

# **TAILWIND** **PLACEMENT EXAMS**

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**MATHEMATICS**

**PRACTICE EXAM**

## GENERAL INSTRUCTIONS:

You will have 90 minutes to complete the mathematics practice test. Work rapidly but carefully. Do not spend too much time on any one question. If you have time after you have finished the test, you may go back and review your answers.

PLEASE NOTE that the use of a non-graphing calculator on this test is optional. No question on this test requires the use of a calculator. GRAPHING CALCULATORS ARE NOT ALLOWED. You may not share a calculator.

When you take the official Math Placement Test, your placement will be based on three math scores which may be used in combination to determine your optimal math placement. In order to get the most accurate assessment using this practice test, you should try to duplicate the actual testing situation as closely as possible. When taking the test, you should not use any additional materials or look up the answers to the questions. You should only allow yourself 90 minutes to take this test and should take the entire test in one sitting. If possible, take the test in a quiet room where you will not be interrupted.

**When you have completed the test, you should score your test using the answer key and scoring instructions provided on the last page.**

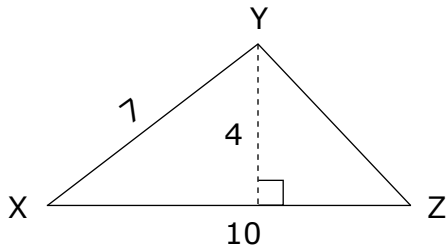
1.  $5(a + b) + 2(a + c) - 4(b + c) =$

- a)  $3(a + b + c)$       d)  $3(a + b)$   
 b)  $7a + b - 2c$       e)  $7a + b + 6c$   
 c)  $7a - 3b + 2c$

2. 120% of 360 is

- a) 3      d) 432  
 b) 72      e) 43200  
 c) 300

3. The area of triangle XYZ is



- a) 20      d) 35  
 b) 22      e) 40  
 c) 28

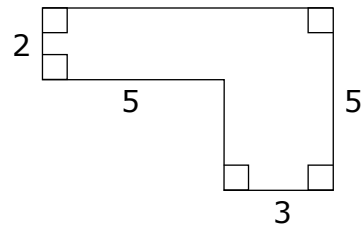
4.  $\frac{2^3 2^5}{2^4}$

- a) 2      d) 16  
 b) 4      e) 32  
 c) 8

5.  $(2x - 3)^2 =$

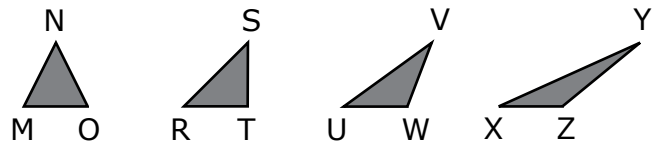
- a)  $-12x$       d)  $4x^2 - 12x + 9$   
 b)  $4x^2 + 9$       e)  $4x^2 - 6x + 9$   
 c)  $4x^2 - 5x + 9$

6. What is the area of the given figure?



- a) 15      d) 30  
 b) 23      e) 40  
 c) 25

7. In which triangle is the sum of the measures of the angles the greatest?



- a) MNO      d) XYZ  
 b) RST      e) None of these  
 c) UVW

8. Fifteen ounces of concentrate is mixed with 45 ounces of water to make 60 ounces of orange juice. What percent of the orange juice is concentrate?

- a) 3
- b) 4
- c) 25
- d) 30
- e)  $33\frac{1}{3}$

9.  $\frac{x^{15}}{x^{12}} =$

- a)  $x^{27}$
- b)  $\frac{5x}{4}$
- c)  $x^{\frac{5}{4}}$
- d)  $x^3$
- e) None of these

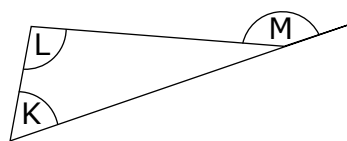
10.  $\frac{x}{3} + \frac{x}{2} - \frac{x}{5} =$

- a)  $\frac{x}{30}$
- b)  $\frac{x}{5}$
- c)  $\frac{x+5}{5}$
- d) 0
- e)  $\frac{19x}{30}$

