J.K. SHAH TEST SERIES
Evaluate Learn Succeed

CPT – DEC. 2015

Test Code – C D J 5 1 7 8

(100 Marks)

Que. No.	Answer	Solution
1.	D	Let the first instalment be a, and the common difference is $d = 10$ The sum of 30 instalments is 6240. $s_{30} = 6240$ In an AP, $S_n = \frac{n}{2}[2a + (n-1)d]$ $6240 = \frac{30}{2}[2a + (30-1)10]$ $\frac{6240\times2}{30} = 2a + 290$ $2a = 416 - 290$ $2a = 126$ $a = 63$ The first instalment of ₹63
2.	C	$a = 80$, $d = -5$ $s_n = \frac{n}{2}[2a + (n-1)d]$ $\therefore S_{20} = \frac{20}{2}[2\times80+(20-1)(-5)]$ $= 10\,[160 - 19 \times 5]$ $= 10\,[160 - 95]$ $= 10 \times 65$ $= 650$
3.	C	Lets consider two O's to be one letter ∴ Total No. of letter is 5 No. of arrangement when both O's together = 5! =120 ∴ Total No. of arrangement = $\frac{6!}{2!}$ = 360 ∴ No. of ways when O's are not together = 360 – 120 = 240
4.	A	3 $S = 2n + 1$ $\therefore {}^{2n+1}C_1 + {}^{2n+1}C_2 + {}^{2n+1}C_3 + \ldots\ldots\ldots + {}^{2n+1}C_n = 63$ $\therefore {}^{2n+1}C_0 + {}^{2n+1}C_1 + {}^{2n+1}C_2 + \ldots\ldots\ldots + {}^{2n+1}C_{2n-1} + {}^{2n+1}C_{2n} + {}^{2n+1}C_{2n+1} = 2^{2n+1}$ $\therefore {}^{2n+1}C_{2n+1} = {}^{2n+1}C_0$ $= 1$ $\therefore {}^{2n+1}C_{2n} = {}^{2n+1}C_1$ Hence $2 + 2 \times 63 = 2^{2n+1}$ Or, $2^{2n+1} = 128 = 2^7$ $2n + 1 = 7$ $2n = 6$ $n = 3$
5.	C	$\log_a e . \frac{1}{x}$ $y = \log_a x$

		$= \dfrac{\log_e x}{\log_e a}$ $\therefore \dfrac{dy}{dx} = \dfrac{1}{\log_e a} . \dfrac{d}{dx}\left(\dfrac{1}{x}\right) = \log_a e . \dfrac{1}{x}$
6.	B	$x^4 + x^3 + x^2 + x + c$ $\int(4x^3 + 3x^2 + 2x + 1)dx = \frac{4x^4}{4} + \frac{3x^3}{3} + \frac{2x^2}{2} + x + c \ = x^4 + x^3 + x^2 + x + c$
7.	D	Let the price of 1 radio be ₹ x and television be ₹ y Then, 6x + 4y = 18,480 ………………(1) 14x + 2y = 18,480 ………………(2) Solving (1) & (2) simultaneously : 6x + 4y = 18,480 28x + 4y = 36,960 $\underline{(-) \quad (-) \quad (-)}$ $-22x = -18{,}480$ x = 840 When, x = 840, 6 × 840 + 4y = 18,480 4y = 18,480 – 5040 y $= \frac{13{,}440}{4}$ = 3360
8.	C	Let $\sqrt{\sqrt{6 + \sqrt{6}} + \sqrt{6 \ldots\ldots\ldots \infty}}$ = y . ………………(1) On squaring both sides, we get 6+$\sqrt{\sqrt{6 + \sqrt{6}} + \sqrt{6 \ldots\ldots\ldots \infty}} = y^2$ 6 + y = y^2 [From(1)] y^2 − y − 6 = 0 y^2 − 3y + 2y − 6 = 0 y (y – 3) + 2(y – 3) = 0 (y + 2) (y – 3) = 0 y = -2, 3 y = -2 is not possible, therefore y = 3
9.	B	Let the numbers be x and x + 2 $x^2 + (x+2)^2 = 34$ $\Rightarrow x^2 + x^2 + 4x + 4 - 34 = 0$ $\Rightarrow 2x^2 + 4x - 30 = 0$ $\Rightarrow x^2 + 2x - 15 = 0$ $\Rightarrow (x+5)(x-3) = 0$ Therefore $x = -5, 3$ Since the numbers are positive, therefore $x = 3$ and $x + 2 = 5$.
10.	C	Here $a = 7, r = -2/7$ $\therefore S_\infty = \frac{a}{1-r} = \frac{7}{1-(-2/7)} = \frac{7}{1+\frac{2}{7}} = \frac{7}{\frac{(7+2)}{7}} = \frac{49}{9}$
11.	B	It is GP with $a = 1$ and $r = 3$, $S_n = 364$ $S_n = \frac{a(r^n - 1)}{r-1}$ $\Longrightarrow 364 = \frac{1(3^n - 1)}{3-1}$ $\Longrightarrow 364 \times 2 = 3^n - 1$ $\Longrightarrow 3^n - 1 = 728$ $\Longrightarrow 3^n = 729$

