

SAT Math Sample Paper 02

MATHEMATICS SECTION PATTERN

- **Total Questions:** 44 Questions
- **Modules:** 2 Modules (22 Questions each)
- **Time:** 70 Minutes Total (35 Minutes per Module)
- **Content Areas:** Algebra, Advanced Math, Problem-Solving and Data Analysis, Geometry and Trigonometry.
- **Question Formats:** Multiple Choice and Student-Produced Response.

Module 1

1. If $4x + 8 = 32$, what is the value of $x + 2$?
(A) 6
(B) 8
(C) 10
(D) 12
2. A line in the xy -plane has a slope of -3 and passes through the point $(0, 4)$. Which of the following is an equation of the line?
(A) $y = 4x - 3$
(B) $y = -3x + 4$
(C) $y = 3x + 4$
(D) $y = -\frac{1}{3}x + 4$
3. The function f is defined by $f(x) = \frac{3}{4}x - 2$. What is the value of $f(12)$?
4. A baker uses 3 cups of flour to make 12 muffins. At this rate, how many cups of flour are needed to make 40 muffins?
(A) 8
(B) 10
(C) 12
(D) 15
5. If 15% of a number n is 45, what is the value of n ?
6. In a right triangle, the length of the hypotenuse is 10 and the length of one leg is 8. What is the length of the other leg?
(A) 2
(B) 4
(C) 6
(D) 8
7. Which of the following expressions is equivalent to $2(3x^2 - 4x) + 5(x^2 + 2x)$?

- (A) $11x^2 + 2x$
- (B) $11x^2 - 2x$
- (C) $11x^2 + 6x$
- (D) $7x^2 + 2x$

8. If $a - 3b = 10$ and $b = 2$, what is the value of a ?

9. A circle has a center at $(3, -4)$ and a radius of 6. Which of the following is the equation of the circle?

- (A) $(x - 3)^2 + (y + 4)^2 = 6$
- (B) $(x + 3)^2 + (y - 4)^2 = 36$
- (C) $(x - 3)^2 + (y + 4)^2 = 36$
- (D) $(x - 3)^2 + (y - 4)^2 = 36$

10. The average (mean) of four numbers is 15. If the sum of three of the numbers is 40, what is the fourth number?

11. If $x^2 - 9 = 0$, what are all possible values of x ?

- (A) 3 only
- (B) -3 only
- (C) 3 and -3
- (D) 9 and -9

12. A store sells notebooks for \$2.50 each and pens for \$1.50 each. If a customer buys n notebooks and p pens for a total of \$20, which equation represents this situation?

- (A) $1.50n + 2.50p = 20$
- (B) $2.50n + 1.50p = 20$
- (C) $4(n + p) = 20$
- (D) $2.50n - 1.50p = 20$

13. In the xy -plane, the graph of $y = 2x + 6$ has an x -intercept at $(a, 0)$. What is the value of a ?

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

- (A) 9
- (B) 11
- (C) 12
- (D) 15

15. If $\cos(x^\circ) = \sin(50^\circ)$ and $0 < x < 90$, what is the value of x ?

16. A rectangular prism has a length of 5, a width of 4, and a height of 10. What is the volume of the prism?

- (A) 20
- (B) 40
- (C) 100
- (D) 200

17. If $3(x + 2) - x = 10$, what is the value of x ?

18. Which of the following points (x, y) is a solution to the system $y > 2x + 1$ and $y < 5$?

- (A) $(0, 0)$
- (B) $(1, 2)$
- (C) $(1, 4)$
- (D) $(3, 10)$

19. A bag contains 12 red marbles and 8 blue marbles. If one marble is drawn at random, what is the probability that it is blue?

