

SAT Math Sample Paper 09

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. A rental car company charges a flat fee of \$45.00 plus \$0.20 per mile driven. If a customer's total bill was \$95.00, how many miles did the customer drive?
(A) 200
(B) 250
(C) 300
(D) 500
2. If $4x + 15 = 7x - 9$, what is the value of x ?
3. Which of the following is equivalent to the expression $2(x^2 - 3x) + 3(x^2 + 4x)$?
(A) $5x^2 + x$
(B) $5x^2 + 6x$
(C) $5x^2 + 10x$
(D) $5x^2 - 6x$
4. The function f is defined by $f(x) = x^2 - 5x + 4$. What is the value of $f(-2)$?
(A) -10
(B) -2
(C) 10
(D) 18
5. A circle in the xy -plane has its center at $(-3, 5)$ and passes through the point $(1, 5)$. What is the equation of the circle?
6. A researcher found that the population of a certain colony of ants doubles every 6 days. If the initial population is 500, which of the following expressions represents the population after t days?
(A) $500(2)^{6t}$
(B) $500(2)^{t/6}$
(C) $500 + 2^{t/6}$
(D) $500(6)^t$
7. In a right triangle, one angle measures x° where $\cos(x) = \frac{4}{5}$. What is the value of $\sin(x)$?
(A) 0.6
(B) 0.75

- (C) 0.8
- (D) 1.25

8. If $3a + 2b = 24$ and $a = 2b$, what is the value of a ?

9. A data set consists of the numbers 12, 15, 15, 18, 20, 22. If the number 40 is added to the set, which of the following will increase the most?

- (A) Mean
- (B) Median
- (C) Mode
- (D) Range

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

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

11. A store is having a sale where all items are 30% off. If the sale price of a jacket is \$56.00, what was the original price of the jacket?

12. Which of the following lines is parallel to $y = -4x + 7$?

- (A) $y = 4x + 7$
- (B) $y = -4x - 10$
- (C) $y = \frac{1}{4}x + 7$
- (D) $y = -\frac{1}{4}x + 2$

13. If $f(x) = \sqrt{x+9}$, for what value of x is $f(x) = 7$?

14. A cylinder has a radius of 5 and a height of 8. What is the surface area of the cylinder in terms of π ?

- (A) 80π
- (B) 100π
- (C) 130π
- (D) 150π

15. If $x^2 + 12x + k = 0$ has exactly one real solution, what is the value of k ?

- (A) 6
- (B) 12
- (C) 36
- (D) 144

16. A bag contains 4 red, 6 blue, and 10 green marbles. If a marble is chosen at random, what is the probability that it is blue?

17. Given $g(x) = 2x - 3$ and $h(x) = x^2$, what is the value of $h(g(4))$?

- (A) 5
- (B) 10
- (C) 25
- (D) 49

18. In the xy -plane, what is the y -intercept of the line $3x - 5y = 15$?

- (A) 3
- (B) -3
- (C) 5
- (D) -5

19. The sum of three consecutive integers is 45. What is the smallest of these integers?

20. A triangle has sides of length 7, 24, and 25. Which of the following is true about this triangle?

- (A) It is acute.
- (B) It is obtuse.
- (C) It is equilateral.
- (D) It is a right triangle.

