

SAT Math Level II Subject Mock Test

50 questions: 60 minutes

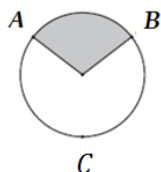
Directions: Decide which answer choice is best. If the exact numerical value is not one of the answer choices, select the closest approximation. Fill in the oval on the answer sheet that corresponds to your choice.

Notes:

- (1) You will need to use a scientific or graphing calculator to answer some of the questions.
- (2) You will have to decide whether to put your calculator in degree or radian mode for some problems.
- (3) All figures that accompany problems are plane figures unless otherwise stated. Figures are drawn as accurately as possible to provide useful information for solving the problem, except when it is stated in a particular problem that the figure is not drawn to scale.
- (4) Unless otherwise indicated, the domain of a function is the set of all real numbers for which the functional value is also a real number.

Reference Information:

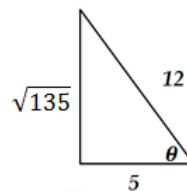
- (1) Volume of a right circular cone with radius r and height h : $V = \frac{1}{3}\pi r^2 h$
- (2) Volume of a sphere with radius r : $V = \frac{4}{3}\pi r^3$
- (3) Volume of a pyramid with base area B and height h : $V = \frac{1}{3}Bh$
- (4) Surface area of a sphere with radius r : $S = 4\pi r^2$



Note: Figure not drawn to scale

1. In the figure above, the radius of the circle is 5 units. If the area of the shaded sector is 10π square units, what is the arc length of shaded region?
(A) 8.71
(B) 12.6
(C) 14.5
(D) 18.2
(E) 21.3

2. What is the remainder when $x^4 - 4x^3 - 15x^2 + 18$ is divided by $x + 2$?
(A) -32
(B) -12
(C) -6
(D) 0
(E) 6



3. In the triangle above, what is the value of θ in degrees?
(A) 56.22
(B) 58.04
(C) 62.12
(D) 73.54
(E) 76.53

4. From a distance of 100 feet, the angle of elevation from the horizontal ground to the top of a building is 40° . What is the height of the building, in feet?

(A) 60
 (B) 70
 (C) 80
 (D) 84
 (E) 90

5. If $f(x) = (2\sqrt{x} - 1)^2$, then $f(5) - f(2) = ?$

(A) 1.013
 (B) 1.414
 (C) 3.343
 (D) 8.713
 (E) 12.056

6. What is the mode of the following data from the stem and leaf plot below?

Stem	Leaf
1	4 4 8
2	2 2 4 4 4
3	1 2 3 3 6 8

(A) 14
 (B) 22
 (C) 24
 (D) 33
 (E) 38

7. The period of the function $f(x) = a \cos^2(ax)$ is π . Find the amplitude of $f(x)$.

(A) $\frac{1}{4}$
 (B) $\frac{1}{2}$
 (C) 1
 (D) 2
 (E) 4

8. If S is the set of all integers that can be written in the form $2n^2 + 1$, then which of the following is a member of S ?

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

(E) 11

9. If $f(a, b) = \frac{a^2+2ab+b^2}{a^2-b^2}$, then $f(-b, -a) = ?$

(A) $\frac{-a-b}{a-b}$
 (B) $\frac{a+b}{-a+b}$
 (C) $\frac{a-b}{a+b}$
 (D) $\frac{1}{a-b}$
 (E) $\frac{a-b}{a+b}$

10. If there are three known broken toys in a box of 10, and three toys are drawn at random, what is the probability that none of the three drawn toys is broken?

(A) $\frac{7}{24}$
 (B) $\frac{5}{12}$
 (C) $\frac{1}{4}$
 (D) $\frac{1}{3}$
 (E) $\frac{1}{2}$

11. Which of the following translations of the graph of $y = x^2$ would result in the graph of $y = x^2 - 4x - k$ where k is a positive integer?

