NATIONAL MATHEMATICS TOURNAMENT

Identifying young global stars

SENIOR SECONDARY CATEGORY 2025

1. If $\text{Log}_{10}(3x-1) + \log_{10} 4 = \log_{10}(9x+2)$ find the value of x. (A) $\frac{1}{3}$ (B) 1 (C) 2 (D) 3
2. Simplify: $\frac{9x3^{n+1}-3^{n+2}}{3^{n+1}-3^n}$ (A) 3 (B) 9 (C) 27 (D) 81.

Consider the following statements:

X: All wrestlers are strong Y: Some wrestlers are not weightlifters

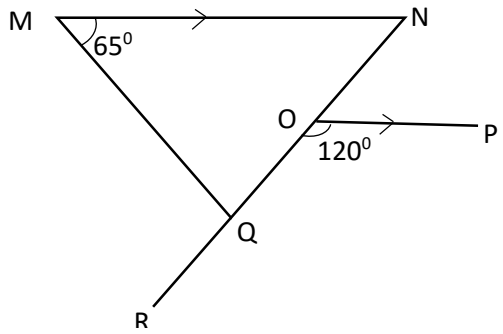
3. Which of the following is a valid conclusion?
   A. All strong wrestlers are weightlifters (B) some strong wrestlers are not weightlifters
   (C) some weak wrestlers are weightlifters (D) All weightlifters are wrestlers.
4. Given that P = {x: x is a multiple of 5}, Q = {x: x is a multiple of 3} and R = {x: x is an odd number}. Are subsets of U = $\{x: 20 \leq x \leq 35\}$. Find $(P \cup Q) \cap R$. (A) {20, 21, 25, 30, 33}
   (B) {21, 25,27,33, 35} (C) {20,21,25, 27, 33, 36} (D) {21, 25, 27,30,33,35}.
5. $U_n = km^2 + Pm$, $U_1 = -1$, $U_5 = 15$, find the values of k and p.
   (A) k = -1, p = 2 (B) k = -1, p = -2 (C) k =1, p = -2 (D) k=1, p = 2.
6. Solve: $3^{2x-2} - 28(3^{x-2}) + 3 = 0$.
   (A) x = -2 or x =1 (B) x = 0 or x = -3 (C) x = 2 or x =1. (D) x = 0 or x =3.
7. The first, second and third terms of an exponential sequence (G.P) are (x - 4), (x + 2) and (3x + 1) respectively. Find the values of x. (A) $-\frac{1}{2}, 8$ $B. \frac{1}{2}, -8$ $C. -\frac{1}{2}, -8$ $D. \frac{1}{2}, 8$
8. Find the range of values of x for which $2x^2 + 7x - 15 \geq 0$.
   $(A).\ x \geq -5 \text{ or } x \leq \frac{3}{2}$ $(B).\ x \leq -5 \text{ or } x \geq \frac{3}{2}$ $(C).\ -5 \leq x \leq \frac{3}{2}$ $(D).\ -\frac{3}{2} \leq x \leq 5.$
9. The probability that a student will graduate from a college is 0.4. if 3 students are selected from the college, what is the probability that at least one student will graduate?
   (A) 0.06 (B) 0.22 (C) 0.78 (D) 0.80.
10. Congratulations! This is a bonus question. What class are you?
    (A) SS1 (B) SS2 (C) SS3 (D) Done with school
11. If α and β are the root of $x^2 + mx - n = 0$, where m and n are constants, form the equation whose roots are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$.
    (A) $mnx^2 - n^2x - m = 0$ (B) $mx^2 - nx + 1 = 0$ (C) $nx^2 - mx + 1 = 0$ (D) $nx^2 - mx - 1 = 0$
12. Simplify, correct to three significant figures. $(27.63)^2 - (12.37)^2$.
    (A) 614 (B) 612 (C) 611 (D) 610.
13. H varies directly as p and inversely as the square of y. If H =1, P =8 and y =2. Find H in terms of p and y. $(A).\ H = \frac{p}{4y^2}$ $(B).\ H = \frac{2p}{y^2}$ $(C).\ H = \frac{p}{2y^2}$ $(D).\ H = \frac{p}{y^2}$.
14. Evaluate $\frac{0.42 \div 2.5}{0.5 \times 2.05}$ leaving the answer in a standard form.

