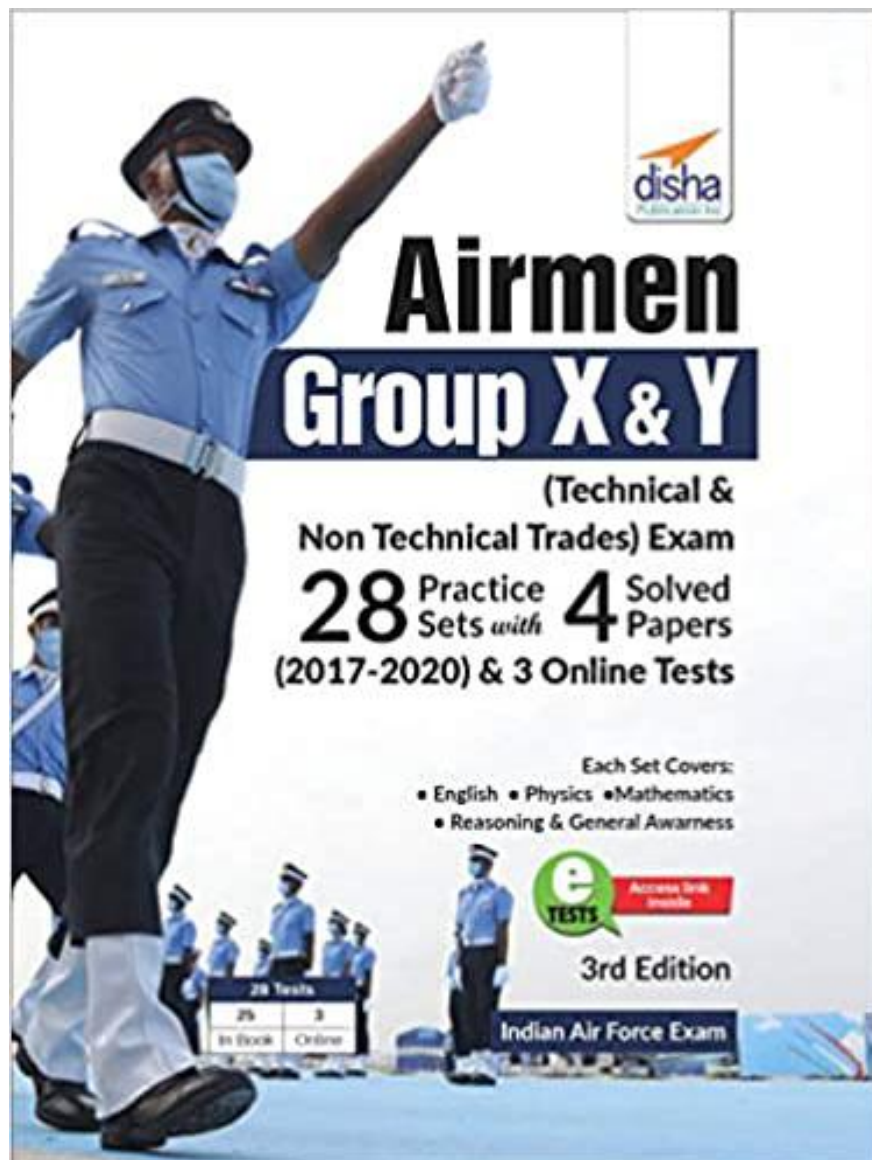




SOLVED PAPER - 2020

This Solved Paper "Airmen Group X & Y" is taken from Book:



ISBN : 9789390486502

INDIAN AIR FORCE AIRMEN GROUP X & Y

SOLVED PAPER - 2020

(Memory Based)

ENGLISH LANGUAGE

1. Find the one which best expresses the meaning of the given word.
Compatible
(a) Suited
(b) Inconsistent
(c) Unfitted
(d) Conflictive
 2. Find the word opposite in meaning to the given word.
Abrupt
(a) Quick (b) Rushing
(c) Gradual (d) Hasty
 3. Find the noun form of the word.
Compel
(a) Compulsory (b) Compulsion
(c) Compeller (d) Compellingly
 4. Find the verb form of the word.
Valid
(a) Validly (b) Validation
(c) Validates (d) Validate
 5. Find the plural form of the word.
Sheep
(a) Sheep (b) Sheeps
(c) Sheepish (d) Sheepishly
 6. Choose the one which can be substituted for the given sentence.
One who can throw his voice
(a) Omnipotent (b) Omniscient
(c) Omnipresent (d) Ventriloquist
 7. Find the correctly spelt word.
(a) Genatics (b) Sterage
(c) Grossest (d) Granaite
 8. Find the meaning of the idiom/phrase.
Song and dance
(a) to have an interest in music and dance
(b) to make an unnecessary fuss
 9. The following sentence has been given in Active/Passive voice. From the given alternatives, choose the one which best expresses the given sentence in Passive /Active voice.
My niece wrote a beautiful poem.
(a) A beautiful poem was written by my niece.
(b) A beautiful poem has been written by my niece.
(c) A beautiful poem had been written by my niece.
(d) A poem which was beautiful had been written by my niece.
 10. The following sentence has been given in direct/indirect speech. From the given alternatives, choose the one which best expresses the given sentence in direct/indirect speech.
Pallavi said, "I will go to Agra tomorrow".
(a) Pallavi said that she would go to Agra the next day.
(b) Pallavi said she would go to Agra tomorrow.
(c) Pallavi said she will be going to Agra the next day.
(d) Pallavi said that she would go to Agra tomorrow.
-
- DIRECTIONS (Qs. 11-12):** *In the following question, some parts of the sentence have errors and some have none. Find out which part of a sentence has an error. The number of that part is your answer. If a sentence is free from error, then your answer is (D) i.e. No Error.*
-
11. A person I met (A) /in the theatre (B)/ was the playwright himself (C). /No Error (D).
(a) (A) (b) (B)
(c) (C) (d) (D)

12. Zoya Akhtar, who conceived, co-authored (A)/ and directed a number of good films, was(B)/ one of India's most talented film maker. (C)/ No Error (D).
- (a) (A) (b) (B)
(c) (C) (d) (D)

DIRECTIONS (Qs. 13-14) : Given below are four jumbled sentences. Out of the given options pick the one that gives their correct order.

13. The white American underclass is in thrall
P: and used heroin needles
Q: to a vicious, selfish culture
R: whose main products are misery
(a) PQR (b) QRP
(c) RPQ (d) RQP
14. A certified, verifiable,
P: would be a valuable
Q: all-purpose identity card
R: document for many people
(a) QPR (b) RQP
(c) PQR (d) PRQ

DIRECTIONS (Qs. 15-16) : In the following questions, sentences are given with blanks to be filled in with an appropriate and suitable word. Four alternatives are suggested for each question. Choose the correct alternative out of the four alternatives.

