EST 2 real Exams

Part 2

EST II – Individual Subject Test

Level 1

TEST no. (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.

1. Today is Friday, what is the day name after 100 days?

A. Friday
B. Saturday
C. Sunday
D. Monday
E. Tuesday

2. For the equation $2x^3 + bx^2 + cx - 24 = 0$, if the product of two of the roots is 6 what is the third root?

A. 2
B. 3
C. 4
D. 6
E. 12

3. If the value of $det\begin{pmatrix} 2 & k \\ 3 & 4k \end{pmatrix} = 30$, the value of k is

A. 2
B. 3
C. 5
D. 6
E. 10

4. What is $\sin(\arctan x)$

A. $\frac{\sqrt{x^2-1}}{x}$
B. $\frac{x}{\sqrt{x^2+1}}$
C. $\frac{1}{\sqrt{x^2+1}}$
D. $\frac{1}{\sqrt{x^2-1}}$
E. $\frac{x}{\sqrt{x^2-1}}$

5. $(x+y+1)^2-(x+y)^2-1=$

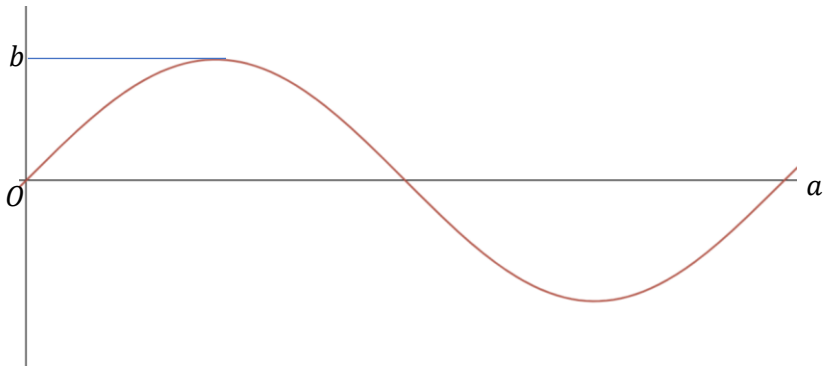
A. $x+y$

B. $2x+2y$

C. 0

D. $-2x-2y$

E. $-x-y$



6. The graph above shows one period of the graph of which function

A. $b\sin ax$

B. $a\sin bx$

C. $b\sin\frac{ax}{2\pi}$

D. $b\sin a\pi x$

E. $b\sin\frac{2\pi x}{a}$

7. A microbe culture initially has a population of 900000 and the population increases by 40% every hour. Let t be the number of hours passed. Find the time when the population reaches 7200000 to three decimal places.

A. $t=6.180\ hours$

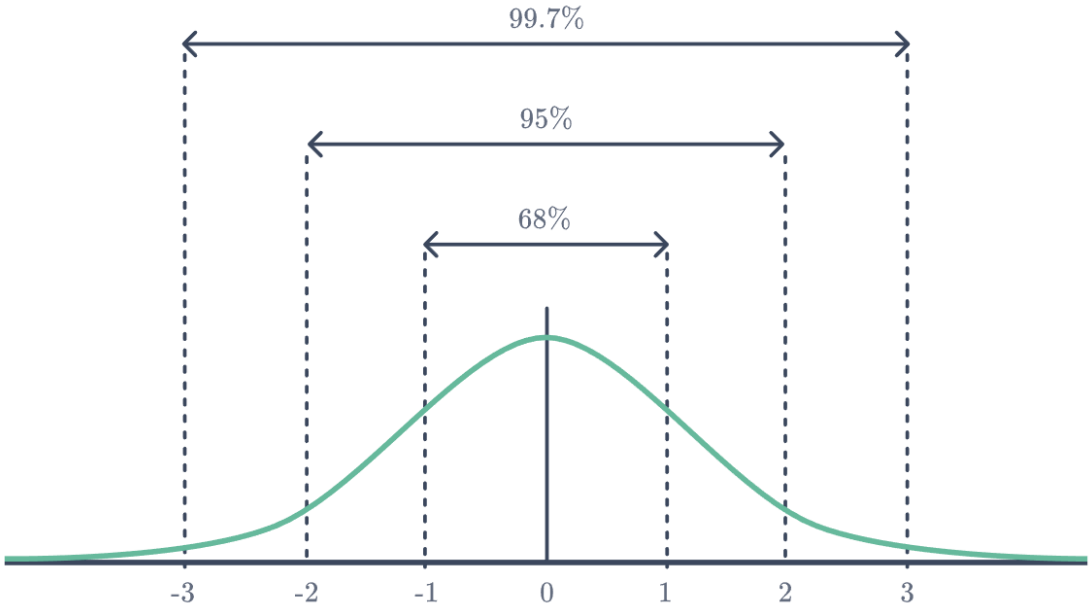
B. $t=59.019\ hours$

C. $t=4.071\ hours$

D. $t=12.360\ hours$

E. $t=3.090\ hours$

8. Consider the graph of a standard normal distribution showing the 68-95-99.7 rule:



Which value is closest to the 16^{th} percentile?

A. -3
B. -2
C. -1
D. 0
E. 1

9. A circle with parametric equations $\begin{cases} x = 3 + \sin t \\ y = 4 + \cos t \end{cases}$, has

A. Center at $(3, 4)$ and radius = 5
B. Center at $(-3, -4)$ and radius = 1
C. Center at $(3, 4)$ and radius = 1
D. Center at $(-3, -4)$ and radius = 5
E. Center at $(0, 0)$ and radius = 5

10. The graph of the function $f(x) = \frac{x^3+x+3}{x^2+1}$ has a slant (oblique) asymptote of equation …

A. $y = x - 2$
B. $y = x - 1$
C. $y = x$
D. $y = x + 1$
E. $y = x + 2$

11. If $\frac{1}{3} < \left|\frac{1}{8-x}\right| < \frac{1}{2}$, then $x \in \cdots$

A. $(4,5) \cup (9,10)$
B. $(5,6) \cup (10,11)$
C. $(6,7) \cup (11,12)$
D. $(6,7) \cup (9,10)$
E. $(4,5) \cup (10,11)$

12. The point with polar coordinates $(3,30°)$ can be written as

A. $(-3, 30°)$
B. $(3, 210°)$
C. $(-3, 390°)$
D. $(3, -30°)$
E. $(-3, -150°)$

13. If $\log_a b + 3\log_a c - \log_a d^2$, is expressed as a single logarithm will be written as

A. $\log_a \frac{3bc}{d^2}$
B. $\log_a \frac{bc^3}{d^2}$
C. $\log_a (b + 3c - d^2)$
D. $\log_a (b + c^3 - d^2)$
E. $\log_a \frac{3bc}{2d}$

14. The domain of $f(x) = \sqrt{-x^2 - 5x + 6}$, is

A. $[-2,3]$

B. $[1,6]$

C. $[-6,1]$

D. $[-1,6]$

E. $[-6,-1]$

15. If $a + bi = 2e^{\frac{\pi}{3}i}$, then $a =$

A. 1

B. 2

C. $\sqrt{3}$

D. $\frac{\sqrt{3}}{2}$

E. $\frac{1}{2}$

16. Find the $\lim_{x\to\infty} \frac{4x^2+2x-3}{2-x-3x^2}$

A. $-\frac{4}{3}$

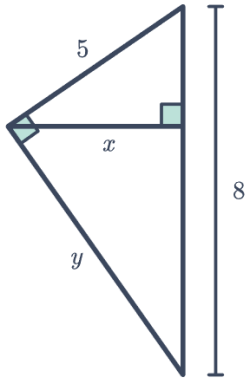
B. $\frac{4}{3}$

C. 0

D. ∞

E. 1

17. It the accompanying figure find $\frac{x}{y}$



A. $\frac{5}{8}$

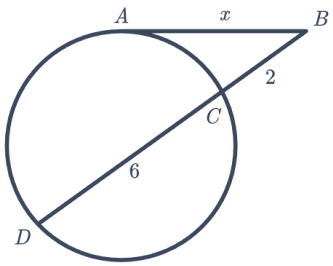
B. $\frac{8}{5}$

C. $\frac{5}{\sqrt{39}}$

D. $\frac{\sqrt{39}}{8}$

E. $\frac{\sqrt{39}}{5}$

18. $\overline{AB}$ is a tangent segment to the circle and $BC = 2, DC = 6$, D, C, B are collinear find x^2



A. 16

B. 12

C. 9

D. 24

E. 18

19. The graph of the cubic function $f(x) = x^3 - 6x^2 + x - 2$ is symmetric about the point of abscissa

A. 1

B. 2

C. 3

D. 4

E. 5

20. On a 50-question multiple choice math contest, students receive 4 points for a correct answer, 0 points for an answer left blank, and -1 point for an incorrect answer. Jesse's total score on the contest was 99. What is the maximum number of questions that Jesse could have answered correctly?

A. 25
B. 27
C. 29
D. 31
E. 33

21. Every high school in the city of Euclid sent a team of 3 students to a math contest. Each participant in the contest received a different score. Andrea's score was the median among all students, and hers was the highest score on her team. Andrea's teammates Beth and Carla placed 34^{th} and 64^{th}, respectively. How many schools are in the city?

A. 22
B. 23
C. 24
D. 25
E. 26

22. Mr. Abdallah attended two meetings during his 9-hour workday. The first meeting took 45 minutes, and the second meeting took twice as long. What percent of his workday was spent attending meetings?

A. 15
B. 20
C. 25
D. 30
E. 35

23. The equations of the asymptotes of the hyperbola $\frac{(x-1)^2}{9} - \frac{(y-5)^2}{16} = 1$, are

A. $y - 5 = \pm\frac{3}{4}(x-1)$

B. $y - 5 = \pm\frac{4}{3}(x-1)$

C. $y - 5 = \pm\frac{9}{16}(x-1)$

D. $y - 5 = \pm\frac{16}{9}(x-1)$

E. $y - 5 = \pm\frac{4}{3}x - 1$

24. The table below summarizes the major selection of students in a high school

	Literature	Biology	Mathematics	Total
Grade 10	A	400		
Grade 11	B		200	
Grade 12	C			
Total		X	Y	1200

What is $A + B + C + X + Y$?

A. 1200

B. 600

C. 400

D. 900

E. Can't be determined

25. The line of equation $y = 2x + 4$, is rotated 90° counterclockwise about the origin then the equation of the image after rotation is

A. $y = -\frac{1}{2}x - 2$

B. $y = \frac{1}{2}x + 4$

C. $y = -\frac{1}{2}x + 2$

D. $y = -\frac{1}{2}x + 4$

E. $y = \frac{1}{2}x + 2$

26. For a set of data, the mean $\mu = 10$, and the standard deviation $\sigma = 2$, If each number in the data were doubled and then decreased by 1 the new mean and standard deviation become

A. $\mu = 20, \sigma = 4$

B. $\mu = 9, \sigma = 1$

C. $\mu = 19, \sigma = 4$

D. $\mu = 19, \sigma = 3$

E. $\mu = 20, \sigma = 3$

27. If $2^x = 3^y = 6^z$, then z

A. xy

B. $x + y$

C. $\frac{x+y}{xy}$

D. $\frac{xy}{x+y}$

E. $\frac{1}{xy}$

28. The parametric equations of a straight line are $\begin{cases} x = 3t + 4 \\ y = -2t - 1 \end{cases}$, then the slope of the line is …

A. -2

B. $\frac{2}{3}$

C. $\frac{3}{2}$

D. $\frac{-3}{2}$

E. $\frac{-2}{3}$

29. The equation of $x^2 - 2xy + y^2 = 4$, a …

A. Circle

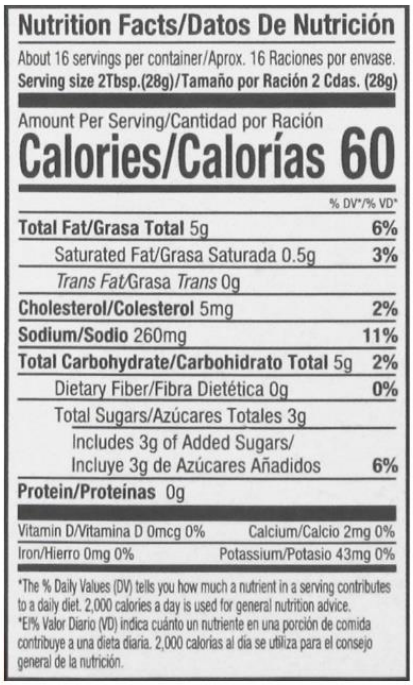
B. Parabola

C. Hyperbola

D. 2 Straight lines

E. Ellipse

Questions 30-31 refer to the information below.



Nutrition Facts/Datos De Nutrición

About 16 servings per container/Aprox. 16 Raciones por envase.
Serving size 2Tbsp.(28g)/Tamaño por Ración 2 Cdas. (28g)

Amount Per Serving/Cantidad por Ración

Calories/Calorías 60

	% DV*/% VD*
Total Fat/Grasa Total 5g	**6%**
Saturated Fat/Grasa Saturada 0.5g	**3%**
Trans Fat/Grasa *Trans* 0g	
Cholesterol/Colesterol 5mg	**2%**
Sodium/Sodio 260mg	**11%**
Total Carbohydrate/Carbohidrato Total 5g	**2%**
Dietary Fiber/Fibra Dietética 0g	**0%**
Total Sugars/Azúcares Totales 3g	
Includes 3g of Added Sugars/ Incluye 3g de Azúcares Añadidos	**6%**
Protein/Proteínas 0g	

Vitamin D/Vitamina D 0mcg 0% — Calcium/Calcio 2mg 0%
Iron/Hierro 0mg 0% — Potassium/Potasio 43mg 0%

*The % Daily Values (DV) tells you how much a nutrient in a serving contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.
*El% Valor Diario (VD) indica cuánto un nutriente en una porción de comida contribuye a una dieta diaria. 2,000 calorías al día se utiliza para el consejo general de la nutrición.

This is the nutrition facts label attached to some food product

30. Approximately, how many grams does the container hold?

A. 28 gm
B. 32 gm
C. 54 gm
D. 224 gm
E. 448 gm

31. Consuming the whole container in one day, give you what percent of the carbohydrates recommended for daily diet?

A. 32%
B. 2%
C. 1%
D. 176%
E. 64%

32. In an infinite geometric series, $1 + x + x^2 + x^3 + x^4 + \cdots$, what is the sum to infinity if $0 < x < 1$?

A. 1

B. x

C. $2x$

D. $\frac{1}{x+1}$

E. $\frac{1}{1-x}$

33. What is the greatest possible integer value for x that satisfy the following inequality?

$$x - 10 < 3x + 5 < 2x + 20$$

A. 12

B. 13

C. 14

D. 15

E. 16

34. What is the interquartile range for the set of data in the table below

2	2	2	3	3	3	5
7	7	10	11	12	13	18
19	20	22	23	24	27	30

A. 16

B. 17

C. 18

D. 19

E. 20

35. What is the range for the function $f(x) = 20 + 5\sin(2x - 1)$, where x measured in radians?

A. $[25, 30]$
B. $[15, 25]$
C. $[-20, 20]$
D. $[-25, 25]$
E. $[-5, 5]$

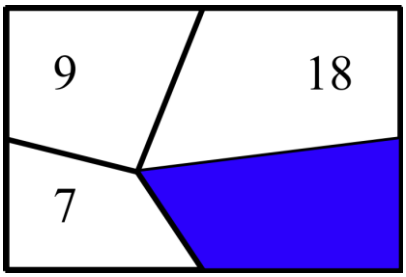
36. Which of the following statements about the function $h(t) = 500 + e^{-10t}$ is true?

A. The function is always decreasing and $h(t) > 500$ for all t.
B. The function is always increasing and $h(t) < 500$ for all t.
C. The function is always increasing and tends to infinity as t increases.
D. The function is always decreasing and tends to negative infinity as t increases.
E. The function is sometimes increasing and sometimes decreasing.

37. If $(x + 1) + 2(x + 2) + 3(x + 3) + 4(x + 4) = 5(x + 5)$, find x

A. $x = -1$
B. $x = 1$
C. $x = -2$
D. $x = 2$
E. $x = 0$

38. In a certain rectangle a point is chosen. A line segment is drawn from the point to the midpoint of each side of the rectangle and thus partitions the rectangle into 4 regions. The areas of 3 of the regions is given in the diagram below. What is the area of the fourth region- the one shaded blue?



A. 12
B. 13
C. 14
D. 15
E. 16

39. What is the horizontal component of a vector having a magnitude of 80 units and a heading 40° West of North?

A. -72.1
B. -74.4
C. -51.4
D. -61.3
E. -56.7

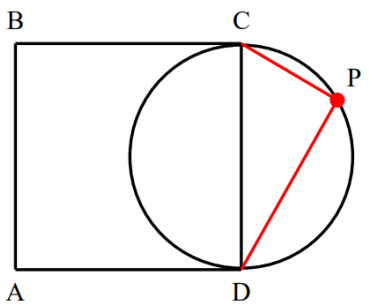
40. Find a positive integer M so that the equation

$$(x-12)(x+M) = M - 51$$

has exactly one solution.

A. 1
B. 2
C. 2.5
D. 4
E. 30

41. In the diagram $CP = 3, DP = 4$, find the area of the square

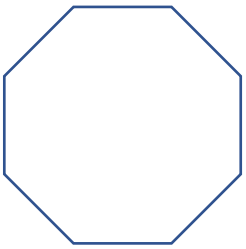


A. 5
B. 25
C. 20
D. 100
E. 625

42. The line that goes through $(1, 3)$ and $(k - 1, k + 4)$ has slope 2. Find k

A. 1
B. 2
C. 3
D. 4
E. 5

43. How many axes of symmetry does a regular octagon have?



A. 1
B. 2
C. 4
D. 8
E. 16

44. If $a^3b^4c^5d^6 > 0$, which of the following must be positive?

A. ab
B. abc
C. ac
D. bd
E. bcd

45. Suppose $f(x) = \frac{3x+4}{2x-1}$, find $f^{-1}(2)$.

A. 1
B. 3
C. 6
D. 0.3
E. $\frac{10}{3}$

46. If $\sqrt{2 + 2\sqrt{x}} = 2$, find x.

A. 0
B. 1
C. 2
D. 4
E. $\sqrt{2}$

47. If $\frac{x}{\ln 0.5} < 1$, then

A. $x < \ln 0.5$
B. $x > \ln 0.5$
C. $x > e^{0.5}$
D. $x < e^{-0.5}$
E. $x > 0.5$

48. $(1 + 2i)^2 - (1 - 2i)^2 =$

A. -6
B. $2i$
C. $4i$
D. $8i$
E. $-6 + 8i$

49. Three squared are aligned as the figure with side lengths 2, 3, 5, find the area of the shaded trapezoid

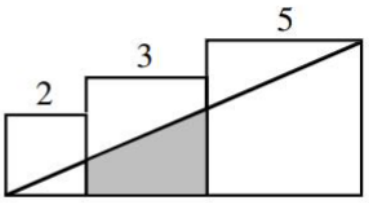
A. 4.5

B. 5

C. 5.25

D. 3.75

E. 6.25



50. The area of a rectangle is $A\ cm^2$ and its perimeter is $P\ cm$, what is the length of its diagonal?

A. $\sqrt{\frac{P^2}{4} - 2A}$

B. $\sqrt{P^2 - A}$

C. $\sqrt{\frac{P^2}{4} - A}$

D. $\sqrt{\frac{P^2}{2} - 2A}$

E. $\sqrt{\frac{P^2}{8} - 4A}$

Mark Scheme

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

EST II – Individual Subject Test

Date:

Test Center:

Room Number

Student's Name

National ID

EST ID

TEST no. (2)
january 2023

Subject: Math Level 1

Duration: 60 minutes

50 Multiple Choice Questions

Instructions:

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- 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 on the following page of the booklet for your reference.

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.

1. Three consecutive odd integers have a sum equal to 39.

How many of these numbers are prime?

A. 0
B. 1
C. 2
D. 3
E. No three consecutive odd integers can add up to 39.

2. An amount of 17,500 EGP is divided between three people in a ratio $3 : 3 : 8$.

The highest amount of money taken is:

A. 2,187 EGP
B. 3,750 EGP
C. 7,500 EGP
D. 10,000 EGP
E. 13,750 EGP

3. Given that $i^2 = -1$, and $\frac{2i-1}{3i+5} + \frac{2i-3}{i-1} = \frac{a(i-b)}{i+c}$, what is the value of $a + b + c$?

