Airmen Group -XY Solved Paper 2018

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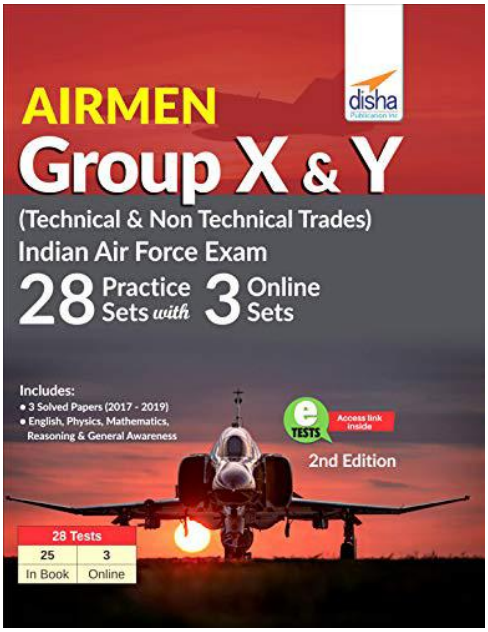

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INDIAN AIR FORCE AIRMEN GROUP X & Y
SOLVED PAPER - 2018
(Memory Based)

ENGLISH LANGUAGE

1. Find the one which best expresses the meaning of the given word.
Literal
(a) Verbatim (b) Formal
(c) Idealistic (d) Outdated

2. Find the word opposite in meaning to the given word.
Appreciation
(a) Aspersions (b) Admiration
(c) Commendation (d) Compliment

DIRECTIONS (Qs. 3-7) : *Find the correct alternative out of the four.*

3. Raju willingly_____my request for financial assistance.
(a) complied to (b) complied with
(c) complied on (d) complied for

4. My friend_____at seven this morning.
(a) took away (b) got up
(c) left up (d) kept up

5. A lady_____I know helped me.
(a) who (b) whom
(c) which (d) that

6. The government has identified food processing as the key_____rapid industrialization in Bihar.
(a) for (b) to
(c) of (d) in

7. Rajan was so tired_____he could not walk.
(a) as (b) than
(c) that (d) still

DIRECTIONS (Qs. 8-9) : *Find out which part of a sentence has an error. If a sentence is free from error, your answer is (d) i.e. No error.*

8. Mohans' eyes (a) / reflect a hope (b) / for a better future in Microsoft. (c) / No error. (d)

9. He went to Mumbai (a) / with a view (b) / to secure a job. (c) / No error. (d)

DIRECTIONS (Qs. 10-11) : *Find the one which can be substituted for the given words/sentence.*

10. Murder of a king
(a) homicide (b) fratricide
(c) regicide (d) parricide

11. A place where birds are kept
(a) Aviary (b) House
(c) Aquarium (d) Apiary

12. Find the correctly spelt word .
(a) exilarate (b) exhilerate
(c) exsilarate (d) exhilarate

13. Find the alternative which best expresses the meaning of the Idiom/Phrase.
The Cauvery water issue led to **apple of discord** between the two Governments.
(a) cause of anger (b) cause of hatred
(c) cause of quarrel (d) cause of animosity

14. **Change the voice**
Who gave you permission to enter ?
(a) By whom were you given permission to enter ?
(b) By whom was you given permission to enter ?
(c) By whom you were given permission to enter ?
(d) By whom given you permission to enter ?

15. **Identify the indirect speech**
He said, "Alas ! I am undone !"
(a) He said that it was his undoing
(b) He exclaimed pathetically that he was undone
(c) He stated that he was undone
(d) He cried that he was being undone

DIRECTIONS (Qs. 16-18): *Read the following passages and choose the correct options.*

In May 1996, the World Health Organization was authorized to initiate global campaign to eradicate small pox. The goal was to eradicate the disease in one decade. Because similar projects for malaria and yellow fever had failed, few believed that small pox mild actually be eradicate, but eleven years after the initial organization of the campaign, no cases were reported in the field. The strategy was not only to provide mass vaccination, but also to Isolate patients with active small pox in order to contain the spread of the disease and to break the chain of huff man transmission. Rewards for reporting small pox assisted in motivating the public to aid health workers. One by one, each small pox victim was sought out, removed from contact with others and treated. At the same time, the entire, village where the victim had lived was vaccinated. Today small pox is no longer a threat to humanity. Routine vaccinations have been stopped worldwide.

16. Which of the following is the best title for the passage?
    (a) The World Health Organization
    (b) The Eradication of small-pox
    (c) Small pox vaccination
    (d) Infectious diseases

17. What was the goal of the campaign against small pox?
    (a) To decrease the spread of small pox worldwide
    (b) To eliminate small pox worldwide in ten years
    (c) To provide mass vaccinations against small pox worldwide
    (d) To initiate worldwide projects for small pox, malaria and yellow fever at the same time

18. According to the paragraph what was the strategy used to eliminate the spread of small pox?
    (a) Vaccination of the individual village
    (b) Treatment of individual victims
    (c) Isolation of victims and mass vaccinations
    (d) Extensive reporting of out breaks

19. **Form an adjective from the given word**
    Nice
    (a) Nicer (b) Nicing
    (c) Nicely (d) Very Nice

20. **Give the plural of the given word**
    Goose
    (a) Gooses (b) Goosess
    (c) Geese (d) Gaze

PHYSICS

21. If the mass of earth is 80 times of that of a planet and diameter is double that of planet and 'g' on earth is 9.8 m/s^2, then the value of 'g' on that planet is
    (a) 4.9 m/s^2 (b) 0.98 ms^2
    (c) 0.49 m/s^2 (d) 49 m/s^2

22. The maximum range of a gun of horizontal terrain is 16 km. If g = 10 ms^{-2}, then muzzle velocity of a shell must be
    (a) 160 ms^{-1} (b) $200\sqrt{2}$ ms^{-1}
    (c) 400 ms^{-1} (d) 800 ms^{-1}

23. If the length of a simple pendulum is increased by 2%, then the time period
    (a) increases by 2% (b) decreases by 2%
    (c) increases by 1% (d) decreases by 1 %

24. A string of 7 m length has a mass of 0.035 kg. If tension in the string is 60.5 N, then speed of a wave on the string is
    (a) 77 m/s (b) 102 m/s
    (c) 110 m/s (d) 165 m/s