(A) 1.639 x 10^2 (B) 1.639 x 10^1 (C) 1.639 x 10^{-1} (D) 1.639 10^{-2}

15. Make b the subject in $Ib = \frac{1}{2}(a+b)h$. $(A).\ \frac{ah}{2I-h}$ $(B).\ \frac{2I-h}{aI}$ $(C).\ \frac{aI}{2I-h}$ $(D).\ \frac{aI}{2-h}$.
16. Eric sold his house through an agent who charged 8% commission on the selling price. If Eric received $117,760.00 after the sale, what was the selling price of the house?
    (A) $130,000.00 (B) $128,000.00 (C) $125,000.00 (D) $120,000.00.
17. Factorize completely: (2x + 2y) (x – y) + (2x – 2y)(x + y).
    (A) 4(x-y)(x+y) (B) 4(x – y) (C) 2(x-y)(x+y) (D) 2(x-y).
18. The length of a piece of stick is 1.75m. A boy measured it as 1.80m. Find the percentage error?
    (A) $4\frac{4}{7}\%$ $(B).\ 2\frac{6}{7}\%$ $(C).\ 2\frac{7}{9}\%$ $(D).\ 4\frac{7}{9}\%$.
19. Mary has $3.00 more than Ben but $5.00 less than Jane. If Mary has $x, how much does Jane and Ben have altogether? (A) $(2x-8) (B) $(2x + 8) (C) $(2x -2) (D) $(2x + 2).
20. What value of p will make (x^2 – 4x + p) a perfect square? (A) -2 (B) 16 (C) 4 (D) -8.
21. Make t the subject of k = $m\sqrt{\frac{t-p}{r}}$
    $(A).\ t = \frac{rk^2+p}{m^2}$ $(B).\ t = \frac{rk^2+pm^2}{m^2}$ $(C).\ t = \frac{rk^2-p}{m^2}$ $(D).\ t = \frac{rk^2+p2}{m^2}$
22. Given that $\sin(5x-28)^0 = \cos(3x-50)^0$. $0^0 \leq \times \leq 90°$, find the value of x.
    (A) 39 (B) 32 (C) 21 (D) 14.
23. The lengths of the parallel sides of a trapezium are 9cm and 12cm. if the area of the trapezium is 105cm^2, find the perpendicular distance between the parallel sides.
    (A) 5cm (B) 7cm (C) 10cm (D) 15cm.
24. A local community has two newspapers: the Morning Times and the Evening Dispatch. The Morning Times is read by 45% of households and the Evening Dispatch by 60%. If 20% of the households read both papers, find the probability that a particular household reads at least one paper. (A) 0.45 (B) 0.65 (C) 0.85 (D) 0.95.
25. The mean of two numbers x and y is 4. Find the mean of the four numbers x, 2x, y and 2y.
    (A) 2 (B) 4 (C) 6 (D) 8.
26. Correct 0.00798516 to three significant figures. (A) 0.0109 (B) 0.0800 (C) 0.00799 (D) 0.008.
27. Factorize 6pq – 3rs -3ps + 6qr.
    (A) 3(r-p)(2q +s) (B) 3(p – r)(2q – s) (C) 3(p – r)(2q + s) (D) 3(r – p)(s – 2q).
28. The sum of the interior angels of a regular polygon with k sides is (3k -10) right angles. Find the size of the exterior angle. (A) 60^0 (B) 40^0 (C) 90^0 (D) 120^0.
29. The height of an equilateral triangles is $10\sqrt{3cm}$. Calculate its perimeter.
    (A) 20cm (B) 60cm (C) 40cm (D) 30cm.
30. A man will be (x + 10) years old in 8 years' time if 2 years ago, he was 63 years, find the value of x. (A) 55 (B) 63 (C) 57 (D) 67.
31. The equation of a line is given as 3x - 5y = 7. Find its gradient (slope).
    (A) $\frac{5}{3}$ $(B).\ \frac{3}{5}$ $(C).\ -\frac{3}{5}$ $(D).\ -\frac{5}{3}$.
32. A man is five times as old as his son. In four years' time the product of their ages would be 340. If the son's age is y, express the product of their age in terms of y.

(A) $5y^2 - 16y - 380 = 0$ (B) $5y^2 + 24y - 308 = 0$ (C) $5y^2 - 16y - 330 = 0$ (D) $5y^2 + 24y - 324 = 0$.

33. In the diagram below, MN//OP, <NMQ = 65^O and <QOP = $120°$. What is the size of <MQR?
(A) 110^0 (B) 120^0 (C) 130^0 (D) 125^0



34. The dimensions of a rectangular base of a right pyramid are 9cm by 5cm. if the volume of the pyramid is $105cm^3$, how high is the pyramid? (A) 10cm (B) 6cm (C) 8cm (D) 7cm.

35. Each interior angle of a regular polygon is 168^0. Find the number of sides of the polygon.
(A) 30 (B) 36 (C) 24 (D) 18.

Consider the following statements:

P: Birds fly q: The sky is blue r: The grass is green.

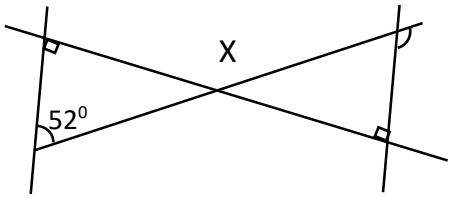
36. What is the symbolic representation of "If the grass is green and the sky is not blue, then the bird do not fly"? (A) (r^p) $\Rightarrow q$ (B) $(r \hat{} q) \Rightarrow \sim p$ (C) $(r \hat{} q) \Rightarrow \sim p$ (D) $(r \wedge \sim q) \Rightarrow \sim p$.

