

**PU-2017**

1. The set  $A = \{x : |2x + 3| < 7\}$  is equal to the set :

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- (a)  $D = \{x : 0 < (x + 5) < 7\}$
- (b)  $B = \{x : -3 < x < 7\}$
- (c)  $E = \{x : -7 < x < 7\}$
- (d)  $C = \{x : -13 < 2x < 4\}$

2. Let S be the set of all real numbers. A relation R has been defined on S by  $aRb \Leftrightarrow |a - b| \leq 1$ , then R is :

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- (a) Symmetric and transitive but not reflexive
- (b) Reflexive and transitive but not symmetric
- (c) Reflexive and symmetric but not transitive
- (d) An equivalence relation

3. Two dice are thrown simultaneously. The probability of obtaining a total score of 5 is :

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- (a)  $\frac{1}{9}$
- (b)  $\frac{1}{18}$
- (c)  $\frac{1}{36}$
- (d)  $\frac{1}{12}$

4. How many 3-digit numbers are there with all different odd digits?

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- (a) 16
- (b) 48
- (c) 54
- (d) 60

5. In how many ways can four students be chosen from a group of 12 students?

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- (a) 495
- (b) 595
- (c) 395
- (d) 295

6. If, for example, 15 is a 2-digit number that is divisible by the product of its digits 1 and 5, then the number of 2-digit numbers divisible by the product of digits is :

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- (a) 8
- (b) 14
- (c) 13
- (d) 5

7. The value of  ${}^{10}C_1 + {}^{10}C_2 + {}^{10}C_3 + {}^{10}C_4 + \dots + {}^{10}C_9$  is :

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- (a)  $2^{10}$
- (b)  $2^{11}$
- (c)  $2^{10} - 2$
- (d)  $2^{10} - 1$

8. If  $r^{\text{th}}$  and  $(r + 1)^{\text{th}}$  terms in the expansion of  $(p + q)^n$  are equal, then  $\frac{(n+1)q}{r(p+q)}$  is :

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- (a) 1
- (b) 2
- (c) 3
- (d) 4

9. The sum of N terms of

$$\frac{1}{(1 \times 2)} + \frac{1}{(2 \times 3)} + \frac{1}{(3 \times 4)} + \frac{1}{(4 \times 5)} \dots \text{ is :}$$

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- (a)  $\frac{(N+1)}{N}$
- (b)  $\frac{N}{(N+1)}$
- (c)  $\frac{N}{(2N+1)}$
- (d)  $\frac{(2N+1)}{N}$

10. The sum of infinite Geometric Progression (GP) : 8, -4, 2, -1, ... is :

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- (a)  $\frac{16}{3}$
- (b)  $\frac{8}{3}$
- (c) 8
- (d) 5

11. If  $i = \sqrt{-1}$  then  $\frac{(3+i)}{(5+5i)}$  is same as :

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- (a)  $\frac{(2-i)}{5}$
- (b) i
- (c)  $5 - 5i$
- (d)  $\frac{(2+i)}{5}$

12. If  $i = \sqrt{-1}$  then  $(1 + i)^{10} = :$

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- (a) 1
- (b) i
- (c) 32
- (d) 32i

13. If  $\alpha$  and  $\beta$  are the roots of the equation  $x^2 - px + q = 0$ , then  $\alpha^2 + \beta^2$  is :

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- (a)  $p^2 + 2q$
- (b)  $p + 2q$
- (c)  $p^2 - 2q$
- (d)  $p - 2q$

14. What are the values of K for which the equation  $x^2 + Kx + 1 = 0$  has no real roots?

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- (a)  $-2 \leq K \leq 2$
- (b)  $-2 < K < 2$
- (c)  $2 < K < -2$
- (d)  $2 \leq K \leq -2$

15.  $x^3 + \sin(x)$  is :

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- (a) constant function
- (b) Odd function
- (c) Even function
- (d) Periodic function

16. If x and y are integers that satisfy the congruence  $3x \equiv 5 \pmod{11}$  and  $2y \equiv 7 \pmod{11}$ , then  $x + y$  is congruent modulo 11 to which of the following?

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- (a) 1
- (b) 3
- (c) 5
- (d) 7

17. Let S, T and U be nonempty sets, and let  $f : S \rightarrow T$  and  $g : T \rightarrow U$  be functions such that the function  $g \circ f : S \rightarrow U$  is one-to-one (injective). Which of the following must not be true?

