

AK

Test 20

MATHEMATICS LEVEL 1 TEST

For each of the following problems, decide which is the BEST of the choices given. If the exact numerical value is not one of the choices, select the choice that best approximates this value. Then fill in the corresponding circle on the answer sheet.

Notes: (1) A scientific or graphing calculator will be necessary for answering some (but not all) of the questions in this test. For each question you will have to decide whether or not you should use a calculator.

(2) For some questions in this test you may have to decide whether your calculator should be in the radian mode or the degree mode.

(3) Figures that accompany problems in this test are intended to provide information useful in solving the problems. They are drawn as accurately as possible EXCEPT when it is stated in a specific problem that its figure is not drawn to scale. All figures lie in a plane unless otherwise indicated.

(4) Unless otherwise specified, the domain of any function f is assumed to be the set of all real numbers x for which $f(x)$ is a real number. The range of f is assumed to be the set of all real numbers $f(x)$, where x is in the domain of f .

(5) Reference information that may be useful in answering the questions in this test can be found on the page preceding Question 1.

USE THIS SPACE FOR SCRATCHWORK.

1. If $f(x) = |x-1| + |x-5|$, what is the value of $f(3)$?

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

2. If $4x+12 = \frac{k}{2}(x+3)$ for all x , then $k =$

- (A) 2
- (B) 4
- (C) 8
- (D) 12
- (E) 16

MATHEMATICS LEVEL 1 TEST - *Continued*

USE THIS SPACE FOR SCRATCHWORK.

3. For all $x \neq 0$, $\frac{x - \frac{1}{x}}{\frac{1}{x}} =$
- (A) $x - 1$
(B) $x^2 - 1$
(C) $1 - x$
(D) $1 - x^2$
(E) $x^3 - x$
4. If $f(x) = \frac{x-1}{2}$ and $g(x) = x+2$, then $f(g(1)) - g(f(1)) =$
- (A) 3
(B) 2
(C) 1
(D) 0
(E) -1
5. What is the image of point $(5, 7)$ over a reflection of the line $x = -2$?
- (A) $(-9, 7)$
(B) $(3, 7)$
(C) $(5, -9)$
(D) $(5, -11)$
(E) $(7, -11)$
6. In triangle PQR in Figure 1, $RP = 7$, and $PQ = 25$. What is the value of $\sec \angle Q$?
- (A) 0.96
(B) 1.04
(C) 1.25
(D) 1.36
(E) 1.68

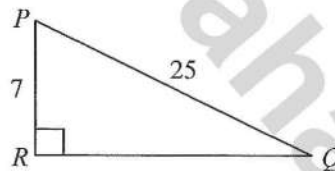


Figure 1

MATHEMATICS LEVEL 1 TEST - *Continued*

USE THIS SPACE FOR SCRATCHWORK.

7. In Figure 2, if $\ell \parallel m$, what is the value of $x + y$?

- (A) 150
(B) 160
(C) 170
(D) 180
(E) 190

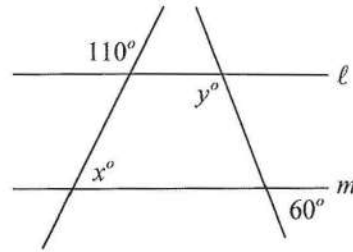


Figure 2

8. If $2^{x+4} = 12$, then $4(2^x) =$

- (A) 2 (B) 3 (C) 6 (D) 12 (E) 24

9. If $\log_3 a$ is 25% of $\log_3 b$, then what is b in terms of a ?

- (A) $\frac{a}{4}$ (B) $\frac{a}{3}$ (C) a^2 (D) a^4 (E) $4a$

10. In trapezoid $ABCD$ in Figure 3, $AB = 4$, $BC = 4$, and $\angle BCD = 135^\circ$. What is the area of the trapezoid?

- (A) 36
(B) 32
(C) 24
(D) 18
(E) 16

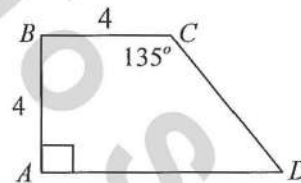


Figure 3

11. $\log_5 25\sqrt{5} =$

- (A) 1.5 (B) 2 (C) 2.5 (D) 4 (E) 5

12. In Figure 4, $AB = BC$, $\angle BAD = 50^\circ$, and $\angle ABC$ is 50° more than $\angle CBD$. Which of the following is the value of $\angle BDA$?

- (A) 20° (B) 25° (C) 30° (D) 45° (E) 60°

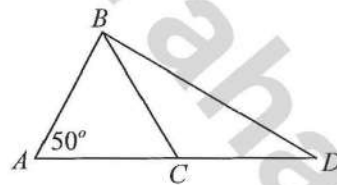


Figure 4

Note: Figure not drawn to scale.

