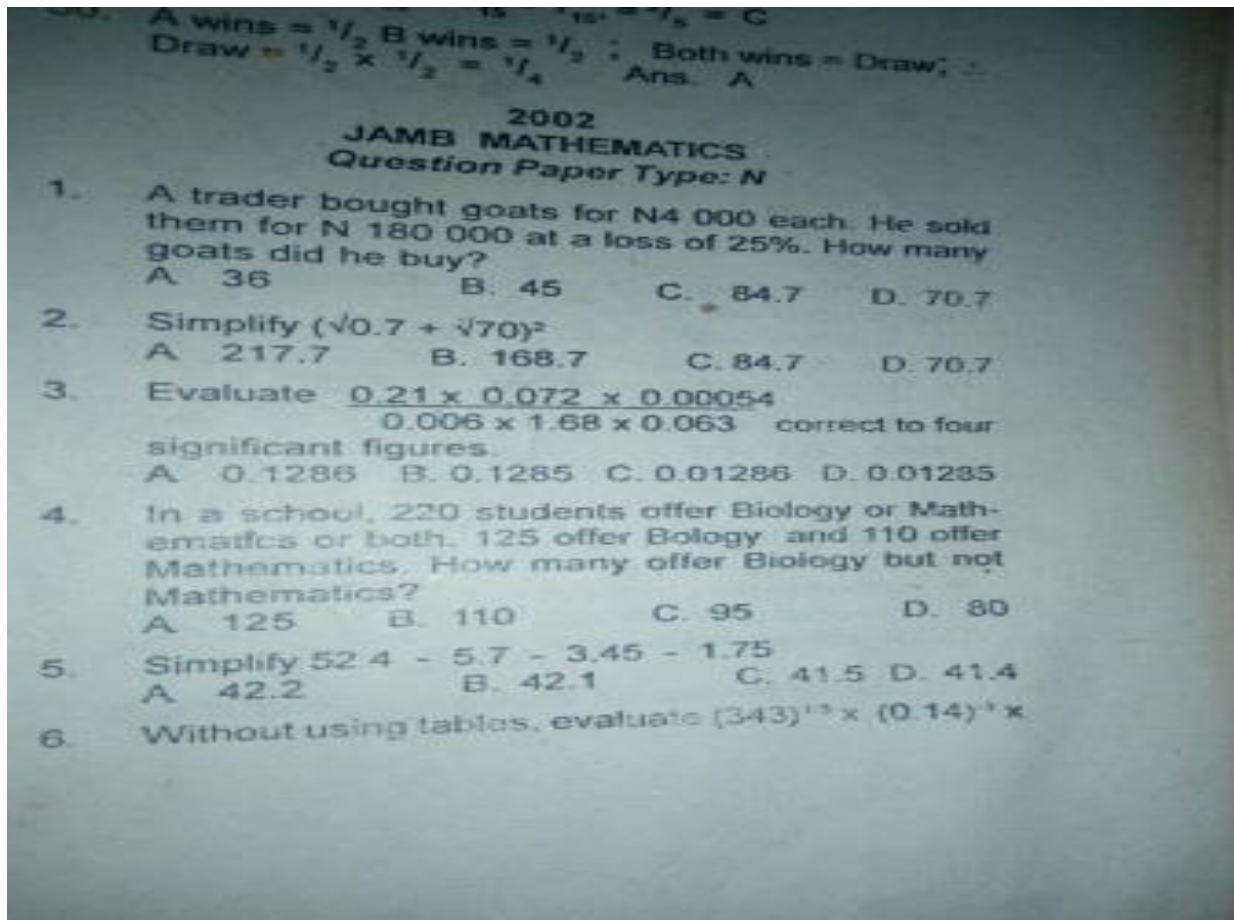
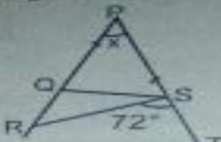



JAMB MATHEMATICS PAST QUESTIONS AND ANSWERS – SERVANTBOY.COM



11. Find the co-ordinate of the midpoint of the intercepts of the line $2y = 4x - 8$
 A. $(-1, -2)$ B. $(1, 2)$ C. $(2, 0)$ D. $(1, -2)$
12. A chord of a circle subtends an angle of 120° at the centre of a circle of diameter $4\sqrt{3}\text{cm}$. Calculate the area of the major sector.
 A. $32\pi\text{cm}^2$ B. $16\pi\text{cm}^2$ C. $8\pi\text{cm}^2$ D. $4\pi\text{cm}^2$
13. If $\tan \theta = 4/3$ calculate $\sin^2 \theta - \cos^2 \theta$.
 A. $7/25$ B. $9/25$ C. $16/25$ D. $24/25$
14. In the diagram below, PST is a straight line, $PQ = QS = RS$. If $\angle RST = 72^\circ$, find x .
 A. 72°
 B. 36°
 C. -4°
 D. 18°
- 
15. The locus of a point P which is equidistant from two given points S and T is
 A. a perpendicular to ST B. a line parallel to ST
 C. the angle bisector of PS and ST
 D. the perpendicular bisector of ST
16. A solid hemisphere has radius 7cm. Find the total surface area.
 A. 462cm^2 B. 400cm^2 C. 308cm^2 D. 66cm^2
 ($\pi = 22/7$)
17. The triangle PQR below is
 A. a scalene triangle
 B. an isosceles triangle
 C. an equilateral triangle
 D. an obtuse-angled triangle.
- 
18. The sum of the interior angles of a polygon is 20

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 B.
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2. In the diagram below are two concentric circles or radii r and R respectively with centre O . If $r = \frac{2}{5}R$, express the area of the shaded portion in terms of π and R .
- A. $\frac{21}{25}\pi R^2$
 B. $\frac{24}{25}\pi R^2$
 C. $\frac{21}{20}\pi R^2$
 D. $\frac{21}{23}\pi R^2$



