

EST II – Individual Subject Test

Level 1

Student's Name _____

National ID _____

Test Center: _____

Subject: Math

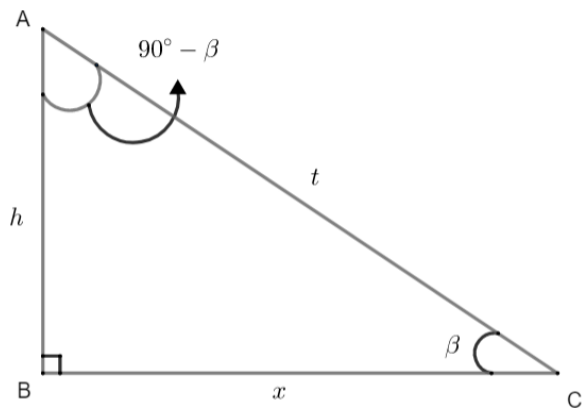
Duration: 60 minutes

50 Multiple Choice Questions

Instructions:

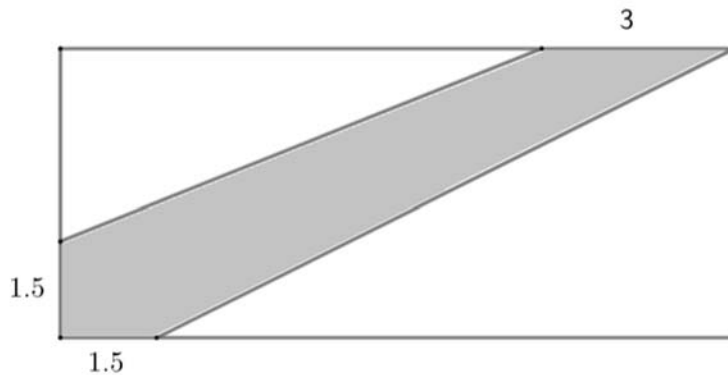
- Place your answer on the answer sheet. Mark only one answer for each of the multiple choice questions.
- Avoid guessing. Your answers should reflect your overall understanding of the subject matter.
- Calculator is allowed. When a calculator is used, be aware of switching between radian mode and median mode.
- Formula sheet is available at the end of the booklet for your reference.

- If $f(x) = 2ax^2 + (3 - b)x + 7$ and $g(x) = (a - 1)x^2 + 2bx + 7$ are identical, what are the zeros of function f ?
 - 1.54 and 4.54
 - 2.19 and 3.19
 - 1.27 and 2.77
 - 1.44 and 2.44
 - 2.44 and 1.44
- $3m$, $2m + 5$, and $4m - 5$ are three consecutive terms of a geometric sequence. If m has a negative value, what is the value of the common ratio of this sequence?
 - 10
 - 2
 - $-\frac{1}{2}$
 - $\frac{1}{2}$
 - 1
- What is the slope of the line perpendicular to the one passing through $(-4, 5)$ and $(3, 7)$?
 - $-\frac{7}{2}$
 - 1
 - $-\frac{2}{7}$
 - $\frac{2}{7}$
 - $\frac{7}{2}$
- If $f(x) = \sqrt{x - 1}$ and $g(x) = x^2$, what is the domain of $(f \circ g)(x)$?
 - All x such that $x \geq 1$
 - All x such that $x \leq -1$
 - All x such that $x \leq -1$ or $x \geq 1$
 - All x such that $x \leq -1$ and $x \geq 1$
 - All real numbers
- Using the adjacent diagram at the right, if $3 \tan \beta = 2$, what is the value of t ?
 - $\frac{2}{3}$
 - $\frac{3}{2}$
 - $2\sqrt{13}$
 - $\sqrt{\frac{2}{3}}$
 - $\sqrt{13}$



