Model Test Paper - I.

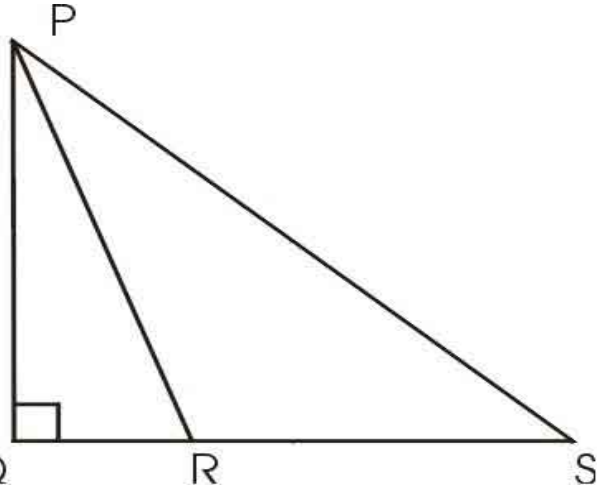
SECTION - A

Question 1 to 15 carry 2 marks each.

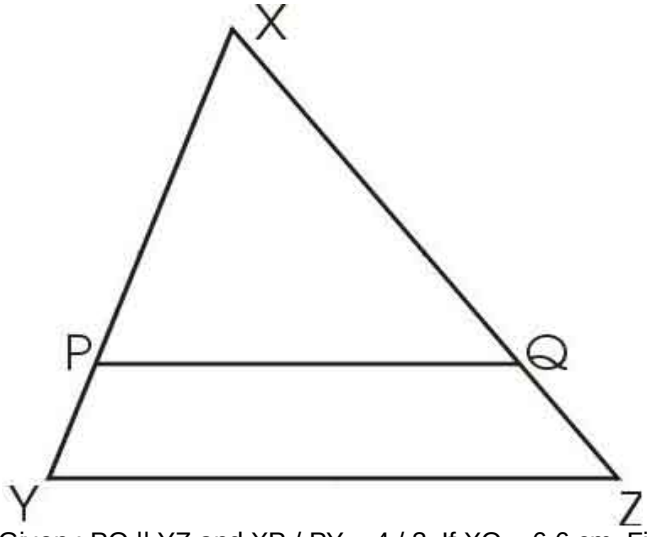
1. $3x + 2y = 6$;$(k + 1)x + 4y = (2k + 2)$
2. For what value of k, will the above system of equation have infinite solution.
3. Find the median of the prime numbers between 20 - 50.
4. Form a quadratic equation whose roots are 3 /2 and -5.
5. Prove that : $Sec^2A / \tan A - \tan A = Cot A$
6. Complete the tabel and find CDR.
7.

Age group	Population	Number of Deaths
0 -10	35650	310
10 - 20	37750	250
20 - 35	-	110
35 - 50	30450	-
above 50	20150	390
	1,40,000	1200

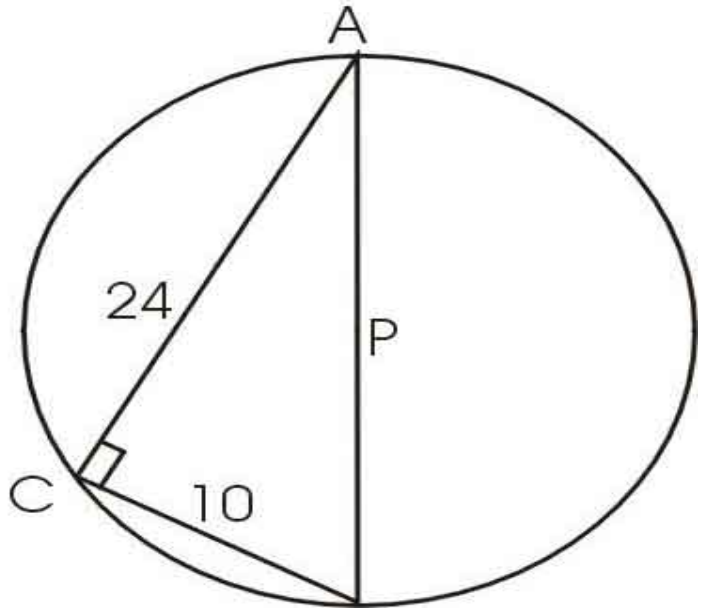
8.
9. Find the GCD of $x^2 - 4x - 12$; $x^3 + 8$
10. Find the value of (sin 44 / cos 46) + (sin 46 / cos 44) without using the trignometric
11. tables.



