class 10

SAT
Scholastic Aptitude Test

TARGET
NTSE
National Talent Search Examination

Solved Paper
2016
Stage 2

Time : 45 Minutes **Max. Marks : 50**

Instructions for Candidates

Read the following instructions carefully before you answer the questions :

1. Answers are to be given on a separate answer-sheet.
2. Write your eight-digit Roll Number very clearly on the test-booklet and answer-sheet as given in your letter/ admission card.
3. Write down the Booklet Number in the appropriate box on the answer sheet.
4. There are 50 questions in this test. All are compulsory.
5. Please follow the instructions for marking the answers given on the answer sheet.
6. For questions 1 – 50, put a cross mark (X) on the number of the correct alternative on the answer-sheet against the corresponding question number.
7. If you do not know the answer to any question, do not spend much time on it and pass on to the next one. Time permitting, you can come back to the questions, which you have left in the first instance and try them again.
8. Since the time allotted for this question paper is very limited you should make the best use of it by not spending too much time on any one question.
9. Rough work can be done anywhere in the booklet but not on the answer sheet/loose paper.
10. Every correct answer will be awarded one mark.
11. Please return the Test-booklet and answer-sheet to the invigilator after the test.

1. Suppose a mutant of a photosynthetic alga has dysfunctional mitochondria, it would affect its ability to perform
   (1) glycolysis (2) anaerobic respiration
   (3) aerobic respiration (4) photosynthesis
2. Cow has a special stomach as compared to that of a lion in order to:
   (1) absorb food in better manner
   (2) digest cellulose present in the food
   (3) assimilate food in a better way
   (4) absorb large amount of water
3. When touched, the leaflets of Touch-me-not plant are closed. Closing of leaflets starts from the point of contact to the leaflets away. The leaflets are closed due to:
   (1) change in turgor pressure
   (2) specialized proteins
   (3) growth hormone retardation
   (4) capillary action
4. Pancreas is composed of
   (1) Only exocrine cells
   (2) Only endocrine cell
   (3) Both endocrine and exocrine
   (4) Nephrons
5. The human embryo gets nutrition from the mother blood with the help of a special organ called
   (1) Zygote (2) Ovary
   (3) Oviduct (4) Placenta
6. Hormones produced in one part of the organism reach the distantly located target via
   (1) muscles (2) bone
   (3) cartilage (4) blood
7. Which of the following are characteristic feature of cells of meristematic tissue?
   (1) Actively dividing cells with dense cytoplasm, thick cell wall and prominent nuclei
   (2) Actively dividing cells with dense cytoplasm, thin cell wall and no vacuoles
   (3) Actively dividing cells with little cytoplasm, thin cell wall and prominent nuclei
   (4) Actively dividing cells with thin cytopalsm, thin cell wall and no vacuoles.
8. Which one of the following animals is different from other in not having the paired gill pouches?
   (1) Whale (2) Water snake
   (3) Star fish (4) Sea horse
9. In the synbiotic relationship between a bacterium and a root of legume the:
   (1) bacteria provide N_2 and the plant roots provide Carbon
   (2) roots provide NH_4 and bacteria provide Carbon
   (3) bacteria provide NH_4 and the roots provide Carbon
   (4) bacteria provide N_2 and the roots provide NH_4
10. Which of the following is an result of biological magnification:
   (1) Top level predators may be harmed by toxic chemicals in environment.
   (2) Increase in carbon dioxide
   (3) The green-house effect will be most significance at the poles
   (4) Energy is lost at each trophic level of a food chain
11. Which one of the following signifies *ex situ* conservation?
   (1) National parks and Biosphere habitats
   (2) Wild animal in their natural habitats
   (3) Inhabitants of natural ecosystems
   (4) Conservation methods practiced in Zoo and Botanical garden
12. What is the main reason for increase in temperature in a glass house:
   (1) Sunlight is completely absorbed by plants in the glass house
   (2) Radiation fails to escape from the glass house completely
   (3) Plant do not utilize sunlight in a glass house
   (4) Plants produce heat inside the glass house
13. Match the items in column-I with those in column-II, and select the correct choice:

Column-I		**Column-II**
A.	Small pox	I. Bacteria
B.	Cholera	II. Virus
C.	Malaria	III. Deficiency of minerals
D.	Anaemia	IV. Female mosquito

   (1) A-IV, B-II, C-III, D-I (2) A-II, B-I, C-IV, D-III
   (3) A-IV, B-III, C-II, D-I (2) A-III, B-IV, C-I, D-II
14. In the experiment conducted by Mendel, RRyy (round green) and rrYY (wrinkled, yellow) seeds of pea plant were used. In the F_2 generation 240 progeny were produced, out of which 15 progeny had specific characteristics. What were the characteristics?
   (1) round and green (2) round and yellow
   (3) wrinkle and yellow (4) wrinkle and green
15. Total number of neutrons in five moles of water molecules is:
   (1) 3.011×10^{24} (2) 2.409×10^{25}
   (3) 3.111×10^{25} (4) 2.711×10^{25}
16. The metal used to recover copper from an aqueous solution of copper sulphate is:
   (1) Na (2) Ag
   (3) Hg (4) Fe
17. Four substance were thoroughly mixed with water separately to obtain mixtures A, B, C and D. Some of their properties give below:
   I. Path of a beam of light passing throught it was visible in A, B and D but invisible in C.
   II. On leaving undisturbed, the particles of the substance settle down in A but not in B, C and D.
   III. The solute particles are visible to naked eye in A but invisible in B,C and D.

Which of the following is correct about A,B,C and D ?