37. Find the value of x for which $6\left(\sqrt{4x^2 + 1}\right) = 13x$, Where $\times > 0$. (A) $\frac{6}{5}$ (B) $\frac{25}{24}$ (C) $\frac{24}{25}$ (D) $\frac{5}{6}$

38. The second and fourth terms of an exponential sequence (G.P.) are $\frac{2}{9}$ and $\frac{8}{81}$ respectively. Find the sixth term of the sequence. (A) $\frac{81}{32}$ (B) $\frac{9}{8}$ (C) ¼ (D) $\frac{32}{729}$.

39. Point X and Y are on the same horizontal base as the foot of a building such that X is 96m due east of the building and Y is due west. If the angle of elevation of the top of the building from X is 30^0 and that of Y is 60^0, calculate the distance of Y from the base of the building.
(A) 30m (B) 32m (C) 42m (D) 50m.

40. Find the size of the angle marked x in the diagram below.
A. 108° (B) 112° (C) 128° (D) 142°.



41. Find the coefficient of the third term in the binomial expansion of $(2x + \frac{3y}{4})^3$ in descending powers of x. (A) $\frac{27}{64}y^2$ (B) $\frac{27}{8}y^2$ (C) $8y^2$ (D) $9y^2$.

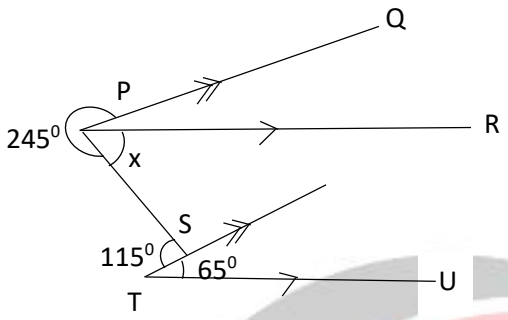
42. One-third the sum of two numbers is 12. Twice their difference is 12. Find the numbers.

(A) 21 and 15 (B) 20 and 16 (C) 22 and 14 (D) 23 and 13.

43. For what values of x is $\frac{x^2+2}{10x^2-13x-3}$ undefined? (A) $\frac{3}{2}, \frac{1}{5}$ $B. -\frac{3}{2}, -\frac{1}{5}$ $C. \frac{3}{2}, -\frac{1}{5}$ $D. -\frac{3}{2}, \frac{1}{5}$.

44. Simplify $\frac{3(5^{n+1})+5^n}{5^{n-2}-5^{n-1}}$ (A) $\frac{-16}{4}$ (B) $\frac{4}{25}$ (C) -100 (D) $\frac{25}{4}$

45. In the diagram, PQ//TS, PR//TU, reflex angle QPS =245^0, angle PST = 115^0, <STU = 65^0 and <RPS = x. Find the value of x. (A) 80^0 (B) 70^0 (C) 60^0 (D) 50^0.



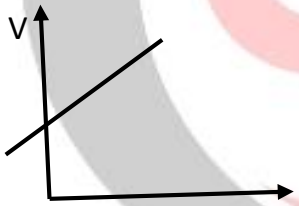
46. In the equation below, solve for x if all the numbers are in base 2. $\frac{11}{x} = \frac{1000}{(x+101)}$

A. 101 (B) 11 (C) 110 (D) 111

47. Simplify $\frac{(a-b)}{(a+b)} - \frac{(a+b)}{(a-b)}$ (A) $\frac{4ab}{(a^2-b^2)}$ (B) $\frac{2ab}{(a^2-b^2)}$ (C) $\frac{-4ab}{(a^2-b^2)}$ (D) $\frac{4ab}{(a-b^2)}$

