

## PU (CHD)-ACTUAL PAPER-2023

1. Find the next number in sequence, 0, 6, 24, 60, 120, 210, ?  
(a) 240 (b) 420 (c) 370 (d) 336
  2. Find missing in alphabetical series as, AYD, BVF, DRH, ?, KGL  
(a) EMK (b) GLJ (c) GMJ (d) FMI
  3. Find the correct relationship, Botany : Plants :: Entomology : ?  
(a) Insects (b) Birds  
(c) Eyes (d) Flowers
  4. If in a certain code, COVET is written as FRYHW, which word would be written as SHDUO?  
(a) UKFVQ (b) QUAKE  
(c) PEARL (d) PEBQL
  5. Pointing to Shyam, Rita said, "He is the son of my father's only son". How is Shyam mother related to Rita?  
(a) Aunt (b) Sister-in-law  
(c) Mother-in-law (d) Daughter
- Directions (Questions 6 to 8):** On the basis of information provided below, answer these questions: Six people A, B, C, D, E and F are sitting on the ground in a hexagonal shape. All the sides of the hexagon so formed are of same length. A is not adjacent to B or C; D is not adjacent to C or E; B and C are adjacent; F is in the middle of D and C.
6. Which of the following is not a correct neighbour pair?  
(a) A and F (b) B and E (c) C and F (d) D and F
  7. If one neighbour of A is D, who is the other one?  
(a) E (b) B (c) C (d) F
  8. Who is placed opposite to E?  
(a) D (b) C (c) B (d) F
  9. How many numbers from 1 to 100 are there each of which is not only exactly divisible by 4 but also has 4 as a digit?  
(a) 8 (b) 25 (c) 7 (d) 20
  10. In a row of forty children, P is thirteenth from the left end and Q is ninth from the right end. How many children are there between P and R if R is fourth to the left of Q?  
(a) 15 (b) 14 (c) 13 (d) 11
  11. Ram left home for the bus stop 15 minutes earlier than usual. It takes 10 minutes to reach the stop. He reached the stop at 8:40 a.m. What time does he usually leave home for the bus stop?  
(a) 8:25 a.m. (b) 8:45 a.m.  
(c) 8:30 a.m. (d) 8:40 a.m.
  12. If  $P(A) = 0.8$ ,  $P(B) = 0.5$  and  $P(B|A) = 0.4$ , what is the value of  $P(A \cap B)$ ?  
(a) 1 (b) 0.25 (c) 0.1 (d) 0.32
  13. If A is a square matrix of order 3 and  $|A| = 5$ , then the value of  $|2A'|$  is,  
(a) 40 (b) 36 (c) 30 (d) -40
  14. The most similar word of CONCEIVE is,  
(a) IMAGINE (b) SPEAK  
(c) PRESENT (d) CONTRADICT
  15. The most similar word of TACITURN is,  
(a) DELICATE (b) DISCUSS  
(c) UNSPOKEN (d) WEIRD
  16. The antonym of COGNITIVE is,  
(a) INTELLECT (b) ILLOGICAL  
(c) JUSTIFY (d) COMMON
  17. The antonym of WEILD is,  
(a) ATTEND (b) NEGLECT  
(c) STRONG (d) WEAK
  18. How many such pairs of letters are there in the word CORPORATE each of which has as many letters in the same sequence between them in the word as in the English alphabet?  
(a) three (b) one (c) none (d) two
  19. Fill suitable word, Because of his \_\_\_\_\_ habits, he could not save much money.  
(a) extravagant (b) frugal  
(c) unsavoury (d) bad
  20. Fill suitable word, The robbers fell \_\_\_\_\_ amongst themselves over the sharing of the loot.  
(a) through (b) off  
(c) out (d) across
  21. Fill suitable word, He crossed the broken bridge \_\_\_\_\_ warning.  
(a) in spite (b) in spite off  
(c) in spite of (d) in spite with
  22. Sounding the same but spelt differently are called \_\_\_\_\_.  
(a) Synonyms (b) Homophonous  
(c) Symphonious (d) Saminymous
  23. The pupil was asked to write \_\_\_\_\_ his name on the front page of the exercise book  
(a) in (b) about (c) with (d) down
  24. A cube painted blue on all faces is cut into 27 small cubes of equal size. How many cubes are painted one oneface only?  
(a) 6 (b) 3 (c) 9 (d) 12
  25. If set A contains 5 elements and the set B contains 6 elements, then the number of oneone and onto mappings from A to B is,  
(a) 11 (b) 30 (c) 0 (d) 720
  26. The magnitude of the vector  $6i + 2j + 3k$  is equal to  
(a) 49 (b) 11 (c) 7 (d) 36
  27. In how many ways a committee consisting of 5 men and 3 women, can be chosen from 9 men and 12 women?  
(a) 1620 (b) 27720 (c) 30720 (d) 16270
  28. The properties as,  $m + (n + r) = (m + n) + r$  and  $m(n + r) = mn + mr$  are called  
(a) Distributive and associative  
(b) Associative and distributive  
(c) Commutative and distributive  
(d) Commutative and associative
  29. Encapsulation is part of,  
(a) Run-time programming  
(b) Structured programming  
(c) Procedural programming  
(d) Object oriented programming
  30. Let X and Y are two numbers, then product of X and Y is,  
(a)  $HCF(X, Y) \times LCM(X, Y)$   
(b)  $HCF(X, Y)/LCM(X, Y)$   
(c)  $LCM(X, Y)$   
(d)  $HCF(X, Y)$
  31. What are the degrees of constant and linear polynomial?  
(a) 1 and 1 (b) 1 and 0  
(c) 0 and 1 (d) 0 and 2

