HARAMAYA IFA BORU SPECIAL BOARDING SECONDARY SCHOOL 2016 E.C MATHEMATICS WORKSHEET FOR GRADE 9 AND 10 FROM NATIONAL EXAM (2005-2010)

MAY 2024

HARAMAYA SPECIAL BOARDING 2NDRY SCHOOL (MAYA CITY)

ADELE SUB CITY

Part one

CHOOSE THE BEST ANSWER FROM THE FOUR GIVEN ALTERNATIVES

1. If set M = {x| - 2< x <2, where x is an integer}, then which one of the following sets is equivalent to set M?

- A. {x | -2< x < 2, where x is a real number}
- B. {x|-1 < x < 1, where x is an integer}
- C. {x| 1< x < 5, where x is an integer}
- D. {x| x < 3,where x is a natural number}

2. Let N be the set all natural numbers and S = {x ∈ N: x is a prime number and x<5}, which of the following is the proper subset of S?

- A. { },{2},{3}
- B. {2}, {3}, {2,3}
- C. { },{1},{2},{3},{1,2},{1,3},{2,3}
- D. {},{2},{3},{2,3}

3. Using the basic trigonometric identifies for a non-quadrantal angle θ. The transformed form of the expression cot θ sec θ =

- A. csc θ
- B. tan θ
- C. cos θ
- D. sin θ

4. Which one of the following is correct about an angle θ that is given in the standard position and whose terminal side contains the pint (2,-1)?

- A. sin θ = $2/\sqrt{5}$
- B. tan θ= 1/2
- C. cos θ= $2/\sqrt{5}$
- D. sin θ= $1/\sqrt{5}$

5. The following table shows the amount of meat consumed by 20 households in the month of March.

Amount of Meat (in KG)	**5**	**8**	**10**	**15**
Number of house holds	3	5	7	5

For the given month, what was the arithmetic mean amount to meat consumed by the 20 households?

- A. 20/3kg
- B. 9.5 kg
- C. 10kg
- D. 7.6 kg

6. A researcher collected data on the monthly income of 10,000 workers in Addis Ababa. After listing down this set of data in the order of the amount of income, the researcher wants to divide it into two equal parts. In order to do this he has to compute the of the data.

- A. Range
- B. Mode
- C. Median
- D. Arithmetic mean

7. A polynomial function p is given by $p(x) = \frac{3x^3-4x^5+x^2-6x+1}{12} + \frac{x}{2} - x^4$ from the following statements which one is true about p?

A. In p(x) the coefficient of x is 0.
B. The degree of p(x) is 3.
C. Its constant term is (-1/2)
D. Its leading coefficients is 1/4

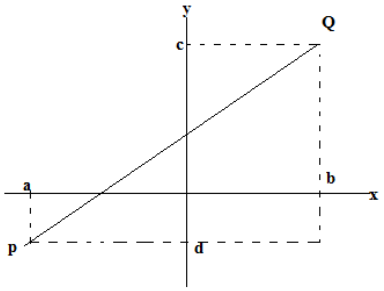
8. Which one of the following is an angle property of a circle?
A. If a central angel measures 180^0, then it is subtended by a major arc.
B. The angle inscribed in a minor arc of a circle is an acute angle.
C. All angles inscribed in a semicircle are congruent.
D. The opposite angle of a cyclic quadrilateral are congruent.

9. Which of the following is NOT correct about an n-sided regular polygon?
A. It has n lines of symmetry
B. All its sides and all its angles are equal.
C. The measure of each central angle and each exterior angle is $360^0/n$.
D. The sum of measures of its exterior angles is 720^0.

10. If the diameter of a sphere is 16 meters, then its surface area is equal to :
A. $256\pi m^2$
B. $64\ \pi m^2$
C. $1024\ \pi m^2$
D. $128\ \pi m^2$

11. Which one of the following is the equation of a line that is perpendicular to the line with equation 2 x+3y+4=0?
A. 3y-2x+4=0
B. -3x-2y-4=0
C. 3x-2y+4=0
D. 2x+3y-4=0

12. P and Q are points given on the coordinate plane as shown in the figure below.



A. $\sqrt{(a+c)^2+(b+d)^2}$
B. $\sqrt{(b-a)^2+(c-d)^2}$
C. $\sqrt{(c-a)^2+(b-d)^2}$
D. $\sqrt{(a-c)^2+(b-d)^2}$

13. If p and q are prime numbers and c is a composite number, then which one of the following is true?

- A. $p^2 + q^2 = c$
- B. $p + q = c$
- C. $p - q = c$
- D. $pq = c$

14. After rationalizing the denominator of the expression $\frac{\sqrt{2}}{\sqrt{2}+\sqrt{5}}$, what expression?

- A. $(\sqrt{10}-2)/3$
- B. $1 -\sqrt{5}$
- C. -2.76
- D. 5/2

15. On the number line which one of the following real numbers is found furthest from the origin?

- $\sqrt{6.25}$
- B. $-\sqrt{8}$
- C. $(\sqrt{5}-4)/3$
- D. $(4+\sqrt{10})/3$

16. If f is a function which is given by $f(x)=x^2 + (1-x)^2 -13$, then what is the minimum value of this function?

- A. -25/2
- B. - 21/2
- C.1/2
- D. -12

17. If $f(x)=3x-3$ and $g(x)=2-3x$, then $(2f+3g)(x)$ is equal to

- A. $12x+6$
- B. $-6x + 5$
- C. $-9x^2 +15x-6$
- D. $-3x$

18. Given the functions f = {(1,0), (-1,2),(3,4),(2,1)} and g = {(0,0),(2,3),(3,-1),(1,-1)} which one of the following is correct?

- A. $(f . g)(2)=-1$
- B. $(f - g)(3)=5$
- C. $2f(2)=2g(1)$
- D. $(f + g)(-1)=1$

19. Which of the following statements is true about the functions $f(x) =b^x$ and $g(x) = \log b^x$ where $b>0$ and $b\neq1$?

- A. The domain of g(x) is {x:x ≷ 0}
- B. The range of f is {y:y∈ R}
- C. The domain of f is the same as the domain of g.
- D. The domain of f is the same as the rage of g.

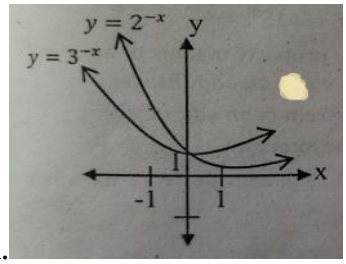
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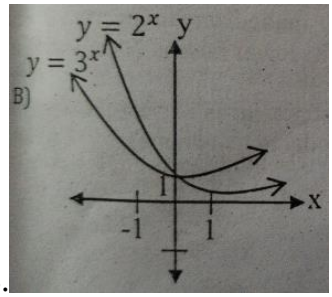
20. If log 3.42=0.5340 and log 2.28=0.3579, then the characteristics of log (3.42/0.228) is equal to

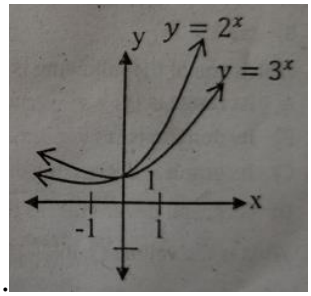
- A. 2
- B. 1
- C. 0
- D. -1

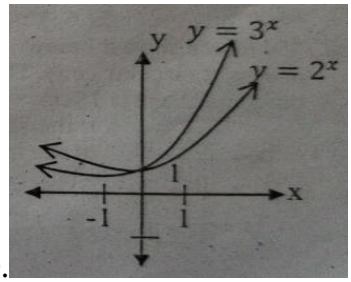
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21. Which one of the following graphical representations correctly shows the corresponding exponential functions?

A. 

B. 

C. 

D. 

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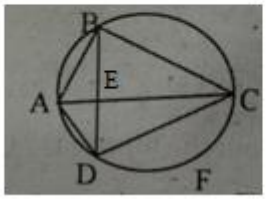
22. The simplified form of the expression $\left(\frac{2}{3}\right)^{-2}\left(\frac{2}{\sqrt{3}}\right)^{4} \div \left(\frac{\sqrt{2}}{\sqrt[3]{3}}\right)^{6}$ is

- A. 1/9

B. 16/9
C. 9/2
D. 8/3

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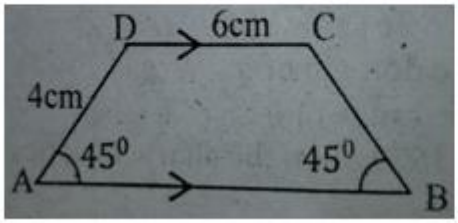
23. In the circle shown below. $m(\angle ACB)=34^0$ and $m(\overset{\frown}{DFC})=122^0$
The degree measure of ∠DEC is equal to



A. 88^0
B. 61^0
C. 95^0
D. 68^0

---

24. Trapezium ABCD, with $\overline{AB} \parallel \overline{DC}$, is given as shown in the figure belo
If DC=6cm, AD = 4cm and $m(\angle A) = m(\angle B)=45^0$, then what is the len



A. 10 cm
B. $(6+4\sqrt{2})$ cm
C. 14 cm
D. $14\sqrt{2}$ cm

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25. If $\sin 15^0 = x$ and $\sin 75^0 = y$, then which one of the following is correct?
A. $\tan 75^0 = x/y$
B. $\tan 15^0 = x/y$
C. $\cot 75^0 = y/x$
D. $\cot 15^0 = x/y$

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26. Which one of the following is the property of tangent function?
A. Its range is $\{y: y \neq n\pi/2$, where n is an odd integer$)$
B. Its domain is $\{\theta: \theta \neq n\pi$, where n is an odd integer$)$
C. Its graph is decreasing on the interval $(-\pi/2, \pi/2)$.
D. Its graph never crosses the line at which $\theta=\pi/2 + n\pi$, where $n \in Z$

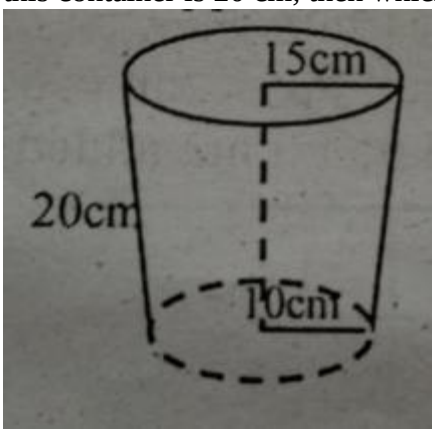
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27. What is the value of cot $(2\pi/3)$?

- A. -1/2
- B. $-\sqrt{3}/2$
- C. $-\sqrt{3}$
- D. $-\sqrt{3}/3$

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28. The figure shown below is a container made from an inverted frustum of a right circular cone. The radius of its lower base is 10cm and that of the upper base is 15 cm. If the height of this container is 20 cm, then which one of the following is equal to its volume?



- A. 5,000 πcm^3
- B. 7,500 πcm^3
- C. 9,500/3 πcm^3
- D. 2,500/3 πcm^3

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29. For two finite sets A and B where $A \subset B$ with n (A) = p and n(B) =q suc which one of the following relationships is true?

- A. $n(A \cup B) = q$
- B. $n(A \cup B) = p$
- C. $n(A \cup B) < q$
- D. $n(A \cup B) = p + q$

---

30. Let H= {Ø,{0,1}}, from the following sets, which one is the power set of set H?

- A. {Ø,{{0,1}},{ Ø,{0,1}}}
- B. {{Ø},{{0,1}},{ Ø,{0,1}}}
- C. {Ø,{Ø}{0,1}},{Ø,(0,1}}}
- D. {Ø,{0}, {1}, {0,1}}

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31. The solution set of the inequality $-2x^2+ 3x + 5 \leq 0$ is:

- A.{x∈ R:$-1 \leq x$ or $x \geq 1$ }
- B {x∈R: $0 \leq x \leq 5/2$}
- C. { x∈R: $-1 \leq x \leq 5/2$}
- D. { x∈ R:$x \leq -1$ or $x \geq 5/2$}

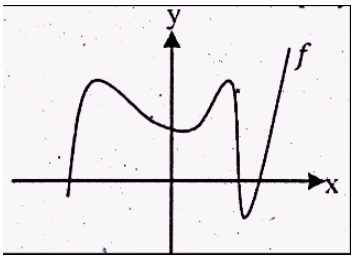
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32. Let $f(x)=x^3 + 5x^2$? x + 8 and $g(x) =x^2 + 2$. If f(x) is divided by g(x), then

- A. The constant term of the quotient is (-2).
- B. The degree of the remainder is 1.
- C. The remainder is x + 5
- D. The quotient is 3x + 2.

---

33. The graph of a certain polynomial function f is given below. Which of the following is true about this function?



- A. Its constant term is negative.
- B. The degree of f is an even number.
- C. Its leading coefficient is positive.
- D. It has three local max.

---

34. The rational root of the polynomial equation $6x^4 + x^3 + 2x - 24 = 0$ is

- A. -3/2
- B. -1/3
- C. 7/3
- D. 5/2

---

35. A ball will be taken out at random from a box containing 6 red, 4 white and 5 blue balls. What is the probability of taking out a ball, which is not red?

- 1/3
- B. 4/15
- C. 3/5
- D. 2/5

---

36. On a given test the arithmetic mean of marks scored by students is 36 points with standard deviation of 8 points. For class activities the teacher added 10 points on each student?s test score. What can you say about the standard deviation of scores after the 10 points are added?

- A. Nothing can be said.
- B. It will not change.
- C. it will decrease by $10-\sqrt{(36/8)}$
- D. it will increase by $10 + \sqrt{8}$

---

37. New couples planned to have three children (excluding multiple births) in their future life. Under the assumption that a boy is as likely as a girl at each birth, the sample space is:
S=(GGG, GGB, GBG, GBB, BGG, BGB, BBG, BBB)
Where G represents a girl and B represents a boy with the sequence of birth. What is the probability that the new couples will have at least two girls in any order of birth?