8. Find the value of α if the line $2y - \alpha x + 4 = 0$ is perpendicular to the line $y + \frac{1}{4}x - 7 = 0$
 A. -8 B. -4 C. 4 D. 8
9. A bucket is 12cm in diameter at the top, 8cm in diameter at the bottom and 4cm deep. Calculate its volume.
 A. $144\pi\text{cm}^3$ B. $\frac{304\pi\text{cm}^3}{3}$ C. $72\pi\text{cm}^3$
 D. $\frac{128\pi\text{cm}^3}{3}$

10. In the diagram below, XZ is the diameter of the circle $XYZW$, with centre O and radius $\frac{12}{5}$ cm. If $XY = 12$ cm, find the area of the triangle XYZ .
- A. 75cm^2
 B. 54cm^2
 C. 45cm^2
 D. 27cm^2



11. Find the co-ordinate of the midpoint of x and y intercepts of the line $2y = 4x - 8$
 A. (-1, -2) B. (1, 2) C. (2, 0) D. (1, -2)
12. A chord of a circle subtends an angle of 120° at the centre of a circle of diameter $4\sqrt{3}$ cm. Calculate the area of the major sector.
 A. $32\pi\text{cm}^2$ B. $16\pi\text{cm}^2$ C. $8\pi\text{cm}^2$ D. $4\pi\text{cm}^2$
13. If $\tan \theta = \frac{4}{3}$ calculate $\sin^2 \theta - \cos^2 \theta$

19. Find the equidist
 A. $y = \dots$
 20. In the f
 by a he
 the soli
 A. 216
 B. 198
 C. 180
 D. 162

21. A hunte
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 A. 8.8
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 A. 110

23. The ran
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 A. 6

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 No. of s

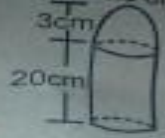
The dist
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 A. 40

25. The ver
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right angles. How many sides does the polygon have?
 A. 10 B. 12 C. 20 D. 40

19. Find the equation of the set of points which are equidistant from the parallel lines $x = 1$ and $x = 7$
 A. $y = 4$ B. $y = 3$ C. $x = 3$ D. $x = 4$

20. In the diagram below, a cylinder is surmounted by a hemispherical bowl. Calculate the volume of the solid.
 A. $216\pi\text{cm}^3$
 B. $198\pi\text{cm}^3$
 C. $180\pi\text{cm}^3$
 D. $162\pi\text{cm}^3$



21. A hunter 1.6m tall, views a bird on top of a tree at an angle of 45° . If the distance between the hunter and the tree is 10.4m, find the height of the tree.
 A. 8.8m B. 9.0m C. 10.4m D. 12.0m

22. The mean of a set of six numbers is 50. If the mean of the first five is 50, find the sixth number in the set.
 A. 110 B. 105 C. 100 D. 95

23. The range of the data $k + 2, k - 3, k + 4, k - 2, k, k - 5, k + 3, k - 1$ and $k + 6$ is
 A. 6 B. 8 C. 10 D. 11

24.

No. of days	1	2	3	4	5	6
No. of students	20	x	50	40	2x	60

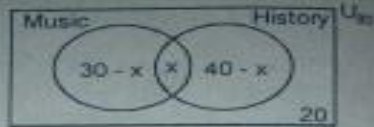
The distribution above shows the number of days a group of 260 students were absent from school in a particular term. How many students were absent for at least four days in the term?
 A. 40 B. 120 C. 160 D. 210

25. The venn diagram below shows the number of students offering Music and History in a class of 80 students.

32. if
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 35. I
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in a particular term. How many students were absent for at least four days in the term?
 A. 40 B. 120 C. 160 D. 210

25. The venn diagram below shows the number of students offering Music and History in a class of 80 students. If a student is picked at random from the class, what is the probability that he offers Music only?



- A. 0.13
- B. 0.25
- C. 0.38
- D. 0.50

26. Find the mean of the data, 7, -3, 4, -2, 5, -9, 4, 8, -6, 12
 A. 1 B. 2 C. 3 D. 4

27. The probability of a student passing any examination is $\frac{2}{3}$. If the student takes three examinations, what is the probability that he will not pass any of them?
 A. $\frac{1}{27}$ B. $\frac{8}{27}$ C. $\frac{4}{9}$ D. $\frac{2}{3}$

28. How many three-digit numbers can be formed from 32564 without digit being repeated?
 A. 10 B. 20 C. 60 D. 120

29. The acres for rice, pineapple, cassava, cocoa and palm oil in a certain district are given respectively as 2, 5, 3, 11 and 9. What is the angle of the sector for cassava in a pie chart?
 A. 36° B. 60° C. 108° D. 180°

30. Calculate the mean deviation of the set of numbers 7, 3, 14, 9, 7 and 8.
 A. $2\frac{1}{2}$ B. $2\frac{1}{3}$ C. $2\frac{1}{6}$ D. $1\frac{1}{6}$

31. Find the maximum value of y in the equation

39.
40.
41.
42.
43.
44.
45.
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47.