(1) A, B and D are colloids. C is a solution

(2) A is a suspension. B and D are colloids. C is a solution

(3) A is a colloid. B, C and D are solutions.

(4) A is a suspension B, C and D are colloids

18. **Assertion (A) :** Aluminium foil cannot be used in α -particle scattering experiment.

Reason (R) : Aluminium is highly malleable metal.

(1) Both A and R are correct. R is the correct reason for A.

(2) Both A and R are correct but R is not the correct reason for A.

(3) A is correct and R is incorrect.

(4) A is incorrect and R is correct.

19. Magnesium ribbon is rubbed with sand paper before making it to burn. The reason of rubbing the ribbon is to:

(1) remove moisture condensed over the surface of ribbon.

(2) generate heat due to exothermic reaction

(3) remove magnesium oxide formed over the surface of magnesium.

(4) mix silicon from sand paper (silicon dioxide) with magnesium for lowering ignition temperature of the ribbon.

20. The reaction that differs from the rest of the reactions given is :

(1) formation of calcium oxide from limestone

(2) formation of aluminium from aluminium oxide

(3) formation of sodium carbonate from sodium hydrogen carbonate

(4) formation of mercury from mercuric oxide

21. An element X reacts with dilute H_2SO_4 as well as with NaOH to produce salt and $H_2(g)$. Hence, it may be concluded that:

I. X is an electropositive element.

II. oxide of X is basic in nature.

III. oxide of X is acidic in nature.

IV. X is an electronegative element.

(1) I, II, III (2) IV, I, II

(3) III, IV, I (4) II, III, IV

22. An element X has electronic configuration 2, 8, 1 and another element Y has electronic configuration 2, 8, 7. They form a compound Z. The property that is not exhibited by Z is

(1) It has high melting point.

(2) It is a good conductor of electrictiy in its pure solid state.

(3) It breaks into pieces when beaten with hammer.

(4) It is soluble in water

23. The compound containing both ionic and covalent bond is

(1) $AlBr_3$ (2) CaO

(3) $MgCl_2$ (4) NH_4Cl

24. The element that cannot be used as a reducing agent is

(1) carbon (2) aluminium

(3) sulphur (4) sodium

25. Somebody wanted to calculate the number of moles of oxygen atoms comprising of 9.033 × 1023 number of its atoms. The person further thought to calculate its mass and to find the number of moles of hydrogen atoms required to combine completely with this amount of oxygen to form water.

The number of moles of oxygen atoms, their mass (in grams) and the number of moles of hydrogen atoms are

(1) 1.5, 3 and 24 respectively

(2) 15, 18 and 3 respectively

(3) 0.15, 27,3 respectively

(4) 1.5, 24 and 3 respectively

26. The molecular formula of carboxylic acid that differs from the rest is

(1) $C_{13}H_{26}O_2$ (2) $C_2H_4O_2$

(3) $C_9H_{18}O_2$ (4) $C_7H_{12}O_2$

27. Foam of soap always appears white as

(1) it contains large hydrocarbon chains.

(2) it absorbs red portion of the visible light

(3) it reflects light of all wavelengths.

(4) it has one hydrophobic end, which is insoluble in water.

28. In a neon gas discharge tube, every second 4.8×10^{18} Ne^+ ions move towards the right through a cross-section of the tube, while 'n' electrons move to the left in the same time. If the current in the tube is 1.12 amperes towards the right, n is equal to

(given $e = 1.6 \times 10^{-19}$ coulomb)

(1) 1.8×10^{18} (2) 2.2×10^{18}

(3) 2.4×10^{19} (4) 2.8×10^{19}

29. Four situations are given below-

I. An infinitely long wire carrying current

II. A rectangular loop carrying current

III. A solenoid of finite length carrying current

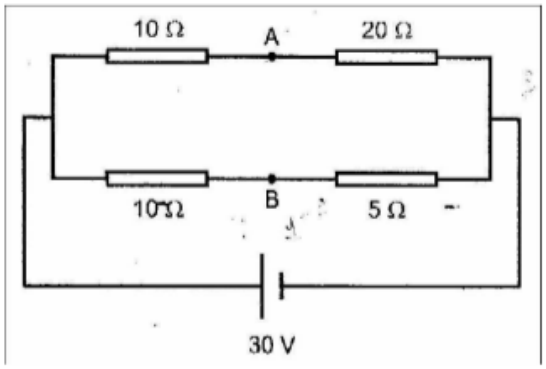
IV. A circular loop carrying current.

In which of the above cases will the magnetic field produced be like that of a bar magnet?

(1) I (2) I and III

(3) Only III (4) Only IV

30. In the circuit diagram shown below, V_A and V_B are the potentials at points A and B respectively. Then, $V_A - V_B$ is



(1) –10 V (2) –20 V

(3) 0 V (4) 10 V

31. **Assertion (A)** : Motion of a charged particle under the action of a magnetic field alone is always with constant speed.
Reason (R) : The magnetic force does not have any component either along or opposite to the direction of motion of the charged particle
(1) Both Assertion and Reason are true and the reason is the correct explanation of the assertion.
(2) Both Assertion and Reason are true, but the reason is not the correct explanation of the assertion.
(3) Assertion is a true statement, but Reason is false.
(4) Both Assertion and Reason are false statements.

