SAT Mathematics Level 2 Practice Test

There are 50 questions on this test. You have 1 hour (60 minutes) to complete it.

1. The measures of the angles of $\triangle QRS$ are $m\angle Q = 2x + 4$, $m\angle R = 4x - 12$, and $m\angle S = 3x + 8$. $QR = y + 9$, $RS = 2y - 7$, and $QS = 3y - 13$. The perimeter of $\triangle QRS$ is

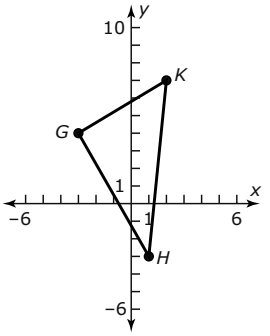
   (A) 11 (B) 20 (C) 44 (D) 55 (E) 68

2. Given $g(x) = \frac{3x+2}{5x-1}$, $g\left(\frac{-3}{4}\right) =$

   (A) $\frac{-1}{2}$ (B) $\frac{1}{9}$ (C) $\frac{1}{11}$ (D) $\frac{7}{16}$ (E) $\frac{1}{2}$

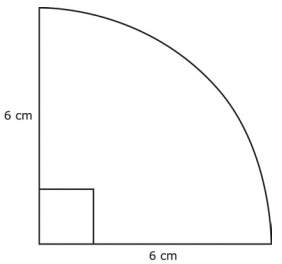
3. $\sqrt[3]{81x^7y^{10}} =$

   (A) $9x^3y^5\sqrt[3]{x}$ (B) $9x^2y^3\sqrt[3]{xy}$ (C) $3x^2y^3\sqrt[3]{9xy}$
   (D) $3x^2y^3\sqrt[3]{3xy}$ (E) $3x^3y^5\sqrt[3]{x}$



4. The vertices of $\triangle GHK$ above have coordinates $G(-3,4)$, $H(1,-3)$, and $K(2,7)$. The equation of the altitude to $\overline{HK}$ is

(A) $10x + y = -26$ (B) $10x + y = 7$ (C) $10x + y = 27$
(D) $x + 10y = 37$ (E) $x + 10y = 72$



5. When the figure above is spun around its vertical axis, the total surface area of the solid formed will be

(A) 144π (B) 108π (C) 72π (D) 36π (E) $9\pi + 12$

6. If $f(x) = 4x^2 - 1$ and $g(x) = 8x + 7$, $g \circ f(2) =$

(A) 15 (B) 23 (C) 127 (D) 345 (E) 2115

7. If p and q are positive integers with $pq = 36$, then $\frac{p}{q}$ cannot be

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

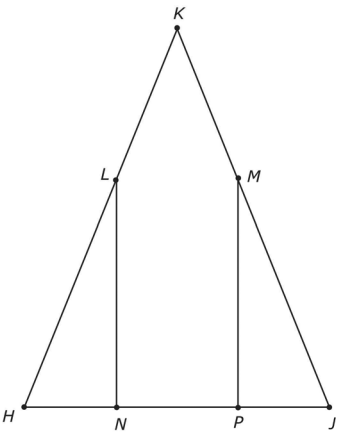
8. $\dfrac{\dfrac{2}{3}+\dfrac{1}{x-4}}{1-\dfrac{2}{3x-12}} =$

(A) $\dfrac{2x}{3x-2}$ (B) $\dfrac{2x-8}{3x-2}$ (C) $\dfrac{2x-8}{3x-12}$

(D) $\dfrac{2x-7}{3x-12}$ (E) $\dfrac{2x-5}{3x-14}$

9. If $\left(\dfrac{1}{125}\right)^{a^2+4ab} = \left(\sqrt[3]{625}\right)^{3a^2-10ab}$ and if a and b do not equal 0, $\dfrac{a}{b} =$

(A) $\dfrac{4}{21}$ (B) 2 (C) $\dfrac{76}{21}$ (D) 4 (E) $\dfrac{76}{3}$



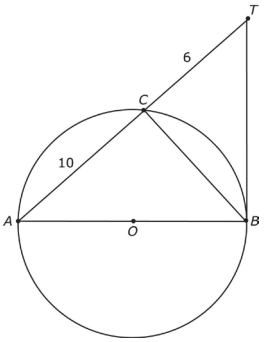
10. In isosceles $\triangle KHJ$, $\overline{HJ} = 8$, $\overline{NL} \perp \overline{HJ}$, and $\overline{MP} \perp \overline{HJ}$. If K is 10 cm from base HJ and $KL = .4KH$, the area of $\triangle LNH$ is

