y = 3x - 5$ and $y = x^2 - x - 2$. At which x-coordinate do the two graphs intersect?

25. A circle in the xy-plane has the equation $x^2 + y^2 - 4x + 6y = 12$. What is the radius of the circle?

(A) 3
(B) 4
(C) 5
(D) 12

26. If $x + 2y = 10$ and $ax + 4y = 20$ has infinitely many solutions, what is the value of a?

27. A bag contains r red marbles and b blue marbles. The probability of picking a red marble is $1/3$. If there are 12 red marbles, what is the value of b?

(A) 18
(B) 24
(C) 36
(D) 48

28. If $\sqrt{2x + 7} = x + 2$, what is the value of x?

29. An equilateral triangle has a perimeter of 18. What is the area of the triangle?

(A) $9\sqrt{3}$
(B) $18\sqrt{3}$
(C) 36
(D) 54

30. If $f(x) = 2^x + 5$, what is the value of x for which $f(x) = 37$?

31. A researcher found that 40% of residents in a city walk to work, with a margin of error of 3%. Which of the following is a plausible value for the percentage of residents who walk to work?

(A) 36%
(B) 38%
(C) 44%
(D) 45%

32. What is the sum of the solutions to $2x^2 - 12x + 10 = 0$?

33. If $\cos\theta = \frac{5}{13}$ for an acute angle θ, what is the value of $\tan\theta$?

(A) 5/12
(B) 12/13
(C) 12/5
(D) 13/5

34. A cylinder has a volume of 72π. If the height is 8, what is the radius?

35. If $g(x) = \frac{x-4}{x+2}$, for what value of x is $g(x) = 0$?

(A) -2
(B) 0
(C) 2
(D) 4

36. A square is inscribed in a circle with a diameter of 10. What is the area of the square?

37. If $x^2 - y^2 = 24$ and $x - y = 4$, what is the value of $x + y$?

(A) 4
(B) 6
(C) 8
(D) 12

38. A population of birds increases by 10% every year. If the population in 2020 was 500, what is the population in 2022?

39. If $|x + 2| + 5 = 2$, how many real solutions exist for x?

(A) 0
(B) 1
(C) 2
(D) Infinitely many

40. What is the y-coordinate of the vertex of $y = x^2 - 6x + 5$?

41. In the xy-plane, the line L is perpendicular to $y = 2x + 3$ and passes through $(4, 10)$. What is the y-intercept of L?