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- (a) f is one-to-one
- (b) f is onto
- (c) g is one-to-one
- (d) g is onto

18. The domain of the function  $f(x) = \sqrt{\cos x}$  is :

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- (a)  $\left[\frac{3\pi}{2}, 2\pi\right]$
- (b)  $\left[0, \frac{\pi}{2}\right]$
- (c)  $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right] \cup [\pi, 2\pi]$
- (d)  $\left[0, \frac{\pi}{2}\right] \cup \left[\frac{3\pi}{2}, 2\pi\right]$

19.  $\int_0^{\pi/2} \cos^3(x) dx =$

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- (a) 3/2
- (b) 2/3
- (c) 8/9
- (d) 8/13

20. The value of  $\int_0^4 |x-1| dx$  is equal to :

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- (a) 5
- (b) 8
- (c) 4
- (d) 6

21.  $\lim_{x \rightarrow 0} \frac{\cos(3x) - 1}{x^2}$  is :

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- (a)  $\frac{9}{2}$
- (b)  $\frac{3}{2}$
- (c)  $-\frac{3}{2}$
- (d)  $-\frac{9}{2}$

22. What is the 19<sup>th</sup> derivative of  $\frac{x-1}{e^x}$ ?

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- (a)  $(18 - x)e^{-x}$
- (b)  $(19 - x)e^{-x}$
- (c)  $(20 - x)e^{-x}$
- (d)  $(x - 20)e^{-x}$

23. If  $f : \mathbb{R} \rightarrow \mathbb{R}$  is defined by  $f(x) = 2x + 3$ , then  $f^{-1}(x)$ :

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- (a) is given by  $\frac{x-3}{2}$
- (b) is given by  $\frac{1}{2x+3}$
- (c) does not exist because f is not injective

(d) does not exist because f is not surjective  
 24. If  $x + y \leq 2$ ,  $x \geq 0$ ,  $y \geq 0$ , then the point at which maximum value if  $3x + 2y$  is attained, will be :  
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- (a) (0, 2) (b) (0, 0) (c) (2, 0) (d)  $\left(\frac{1}{2}, \frac{1}{2}\right)$

25. The solution of the differential equation

$$\frac{dy}{dx} = e^{x-y} + x^2 e^{-y} \text{ is :}$$

- (a)  $e^y = e^x + \frac{x^3}{3} + C$  (b)  $e^y - e^x = C$   
 (c)  $x - e^x = C$  (d)  $e^y + e^x + \frac{x^3}{3} + C = 0$

where c is constant

26. The value of the determinant  $\begin{vmatrix} \cos \theta & 0 & \sin \theta \\ 0 & 1 & 0 \\ -\sin \theta & 0 & \cos \theta \end{vmatrix}$  is :  
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- (a) 0 (b) -1 (c) 1 (d) 2

27. Rank of a non-singular square matrix of order N is :  
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- (a) N (b) 0 (c) N - 1 (d) 1

28. The value of K for which the lines  $2x + y - 1 = 0$ ,  $4x + 3y - 3 = 0$  and  $3x + Ky - 2 = 0$ , are concurrent is :  
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- (a) -2 (b) 3 (c) 2 (d) -3

29. If A is  $3 \times 4$  matrix and B is a matrix such that  $A^T B$  and  $BA^T$  are both defined, then B is of the type:  
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- (a)  $4 \times 4$  (b)  $3 \times 4$  (c)  $4 \times 3$  (d)  $3 \times 3$

30. The inverse of the matrix  $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$  is :  
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- (a)  $\frac{1}{24} \begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$  (b)  $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$

- (c)  $\frac{1}{24} \begin{bmatrix} 24 & 0 & 0 \\ 0 & 24 & 0 \\ 0 & 0 & 24 \end{bmatrix}$  (d)  $\begin{bmatrix} \frac{1}{2} & 0 & 0 \\ 0 & \frac{1}{3} & 0 \\ 0 & 0 & \frac{1}{4} \end{bmatrix}$

31. The distance of the point P(a,b,c) from the x-axis is :  
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- (a)  $\sqrt{a^2 + b^2}$  (b)  $\sqrt{b^2 + c^2}$   
 (c) a (d)  $\sqrt{a^2 + c^2}$

32. If  $\sin \theta + \cos \theta = p$  and  $\tan \theta + \cot \theta = q$ , then  $q(p^2 - 1) =$   
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- (a) 1/2 (b) 2 (c) 1 (d) 3

33.  $\frac{\sin 70^\circ + \cos 40^\circ}{\cos 70^\circ + \sin 40^\circ} =$   
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- (a)  $\frac{1}{\sqrt{3}}$  (b)  $\sqrt{3}$  (c) 1/2 (d) 1

34. The equation of the circle passing through (2, 0) and (0, 4) and having the minimum radius is :  
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- (a)  $x^2 + y^2 = 20$  (b)  $x^2 + y^2 - 2x - 4y = 0$   
 (c)  $x^2 + y^2 = 4$  (d)  $x^2 + y^2 = 18$

35. The point (3, 4) is the focus and  $2x - 3y + 5 = 0$  is the directrix of a parabola. Its Latus rectum is :  
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- (a)  $\frac{2}{\sqrt{13}}$  (b)  $\frac{4}{\sqrt{13}}$  (c)  $\frac{1}{\sqrt{13}}$  (d)  $\frac{3}{\sqrt{13}}$