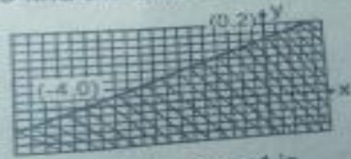
- A. $\frac{1}{3}x - 3x^2$ B. $\frac{1}{3}x$ C. $\frac{1}{3}x^2$ D. $\frac{1}{3}x^3$
 14. The 9th term of an AP is five times the 5th term. Find the relationship between a and d.
 A. $a + 2d = 0$ B. $a + 3d = 0$ C. $3a + 5d = 0$
 D. $2a + d = 0$

The time taken to do a piece of work is inversely proportional to the number of men employed. If it takes 45 men to do a piece of work in 5 days, how long will it take 25 men?
 A. 5 days B. 9 days C. 12 days D. 15 days

15. The binary operation $*$ is defined on the set of integers p and q by $p * q = pq + p + q$. Find $2 * (3 * 4)$.
 A. 19 B. 38 C. 59 D. 67
 16. If -2 is the solution of the equation $2x + 1 - 3c = 2c + 3x - 7$, find the value of c.
 A. 1 B. 2 C. 3 D. 4

18. If $N = \begin{pmatrix} 3 & 5 & -4 \\ 6 & -3 & -5 \\ -2 & 2 & 1 \end{pmatrix}$, find $|N|$.
 A. 91 B. 65 C. 23 D. 17

17. Use the graph below to find the values of p and q if $px + qy \leq 4$.
 A. $p = 1, q = 2$
 B. $p = 2, q = 1$
 C. $p = -1, q = 2$
 D. $p = 2, q = -1$



18. The inverse of the equation $f(x) = 3x + 4$ is
 A. $\frac{1}{3}(x+4)$ B. $\frac{1}{4}(x+3)$ C. $\frac{1}{3}(x-5)$
 D. $\frac{1}{3}(x-4)$

- ing at the
 according
 A. 5
 46. If $x^2 - 3x$
 of x.
 A. $x^2 - 3x$
 49. Find the
 A. 2
 C. 10
 50. The slope
 5 at the
 A. 1

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2. $\sqrt{10}$
 $\sqrt{7}$
 $\sqrt{10}$
 +
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 3.

39. The inverse of the equation $f(x) = 3x + 4$ is
 A. $\frac{1}{3}(x+4)$ B. $\frac{1}{3}(x+3)$ C. $\frac{1}{3}(x-5)$ D. $\frac{1}{3}(x-4)$
40. Solve for x in the equation $x^2 - 5x^2 - x + 5 = 0$
 A. 1, 1 or 5 B. -1, 1 or -5 C. 1, 1 or -5 D. 1, -1 or 5
41. If $P = \begin{pmatrix} 2 & 1 \\ 3 & 0 \end{pmatrix}$ and I is a 2×2 unit matrix, evaluate $P^2 - 2P + 4I$
 A. $\begin{pmatrix} 1 & 4 \\ 4 & 1 \end{pmatrix}$ B. $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ C. $\begin{pmatrix} -3 & 0 \\ 0 & -3 \end{pmatrix}$ D. $\begin{pmatrix} 9 & 4 \\ -12 & 1 \end{pmatrix}$
42. Find the range of values of x for which $\frac{x+2}{4} - \frac{2x-3}{3} < 4$
 A. $x > -3$ B. $x < 4$ C. $x > -6$ D. $x < 8$
43. If x varies directly as \sqrt{n} and $x = 9$ when $n = 9$, find x when $n = 17$
 A. 27 B. $\sqrt{17}$ C. 4 D. $\sqrt{3}$
44. The sum to infinity of the series $1 + \frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \dots$ is
 A. $\frac{3}{2}$ B. $\frac{5}{2}$ C. $\frac{10}{3}$ D. $\frac{11}{3}$
45. Make r the subject of the formula $\frac{x}{r+a} = \frac{a}{r}$
 A. $\frac{a}{x-a}$ B. $\frac{a}{x+a}$ C. $\frac{a^2}{x-a}$ D. $\frac{a^2}{x+a}$
46. If $y = x^2 - \frac{1}{x}$, find $\frac{dy}{dx}$
 A. $2x + x^2$ B. $2x - x^2$ C. $2x + 1/x^2$ D. $2x - 1/x^2$
47. Evaluate $\int \sin 3x dx$
 A. $-\frac{2}{3} \cos 3x + c$ B. $-\frac{1}{3} \cos 3x + c$
 C. $\frac{1}{3} \cos 3x + c$ D. $\frac{2}{3} \cos 3x + c$
48. A circle with a radius 5cm has its radius increas-

3. 0.21×10^3
 0.009
 2.1×10^3
 8.5×10^3
 $= 1.2857$

4. Let no.
 $n(B) =$
 $= 125$
 matics
 $x = \text{both}$
 venn d

From th
 $-x = 22$
 110

5. $52.4 -$
 Ans.

6. $(343)^{1/3}$
 $(5^2)^{-1/2}$
 $\frac{50^{10}}{1} \times$

7. Big Ra
 the wh
 $\pi(2^2/3)$
 A.S.P
 $= \pi R^2$

8. $2y - a$
 $y = \frac{1}{2}$
 Also,

- ... the rate of 0.2cm/s. What will be the corresponding increase in the area?
 A. 5π B. 4π C. 2π D. π
48. If $\frac{dy}{dx} = 2x - 3$ and $y = 3$ when $x = 0$, find y in terms of x .
 A. $x^2 - 3x$ B. $x^2 - 3x + 3$ C. $2x^2 - 3x$ D. $x^2 - 3x - 3$
49. Find the derivative of $y = \sin^2(5x)$ with respect to x .
 A. $2 \sin 5x \cos 5x$ B. $5 \sin 5x \cos 5x$
 C. $10 \sin 5x \cos 5x$ D. $15 \sin 5x \cos 5x$
50. The slope of the tangent to the curve $y = 3x^2 - 2x + 5$ at the point $(1, 6)$ is
 A. 1 B. 4 C. 5 D. 6

**2002
 JAMB MATHEMATICS SOLUTIONS**

1. C.P = N400 each; S.P for All = N180,000; Loss = 25%; S.P = 75%; But, C.P = 100% for all, then if 75% = N180,000, 100% = x ; Using simple proportion $x = \frac{N180,000 \times 100}{75} = \text{C.P} = \text{N}240,000$
 Number of goats = $\frac{\text{cost of all the goats}}{\text{cost of each}}$
 $= \frac{\text{N}240,000}{\text{N}400}$ n(goats) = 60 Ans. D