A. 75
B. 16
C. 14
D. 6
E. -16

4. The curve of equation $f(x) = 4x^2 + 9x - 4$ intersect with the line of equation $y = x - a$ at $x = \frac{-2 \pm \sqrt{10}}{2}$. What is the value of a?

A. -2
B. 0
C. 2
D. 4
E. 6

5. $\frac{2x-5}{3x} = \frac{x-1}{x+1}$

Using the equation above, find the value of x^2.

A. -5
B. -1
C. 1
D. $\sqrt{5}$
E. 5

6. If $8^x \cdot 4^{2x-1} = 16$, what is the value of 3^x ?

A. $3\sqrt[6]{3}$

B. $\sqrt[7]{3^6}$

C. $27\sqrt{3}$

D. $3\sqrt[7]{3}$

E. 27

7. ABC is a right isosceles triangle at A.

M is a point on $\overline{BC}$ such that $\overline{AM}$ is the perpendicular bisector of $\overline{BC}$.

Which of the following statements is not true?

A. $\overline{AM}$ is the angle bisector of the right angle in triangle ABC.

B. AMC is a right isosceles triangle at M.

C. $\Delta AMC \cong \Delta AMB$

D. If N is the symmetric of A with respect to M, then $ABNC$ is a square.

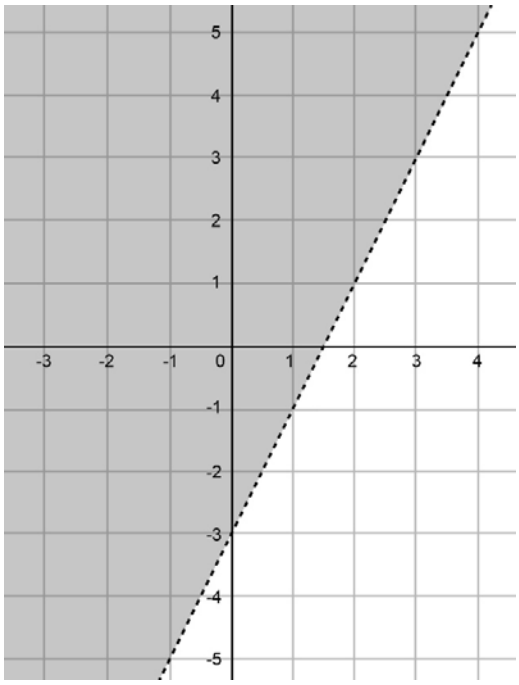
E. If K is the symmetric of M with respect to A, then BKC is an equilateral triangle.

8. The coefficient of x^2 in the expanded form of $3(4x-3)+(x^2+8x)(x-5)$ is:

A. -28
B. -9
C. 1
D. 3
E. 9

9. Which of the following is the equation of the oblique asymptote of the curve of equation $f(x) = \frac{2x^3 - 13x^2 + 17x + 12}{x^2 - 16}$?

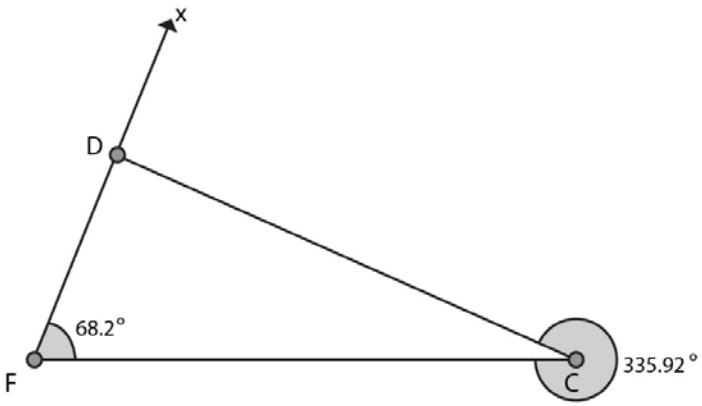
A. $y = -2x - 13$
B. $y = 2x - 13$
C. $y = 2x + 13$
D. $y = -2x + 13$
E. None of the above



10. The inequality represented in the graph above is $ax + by > c$.

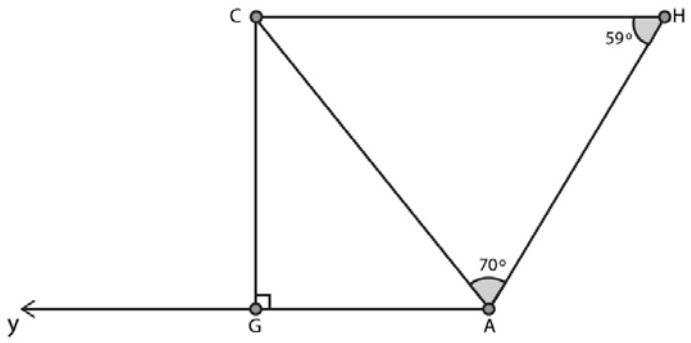
Which of the following can be the expression representing the value of $a + b - c$?

A. $-3b$
B. $-b$
C. b
D. $2b$
E. $3b$



11. Use the figure above to find $m\angle CDx$. *(Figure not drawn to scale)*

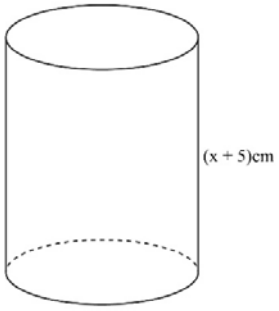
A. 21.8°
B. 24.08°
C. 68.2°
D. 90°
E. 92.28°



12. In the figure above, $m\angle ACG = 3x° - 7°$, and $m\angle CAG = 2t° + 10°$ where x and t are two positive integers.

What is the value of $5x° - t°$ if $\overrightarrow{AC}$ is the angle bisector of $\angle GAH$? *(Figure not drawn to scale)*

A. 12
B. 15
C. 46.67
D. 98.33
E. 123.33



13. The cylinder above has a diameter equal to 18 cm, and it is opened from the top. If its surface area is $198\pi\ cm^2$, what is the value of x ? *(Figure not drawn to scale) Given: The surface area of a cylinder is* $2\pi rh + 2\pi r^2$.

A. 1.5 cm
B. 3.5 cm
C. 4.5 cm
D. 6.5 cm
E. 9 cm

14. A line T passes through the midpoint of a segment with endpoints $A\,(3, 7)$ and $H\,(4, -5)$. Given that T is parallel to line L of equation $y = 5x + 8$, what is the sum of the intercepts of T ?

A. -16.5
B. -13.2
C. 3.3
D. 4.5
E. 13.2

15. Which of the following is the vertex form of the equation $y = 3x^2 - 4x + 1$?

A. $y = 3\left(x + \frac{2}{3}\right)^2 - \frac{1}{3}$

B. $y = -3\left(x - \frac{2}{3}\right)^2 - \frac{1}{3}$

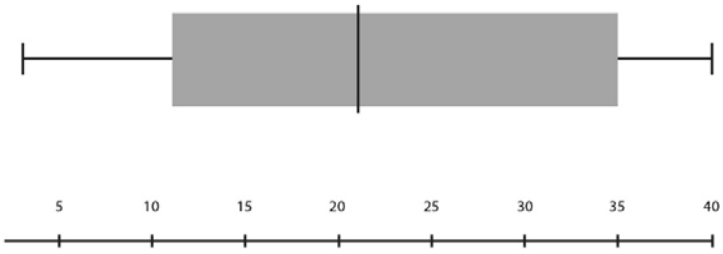
C. $y = -3\left(x - \frac{2}{3}\right)^2 + \frac{1}{3}$

D. $y = 3\left(x - \frac{2}{3}\right)^2 + \frac{1}{3}$

E. $y = 3\left(x - \frac{2}{3}\right)^2 - \frac{1}{3}$

16. If $-4 \leq -3x - 5 \leq 9$, and the greatest possible value for $2x$ is $\frac{a+7}{3}$, what is the value of $-2a$?

A. -2
B. -1
C. 2
D. 10
E. 18



17. Use the box-and-whisker plot above to find the approximate value of $a + 2b - c$ if a is the lower quartile, b is the interquartile range, and c is the maximum value in the data.

A. 11
B. 15
C. 19
D. 24
E. 40

18. A cone of radius r and height $7\,cm$ has a volume approximately equal to $9.33 \times 10^{-6}\pi\ m^3$. What is the value of r ?

A. $1\,cm$
B. $2\,cm$
C. $3\,cm$
D. $4\,cm$
E. $5\,cm$

19. A tour bus company in Giza serves 150 people and charges each passenger an amount of 25 EGP. In June, the company decides to increase the fare by 3 EGP starting the next month. This increase will cause a loss of 15 passengers. *(Hint: the tour bus makes daily trips.)*
What is the maximum income the company could get in the next month?

A. 113,400 EGP
B. 113,437.50 EGP
C. 117,180 EPG
D. 117,218.75 EGP
E. 117,567.50 EGP

20. A square $ABCD$ is inscribed in a circle C of radius $10\ cm$.

What is the area of the square $ABCD$?

A. $100\ cm^2$
B. $100\sqrt{2}\ cm^2$
C. $150\ cm^2$
D. $200\ cm^2$
E. $200\sqrt{2}\ cm^2$

21. Given U as an arithmetic sequence with a difference $d = 7$, and the 15^{th} term of this sequence is $a_{15} = 95$. If T is a geometric sequence such that its infinite sum of terms is equal to a_{15}, and its first term is equal to the first term of U, what is r, the common ratio of T, to the nearest hundredth?

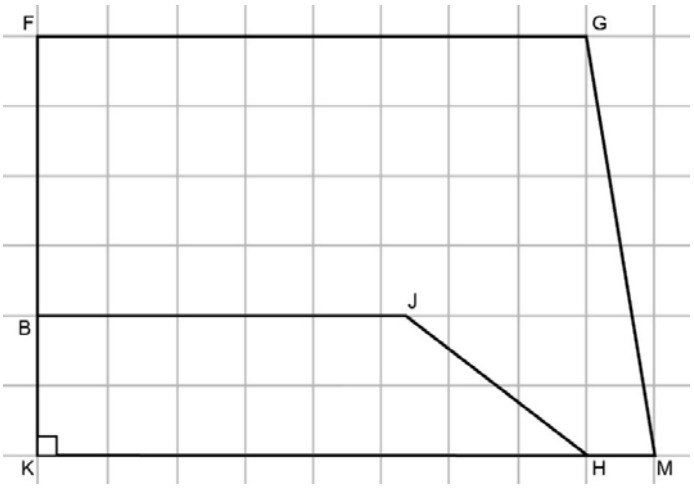
A. 0.78
B. 0.97
C. 1.03
D. 1.09
E. 1.14

Item	Price in $	Number of items sold by Ali	Number of items sold by Jamal
Laptop	1,200	6	2
Earbuds	180	1	4
Smartwatch	390	3	2
Hard disk	150	x	1

22. Ali and Jamal work as sales associates in a store. The table above shows the number of items sold by each one of them during a certain week. Ali earns $300 per week untaxable with 1.2% commission on each item he sells. Jamal earns $500 per week and gets 1.5% commission on each item he sells, but 13% taxes are applied on his total earnings.

How many hard disks should Ali sell to earn more than what Jamal earned during the week shown in the table?

A. 5
B. 18
C. 19
D. 47
E. 48



23. In the figure above, each square has dimensions of $1.5 \times 1.5\ cm$.

What is the difference between the areas of $FGMHJB$ and $BJHK$? (Extending $\overleftrightarrow{HJ}$ will intersect F).

A. $30.375\ cm^2$
B. $31.5\ cm^2$
C. $54.75\ cm^2$
D. $60.75\ cm^2$
E. $85.5\ cm^2$

24. If two angles $\angle 1$ and $\angle 2$ are complementary, and $m\angle 1 = m\angle 2$, and $m\angle 1 = 4x + 15$, what is the value of x ?

A. $x = 2.5$
B. $x = 5$
C. $x = 7.5$
D. $x = 10$
E. $x = 30$

25. What is the square of the distance between $A\ (-4, -9)$ and $B\ (7, 11)$?

A. 521
B. 409
C. 125
D. 75
E. 13

26. If $f(x) = \frac{2}{x+4}$ and $g(x) = -\frac{3}{x^2} + 1$, what is $g(f(x))$?

A. $-3x^2 - 6x - 11$

B. $-\frac{3}{4x^2} - 6x - 11$

C. $-\frac{3}{4}x^2 - 6x - 44$

D. $-\frac{3}{4}x^2 - 6x - 11$

E. $-3x^2 - 6x - 44$

27. Scientifically, the half-life of caffeine in a human body is about 6 hours. Sophie had 2 cups of coffee 10 hours ago.

How much is left in her system?

Hint: The equation of half-life is $y(t) = ae^{-kt}$.

A. About 0.09 of the original amount
B. About 0.19 of the original amount
C. About 0.31 of the original amount
D. About 0.38 of the original amount
E. About 0.63 of the original amount

28. The center of a circle is on the line of equation $y = -2x + 1$. The circle passes through point $M\ (-5, 6)$ and has a radius equal to $\sqrt{130}$ units.

Which of the following is the correct equation of this circle?

A. $(x-2)^2 + y^2 + 6x + 9 = \sqrt{130}$

B. $(x-2)^2 + y^2 - 6x + 9 = 130$

C. $x^2 - 4x + y^2 + 6y = 117$

D. $x^2 - 4x + y^2 - 6y = 117$

E. $(x-2)^2 + (y+3)^2 = \sqrt{130}$

29. ATE is a right triangle at T with $AT = 5$ units, and $TE = 7$ units.

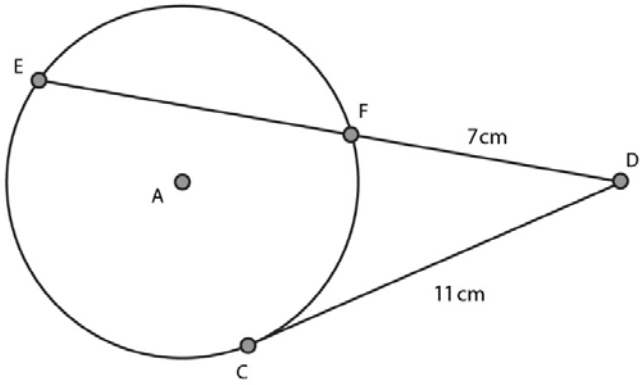
What is the value of $\tan(A) + \sin^2(E)$?

A. 1.981
B. 1.738
C. 1.655
D. 1.411
E. 1.129

30. The product of two consecutive integers is 156. The smallest integer between them is referred to as m.

What is the value of $\sqrt{m}$?

A. $\sqrt{3}$
B. $2\sqrt{3}$
C. 4
D. $3\sqrt{3}$
E. 12



31. In the figure above, $\overline{DE}$ is a secant to the circle, $\overline{DC}$ is a tangent to the circle, and $DA = 16\ cm$.

Find the perimeter of triangle AEF. *(Figure not drawn to scale)*

A. $28.3\ cm$
B. $28.7\ cm$
C. $30.1\ cm$
D. $32.2\ cm$
E. $33.5\ cm$

32. The average of n numbers is 19. When adding 7 to the numbers, the new average is 18.25.

What is the value of n?

A. 15
B. 16
C. 17
D. 18
E. 19

33. The measures of the interior angles in a hexagon are respectively $(2x + 1)°$, $(x + 15)°$, $(3x)°$, $(3x - 18)°$, $(2x - 5)°$, and $(x + 7)°$. If y is the measure of one angle in a regular nonagon, which regular polygon will have $(x + y)°$ as a measure of one of its interior angles?

A. 18-gon
B. 100-gon
C. 180-gon
D. 200-gon
E. No regular polygon has $(x + y)°$ as a measure of its interior angle.

34. The sum of three consecutive odd integers is 609. What is the greatest integer between these three integers?

A. 199
B. 201
C. 205
D. 207
E. 209

35. Which of the following is not the equation of a line perpendicular to the line of equation $4y = -16x + 1$?

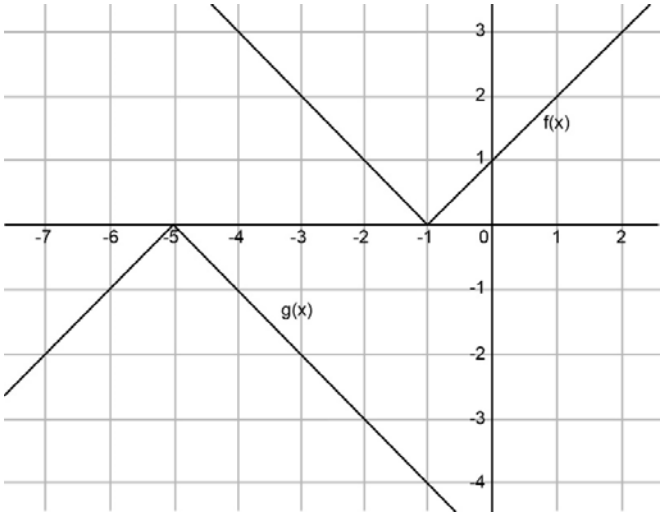
A. $4y - x - 12 = 4$

B. $-16y + 4 = 4 - 4x$

C. $2(4x + 1) = 4(8y - 5)$

D. $8(4x^2 - x) = 32(-y + x^2 - 4)$

E. $3y - 5 = -\frac{3}{4}x + 1$



36. Explain what was done to the graph of $f(x)$ to get the graph of $g(x)$.

A. Reflection over the $y\text{-}axis$, then shifting 4 steps to the left
B. Reflection over the $x\text{-}axis$, then shifting 4 steps to the left
C. Reflection over the $x\text{-}axis$, then shifting 4 steps to the right
D. Horizontal compression, followed by reflection over the $x\text{-}axis$, then shifting 4 steps to the left
E. Horizontal compression, followed by reflection over the $x\text{-}axis$, then shifting 4 steps to the right

37. All the following statements are true except

A. An equilateral triangle is also isosceles.
B. A right triangle cannot have an obtuse angle.
C. A square cannot be similar to another square.
D. An isosceles triangle can be obtuse.
E. A right triangle cannot have three congruent sides.

38. Which of the following cannot be the length of the third side in a triangle given that the two other sides have lengths equal to 8.5 cm and 11.4 cm?

A. 4 cm
B. 10 cm
C. 14 cm
D. 19 cm
E. 20 cm

39. $10, 10, 15, 18, 18, 21, 22, 30, 33$

Which of the following is not true regarding the set of data above?

A. The sum of the mean and median is an irrational number.
B. The range is equal to 23.
C. The sum of the numbers in this data is a prime number.
D. The median is 18.
E. There are two modes in this set of data.

40. What is the value of x if $\sin\left(\frac{\pi}{2} - x\right) - \cot\left(\frac{\pi}{2} - x\right) = \frac{\sqrt{3}}{6}$?

A. $x = \frac{\pi}{2}$
B. $x = \frac{\pi}{4}$
C. $x = \frac{\pi}{5}$
D. $x = \frac{\pi}{6}$
E. $x = \frac{\pi}{8}$

41. What is the domain of the function $f(x) = \sqrt{\frac{x^2 - 1}{x + 5}}$?

A. $(-5, -1) \cup [1, +\infty)$
B. $(-5, -1] \cup [1, +\infty)$
C. $(-5, -1) \cup (-1, +\infty)$
D. $(-\infty, -5) \cup [1, +\infty)$
E. $(-5, -1] \cup (1, +\infty)$

42. Which of the following could be the lengths of the sides of a right triangle?

A. $\sqrt{2}, 5, \sqrt{3}$
B. $\sqrt{2}, 4, 2\sqrt{2}$
C. $3.5, 8, \frac{\sqrt{305}}{3}$
D. $\sqrt{3}, 6, \sqrt{39}$
E. $3, 5, 9$

43. A man drove his car 70 km with an average speed of 80 km/h, stopped at a restaurant for two hours, then drove 55 km with an average speed of 60 km/h. If he left his house at the beginning at 9: 00 a.m., approximately at what time did he reach his destination?

A. 11: 30 a.m.
B. 12: 47 p.m.
C. 12: 55 p.m.
D. 01: 35 p.m.
E. 01: 47 p.m.

44. $f(x) = x^2 + 4x - 1$

$g(x) = -2x^2 - 4x + 2$

The graphs of the two functions above intersect at two points. The point of intersection, such that $x < 0$, is the vertex of the graph of a third function $h(x)$ whose y-intercept is the same as the y-intercept of g.

Which of the following is the correct equation of h?