36. If  $\vec{a}, \vec{b}, \vec{c}$  are unit vectors such that  $\vec{a} + \vec{b} + \vec{c} = 0$ , then angle between  $\vec{a}$  and  $\vec{b}$  is :  
**PU-2017**

- (a)  $\frac{\pi}{3}$  (b)  $\frac{2\pi}{3}$  (c)  $\frac{\pi}{4}$  (d)  $\frac{\pi}{2}$

37. If A and B are two events such that

$$P(A \cup B) + P(A \cap B) = \frac{7}{8} \text{ and } P(A) = 2P(B), \text{ then}$$

$P(A) =$

- (a)  $\frac{7}{12}$  (b)  $\frac{7}{24}$  (c)  $\frac{5}{12}$  (d)  $\frac{17}{24}$

38. If  $\frac{1}{(3-5x)(2+3x)} = \frac{A}{(3-5x)} + \frac{B}{(2+3x)}$ , then A : B is :  
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- (a) 3 : 5 (b) 3 : 2 (c) 2 : 3 (d) 5 : 3

39. The arithmetic mean of the five numbers 10, 8, 5, a and b is 6 and their variance is 6.80. Then the value of  $a \times b =$   
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- (a) 16 (b) 10 (c) 12 (d) 14

40. If the median of the data 6, 7, x - 2, x, 18, 21 written in ascending order is 16, then x =  
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- (a) 15 (b) 16 (c) 17 (d) 18

41. ICT means :  
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- (a) Information and Collaborative Technology  
 (b) Information and Communicable Technology  
 (c) Information and Communication Technology  
 (d) Internal Communication Theory

42. In Computer Networking, the "http" you type at the beginning of any web-site's address is an acronym for :  
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- (a) Hyper Text Transfer Protocol  
 (b) Hyper Transfer Text Protocol  
 (c) Hyper Technical Transfer Protocol  
 (d) Hyper Text Technical Protocol

43. Which of the following is the next step in the evolution of the Internet and Web applications?  
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- (a) Web 1.0 (b) Web 2.0 (c) Web 3.0 (d) Web 4.0

44. Who among the following is the principal force behind the development of Linux Operating System?  
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- (a) Tim Berners-Lee (b) Linus Torvalds  
 (c) Bill Gates (d) Litms Torrent

45. The Brain of a computer is its :  
**PU-2017**

- (a) CPU (b) CD  
(c) Floppy disc (d) clock
46. In MS-WORD, the process of combining static information in a publication together with variable information in a data source to create one merged publication is called:

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- (a) Merging (b) Data sourcing  
(c) Mail merge (d) Consolidation
47. With regard to e-mail, what does bcc : mean?

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- (a) Blind Carbon Copy  
(b) Blind Computer Communication  
(c) Blind Communication Channel  
(d) Blind Computer Copy
48. What is WiFi?

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- (a) Wireless Fixture (b) Wireless Friction  
(c) Wireless Fidelity (d) Wired Fidelity
49. Which of the following application software are in correct order with respect to .doc, .xls, .mdb, and .ppt file extensions?

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- (a) MS Word, MS Excel, MS PowerPoint, MS Access  
(b) MS Excel, MS PowerPoint, MS Access, MS Outlook Express  
(c) MS Word, MS Excel, MS Access, MS PowerPoint  
(d) MS Document, MS Excel, MS PowerPoint, MS Access

50. 1 Terabyte = ..... Bytes.

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- (a)  $2^{20}$  (b)  $2^{30}$  (c)  $2^{40}$  (d)  $2^{50}$
51. A 21 inches computer monitor implies that :

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- (a) The screen is 21 inches wide  
(b) The screen is 21 inches high  
(c) A circle of 21 inches diameter is available for display  
(d) The diagonal across the screen is 21 inches

52. Consider the following EXCEL table :

	A	B	C
1	10	16	
2	20		
3	8		
4	12		
5	0		

The equation in cell B2 is : “= A2 + B1”. This equation is then copied and pasted to cells, B3, B4 and B5. What should be the value in B5?

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- (a) 36 (b) 24 (c) 44 (d) 56
53. A \_\_\_\_\_ is a utility that reorganizes the files and unused space on a computer’s hard disk so the operating system can access data more quickly and programs can run faster.

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- (a) File compression utility (b) disk defragmenter  
(c) disk scanner (d) File viewer
54. Printer resolution is measured by the number of \_\_\_\_\_ a printer can output.

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- (a) Characters per page (cpp)

- (b) Pixels per segment (pps)  
(c) Dots per inch (dpi)  
(d) Bits per centimeter (bpc)
55. Given a bit rate of b bits / second, the time required to send 16 bits it :

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- (a)  $16 \times b$  seconds (b)  $16/b$  seconds  
(c)  $16^b$  seconds (d)  $b^{16}$  seconds
56. Find the next number in the series :  
4, 9, 25, 49, \_\_\_\_\_ .