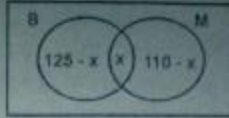
2. $(\sqrt{0.7} + \sqrt{70})^2$; $\sqrt{0.7}(\sqrt{0.7} + \sqrt{70}) + \sqrt{70}(\sqrt{0.7} + \sqrt{70}) = 0.7 + 2\sqrt{0.7}(\sqrt{70}) + 70 = 70.7 + 2\sqrt{0.7 \times 70} = 70.7 + 2\sqrt{49} = 70.7 + 2 \times 7 = 70.7 + 14 = 84.7$
 Ans. C

3. $\frac{0.21 \times 0.072 \times 0.00054}{0.006 \times 1.68 \times 0.063}$
 $\frac{2.1 \times 10^{-1} \times 7.2 \times 10^{-3} \times 5.4 \times 10^{-4}}{6.0 \times 10^{-3} \times 1.68 \times 6.3 \times 10^{-2}} = \frac{81.648 \times 10^{-7}}{63.504 \times 10^{-5}}$
 $= 1.2857 \times 10^{-2} = 0.012857 \approx 0.01286$ Ans. C

4. Let $n(L) = \text{students} = 220$
 $n(B) = \text{Biology students}$

$$= 1.2857 \times 10^{-2} = 0.012857 \approx 0.01286 \text{ Ans. C}$$

4. Let $n(U) = \text{students} = 220$
 $n(B) = \text{Biology students} = 125$; $n(M) = \text{Mathematics students} = 110$
 $x = \text{both subjects}$, using venn diagram.



From the diagram $125 - x + x + 110 - x = 220$; $135 - x = 220$. $x = 15$; Biology only = $125 - 15 = 110$ Ans. B

5. $52.4 - (5.7 + 3.45 + 1.75) = 52.4 - 10.9 = 41.5$
 Ans. C.

6. $(343)^{1/3} \times (0.14)^{-1} \times (25)^{-1/2} = (7^3)^{1/3} \times (0.14)^{-1} \times (5^2)^{-1/2}$
 $= \frac{7}{1} \times \frac{1}{0.14} \times \frac{1}{5} = \frac{1}{0.02} \times \frac{1}{5} =$
 $\frac{50}{1} \times \frac{1}{5} = 10$ Ans. C

7. Big Radius = R ; Small Radius = $\frac{2}{5}R$; Area of the whole circle = πR^2 ; Area of the inner circle = $\pi(\frac{2R}{5})^2$; Area of shaded portion = $\pi R^2 - \frac{\pi 4R^2}{25}$

$$\text{A.S.P} = \pi R^2 (1 - \frac{4}{25}) = \pi R^2 \frac{(25 - 4)}{25}$$

$$= \pi R^2 \frac{21}{25} = \frac{21}{25} \pi R^2 \text{ Ans. C}$$

8. $2y - \alpha x + 4 = 0$; $2y = \alpha x - 4$, $y = \frac{\alpha}{2}x - 2$
 $y = \frac{\alpha}{2}x - 2$; $M_1 = \frac{\alpha}{2}$ ($M_1 = \text{gradient of line one}$).
 Also, $y + \frac{1}{4}x - 7 = 0$, $y = 7 - \frac{1}{4}x$, $M_2 = -\frac{1}{4}$ (M_2)

∴ gradient of the second line) Two lines are perpendicular if $m_1 m_2 = -1 \Rightarrow \frac{1}{2} \cdot (-2) = -1 \Rightarrow \frac{1}{2} \cdot (-2) = -1$
 $m = 2$ Ans. D

9. Since $d = 12$, $r = \frac{12}{2} = 6$ cm, also $r_1 = \frac{12}{2} = 6$ cm
 Using ratio of similar figure from the diagram,

$$\frac{x}{x+4} = \frac{6}{8} \Rightarrow 6x = 4(x+4), 6x = 4x + 16; 2x = 16, x = 8; H = 4 + 8 = 12\text{cm}, h = 8; \text{Volume of the bigger cone} = \frac{1}{3} \pi r^2 h$$

$$V_c = \frac{1}{3} \pi (6^2) (12) = \frac{36 \times 12 \pi}{3} = 144\pi$$

$$\text{Volume of the smaller cone} = V_c; V_c = \frac{1}{3} \pi (4^2) (8) = \frac{16 \times 8 \pi}{3} = \frac{128\pi}{3}$$

$$\text{Volume of the bucket} = V_c - V_c; V_B = \frac{144\pi}{3} - \frac{128\pi}{3} = \frac{432 - 128\pi}{3} = \frac{304\pi}{3} \text{cm}^3$$

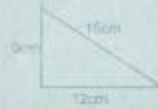
Ans. B



10. ΔXYZ is Right angled (angle in a semicircle), $XZ = 2r = 15$ cm, $XY = 12$ cm. Then $XZ^2 = XY^2 + YZ^2$ (Pythagoras theorem) $15^2 = 12^2 + YZ^2$, $225 - 144 = YZ^2$, $81 = YZ^2$, $YZ = \sqrt{81} = 9$ cm

$$\text{Area} = \frac{1}{2} b \times h = \frac{1}{2} \times 12 \times 9 = 54\text{cm}^2$$

Ans. B



Alternatively

$$A_1 = \frac{\sqrt{s(s-a)(s-b)(s-c)}}{2} \quad s = \frac{a+b+c}{2}$$

$$S = \frac{12+9+15}{2} = 18$$

$$A_1 = \frac{\sqrt{18(18-9)(18-12)(18-15)}}{2} = \frac{\sqrt{18 \times 9 \times 6 \times 3}}{2} = \frac{\sqrt{2916}}{2} = 54\text{cm}^2 \text{ fine}$$