25. A student has measured the length of a wire equal to 0.04580 m. This value of length has the number of significant figures equal to
    (a) five (b) four
    (c) six (d) None of these

26. The cause of heat production in a current carrying conductor is
    (a) collisions of free electrons with one another
    (b) high drift speed of free electrons
    (c) collisions of free electrons with atoms or ions of the conductor
    (d) high resistance value

27. For good demodulation of AM signal of carrier frequency *f*, the value of RC should be
    (a) $RC = \frac{1}{f}$ (b) $RC < \frac{1}{f}$
    (c) $RC \geq \frac{1}{f}$ (d) $RC >> \frac{1}{f}$

28. Two bodies of different masses m_a and m_b are dropped from two different heights a and b. The ratio of the time taken by the two to cover these distances is
(a) a : b (b) b : a
(c) $\sqrt{a} : \sqrt{b}$ (d) $a^2 : b^2$

29. They decay constant of radium is 4.28×10^{-4} per year. Its half life will be
(a) 2000 years (b) 1240 years
(c) 63 years (d) 1620 years

30. When the speed of a moving body is doubled :
(a) its acceleration is doubled
(b) its momentum is doubled
(c) its kinetic energy is doubled
(d) its potential energy is doubled

31. If a full wave rectifier circuit is operating from 50Hz mains, the fundamental frequency in the ripple will be
(a) 100 Hz (b) 25 Hz
(c) 50 Hz (d) 70.7 Hz

32. A ring of mass m and radius r rotates about an axis passing through its centre and perpendicular to its plane with angular velocity ω. Its kinetic energy is
(a) $\frac{1}{2}mr^2\omega^2$ (b) $mr\omega^2$
(c) $mr^2\omega^2$ (d) $\frac{1}{2}mr\omega^2$

33. Minimum deviation is observed with a prism having angle of prism *A*, angle of deviation δ, angle of incidence *i* and angle of emergence *e*. We then have generally
(a) $i > e$ (b) $i < e$
(c) $i = e$ (d) $i = e = \delta$

34. Two mercury drops (each of radius r) merge to form a bigger drop. The surface energy of the bigger drop, if T is the surface tension, is
(a) $2^{5/3}\pi r^2 T$ (b) $4\pi r^2 T$
(c) $2\pi r^2 T$ (d) $2^{8/3}\pi r^2 T$

35. If c is the speed of electromagnetic waves in vacuum, its speed in a medium of dielectric constant K and relative permeability μ_r is
(a) $v \frac{1}{\sqrt{\mu_r K}}$ (b) $v = c\sqrt{\mu_r K}$
(c) $v \frac{c}{\sqrt{\mu_r K}}$ (d) $v \frac{K}{\sqrt{\mu_r C}}$

36. 100g of water is heated from 30°C to 50°C. Ignoring the slight expansion of the water, the change in its internal energy is (*specific heat of water is* 4184 *J/Kg/K*).
(a) 8.4 kJ (b) 84 kJ
(c) 2.1 kJ (d) 4.2 kJ

37. An electric dipole of moment $\vec{p}$ is lying along a uniform electric field $\vec{E}$. The work done in rotating the dipole by 90° is
(a) $\frac{pE}{2}$ (b) $2pE$
(c) pE (d) $\sqrt{2}pE$

38. If the temperature of the sun were to increase from *T* to 2*T* and its radius from *R* to 2*R*, then the ratio of the radiant energy received on earth to what it was previously will be
(a) 32 (b) 16 (c) 4 (d) 64

39. A beam of light of wavelength 600nm from a distant source falls on a single slit 1.00mm wide and the resulting diffraction pattern is observed on a screen 2m away. The width of the central maximum is
(a) 1.2 cm (b) 1.2 mm
(c) 2.4 cm (d) 2.4 mm

40. The magnetic induction at a point P which is at a distance of 4 cm from a long current carrying wire is 10^{-3} T. The field of induction at a distance 12 cm from the current will be
(a) 3.33×10^{-4} T (b) 1.11×10^{-4} T
(c) 3×10^{-3} T (d) 9×10^{-3} T

41. If the atom ${}_{100}Fm^{257}$ follows the Bohr model and the radius of ${}_{100}Fm^{257}$ is *n* times the Bohr radius, then find *n*.
(a) 100 (b) 200 (c) 4 (d) 1/4

42. An AC generator of 220 V having internal resistance r = 10Ω and external resistance R = 100Ω. What is the power developed in the external circuit?
(a) 484 W (b) 400 W
(c) 441 W (d) 369 W

43. In an electron gun, the potential difference between the filament and plate is 3000 V. What will be the velocity of electron emitting from the gun?
(a) 3×10^8 m/s (b) 3.18×10^7 m/s
(c) 3.52×10^7 m/s (d) 3.26×10^7 m/s

44. When a piece of a ferromagnetic substance is put in a uniform magnetic field, the flux density inside it is four times the flux density away from the piece. The magnetic permeability of the material is
(a) 1 (b) 2
(c) 3 (d) 4

45. A generator at a utility company produces 100 A of current at 4000 V. The voltage is stepped up to 2,40,000V by a transformer before it is sent on a high voltage transmission line. The current in transmission line is
(a) 3.67A (b) 2.67A
(c) 1.67A (d) 2.40A

MATHEMATICS

46. If $f(x+2y, x-2y) = xy$, then $f(x, y)$ equals
(a) $\frac{x^2 - y^2}{8}$ (b) $\frac{x^2 - y^2}{4}$
(c) $\frac{x^2 \quad y^2}{4}$ (d) $\frac{x^2 - y^2}{2}$

47. If $\sin^2 \theta \quad \frac{x^2 \quad y^2 \quad 1}{2x}$, then x must be :
(a) -3 (b) -2
(c) 1 (d) None of these

48. For the equation $3x^2 + px + 3 = 0, p > 0$, if one of the root is square of the other, then p is equal to
(a) 1/3 (b) 1
(c) 3 (d) 2/3

49. If a man and his wife enter in a bus, in which five seats are vacant, then the number of different ways in which they can be seated is :
(a) 2 (b) 5
(c) 20 (d) 40