- A. 1/4

- B. 7/8
- C. 1/2
- D. 3/8

---

38. Cos $(-7\pi/6)$ = ?
- A. $-\sqrt{3}/2$
- B. 1/2
- C. -1/2
- D. $\sqrt{3}/2$

---

39. From the following trigonometric values which one is equal to sin (420^0)?
- A. Sin $(-60)^0$
- B. Sin $(30)^0$
- C. sin $(-780)^0$
- D. sin (-300^0)

---

40. Which one of the following relationships holds correct?
- A. tan 200^0 = -tan 20^0
- B. sin 130^0 = sin 50^0
- C. cos 130^0=cos 50^0
- D. tan 130^0= tan 50^0

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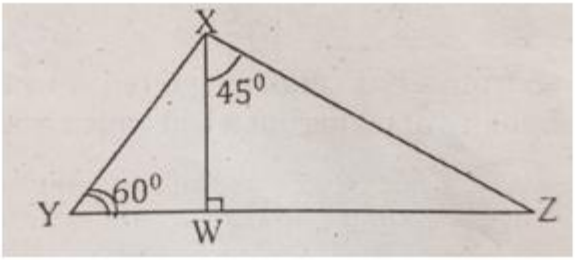
41. Given ΔABC with AB=5cm, BC=7cm and AC=8cm, then the area of this triangle is equal to
- A. $100cm^2$
- B. $100\sqrt{3}\ cm^2$
- C. $10cm^2$
- D. $10\sqrt{3}\ cm^2$

---

42. If the measure of each exterior angle of a regular polygon is 40^0 then how many sides does this polygon have?
- A.7
- B. 9
- C. 8
- D. 10

---

43. ΔXYZ is given as shown in the figure below with m(∠XYZ)=60⁰. Point W such that $\overline{YZ}$ is perpendicular to $\overline{XW}$.
If YW=3m and m(∠WXZ)=45⁰ , then what is the length of side $\overline{XZ}$?



- A. 3/3cm
- B. 6cm
- C. 3/2cm
- D. 3/6cm

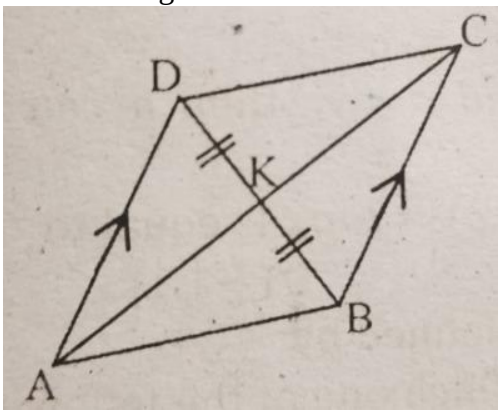
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44. What are the co-ordinates of a point that divides the line segment joining points A(2,3) and B(5, -7) in the ration 3:4?

- A. $\left(\frac{23}{7}, \frac{9}{7}\right)$
- B. $\left(\frac{2}{7}, -\frac{9}{7}\right)$
- C. $\left(-\frac{23}{7}, -\frac{2}{7}\right)$
- D. $\left(\frac{23}{7}, -\frac{9}{7}\right)$

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45. On the figure shown below, ABCD is quadrilateral with AD || BC and DK = KB. Which of the following is NOT correct about this quadrilateral?



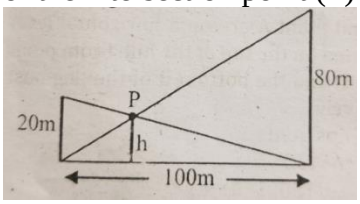
- A. ΔABK=ΔCDK
- B. ΔABC=ΔBDC

C. ABCD is parallelogram

D. ΔADK=ΔCBK

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46. Two Vertical poles are erected 100 meters apart on a horizontally leveled ground. Their heights are 20 meters and 80 meters as shown in the figure below. What is the vertical height (h) of the intersection point (P) of the lines joining the top of each pole to the foot of the other pole?



A. 16 m

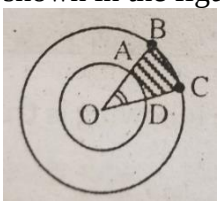
B. 15 m

C. 10 m

D. 12 m

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47. Suppose two concentric circles of radii of 3cm and 6 cm with a shaded region are drawn as shown in the figure below. If m(∠BOC) = 400, then what is the area of the shaded region?



A. $3\pi cm^2$

B. πcm^2

C. $6\ \pi cm^2$

D. $4\ \pi cm^2$

---

48. Given three sets X, Y and Z, which one of the following statements is NOT true about them?

A. If $X \cap Y = \{\}$, then $Y \backslash X = Y$.

B. If $X \cap Y \neq \{\}$, and $X \cap Z = \{\}$, then $X \cap Y \cap Z = \{\}$

C. If $X \cap Y = \{\}$, then $X \backslash Y \subseteq X$.

D. If $X \cap Y = Y$, then $Y \subset X$.

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49. In a biology laboratory at the beginning of an experiment there are 100 bacteria. During the experiment it is expected that the number of bacteria will double itself every 2 hours. Under this condition how long will it take the number of bacteria to reach 3,200?

A. 32 hours

B. 20 hours

C. 5 hours

D. 10 hours

---

50 From the following statements, which one is true about an exponential expression a^x?

A. If $a > 0$, then for a positive real number x the value of $a^{\sqrt{x}}$ cannot be a real number.

B. If $a > 0$ and $x, y \in Q$, then $a^x \in R$ is found between a^m and a^n, where m and n are integers and $m < x < n$.

C. If a>0 and x = m/n is positive rational number with n>0, then there is b ∈R, such that $b=a^x$ and $a^n = a^m$.

D. For a ≠ 0 and x, y ∈Q , if $a^x = a^y$ and x ≠ y, then a can be any real number that is different from 1.

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51. The solution set of log (2x + 1) - log(x + 2) = log x is equal to

A. {2}

B. {1}

C. {-1}

D. {-1, 1}

---

52. Let A= {-1.0.1}. A relation R on set A is defined by
R= {(x, y)| y < 2x, where x, y ∈ A}. Which one of the following sets is equal to R?

A. {(0, -1), (1,-1)}

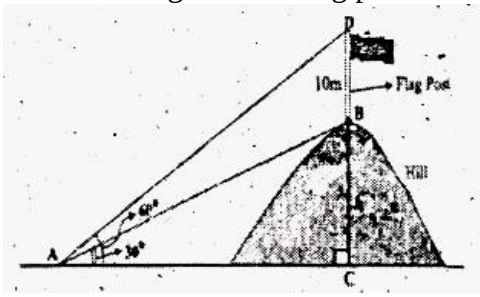
B. {(0, -1), (-1,0) (0,1)}

C. {(0, -1),(1,-1)(1,0)(1,1)}

D. {(0, -1)}

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53. In the figure shown below a hill and point A are on a horizontal level ground. A flag post is vertically erected on the top of the hill. From point A the angels of elevation of the top D and the bottom B of the flag post are measured 600 and 300, respectively. What is the height (h) of the hill if the height of the flag post is 10 meters?



A. 15 √3 meters

B. 15 meters

C. 10 √3 meters

D. 5 meters

---

54. If tan θ= -2 and cos θ < 0, then which one of the following is true?

A. sec θ = -1/√5

B. csc θ = √5/2

C. cot θ =2

D. sec θ= -√5/2

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55. A wooden sphere of radius 3cm is drilled along its diameter by a metal driller. The driller has a shape of right circular cylinder of radius 1cm. after the drilling, what is the volume of the remaining part of the sphere?

A. $30\pi cm^3$

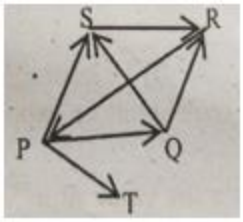
B. $42\pi cm^3$

C. $24\pi cm^3$

D. $35\pi cm^3$

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56. Seven Vectors are drawn as shown in the figure below, where PQRS is a parallelogram and $\overline{PT} = -\overline{QS}$



Which one of the following is true about these vectors?

A. PR-QR = PQ

B. PQ-PS = PT

C. PS-PT = RS

D. PS-SR = PR

---

57. If f(x) is a polynomial of degree n, where $n \geq 1$ and if c is any real number, then which one of the following statements is true?

A. If f(c) = 0 and n = 1, then f(x) = k(x-c), for some non-zero real number k.

B. If f(c) = 0 & n = 2, then f(x) =(x-c)q(x)+r(x). Where both q(x) and r(x) are polynomials of degree1.

C. If f(c) = 0 & n>1, then f(x)=(x-c)q(x)+r(x), where q(x) and r(x) are polynomials and of degree r(x) is 1.

D. If f(c) = 0 & n>2, then f(x)=(x-c)q(x) where q(x), is polynomials and of degree 1.

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58. If the ratio of the roots of the quadratic equation $8x^2 - 18x + k = 0$ is 2 then what is the value of k?

A. 9/4

B. 9

C. 3/4

D. 16

---

59. Which one of the following systems of equations has infinitely many solutions?

A. $\begin{cases} \frac{3}{2}x - 2y = 1 \\ 3x - 4y = 2 \end{cases}$

B. $\begin{cases} \frac{2}{3}x + 2y = 5 \\ 2x + 6y = 2 \end{cases}$

C. $\begin{cases} \frac{1}{2}x - 2y = 5 \\ x + 4y = 7 \end{cases}$

D. $\begin{cases} -2x + y = 4 \\ 2x + y = 4 \end{cases}$

---

60. Consider the following four groups of data sets.

Group	Values						Mean
W	9	4	6	5			6
X	8	6	9	3			6
Y	11	6	7				8
Z	2	5	7	2	3	5	4

Which one of the above group of data sets has values that are most concentrated around its arithmetic mean?

A. Z
B. Y
C. X
D. W

Answer Key

1.C	11.C	21.C	31.	41.D	51.C
2.A	12.B	22.C	32.B	42.B	52.C
3.A	13.D	23.C	33.C	43.D	53.D
4.C	14.A	24.B	34.A	44.D	54.B
5.C	15.B	25.B	35.D	45.B	55.A
6.C	16.A	26.D	36.B	46.A	56.B
7.A	17.D	27.D	37.C	47.A	57.A
8.C	18.B	28.C	38.A	48.D	58.B
9.D	19.D	29.A	39.D	49.D	59.A
10.A	20.B	30.C	40.B	50.C	60.A

PART TWO

Choose the beast answer for the following

1. If we double the magnitude of the force F = 2i + 5j in the opposite direction, then what will be the resulting force?

- A. -4i +10j
- B. 2i + 10j
- C. -4i - 10j
- D. 4i + 5j

---

2. The perimeter of regular pentagon with radius 10cm is equal to (use: sin 360 = 0.59, cos 36^0 = 0.81, sin 72^0 = 0.95 and cos 36^0 = 0.31)

- A. 81 cm
- B. 59 cm
- C. 50cm
- D. 91cm

---

3. Let ΔABC ~ ΔDEF. the area of ΔABC and ΔDEF are $256m^2$ and $64m^2$ respectively, which one of the following statement is true?

- A. If CA=9m, then FD=3m
- B. The ratio of their corresponding sides is 4.
- C. The ratio of their perimeter is 2.
- D. The ratio of their area is 16.

---

4. The degree measure of each exterior angle of a regular eight sided polygon is.

- A. 270^0
- B. 45^0
- C. 135^0
- D. 90^0

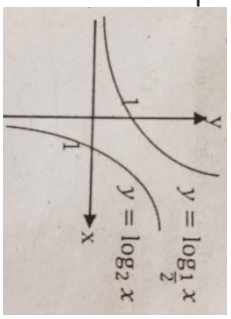
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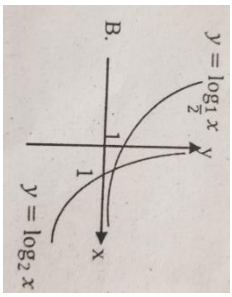
5. The solution set of the equation $\log_2 (2x + 3)= 4$ is.

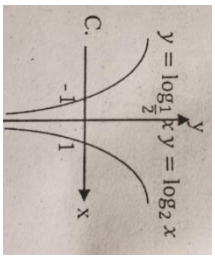
- A. {1/2}
- B. {19/2}
- C. {5/2}
- D. {13/2}

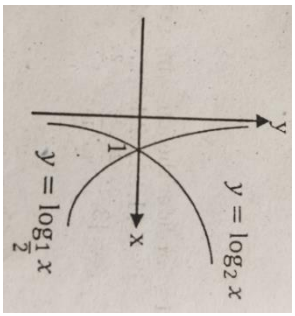
---

6. Which one of the following sketches represents both $y=\log_2 x$ and $y= \log_{1/2} x$ on the same coordinate plane.









---

7. A function f is said to be an exponential function, where

- A. $f(x) = a^x$, $a > 0$ and $a \neq 1$
- B. $f(x) = a^x$, $a \in \mathbb{R}$ and $a \neq 1$
- C. $f(x) = a^x$, $a > 0$
- D. $f(x) = a^x$, $a \neq 0$

---

8. On the coordinate plane if $P(x_1, y_1)$ and $Q(x_2, y_2)$ are distinct points on a certain straight line, then which one of the following is true about the gradient of the line?

- A. If $x_1 = x_2$, then the gradient of the line is 1.
- B. If $y_1 = y_2$ then the line has no gradient.
- C. If $x_1 = x_2$, then the gradient of the line is 0.
- D. If $y_1 = y_2$, then the gradient of the line is 0.

---

9. The GCF of two numbers is 18 and their LCM is 108. If one of the numbers is 36, then the other number is.

- A. 64
- B. 72
- C. 27
- D. 54

---

10. The Ethiopian broadcasting corporation, EBC, uses the arithmetic mean to describe

the price of a given commodity in the market. Why it uses the arithmetic mean? Because, the arithmetic mean.

- A. Is calculated by considering all prices of the commodity in the market.
- B. Indicates 50% of the market prices of the commodity are below the arithmetic mean price.
- C. Describes the most frequent price of the commodity in the market.
- D. Is the difference between the highest and the lowest price of the commodity.