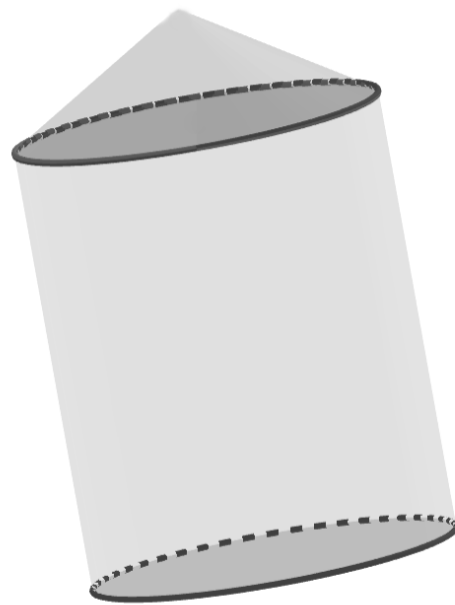
6. If $x + 4y = -10$ and $2x = 35 + 3y$, what is the value of twice the quotient of x and y ?
- A. -4
 B. -2
 C. $\frac{1}{2}$
 D. 2
 E. 4
7. How many 2-digit numbers are even but do not have a zero digit?
- A. 27
 B. 30
 C. 36
 D. 40
 E. 45

8. The length of the adjacent rectangle is equal to 14 cm , and the width is equal to 6 cm . What is the area of the shaded region? (figure is not drawn to scale)



- A. 4.5 cm^2
 B. 21.75 cm^2
 C. 24.75 cm^2
 D. 37.5 cm^2
 E. 84 cm^2

9. The adjacent figure at the right shows a shape made out of a cone and a cylinder. The total volume of this shape is 39π cubic units. If the height of the cylinder is 4 units, and the radius is 3 units, what is the height of the cone?

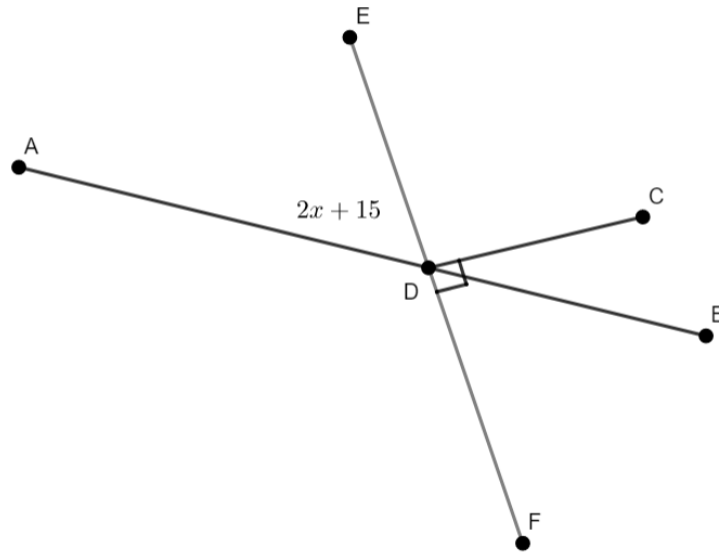


- A. 1 unit
 B. 2 units
 C. 3 units
 D. 4 units
 E. 5 units

10. If $|x - 3| = 2x$, which of the following is the correct value of x ?
- A. -3
 - B. -1
 - C. 0
 - D. 1
 - E. 3
11. During the first 4 months of this academic year, Ross passed 70% of his math assignments and 55% of his chemistry assignments, independently one of another. What is the chance that on the next attempt of each subject, he will pass the math assignment but not the chemistry?
- A. 1
 - B. 0.385
 - C. 0.315
 - D. 0.165
 - E. 0.135
12. What is the value of $2x^3$ if $3125 = 5^{3x-4}$?
- A. 3
 - B. 6
 - C. 27
 - D. 54
 - E. 250
13. What is the equation of the oblique asymptote of the function $f(x) = \frac{3x^2 - 4x + 1}{2x + 1}$?
- A. $y = 1.5x - 2$
 - B. $y = 1.5x - 2.75$
 - C. $y = 1.5x$
 - D. $y = 1.5x + 2.75$
 - E. $y = 1.5x + 2$
14. $x^2 - 6x + y^2 - 4y + 2 = 0$ represents the equation of a circle (C). What is the radius of this circle?
- A. $\sqrt{2}$
 - B. 2
 - C. $\sqrt{11}$
 - D. 5.5
 - E. 11

15. $A(-5.84, 2.27, 0)$ and $G(-3, 2, 0)$ are two vertices of a cube $AGCFEDBH$. What is the surface area of this cube?
- A. 2.85 square units
 - B. 15.41 square units
 - C. 48.83 square units
 - D. 237.47 square units
 - E. 2384.46 square units

