

SAT Math Sample Paper 03

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 $5x + 15 = 40$, what is the value of $x - 2$?
(A) 3
(B) 5
(C) 7
(D) 10
2. A line in the xy -plane passes through $(0, -2)$ and has a slope of 5. Which of the following is the equation of the line?
(A) $y = -2x + 5$
(B) $y = 5x - 2$
(C) $y = 5x + 2$
(D) $y = \frac{1}{5}x - 2$
3. If $f(x) = 3x^2 - 4$, what is the value of $f(2)$?
4. A bag contains 20 marbles: 8 are red, 7 are blue, and 5 are green. If one marble is drawn at random, what is the probability that it is blue?
(A) 0.25
(B) 0.35
(C) 0.40
(D) 0.75
5. The function $P(t) = 500(1.08)^t$ models the population of a town t years after 2010. By what percentage does the population increase each year?
6. Which of the following is equivalent to $4(x + 2) - 3(x - 1)$?
(A) $x + 5$
(B) $x + 11$
(C) $x - 1$
(D) $7x + 5$
7. If $a + 2b = 18$ and $a = 4$, what is the value of b ?

8. A right triangle has legs of length 5 and 12. What is the length of the hypotenuse?
- (A) 13
(B) 15
(C) 17
(D) 20
9. Which of the following is the equation of a circle with center $(2, 3)$ and radius 4?
- (A) $(x + 2)^2 + (y + 3)^2 = 16$
(B) $(x - 2)^2 + (y - 3)^2 = 4$
(C) $(x - 2)^2 + (y - 3)^2 = 16$
(D) $(x + 2)^2 + (y + 3)^2 = 4$
10. If $\frac{x}{3} + \frac{x}{2} = 10$, what is the value of x ?
11. The average (mean) of five numbers is 12. If four of the numbers are 8, 10, 14, and 16, what is the fifth number?
- (A) 8
(B) 10
(C) 12
(D) 14
12. If $\sin(x^\circ) = \cos(20^\circ)$, what is the value of x ?
13. A rectangular field has a perimeter of 60 meters. If the length is 20 meters, what is the width of the field?
- (A) 10
(B) 20
(C) 30
(D) 40
14. If $y = x^2 - 6x + 8$, what are the x -intercepts of the graph?
- (A) $(2, 0)$ and $(4, 0)$
(B) $(-2, 0)$ and $(-4, 0)$
(C) $(2, 0)$ and $(-4, 0)$
(D) $(0, 8)$
15. If $|2x - 4| = 12$, what is the positive solution for x ?
16. A cylinder has a radius of 2 and a height of 10. What is the volume in terms of π ?
- (A) 20π
(B) 40π
(C) 80π
(D) 100π
17. If $2x - 3y = 6$ and $y = 2$, what is the value of x ?
18. The scatterplot of a data set shows a strong positive linear correlation. Which of the following could be the slope of the line of best fit?

- (A) -2.5
- (B) -0.1
- (C) 0.8
- (D) 5.0 (with no context)

19. What is the value of $2^5 - 3^2$?

20. A square has an area of 49. What is its perimeter?

- (A) 14
- (B) 28
- (C) 35
- (D) 49

21. If $h(x) = \sqrt{x+7}$, what is the value of x when $h(x) = 5$?

22. Which of the following lines is parallel to $y = 3x - 4$?

- (A) $y = -3x + 2$
- (B) $y = 3x + 10$
- (C) $y = \frac{1}{3}x - 4$
- (D) $y = -\frac{1}{3}x + 4$

Module 2

23. If $x^2 + y^2 = 100$ and $(x + y)^2 = 144$, what is the value of xy ?
- (A) 22
(B) 24
(C) 44
(D) 48
24. A line passes through $(1, 3)$ and $(2, 7)$. What is the y -intercept of the line?
25. If $x > 0$ and $2x^2 - 32 = 0$, what is the value of x ?
26. Which of the following is a factor of $x^3 - 4x$?
- (A) $x - 4$
(B) $x + 4$
(C) $x - 2$
(D) $x + 1$
27. If $3^{x+2} = 27^x$, what is the value of x ?
- (A) 1
(B) 2
(C) 3
(D) 4
28. A circle is defined by $x^2 + y^2 - 6x + 8y = 0$. What is the radius of the circle?
29. The ratio of x to y is 3 to 4. If $2x + y = 30$, what is the value of y ?
- (A) 8
(B) 10
(C) 12
(D) 15
30. A right triangle has a hypotenuse of 25 and one leg of 7. What is the value of the sine of the angle opposite the leg of length 7?
31. If $f(x) = (x - h)^2 + 5$ has a vertex at $(3, 5)$, what is the value of $f(1)$?
- (A) 7
(B) 9
(C) 11
(D) 13
32. If $ax + 5 = 2x - 3$ has no solution, what is the value of a ?
33. A container holds 500 mL of a 10% salt solution. How many mL of salt are in the container?
- (A) 5
(B) 50
(C) 100
(D) 450

34. What is the sum of the solutions to $x^2 + 8x - 20 = 0$?
35. A sphere has a surface area of 36π . What is the radius of the sphere? (Surface Area = $4\pi r^2$)
- (A) 3
(B) 6
(C) 9
(D) 12
36. If $g(x) = \frac{x+4}{x-2}$, for what value of x is $g(x)$ undefined?
37. In the xy -plane, point $(k, 5)$ lies on the line $y = 2x - 7$. What is the value of k ?
- (A) 1
(B) 3
(C) 6
(D) 12
38. If $\tan \theta = \frac{5}{12}$, what is the value of $\cos \theta$ if θ is an acute angle?
39. A population P decreases by 15% each year. If the initial population is 2000, which expression represents the population after 3 years?
- (A) $2000(0.85)^3$
(B) $2000(0.15)^3$
(C) $2000(1.15)^3$
(D) $2000 - 0.15(3)$
40. If $|x + 2| + 5 = 3$, what is the number of real solutions for x ?
41. The average of x , y , and z is 10. If $x + y = 14$, what is the value of z ?
- (A) 10
(B) 14
(C) 16
(D) 30
42. A square has a diagonal of 10. What is the area of the square?
43. Which of the following is equivalent to $\frac{x^2-1}{x-1}$ for $x \neq 1$?
- (A) $x - 1$
(B) $x + 1$
(C) x
(D) 1
44. If $x + y = 5$ and $2x + 2y = k$ has infinitely many solutions, what is the value of k ?