(A) Left 2 units and up k units
 (B) Left 2 units and up $k + 9$ units
 (C) Right 2 units and up $k + 9$ units
 (D) Right 2 units and down $k - 4$ units
 (E) Right 2 units and down $k + 4$ units

12. A regular octagon is inscribed in a circle with a radius 1. What is the side length of the octagon?

(A) $\sqrt{2}$
 (B) $\frac{\sqrt{3}}{2}$
 (C) $\sqrt{2 + \sqrt{2}}$
 (D) $\sqrt{2 - \sqrt{2}}$
 (E) None of the above

13. If $2 \log(x) = \log(2x + 8)$, then which of the following is the solution set of x ?
- (A) $\{4\}$
 (B) $\{-4\}$
 (C) $\{2\}$
 (D) $\{-2, 4\}$
 (E) All real numbers
14. If $f(x) = \frac{x+2}{(x-1)(x^2-4)}$, its graph will have
- (A) no horizontal and two vertical asymptotes.
 (B) one vertical asymptote only.
 (C) one horizontal and one vertical asymptotes.
 (D) one horizontal and two vertical asymptotes.
 (E) one horizontal and three vertical asymptotes.
15. Which of the following lines are asymptotes for the graph of $= \frac{2x^2-5x+2}{x^2+2x-8}$?
- I. $x = 2$
 II. $x = -4$
 III. $y = 2$
- (A) II only
 (B) I and II only
 (C) II and III only
 (D) I and III only
 (E) I, II, and III
16. If vector $\vec{u} = (\sqrt{2}, 1)$ and vector $\vec{v} = (\frac{3\sqrt{2}}{4}, -2)$, find the value of $|3\vec{u} - 4\vec{v}|$.
- (A) 3.4
 (B) 6.7
 (C) 9
 (D) 11
 (E) 12.5
17. What is the minimum value of $y = 2\cos(|x|) + 6$?
- (A) 0
 (B) 2.5
 (C) 4
 (D) 5.5
 (E) 6
18. The focus of a parabola is the point $(0, 3)$ and its directrix is the line $y = -1$. Write the equation of the parabola.
- (A) $y^2 = 8(x - 1)$
 (B) $x^2 = 8(y - 1)$
 (C) $x^2 = 4(y - 1)$
 (D) $y^2 = 4(y - 1)$
 (E) $x^2 = 4y$
19. What is the coefficient of the term x^3 in the expansion of $(2x - 3)^6$?
- (A) $-4,320$
 (B) $-2,160$
 (C) $-1,080$
 (D) $1,080$
 (E) $2,160$
20. If $\sin(A) = \frac{3}{5}$, $90^\circ < A < 180^\circ$, $\cos(B) = \frac{1}{3}$, and $270^\circ < B < 360^\circ$, the value of $\sin(A + B)$ is
- (A) -0.95
 (B) 0.95
 (C) -0.73
 (D) 0.73
 (E) 0.34
21. The graph of $y = |x - 1| + 1$ consists of
- (A) the sides of square.
 (B) one straight line.
 (C) a pair of straight rays.
 (D) a semicircle.
 (E) two perpendicular lines.
22. If $\sin^{-1}(\sin(x)) = -\frac{\pi}{6}$ and $\frac{3\pi}{2} \leq x \leq 2\pi$ then x could be
- (A) $\frac{\pi}{6}$
 (B) $-\frac{\pi}{6}$
 (C) $\frac{5\pi}{3}$
 (D) $\frac{11\pi}{6}$
 (E) 2π

23. Which of the following equations describes a parabola with focus (2, 3) and directrix $y = -1$?

(A) $(x - 2)^2 = 8y - 1$
 (B) $(x + 2)^2 = 8(y + 1)$
 (C) $(x + 2)^2 = 8(y - 1)$
 (D) $(x - 2)^2 = 8(y - 1)$
 (E) $(x - 2)^2 = 4(y - 1)$

24. What is the approximate value of $15^\circ @ 30^\circ$ if the operation @ is defined as $a @ b = \sin(a)\sin(b) - \cos(a)\cos(b)$?

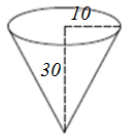
(A) 0.957
 (B) 0.896
 (C) 0.707
 (D) -0.707
 (E) -0.896

25. If $f(x) = x \ln x$ and $g(x) = e^x$, then $g(f(3)) = ?$

(A) 14
 (B) 17
 (C) 24
 (D) 27
 (E) 36

26. If $a_1 = 2$ and $a_{n+1} = \sqrt{3 + a_n}$ then $a_4 = ?$

(A) 2.3
 (B) 2.6
 (C) 3.2
 (D) 3.7
 (E) 4.1



27. The cone shown above has a height of 30 feet and a radius of 10 feet. If the cone is filled with water at a rate of 226 cubic feet per hour, what is the approximate height, in feet, of the water after 1 hour?