32. When a charged particle passes through an electric field, which among the following properties change?
I. mass II. charge
III. velocity IV. momentum
(1) II & III (2) Only III
(3) III & IV (4) I, III, & IV

33. A ray of light in air is incident on an equilateral glass prism at an angle θi to the normal. After refraction, the light travelled parallel to the base of prism and emerged in air at an angle θe to the normal. If the angle between the incident and the emergent rays is 60°, then the refractive index of glass with respect ot air is
(1) 1.33 (2) 1.5
(3) 1.73 (4) 1.66

34. You are standing on the shore of a lake. You spot a fish swimming below the lake surface. You want to kill the fish first by throwing a spear and next, by pointing a high-power laser torch. How should you aim the spear and torch, respectively, from the options given below?
I. above the apparent position of the fish
II. below the appearent position of the fish
III. directly at the apparent position of the fish
(1) SPEAR : II ; LASER : III
(2) SPEAR : I ; LASER : II
(3) SPEAR : II ; LASER : II
(4) SPEAR : III ; LASER : III

35. A beam of light coming from a rarer medium is partially reflected from the surface fo a denser medium and partially refracted into the denser medium. If the reflected and the refracted rays are perpendicular to each other and the ratio of the refractive indices of denser and rarer medium is $\sqrt{3}$, the angle of refraction will be -
(1) 60° (2) 30°
(3) 45° (4) 41.5°

36. A person can see clearly only the objects situated in the range 50 cm to 300 cm. He went to an Optometist who prescribed him a lens of certain power to increase the maximum distance of his vision to infinity, i.e., it corrected the near-sightedness. However, upon using the prescribed lens the person discovered that the near point of his vision has shifted from 50 cm to a distance 'd'. What is the value of d ?
(1) 60 cm (2) 100 cm
(3) 40 cm (4) 500 cm

37. A ball of mass m is thrown from a height h with a speed v. For what initial direction of the ball will its speed on hitting the ground be maximum?
(1) horizontally
(2) vertically downwards
(3) at an angle of 45° from the vertical in the downward direction
(4) speed does not depend on the direction in which the ball is thrown

38. A beaker is filled with two non-mixing liquids. The lower liquid has density twice that of the upper one. A cylinder of height h floats with one-fourth of its height submerged in the lower liquid and half of its height submerged in the upper liquid. Another beaker is filled with the denser of the two liquids alone. If the same cylinder is kept in the second beaker, the height of the submerged position would be.
(1) h (2) $\frac{3h}{4}$
(3) $\frac{h}{2}$ (4) $\frac{h}{4}$

39. A spring -loaded toy sits at rest on horizontal frictionless surface. When the spring releases, the toy breaks into three equal-mass pieces A, B and C, which slide along the surface. Piece A moves off in the negative x-direction, while piece B moves off in the negative y-direction. Which of the three pieces is moving the fastest?
(1) A
(2) B
(3) C
(4) They move with identical speeds

40. A truck and a car of masses m1 and m2 respectively are moving with equal kinetic energies. Equal stopping forces are applied and they come to a halt after travelling further distances x1 and x2 respectively.
(1) $x_1 = x_2$ (2) $\frac{X_1}{X_2} = \frac{m_1}{m_2}$
(3) $\frac{X_1}{X_2} = \sqrt{\frac{m_1}{m_2}}$ (4) $\frac{X_1}{X_2} = \sqrt{\frac{m_2}{m_1}}$

41. On dividing a natural number by 13, the remainder is 3 and on dividing the same number by 21, the remainder is 11. If the number lies between 500 and 600, then the remainder on dividing the number by 19 is
(1) 4 (2) 6
(3) 9 (4) 13

42. Expressing $0.\overline{34} + 0.\overline{34}$ as a single decimal , we get
(1) $0.67\overline{88}$ (2) $0.6\overline{89}$
(3) $0.6\overline{878}$ (4) $0.6\overline{87}$

43. If the value of a quadratic polynomial p(x) is 0 only at $x = -1$ and $p(-2) = 2$, then the value of p(2) is

(1) 18 (2) 9

(3) 6 (4) 3

44. The graphs of the equations $x.y = 2$ and $kx + y = 3$, where k is a constant, intersect at the point (x, y) in the first quadrant, if and only if k is

(1) equal to -1 (2) greater than -1

(3) less than 3/2 (4) lying between .1 and 3/2

45. If α and β are the roots of the quadratic equation $x^2 - 6x - 2 = 0$ and if

$a_n = \alpha^n - \beta^n$, then the value of $\frac{a_{10} - 2a_8}{2a_9}$ is

(1) 6.0 (2) 5.2

(3) 5.0 (4) 3.0

46. If S1, S2, S3, ..., Sr are the sum of first n terms of r arithmetic progressions respectively. Whose first terms are 1,2,3, ...and whose common differences are 1,3,5, ... respectively, then the value of S1+ S2+ S3 +.....Sr is

(1) $\frac{(nr-1)(nr+1)}{2}$ (2) $\frac{(nr+1)nr}{2}$

(3) $\frac{(nr-1)nr}{2}$ (4) $\frac{n(nr+1)}{2}$

47. A person walks towards a tower. Initially when he starts, angle of elevation of the top of tower is 30°. On travelling 20 metres towards the tower, the angle changes to 60°. How much more has he to travel to reach the tower?