SENIOR SECONDARY CATEGORY 2024

1. Simplify $\frac{4-x^2}{2x-x^2}$ where $x \neq 0$ and $x \neq 2$. A. $\frac{2-x}{x}$ B. $\frac{2+x}{x}$ C. $\frac{2}{x}$ D. $\frac{x-2}{x}$
2. Simplify the expression $\frac{x+y}{x^{-1}+y^{-1}}$. A. $\frac{x}{y}$ B. xy C. $\frac{y}{x}$ D. $\frac{1}{y}$
3. A girl has x pieces of cake, she gives y pieces to each of her 6 friends. How many pieces does she have left? A. 6y-x B. x-6y C. x + 6y D. 6xy
4. Simplify $\frac{x^2-5x-14}{x^2-9x+14}$ A. $\frac{x+2}{x-2}$ B. $\frac{x-2}{x+4}$ C. $\frac{x+7}{x-7}$ D. $\frac{x-7}{x+7}$
5. Simplify $\frac{a^2b^2-b^2a^4}{ab(a+b)}$. A. $a^2 - b^2$ B. $b^2 - a^2$ C. $a^2b - ab^2$ D. $ab^2 - a^2b$
6. Expand $(x-\sqrt{2})(x+\sqrt{2})$. A. $x^2 - \sqrt{2} - 2$ B. $x^2 + 2\sqrt{2} - 2$ C. $x^2 - \sqrt{2}$ D. $x^2 - 2$
7. Subtract $\frac{1}{2}(a-b-c)$ from the sum of $\frac{1}{2}(a-b+c)$ and $\frac{1}{2}(a+b-c)$. A. $\frac{1}{2}(a+b+c)$ B. $\frac{1}{2}(a-b-c)$ C. $\frac{1}{2}(a-b+c)$ D. $\frac{1}{2}(a+b-c)$
8. A quantity z varies directly as x and inversely as cube of y. if z = 2, x = 2 and y = 1. Find the relation of z in terms of x and y. A. $z = \frac{x}{3y}$ B. $z = xy^3$ C. $z = \frac{x}{y^3}$ D. $Z = \frac{y}{x^3}$
9. P varies directly as the square of Q. If P = 3, when Q = 2, find Q when P = 27.
   A. 6 B. $4\frac{1}{2}$ C. 4 D. $1\frac{1}{3}$
10. Which of the following relationships is illustrated in the graph below?



   A. V varies directly as t B. V varies inversely as t C. V is partly constant and partly varies directly as t D. V is partly constant and partly varies inversely as t.
11. If $P \propto \frac{1}{q}$ and $q \propto r$, find the equation connecting P and r. A. $P = \frac{k}{r}$ B. P =kr C. $P=\frac{r}{k}$ D. $P=kr^2$
12. Given that $R \propto \frac{S^2}{\sqrt{T}}$ and R = 3 and T = 4 and S = 4, find R when S = 2 and T = 81. A. $\frac{1}{8}$ B. $\frac{1}{6}$ C. $\frac{3}{8}$ D. $\frac{4}{9}$
13. The table below shows the corresponding values of x and y for a relation.

x	4	16	36
y	1	2	3

   Using the table, find the value of k if y and x are connected by the equation $y = \frac{\sqrt{x}}{k}$ A. $\frac{1}{3}$ B. $\frac{1}{2}$ C. 1 D. 2
14. Find the truth set of (x-2) (x+3) = 0. A. (-2, -3), B. (-2, 3) C. (2, -3) D. (2, 3).

15. Which of the following equations has root as $1\frac{2}{3}$ and $-1\frac{2}{3}$? A. $3x + 5 = 0$ B. $3x - 5 = 0$ C. $9x^2 - 25 = 0$ D. $9x^2 + 25 = 0$

What should be added to $k^2 - \frac{1}{2}k$ to make it a perfect square? A. $\frac{-1}{16}$ B. $\frac{-1}{4}$ C. $\frac{1}{4}$ D. $\frac{1}{16}$

16. The sum of the squares of two positive consecutives odd numbers is 130. Find the larger number. A. 3 B. 5 C. 9 D. 13

17. Find the value of x if $x = \sqrt{2x + 3}$ A. 3, -2 B. $-3, -1$, C. $-3, 1$ D. 3, 1

18. Using the table below, find the quadric equation for f(x).

X	0	1	2	3	4
f(x)	3	4	7	12	19

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

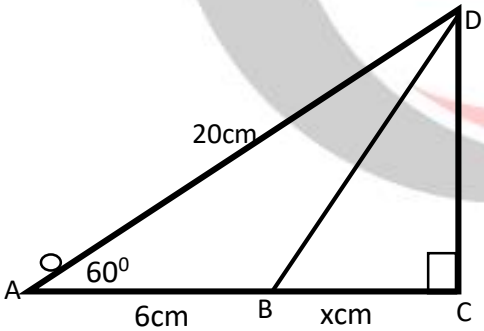
19. Find the equation of the line which passes through the points (-2,7) and $(2, -3)$. A. $y = \frac{5}{2}x + 2$ B. $y = -\frac{5}{2}x + 2$ C. $y = \frac{5}{2}x - 2$ D. $y = -\frac{5}{2}x - 2$

20. A straight line that passes through the point (-2, 0) has gradient of 3. Find the equation of the line. A. $y + 3x + 6 = 0$ B. $y + 3x - 6 = 0$ C. $y - 3x - 6 = 0$ D. $y - 3x + 6 = 0$

21. At what point does the graph of $3y - 2x + 6 = 0$ cuts the y – axis? A. (-3, 0) B. (3, 0) C. (0, 2) D. (0, - 2)

Use the diagram below to answer questions 23 & 24

22. Find the value of x in the diagram below



A. 4 B. 6 C. 10 D 11.32

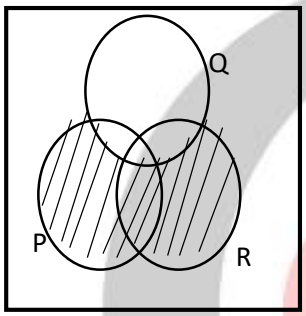
23. Find $A\hat{B}D$. A. 105^0 B. 113^0 C. 103^0 D. 110^0