12. Given : $\angle PQS = \angle PQR = 90^0$ Show that $QS^2 + PR^2 = PS^2 + QR^2$



13. Given : PQ || YZ and XP / PY = 4 / 3. If XQ = 6.6 cm. Find QZ.
14. If $x^3 + y^3 / x^3 - y^3 = 91 / 37$. Show that x : y = 4 :3.
15. Aarti buys a saree costing Rs. 2500/- at Rs. 2700/- after paying sales tax.
16. Calculate the ratio of sales tax paid by her.
17. Find side of square whose diagonal is 12 cm.
18. Quadrilateral ABCD is a cyclic quadrilateral in which $\angle A = 2\angle C$.
19. Find $\angle A$.
20. If the mean of the following data is 14.5 Find the value of k.
21.
22. Marks obtained (x) 5 10 15 20 25
23. Number of student (y) 3 6 4 k 3



24. P is the centre of the circle. Seg AB is the diameter, BC = 10, AC = 24. Determine Radius.

SECTION - B

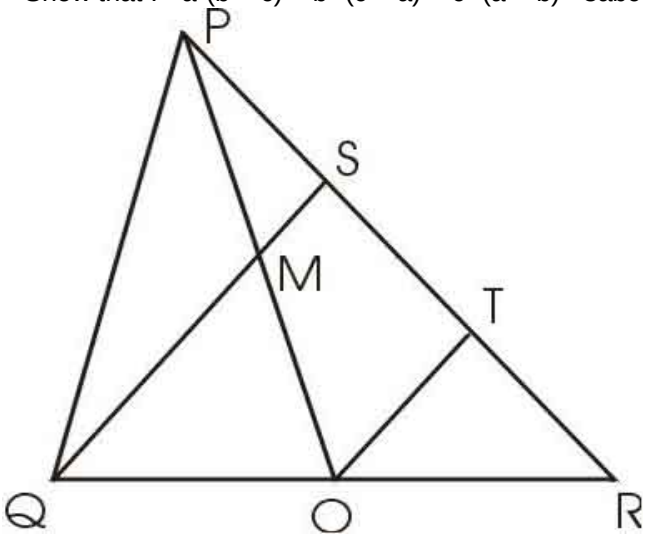
Question number 16 to 25 are of 4 marks each.

16. Calculate cost of living index from the following data :-
17.

Commodity	Quantity	Price in 1999	Price of 2000
P	5	4.20	6.00

R	4	5.00	8.50
A	3	8.00	10.50
G	7	9.00	11.50
S	8	12.50	16.00

18. If $Cos^2 45 + Sin\ 30 = 2\ Cos^2 A$, Find $Sec^2 A$.
19. Solve graphically $3x - y = 6$, $2x + y = 4$.
20. Show that : - $a^2(b + c) + b^2 (c + a) + c^2 (a + b) + 3abc = (a+b+c)(ab + bc + ca)$.



21. O is the midpoint of seg QR, M is the midpoint of seg OP, seg QS meets side PR at S and QS || OT. Show that PS = 1 / 3 PR.
22. The radius of a circle is less than twice the radius of the other by 1 cm.
23. The sum of their areas is 34 π sq cm. Find the radius of each circle.
24. Draw a circle with O as a centre and radius 4 cm. Take two points A and B on the
25. circle such that $\angle AOB = 80^0$. Draw tangents to the circle at the points A and B.
26. The radius and height of a solid right circular cylinder are 10 cm and 30 cm respectively.
27. It is melted and solid cones are prepared. If the diametre base of the cone is 2 cm and
28. its height is 10 cm. Find how many such cones are prepared from the whole metal of the cylinder.
29. Find the mean of the following frequency distribution.
30.