32. In a class,  $\frac{3}{5}$  of the students are girls and rest are boys. If  $\frac{2}{9}$  of the girls and  $\frac{1}{4}$  of the boys are absent, what part of the total number of students is present?  
 (a)  $\frac{23}{36}$  (b)  $\frac{17}{36}$  (c)  $\frac{23}{30}$  (d)  $\frac{19}{36}$
33. What is value of  $\sin 75^\circ$ ?  
 (a)  $\frac{\sqrt{3}}{2\sqrt{2}}$  (b)  $\frac{\sqrt{3}+1}{2\sqrt{2}}$   
 (c)  $\frac{1}{2\sqrt{2}}$  (d)  $\frac{\sqrt{3}+1}{\sqrt{2}}$
34. A MegaByte (MB) contains,  
 (a) 1024 bytes (b) 1000 kilobytes  
 (c) 1024 kilobytes (d) 1000 bytes
35. Which of the following is not a language?  
 (a) COBOL (b) BASIC  
 (c) PASCAL (d) LASER
36. The full form of HTTP is,  
 (a) Hypertext Transfer Policy  
 (b) Hypertext Transfer Protocol  
 (c) Hyper Transfer Text Protocol  
 (d) Hypertext Transfer Time Protocol
37. The 2's complement of 10001 is,  
 (a) 01111 (b) 01110 (c) 0111 (d) 11111
38. The correct ascending order of complexities of  $\log(x)$ ,  $x$ ,  $x^2$ ,  $2^x$ ,  
 (a)  $\log(x)$ ,  $x$ ,  $2^x$ ,  $x^2$  (b)  $x$ ,  $x^2$ ,  $2^x$ ,  $\log(x)$   
 (c)  $x$ ,  $x^2$ ,  $\log(x)$ ,  $2^x$  (d)  $\log(x)$ ,  $x$ ,  $x^2$ ,  $2^x$
39. The NLP in computer science is,  
 (a) Natural Logical Processing  
 (b) New Language Parser  
 (c) Natural Language Parser  
 (d) Natural Language Processing
40. The CFG in computer science is,  
 (a) Common Free Games  
 (b) Context Fast Grammar  
 (c) Context Free Grammar  
 (d) Common Free Grammar
41. The selection, insertion, radix are types of,  
 (a) Searching Techniques  
 (b) Sorting Techniques  
 (c) Both Sorting and Searching Techniques  
 (d) Heuristic Techniques
42. What is the number of edges present in a complete graph having  $N$  vertices?  
 (a)  $N + 1$  (b)  $\frac{(N \times (N - 1))}{2}$   
 (c)  $\frac{(N \times (N + 1))}{2}$  (d)  $N$
43. For a given graph  $G$  having  $V$  vertices and  $E$  edges which is connected and has no cycles, which of the following statements is true?  
 (a)  $V=E+1$  (b)  $V=E-1$   
 (c)  $E=V+1$  (d)  $2V=E$
44. A graph with all vertices having equal degree is known as a,  
 (a) Bipartite graph (b) Simple graph  
 (c) Regular graph (d) Euler graph
45. What is the full name of FAT?  
 (a) File attribute table  
 (b) Format allocation table  
 (c) First allocation table  
 (d) File allocation table
46. Which of the following is not application software?  
 (a) MS word (b) Windows 11  
 (c) Photoshop (d) Wordpad
47. The decimal value of 101111 is,  
 (a) 32 (b) 48 (c) 49 (d) 47
48. If  $f: R \rightarrow R$  be given by  $f(x) = (3 - x^3)^{\frac{1}{3}}$ , then  $f \circ f(x)$  is,  
 (a)  $x^3$  (b)  $x$   
 (c)  $(x^3 - 3)$  (d)  $(3 - x^3)$
49. If  $f: R \rightarrow R$  be given by  $f(x) = x^2$ , then  
 (a)  $f$  is one-one  
 (b)  $f$  is one-one and onto  
 (c)  $f$  is not one-one but onto  
 (d)  $f$  is neither one-one nor onto
50. The value of  $\tan^{-1} \sqrt{3} - \cot^{-1}(-\sqrt{3}) =$   
 (a)  $\frac{\pi}{2}$  (b) 0 (c)  $-\frac{\pi}{2}$  (d)  $\sqrt{3}$
51. The number of all possible matrices of order  $2 \times 3$  with each entry 0 or 1 is,  
 (a) 64 (b) 128 (c) 36 (d) 32
52. If area of a triangle is 35 square units with vertices  $(2, -6)$ ,  $(5, 4)$  and  $(k, 4)$ , then  $k$  value  
 (a)  $-2, 12$  (b)  $2, -12$   
 (c)  $-2, -12$  (d)  $2, 12$
53. If  $x = 2at^2$  and  $y = at^4$ , then value of  $\frac{dy}{dx}$  is,  
 (a)  $at$  (b)  $t^3$  (c)  $at^2$  (d)  $t^2$
54. The covariance  $(x, t)$  values for  $\sum x_i = 60$ ,  $\sum y_i = 95$ ,  $\sum x_i y_i = 574$ ,  $n = 10$  is  
 (a) 5.74 (b) -1.4 (c) 1.4 (d) 0.4
55. Find the probability that in a random arrangement of letters of the word UNIVERSITY, two I's do not come together,  
 (a)  $\frac{4}{10}$  (b)  $\frac{3}{5}$  (c)  $\frac{4}{5}$  (d)  $\frac{2}{5}$
56. Two dice are thrown simultaneously, find the probability of getting six as the product.  
 (a)  $\frac{1}{6}$  (b)  $\frac{1}{9}$  (c)  $\frac{4}{33}$  (d)  $\frac{4}{9}$
57. If  $P(\text{not } A) = 0.4$ ,  $P(A \cup B) = 0.7$ , where  $A$  and  $B$  are given to be independent events, find the value of  $P(B)$ .  
 (a) 0.75 (b) 0.25 (c) 0.3 (d) 0.28
58. A problem is given to three students whose chances of solving it are  $\frac{1}{2}$ ,  $\frac{1}{3}$  and  $\frac{1}{4}$ . What is the probability that the problem will be solved?  
 (a)  $\frac{1}{24}$  (b)  $\frac{1}{4}$  (c)  $\frac{3}{24}$  (d)  $\frac{3}{4}$
59. A speaks truth 5 times out of 6 and B speaks truth 9 times out of 10. What is the probability that they contradict each other in stating the same facts?  
 (a)  $\frac{7}{30}$  (b)  $\frac{3}{4}$  (c)  $\frac{1}{60}$  (d)  $\frac{1}{3}$
60. A fair coin is tossed 7 times. Find the probability of obtaining at least 5 tails.  
 (a)  $\frac{1}{35}$  (b)  $\frac{7}{125}$  (c)  $\frac{29}{128}$  (d)  $\frac{35}{128}$
61. The value of  $\lim_{x \rightarrow 2} \frac{x-2}{2 - (\sqrt{6-x})}$  is,  
 (a) 4 (b) 2 (c) -2 (d) 0