		$\Rightarrow 3^n = 3^6$ $\Rightarrow n = 6$
12.	C	34 $\lim_{x\to 3} \frac{x + x^2 + x^3 - 39}{x-3} = \frac{0}{0}$ $= \lim_{x\to 3} \frac{1+2x+3x^2}{1} = 1 + 6 + 27 = 34$
13.	D	$\lim_{x\to 0} \left(1 + \frac{4x}{3}\right)^{5/x}$ $= \left[\lim_{x\to 0} \left(1 + \frac{4x}{3}\right)^{1/x}\right]^5$ $= (e^{4/3})^5 = e^{20/3}$
14.	B	Mean $\overline{x} = \frac{\sum x}{N}$ In correct $\sum x = N\overline{x}$ $= 50 \times 5{,}850$ $= 2{,}92{,}500$ Correct $\sum x$ = in correct $\sum x$ + Right value – wrong value = 2,92,500 + 7,800 – 8,000 = 2,92,500 – 200 = 2,92,300 Correct mean $= \frac{\text{Correct} \sum x}{N}$ $= \frac{2{,}92{,}300}{50}$ = 5,846
15.	B	17.75 $\overline{X} = \frac{\sum X}{N}$ $\sum X = \overline{X}.N$ $18 = \frac{\sum X}{7}$ $\sum X = 126$ When New observation is Added $\sum X = 126 + 16 = 142$ $\overline{X} = \frac{\sum X}{N}$ $= \frac{142}{8}$ = 17.75 New $\overline{X}$ = 17.75
16.	B	11.5 $\overline{X}_{12} = 11.0$ $N_{12} = 12$ $\overline{X}_1 = 10.5$ $N_1 = 6$ $\overline{X}_2 = ?$ $N_2 = 6$ $\bar{x}_{12} = \frac{N_1.\overline{X}_1 + N_2.\overline{X}_2}{N_1 + N_2}$ $11.0 = \frac{6\times 10.5 + 6\times \overline{X_2}}{6+6}$ $11.0 = \frac{63 + 6\times \overline{X}_2}{12}$ $132 = 63 + 6.\overline{X_2}$

		132 – 63 = 6. $\bar{X}2$ 69 = 6. $\bar{X}_2$ $\bar{X}_2 = 11.5$ Average of last six Numbers = 11.5
17.	C	Coincident As the value of r increase numerically from 0 to 1, the angle between regression equations decreases from 90^0 to 0^0. In other words, the farther the two regression lines are from each other, the lesser is the degree of correlation (i.e. approaching – 1) and nearer the two regression lines are to each other, the higher is the degree of correlation(i.e. approaching + 1) The above explanation clarifies if r = 1. The two lines of regressions are coincident.
18.	B	0.28 Cov (x, y) = 8.4 Var(x) = 25 S.D.(σx) = $\sqrt{25} = 5$ Var(y) = 36 S.D. of y (σy) = $\sqrt{36} = 6$ Karl Pearson's Coefficient of Correlation R = $\frac{Cov(x,y)}{\sigma x \,.\, \sigma y}$ R = $\frac{8.4}{5 \times 6}$ r = $\frac{8.4}{30}$ R = 0.28
19.	C	1 / 36 The equiprobable sample space of the experiment consists $6 \times 6 \times 6$ sample points Event A = same number appears on each of the three die. $= \{(1,1,1)\ (2,2,2)(3,3,3)\ (4,4,4)\ (5,5,5)\ (6,6,6)\}$ i.e. $n(A) = 6$ Hence, the required probability $= \frac{6}{6 \times 6 \times 6} = \frac{1}{36}$
20.	B	Exhaustive
21.	B	A ratio
22.	C	Let the number of boys and girls be x and 2x respectively. Number of those who do not get scholarship $= (80\%\ of\ 3x) + (75\%\ of\ 2x)$ $= \left(\frac{80}{100} \times 3x\right) + \left(\frac{75}{100} \times 2x\right) = \frac{39x}{10}$ Required percentage $= \left(\frac{39x}{10} \times \frac{1}{5x} \times 100\right)\% = 78\%$
23.	A	Let the original number of seats in Mathematics, Physics and Biology be 5x, 7x and 8x respectively. Number of increased seats are : (140% of 5x), (150% of 7x and (175% of 8x) i.e., $\left(\frac{140}{100} \times 5x\right), \left(\frac{150}{100} \times 7x\right)$ and $\left(\frac{175}{100} \times 8x\right)$ or $7x, \frac{21x}{2}$ and $14x$. Required Ratio $= 7x : \frac{21x}{2} : 14x = 14x : 21x : 28x = 2 : 3 : 4$
24.	C	16,4,8 Let the number of Re. 1, 50p. and 25p. coins be 4x, x and 2x respectively