15. The man _____ heavy losses in his investments.
(a) raised (b) reaped
(c) earned (d) incurred
16. It is very difficult for him to give up smoking as he is an _____ smoker.
(a) Indifferent (b) Inveterate
(c) Insensitive (d) Innate

DIRECTIONS (Qs. 17-20) : Read the following passage carefully and choose the best answer to each question out of the four given alternatives.

On a surface which is free from obstacles, such as a clear road or path, only two or three species of snakes can hope to catch up with a human being, even if they are foolish to try. A snake seems to move very fast but its movements are deceptive. In spite to the swift, wave-like motions of its body, the snake crawls

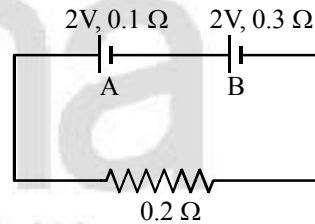
along the ground at no more than the speed of a man's walk. It may, however, have an advantage inside a jungle, where the progress of a man is obstructed by thorny bushes. But in such places, the footsteps of a man are usually more than enough to warn snakes to keep away. Although they have no ears of the usual kind, they can feel slight vibrations of the ground through their bodies, and thus get an early warning of danger.

17. What is deceptive about the snake is its?
(a) Speed
(b) Crawling
(c) Sense of direction
(d) Movement
18. The snake has an advantage over men inside a jungle, because there?
(a) it can crawl faster
(b) Man's movement is obstructed
(c) It is dark
(d) It gets warning
19. What helps snakes to receive advance warning is their sensitivity to?
(a) Light
(b) Smell
(c) Darkness
(d) Movements
20. The speed at which a snake normally moves is?
(a) Less than man's
(b) Greater than man's
(c) As fast as that of a man
(d) As deceptive as that of a man

PHYSICS

21. Which is more dangerous?
(a) 220 V AC
(b) 290 V DC
(c) Both produce same effect
(d) Can't say
22. The correct formula of escape velocity is
(a) $V = \sqrt{\frac{Gm}{R}}$ (b) $V = \sqrt{\frac{2GM}{R}}$
(c) $V = \sqrt{\frac{3GM}{R}}$ (d) $V = \sqrt{\frac{GM}{2R}}$

23. What will be the same in microwave, gamma ray and x-ray?
- (a) frequency (b) wavelength
(c) speed in vacuum (d) Both (a) & (b)
24. Rainbow is formed due to
- (a) The dispersion of light suffering refraction and total internal reflection
(b) the reflection of light
(c) the refraction of light
(d) the scattering of light
25. Which is the semiconductor among the following?
- (a) copper (b) silver
(c) silicon (d) lithium
26. The S.I unit of magnetic flux density is
- (a) newton metre ampere
(b) newton metre⁻¹ ampere⁻¹
(c) newton metre coulomb⁻¹
(d) newton metre coulomb
27. In a circular motion if radius is half then the force is
- (a) doubled (b) one-fourth
(c) four times (d) halved
28. NOR gate is the combination of
- (a) NOT and OR gate
(b) NOT and AND gate
(c) AND and NOT gate
(d) AND and OR gate
29. A one-ton car moves with a constant velocity of 15 ms^{-1} on a rough horizontal road. The total resistance to the motion of the car is 12% of the weight of the car. The power required to keep the car moving with the same constant velocity of 15 ms^{-1} is [Take $g = 10 \text{ ms}^{-2}$]
- (a) 9 kW (b) 18 kW
(c) 24 kW (d) 36 kW
30. If in a parallel plate capacitor, which is connected to a battery, we fill dielectrics in whole space of its plates, then which of the following increases?
- (a) Q and V (b) V and E
(c) E and C (d) Q and C
31. The decreasing order of wavelength of infrared, microwave, ultraviolet and gamma rays is
- (a) microwave, infrared, ultraviolet, gamma rays
(b) gamma rays, ultraviolet, infrared, microwaves
(c) microwaves, gamma rays, infrared, ultraviolet
(d) infrared, microwave, ultraviolet, gamma rays
32. Eddy currents are produced when
- (a) a metal is kept in varying magnetic field
(b) a metal is kept in steady magnetic field
(c) a circular coil is placed in a magnetic field
(d) through a circular coil, current is passed
33. The frequency of A.C. mains in India is
- (a) 30 c/s (b) 50 c/s
(c) 60 c/s (d) 120 c/s
34. Which of the following processes is adiabatic ?
- (a) Melting of ice
(b) Bursting of tyre
(c) Motion of piston of an engine with constant speed
(d) None of these
35. The internal resistance of two cells shown are 0.1Ω and 0.3Ω . If $R = 0.2 \Omega$, the potential difference across the cell



- (a) B will be zero
(b) A will be zero
(c) A and B will be 2V
(d) A will be $>2V$ and B will be $<2V$
36. In order that a floating object be in a stable equilibrium, its centre of buoyancy should be
- (a) vertically above its centre of gravity
(b) below its centre of gravity
(c) horizontally in a line with its centre of gravity
(d) may be anywhere
37. A geostationary satellite is orbiting the earth at a height of $5R$ above that surface of the earth, R being the radius of the earth. The time period of another satellite in hours at a height of $2R$ from the surface of the earth is

- (a) 5 (b) 10
(c) $6\sqrt{2}$ (d) $\frac{6}{\sqrt{2}}$
38. Nucleus of an atom whose atomic mass is 24 consists of
(a) 11 electrons, 11 protons and 13 neutrons
(b) 11 electrons, 13 protons and 11 neutrons
(c) 11 protons and 13 neutrons
(d) 11 protons and 13 electrons
39. The mass of neutron is the same as that of
(a) a proton (b) a meson
(c) an epsilon (d) an electron
40. The tides in sea are primarily due to the
(a) atmospheric effect of the earth
(b) gravitational effect of venus on the earth
(c) gravitational effect of the sun on the earth
(d) gravitational effect of the moon on the earth
41. A galvanometer of resistance 100Ω gives a full scale deflection for a current of 10^{-5} A. To convert it into an ammeter capable of measuring upto 1 A, we should connect a resistance of
(a) 1Ω in parallel
(b) $10^{-3} \Omega$ in parallel
(c) $10^5 \Omega$ in series
(d) 100Ω in series
42. The S.I. unit of latent heat is
(a) J Kg^{-1} (b) J mol^{-1}
(c) N Kg^{-1} (d) N mol^{-1}
43. A hollow insulated conduction sphere is given a positive charge of $10 \mu\text{C}$. What will be the electric field at the centre of the sphere if its radius is 2 metres?
(a) Zero (b) $5 \mu\text{Cm}^{-2}$
(c) $20 \mu\text{Cm}^{-2}$ (d) $8 \mu\text{Cm}^{-2}$
44. The radius of the earth is 4 times that of the moon and its mass is 80 times that of the moon. If the acceleration due to gravity on the surface of the earth is 10 m/s^2 , then on the surface of the moon its value will be
(a) 1 ms^{-2} (b) 2 ms^{-2}
(c) 3 ms^{-2} (d) 4 ms^{-2}
45. A step-up transformer has transformation ratio of 3 : 2. What is the voltage in secondary, if voltage in primary is 30 V?
(a) 45 V (b) 15 V
(c) 90 V (d) 300 V