(1) $10\sqrt{3}$ metres (2) 10 metres

(3) 20 metres (4) $\frac{10}{\sqrt{3}}$ metres

48. If cosec x . sin x = a and secx . cosx = b, then

(1) $(a^2b)^{\frac{2}{3}}(ab^2)^{\frac{2}{3}} = 1$ (2) $(ab^2)^{\frac{2}{3}}(a^2b^2)^{\frac{2}{3}} = 1$

(3) $a^2 + b^2 = 1$ (4) $b^2 - a^2 = 1$

49. A calf is tied a rope of length 12m at a corner of a rectangular field of the dimensions 35m × 25m. If the length of the rope is increased to 23 m, then the additional grassy area in which the calf can graze is

(Take $\pi = \frac{22}{7}$)

(1) $280.0\,m^2$ (2) $300.0\,m^2$

(3) $302.5\,m^2$ (4) $312.5\,m^2$

50. If Anish is moving along the boundary of a triangular field of sides 35 m, 53m and 66m and your are moving along the boundary of a circular field whose area is double the area of the triangular field, then the radius of the circular field is

(Take $\pi = \frac{22}{7}$)

(1) $14\sqrt{3}$ m (2) $3\sqrt{14}$ m

(3) $28\sqrt{3}$ m (4) $7\sqrt{3}$ m

51. A circular metallic sheet is divided into two parts in such a way that each part can be folded in to a cone. If the ratio of their curved surface areas is 1 :2, the the ratio of their volumes is

(1) 1 : 8 (2) $1 : \sqrt{16}$

(3) $1 : \sqrt{10}$ (4) 2 : 3

52. A solid metallic block of volume one cubic metre is melted and recast into the form of a rectangular bar of length 9 metres having a square base. If the weight of the block is 90 kg and biggest cube is cut off from the bar, then the weight of the cube is

(1) $6\frac{1}{3}$kg (2) $5\frac{2}{3}$kg

(3) $4\frac{2}{3}$kg (4) $3\frac{1}{3}$kg

53. Two circles with centres P and R touch each other externally at O. A line passing through O cuts the circles at T and S respectively. Then

(1) PT and RS are of equal length

(2) PT and RS are perpendicular to each other

(3) PT and RS are intersecting

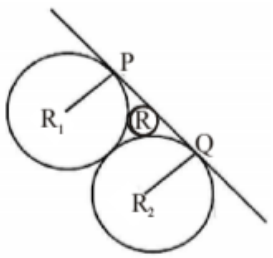
(4) PT and RS are parallel

54. If in a triangle ABC, D is the mid-point of side BC $\angle ADB = 45°$ and $\angle ACD = 30°$. then $\angle BAD$ and $\angle ABC$ are respectively equal to

(1) 15°, 105° (2) 30°, 105°

(3) 30°, 100° (4) 60°, 100°

55. Three circles with radii R1, R2 and r touch each other externally as shown in the adjoining figure. If PQ is their common tangent and R1 > R2, then which of the following relations is correct?



(1) $R_1 - R_2 = r$ (2) $R_1 + R_2 = 2r$

(3) $\frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{r}$ (4) $\frac{1}{\sqrt{R_1}} + \frac{1}{\sqrt{R_2}} = \frac{1}{\sqrt{r}}$

56. ABC is a triangle in which AB = 4 cm, BC = 5 cm and AC = 6 cm. A circle is drawn to touch side BC at P, side AB extended at Q and side AC extended at R. Then, AQ equals

(1) 7.0 cm (2) 7.5 cm

(3) 6.5 cm (4) 15.0 cm

57. The centre of the circle passing through the ponts $(6, -6)$, $(3, -7)$ and $(3, 3)$ is

(1) $(3, 2)$ (2) $(-3, -2)$

(3) $(3, -2)$ (4) $(-3, 2)$

58. If the line segment joining $(2, 3)$ and $(-1, 2)$ is divided internally in the ratio 3: 4 by the graph of the equation $x + 2y = k$, the value of k is

(1) $\frac{5}{7}$ (2) $\frac{31}{7}$

(3) $\frac{36}{7}$ (4) $\frac{41}{7}$

59. The mean of three positive numbers is 10 more than the smallest of the numbers and 15 less than the largest of the three. If the median of the three numbers is 5, then the mean of squares of the numbers is

(1) $108\frac{2}{3}$ (2) $116\frac{2}{3}$

(3) $208\frac{1}{3}$ (4) $216\frac{2}{3}$

60. Three dice are thrown simultaneously. The probability of getting a total of at least 5 of the numbers appearing on their tops is

(1) $\frac{5}{54}$ (2) $\frac{7}{54}$

(3) $\frac{49}{54}$ (4) $\frac{53}{54}$

61. Match the following

A.	Livre	I.	Unit of currency
B.	Manor	II.	An estate of Lord's lands and his mansion
C.	Tithe T	Ill.	Tax to be paid directly to the state
D.	Taille	IV.	A tax levied by the Church

(1) A-III, B-II, C-IV, D-I (2) A-II, B-Iv, C-I, D-III

(3) A-IV, B-II, C-III, D-I (4) A-IV, B-I, C-II, D-III

62. **Assertion (A)** : After the 1905 revolution in Russia, Duma or the first elected consultative parliament came into existance.

Reason (R) : The power of Tsar was curbed by it

(1) Both A and R are true and R is the correct explanation of A

(2) Both A and R are true but R is not the correct explanation of A

(3) A is true and R is false

(4) A is false and R is true

63. Arrange in correct chronological order

I. Dawes Plan

II. Crashing of the Wall Street Exchange

III. Birth of Weimar Republic

IV. Creation of Gestapo (Secret State Police)

(1) I, II, III, IV (2) III, II, I, IV

(3) IV, II, III, I (4) III, I, II, IV

64. **Assertion (A)**: Cricket as a game has, a long and strong rural connection.

Reason (R): The time limit of a match and vagueness about the size of Cricket ground is a result of the rhythms of village life.

(1) Both A and R are true and R is the correct explanation of A

(2) Both A and R are true but R is not the correct explanation of A

(3) A is true and R is false

(4) A is false and R is true

65. **Assertion (A)**: In the 17th and 18th Century merchants from the towns in Europe started financing peasants and artisans in the country side for productton for them.