(A) 4 (B) 4.8 (C) 6 (D) 7.2 (E) 16

11. The equation of the perpendicular bisector of the segment joining $A(-9,2)$ to $B(3,-4)$ is

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

(C) $y + 1 = 2(x + 3)$ (D) $y + 3 = 2(x + 1)$ (E) $y - 1 = 2(x - 3)$



12. Tangent $\overline{TB}$ and secant $\overline{TCA}$ are drawn to circle O. Diameter $\overline{AB}$ is drawn. If $TC = 6$ and $CA = 10$, then $CB =$

(A) $2\sqrt{6}$ (B) $4\sqrt{6}$ (C) $2\sqrt{15}$ (D) 10 (E) $2\sqrt{33}$

13. Let $p \,@\, q = \frac{p^q}{q - p}$. $(5 \,@\, 3) - (3 \,@\, 5) =$

(A) –184 (B) –59 (C) 0 (D) 59 (E) 184

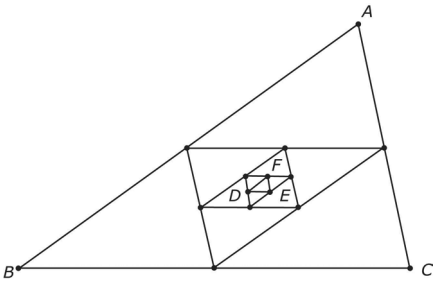
14. Grades for the test on proofs did not go as well as the teacher had hoped. The mean grade was 68, the median grade was 64, and the standard deviation was 12. The teacher curves the score by raising each score by a total of 7 points. Which of the following statements is true?

I. The new mean is 75.

II. The new median is 71.

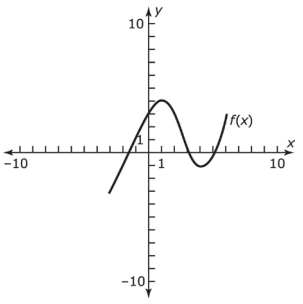
III. The new standard deviation is 7.

(A) I only (B) III only (C) I and II only
(D) I, II, and III (E) None of the statements are true

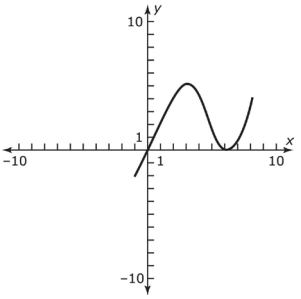


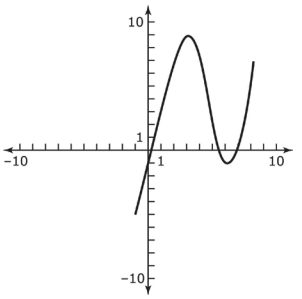
15. A set of triangles is formed by joining the midpoints of the larger triangles. If the area of $\triangle ABC$ is 128, then the area of $\triangle DEF$, the smallest triangle formed, is

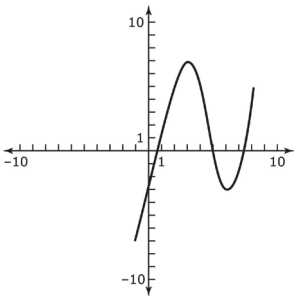
(A) $\frac{1}{8}$ (B) $\frac{1}{4}$ (C) $\frac{1}{2}$ (D) 1 (E) 4

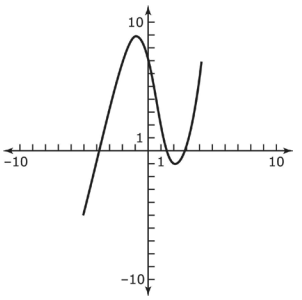


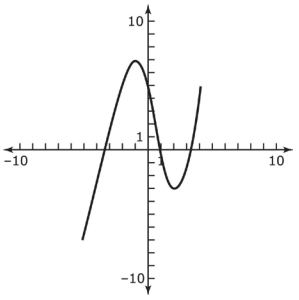
16. The graph of $y = f(x)$ is shown above. Which is the graph of $g(x) = 2f(x - 2) + 1$?

(A)


(B)


(C)


(D)


(E)


17. The number of bacteria, measured in thousands, in a culture is modeled by the equation $b(t) = \frac{380e^{2.31t}}{175 + e^{3.21t}}$, where t is the number of days since the culture was formed. According to this model, the culture can support a maximum population of

(A) 2.17 (B) 205 (C) 380 (D) 760 (E) ∞

18. A sphere with diameter 50 cm intersects a plane 14 cm from the center of the sphere. What is the number of square centimeters in the area of the circle formed?