62. If  $y = \sqrt{\cos(x) + \sqrt{\cos(x) + \sqrt{\cos(x) + \dots}}}$ , then value of  $\frac{dy}{dx}$  is,
- (a)  $\frac{\cos(x)}{2y-1}$  (b)  $\frac{\sin(x)}{1-2y}$   
 (c) 0 (d)  $\frac{\cos(x)}{1-2y}$
63. Find the point on the curve  $y = x^2 - 4x + 3$ , the normal at which is parallel to the line whose slope is  $\frac{1}{2}$ .
- (a) (0,1) (b)  $(\frac{1}{2}, 0)$   
 (c)  $(0, \frac{1}{2})$  (d) (1, 0)
64. The value of  $\int_0^1 \frac{1-x}{1+x} dx$  is,
- (a) 1 (b)  $\log 2$   
 (c)  $2 \log 2 - 1$  (d)  $1 + 2 \log 2$
65. The value of  $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \sin^2 x dx$  is,
- (a)  $\frac{\pi}{4}$  (b)  $\frac{1}{2}$   
 (c)  $\frac{\pi}{4} - \frac{1}{2}$  (d)  $\frac{\pi}{4} + \frac{1}{2}$
66. The  $\cos(A + B)$  is equal to,
- (a)  $\cos A \cos B - \sin A \sin B$   
 (b)  $\cos A \sin B + \sin A \cos B$   
 (c)  $2 \cos A \cos B$   
 (d)  $\cos A \cos B + \sin A \sin B$
67. The coordinates of the point where the line passing through the points (1, 3, 4) and (2, -4, 6) crosses the XY plane.
- (a) (2, 17, 0) (b) (-1, 17, 0)  
 (c) (0, 17, 1) (d) (2, -17, 0)
68. If  $z_1 = 2 + 8i$  and  $z_2 = 1 - i$ , then value of  $\left| \frac{z_1}{z_2} \right|$  is ,
- (a)  $\sqrt{17}$  (b) 24  
 (c) 15 (d)  $\sqrt{34}$