Reason (R): In the urban centres powerful crafts and trade guilds with monopoly rights restricted the entry of new people into the trade.

(1) Both A and R are True and R is correct explanation of A

(2) Both A and R are True but R is not correct explanation of A

(3) A is True and R is False

(4) A is False and R is True

66. **Assertion (A)**: Colonial Forest Act changed the lives of villagers across the country

Reason (R): Now the villagers could comfortably make use of the forest resources for everyday needs

(1) Both A and R are true and R is the correct explanation of A

(2) Both A and R are true but R is not the correct explanation of A

(3) A is true and R is false

(4) A is false and R is true

67. Arrange the following events of nineteenth century Europe in ascending order.

I. Unification of Germany

II. Beginning of Greek struggle for independence

III. Unification of Italy

IV. Vienna Peace Settlements

(1) III, I, II, IV (2) IV, II, III, I

(3) I, III, IV, II (4) IV, II, I, III

68. Arrange the following events in descending order with regard to Nationalist Movement in Indo-China.

I. Creation of Indo-China union,

II. Formation of Communist Party in Vietnam

III. Paris Peace Treaty

IV. Declaration of independence by Ho Chi Minh

(1) III, IV, II, I (2) III, IV, I, 11
(3) I, II, III, IV (4) I, II, IV, III

69. Find out the correct statements with regard to Rowlatt Act.
I. The Rowlatt Act was passed in 1919
II. The Act was passed by Imperial Legislative Council
III. The Act allowed detention of Political prisoners without trial for three years
IV. Protests against the Act led to Jallianwalla Bagh massacre in April 1920.
(1) Only II and Ill are correct
(2) Only I and III are correct
(3) Only III and IV are correct
(4) Only I and II are correct

70. **Assertion (A)**: Population growth from the late eighteenth century, increased the demand for food grains in Britain
Reason (R): .Corn Laws. introduced by the government helped in -reducing the food prices.
(1) Both A and R are True and R is correct explanation of A
(2) Both A and R are True but R is not correct explanation of A
(3) A is True R is False
(4) A is False R is True

71. Match the fallowing

A.	Galley	I.	Old name of Tokyo
B.	Edo	II.	Contained six sheets of text and wood cut illustrations
C.	Vellum	III.	Metal Frame in which types are laid and the text composed
D.	Diamond Sutra	IV.	A parchment made from skin of animals

(1) A-III, B-I, C-II, D-IV (2) A-I, B-III, C-II, D-IV
(3) A-I, B-III, C-IV, D-II (4) A-III, B-I, C-IV, D-II

72. Given below are statements regarding the course of development of Socialism in Europe. Arrange them in chronological sequence.
I. Socialists took over the government in Russia through the October Revolution.
II. Socialists and trade unionists formed a labour party in Britain and Socialist party in France.
III. The Russian Social Democratic Worker's Party was founded by Socialists who respected Marx's ideas.
IV. Socialists could not succeed in forming a government in Europe and governments continued to be run by conservatives, liberals and radicals.
V. Second International was formed to coordinate the efforts of socialists throughout Europe.
(1) V, III, II,IV,I (2) I, II, III, IV, V
(3) V, II, III, I, IV (4) IV, V, III, I, II

73. Hitler's ideology related to the geopolitical concept of Lebensraum, or living space implied:
(1) There was no equality between people, but only a racial hierarchy
(2) Only those species survived on earth that could adapt themselves to changing climatic conditions.
(3) New territories had to be acquired for settlement to increase the area of the mother country.
(4) An exclusive racial community of pure Germans to be created by physically eliminating all those who were seen as undesirable.

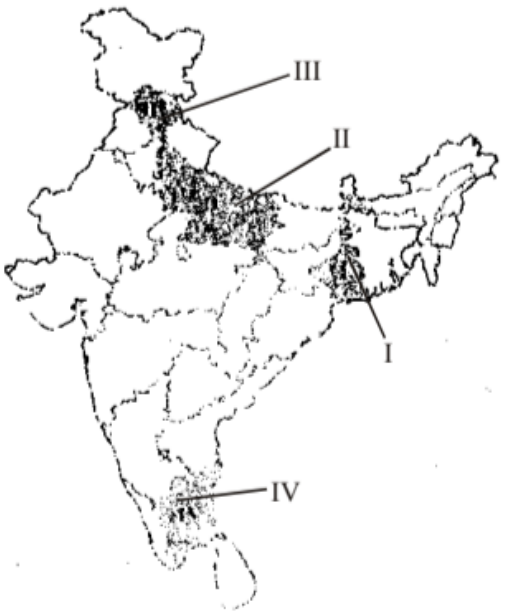
74. During the mid-eighteenth century
Assertion (A): Indian spinners and weavers were left without work and important centers of textile declined
Reason (R): Large number of people began boycotting British cloth and started adopting khadi.
(1) Both A and R are true and R is the correct explanation of A.
(2) Both A and R are true but R is not the correct explanation of A.
(3) A is true and R is false
(4) A is false and R is true

75. **Assertion (A)**: Mahatma Gandhi called off the Civil Disobedience Movement and entered into a Pact with Irwin in 1931.
Reason (R): Industrial workers in Sholapur attacked structures that symbolized British rule.
(1) Both A and R are true and R is the correct explanation of A.
(2) Both A and R are true but R is not the correct explanation of A.
(3) A is true and R is false
(4) A is false and R is true

76. **Assertion (A)**: The latitudinal extent influences the duration of day and night, as one moves from south to north of India.
Reason (R): From Gujarat to Arunachal Pradesh there is a time lag of two hours.
(1) Both A and R are true and R explains A
(2) Both A and R are true but R does not explain A
(3) A is true and R is false
(4) A is false and R is true