16. Using the diagram below, what is the measure of $\angle BDC$?



- A. $2x + 105$
 - B. $2x + 75$
 - C. $2x - 75$
 - D. $105 - 2x$
 - E. $75 - 2x$
17. Which of the following is equivalent to the expression: $2a^2 - 3a + 4ba - 6b$?
- A. $(2a - 3)(a - 2b)$
 - B. $(2a - b)(a + 3)$
 - C. $(2 - b)(ab - 3)$
 - D. $(2a - 3)(a + 2b)$
 - E. $(2a + 3)(a - 2b)$

18. Jimmy decided to spend an average of \$40 a week on buying clothes. He spent \$25 the first week, and \$66 the second week. How much can he equally spend the third and the fourth week without surpassing his budget?
- A. \$69
 B. \$54.5
 C. \$34.5
 D. \$45
 E. \$38
19. The height of a trapezoid is equal to $2x + 1$. Its small base is half the height, and the large base is triple the small one. What is the expression that represents the area of this trapezoid?
- A. $2x + 1$
 B. $(2x + 1)^2$
 C. $2(2x + 1)^2$
 D. $2x - 1$
 E. $4x^2 - 1$
20. What is the product of the solutions of $x^4 - 3x^2 = -2$?
- A. $-2\sqrt{2}$
 B. -2
 C. 1
 D. 2
 E. $2\sqrt{2}$
21. What are the transformations of $f(x) = x^2$ when the graph of $g(x) = 2x^2 - 2$ is sketched?
- A. It is vertically stretched with a vertical shift down 2 units
 B. It is vertically stretched with a horizontal shift right 2 units
 C. It is vertically compressed with a vertical shift down 2 units
 D. It is vertically compressed with a vertical shift up 2 units
 E. It is horizontally stretched with a vertical shift down 2 units
22. Lora went to the mall and purchased the items that are shown in the adjacent table. What is the sum of the mean and the median of the list shown?
- A. 25.17
 B. 29.56
 C. 33.95
 D. 59.12
 E. 101.72

<i>Items</i>	<i>Price</i>
Jeans	\$44.77
T-shirt	\$25.67
Sweatshirt	\$20.67
Backpack	\$24.67
Jacket	\$67.77
Hat	\$20.17

23. Which constant should be added to $3x^2 - 8x$ in order to be made into a perfect square?

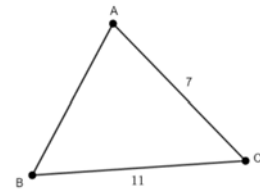
- A. $\frac{4}{3}$
- B. $\frac{16}{3}$
- C. $\frac{8}{3}$
- D. 4
- E. 16

24. The area of a parallelogram is $16 m^2$. The ratio of its height to base is 1:4. What is the dimension of its height?

- A. $2 m$
- B. $4 m$
- C. $8 m$
- D. $16 m$
- E. $64 m$

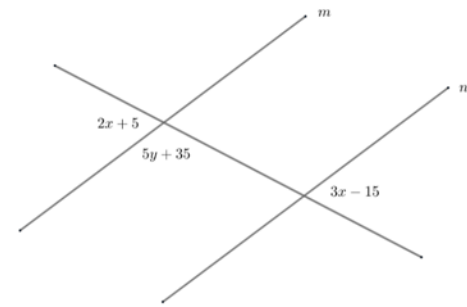
25. Which value for the dimension of segment AB could be true so that ABC can be a triangle?

- A. 0.5
- B. 1.5
- C. 2.5
- D. 3.5
- E. 4.5



26. Using the adjacent diagram, if lines m and n are parallel, what is the value of y ?

- A. 100
- B. 80
- C. 60
- D. 40
- E. 20



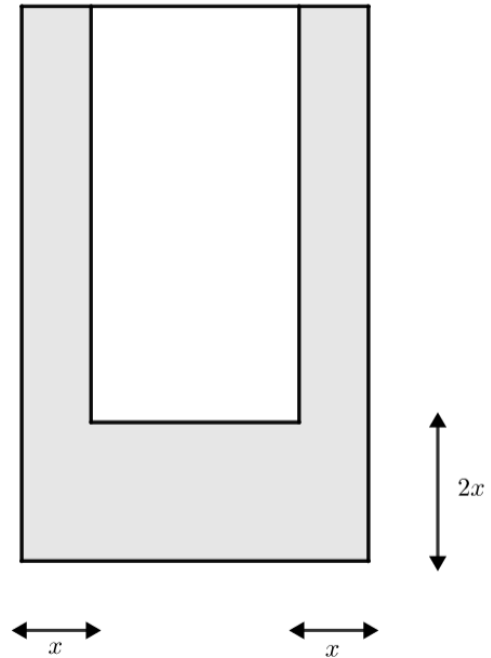
27. Which of the following is the inverse function of $f(x) = x^2 - 4x + 4$?