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- (a) 64 (b) 81 (c) 121 (d) 123
57. Find the odd man out.  
395, 462, 572, 427, 671, 264:

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- (a) 671 (b) 462 (c) 427 (d) 264
58. In a certain language, ‘PROBLEM’ is written as ‘MPERLOB’. How will ‘NUMBERS’ be written in that code?

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- (a) SNUREMB (b) SNRUBME  
(c) SNRUEMB (d) SNRUMEB
59. The number 3 divides ‘a’ with a result of ‘b’ and a remainder of 2. The number 3 divides ‘b’ with a result of 2 and a remainder of 1. What is the value of ‘a’?

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- (a) 13 (b) 17 (c) 21 (d) 23
60. The age of the two persons differ by 20 years. If 5 year ago, the older one was 5 times as old as the younger one, then their present ages, in year are:

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- (a) 25, 5 (b) 30, 10 (c) 35, 15 (d) 50, 30
61. In a Computer Science (CS) examination, the average for the entire class was 80 marks. If 10% of the students scored 95 marks and 20% scored 90 marks, then what were the average marks of the remaining students of the class?

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- (a) 65 (b) 70 (c) 75 (d) 60
62. In a purse containing only Rs. 100, Rs. 500 and Rs. 2000 denomination notes, all but 15 are Rs. 100 notes, all but 13 are Rs. 500 notes and all but 12 are Rs. 2000 notes. How many are Rs. 500 notes?

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- (a) 13 (b) 7 (c) 25 (d) 20
63. There are a certain number of swans swimming in a lake. There are two swans in front of swan, two behind one and one between two. What is the smallest number of swans that could swim in that formation?

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- (a) 5 (b) 3 (c) 8 (d) 2
64. One the basis of two statements given below, a conclusion has been drawn.

(i) Every women wants to look and feel younger than she is.

(ii) Women are generally reluctant to disclose their age.

Conclusion: Every woman is older than she says she is.

Mark the conclusions as:

**PU-2017**

- (a) Statement (i) supports the conclusion.  
(b) Statement (ii) supports the conclusion

- (c) Both statements (i) and (ii) read together support the conclusion  
 (d) Neither (i) nor (ii) supports the conclusion.
65. Choose the correct alternative from the given ones which will complete the letter series.  
 NBM, KEP, HHS, ?, BNY :  
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 (a) EJW (b) EKV (c) EKV (d) FLV

**Directions (Questions nos. 66-70):**

In the following questions, sentences are given with blanks to be filled in with appropriate words. Four alternatives are suggested for each question. Choose the correct alternative out of the four.

66. How long \_\_\_\_\_ English?  
**PU-2017**  
 (a) do you learn  
 (b) are you learning  
 (c) have you been learning  
 (d) you learn
67. The doctor gave me a \_\_\_\_\_ for some medicine yesterday.  
**PU-2017**  
 (a) note (b) receipt  
 (c) prescription (d) recipe
68. You won't be allowed into the club \_\_\_\_\_ you wear a suit and tie.  
**PU-2017**  
 (a) it (b) unless  
 (c) whether (d) apart
69. The workers left early and \_\_\_\_\_ home.  
**PU-2017**  
 (a) gone (b) went  
 (c) have dinner (d) drives
70. He is always true \_\_\_\_\_ his word.  
**PU-2017**  
 (a) with (b) of (c) for (d) to
71. The antonym for the word 'adversity' is :  
**PU-2017**  
 (a) Scarcity (b) Deficiency

- (c) Catastrophe (d) Prosperity
72. Choose the option closest in meaning to the word 'ancestor':  
**PU-2017**  
 (a) Old (b) Forefather  
 (c) Past (d) Dead
73. Which of the following idioms means "to break an uncomfortable silence"?  
**PU-2017**  
 (a) Break down (b) Break away  
 (c) Break the record (d) Break the ice
74. Find the correctly spelt word.  
**PU-2017**  
 (a) Servent (b) Sarvent  
 (c) Servant (d) Sarvant
75. Consider the following two statements :  
 (i) He dies from a wound.  
 (ii) He died of cancer.  
 What can you say about these two statements?  
**PU-2017**  
 (a) Only (i) is correct.  
 (b) Only (ii) is correct  
 (c) Both (i) and (ii) are correct  
 (d) Neither (i) nor (ii) is correct.