---

11. The number of proper subset of a set with 7 elements is:

- A. 127
- B. 128
- C. 14
- D. 28

---

12. The solution set of the equation $(252^{x-1}) \cdot (1/125)^{x+2} = 625$ is equal to

- A. {8}
- B. {12}
- C. {2}
- D. {4}

---

13. If A= {x ∈ N| 1 ≤ x ≤ 20} and B={x ∈ N] 1≤ x ≤ 20 and x is odd}, then the relative complement of the set B with respect to A (or A\B) is

- A. {2, 3, 4, 5, 7, 11, 13, 17, 19}
- B. Ø
- C. {2, 4, 6... 20}
- D. {2, 4 .. 18}

---

14. Consider the following sets,
W= {1, 1.1, 1.2, 1.3, ..., 1.9, 2}, X ={0,1,2,?,9,10}
Y= {3, 29/10, 28/10, 27/10, ..., 21/10, 2) and Z = {x , N| x ∈ 10}
Which one of the following is true about the given sets?

- A. X=Z
- B. X~Z
- C. W=X
- D. W~Y

---

15. Let θ be an angle in standard position, for a ≠ 0 and b ≠ 0, let P(a, b) be a point that lies on the terminal side of θ. If r is the distance between point P and the origin O, then which of the following expression defines cotangent of θ?

- A. a/b
- B. b/a
- C. r/b

D. r/a

16. csc 240^0= _____

A. -√3
B. -√2/2
C. -2
D. -2√3/3

17. Tan 1410^0=

A. √3/2
B. 1/2
C. -√3/3
D. -1/2

18. Which one of the following is correct?

A. tan $495^0 > 0$
B. tan $(-495^0) < 0$
C. sin $495^0 > 0$
D. sin $(-495^0) > 0$

19. Let sec θ =-3/2 and tan θ >0, then which one of the following is correct?

A. sin θ = √5/3
B. tan θ = √5/3
C. cot θ = 2√5/5
D. csc θ = 3√5/5

20. If f(x)= cos x, then which one of the following is true about the function?

A. The period of f is π
B. f is an odd function
C. Domain of f ={x: -1 ≤ x ≤ 1}
D. Range of f is [-1,1]

21. The following raw data were collected from a small town showing the number of children in sixteen families.

2	**1**	**3**	**2**	**5**	**1**	**2**	**3**
4	3	2	1	2	1	2	4

Which of the following tables shows the correct frequency distribution of the above raw data ?

A.

Number of Children's	**1**	**2**	**3**	**4**	**5**
Number of Families	4	6	3	2	1

B.

Number of Children's	**1**	**2**	**3**	**4**	**5**
Number of Families	3	6	4	2	1

C.

Number of Children's	**1**	**2**	**3**	**4**	**5**
Number of Families	5	5	3	2	1

D.

Number of Children's	**1**	**2**	**3**	**4**	**5**
Number of Families	4	5	4	2	1

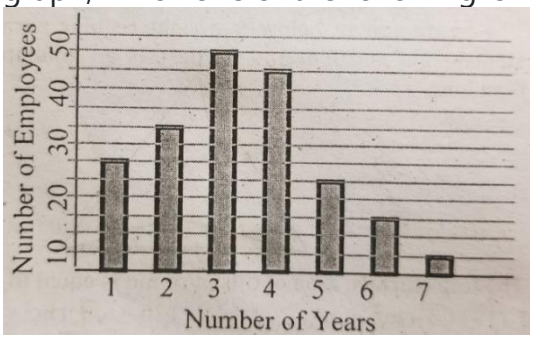
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22. Two dice are rolled simultaneously, what will be the probability that the sum of the two numbers on the upper is less than 4?

- A. 1/12
- B. 2/3
- C. 1/6
- D. 1/9

---

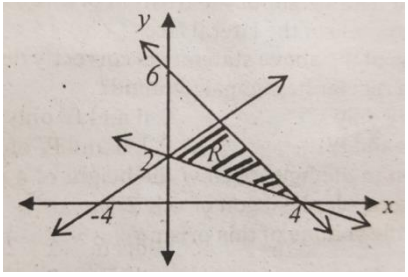
23. Human resource department of private company has compiled data on the number of employees who have been with the company for various periods of time. The resulting information was presented on the bar graph shown below. Based on the graph, which one of the following is NOT true?



- A. The total number of employees who work in the company is 230.
- B. The model service time in the company is 3 years.
- C. 100 employees have worked for more than three years.
- D. The longest period of time employees served in the company is three years.

---

24. Consider the following graph of a certain relation R. From the graph the domain of this relation is.



- A. {x ∈ R| -4 ≤ x ≤ 4}

- B. $\{x \in R | 0 \leq x \leq 3\}$
- C. $\{x \in R | 2 \leq x \leq 4\}$
- D. $\{x \in R | 0 \leq x \leq 4\}$

---

25. If a function f is given by $f(x) = \sqrt{9-x^2}$: where $x \in [-3, 3]$, then the range of f is:

- A. [0, 3]
- B. [-3, 3]
- C. R
- D. [-9, 9]

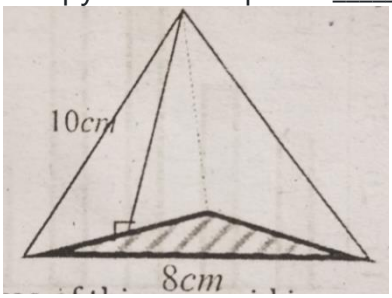
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26. If $f(x) = x^2 + 6x + 9$, then which one of the following statements is true about the graph of f ?

- A. The graph of f is symmetrical with respect to y-axis.
- B. The minimum value of this function is 9.
- C. The graph of f is open down ward.
- D. The range of f is $\{y \mid y \geq 0\}$.

---

27. The figure shown below is a right regular pyramid. The length of its slant height is 10cm and its base is an equilateral triangle with side 8cm long. The total surface area of this pyramid is equal to_____



- A. $(12 + \sqrt{3})\ cm^2$
- B. $(120 + 3\sqrt{3})\ cm^2$
- C. $(120 + \sqrt{3})\ cm^2$
- D. $(120 + 16\sqrt{3})\ cm^2$

---

28. The following four statements are about frustum of a regular pyramid.

I. The lateral faces of a frustum of a regular pyramid are isosceles trapezium.

II. The slant height of the frustum of a regular pyramid is the edge of the lateral faces.

III. The lateral faces of a frustum of a regular pyramid are triangles.

IV. The slant height of the frustum of a regular pyramid is the altitude of any one of the lateral faces.

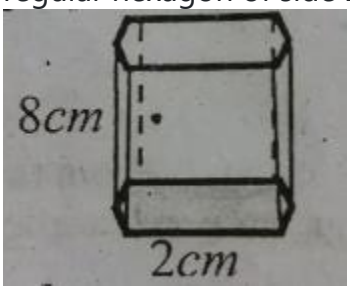
Which group of the above statements correctly describes properties of the frustum of a regular hexagonal pyramid?

- A. I and IV only
- B. I, II, III and IV
- C. II and IV only

D. I, II and IV only

---

29. As shown in the figure below the height of a right prism is 8cm and its base is a regular hexagon of side 2cm. What is the volume of this prism?



A. $15\sqrt{3}$ cm^3

B. 60 cm^3

C. $48\sqrt{3}$ cm^3

D. 30 cm^3

---

30. If the line passes through points (2, 8) and (-7, t+4) is parallel to the line passing through points (1, t) & (4, -2) then what is the value of t?

A. -5

B. 1

C. -1/2

D. 5/2

---

31. If a line passes through (2, 8) and (-5, 15), then what is the degree measure of the angle of inclination that this line makes with the positive x-axis?

A. 135^0

B. 225^0

C. 30^0

D. 45^0

---

32. If E and F are two unequal sets and U be the corresponding universal set, then which one of the following statements is true?

A. $E \cup \emptyset = U$

B. If $E \subseteq F$, $(E \cap F) \cup F = E$

C. If $E \subseteq F$, $E \cup F = E$

D. $E \cup \emptyset = U$

---

33. Which one of the following pairs represents equal sets?

A. $\{x \in Z \mid (x^2 - 4)(3-x) = 0\}$ and $\{x \in N \mid (4 - x^2)(x-3) = 0\}$

B. {x | x is an even natural number} and {x | x is an odd natural number)

C. {6, 12} and {3, 9}

D. {x ∈ Z | 2< x ?3) and {x ∈ Z | 3 ≤ x <4}

---

34. If sin θ = 9/40 and θ is an obtuse angle then cos θ=

A. (-3)/√40
B. 3/√40
C. (-9)/√1519
D. (-√1519)/40

---

35. If sin θ =-1/2 and tan θ= -√3/3, then the degree measure of θ is

A. 150^0
B. 330^0
C. 30^0
D. 210^0

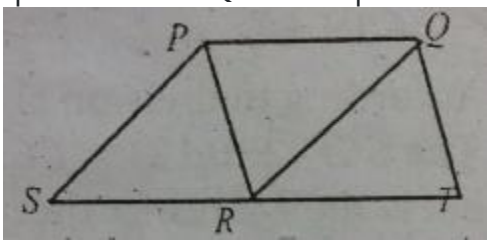
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36. If a position vector V is given as V = 5i +j, then which one of the following vectors is equal to V?

A. $\overrightarrow{EF}$ where, E(-1,-2) and F(0,3)
B. $\overrightarrow{GH}$ where, G(3,-1) and H(2,2)
C. $\overrightarrow{PQ}$ Where, P(-3,-4) and S(10,7)
D. $\overrightarrow{RS}$ where, R(5,6) and S(10,7)

---

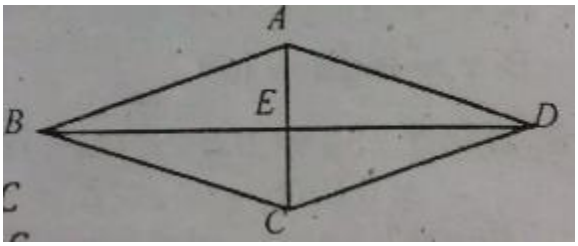
37. In the figure shown below PQRS and PQTR are parallelograms. The area of quadrilateral PQTS is 6 square units. What is the area of quadrilateral PQRS?



A. 5 square units
B. 3 square units
C. 2 square units
D. 4 square units

---

38. Given quadrilateral ABCD as shown in the figure below. If AC and BD are perpendicular bisectors of each other, then which one of the following congruence of triangles holds true?



A. ΔADE = ΔCBE
B. ΔCBD = ΔADE
C. ΔABE = ΔABC
D. ΔABD = ΔABC

---

39. Which one of the following is NOT the property of a regular polygon?

A. The degree measure of each central angle of a regular polygon with n-sides is equal to (360/n)0.
B. Radius of a regular polygon is the distance from its center to the mid-point of its side.
C. A regular polygon is a convex polygon where all its sides and all its angles are equal.
D. A regular polygon with n-sides has n-lines of symmetry.

---

40. The simplified form of the expression $\sqrt[3]{\sqrt{125}}$ is

A. $(125)^{\frac{5}{6}}$
B. $5^{\frac{1}{3}}$
C. $5^{\frac{1}{2}}$
D. $5^{\frac{1}{5}}$

---

41. If a and b are positive real numbers, m and n are any positive integers, then which one of the following relationship is correct?

A. $\left(\sqrt[m]{\frac{a}{b}}\right)^n = \left(\frac{b}{a}\right)^{\frac{m}{n}}$
B. $\left(\sqrt[m]{\frac{a}{b}}\right)^n = \left(\frac{b}{a}\right)^{\frac{-n}{m}}$
C. $\sqrt[m]{b^n} = b^{\frac{m}{n}}$

D. $(\sqrt[m]{b})^n = b^{\frac{m}{n}}$

---

42. The solution set of the inequality $x^2 + 7x + 12 \geq 0$ is:

A. {x : x ≤ 3 or x ≥ 4}
B. {x : x ≤ -4 or x ≥ -3}
C. {x : -3 ≤ x ≤ -4}
D. {x : 3 ≤ x ≤ 4}

---

43. The solution set of $|2x-5| \geq 3$ is:

A. {x : x ≤ -1 or x ≥ 4}
B. {x : x ≤ -4 or x ≥ -1}
C. {x : 1 ≤ x ≤ 4}
D. {x : x ≤ 1 or x ≥ 4}

---

44. Which one of the following is NOT zero of the polynomial function $f(x) = 2x^3 - x^2 - 10x+5$?

A. -√5
B. 2
C. 1/2
D. -√5

---

45. Which one of the following is the solution set of $|1-2x| - 5 = 3x+1$?

A. {-1, -7}
B. {-7, 1}
C. {1, 7}
D. {-1, 7)

---

46. Which one of the following statement is NOT true about 236/12?

A. The GCF (236,19) = GCF (236,8)
B. 236/12 = 19 + 2/3
C. According to division algorithm 236 = 19 x 12 + 8.
D. The GCF (236,12) = GCF (12, 8)

---

47. What is the value of x that makes $2^{2x-1}=3$?

A. $x = 1/2 (\log_2 3)+1$
B. x = log 3-log2
C. $x =1/2 + \log_2 3$
D. $x =1/2 (1+\log_2 3)$

---

48. If log 3.54 =0.549, then the mantissa of log 35,400 is

A. 0.051

B. 4
C. 0.549
D. 4.549

---

49. For the polynomial functions $f(x)= x^2-2x+2$ and $g(x)= x^2 + 2x + 2$, the product $(f . g)(x)=$.

A. $x^4 - 4x^3 - 8x^2 - 8x + 4$
B. $x^4 - 8x^2 + 4$
C. $x^4+ 4$
D. $x^4 - 4x^3 - 6x^2 - 8x + 4$

---

50. If f(x) and d(x) are polynomials, such that $d(x) \neq 0$ and degree of d(x) is less than or equal to that of f(x), then after long division of f(x) by d(x) there exist unique polynomial q(x) and r(x), such that

$$f(x)= d(x) \cdot q(x) + r(x)$$

Which one of the following is correct about r(x)?

A. r(x)=0 or degree of r(x) ≤ degree of d(x)
B. r(x)=0 or degree of r(x) < degree of d(x)
C. Degree of r(x) < degree of d(x)
D. Degree of r(x) ≥ degree of d(x)

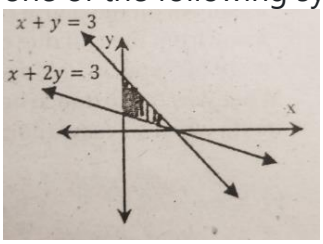
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51. When you divide the polynomial $f(x)=3x^3 + 2x^2 -19x + 6$ by x-1 the remainder that you will get is

A. 24
B. 8
C. 0
D. -8

---

52. The shaded region on the graph shown below is the solution of a relation R. which one of the following system of linear inequalities represents the relation R?