24. If $\cos x = P$, which of the following is equal to $\sin x$. A. $\frac{1-P^2}{P}$ B. $1 - P^2$ C. $\sqrt{1 + P^2}$ D. $\sqrt{1 - P^2}$

25. Given that $\theta = 60^0$ and $\beta = 30^0$, evaluate $\frac{sin\beta + 2cos\theta}{cos\beta}$ A. $3\sqrt{3}$ B. $1 + 2\sqrt{3}$ C. $\sqrt{3}$ D. $1 - \sqrt{3}$

26. From the top of a tower 25m above the ground level, the angle of depression of a stone on the ground is 60^0. Calculate the horizontal distance between the foot of the tower and the stone. A. $50\sqrt{3}$ B. $25\sqrt{3}$ C. $25\frac{\sqrt{3}}{3}$ D. $\frac{25}{\sqrt{3}}$

27. If P = {3, 4, 5, 6} Q = {5, 6, 7, 8} and R = {2, 3, 7, 9}. Which of the following represents the set P ∩ (Q∪ R)? A. {5, 6} B. {3, 4, 5} C. {3, 5, 6} D. {3, 4, 5, 8}
28. If P = {x : x < 5}, Q = {x : 2 < x < 7} and R ={odd numbers} are subsets of μ={2, 3, 4, 5, 6, 7, 8, 9}. Find P∩ $Q \cap R^I$. A. {3} B. {4} C. {5, 7, 9} D. {3, 4, 6, 8}
29. A set is defined as {x : -4 < x ≤ 2} and x is an integer. List the elements of x.
A. {-3, -2, -1, 0, 1, 2} B. { -4, -3, -2, -1, 0, 1, 2} C. {-4, -3, -2, -1, 0, 1} D. {-3, -2, -1, 0, 1}
30. In a class of 20 students, 16 play soccer, 12 play hockey and 2 do not play any of the two games. How many students play only hockey? A. 10 B. 8 C. 4 D. 2
31. Which of the following describes the set P = {1, 2, 3, 4, 5, 6}? A. P = {prime numbers < 7} B. P = {x: x is a positive integer < 7} C. P = {rational numbers < 7} D. P = {x: x is a real number < 7}
32. In the Venn diagram below, the shaded portion represents.
A. Q^I∪ ($P \cap R$) B. Q^I∩ $P \cap R$ C. Q ∩ ($P \cup R$) D. Q^I ∩ ($P \cup R$)



33. Evaluate 893 +412 (mod 4) A. 0 B. 1 C. 2 D. 3
34. If 25 (mod 7) = x, find x. A. 2 B. 3 C. 4 D. 5
35. What is the truth set of n⊗n = 4 (mod 5). A. {1} B. {3} C. {2, 3} D. {2, 4}
36. Find the value of x such that 2x + 5 = 1 (mod 7). A. 2 B. 3 C. 4 D. 5
37. If 20 (mod 9) is equivalent to y (mod 6), find y. A. 1 B. 2 C. 3 D. 4
38. Which of the following is a valid conclusion to the statement "if one works hard, one must pass his or her examination"? A. John is hardworking and so must pass his examination with distinction B. Yaw is not hardworking and must fail his examination. C. Gbenga did not pass his examination and so he did not work hard D. Amina is hardworking and so her parents must like her.
39. Consider the statements: p: The well is wider, q: the well is clean, r: the well is deep. Write in symbol form, the statement "If the well is wide and clean, then it is deep.
A. p ^ q $\rightarrow$ r B. p ^{v} q $\rightarrow$ r C. P ^ q ^{v} r D. p ^{v} q $\Leftrightarrow$ r
40. Which of the following statements is a preposition? A. Good morning sir B. Is she okay? C. Oh my God D. It is raining
41. Consider the following statements: x: All mathematicians are intelligent, y: Most of my friend are mathematicians. Which of the following is a valid conclusions form the above statements? A. All my friends are mathematicians B. None of my friends is intelligent C. Some of my friends are intelligent D. All intelligent people are mathematicians.