11. Subtracting  $n$  from 4 added to three times  $n$  is equal to

- a)  $-2n - 4$
- b)  $-2n + 4$
- c)  $2n + 4$
- d)  $4n - 4$
- e)  $4n + 4$

12. Which best describes how angles  $K$ ,  $L$ , and  $M$  are related?



- a)  $K + L = M$
- b)  $K + L > M$
- c)  $K + L < M$
- d)  $K + L + M = 180$
- e) More information needed

13.  $(-2)^3 + (-3)^2 =$

- a) -17
- b) -1
- c) 0
- d) 1
- e) 17

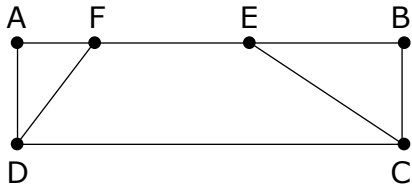
14. 9 square yards is

- a) 1 square foot
- b) 3 square foot
- c) 27 square foot
- d) 81 square foot
- e) 243 square foot

15. If  $\frac{3}{4}x = 12 - x$ , then  $x =$

- a)  $\frac{12}{7}$                       d)  $\frac{48}{7}$   
 b)  $\frac{45}{4}$                       e) 48  
 c) 12

16. If ABCD is a rectangle, then



- a) DCEA is a rectangle.  
 b) DCBF is a parallelogram.  
 c) DCEF is a trapezoid.  
 d) DCEF is a parallelogram.  
 e) DCEF is a rhombus.

17. If  $d = \frac{F + 2}{p}$ , then  $p =$

- a)  $d(F + 2)$                       d)  $\frac{F + 2}{d}$   
 b)  $dF - 2$                       e)  $\frac{d - 2}{F}$   
 c)  $\frac{d}{F + 2}$

18. Solve for  $x$ :  $x + 3(x - 5) = x - 2(x + 5)$

- a)  $x = -1$                       d)  $x = 3$   
 b)  $x = 1$                       e)  $x = 5$   
 c)  $x = 2$

19. Which of the following has been reduced to lowest terms?

- a)  $\frac{26}{65}$                       d)  $\frac{49}{119}$   
 b)  $\frac{31}{128}$                       e)  $\frac{121}{352}$   
 c)  $\frac{34}{51}$

20.  $(3a^3)^2 =$

- a)  $6a^5$                       d)  $9a^6$   
 b)  $6a^6$                       e)  $9a^9$   
 c)  $9a^5$

21. Express 0.000719 in scientific notation.

- a)  $7.19 \times 10^3$   
 b)  $7.19 \times 10^{-3}$   
 c)  $0.719 \times 10^{-4}$   
 d)  $7.19 \times 10^{-4}$   
 e)  $7.19 \times 10^4$