(A) 49π (B) 196π (C) 429π (D) 576π (E) 2304π

19. Given $g(x) = \frac{3x-1}{2x+9}$, $g(g(x)) =$

(A) $\frac{9x-4}{6x+7}$ (B) $\frac{7x-12}{24x+79}$ (C) $\frac{x-10}{21x+80}$

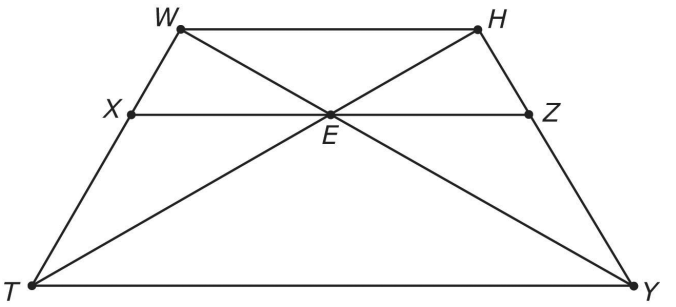
(D) $\frac{7x+6}{24x+79}$ (E) $\frac{9x^2-6x+1}{4x^2+36x+81}$

20. The area of $\triangle QED = 750$. $QE = 48$ and $QD = 52$. To the nearest degree, what is the measure of the largest possible angle of $\triangle QED$?

(A) 76 (B) 77 (C) 78 (D) 143 (E) 145

21. Given $\log_3(a) = c$ and $\log_3(b) = 2c$, $a =$

(A) $3c$ (B) $c + 3$ (C) b^2 (D) $\sqrt{b}$ (E) $\frac{b}{2}$



22. In isosceles trapezoid $WTYH$, $WH \parallel XZ \parallel TY$, $m\angle TWH = 120$, and $m\angle HWE = 30$. XZ passes through point E, the intersection of the diagonals. If $WH = 30$, determine the ratio of XZ:TY.

(A) 1:2 (B) 2:3 (C) 3:4 (D) 4:5 (E) 5:6

23. The lengths of the sides of a triangle are 25, 29, and 34. To the nearest tenth of a degree, the measure of the largest angle is

(A) 77.6° (B) 77.7° (C) 87.6° (D) 87.7° (E) 102.3°

24. One of the roots of a quadratic equation that has integral coefficients is $\frac{-4}{5} + \frac{3\sqrt{2}}{8}i$. Which of the following describes the quadratic equation?

(A) $800x^2 + 1280x + 737 = 0$ (B) $800x^2 - 1280x + 737 = 0$
(C) $800x^2 + 1280x + 287 = 0$ (D) $800x^2 - 1280x + 287 = 0$
(E) $800x^2 + 1280x - 287 = 0$

25. The parametric equations $x = \cos(2t) + 1$ and $y = 3\sin(t) + 2$ correspond to a subset of the graph

(A) $\frac{(x-1)^2}{1} + \frac{(y-2)^2}{9} = 1$ (B) $\frac{(x-1)^2}{1} - \frac{(y-2)^2}{9} = 1$

(C) $x - 2 = \frac{2}{9}(y-2)^2$ (D) $x - 2 = -\frac{2}{9}(y-2)^2$

(E) $x - 2 = -\frac{2}{3}(y-2)$

26. A county commissioner will randomly select 5 people to form a non-partisan committee to look into the issue of county services. If there are 8 Democrats and 6 Republicans to choose from, what is the probability that the Democrats will have the more members than the Republicans on this committee?

(A) $\frac{686}{2002}$ (B) $\frac{1316}{2002}$ (C) $\frac{1876}{2002}$

(D) $\frac{2688}{24024}$ (E) $\frac{21336}{24024}$

27. Given the vectors $u = [-5, 4]$ and $v = [3, -1]$, $|2u - 3v| =$

(A) $[-19, 11]$ (B) $\sqrt{502}$ (C) $[19, 11]$

(D) $2\sqrt{41} - 3\sqrt{10}$ (E) $2\sqrt{65}$

28. $\triangle ABC$ has vertices $A(-11,4)$, $B(-3,8)$, and $C(3,-10)$. The coordinates of the center of the circle circumscribed about $\triangle ABC$ are

(A) (–2,–3) (B) (–3,–2) (C) (3,2)
(D) (2,3) (E) (–1,–1)

29. Each side of the base of a square pyramid is reduced by 20%. By what percent must the height be increased so that the volume of the new pyramid is the same as the volume of the original pyramid?