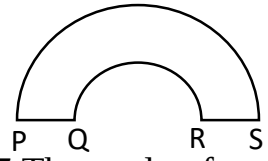
42.Simplify $\frac{log729}{log9}$ A. 2 B. 2 ½ C. 3 D. 4

43.Evaluate Log $\sqrt{243} - Log\sqrt{27}$. A. $\frac{1}{4}$ B. $\frac{3}{8}$ C. $\frac{3}{4}$ D. $1\frac{1}{2}$

44.If $\log_2{}^x = 0.5$. find the value of x. A. 4 B. 2 C. $\sqrt{2}$ D. $\sqrt{\frac{1}{2}}$

45.Given that $Log_{10}{}^y = 1 + 3log_{10}{}^x$, express y in terms of x. A. $10x^3$ B. 10^{3x} C. $10x^{-3}$ D. x^3

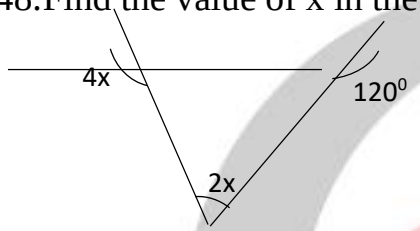
46.



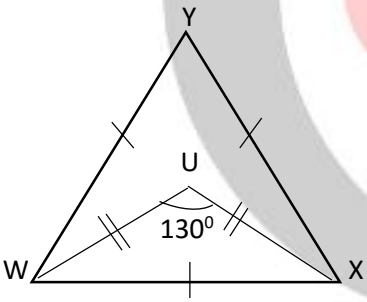
The figure beside is made up of two semi-circles whose diameters are 14cm and 7cm. if /PQ/ = /RS/ = 3 ½ cm. find the perimeter of the figure. (Take $\pi = \frac{22}{7}$) A. 73cm B.66cm C.44cm d. 40cm

47.The angle of a sector of a circle of radius 6cm is 120^0. Find the area of the sector in terms of π. A. $4\pi cm^2$ B. $8\pi cm^2$ C.$12\pi cm^2$ D.$24\pi cm^2$

48.Find the value of x in the diagram below. A. 120^0 B. 60^0 C. 40^0 D. 30^0

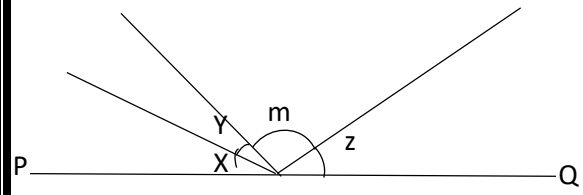


49.In the diagram below, WXY is an equilateral triangle W$\hat{U}$Z = 130^0. Find the value of U$\hat{X}$Y. A. 35^0 B. 40^0 C. 45^0 D. 50^0



SENIOR SECONDARY CATEGORY 2023

1. Factorise: x + y – ax -ay A. (x – y) (1 – a) B. (x + y) (1 + a) C. (x + y) (1 – a) D. (x – y) (1 + a)
2. A car uses one litre of petrol for every 14km. if one litre of petrol costs #63.00, how far can the car go with #900.00 worth of petrol. A. 420km B. 405km C. 210km D. 200km.
3. Given that P = {x: 1 ≤x ≤ 6} and Q = {x: 2 < x < 10}, where x is an integer. Find n(P∩Q).
   A. 4 B. 6 C. 8 D. 10.
4. Solve the inequality: 3(x + 1) ≤ 5(x + 2) + 15. A. $x \geq -14$ B. ≤ -14 C. $x \leq -11$ D. $x \geq -11$
5. If $y = \frac{2(\sqrt{x^2+m})}{3N}$, make x the subject of the formula.
   A. $\frac{\sqrt{9y^2N^2-2m)}}{2}$ B. $\frac{\sqrt{9y^2N^2+2m)}}{2}$ C. $\frac{\sqrt{9y^2N^2-4m)}}{2}$ D. $\frac{\sqrt{9y^2N^2+4m)}}{2}$
6. Given that cosx = $\frac{1}{r}$, express tanx in terms of r. A. $\frac{1}{\sqrt{r}}$ B. $\sqrt{r}$ C. $\sqrt{r^2+1}$ D. $\sqrt{r^2-1}$
7. Solve the equations: 3x – 2y = 7; x + 2y = -3
   A. x = 1, y = -2 B. x = 1, y = 3 C. x = -2, y = -1 D. x = 4, y = -3
8. Form the equation whose roots are x = $\frac{1}{2}$ and -$\frac{2}{3}$
   A. $6x^2 - x + 2 = 0$ B. $6x^2 - x - 2 = 0$ C. $6x^2 + x + 2 = 0$ D. $6x^2 + x - 2 = 0$
9. Simplify $\frac{log\sqrt{27}}{log\sqrt{81}}$ A. 3 B. 2 C. $\frac{3}{2}$ D. $\frac{3}{4}$
10. Simplify $\frac{m}{n} + \frac{(m-1)}{5n} - \frac{(m-2)}{10n}$ where n ≠ 0. A. $\frac{m-3}{10n}$ B. $\frac{11m}{10n}$ C. $\frac{m+1}{10n}$ D. $\frac{11m+4}{10n}$
11. G varies directly as the square of H. if G is 4 when H is 3, find H when G = 100.
    A. 15 B. 25 C. 75 D. 225
12. Given that $124_x = 7(14_x)$, find the value of x A. 12 B. 11 C. 9 D. 8
13. Find the least value of x which satisfies the equation 4x = 7(mod 9). A. 7 B. 6 C. 5 D. 4.
14. The expression $\frac{5x+3}{6x(x+1)}$ will be undefined when x equals. A. {0,1} B. {0,-1} C. {-3,-1} D. {-3,0}.
15. If X = {x : x < 7} and Y = {y is a factor of 24} are subsets of μ = {1,2,3,….10} find X∩ Y.
    A. {2,3,4,6} B. {1,2,3,4,6} C. {2,3,4,6,8} D. {1,2,3,4,6,8}.
16. Given that x is directly proportional to y and inversely proportional to Z, X =15 when y=10 and Z =4, find the equation connecting X, Y and Z A. $x = \frac{6y}{z}$ B. $x = \frac{12y}{z}$ C. $x = \frac{3y}{z}$ D. $x = \frac{3y}{2z}$.