- A. $f^{-1}(x) = -4 \pm \sqrt{x}$
- B. $f^{-1}(x) = -2 \pm \sqrt{x}$
- C. $f^{-1}(x) = \pm \sqrt{x}$
- D. $f^{-1}(x) = 2 \pm \sqrt{x}$
- E. $f^{-1}(x) = 4 \pm \sqrt{x}$

28. Which of the following is equivalent to $f(x) = 343(7^{-2x})$?
- A. $f(x) = 7^{2+3x}$
 - B. $f(x) = 7^{3-2x}$
 - C. $f(x) = 7^{6x}$
 - D. $f(x) = \frac{1}{7^{6x}}$
 - E. $f(x) = \frac{1}{7^{3-2x}}$
29. The perimeter of an equilateral triangle is equal to $3\sqrt{7} - 6$. What is the dimension of the height of the triangle?
- A. 0.16
 - B. 0.31
 - C. 0.56
 - D. 0.65
 - E. 1.25
30. Which of the following equations has roots equal to $2\sqrt{2}$ and $-\frac{7}{2}$?
- A. $0 = x^2 + x\left(\frac{-7+4\sqrt{2}}{2}\right) - 7\sqrt{2}$
 - B. $0 = x^2 + x\left(\frac{7-4\sqrt{2}}{2}\right) - 7\sqrt{2}$
 - C. $0 = x^2 + x\left(\frac{-7+4\sqrt{2}}{2}\right) + 7\sqrt{2}$
 - D. $0 = x^2 + x\left(\frac{7-4\sqrt{2}}{2}\right) + 7\sqrt{2}$
 - E. $0 = x^2 + x\left(\frac{7-2\sqrt{2}}{2}\right) - 7\sqrt{2}$
31. Jack bought a bag of 30-pieces of chocolates in which he found three different types of chocolate bars. If there are 11 bars of type A, 13 bars of type B, and the remaining are bars of type C, what is the probability that the first bar of chocolate that Jack will choose will be of type C?
- A. $\frac{4}{5}$
 - B. $\frac{1}{2}$
 - C. $\frac{1}{4}$
 - D. $\frac{1}{5}$
 - E. $\frac{1}{6}$

32. Using the adjacent figure, the length of the larger rectangle is $8x + 1$ while the width is equal to $4x + 3$. If the area of the shaded region is equal to 204 square units, what is the value of x ?

- A. $\frac{1}{2}$
- B. 2
- C. 3
- D. 6
- E. 9



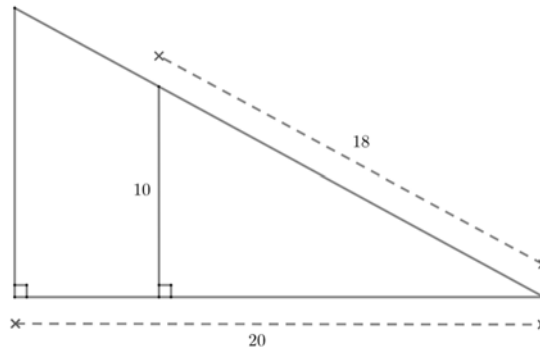
33. The adjacent table shows the heights of 10 randomly chosen buildings in Egypt. What is the sum of the interquartile range and the median of the data shown?