A. $\begin{cases} x + y \geq 3 \\ x + 2y \leq 3 \end{cases}$

B. $\begin{cases} x + y \leq 3 \\ x + 2y \geq 3 \\ y \geq 0 \end{cases}$

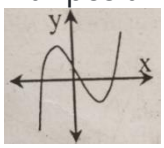
C. $\begin{cases} x + y \leq 3 \\ x + 2y \geq 3 \end{cases}$

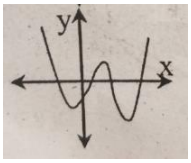
D. $\begin{cases} x + y \leq 3 \\ x + 2y \geq 3 \\ x \geq 0 \end{cases}$

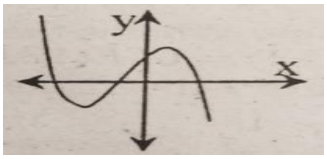
53. If set A = {1/4, 1/2, 2, 4), then which one of the following is a function from set A onto set A?

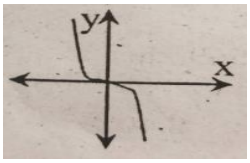
- A. {(x, y)| y = 2x}
- B. {(x, y)| y = x^2}
- C. {(x, y)| y = 1/x}
- D. {(x, y)| y ≤ x}

54. Which one of the following can be the graph of a polynomial function of degree three with positive leading coefficient?

A. 

B. 

C. 

D. 

---

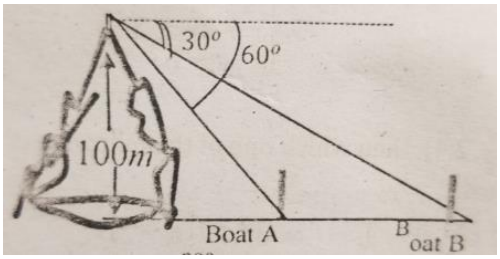
55. The world population at the beginning of 1990 was estimated to be 5.3 billion. Assume the population is expected to grow at the rate of 2% per year as shown in the table below

Year	1990	1991	1992
World population	5.3	$5.3e^{(0.02(1))}$	$5.3e^{(0.02(2))}$

Find the approximate length of t required for the world populatic

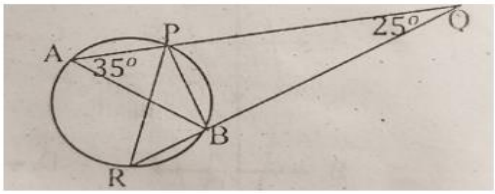
- A. 50ln(10/53) years
- B. 1000/53 years
- C. 50 ln (2) years
- D. 100 years

56. A woman was at the top of a cliff that is 100 meters above the sea level as shown in the figure below. When she saw two boats A and B sailing away from the cliff due east, the angle of depression to boats A and B where 60^0 and 30^0 respectively (see figure). What was the distance between the two boats when she saw them?



- A. $100\sqrt{3}$ meters
- B. $200\sqrt{3}$ meters
- C. $200/3\sqrt{3}$ meters
- D. $100/3\sqrt{3}$ meters

57. In the figure shown below, $\overline{AB}$ is a diameter of the circle where APQ and RBQ are straight lines. What is the degree measure of $\angle RPB$?



- A. 30^0
- B. 40^0
- C. 20^0
- D. 25^0

58. $\sin 25^0$ is equal to _____

- A. $\frac{1}{\csc 65^0}$
- B. $\frac{1}{\sec 65^0}$
- C. $\csc 65^0$
- D. $\sin 65^0$

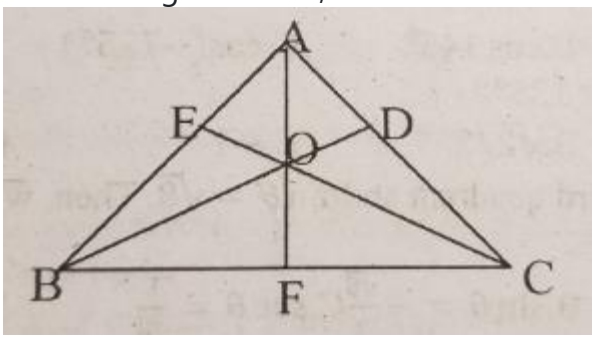
59. On a given week the number of students who were absent from six kindergarten school were recorded as follows:

10 13 6 9 12 4

The standard deviation for the number of absentees in the given week was

- A. 9.5
- B. 10
- C. 9
- D. ?10

60. In the figure below, ΔABC is an isosceles triangle with AB = AC =15cm BC = 18cm.



If the medians AF, BD and CE meet at the centroid O, then AO =

- A. 4cm
- B. 6cm
- C. 12cm
- D. 8cm

Answer Key

1.C	11.A	21.A	31.A	41.B	51.D
2.B	12.B	22.A	32.D	42.B	52.D
3.C	13.D	23.D	33.D	43.D	53.C
4.B	14.D	24.D	34.D	44.B	54.A
5.D	15.A	25.A	35.B	45.A	55.C
6.D	16.D	26.D	36.D	46.A	56.C
7.A	17.C	27.D	37.D	47.D	57.A
8.D	18.D	28.A	38.A	48.C	58.B
9.D	19.C	29.C	39.B	49.C	59.D
10.A	20.D	30.A	40.C	50.B	60.D

PART THREE

Choose The Best Answer from the given alternatives

1. Which one of the following pairs of functions are co-functions?

- A. sec θ and csc θ
- B. tan θ and sec θ
- C. cos θ and csc θ
- D. sin θ and sec θ

2. Which of the following is correct quotient identity?

- A. tan θ = 1/cosθ
- B. cot θ = cosθ/sinθ

- C. $\tan\theta = \cos\theta/\sin\theta$
- D. $\cot\theta = \sin\theta/\cos\theta$

---

3. From the following trigonometric values, which one is NOT equal to $\cos 35^0$?

- A. $\cos(-395^0)$
- B. $\cos 145^0$
- C. $\cos(-755^0)$
- D. $\cos 325^0$

---

4. What is the value of $\cot 135^0$?

- A. $-\sqrt{2}/2$
- B. $\sqrt{2}/2$
- C. -1
- D. 1

---

5. Let θ be an angle in third quadrant and $\tan\theta = \sqrt{8}$. Then, which of the following is true?

- A. $\csc\theta = 3/\sqrt{8}$
- B. $\sin\theta = -\sqrt{8}/3$
- C. $\sec\theta = 1/\sqrt{8}$
- D. $\cot\theta = -3$

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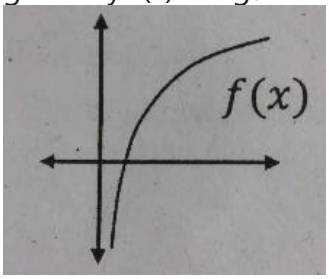
6. What is the value of the y-coordinate of the solution of the following system of linear equations?

$$\begin{cases} x + y = 3 \\ 3x - 2y = 5 \end{cases}$$

- A. 4/5
- B. 11/5
- C. -4
- D. 11

---

7. Consider the sketch given below, which represent the graph of a logarithm function given by $f(x) = \log_b x$.



Which one of the following is true about the function?

- A. Its base is between 0 and 1.

- B. It is decreasing function
- C. Its domain is the set of all real numbers.
- D. Its range is the set of all real numbers

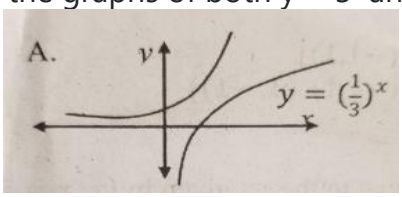
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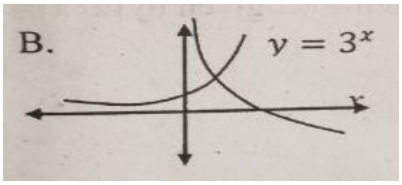
8. If $\log_a 6 = x$ and $\log_a 3 = y$, where $a > 0$ and $a \neq 0$, then which of the following expressions is equal to $\log_a(a/18)$

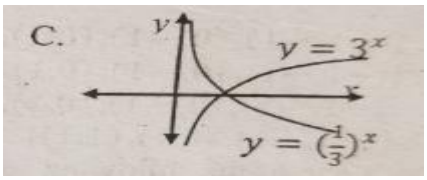
- A. 1/x+y
- B. 1 - (x + y)
- C. x + y + 1
- D. x + y - 1

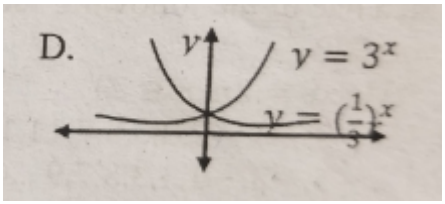
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9. From the following sketches drawn on the same coordinate plane which part looks like the graphs of both $y = 3^x$ and $y = (1/3)^x$?









---

10. Which of the following is primary data?

- A. The weight of children taken by researcher after measuring them in a certain clinic.
- B. Students? marks in mathematics examination from the record office of your school.
- C. The number of students sitting for EGSECE taken from ministry of education.
- D. The average weekly temperatures of a certain city taken from Addis Zemen newspaper.

---

11. A right circular cylinder, which is closed at its upper and lower base, has height of 8cm. if the diameter of the bases is 8cm, then what is its total surface area?

- A. $256\pi cm^2$
- B. $122\pi cm^2$
- C. $96\pi cm^2$
- D. $48\pi cm^2$

---

12. Which one of the following is greatest common factor (GCF) of 160 and 520?

- A. 160
- B. 80
- C. 40
- D. 10

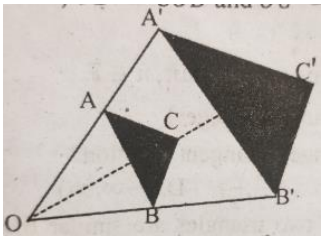
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13. Let $v_1 = \begin{pmatrix} \sqrt{3} \\ -1 \end{pmatrix}$ & $v_2 = \begin{pmatrix} -2\sqrt{3} \\ 2 \end{pmatrix}$ be vectors. Then, $v_1 + v_2$ is equal to:

- A. $\begin{pmatrix} \sqrt{3} \\ 1 \end{pmatrix}$
- B. $\begin{pmatrix} 2\sqrt{3} \\ -1 \end{pmatrix}$
- C. $\begin{pmatrix} \sqrt{3} \\ -1 \end{pmatrix}$
- D. $\begin{pmatrix} -\sqrt{3} \\ -1 \end{pmatrix}$

---

14. In the figure below, let O be the center is the enlargement such that, OA?= 3OA, OB? 3 and OB and OC?=3OC.
What is the scale factor of enlargement for this figure?



- A. 1/9
- B. 1
- C. 3
- D. 2

---

15. What is the perimeter of a regular hexagon whose radius is 6cm?

- A. $6\sqrt{3}$ cm
- B. $36\sqrt{3}$ cm

- C. 6 cm
- D. 36cm

---

16. If A= {-1, 0, 1} and B= {-1, 1}, then Cartesian product of A and B is:

- A. {(-1, -1), (0, -1), (0, 1), (1, 1), (-1, 1)}
- B. {(-1, -1), (0, -1), (0, 1), (1, 1), (-1, 1), (1, -1)}
- C. {(-1, -1), (0, -1), (0, 1), (1, 1)}
- D. {(-1, -1), (0, 1), (1, 1)

---

17. Which one of the following sets is equal to the set given by {x: x = 2n + 1, n ∈ Z}?

- A. R\{x : x = 2n, n ∈ Z)
- B. {..., -5, -3, -2, 2, 3, 5, 7, 11, 13...}
- C. {..., -5, -3, -1, 1, 3, 5, 7, 9...}
- D. {..., -6, -4, -2, 0, 2, 4, 6 ...}

---

18. Solving √x+3 ?6, which one of the following is the Universal set?

- A. [-3, 33) ∪ (33, ∞)
- B. [-∞, -3) ∪ (33, ∞)
- C. [-∞, -3)
- D. [-3, ∞)

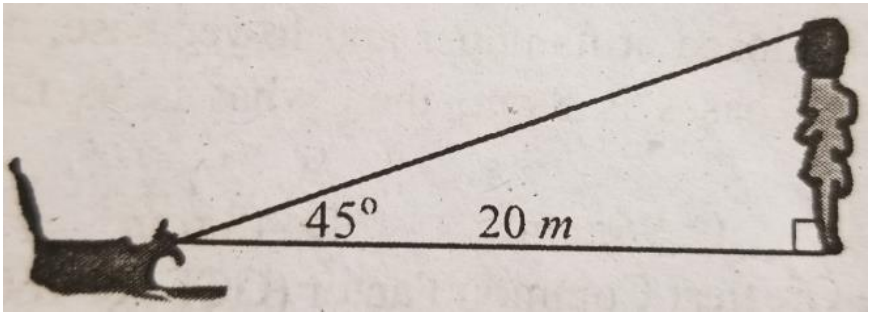
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19. The value of sec 420^0 is equal to:

- A. √3
- B. 2/√3
- C. 2
- D. √3/2

---

20. A cat is lying on a level ground 20 meters away from the base of tree. The cat can see a bird?s nest directly above the bases of the tree. The angel of elevation from the car to the bird?s nest is 450.
How far above the base of the tree is the bird's nest?