22. If a train travels 60 miles in 40 minutes, what is its average speed in miles per hour?

- a) 120
- b) 100
- c) 90
- d) 60
- e) 40

23. Find the value of  $\frac{(-1)^n(A - 2B)}{C}$  when  $n = 4$ ,  $A = 5$ ,  $B = -4$  and  $C = 2$ .

- a) -6
- b)  $-\frac{13}{2}$
- c)  $-\frac{3}{2}$
- d)  $\frac{13}{2}$
- e) 6

24. The remainder when  $x^3 - 4x^2 + x + 9$  is divided by  $x - 2$  is

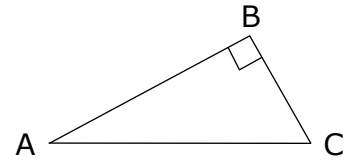
- a) -1
- b) 3
- c) 15
- d) -17
- e) 19

25. If  $h(y) = \frac{4 - y^2}{3 - y}$ , which of the following is not defined?

- a)  $h(0)$
- b)  $h(3)$
- c)  $h(-3)$
- d)  $h(2)$
- e)  $h(-2)$

26. Right triangle ABC has  $AC = 13$  and  $AB = 12$ . The area of triangle ABC is

- a) 78
- b) 65
- c) 60
- d) 30
- e) None of these

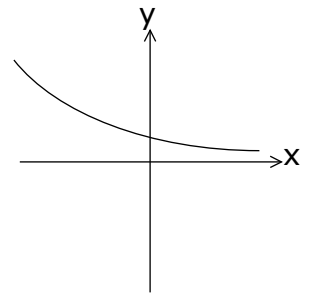


27.  $3\sqrt{12} + 2\sqrt{75} - 5\sqrt{27} =$

- a)  $\sqrt{60}$
- b)  $\sqrt{27}$
- c)  $\sqrt{3}$
- d)  $\sqrt{12}$
- e) 0

28. Which of the functions listed below has this graph?

- a)  $f(x) = 2^x$
- b)  $f(x) = \left(\frac{1}{2}\right)^x$
- c)  $f(x) = -2^x$
- d)  $f(x) = \log_2 x$
- e)  $f(x) = -\log_{\frac{1}{2}} x$



29. The slope of the line with the equation  $y = -7x + 3$  is

- a) 3                      d)  $-\frac{3}{7}$   
 b) 7                      e) -7  
 c)  $-\frac{1}{7}$

30.  $\frac{(3y)^{-2}(9y^2)}{3y^{-4}} =$

- a) 27                      d)  $\frac{y^4}{3}$   
 b)  $\frac{1}{9}$                       e)  $-\frac{y^4}{3}$   
 c)  $\frac{3}{y^6}$

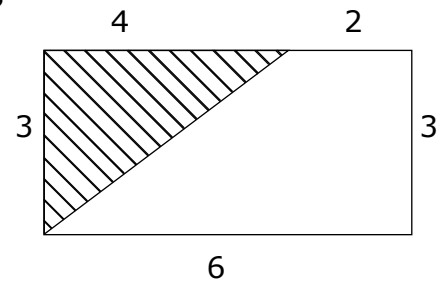
31. Find all values of  $x$  for which  $(3x + 2)(4x - 5) = 0$

- a)  $\frac{3}{2}, -\frac{4}{5}$                       d)  $\frac{2}{3}, -\frac{5}{4}$   
 b)  $-\frac{3}{2}, \frac{4}{5}$                       e)  $-\frac{2}{3}, -\frac{5}{4}$   
 c)  $-\frac{2}{3}, \frac{5}{4}$

32.  $(a^{16})^{\frac{3}{4}} =$

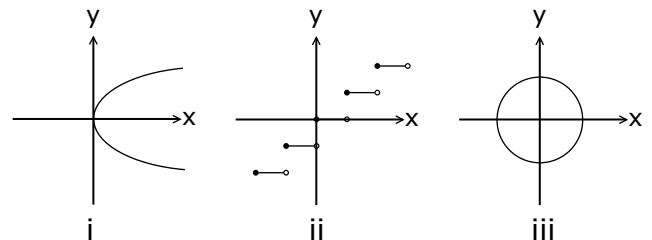
- a)  $a^{\frac{3}{64}}$                       d)  $a^8$   
 b)  $a^{\frac{19}{4}}$                       e)  $a^{12}$   
 c)  $a^{\frac{67}{4}}$

33. What fraction of the rectangle's area is shaded?



- a)  $\frac{1}{5}$                       d)  $\frac{2}{5}$   
 b)  $\frac{1}{4}$                       e)  $\frac{2}{3}$   
 c)  $\frac{1}{3}$

34. Which of the following represent(s) functions of  $x$ ?



- a) i only                      d) i and iii  
 b) ii only                      e) i, ii, and iii  
 c) iii only

35. One factor of  $3x^2 + 6x + 3$  is

- a)  $3x + 1$
- b)  $x + 1$
- c)  $x + 3$
- d)  $3x - 1$
- e)  $x - 1$

36.  $(2x^2 - 3x + 4)(2x - 3) =$

- a)  $4x^3 + 12x^2 + 17x - 12$
- b)  $10x^5 + 15x^3 + 20x$
- c)  $-2x^5 + 3x^3 - 4x$
- d)  $4x^5 - 12x^3 + 17x - 12$
- e)  $4x^3 - 12x^2 + 17x - 12$