		Therefore the amount will be $4x \times 1 + x \times 0.5 + 2x \times 0.25 = 20$ $\Rightarrow 4x + 0.5x + 0.5x = 20$ $\Rightarrow 5x = 20$ $\Rightarrow x = 4$ The number of Re. 1, 50p. and 25p. coins are 16, 4, 8.
25.	C	$^{16}C_9$ 2 are already selected So, there are only 9 4 are excluded & 2 are selected ∴ total 22 – 4 – 2 = 16 No. of ways is $16C_9$
26.	B	18 No. of matches played = nC_2 = 153 $\frac{n(n-1)}{2}$ = 153 n^2 – n = 153 × 2 n^2 – n = 305 n^2 – n – 306 = 0 (n – 18) (n + 17) n = 18 , n = -17 n = -17 is negative ∴ n = 18
27.	B	$\lim_{x\to 0} \frac{5^x+3^x-2^x-1}{x} = \frac{0}{0}$ form $= \lim_{x\to 0} \frac{5^x \log 5+3^x \log 3-2^x \log 2}{1}$ $= \log 5 + \log 3 - \log 2$ $= \log 15 - \log 2 = \log 15/2$
28.	B	$\frac{(x-1)(2x-3)}{x^2} = \lim_{x\to\infty} \frac{x-1}{x} \times \frac{(2x+3)}{x} = \lim_{x\to\infty} \left(1 - \frac{1}{x}\right) \lim_{x\to\infty} \left(2 + \frac{3}{x}\right) = 2$
29.	A	R = ? n = 2 A = $P(1 + R)^n$ 1348.32 = $1200(1 + R)^2$ $\frac{1348.32}{1200}$ = $(1 + R)^2$ 1.1236 = $(1 + R)^2$ $(1.06)^2$ = $(1 + R)^2$ R = 0.06 = 6%
30.	A	R = $\frac{20}{4}$ = 5 = 0.05 N = 4 × $\frac{1}{2}$ = 2 A = $P(1 + R)^n$ = $2000\ (1 + 0.05)^2$ = $2000 \times (1.05)^2$

		$= 2000 \times 1.1025$ $= 2205$
31.	B	₹1.50 S.I. $= \frac{600\times10\times1}{100} =$ ₹60 C.I. $= 600\left[\left(1+\frac{10}{100\times2}\right)^{2\times1}-1\right] = 600\left[\left(\frac{21}{20}\right)^{2}-1\right] = \frac{600\times41}{20\times20} =$ ₹61.50 Difference between C.I. and S.I = ₹(61.50 – 60) = ₹1.50
32.	C	An individual series is a particular case of discrete series
33.	A	Pie-chart
34.	D	Sum of components $= 12 + 20 + 35 + 23 = 90$ Central angle for the largest component $= \frac{35}{90} \times 360 = 140°$ Central angle for the smallest component $= \frac{12}{90} \times 360 = 48°$ Central angle differential between the largest and smallest component $= 140° - 48° = \mathbf{92}°$
35.	B	Dom = real numbers, Ran = positive real numbers
36.	C	We know that $1^2 + 2^3 + 3^3 + 4^3 + \ldots n^3 = \left[\frac{n(n+1)}{2}\right]$ $1^2 + 2^3 + 3^3 + 4^3 + \ldots 20^3 = \left[\frac{20(20+1)}{2}\right]^2$ $= (10 \times 21)^2$ $= (210)^2$ $= 44100$
37.	B	Let the 1st term be a and common ratio be r. $\therefore a_4 = x \implies ar^3 = x$ $a_{10} = y \implies ar^9 = y$ $a_{16} = z \implies ar^{15} = z$ $\therefore$ xz $= (ar^3)(ar^{15})$ $= a^2r^{18}$ $= (ar^9)^2$ $= y^2$
38.	A	1
39.	C	2 $\lim\limits_{x\to1}\left[\frac{x}{x-1} - \frac{1}{x^2-x}\right] = \lim\limits_{x\to1}\left[\frac{x^2-1}{x(x-1)}\right].$ $= \lim\limits_{x\to1}\left[\frac{(x-1)(x+1)}{x(x-1)}\right] = \lim\limits_{x\to1}\frac{x+1}{x} = \frac{2}{1} = 2$
40.	B	0.92 P(A) = 80% = 0.8 P(B) = 60% = 0.6 P(A∪B) = P(A) + P(B) – P(A∩B) = 0.8 + 0.6 – (0.8× 0.6) = 0.14 – 0.48 = 0.92
41.	D	0.875 Event X: Part A is free defect and Event Y: Part B is free from defect P(X)= 1 - 0.08 = 0.92 P(Y) = 1 – 0.05 = 0.95

		The two events X and y are independent as part A having no defects or otherwise does not influence on part B's being defective or otherwise. P(X∩ Y) = P(X), P(Y) = 0.92 × 0.95 = 0.874
42.	D	mutually exclusive, exhaustive and equally likely cases.
43.	A	0 Log $\frac{a^2}{bc} + \log \frac{b^2}{ca} + log\, \frac{c^2}{ab}$ = log $\left(\frac{a^2}{bc} \times \frac{b^2}{ca} \times \frac{c^2}{ab}\right)$ using log $_a$ (mn) = log $_a$ m+ $\log_a n$ = log $\left(\frac{a^2b^2c^2}{a^2b^2c^2}\right)$ = log 1 = 0.
44.	B	$x = 3^{1/3} + 3^{-1/3}$ $x^3 = \left(3^{1/3} + 3^{-1/3}\right)^3$ $x^3 = 3 + 3^{-1} + 3 \times 3^{1/3} \times 3^{-1/3} \times (3^{1/3} + 3^{-1/3})$ $x^3 = 3 + \frac{1}{3} + 3 \times \left(3^{1/3} + 3^{-1/3}\right)$ $x^3 = \frac{10}{3} + 3x$ $\left(\therefore\ 3^{1/3} + 3^{-1/3} = x\right)$ $3x^3 = 10 + 9x$ $3x^3 - 9x = 10$
45.	C	$1 - 3\log_7 2$ $\sqrt{7\left(\sqrt{7\sqrt{7}}\right)} = \sqrt{7 \times 7^{\frac{1}{2}+\frac{1}{4}}} = \sqrt{7^{\frac{7}{4}}} = 7^{\frac{7}{8}}$ $\log_7 \sqrt{7\left(\sqrt{7\sqrt{7}}\right)} = 7/8$ $\log_7 log\, 7\sqrt{7\left(\sqrt{7\sqrt{7}}\right)} = \log_7 \frac{7}{8} = \log_7 7 - \log_7 8 = 1 - 3\log_7 2$
46.	B	0.06 n = 16 r = 0.8 probable error of r : p.e. = 0.6745($\frac{1-y^2}{\sqrt{N}}$) = 0.6745($\frac{1-(0.8)^2}{\sqrt{16}}$) = 0.6745($\frac{1-0.64}{4}$) = 0.6745 * $\frac{0.36}{4}$ = 0.06
47.	C	Four time of b_{yx} U = $\frac{x}{2} \Rightarrow c_x = 2$ V = 2y ⇒ $c_y = \frac{1}{2}$ Bvu = $\frac{c_x}{c_y} b_{yx}$ = $\frac{2}{1/2} b_{yx}$ = 4 b_{yx} = four times b_{yx}
48.	B	144 In the word 'ARTICLE' Total Vowels = A, I, E (3) Total consonant = R, T, C, L (4) O ***E*** O ***E*** O ***E*** O No of ways = ${}^3p_3 \times 4$! = 3 ! × 4 !