- A. 10 meters
- B. 45/2 meters
- C. 15√2 meters
- D. 20 meters

21. Which one of the following is equal to sin θ?

- A. sin $(90^0 - \theta)$ if $0^0 \leq \theta \leq 90^0$
- B. csc $(90^0 - \theta)$ if $0^0 \leq \theta \leq 90^0$
- C. sin $(180^0 - \theta)$ if $0^0 \leq \theta \leq 180^0$
- D. cos $(180^0 - \theta)$ if $0^0 \leq \theta \leq 180^0$

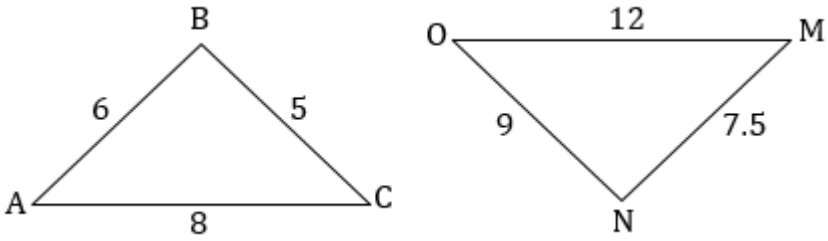
22. Which one of the following is NOT true about f(x) = tan x?

- A. If x varies from $-\pi/2$ to $\pi/2$ then f(x) gets closer and closer to 0.
- B. Period of f is π.
- C. Graph of f doesn't cross the vertical line $x = \pi/2 + n\pi$, $n \in Z$.
- D. Domain of f is $\{x : x \neq n\pi/2$, where n is an odd integer$\}$

23. Which one of the following sets is the range of a tangent function?

- A. $(-\infty, -\pi/2) \cup (\pi/2, \infty)$
- B. (-1, 1)
- C. $(-\pi/2, \pi/2)$
- D. $(-\infty, \infty)$

24. A student found out that the following two triangles are similar by SSS similarity theorem. Which one of the following correct naming of these two similar triangles?



- A. ΔABC ~ ΔOMN
- B. ΔABC ~ ΔNMO
- C. ΔABC ~ ΔMON
- D. ΔABC ~ ΔONM

25. In the afternoon at certain time of the day a tree casts a 25m shadow. At the same time a 1.8m boy casts a shadow of 1.5m. What is the height of the tree?

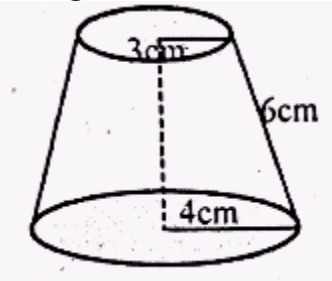
- A. 30m
- B. 35m
- C. 50m
- D. 40m

26. What is the area of a regular octagon whose radius is 8cm?

- A. $162\sqrt{2}$ cm^2
- B. $96\sqrt{2}cm^2$
- C. 128&radic2 cm^2

D. $64\sqrt{2}\ cm^2$

27. Frustum of a right circular cone with base radii 3cm and 4cm and a slant height of 6cm given as shown below. What is the total surface area of this frustum?



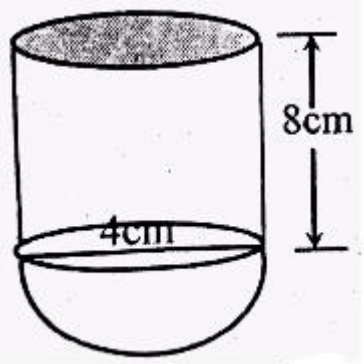
A. 67πcm2

B. 74πcm2

C. 56πcm2

D. 36πcm2

28. If a right circular cylinder of height 8cm is placed on top of a hemispherical iron ball of radius 2cm as shown on the figure below. What is the volume of this solid?



A. $640/3\ \pi cm^3$

B. $112/3\ \pi cm^3$

C. $256/3\ \pi cm^3$

D. $128/3\ \pi cm^3$

29. The volume of a right circular cone of height 12cm and a slant height 13cm is equal to:

A. $300\ \pi cm^3$

B. $200\ \pi cm^3$

C. $75\ \pi cm^3$

D. $100\ \pi cm^3$

30. From the following pairs of numbers which one represents the rational zeros of polynomial $f(x) = x^4 - x^3 - 4x^2 + 4x$?

A. -2 and 1

B. -4 and -1

C. -1 and -3

D. -1 and 3

31. After rewriting the polynomial $2 - 11x^2 - 8x + 6x^2$ in the standard form, what are the respective simplified forma and the name of this polynomial?

A. $6x^2 - 8x + 2$, cubic trinomial

- B. $5x^2 - 8x - 2$, quadric trinomial
- C. $-6x^2 - 8x - 2$, cubic trinomial
- D. $-5x^2 - 8x + 2$, quadratic trinomial

32. Which of the following is defines by "The measure of a central angle subtended by an arc of a circle that is equal in length to the radius of the circle"?

- A. 2π radians
- B. 360 degrees
- C. 1 radian
- D. 1 degree

33. Find the volume of right square prism whose length of sides of the base is 6cm and height 10cm.

- A. 312 cm^3
- B. 360 cm^3
- C. 430 cm^3
- D. 240 cm^3

34. On the coordinate plane, if P is a point between A(2, -6) and B(1, 8) such that AP : PB=3:2, then what are the coordinates of P?

- A. (7/5,12/5)
- B. (8/5, -2/5)
- C. (-14/5,26/5)
- D. (-6/5,19/5)

35. Which one of the following is rationalizing factor of the denominator of $\frac{5\sqrt{2}+2\sqrt{3}}{5\sqrt{2}-2\sqrt{3}}$?

- A. $\frac{3\sqrt{2}+5\sqrt{3}}{3\sqrt{2}+5\sqrt{3}}$
- B. $\frac{5\sqrt{2}+2\sqrt{3}}{5\sqrt{2}+2\sqrt{3}}$
- C. $\frac{3\sqrt{2}-5\sqrt{3}}{3\sqrt{2}-5\sqrt{3}}$
- D. $\frac{5\sqrt{2}-2\sqrt{3}}{5\sqrt{2}-2\sqrt{3}}$

36. On the number line, what are the two consecutive integers between which $3 + \sqrt{2}$ is located?

- A. 5 and 6
- B. 3 and 4
- C. 4 and 5
- D. 2 and 3

37. Let $x= 3.1\overline{425}$. Which one of the following is equal to x?

- A. $\frac{15697}{4995}$
- B. $\frac{3111}{990}$
- C. $\frac{283}{90}$
- D. 31394/9999

---

38. If Birr 8,000 is invested at the rate of 4% compounded yearly, then what is the approximate amount at the end of 2 years?

- A. 9504.8
- B. 8323.20
- C. 9331.20
- D. 8652.80

---

39. If log 2= 0.3010 and log 3 = 0.4471, where a > 0 and a ≠ 1, then which one of the following is a value of log 12?

- A. 1.0791
- B. 1.2552
- C.0.6020
- D. 0.9542

---

40. Let $f(x)= -x^2 + 3x -8$. Then which one of the following is true about f?

- A. The minimum point on the graph of f is (-23/4, 3/2)
- B. The maximum point on the graph of f is (3/2, -23/4)
- C. The maximum point on the graph of f is (-23/4, 3/2)
- D. The minimum point on the graph of f is (3/2, -23/4)

---

41. Let $f(x) = x - 2$ and $g(x)= x^2 + 3x -7$ be two functions. Then evaluate (g/f) (-1)?

- A. 1/3
- B. -3
- C. -1/3
- D. 3

---

42. Given three sets A, B, C and a universal set U, which one of the following is true about these three sets?

- A. $A \subseteq A \cap B$
- B. $A \cap (B \cap C)=(A \cap B) \cap C$
- C. $A \cap U = U$
- D. $A \cap (B \cap C)'=(A \cap B') \cap C'$

43. Let A and B be non-empty sets. If R is a relation from A to B, then which one of the following is NOT always true?

- A. The range of R is a subset of B
- B. $R \subseteq A \times B$
- C. The domain of R is A
- D. R is the set of ordered pairs

44. If B = {-2, -1, 0, 1, 2} and A={x + y : x ∈ B and y ∈ B}, then the list of all elements of A is:

- A. {-2, -1, 0, 1, 2}
- B. {-4, -3, -2, -1, 0, 1, 2, 3, 4}
- C. {-3, -2, -1, 0, 1, 2, 3}
- D. {-3, -1, 0, 1, 3}

---

45. If a pair of dice is tossed simultaneously & the numbers on the upper faces are added, then what will be the probability of not getting a sum 4 or 8?

- A. 1/9
- B. 2/9
- C. 8/9
- D. 7/9

---

46. The following table shows the number of car washes Alemu and his friends had done on last week.

Day	Number of Car Washes
Monday	5
Tuesday	6
Wednesday	5
Thursday	7
Friday	15
Saturday	16

What is the median number of car washes that Alemu and his friends had done in these six days?

- A. 11
- B. 6.5
- C. 7
- D. 6

---

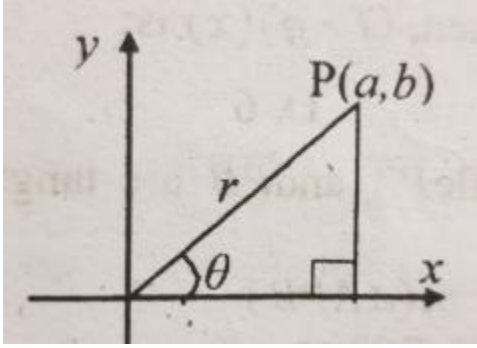
47. If a six-faced fair die is tossed twice, then find the probability that the first toss will be a number less than 4 and the second toss will be a number greater than 4?

- A. 1/6
- B. 1/3
- C. 1/4
- D. 1/2

48. What is the variance of data given as 1, 2, 3, 4, 5?

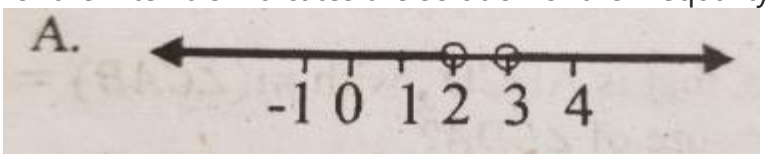
- A. 2
- B. 3
- C. √3
- D. √2

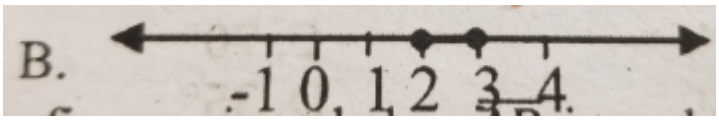
49. Consider the following figure, where $r = \sqrt{a^2 + b^2}$. Which one of the following expression is equal to csc θ? Hypotenuse

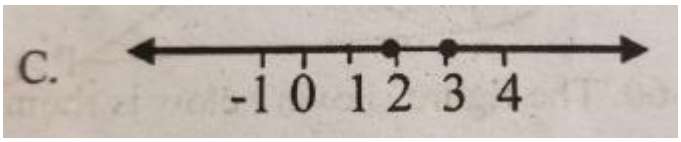


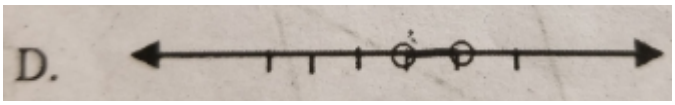
- A. b/r
- B. r/a
- C. a/r
- D. r/b

50. On the following number lines, intervals are indicated by dark (bold) regions. Which one of the intervals indicates the solution of the inequality $x^2 - 5x + 6 < 0$.

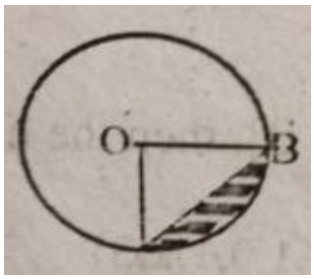








51. In the figure given below, AB is a chord of a circle with center O and radius 6cm. If $m(\angle AOB) = 90^0$, then what is the perimeter of the shaded region?



- A. $(3\pi + 6\sqrt{2})$cm
- B. $(9\pi + 12)$cm
- C. $(9\pi + 6\sqrt{6})$cm
- D. $(3\pi + 12)$cm

---

52. If a and b are the two roots of quadratic equation $2x^2 + 3x - 5 = 0$, then what is the value of (a-1)(b-1)?

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

---

53. Given log 2.29 = 0.3598, what is the characteristic of log 0.0229?

- A. 0.6402
- B. -1
- C. 0.3598
- D. -2

---

54. Between tho consecutive integers does $f(x) = x^5 - 2x^3 - 1$ has a zero?

- A. 3 and 4
- B. 2 and 3
- C. 1 and 2
- D. 0 and 1

55. Let f(x) be a polynomial function of degree greater than or equal to one. Which one of the following statements correctly describes the Remainder Theorem using f(x)?

- A. For real number c, if f(x) is divided by x - c, then the remainder is a polynomial r(x) of degree less than or equal to one
- B. For real number c, if f(x) is divided by x - c, then the remainder is f(c)=0.
- C. For real number c, if f(x) is divided by x - c, then the remainder is f(c).
- D. For real number c, if f(c) = 0, then x - c divides f(x).

56. Which one of the following is a factor of $x^3 + 5x^2 + 2x - 8$

- A. x - 3
- B. x + 4
- C. x - 2
- D. x + 1

57. Which one of the following is equation of the line passing through the poinrt A(1, 2)

and parallel to the line 3x + 1/2y =11?