MATHEMATICS

46. The incenter of the triangle with vertices $(1, \sqrt{3})$, $(0, 0)$ and $(2, 0)$ is
(a) $(1, \sqrt{3}/2)$ (b) $(2/3, 1/\sqrt{3})$
(c) $(2/3, \sqrt{3}/2)$ (d) $(1, 1/\sqrt{3})$
47. The equation of a straight line, which passes through the point $(a, 0)$ and whose perpendicular distance from the point $(2a, 2a)$ is a , is
(a) $3x - 4y - 3a = 0$
(b) $x - a = 0$
(c) both (a) and (b)
(d) Neither (a) nor (b)
48. The equation of the circle, the end points of whose diameter are the centres of the circles $x^2 + y^2 + 6x - 14y = 1$ and $x^2 + y^2 - 4x + 10y = 2$, is
(a) $x^2 + y^2 + x - 2y - 41 = 0$
(b) $x^2 + y^2 + x + 2y - 41 = 0$
(c) $x^2 + y^2 + x + 2y + 41 = 0$
(d) None of these
49. $f(x) = \sqrt{\frac{(x+1)(x-3)}{(x-2)}}$ is a real valued function in the domain
(a) $(-\infty, -1] \cup [3, \infty)$
(b) $(-\infty, -1] \cup (2, 3]$
(c) $[-1, 2) \cup [3, \infty)$
(d) None of these
50. The position vectors of the points A, B, C and D are $3\hat{i} - 2\hat{j} - \hat{k}$, $2\hat{i} + 3\hat{j} - 4\hat{k}$, $-\hat{i} - \hat{j} + 2\hat{k}$ and $4\hat{i} + 5\hat{j} + \lambda\hat{k}$. If these points are collinear, then λ is equal to
(a) $-\frac{146}{17}$ (b) $-\frac{137}{17}$
(c) $-\frac{154}{17}$ (d) $-\frac{162}{17}$
51. If the mean and variance of a binomial variate X are 2 and 1 respectively, then the probability that X takes a value at least one is :

- (a) $\frac{2}{3}$ (b) $\frac{4}{5}$ (c) $\frac{7}{8}$ (d) $\frac{15}{16}$
52. There are 10 points in a plane, no three are collinear, except 4 which are collinear. All points are joined. Let L be the number of different straight lines and T be the number of different triangles, then
 (a) $T = 120$ (b) $L = 30$
 (c) $T = 3L - 4$ (d) None of these
53. Given that $\tan A$ and $\tan B$ are the roots of $x^2 - ax + b = 0$. The value of $\sin^2(A + B)$ is
 (a) $\frac{a^2}{a^2 + (1-b)^2}$ (b) $\frac{a^2}{a^2 + b^2}$
 (c) $\frac{a^2}{(b+c)^2}$ (d) $\frac{a^2}{b^2 + (1-a)^2}$
54. If 12 persons are seated in a row, the number of ways of selecting 3 persons from them, so that no two of them are seated next to each other is
 (a) 85 (b) 100
 (c) 120 (d) 240
55. The number of ways in which a mixed doubles game in tennis can be arranged from 5 married couples, if no husband and wife play in the same game, is
 (a) 46 (b) 54
 (c) 60 (d) None of these
56. Six teachers and six students have to sit round a circular table such that there is a teacher between any two students. The number of ways in which they can sit is
 (a) $6! \times 6!$ (b) $5! \times 6!$
 (c) $5! \times 5!$ (d) None of these
57. Five digit number divisible by 3 is to be formed by using 0, 1, 2, 3, 4, 6 without repetition. Total number of such numbers are
 (a) 312 (b) 3125
 (c) 192 (d) 216
58. A boy is throwing stones at a target. The probability of hitting the target at any trial is $\frac{1}{2}$. The probability of hitting the target 5th time at the 10th throw is:
- (a) $\frac{5}{2^{10}}$ (b) $\frac{63}{2^9}$
 (c) $\frac{{}^{10}C_5}{2^{10}}$ (d) None
59. On which of the following intervals is the function $x^{100} + \sin x - 1$ decreasing?
 (a) $(0, \pi/2)$
 (b) $(0, 1)$
 (c) $(\pi/2, \pi)$
 (d) None
60. The mean and SD of 63 children on an arithmetic test are respectively 27, 6 and 7.1. To them are added a new group of 26 who had less training and whose mean is 19.2 and SD 6.2. The values of the combined group differ from the original as to (i) the mean and (ii) the SD is
 (a) 25.1, 7.8 (b) 2.3, 0.8
 (c) 1.5, 0.9 (d) None of these
61. The quartile deviation of the following items : 12, 7, 15, 10, 16, 17, 25 is
 (a) 4.5 (b) 13.5
 (c) 9 (d) 3.5
62. The mean of 20 observations is 15. On checking it was found that the two observations were wrongly copied as 3 and 6. The correct values are 8 and 4, then correct mean will be given by
 (a) 15.15 (b) 14.69
 (c) 14.74 (d) 15.25
63. The value of the limit $\lim_{x \rightarrow \infty} \left(\frac{x^2 - 1}{x^2 + 1} \right)^{x^2}$ equals
 to
 (a) e^2 (b) e^{-2}
 (c) e (d) e^{-1}
64. The value of $0.\overline{2} + 0.\overline{23}$ is equal to
 (a) $0.\overline{43}$ (b) $0.\overline{25}$
 (c) $0.\overline{223}$ (d) $0.\overline{45}$
65. If a, b, c, d are in G.P. then
 (a) $a + b, b + c, c + d$ are in G.P.
 (b) $(b - c)^2 + (c - a)^2 + (d - b)^2 = (a - d)^2$
 (c) $(a^2 + b^2 + c^2)(b^2 + c^2 + d^2) = (ab + bc + cd)^2$
 (d) All are correct

66. The unit digit of

$$2^{3^4} \times 3^{4^5} \times 4^{5^6} \times 5^{6^7} \times 6^{7^8} \times 7^{8^9} \text{ is :}$$

- (a) 0
(b) 5
(c) Can't be determined
(d) None of these

67. A cone, a hemisphere and a cylinder stand on equal bases and have the same height, the height being equal to the radius of the circular base. Their total surface areas are in the ratio:

- (a) $(\sqrt{2} - 1) : 3 : 4$ (b) $(\sqrt{3} - 1) : 3 : 4$
(c) $\sqrt{2} : 3 : 4$ (d) $\sqrt{3} : 7 : 8$

68. Find the radius of maximum size sphere which can be inscribed or put in a cone whose base radius and height are 6 cm and 8 cm respectively?

- (a) 4 cm (b) 5 cm
(c) 3 cm (d) None of these

69. In what ratio must a grocer mix two varieties of pulses costing ₹15 and ₹20 per kg respectively to obtain a mixture worth ₹16.50 per kg?