		$= 6 \times 24$ $= 144$
49.	C	371 The committee of 6 members is to include at least 2 girls. This can be constituted as follows : (i) 4 **boys** and 2 **girls**, it can be done is ${}^7C_4 \times {}^4C_2$ ways (ii) 3 **boys** and 3 **girls**, it can be done is ${}^7C_3 \times {}^4C_3$ ways (iii) 2 **boys** and 4 **girls**, it can be done is ${}^7C_2 \times {}^4C_4$ ways Thus, the total number of ways of selecting the committee $= {}^7C_4 \times {}^4C_2 + {}^7C_3 \times {}^4C_3 + {}^7C_2 \times {}^4C_4$ $= \frac{7!}{4!\times3!} \times \frac{4!}{2!\times2!} + \frac{7!}{3!\times4!} \times \frac{4!}{3!\times1!} + \frac{7!}{2!\times5!} \times \frac{4!}{4!\times0!}$ $= 35 \times 6 + 35 \times 4 + 21 \times 1$ $= 371$
50.	C	$\frac{17}{2}$ $\int_1^2 (3x+4)dx =$ $\int_1^2 (3x+4)dx = \left[\frac{(3x+4)^2}{6}\right]_1^2$ $= \left[\frac{(3.2+4)^2}{6}\right] - \left[\frac{(3.1+4)^2}{6}\right]$ $= \left[\frac{10^2}{6}\right] - \left[\frac{7^2}{6}\right]$ $= \frac{100-49}{6}$ $= \frac{51}{6}$ $= \frac{17}{2}$
51.	C	$\frac{(3x+5)^5}{15} - \frac{(5-3x)^8}{24} + c$ Let $I = \int[(3x+5)^4 + (5-3x)^7]dx$ $\int(3x+5)^4\,dx + \int(5-3x)^7\,dx$ $= \frac{(3x+5)^5}{15} - \frac{(5-3x)^8}{24} + C$
52.	A	∴ the numbers are divisible by both 3 & 7 ∴ they should be divisible by 21 ∴ The numbers between 200 and 400 are 210, 231, 252, ………. 399. Here a = 210, d = 21, $a_n = 399$. $\therefore a_n = a + (n-1)d$ $\Rightarrow 399 = 210 + (n-1)21$ $\Rightarrow 21\,(n-1) = 189$ $\Rightarrow n - 1 = \frac{189}{21} = 9$ $\Rightarrow n = 10.$ $\therefore\ s_n = \frac{n}{2}[a + a_n]$ $= \frac{10}{2}\,[210 + 399] = 5 \times 609$ $= 3045$
53.	B	5, 9, 13, 17 $S_n = 2n^2 + 3n$ $\therefore S_1 = a_1 = 2 + 3 = 5$