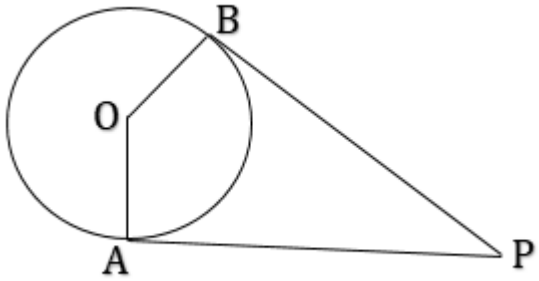
- A. x - 6y = -13
- B. 6x + y = 8
- C. 6x + y = 13
- D. y - 6x = -8

58. Let f(x) = 2x - 2 and g(x) = 3/x - 1 for x ≠ 1. Then, (f . g)(x) is:

- A. 8 - 2x/x-1
- B. 12
- C. 2/2x-3
- D. 6

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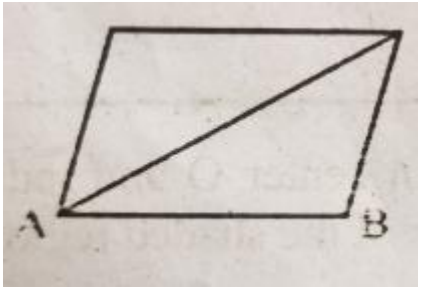
59. On the circle shown below, O is the center while PA and PB are tangent lines. If m(∠AOB) is 1100, then find m(∠APB)



- A. 125^0
- B. 140^0
- C. 70^0
- D. 250^0

---

60. The figure shown below is rhombus, that is ABCD, with m(∠CAB) 35^0 what is the measure of ∠CDA?



- A. 55^0
- B. 110^0
- C. 70^0
- D. 35^0

Answer Key

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

PART FOUR
CHOOSE THE BEST ANSWER FROM THE GIVEN ALTERNATIVES

1. Let set M contains 25 elements. Then, which of the following sets is equivalent to M?

- A. {x : x is a natural number and x < 25}
- B. {x : x is a natural number and x < 26}
- C. {x : x is a natural number and x = 25}
- D. {x : x is a natural number and x > 25}

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2. In a certain Ethiopian High school 100 students are studying English, 85 students are studying French, and 35 students are studying both languages. Then, how many students are studying any one of the foreign languages?

- A. 220
- B. 115
- C. 185
- D. 150

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3. Suppose F and G are two sets, where $F \cap G' = \{0, 2, 5\}$ and $F' \cap G = \{1, 4\}$. Which one of the following is equal to $F \Delta G$?

- A. $\emptyset$
- B. {0, 2, 4}
- C. {0, 1, 2, 4, 5}
- D. {1, 4}

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4. When $f(x) = x^5 + x - 1$ is divided by $x + 1$, the remainder is equal to:

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

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5. Which one of the following is considered as an exponential expression?

- A. $3x^2 + x + 1$

- B. $\sqrt{x^2+6}$
- C. $3^x + 2x + 1$
- D. $2^x + 3^x$

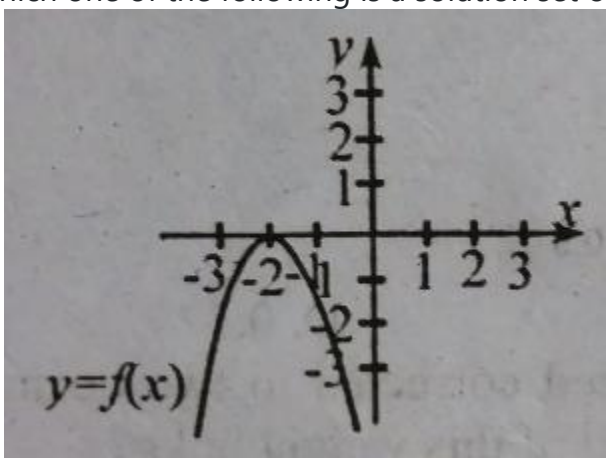
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6. What is the interval notation of $\{x \in \mathbb{R} : -x < 9 \text{ and } x \neq 5\}$?

- A. $(-\infty, -9)$
- B. $(-9, 5) \cup (5, \infty)$
- C. $(9, \infty)$
- D. $(-9, \infty)$

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7. Let $f(x) = ax^2 + bx + c$ be a quadratic function whose graph is given as shown below. Which one of the following is a solution set of $ax^2 + bx + c < 0$?



- A. $(-\infty, \infty)$
- B. $(-\infty, -2)$
- C. $(-2, \infty)$
- D. $(-\infty, \infty)/\{-2\}$

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8. Let $\theta = 420^0$, which one of the following is true about θ?

- A. $\sin \theta = 1/2$
- B. $\cos \theta = 1/2$
- C. $\sin \theta = -1/2$
- D. $\cos \theta = -1/2$

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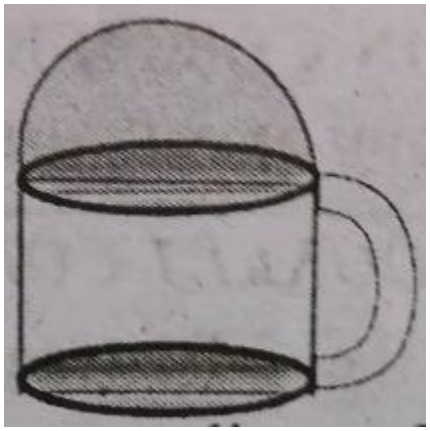
9. Which one of the following is the domain of $f(x) = 3x - \sqrt{2 - x}$?

- A. $\{x \in \mathbb{R} : x \leq 2\}$
- B. $\{x \in \mathbb{R} : x \geq 2\}$
- C. $\{x \in \mathbb{R} : x \geq 0\}$
- D. $\{x \in \mathbb{R} : x \leq 6\}$

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10. A cylindrical teacup of base radius 4cm and height 10cm has a hemispherical lid (top cover).

What is the surface area of the lid part?



- A. 16 cm^2
- B. 32πcm^2
- C. 40πcm^2
- D. 64πcm^2

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11. How many lines of symmetry does a regular hexagon have?

- A. 6
- B. 7
- C. 5
- D. 8

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12. Which of the following is necessarily true about similar polygons?

- A. They have congruent corresponding sides.
- B. They have congruent corresponding angels.
- C. They are always congruent.
- D. Any two regular polygons are similar

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13. Consider an angle of 324^0. Then which one of the following is the radian measure of this angle?

- A. 5/7 π
- B. 5/9 π
- C. 7/5 π
- D. 9/5 π

---

14. Let u = (2, 5) & v = (-3, 8) be vectors. Then the vector u - v equals to:

- A. (5, 13)
- B. (5, -3)
- C. (-1, 3)
- D. (-5, -3)

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15. Which of the following describes the property of composite numbers?

- A. All composite numbers are even except 9 and 15.
- B. Each composite number has more than one prime factor.
- C. Every composite number has at least two odd factors.
- D. Every composite number has three or more different factors.

---

16. Let a be a rational number and b an irrational number. Then, which of the following is necessarily true?

- A. $\sqrt{3a} + 2b$ is an irrational number
- B. $b^2 - 3a$ is a rational OR irrational number.
- C. $2b - 2(1 + b - a)$ is a rational number.
- D. $3ab + 3a$ is a rational number.

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17. The simplified form of $\sqrt[3]{-0.027} - (2^{-\frac{1}{2}})\ (1.28)^{0.5}$ is:

- A. -1.1
- B. -0.5
- C. 0.5
- D. 0.7

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18. A farmer sold 57.36 kg of corn when measured corrected to two decimal places. Which of the following is a lower bound of this weight in kg?

- A. 57.35
- B. 57.355
- C. 57.359
- D. 57.36

---

19. Consider the polynomial function $p(x) = \frac{x^3-1}{3} - (x + 1)\ (x^2 - 2).$. Which of the following pairs is the leading coefficient and the constant term of p(x) respectively?

- A. -2/3, 5/3
- B. -2/3, -4/5
- C. 1/3, 5/3
- D. -1/3, -7/5

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20. When dividing $x^3 + 2x^2 - 5x + 3$ by $x^2 + x - 1$, the quotient and the remainder respectively are:

- A. x + 1 and -3x + 4
- B. x + 1 and -5x + 2
- C. x + 1 and -5x + 4
- D. x - 1 and -5x - 4

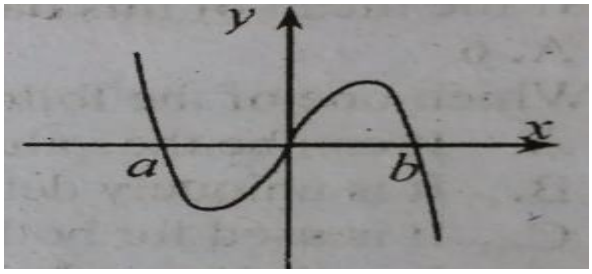
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21. Which of the following is NOT true?

- A. $f(x) = x^4 - x - 1$ has a zero between -1 and 1.
- B. $f(x) = x^3 + x - 3$ has a zero between 0 and 2.
- C. $f(x) = (x^3 + 1)(x + 1)$ has a zero between -2 and -1.
- D. $f(x) = x^3 - 2x + 1$ has a zero between -2 and -1.

---

22. The following figure is a sketche of the graph of polynomial function f, where a and b are real numbers. Referring to this graph, which one of the following is NOT true about f(x)?



- A. $f(x) > 0$ only for $x \in (-\infty, a)$.
- B. $f(x) < 0$ on $(a, 0) \cup (b, \infty)$.
- C. The degree of f(x) is 3.
- D. Zero is simple root of f(x)

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23. Consider the system of linear equations $\begin{cases} 3x - 2y = 10 \\ 2x + 2y = 5 \end{cases}$. Which one of following is true about its solution?

- A. It has infinitely many solutions.
- B. It has no solution
- C. It has a unique solution
- D. It is difficult to determine

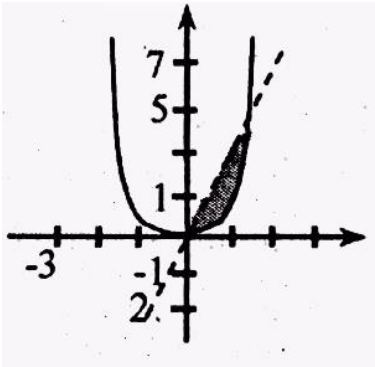
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24. Consider the equation $2x^2 - a = 3x$. If -1 is its solution, then which one of the following is the other solution?

- A. 5
- B. 2.5
- C. 1/2
- D. -5/2

---

25. Consider the graph of a relation $R = \{(x, y): y \in x^2 \text{ and } y < 2x\}$ that shown below. Then which one of the following is true of this relation?



A. The domain of R is $\{x \in \mathbb{R}: 0 \leq x \leq 2\}$
B. The range of R is $\{y \in \mathbb{R}: 0 < y < 4\}$
C. The domain of R is $\{x \in \mathbb{R}: x \leq 2\}$
D. The range of R is $\{y \in \mathbb{R}: y > 0\}$

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26. Which one of the following is true about the graph of quadratic function $f(x)= ax^2 +bx +c$?

A. It has a y intercept.
B. It is increasing.
C. It has exactly two zeros
D. It has exactly one x-intercept

---

27. Let $A = \{x: | x - 1 | = 1\}$. Then the power set of A equals to:

A. {0, 2}
B. {∅, {0},{2}}
C. {{0}, {2}, {0,2}}
D. {∅, {0}, {2}, {0, 2}}

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28. For $a > 0$ & $a \neq 1$, which one of the following is true about $f(x) = a^x$ and $g(x) = \log_a x$?

A. They have the same domain.
B. They have the same range.
C. The domain of f(x) is the same as the range of g(x)
D. Their y-intercepts are the same.

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29. The solution set of $3^{6(x-2)} = 9^{x+2}$ is equal to:

A. {4}
B. {-4}
C. {2}
D. {-3}

---

30. The following table is the frequency distribution of certain set of data.

x	10	11	12	13	14	15
f	2	0	?	2	4	2

If the mean of this data is 12.8, then the frequency of 12 equals to:

- A. 6
- B. 5
- C. 4
- D. 3

---

31. Which one of the following is true about the Mode of data set?

- A. It can be the value out of the data set.
- B. It is uniquely determined.
- C. It is used for both qualitative and quantitative data.
- D. It is the one which occurs exactly at the half way in the data set.

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32. Which one of the following is the property of the arithmetic mean of a data?

- A. There can be more than one value for the mean.
- B. It cannot be the value out of the data set.
- C. We do not need all the data values to calculate it.
- D. The arithmetic mean is affected by extreme values.

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33. A fair coin will be tossed three times. What is the probability that at least two heads show up?

- A. 1/2
- B. 3/4
- C. 3/8
- D. 5/8

---

34. Which one of the following inequalities is true?

- A. $\sin(-100^0) < 0$
- B. $\sin(-180^0) > 0$
- C. $\tan(370^0) < 0$
- D. $\cos(200^0) > 0$

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35. If $\sin\alpha = r$ and $\alpha + \theta = 90^0$, then which of the following is true?

- A. $\cos\theta = 1/r$
- B. $\cos\theta = r$
- C. $\sin\theta = r$
- D. $\sec\theta = 1/r\text{-}1$

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36. Consider the function $g(\theta) = -\cos\theta$. Which of the following statements is correct about this function?

- A. The period of g is 2π.
- B. The period of g is -2π.

- C. The range of g is $(-\infty, \infty)$.
- D. The range of g is $(-\infty, 1]$.

37. Let $h(\theta) = \tan\theta$. Which one of the following is NOT true?

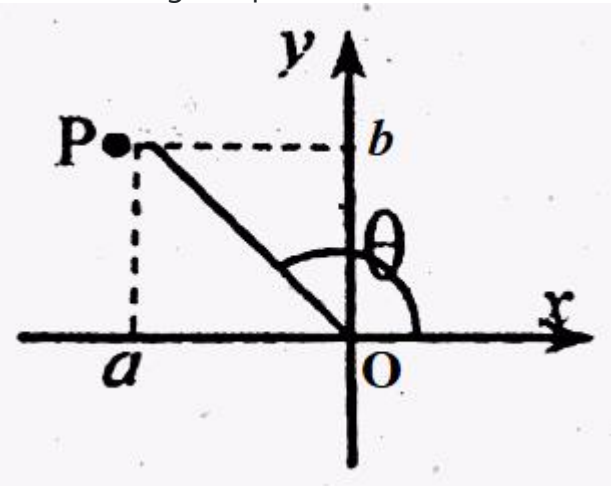
- A. $\tan 70^0 > 1$
- B. $\tan(-20^0) < -1$
- C. $\tan(-135^0) = 1$
- D. $\tan(270^0)$ = undefined

38. $\csc(330^0)$ is equal to:

- A. 1/2
- B. -1/2
- C. 2
- D. -2

---

39. let θ be an angle show in the figure below and d be the length of OP. Which one of the following is equal to sec θ?