(A) 6.5
 (B) 8
 (C) 9.5
 (D) 12.5
 (E) 15

28. If $i^n = 1$, then n could be

(A) 7
 (B) 8
 (C) 9
 (D) 10
 (E) 11

29. The maximum value of $4\sin(x)\cos(x)$ is

(A) 1
 (B) 2
 (C) $\frac{9}{2}$
 (D) 3
 (E) $\frac{13}{4}$

30. If $\frac{2}{x^2-4} = \frac{a}{x+2} - \frac{b}{x-2}$ for all real x , what is the value of $2b$?

(A) 0.5
 (B) -0.5
 (C) 0
 (D) 1
 (E) -1

31. Which of the following statements is true about the graph of the function

$$f(x) = \frac{(2x-1)(x-2)(2x+1)}{x^2-4}$$

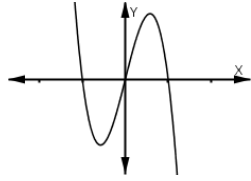
I. $f(x) = 0$ has two solutions.

II. $f(x) = \frac{15}{4}$ has two solutions.

III. The range of the function is the set of all real numbers.

(A) I only
 (B) I and II only
 (C) II and III only
 (D) I and III only
 (E) I, II, and III

32. The graph of a polynomial function is shown below. Which of the following could be the equation of the polynomial function?



- (A) $P(x) = -x(x+2)(x-2)(x^2-16)$
 (B) $P(x) = -x(x+2)(x-2)(x^2+5x+10)$
 (C) $P(x) = -x(x-1)(x+2)(x^2+5)$
 (D) $P(x) = x(x-2)(x+2)$
 (E) $P(x) = -(x-2)(x+2)^2(x^2+1)$

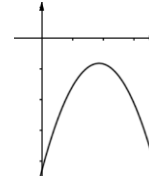
33. For what positive value of k are the zeroes of $f(x) = 4x^2 + kx + 15$ in ratio 3 : 5?
 (A) 8
 (B) 16
 (C) 18
 (D) 20
 (E) 23

34. Diagonals AC and BD of quadrilateral ABCD are perpendicular. $AD = DC = 6$, $AB = BC = 8$, $m\angle ABC = 60^\circ$. The area of ABCD is
 (A) 16
 (B) $8\sqrt{5}$
 (C) $16\sqrt{15}$
 (D) $16\sqrt{5} + 32\sqrt{3}$
 (E) $8\sqrt{5} + 16\sqrt{3}$

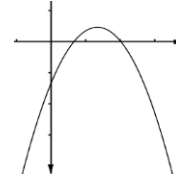
35. If $f(x, y) = \frac{xy}{5}$ for all x, y , $f(a, b) = 4$, $f(b, c) = 8$, and $f(a, c) = 10$, then what could be the value of abc ?
 (A) 50
 (B) 120
 (C) 150
 (D) 180
 (E) 200

36. Which of the following could be a graph of the equation $y = ax^2 + bx + c$, where $b^2 - 4ac = 0$?

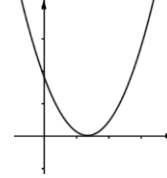
(A)



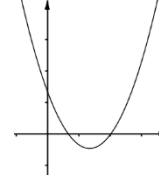
(B)



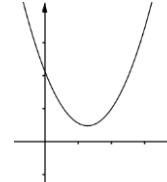
(C)



(D)



(E)



37. How many real roots does the following equation have?

$$3^x - 2 \times 3^{-x} + 1 = 0$$

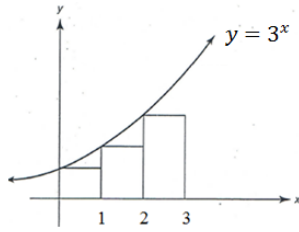
(A) 0

(B) 1

(C) 2

(D) 4

(E) Infinite number of roots



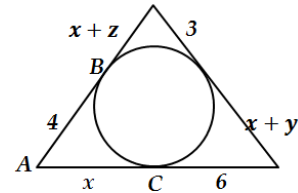
38. The figure above shows the graph of $y = 3^x$. What is the sum of the areas of the rectangles?
- (A) 6
 (B) 10
 (C) 13
 (D) 25
 (E) 39

39. If two lines $y = 4x - 3$ and $y = kx + 7$ are parallel, where k is a constant, what is the distance between the two lines?
- (A) 5.13
 (B) 3.47
 (C) 2.43
 (D) 2.25
 (E) 1.67



40. The polynomial function, $f(x) = x^6 + ax^5 + bx^4 + cx^3 + dx^2 + ex - 2$, as shown in the figure above, has two complex roots. The product of these complex roots is
- (A) -2
 (B) 2
 (C) -1
 (D) 1
 (E) 0