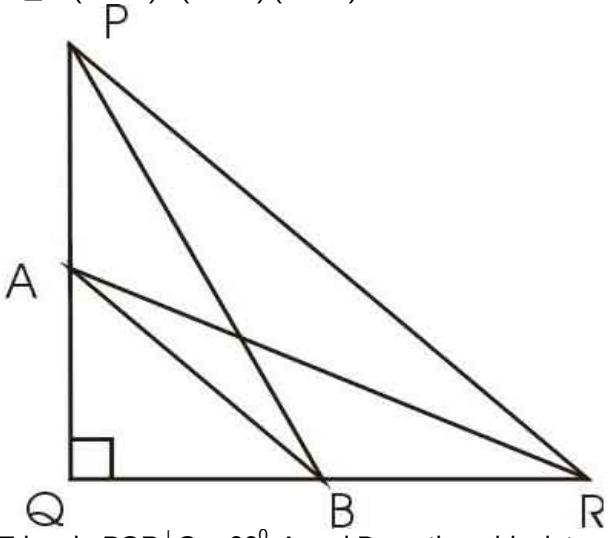
Class	Frequency
00 - 10	3
10 - 20	9
20 - 30	15
30 - 40	8
40 - 50	5

31.
32.
33. If a, b are the roots of the equation $4x^2 - 5x + 4 = 0$. Form the equation whose roots are a^2, b^2.
34.
35.

SECTION - C

Question 26 - 30 carry 6 marks each.

26. Sachin's Annual Income is Rs. 74,600/- (excluding House Rent Allowance).
27. His contribution to Provident Fund is Rs. 600 per month and he pays
28. Rs. 2,600 as LIC premium during the year.
29. Find the tax paid by him during the year.
30. a) Standard deduction = 1/3 of total income subject to maximum of Rs. 15,000.
31. b) Rate of Income tax for individual income
32. i) upto Rs. 35,000 --> No tax
33. ii) Rs. 35000 to Rs. 60,000 --> 20% of the amount exceeding 35,000
34. iii) Rs. 60,001 to Rs. 1,00,000 --> Rs. 5000 + 30% of the amount exceeding
35. Rs. 60,000
36. c) Rebate in tax - 20% of the saving to a maximum of Rs. 12000 whichever is less.
37. A vertical tower stands on a horizontal plane and is surmounted by a
38. vertical flagstaff the elevation of the bottom of the flagstaff is A and
39. that of the top of the flagstaff is B . Prove that the height of the tower
40. is h. tanA / tanB - tanA.
41. $\sum a (x - a) / (a - b) (a - c) = -1$. Prove that.



42. Triangle PQR $\angle Q = 90^0$, A and B are the midpoints of sides PQ and QR respectively. Prove that $4[RA^2 + PB^2] = 5PR^2$
43. In the circle radius 5 cm, AB and AC are two chords such that AB = AC = 6 cm.
44. Find the length of the chord BC.

ANSWERS:

Model Paper - 1

Answers

Section - A

1. $3x+2y=6$; $(k+1)x+4y=(2k+2)$.
2. Here, $a1 = 3$, $b1 = 2$, $c1 = 6$.
3. $a2 = k+1$, $b2 = 4$, $c2 = 2k+2$.
4. For a system of linear equations to have infinite solutions,
5. We must have $\frac{a1}{a2} = \frac{b1}{b2} = \frac{c1}{c2}$ Þ $\frac{3}{k+1} = \frac{2}{4} = \frac{6}{2k+2}$
6. $\therefore$ Taking $\frac{3}{k+1} = \frac{2}{4}$ & Taking $\frac{2}{4} = \frac{6}{2k+2}$
7. $\therefore$ $12 = 2k+2$ $\therefore$ $4k + 4 = 24$
8. $\therefore$ $2k = 10$ $\therefore$ $4k = 20$
9. $\therefore$ $k = 5$ $\therefore$ $k = 5$
10. $\therefore$ Ans is $k = 5$.
11. The Prime numbers from 20-50 are 23,29,31,37,41,43,47
12. As the number of terms is seven (odd)
13. $\therefore$ The median = $\frac{(7+1)^{th}}{2}$ term = $\frac{8^{th}}{2}$ term
14. = 4th term
15. median = 37 Ans.
16. Roots of the equation are3/2 & -5
17. $\therefore$ sum of the roots = $\frac{3}{2} + (-5)$
18. $= \frac{3}{2} - 5$
19. $= \frac{3 - 10}{2}$
20. $= \frac{-7}{2}$
21. Product of the roots = $\frac{3}{2} * (-5) = \frac{-15}{2}$
22. Equation x^2 - (sum of the roots) x + product of the roots = 0
23. $\therefore x^2 + \frac{7}{2} x - \frac{15}{2} = 0$
24. $\therefore 2x^2 + 7x - 15 = 0$ Ans.
25. L.H.S. = $\frac{\sec^2 A - \tan^2 A}{\tan A}$
26. $= \frac{\sec^2 A - \tan^2 A}{\tan A}$
27. $= \frac{1}{\tan A}$ [since $\sec^2 A - \tan^2 A = 1$]
28. $= \cot A$ [since $1/\tan A = \cot A$]
29. = R.H.S.

42.

Age Group	Population	Number of Deaths
0 -10	35650	310
10 - 20	37750	250
20 - 35	-	110
35 - 50	30450	-
above 50	20150	390
	1,40,000	1200

43.
44. Population of age group 20-35 = 1,40,000 - (35650+37750+30450+20150)
45. = 26000
46. No. of deaths of age group 35-50 = 1200 - (310+250+110+390)
47. = 140
48. C.D.R. = No of deaths * 1000
49. Total Population
50. = 1200 * 1000
51. 1,40,000
52. = 8.57 per thousand. Ans.
53. $x^2 - 4x - 12 = (x-6)(x+2)$
54. $x^3 + 8 = (x+2)(x^2-2x+4)$
55. ∴ G.C.D. = x+2.
56. $\frac{\sin 44°}{\cos 46°} + \frac{\sin 46°}{\cos 44°} = \frac{\sin(90 - 46°)}{\cos 46°} + \frac{\sin(90 - 44°)}{\cos 44°}$
57.
58. = cos46°/cos46° + cos44°/cos44° = 1 + 1 = 2.
59.
60.

61.
Given Þ ∠Q = 90° in Δ PQS
62. Prove that Þ $QS^2 + PR^2 = PS^2 + QR^2$
63. Proof Þ In Δ PQR
64. $PR^2 = PQ^2 + QR^2$ ..... (By Pythegorus theorem) (1)
65. ∴ QR.
66. In Δ PQS.
67. $PS^2 = PQ^2 + QS^2$ ..... (By pythegorus theorem)
68. ∴ $QS^2 = (- PQ^2 + PS^2)$ ..... (2)
69. ∴ (1) + (2)
70. $PR^2 + QS^2 = PQ^2 + QR^2 - PQ^2 + PS^2$
71. $PR^2 + QS^2 = QR^2 + PS^2$. ..... Hence Proved.

72.
73.

74.
Given Þ (1) PQ || YZ
75. (2) $\frac{XP}{PY} = \frac{4}{3}$
76.
77. (3) XQ = 6.6 cms.
78. Find Þ l (QZ)
79. Proof Þ since PQ || YZ. Then,
80. $\frac{XP}{PY} = \frac{XQ}{QZ}$
81.
82. $\therefore \frac{4}{3} = \frac{6.6}{QZ}$
83.
84. $\therefore QZ = \frac{6.6 * 3}{4}$
85.
86. $\therefore QZ = \frac{19.8}{4}$
87.
88. $l(QZ) = 4.95$ cms.
89. $\frac{x^3 + y^3}{x^3 - y^3} = \frac{91}{37}$ By componendo & dividendo
90.
91. $\frac{x^3+y^3 + x^3-y^3}{x^3+y^3 - x^3+y^3} = \frac{91+37}{91-37}$ $\therefore \frac{2x^3}{2y^3} = \frac{128}{54}$
92.
93. $\therefore \frac{x^3}{y^3} = \frac{128}{54}$ $\therefore \frac{x^3}{y^3} = \frac{64}{27}$ $\therefore \frac{x}{y} = \frac{4}{3}$ (Taking cube root on both sides)
94.
$\therefore x : y = 4:3$ Ans proved.
95. Sales tax (difference) = 2700-2500
96. = Rs. 200/-
97. $\therefore$ Rate of sales tax = $\frac{\text{Sales tax}}{\text{Cost price}} * 100$
98.
99. $= \frac{200}{2500} * 100$
100.
101. $= 8\%$
102.