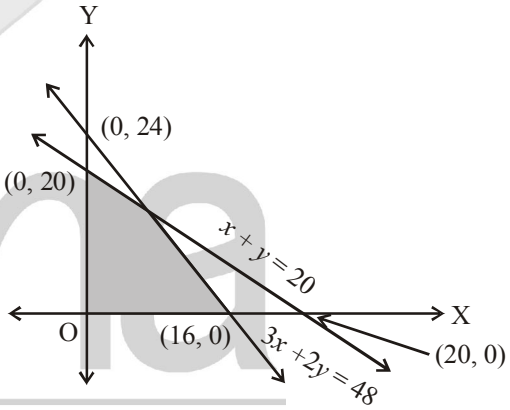
50. In rule method the null set is represented by
(a) $\{\}$ (b) ϕ
(c) $\{x : x = x\}$ (d) $\{x : x \neq x\}$

51. Three numbers are in G.P. such that their sum is 38 and their product is 1728. The greatest number among them is :
(a) 18 (b) 16
(c) 14 (d) None of these

52. A straight line $(\sqrt{3}-1)x = (\sqrt{3}+1)y$ makes an angle 75°with another straight line which passes through origin. Then the equation of the line is
(a) $x = 0$ (b) $y = 0$
(c) $x + y = 0$ (d) $x - y = 0$

53. Eccentricity of the curve $x^2 - y^2 \quad a^2$ is :
(a) 2 (b) $\sqrt{2}$
(c) 4 (d) None of these

54. Find the linear inequalities for which the shaded region in the given figure is the solution set.



(a) $x+y<20, 3x+2y<48, x \geq 0, y \geq 0$
(b) $x+y \leq 20, 3x+2y \leq 48, x \geq 0, y \geq 0$
(c) $x+y>20, 3x+2y>48, x \geq 0, y \geq 0$
(d) $x+y \geq 20, 3x+2y \geq 48, x \geq 0, y \geq 0$

55. The number of integral terms in the expansion of $(\sqrt{3} + \sqrt[8]{5})^{256}$ is
(a) 35 (b) 32
(c) 33 (d) 34

56. Let f and g be functions from R to R defined as

$$f(x) \begin{cases} 7x^2 + x - 8, x \leq 1 \\ 4x \quad 5, \quad 1 \quad x \leq 7, \\ \quad 8x \quad 3, x \quad 7 \end{cases} \quad g(x) = \begin{cases} |x|, \quad x < -3 \\ 0, \quad -3 \leq x \quad 2 \\ x^2 + 4, \quad x \geq 2 \end{cases}$$

Then
(a) $(fog)(-3) = 8$ (b) $(fog)(9) = 683$
(c) $(gof)(0) = -8$ (d) $(gof)(6) = 427$

57. $\sec^{-1}(\sin^2 x)$ is well - defined if and only if

(a) $x \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$ (b) $x \in \mathbf{R}$

(c) $x \in \{(2n+1)\pi/2 : n \in \mathbf{I}\}$ (d) None of these

58. If matrix $P = \begin{bmatrix} 0 & -\tan(\theta/2) \\ \tan\theta/2 & 0 \end{bmatrix}$ then

$\left((I-P)\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix} \text{is equal to}\right)$

(a) I + P (b) I - P

(c) 2 I + P (d) None of these

59. Negation of "Paris in France and London is in England" is

(a) Paris is in England and London is in France

(b) Paris is not in France or London is not in England

(c) Paris is in England or London is in France

(d) None of these

60. If the system of equation : $x + 2ay + az = 0$; $x + 3by + bz = 0$; $x + 4cy + cz = 0$ has non-zero solutionthen

a, b, c

(a) are in A.P. (b) are in G.P.

(c) are in H.P. (d) satisfy $a + 2b + 3c = 0$

61. Let $a = (101)^{202}$, $b = (202)^{101}$, then

(a) $a > b$ (b) $a < b$

(c) $2a = b$ (d) $a^2 = b$

62. In a series of $2n$ observations, half of them equals 'a' and remaining equals '$-a$'. If S.D. is 2, then $|a|$ equals

(a) $\frac{1}{n}$ (b) $\sqrt{2}$

(c) 2 (d) $\frac{\sqrt{2}}{n}$

63. $\int \frac{dx}{x(x^5+1)}$ is equal to :

(a) $\frac{1}{5}\log x^5(x^5+1) + C$

(b) $\frac{1}{5}\log\left(\frac{(x^5+1)}{x^5}\right) + C$

(c) $\frac{1}{5}\log\left(\frac{x^5}{(x^5+1)}\right) + C$

(d) None of these

64. A coin is tossed 7 times. The probability that at least 4 consecutive heads appear is

(a) $\frac{3}{16}$ (b) $\frac{5}{32}$

(c) $\frac{3}{32}$ (d) $\frac{1}{8}$

65. If the odds in favour of an event be 3 : 5, then the probability of non-occurrence of the event is

(a) $\frac{3}{5}$ (b) $\frac{5}{3}$

(c) $\frac{3}{8}$ (d) $\frac{5}{8}$

66. If $y(t)$ is a solution of $(1+t)\frac{dy}{dt} - ty \quad 1$ and $y(0) = -1$, then $y(1)$ is equal to

(a) $-\frac{1}{2}$ (b) $e \quad \frac{1}{2}$

(c) $e - \frac{1}{2}$ (d) $\frac{1}{2}$

67. The value of the following integral $\int_{-1}^{1} \sin^{11} x\,dx$ is :

(a) $\frac{10}{11}\cdot\frac{8}{9}\cdot\frac{6}{7}\cdot\frac{4}{7}\cdot\frac{4}{5}\cdot\frac{2}{3}$ (b) $\frac{10}{11}\cdot\frac{8}{9}\cdot\frac{6}{7}\cdot\frac{4}{5}\cdot\frac{2}{3}\cdot\frac{\pi}{2}$

(c) 1 (d) 0

68. If f be a function such that $f(9) = 9$ and $f'(9) = 3$, then $\lim_{x\to 9}\frac{\sqrt{f(x)} - 3}{\sqrt{x} - 3}$ is equal to