37. An equation of the circle with center  $(-2, k)$  and radius 5 is

- a)  $\frac{x^2}{4} + \frac{y^2}{k^2} = 25$
- b)  $(x - 2)^2 + (y + k)^2 = 5$
- c)  $(x - 2)^2 + (y + k)^2 = 25$
- d)  $(x + 2)^2 + (y - k)^2 = 5$
- e)  $(x + 2)^2 + (y - k)^2 = 25$

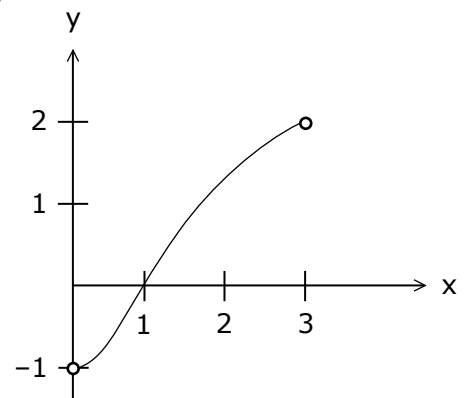
38. The graph of  $3x + 4y = 24$  crosses the y-axis at

- a)  $y = -\frac{4}{3}$
- b)  $y = -\frac{3}{4}$
- c)  $y = 3$
- d)  $y = 4$
- e)  $y = 6$

39. When you solve the equation  $x^3 - 3x^2 + 2x = 0$ , how many roots are greater than  $\frac{1}{2}$ ?

- a) no root
- b) one root
- c) two roots
- d) three roots
- e) all roots

40. The graph of a function  $y = f(x)$  is given by

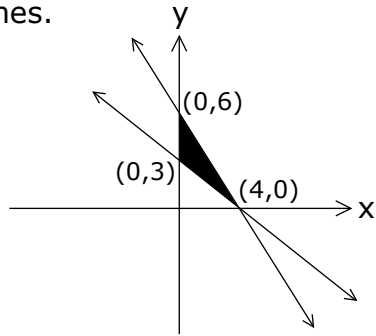


The domain of the inverse  $f^{-1}(x)$  is the set of real numbers between

- a) 0 and 3
- b) -1 and 1
- c) -1 and 2
- d) -1 and 3
- e) 1 and 3



41. Find the area of the shaded region between the lines.



- a) 4  
b) 6  
c) 8  
d) 10  
e) 12

42. In lowest terms,  $\frac{x - \frac{4}{x}}{\frac{x}{2} + 1} =$

- a)  $\frac{2(x-2)}{x}$       d)  $\frac{(x-4)(x+1)}{2x}$   
b)  $\frac{x^3-8}{2x}$       e)  $\frac{-8}{x+1}$   
c)  $\frac{2x-3}{2x}$

43.  $|6 + 3x| < 9$  is equivalent to

- a)  $-1 < x < 1$       d)  $-5 < x < 5$   
b)  $1 < x < -5$       e)  $-5 < x < 1$   
c)  $x < 1$

44. One factor of  $4x^2 - 8x + 4$  is

- a)  $2x + 2$       d)  $x - 1$   
b)  $x - 2$       e)  $x + 1$   
c)  $x + 4$

45. If  $(ax + 3y)^2 = a^2x^2 - 6xy + 9y^2$ , then  $a =$

- a) 2      d) -1  
b) -2      e) -6  
c) 1

46. If  $3 \log x = \log 8$ , then  $x =$

- a)  $\frac{8}{3}$       d)  $\frac{\log 8}{3}$   
b) 2      e)  $\log\left(\frac{8}{3}\right)$   
c) 8

47.  $\frac{2^{-2} + 3^{-2}}{2^{-1} + 3^{-1}} =$

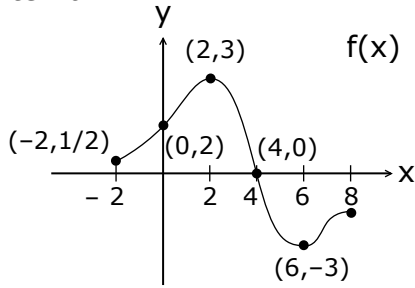
- a)  $\frac{13}{30}$       d)  $\frac{13}{5}$   
b)  $\frac{5}{6}$       e)  $\frac{1}{5}$   
c)  $\frac{6}{5}$