17. In the diagram above, PQ is a straight line . If m = $\frac{1}{2}(x + y + z)$, find the value of m.
    A. 45^0 B. 60^0 C. 90^0 D. 100^0.

18. If $\cos (x + 25)^o = \sin 45^0$, find the value of x. A. 25^0 B. 30^0 C. 35^0 D. 20^0

19. If y varies directly as the square root of (x + 1) and y = 6 when x = 3, find x when y = 9.
A. 8 B. 7 C. 6 D. 5

20. Given that $(x + 2)(x^2 – 3x + 2) + 2(x + 2)(x – 1) = (x + 2)M$, find M.
A. $(x + 2)^2$ B. $x(x + 2)$ C. $x^2 + 2$ D. $x^2 – x$

21. If $23_x = 32_5$, find the value of x A. 7 B. 6 C. 5 D. 4

22. Three quarters of a number added to two and a half that number gives 13. Find the number.
A. 4 B. 5 C. 6 D. 7

23. Given that $\cos x = \frac{12}{13}$, evaluate $\frac{1-\tan x}{\tan x}$ A. $\frac{5}{13}$ B. $\frac{5}{7}$ C. $\frac{7}{5}$ D. $\frac{13}{5}$

24. In what modulus is it true that 9 + 8 = 5? A. mod 10 B. mod 11 C. mod 12 D. mod 13

25. If $\frac{27^x \times 3^{1-x}}{9^{2x}} = 1$, find the value of x. A. 1 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -1

26. Given that $\log_x 64 = 3$, evaluate $x \log_2 8$. A. 6 B. 9 C. 12 D. 24

27. Find the equation whose roots are $\frac{3}{4}$ and -4
A. $4x^2 – 13x + 12 = 0$ B. $4x^2 – 13x – 12 = 0$ C. $4x^2 + 13x – 12 = 0$ D. $4x^2 + 13x + 12 = 0$.

28. Simplify $\frac{3^{n-1} \times 27^{n+1}}{81^n}$. A. 3^{2n} B. 9 C. 3^n D. 3^{n+1}

29. Find the value of y for which the expression $\frac{y^2 - 9y + 18}{y^2 + 4y - 21}$ is undefined.
A. 6,7 B. 3, -6 C. 3, -7 D. -3, -7

30. Make s the subject of the relation: $p = s + \frac{sm^2}{nr}$
A. $s = \frac{mrp}{nr + m^2}$ B. $s = \frac{nr + m^2}{mrp}$ C. $s = \frac{nrp}{mr + m^2}$ D. $s = \frac{nrp}{nr + m^2}$

31. Factorise: $(2x + 3y)^2 – (x – 4y)^2$.
A. $(3x – y)(x + 7y)$ B. $(3x + y)(2x – 7y)$ C. $(3x + y)(x – 7y)$ D. $(3x – y)(2x + 7y)$

32. Simplify $\frac{(p-r)^2 - r^2}{2p^2 - 4pr}$ A. $\frac{1}{2}$ B. $p – 2r$ C. $\frac{1}{p-2r}$ D. $\frac{2p}{p-2r}$

33. Simplify $\frac{3\frac{1}{4} \times 1\frac{3}{5}}{11\frac{1}{3} - 5\frac{1}{3}}$ A. $\frac{14}{15}$ B. $\frac{13}{15}$ C. $\frac{4}{5}$ D. $\frac{11}{15}$

34. Consider the statements:
P: The interior angle of a polygon are equal
Q: The polygon is regular.
Write in symbolic form the statement: “if the interior angles of a polygon are equal, then the polygon is regular”. A. $Q \Rightarrow P$ B. $P \Rightarrow Q$ C. $P \Leftrightarrow Q$ D. $\sim Q \Leftrightarrow P$

35. Given the propositions:
p: It is a cold day.
q: the wind is blowing.
The negation ‘It is not a cold day or the wind is not blowing’ is
A. $\sim p \wedge \sim q$ B. $p \vee \sim q$ C. $\sim p \vee \sim q$ D. $\sim p \Rightarrow \sim q$

36. Which one of the following statements is **WRONG?** A. $(5 < 7) \vee (5 = 8)$ is true. B. $(7 = 10 - 6) \vee (7 = 8 – 3)$ is false. C. $(5 < 8) \wedge (8 < 2)$ is false D. $(6 = 8 – 2) \Leftrightarrow (5 = 7 – 2)$ is true

37. *Given the propositions:*

p: Samuel is not fat.