11. $2y = 4x - 6$, $y = 2x - 4$ Intercept at y , $x = 0$, $y = 2(0) - 4 = -4$ co-ordinate (0, -4), Intercept at x , $y = 0$, $0 = 2x - 4 = 2x$, $x = 2$ (2, 0) A (0, -4) B(2, 0); Coordinates of mid-point $X = \frac{x_1 + x_2}{2} = \frac{0 + 2}{2} = 1$
 $Y = \frac{y_1 + y_2}{2} = \frac{-4 + 0}{2} = -2$

14. From above $x + 180 - 4x + 72 = 180$ (angle on a straight line)
 $\Rightarrow -3x + 72 = 180 - 180 - 3x = -72$; $x = \frac{-72}{-3} = 24^\circ$

15. D

16. Hemisphere; $r = 7$ cm
 circular face = πr^2
 $(7^2) = 3 \times 49\pi = 147\pi$

$$\text{T.S.A} = 462\text{cm}^2$$

17. B (An Isosceles)

18. $5n = 20 \Rightarrow 90^\circ = 1800^\circ = 180(n-2)$
 Ans. B

19. $X_1 = X_2 = X_3 = 7$

1. $X_1 = 7 \Rightarrow X_2 = 7$
 $\Rightarrow B \cdot X = \frac{7}{2} = 4$
 \therefore Line $x = 4$ is a vertical line.

Note: A straight line

20. Let volume of sphere = V_s
 Volume of Hemisphere = V_h
 Volume of cylinder = V_c

$$\therefore V_s = V_h + V_c$$

$$\frac{4}{3} \pi (3)^3 = 18\pi + \pi r^2 h$$

$$\therefore V_s = 180\pi + \pi r^2 h$$

21. The height of the triangle = H , to find H ,
 $x + 1.6 = H$, to find H ,
 $\tan 45^\circ = \frac{H}{1.6} \Rightarrow H = 1.6 \tan 45^\circ = 1.6 \times 1 = 1.6$
 $1.6 + 1.6 = 3.2$

22. $X_1 = 60$, $\sum(X_i) = 360$
 $5 \times 60 = 250$
 $360 - 250 = 110$

23. The least = $K - 1$

Ans. B

Alternatively

$$A = \frac{1}{2} \sqrt{s(s-a)(s-b)(s-c)} \quad s = \frac{a+b+c}{2}$$

$$s = \frac{2+12+15}{2} = 14.5$$

$$A = \frac{1}{2} \sqrt{14.5(14.5-2)(14.5-12)(14.5-15)} = \frac{1}{2} \sqrt{14.5 \times 12.5 \times 2.5 \times 3} = \frac{1}{2} \sqrt{2918.75} \quad \text{AT} = 54 \text{cm}^2 \text{ fine.}$$

11. $2y = 4x - 8, y = 2x - 4$ Intercept at $y, x = 0, y = 2(0) - 4 = -4$ co-ordinate $(0, -4)$, intercept at $x, y = 0, 0 = 2x - 4, 4 = 2x, x = 2 (2, 0)$ A $(0, -4)$ B $(2, 0)$; Coordinates of mid-point $X = \frac{x_1 + x_2}{2} = \frac{2 + 0}{2} = 1$

$$Y = \frac{y_1 + y_2}{2} = \frac{-4 + 0}{2} = -2 \quad \therefore (X, Y) = (1, -2) \text{ Ans. D}$$

12. $D = 4\sqrt{3} \text{ cm}, r = D/2$

$$= 2\sqrt{3} \text{ cm, Area of major}$$

$$\text{sector} = \frac{\theta}{360} \times \pi r^2$$

$$= \frac{240}{360} \times \pi (2\sqrt{3})^2$$

$$A = \frac{2}{3} \times \pi \times 4 \times 3 = 8\pi \text{ cm}^2 \quad \text{Ans. C}$$



13. $\tan \theta = \frac{4}{3}$, by pythagoras theorem

$$AC^2 = AB^2 + BC^2 + AC^2$$

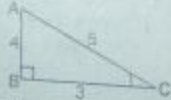
$$= 4^2 + 3^2 = 16 + 9 = 25$$

$$AC = \sqrt{25} = 5; \sin \theta = \frac{4}{5}$$

$$\cos \theta = \frac{3}{5}; \sin^2 \theta = \left(\frac{4}{5}\right)^2 = \frac{16}{25}$$

$$\cos^2 \theta = \left(\frac{3}{5}\right)^2 \therefore \cos^2 \theta = \frac{9}{25}; \sin^2 \theta - \cos^2 \theta =$$

$$\frac{16}{25} - \frac{9}{25} = \frac{7}{25} \quad \text{Ans. A}$$



Volume of
Volume of
 $\therefore V_1 = V_2$
 $\frac{1}{2} \times (3)^2 \times h = 1$
 $\therefore V_2 = 11$

21. The height
 $x + 1.6 = 1$
 $\tan 45^\circ = 1$
 $\tan 45^\circ = 1$
 $1.6 + 10.4$

22. $X_1 = 60, X_2 = 50$
 $5 \times 50 = 250$
 $360 - 250 = 110$

23. The least + largest-le
 $+ 5 = 11$

24. Sum of stu
 $+ 60 = 280$
least 4 day
but must r
are the stu
 $+ 60 = 4$

25. From the c
 $90 - x = 80$
only = 30

- $= \frac{20}{80} = \frac{1}{4}$

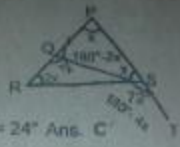
26. Mean =
 $\bar{X} = \frac{7 \cdot 3}{4}$