48. Which of the following equations has the same solution as  $2 - 3x = \frac{x-2}{3x+1}$ ?

- a)  $-6x^2 + 2x + 4 = 0$   
b)  $-9x^2 + 2x = 0$   
c)  $9x^2 + x - 4 = 0$   
d)  $-9x^2 + 2x + 4 = 0$   
e)  $-9x^2 + 4x + 4 = 0$



55. The function  $f(x)$  is graphed over the interval from  $x = -2$  to  $x = 8$ . Which statement is true about  $f(x)$  over the given interval?



- a) The largest value of the function is 8.  
 b) The maximum value of  $f(x)$  is  $\frac{1}{2}$ .  
 c) The solution to  $f(x) = 0$  is 2.  
 d)  $f(x) = 0$  when  $x = 4$ .  
 e) None of these

56. How many real numbers are solutions for  $x^2 - 5x + 7 = 0$ ?

- a) none                      d) three  
 b) one                        e) more than three  
 c) two

57. The function  $f(x) = \frac{3}{2}x + 4$  multiplies the input by  $\frac{3}{2}$  then adds 4. Then  $f^{-1}(x)$ , the inverse of  $f$ ,

- a) multiplies the input by  $\frac{2}{3}$ , then subtracts 4.  
 b) multiplies the input by 4, then subtracts  $\frac{3}{2}$ .  
 c) subtracts 4 from the input, then multiplies by  $\frac{2}{3}$ .  
 d) adds 4 to the input, then multiplies by  $\frac{3}{2}$ .  
 e) multiplies the input by  $-\frac{3}{2}$ , then subtracts 4.

58. The line  $3x - 4y - 1 = 0$  is parallel to

- a)  $8x = 6y - 6$   
 b)  $8x + 6y + 5 = 0$   
 c)  $y = \frac{4}{3}x$   
 d)  $4y = 3x - 7$   
 e)  $4x - 3y - 1 = 0$

59. If  $(5x + ay)^2 = 25x^2 - 10xy + a^2y^2$ , then  $a =$

- a) 2                              d) -1  
 b) -2                            e) -10  
 c) 1

60. A line not parallel to  $y - 3 = ax$  is
- a)  $x - 3 = \frac{y}{a}$       d)  $2ax = 2y + 5$
- b)  $x = \frac{y}{a} - \frac{3}{a}$       e)  $ax - y = 5a$
- c)  $x = ay - 3$

61. The cost, in thousands of dollars, of producing  $x$  thousand textbooks is  $C(x) = 50 + 10x - 2x^2$ . The revenue, also in thousands of dollars, is  $R(x) = 5x$ . Find the profit or loss if 5 thousand textbooks are produced. (Profit = Revenue - Cost)

- a) 50 thousand dollar loss
- b) 25 thousand dollar loss
- c) 5 thousand dollar loss
- d) 10 thousand dollar profit
- e) 25 thousand dollar profit

62. The total production costs  $C$  to manufacture  $S$  skateboards are shown below for a 3-week period. Write a linear equation that represents this data.

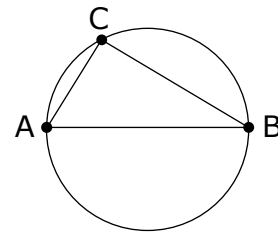
	# OF SKATEBOARDS	PRODUCTION COSTS
WEEK 1	115	\$18,020
WEEK 2	352	\$29,396
WEEK 3	408	\$32,084

- a)  $C = 48S + 11,376$
- b)  $C = 48S + 12,500$
- c)  $C = 48S + 18,020$
- d)  $C = 156.70S + 18,020$
- e)  $C = 90.86S + 12,500$

63. Which of the following equations has a graph that is a straight line?

- a)  $y = x^2 + 1$
- b)  $2x + 3xy = 5$
- c)  $x^2 - y^2 = 3$
- d)  $x - y = 2x$
- e) None of these