(3)

MATHEMATICS LEVEL 1 TEST - *Continued*

USE THIS SPACE FOR SCRATCHWORK.

13. In triangle ABC , if $AB = 5$ and $BC = 10$, what is the smallest integer value of CA ?

(A) 3 (B) 4 (C) 5 (D) 6 (E) 14

14. If the multiplicative inverse of $3 - 4i$ is $a + bi$, what is the value of $a + b$?

(A) $\frac{7}{25}$ (B) $\frac{3}{4}$ (C) $\frac{4}{3}$ (D) 3 (E) 5

15. In Figure 5, if the area of isosceles trapezoid $OPQR$ is 128 square units, what is the value of a ?

(A) 8 (B) 10 (C) 12 (D) 14 (E) 16

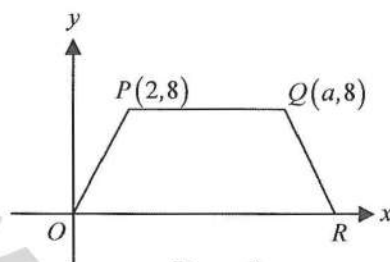


Figure 5

Note: Figure not drawn to scale.

16. For what value(s) of x is the expression $x(x^2 - 1)^{-2}$ undefined?

(A) 0 only
 (B) 1 only
 (C) 1 and -1 only
 (D) 0 and 1 only
 (E) 0, 1, -1

17. Which of the following is not in the range of $y = 2^x - 3$?

(A) 3 (B) 2 (C) -1 (D) -2 (E) -3

18. If $a^{\frac{3}{5}} - 10 = 17$, what is the value of a ?

(A) 9
 (B) 27
 (C) 81
 (D) 243
 (E) 729

MATHEMATICS LEVEL 1 TEST - *Continued*

USE THIS SPACE FOR SCRATCHWORK.

19. What are all values of x for which $\left|5 - \frac{x}{3}\right| \leq 4$?

- (A) $x \leq -4$ or $x \geq 4$
 (B) $x \leq -9$ or $x \geq 9$
 (C) $x \leq 9$ or $x \geq 15$
 (D) $1 \leq x \leq 9$
 (E) $3 \leq x \leq 27$

20. If the line $y = mx + b$ is perpendicular to the line $2x - y = 12$ and passes through the point $(1, 4)$, what is the value of b ?

- (A) $\frac{9}{2}$ (B) 4 (C) $\frac{7}{2}$ (D) 3 (E) $\frac{5}{2}$

21. In circle O shown in Figure 6, the area of $\triangle ABC$ is 10. What is the area of circle O ?

- (A) 27
 (B) 31.4
 (C) 36.3
 (D) 40.5
 (E) 62.8

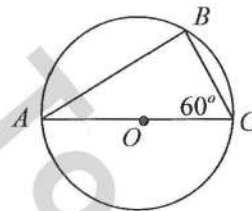


Figure 6

22. If the circumference of a circle is twice the perimeter of a square, what is the ratio of the area of the circle to the area of the square?

- (A) 2 : 1
 (B) $4 : \pi$
 (C) $16 : \pi$
 (D) $4\pi : 3$
 (E) 25 : 9

MATHEMATICS LEVEL 1 TEST - *Continued*

USE THIS SPACE FOR SCRATCHWORK.

23. In Figure 7, $\triangle ABC$ is equilateral and $\overline{EF} \parallel \overline{DG} \parallel \overline{AC}$. If $AD = 2$, $DE = 4$, and $BE = 2$, then what is the area of quadrilateral $DEFG$?

- (A) 4
(B) 6
(C) $6\sqrt{3}$
(D) $8\sqrt{3}$
(E) $16\sqrt{3}$

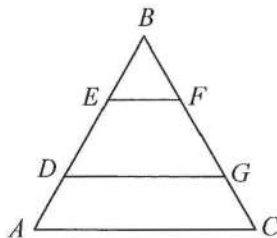


Figure 7

24. A projectile is fired from ground level shown in Figure 8. If the height is defined by $h(t) = 160t - 16t^2$ feet after t seconds, how long does the projectile stay higher than 336 feet, in seconds?

- (A) 3
(B) 4
(C) 5
(D) 6
(E) 10

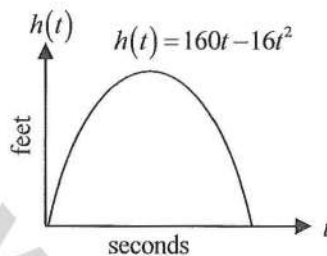


Figure 8

Note: Figure not drawn to scale.