- $\bar{X} = \frac{40}{10}$

27. Pr (P) = 7

per-
x 1
4cm
am,
2x
ime

14. From above
 $x + 180 - 4x + 72^\circ$
 $= 180^\circ$ (angle on
a straight line)
 $\Rightarrow -3x + 72^\circ =$
 $180^\circ - 180^\circ - 3x$
 $= -72^\circ; x = \frac{72^\circ}{3} = 24^\circ; \therefore x = 24^\circ$ Ans. C



15. D

16. Hemisphere; $r = 7\text{cm}$; curved SA = $2\pi r^2$; Area of
circular face = πr^2 ; T.S.A = $2\pi r^2 + \pi r^2$; $3\pi r^2 = 3\pi$
 $(7^2) = 3 \times 49\pi = 147\pi = \frac{147}{1} \times \frac{22}{7}$
T.S.A = 462cm^2 Ans. A

17. B (An isosceles triangle).

18. $S_n = 20 \times 90^\circ = 1800^\circ$ but $S_n = 180^\circ (n - 2) \Rightarrow$
 $1800^\circ = 180 (n - 2) \Rightarrow 10 = n - 2; n = 10 + 2 = 12$
Ans. B

19. $\frac{X_1}{1} = \frac{X}{7} = \frac{X_2}{7}$; Line $x - x_1 = x_2 - x \Rightarrow X_1 =$
 $1; X_2 = 7 \Rightarrow X - 1 = 7 - X; X + X = 7 + 1; 2x$
 $= 8 \Rightarrow x = \frac{8}{2} = 4$
 \therefore Line $x = 4$ is equidistant from the two parallel
lines; $\therefore x = 4$ Ans. D
Note: A straight line is parallel to itself ok.

20. Let volume of solid = V_s

Volume of Hemisphere = V_H

Volume of cylinder = V_C

$\therefore V_s = V_H + V_C$; ($r = 3\text{cm}, h = 20\text{cm}$); $V_H = \frac{2}{3}\pi r^3 =$
 $\frac{2}{3}\pi (3)^3 = 18\pi$; $V_C = \pi r^2 h = \pi (3)^2 (20) = 180\pi$
 $\therefore V_s = 180\pi + 18\pi = 198\pi \text{ cm}^3$ Ans. B

21. The height of the tree = H

$x + 1.6 = H$; to find x

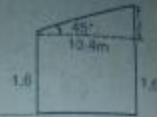
$\tan 45^\circ = \frac{H}{x}$; $x = 10.4$



28.
29.
30.
31.
32.

$V_s = V_c + V_p$ ($r = 3\text{cm}$, $h = 20\text{cm}$), $V_c = \pi r^2 h = \pi(3)^2(20) = 180\pi$
 $V_p = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(3)^2(20) = 60\pi$
 $V_s = 180\pi + 60\pi = 240\pi \text{ cm}^3$ Ans. B

21. The height of the tree = H
 $x + 1.6 = H$; to find x
 $\tan 45^\circ = \frac{H}{x}$; $x = 10.4$
 $\tan 45^\circ = 10.4$ $\therefore H =$
 $1.6 + 10.4 = 12.0$ Ans. D



22. $\bar{X}_1 = 60$; $\Sigma f(X_1) = 6 \times 60 = 360$; $\bar{X}_2 = 50$; $\Sigma f(X_2) =$
 $5 \times 50 = 250$ \therefore Sixth number = $\Sigma f(X_1) - \Sigma f(X_2) =$
 $360 - 250 = 110$ Ans. A

23. The least = $K - 5$ The largest = $K + 6$; Range =
 largest - least = $K + 6 - (K - 5) = K + 6 - K + 5 = 6$
 $+ 5 = 11$ Ans. B

24. Sum of students = 260; $\Rightarrow 20 + x + 50 + 40 + 2x$
 $+ 60 = 260$; $170 + 3x = 260$; $3x = 90$; $x = 30$. At
 least 4 days means it could be more than 4 days
 but must not be smaller than 4. $\therefore 40 + 2x + 60$
 are the students of these categories. $\Rightarrow 40 + 2(30)$
 $+ 60 = 40 + 60 + 60 = 160$ Ans. C

25. From the diagram $30 - x + x = 40 - x + 20 = 80$
 $90 - x = 80$; $-x = 80 - 90 = -10$; $\therefore x = 10$; Music
 only = $30 - 10 = 20$; Pr (music only) = $\frac{n(\text{Music only})}{n}$
 $= \frac{20}{80} = \frac{1}{4} = 0.25$ Ans. B

26. Mean = $\bar{X} = \frac{\Sigma fx}{\Sigma f}$
 $\bar{X} = \frac{7 \cdot 3 + 4 \cdot 2 + 5 \cdot 9 + 4 \cdot 3 + 6 \cdot 12}{10}$

$\bar{X} = \frac{40 - 20}{10}$; $\bar{X} = \frac{20}{10} = 2$ Ans. B

27. Pr (P) = $\frac{1}{3}$, P = passed, Pr (F) = $\frac{1}{3}$, f = failed

Probability of failing 3 times; $Pr(f) = Pr(f_1)$ and $Pr(f_2)$ and $Pr(f_3) = \frac{1}{3} \times \frac{1}{3} \times \frac{1}{3} = \frac{1}{27}$; $Pr(f) = \frac{1}{27}$
 Ans. A

28. From 32564 we permit 3 = $5p_3$; $\therefore 5p_3 = \frac{3!}{3! \cdot 0!} = 5 \times 4 \times 3 = 60$ Ans. C

29. Rice, Pineapple, Cassava, Cocoa, Palm oil
 2 5 3 11 9
 Cassava = $\frac{3}{2+5+3+11+9} = \frac{3}{30} = \frac{1}{10}$
 Cassava = $\frac{3}{36}$ Ans. A