**PU-2017 ANSWERS**

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

PU-2017 SOLUTIONS

1. **Ans. (a)**  $|2x + 3| < 7$

$$\begin{aligned} -(2x + 3) < 7 & \quad + (2x + 3) < 7 \\ 2x + 3 > -7 & \quad 2x < 4 \\ 2x > -10 & \quad x < 2 \\ x > -5 & \\ -5 < x < 2 & \\ -5 + 5 < x + 5 < 2 + 5 & \\ 0 < x + 5 < 7 & \end{aligned}$$

2. **Ans. (c)**  $|a - b| \leq 1$

Ref:-  $\forall a \in A$   
 $(a, a) \in R$   
 $\therefore |a - b| \leq 1$   
 $\Rightarrow |a - a| \leq 1 \quad 0 \leq 1$

Which is true  
 $\therefore$  it is reflexive

**Transitive :-** If  $|a - b| \leq 1$

$|b - c| \leq 1$   
 then  $|a - c| \leq 1$   
 not always,

**eg:-**  $|2 - 2.4| \leq 1$

$|2.4 - 3.1| \leq 1$

but  $|2 - 3.1| \leq 1$

$\therefore$  it is not transitive.

Symmetric:  $|a - b| \leq 1$

$|(b - a)| \leq 1$

$|b - a| \leq 1$

$\therefore$  it is symmetric

3. **Ans. (a)** Total outcomes = 36

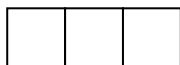
Total score 5

Favourable outcomes

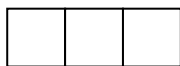
$\{(1, 4), (2, 3), (3, 2), (4, 1)\}$

$$P(E) \Rightarrow \frac{4}{36} \Rightarrow \frac{1}{9}$$

4. **Ans. (d)** odd nos. :- 1, 3, 5, 7, 9



Since all 3 digits are different,  $\therefore$  Repetition is not allowed



5      4      3      60

5. **Ans. (a)**  $\Rightarrow {}^{12}C_4 \Rightarrow \frac{12!}{8!4!}$

$$\frac{12 \times 11 \times 10 \times 9 \times 8!}{8 \times 4 \times 3 \times 2 \times 1}$$

$$45 \times 11 \Rightarrow 495$$

6. **Ans. (d)** Check no. by no.

11 $\sqrt{\quad}$	12 $\sqrt{\quad}$	13x	14x	15 $\sqrt{\quad}$	16 x
17x	18x	19x	20x	21x	22x
23x	24 $\sqrt{\quad}$	36 $\sqrt{\quad}$			

Only 5 nos. are divisible by the product of digits

7. **Ans. (c)**  ${}^nC_0 + {}^nC_1 + {}^nC_2 + \dots + {}^nC_n = 2^n$

$${}^{10}C_0 + {}^{10}C_1 + {}^{10}C_2 + \dots + {}^{10}C_{10} = 2^{10}$$

$${}^{10}C_1 + {}^{10}C_2 + \dots + {}^{10}C_9 = 2^{10} - {}^{10}C_0 = {}^{10}C_2$$

$$\Rightarrow 2^{10} - 1 - 1$$

$$2^{10} - 2$$

8. **Ans. (a)** rth term of  $(p + q)^n$

$$= {}^nC_{r-1} (p)^{n-r+1} q^{r-1}$$

$(r + 1)$ th term of  $(p + q)^n$

$$= {}^nC_r (p)^{n-r} q^r$$

ATQ

$${}^nC_{r-1} (p)^{n-r+1} \cdot q^{r-1} = {}^nC_r p^{n-r} \cdot q^r$$

$${}^nC_{r-1} p \cdot = {}^nC_r q$$

$$\frac{n!}{(n-r+1)! (r-1)!} \cdot p = \frac{n!}{(n-r)! r!}$$

$$\frac{p}{(n-r+1)(n-r)! (r-1)!} = \frac{q}{(n-r)! r(r-1)!}$$

$$\frac{p}{(n-r+1)} = \frac{q}{r}$$

$$rp = q(n-r+1)$$

$$rp = nq - rq + q$$

$$rp + rq = q(n+1)$$

$$r(p+q) = q(n+1)$$

$$\frac{q(n+1)}{r(p+1)} = 1$$

9. **Ans. (b)**  $\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \frac{1}{4 \times 5} + \dots$

$$\Rightarrow \sum \frac{1}{n(n+1)} = \sum \left( \frac{1}{n} - \frac{1}{n+1} \right)$$

$$\sum \frac{1}{n} - \sum \frac{1}{n+1} + 1$$

$$\Rightarrow \frac{1}{1} - \frac{1}{2} + \frac{1}{2} - \frac{1}{3} + \frac{1}{3} - \frac{1}{4} + \dots + \frac{1}{n} - \frac{1}{n+1}$$

$$1 - \frac{1}{n+1}$$

$$\frac{n+1-1}{n+1} = \frac{n}{n+1}$$

10. **Ans. (a)** 8, -4, 2, -1, .....