		$S_2 = a_1 + a_2 = 2.2^2 + 3 \times 2$ $= 8 + 6$ $= 14$ $\Rightarrow 5 + a_2 = 14$ $\Rightarrow a_2 = 9$ $\therefore d = a_2 - a_1 = 9 - 5 = 4$ ∴ the series is 5, 9, 13, 17 Shortcut In an AP if $S_n = An^2 + Bn$ Then a = A+B & d = 2A ∴ Here a = 2 + 3 = 5 And d = 2 ×2 = 4 ∴ the series is 5, 9, 13, 17.
54.	D	The regression equation of y of x is: $y - \overline{y} = by\ x\ (x - \overline{x})$ $y - 27.9 = (-1.5)\ (x - 53.2)$ Or $y = 107.7 - 1.5x$ When $x = 60$ then $y = 107.7 - 1.5\ \times 60 = 17.7$
55.	D	$r = \frac{\sum xy - \frac{(\sum x) \times (\sum y)}{N}}{\sqrt{\sum x^2 - \frac{(\sum x)^2}{N}} \sqrt{\sum y^2 - \frac{(\sum y)^2}{N}}}$ $= \frac{120 - \frac{75 \times 80}{50}}{\sqrt{130 - \frac{(75)^2}{50}} \sqrt{140 - \frac{(80)^2}{50}}} = 0$
56.	C	e $\lim_{x \to 0} \left(\frac{2+x}{2-x}\right)^{1/x}$ $= \lim_{x \to 0} \frac{\left(1 + \frac{1}{2}x\right)^{1/x}}{\left(1 - \frac{1}{2}x\right)^{1/x}}$ $= \frac{e^{1/2}}{e^{-1/2}} = e^{\frac{1}{2} + \frac{1}{2}}$ $= \boldsymbol{e}$
57.	D	$L = \lim_{x \to 2} \frac{x^2 - 5x + 6}{x^2 - 4}$ $= \frac{4 - 10 + 6}{4 - 4} = \frac{0}{0}$ from Applying L's Hospital rule $L = \lim_{x \to 2} \frac{2x - 5}{2x} = \frac{4 - 5}{4} = -\frac{1}{4}$
58.	B	Let x, y be the two numbers, then their A.M. = $\frac{x+y}{x}$ = 6.5 ⟹ x + y = 13 …(1) G.M. = $\sqrt{xy}$ = 6 ⟹ xy = 36 Now (x – y) = $\sqrt{(x+y)^2 - 4xy}$ = $\sqrt{169 - 144}$ = 5 …(2) From (1) and (2), we get: x=9, y=4

59.	A	Mean = 3.57 Mode = 2.13 As per empirical formula, Mode = 3 Median – 2 Mean 2.13 = 3 Me – 2 × 3.57 2.13 = 3 Me – 7.14 3 Me = 2.13 + 7.14 3 Me = 9.27 Me = $\frac{9.27}{3}$ = 3.09 ∴ Median = 3.09
60.	C	The sample space S is given by, $S = \{HHT, HHT, HTH, HTT, THH, THT, TTH, TTT\}$ The number of sample points = $n(S) = 8$ Let A be the event that of getting at mot one head, i.e., one head or no head (all tails) $A = \{HTT, THT, TTH, TTT\}$ $\therefore n(A) = 4 \;\; P(A) = \frac{n(A)}{n(S)} = \frac{4}{8} = \frac{1}{2}$ Let B be the event that of getting two consecutive heads $B = \{THH, HHT\}$ $P(B) = \frac{n(A)}{n(S)} = \frac{2}{8} = \mathbf{\frac{1}{4}}$
61.	A	Let X be a variable which takes the values a and b, with probability p and q respectively a =₹ 300, b =₹ 80, p = 0.57, q = 0.43, The expectation is: $E(X) = (a \times p) + (-b)\, q$ $\therefore E(X) = (300 \times 0.57) + (80 \times 0.43)$ =₹ (171 – 34.4) = 136.6
62.	B	The units of the variables are different
63.	D	Produce an outcome which is neither certain nor impossible
64.	A	4 We have $\frac{^{2n+1}P_{n-1}}{^{2n-1}P_n} = \frac{3}{5}$ $\Rightarrow 5.\ ^{2n+1}P_{n-1} = 3.\ ^{2n-1}P_n$ $\Rightarrow \frac{5.(2n+1)!}{(n+2)!} = \frac{3(2n-1)!}{(n-1)!}$ $\Rightarrow \frac{5.(2n+1)(2n)(2n-1)!}{(n+2)(n+1)n(n+1)!} = \frac{3(2n-1)!}{(n-1)!}$ $\Rightarrow 10(2n+1) = 3(n+2)(n+1)$ $\Rightarrow 3n^2 - 11n - 4 = 0 \Rightarrow n = 4$
65.	C	100 The selection may have, 1 girl and 6 boys = $^4C_1 \times {}^6C_6$ = 4 Or 2 girls and 5 boys = $^4C_2 \times {}^6C_5$ = 36 Or 3 girls and 4 boys = $^4C_3 \times {}^6C_4$ = 60 Hence total number of ways is 60 + 36 + 4 = 100.
66.	C	$\frac{x^2}{2} + 2.x + log\|x\|$