30. $\bar{X} = \frac{7+3+14+9+7+8}{6} = \frac{48}{6} = 8$
 $X - \bar{X} = 7-8 = -1$; $3-8 = -5$; $14-8 = 6$; $9-8 = 1$; $7-8 = -1$; $8-8 = 0$; $|X - \bar{X}| = 1-1 = 0$; $| -5 | = 5$; $|6| = 6$; $|1| = 1$; $| -1 | = 1$; $|0| = 0$; $\Sigma |X - \bar{X}| = 14$; Mean deviation = $\frac{\Sigma |X - \bar{X}|}{\Sigma f} = \frac{14}{6} = \frac{7}{3} = 2\frac{1}{3}$ Ans. B

31. $Y = 1 - 2x - 3x^2$ at maximum point, $\frac{dy}{dx} = 0$ and $\frac{d^2y}{dx^2} = -6$; $\Rightarrow \frac{dy}{dx} = -2 - 6x = 0$ and $\frac{d^2y}{dx^2} = -6$
 $\Rightarrow Y = 1 - 2x - 3x^2$ has maximum value at $-2 - 6x = 0$, $-6x = 2$; $x = -\frac{2}{6} = -\frac{1}{3}$; \therefore The value = $1 - 2(-\frac{1}{3}) - 3(-\frac{1}{3})^2 = 1 + \frac{2}{3} - 3 \times \frac{1}{9} = 1 + \frac{2}{3} - \frac{1}{3} = \frac{3+2-1}{3} = \frac{5-1}{3} = \frac{4}{3}$ Ans. B

32. $T_5 = 5T_1$; but T_n of A.P. = $a + (n-1)d$; $\Rightarrow a + (5-1)d = 5(a + (1-1)d)$; $\Rightarrow a + 4d = 5a$; $\Rightarrow a + 8d = 5a$; $\Rightarrow 4a + 12d = 5a + 20d$; $\Rightarrow 5a + 20d - a - 8d = 0$; $\Rightarrow 4a + 12d = 0$; $\Rightarrow a + 3d = 0$ Ans. B

33. $T \propto \frac{1}{N}$; $\Rightarrow T = \frac{K}{N}$
 Find T when $N = 25$; $\Rightarrow T = \frac{K}{25}$

$x^2 - 4$
 $(x^2 + x) -$
 $(x - 5) =$
 $0, x = 1,$
 $-1, 5$
 40. $\begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix}$
 To solve
 $\begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix}$
 $a_1 =$
 $b_1 =$
 $a_2 =$
 $b_2 =$
 $\therefore P$
 $41 =$
 $\therefore P$
 $=$
 41. $\frac{x+7}{4}$

32. $Tg = 5T$, but Tn of A, $P = a + (n-1)d$, $\Rightarrow a + (9-1)d = 5a + 20d$, $\Rightarrow a + 8d = 5a + 20d$, $\Rightarrow 4a + 12d = 0$, $\Rightarrow a + 3d = 0$ Ans. B
33. $T = \frac{1}{N}$, $\Rightarrow T = \frac{K}{N}$
 $N = 45$, $T = 5$, Find T when $N = 25$, $\Rightarrow T = \frac{K}{N}$, $\Rightarrow \frac{5}{45} = \frac{K}{25}$
 $K = 5 \times 45 = 225$
 $T = \frac{225}{25} = 9$ days Ans. B
34. $P^*q = pq + p + q$; $2^*3 = 2 \times 3 + 2 + 3 = 12 + 5 = 17$; $3^*4 = 3 \times 4 + 3 + 4 = 12 + 7 = 19$; $2^*19 = 2 \times 19 + 2 + 19 = 38 + 21 = 59 = C$
35. $f(x) = 2x + 1 - 3c = 2c + 3x - 7$; $f(-2) = 2(-2) + 1 - 3c = 2c + 3(-2) - 7$; $-4 + 1 - 3c = 2c - 6 - 7$
 $-3 - 3c = 2c - 13$, $-3c - 2c = -13 + 3$, $-5c = -10$
 $C = 2$ Ans. B
36. $N = \begin{bmatrix} 3 & 5 & -4 \\ 6 & -3 & -5 \\ -2 & 2 & 1 \end{bmatrix}$; $NV = \begin{bmatrix} 3 & 5 & -4 \\ 6 & -3 & -5 \\ -2 & 2 & 1 \end{bmatrix}$
 $+3(-3+10) - 5(6-10) - 4(12-6)$; $3(7) - 5(-4) - 4(6)$
 $= 21 + 20 - 24$; $41 - 24 = 17$ Ans. D
37. $Px + qy \leq 4$ at point $(-4, 0)$; $P(-4) + q(0) \leq 4$
 $-4P = 4$, $P = -4/4 = -1$, at point $(0, 2)$; $P(0) + q(2) \leq 4$; $2q = 4$, $q = 4/2 = 2$; $\therefore P = -1$, $q = 2$ Ans. C
38. $f(x) = 3x + 4$, for $f^{-1}(x)$, But $f(x) = y$, $\Rightarrow Y = 3x + 4$, $y - 4 = 3x$, $x = \frac{y-4}{3} = \frac{1}{3}(y-4)$; Then replace variable y by x ; $f^{-1}(x) = \frac{1}{3}(x-4)$ Ans. D
39. $f(x) = x^2 - 5x^2 - x + 5 = 0$; $Pry f(1) = 1 - 5 - 1 + 5 = 0$; $\therefore x - 1$ is a factor $\Rightarrow x - 1 = 0$