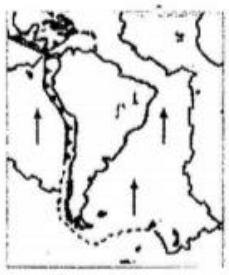
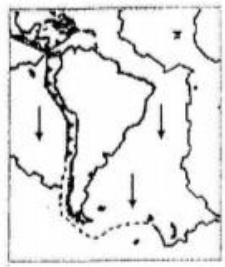
77. **Assertion (A)**: Kharif crops are grown, with the onset of monsoon in different parts of India and harvested September-October.
Reason (R): Availability of precipitation due to the western temperate cyclones helps in growing of these crops.
(1) Both A and R are true and R explains A
(2) Both A and R are true but R does not explain A
(3) A is true and R is false
(4) A is false and R is true

78. Arrange the shaded states shown on the map of India in descending order of population density and select the right code.



(1) II, I, IV, III (2) I, II, III, IV
(3) I, II, IV, III (4) I,IV,II,III

79. Which one of the following figure is showing the correct direction of movement of the South America plate?

(1) 
(2) 
(3) 
(4) 

80. Based on the data (elevation and latitude) provided below which of the following tourist center is most probably indicated?
Elevation: 3500 meters -
Latitude: 34°N
(1) Shillong (2) Mussoorie
(3) Kodaikanal (4) Leh

81. Keeping in mind the location of the following sanctuaries/ national parks of India, arrange them from south to north:
I. Periyar, II. Dachiga.m,
III. gariska, IV. Kanha
(1) I, IV, II, III (2) III, I, IV, II
(3) IV, I, III, IV (4) I, IV, III, II

82. Match list I (Revolution) with list II (Area) and select the correct answer using the codes given below :

List 1 (Revolution)		List II (Area)	
A.	Blue	I.	Dairy development
B.	Green	II.	Fisheries development
C.	White	III.	Food production
D.	Yellow	IV.	Silk production

(1) A-II,B-III,C-IV,D-I (2) A-III,IV,C-II,D-I
(3) A-IV, B-II,C-I,D-III (4) A-II,B-III,C-I,D-IV

83. **Assertion (A)** : The availability of water resources varies over space and time in India
Reason (R) : Water availability is governed by variations in seasonal annual precipitation although water scarcity is aggravated by over-exploitation and unequal access to water among different social groups.
(1) Both A and R are true and R explains A
(2) Both A and R are true but R does not explain A
(3) A is ture and R is false
(4) A is false and R is true

84. Match list I (Type of Resources) with list II (Basis of Classification) and select the codes given below :

List 1 (Type of Resources)		List II (Basis of Classification)	
A.	Biotic and abiotic	I.	Status of development
B.	Renewable and non renewable	II.	Origin
C.	Individual, community, national and international	III.	Ownership
D.	Potential, developed, stock and reserves	IV.	Exhaustibility

(1) A-II, B-I, C-III,D-IV (2) A-II,B-III,C-IV, D-I
(3) A-II,B-IV, C-III,D-I (4) A-IV, B-II, C-III,D-I

85. Which one of the following is the correct order of rivers from north to south ?
(1) Ravi, Chenab, Jhelum, Indus
(2) Indus, Jhelum, Chenab, Ravi
(3) Jhelum, Indus, Ravi, Chenab
(4) Chenab, Ravi, Indus, Jhelum

86. Match list I (National Highways of India) with list II (Description) and select the codes given below :

List-I (National Highway of India)		List-II (Description)	
A.	National Highway Number 1	I.	Covers most of Rajasthan
B.	National Highway Number 15	II.	Known as Sher Shah Suri Marg
C.	National Highway Number 7	III.	Connects Delhi and Mumbai
D.	National Highway Number 8	IV.	Is the longest National Highway

(1) A-IV, B-III,C-I, D-II (2) A-I, B-II, C-IV,D-III
(3) A-II,B-I,C-IV,D-III (4) A-I, B-III,C-II,D-IV

87. Which of the following statement is not true to the context of Mawsynram ?
(1) It is considered as the wettest place on the earth
(2) It possesses caves with stalagmites and stalactites
(3) It is located Very close to Cherrapunji
(4) It is located very close to the Myanmar border

88. Which one of the following facts about the shaded state shown below is incorrect ?

(1) Terrace cultivation is widespread in the hill areas
(2) The state is a major producer of uranium
(3) Population density is well below the national average
(4) More than 80 per cent of the area has forest as the land cover

89. The Tropic of Cancer passes through which of the following plateau ?
(1) Only Malwa
(2) Only Chotanagpur
(3) Only Meghalaya
(4) Both Malwa and Chotanagpur

90. **Assertion (A)** : The Coriolis force is responsible for deflecting winds towards the right in the northern hemispere and towards the left in the southern hemisphere.
Reason (R) : The pressure and wind system of any area depend on the latitude and altitude of the place.
(1) Both A and R are true and R explains A
(2) Both A and R are true but R does not explain A
(3) A is true and R is false
(4) A is false and R is true

91. Which of the following arguments against prescribing educational qualification for elected representatives are true?
I. Educational qualification will deprive illiterate citizens of the right to contest elections.
II. Relevatn qualification for being elected representatives is not education but ability to address people's problems.
III. Educated clected represcntatives keep distance from the common people.
IV. It is casier for the educated elected representaivcs to use power for personal gains.
V. It should be left to the voters to decide how much importance is to be given to educational qualification of a candidate.
(1) I, II and IV only
(2) I, III and V only
(3) I, IV and V only
(4) I, II and V only