- A. -d/a
- B. -d/b
- C. d/a
- D. d/b

---

40. Which of the following is NOT true about a regular polygon of n sides?

- A. Each interior angle measures (1-2/n) π radians
- B. The length of all its sides are equal,
- C. The measure of each exterior angle π/n radians
- D. It is a convex polygon

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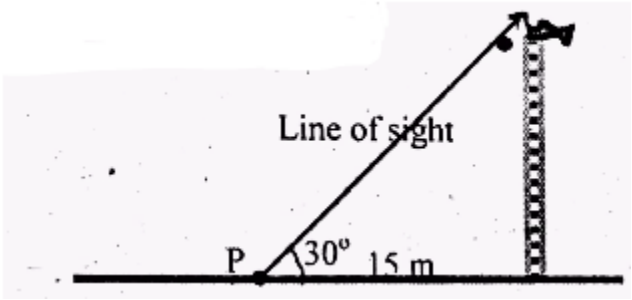
41. The sides of a given triangle are 6 units, 8 units and 10 units long. Which of the following is the area of the triangle?

- A. 30 square units
- B. 24 square units
- C. 40 square units

D. 32 square units

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42. A bird is at the top of a vertical pole posted on a level ground. At a point P on the level ground which is 15 meters away from the foot of the pole, the line of sight of the bird makes an angle of $30^0$with the ground. (see the figure below) How far is the bird from the point?



A. $10\sqrt{3}$ meters
B. $15/2\ \sqrt{3}$ meters
C. 25.5 meters
D. 30 meters

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43. If the point A(b, 4) is 10 units away from B(0, -2), then the possible value(s) of b is(are):

A. 10
B. 8 and -8
C. $2\sqrt{3}$
D. 4 and 6

---

44. A right angle triangle has vertices at P(-1, 1), Q(3, 4) and R(-1, 4). Which one of the following is the gradient of the hypotenuse of this triangle?

A. 3/4
B. 4/3
C. 4
D. -3/4

---

45. From the following pairs of equations of lines, which pair represents perpendicular lines?

A. $2x + 5y + 1 = 0$ and $4x + 10y + 2 = 0$
B. $2x + 5y + 1 = 0$ and $5x + 2y + 1 = 0$
C. $2x - 5y + 1 = 0$ and $5x - 2y + 1 = 0$
D. $2x - 5y + 1 = 0$ and $5x + 2y + 1 = 0$

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46. The area of a regular 8 sided polygon with radius 4 units is:

A. $8\sqrt{2}$ sq. units
B. $64\sqrt{2}$ sq. units

- C. $16\sqrt{2}$ sq. units
- D. $32\sqrt{2}$ sq. units

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47. A regular pyramid has a square base whose side is 8 cm long. If the length of the lateral edge is 12 cm, then which one of the following is the total surface area?

- A. $64(1+2\sqrt{2})$ cm^2
- B. $128\sqrt{2}$ cm^2
- C. $64\sqrt{5}$ cm^2
- D. $64(1+\sqrt{5})$ cm^2

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48. A frustum of height 12 cm is formed from right circular cone of height 16 cm and base radius 8 cm. the volume of the frustum is:

- A. 330π cm^3
- B. 104π cm^3
- C. 336π cm^3
- D. 312π cm^3

---

49. A right circular cylinder with base diameter 10 cm contains enough water that can immerse an object. If an iron ball of diameter 6 cm is immersed, how high will the water rise?

- A. 12/25 cm
- B. 36/25 cm
- C. 48/25 cm
- D. 72/25 cm

---

50. A factory has 30 male and 40 female workers. Out of these workers only 20 male workers have a college degree. If 60% of these workers have a college degree, then how many female workers do not have a college degree?

- A. 10
- B. 18
- C. 22
- D. 24

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51. The simplified form of $\log_{100}(0.01\sqrt{0.01})$ is:

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

---

52. Let $f(x) = (1/3)^x$ and $g(x) = (3/4)^x$. which one of the following is true about these functions?

- A. For $x < 0$, the graph of f(x) lies above the graph of g(x).

B. For $x \geq 0$, the graph of f(x) lies above the graph of g(x).
C. For $x > 0$, both the graphs of f(x) and g(x) lie below the line $y = 1$.
D. For $x < 0$, both the graphs of f(x) and g(x) lie below the line $y = 1$.

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53. Use the following table of logarithm to answer the questions below it. Which of the following is the approximate value of $\sqrt[4]{72300}$?

N	0	1	2	3	4	5	6	7	8	9
1.5	0.1761	0.1790	0.1818	0.1847	0.1875	0.1903	0.1931	0.1959	0.1987	0.2014
1.6	0.2041	0.2068	0.2095	0.2122	0.2148	0.2175	0.2201	0.2227	0.2253	0.2279
1.7	0.2304	0.2330	0.2355	0.2380	0.2405	0.2430	0.2455	0.2480	0.2504	0.2529
1.8	0.2553	0.2577	0.2601	0.2625	0.2648	0.2672	0.2695	0.2718	0.2742	0.2765
1.9	0.2788	0.2810	0.2833	0.2856	0.2878	0.2900	0.2923	0.2945	0.2967	0.2989
7.0	0.8451	0.8457	0.8463	0.8470	0.8476	0.8482	0.8488	0.8494	0.8500	0.8506
7.1	0.8513	0.8519	0.8525	0.8531	0.8537	0.8543	0.8549	0.8555	0.8561	0.8567
7.2	0.8573	0.8579	0.8585	0.8591	0.8597	0.8603	0.8609	0.8615	0.8621	0.8627
7.3	0.8633	0.8639	0.8645	0.8651	0.8657	0.8663	0.8669	0.8675	0.8681	0.8686
7.4	0.8692	0.8698	0.8704	0.8710	0.8716	0.8722	0.8727	0.8733	0.8739	0.8745

A. 15.4
B. 17.4
C. 14.7
D. 16.4

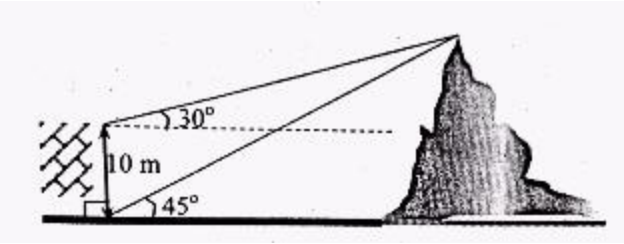
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54. Let θ be a second quadrant angle in standard position whose terminal side lies on the line $y = -3x$. Then which of the following is equal to cos θ?
A. $-3/\sqrt{10}$
B. $1/\sqrt{10}$
C. $-1/\sqrt{10}$
D. $3/\sqrt{10}$

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55. Let $f(\theta) = 1 + \sin\theta$. Which one of the following is NOT true about f (θ)?
A. The domain of f(θ) is $(-\infty, \infty)$.
B. Range of f(θ) is [0, 2]
C. $f(\theta) > 0$ for each values of θ?.
D. The period of f(θ) is 2π.

56. As shown in the figure below, the angle of elevation of the top of the cliff when seen from the foot and top of a building are 45^0 and 30^0 respectively. If the height of the building is 10m, then how high is the top of the cliff?



- A. 14.3 m
- B. 23.7 m
- C. 35.0 m
- D. 56.7 m

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57. In certain company, data of the workers? salary in Birr is given as shown below.

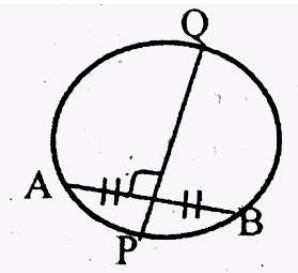
4700	**5600**	**5000**	**4100**	**5300**	**4700**	**5000**
4700	5300	5600	5300	4100	5300	4700
5000	5300	5300	5600	5000	5300	

Which one of the following is NOT true about this data?

- A. Only two values have the same frequency.
- B. The most frequent salary is 5300 Birr.
- C. 20% of the workers receive the latest salary.
- D. 70% of the workers receive a salary more than 4900 Birr.

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58. In the figure below, the circle has radius 5cm and the length of the chord $\overline{AB}$ is 6 cm. Moreover $\overline{PQ}$ is perpendicular bisector of $\overline{AB}$. Which of the following equals the distance from Q to $\overline{AB}$?



- A. √11 cm
- B. 8 cm
- C. 6√2 cm
- D. 9 cm

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59. The base of right prism is right-angled triangle with legs 6 cm and 8 cm. If the altitude of the prism is 7 cm, then the total surface are is:

- A. 216 cm^2

- B. 182 cm^2
- C. 158 cm^2
- D. 48 cm^2

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60. In the right angled triangle ABC below, $\overline{BD}$ is altitude to hypotenuse $\overline{AC}$. If AD = 16cm and DC = 9cm, then BD equals to:

- A. 9 cm
- B. 12 cm
- C. 16 cm
- D. 7 cm

Answer Key

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

PART SIX
CHOOSE THE BEST ANSWER FROM THE GIVEN ALTERNATIVES

1. When cot (-340°) is expressed in terms of an acute angle, it is equal to

- A. Cos 20^0
- B. sin 20^0
- C. Cot 20^0
- D. tan 20^0

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2. Consider the function f(θ)=cosθ,where $0 \leq \theta \leq \pi$. Then the range of f is

- A. [1/2, 1]
- B. [0, 1]
- C. [-1, 0]
- D. [-1, 1]

---

3. If θ= - 60°, then which of the following is true?

- A. sin θ= -1/2
- B. tan θ = -√3

- C. cos θ = -1/2
- D. sin θ = √3/2

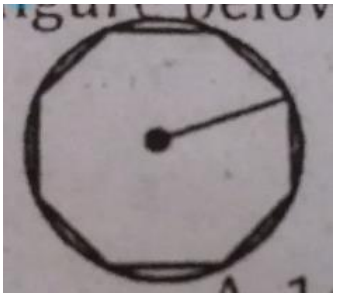
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4. Which one of the following is NOT a third quadrant angel?

- A. 550°
- B. 260°
- C. -185°
- D. -100°

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5. A regular octagon is inscribed in a circle of radius 12 cm as shown in the figure below. What is the area of the shaded region (the region between the circle and the octagon)?



- A. 144(2√3 - π)sq.cm
- B. 144(4√2 - π)sq.cm
- C. 144(π - √3)sq.cm
- D. 144(π-2√(2))sq.cm

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6. On the coordinate plane ΔPQR has vertices at P(-1, 0), Q(3, 0) and R(2, 3). The distance from the point of concurrency of the medians to vertex R is

- $\frac{1}{3}\sqrt{10}units$
- $\frac{1}{2}\sqrt{10}unit$
- $\frac{2}{3}\sqrt{10}\ units$
- $\frac{3}{4}\sqrt{10}units$

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7. Let F_{30}= {1, 2, 3, 5, 6, 10, 15, 30} and F_{42}= {1, 2, 3, 6, 7, 14, 21, 42} be the sets of all factors of 30 and 42 respectively. What is the greatest common factor of 30 and 42?

- A. 42
- B. 30
- C. 6
- D. 3

8. Which of the following is the radian measure of an angel of 210°?

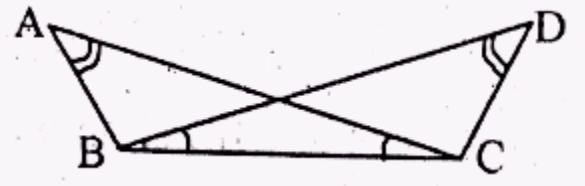
A. $\frac{7}{3}\pi\ radians$

B. $\frac{1}{2}\sqrt{10}unit$

C. $\frac{2}{3}\sqrt{10}\ units$

D. $\frac{3}{4}\sqrt{10}units$

9. In the figure below, ∠BCA ≡ ∠CBD and∠ BAC ≡ ∠CDB. Based on the given conditions in the figure below, which one of the following theorems can be used to prove that ΔABC ≡ ΔDCB?



A. AA
B. SSA
C. SAS
D. ASA

10. A regular polygon in which the measure of each interior angel is equal to the measure of each of its central angel is

A. Regular hexagon
B. Square
C. Regular pentagon
D. Equilateral triangle

11. The solution set of the inequality $2 - x - x^2 < 0$ is given by

A. $(-\infty, 1) \cup (-2, \infty)$

B. $(-2,1)$

C. $(-\infty, -2) \cup (1, \infty)$

D. $(-\infty, 1) \cup (2, \infty)$

12. In which of the following intervals does a zero of the polynomial function $f(x)=x^3 + 2$ exist?

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

---

13. A fair coin will be tossed three times. What is the probability of getting exactly two heads?

- A. 5/8
- B. 3/8
- C. 1/4
- D. 1/2

---

14. Let D={0, 1, 2, 4} and R= {(x, y): x, y ∈ D and y < x}. From the following ordered pairs which one belongs to R?

- A. (4, 4)
- B. (0, 4)
- C. (1, 3)
- D. (2, 0)

---

15. What is the value of x for which $9^{x-1} + 6 = 3^{2x-1}$ is true?

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

---

16. csc (-405^0) is equal to

- A. -2
- B. -√2
- C. 2
- D. √2

---

17. If θ is an angle in the first quadrant such that sin θ = 5/13, then which one of the following is true?

- A. $\cos(90° - \theta) = -\frac{5}{13}$
- B. $\tan(90° - \theta) = \frac{5}{12}$
- C. $\sin(90° - \theta) = \frac{5}{12}$
- D. $\cos(90° - \theta) = \frac{5}{13}$

---

18. Suppose that P (3, -1) is on the terminal side of an angle θ in the standard position. What is cot θ ?

- A. √10/3
- B. -1/3
- C. -√10/3
- D. -3

---

19. What is the period of the tangent function?

- A. -π
- B. π/2
- C. π
- D. 2π

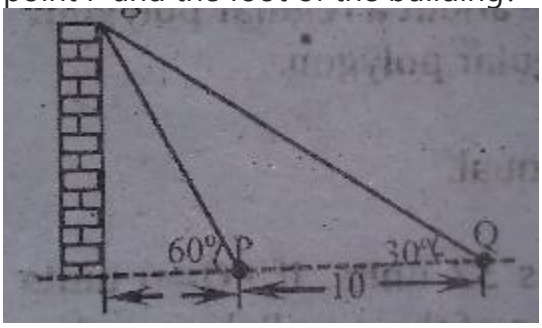
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20. For an acute angel θ, the simplified form of $\cot\theta \cos\left(\frac{\pi}{2}-\theta\right)$ is

- A. csc θ
- B. sec θ
- C. sin θ
- D. cos θ

---

21. At a point P on a level ground, the angel of elevation of the top of a building is 60^0 . at point Q which is 10 meters away from P, the angel of elevation of the top of this building is found to be 30^0 , as shown in the figure below. What is the distance between point P and the foot of the building?