103.
104. Given Þ (1) ABCD is a square
105. (2) l(AC) = 12 CM.
106. Find Þ Side of square
107. Proof Þ because ABCD is a square
108. AB = BC = CD = AD . .....(1)
109. $\angle A = \angle B = \angle C = \angle D = 90°$ .....(2)
110. $\therefore$ By Pythagorus theorem

$AC^2 = AD^2 + DC^2$

$(12)^2 = AD^2 + AD^2$ ..... from (1)

$144 = 2AD^2$

$\therefore AD^2 = 72$

$\therefore AD = 6\sqrt{2}$ cms. Ans

Given 1) ABCD is a cyclic quadrilateral

2) $\angle A = 2\angle C$

Find Þ $\angle A$

Proof Þ$\angle A+\angle B+\angle C+\angle D=360^0$

$\angle A+\angle C=180^0$ given (1)

$2\angle C+\angle C = 180^0$ given (2)

$3\angle C = 180^0$

$\angle C = 60^0$

$\therefore \angle A = 2\angle C$

$=2 * 60^0$

$= 120^0$ Ans.

x	f	fx
5	3	15
10	6	60
15	4	60
20	k	20k
255	3	75
Total	16 + k	210 + 20k

Mean = 14.5

$\text{Mean} = \frac{\sum f(x) .x.}{\sum f}$

$14.5 = \frac{260+20k}{16+k}$

$14.5k + 232 = 210 + 20k$

$\therefore 5.5k = 22$

$\therefore k = 4$ Ans

Given 1) AB --- diameter 2)P-centre

3)BC =10

143. 4)AC=24 5) $\angle C = 90^0$
144. Find Þ AP
145. Proof Þ In ΔABC $\angle C = 90^0$ given 5)
146. $\therefore AB^2 = AC^2 + BC^2$ ..... Pythagorous theoram
147. $\therefore AB^2 = (24)^2 + (10)^2$
148. $= 576 + 100$
149. $AB^2 = 676$
150. $\therefore AB = 26$
151.
152. AP= ½ AB ---- given 1) & 2)
153. =1/2 * 26
154. AP = 13 units Ans.

Section B

16.
17.