21. If $x^3 = 125$, what is the value of x^2 ?

- (A) 5
- (B) 15
- (C) 25
- (D) 125

22. If $\sin(x^\circ) = \cos(20^\circ)$, what is the value of x ?

Module 2

23. The function h is defined by $h(x) = ax^2 + c$. If $h(0) = 5$ and $h(2) = 17$, what is the value of a ?
- (A) 3
(B) 4
(C) 5
(D) 6
24. If $x + 2y = 10$ and $2x + y = 14$, what is the value of $x + y$?
25. A population of birds decreases by 10% each year. If the population was 1,000 in 2020, which expression represents the population t years after 2020?
- (A) $1000(0.10)^t$
(B) $1000(0.90)^t$
(C) $1000(1.10)^t$
(D) $1000 - 0.10t$
26. What is the distance between the points $(-1, 2)$ and $(2, 6)$ in the xy -plane?
27. Which of the following is equivalent to $\frac{x^2-25}{x-5}$ for $x \neq 5$?
- (A) $x - 5$
(B) $x + 5$
(C) $x^2 + 5$
(D) 1
28. If $|x - 4| + 5 = 2$, how many real solutions exist for x ?
- (A) 0
(B) 1
(C) 2
(D) Infinitely many
29. What is the slope of the line perpendicular to $y = \frac{2}{3}x - 5$?
30. A circle is defined by $x^2 + y^2 - 4x + 10y = 7$. What is the radius of the circle?
- (A) 4
(B) 6
(C) 7
(D) 12
31. The average (mean) of 5, 8, 12, and k is 10. What is the value of k ?
32. If $\tan \theta = \frac{3}{4}$ for an acute angle θ , what is the value of $\cos \theta$?
- (A) 0.6
(B) 0.75
(C) 0.8
(D) 1.25
33. In the xy -plane, the graph of $y = 2x^2 - 12x + 16$ has two x -intercepts. What is the distance between these intercepts?
34. A cylinder has a volume of 100π . If the height is 4, what is the radius of the base?

- (A) 5
- (B) 10
- (C) 20
- (D) 25

35. If $2^{x-3} = 32$, what is the value of x ?

36. A square has a perimeter of 24. What is the area of the square?

- (A) 24
- (B) 36
- (C) 48
- (D) 144

37. If $f(x) = x^2 - kx + 10$ and $f(3) = 1$, what is the value of k ?

38. A bag contains 5 red and n blue marbles. If the probability of drawing a red marble is 0.25, what is the value of n ?

- (A) 10
- (B) 12
- (C) 15
- (D) 20

39. What is the sum of the solutions to $(x - 5)(x + 2) = 0$?

- (A) -3
- (B) 3
- (C) 7
- (D) 10

40. A rectangular box has a length of 5, a width of 4, and a height of 3. What is the length of the diagonal of the box?

41. If $\cos(x^\circ) = \sin(70^\circ)$, what is the value of x ?

- (A) 20
- (B) 70
- (C) 90
- (D) 110

42. What is the x -coordinate of the vertex of $y = 3x^2 - 12x + 5$?

43. A square is inscribed in a circle with a radius of 10. What is the area of the square?

- (A) 100
- (B) 150
- (C) 200
- (D) 400

44. If $ax + 2y = 10$ and $3x + 6y = 30$ have infinitely many solutions, what is the value of a ?

- (A) 1
- (B) 3
- (C) 6
- (D) 9

Answers and Detailed Solutions

1. **B**
Sol: $45 + 0.20m = 95 \Rightarrow 0.20m = 50 \Rightarrow m = 250$.
2. **8**
Sol: $15 + 9 = 7x - 4x \Rightarrow 24 = 3x \Rightarrow x = 8$.
3. **B**
Sol: $2x^2 - 6x + 3x^2 + 12x = 5x^2 + 6x$.
4. **18**
Sol: $f(-2) = (-2)^2 - 5(-2) + 4 = 4 + 10 + 4 = 18$.
5. $(x+3)^2 + (y-5)^2 = 16$
Sol: Radius is distance from $(-3, 5)$ to $(1, 5)$, which is 4. $r^2 = 16$.
6. **B**
Sol: Growth formula $P = P_0(2)^{t/d}$ where doubling period $d = 6$.
7. **A**
Sol: In a 3-4-5 triangle, if $\cos = 4/5$, then $\sin = 3/5 = 0.6$.
8. **6**
Sol: $3(2b) + 2b = 24 \Rightarrow 8b = 24 \Rightarrow b = 3$. Then $a = 2(3) = 6$.
9. **D**
Sol: Range changes from $22 - 12 = 10$ to $40 - 12 = 28$.
10. **10**
Sol: $2x - 10 = 6 \Rightarrow x = 8$; $2x - 10 = -6 \Rightarrow x = 2$. Sum $8 + 2 = 10$.
11. **80**
Sol: $0.70P = 56 \Rightarrow P = 56/0.7 = 80$.
12. **B**
Sol: Parallel lines must have the same slope, $m = -4$.
13. **40**
Sol: $\sqrt{x+9} = 7 \Rightarrow x + 9 = 49 \Rightarrow x = 40$.
14. **C**
Sol: $SA = 2\pi r^2 + 2\pi rh = 2\pi(25) + 2\pi(5)(8) = 50\pi + 80\pi = 130\pi$.
15. **C**
Sol: For one solution, $D = b^2 - 4ac = 144 - 4k = 0 \Rightarrow k = 36$.
16. **0.3**
Sol: Total = 20. Blue = 6. Probability = $6/20 = 0.3$.
17. **C**
Sol: $g(4) = 2(4) - 3 = 5$. $h(5) = 5^2 = 25$.
18. **B**
Sol: $x = 0 \Rightarrow -5y = 15 \Rightarrow y = -3$.
19. **14**
Sol: $n + (n+1) + (n+2) = 45 \Rightarrow 3n + 3 = 45 \Rightarrow n = 14$.