- A. 15 meters
- B. 10√3
- C. 7 meters
- D. 5 meters

---

22. Which of the following is the value of sin 270^0?

- A. 1
- B. 0
- C. -0.5
- D. -1

---

23. Let $f(x)=x^2 + 4x + 1$. Thus the graph of f is obtained by shifting the graph of

- A. $g(x) = (x + 2)^2$ by 1 unit downward
- B. $g(x) = (x + 2)^2$ by 1 unit upward
- C. $g(x) = (x + 2)^2$ by 3 units downward
- D. $g(x) = (x + 2)^2$ by 1 unit upward.

---

24. Let $R= \{(x, y): x, y \in \mathbb{R} \text{ and } y < 2x - x^2 \}$ be a relation. What is the range of R?

- A. $\{y \in \mathbb{R} : y < 2\}$
- B. $\{y \in \mathbb{R} : y > 2\}$
- C. $\{y \in \mathbb{R} : y < 1\}$
- D. $\{y \in \mathbb{R} : y > 1\}$

---

25. Which one of the following lines is parallel to the line with equation $y+2x= 1$?

- A. A line having the equation $1/2y - x = 0$
- B. The line with the equation, $2y = 1-x$
- C. The line which contains points (2, -1) and (0, -3)
- D. A line which passes through points (2, -1) and (0, 3)

---

26. The coordinates of the vertices of a triangle are (-1, 1), (2, 1) and (-1, 3). What is the length of the longest side of this triangle?

- A. $\sqrt{20}$ units
- B. $\sqrt{13}$ units
- C. 3 units
- D. $\sqrt{8}$ units

---

27. Let A and B be two sets. If $A\backslash B=\emptyset$, then which of the following is always true?

- A. $B\backslash A = A\backslash B$
- B. $A \cup B = B$
- C. $B\backslash A = \emptyset$
- D. $A \cap B = B - A$

28.

Let $a > 0$ and n be a natural number. Which one of the following is equal t

- A. $\sqrt[n+2]{a^{2n}}$
- B. $\sqrt[2n]{a^{n+2}}$
- C. $\sqrt[2n]{a^2}$
- D. $\sqrt[2n]{a}$

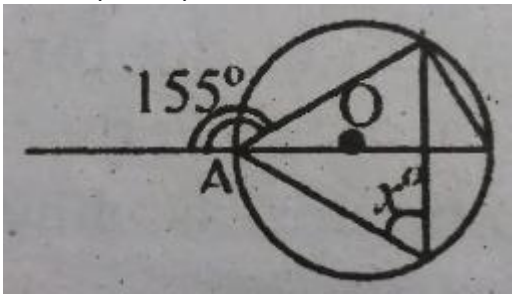
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29. Which of the following is a prime number?

- A. 77
- B. 71
- C. 57
- D. 51

---

30. For the circle shown below, O is its center and AB is its diameter. If m(∠CAD)= 155^0, and m(∠AED)= x^0, then which one of the following is equal to x?



- A. 65
- B. 45.5
- C. 32.5
- D. 25

---

31. Which of the following is NOT necessarily true a regular polygon?

- A. A cyclic quadrilateral is an example of a regular polygon.
- B. It can be inscribed in circle
- C. The measures of all its interior angels are equal.
- D. The lengths of all its sides are equal.

---

32. PQRS is a parallelogram and its perimeter is 32 units. If PQ= 6 units long and m(∠PQR)= 135^0, then what is the area of this parallelogram?

- A. 65 sq. units
- B. $18\sqrt{2}$ sq. units
- C. $30\sqrt{2}$ sq. units
- D. 60 sq. units

---

33. Let P = {-1, 0, 1, 2} and S = {0, 2 ,3}. Then the number of elements in (PΔS) equals to

- A. 5
- B. 4
- C. 3
- D. 2

---

34. Which one of the following sets is equal to S = {x ∈ N ≤ -1 ≤ x ≤ 4 }?

- A. {-1, 0, 1, 2, 3}
- B. {0, 1, 2, 3}

C. {1, 2, 3, 4}
D. {1, 2, 3}

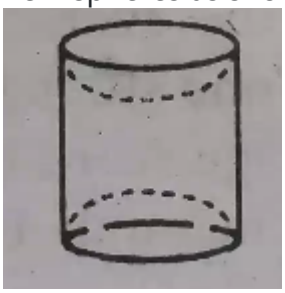
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35. Let B = {3, { 3, √3} } and P(B) be the power set of B. which one of the following is true?

A. {{3, √3}} ∈ P(B)
B. {√3} ⊆ P(B)
C. {3, √3} ∈ P(B)
D. {3} ⊆ P(B)

---

36. A solid is formed by a cylinder with radius 3 cm and height 5 cm and by two hemispheres as shown below. Which of the following is the volume of the solid object?



A. 16 π cm^3
B. 15 π cm^3
C. 12 π cm^3
D. 9 π cm^3

---

37. A right circular cone of base radius 4 cm and height 10 cm is cut off by a plane parallel to the base at a distance of 5 cm from the base. What is the volume of the resulting frustum?

A. 140/3 πcm^3
B. 28/3 πcm^3
C. 160/3 πcm^3
D. 16 √21 πcm^3

---

38. Let a and b be positive real numbers and r and s be real numbers. Which of the following is necessarily true?

A. $\left(\frac{b}{a^r}\right)^r = a^{-r}\,b^r$
B. $\frac{a^r}{b^r} = (ab^{-1})^r$
C. $a^{-r} \times a^s = a^{-r \times s}$
D. $a^r \times a^s = a^{r+s}$

---

39. Let b > 1 be a real number, $f(x)=\log_b x$ and $g(x)=\log_{1/b} x$. Which of the following statements is true?

- A. For x > 1, 0 < g(x) < 1
- B. For x > 1, f (x) < 1
- C. For 0 < x < 1, g(x) > 0
- D. For 0 < x < 1, f (x) > 0

---

40. In a laboratory a colony of 100 bacteria grows at a rate of 4% per minute. Which one of the following expressions gives the time (in minutes) that takes for the colony of bacteria to reach 10,000?

- A. $\text{Log}_{1.04}100$
- B. $\text{Log}_{10}1.4$
- C. $\text{Log}_{100}1.04$
- D. $\text{Log}_{1.04}10$

---

41. Which of the following is the solution set of the equation, $\log_3 x - 2\log_x 9 = 0$

- A. {-9, 9}
- B. {3, 1/9}
- C. {9, 1/9}
- D. {-9, 1/9}

---

42. The solution set of the equation $\left(\frac{25}{9}\right)^{x-1} = \sqrt{0.6}$ is

- A. {3/4}
- B. {4/5}
- C. {4/3}
- D. {5/4}

43.

Which of the following is true about the graph of the function $f(x) =$

- A. For x > 0, it lies between the lines y = 1and y = 2
- B. The line y = 0 is its asymptote
- C. It intersects the y –axis at (0, 1)
- D. It is increasing on [0, ∞)

---

44. Which of the following is the standard deviation of the data given by -2, -1, 1, 3, 4?

- A. 5.4
- B. 5.2
- C. √ 5.4

D. $\sqrt{5.2}$

---

45. A teacher gave a test to 15 students and she calculated the average score as 7.6. later on, she found out that the test paper of one student was missed. After she included the missed score, the average score of the 15 students became 8, while the original data for the remaining 14 students was given as follows,

Score	5	7	8	9	10
No. of students	1	3	5	2	3

What was the score on the missed test paper?

A. 10
B. 9
C. 8
D. 6

---

46. Which of the following is true about the mean of a given data?

A. Subtracting a constant from each value of a data does not change the mean
B. The sum of the deviation of all values from the mean is zero.
C. It exists for any set of data values.
D. It is not affected by extreme values.

---

47. In the polynomial division theorem, if f(x) and d(x) are polynomials, then there exist polynomials q(x) and r(x) such that f(x)= q(x) d(x) + r(x). Which of the following is assumed?

A. The degree of r(x) > the degree of f(x)
B. The degree of q(x) > 0
C. The degree of r(x) < the degree of d(x)
D. The degree of r(x) < the degree of q(x)

---

48. A polynomial function is given by; $y = 3x^2 - 3x^4$. which of the following is NOT true about its graph?

A. As x takes large positive values, |y| becomes large
B. It touches the x- axis but does not cross it at (0,0).
C. It crosses the x-axis two times
D. It has exactly two turning points

---

49. Which of the following is not true about $f(x)=x(1 - x^2)^2 + 2x^3$?

A. The constant term is 0
B. The coefficient of x^3 is 2
C. The leading coefficient is 1
D. The degree of f is 5

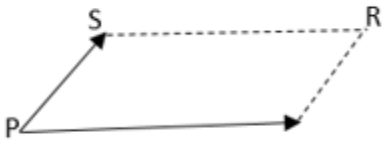
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50. When $f(x)= x^5- 6x + 2$ is divided by $x - c$, the remainder is 7. Which of the following is a possible value of c?

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

51.

Consider the parallelogram PQRS which is determined by vectors $\overrightarrow{PS}$ an below.



Which of the following is equal to the difference vector $\overrightarrow{PR} - \overrightarrow{PQ}$?

- A. $\overrightarrow{SQ}$
- B. $\overrightarrow{RQ}$
- C. $\overrightarrow{SR}$
- D. $\overrightarrow{PS}$

---

52. Which of the following is the volume of a sphere whose surface area is 144 π cm^2?

- A. 288 πcm^3
- B. 268 πcm^3
- C. 162 πcm^3
- D. 122 πcm^3

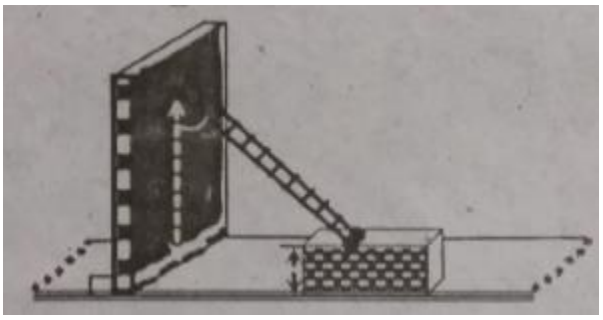
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53. The base of a right triangular prism is an isosceles triangle of sides 7cm, 6cm, and 7cm long. If the height of the prism is 9cm, what is the volume of this prism?

- A. 54√10 cm^3
- B 18 √10cm^3
- C. 27√10 cm^3
- D. 21√10 cm^3

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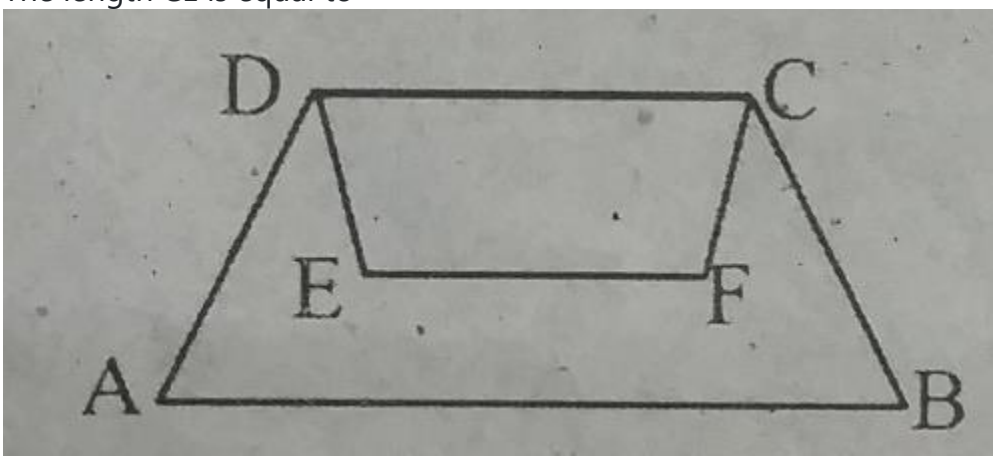
54. From a stand which is 2 meters high, a 10 meters long ladder leans against a vertical wall and makes an angel of 60^0 with the wall as shown in the figure below. How high (h) is the top of the ladder from the foot of the wall on the ground?



- A. (2 + 5√3) meters
- B. 7 meters
- C. 5√3 meters
- D. 5 meters

---

55. In the figure below quadrilaterals ABCD and CDEF are similar and AB = 10cm, CD = 8cm, AC = 12cm and DE = 6cm.
The length CE is equal to



- A. 6.4 cm
- B. 7.2 cm
- C. 7.5 cm
- D. 9.6 cm

---

56. Which of the following is true about the standard deviation of the numbers x_1, x_2, x_3,..., x_{10}, with variance σ^2 ?

- A. If each value is divided by 1/2 , the new standard deviation is 2σ
- B. If σ is subtracted from each value, the new standard deviation is zero.
- C. If each value is multiplied by 1/4 , the new standard deviation is 1/2 σ
- D. If 3 is added to each value, the standard deviation is √σ

---

57. Let r be a rational number and t be an irrational number. Which of the following is always an irrational number?

- A. $\sqrt{1+r}$
- B. r × t

C. $r + t^2$

D. r - t

---

58. Let f be a function defined by $f(x) = \sqrt{x-1}$ and is given by f={(a, 1),(b, √2),(c, 2),(d, √5)}. Then what is the domain of f?

A. {x ∈ R | x ≥ 1}

B. {x ∈ R | 1 ≤ x ≤ 10}

C. {1, 2, 4, 5}

D. {2, 3, 5, 6}

---

59. Given set A = {-1, ∅, {0, -1}}, how many sub sets does A have?

A. 3/2

B. 4

C. 7

D. 8

---

60. Which of the following is the solution set of the equation |1-3x| = 2|x - 2|?

A. {-3, 1}

B. {-1, 0}

C. {-1, 3}

D. {1, 3/5}

Answer Key

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