- (a) 1 : 2 (b) 2 : 1
(c) 3 : 7 (d) 7 : 3

70. In what ratio should freely available water be mixed with the wine worth ₹60 per litre so that after selling the mixture at ₹50 per litre, the profit will be 25%?

- (a) 1 : 2 (b) 2 : 3
(c) 3 : 4 (d) 4 : 5

REASONING & GENERAL AWARENESS

71. Find the missing number from the given responses.

6 10 26
11 5 21
8 8 ?

- (a) 22 (b) 24
(c) 16 (d) 20

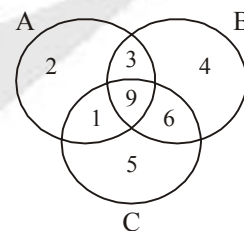
72. Mohan cycles 7 km East, then turns South and cycles 12 km, then turns West and cycles 7 km, then turns to his left and cycles 10 km. Where is he now with reference to his starting position?

- (a) 22 Kms South
(b) 2 Kms South
(c) 22 Kms East
(d) 2 Kms East

73. Isha hire a taxi from my home to go to my workplace. The fare system in the city is such that for the first kilometre, Isha charged Rs 25, and after that, Isha charged Rs 6 per kilometre. If my workplace is 10 km far from my home, what amount do Isha have to pay if Isha go by taxi?

- (a) ₹ 64 (b) ₹ 89
(c) ₹ 90 (d) ₹ 79

74. The given Venn diagram represents the food item preference of a group of school students. There are three items: A-Burger, B-Chickpea, C- Pizza. How many students eat at least one item?



- (a) 15 (b) 21
(c) 30 (d) 25

75. Choose the correct alternative from the given ones that will complete the series.

13, 32, 24, 43, 35, ?, 46, 65, 57, 76
(a) 45 (b) 52
(c) 54 (d) 55

76. In the following question, which one set of letters when sequentially placed at the gaps in the given letter series shall complete it?

pfg _ _ pff _ ghhp _ pff _ gggh _ h
(a) pghhfp (b) ghhhh
(c) hpgpfh (d) hgpfh

77. How is Rahul related to the daughter of only daughter-in-law of wife of Rahul's father?

- (a) Husband (b) Son
(c) Father (d) Grand Father

78. Sunil's position from the left in a row of boys is 20th and Deepak's position from the right is 36th. After interchanging their position, Sunil becomes 28th from the left. How many boys are there in the row?

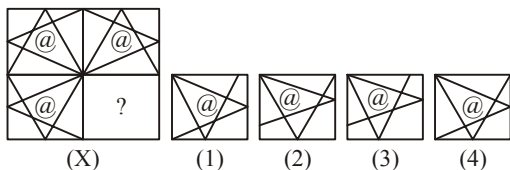
- (a) 52 (b) 63
(c) 59 (d) 48

79. If $-$ means \div , $+$ means \times , \div means $-$, \times means $+$, then which one of the following is true?
- (a) $52 \div 4 + 5 \times 8 - 2 = 36$
 (b) $43 \times 7 \div 5 + 4 - 8 = 25$
 (c) $36 \times 4 - 12 + 5 \div 3 = 420$
 (d) $36 - 12 \times 6 \div 3 + 4 = 60$

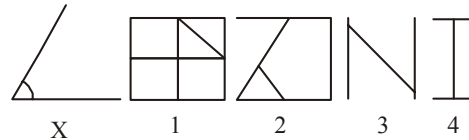
DIRECTIONS (Qs. 80-81): Answer the questions on the basis of the information given below.

WGM Lights Company launches eight lights— Q, R, S, T, V, W, Y and Z—in one of the four metro of India. The lights were launched one after the other over a period of six months in 2019. The order in which the lights were launched is consistent with the following conditions:

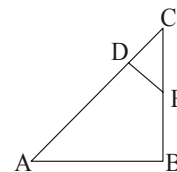
- (i) V is launched before both Y and Q
 (ii) Q gets launched after Z.
 (iii) T gets launched before V but after R.
 (iv) S get launched after V.
 (v) R get launched before W.
80. Which one of the following could be true?
 (a) Y is the second lights to be launched
 (b) R is the third lights to be launched
 (c) Q is the fourth lights to be launched
 (d) S is the fifth lights to be launched
81. If Z is the seventh lights to be launched then which one of the following could be true
 (a) W is the fifth lights to be launched.
 (b) T is the fourth lights to be launched.
 (c) R is the second lights to be launched.
 (d) V is the sixth lights to be launched.
82. Find the related word from the given alternative.
 Odometer: mileage :: Compass:
 (a) Speed (b) Hiking
 (c) Direction (d) Needle
83. Identify the figure that completes the pattern.



- (a) 1
 (b) 2
 (c) 3
 (d) 4
84. Find out the alternative figure which contains figure (X) as its part.



- (a) 1 (b) 2
 (c) 3 (d) 4
85. Choose the alternative which is closely resembles the mirror image of the given combination.
 TERMINATE
 (a) ТЕРМИНАТЕ (b) ЕТАИИМЯЕТ
 (c) ЕТАИИМЯЕТ (d) ЕТАИИМЯЕТ
86. If the 8-digit number $789 \times 531y$ is divisible by 72, then the value of $(5x - 3y)$ is
 (a) 0 (b) -1
 (c) 2 (d) 1
87. The income of Raju is 20% more than his expenditure. If his income increases by 60% and his expenditure increases by 70%, then by what percent do his savings increase/decrease?
 (a) It decreases by 10%
 (b) It decreases by 2%
 (c) It increases by 10%
 (d) It increases by 2%
88. ABC and CDE are right angled triangle. $\angle ABC = \angle CDE = 90^\circ$, D lies on AC and E lies on BC. $AB = 24$ cm, $BC = 60$ cm. If $DE = 10$ cm, then CD is:



- (a) 28 cm (b) 35 cm
 (c) 25 cm (d) Can't be determined

89. Maximum value of $(\cos \theta - \sin \theta)$ is:
- (a) $\frac{1}{\sqrt{2}}$ (b) $\frac{1}{2}$
(c) 2 (d) $\sqrt{2}$
90. What will be the maturity value, if ₹ 15,500 is deposited at a simple rate of interest of 12.5% for two years?
- (a) ₹ 16,187.50 (b) ₹ 19,375.00
(c) ₹ 19,375.50 (d) ₹ 18,785.00
91. Who among the following is the father of computer science?
- (a) Alan Turing
(b) Charles Babbage
(c) Gary Kildall
(d) Bill Gates
92. Where is black forest situated?
- (a) Australia (b) Newzeland
(c) Germany (d) Italy
93. In which country Commonwealth 2022 will be conducted?
- (a) Birmingham, England
(b) Gold Coast, Australia
(c) Glasgow , United Kingdom
(d) New Delhi, India
94. What is the full form of USB?
- (a) Universal Series Bus
(b) Universal Serial Bus
(c) Universe Series Bus
(d) Universe Serial Bus
95. Shivraj Singh Chauhan is the CM of which state?
- (a) Uttar Pradesh
(b) Rajasthan
(c) Madhya Pradesh
(d) Maharashtra
96. Who invented aeroplane?
- (a) Graham bell
(b) Newton
(c) Wright brothers
(d) Blaise Pascal
97. International Day of Zero Tolerance for Female Genital Mutilation is celebrated every year on?
- (a) 5th March
(b) 6th February
(c) 4th May
(d) 1stApril
98. Largest planet of solar system is
- (a) Mars (b) Venus
(c) Neptune (d) Jupiter
99. Manika Batra is associated with which game?
- (a) Football (b) Wreslling
(c) Tennis (d) Table Tennis
100. What is the currency of Algeria?
- (a) Algerian Dinar (b) Euro
(c) Kwanza (d) Dollar