(A) 8
(B) 10
(C) 12
(D) 14

42. If $x^3 - 4x = 0$, what is the sum of all possible values of x?

43. A rectangular box has dimensions 3, 4, and 12. What is the length of the diagonal connecting opposite corners?

(A) 13
(B) 15
(C) 17
(D) 19

44. If $\sin(x + 10)^\circ = \cos(x)^\circ$, what is the value of x?

(A) 35
(B) 40
(C) 45
(D) 50

Answers and Detailed Solutions

1. **3.5**
   Sol: $40 + 60h = 250 \Rightarrow 60h = 210 \Rightarrow h = 3.5$.
2. **A**
   Sol: Factor out $(x + 4)$ to get $(3x + 2)(x + 4)$.
3. **C**
   Sol: $0 = 0.5x - 7 \Rightarrow 0.5x = 7 \Rightarrow x = 14$.
4. **6**
   Sol: Adding equations: $3x = 18 \Rightarrow x = 6$.
5. **A**
   Sol: $2(w + w + 4) = 48 \Rightarrow 4w + 8 = 48 \Rightarrow 4w = 40 \Rightarrow w = 10$.
6. **14**
   Sol: $x + 11 = 25 \Rightarrow x = 14$.
7. **B**
   Sol: $P = P_0(2)^{t/d}$ where d is the doubling period.
8. **25%**
   Sol: Initial band = 12. New total = 48. $12/48 = 0.25$.
9. **B**
   Sol: Parallel lines have the same slope $2/3$.
10. **-3**
    Sol: $2x - 5 = -11 \Rightarrow 2x = -6 \Rightarrow x = -3$.
11. **B**
    Sol: New sum $= 250 + 47 = 297$. New mean $= 297/11 = 27$.
12. **8**
    Sol: $\sqrt{17^2 - 15^2} = \sqrt{289 - 225} = 8$.
13. **B**
    Sol: $\tan\theta = 1$ at $45°$. $\cos(45°) = \sqrt{2}/2 \approx 0.707$.
14. **25**
    Sol: $b^2 - 4ac = 100 - 4c = 0 \Rightarrow c = 25$.
15. **A**
    Sol: $(x + 6)(x - 4) = x^2 + 2x - 24$.
16. **B**
    Sol: $r = 8$. $C = 2\pi(8) = 16\pi$.
17. $x^2 - 7x + 10$
    Sol: $(x - 2)^2 - 3(x - 2) = x^2 - 4x + 4 - 3x + 6$.
18. **C**
    Sol: $5 + 10 + 15 + 20 + k = 75 \Rightarrow 50 + k = 75 \Rightarrow k = 25$.
19. **2**
    Sol: $3^{2x} = 3^4 \Rightarrow 2x = 4 \Rightarrow x = 2$.
20. **C**
    Sol: $V = \pi(3^2)(5) = 45\pi$.
21. **-5**
    Sol: Solutions are 4 and -9. Sum $= -5$.
22. **A**
    Sol: $\sin x = \cos(90 - x) \Rightarrow x = 90 - 52 = 38$.
23. **B**
    Sol: $h(2) = 4a + 10 = 22 \Rightarrow a = 3$. $h(3) = 3(9) + 10 = 37$.
24. **1 or 3**
    Sol: $3x - 5 = x^2 - x - 2 \Rightarrow x^2 - 4x + 3 = 0 \Rightarrow (x - 1)(x - 3) = 0$.
25. **5**

Sol: $(x-2)^2+(y+3)^2 = 12+4+9 = 25$. Radius $= 5$.

26. **2**
Sol: Equations must be multiples: $a/1 = 4/2 = 20/10$. So $a = 2$.

27. **24**
Sol: $12/(12+b) = 1/3 \Rightarrow 36 = 12+b \Rightarrow b = 24$.

28. **1**
Sol: $2x+7 = (x+2)^2 = x^2+4x+4 \Rightarrow x^2+2x-3 = 0 \Rightarrow x = 1$.

29. **A**
Sol: Side $= 18/3 = 6$. Area $= (6^2\sqrt{3})/4 = 9\sqrt{3}$.

30. **5**
Sol: $2^x = 32 \Rightarrow x = 5$.

31. **B**
Sol: Range is $40 \pm 3 = [37, 43]$. 38% is plausible.

32. **6**
Sol: Sum of roots $= -b/a = -(-12)/2 = 6$.

33. **C**
Sol: Opp $= \sqrt{13^2-5^2} = 12$. $\tan = 12/5$.

34. **3**
Sol: $72\pi = \pi r^2(8) \Rightarrow r^2 = 9 \Rightarrow r = 3$.

35. **D**
Sol: $x-4 = 0 \Rightarrow x = 4$.

36. **50**
Sol: Diagonal $= 10$. Area $= d^2/2 = 100/2 = 50$.

37. **B**
Sol: $(x+y)(x-y) = 24 \Rightarrow (x+y)(4) = 24 \Rightarrow x+y = 6$.

38. **605**
Sol: $500(1.1)^2 = 500(1.21) = 605$.

39. **A**
Sol: Absolute value cannot equal -3. Zero real solutions.

40. **-4**
Sol: Vertex $x = -(-6)/2 = 3$. $y = 3^2-18+5 = -4$.

41. **C**
Sol: Slope $= -0.5$. $10 = -0.5(4)+b \Rightarrow 10 = -2+b \Rightarrow b = 12$.

42. **0**
Sol: $x(x^2-4) = x(x-2)(x+2)$. Sum $= 0+2+(-2) = 0$.

43. **13**
Sol: $\sqrt{3^2+4^2+12^2} = \sqrt{169} = 13$.

44. **B**
Sol: $(x+10)+x = 90 \Rightarrow 2x = 80 \Rightarrow x = 40$.