64. Let  $A$ ,  $B$ ,  $C$  be distinct points on a circle with diameter  $AB$ . Then we may conclude that

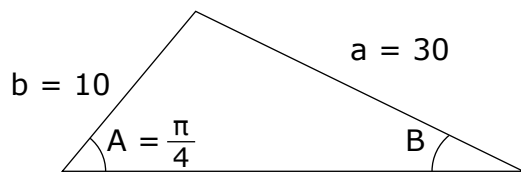


- a)  $AC$  is longer than  $AB$ .
- b) angle  $ABC$  is greater than angle  $BAC$ .
- c) angle  $BAC$  is greater than angle  $ACB$ .
- d) angles  $BAC$  and  $ACB$  are complementary.
- e) angle  $ACB$  is a right angle.

65. If  $\sin A = \frac{1}{3}$  and  $0^\circ < A < 90^\circ$ , then  $\cos A =$

- a)  $\frac{\sqrt{8}}{3}$                       d)  $\frac{\sqrt{8}}{9}$   
 b)  $\frac{2}{3}$                               e)  $\frac{\sqrt{8}}{\sqrt{10}}$   
 c)  $\frac{3}{\sqrt{8}}$

66. Suppose a triangle has the dimensions indicated below:



Then  $\sin B$  equals

- a)  $\frac{60}{\sqrt{2}}$                       d)  $\frac{\sqrt{2}}{6}$   
 b)  $\frac{6}{\sqrt{2}}$                       e)  $\frac{\sqrt{2}}{60}$   
 c)  $\frac{\sqrt{6}}{2}$

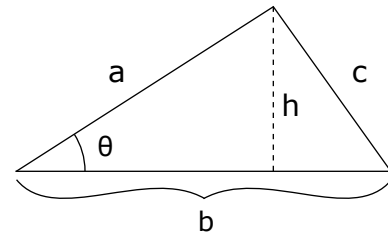
67.  $\cos \theta \tan \theta =$

- a)  $\sin \theta$                       d)  $\cot \theta$   
 b)  $\frac{\cos^2 \theta}{\sin \theta}$                       e)  $\sec \theta$   
 c) 1

68. Let  $\theta$  be the angle formed by the line  $y = 3x$  and the positive  $x$ -axis. Then  $\sin \theta$  equals

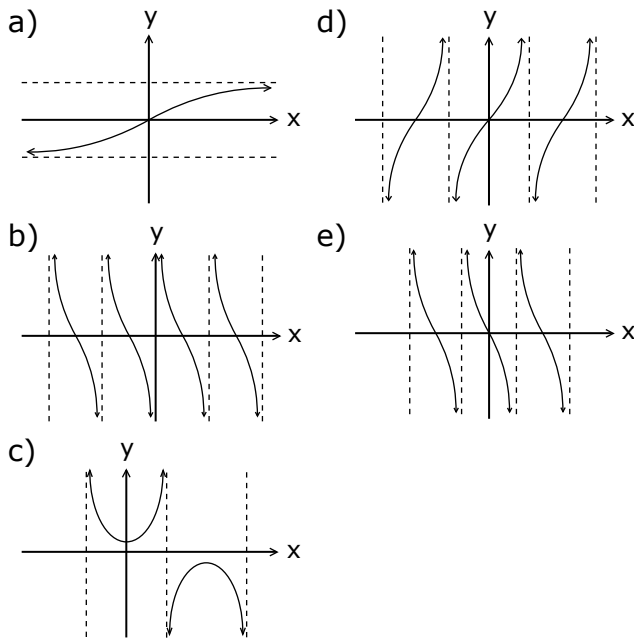
- a)  $\sqrt{10}$                               d)  $\frac{\sqrt{10}}{3}$   
 b)  $\frac{1}{\sqrt{10}}$                               e)  $\frac{3}{\sqrt{10}}$   
 c) 3

69. If  $h$  is an altitude of the triangle, then the area is

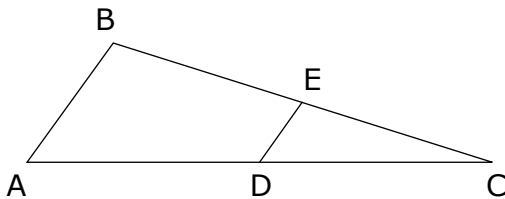


- a)  $\frac{1}{2} bc$                               d)  $\frac{1}{2} ab \sin \theta$   
 b)  $\frac{1}{2} ab$                               e)  $\frac{1}{2} ab \cos \theta$   
 c)  $\frac{1}{2} ab \tan \theta$