41. $\frac{x+2}{4} - \dots$
 $\frac{3x+6}{4} - \dots$
 $= 5x + 18 - 18 - 5x$
42. $X \propto \sqrt{n}$
 $k \sqrt{9} = 9$
 $n = 17$
 $x = 3 \frac{\sqrt{17}}{3}$
43. The series
 $a = 1$, $r = \frac{1}{2}$
44. $\frac{x}{r+a} = \dots$
 $r(x-a) = \dots$
45. $x^2 - 1/x = \dots$
 $2x - (-1)x = \dots$
46. $l = \dots$
 $\therefore l = \dots$
 $+ C = \dots$
 $+ C = A$

$$\begin{array}{r}
 (x-1) \quad \begin{array}{l} x^2 - 4x - 5 \\ x^2 - 5x^2 - x + 5 \\ x^2 - x \\ -4x^2 - x \\ -4x^2 + 4x \\ -5x + 5 \\ -5x - 5 \end{array} \\
 \hline
 \end{array}$$

$\therefore x^2 - 4x - 5$ is also a factor, $\Rightarrow x^2 + x - 5x - 5 = 0$,
 $(x^2 + x) - (5x + 5) = 0$, $x(x+1) - 5(x+1) = 0$, $(x+1)(x-5) = 0$, $\Rightarrow (x-1)(x+1)(x-5) = 0$, Either $x-1 = 0$, $x = 1$ or, $x+1 = 0$; $x = -1$ or $x-5 = 0$, $x = 5$, $x = 1, -1, 5$ Ans. D

40. $\begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix} = P$; $P^2 = \begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix}^2 = \begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix} \begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix}$

To solve this

$$\begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix} = \begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix} \begin{pmatrix} a_1 & b_1 \\ a_2 & b_2 \end{pmatrix}$$

$$a_1 = \begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix} \begin{pmatrix} 2 \\ -3 \end{pmatrix} = 4 - 3 = 1$$

$$b_1 = \begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} = 2 + 0 = 2$$

$$a_2 = \begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix} \begin{pmatrix} 2 \\ -3 \end{pmatrix} = -6 + 0 = -6$$

$$b_2 = \begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} = -3 + 0 = -3$$

$$\therefore P^2 = \begin{pmatrix} 1 & 2 \\ -6 & -3 \end{pmatrix}; 2P = 2 \begin{pmatrix} 2 & 1 \\ -3 & 0 \end{pmatrix} = \begin{pmatrix} 4 & 2 \\ -6 & 0 \end{pmatrix}$$

$$4I = 4 \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = \begin{pmatrix} 4 & 0 \\ 0 & 4 \end{pmatrix} = \text{identity matrix}$$

$$\therefore P^2 - 2P + 4I = \begin{pmatrix} 1 & 2 \\ -6 & -3 \end{pmatrix} - \begin{pmatrix} 4 & 2 \\ -6 & 0 \end{pmatrix} + \begin{pmatrix} 4 & 0 \\ 0 & 4 \end{pmatrix}$$

$$= \begin{pmatrix} -3 & 0 \\ 0 & -3 \end{pmatrix} + \begin{pmatrix} 4 & 0 \\ 0 & 4 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \text{ Ans. B}$$

41. $\frac{x+2}{4} - \frac{2x-3}{3} < 4$; $\frac{3(x+2) - 4(2x-3)}{12} < 4 =$
 $\frac{3x+6 - (8x-12)}{12} < 4$; $\frac{3x+6 - 8x+12}{12} < 4$

47. $r = 5\text{cm}$; Area of circle $= \pi r^2$; $\frac{dA}{dt} = 2\pi r$; when r increases with time; $\Rightarrow \frac{dr}{dt} = 0.2\text{ cm}^{-1}$; using chain rule $\frac{dA}{dt} = \frac{dA}{dr} \times \frac{dr}{dt}$ but; $\therefore \frac{dA}{dt} = 2\pi r = 2\pi(5) = 10\pi$; $\frac{dA}{dt} = 10\pi \times 0.2\text{ cm}^{-1} = 2\text{ cm}^{-1}$
 Ans. C

48. $\frac{dy}{dx} = 2x-3$; $dy = (2x-3)dx$; $y = \int dy = \int (2x-3)dx$; $y = \frac{2x^2}{2} - \frac{3x}{1} + C$;
 $y = x^2 - 3x + C$; when $y=3$, $3 = 0 - 0 + x$; $\therefore C = 3$; $\therefore y = x^2 - 3x + 3$ Ans. B

49. $y = \sin^2(5x)$; $\frac{dy}{dx} = \frac{d}{dx} \sin^2(5x)$; Put $u = 5x$
 $\frac{du}{dx} = 5$; $y = \sin^2 u$; $y = \sin u \sin u$;
 $\frac{dy}{dx} = \frac{d}{dx} (\sin u \sin u)$ from product rule
 $\sin u \cos u + \cos u \sin u$
 $= 2 \sin u \cos u$; Using chain rule $\therefore \frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$
 $= 2 \sin u \cos u \times 5$; since $u = 5x$ $\therefore \frac{dy}{dx} = 2 \sin 5x \cos 5x \times 5 = 10 \sin 5x \cos 5x$ Ans. C

50. $y = 3x^2 - 2x + 5$; the slope $= \frac{dy}{dx}$; $\Rightarrow \frac{dy}{dx} = 6x - 2$;
 $\frac{dy}{dx} \Big|_{x=1} = 6(1) - 2 = 4$; the slope = 4
 5x Ans. B

2003
JAMB MATHEMATICS
 Question Type: S

1. Simplify $1 - (2^{1/3} \times 1^{1/4}) + 3/5$
 A. $-2^{1/3}$ B. $-2^{1/12}$ C. $-1^{1/12}$ D. $-1^{1/3}$