- A. 32
- B. 110
- C. 136.9
- D. 142
- E. 168.9

Building	Height (m)
Cairo Tower	187
Ministry of Foreign Affairs Building, Cairo	143
Nile City South Tower	142
El Maadi Residential Tower 16	140
Great Pyramid of Giza	138.8
National Bank of Egypt Tower 1	135
Residences Roda Island	118
Ramses Hilton & World Trade Center	110
Hilton World Trade Center Residences	110
Four Seasons Cairo at First Residence	103

34. The adjacent figure shows two similar triangles. What is the area of the larger triangle?

- A. 100 square units
- B. 120.27 square units
- C. 133.63 square units
- D. 240.53 square units
- E. 267.2 square units



35. Which of the following is not a solution of $|-8 + 3x| - 2 < 3$?

- A. $\frac{108}{25}$
- B. $\frac{19}{5}$
- C. $\frac{16}{5}$
- D. 2
- E. $\frac{19}{20}$

36. In a triangle TRD , $m\angle T = 66^\circ$ while $\sec R = 1.887$. What is the measure of angle D ?

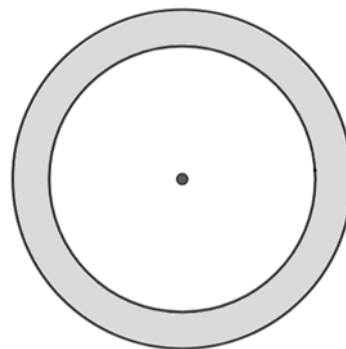
- A. 56°
- B. 58°
- C. 60°
- D. 62°
- E. 64°

37. The polynomial $2x^3 - ax^2 - 7x + 6$ has no remainder when it is divided by $x - 1$. What is the value of a ?

- A. -2
- B. -1
- C. 0
- D. 1
- E. 2

38. The area of the shaded region in the adjacent circle is equal to 42.75π square units. The circumference of the smaller circle is equal to 5π units. What is the radius of the larger circle?

- A. 14 units
- B. 7 units
- C. 6.25 units
- D. 5 units
- E. 2 units

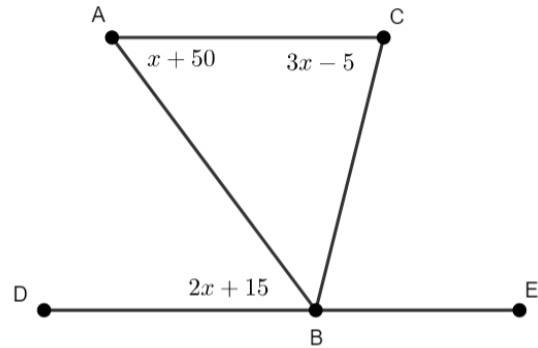


39. What is the equation of the line parallel to the line with equation $\sqrt{2}x - 3y = 1$ and passing through the center of the circle with equation $(x - 3\sqrt{2})^2 + (y^2 - 8y + 16) = 25$?

- A. $y = \frac{\sqrt{2}}{3}x + 2$
- B. $y = \frac{\sqrt{2}}{3}x - 2$
- C. $y = \frac{\sqrt{2}}{3}x$
- D. $y = -\frac{\sqrt{2}}{3}x + 2$
- E. $y = -\frac{\sqrt{2}}{3}x - 2$

40. In the adjacent figure, $m\angle ABD = \frac{2}{3}m\angle CBE$.
What is the value of x ?

- A. 3.75
- B. 7.5
- C. 15
- D. 30.8
- E. 42.5



41. Which of the following expressions is equivalent to $\sqrt[3]{135x^5y^7} \cdot \sqrt{180x^3y}$?

- A. $18x^3y^2 \cdot \sqrt[6]{5^5y^4x}$
- B. $18x^2y^3 \cdot \sqrt[6]{5^5y^5x}$
- C. $18x^2y^3 \cdot \sqrt[6]{5^5y^4x}$
- D. $18x^3y^2 \cdot \sqrt[6]{5^5y^5x^2}$
- E. $18x^3y^2 \cdot \sqrt[6]{5^5y^5x}$

42. Given $A = \begin{bmatrix} 3 & 1 \\ 0 & 5 \\ 2 & 4 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 4 \\ 5 & 3 \\ 9 & 6 \\ 3 & -2 \end{bmatrix}$. What is the matrix representing $A + 2B$?