69. For all  $n \in \mathbb{N}$ ,  $3 \cdot 5^{2n+1} + 2^{3n+1}$  is divisible by  
 (a) 21 (b) 23 (c) 17 (d) 9
70. The number of ways 4 men and 3 women can be seated in a row so that they are alternate is,  
 (a) 12 (b) 24 (c) 72 (d) 144
71. If x, y and z are in arithmetic progression then,  
 (a)  $z^2 = x + y$  (b)  $2y = x + z$   
 (c)  $2z = x + y$  (d)  $2x = y + z$
72. Two lines are said to be perpendicular if the product of their slope is equal to:  
 (a) -1 (b) 1 (c) 0 (d)  $\frac{1}{2}$
73. The contrapositive of the statement "If p, then q", is  
 (a) If q, then p. (b) If p, then  $\sim q$ .  
 (c) If  $\sim q$ , then  $\sim p$ . (d) If  $\sim p$ , then  $\sim q$ .
74. Let a and b be natural numbers. If  $a^2 + ab + a = 14$  and  $b^2 + ab + b = 28$ , then  $(2a + b)$  equals to  
 (a) 7 (b) 12 (c) 8 (d) 10
75. All the vertices of a rectangle lie on a circle of radius R. If the perimeter of the rectangle is P, then the area of the rectangle is  
 (a)  $\frac{P^2}{8} - 2R^2$  (b) 2RP  
 (c)  $\frac{P^2}{4} - 2R^2$  (d)  $\frac{P^2}{2} - 2R^2$

**PU-2023 ANSWER KEY**

1	2	3	4	5	6	7	8	9	10
d	c	a	c	b	a	a	d	c	b
11	12	13	14	15	16	17	18	19	20
b	d	a	a	c	b	b	a	a	c
21	22	23	24	25	26	27	28	29	30
c	b	d	a	c	c	b	b	d	a
31	32	33	34	35	36	37	38	39	40
c	c	b	c	d	b	a	d	d	c
41	42	43	44	45	46	47	48	49	50
b	b	a	c	d	b	d	b	d	c
51	52	53	54	55	56	57	58	59	60
a	a	d	d	c	b	b	d	a	c
61	62	63	64	65	66	67	68	69	70
a	b	d	c	c	a	b	d	c	d
71	72	73	74	75					
b	a	c	c	a					

**PU-ACTUAL PAPER 2023 SOLUTIONS**

1. **Ans. (d) Pattern is :-**  
 0 →  $1^3 - 1$ ,  
 6 →  $2^3 - 2$ ,  
 24 →  $3^3 - 3$ ,  
 60 →  $4^3 - 4$ ,  
 120 →  $5^3 - 5$ ,  
 210 →  $6^3 - 6$ ,  
 Similarly  $7^3 - 7 = 343 - 7 = 336$

2. **Ans. (c)**  
 AYD, BVF, DRH \_\_\_\_\_, KGJ  
 A            B            D            G            K  
 1            2            4            7            11  
 {            {            {            {            {  
 1            2            3            4

As difference of +1, +2 + 3 + 4 in first.

Y	V	R	M	G
25	22	18	13	7
- 3            - 4            - 5            - 6				

As difference of -3, -4, - 5, - 6 in 2<sup>nd</sup> series.

D	F	H	J	L
4	6	8	10	12
+ 2            + 2            + 2            + 2				

Difference of +2, +2, + 2 in 3<sup>rd</sup> series.

(c) GMJ.

3. **Ans. (a)** Botany is study of plant similarly entomology is study of Insects.

4. **Ans. (c)**

C O V E T  
3 15 22 5 20 Pattern of +3, +3, +3, +3  
+3 +3 +3 +3 +3 similarly, Pearl is related to SHDUO

F R Y H W  
6 18 25 8 23

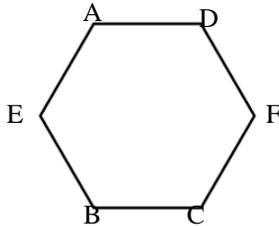
5. **Ans. (b)** Rita's father is only son is Rita's brother and Rita's brother is son is nephew. So Shyam is nmother is sister in law of Rita.