92. Which of the following terms were inserted in the Preamble to the Indian Constitution by the 42nd Amendment Act, 1976 ?
I. Integrity II. Secular
III. Socialist IV. Unity
(1) I, III and IV (2) II and III
(3) I, II and III (4) I, II and IV

93. Which of the following international institutions has a more democratic way of decision -making on matters of global importance ?
(1) General Assembly of the united Nations
(2) International Monetary Fund
(3) Security Council of the United Nations
(4) World Bank

94. Which of the following factors have contributed to changes in the caste system?
I. Economic development
II. Language
III. Education
IV. Elections
V. Region
(1) I, III, and IV (2) II, IV and V
(3) II, III and IV (4) I, III and V

95. Match List I with List II and select the answer using the codes given below.

List-I		List-II	
A.	Supervises the overall functioning of all the political institutions in the country	I.	The Supreme Court
B.	Distributes and redistributes work to the ministers	II.	The President
C.	Ministers may have different views but have to own up every decision	III.	The Prime Minister
D.	Determines the constituionality of any contentious action	IV.	The Cabinet

(1) A-IV, B-III, C-II, D-I (2) A-II, B-III, C-IV, D-I
(3) A-II, B-IV, C-III, D-I (4) A-III, B-IV, C-I, D-II

96. Calculate the female literacy rate from the given data.

Gender	Total persons	Literate persons
Males	1200	1050
Females	580	340
Total	1780	1390

(1) 32.5 (2) 19.1
(3) 58.6 (4) 28.3

97. Which of these activities contributes to India's national income?
I. Cooking at home
II. A teacher teaching his children at home
III. A doctor prescribing medicines in a clinic
IV. Cooking in a restaurant
(1) I and II (2) II and III
(3) III and IV (4) I and IV

98. In an imaginary economy the monetary value of contributions of primary sector, public sector, secondary sector and service sector are Rs.100, ` 25, ` 28 and ` 77 respectively. The gross domestic product of the economy is
(1) ` 100 (2) ` 205
(3) ` 153 (4) ` 230

99. Four families in a village, which has only a ration shop, have access to foodgrains as shown in the table. Identify the families that lack food security.

Family	Food requirement in kg	Food grain price / kg	Money available to each family for buying food grains	Possessing Ration Card
A	50	10	600	Yes
B	30	10	330	No
C	20	10	180	Yes
D	40	10	400	Yes

(1) A and B (2) B and C
(3) C and D (4) D and A

100. Robinson Crusoe goes to sea with a net for fishing. Classify the factors of production and choose the appropriate option given below.

Item		Classification	
A.	Knowledge of fishing	I.	Physical Capital
B.	Net	II.	Labour
C.	Sea	III.	Human Capital
D.	Swimming	IV.	Land

(1) A-III,B-IV,C-II,D-I (2) A-IV,B-III,C-I,D-II
(3) A-III,B-I,C-IV,D-II (4) A-II,B-I,C-III,D-IV

ANSWER KEY																			
1	(3)	**11**	(4)	**21**	(1)	**31**	(1)	**41**	(1)	**51**	(3)	**61**	Bonous	**71**	(4)	**81**	(4)	**91**	(4)
2	(2)	**12**	(2)	**22**	(2)	**32**	(3)	**42**	(4)	**52**	(4)	**62**	(3)	**72**	(1)	**82**	(4)	**92**	(3)
3	(1)	**13**	(2)	**23**	(4)	**33**	(3)	**43**	(1)	**53**	(4)	**63**	(4)	**73**	(3)	**83**	(1)	**93**	(1)
4	(3)	**14**	(4)	**24**	(3)	**34**	(2)	**44**	(4)	**54**	(2)	**64**	(1)	**74**	(2)	**84**	(3)	**94**	(1)
5	(4)	**15**	(2)	**25**	(4)	**35**	(3)	**45**	(4)	**55**	(4)	**65**	(1)	**75**	(1)	**85**	(2)	**95**	(2)
6	(4)	**16**	(4)	**26**	(4)	**36**	(1)	**46**	(2)	**56**	(2)	**66**	(3)	**76**	(2)	**86**	(3)	**96**	(3)
7	(2)	**17**	(2)	**27**	(3)	**37**	(4)	**47**	(2)	**57**	(3)	**67**	(2)	**77**	(3)	**87**	(4)	**97**	(3)
8	(3)	**18**	(2)	**28**	(2)	**38**	(3)	**48**	(1)	**58**	(4)	**68**	(4)	**78**	(3)	**88**	(2)	**98**	(2)
9	(3)	**19**	(3)	**29**	(3)	**39**	(3)	**49**	(3)	**59**	(4)	**69**	(4)	**79**	(3)	**89**	(4)	**99**	(2&3)
10	(1)	**20**	(2)	**30**	(4)	**40**	(1)	**50**	(1)	**60**	(4)	**70**	(3)	**80**	(4)	**90**	(2)	**100**	(3)

Hints & Explanations

1. (3) Aerobic respiration takes place in mitochondria. The disfunction of mitochondria will affect the cellular respiration of photosynthetic algae.

2. (2) Cows are herbivorous, these are ruminant animals, as cows have anaerobic bacteria in their stomach, which digest the cellulose. The breakdown of cellulose takes place in rumen. Lion is a carnivorous animal, they eat flesh.

3. (1) When touch me not plant are disturbed by touching or another stimuli, it stimulates the region of stems to release certain chemicals with potassium ions, that forces the water to move out of cell vacuoles, due to diffusion of water out of the cells, it causes differential turgidity between different region of cells, which causes closing of leaflets.