(a) 9 (b) 3

(c) 1 (d) None of these

69. Two aeroplanes I and II bomb a target in succession. The probabilities of I and II scoring a hit correctly are 0.3 and 0.2, respectively. The second plane will bomb only if the first misses the target. The probability that the target is hit by the second plane is

(a) 0.2 (b) 0.7

(c) 0.06 (d) 0.14

70. The area enclosed between the curve $y = \log_e(x + e)$ and the coordinate axes is

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

REASONING & GENERAL AWARENESS

71. Which one of the given responses would be a meaningful order of the following ?

1. Orange 2. Indigo 3. Red 4. Blue 5. Green 6. Yellow 7. Violet

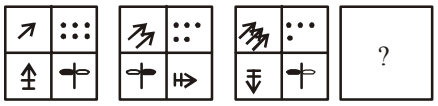
(a) 7, 2, 4, 5, 6, 1, 3 (b) 7, 2, 4, 6, 5, 1, 3

(c) 7, 2, 6, 4, 5, 1, 3 (d) 7, 2, 6, 4, 1, 5, 3

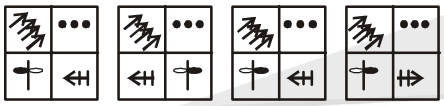
72. Which one set of letters when sequentially placed at the gaps in the given letter series shall complete it ?
rtx _ sx _ z _ txy _ _ yz
(a) y y r x s (b) y y s x r
(c) y y r s x (d) y y x r s

73. Find the correct alternative from the given ones that will complete the series.

Question figures:



Answer figures :



(a) (b) (c) (d)

74. Govind is 48 years old. He is twice as old as his son Prem is now. How old was Prem seven years before ?
(a) 16 (b) 17
(c) 13 (d) 18

75. Pointing to a man, a lady said "His mother is the only daughter of my mother". How is the lady related to the man?
(a) Mother (b) Daughter
(c) Sister (d) Aunt

76. Five policemen are standing in a row facing south. Shekhar is to the immediate right of Dhanush. Bala is between Basha and Dhanush. David is at the extreme right end of the row. Who is standing in the middle of the row?
(a) Bala (b) Basha
(c) Shekhar (d) Dhanush

77. From the given alternatives select the word which cannot be formed using the letters of the given word.
LEGALIZATION
(a) ALERT (b) ALEGATION
(c) GALLANT (d) NATAL

78. In a certain code DEPUTATION is written as ONTADEPUTI. How is DERIVATION written in that code ?
(a) ONVADERITI (b) ONDEVARITI
(c) ONVAEDIRTI (d) ONVADEIRIT

79. If MADRAS is coded as 517916 and TENANT is coded as 432121, how would you encode RMATSN?
(a) 851353 (b) 951363
(c) 951462 (d) 941562

80. If '–' stands for '+', '+' stands for '×', '×' stands for '–' then which one of the following is not correct ?
(a) $22 + 7 - 3 \times 9 = 148$
(b) $33 \times 5 - 10 + 20 = 228$
(c) $7 + 28 - 3 \times 52 = 127$
(d) $44 - 9 + 6 \times 11 = 87$

DIRECTIONS (Qs. 81-82) : *In questions below, select the missing number from the given responses.*

81.

7	9	8
2	4	3
5	7	6
16	32	?

(a) 17 (b) 23
(c) 47 (d) 73

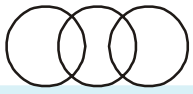
82.

(a) 1 (b) 8
(c) 6 (d) 16

83. A person walks towards his house at 8.00 am and observes his shadow to his right. In which direction he is walking ?
(a) North (b) South
(c) East (d) West

84. A boat moves from a jetty towards East. After sailing for 9 nautical miles, she turns towards right and covers another 12 nautical miles. If she wants to go back to the jetty, what is the shortest distance now from her present position ?
(a) 21 nautical miles (b) 20 nautical miles
(c) 18 nautical miles (d) 15 nautical miles

85. Identify the diagram that best represents the relationship among classes given below :
Food, Curd, Spoons

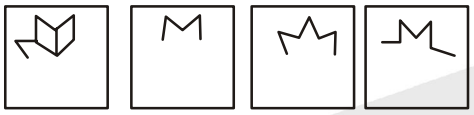
(a)  (b) 

(c)  (d) 

86. Which answer figure will complete the pattern in the question figure ?

Question figure:

Answer figure:

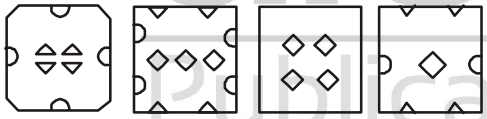


(a) (b) (c) (d)

87. A piece of paper is folded and cut as shown below in the question figures. From the given answer figures, indicate how it will appear when opened.

Question figure:

Answer figures:



(a) (b) (c) (d)

88. The first country which discovered sea route to India was
(a) Portugal (b) Dutch
(c) French (d) Britain

89. Who introduced the Indian University Act?
(a) Lord Curzon (b) Lord Minto
(c) Lord Morelay (d) Lord Rippon

90. The pancreas secretes
(a) Insulin (b) Bile juice
(c) Peptic juice (d) None of these

91. Purity of a metal can be determined with the help of
(a) Pascal's law
(b) Boyle's law
(c) Archimedes principle
(d) Conservation of mass principle

92. Which measure of memory is the largest ?
(a) MB Megabyte (b) GB Gigabyte
(c) TB Terabyte (d) KB Kilobyte

93. The inert gas which is substituted for nitrogen in the air used by deep sea divers for breathing is
(a) Neon (b) Krypton
(c) Argon (d) Helium

94. A trader who marks his goods up to 50% offered a discount of 20%. What % profit the trader makes after offering the payment?
(a) 30% (b) 70%
(c) 20% (d) 50%

95. A retailer buys a sewing machine at a discount of 15% and sells it for ₹1955. Thus he makes a profit of 15%. The discount is
(a) ₹270 (b) ₹290
(c) ₹300 (d) ₹310

96. Mahesh earned a profit of 20% by selling 60 apples at the rate of ₹ 42.50 for 5 apples. Then the total cost, at which the apples were bought is
(a) ₹452 (b) ₹425
(c) ₹450 (d) ₹485