		$\frac{x^2}{2} + 2.x + log\|x\| + c$ Let I $\int \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right)^2$ dx = $\int \left(x + 2 + \frac{1}{x}\right) dx$ = $\int xdx + 2\int dx + \int \frac{1}{x} dx$ = $\frac{x^2}{2} + 2.x + log\|x\| + c$
67.	C	X+8y=18 The equation of the straight line passing through the points (2,2) and (-6,3) is given by two point form (y – y,) = $\left(\frac{y_2 - y_1}{x_2 - x_1}\right)$ (x – x_1) ⇒ (y – 2) = $\left(\frac{3-2}{-6-2}\right)$ (x-2) ⇒ (y -2) $\left(\frac{1}{-8}\right)$ (x-2) ⇒ −8y + 16 = x – 2 ⇒ x + 8y = 18
68.	A	(-1, 1) X^3+x^2-x-1=0 Or, $x^3 - x^2 + 2x^2 - 2x + x - 1 = 0$ Or, $x^2 (x - 1) + 2x (x - 1) + (x - 1) = 0$ Or, $(x - 1) (x^2 + 2x + 1) = 0$ Or, $(x - 1) (x + 1)^2 = 0$ Therefore, x = 1, -1
69.	A	If $y = a + bx, then\ \sigma_y = \|b\|\sigma_x$ Let $y = 5 - 2x \ \therefore\ \sigma_y = \|-2\|\ \sigma x$ $= 2\ \times 3 = 6$ ∴ Variance $(5 - 2x) = (2)^2\ \times 9 = 36$
70.	C	Total salary of 75 employees = 1420×75 =₹1,06,500 Total salary of 25 employees =₹25×1350 =₹ 33,750 Total salary of 30 other employees =₹30×1425 =₹ 42,750 Total salary of 20 remaining =₹$(1,06,500 - 33,750 - 42,750)$ =₹ 30,000 Required Average =₹$\frac{30,000}{20}$ =₹ 1500
71.	A	Required probability $= P(ABC') + P(AB'C) + P\ (A'BC)$ $= \frac{4}{5} \times \frac{3}{4} \times \left(1 - \frac{2}{3}\right) + \frac{4}{5} \times \left(1 - \frac{3}{4}\right)\ \times \frac{2}{3} + \left(1 - \frac{4}{5}\right)\ \times \frac{3}{4} \times \frac{2}{3}$ $= \frac{12+8+6}{60} = \frac{13}{30}$
72.	D	Given $P(E) = \frac{1}{5}, P\left(\frac{F}{E}\right) = \frac{1}{10}$ $\therefore P(E \cap F) = P(E).P(F/E)$ $= \frac{1}{5}.\frac{1}{10} = \frac{1}{50}$ ∴ Probability of non-occurrence of at least one of the events of E and F =1−p(E ∩ F) $= 1 - \frac{1}{50} = \frac{49}{50}$
73.	C	6, 12, 24, 48 For GM's between a and b, $r = \left(\frac{b}{a}\right)^{\frac{1}{n+1}}$

		$r = \left(\frac{96}{3}\right)^{\frac{1}{4+1}} = (32)^{1/5} = 2$ The four G.M.'s are $G_1 = a \times r = 3 \times 2 = 6$ $G_2 = a \times r^2 = 3 \times 2 = 12$ $G_3 = a \times r^3 = 3 \times 2 = 24$ $G_4 = a \times r^4 = 3 \times 2 = 48$
74.	D	Given :$T_n = 164\ and\ s_n = 3n^2 + 5n.\quad s_{n-1} = 3(n-1)^2 + 5(n-1) = 3n^2 - n - 2$ But, $T_n = S_n - S_{n-1} \implies 164 = 3n^2 + 5n - (3n^2 - n - 2) = 6n + 2$ $\implies 6n = 164 - 2 = 162.\ \therefore n = 27 \quad \therefore 27th\ term\ is = 6 \times 27 + 2 = 164$
75.	D	1 or 2 $\log_2(3^{2x-2} + 7) = \log_2 4 + \log_2(3^{x-1} + 1)$ $[\because 2 = 2\ \log_2 2 = \log_2 2^2]$ $\implies 3^{2x-2} + 7 = 4(3^{x-1} + 1)$ $\implies t^2 + 7 = 4\ (t+1)$, where$3^{x-1} = t$ $\implies t^2 - 4t + 3 = 0 \implies t = 1,3.$ When t=1 $\implies 3^{x-1} = 1 \implies x = 1;$ When t=3 $\implies 3^{x-1} = 3^1 \implies x = 2.$
76.	B	$\left(\frac{1}{1+x^{n-m}} + \frac{1}{1+x^{m-n}}\right) =$ $= \left(\frac{1}{1+x^{n-m}} + \frac{1}{1+x^{m-n}}\right)$ $= \left(\frac{1}{1+x^n/x^m} + \frac{1}{1+x^m/x^n}\right)$ $= \left(\frac{x^m}{x^m+x^n} + \frac{x^n}{x^n+x^m}\right)$ $= \left(\frac{x^m+x^n}{x^m+x^n}\right)$ $= 1$
77.	B	9% Let the required rate be R%$\therefore \left(\frac{20000\times8\times1}{100}\right) + \left(4000 \times \frac{15}{2} \times \frac{1}{100}\right)$ $+ \left(1400 \times \frac{17}{2} \times \frac{1}{100}\right) + \left(2600 \times R \times \frac{1}{100}\right) = \left(\frac{813}{10000} \times 10000\right)$ $\Rightarrow 160 + 300 + 119 + 26R = 813 \Rightarrow \boldsymbol{R = 9}\%$
78.	C	4% Here T=20/12 years= 5/3 years $A = P\left(1 + \frac{R\times T}{100}\right) \Rightarrow 50000 = 46875\left(1 + \frac{R\times\left(\frac{5}{3}\right)}{100}\right)$ $\Rightarrow \left(\frac{50000}{46875}\right) \times 100 = 100 + \left(\frac{5}{3}\right) R \Rightarrow \boldsymbol{R = 4}\%$
79.	C	$\mathrm{R} \subset \mathrm{I}$ If R is the set of Isosceles right angled triangles and I is the set of isosceles triangles, then $\mathrm{R} \subset \mathrm{I}$, because some isosceles triangles are isosceles right angled triangles, but all isosceles right angled triangles are isosceles triangles.
80.	B	We have $A' \cap B' = (A \cup B)'$ $\therefore\ n\ (A' \cap B') = n\ (A \cup B)' = n(U) - n(A \cup B) = n - [n(A) + n(B) - n(A \cap B)]$ $= 700 + (200 + 300 - 100) = 300.$
81.	A	The two lines of regression are x + 4y = 3 .....(1) and 3x + y = 15 .....(2) If we take (1) as the regression equation of Y on X, then (2) is that of X on Y. These two equations can be written as: $y = -\frac{1}{4}x + \frac{3}{4}\ \ and\ x = -\frac{1}{3}y + \frac{15}{3}$