A. $3h(x) = 2x^2 + 12x + 6$

B. $h(x) = 2x^2 + 4x + 1$

C. $3h(x) = 2x^2 + 12x + 2$

D. $3h(x) = -2x^2 + 12x - 2$

E. $h(x) = 2x^2 + 12x - 6$

45. $\frac{x+1}{x^2+2x-1} = \frac{3x+4}{2x-y}$

In reference to the equation above, which of the following represents the expression of y in terms of x?

A. $y = \frac{3x^3+8x^2+9x-4}{-x-1}$

B. $y = \frac{3x^3+8x^2+3x+4}{-x-1}$

C. $y = \frac{3x^3-8x^2+3x-4}{-x-1}$

D. $y = \frac{3x^3+12x^2+3x-4}{-x-1}$

E. $y = \frac{3x^3+8x^2+3x-4}{-x-1}$

46. Johan has two bags. The first bag contains 2 red and 7 white balls, while the second contains 4 red and 5 white balls. One of the bags is selected randomly, and a ball is drawn from this bag. If the ball drawn is white, what is the probability that it is drawn from the second bag?

A. $\frac{5}{12}$

B. $\frac{1}{2}$

C. $\frac{5}{9}$

D. $\frac{7}{9}$

E. $\frac{70}{81}$

47. $\begin{cases} y = \frac{-36 + ax}{12} \\ \frac{x}{3} = -3 - y \end{cases}$

What should be the value of a in the above system of equations so that it has infinite number of solutions?

A. 4
B. 3
C. -2
D. -3
E. -4

48. $\begin{bmatrix} 1 & 0 & -5 \\ 3 & -3 & 3 \\ 4 & 7 & 1 \end{bmatrix}$

What is the determinant of the matrix above?

A. 189
B. 144
C. 98
D. -144
E. -189

49. A right trapezoid with bases equal to $7\ cm$ and $12\ cm$ has an area equal to the area of a triangle with a base equal to $5\ cm$ and a height of $4.2\ cm$.

What is the length of the height of the trapezoid?

A. $0.25\ cm$
B. $0.905\ cm$
C. $1.105\ cm$
D. $1.782\ cm$
E. $2.333\ cm$

50. What is the probability of selecting the letter E from the letters in the word "Hostesses"?

A. $\frac{1}{3780}$
B. $\frac{2}{9}$
C. $\frac{1}{4}$
D. $\frac{2}{7}$
E. $\frac{1}{2}$

EST II Math Leve1

Answer key

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

Distribution Table

	Topics Covered	Knowledge	Application	Reasoning	Synthesis
5/50	**Numerations and Operations**	2, 48	1	3, 21	
19/50	**Algebra and Functions**	8, 34	4, 5, 6, 9, 15, 26, 30, 45	10, 16, 22, 27, 41, 43, 47	19, 44
11/50	**Plane Shapes / Measurement**	11	12, 20, 23, 24, 38, 49	7, 31, 37	33
5/50	**Coordinates System**	36	25	14, 35	28
2/50	**Solid Shapes**		13, 18		
3/50	**Trigonometry**		29, 42	40	
5/50	**Data Analysis, Statistics and Probability**	17, 50	39, 46	32	
		8/50	**22/50**	**16/50**	**4/50**

EST II – Individual Subject Test

Date:

Test Center:

Room Number:

Student's Name:

National ID:

EST ID:

TEST no. (3)
January 2024

Subject: Math Level 1

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 on the following page of the booklet for your reference.

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

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

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

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

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

1. The third term of an arithmetic sequence is 34, and the seventh term is 86. Find the 11^{th} term of this sequence.

A. 554
B. 216
C. 164
D. 138
E. 78

2. Given the equation $3(x-4)(x+2) = (3x+7)(x+5)$. The value of x is $-\frac{a}{28}$ where a is a real number. Find the value of a.

A. 11
B. 25
C. 31
D. 45
E. 59

3. Given a geometric sequence such that one of the terms is 20, and another one is 5,120. If there are 3 terms between these two, then the common ratio is:

A. 1
B. 1.5
C. 4
D. 5
E. 10

4. Given the two functions $f(x) = -x + 5$ and $g(x) = x^2 - 1$ such that their graphs are sketched only on the positive side of the x-axis. Which of the following statements is/are true?

I. If the graph of g intersects the x-axis at $(x_1, 0)$, then the graph of f intersects the x-axis at $(x_1 + 4, 0)$.
II. The graphs of the two functions intersect at $(2, 3)$.
III. When $x \in [2, +\infty)$, the graph of f is sketched above the graph of g.

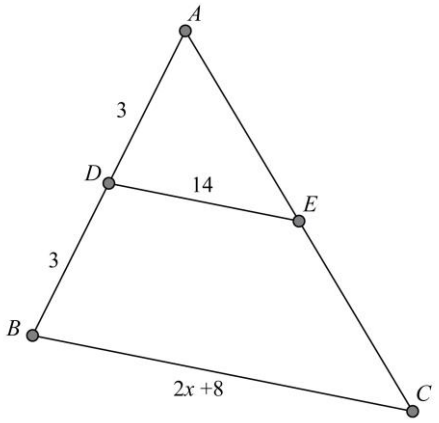
A. **I** only
B. **I** and **II**
C. **I** and **III**
D. **II** and **III**
E. **I**, **II**, and **III**

5. Given $f(x) = x^2 + 4x - 1$, and $g(x) = |x - 4| + 7$. Find $f(g(-1))$.

A. 44
B. 159
C. 177
D. 191
E. 211

6. Given the function f defined by $f(x) = 4x^2 - 10x + 1$. The equation of the axis of symmetry of f is:

A. $x = 5$
B. $x = 4$
C. $x = \frac{5}{4}$
D. $x = 1$
E. $x = -\frac{5}{4}$



7. In the figure above, $\overleftrightarrow{DE}$ and $\overleftrightarrow{BC}$ are parallel. If D and E are the midpoints of $\overline{AB}$ and $\overline{AC}$, respectively, what is the value of x?

A. 3
B. 6
C. 10
D. 14
E. 28

8. $x°$, $(4x + 12)°$, and $(2x - 7)°$ are the measures of the angles in a triangle. Find x.

A. 24
B. 25
C. 26
D. 27
E. 28

9. A virus struck a country, infecting 12 million people. The health authorities provided medication to the patients, and the number of infected people began to decrease. After t hours, the number of people still infected is represented by the function $p(t) = 12{,}000{,}000 \times (0.95)^t$. Approximately, how many people are still infected by this virus after 4 days?

A. 9,774,075
B. 3,503,868
C. 1,255,087
D. 770,665
E. 87,226

10. Given two polynomial functions $p(x)$ and $q(x)$ such that n and m are their degrees, respectively. Which of the following statements is/are always true?

I. If $f(x) = \frac{p(x)}{q(x)}$ where $q(x) \neq 0$, and $n < m$, then the graph of f has $y = 0$ as a horizontal asymptote.
II. If $g(x) = p(x) \times q(x)$, then the degree of $g(x)$ is n^m.
III. If $h(x) = p(q(x))$, then the degree of $h(x)$ is $n \times m$.

A. **I** only
B. **II** only
C. **III** only
D. **I** and **III**
E. **II** and **III**

11. An open-topped box with a square base has a volume equal to $6{,}000\ cm^3$. Suppose the side of the base is $x\ cm$, and the height of the box is $h\ cm$. At the turning point of $S(x)$, the surface area of the box, the height of the box is approximately equal to:

A. $11\ cm$
B. $23\ cm$
C. $92\ cm$
D. $133\ cm$
E. $262\ cm$

12. If the slant height of a cone is $5\ cm$, and the area of the curved surface is $62.5\pi\ cm^2$, then the surface area of this cone is:

A. $156.25\ cm^2$
B. $156.25\pi\ cm^2$
C. $218.75\pi\ cm^2$
D. $344.75\pi\ cm^2$
E. $3{,}906.25\pi\ cm^2$

13. The coefficient of the x term after dividing $3x^4 + 3x^2 + 9x - 7$ by $-3x^3$ is:

A. -1
B. 0
C. $\frac{1}{3}$
D. 1
E. 3

14. What is the length of the height of an equilateral triangle whose perimeter is $22.5\ cm$?

A. $6.1\ cm$
B. $6.5\ cm$
C. $6.9\ cm$
D. $7.3\ cm$
E. $7.5\ cm$

15. Last week, 77,000 people visited country X; 22% of them attended a conference related to the environment, 12% attended the opening of the national museum, 7,800 visited their relatives, and the rest were searching for an employment opportunity. One person was selected randomly. What is the probability that he visited country X to attend the opening of the national museum?

A. 0.06
B. 0.12
C. 0.22
D. 0.42
E. 0.51

16. Nabil has a 30 cm by 14 cm rectangular sheet of metal. He wants to form an open-top box using this sheet by cutting a square side of length $x\ cm$ from each corner, then folding up the sides. Which of the following expressions represents the surface area of the box formed?

A. $S = -4x^2 + 420$ where $x \geq 0$

B. $S = -4x^2 + 60x + 420$ where $x \geq 0$

C. $S = 4x^3 - 88x^2 + 420x$ where $x \geq 0$

D. $S = 8x^2 - 32x + 420$ where $x \geq 0$

E. $S = 8x^2 - 28x + 420$ where $x \geq 0$

17. What is the remainder when dividing $x^4 - 2x^3 + 3x - 1$ by $x - 3$?

A. 5
B. 10
C. 15
D. 25
E. 35

18. $\dfrac{\frac{2}{5} + \frac{3}{1-x}}{1 - \frac{2}{x-4}} =$

A. $\frac{2x^2-25x+68}{-5x^2+35x-30}$

B. $\frac{-2x^2-25x-68}{-5x^2-35x+30}$

C. $\frac{-2x^2-68}{-5x^2+30}$

D. $\frac{-2x^2+25x-68}{-5x^2+35x-30}$

E. $\frac{25x-68}{35x-30}$

19. A basketball club signed 11 players with an average height of 199 cm. After 2 months, they signed another player with a height of 210 cm. Calculate the new mean of the height of the 12 players.

A. 199.19 cm
B. 199.50 cm
C. 199.92 cm
D. 200.11 cm
E. 201.21 cm

20. What is the solution set of $2x^2 + x - 21 < 0$?

A. $x > 3$ only

B. $x < 3$ only

C. $x > -\frac{7}{2}$ only

D. $-\frac{7}{2} < x < 3$

E. Empty set

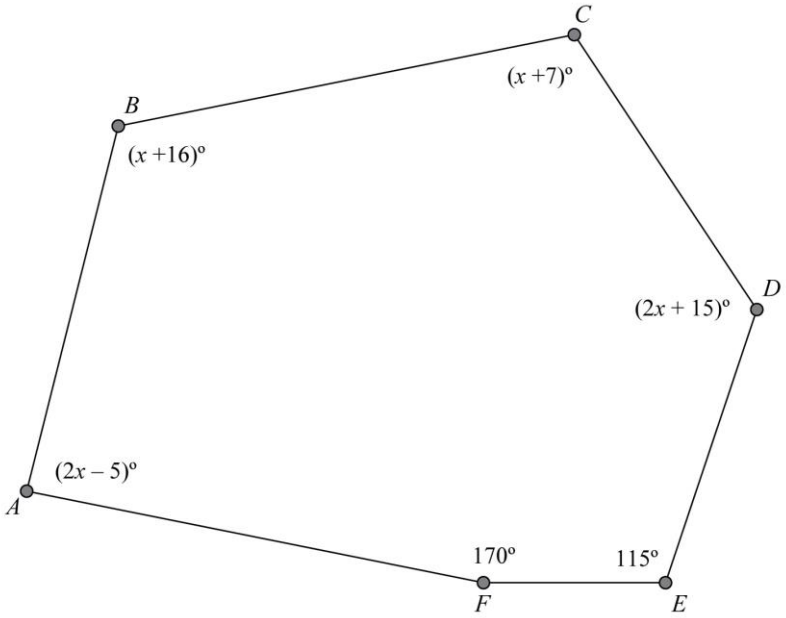
21. Given the complex number $z = \sqrt{2} + 2i$ and its conjugate $\bar{z}$. Which of the following statements is/are true?

I. $z \times \bar{z} = 6$.
II. The sum of the two complex numbers is a real number.
III. $|z| = |\bar{z}|$.

A. **I** only
B. **II** only
C. **I** and **II**
D. **II** and **III**
E. **I**, **II**, and **III**

22. Given an isosceles trapezoid $ABDG$ where $\overline{AB}$ and $\overline{GD}$ are the two bases with lengths $(x + 1)\ cm$ and $18\ cm$, respectively. If N and H are the midpoints of $\overline{AG}$ and $\overline{BD}$, respectively, and $NH = \frac{1}{3}(2x - 1)\ cm$, what is the length of $\overline{AB}$?

A. 58
B. 59
C. 60
D. 61
E. 62



23. Find $m\angle BAF$ in the figure above. (*Figure not drawn to scale*)

A. $67°$
B. $83°$
C. $95°$
D. $129°$
E. $134°$

24. The distance between the two points $A\ (3, 7)$ and $B\ (-1, c)$ is 5. Find the coordinates of N, the midpoint of $\overline{AB}$.

A. $N\ (1, 5)$
B. $N\ (1, 5.5)$
C. $N\ (4, 1.5)$
D. $N\ (4, 5.5)$
E. $N\ (1.5, 5.5)$

25. Given triangle ABC formed by the three points $A\ (4, 6)$, $B\ (2, 3)$, and $C\ (5, 1)$. Find the coordinates of A', B', and C' if triangle ABC is reflected over the y-axis, then translated 2 units up to form triangle $A'B'C'$.

A. $A'(-4, 8)$, $B'(-2, 5)$, and $C'(-5, 3)$
B. $A'(-4, 4)$, $B'(-2, 1)$, and $C'(-5, -1)$
C. $A'(-4, 6)$, $B'(-2, 3)$, and $C'(-5, 1)$
D. $A'(6, -6)$, $B'(4, -3)$, and $C'(7, -1)$
E. $A'(2, -6)$, $B'(0, -3)$, and $C'(3, -1)$

$$1, 3, 4, 5, 5, 6, 6, 8, 10$$

26. Find the 75^{th} percentile of the data set above.

A. 3.5
B. 6
C. 7
D. 8
E. 9

27. In a parallelogram $ABFV$, $m\angle VAB = (2x + 15)°$, $m\angle ABF = 71°$, $AB = 2x + y$, and $VF = 16\ cm$. Find the value of y.

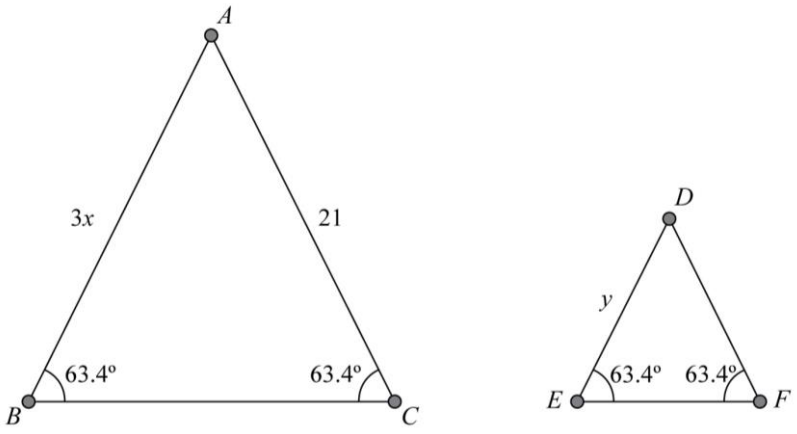
A. 78
B. 31
C. 16
D. -31
E. -78

28. Which of the following statements is never true?

A. If two angles of a triangle are congruent to two angles in another triangle, then the triangles are said to be similar.
B. In a parallelogram, diagonals always bisect each other and can sometimes be congruent.
C. If the diagonals of a rhombus are congruent, then we consider this rhombus to be a square.
D. In a convex polygon, the sum of the measures of the exterior angles is always 360°.
E. All of the above statements are false.

29. If $\angle A$ is the supplement of $\angle G$, and $m\angle A = \frac{2}{3}m\angle G$, then $m\angle G =$

A. 90°
B. 94°
C. 98°
D. 108°
E. 116°



30. Use the figure above to find the length of $\overline{DF}$ given that $y + 2x = 40$. (*Figure not drawn scale*)

A. 14
B. 21
C. 26
D. 31
E. 34

Item	Price in USD
One cup of yogurt	1.5
One piece of bread	x
Battery type AA	y

31. Salim and Layla went to the supermarket to buy some stuff. The price of the items is shown in the table above. Salim bought 2 cups of yogurt, one piece of bread, and 3 batteries of type AA, then paid an amount of \$8.5. Layla bought one cup of yogurt, 3 pieces of bread, and one battery of type AA, then paid an amount of \$4. What is the price of one piece of bread?

A. \$0.25
B. \$0.50
C. \$0.75
D. \$1.00
E. \$1.75

32. Simplify $2(x+4)^3 + 3x(2x-1)^2 + x$.

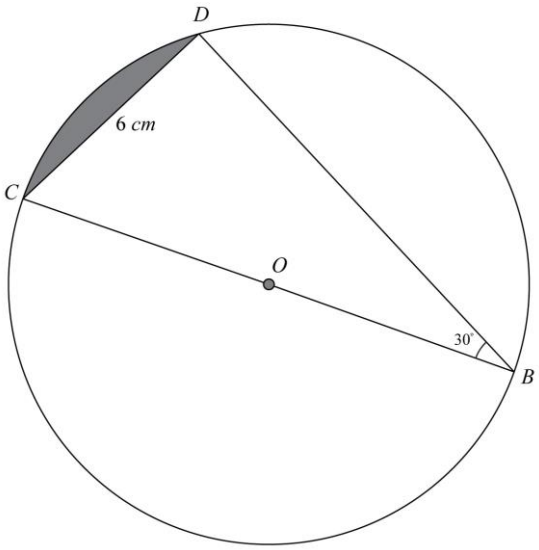
A. $14x^3 + 12x^2 + 99x + 128$
B. $14x^3 + 12x^2 + 100x + 128$
C. $12x^3 + 12x^2 + 100x + 128$
D. $12x^3 + 52x + 64$
E. $14x^3 - 12x^2 + 100x + 128$

33. $\frac{\sqrt{2}}{2}(\cos(x) - \sin(x)) =$

A. $\cos\left(x - \frac{\pi}{4}\right)$
B. $\sin\left(x + \frac{\pi}{4}\right)$
C. $\sin\left(x + \frac{\pi}{4}\right) - \cos\left(x + \frac{\pi}{4}\right)$
D. $\cos\left(x + \frac{\pi}{4}\right)$
E. $\sin\left(x - \frac{\pi}{4}\right)$

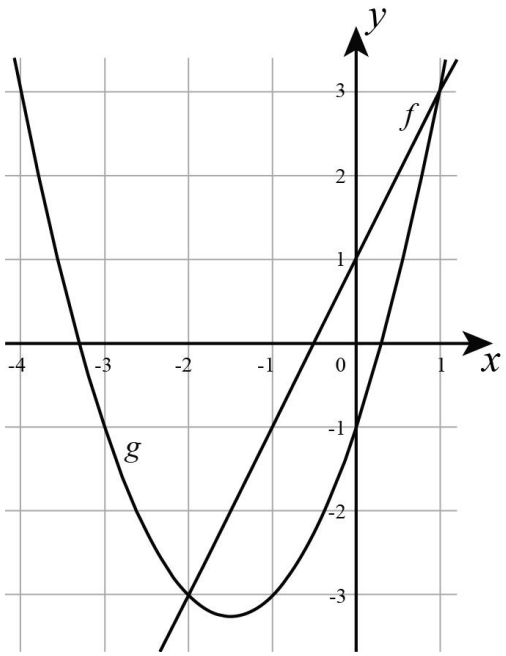
34. What is the equation of the line passing through point $E\ (9, -9)$ and perpendicular to the line whose equation $2y - 6x = 1$?

A. $y = -\frac{1}{3}x - 6$
B. $y = -3x - 6$
C. $y = -3x + 18$
D. $y = -\frac{1}{3}x - 12$
E. $y = 3x + 18$



35. In the figure above, triangle DCB is inscribed in the circle of center O such that $\overline{CB}$ is a diameter in the circle. Find the area of the shaded region. (*Figure not drawn to scale*)

A. $1.44\ cm^2$
B. $3.26\ cm^2$
C. $9.85\ cm^2$
D. $22.11\ cm^2$
E. Not enough information



36. The figure above represents two functions f (linear) and g (quadratic). Find the value of $f(g(0))$.

A. -3
B. -2
C. -1
D. 0
E. 1

37. Find the determinant of the matrix $A = \begin{pmatrix} 2 & 3 & -2 \\ 1 & 0 & -2 \\ 2 & 10 & 4 \end{pmatrix}$.

A. 4
B. 2
C. 1
D. -4
E. -10

38. Jamal bought a car for $\$13{,}000$. After 3 years, he sold it to Karim for 20% less than its original price. After doing some maintenance, Karim sold it to Jana for 7% more than the price he paid to Jamal. How much did Jana pay for the car?