97. A student goes to school at the rate of $\frac{5}{2}$ km/hr and reaches 6 minutes late. If he travels at the speed of 3 km/hr, he reaches 10 minutes earlier. The distance of the school is
(a) 45 km (b) 20 km
(c) 10 km (d) 4 km

98. Which country's passport ranked 'most powerful' in world?
(a) Japan (b) China
(c) Australia (d) US

99. Who is the author of book Straight Talk?
(a) Vengaiya Naidu
(b) Manmohan Singh
(c) Abhishek Manu Singhvi
(d) Chidambaram

100. Name the latest desktop operating system launched by Apple?
(a) macOS Mojave (b) macOS Mojo
(c) macOS Mojas (d) macOS Mojan

Hints & Explanations

1. (a) The meaning of Literal (adj.): exact, real. "Verbatim" means exactly the same words.
2. (a) The meaning of word Appreciation (Noun) is : Thankfullness.
It's antonym should be : Aspersions, e.g, to criticise harshly.
3. (b) 4. (b) 5. (b) 6. (a)
7. (c)
8. (b) Here, Mohan's is eyes reflect'means it is Mohan's habit which is not the case. Hence, it should be as 'Mohan's eyes reflected...
9. (c) With a view to (doing) something because you are planning to do something in the future. Ex: We bought the house with a view to retiring there. To seeuring is correct.
10. (c) Regicide means the act of killing a king.
11. (a) Aviary is a building where birds are kept.
12. (d) Exhilarate
13. (c) Apple of discord means: cause of quarrel.
14. (a)
15. (b)
16. (b)
17. (b)
18. (c)
19. (c)
20. (a)
21. (c) $g_p = g_e\left(\frac{M_p}{M_e}\right)\left(\frac{R_e}{R_p}\right)^2 = 9.8\left(\frac{1}{80}\right)(2)^2$
$= 9.8/20 = 0.49\ \text{m/s}^2$
22. (c)
$R_{max} = \frac{v^2}{g} = 16000\text{m}\ [16\text{km} = 16000\text{m}]$
or $v = (16000g)^{1/2} = (16000\times10)^{1/2}$
$= 400\ \text{ms}^{-1}$
23. (c) We know that $T = 2\pi\sqrt{\frac{l}{g}}$
$\frac{\Delta T}{T}\times100 = \frac{1}{2}\frac{\Delta l}{l}\times100$
If length is increased by 2%., time period increases by 1%.
24. (c) Given : Length (l) = 7 m
Mass (M) = 0.035 kg and tension (T) = 60.5 N. We know that mass of string per unit length (m)
$= \frac{0.035}{7} = 0.005\ \text{kg/m}$
and speed of
wave $= \sqrt{\frac{T}{m}} = \sqrt{\frac{60.5}{0.005}} = 110\ \text{m/s}$.
25. (b) The given value of length has four significant figures – 4, 5, 8 and 0 because the zeroes left to a non-zero number are not counted but all other zeroes are counted if a number contains a decimal point.
26. (c) When current flows through a conductor electrons start moving in the opposite direction of current and collide with the metal atoms or ions in the conductor.
27. (d) For good demodulation,
$\frac{1}{f} << RC$ or, $RC >> \frac{1}{f}$
28. (c) $h = \frac{1}{2}gt^2 \Rightarrow t = \sqrt{2h/g}$
$t_a = \sqrt{\frac{2a}{g}}$ and $t_b = \sqrt{\frac{2b}{g}} \Rightarrow \frac{t_a}{t_b} = \sqrt{\frac{a}{b}}$
29. (d)
T $\frac{0.6931\times1}{\lambda}$ $\frac{0.6931}{4.28\times10^{-4}}$ year 1620 years
30. (b) When the speed of a moving body is doubled :
linear momentum = p = mv, doubles
kinetic energy = $E = \frac{1}{2}mv^2$, quadraples
potential energy do not change.

31. (a) In case of full wave rectifier,
Fundamental frequency = 2 × mains frequency
$= 2 \times 50 = 100\text{Hz}$.

32. (a) Kinetic energy $= \frac{1}{2} I\omega^2$ and for ring about its axis passing through its centre and perpendicular to its plane $I = mr^2$

Hence, $KE = \frac{1}{2} mr^2\omega^2$

33. (c) In minimum deviation condition $\angle i = \angle e$, $\angle r_1 = \angle r_2$

34. (d) Let R be the radius of the bigger drop, then Volume of bigger drop = 2 × volume of small drop

$$\frac{4}{3}\pi R^3 = 2 \times \frac{4}{3}\pi r^3 \Rightarrow R = 2^{1/3} r$$

Surface energy of bigger drop,

$$E = 4\pi R^2 T = 4 \times 2^{2/3} \pi r^2 T = 2^{8/3} \pi r^2 T$$

35. (c) Speed of light of vacuum $c = \frac{1}{\sqrt{\mu_0 \varepsilon_0}}$ and in another medium $v = \frac{1}{\sqrt{\mu\varepsilon}}$

$$\therefore \frac{c}{v} = \sqrt{\frac{\mu\varepsilon}{\mu_0\varepsilon_0}} = \sqrt{\mu_r K} \Rightarrow v = \frac{c}{\sqrt{\mu_r K}}.$$

36. (a) As work done = 0
$\Delta U = mC\Delta T = 100 \times 10^{-3} \times 4184 \times (50 - 30)$
$\approx 8.4\,\text{kJ}$

37. (c) Work done in rotating a dipole = $pE(1 - \cos\theta)$
If $\theta = 90°$, work done = $pE(1 - 0) = pE$

38. (d) $E = \sigma A T^4$; $A \propto R^2$ $\therefore E \quad R^2 T^4$

$$\therefore \frac{E_2}{E_1} = \frac{R_2^2 T_2^4}{R_1^2 T_1^4}$$

put $R_2 = 2R, R_1 = R$; $T_2 = 2T, T_1 = T$

$$\Rightarrow \frac{E_2}{E_1} = \frac{(2R)^2 (2T)^4}{R^2 T^4} = 64$$

39. (d) Width of central maximum

$$= \frac{2\lambda D}{d} = \frac{2 \times 600 \times 10^{-9} \times 2}{1 \times 10^{-3}}$$

$= 24 \times 10^{-4}\,\text{m} = 2.4\,\text{mm}$

40. (a) $B \propto \frac{1}{r} \Rightarrow r' = 3r$

$$\therefore B' = \frac{1}{3}B = \frac{1}{3} \times 10^{-3} = 3.33 \times 10^{-4}\,\text{T}$$

41. (d) For an atom following Bohr's model, the radius is given by

$r_m = \frac{r_0 m^2}{Z}$ where r_0 = Bohr's radius and m = orbit number.