20. **D**
Sol: $7^2 + 24^2 = 49 + 576 = 625 = 25^2$, which satisfies Pythagoras.
21. **25**
Sol: $x = \sqrt[3]{125} = 5$. Then $x^2 = 5^2 = 25$.
22. **70**
Sol: $\sin x = \cos(90 - x) \Rightarrow x = 90 - 20 = 70$.
23. **A**
Sol: $h(0) = c = 5$. $h(2) = a(4) + 5 = 17 \Rightarrow 4a = 12 \Rightarrow a = 3$.
24. **8**
Sol: Adding equations: $3x + 3y = 24 \Rightarrow x + y = 8$.
25. **B**
Sol: Decay factor is $1 - 0.10 = 0.90$.
26. **5**
Sol: $d = \sqrt{(2 - (-1))^2 + (6 - 2)^2} = \sqrt{3^2 + 4^2} = 5$.
27. **B**
Sol: $\frac{(x-5)(x+5)}{x-5} = x + 5$.
28. **A**
Sol: Absolute value cannot equal $-3(2 - 5)$.
29. **-1.5**
Sol: Perpendicular slope is $-1/(2/3) = -3/2 = -1.5$.
30. **6**
Sol: $(x - 2)^2 + (y + 5)^2 = 7 + 4 + 25 = 36$. Radius = $\sqrt{36} = 6$.
31. **15**
Sol: $5 + 8 + 12 + k = 40 \Rightarrow 25 + k = 40 \Rightarrow k = 15$.
32. **C**
Sol: In a 3-4-5 triangle, $\cos = 4/5 = 0.8$.
33. **2**
Sol: $2(x^2 - 6x + 8) = 0 \Rightarrow 2(x - 4)(x - 2) = 0$. Intercepts at 4 and 2. Dist = 2.
34. **A**
Sol: $100\pi = \pi r^2(4) \Rightarrow r^2 = 25 \Rightarrow r = 5$.
35. **8**
Sol: $2^5 = 32$, so $x - 3 = 5 \Rightarrow x = 8$.
36. **B**
Sol: Side = $24/4 = 6$. Area = $6^2 = 36$.
37. **6**
Sol: $3^2 - 3k + 10 = 1 \Rightarrow 19 - 3k = 1 \Rightarrow 3k = 18 \Rightarrow k = 6$.
38. **15**
Sol: $5/(5 + n) = 0.25 \Rightarrow 20 = 5 + n \Rightarrow n = 15$.
39. **B**
Sol: Sum of roots = $-b/a = -(-3)/1 = 3$.

40. **7.07 or $5\sqrt{2}$**

Sol: $D = \sqrt{5^2 + 4^2 + 3^2} = \sqrt{50} = 5\sqrt{2} \approx 7.07.$

41. **A**

Sol: $x = 90 - 70 = 20.$

42. **2**

Sol: $x = -b/2a = 12/6 = 2.$

43. **C**

Sol: $d = 20.$ Area = $d^2/2 = 400/2 = 200.$

44. **B**

Sol: Equations are identical if $a/3 = 2/6 = 10/30$, so $a = 1.$

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