A. $\$10{,}400$
B. $\$11{,}128$
C. $\$12{,}480$
D. $\$12{,}882$
E. $\$13{,}118$

39. The intersection point of the two linear functions defined by $f(x) = 2x - 1$ and $g(x) = -x + 5$ is the local minimum of a quadratic function $h(x)$, such that its y-intercept is $(0, 7)$, and it is passing through point $(3, 4)$. Find the equation of $h(x)$.

A. $y = x^2 + 4x + 7$
B. $y = x^2 + 2x + 7$
C. $y = x^2 - 4x + 7$
D. $y = -x^2 + 4x + 7$
E. $y = -x^2 - 2x + 7$

40. Consider the function f defined by $f(x) = \frac{(2x-1)^2}{x-1}$. For which values of x does the graph of f increase?

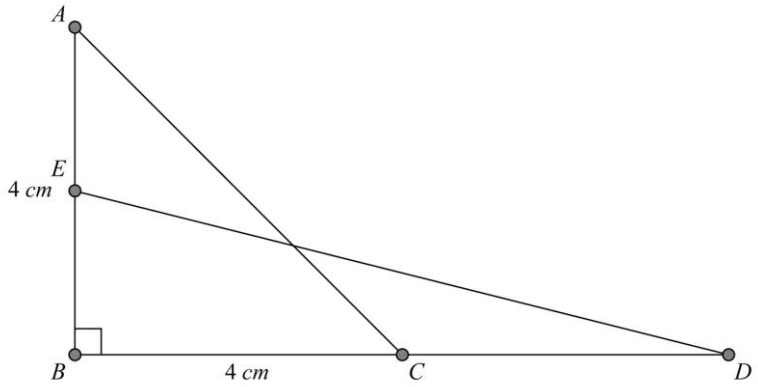
A. $x > \frac{3}{2}$ only
B. $x < \frac{1}{2}$ only
C. $\frac{1}{2} < x < \frac{3}{2}$
D. $x < \frac{1}{2}$ and $x > \frac{3}{2}$
E. None of the above

41. If $16^{2n-1} = 256$, then $4n + 3 =$

A. 1.5
B. 3
C. 5
D. 7
E. 9

42. Given the three points $A\ (-3, 1)$, $B\ (3, 3)$, and $D\ (6, 0)$. Which of the following should be the coordinates of point C so that $ABDC$ becomes a parallelogram?

A. $(0, -1)$
B. $(0, 1)$
C. $(-1, 2)$
D. $(0, -2)$
E. $(-1, -2)$



43. In the figure above, ABC is a right isosceles triangle at B. Let D be the symmetric of B with respect to C and E the midpoint of $\overline{AB}$. What is the approximate measure of $\angle AED$? (*Figure not drawn to scale*)

A. $14°$
B. $76°$
C. $94°$
D. $100°$
E. $104°$

Hours per week	$1 \leq h < 4$	$4 \leq h < 6$	$6 \leq h < 8$	$8 \leq h < 12$	$12 \leq h < 15$
Frequency	4	2	3	6	5

44. Twenty students work in 3 different restaurants to pay their tuition fees. They were surveyed about the number of hours they work per week. The results are shown in the table above. What is the approximate number of students who work less than 7 hours per week?

A. 6 students
B. 7 students
C. 9 students
D. 10 students
E. Not enough information

45. In how many ways can we arrange the letters in the word FOLLOWERS if one L should be placed in the middle?

A. 362,880 ways
B. 40,320 ways
C. 20,160 ways
D. 10,080 ways
E. 5,040 ways

46. If $\sqrt{x+a} = x - a$ where a is a real constant and $x \geq 1$, then x can be equal to:

A. $\frac{2a+1}{2}$

B. $\frac{2a+1+\sqrt{8a-1}}{2}$

C. $\frac{2a+1-\sqrt{8a-1}}{2}$

D. $\frac{2a+1+\sqrt{8a+1}}{2}$

E. $\frac{2a-1}{2}$

47. Which of the following is the expression of the surface area of a cylinder with radius $r\ cm$, a height twice the radius, and an opened top?

Given: The surface area of a cylinder is $2\pi rh + 2\pi r^2$

A. $SA = 5\pi r^2$
B. $SA = 2r^2 + rh$
C. $SA = 6\pi r^2$
D. $SA = 4\pi r^2$
E. $SA = 2\pi r^2 + 4\pi r$

48. If $i^2 = -1$, $x + 2(2i - 7y) = 3bx + 4i$, $y = 0$, and $x \neq 0$, then $b =$

A. $\frac{1}{3}$
B. $\frac{1}{7}$
C. $\frac{7}{2}$
D. 7
E. 14

49. The absolute value of the n exponent in the simplified form of $\left(\frac{9n^3p^4}{2n^{-5}p^2}\right)^{-3}$ is:

A. 3
B. 5
C. 8
D. 11
E. 24

50. If $a + b = 3$, $a - c = -6$, and $2b + c = 11$, then $c - b =$

A. 3
B. 5
C. 6
D. 7
E. 8

EST II - Math Level 1

Answer Key

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

Distribution of Items

Topics Covered & Skills Specification Table

	Topics Covered	Knowledge	Application	Reasoning	Synthesis
5/50	**Numerations and Operations**	37	1, 48	3, 21	
21/50	**Algebra and Functions**	6, 13, 36	2, 5, 9, 17, 18, 20, 31, 32, 38, 41, 49, 50	4, 10, 46	11, 39, 40
10/50	**Plane Shapes / Measurement**	8	7, 14, 23, 29, 30	22, 27	28, 35
4/50	**Coordinate Systems**		34	24, 25, 42	
3/50	**Solid Shapes**			12, 47	16
2/50	**Trigonometry**			33, 43	
5/50	**Data Analysis, Statistics, and Probability**	15, 26	44	19, 45	
		7/50	**20/50**	**17/50**	**6/50**

EST II – Individual Subject Test

Date:

Test Center:

Room Number:

Student's Name:

National ID:

EST ID:

TEST no. (4)
March 2024

Subject: Math Level 1

Duration: 60 minutes

50 Multiple Choice Questions

Instructions:

- Place your answers 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 on the following page of the booklet for your reference.

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

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

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

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

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

1. Point $F\ (m, n)$ is being reflected across the vertical line $x = 1$ to become $F'(a', b')$. Which of the following transformations of F gives the same image F'?

A. Reflection across the y-axis, then translation 2 units to the right
B. Reflection across the y-axis, then translation 2 units to the left
C. Reflection across the y-axis, then translation 1 unit to the right
D. Reflection across the x-axis, then translation 2 units upwards.
E. Reflection across the x-axis, then translation 2 units downwards.

2. The first, third, and fifth terms of an arithmetic sequence are 8, 16, and 24, respectively. What is the 20^{th} term of this sequence?

A. 54
B. 84
C. 88
D. 96
E. 160

3. Amir has \$4,600,000 in his bank account. He decided to divide the amount between his three children, Mustafa, Khalil, and Faisal, in a ratio of $3 : 5 : 6$, respectively. How much money is Khalil going to get from his father?

A. Approximately \$985,714
B. Approximately \$1,550,050
C. Approximately \$1,598,922
D. Approximately \$1,642,857
E. Approximately \$1,971,428

4. Let $z = a + bi$ be a complex number, z' be its complex conjugate, and $i = \sqrt{-1}$. Which of the following statements is/are true?

I. The product of z and z' is a real number.
II. The sum of z and z' is a real number.
III. The difference of z and z' is never a real number when $b \neq 0$.

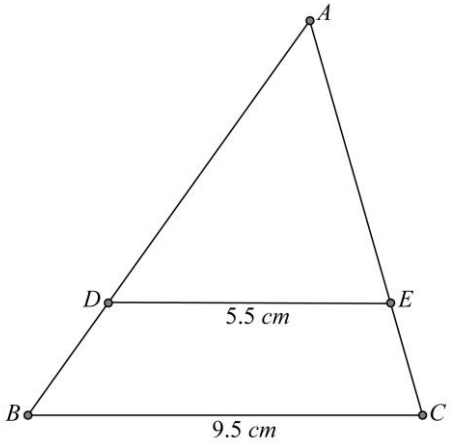
A. **I** only
B. **II** only
C. **III** only
D. **I** and **II**
E. **I**, **II**, and **III**

5. Bilal has a mobile store in Cairo, Egypt, and is selling the Phone X for \$1,500. Anwar decided to open a store in Alexandria and invested \$85,000 in buying phones of the mentioned type from Bilal. If Bilal decides to give Anwar a 10% discount off the total bill, which of the following inequalities will help us find how many x phones Anwar can buy?

A. $1{,}300x < 85{,}000$
B. $1{,}500x - 0.1x \leq 85{,}000$
C. $1{,}500x - 0.1(1{,}500) \leq 85{,}000$
D. $1{,}350x \leq 85{,}000$
E. $1{,}350x - 0.1(1{,}500) < 85{,}000$

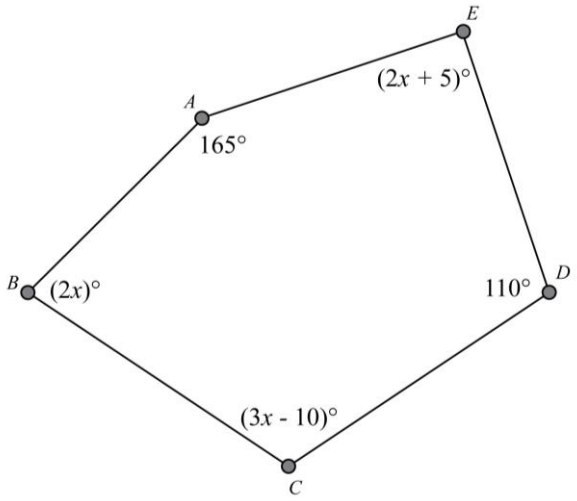
6. If $2(9x-1)+(x-4)(2x+5)=2(x^2+8x-1)+4$, then $x+6=$

A. -24
B. -20
C. -18
D. 8
E. 22



7. In the figure above, $\overline{DE}$ is parallel to $\overline{BC}$ with $DE = 5.5\ cm$, and $BC = 9.5\ cm$. If $AE = (2x+3)\ cm$, $EC = BD = 3\ cm$, and $AB = (7y-4)\ cm$, what is the value of $100y + x$, to the nearest tenth? *(Figure not drawn to scale)*

A. 2.15
B. 11.0
C. 11.2
D. 74.4
E. 159.5



8. What is the measure of angle AED in the figure above? *(Figure not drawn to scale)*

A. 77.14°
B. 82.14°
C. 105.71°
D. 108.33°
E. 113.34°

9. The measure of an exterior angle in a regular polygon is 20°. How many sides are there in this polygon?

A. 12 sides
B. 15 sides
C. 16 sides
D. 18 sides
E. 20 sides

10. Given the two functions $f(x) = 2x + 1$ and $g(x) = x^2 + 2x - 3$. Their graphs intersect at two points A and B, such that $x_A < x_B$. In the interval $[x_A, x_B]$, which of the following statements is/are true?

I. The graph of f is below the graph of g.
II. The vertex of the graph of g is above the graph of f.
III. The origin of the coordinate plane is not in the region bounded by the graph of f and the graph of g.

A. **I** only
B. **II** only
C. **I** and **II**
D. **I**, **II**, and **III**
E. All statements are false.

$$\begin{cases} 3x - ay = 3 \\ 2x + 7y = 11 \end{cases}$$

11. For what value of a does the system of equations above have no solution?

A. -21
B. -10.5
C. 6
D. 10.5
E. 21

12. Two lines l and m are perpendicular to each other; their equations are, respectively, $2x + ay = 3$ and $3x + by = 5$ where a and b are non-zero. Which of the following expresses a in terms of b?

A. $a = -\frac{6}{b}$

B. $a = \frac{6}{b}$

C. $a = -6b$

D. $a = 6b$

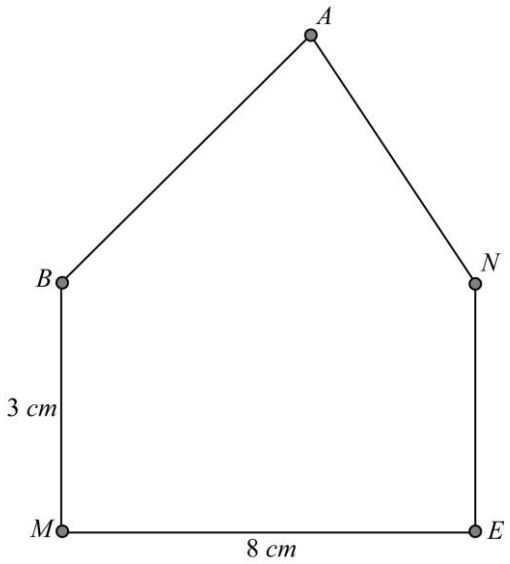
E. $a = \frac{b}{6}$

13. The graph of a function $h(x)$ has the shape of a parabola and passes through $(-3, 4)$ and $(0, -2)$, and its vertex is $(-1, -4)$. Which of the following equations represents the given function?

A. $h(x) = 2x^2 - 4x + 2$
B. $h(x) = -2x^2 + 4x - 2$
C. $h(x) = 2x^2 + 4x - 2$
D. $h(x) = 2x^2 - 4x - 2$
E. $h(x) = -2x^2 - 4x - 2$

14. If $49^{2x-5} = 343^{2x}$, what is the value of $5x - 7$?

A. -42
B. -32
C. 18
D. 28
E. 42

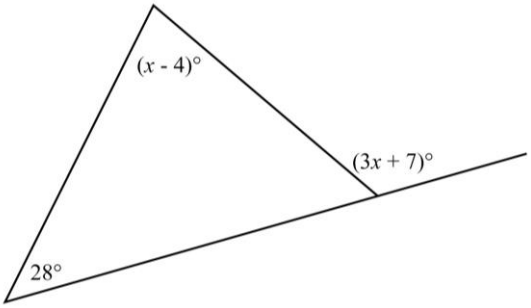


15. In the figure above, H is the feet of the height drawn from A to $\overline{BN}$, $NH = \frac{AN}{2} = 2\ cm$, and $BM = NE$. If $\overline{BM}$ and $\overline{NE}$ are both perpendicular to $\overline{ME}$, what is the area of the polygon $ABMEN$ shown above? *(Figure not drawn to scale)*

A. $13.9\ cm^2$
B. $17.8\ cm^2$
C. $24.0\ cm^2$
D. $32.0\ cm^2$
E. $37.9\ cm^2$

16. The measure of an angle is twice its complement. What is the measure of this angle?

A. 15°
B. 30°
C. 45°
D. 60°
E. 90°



17. Use the figure above to find the value of x. *(Figure not drawn to scale)*

A. 7.0
B. 7.5
C. 8.0
D. 8.5
E. 9.0

18. Ismael went to the supermarket and bought two bottles of shampoo and one bottle of shower gel for \$41. Ron went to the same supermarket and bought three bottles of each and paid an amount of \$87. What is the price of a bottle of shampoo?

A. \$7
B. \$12
C. \$15
D. \$17
E. \$21

Item	Unit price	Discount
Pen	\$1.25	2.0%
Pencil	\$0.80	4.0%
Copybook	\$4.50	3.0%
Highlighter	\$2.75	2.5%

19. Jad is opening a store, and a list of four needed items was prepared for this matter. The list of prices and the discount applied to each item is shown in the table above. If he needs to buy 100 pieces of each item, how much is he going to pay?

A. \$900
B. \$902
C. \$904
D. \$930
E. \$956

20. Given $f(x) = 2^{x-5}$. If x approaches a negative infinite number, $f(x)$ will approach:

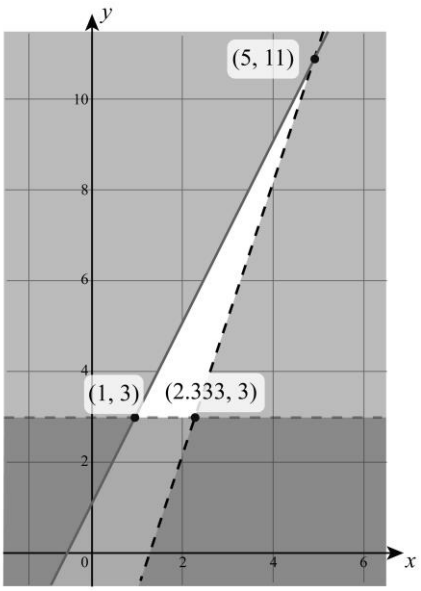
A. -5
B. -2
C. 0
D. 2
E. 5

21. The St. Regis Cairo is one of the tallest buildings in Egypt. It is $446\ ft$ tall. An object is dropped from the top of the building, and its position h, in feet, above the ground after s seconds is given by $h = 446 - 9s^2$. If a man is standing on the balcony of one of the floors such that he is $88\ ft$ above the ground, how long does it take the object to reach him?

A. 5.3 seconds
B. 5.7 seconds
C. 6.0 seconds
D. 6.3 seconds
E. 6.7 seconds

22. Find m if $G(x) = 2x^3 + (m-4)x^2 + 3(m-4)x + 3$ is divisible by $(x+4)$.

A. 25.25
B. 27.25
C. 29.25
D. 35.25
E. 36.25



23. The unshaded region in the graph above is the solution set of a system of inequalities. The lines corresponding to the three inequalities intersect at the points with the coordinates shown on the graph. Foden has a business, and he would like to maximize his profit based on the constraints in the given system. If his profit can be found using $P = 3x + 2y$, in million USD, what is the maximum profit he can reach?

A. 9 million USD
B. 13 million USD
C. 24 million USD
D. 30 million USD
E. 37 million USD

24. Given $K = \frac{1}{4^2} \times \frac{2^6}{3^7} \div (2 \times 3^2)^2$. Which of the following is/are equal to K?

I. 3^{-11}

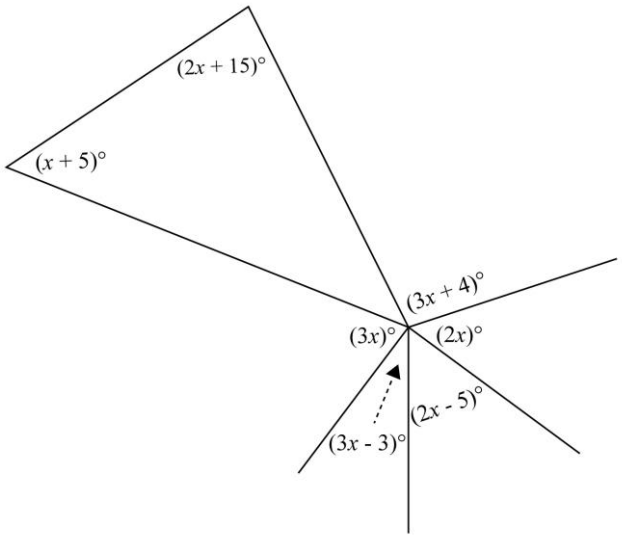
II. $\frac{2^6}{2^4 \times 3^{11} \times 2^2}$

III. $\frac{1}{4^2 \times 3^7 \times 3^2}$

A. **I** only
B. **II** only
C. **III** only
D. **I** and **II**
E. None of the statements is true.

25. Let U be the set containing all numbers from 1 to 100. We picked at random a number from U. If $P(E)$ is the probability of choosing a perfect square from U, and $P(M)$ is the probability of choosing a multiple of 4 from U, what is the probability of having a multiple of 4 given that the event of choosing a perfect square already occurred?