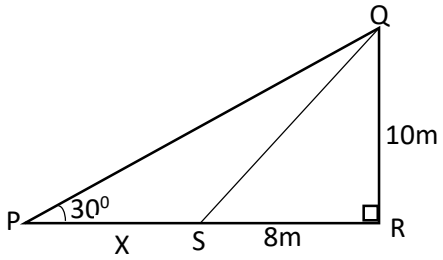
q: Samuel is not short.

The compound proposition "Samuel is neither fat nor short" is

A. $p \wedge q$ B. $\sim p \wedge \sim q$ C. $\sim p \vee \sim q$ D. $\sim p \Rightarrow \sim q$

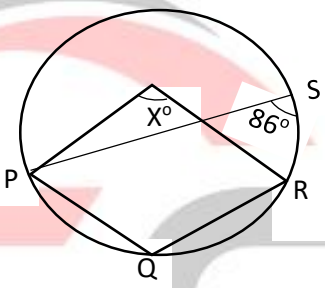
38. *In the diagram, /QR/ = 10m, /SR/ = 8m, <QPS = 30^0, <QRP = 90^0 and /PS/=x. find x.*

A. 1.32m B. 6.32m C. 9.32m D. 17.32m.

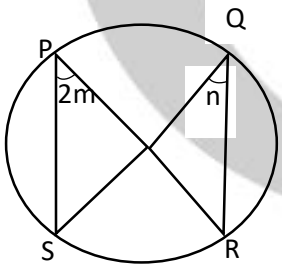


39. *In the diagram, O is the centre of the circle PQRS and* $< PSR = 86°,$ *if* $< POR = x°, find\ x.$

A. 274 B. 172 C. 129 D. 86.

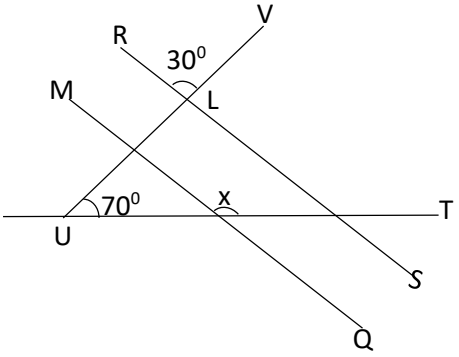


40. *The diagram is a circle with centre O. if* $< SPR = 2m\ and < SQP = n, express\ \boldsymbol{m}\ in\ term\ of\ \boldsymbol{n}.$ $A.\ m = \frac{n}{2}$ $B.\ m = 2n$ $C.\ m = n - 2$ $D.\ m = n + 2.$



41. *In the diagram, MQ//RS, <TUV = 70^o and <RLV = 30^0. Find the value of x.*

A. 150^0 B. 110^0 C. 100^0 D. 95^0.

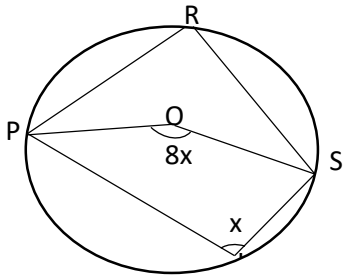


42. The volume of a cylindrical tank, 10m high is 385m^3. Find the diameter of the tank. [take Ƞ = 22/7].

A. 14m B. 10m C. 7m D. 5m.

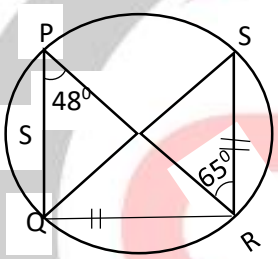
43. The diagram is a circle with centre O. PRST are points on the circle. Find the value of <PRS.

A. 144^0 B. 72^0 C. 40^0 D. 36^0.



44. In the diagram, /SR/ = /QR/, <SRP = 65^O and <RPQ = 48^0, find <PRQ.

A. 65^0 B. 45^0 C. 25^0 D. 19^0



45. A cone has a base radius of 8cm and height 11cm. calculate, correct to two decimal places, the curved surface area. [Take $\pi = \frac{22}{7}$]

A. 341.98cm^2 B. 276.57cm^2 C. 201.14cm^2 D. 477.71cm^2.

46. From a point T, a man moves 12km due West and then moves 12km due South to another point Q. Calculate the bearing of T from Q.

A. 225^0 B. 315^0 C. 045^0 D. 135^0