For Fm, $m = 5$ (Fifth orbit in which the outermost electron is present)

$$\therefore r_m = \frac{r_0 5^2}{100} = nr_0 \text{ (given)} \Rightarrow n = \frac{1}{4}$$

42. (b) $V = 200\text{V}$; $r = 10\Omega$
$R' = 10 + 100\Omega = 110\Omega$

$$I = \frac{V}{R'} = \frac{220}{110} = 2A$$

$P = I^2 R = 4 \times 100 = 400\,W$

43. (d) V = 3000 volt.

$$\frac{1}{2}mv^2 = eV \Rightarrow v = \sqrt{\frac{2eV}{m}}$$

$$\therefore v = \sqrt{\frac{2 \times 1.6 \times 10^{-19} \times 3000}{9.1 \times 10^{-31}}}$$

$= 32.6 \times 10^6 = 3.26 \times 10^7$ m/s.

44. (d) The magnetic permeability of the material

$$\mu = \frac{B}{H} = \frac{4H}{H} = 4$$

45. (c) For a transformer,

$$V_p I_p = V_s I_s \Rightarrow I_s = \frac{V_p I_p}{V_s}$$

$$\frac{4000 \times 100}{240000}\,\text{A} = 1.67\,\text{A}$$

46. (a) $f(x+2y, x-2y) = xy$

Let $x+2y = m$ .....(i)

$x-2y = n$ .....(ii)

Equation (i) + (ii) and equation (i) – (ii) gives

$x = \frac{m \quad n}{2}$, $y = \frac{m-n}{4}$

$f(m, n) = \frac{m^2 - n^2}{8}$ and $f(x, y) = \frac{x^2 - y^2}{8}$

47. (d) It is impossible to find the value of x, because of one equation in 2 variable.

48. (c) Let α, α^2 be the roots of $3x^2 + px + 3$.

$\therefore \quad \alpha + \alpha^2 = -p/3$ and $\alpha^3 = 1$

$\Rightarrow \quad (\alpha - 1)(\alpha^2 + \alpha + 1) = 0$

$\Rightarrow \quad \alpha = 1$ or $\alpha^2 + \alpha = -1$

If $\alpha = 1, p = -6$ which is not possible as $p > 0$

If $\alpha^2 + \alpha = -1 \Rightarrow -p/3 = -1 \Rightarrow p = 3$.

49. (c) In bus, five seats are vacant.

If one seat be selected by anybody by 5 ways, then 4 seats be left. Therefore no. of ways of seating them = 5 × 4 = 20.

50. (d) It is fundamental concept.

51. (a) Let the required three numbers of G.P. be $\frac{a}{r}, a$ and ar. Then, their sum

$\frac{a}{r} \quad a \quad ar \quad 38$

$\Rightarrow \quad a\left(\frac{1 \quad r \quad r^2}{r}\right) \quad 38$ ...(i)

product $= \frac{a}{r} \times a \times ar \quad 1728$

$\Rightarrow \quad a^3 \quad (12)^3$

$\therefore \quad a = 12$ ...(ii)

Substitute the value of a, in equation (i), we get

$\therefore \quad 12 \times \left(\frac{1 + r + r^2}{r}\right) = 38$

$\Rightarrow \quad 6 \quad 6r \quad 6r^2 \quad 19r$

$\Rightarrow \quad 6r^2 - 13r \quad 6 \quad 0$

$\Rightarrow \quad (3r - 2)(2r - 3) \quad 0$

$\therefore \quad r \quad \frac{2}{3} or \frac{3}{2}$

Hence, the required numbers are 18, 12, 8 or 8, 12, 18

$\therefore$ Greatest number = 18

52. (a) We know that $\frac{\sqrt{3} \quad 1}{\sqrt{3} - 1} \quad \tan 75$

Hence, the line makes an angle of 75° with y-axis, so the equation of y-axis is $x = 0$.

53. (b) Given curve is $x^2 - y^2 = a^2$

which is hyperbola (or rectangular hyperbola)

i.e. $\frac{x^2}{a^2} - \frac{y^2}{b^2} \quad 1$

Now, eccentricity of hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} \quad 1$

is $\sqrt{1 \quad \frac{b^2}{a^2}}$

$\therefore$ Required eccentricity $= \sqrt{1 \quad \frac{a^2}{a^2}} \quad \sqrt{2}$

54. (b) $x + y \le 20, 3x + 2y \le 48, x \ge 0, y \ge 0$

55. (c) $T_{r \ 1} \quad {}^{256}C_r (\sqrt{3})^{256-r} (\sqrt[8]{5})^r$

${}^{256}C_r (3)^{\frac{256-r}{2}} (5)^{r/8}$

Terms will be integral if $\frac{256-r}{2} \& \frac{r}{8}$ both are +ve integer, which is so if r is an integral multiple of 8. As $0 \le r \le 256$

$\therefore r = 0, 8, 16, 24, ...256$, total 33 values.