A. 0.25
B. 0.40
C. 0.50
D. 0.65
E. 0.75

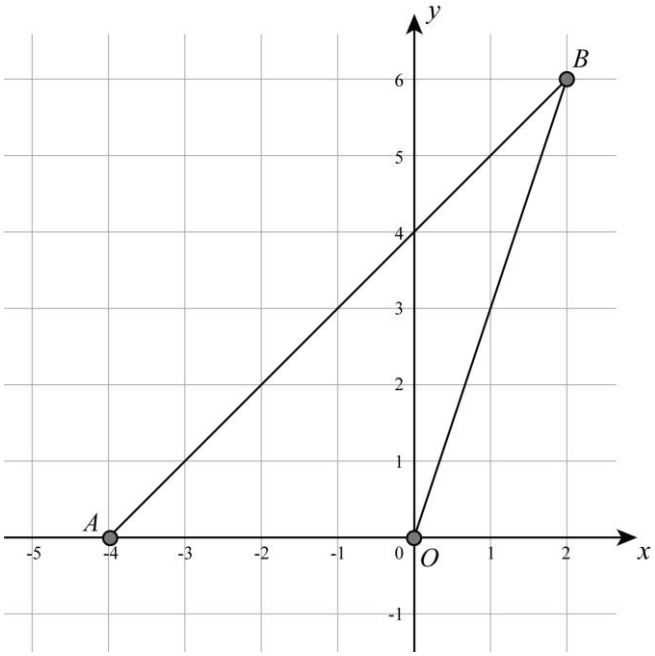


26. Use the figure above to determine the value of x. *(Figure not drawn to scale)*

A. 20.4
B. 21.4
C. 22.4
D. 23.4
E. 24.4

27. The numerical value of the volume of a sphere with diameter $7.2\ cm$ is equal to the numerical value of the surface area of a cylinder with radius $1.8\ cm$. What is the height of the cylinder?

A. $55.73\ cm$
B. $44.22\ cm$
C. $18.77\ cm$
D. $15.48\ cm$
E. $12.16\ cm$



28. In the coordinate plane above, two points A and B are connected together, and each is connected to the origin. A triangle AOB is then formed.
What is the value of $\sin(A) + 2\cos(B)$?

A. 1.789
B. 1.898
C. 2.134
D. 2.332
E. 2.496

$$2, 5, 6, 7, 7, 8, 9, 12, 13, 16, 18, 19, 19$$

29. In the set of data above, m is the mean, and n is the median.
What is the value of $m + n$?

A. $\frac{258}{13}$
B. $\frac{261}{13}$
C. $\frac{266}{13}$
D. $\frac{271}{13}$
E. $\frac{277}{13}$

30. A pyramid has a base with the shape of a right isosceles triangle such that its hypotenuse is equal to $3\sqrt{2}\ cm$. The height of this pyramid is $6\ cm$. What is the volume of this pyramid?

A. $6.0\ cm^3$
B. $7.5\ cm^3$
C. $9.0\ cm^3$
D. $12.0\ cm^3$
E. $18.0\ cm^3$

31. Given $\alpha = 42°$, and θ is its complement. If $\sin(\alpha) + \sin(\theta) \cdot \tan(\theta) = x + 5$, which expression represents $\frac{1}{\cos(\theta)}$?

A. $x - 5$
B. $x + 5$
C. x
D. $2x$
E. $2x + 10$

32. The accountant team in a tech company found that the monthly cost function for designing x copies of a software can be given by $F(x) = 10{,}000 + 300x + 83x^2$ USD, and each software is sold for 3,000 USD. Which of the following statements is/are true?

I. The monthly profit of the company can be found by $P(x) = -10{,}000 + 2{,}700x - 83x^2$.
II. In case of selling 29 copies or more of the software, the company will start losing money.
III. In case of selling 4 copies of the software, the monthly profit will be positive.

A. **I** only
B. **II** only
C. **II** and **III**
D. **I** and **II**
E. **I**, **II**, and **III**

a	2	4	6	5	-3
+	↓	-10	30	c	d
	2	-6	b	-175	e

33. The synthetic division above represents $(2x^4 + 4x^3 + 6x^2 + 5x - 3) \div (x - a)$. What are the values of $a, b, c, d,$ and e?

A. $a = -5, b = 36, c = -175, d = 872, e = 869$
B. $a = -5, b = 36, c = -180, d = 872, e = 869$
C. $a = -5, b = 36, c = -180, d = 875, e = 872$
D. $a = -5, b = 36, c = -175, d = 875, e = 878$
E. $a = -5, b = 36, c = -180, d = 872, e = 878$

$$f(x) = \frac{2x - 5}{x^2 + 3x + 5}$$

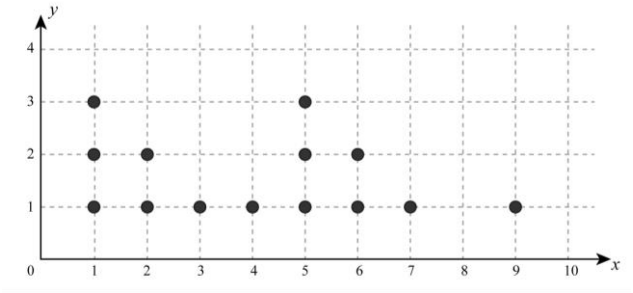
34. Which of the following statements is/are true regarding the graph of the function f above?

I. The graph of f has no vertical asymptote.

II. The graph is below the x-axis in the interval $\left(-\infty, \frac{5}{2}\right)$.

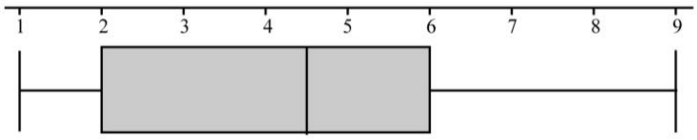
III. The minimum value that this graph can have is approximately $y = -4$.

A. **I** only
B. **I** and **II**
C. **I** and **III**
D. **II** and **III**
E. **I**, **II**, and **III**

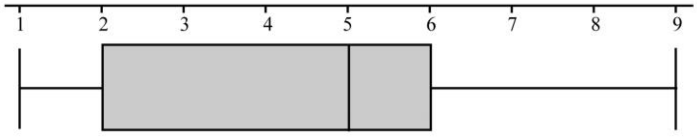


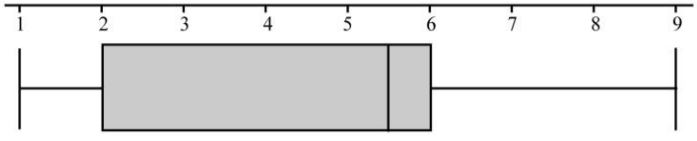
35. The dot plot above represents the rating over 10 given by 14 people at a certain workshop they attended. Which of the following is the correct box-and-whisker plot that could also represent the same case?

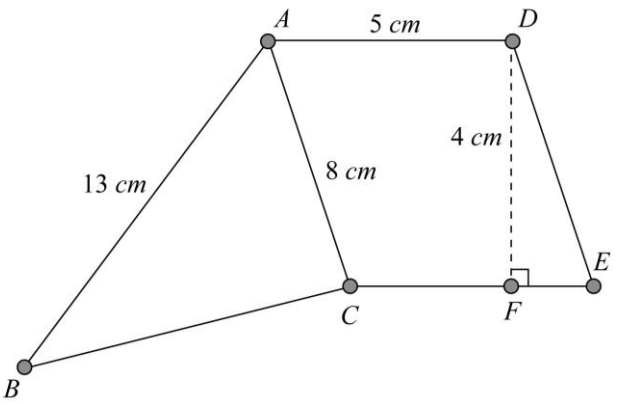
A.


B.


C.


D.


E.




36. In the figure above, ABC is a right triangle at C, and $ADEC$ is a parallelogram with height $DF = 4\ cm$. Find the area of the whole figure. *(Figure not drawn to scale)*

A. $61\ cm^2$
B. $51\ cm^2$
C. $41\ cm^2$
D. $33\ cm^2$
E. $25\ cm^2$

37. A club in country X has 60 members. Out of these members, 30 play football, 17 play basketball, and 12 play both. How many members play neither football nor basketball?

A. 1
B. 12
C. 25
D. 30
E. 31

38. Juan is flipping a coin, and Andrew is throwing a dice at the same time. What is the probability that Juan will get a head, and Andrew will get a multiple of 3?

A. $\frac{1}{6}$
B. $\frac{1}{3}$
C. $\frac{1}{2}$
D. $\frac{2}{3}$
E. $\frac{5}{6}$

39. Which of the following are the possible rational zeros of

$$A(x) = x^5 + 4x^3 + 2x^2 - 10?$$

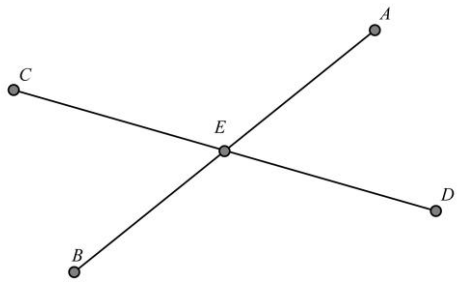
A. $\pm 1, \pm 2, \pm 5$
B. $\pm 1, \pm 2, \pm 5, \pm 10$
C. $\pm 1, \pm 2, \pm 5, \pm 10, \pm \frac{1}{2}, \pm \frac{1}{5}, \pm \frac{1}{10}$
D. $\pm 1, \pm 2$
E. $\pm 1, \pm 2, \pm 5, \pm \frac{1}{2}, \pm \frac{1}{5}, \pm \frac{1}{10}$

40. Given the function $f(x) = x^3 + 4x - 5$. Which of the following statements is true?

A. The function f is an odd function.
B. The function f is an even function.
C. The graph of f has no local extrema.
D. The line $x = -5$ is a vertical asymptote to the graph of f.
E. The coordinates of the x-intercept of the graph of f is $(-5, 0)$.

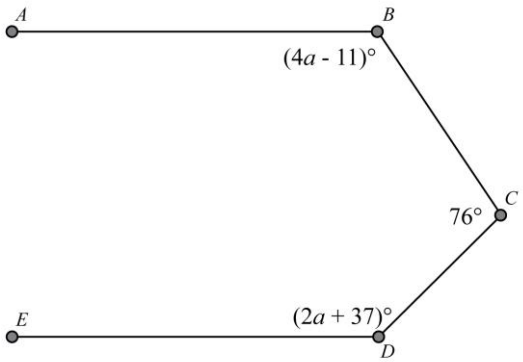
41. How many integers satisfy the inequality $x^2 + 3x < 4$?

A. 1
B. 2
C. 3
D. 4
E. Infinite number of integers



42. In the figure above, $CE = 2x + 5$, $CD = 7y - 3$, $BE = 2x$, and $AB = 18\ cm$. If $ED = EA$, what is the length of $\overline{CD}$? *(Figure not drawn to scale)*

A. $18\ cm$
B. $20\ cm$
C. $21\ cm$
D. $22\ cm$
E. $23\ cm$



43. In the figure above, $\overline{AB}$ and $\overline{ED}$ are two parallel segments. Find the value of a. *(Figure not drawn to scale)*

A. 28.75
B. 33.5
C. 38
D. 43
E. 67

44. Given the two points $A(5, d)$ and $B(7, -8)$. What is the possible value of d if $AB = 2\sqrt{17}$?

A. 0
B. 2
C. 3
D. 5
E. 6

45. Two lines that have equal slopes are necessarily:

A. Perpendicular
B. Parallel
C. Coincident
D. Intersecting
E. None of the above

46. In a triangle HER, right at H, $HE = 3\ cm$, and $\sin(E) = \frac{1}{2}$. What is the value of $\cot(R)$?

A. $\frac{\sqrt{3}}{3}$
B. $\frac{\sqrt{3}}{2}$
C. $\sqrt{3}$
D. 2
E. $2\sqrt{3}$

47. If $A = \begin{pmatrix} 2 & 7 \\ 2 & 5 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & -1 \\ 3 & 2 \end{pmatrix}$, what is $2A - 5B$?

A. $\begin{pmatrix} -1 & 9 \\ -11 & 0 \end{pmatrix}$
B. $\begin{pmatrix} -1 & 19 \\ 11 & 0 \end{pmatrix}$
C. $\begin{pmatrix} -1 & 0 \\ -11 & 20 \end{pmatrix}$
D. $\begin{pmatrix} 9 & 19 \\ -11 & 0 \end{pmatrix}$
E. $\begin{pmatrix} -1 & 19 \\ -11 & 0 \end{pmatrix}$

48. If a is a positive even number, and b is a negative odd number, then $b^a - 2ab$ is:

A. A positive even number
B. A negative even number
C. A positive odd number
D. A negative odd number
E. Can be positive or negative odd number

x	1	4	5	7
y	3	5	6	4

49. Basel is calculating the linear least-square regression equation in the form of $y = mx + b$ of the data shown in the table above. He found out that $\sum xy = 81$, and $\sum x^2 = 91$. He then calculated m and got $m = 0.24$. The value of b he found was equal to 2.48. Which of the values that Basel calculated was wrong?

A. $\sum xy$
B. $\sum x^2$
C. m
D. b
E. All the values found are correct.

$$f(x) = \sqrt{x^2 + 5x - 6}$$

50. Which of the following x-coordinates is not in the domain of f shown above?

A. -9
B. -6
C. -2
D. 1
E. 3

EST II – Individual Subject Test

Math Level 1 – Answer Key

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

Distribution of Items

Topics Covered & Skills Specification Table

	Topics Covered	Knowledge	Application	Reasoning	Synthesis
6/50	**Numerations and Operations**	37	2, 3, 47	4, 48	
20/50	**Algebra and Functions**	20, 33, 39	6, 13, 14, 18, 19, 23, 50	5, 10, 11, 21, 22, 24, 34, 40, 41	32
10/50	**Plane Shapes / Measurement**	9, 16	7, 8, 15, 17, 36	42	26, 43
4/50	**Coordinate Systems**	45	44	12	1
2/50	**Solid Shapes**		30	27	
3/50	**Trigonometry**		46	31	28
5/50	**Data Analysis, Statistics, and Probability**	29	38	25, 49	35
		8/50	**19/50**	**17/50**	**6/50**

EST II – Individual Subject Test

Date:

Test Center:

Room Number:

Student's Name:

National ID:

EST ID:

TEST no. (5)
April 2025

Subject: Math - Level 1

Duration: 60 minutes

50 Multiple Choice Questions

Instructions:

- Place your answers 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 degree mode.
- Formula sheet is available on the following page of the booklet for your reference.

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

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

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

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

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

1. Consider the operation ■ defined by $a \blacksquare b^2 = b^{-a}$, where $a \in \mathbb{R}$ and $b \in \mathbb{R}^+$. If $-4 \blacksquare x = \frac{1}{4}$, then $x =$

A. ± 2

B. $-\frac{1}{2}$ only

C. $\pm \frac{1}{2}$

D. $\frac{1}{2}$ only

E. 2 only

2. Given m and n are two real numbers. What is the value of $m + n$ if $2m - 3ni = 4n + m(2 + 3i) + 4$?

A. -2
B. 0
C. 1
D. 3
E. 5

$$\begin{cases} x + y = 1 \\ x^2 + 2x + 1 = y \end{cases}$$

3. In the system of equations above, $x < 0$. What is the value of y?

A. -2
B. 2
C. 4
D. 8
E. 10

4. Which of the following expressions is true?

A. $(x^2y^3)^2 \cdot x^2y = (xy)^6$

B. $(x^5y^{10})^{\frac{1}{5}} \cdot xy = x^2y$

C. $(3x^2y)^2 \cdot \frac{1}{3}xy^2 = 3x^5y^4$

D. $(2xy^3)^2 \cdot (2xy)^2 = 16x^4y^6$

E. $2^5xy \cdot xy = 5^2x^2y^2$

5. What is the constant term in the expansion of $(2x - 5)^6$?

A. 125
B. 625
C. $1{,}250$
D. $15{,}625$
E. $93{,}750$

6. If $|3x - 1| = -x + 1$, then $x =$

A. -1.0
B. -0.5
C. 0.5
D. 1.0
E. 3.0

$$3(4x - 5) + 4x - 1 = 2(x - 3) + 7$$

7. Using the equation above, $28x - 6 =$

A. 28
B. 24
C. 22
D. 18
E. 14

8. ΔANE is a right triangle at N such that $m\angle NAE = 35°$. If G is the midpoint of $\overline{AE}$ with $NG = 5\ cm$, what is the length of $\overline{AN}$, to the nearest hundredth?

A. $4.10\ cm$
B. $4.76\ cm$
C. $5.77\ cm$
D. $6.88\ cm$
E. $8.19\ cm$

9. The 5^{th} and 10^{th} terms of a geometric sequence are 48 and $1{,}536$, respectively. The first term of this sequence is also the first term of an arithmetic sequence with a common difference of 6. The 20^{th} term of the arithmetic sequence is:

A. 96
B. 117
C. 162
D. 288
E. 312

10. Rachel runs a small business selling handmade souvenirs. The total cost to produce the souvenirs includes a fixed cost of $\$70$ for materials and equipment, plus an additional $\$3.5$ for each souvenir made. If Rachel sells each souvenir for $\$9$, how many souvenirs does she need to sell to make a profit of $\$315$?

A. 25
B. 30
C. 50
D. 65
E. 70

11. Given $f(x) = 2x + 4$ and $g(x) = \frac{x}{x+1}$.
Which one of the following expressions represents $(f \circ g)(2x)$?

A. $\frac{3x+1}{2x+1}$

B. $\frac{2x+1}{3x+1}$

C. $\frac{4(3x+1)}{x+1}$

D. $\frac{4(3x+1)}{2x+1}$

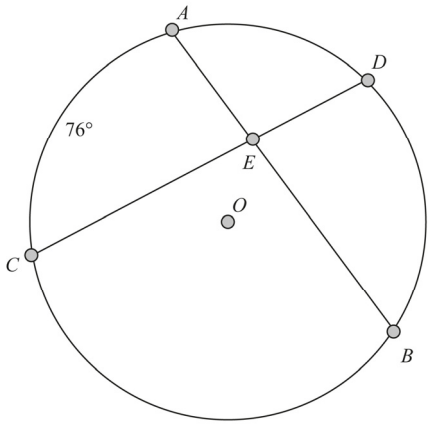
E. $\frac{3x+1}{4(2x+1)}$

12. What are the coordinates of the vertex of the function $f(x) = 3x^2 + 12x - 1$?

A. $(2, 13)$
B. $(2, 35)$
C. $(-2, -13)$
D. $(-2, 35)$
E. $(1, 14)$

13. Two angles $\angle A$ and $\angle B$ are linear pair such that $m\angle A = (3x - 11)°$ and $m\angle B = (2x + 6)°$. What is the value of $x - 4$?

A. 30
B. 33
C. 37
D. 41
E. 45



14. In the figure above, O is the center of the circle, and the minor arc DB measures 80% of the size of the minor arc AC. The value of $m\angle AED$ is: *(Figure not drawn to scale)*

A. 52.0°
B. 69.4°
C. 76.0°
D. 111.6°
E. 125.5°

15. In triangle ABC, the lengths of sides $\overline{AB}$ and $\overline{AC}$ are 13 cm and 14 cm, respectively. The altitude from vertex A to side $\overline{BC}$ divides the triangle into two right triangles. The length of the altitude is 12 cm. To the nearest hundredth, what is the length of $\overline{BC}$?

A. 5.34 cm
B. 7.21 cm
C. 9.71 cm
D. 10.45 cm
E. 12.21 cm

16. Given points $A(2, 6)$ and $B(8, a)$. If $AB = \sqrt{117}$ units, $a =$

A. -3
B. -1
C. 0
D. 3
E. 5

17. What is the value of x in $\ln(3x - 1) = \ln(8x + 4)$?

A. -1
B. 0
C. 1
D. 2
E. No solution

18. A ball is thrown upwards from the top of a building. The height of the ball, $h(t)$, in meters, after t seconds, is given by the equation: $h(t) = -5t^2 + 16t + 50$. What does "50" represent in the equation?

A. It is the maximum height the ball reached.
B. It is the time in seconds the ball needed to reach its maximum height.
C. It is the initial height of the ball above the ground.
D. It is the time in seconds when the ball hit the ground.
E. It is the minimum height the ball reached.