+ Fathers

Rita - Rita Brother  
|  
Son

(b) Brother in law

6. **Ans. (a)**



A → B/C ×  
D → C/E ×  
B and C are adjacent

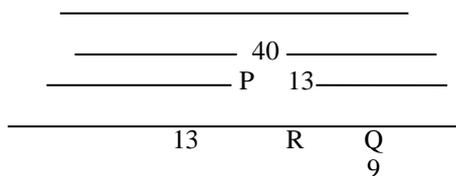
7. **Ans. (a)**

8. **Ans. (d)**

9. **Ans. (c)**

1 to 100, there are 25 digit which are divisible by 4. i.e.,  
4, 8, 12, 16, 20, 24, \_\_\_\_\_  
and 4 as a digit are :-  
4, 24, 40, 44, 48, 64, 84  
There are 7 numbers.

10. **Ans. (b)**



T = L + R + M  
40 = 13 + 9 + M  
40 = 22 + M  
M = 18  
So R is left of Q so R occupy 13 from right end.  
As there are 14 person between P and R.

11. **Ans. (b)**

Ram reach at 8:40 a.m.  
So he start at 8:30 a.m.  
But Ram left 15 min early, so his actual time is 8:30 + 15 min = 8 : 45

12. **Ans. (d)** P(A) = .8, P(B) = .5

$$P(B/A) = \frac{P(B \cap A)}{P(A)} = .4$$

$$\Rightarrow P(A \cap B) = P(A) \times (.4) = (.8) (.4) = .32$$

13. **Ans. (a)** |A| = 5 ⇒ |A'| = 5  
⇒ |2A'| = 2<sup>3</sup> |A'| = 8.5 = 40  
As |kA| = k<sup>n</sup> |A| where n is order of matrix A.

14. **Ans. (a)**

15. **Ans. (c)**

16. **Ans. (b)**  
COGNITIVE Meaning ILLOGICAL so answer is (b)

17. **Ans. (b)**  
WEILD Meaning Display or brandish so answer is (b)

18. **Ans. (a)** Such pairs are P and T  
P and R  
R and T  
Only three pairs.

19. **Ans. (a)**

20. **Ans. (c)**

21. **Ans. (c)**

22. **Ans. (b)**

23. **Ans. (d)**

24. **Ans. (a)**

25. **Ans. (c)** Here n(A) = 5, n(B) = 6 As n(A) < n(B) ⇒ No onto function is possible  
⇒ No. of one-one and onto functions from A → B is zero.

26. **Ans. (c)** Magnitude of 6i + 2j + 3k  
= |6i + 2j + 3k| = √(36 + 4 + 9) = 7

27. **Ans. (b)**

No. of committee of 5 men and 3 women out of 9 men and 12 women = <sup>9</sup>C<sub>5</sub> · <sup>12</sup>C<sub>3</sub>

$$= \frac{9!}{5!4!} \cdot \frac{12!}{3!9!} = \frac{12!}{5!4!3!}$$

$$= \frac{12 \times 11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5}{5(4 \times 3 \times 2)(3 \times 2 \times 1)}$$

$$= 11 \times 10 \times 9 \times 4 \times 7 = 27720$$

28. **Ans. (b)**

29. **Ans. (d)**

30. **Ans. (a)** Result

31. **Ans. (c)**

32. **Ans. (c)** Let total no. of students = x

So total girls are  $\frac{3}{5}x$ , boys are  $\frac{2}{5}x$

So absent students are  $= \frac{2}{9}\left(\frac{3}{5}x\right) + \frac{1}{4}\left(\frac{2}{5}x\right)$

$$= \frac{2}{15}x + \frac{1}{10}x = \frac{7x}{30}$$

$\Rightarrow$  Present students are  $x - \frac{7x}{30} = \frac{23x}{30}$

33. **Ans. (b)**

$$\sin 75^\circ = \cos 15^\circ = \frac{\sqrt{3}+1}{2\sqrt{2}}$$

34. **Ans. (c)**

35. **Ans. (d)**

36. **Ans. (b)**

37. **Ans. (a)**

38. **Ans. (d)**

39. **Ans. (d)**

40. **Ans. (c)**

41. **Ans. (b)**

42. **Ans. (b)**

43. **Ans. (a)**

44. **Ans. (c)**

45. **Ans. (d)**

46. **Ans. (b)**

47. **Ans. (d)**

48. **Ans. (b)** fof (x) = f(f(x))

$$= f\left(\left(3-x^3\right)^{\frac{1}{3}}\right)$$

$$= \left(3 - \left(\left(3-x^3\right)^{\frac{1}{3}}\right)^3\right)^{\frac{1}{3}}$$

$$= \left(3 - (3-x^3)\right)^{\frac{1}{3}} = (x^3)^{\frac{1}{3}} = x$$

49. **Ans. (d)** f(x) = x<sup>2</sup> is neither one-one nor onto as f(1) = f(-1) = 1  $\Rightarrow$  many-one  
Also range of f is  $[0, \infty) \subset \mathbb{R}$   
 $\Rightarrow$  Into