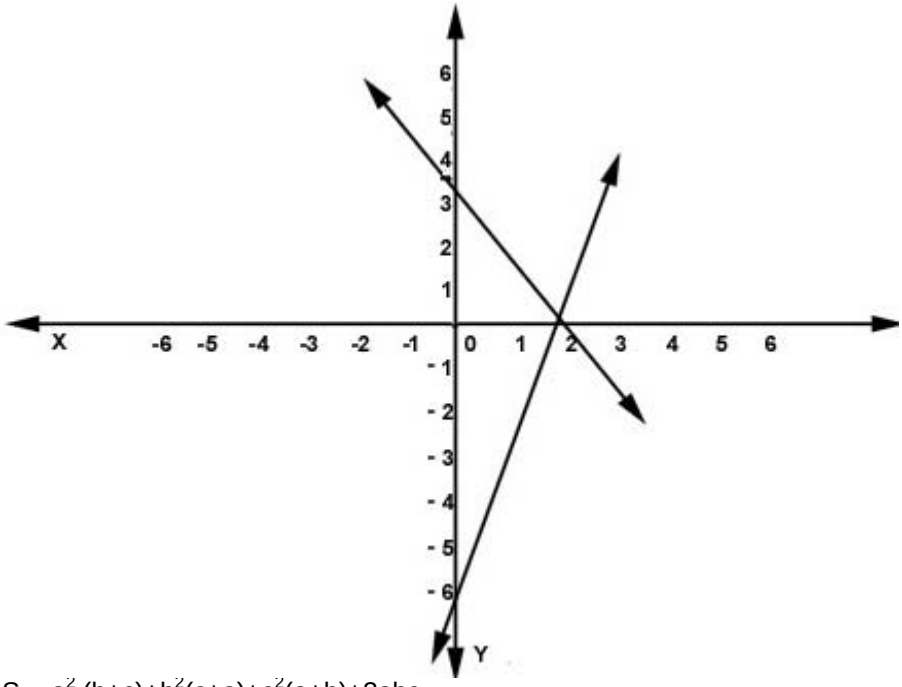
Commodity	Quantity(q_0)	Price in 1999(p_0)	Price of 2000 (p_1)	p_0q_0	p_1q_0
P	5	4.20	6.00	21	30
R	4	5.00	8.50	20	34
A	3	8.00	10.50	24	31.50
G	7	9.00	11.50	63	80.50
S	8	12.50	16.00	100	128
			Total :	228.00	304.00

18.
19. Cost of living index = $\frac{\sum p1q0}{\sum p0q0} * 100$
20.
21. $= \frac{304}{228} * 100$
22.
23. = 133.33 Ans.
24. $\text{Cos}^2 45 + \text{Sin } 30 = 2\text{Cos}^2 A$
25. $\therefore \frac{(1)^2}{(\sqrt{2})^2} + \frac{1}{2} = 2\text{Cos}^2 A$
26.
27. $\therefore \frac{1}{2} + \frac{1}{2} = 2\text{Cos}^2 A$
28.
29. $\therefore 2\cos^2 A = 1$
30. $\therefore \text{Cos}^2 A = \frac{1}{2}$
31.
32. because $\text{Cos } A = \frac{1}{\sqrt{2}}$
33.
34. because $\text{Cos } 45^0 = \frac{1}{\sqrt{2}}$
35.
36. because $A = 45^0$
37. $\therefore \text{Sec}^2 A = \text{Sec}^2 45^0 = (\sqrt{2})2$
38. = 2 Ans.
39. 3x-y = -6 2x+y =4
40.

41.

x	0	2	x	0	2
y	-6	0	y	4	0
(x,y)	(0,-6)	(2,0)	(x,y)	(0,4)	(2,0)

42.



43.

44. LHS = $a^2 (b+c)+b^2(c+a)+c^2(a+b)+3abc$

45. $= a^2b+a^2c+b^2c+ab^2+ac^2+bc^2+3abc$

46. $= a^2b+ab^2+a^2c+ac^2+b^2c+bc^2+3abc$

47. $= a^2b+ab^2+abc+a^2c+ac^2+abc+b^2c+bc^2+abc$

48. $= ab(a+b+c)+ac(a+b+c)+bc(b+c+a)$

49. $= (ab+ac+bc)\ (a+b+c)$

50. = R.H.S.

51.

52.