19. If t varies inversely as m^2, and $t = 2$ when $m = 4$, what is the value of t when $m = -2$?

A. 2
B. 4
C. 5
D. 8
E. 10

$$f(x) = \frac{x^2 + 4x - 5}{x - 4}$$

20. The graph of the function f defined above has $y = ax + b$ as an oblique asymptote, where a and b are two real numbers. The value of $a + b$ is:

A. 1
B. 7
C. 8
D. 9
E. 12

21. The fourth proportional to $4, 9$, and 15 is:

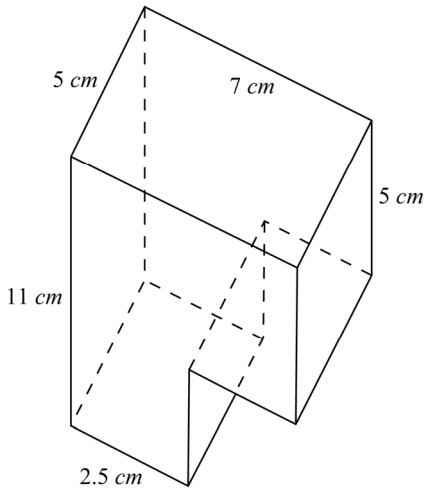
A. 30.0
B. 31.25
C. 33.75
D. 35.0
E. 40.0

22. The product of two positive consecutive odd integers is 483. What is the sum of the two numbers?

A. 40
B. 42
C. 44
D. 46
E. 48

23. The angles with measures $(4x - 11)°$ and $(2x + 21)°$ are vertically opposite. What is the value of $2x + 5$?

A. 16
B. 32
C. 35
D. 37
E. 55



24. What is the surface area of the shape represented in the figure above? *(Figure not drawn to scale)*

A. $242\ cm^2$
B. $245\ cm^2$
C. $260\ cm^2$
D. $272\ cm^2$
E. $280\ cm^2$

25. A box contains 8 red balls and 5 blue balls. What is the probability that a random selection of 4 balls from the box contains at least 3 balls of the same color?

A. 0.412
B. 0.503
C. 0.608
D. 0.691
E. 0.711

$$3, 7, a, 8, 9, 9, 10, b, 13, 14$$

26. The set of data above, arranged from smallest to largest, has an interquartile range of 3. What is the value of $b - a$?

A. 1
B. 3
C. 5
D. 7
E. 9

$$x^2 - 4x + y^2 + 6y = -4$$

27. Which of the following are the coordinates of the center of the circle represented by the equation above?

A. $(-2, 3)$
B. $(2, 3)$
C. $(-2, -3)$
D. $(2, -3)$
E. $(4, -6)$

28. What is the equation of the line that passes through $H(-1, 8)$ and is perpendicular to the line with the equation $3y - 4x = 4$?

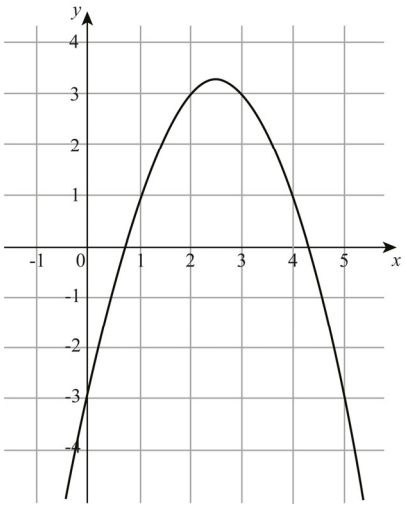
A. $y = \frac{-3x+29}{4}$

B. $y = -\frac{3}{4}x + 29$

C. $y = \frac{3x+29}{4}$

D. $y = \frac{4}{3}x + 28$

E. $y = \frac{4x+28}{3}$



29. Which of the following is true about the function f represented in the graph above?

I. The degree of the function is even.

II. The leading coefficient is negative.

III. $f(4) = 1$.

A. **I** only
B. **II** only
C. **I** and **II**
D. **II** and **III**
E. **I**, **II** and **III**

30. In a factory, there are two machines, A and B, producing widgets. Machine A produces 60% of the total widgets, while Machine B produces 40%. It is known that 5% of the widgets produced by Machine A are defective, and 2% of the widgets produced by Machine B are defective.

If a randomly selected widget is found to be defective, what is the probability that it was produced by Machine A?

A. $\frac{2}{5}$

B. $\frac{11}{23}$

C. $\frac{18}{35}$

D. $\frac{13}{17}$

E. $\frac{15}{19}$

31. The measure of an angle in a regular octagon is:

A. $90°$
B. $120°$
C. $135°$
D. $145°$
E. $160°$

32. If $2x - 3a + 1 = 4ax - a$, for what value of a does the equation have infinite solutions?

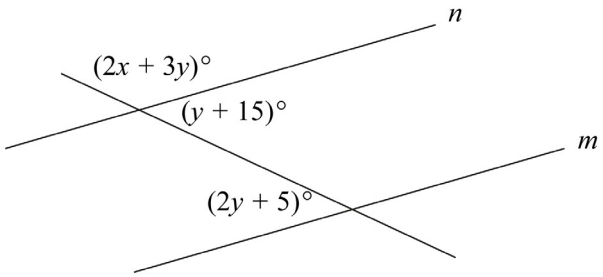
A. $\frac{1}{2}$

B. 1

C. $\frac{3}{2}$

D. 4

E. 6



33. In the figure above, n and m are two parallel lines. What is the value of x? *(Figure not drawn to scale)*

A. 17.5
B. 32.5
C. 40.0
D. 62.5
E. 70.0

34. The width of a rectangle is half of its length. If the area of the rectangle is 72 cm^2, then the width measures:

A. 4 cm
B. 6 cm
C. 8 cm
D. 9 cm
E. 18 cm

35. ΔABG is a right triangle at G such that $m\angle AGB = (2x + 34)°$, and $m\angle ABG = m\angle GAB = (x + y)°$. The value of $2x - y$ is:

A. 17
B. 22
C. 28
D. 31
E. 39

$$(15 - x)(x + 2) = 12$$

36. In the equation above, $x = \frac{13 \pm \sqrt{a}}{2}$ where a is a real number. What is the value of a?

A. 17
B. 117
C. 189
D. 241
E. 255

37. $\left(\frac{\sqrt{m^3}}{\sqrt{n^4}}\right)^{-2} =$

A. $\frac{n^3}{m^4}$

B. $\frac{m^3}{n^4}$

C. $m^4 n^3$

D. $\frac{n^4}{m^3}$

E. $n^4 m^3$

38. In a coordinate plane, points $A(-3, 4)$ and $B(5, -2)$ are the endpoints of a line segment. A third point C is on this segment, such that the distance from A to C is twice the distance from C to B. The coordinates of C are:

A. $\left(0, \frac{7}{3}\right)$

B. $\left(-\frac{7}{3}, 0\right)$

C. $\left(-\frac{7}{3}, 2\right)$

D. $\left(\frac{7}{3}, 0\right)$

E. $\left(\frac{7}{3}, -2\right)$

39. An angle is triple its complement. Which of the following is its measure in degrees?

A. 22.5
B. 30.0
C. 45.0
D. 60.0
E. 67.5

40. The volume of a cylinder is $670\ cm^3$. If the height of the cylinder is $13.5\ cm$, what is the radius of its base?

Given: The volume of a cylinder is: $V = \pi r^2 h$.

A. $1.45\ cm$
B. $3.97\ cm$
C. $4.11\ cm$
D. $4.76\ cm$
E. $5.07\ cm$

41. The width to the length in a rectangle is in the ratio $3:4$. If the perimeter of this rectangle is $56\ cm$, then the width is:

A. $12\ cm$
B. $14\ cm$
C. $16\ cm$
D. $18\ cm$
E. $20\ cm$

42. Which of the following is true for $f(x) = \frac{4}{\sqrt{2x-6}}$?

I. The domain of the function is all real numbers excluding 3.

II. The inverse function of f is $f^{-1}(x) = \frac{8}{x^2} + 3$.

III. There are no roots for the graph of f.

A. **I** only
B. **II** only
C. **III** only
D. **I** and **II**
E. **II** and **III**

43. The vertex angle of an isosceles triangle measures $50°$. The altitude drawn from the vertex to the opposite side has a length of $7\ cm$. The area of this triangle is equal to:

A. $13.5\ cm^2$
B. $17.8\ cm^2$
C. $20.4\ cm^2$
D. $22.8\ cm^2$
E. $28.1\ cm^2$

44. The sum of the interior angles of a polygon is four times the sum of its exterior angles. How many sides does the polygon have?

A. 6 sides
B. 8 sides
C. 10 sides
D. 14 sides
E. 15 sides

45. Two perpendicular lines intersect at point $(0, -3)$. If the equation of one line is $2y - 3x = -6$, what is the y-intercept of the second line?

A. $(0, -9)$
B. $(0, -3)$
C. $(0, -2)$
D. $(0, 3)$
E. $(0, 5)$

46. If x is negative, and $x^2 = y = 16$, $\left(\frac{2y}{\sqrt{|x|}}\right)^{-\frac{y}{8}}$ equals:

A. $\frac{1}{8}$

B. $\frac{1}{16}$

C. $\frac{1}{32}$

D. $\frac{1}{48}$

E. $\frac{1}{256}$

47. The determinant of $A = \begin{pmatrix} 1 & -1 & 3 \\ 0 & 1 & a \\ -7 & 8 & -3 \end{pmatrix}$ is 11. What is the value of a?

A. 3
B. 4
C. 7
D. 9
E. 10

48. The probability that Mariam draws a portrait on any given day is 0.34, and she doesn't draw more than one portrait in a day. The probability that, in a 3-day period, Mariam draws at most two portraits is approximately:

A. 0.944
B. 0.961
C. 0.970
D. 0.977
E. 0.984

49. In quadrilateral $ABCD$, $\overline{AB}$ and $\overline{CD}$ are parallel, and $m\angle A = 70°$. $\overline{AC}$ and $\overline{DB}$ intersect at E, forming an isosceles triangle AEB at E with $m\angle AEB = 66°$.

The measure of $\angle BCE$ is:

A. $13°$
B. $22°$
C. $30°$
D. $53°$
E. $66°$

50. If $\ln(x - 3) \geq 4$, then x can be equal to:

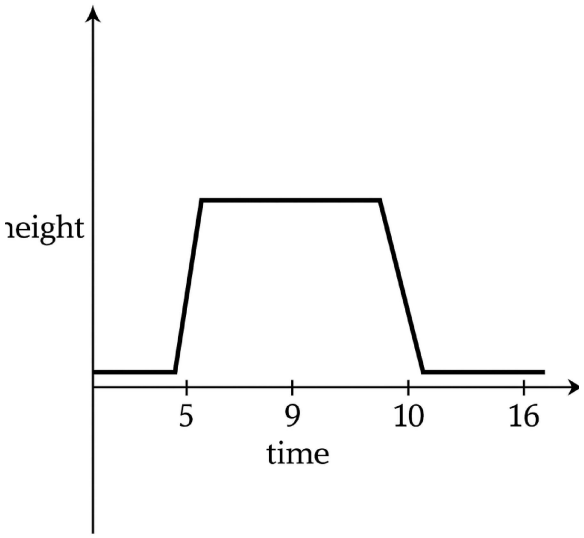
A. 50.1
B. 52.2
C. 54.5
D. 57.0
E. 57.6

EST2 october 2025

TEST no. (6)

____ 1. Find the range if $y = 2 - \sqrt{2x - 3}$

a. (-∞,2)
b. (-∞,-2)
c. (∞,2)
d. (∞,-2)
e. (-∞,1.5)



____ 2.

The graph above represents the relation between the height and the time (with respect to the time). When the height is constant?

a. Between 5 and 18
b. Between 9 and 13
c. Between 10 and 13
d. Between 10 and 16
e. Between 5 and 10

____ 3. The distance between points A(4,y) and B(10,-2) is 10 units. What is the value of y?

a. -10
b. 4
c. 8
d. 2
e. -6

____ 4. A parabola opens downward and has its vertex at the point (2,3). Which of the following could be its equation?

a. $y = -2(x-2)^2 + 3$
b. $y = 2(x-2)^2 + 3$
c. $y = -2(x+2)^2 - 3$
d. $y = 2(x-2)^2 - 3$
e. $y = -2(x-3)^2 + 3$

____ 5. Let $f(x) = x^2 + bx + m$, passes through the point (0,-3). When f(x) is divided by (x-1), the remainder is 22., what is the value of b+m?

a. -5
b. -2
c. 21
d. 3
e. 5

____ 6. In the expression $\frac{2x+2}{2} - \frac{3x}{3}$ is fully simplified, what is the numerator of the simplified expression?

a. 0
b. 1
c. 6
d. x
e. 2x

____ 7. In an arithmetic sequence, the 4th term is 14 and the 10th term is 38. What is the value of the 1st term?

a. 2
b. 32
c. 6
d. 8
e. 10

____ 8. The graph has a vertex at (3,-2) and opens upward. The point (5,0) lies on the graph. Based on the graph, which of the following is the equation of the function?

a. $y = |x-3| - 2$
b. $y = 2|x-3| - 2$
c. $y = \frac{1}{2}|x-3| - 2$
d. $y = |x+3| - 2$
e. $y = |x-3| + 2$

Given the matrix

$$A = \begin{pmatrix} 2 & -1 \\ 3 & 4 \end{pmatrix},$$

which of the following is the inverse of A?

___ 9.

a. $\begin{pmatrix} 4 & 1 \\ -3 & 2 \end{pmatrix}$

b. $\frac{1}{11}\begin{pmatrix} 4 & 1 \\ -3 & 2 \end{pmatrix}$

c. $\frac{1}{5}\begin{pmatrix} 4 & 1 \\ -3 & 2 \end{pmatrix}$

d. $\frac{1}{5}\begin{pmatrix} -4 & -1 \\ 3 & -2 \end{pmatrix}$

e. $\frac{1}{10}\begin{pmatrix} -4 & -1 \\ 3 & -2 \end{pmatrix}$

___ 10. Two similar triangles ABC and DEF angles B and E each 90. AB=12, BC=4, DE=3 .Find the area of triangle DEF

a. 1
b. 2
c. 1.5
d. 2.5
e. 3

____ 11. A sphere has a radius such that its volume is equal to the volume of a cylinder with diameter 12.Find the height of the cylinder.(both have same radius)
   a. 8
   b. 12
   c. 18
   d. 24
   e. 36

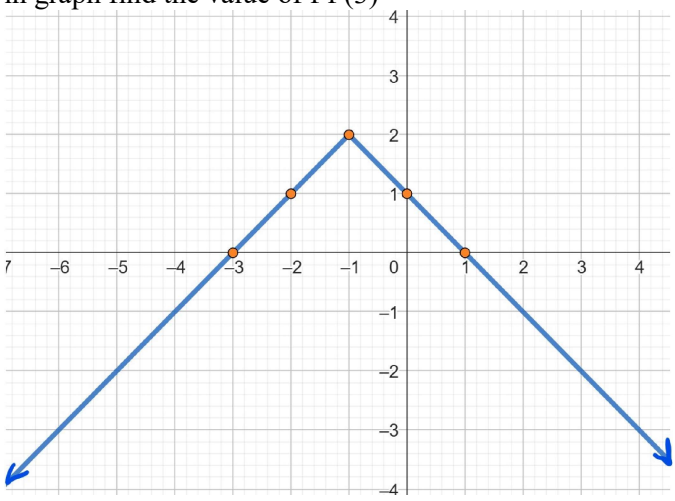
____ 12. A right triangle has sides (2x+8),(3x+10), and hypotenuse 12.Find the smallest side.
   a. 4
   b. 6.45
   c. 7.5
   d. 10.2
   e. 12

____ 13. A rectangle has an area of 64 .The length is twice the width.Find the length.
   a. 6
   b. 8.9
   c. 10.45
   d. 11.3
   e. 16

____ 14. A spinner is spun once. It has equal sections labeled: 2, 3, 4, 5, 7, 9.What is the probability of getting an even number?
   a. 1/6
   b. 2/6
   c. 3/6
   d. 4/6
   e. 5/6

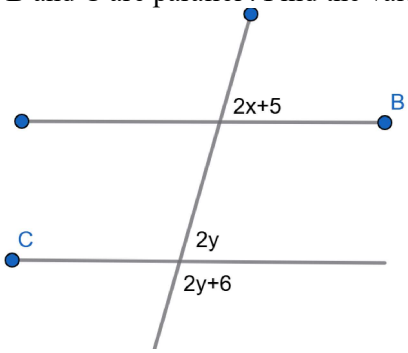
____ 15. A spinner is spun once. It has equal sections labeled: 2, 3, 4, 5, 7, 9.The spinner is spun twice.Find the probability that both results are even.
   a. 1/36
   b. 2/9
   c. 4/36
   d. 16/36
   e. 8/36

____ 16. in graph find the value of f f (3)



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

____ 17. Line B and C are parallel . Find the value of x



a. 1.8
b. 43
c. 43.5
d. 41.5
e. 41

____ 18. A box contains red, blue, and white balls.The probability of choosing a white ball is 0.33, and the probability of choosing a blue ball is 0.24.The box contains 200 balls in total.What is the probability of choosing a red ball?

a. 0.24
b. 0.33
c. 0.43
d. 0.57
e. 0.67

____ 19. Point P(2,-3) is rotated 90° counterclockwise about the origin and then translated 6 units left and 4 units up.What are the coordinates of the final image of P?

a. (3,2)
b. (-3,6)
c. (-6,3)
d. (6,-3)
e. (-2,3)

____ 20. A point A(a,b) is translated 3 units up to A'(5,-4).Find the value of b.

a. -1
b. -3
c. -4
d. -7
e. -8

____ 21. Let $f(x) = x^2 - 3$

$g(x) = mx + 4$

and g(f(4))=34 . Find the value of m

a. 15/13
b. 30/13
c. 34/13
d. 13/30
e. 7/13

____ 22. If $4^x \times 32 = 64$. Find the value of 6x

a. 1
b. 2
c. 3
d. 4
e. 5

Khadija opens a market and sells items A, B, C, and D.

Their **original prices** are shown in the table:

Item	Price (EGP)
A	700
B	735
C	800
D	850

She changes the prices as follows:

- A and B get an **18% increase**.
- C gets a **4% decrease**.
- D gets a **3% discount**.

Consider the statements:

I. After the changes, **item B has the highest price**.

II. After the changes, **item C has the lowest price**.

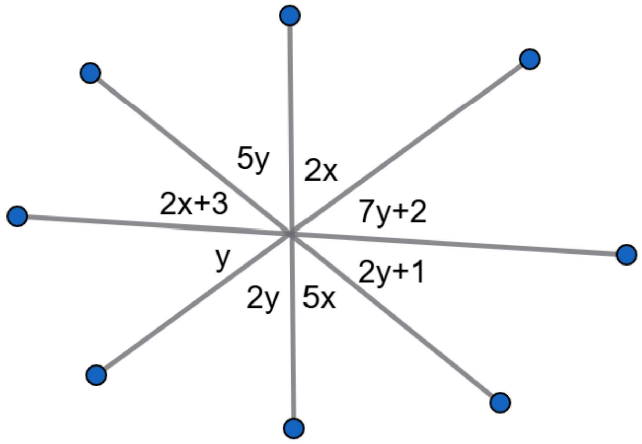
III. After the changes, **item A is cheaper than item D**.