50. **Ans. (c)**

$$\tan^{-1}(\sqrt{3}) - \cot^{-1}(-\sqrt{3})$$

$$= \frac{\pi}{3} - \left(\pi - \frac{\pi}{6}\right) = \frac{\pi}{3} + \frac{\pi}{6} - \pi = \frac{3\pi}{6} - \pi = \frac{\pi}{2} - \pi = -\frac{\pi}{2}$$

51. **Ans. (a)** Here  $2 \times 3$  matrix means 6 elements can be filled by 0, 1 only  
Total ways =  $2^6 = 64$

52. **Ans. (a)**

Area of  $\Delta$

$$= \frac{1}{2} \begin{vmatrix} 2 & -6 \\ 5 & 4 \\ k & 4 \\ 2 & -6 \end{vmatrix}$$

$$\Rightarrow \frac{1}{2}(38 + 20 - 4k - 6k - 8) = \pm 35$$

$$50 - 10k = \pm 70 \Rightarrow k = -2, 12$$

53. **Ans. (d)**  $x = 2at^2$ ,  $y = at^4$ .

$$\frac{dx}{dt} = 4at, \frac{dy}{dt} = 4at^3$$

$$\Rightarrow \frac{dy}{dx} = \frac{4at^3}{4at} = t^2$$

54. **Ans. (d)** Covariance (x, y)

$$= \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{n}$$

$$= \frac{\sum_{i=1}^n x_i y_i - \bar{x} \sum y_i - \bar{y} \sum x_i + \sum \bar{x} \bar{y}}{n}$$

$$= \frac{\sum x_i y_i}{n} - \bar{x} \bar{y} = \frac{574}{10} - \left(\frac{60}{10}\right)\left(\frac{95}{10}\right)$$

$$= \frac{574}{10} - \frac{570}{10} = \frac{4}{10} = .4$$

55. **Ans. (c)** University

Total alphabets are 10

U, N, V, E, R, S, T,  $\rightarrow$  one time each  
and I  $\rightarrow$  two times

$$\Rightarrow \text{Total ways} = \frac{10!}{2!}$$

Now when two I's come together, take them as one element. So total places  $8 + 1 = 9$  places can be arranged in  $9!$  ways. So required probability

$$= \frac{9!}{\frac{10!}{2!}} = 1 - \frac{9!2}{10!}$$

$$= 1 - \frac{2}{10} = \frac{4}{5}$$

56. **Ans. (b)**

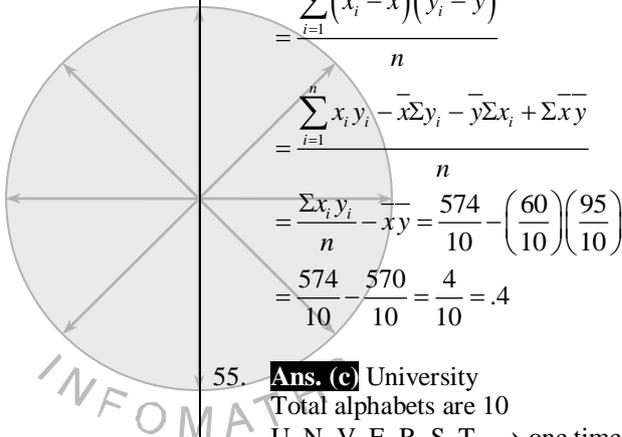
Getting 6 as a product so event  $\epsilon = \{(1, 6), (6, 1), (2, 3), (3, 2)\}$

$$\text{So } P(\epsilon) = \frac{4}{36} = \frac{1}{9}$$

57. **Ans. (b)**

$$P(\bar{A}) = .4 \Rightarrow P(A) = .6$$

$$P(A \cup B) = .7$$



As A, B independent  
 $\Rightarrow P(A \cap B) = P(A) \cdot P(B)$   
 Now  $P(A \cup B) = P(A) + P(B) - P(A) \cdot P(B)$   
 $.7 = .6 + P(B) - .6P(B)$   
 $.1 = .4P(B) \Rightarrow P(B) = \frac{1}{4} = .25$