A. $\begin{bmatrix} -1 & 9 \\ 10 & 11 \\ 20 & 16 \\ 9 & 0 \end{bmatrix}$

B. $\begin{bmatrix} 1 & -3 \\ 5 & 8 \\ 11 & 10 \\ 6 & 2 \end{bmatrix}$

C. $\begin{bmatrix} 7 & -1 \\ 11 & 10 \\ 16 & 20 \\ 0 & 9 \end{bmatrix}$

D. $\begin{bmatrix} 7 & -7 \\ -10 & -1 \\ -16 & -8 \\ -3 & 8 \end{bmatrix}$

E. $\begin{bmatrix} 9 & 0 \\ 20 & 16 \\ 10 & 11 \\ -1 & 7 \end{bmatrix}$

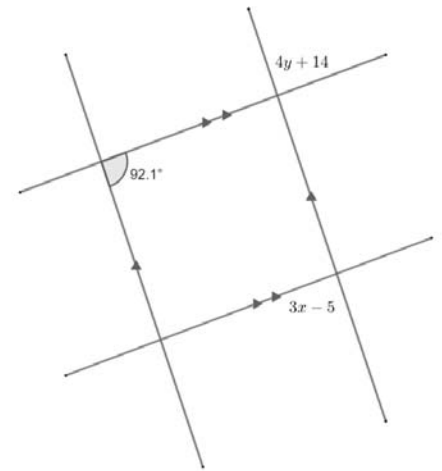
43. Given $A(2, 3, -7)$ and $B(3m, -2m + 1, 6)$. What is the value of m if $AB^2 = 221$?

- A. -2
- B. 0
- C. 1
- D. 2
- E. 4

44. If $f(x) = 2 \cdot 3^x + 2$, which of the following statements is correct?
- A. The graph of $f(x)$ is increasing and the equation of the vertical asymptote is $x = 2$.
 - B. The graph of $f(x)$ is increasing and the equation of the horizontal asymptote is $y = 2$.
 - C. The graph of $f(x)$ is decreasing and the equation of the horizontal asymptote is $y = 2$.
 - D. The graph of $f(x)$ is decreasing and the equation of the vertical asymptote is $x = 2$.
 - E. The graph of $f(x)$ is increasing and there are no asymptotes.
45. Given $f(x) = 3x^2 - 6x + 1$. What is the product of the coordinates of the vertex of this function?
- A. -10
 - B. -1
 - C. -2
 - D. 1
 - E. 2

46. Using the adjacent diagram, what is the value of $\frac{2x}{y}$?

- A. 0.6
- B. 0.83
- C. 1.19
- D. 1.67
- E. 3.35



47. If $21x - i + 8y = 7xi + 2y - 1$, what real values of x and y satisfy the equation?

- A. $x = -\frac{1}{7}$ and $y = \frac{1}{3}$
- B. $x = \frac{1}{7}$ and $y = -\frac{1}{3}$
- C. $x = -\frac{1}{7}$ and $y = -\frac{1}{3}$
- D. $x = -7$ and $y = 3$
- E. $x = \frac{1}{7}$ and $y = \frac{1}{3}$

48. Which of the following expressions can never have a negative answer for any x ?

- A. $|2x - 3(x - 5)| - 1$
- B. $\frac{x^2 - x - 6}{x^4}$
- C. $(-2|x - 3|)^2 - 3$
- D. $\frac{x^2 + 3}{(x - 7)^2}$
- E. $(x - 1)^3$

49. Ahmad bought 7 pencils and 11 pens from a shop for \$11.2. The price of 5 pens is equal to the price of 7 pencils. What is the price of 3 pens?
- A. \$1.0
 - B. \$1.4
 - C. \$1.5
 - D. \$2.1
 - E. \$3.5
50. A group of 7 persons is to be chosen from 5 men and 4 women. If at least 3 women should be included, in how many ways can this be done?
- A. 4320 ways
 - B. 30 ways
 - C. 24 ways
 - D. 20 ways
 - E. 10 ways

THE FORMULAS BELOW MAY BE USEFUL IN ANSWERING QUESTIONS ON THIS TEST.

$S = 4\pi r^2$ is the formula for the surface area of a sphere with a radius of r .

$V = \frac{1}{3}\pi r^2 h$ is the formula for a right circular cone with a radius of r and a height of h .

$V = \frac{4}{3}\pi r^3$ is the formula for a sphere with a radius of r .

$V = \frac{1}{3}Bh$ is the formula for a pyramid with a base area of B and a height of h .