(A) 20 (B) 40 (C) 46.875 (D) 56.25 (E) 71.875

30. $\frac{20\text{cis}\left(\frac{19\pi}{18}\right)}{5\text{cis}\left(\frac{2\pi}{9}\right)} =$

(A) $-2\sqrt{3} + 2i$ (B) $-2\sqrt{3} - 2i$ (C) $2\sqrt{3} + 2i$

(D) $-2 + 2i\sqrt{3}$ (E) $2 - 2i\sqrt{3}$

31. Given $\log_b(a) = x$ and $\log_b(c) = y$, $\log_{a^2}\left(\sqrt[3]{b^5c^4}\right) =$

(A) $\dfrac{\frac{5}{3}+y^4}{x^2}$ (B) $\dfrac{5+4y}{6x}$ (C) $\dfrac{20y}{3x}$

(D) $2x+4y$ (E) $2x+\dfrac{20y}{3}$

32. The asymptotes of a hyperbola have equations $y-1=\pm\frac{3}{4}(x+3)$. If a focus of the hyperbola has coordinates (7,1), the equation of the hyperbola is

(A) $\dfrac{(x+3)^2}{16}-\dfrac{(y-1)^2}{9}=1$ (B) $\dfrac{(y-1)^2}{9}-\dfrac{(x+3)^2}{16}=1$

(C) $\dfrac{(x+3)^2}{64}-\dfrac{(y-1)^2}{36}=1$ (D) $\dfrac{(y-1)^2}{36}-\dfrac{(x+3)^2}{64}=1$

(E) $\dfrac{(x+3)^2}{4}-\dfrac{(y-1)^2}{3}=1$

33. An inverted cone (vertex is down) with height 12 inches and base of radius 8 inches is being filled with water. What is the height of the water when the cone is half filled?

(A) 6 (B) $6\sqrt[3]{4}$ (C) $8\sqrt[3]{6}$ (D) $9\sqrt[3]{4}$ (E) $9\sqrt[3]{6}$

34. Solve $\sin(t)=\cos(2t)$ for $-4\pi \le t \le -2\pi$.

(A) $\left\{\dfrac{-\pi}{6},\dfrac{-5\pi}{6},\dfrac{-\pi}{2}\right\}$ (B) $\left\{\dfrac{-\pi}{3},\dfrac{-5\pi}{3},\dfrac{-\pi}{2}\right\}$

(C) $\left\{\dfrac{-23\pi}{6},\dfrac{-19\pi}{6},\dfrac{-5\pi}{2}\right\}$ (D) $\left\{\dfrac{-23\pi}{3},\dfrac{-19\pi}{3},\dfrac{-5\pi}{2}\right\}$

(E) $\left\{\dfrac{-11\pi}{3},\dfrac{-7\pi}{3},\dfrac{-5\pi}{2}\right\}$

35. $|2x - 3||x - 1| < 2$ when

(A) $\frac{1}{5} < x < 5$ (B) $\frac{1}{5} < x < 2$ and $2 < x < 5$ (C) $x < \frac{1}{5}$ or $x > 5$

(D) $x < 5$ (E) $x > \frac{1}{5}$

36. $\sum_{k=0}^{\infty} 12\left(\frac{2}{3}\right)^k - \sum_{k=0}^{\infty} 18\left(\frac{-1}{2}\right)^k =$

(A) –5 (B) 5 (C) 24 (D) 27 (E) 30

37. If $\frac{3}{x} - \frac{4}{y} + \frac{2}{z} = 3$

$\frac{2}{x} - \frac{8}{y} - \frac{1}{z} = -8$

$\frac{4}{x} - \frac{6}{y} - \frac{3}{z} = 1$

then $\frac{1}{x - y + z} =$

(A) $\frac{2}{25}$ (B) $\frac{30}{31}$ (C) $\frac{31}{30}$ (D) $\frac{19}{2}$ (E) $\frac{25}{2}$

38. Which of the following statements is true about the function $f(x) = 3 - 2\cos\left(\frac{3\pi}{5}x - \frac{3\pi}{10}\right)$?

I. The graph has an amplitude of 2.

II. The graph is shifted to the right 2.

III. The function satisfies the equation $f\left(\frac{5}{2}\right) = f\left(\frac{31}{6}\right)$.

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

39. All of the following solve the equation $z^5 = 32i$ EXCEPT

(A) $2\text{cis}\left(\frac{\pi}{2}\right)$ (B) $2\text{cis}\left(\frac{9\pi}{10}\right)$ (C) $2\text{cis}\left(\frac{11\pi}{10}\right)$

(D) $2\text{cis}\left(\frac{13\pi}{10}\right)$ (E) $2\text{cis}\left(\frac{17\pi}{10}\right)$

40. Given $a_1 = 4$, $a_2 = -2$, and $a_n = 2a_{n-2} - 3a_{n-1}$, what is the smallest value of n for which $|a_n| > 1{,}000{,}000$?