25. If $i = \sqrt{-1}$, what is the value of $(1-i)^4$?

- (A) -4
(B) -2
(C) -1
(D) 2
(E) 4

26. If the first three positive numbers x , $x+4$, and $3x+4$ form a geometric progression in which $x > 0$, what is the fourth term?

- (A) 8
(B) 12
(C) 16
(D) 24
(E) 32

MATHEMATICS LEVEL 1 TEST - *Continued*

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27. If a square pyramid has a base that measures 10 feet on a side and an altitude of 12 feet, which of the following is the total surface area of the pyramid?

(A) 120
 (B) 240
 (C) 360
 (D) 480
 (E) 600

28. In Figure 9, a circle with radius 5 is tangent to the x - and y -axis. If line ℓ is tangent to the circle and passes through point $(-7, 0)$, what is the length of \overline{PQ} ?

(A) 10
 (B) 12
 (C) 13
 (D) 14.5
 (E) 16

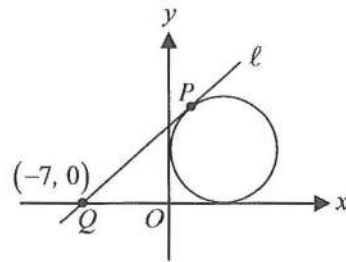


Figure 9

29. In Figure 10, what is the value of x ?

(A) 5
 (B) 6
 (C) 7
 (D) 8
 (E) 9

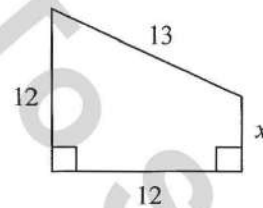


Figure 10

30. If the diagonals of a parallelogram are congruent, then the parallelogram is

(A) a rectangle
 (B) a square
 (C) a rhombus
 (D) a trapezoid
 (E) an isosceles trapezoid

Note: Figure not drawn to scale.

31. If the measure of angles in a quadrilateral are in the ratio 3:4:5:6, which of the following cannot be the measure of an exterior angle of the quadrilateral?

(A) 120° (B) 100° (C) 80° (D) 60° (E) 40°

MATHEMATICS LEVEL 1 TEST - *Continued*

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32. If the coordinates of the turning point of the graph of $y = x^2 + px + q$ are $(-2, 8)$, what are the values of p and q ?

(A) $p = 2, q = 10$
(B) $p = 2, q = 12$
(C) $p = 4, q = 10$
(D) $p = 4, q = 12$
(E) $p = -2, q = 10$

33. A circle has a center $(-2, 3)$ and diameter \overline{AB} . If the coordinates of A are $(1, 7)$, which of the following is the equation of the circle?

(A) $x^2 + y^2 = 5$
(B) $(x-2)^2 + (y+3)^2 = 5$
(C) $(x+2)^2 + (y-3)^2 = 5$
(D) $(x+2)^2 + (y-3)^2 = 25$
(E) $(x+2)^2 + (y-3)^2 = 36$

34. If $f(x) = 5x - 3$ and $g(x) = \sqrt[3]{x^2}$, then $f(g(-8)) =$

(A) -23 (B) -13 (C) 13 (D) 17 (E) 24

35. If the roots of the equation $x^2 - 4x + k = 0$ are a and b such that $b = 3a$, what is the value of k ?

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

36. What is the period of the graph of the equation $y = 5 \tan \frac{x}{3}$, in degrees?

(A) 60 (B) 120 (C) 240 (D) 360 (E) 540

MATHEMATICS LEVEL 1 TEST - *Continued*

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37. If the radius of a sphere decreases by 20%, by what percent of the volume of the sphere is decreased?

(A) 20.4
 (B) 40.2
 (C) 48.8
 (D) 51.2
 (E) 60.6

38. In how many ways can the letters of the word CAREER be rearranged?

(A) 60 (B) 120 (C) 180 (D) 360 (E) 720

39. A line with equation $y = x$ and a circle are graphed in Figure 11. What is the length of \overline{OP} ?

(A) 10.5
 (B) 10.8
 (C) 11.3
 (D) 11.8
 (E) 12.1

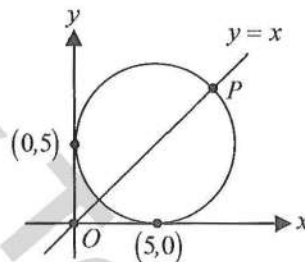


Figure 11

40. If $\frac{1}{x^2 - 4} = \frac{a}{x - 2} - \frac{b}{x + 2}$, then $a =$

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

41. In Figure 12, the radius of the top circle is 1 and the radius of the bottom circle is 4. If $AC = BD = 5$, what is the length of \overline{BC} ?