$$S_n = \frac{a}{1-r} \quad r = -\frac{1}{2}$$

$$\Rightarrow \frac{8}{1 + \frac{1}{2}} \quad \Rightarrow \frac{8}{\frac{3}{2}}$$

$$\Rightarrow \frac{16}{3}$$

11. **Ans. (a)**  $\frac{3+i}{5+5i} \Rightarrow \frac{3+i}{5(1+i)}$

$$\frac{1}{5} \left[ \frac{3+i}{1+i} \times \frac{1-i}{1-i} \right]$$

$$\frac{1}{5} \left[ \frac{(3+i)(1-i)}{1-i^2} \right]$$

$$\frac{1}{5} \left[ \frac{3-2i-i^2}{1+1} \right] = \frac{1}{5} \left[ \frac{4-2i}{2} \right]$$

$$\frac{1}{5} \left[ \frac{2(2-i)}{2} \right]$$

$$\frac{2-i}{5}$$

12. **Ans. (d)**

13. **Ans. (c)**  $x^2 - px + q = 0$

$$\alpha + \beta = p$$

$$\alpha\beta = q$$

$$\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$$

$$\Rightarrow p^2 - 2q$$

14. **Ans. (b)**  $x^2 + kx + 1 = 0$

Has no real roots

$$D < 0$$

$$k^2 - 4 < 0$$

$$-2 < k < 2$$

15. **Ans. (b)**  $x^3 + \sin x$

$x^3$  is an odd function

$\sin x$  is also an odd function

$\therefore x^3 + \sin x$  is also an odd function

16. **Ans. (d)**  $3x \equiv 5 \pmod{II}$

Also  $3x \equiv 27 \pmod{II}$

$$x \equiv 9 \pmod{II} \dots (i)$$

$$2y \equiv 7 \pmod{II}$$

$$2y \equiv 18 \pmod{II}$$

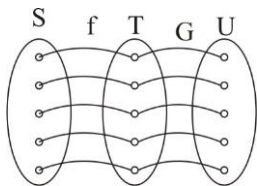
$$y \equiv 9 \pmod{II} \dots (ii)$$

Adding (i) and (ii)

$$x + y \equiv 18 \pmod{II}$$

ie.  $x + y \equiv 7 \pmod{II}$

17. **Ans. (0)**



$\text{gof} : S \rightarrow U$

function of must be one-one and onto and g must be onto.

18. **Ans. (d)**  $\sqrt{\cos x}$   $\cos x \geq 0$

$\cos x$  positive

in 1<sup>st</sup> and 4<sup>th</sup> quadrant

now check by options

(a)  $\left[ \frac{3\pi}{2}, 2\pi \right]$

(b)  $\left[ 0, \frac{\pi}{2} \right]$

(d)  $\left[ 0, \frac{\pi}{2} \right] \cup \left[ \frac{3\pi}{2}, 2\pi \right]$

19. **Ans. (b)**  $\int_0^{\frac{\pi}{2}} \cos^n x dx \Rightarrow \frac{a(n-1)(n-3)}{n(n-2)(n-4)}$

Since  $n = 3$

$$\int_0^{\frac{\pi}{2}} \cos^3 x dx = \frac{(n-3)}{n(3-2)} \Rightarrow \frac{2}{3(1)} = \frac{2}{3}$$

20. **Ans. (a)**  $\int_0^4 |x-1| dx$

$$\int_0^1 -(x-1) dx + \int_1^4 (x-1) dx$$

$$-\int_0^1 (x-1) dx + \int_1^4 (x-1) dx$$

$$-\left[ \frac{x^2}{2} - x \right]_0^1 + \left[ \frac{x^2}{2} - x \right]_1^4$$

$$\left[ x - \frac{x^2}{2} \right]_0^1 + \left[ \frac{x^2}{2} - x \right]_1^4$$

$$\Rightarrow \left[ 1 - \frac{1}{2} \right] + \left[ 8 - 4 - \frac{1}{2} + 1 \right]$$

$$\Rightarrow 5$$

21. **Ans. (d)**  $\lim_{x \rightarrow 0} \frac{\cos(3x) - 1}{x^2}$   $\frac{0}{0}$  form