Hints & Explanations

1. (a) Compatible means (of two things) able to exist or occur together without problems or conflict; suited means adapted for an occasion or use.
2. (c) Abrupt means sudden and unexpected while Gradual means proceeding in small stages which is antonym.
3. (b) The simplest noun form of compel (verb) is compulsion.
4. (d) Valid means legally or officially acceptable; validate (verb) means declare or make legally valid.
5. (a) The plural form of the word sheep is sheep.
6. (d) Ventriloquist means a person, especially an entertainer, who can make their voice appear to come from somewhere else, typically a dummy of a person or animal.
7. (c) Grossest means before any deductions; other correctly spelt should be genetics, Steerage and Granite.
8. (b) If someone is making song and dance, you mean they are making an unnecessary fuss about it.
9. (a) The general rule for sentences in simple past passive is: 'Object + was / were + past participle of main verb (third form)' in an affirmative sentence. 'Was / were + object + past participle of main verb (third form)' in the case of a question.
10. (a) The Helping verb of Future Simple tense will convert to 'Would' in the Indirect (reported) Speech. Tomorrow become the next day.
11. (a) Replace 'A' by 'The'. The is used before specified objects.
12. (c) Replace 'maker' by 'makers'. One of the/ Many/Most of the + Plural Noun +
13. (b) The idiom 'in thrall' means in a state of being controlled or strongly influenced by someone or something and it is followed by the preposition 'to'. Hence, correct sequence is 'QRP'.
14. (a) All-purpose complements with certified, verifiable; hence, the correct sequence is 'QPR'.
15. (d) **Incur:** become subject to (something unwelcome or unpleasant) as a result of one's own behavior or actions.
Reap means cut or gather (a crop or harvest).
16. (b) Inveterate means always doing something and unlikely to stop which perfectly complements with a habit which is here smoking.
17. (d) It is mentioned in the passage that the movement of the snakes is deceptive.
18. (b) The snake has an advantage over men inside a jungle because there man's movement is obstructed
19. (d) Movements help snakes to receive advance warning with their sensitivity.
20. (c) The speed at which a snake normally moves is as fast as that of a man.
21. (a) 220 V AC means rms value, not the actual magnitude so,
rms value of 220 V AC = 311 V
Clearly magnitude of 220 V AC (311 V) > 290 VDC
Hence 220 V AC is more dangerous than 290 VDC.
22. (b) Escape velocity, $V = \sqrt{\frac{2GM}{R}} = \sqrt{2gR}$
23. (c) Microwave, gamma ray and x-ray are electromagnetic wave and velocity of electromagnetic wave in vacuum
$$c = \frac{1}{\sqrt{\epsilon_0\mu_0}} = 3 \times 10^8 \text{ m/s}$$

24. (a)
25. (c) Silicon and germanium are the semiconductors whose conductivity is between the conductors like- copper, silver, lithium etc and insulators.

26. (b) Magnetic flux density = $\frac{\text{Force}}{\text{Current} \times \text{length}}$

27. (a) In circular motion, force

$$F = \frac{mv^2}{r}$$

28. (a) NOR gate is the combination of NOT & OR gate.

29. (b) $F = \frac{12}{100} \times 1000 \times 10 \text{ N} = 1200 \text{ N}$

$$P = Fv = 1200 \text{ N} \times 15 \text{ ms}^{-1} = 18 \text{ kW.}$$

30. (d) Since battery remains connected so P.D. between the plates is constant. But as we introduce the dielectric, the capacitance increases and hence charge increases.

31. (a) The decreasing order of the wavelengths is as given below :

32. (a)
33. (b) In India the frequency of A.C. current is 50 Hz.

34. (b)
35. (a) Applying Kirchoff's second law,

$$(2 + 2) = (0.1 + 0.3 + 0.2)i \Rightarrow i = \frac{20}{3} \text{ A}$$

Hence potential difference across A

$$= 2 - 0.1 \times \frac{20}{3} = \frac{4}{3} \text{ V} [< 2 \text{ V}]$$

Potential difference across B

$$= 2 - 0.3 \times \frac{20}{3} = 0$$

36. (a)
37. (c) According to Kepler's law of period $T^2 \propto R^3$

$$\frac{T_1^2}{T_2^2} = \frac{R_1^3}{R_2^3} = \frac{(6R)^3}{(3R)^3} = 8$$

$$\frac{24 \times 24}{T_2^2} = 8$$

$$T_2^2 = \frac{24 \times 24}{8} = 72 = 36 \times 2$$

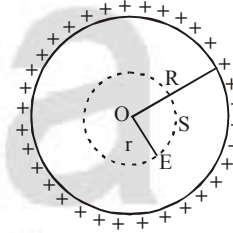
$$T_2 = 6\sqrt{2}$$

38. (c) Nucleus does not contain electron.
39. (a)
40. (d) Tides occurs due to gravitational pull of moon on the earth & they have regular character. On new moon & full moon high tides occur.
41. (b) Here, $R_g = 100 \Omega$; $I_g = 10^{-5} \text{ A}$; $I = 1 \text{ A}$; $S = ?$

$$S = \frac{I_g R_g}{I - I_g} = \frac{10^{-5} \times 100}{1 - 10^{-5}} = 10^{-3} \Omega \text{ in parallel}$$

42. (a) $L = \frac{Q}{m} = \frac{J}{\text{kg}} = \text{J kg}^{-1}$

43. (a) Charge resides on the outer surface of a conducting hollow sphere of radius R. We consider a spherical surface of radius $r < R$. By Gauss theorem



$$\int_s \vec{E} \cdot d\vec{s} = \frac{1}{\epsilon_0} \times \text{charge enclosed} \quad \text{or}$$

$$E \times 4\pi r^2 = \frac{1}{\epsilon_0} \times 0 \Rightarrow E = 0$$

i.e electric field inside a hollow sphere is zero.