58. **Ans. (d)** Let events be A, B, C  
 So  $P(A) = \frac{1}{2}, P(B) = \frac{1}{3}, P(C) = \frac{1}{4}$   
 $P(\text{Solved}) = 1 - P(\text{not solved by any of three students})$   
 $= 1 - \left(1 - \frac{1}{2}\right)\left(1 - \frac{1}{3}\right)\left(1 - \frac{1}{4}\right)$   
 $= 1 - \frac{1}{2} \cdot \frac{2}{3} \cdot \frac{3}{4}$   
 $= 1 - \frac{1}{4} = \frac{3}{4}$

59. **Ans. (a)**  $P(A, \text{ speaks truth}) = \frac{5}{6}$   
 $P(B, \text{ speaks truth}) = \frac{9}{10}$   
 $P(\bar{A}, \text{ speaks lie}) = \frac{1}{6}$   
 $P(\bar{B}, \text{ speaks lie}) = \frac{1}{10}$   
 $P(\text{contradict each other})$   
 $= P(\bar{A}\bar{B}) + P(\bar{A}B)$   
 $= \frac{5}{6} \cdot \frac{1}{10} + \frac{1}{6} \cdot \frac{9}{10}$   
 $= \frac{14}{60} = \frac{7}{30}$

60. **Ans. (c)**  $P(\text{Getting tail}) = \frac{1}{2}$   
 $P(\text{getting Head}) = \frac{1}{2}$   
 Getting atleast 5 heads  
 $= {}^7C_5 \left(\frac{1}{2}\right)^5 \left(\frac{1}{2}\right)^2 + {}^7C_6 \left(\frac{1}{2}\right)^6 \left(\frac{1}{2}\right)^1 + {}^7C_7 \left(\frac{1}{2}\right)^7$   
 $= \left(\frac{1}{2}\right)^7 [{}^7C_5 + {}^7C_6 + {}^7C_7]$   
 $= \left(\frac{1}{2}\right)^7 \cdot [21 + 7 + 1] = \frac{29}{2^7} = \frac{29}{128}$

61. **Ans. (a)**  
 $\lim_{x \rightarrow 2} \left( \frac{x-2}{2 - (\sqrt{6-x})} \right) \rightarrow \frac{0}{0}$  form  
 By L' Hospital Rule  
 $= \lim_{x \rightarrow 2} \frac{1}{\frac{1}{2\sqrt{6-x}} \times (+1)} = \lim_{x \rightarrow 2} 2\sqrt{6-x}$   
 $= +2\sqrt{4}$   
 $= +4$

62. **Ans. (b)**  
 $y = \sqrt{\cos x + \sqrt{\cos x + \sqrt{\cos x + \dots \infty}}}$   
 $\Rightarrow y = \sqrt{\cos x + y}$   
 $y^2 = \cos x + y$   
 $2y \frac{dy}{dx} = -\sin x + \frac{dy}{dx}$   
 $\Rightarrow \frac{dy}{dx} (2y - 1) = -\sin x$   
 $\Rightarrow \frac{dy}{dx} = \frac{\sin x}{1 - 2y}$

63. **Ans. (d)** Here curve is  $y = x^2 - 4x + 3$   
 Slope of tangent  
 $\frac{dy}{dx} = 2x - 4 \Rightarrow$  slope of normal  $= \frac{-1}{2x - 4}$   
 And slope of normal is  $\frac{1}{2}$   
 $\Rightarrow \frac{-1}{2x - 4} = \frac{1}{2} \Rightarrow -2 = 2x - 4$   
 $2x = 2 \Rightarrow x = 1$   
 Put  $x = 1$  in curve  $y = x^2 - 4x + 3$   
 $\Rightarrow y = 0$   
 $\Rightarrow$  point is  $(1, 0)$

64. **Ans. (c)**  $\int_0^1 \frac{1-x}{1+x} dx = -\int_0^1 \frac{x-1}{x+1} dx$   
 $= -\int_0^1 \frac{(x+1) - 2}{x+1} dx$   
 $= -\int_0^1 \left(1 - \frac{2}{x+1}\right) dx$   
 $= -\left[x - 2 \log|x+1|\right]_0^1$   
 $= -[1 - 2 \log 2] = 2 \log 2 - 1$

65. **Ans. (c)**  
 $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \sin^2 x dx = 2 \int_0^{\frac{\pi}{4}} \frac{(1 - \cos 2x)}{2} dx$   
 As  $\int_{-a}^a f(x) dx = 2 \int_0^a f(x) dx$  iff  $f(x)$  is even function.  
 $= 2 \left[ \frac{1}{2} x - \frac{\sin 2x}{4} \right]_0^{\frac{\pi}{4}}$   
 $= 2 \left[ \frac{1}{2} \cdot \frac{\pi}{4} - \frac{1}{4} \right] = \frac{\pi}{4} - \frac{1}{2}$

66. **Ans. (a)**  $\cos(A + B) = \cos A \cos B - \sin A \sin B$ .