Apply L'hospital Rule

$$\lim_{x \rightarrow 0} \frac{-3 \sin 3x}{2x}$$

Again applying L'hospital

$$\lim_{x \rightarrow 0} \frac{-3 \cdot 3 \cdot \cos 3x}{2}$$

$$\lim_{x \rightarrow 0} -\frac{9}{2} \cos 3x$$

$$-\frac{9}{2} \cdot 1 \Rightarrow -\frac{9}{2}$$

22. **Ans. (c)**  $\frac{x-1}{e^x}$

$$y \Rightarrow (x-1)e^{-x}$$

$$\frac{dy}{dx} = (x-1)e^{-x} \cdot (-1) + e^{-x} \cdot 1$$

$$e^{-x} (-x+1+1)$$

$$\frac{dy}{dx} = e^{-x} (-x+2)$$

$$\frac{dy}{dx} = e^{-x} (2-x)$$

$$\frac{d^2y}{dx^2} = (2-x)e^{-x} (-1) + e^{-x} (-1)$$

$$e^{-x} [x-2-1]$$

$$\frac{d^2y}{dx^2} = e^{-x} (x-3)$$

Now according to pattern

$$\frac{d^{19}y}{dx^{19}} = e^{-x} (20-x)$$

23. **Ans. (a)**  $f(x) = 2x + 3$

$$y = 2x + 3$$

$$y - 3 = 2x$$

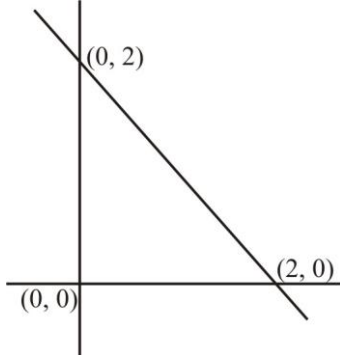
$$x = \frac{y-3}{2}$$

$$f^{-1}(x) = \frac{x-3}{2}$$

24. **Ans. (c)**  $x + y \leq 2$        $x + y = 2$   
 $x \geq 0$        $y \geq 0$   
 $3x + 2y = 0$   
 $x + y = 2$

x	0	2
y	2	0

Value of  $(3x + 2y)$



- at  $(0, 0) \Rightarrow 0$   
 $(2, 0) \Rightarrow 6$   
 $(0, 2) = 4$   
 $\therefore$  Max. value  $\Rightarrow 6$  at pt  $(2, 0)$

25. **Ans. (a)**

$$\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$$

$$\frac{dy}{dx} = e^x - e^{-y} + x^2 - e^{-y}$$

$$\frac{dy}{dx} = e^{-y} (e^x + x^2)$$

$$\int \frac{dy}{e^{-y}} = \int (e^x + x^2) dx$$

$$\int e^y dy = \int (e^x + x^2) dx$$

$$e^y = e^x + \frac{x^3}{3} + C$$

26. **Ans. (c)**  $\begin{vmatrix} \cos \theta & 0 & \sin \theta \\ 0 & 1 & 0 \\ -\sin \theta & 0 & \cos \theta \end{vmatrix} = \cos^2 \theta + \sin^2 \theta \Rightarrow 1$

27. **Ans. (a)** Rank of non-singular matrix is N.  
 $\det A \neq 0$

28. **Ans. (c)** Since lines are concurrent

$$\begin{vmatrix} 2 & 1 & -1 \\ 4 & 3 & -3 \\ 3 & k & -2 \end{vmatrix} = 0$$

$$2(-6 + 3k) - 1(-8 + 9) - 1(4k - 9) = 0$$

$$-12 + 6k - 1 - 4k + 9 = 0$$

$$2k - 13 + 9 = 0$$

$$2k - 4 = 0$$

$$2k = 4$$

$$k = 2$$

29. **Ans. (b)**  $A = 3 \times 4$  matrix  
 $A^T = 4 \times 3$  matrix  
 $A^T B$  is defined  
 $4 \times 3 \underline{m} \times n$   
 $m$  has to be 3.  
 $BA^T$  is also defined  
 $3 \times \underline{n} \quad 4 \times 3$   
 $n$  has to be 4  
 $\therefore$  Order of  $B$  is  $3 \times 4$ .

30. **Ans. (d)**

$$\begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$$

$$|A| \Rightarrow 2 \times 3 \times 4$$

$$\Rightarrow 24$$

$$C_{11} \Rightarrow 12 \quad C_{22} = 8 \quad C_{33} = 6$$

$$\frac{1}{24} \begin{bmatrix} 12 & 0 & 0 \\ 0 & 8 & 0 \\ 0 & 0 & 6 \end{bmatrix} \Rightarrow \begin{bmatrix} \frac{1}{2} & 0 & 0 \\ 0 & \frac{1}{3} & 0 \\ 0 & 0 & \frac{1}{4} \end{bmatrix}$$

31. **Ans. (b)**  $P(a, b, c)$  from x-axis.  
 Let pt on x-axis be  $(a, 0, 0)$

$$\sqrt{(a+a)^2 + (0-b)^2 + (0-c)^2}$$

$$\sqrt{(-b)^2 + (-c)^2} = \sqrt{b^2 + c^2}$$

32. **Ans. (0)**

$$\sin \theta + \cos \theta = P$$

$$\frac{\sin \theta}{\cos \theta} + \frac{\cos \theta}{\sin \theta} = q$$

$$\sin^2 \theta + \cos^2 \theta = q \sin \theta \cos \theta$$

$$\sin \theta \cos \theta = \frac{1}{q}$$

$$(\sin \theta + \cos \theta)^2 = \sin^2 \theta + \cos^2 \theta + 2 \sin \theta \cos \theta$$