56. (b) We have $g(-3) = 0$

$\Rightarrow \quad f(g(-3)) = f(0) = 7(0)^2 + 0 - 8 = -8$

$\therefore \quad fog(-3) = -8$

$g(9) = 9^2 + 4 = 85 \Rightarrow f(g(9)) = f(85) = 8.85 + 3 = 683$

$\therefore \quad fog(9) = 683$

$f(0) = 7.0^2 + 0 - 8 = -8 \Rightarrow g(f(0)) = g(-8) = |-8| = 8$

$f(6) = 4.6 + 5 = 29 \Rightarrow g(f(6)) = g(29) = (29)^2 + 4 = 845$

$\therefore \quad gof(6) = 845$

57. (c) $\sec^{-1}(\sin^2 x)$ is well defined if and only if

$\sin^2 x \geq 1 \Leftrightarrow \sin^2 x \quad 1$ [$\because \sin^2 x \mid 1$]

$\therefore \quad x = n\pi + \frac{\pi}{2}, \; n \in I$

58. (a) $\text{I} - \text{P} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} - \begin{bmatrix} 0 & -\tan(\theta/2) \\ \tan(\theta/2) & 0 \end{bmatrix}$

$= \begin{bmatrix} 1 & \tan(\theta/2) \\ -\tan(\theta/2) & 1 \end{bmatrix}$

$\therefore \quad (\text{I} - \text{P}) \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$

$= \begin{bmatrix} 1 & \tan(\theta/2) \\ -\tan\theta/2 & 1 \end{bmatrix} \cdot \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$

$= \begin{bmatrix} \cos\theta + \tan(\theta/2)\sin\theta & -\sin\theta + \tan(\theta/2)\cos\theta \\ -\tan(\theta/2)\cos\theta + \sin\theta & \tan(\theta/2)\sin\theta + \cos\theta \end{bmatrix}$

$= \begin{bmatrix} 1 - 2\sin^2(\theta/2) + 2\sin^2(\theta/2) & -2\sin(\theta/2)\cos(\theta/2) + \tan(\theta/2)(2\cos^2(\theta/2) - 1) \\ -\tan(\theta/2)(2\cos^2\theta/2 - 1) + 2\sin(\theta/2)\cos(\theta/2) & \tan(\theta/2)(2\sin(\theta/2)\cos(\theta/2)) + (1 - 2\sin^2(\theta/2)) \end{bmatrix}$

$= \begin{bmatrix} 1 & -\tan(\theta/2) \\ \tan\theta/2 & 1 \end{bmatrix} = \text{I} + \text{P}$

59. (b) Let p : Paris is in France, q : London is in England

$\therefore$ we have $p \wedge q$

Its negation is $\sim (p \wedge q) = \sim p \vee \sim q$

i.e., Paris is not in France or London is not in England.

60. (c) $\Delta = 0 \Rightarrow \begin{vmatrix} 1 & 2a & a \\ 1 & 3b & b \\ 1 & 4c & c \end{vmatrix} = 0$

$-bc + 2ac - ab = 0$

$2ac = ab + bc$

$\frac{2}{b} = \frac{1}{a} + \frac{1}{c}$; a, b, c are in H.P.

61. (a) Consider a function $f(x) = x^{1/x}$, x > 0 then

$f'(x) = x^{\frac{1}{x}-2}(1 - \ln x)$; f'(x) > 0 if x < e

$\therefore$ f(x) is decreasing function if x > e

$\therefore \quad f(101) > f(202) \Rightarrow (101)^{\frac{1}{101}} > (202)^{\frac{1}{202}}$

$\therefore \quad (101)^{202} > (202)^{101}$

62. (c) $\because \quad \sigma = \sqrt{\frac{\Sigma xi^2}{\text{N}} - \left(\frac{\Sigma x_i}{\text{N}}\right)^2}$

$\therefore \quad 2 = \sqrt{\frac{(a^2 \quad a^2 \ldots\ldots \text{'2}n\text{' times})}{2n} - 0}$

$\Rightarrow \quad 4 = \frac{2na^2}{2n} \Rightarrow a^2 = 4 \Rightarrow |a| \quad 2$

63. (c) Let $\text{I} = \int \frac{dx}{x(x^5+1)} = \int \frac{dx}{x^6(1+x^{-5})}$

Put $(1 + x^{-5}) = t \Rightarrow -5x^{-6}dx = dt$

$\Rightarrow I = \int \frac{x^{-6}dx}{(1+x^{-5})} = -\frac{1}{5}\int \frac{dt}{t} = -\frac{1}{5}\log t + C$

$= -\frac{1}{5}\log(1 + x^{-5}) + C = -\frac{1}{5}\log\left(\frac{x^5+1}{x^5}\right) + C$

$= \frac{1}{5}\log\left(\frac{x^5+1}{x^5}\right)^{-1} + C = \frac{1}{5}\log\left(\frac{x^5}{x^5+1}\right) + C$

64. (b) We have a result that if a coin is tossed $(m+n)$ times $(m > n)$. The probability of at least m consecutive heads is $\frac{n \quad 2}{2^{m \quad 1}}$.

Here $m = 4, n = 3$

$\therefore$ Required prob $= \frac{3 \quad 2}{2^{4 \quad 1}} \quad \frac{5}{32}$

65. (d) Required probability $1-\frac{3}{8}\quad\frac{5}{8}$.

66. (a) By multiplying e^{-t} and rearranging the terms, we get

$$e^{-t}(1\quad t)dy\quad y(e^{-t}-(1\quad t)e^{-t})dt\quad e^{-t}dt$$

$$\Rightarrow d(e^{-t}(1\quad t)y)\quad d(-e^{-t})\Rightarrow ye^{-t}(1\quad t)\quad -e^{-t}\quad c.$$

Also $y_0=-1\Rightarrow c=0\Rightarrow y(1)=-1/2$

67. (d) Let $I=\int_{-1}^{1}\sin^{11}x\,dx$ ....(i)

We know that $\int_{-a}^{a}f(x)\,dx=\int_{-a}^{a}-f(x)\,dx$

If f(x) is odd function.

Similarly, here $\sin^{11}x$ is an odd function

So, $I=\int_{-1}^{1}\sin^{11}x\,dx=-\int_{-1}^{1}\sin^{11}x\,dx$ ...(ii)

Euq. (i) + equ. (ii),

$$2I=\int_{-1}^{1}\sin^{11}x\,dx-\int_{-1}^{1}\sin^{11}x\,dx$$

$$\Rightarrow\ 2I=0\Rightarrow\ I=0$$

68. (b) Let 'f' be the function such that f(9) = 9, f'(9) = 3.