		$b_{yx} = -\frac{1}{4}$ $an\ b_{xy} = -\frac{1}{3}$ $b_{xy} \times b_{yx} = \frac{1}{12} < 1.$ So, our choice is valid. To find x, when y = 3, we are to use the regression equation of X on Y. $x = -\frac{1}{3} \times 3 + 5 = 4.$
82.	A	$b_{xy} = r(\sigma_y/\sigma_x)$ $= 0.75 \times (12/12) = (3/4)$ Regression line y on x is $y - \overline{y} = b_{xy}(x - \overline{x})$ $\Rightarrow y - 80 = (3/4)(x - 15)$ Putting $x = 55$ in it, we get : $y = 110$
83.	A	Let the father's age = x years, and the son's age = y years. As per conditions of the problem, $x + 2y = 70$ ………(1) and $2x + y = 95$ ……..(2) From (1), we get : $x = 70 - 2y$. Substituting it in (2), we get $2(70 - 2y) + y = 95$ $-3y = -45$ $or\ y = 15$ $x = 70 - 2 \times 15 = 40$ Hence father's age = 40 years and son's age = 15 years
84.	C	The numbers divisible by 5 between 234 and 1234 are 235, 240, 245,…1230. It is an AP with a = 235, d = 5 and a_n =1230 $a_n = a + (n-1)d$ $\Longrightarrow 1230 = 235 + (n-1)5$ $\Longrightarrow 5(n - 1) = 1230 - 235$ $\Longrightarrow n - 1 = 995\ /\ 5$ $\Longrightarrow n - 1 = 119$ $\Longrightarrow n = 200$ ∴ there are 200 such numbers
85.	B	$L = \lim_{x \to 3} \frac{\sqrt{3+x} - \sqrt{9-x}}{x^2-9} = \frac{0}{0}$ Applying L's Hospital rule $L = \lim_{x \to 3} \frac{\frac{1}{2\sqrt{3+x}} - \frac{1}{2\sqrt{9-x}}(-1)}{2x}$ $\lim_{x \to 3} \frac{\sqrt{3+x} - \sqrt{9-x}}{x^2-9} == \lim_{x \to 3} \frac{1}{2x}\left[\frac{1}{2\sqrt{3+x}} + \frac{1}{2\sqrt{9-x}}\right]$ $= \frac{1}{6}\left[\frac{1}{2\sqrt{6}} + \frac{1}{2\sqrt{6}}\right]$ $= \frac{1}{6}\left[\frac{2}{2\sqrt{6}}\right] = \frac{1}{6\sqrt{6}}$
86.	B	$\log abc$ $\lim_{x \to 0} \frac{a^x + b^x + c^x - 3}{x} = \frac{0}{0}$ $\lim_{x \to 0} \frac{a^x \log a + b^x \log b + c^x \log c}{1}$ $= \log a + \log b + \log c = \log abc$
87.	A	Let us denote P = Practice, I = Industry, S= Service. Then it is given that $n(P) = 120, n(I) = 112, n(A) = 160$ $n(P \cap S) = 32, n(P \cap S) = 40, n(I \cap S) = 20, n(I \cap P \cap S) = 12.$ Now $n(I \cup P \cup S\ )$ $= n(I) + n(P) + n(S) - n(I \cap P) - n(I \cap S) - n(P \cap S) + n(I \cap P \cap S)$