(A) 6.1
 (B) 6.4
 (C) 7.2
 (D) 7.5
 (E) 8.4

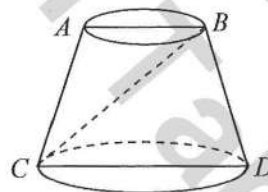


Figure 12

Note: Figure not drawn to scale.

MATHEMATICS LEVEL 1 TEST - *Continued*

USE THIS SPACE FOR SCRATCHWORK.

42. Which of the following could be not true?
- (A) All equilateral triangles are similar.
 (B) All squares are similar.
 (C) All regular pentagons are similar.
 (D) All rectangles are similar.
 (E) All circles are similar.
43. Which of the following is equivalent to the statement “If $x = 3$, then $x^2 = 9$ ”?
- (A) If $x \neq 3$, then $x^2 \neq 9$.
 (B) If $x \neq 3$, then $x^2 > 9$.
 (C) If $x^2 = 9$, then $x = 3$.
 (D) If $x^2 \neq 9$, then $x \neq -3$.
 (E) If $x^2 \neq 9$, then $x \neq 3$.

44. In Figure 13, $\ell \parallel m$, \overline{AC} is the angle bisector of $\angle BAD$, and \overline{CD} is the angle bisector of $\angle ADE$. What is the measure of $\angle ACD$?

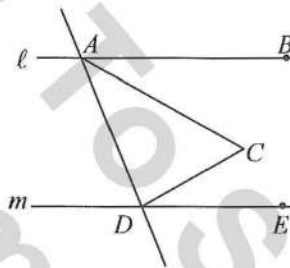


Figure 13

Note: Figure not drawn to scale.

45. If $4^x - 2^x = 6$, what is the value of x ?
- (A) 1
 (B) $\log_2 3$
 (C) $\log 5$
 (D) 2
 (E) 5
46. If $2x^2 - 4x + 7 = 2(x - a)^2 + b$, what is the value of b ?
- (A) 2 (B) 3 (C) 4 (D) 5 (E) 7

MATHEMATICS LEVEL 1 TEST - *Continued*

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47. Alex painted one-third of his house in three hours and his brother Kevin took over and finished the job in 5 hours. If they both paint the entire house working together, how long would it take, in hours?

(A) 3 (B) 3.51 (C) 4.09 (D) 5.63 (E) 6

48. A solution is made by mixing concentrate with water. How many gallons of acid must be added to 40 gallons of a 20% acid solution to get a 50% acid solution?

(A) 24 (B) 18 (C) 12 (D) 10 (E) 8

49. Figure 14 shows the graph of $f(x) = 3|x - 5| - 6$. What is the area of the shaded region?

(A) 3
(B) 6
(C) 12
(D) 18
(E) 24

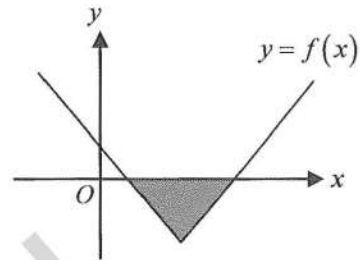


Figure 14

50. Figure 15 shows the graph of $y = f(x)$. What is the length of \overline{PQ} ?

(A) 4
(B) 8
(C) $2\sqrt{11}$
(D) $4\sqrt{10}$
(E) 9.5

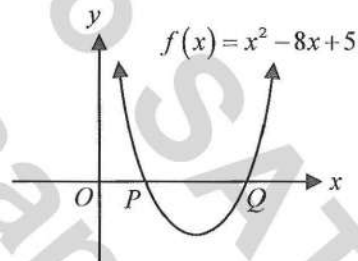


Figure 15

STOP

IF YOU FINISH BEFORE TIME IS CALLED, YOU MAY CHECK YOUR WORK ON THIS TEST ONLY.
DO NOT TURN TO ANY OTHER TEST IN THIS BOOK.

Right Way To SAT
Mr. Abd El-Rahman Taha

NO MATERIAL ON THIS PAGE

ANSWERS TEST (1) - Right Way To SAT

AK

	answer	#	answer	#	answer	#	answer	#	answer
1	D	11	C	21	C	31	E	41	B
2	C	12	A	22	C	32	D	42	D
3	B	13	D	23	D	33	D	43	E
4	E	14	A	24	B	34	D	44	E
5	A	15	E	25	A	35	C	45	B
6	B	16	C	26	E	36	E	46	D
7	E	17	E	27	C	37	C	47	C
8	B	18	D	28	B	38	C	48	A
9	D	19	E	29	C	39	E	49	C
10	C	20	A	30	A	40	D	50	C