53. Given ∴ in ∆PQR

54. 1) O is midpoint of seg QR

55. 2) M is midpoint of Seg OP

56. 3) Seg QS meets side PR at S

57. 4) QS ||OT

58. Prove ∴ PS =1/3PR

59. Proof ∴ In ∆ POT

60. MS ||OT .....Given 4)

61. M is the midpoint of seg OP .....given 2)

62. ∴ S is the midpoint of seg PT -(A line is drawn through the midpoint of

63. one side and parallel to the second side bisects the third side)
64. $\therefore$ PS = ST I
65. In Δ SQR OT || QS .....given 4)
66. O is the midpoint of QR
67. $\therefore$ T is the midpoint of SR
68. $\therefore$ ST = TR II
69. $\therefore$ from I & II PS=ST=TR
70. But PS+ST+TR=PR
71. $\therefore$ PS+PS+PS=PR
72. $\therefore$ 3PS=PR $\therefore$ PS =1/3 PR is proved.
73. Let radius of smaller circle be x
74. $\therefore$ radius of larger circle = 2x-1
75. $\therefore$ Area of smaller circle = πx^2
76. Area of larger circle = $\pi(2x-1)^2$
77. $\therefore$ As per conditions given
78. $\pi x^2+\pi(2x-1)^2 = 34\ \pi$
79. $\pi[x^2+4x^2-4x+1]=34\pi$
80. $\therefore 5x^2-4x+1=34$
81. $\therefore 5x^2-4x-33=0$
82. $\therefore$ 5x2-15x+11x-33=0
83. $\therefore$ 5x(x-3)+11 (x-3)=0
84. $\therefore$ (x-3) (5x+11) =0
85. $\therefore$ x-3=0 & 5x+11=0
86. $\therefore$ x=3 & x = -11/5
87. because radius can not be -ve
88. $\therefore$ x = 3 Ans
23. For the right circular cyliner.
24. X =10cm & h=30 cm
25. $\therefore$ volume of the right circular cylinder = πr2
26. $=\pi * 10^2 * 30 = \pi$ x100 * 30cm^3
27. For the cone, radius (R) of the base = $\frac{\text{diameter}}{2} = \frac{2}{2}$ =1cm
28.
29. height (H) =10cm
30. \volume of each cone =$1/3\pi R^2H=1/3\pi*1^{2*}10 = \frac{10\pi}{3}$ cm^3
31.
32. Number of cones prepared from the cylinder
33. = $\frac{\text{volume of the cylinder}}{\text{volume of each cone}} = \frac{\pi x100*30}{10\pi/3}$
34.
35. $=\pi *100 * 30* 3/10\pi = 900$ Ans
36.
37.

Class	Frequency(f)	Mid - Interval (a)	f(a)
00 - 10	3	5	15
10 - 20	9	15	135
20 - 30	15	25	375
30 - 40	8	35	280
40 - 50	5	45	225
Total	40	125	1030

38.

39. Mean = $\frac{\sum f(x)}{\sum f} = \frac{1030}{40} = 25.75$ Ans

40.

41. a , b are roots of the equation

42. $\therefore a+b = 5/4$ & $ab = 4/4 = 1$

43. for new equation the roots are a^2, b^2.

44. $\therefore$ sum of the roots $= a^2+b^2 = (a+b)^2-2ab$

45. $= \frac{(5/4)^2}{} - 2(1)$

46.

47. $= \frac{25}{} - 2$

48. 16

49. $= \frac{25-32}{}$

50. 16

51. $= \frac{-7}{}$

52. 16

53. Product of the root $= a^2b^2 = (ab)^2$

54. $=(1)^2$

55. $= 1$

56. $\therefore$ The required equation is x^2-(sum of roots)x + Product of roots =0

57. $\therefore x^2+7x/16+1 = 0$

58. $\therefore 16x^2+7x+16=0$ Ans

Section C

26.

Total Annual Income	Rs.74,600/-
Standard deduction 1/3of Rs.74,600 or Rs. 10,000 whichever is less	(- Rs. 15,000)
Income after Std. Deduction	Rs.59,600/-
Income tax on Rs.35,000/-	NIL
Income tax on 24,600/- @ 20%	Rs.4920/-
Total income tax	Rs.4920/-
Savings for tax rebate	
P.F.600x12 = Rs.7200/-L.I.C. Rs.2600/-	
Total Savings Rs.9800/-	
Rebate in tax @ 20%	(-) Rs.1960/-
Income tax payable Ans.	Rs.2960/-

27.

28.

29.