Consider, $\lim_{x\to9}\frac{\sqrt{f(x)}-3}{\sqrt{x}-3}$

$$=\lim_{x\to9}\frac{f(x)-9}{x-9}\times\frac{\sqrt{x}\quad3}{\sqrt{f(x)}\quad3}$$

(Double Rationalizing)

$$=\lim_{x\to9}\frac{f(x)-9}{x-9}\lim_{x\to9}\frac{\sqrt{x}+3}{\sqrt{f(x)}+3}$$

$$=f'(x)|_{x=9}=\lim_{x\to9}\frac{\sqrt{x}+3}{\sqrt{f(x)}+3}$$

$$=f'(9)\times\left(\frac{\sqrt{9}\quad3}{\sqrt{f(9)}\quad3}\right)=f'(9)\times\frac{3\quad3}{3\quad3}$$

$$=f'(9)=3$$

69. (d) Given : Probability of aeroplane *I*, scoring a target correctly i.e., $P(I)=0.3$ probability of scoring a target correctly by aeroplane *II*, i.e. $P(II)=0.2$

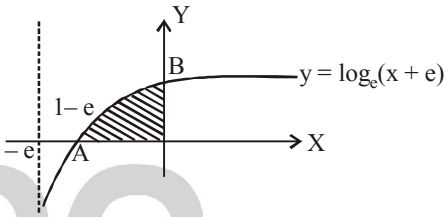
$\therefore\ P(\overline{I})=1-0.3=0.7$

$\therefore$ The required probability

$=P(\overline{I}\cap II)\quad P(\overline{I}).P(II)=0.7\times0.2=0.14$

70. (a) Required area (OAB) $=\int_{1-e}^{0}\ln(x+e)dx$

$$=\left[x\ln(x+e)-\int\frac{1}{x+e}xdx\right]_0^1=1.$$



71. (a) These all are the colours of the rainbow. Hence meaningful order is V I B G Y O R.

72. (c) rtxy/
sxyz/
rtxy/
sxyz.

73. (c)
- Arrows (→) are increasing by one.
- Dots (•) are decreasing by one.
- P element changes its position from right to left. Square alternately also changes its shaded portion also.
- ↑ element changes its position from left to right in square after rotating 45° clockwise

74. (b) Govind's age = 48 years
According to question
Prem's age = 48/2 = 24 years
Prem's age seven years before = 24 – 7 = 17 years.

75. (a)

Mother
↓ (–)
Mother = Lady
↓ (–)
Man
(+)

man
His mother is the only daughter of my lady mother.

76. (d) Standing arrangement : (facing south)

Right End ↓ David ↓ Shekhar ↓ Dhanush ↓ Bala ↓ Basha Left End

Hence, Dhanush is standing at the middle of the row.

77. (a) ALERT can not be formed as there is no 'R' in the word LEGALIZATION. Hence, (a) is the correct choice.

78. (a)

1	2	3	4
DEPU	TA	TI	ON

Coded ⟶

ON	TA	DEPU	TI
4	2	1	3

Similarly,

1	2	3	4
DERI	VA	TI	ON

Coded ⟶

ON	VA	DERI	TI
4	2	1	3

79. (c)

M	A	D	R	A	S	T	E	N	T
↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
5	1	7	9	1	6	4	3	2	1

Coded as →

Similarly,

R	M	A	T	S	N
↓	↓	↓	↓	↓	↓
9	5	1	4	6	2

Coded as →

80. (c) By options–

(a) $22 \times 7 + 3 - 9 = 148$

$154 + 3 - 9$

$157 - 9 = 148$ (Correct)

(b) $33 - 5 + 10 \times 20 = 228$

$33 - 5 + 200$

$200 + 33 - 5$

$233 - 5 = 228$ (Correct)

(c) $7 \times 28 + 3 - 52 = 127$

$196 + 3 - 52$

$199 - 52 = 147$ (Incorrect)

(d) $44 + 9 \times 6 - 11 = 87$

$44 + 54 - 11$

$98 - 11 = 87$ (Correct)

81. (b) $7 + 2^2 + 5 = 16$

$9 + 4^2 + 7 = 32$

$8 + 3^2 + 6 = (23)$

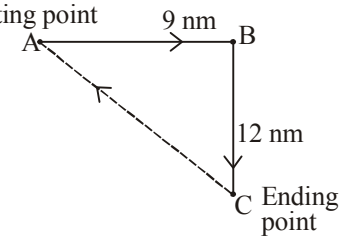
82. (c) $3 + 9 - 5 = 7$

$2 + 8 - 6 = 4$

$4 + 7 - 5 = (6)$

83. (b) A person observes his shadow to his right. The sun is to his left. He is walking towards the south.

84. (d) Starting point A, 9 nm to B, 12 nm to C Ending point

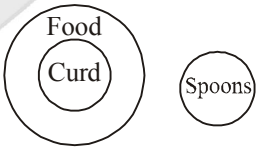


The shortest distance = $\sqrt{AB^2 + BC^2}$

$= \sqrt{9^2 + 12^2}$

$= \sqrt{225} = 15$ nautical niles

85. (d)



86. (b)

87. (b)

88. (a)

89. (a)

90. (a)

91. (c)

92. (c)

93. (d)

94. (c) Let cost price of goods be 100

Trader mark up at 50% more i.e. 150

Selling price of goods

$= 150 - \frac{20}{100} \times 150$ 120

$\text{Profit \%} = \frac{120 - 100}{100} \times 100$ 20

95. (c) Let original price of sewing machine be ₹ x

Retailer bought it at $x - \frac{15}{100}x = 0.85x$

$0.85x + \frac{15}{100} \times 0.85x = 1955$

$1.15 \times 0.85\,x = 1955$

$x = \frac{1955 \times 10000}{115 \times 85} = 2000$

Discount is $\frac{15}{100} \times 2000 = ₹\,300$

96. (b) Selling price of 5 apples = ₹ 42.50
Selling price of 60 apples

$= \frac{42.5}{5} \times 60 \quad 510$

C.P + Profit = S.P

$C.P + \frac{20}{100} \times C.P \quad 510$

$C.P. = \frac{510}{120} \times 100 = ₹ 425$

97. (d) Let original time taken by student be x hours.

$\frac{5}{2} \times \left(x \quad \frac{6}{60} \right) \quad 3 \times \left(x - \frac{10}{60} \right)$

$5x \quad \frac{1}{2} = 6x - 1$

$x = \frac{3}{2}$ hours

∴ Distance from school

$= \frac{5}{2} \times \left(\frac{3}{2} \quad \frac{1}{10} \right) \quad 4\,km$

98. (a) 99. (c) 100. (a)