44. (b)

45. (a) Transformation ratio $k = \frac{N_S}{N_P}$

$$\text{Since } \frac{V_S}{V_P} = \frac{N_S}{N_P} \therefore V_S = \frac{N_S}{N_P} \times V_P$$

$$V_S = \frac{3}{2} \times 30 = 45 \text{ V}$$

46. (d) Here, $AB = BC = CA = 2$. So, it is an equilateral triangle and the incenter coincides with the centroid. Therefore, the centroid is

$$\left(\frac{0+1+2}{3}, \frac{0+0+\sqrt{3}}{3} \right) \equiv \left(1, \frac{1}{\sqrt{3}} \right)$$

47. (c) Equation of line passing through $(a, 0)$ is $y = m(x-a)$

$$\Rightarrow mx - y - ma = 0 \quad \dots(i)$$

Its distance from the point $(2a, 2a)$ is

$$\left| \frac{2am - 2a - ma}{\sqrt{m^2 + 1}} \right| = a \quad (\text{given})$$

$$\Rightarrow (m-2)^2 = (m^2 + 1)$$

$$\Rightarrow m^2 - 4m + 4 = m^2 + 1$$

$$\Rightarrow 0m^2 - 4m + 3 = 0 \Rightarrow m = \frac{3}{4}, \infty$$

[If $a = 0$ then one root of $ax^2 + bx + c = 0$ is infinite]

This result must be taken into care otherwise one root will be lost.

The required equation of lines are, from (i)

$$3x - 4y - 3a = 0 \text{ and } x - a = 0.$$

48. (a) Since centred of circle $x^2 + y^2 + 6x + 14y = 1$ is $(-3, 7)$ and centre of circle $x^2 + y^2 + 4x + 10y$ is $(2, -5)$

$$\therefore \text{centred required circle} = \left(\frac{-3+2}{2}, \frac{7-5}{2} \right)$$

$$= \left(-\frac{1}{2}, 1 \right)$$

$$\text{Radius} = \frac{1}{2} \sqrt{(2+3)^2 + (7+5)^2}$$

$$= \frac{1}{2} \sqrt{25+144} = \frac{13}{2}$$

Equation of circle is

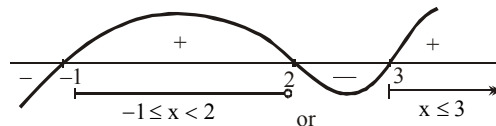
$$\left(x + \frac{1}{2} \right)^2 + (y-1)^2 = \left(\frac{13}{2} \right)^2$$

$$\Rightarrow x^2 + y^2 + x - 2y - 41 = 0$$

49. (c) $\sqrt{\{g(x)\}}$ is real if $g(x) \geq 0$

$$\text{or } \frac{(x+1)(x-3)}{(x-2)} \geq 0 \text{ or } \frac{(x+1)(x-2)(x-3)}{(x-2)^2} \geq 0$$

$$\text{or } [x - (-1)](x-2)(x-3) \geq 0, x \neq 2$$



$$\text{Domain} = [-1, 2) \cup [3, \infty)$$

50. (a) Given position vectors of points A, B, C and D are

$$3\hat{i} - 2\hat{j} - \hat{k}, 2\hat{i} + 3\hat{j} - 4\hat{k},$$

$$-\hat{i} - \hat{j} - 2\hat{k} \text{ and } 4\hat{i} - 5\hat{j} - \lambda\hat{k} \text{ respectively.}$$

$$\therefore \text{points are } A(3, -2, -1), B(2, 3, -4),$$

$$C(-1, 1, 2) \text{ and } D(4, 5, \lambda).$$

These are collinear if

$$\begin{vmatrix} (2-3) & [3-(-2)] & -4-(-1) \\ -1-3 & 1+2 & 2+1 \\ 4-3 & 5-(-2) & \lambda-(-1) \end{vmatrix} = 0$$

$$\Rightarrow \begin{vmatrix} -1 & 5 & -3 \\ -4 & 3 & 3 \\ 1 & 7 & \lambda+1 \end{vmatrix} = 0 \Rightarrow \lambda = \frac{-146}{17}$$

51. (d) We have mean $= np = 2$

$$\text{Variance} = npq = 1 \Rightarrow q = \frac{1}{2} \text{ and } p = \frac{1}{2}$$

$$\text{According to given, } n \cdot \frac{1}{2} = 2 \Rightarrow n = 4$$

$$\text{Thus, } P(X \geq 1) = 1 - P(X = 0)$$

$$= 1 - {}^4C_0 \left(\frac{1}{2} \right)^4 = 1 - \frac{1}{16} = \frac{15}{16}$$

52. (c) $L = {}^{10}C_2 - {}^4C_2 + 1 = 45 - 6 + 1 = 40$
 $T = {}^{10}C_3 - {}^4C_3 = 120 - 4 = 3L - 4$

53. (a) Here, $\tan A + \tan B = a$, $\tan A \tan B = b$
 Now,

$$\sin^2(A+B) = \frac{1 - \cos 2(A+B)}{2}$$

$$= \frac{1 - \frac{1-t^2}{1+t^2}}{2} = \frac{2t^2}{2(1+t^2)}$$

[where $t = \tan(A+B)$]

$$\text{and } t = \tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B} = \frac{a}{1-b}$$

$$\sin^2(A+B) = \frac{2 \cdot a^2 / (1-b)^2}{2[1 + a^2 / (1-b)^2]}$$

$$= \frac{a^2}{a^2 + (1-b)^2} \left[\text{Using } \cos 2\theta = \frac{1 - \tan^2 \theta}{1 + \tan^2 \theta} \right]$$

54. (c) The number of ways of selecting 3 persons from 12 person under the given condition :

= Number of ways of arranging 3 person among 9 people seated in a row, so that no two of them are consecutive

= Number of ways of choosing 3 places out of the 10 [8 in between and 2 extremes]

$$= {}^{10}C_3 = \frac{10 \times 9 \times 8}{3 \times 2 \times 1} = 5 \times 3 \times 8 = 120$$

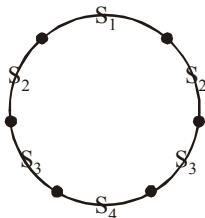
55. (c) Let the sides of the game be A and B. Given 5 married couples, i.e., 5 husbands and 5 wives. Now, 2 husbands for two sides A and B can be selected out of $5 = {}^5C_2 = 10$ ways.

After choosing the two husbands their wives are to be excluded (since no husband and wife play in the same game). So we have to choose 2 wives out of remaining $5 - 2 = 3$ wives i.e., ${}^3C_2 = 3$ ways.

Again two wives can interchange their sides A and B in $2! = 2$ ways.

By the principle of multiplication, the required number of ways = $10 \times 3 \times 2 = 60$

56. (b)



Six students S_1, S_2, \dots, S_6 can be arranged round a circular table in $5!$ ways. Among these 6 students there are six vacant places, shown by dots (\bullet) in which six teachers can sit in $6!$ ways.

Hence, number of arrangement = $5! \times 6!$

57. (c) \therefore sum of given 6 digits

$$= 0 + 1 + 2 + 3 + 4 + 6 = 16$$

and we have to use 5 digits out of given six digits i.e. 1 digit is not to be used and that is either 1 or 4 (Because a number is divisible by 3 if sum of its digits is divisible by 3.)