____ 23. Which of the following is **true**?

a. I only
b. II only
c. I and II only
d. I and III only
e. I, II, and III

____ 24. In a company:40% of the employees play football, and 20% of the football players are women.60% of the employees play volleyball, and 10% of the volleyball players are women.Each employee plays exactly one of the two sports.If one employee is chosen at random, what is the probability that the employee is a man?

a. 0.4
b. 0.54
c. 0.68
d. 0.7
e. 0.86



____ 25.

find x in terms of y

a. $x = \frac{354 - 17y}{9}$

b. $x = -\frac{354 - 17y}{9}$

c. $x = \frac{354 + 17y}{9}$

d. $x = \frac{354 - 17y}{8}$

e. $x = \frac{54 - 17y}{9}$

____ 26. The numbers , 2a, a+3 , 3 , 3a, 6 , 7 , 8 , 12 have a mean of 14.Find a.

a. 4
b. 5.84
c. 6.23
d. 7.55
e. 12.16

____ 27. An angle is twice its supplementary angle.Find the measure of the angle.

a. 40
b. 60
c. 90
d. 120
e. 140

____ 28. Given $4x^2 + 8xz + 4y^2 - 4y = 110$. Find the value of $4r^3$, if x = y = z = r

a. 32
b. 64.18
c. 83.18
d. 128
e. 256

____ 29. Find the distance between the points (5,6,7)and (4,8,9).

a. 2
b. $\sqrt{6}$
c. $\sqrt{14}$
d. $\sqrt{21}$
e. 3

____ 30. If z = 3 - 4 i and w = 2 i +4 . Find the magnitude of 4w-3z

a. $\sqrt{449}$
b. 449
c. $\sqrt{228}$
d. 228
e. 10

____ 31. Find the x-coordinate of the hole.

$$\frac{3x^2 - 3x + 1}{x^2 - 3x + 2}$$

a. 1
b. 2
c. 3
d. No holes
e. -9

____ 32. Simplify $3\cos^3 x + 3\cos x \sin^2 x$

a. -3 cosx
b. 3 $\cos^2$
c. 3 cos x
d. 3 sin x
e. 3 cos x sin x

____ 33. Given $4x^3 + ax - c = 0$
with sum of roots = 0.25 and product of roots = 4 . Find a and C

a. a =1 , c=4
b. a = -1 , c =16
c. a =1 , c = -4
d. a =-1 , c = -16
e. a = 0 , c =16

____ 34. A letter is chosen at random from the word FIRSTPLACE to occupy the first position.What is the probability that the letter C is in the first place?

a. 1/5
b. 1/8
c. 1/10
d. 1/2
e. 1

____ 35. An amount of $2000 is invested at an interest rate of 8% compounded monthly.What is the increase in the value of the investment after 5 years?

a. 900
b. 979
c. 1200
d. 1480
e. 1980

____ 36. The ratio between x:y is 3 : 5.If x+y=20, what is the value of y?

a. 5
b. 8
c. 10
d. 12.5
e. 15

____ 37. What is the least solution in $x^4 + 2x^3 + x + 68$

a. -4
b. -2
c. 0
d. 2
e. No real solution

____ 38. The five-number summary of a data set is shown below:

Minimum = 1
Q1 = 5
Median = 9
Q3 = b
Maximum = c
The range of the data is equal to c - 1, and the upper quartile is 12.What is the value of b?

a. 10
b. 11
c. 12
d. 20
e. 14

____ 39. A parallelogram ABCD has a perimeter of 42 units.Side AB = 12, and side BC = x + 5.What is the length of CB?

a. 7
b. 9
c. 11
d. 12
e. 14

____ 40. A rectangular prism has dimensions:Length = x-1 Width = x
Height = 2x+3. If the volume of the prism is 64, what is the value of x?

a. 2.1
b. 3.1
c. 4.1
d. 5
e. 6

EST2 october 2025 collecetd by students
Answer Section

MULTIPLE CHOICE

1. ANS: A PTS: 1
2. ANS: E PTS: 1
3. ANS: A PTS: 1
4. ANS: A PTS: 1
5. ANS: C PTS: 1
6. ANS: C PTS: 1
7. ANS: A PTS: 1
8. ANS: A PTS: 1
9. ANS: B PTS: 1
10. ANS: C PTS: 1
11. ANS: A PTS: 1
12. ANS: C PTS: 1
13. ANS: D PTS: 1
14. ANS: B PTS: 1
15. ANS: C PTS: 1
16. ANS: D PTS: 1
17. ANS: E PTS: 1
18. ANS: C PTS: 1
19. ANS: B PTS: 1
20. ANS: D PTS: 1
21. ANS: B PTS: 1
22. ANS: C PTS: 1
23. ANS: C PTS: 1
24. ANS: E PTS: 1
25. ANS: A PTS: 1
26. ANS: E PTS: 1
27. ANS: D PTS: 1
28. ANS: C PTS: 1
29. ANS: E PTS: 1
30. ANS: A PTS: 1
31. ANS: D PTS: 1
32. ANS: C PTS: 1
33. ANS: E PTS: 1
34. ANS: C PTS: 1
35. ANS: B PTS: 1
36. ANS: D PTS: 1
37. ANS: E PTS: 1
38. ANS: C PTS: 1
39. ANS: B PTS: 1

40. ANS: B PTS: 1

EST II
MATH – LEVEL 1

Date:

Test Center:

Room Number:

Student's Name:

National ID:

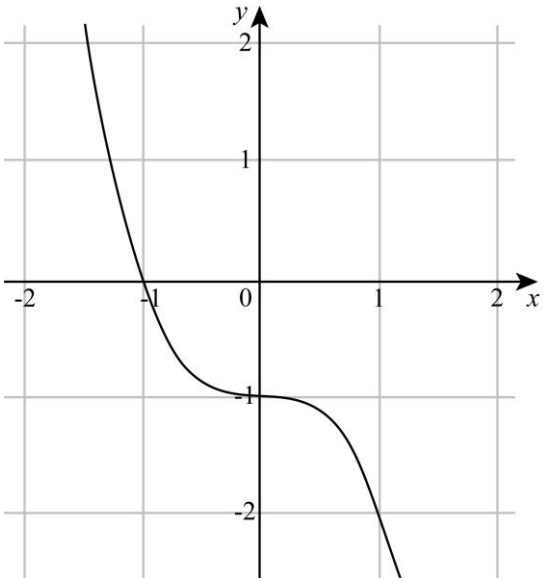
EST ID:

Duration: 60 minutes

40 Multiple Choice Questions

Instructions:

- Place your answers 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.
- Graphing and scientific calculators are allowed.



1. Which of the following statements can be true regarding the polynomial function P represented in the graph above?

A. -1 is a root of P.

B. The constant term of P is positive.

C. The degree of the function is 2.

D. The function P is increasing over $\mathbb{R}$.

E. The value of P at zero is equal to the value of P at -1.

2. The graph of a function g cuts the x-axis two times and has a positive y-intercept. Which of the following could be the equation of $g(x)$?

A. $g(x) = x(x+7)(x+6)$

B. $g(x) = (x^2-3)(2x+7)(3x-1)$

C. $g(x) = (x^2+2)(x-1)(x-14)$

D. $g(x) = 2(x+1)(x+2)(x+3)$

E. $g(x) = 4(x-2)(x-1)(x-3)$

3. What is the probability that a randomly formed six-letter word using all the letters of the word EUROPE has the two E's next to each other?

A. $\frac{1}{4}$

B. $\frac{1}{3}$

C. $\frac{1}{2}$

D. $\frac{3}{5}$

E. $\frac{3}{4}$

4. $2\cos(x) \times (-10\cos(x)) - (-4\sin(x)) \times (-5\sin(x)) =$

A. -20
B. -2
C. 1
D. 20
E. None of the above

5. A geometric sequence has a first term equal to 16 and a sixth term equal to 121.5. What is the value of the square of the common ratio?

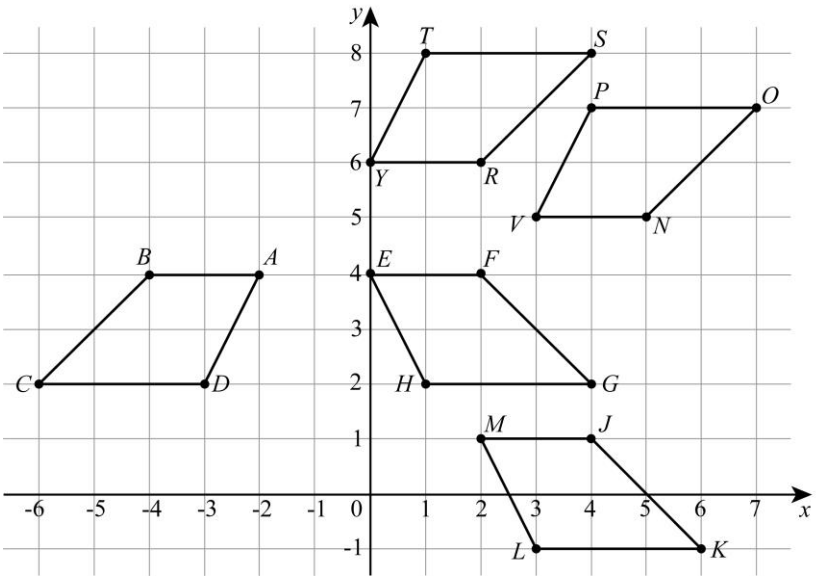
A. 1.0
B. 1.50
C. 2.0
D. 2.25
E. 4.0

6. If the ratio of x to y is equal to 2 and the ratio of y to z is equal to 1, which of the following must be true?

A. $x = \frac{1}{z}$
B. $x = z$
C. $x = 3z$
D. $y = 2z$
E. $z = \frac{x}{2}$

7. The supplement of an angle T is $(3x + 5)°$ and the vertically opposite angle to T measures $(x - 15)°$. What is the value of x?

A. $x = 42.5$
B. $x = 44.5$
C. $x = 45.5$
D. $x = 46.5$
E. $x = 47.5$



8. Amin drew the polygon $ABCD$ shown above. Ismail drew the four polygons to the right, all congruent to $ABCD$. The lengths of all drawn segments are equal to:

A. $\sqrt{5} + 2\sqrt{2} + 5$ units

B. $5\sqrt{5} + 2\sqrt{2} + 25$ units

C. $6\sqrt{5} + 12\sqrt{2} + 30$ units

D. $5\sqrt{5} + 10\sqrt{2} + 25$ units

E. $4\sqrt{5} + 8\sqrt{2} + 20$ units

9. What is the distance between the vertex of $y = 2x^2 + 4x - 1$ and the point of coordinates $(9, 7)$?

A. $5\sqrt{2}$

B. $10\sqrt{2}$

C. $20\sqrt{2}$

D. 30

E. 31

10. If $625^{3x} \cdot 10^6 = 5^{24} \cdot 2^y$, then $\frac{y}{x} =$

A. 1

B. 2

C. 3

D. 4

E. 6

11. Given line d with equation $2(x - 3y) + x = 1$, what is the equation of the line parallel to d and passing through point $M(1, -3)$?

A. $y = \frac{1}{2}x - 7$

B. $y = \frac{1}{2}x + 7$

C. $y = x - 7$

D. $2y = x - 7$

E. $2y = x + 7$

$$3, 7, 9, 2, 11, 13, 14$$

12. What is the product of the range and the median of the set above?

A. 9

B. 21

C. 100

D. 108

E. 200

13. In a basketball game, a team of 8 players scored a total of 122 points. What was the average number of points scored per player?

A. 13.65

B. 14.50

C. 14.75

D. 15.20

E. 15.25

14. $ABFD$ is a parallelogram with base $AB = 5\ m$ and a height of $2\ m$. Let M be the midpoint of segment $\overline{DF}$ and T the symmetric point of B with respect to M. What is the area of triangle DTM?

A. $20.0\ m^2$

B. $10.0\ m^2$

C. $7.5\ m^2$

D. $5.0\ m^2$

E. $2.5\ m^2$

15. The area of a rectangle is $44\ m^2$. The length of this rectangle is $2.5\ m$ more than its width. What is the perimeter, rounded to the nearest tenth, of the triangle formed by two adjacent sides of this rectangle and one of its diagonals?

A. 16.6

B. 23.2

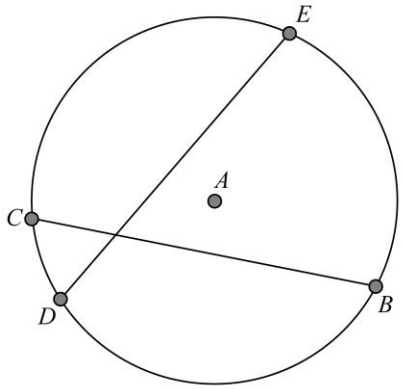
C. 33.2

D. 66.5

E. 83.1

16. What is/are the root(s) of $\frac{x^2+4x-77}{x^2-x-42}$?

A. $x = -11$ only
B. $x = 6$ only
C. $x = 7$ only
D. $x = -6$ and $x = 11$
E. $x = 11$ and $x = -11$



17. In the figure above, $\overline{BC}$ and $\overline{DE}$ intersect at M. If $CM = 4.0\ cm$, $DM = 4.5\ cm$, and $ME = 8.0\ cm$, what is the length of $\overline{MB}$? (*Figure not drawn to scale*)

A. $0.1\ cm$
B. $2.3\ cm$
C. $5.0\ cm$
D. $7.1\ cm$
E. $9.0\ cm$

18. Given $y = 3x^2 + 7x + c$, where c is a real number. Which of the following statements is/are true?

I. The product of the roots of the equation is positive if $c > 0$.

II. If $c > \frac{49}{12}$, then the equation has two real solutions.

III. If $c < \frac{49}{12}$, then the sum of the roots of the equation is $-\frac{7}{3}$.

A. **I** only
B. **II** only
C. **I** and **II** only
D. **I** and **III** only
E. **II** and **III** only

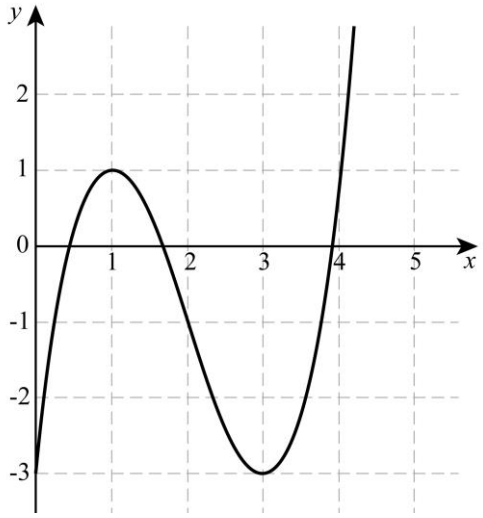
$$7x^2 + 3(x - 5) + 2 = 7(x^2 + 7x - 4)$$

19. The solution of the equation above is $\frac{k}{46}$, where k is a constant. What is the value of k^2?

A. 225
B. 260
C. 365
D. 370
E. 400

20. Six friends want to sit on a bench that can fit all six of them. Alice wants to sit at the edge of the bench. In how many possible ways can the six friends sit?

A. 120
B. 240
C. 420
D. 720
E. 1,440



21. The figure above shows the graph of a function f. The function g is defined as $g(x) = 1 - f(x)$. Which of the following is the maximum value of $g(x)$ over $[0, 4]$?

A. -3
B. 0
C. 1
D. 3
E. 4

22. Three interior angles of a convex hexagon have measures $x°$, $(2x + 12)°$, and $(3x - 8)°$. The other three angles are congruent, each with an exterior angle measuring $(x - 7)°$. If the value of x can be expressed as $\frac{m}{3}$, where m is a constant, what is the value of m?

A. 120
B. 155
C. 240
D. 310
E. 930

23. Consider the parabola P with the equation $y = -3x^2 + 12$. Which of the following has the same y-intercept as P and only one x-intercept in common with P?

A. $y = -6x^2 + 12$
B. $y = -3(x - 2.5)^2 + 2$
C. $y = -3x + 12$
D. $y = x^2 + x + 12$
E. $y = 2(x - 2.5)^2 - 0.5$

$$\begin{cases} x + 2y = 5 \\ 4x + by = c \end{cases}$$

24. The system of equations above, where b and c are two constants, has infinitely many solutions. What is the value of $b + c$?

A. 8
B. 20
C. 21
D. 28
E. 42

25. Consider a line l that passes through points $A(5, -3)$ and $B(-1, 4)$. What is the slope of the line perpendicular to l?

A. $-\frac{7}{6}$
B. $-\frac{6}{7}$
C. $\frac{5}{7}$
D. $\frac{6}{7}$
E. $\frac{8}{7}$

26. What is the value of $\frac{8^{2x}}{128^{y}}$ if $12x - 14y = 3$?

A. -1
B. $2\sqrt{2}$
C. $4\sqrt{2}$
D. 6
E. 8

27. Given a circle C with center K and radius $15\ cm$, if $\overline{AB}$ is a diameter of C and M is a point on C, what is the value of $MA^2 + MB^2 - MK^2$?

A. 225
B. 675
C. 685
D. 775
E. $1{,}125$

28. Which of the following represents the expression of the n-th term of the arithmetic sequence $3, 11, 19, 27, \ldots$?

A. $a_n = n^8 - 5$
B. $a_n = n + 5$
C. $a_n = 8n - 5$
D. $a_n = 8n$
E. $a_n = 8n + 5$

29. If $\frac{2}{3x - 1} = -\frac{3}{4}$, what is the value of $9x + 1$?

A. -6
B. -4
C. $\frac{4}{9}$
D. 4
E. 6

30. What is the measure of each angle in a regular octagon?

A. $180°$
B. $160°$
C. $150°$
D. $135°$
E. $120°$

31. In a simple game of dice, three fair dice are rolled. The player wins if all three dice show either even numbers or odd numbers. A player rolled the three dice for two rounds. What is the probability that the player loses in the first round but wins in the second round?

A. $\frac{3}{16}$

B. $\frac{1}{4}$

C. $\frac{3}{4}$

D. $\frac{15}{16}$

E. 1

32. A construction company is laying tiles in a new mall. It was observed that 8 workers can tile 120 square meters in 6 hours. Assuming all workers work at the same rate, how many square meters can 10 workers tile in 9 hours?

A. 180

B. 200

C. 225

D. 240

E. 250

33. The triangle ABC is right angled at B. If $5\sin(A) = \cos(A)$, then which of the following is equal to $\sin(C)$?

A. $\frac{AB}{5AC}$

B. $\frac{AC}{AB}$

C. $\frac{BC}{AC}$

D. $5\frac{AC}{BC}$

E. $5\frac{BC}{AC}$

34. Given a circle C with center O and a point A outside the circle such that $AO = 8\ cm$, if the radius of the circle is $4\ cm$, what is the measure of the angle between $\overline{AO}$ and the tangent drawn from A to C?

A. $20°$

B. $25°$

C. $30°$

D. $60°$

E. $90°$

35. If $ABMN$ is a parallelogram such that $m\angle ABM = 40°$ and $m\angle NMB = (3x - 13)°$, what is the value of x?

A. 49
B. 51
C. 53
D. 55
E. 57

$$|2x - 12| > |x| + 1$$

36. Which of the following is the interval notation representing the solution set of the inequality above?

A. $\left(-\infty, \frac{11}{3}\right] \cup \left[\frac{4}{3}, +\infty\right)$

B. $\left(-\infty, \frac{11}{3}\right) \cup (13, +\infty)$

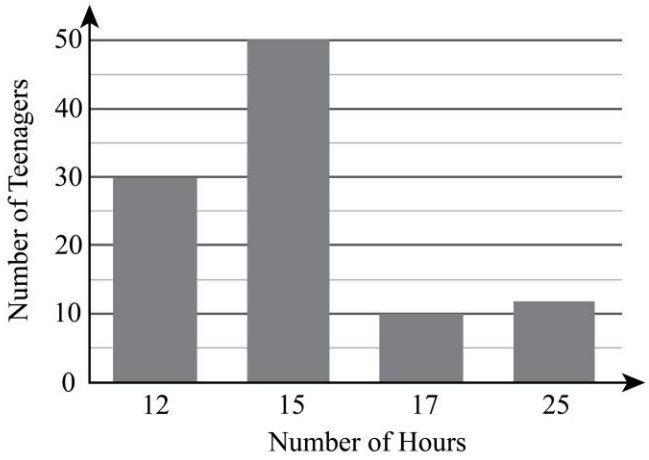
C. $\left(-\infty, \frac{4}{3}\right] \cup [13, +\infty)$

D. $\left(-\infty, \frac{3}{4}\right) \cup (18, +\infty)$

E. $(-\infty, 0) \cup \left(\frac{4}{3}, +\infty\right)$

37. Given the inequality $6(x + 2y) < 2x - 3(y - 1)$, which of the following points does not belong to its set of solutions?

A. $(-17, 2)$
B. $(-8, 3)$
C. $(0, 0)$
D. $(2, -1)$
E. $(3, -1)$



38. The graph above shows the number of hours per week teenagers spend playing video games in a certain neighborhood. Approximately, what is the average number of hours spent by one teenager?

A. 13.0
B. 14.5
C. 15.5
D. 20.0
E. 30.0

39. Consider the triangle ABC, isosceles at A with $m\angle ACB = 50°$, and $\overline{AM}$ is the median drawn from A to $\overline{BC}$. If D and E are respectively the symmetric points of C and M with respect to A, what is the measure of $\angle DAE$?