20. If $x^2 + 6x + 9 = 0$, what is the value of x ?

- (A) 3
- (B) -3
- (C) 0
- (D) 9

21. What is the slope of a line that is perpendicular to the line $y = 2x + 5$?

22. If $g(x) = 3x^2 - 1$, what is the value of $g(-2)$?

- (A) -13
- (B) -11
- (C) 11
- (D) 13

Module 2

23. If $x + y = 10$ and $x - y = 6$, what is the value of $x^2 - y^2$?
- (A) 16
(B) 36
(C) 60
(D) 100
24. A population of insects triples every 4 days. If the initial population is 100, which of the following functions $P(t)$ models the population after t days?
- (A) $P(t) = 100(3)^t$
(B) $P(t) = 100(3)^{4t}$
(C) $P(t) = 100(3)^{t/4}$
(D) $P(t) = 100 + 3^{t/4}$
25. If $\sqrt{3x - 2} = 5$, what is the value of x ?
26. Which of the following is equivalent to $\frac{x^2 - 16}{x + 4}$ for $x \neq -4$?
- (A) $x - 4$
(B) $x + 4$
(C) $x - 16$
(D) 4
27. A right triangle has a side of 5 and an hypotenuse of 13. What is the value of the sine of the angle opposite the side of length 5?
- (A) $5/12$
(B) $12/13$
(C) $5/13$
(D) $13/5$
28. If $f(x) = x^2 - 4x + 7$, what is the vertex of the parabola?
- (A) (2, 3)
(B) (2, 7)
(C) (-2, 19)
(D) (4, 7)
29. If $2^{x-3} = 16$, what is the value of x ?
30. A circle in the xy -plane is defined by $x^2 + y^2 - 4x + 6y = 3$. What is the radius of the circle?
- (A) 3
(B) 4
(C) 13
(D) 16
31. If $3x + 2y = 12$ and $y = 3$, what is the value of x ?
32. The average of a set of 6 numbers is 25. When a 7th number is added, the new average is 27. What is the value of the 7th number?

- (A) 27
- (B) 31
- (C) 39
- (D) 41

33. In the xy -plane, the line L passes through $(1, 2)$ and is parallel to $y = 3x - 5$. What is the y -intercept of line L ?

34. If $x^2 + kx + 16 = 0$ has exactly one real solution and $k > 0$, what is the value of k ?

- (A) 4
- (B) 8
- (C) 16
- (D) 32

35. A cylinder has a radius of r and a height of $2r$. If the volume of the cylinder is 54π , what is the value of r ?

36. If $|2x - 4| + 6 = 10$, what is the sum of all possible values of x ?

- (A) 0
- (B) 2
- (C) 4
- (D) 8

37. The function h is defined by $h(x) = \frac{x+2}{x-1}$. For what value of x is $h(x) = 0$?

38. Which of the following is an equation of a line with no y -intercept?

- (A) $y = 0$
- (B) $x = 5$
- (C) $y = x$
- (D) $x + y = 0$

39. A cone has a radius of 3 and a height of 4. What is the slant height of the cone?

40. If $f(x) = 3x - 5$, what is $f(2x + 1)$?

- (A) $6x - 2$
- (B) $6x - 4$
- (C) $6x - 5$
- (D) $6x + 3$

41. A square is inscribed in a circle with a radius of 5. What is the area of the square?

42. If $x + 2y = 10$ and $3x + 6y = k$, for what value of k will the system have infinitely many solutions?

- (A) 10
- (B) 20
- (C) 30
- (D) 60

43. If $\tan \theta = 1$ and $0 < \theta < 90$, what is the value of θ in degrees?

44. A researcher found that the mean score of a group was 80 with a margin of error of 3. Which of the following scores is outside the range of likely mean scores?

- (A) 77
- (B) 79
- (C) 81
- (D) 84

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Answers and Detailed Solutions