30. Let QR = Tower, SR = H, RS=Flagstaff
31. P is any point on the plane
32. $\angle RPQ = A^0$ & $\angle SPQ = B^0$
33. From Δ ABC
34. Tan A = $\frac{QR}{PQ}$
36. In Δ ABD
37. Tan B = $\frac{QS}{PQ} = \frac{RQ+h}{PQ}$
39. $\frac{\text{Tan B}}{\text{Tan A}} = \frac{RQ+h}{QR}$
41. $\therefore$ QR . Tan B = (RQ+h) tan A
42. $\therefore$ QR. tan B = RQ. tan A +h . tan A
43. $\therefore$ h. tan A = QR tan A-QR tan B
44. $\therefore$ h. tan A = QR(tan A-tan B)
45. $\therefore$ QR = $\frac{h.\ \tan A}{\tan A-\tan B}$
46. $\frac{a\,(x-a)}{}$
47. $\sum \frac{}{(a-b)\,(a-c)}$
48. = $\frac{a\,(x-a)}{(a-b)\,(a-c)} + \frac{b(x-b)}{(b-c)\,(b-a)} + \frac{c\,(x-c)}{(c-a)\,(c-b)}$
50. = $\frac{-a\,(x-a)(b-c) -b\,(x-b)\,(c-a) -c\,(x-c)\,(a-b)}{(a-b)\,(b-c)\,(c-a)}$
52. = $\frac{-a\,(\,bx - cx - ab + ac) -b\,(\,cx -ax- bc + ab\,) -c\,(ax - bx -ac +bc)}{(a-b)\,(b-c)\,(c-a)}$
54. = $\frac{a^2b- a^2c+b^2c-ab^2+ac^2-bc^2}{(a-b)\,(b-c)\,(c-a)}$
56. = $\frac{a^2(b-c) +bc\,(b-c)-a^2(b^2-c^2)}{(a-b)\,(b-c)\,(c-a)}$
58. = $\frac{(b-c)\,[a^2+bc-a\,(b+c)]}{(a-b)\,(b-c)\,(c-a)}$
60. = $\frac{a2+bc-ab-ac}{(a-b)\,(c-a)}$
62. = $\frac{a(a-c)-b(a-c)}{(a-b)\ (c-a)}$

= $\frac{\cancel{(a-b)}\ (a-c)}{\cancel{(a-b)}\ (c-a)}$

64. = $\frac{-(c-a)}{(c-a)}$
66. = -1 Ans.
67. Given 1) $\angle Q=90^0$; 2) A & B are midpoints of PQ & QR respectively.
68. $PB^2 = PQ^2+QB^2$

Prove Þ $4\,(RA^2+PB^2) = 5(PR)^2$

Proof Þ In ∆ AQR

$AR^2=AQ^2+QR^2$ .....1)

In ∆ PQB

$PB^2=PQ^2+QB^2$ .....2)

by adding 1 & 2

$AR^2+PB^2=AQ^2+QR^2+PQ^2+QB^2$ ..... 3)

In ∆ PQR & ∆ AQB

$PR^2=PQ^2+QR^2$ & $AB^2 = AQ^2+QB^2$.....4)

∴ $AR^2+PB^2=PR^2+AB^2$ By substituting 3 Þ 4

A & B are midpoints of PQ & QR respectively.

∴ $AB = ½ PR^2$

∴ $AR^2+PB^2 = PR^2+(1/2PR)$ ..... Substituting in 4

∴ $AR^2+PB^2 = PR^2+1/4PR^2$

∴ $4(AR^2+PB^2) = 4PR^2+PR^2$

$\underline{4 (AR^2+PB^2) = 5PR^2 \text{ Ans.}}$

69.

70.

In right ∆ APC OP = 5-y

71.

72. $y^2 = 62-x^2$
73. $y^2 = 36-x^2$

$x^2 = 36-y^2$ .....(I)

In right Δ OPC,

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

$x^2 + 25 - 10y + y^2 = 25$

$x^2 - 10y - y^2$ .....(II)

From (I) & (II)

$10y - \cancel{y^2} = 36 - \cancel{y^2}$

$10y = 36$

$y = 3.6$

Substituting y = 3.6 in (I) we get

$x^2 = 36 - (3.6)^2$

$x^2 = 36 - 12.96$

x2 = 23.04

$x = \sqrt{23.04}$

x = 4.8

BC = 2x = 2*4.8 = 9.6 cm Ans.