A. 25°
B. 40°
C. 45°
D. 50°
E. 80°

40. Among the following, for which value(s) of b does the equation $3x^2 + bx + 3 = 0$ have two distinct real solutions?

I. -14

II. 5

III. 12

A. **I** only
B. **I** and **II** only
C. **I** and **III** only
D. **II** and **III** only
E. **I**, **II**, and **III**

EST II
MATH – LEVEL 1
Answer Key

1	A	**16**	A	**31**	A
2	C	**17**	E	**32**	C
3	B	**18**	D	**33**	E
4	A	**19**	A	**34**	C
5	D	**20**	B	**35**	B
6	E	**21**	E	**36**	B
7	E	**22**	B	**37**	B
8	D	**23**	E	**38**	C
9	B	**24**	D	**39**	B
10	D	**25**	D	**40**	C
11	D	**26**	B		
12	D	**27**	B		
13	E	**28**	C		
14	E	**29**	B		
15	B	**30**	D		

Distribution Table

Topics Covered & Skills Specification Table

		Knowledge	Application	Reasoning	Synthesis
5/40 12.5%	**Numerations and Operations**	28	5, 10, 32	6	
12/40 30%	**Algebra and Functions**	16, 40	19, 21, 29, 36, 37	1, 2, 24, 26	18
9/40 22.5%	**Plane Shapes / Measurement**	17, 35	7, 27, 30	14, 39	15, 22
5/40 12.5%	**Coordinate Systems**	25	9, 11	8, 23	
3/40 7.5%	**Trigonometry**		4, 34	33	
6/40 15%	**Data Analysis, Statistics, and Probability**	13, 38	3, 12	20, 31	
		8/40 20%	**17/40 42.5%**	**12/40 30%**	**3/40 7.5%**

EST II
MATH – LEVEL 2

Date:

Test Center:

Room Number:

Student's Name:

National ID:

EST ID:

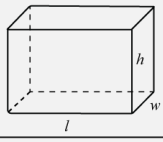
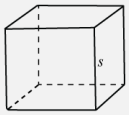
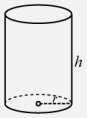
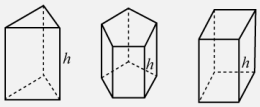
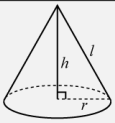
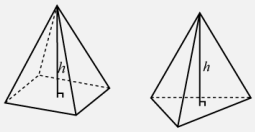
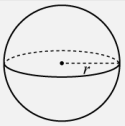
Duration: 60 minutes

40 Multiple Choice Questions

Instructions:

- Place your answers on the answer sheet. Mark only one answer for each of the multiple-choice questions.
- Graphing and scientific calculators are allowed.
- Formula sheet is available on the following page of the booklet for your reference.

Formula Sheet

	Volume	Surface area	Lateral surface area
Cuboid 	$V = lwh$	$S.A. = 2(lw + lh + wh)$	
Cube 	$V = s^3$	$S.A. = 6s^2$	
Cylinder 	$V = \pi r^2 h$	$S.A. = 2\pi rh + 2\pi r^2$	
Prism 	$V = Bh$ (where B is the area of one of the bases, whether it is a square, a circle, a triangle, or a polygon)		
Cone 	$V = \frac{1}{3}\pi r^2 h$	$S.A. = \pi rl + \pi r^2$	$L.A. = \pi rl$
Pyramid 	$V = \frac{1}{3}Bh$ (where B is the area of the base)		
Sphere 	$V = \frac{4}{3}\pi r^3$	$S.A. = 4\pi r^2$	
Hemisphere 	$V = \frac{2}{3}\pi r^3$	$S.A. = 3\pi r^2$	$L.A. = 2\pi r^2$

1. $\frac{2i}{3-4i}$ can be written as:

A. $\frac{3i-4}{25}$

B. $\frac{3i+4}{25}$

C. $\frac{2(3i-4)}{25}$

D. $\frac{2(3i+4)}{25}$

E. $2(3i-4)$

2. If $(3x-4)^2+(7x-1)^2=2mx^2+(3p-4)x+17t$ for all real values of x, what is the value of $6p-m+4t$?

A. -93

B. -77

C. -59

D. -45

E. -34

3. Which of the following could be the value of m if $x^2+(2m-1)x-(m-1)=0$ has 2 equal roots?

A. $-\frac{\sqrt{3}}{4}$

B. $-\sqrt{3}$

C. $\frac{\sqrt{3}}{2}$

D. $\sqrt{3}$

E. $\frac{\sqrt{3}}{4}$

4. If $i^2=-1$, then $\sqrt{2}\left(2\sqrt{2}-i\sqrt{7}\right)\left(\sqrt{2}+2i\sqrt{7}\right)=$

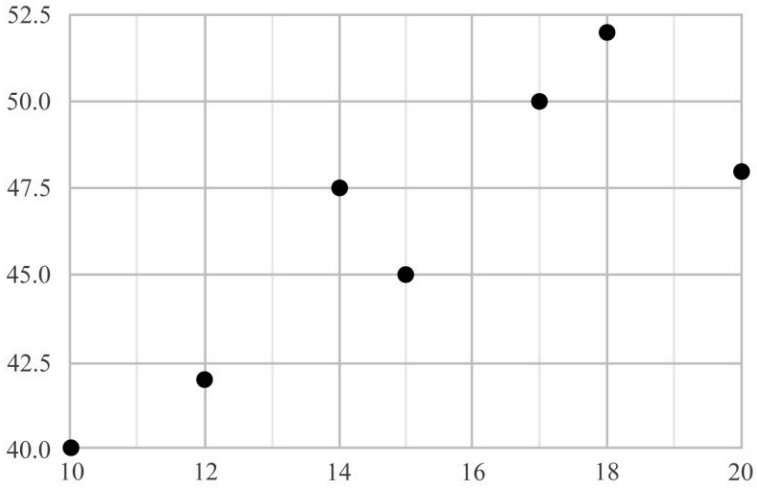
A. $-18\sqrt{2}-i\sqrt{7}$

B. $-10\sqrt{2}+3i\sqrt{7}$

C. $18\sqrt{2}-3i\sqrt{7}$

D. $18\sqrt{2}+6i\sqrt{7}$

E. $18\sqrt{2}+8i\sqrt{7}$



5. The scatterplot above shows the relation between some x-values and y-values. Using the least squares regression line, what could be the value of x when $y = 62.5$, to the nearest integer?

A. 28
B. 29
C. 31
D. 95
E. 96

6. Given the four points $A(3, 1, 5)$, $B(2, 3, -1)$, $C(7, 2, 5)$, and $D(-7, -1, 3)$, what is the distance between the midpoints of $\overline{AB}$ and $\overline{CD}$?

A. $\frac{\sqrt{2}}{2}$
B. $\sqrt{2}$
C. $\frac{5\sqrt{2}}{2}$
D. 5
E. $\sqrt{29}$

7. Which of the following is the solution of $2x^2 + 7x + 6 \leq 0$?

A. $x \leq -2$
B. $x \leq -\frac{3}{2}$
C. $x \geq -\frac{3}{2}$
D. $-2 < x \leq -\frac{3}{2}$
E. $-2 \leq x \leq -\frac{3}{2}$

8. Which of the following lines is not perpendicular to the line of equation $2y - x = 7$?

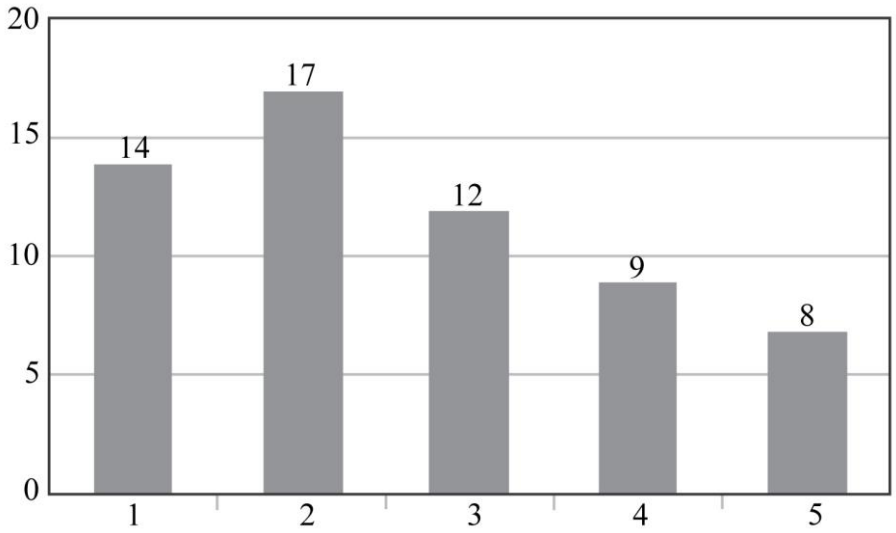
A. $\frac{y}{2} - 4 = -x$

B. $\frac{y}{3} + \frac{2}{3}x = 1$

C. $\frac{y}{3} + 2x = 1$

D. $3y + 6x = 30$

E. $4x = 2 - 2y$



9. The chart above shows Ryan's scores out of 20 on his math quizzes from the past semester. One score is missing. If twice the average of all his scores is 23, what was his score on the missing quiz?

A. 20.0

B. 15.0

C. 11.5

D. 10.0

E. 9.0

10. Given the matrix $A = \begin{pmatrix} 2 & 1 & -2 \\ -3 & 0 & 4 \\ 1 & 4 & 4 \end{pmatrix}$ and B its inverse, then $\det(B) =$

A. $\frac{1}{8}$

B. $\frac{1}{4}$

C. $\frac{1}{2}$

D. $\frac{3}{4}$

E. 2

11. A circle is inscribed in a square with an area of $4.84\ m^2$. The center of the circle is at the origin of the coordinate plane. What is the equation of the circle?

A. $x^2 + y^2 = 1.10$

B. $x^2 + y^2 = 1.21$

C. $x^2 + y^2 = 4.84$

D. $(x - 1.1)^2 + (y - 1.1)^2 = 4.84$

E. $(x - 2.2)^2 + (y - 2.2)^2 = 1.21$

$$2(x - 5) + 3(4x - 1) = 2x + 7$$

12. If x verifies the equation above, then the value of 2^{3x-2} is:

A. 2

B. 4

C. 6

D. 8

E. 10

13. A company produces bottles of water in two different sizes. Small bottles cost \$0.70 each, and large bottles cost \$1.10 each. If Jamal bought 18 bottles for a total of \$15.4, how many large bottles did he purchase?

A. 5

B. 6

C. 7

D. 10

E. 11

14. To travel from country X to country Z, a pilot can choose among 4 different routes $A, B, C,$ and D with probabilities 0.40, 0.35, 0.15, and 0.10, respectively. The probabilities that the trip takes more than two hours are 0.30 for route A, 0.25 for route B, 0.40 for route C, and 0.35 for route D. What is the probability that a pilot chose route C given that the trip did not take more than two hours?

A. 0.033
B. 0.086
C. 0.129
D. 0.298
E. 0.303

15. The central angle of a circle measures $\frac{3}{8}\pi\ rad$. What is its measure in degrees?

A. 9.4°
B. 48.5°
C. 67.5°
D. 83.0°
E. 130.5°

16. An open top cube has a surface area equal to 80 cm^2. The volume of this cube is:

A. 48.69 cm^3
B. 64.0 cm^3
C. 78.0 cm^3
D. 100.25 cm^3
E. 125.0 cm^3

17. A substance initially weighs 15 g and decreases in weight by 2% each month. What will its weight be after one year and three months, to the nearest hundredth?

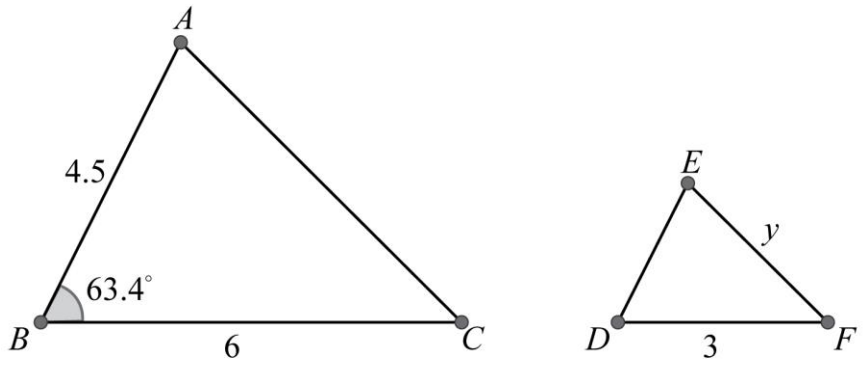
A. 14.70 g
B. 14.12 g
C. 13.84 g
D. 11.08 g
E. 11.03 g

18. $\lim\limits_{x\to+\infty} \frac{x^2+2x-1}{x-1} =$

A. $-\infty$
B. -1
C. 1
D. 2
E. $+\infty$

19. There are four terms between 9 and 39 in an arithmetic sequence. What is the largest number among them?

A. 13
B. 15
C. 21
D. 33
E. 38



20. If triangles ABC and EDF are similar, what is the value of y?

A. 2.25
B. 2.83
C. 5.66
D. 11.32
E. 15.0

21. Let a and b be two integers such that $a < -2$, and $b > 1$, where b is an odd number. Which of the following is true regarding the number $a^b + b$?

A. It is always a negative number.
B. It is always a positive number.
C. It is always an even number.
D. It is always an odd number.
E. It is bigger than -20.

22. Given $f(x) = ax^3 + bx - 4$, where $f(1) = -1$, what is the value of $a + b$?

A. 3
B. 4
C. 6
D. 11
E. 16

23. What is the approximate area of triangle ABC if $AB = 7\ cm$, $BC = 6\ cm$, and $m\angle ABC = 35°$?

A. $12.05\ cm^2$

B. $15.55\ cm^2$

C. $17.20\ cm^2$

D. $24.09\ cm^2$

E. $34.40\ cm^2$

24. A spherical ball is inscribed in a cube with volume $64\ cm^3$. What is the largest possible volume of the ball?

A. $\frac{256}{3}\pi\ cm^3$

B. $\frac{128}{3}\pi\ cm^3$

C. $\frac{64}{3}\pi\ cm^3$

D. $\frac{32}{3}\pi\ cm^3$

E. $\frac{16}{3}\pi\ cm^3$

25. Suppose $\vec{u} = (2, -1)$ and $\vec{v} = (-2, 3)$. What is the square of $\big||\vec{u}| + |\vec{v}|\big|$?

A. $18 - 2\sqrt{65}$

B. 18

C. $18 + \sqrt{65}$

D. $18 + 2\sqrt{65}$

E. 324

26. The sum of the base angles in an isosceles triangle is $130°$. If the length of one leg is $3\ cm$, what is the length of the altitude from the apex, to the nearest tenth?

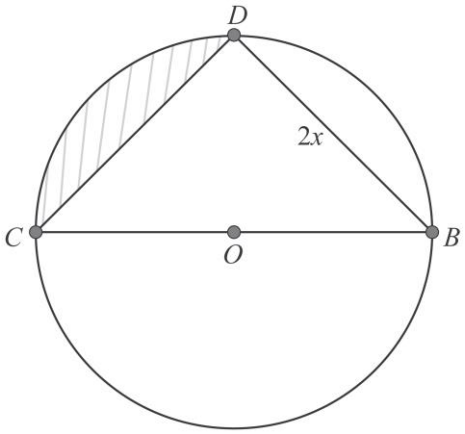
A. $1.5\ cm$

B. $1.8\ cm$

C. $1.9\ cm$

D. $2.7\ cm$

E. $2.8\ cm$



27. The figure above shows a $45° - 45° - 90°$ triangle inscribed in a circle with $DB = 2x$. What is the area of the hatched region in terms of x?

A. $\frac{x^2}{2}(\pi - 2)$

B. $x^2(\pi - 2)$

C. $2x^2(\pi - 1)$

D. $2x^2(\pi\sqrt{2} - 1)$

E. $2x^2\pi$

28. $M\left(\frac{5}{2}, \frac{1}{2}, z\right)$ is the midpoint of $\overline{AB}$, where $A(2, 3, 4t + 1)$ and $B(3, -2, 8)$, with z and t being real numbers. If $AB = 3\sqrt{3}$, what is a possible value of $|t - z|$?

A. -6

B. 1

C. $\frac{3}{2}$

D. 6

E. $\frac{15}{2}$

29. What is the period of the function $y = \sin(2x - 3)$?

A. $\frac{\pi}{2}$

B. 2

C. $\frac{2}{3}\pi$

D. π

E. 4

30. What is the simplified form of $\frac{\sin(2x)}{\csc(x)} \cdot \frac{\cos\left(\frac{x}{2}\right)}{\cot(x)}$?

A. $\sin^3(x) \cdot \cos\left(\frac{x}{2}\right)$

B. $\sin^3(x) \cdot \cos(x)$

C. $2\sin^2(x) \cdot \cos\left(\frac{x}{2}\right)$

D. $2\sin^3(x) \cdot \cos\left(\frac{x}{2}\right)$

E. $2\sin^3(x) \cdot \cos(x)$

31. What is the product of $A = \begin{pmatrix} 2 & 5 & 7 \\ 2 & -1 & -8 \\ 0 & 5 & 1 \end{pmatrix}$ and the matrix B defined by $\begin{pmatrix} 1 \\ 5 \\ 7 \end{pmatrix}$?

A. $\begin{pmatrix} -12 \\ -35 \\ 26 \end{pmatrix}$

B. $\begin{pmatrix} 12 \\ 35 \\ -26 \end{pmatrix}$

C. $\begin{pmatrix} 12 \\ 35 \\ 26 \end{pmatrix}$

D. $\begin{pmatrix} 76 \\ -59 \\ 32 \end{pmatrix}$

E. $\begin{pmatrix} 76 \\ 59 \\ -32 \end{pmatrix}$

32. What is the inverse function of $f(x) = \frac{2}{3}x + 4$?

A. $f^{-1}(x) = -\frac{3}{2}x + 6$

B. $f^{-1}(x) = \frac{3x - 6}{2}$

C. $f^{-1}(x) = \frac{3x + 6}{2}$

D. $f^{-1}(x) = \frac{3}{2}x - 6$

E. $f^{-1}(x) = \frac{3}{2}x + 6$

33. Consider the word TISSUES. How many different arrangements of its letters can be formed such that I and U have exactly 3 letters between them?

A. 60
B. 80
C. 120
D. 720
E. 1,020

34. Consider the vector $\vec{v} = 4\vec{\imath} - 9\vec{\jmath}$. What is the norm of $\vec{v}$, to the nearest hundredth?

A. 3.61
B. 8.06
C. 9.85
D. 13.0
E. 97.0

35. If the radius of the circle whose equation is $x^2 - 4x + y^2 + 6y + m = 0$ is 9, then $m =$

A. -68
B. -33
C. -20
D. 10
E. 24

$$2, 5, 11, 14, 18, 20, 21, x, 32$$

36. The interquartile range of the set above, arranged in increasing order, is 15.5. The product of x and the range of the set is equal to:

A. 900
B. 780
C. 540
D. 465
E. 403

37. Given the parabola defined by the equation $2y - x^2 = 4x + 1$, what are the coordinates of its turning point?

A. $(2.0, 6.5)$
B. $(2.0, 1.5)$
C. $(-2.0, -1.0)$
D. $(-2.0, -1.5)$
E. $(-2.0, -2.5)$

38. A ball is thrown into the air. Its height above the ground, in meters, at time t seconds after being thrown is given by the function $f(t) = -2t^2 + 18t + 8$. What is the maximum height the ball reaches before falling back to the ground?

A. 4.5 $meters$
B. 8.0 $meters$
C. 8.7 $meters$
D. 48.5 $meters$
E. 80.0 $meters$

39. Country X taxes the first \$1,500 of an individual's monthly income at a rate of 8%, and any money above that at a rate of 15%. Malek started a new job at a company and was compensated \$1,250 per month for the first 4 months. Afterwards, he received a \$400 raise. After the 9^{th} month of Malek's employment, the accounting team realized that they had not deducted the required taxes and decided to deduct all the previous taxes from Malek's 10^{th} −month paycheck. How much will Malek be paid in his 10^{th} month after the tax deductions?

A. \$165
B. \$395
C. \$413
D. \$538
E. \$795

40. If $\frac{3x-1}{6} - \frac{1}{3} = \frac{2x-3}{2}$, then $x =$

A. 1
B. 2
C. 3
D. 5
E. 7

EST II
MATH – LEVEL 2
Answer Key

1	C	**16**	B	**31**	D
2	A	**17**	D	**32**	D
3	C	**18**	E	**33**	C
4	D	**19**	D	**34**	C
5	C	**20**	B	**35**	A
6	C	**21**	A	**36**	B
7	E	**22**	A	**37**	D
8	C	**23**	A	**38**	D
9	D	**24**	D	**39**	B
10	A	**25**	D	**40**	B
11	B	**26**	D		
12	D	**27**	A		
13	C	**28**	D		
14	C	**29**	D		
15	C	**30**	D		

Distribution Table

Topics Covered & Skills Specification Table

		Knowledge	Application	Reasoning	Synthesis
8/40 20%	**Numerations and Operations**	34	1, 4, 10, 19, 25, 31	21	
14/40 35%	**Algebra and Functions**	29, 32, 40	3, 12, 18, 22, 37, 38	2, 7, 13, 17	39
3/40 7.5%	**Coordinate Systems**	11		8, 35	
4/40 10%	**Solid Shapes**		6, 28	16, 24	
6/40 15%	**Trigonometry**	15, 23	26, 30	20	27
5/40 12.5%	**Data Analysis, Statistics, and Probability**		5, 9	33, 36	14
		7/40 17.5%	**18/40 45%**	**12/40 30%**	**3/40 7.5%**