$$p^2 = 1 + 2 \frac{1}{q}$$

$$p^2 = 1 + \frac{2}{q}$$

$$p^2 - 1 = \frac{2}{q}$$

$$q(p^2 - 1) = 2$$

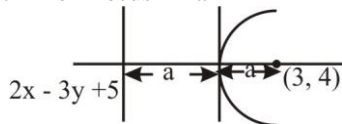
33. **Ans. (b)**  $\frac{\sin 70^\circ + \cos 40^\circ}{\cos 70^\circ + \sin 40^\circ} \Rightarrow \frac{\sin 70^\circ + \sin 50^\circ}{\cos 70^\circ + \cos 50^\circ}$

$$\Rightarrow \frac{2 \sin \frac{120^\circ}{2} \cos \frac{20^\circ}{2}}{2 \cos \frac{120^\circ}{2} \cos \frac{20^\circ}{2}}$$

$$\tan 60^\circ = \sqrt{3}$$

34. **Ans. (b)** Put point directly in options only (b) option satisfy both the points.

35. **Ans. (a)** point (3, 4) focus  $2x - 3y + 5 = 0$  distance of directrix from focus =  $2a$



$$2a = \frac{|2(3) - 3(4) + 5|}{\sqrt{2^2 + 3^2}}$$

$$2a = \frac{|6 - 12 + 5|}{\sqrt{13}} \Rightarrow \frac{1}{\sqrt{13}} \quad a = \frac{1}{2\sqrt{13}}$$

$$\text{Latus Rectum} = 4a = 4 \times \frac{1}{2\sqrt{13}} = \frac{2}{\sqrt{13}}$$

36. **Ans. (b)**  $\vec{a} + \vec{b} + \vec{c} = 0$

$$\vec{a} + \vec{b} = -\vec{c}$$

$$|\vec{a} + \vec{b}| = |-\vec{c}|$$

S.B.S

$$|\vec{a} + \vec{b}|^2 = |\vec{c}|^2$$

$$|\vec{a}|^2 + |\vec{b}|^2 + 2|\vec{a}||\vec{b}|\cos\theta = |\vec{c}|^2$$

$$1 + 1 + 2 \times 1 \times 1 \cos\theta = 1$$

$$2\cos\theta = -1$$

$$\cos\theta = -\frac{1}{2}$$

$$\theta = -\frac{2\pi}{3}$$

37. **Ans. (a)**  $P(A) = 2P(B)P(B) = \frac{1}{2}P(A)$

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$P(A \cup B) + P(A \cap B) = P(A) + \frac{1}{2}P(A)$$

$$\frac{7}{8} = \frac{3}{2}P(A)$$

$$P(A) = \frac{7}{12}$$

38. **Ans. (d)**  $\frac{1}{(3-5x)(2+3x)} = \frac{A}{(3-5x)} + \frac{B}{(2+3x)}$

$$1 = A(2+3x) + B(3-5x)$$

$$3(2A+3B=1)$$

$$2(3A-5B=0)$$

$$6A + 9B = 3$$

$$6A - 10B = 0$$

$$\begin{matrix} (-) & (+) & (-) \\ \hline 19B = 3 \end{matrix}$$

$$B = \frac{3}{19}$$

$$\text{Illy } A = \frac{5}{19}$$

$$\therefore A : B = \frac{5}{19} : \frac{3}{19}$$

$$\Rightarrow 5 : 3$$

39. **Ans. (c)** Mean =  $\frac{10+8+5+a+b}{5} = 6$

$$= \frac{\sum(x_i - \mu)^2}{N}$$

$$6.80 \Rightarrow \frac{(10-6)^2 + (8-6)^2 + (5-6)^2 + (a-6)^2 + (b-6)^2}{5}$$

$$6.80 \cdot \frac{16+4+1+(a-b)^2+(b-6)^2}{5}$$

$$21 + (a-6)^2 + (b-6)^2 = 34$$

$$(a-6)^2 + (b-6)^2 = 13$$

$$b = 7 - a$$

$$(a-6)^2 + (1-a)^2 = 13$$

$$2a^2 - 14a + 37 = 13$$

$$2a^2 - 14a + 24 = 0$$

$$a^2 - 7a + 12 = 0$$

$$(a-4)(a-3) = 0$$

$$\text{either } a = 4$$

$$\text{or } a = 3$$

$$\text{if } a = 4 \text{ then } b = 3$$

$$\text{if } a = 3 \text{ then } b = 4$$

$$\therefore a \times b \text{ in both cases} = 12$$

40. **Ans. (c)** 6, 7,  $x-2$ ,  $x$ , 18, 21

$$\text{Median} = \frac{x-2+x}{2}$$

$$16 = \frac{2x-2}{2}$$

$$16 = x - 1$$

$$x = 17$$