70. A sketch of the graph of  $y = \tan(x)$  is



71. Given  $\triangle ABC$  with D the midpoint of side AC and E the midpoint of side BC.



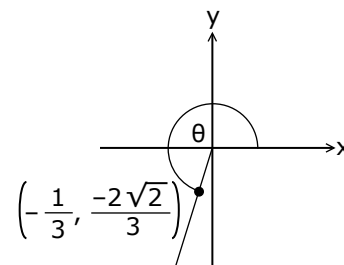
Then which of the following is not true?

- a)  $\overline{AB} \parallel \overline{DE}$
- b)  $\overline{AB} = 2\overline{DE}$
- c)  $\angle ADE = \angle DEC$
- d)  $\angle A = \angle EDC$
- e)  $\triangle ABC$  is similar to  $\triangle DEC$

72. If  $\cos \theta = \frac{3}{5}$  and  $0 < \theta < 90^\circ$ , then  $\cos(90^\circ - \theta)$  equals

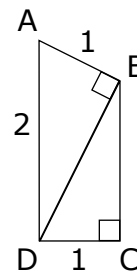
- a)  $-\frac{3}{5}$
- b)  $\frac{4}{5}$
- c)  $-\frac{4}{5}$
- d)  $\frac{5}{3}$
- e)  $-\frac{5}{3}$

73. The cosine of the angle  $\theta$  in the figure is



- a)  $\frac{1}{3}$
- b)  $-\frac{1}{3}$
- c)  $\frac{2\sqrt{2}}{3}$
- d)  $\frac{-2\sqrt{2}}{3}$
- e)  $\frac{1}{2\sqrt{2}}$

74. In the figure below,  $\angle ABD = 90^\circ$  and  $\angle BCD = 90^\circ$ . The length of BC is



- a)  $\frac{\sqrt{2}}{2}$
- b)  $\sqrt{2}$
- c)  $\frac{\sqrt{3}}{2}$
- d)  $\sqrt{3}$
- e)  $\sqrt{6}$

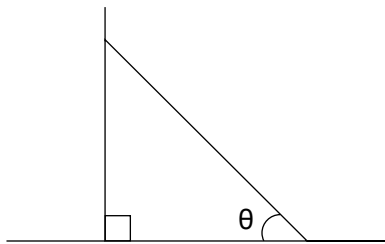
75. Which of the following statements is false?

- a) All squares are similar.
- b) All congruent rectangles are similar.
- c) All equiangular triangles are similar.
- d) All equilateral triangles are similar.
- e) All right triangles are similar.

76. If  $\cos x = 0.70$ , then  $\cos(-x) =$

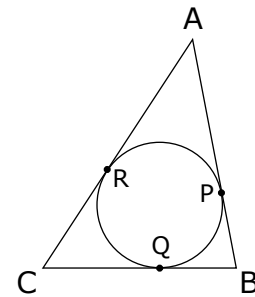
- a) 0.70
- b) 0.30
- c) -0.70
- d) -0.30
- e)  $\frac{1}{0.70}$

77. Suppose a 5 foot ladder is leaning against a vertical wall, where the bottom of the ladder is a distance of  $x$  feet from the wall. Then the angle  $\theta$  that the ladder makes with the ground is given by



- a)  $\frac{x}{5}$
- b)  $\cos\left(\frac{x}{5}\right)$
- c)  $\frac{1}{\cos\left(\frac{x}{5}\right)}$
- d)  $\cos^{-1}\left(\frac{x}{5}\right)$
- e)  $\cos^{-1}\left(\frac{5}{x}\right)$

78. The triangle ABC is circumscribed about a circle with P, Q, and R as the points of tangency. If  $AR = 10$ ,  $CQ = 8$ , and  $BQ = 4$ , then the length of AB is