41. Seven blue marbles and six red marbles are held in a single container. Marbles are randomly selected one at a time and not returned to the container. If the first two marbles selected are both red, what is the probability that at least two blue marbles will be chosen in the next three selections?
- (A) $\frac{7}{33}$
 (B) $\frac{28}{55}$
 (C) $\frac{119}{165}$
 (D) $\frac{119}{330}$
 (E) $\frac{23}{33}$

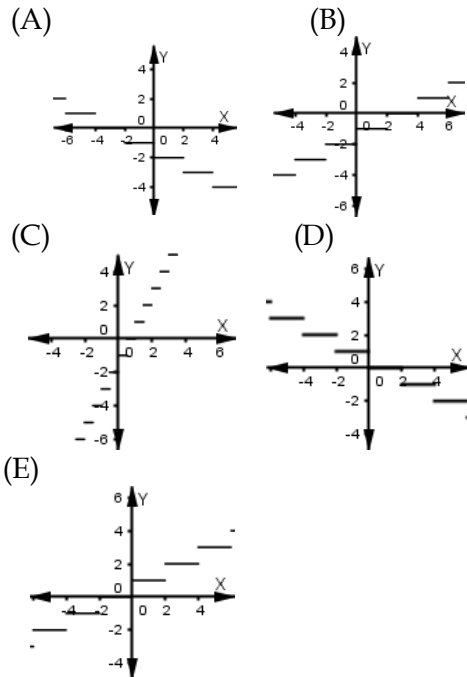


42. Given the figure above, find $x + y + z$.
- (A) 5
 (B) 7
 (C) 9
 (D) 10
 (E) 11
43. If $(\frac{1}{25})^{x^2-2xy} = (\sqrt[4]{625})^{2x^2+xy}$ and x and y are not 0, $\frac{x}{y} = ?$
- (A) 1
 (B) $-\frac{3}{4}$
 (C) $-\frac{4}{3}$
 (D) $\frac{3}{4}$
 (E) $\frac{4}{3}$

44. $\triangle ABC$ has vertices $A(2, 1)$, $B(3, 2)$, and $C(4, 4)$. What are the coordinates of the center of the circle circumscribed about $\triangle ABC$?
- (A) $(0, 0)$
 (B) $(1.5, 5.5)$
 (C) $(-1.5, 5.5)$
 (D) $(12, 4)$
 (E) $(12, -4)$

45. The constant term of the expansion of $\left(x + \frac{1}{x}\right)^{10}$ is
- (A) 252
 (B) 234
 (C) 198
 (D) 167
 (E) 143

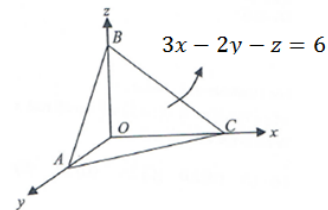
46. If $f(x) = [x]$ where $[x]$ is the greatest integer less than or equal to x , which of the following is a graph of $f\left(\frac{x}{2}\right) - 1$?



47. If the points $(-2, -5)$, $(1, 4)$, and $(-1, 2)$ are all on the graph of $f(x) = ax^2 + bx + c$, then what are the values of a , b , and c respectively?
- (A) 3, -2, and -1
 (B) -2, 5, and -1
 (C) -3, 2, and 1
 (D) -2, 1, and 5
 (E) -2, -1, and 4

48. Which of the following is the equation of the circle that has its center at the origin and is tangent to the line with equation $4x - 3y = 15$?
- (A) $x^2 + y^2 = 2$
 (B) $x^2 + y^2 = 3$
 (C) $x^2 + y^2 = 9$
 (D) $x^2 + y^2 = 15$
 (E) $x^2 + y^2 = 25$

49. Machine A can make x screws in m hours, while machine B can make y screws in n minutes. If the two machines work together, how many screws can be made in t minutes?
- (A) $\left(\frac{x}{60m} + \frac{y}{n}\right)t$
 (B) $6t\left(\frac{x}{m} + \frac{60y}{n}\right)$
 (C) $\left(\frac{x}{m} + \frac{y}{60n}\right) \times t$
 (D) $60t\left(\frac{y}{m} + \frac{y}{n}\right)$
 (E) $\left(\frac{x}{m} + \frac{y}{n}\right)t$



50. In the figure above, the graph of plane $2x + 4y + 3z = 24$ in three dimensions forms a pyramid with base is ΔAOC . What is the volume of the cone?
- (A) 6
 (B) 8
 (C) 9
 (D) 10
 (E) 12