67. **Ans. (b)** Let points be  $\vec{a}(1, 3, 4), \vec{b}(2, -4, 6)$   
 is  $\vec{r} - \vec{a} = \lambda(\vec{b} - \vec{a})$   
 $\vec{r} - (1, 3, 4) = \lambda(1, -7, 2)$   
 $\Rightarrow \frac{x-1}{1} = \frac{y-3}{-7} = \frac{z-4}{2} = \lambda$   
 As crosses xy plane

$$\Rightarrow z = 0$$

$$\Rightarrow \frac{x-1}{1} = \frac{y-3}{-7} = \frac{-4}{2} = -2$$

$$x - 1 = -2 \Rightarrow x = -1$$

$$y - 3 = 14 \Rightarrow y = 17$$

$$\Rightarrow (x, y, z) = (-1, 17, 0)$$

68. **Ans. (d)**  $\frac{z_1}{z_2} = \frac{2+8i}{1-i}$

$$= \frac{2+8i}{1-i} \times \frac{1+i}{1+i} = \frac{-6+10i}{1-i^2}$$

$$= \frac{-6+10i}{2} = -3+5i$$

$$\Rightarrow \left| \frac{z_1}{z_2} \right| = |-3+5i| = \sqrt{34}$$

69. **Ans. (c)**  
 Take  $n = 1$   
 $\Rightarrow 3 \cdot 5^{2n+1} + 2^{3n+1}$   
 $= 3 \cdot 5^3 + 2^4$   
 $= 375 + 16 = 391$  is divisible by 17

70. **Ans. (d)** Here we are given 4 men, 3 women.  
 So at first 3 women can be arranged in  $|3|$  ways  
 among 3-women there are 4 places.  
 So 4 men can be arranged in  $|4|$  ways.  
 So total ways =  $|4|3|$   
 $= 24 \cdot 6 = 144$

71. **Ans. (b)** As  $x, y, z$  in A.P.  
 $\Rightarrow 2y = x + z$

72. **Ans. (a)** As lines are perpendicular  $m_1 m_2 = -1$

73. **Ans. (c)**

74. **Ans. (c)**  $a^2 + ab + a = 14$   
 $b^2 + ab + b = 28$   
 subtract  
 $\Rightarrow (a^2 - b^2) + (a - b) = -14$   
 $\Rightarrow (a - b)(a + b + 1) = -14 \dots(i)$

$$\text{Add } a^2 + b^2 + 2ab + a + b = 42$$

$$(a + b)^2 + a + b = 42$$

$$(a + b)[a + b + 1] = 42 \dots(ii)$$

Divide (i) by (ii)

$$\Rightarrow \frac{a-b}{a+b} = \frac{-1}{3} \dots(iii)$$

Apply componendo / dividendo

$$\Rightarrow \frac{a-b}{a+b} = \frac{-1}{3} \Rightarrow \frac{2a}{-2b} = \frac{2}{-4} = \frac{1}{-2}$$

$$\Rightarrow \frac{a}{b} = \frac{1}{2} \Rightarrow 2a - b = 0 \Rightarrow b = 2a$$

Put in (ii)  $\Rightarrow 3a(3a + 1) = 42$

$$a(3a + 1) = 14$$

$$3a^2 + a - 14 = 0$$

$$3a^2 + 7a - 6a - 14 = 0$$

$$3a(a - 2) + 7(a - 2) = 0$$

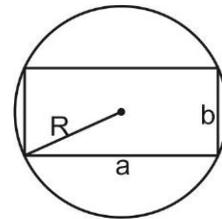
$$(a - 2)(3a + 7) = 0$$

$$a = 2 \Rightarrow b = 2a = 4$$

$$\Rightarrow 2a + b$$

$$= 4 + 4 = 8$$

75. **Ans. (a)**



Here  $2(a+b) = P$

$$\Rightarrow a + b = \frac{P}{2} \Rightarrow a^2 + b^2 + 2ab = \frac{P^2}{4} \dots(i)$$

$$\text{Also } a^2 + b^2 = (2R)^2 = 4R^2 \dots(ii)$$

Subtract (i) and (ii)

$$\Rightarrow 2ab = \frac{P^2}{4} - 4R^2 \Rightarrow ab = \frac{P^2}{8} - 2R^2$$

$$\Rightarrow \text{Area of Rectangle} = \frac{P^2}{8} - 2R^2$$



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