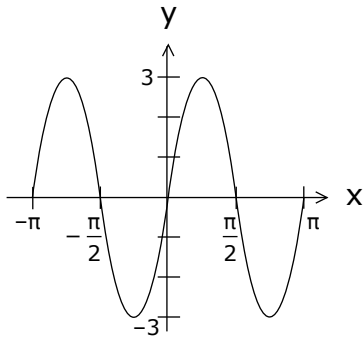


- a) 10
- b) 12
- c) 14
- d) 16
- e) 18

79. The solutions to  $\sin^2 x = \frac{1}{4}$  in the interval  $0 \leq x \leq 2\pi$  are

- a)  $x = \frac{\pi}{6}, \frac{5\pi}{6}$
- b)  $x = \frac{\pi}{3}, \frac{2\pi}{3}$
- c)  $x = \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$
- d)  $x = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$
- e)  $x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$

80. Let  $f(x)$  have the graph shown below:



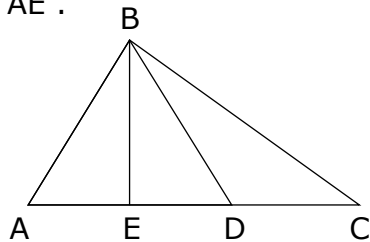
Then  $f(x)$  could be

- a)  $3 \sin\left(\frac{x}{2}\right)$                       d)  $2 \sin(3x)$   
 b)  $3 \cos(2x)$                       e)  $3 \sin(2x)$   
 c)  $3 \cos\left(\frac{x}{2}\right)$

81.  $\sin^2(3x) + \cos^2(3x) =$

- a) 9                      d)  $\cos(6x)$   
 b) 3                      e) None of these  
 c) 1

82. In the figure below,  $AB = BD$  and  $BE$  is perpendicular to  $AC$ . If  $AC = 13$  and  $AD = 8$ , find  $AE$ .



- a)  $\frac{13}{2}$                       d) 5  
 b)  $\frac{13}{3}$                       e) None of these  
 c) 4

83.  $\tan 30^\circ =$

- a)  $\frac{1}{2}$                       d)  $\sqrt{3}$   
 b)  $\frac{\sqrt{3}}{3}$                       e)  $\frac{\sqrt{3}}{2}$   
 c) 2

84. An angle of radian measure,  $x$ , has degree measure of

- a)  $\frac{180}{\pi x}$                       d)  $\frac{180x}{\pi}$   
 b)  $\frac{\pi}{180x}$                       e) None of these  
 c)  $\frac{\pi x}{180}$

85.  $\sin 2\theta =$

- a)  $2 \sin \theta$   
 b)  $2 \cos \theta$   
 c)  $2 \sin \theta \cos \theta$   
 d)  $\sin \theta + \cos \theta$   
 e)  $\sin 2\theta - \sin \theta$



## ANSWER KEY:

The answers to this practice test are given below. Give yourself one point for each question you answered correctly and zero points for each question you answered incorrectly. Add up your points for each section: Math Fundamentals, Advanced Algebra, and Trigonometry. An average score on Math Fundamentals is between 11 and 19. An average score on Advanced Algebra is between 10 and 26 and an average score on Trigonometry is between 4 and 12.

### Math Fundamentals

1. B
2. D
3. A
4. D
5. D
6. C
7. E
8. C
9. D
10. E
11. C
12. A
13. D
14. D
15. D
16. C
17. D
18. B
19. B
20. D
21. D
22. C
23. D

### Advanced Algebra

24. B
25. B
26. D
27. C
28. B
29. E
30. D
31. C
32. E
33. C
34. B
35. B
36. E
37. E
38. E
39. C
40. C
41. B
42. A
43. E
44. D
45. D
46. B
47. A
48. D
49. E
50. E
51. D
52. C
53. E
54. A
55. D
56. A
57. C
58. D
59. D
60. C
61. B
62. B
63. D

### Trigonometry

64. E
65. A
66. D
67. A
68. E
69. D
70. D
71. C
72. B
73. B
74. B
75. E
76. A
77. D
78. C
79. E
80. E
81. C
82. C
83. B
84. D
85. C