Case-1

$$\boxed{1 \times}$$

0, 2, 3, 4, 6

$\times, \times, \times, \times, \times$

$$4 \times 4 \times 3 \times 2 \times 1 = 96$$

$$\text{Total} = 96 + 96 = 192$$

Case-2

$$\boxed{4 \times}$$

0, 1, 2, 3, 4

$\times, \times, \times, \times, \times$

$$4 \times 4 \times 3 \times 2 \times 1 = 96$$

58. (b) The probability of hitting the target 5th time at the 10th throw = P(the probability of hitting the target 4 times in the first 9 throws) \times (the probability of hitting the target at the 10th throw)

$$= \left[{}^9C_4 \left(\frac{1}{2} \right)^4 \left(\frac{1}{2} \right)^5 \right] \left(\frac{1}{2} \right) = \frac{9!}{4!5!} \times \left(\frac{1}{2} \right)^{10} = \frac{63}{2^9}$$

59. (d)

$$f(x) = x^{100} + \sin x - 1 \Rightarrow f'(x) = 100x^{99} + \cos x.$$

If $0 < x < \pi/2$, then $f'(x) > 0$,

therefore $f(x)$ is increasing on $(0, \pi/2)$.

If $0 < x < 1$, then $100x^{99} > 0$ and $\cos x > 0$

[$\therefore x$ lies between 0 and 1 radian]

$$\Rightarrow f'(x) = 100x^{99} + \cos x > 0$$

$\Rightarrow f(x)$ is increasing on $(0, 1)$.

If $\pi/2 < x < \pi$, then $100x^{99} > 100$

[$\therefore x > 1, \therefore x^{99} > 1$]

$$\Rightarrow 100x^{99} + \cos x > 0$$

[$\therefore \cos x \geq -1, \therefore 100x^{99} + \cos x > 99$]

$\Rightarrow f'(x) > 0 \Rightarrow f(x)$ is increasing on $(\pi/2, \pi)$.

60. (a) Mean and SD σ of the combined group are

$$m = \frac{63 \times 27.6 + 26 \times 19.2}{63 + 26} = 25.1$$

Thus, AM is decreased by $27.6 - 25.1 = 2.5$.

$$\sigma^2 = \frac{63 \times (7.1)^2 + 26 \times (6.2)^2}{89} + \frac{63(25.1 - 27.6)^2 + 26(25.1 - 19.2)^2}{89}$$

$$\Rightarrow \sigma = 7.8 \text{ (approx.)}$$

61. (d) The given data in ascending order of magnitude is

7, 10, 12, 15, 16, 17, 25

Here, lower quartile $Q_1 = 10$,

median = 15 and upper quartile $Q_3 = 17$

$$\therefore \text{Q.D.} = \frac{Q_3 - Q_1}{2} = \frac{17 - 10}{2} = 3.5$$

62. (a) Correct mean

$$= \frac{300 - (3 + 6) + (8 + 4)}{20} = 15.15.$$

63. (b)

$$\lim_{x \rightarrow \infty} \left(\frac{x^2 + 1 - 2}{x^2 + 1} \right)^{x^2} = \lim_{x \rightarrow \infty} \left(1 + \frac{-2}{x^2 + 1} \right)^{x^2}$$

$$= \lim_{x \rightarrow \infty} \left[1 + \frac{-2}{x^2 + 1} \right]^{\frac{x^2 + 1 - 2x^2}{-2} \cdot \frac{-2}{x^2 + 1}} = e^{-2}$$

64. (d) $0.\overline{2} + 0.\overline{23} = \frac{2}{9} + \frac{23}{99}$

$$= \frac{22 + 23}{99} = \frac{45}{99} = 0.\overline{45}$$

65. (d) We have $\frac{b}{a} = \frac{c}{b} = \frac{d}{c} = r$

$$b = ar, c = br = ar^2, d = cr = br^2 = ar^3$$

$$\text{Now, } \frac{b+c}{a+b} = \frac{ar+ar^2}{a+ar} = r \text{ and}$$

$$\frac{c+d}{b+c} = \frac{br+cr^2}{b+c} = r$$

$\therefore a+b, b+c, c+d$ are in G.P.

$$\text{Again } (b-c)^2 + (c-a)^2 + (d-b)^2$$

$$\begin{aligned} &= (ar - ar^2)^2 + (ar^2 - a)^2 + (ar^3 - ar)^2 \\ &= a^2 r^2 (1-r)^2 + a^2 (1-r^2)^2 + a^2 r^2 (1-r^2)^2 \\ &= a^2 (1-r)^2 [r^2 + (1+r)^2 + r^2 (1+r)^2] \\ &= a^2 (1-r)^2 [r^2 + (1+r)^2 (1+r)^2] \\ &= a^2 (1-r)^2 \left[r^2 + (1+r^2)^2 + 2r(1+r^2) \right] \\ &= a^2 (1-r)^2 (r+1+r^2)^2 \\ &= a^2 (1-r^3)^2 = (a - ar^3)^2 = (a-d)^2 \end{aligned}$$

Further, $(a^2 + b^2 + c^2)(b^2 + c^2 + d^2)$

$$\begin{aligned} &= (a^2 + a^2 r^2 + a^2 r^4)(a^2 r^2 + a^2 r^4 + a^2 r^6) \\ &= a^4 r^2 (1+r^2+r^4)(1+r^2+r^4) \end{aligned}$$

$$= [a^2 r(1+r^2+r^4)]^2$$

$$= (a \cdot ar + ar \cdot ar^2 + ar^2 \cdot ar^3)^2 = (ab + bc + cd)^2$$

66. (a) (Even number) $\times 5 \rightarrow$ unit digit 0.

(Odd number) $\times 5 \rightarrow$ unit digit 5.

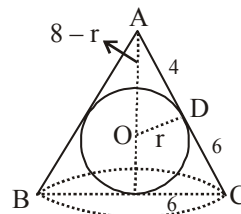
Here, $2^{3^4}, 4^{5^6}$ and 6^{7^8} are even terms and 5^{6^7} is an odd multiple of 5. Hence the unit digit of the expression will be zero.