		$= 112 + 120 + 160 - 40 - 20 - 32 + 12 = 312$ Those who could not get any job=400−$n(I \cup P \cup S)$ =400−312=88
88.	A	Symmetric
89.	D	Now $(18)^{3.5} \div (27)^{3.5} \times 6^{3.5} = 2^x \implies (18)^{3.5} \times \frac{1}{(27)^{3.5}} \times 6^{3.5} = 2^x$ $\implies (3^2 \times 2)^{3.5} \times \frac{1}{(3^3)^{3.5}} \times (2 \times 3)^{3.5} = 2^x \implies 3^{(2\times3.5)} \times 2^{3.5} \times \frac{1}{3^{(3\times3.5)}} \times 2^{3.5} \times 3^{3.5} = 2^x$ $\implies 3^7 \times 2^{3.5} \times \frac{1}{(3)^{10.5}} \times 2^{3.5} \times 3^{3.5} = 2^x \implies 2^7 = 2^x \implies x = 7$
90.	C	$a + b = 6k, b + c = 7k, c + a = 8k. \therefore (a + b) + (b + c) + (c + a) = 6k + 7k + 8k$ $\implies 2(a + b + c) = 21k \implies k = \frac{2(a+b+c)}{21} = \frac{2\times14}{21} = \frac{4}{3}$ $c = (a + b + c) - (a + b) = 14 - 6 \times \frac{4}{3} = 6.$
91.	C	$\mathrm{p}(7,\mathrm{k}) = 60\mathrm{P}(7,\mathrm{k}-3)$ $= {}^7p_k = 60\,{}^7P_{k-3}$ $\frac{7!}{(7-k)!} = 60 \times \frac{7!}{[(7-(k-3)]!} = \frac{1}{(7-k)!} = 60 \times \frac{1}{(7-k+3)!} = (10-k)! = 60\,(7-k)!$ $\frac{(10-k)\,(9-k)(8-k)\,(7-k)!}{(7-k)!} = 60$ $(10 - k)\,(9 - k)\,(8 - k) = 60$ $720 - 242k + 27k^2 - k^3 = 60$ $660 - 242k + 27k^2 - k^3 = 0$ $k^3 - 27k^2 + 242k - 660 = 0$ $(k - 5)(k^2 - 22k + 132) = 0$ K = 5, since $k^2 - 22k + 132 = 0$ gives imaginary roots
92.	B	Total number of numbers = $\frac{7!}{2!\times3!} = 420$ ways Out of these 420 number, some will begin with 0 and are less than one million, and they are rejected. ∴ Number of numbers beginning with 0 = $\frac{6!}{2!\times3!}$ = 60 ways Hence required number of numbers = 420 − 60 = 360 ways
93.	A	Here, $\overline{u} = 3\overline{x} + 4\overline{y}$ and $\overline{u} = 3\overline{x} - \overline{y}.$ $\therefore u - \overline{u} = 3(x - \overline{x}) + 4(y - \overline{y})$ $v - \overline{v} = 3(x - \overline{x}) - (y - \overline{y})$ $Cov\,(U,V) = \frac{1}{n}\sum(u - \overline{u})(v - \overline{v})$ $= \frac{1}{n}\sum[\{9(x - \overline{x})^2 - 4(y - \overline{y})^2 + 9(x - \overline{x})(y - \overline{y})\}$ $= 9\left(\frac{\sum(x-\overline{x})^2}{n}\right) - 4\left(\frac{\sum(y-\overline{y})^2}{n}\right) + 9\left(\frac{(x-\overline{x})(Y-\overline{Y})}{n}\right)$ $= 9\sigma_x^2 - 4\sigma_y^2 + 9Cov(X,Y)$ $= 9 \times 4 - 4 \times 9 + 9(0) = 0.$ $(\therefore X, Y$ are $independent$ $\therefore Cov(X,Y) = 0\,)$ $\implies p(U,V) = \frac{Cov\,(U,V)}{\sigma_u\sigma_v} = 0$
94.	D	As we know, that the mean values of 2 regression equations are their points of intersection, therefore solving the equations simultaneously. Given:- $5x - 145 = -10\overline{y}$ and $14\overline{y} - 20 = -8\overline{x}$ $\implies 5\overline{x} + 10\overline{y} = 145$ ……………………….(1) $8\overline{x} + 14\overline{y} = 208$ ……………………….(2) $\therefore 40\overline{x} + 80\overline{y} = 1160$ …………………..….(3) $40\overline{x} + 70\overline{y} = 1040$ …………………..….(4) Subtracting (4) from (3), we get: $\overline{y} = 12$ Putting $\overline{y} = 12$ in (1), we get

		$\bar{x} = 5$ $\therefore (\bar{x}, \bar{y}) = (5, 12)$
95.	A	Since α, β are the roots of $3x^2 - 4x + 1 = 0$, therefore, $\alpha + \beta = 4/3$ and $\alpha\beta = 1/3$. $S = \frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha} = \frac{\alpha^3+\beta^3}{\alpha\beta} = \frac{1}{\alpha\beta}[(\alpha+\beta)^3 - 3\alpha\beta(\alpha+\beta)]$ $= 3.\left[\frac{64}{27} - 3 \times \frac{1}{3} \times \frac{4}{3}\right] = \frac{28}{9}$. Also $P = \frac{\alpha^2}{\beta} . \frac{\beta^2}{\alpha} = \alpha\beta = \frac{1}{3}$ Hence required equation is $x^2 - Sx + P = 0$. i.e. $x^2 = \frac{28}{9}x + \frac{1}{3} = 0$ Or $9x^2 - 28x + 3 = 0$
96.	A	Let the sides of the equilateral triangle be x each. They are shortened by 3, 2, 1 units respectively Therefore the sides of the new triangle are $x - 3, x - 2, x - 1$. It is a right angle triangle, with longest side $= x - 1$. $\therefore (x-2)^2 + (x-3)^2 = (x-1)^2$ $x^2 - 4x + 4 + x^2 - 6x + 9 = x^2 - 2x + 1$ $x^2 - 8x + 12 = 0$ $(x-6)(x-2) = 0$ x cannot be 2 as it will make the sides negative Therefore, $x = 6$
97.	B	The equation of a line passing through the intersection of $x - y - 1 = 0$ and $2x - 3y + 1 = 0$ is: $x - y - 1 + k\,(2x - 3y + 1) = 0 \;\; \Longrightarrow (1+2k)\,x - (1+3k) - (1-k) = 0$ ....(1) Slope of line (1) $= \frac{1+2k}{1+3k} = m_1$. Slope of the line $3x + 4y = 12\ is \frac{-3}{4} = m_2$ (say) Now $m_1 = m_2 \;\; \Longrightarrow (1+2k)/(1+3k) = (-3/4) \Longrightarrow k = -7/17$ Putting $k = -7/17$ in (1) , we get $3x + 4y - 24 = 0\ \ or\ 3x + 4y = 24$
98.	C	Median
99.	C	Grouped mean
100.	A	all observations have the same sign and none is zero