1. **B**
Sol: $4x = 24 \Rightarrow x = 6$. Then $6 + 2 = 8$.
2. **B**
Sol: Use $y = mx + b$ with $m = -3$ and $b = 4$.
3. **7**
Sol: $f(12) = \frac{3}{4}(12) - 2 = 9 - 2 = 7$.
4. **B**
Sol: Ratio $\frac{3}{12} = \frac{x}{40} \Rightarrow \frac{1}{4} = \frac{x}{40} \Rightarrow x = 10$.
5. **300**
Sol: $0.15n = 45 \Rightarrow n = 45/0.15 = 300$.
6. **C**
Sol: Pythagorean theorem: $a^2 + 8^2 = 10^2 \Rightarrow a^2 = 36 \Rightarrow a = 6$.
7. **A**
Sol: $6x^2 - 8x + 5x^2 + 10x = 11x^2 + 2x$.
8. **16**
Sol: $a - 3(2) = 10 \Rightarrow a - 6 = 10 \Rightarrow a = 16$.
9. **C**
Sol: Equation is $(x - h)^2 + (y - k)^2 = r^2$. Sub $(3, -4)$ and $6^2 = 36$.
10. **20**
Sol: Sum $= 4 \times 15 = 60$. Fourth number $= 60 - 40 = 20$.
11. **C**
Sol: $x^2 = 9 \Rightarrow x = \pm 3$.
12. **B**
Sol: Price per item $\times$ quantity: $2.50n + 1.50p = 20$.
13. **-3**
Sol: $0 = 2a + 6 \Rightarrow 2a = -6 \Rightarrow a = -3$.
14. **B**
Sol: $f(3) = 2^3 + 3 = 8 + 3 = 11$.
15. **40**
Sol: $\cos(x) = \sin(90 - x)$, so $x = 90 - 50 = 40$.
16. **D**
Sol: $V = l \times w \times h = 5 \times 4 \times 10 = 200$.
17. **2**
Sol: $3x + 6 - x = 10 \Rightarrow 2x = 4 \Rightarrow x = 2$.
18. **C**
Sol: $4 > 2(1) + 1 \Rightarrow 4 > 3$ (True) and $4 < 5$ (True).
19. **0.4**
Sol: Total $= 20$. Blue $= 8$. Probability $= 8/20 = 0.4$.

20. **B**

Sol: $(x + 3)^2 = 0 \Rightarrow x = -3.$

21. **-0.5**

Sol: Perpendicular slope is the negative reciprocal of 2, which is $-1/2$.

22. **11**

Sol: $3(-2)^2 - 1 = 3(4) - 1 = 11.$

23. **C**

Sol: $x^2 - y^2 = (x + y)(x - y) = 10 \times 6 = 60.$

24. **C**

Sol: Exponential growth $P_0(r)^{t/d}$. Here $r = 3, d = 4$.

25. **9**

Sol: $3x - 2 = 25 \Rightarrow 3x = 27 \Rightarrow x = 9.$

26. **A**

Sol: $\frac{(x-4)(x+4)}{x+4} = x - 4.$

27. **C**

Sol: $\sin = \text{opp/hyp} = 5/13.$

28. **A**

Sol: $x = -b/2a = 4/2 = 2.$ $y = 2^2 - 4(2) + 7 = 3.$ Vertex $(2, 3).$

29. **7**

Sol: $x - 3 = 4$ (since $2^4 = 16$), so $x = 7.$

30. **B**

Sol: $(x - 2)^2 + (y + 3)^2 = 3 + 4 + 9 = 16.$ Radius $= \sqrt{16} = 4.$

31. **2**

Sol: $3x + 2(3) = 12 \Rightarrow 3x = 6 \Rightarrow x = 2.$

32. **39**

Sol: Sum 6 = 150. Sum 7 = 189. $189 - 150 = 39.$

33. **-1**

Sol: $y - 2 = 3(x - 1) \Rightarrow y = 3x - 1.$ y-intercept is $-1.$

34. **B**

Sol: $k^2 - 4(1)(16) = 0 \Rightarrow k^2 = 64 \Rightarrow k = 8.$

35. **3**

Sol: $\pi r^2(2r) = 54\pi \Rightarrow 2r^3 = 54 \Rightarrow r^3 = 27 \Rightarrow r = 3.$

36. **4**

Sol: $|2x - 4| = 4.$ $2x - 4 = 4 \Rightarrow x = 4;$ $2x - 4 = -4 \Rightarrow x = 0.$ Sum = 4.

37. **-2**

Sol: Set numerator $x + 2 = 0 \Rightarrow x = -2.$

38. **B**

Sol: Vertical lines $x = c$ never cross the y-axis (unless $x = 0$).

39. **5**

Sol: $l = \sqrt{r^2 + h^2} = \sqrt{3^2 + 4^2} = 5.$

40. **A**

Sol: $3(2x + 1) - 5 = 6x + 3 - 5 = 6x - 2.$

41. **50**

Sol: Square diagonal = diameter = 10. Area = $d^2/2 = 100/2 = 50.$

42. **C**

Sol: Multiply 1st eq by 3: $3x + 6y = 30.$ So $k = 30.$

43. **45**

Sol: $\tan(45^\circ) = 1.$

44. **D**

Sol: Range is $80 \pm 3 = [77, 83].$ 84 is outside this range.

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