Answers and Detailed Solutions

1. **A**
Sol: $5x = 25 \Rightarrow x = 5$. Then $5 - 2 = 3$.
2. **B**
Sol: $y = mx + b \Rightarrow y = 5x - 2$.
3. **8**
Sol: $f(2) = 3(2^2) - 4 = 12 - 4 = 8$.
4. **B**
Sol: Total = 20. Blue = 7. $7/20 = 0.35$.
5. **8**
Sol: In ab^t , $b = 1 + r$. $1.08 = 1 + 0.08$, which is 8%.
6. **B**
Sol: $4x + 8 - 3x + 3 = x + 11$.
7. **7**
Sol: $4 + 2b = 18 \Rightarrow 2b = 14 \Rightarrow b = 7$.
8. **A**
Sol: $c = \sqrt{5^2 + 12^2} = \sqrt{169} = 13$.
9. **C**
Sol: $(x - h)^2 + (y - k)^2 = r^2 \Rightarrow (x - 2)^2 + (y - 3)^2 = 16$.
10. **12**
Sol: $(2x + 3x)/6 = 10 \Rightarrow 5x = 60 \Rightarrow x = 12$.
11. **C**
Sol: Total sum = $5 \times 12 = 60$. $60 - (8 + 10 + 14 + 16) = 60 - 48 = 12$.
12. **70**
Sol: $\sin(x) = \cos(90 - x) \Rightarrow x = 90 - 20 = 70$.
13. **A**
Sol: $2(20 + w) = 60 \Rightarrow 20 + w = 30 \Rightarrow w = 10$.
14. **A**
Sol: $(x - 2)(x - 4) = 0 \Rightarrow x = 2, 4$.
15. **8**
Sol: $2x - 4 = 12 \Rightarrow 2x = 16 \Rightarrow x = 8$.
16. **B**
Sol: $V = \pi r^2 h = \pi(2^2)(10) = 40\pi$.
17. **6**
Sol: $2x - 3(2) = 6 \Rightarrow 2x = 12 \Rightarrow x = 6$.
18. **C**
Sol: Positive linear correlation requires a positive slope. 0.8 is the only logical choice.
19. **23**
Sol: $32 - 9 = 23$.

20. **B***Sol:* $s = \sqrt{49} = 7$. Perimeter $= 4 \times 7 = 28$.21. **18***Sol:* $\sqrt{x+7} = 5 \Rightarrow x+7 = 25 \Rightarrow x = 18$.22. **B***Sol:* Parallel lines have the same slope (3).23. **A***Sol:* $(x+y)^2 = x^2 + y^2 + 2xy \Rightarrow 144 = 100 + 2xy \Rightarrow 2xy = 44 \Rightarrow xy = 22$.24. **-1***Sol:* $m = (7-3)/(2-1) = 4$. $3 = 4(1) + b \Rightarrow b = -1$.25. **4***Sol:* $2x^2 = 32 \Rightarrow x^2 = 16 \Rightarrow x = 4$.26. **C***Sol:* $x(x^2 - 4) = x(x-2)(x+2)$.27. **A***Sol:* $x+2 = 3x \Rightarrow 2 = 2x \Rightarrow x = 1$.28. **5***Sol:* $(x-3)^2 + (y+4)^2 = 0 + 9 + 16 = 25$. $r = \sqrt{25} = 5$.29. **C***Sol:* $x = 0.75y \Rightarrow 2(0.75y) + y = 30 \Rightarrow 2.5y = 30 \Rightarrow y = 12$.30. **0.28***Sol:* $\sin \theta = \text{opp/hyp} = 7/25 = 0.28$.31. **B***Sol:* $f(1) = (1-3)^2 + 5 = 4 + 5 = 9$.32. **2***Sol:* No solution if slopes are equal: $a = 2$.33. **B***Sol:* $0.10 \times 500 = 50$.34. **-8***Sol:* Sum of roots $= -b/a = -8/1 = -8$.35. **A***Sol:* $4\pi r^2 = 36\pi \Rightarrow r^2 = 9 \Rightarrow r = 3$.36. **2***Sol:* $x-2 = 0 \Rightarrow x = 2$.37. **C***Sol:* $5 = 2k - 7 \Rightarrow 12 = 2k \Rightarrow k = 6$.38. **12/13***Sol:* Hypotenuse $\sqrt{5^2 + 12^2} = 13$. $\cos \theta = \text{adj/hyp} = 12/13$.39. **A***Sol:* Decay is $P_0(1-r)^t \Rightarrow 2000(1-0.15)^3 = 2000(0.85)^3$.

40. **0***Sol:* $|x + 2| = -2$. Absolute value cannot be negative.41. **C***Sol:* $(x + y + z)/3 = 10 \Rightarrow 14 + z = 30 \Rightarrow z = 16$.42. **50***Sol:* Area = $d^2/2 = 100/2 = 50$.43. **B***Sol:* $\frac{(x-1)(x+1)}{x-1} = x + 1$.44. **10***Sol:* Lines are identical if $k = 2(5) = 10$.
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