67. (a) $\pi r(r+l) : 3\pi r^2 : 2\pi r(r+h)$

$$= \pi \times 1(1-\sqrt{2}) : 3 \times \pi \times 1 : 2 \times \pi \times 1(1+1)$$

$$= (\sqrt{2}-1) : 3 : 4$$

68. (c)



$$AC = \sqrt{6^2 + 8^2} \Rightarrow l = 10$$

$$\text{In } \triangle ODA, AO^2 = OD^2 + AD^2$$

$$\Rightarrow (8-r)^2 = r^2 + 4^2$$

$$\Rightarrow 64 + r^2 - 16r = r^2 + 16$$

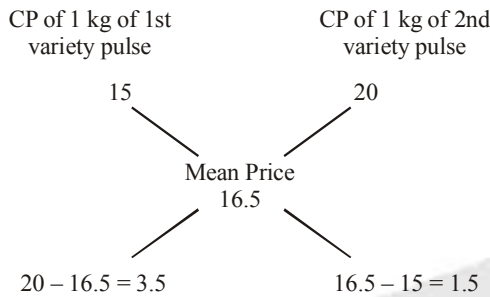
$$\Rightarrow 16r = 48 \Rightarrow r = 3 \text{ cm}$$

Alternate: –

Radius of maximum size sphere

$$= \frac{hr}{l+r} = \frac{8 \times 6}{10+6} = 3 \text{ cm}$$

69. (d) By rule of alligation,



Required ratio = 3.5 : 1.5 = 35 : 15 = 7 : 3

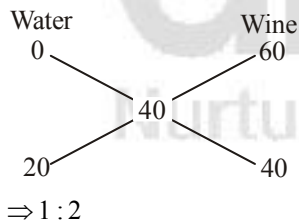
70. (a) Selling price = ₹ 50

Therefore, the cost price

= ₹ 40, which is the average price.

It means the wine, worth ₹ 60 becomes worth ₹ 40 when the water was mixed in it. So we can conclude that in the mixture of ₹ 60, there is wine worth ₹ 40 and the rest is water. Therefore, the ratio of water and wine is 20 : 40 i.e., 1 : 2

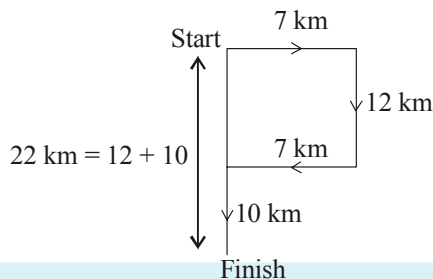
Alternatively :



71. (b) Missing no. is

$$6 + 10 \times 2 = 26, 11 + 5 \times 2 = 21, 8 + 8 \times 2 = 24.$$

72. (a)



\therefore Mohan is 22 km in south direction from his starting position.

73. (d) Total amount = 25 + (10 - 1) × 6
= 25 + 54 = ₹ 79

74. (c) No. of students eat at least one item
= 9 + 1 + 6 + 3 + 2 + 4 + 5 = 30

75. (c) The given sequence is a combination of two series

I. 13, 24, 35, 46, 57 and

II. 32, 43, ?, 65, 76

The pattern in both I and II is + 11.

So, missing term = 43 + 11 = 54

76. (c) p f g h / p p f f g g h h / p p p f f f g g g h h h

77. (c) Father – Wife
| |
Rahul – Daughter in Law

|
Daughter

Rahul is the father.

78. (b) Sunil ← → Deepak
20th (Left) 36th (Right)
28th (Left)
(Sunil after interchanging)

\therefore Total number of boys in the row
= 36 + 28 - 1 = 63

79. (a) 52 ÷ 4 + 5 × 8 - 2 = 36

On interchanging signs we get,
= 52 - 4 × 5 + 8 ÷ 2 = 32 + 4 = 36

80. (d) According to the question,

V < Y and Q

Z < Q

R < T < V < S

R < W

Option (d) → S must be launched after R, T and V hence it can be launched after 3. In one possibility it can be launched after Z, then it could be launched as fifth light.

Option (a) → Since Y launched after V hence after V, R and T launched, so at the earliest Y can be launched is at 4th position.

Option (b) → R must be either 1st or the 2nd position.

Option (c) → Q launched after R, T, V and Z.

81. (a) According to the question,
RTVSWYZQ

Option (a) could be true

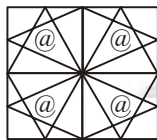
Option (b) could not be true

Option (c) could not be true as R is in first position

Option (d) could not be true.

82. (c) Odometer is an instrument used to measure mileage.

Similarly → Compass is an instrument used to determine direction



83. (d)



84. (b)

85. (c)

86. (b) Divisible by 72 means divisible by 8 and 9.
Last 3 digits must be divisible by 8

$$31y \div 8$$

We get,

$$y = 2$$

Sum of digit must be multiple of 9.

$$\text{So, } 7 + 8 + 9 + x + 5 + 3 + 1 + 2 = 8 + x$$

$$\text{So, } x = 1$$

$$\text{Now, } 5x - 3y = 5 - 6 = -1$$

87. (c)

Expenditure.....	5	$\xrightarrow{70\%}$	3.5
Income	6	$\xrightarrow{60\%}$	$\frac{3.6}{0.1}$
Saving	1	$\xrightarrow{+0.1}$	0.1

$$\text{Increase in Saving} = \frac{0.1}{1} \times 100\% = 10\%$$

88. (c) $\angle CDE = \angle ABC = 90^\circ$

$$\angle DEC = \angle BAC$$

$$\triangle ABC \sim \triangle EDC$$

$$\frac{AB}{BC} = \frac{ED}{CD}$$

$$\frac{24}{60} = \frac{10}{CD}$$

$$CD = 25 \text{ cm}$$

89. (d) Maximum value of $a \sin \theta + b \cos \theta$ is given

$$\text{by } \sqrt{a^2 + b^2}$$

$$\text{Here } a = -1, b = 1$$

$$\text{So, } \sqrt{(-1)^2 + 1^2} = \sqrt{2}$$

90. (b) $\text{S.I.} = \frac{15500 \times 12.5 \times 2}{100}$

$$\text{S.I.} = 3875$$

$$\text{Amount} = 15500 + 3875 = 19375$$

91. (a) Alan Turing is considered to be the father of computer science and artificial intelligence. He formed the concept of the algorithms and computations with one of his inventions the turning machine.

92. (c) Black forest is situated in the state of Baden-Wurttemberg in southwest Germany. It is bounded by the Rhine valley to the west and south. It occupies an area of 2,320 Square miles (6009 Square km).

93. (a) The 2022 Commonwealth Games will be held in Birmingham, England. They will be the third Commonwealth Games to be hosted in England following London 1934 and Manchester 2002.

94. (b) The full form of USB is Universal Serial Bus. It is a common platform that allows communication between devices and a host controller such as a PC.

95. (c) Shivraj Singh Chouhan is the 19th and current Chief Minister of Madhya Pradesh, having been elected to the same position 3 times in the past, and a Member of Legislative Assembly in Madhya Pradesh from Budhni.

96. (c) The Wright brothers invented an aeroplane and flew the first airplane in 1903.
97. (b) International Day of Zero Tolerance for Female Genital Mutilation is a United Nations-sponsored annual awareness day that takes place on February 6.
98. (d) The largest planet in our solar system is Jupiter, which beats out all the other planets in both mass and volume. Jupiter's mass is more than 1300 times that of Earth, and its diameter, at 140,000 km, is about 11 times Earth's diameter.
99. (d) Manika Batra is an Indian table tennis player. She received Rajiv Gandhi Khel Ratna Award in 2020.
100. (a) The Algerian dinar is the monetary currency of Algeria.