(A) 11 (B) 12 (C) 13 (D) 14 (E) 15

41. Which of the following statements is true about the graph of the function $f(x) = \frac{(2x-3)(x+2)(2x-1)}{4x^2-9}$?

I. $f(x) = \frac{9}{4}$ has two solutions.

II. $f(x) = \frac{7}{6}$ has two solutions.

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

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

42. Given $g(x) = 9\log_8(x-3) - 5$, $g^{-1}(13) =$

(A) $3\frac{1}{3}$ (B) 6 (C) 61 (D) 67 (E) 259

43. Isosceles $\triangle QRS$ has dimensions $QR = QS = 60$ and $RS = 30$. The centroid of $\triangle QRS$ is located at point T. What is the distance from T to $\overline{QR}$?

(A) $2\sqrt{15}$ (B) $\frac{5}{2}\sqrt{15}$ (C) $3\sqrt{15}$

(D) $\frac{7}{2}\sqrt{15}$ (E) $5\sqrt{15}$

44. Diagonals $\overline{AC}$ and $\overline{BD}$ of quadrilateral $ABCD$ are perpendicular. $AD = DC = 8$, $AC = BC = 6$, $m\angle ADC = 60°$. The area of $ABCD$ is

(A) $4\sqrt{5}+8\sqrt{3}$ (B) $16\sqrt{3}$ (C) $32\sqrt{3}$

(D) $8\sqrt{5}+16\sqrt{3}$ (E) 48

45. $\cos\left(2\csc^{-1}\left(\frac{x+4}{5}\right)\right) =$

(A) $\frac{x^2+8x-16}{x+4}$ (B) $\frac{x^2+8x-16}{(x+4)^2}$ (C) $\frac{x^2+8x-34}{x+4}$

(D) $\frac{x^2+8x-34}{(x+4)^2}$ (E) $\frac{-16-8x-x^2}{(x+4)^2}$

46. Which of the following statements is true about the expression $(a + b)^n - (a - b)^n$?

I. It has $\frac{n}{2}$ terms if n is even.

II. It has $\frac{n+1}{2}$ terms if n is odd.

III. The exponent on the last term is always n.

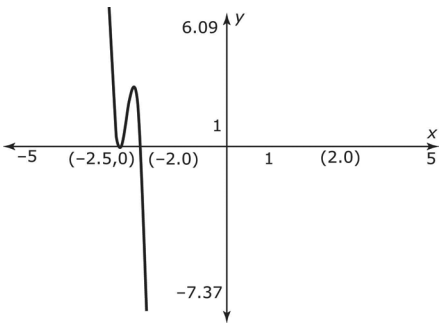
(A) I only (B) II only (C) I and II only
(D) I and III only (E) II and III only

47. In $\triangle VWX$, $\sin(X) = \frac{8}{17}$ and $\cos(W) = \frac{-3}{5}$. Find $\cos\left(\frac{V}{2}\right) =$

(A) $\frac{-77}{85}$ (B) $\frac{-2}{\sqrt{85}}$ (C) $\frac{2}{\sqrt{85}}$ (D) $\frac{9}{\sqrt{85}}$ (E) $\frac{77}{85}$

48. The intersection of the hyperbola $\frac{(x+1)^2}{8}-\frac{(y-1)^2}{9}=1$ and the ellipse $\frac{(x+1)^2}{32}+\frac{(y-1)^2}{18}=1$ is

(A) (3,4), (3,–4), (–5,4), (–5,–4)
(B) (3,2), (3,–2), (–5,2), (–5,–2)
(C) (3,4), (3,–2), (–5,4), (–5,–2)
(D) (–3,4), (–3,–2), (5,4), (5,–2)
(E) (3,–4), (3,2), (–5,–4), (–5,2)



49. The equation $8x^6 + 72x^5 + bx^4 + cx^3 - 687x^2 - 2160x - 1700 = 0$, as shown in the figure, has two complex roots. The product of these complex roots is

(A) –4 (B) $\frac{17}{2}$ (C) 9 (D) $\frac{-687}{2}$ (E) $\frac{425}{2}$

50. If $\sin(A) = \frac{-8}{17}$, $\frac{3\pi}{2} < A < 2\pi$, and $\cos(B)\ 0 = \frac{-24}{25}$, $\pi < B < \frac{3\pi}{2}$, $\cos(2A + B) =$

(A) $\frac{-5544}{7225}$ (B) $\frac{-2184}{7225}$ (C) $\frac{-3696}{7225}$ (D) $\frac{2184}{7225}$

(E) $\frac{5544}{7225}$