4. (3) Pancreas secretes pencreatic juices certain digestive enzymes and it also secretes hormones like insulin, etc. Hence it is composed of both exocrine and endocrine cells.

5. (4) It is a connecting link between mother and developing foetus, which provides nutrients and removes the waste from baby's blood.

6. (4) Hormones are poured directly into the blood. Blood helps hormones to reach at their target place.

7. (2) Meristematic tissue actively dividing cells contains dense cytoplasm, their cell wall and no vacuoles.

8. (3) Starfish is not having paired gill pouches. It respires through its tube like appendages i.e. tube feet.

9. (3) During ammonification bacteria provides NH_4 and roots provides carbon.

10. (1) The accumulation of harmful chemicals with an increase in trophical level is known as biological magnification.

11. (4) In the process of ex-situ conservation, the diversity of species are removed from their habitat and conserved in another managed and controlled environment, ex-zoo, botanical garden, etc.

12. (2) This process can be seen in green house effect. Infra-red radiations fails to escape from glass house. As a result temperature rises in a glass house.

13. (2) Small pox is caused by 'Variola virus'. Cholera, is a bacterial disease, caused by '*Vibrio cholerae*'. Malaria is a protozoan disease, caused by plasmodium and it's vector is 'Anopheles female mosquito'. Anaemia is caused due to the deficiency of iron.

14. (4)

15. (2) Number of neutrons present in one molecule of $H_2O = 8$.

$^{16}_{8}O$ = atomic weight of oxygen is 16 and its atomic number is 8.

1 mole of H_2O contains $= 8\ N_A$ neutrons

So in 5 moles of $H_2O = 8 \times N_A \times 5$

$= 5 \times 8 \times 6.023 \times 10^{23}$

$= 2.409 \times 10^{25}$

16. (4) $Fe(s) + CuSO_4(aq) \longrightarrow FeSO_4(aq) + Cu(s)$

Iron is more reactive than copper, so it is used to recover Cu from $CuSO_4$.

17. (2) A is suspension solution in which path of light is visible and particles settles down at the bottom.

B and D are colloids, in which path of light is visible and particles does not settle at the bottom.

C is a true solution, in which path of light is invisible and particles does not settle down at the bottom.

18. (2) Both assertion and reason is correct. Gold has a capacity of being rolled to extremely thin foil i.e. it is most maleable metal. So, it is used in α-scattering experiment.

19. (3) When magnesium is exposed to air, a layer of oxide is formed on its surface and it gets corroded. So, as to remove the layer, magnesium ribbon is rubbed.

20. (2) (i), (iii) and (iv) are the example of thermal decomposition.

When limestone ($CaCO_3$) is heated strongly. It forms calcium carbonate and carbon dioxide.

$CaCO_3 \xrightarrow{\Delta} CaO + CO_2$

Like this, when ($2NaHCO_3$) sodium hydrogen carbonate is heated, it forms sodium carbonate, carbon dioxide and water.

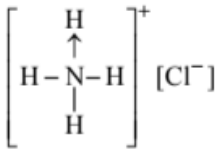
When mercuric oxide is heated, Mercury and Oxygen is formed.

$$2HgO \xrightarrow{\Delta} 2Hg + O_2$$

21. (1) Element X can react with both acid and base. It shows that element X is amphoteric in nature and is an electropositive agent.

22. (2) The electronic configuration of X is 2, 8, 1 i.e. it is 'Na'. The electronic configuation of Y is 2, 8, 7 i.e. it is chlorine 'Cl'. Compound 'NaCl'. It is not a good conductor of electricity, until it is melted.

23. (4)



$[Cl^-]$

It is strucutre of NH_4Cl, which contains ionic, covalent and co-ordinate bond.

24. (3) Sulphur has a tendency to gain electrons. It is a non-metal and cannot be used as reducing agent.

25. (4) The number of oxygen atoms $= 9.033 \times 10^{23}$

(a) The no. of moles of oxygen

$$= \frac{9.033\times10^{23}}{6.022\times10^{23}} = 1.499 \text{ moles} = 1.5 \text{ moles}$$

(b) The mass of $O_2 = 1.5 \times 16$ gm $= 24$ gms

(c) $2H_2 + O_2 \longrightarrow 2H_2O$

2 mole of O_2 requires $= 4$ gm of H_2

1.5 mole of O_2 requires $= \frac{1.5\times4}{2}$

$= 3$ moles H-atom

26. (4) $C_{13}H_{26}O_2, C_2H_4O_2, C_9H_{18}O_2 \rightarrow$ These acids contains single bond between carbon atoms (C–C). Its general formula is $(C_nH_{2n}O_2)$.

$C_7H_{12}O_2 \rightarrow$ It contains double bond (C = C). Its general formula is $(C_nH_{2n-2}O_2)$.

27. (3) Whenever soap is mixed with water, air is also mixed, in order to avoid air the bubbles are formed, the light which passes through the bubbles are scattered, so foam appears white.

28. (2) We know that

$$q = ne$$

or $I = (4.8 \times 10^{18} + n)\, 1.6 \times 10^{-19}$

$1.12 = (4.8 \times 10^{18} + n)\, 1.6 \times 10^{-19}$

$$4.8 \times 10^{18} + n = \frac{1.12\times10^{19}}{1.6}$$

$4.8 \times 10^{18} + n = 7 \times 10^{18}$

$n = (7 - 4.8) \times 10^{18}$

$$\boxed{n = 2.2\times10^{18}}$$

Hence number of electrons $= 2.2 \times 10^{18}$.

29. (3) A long coil of finite length of wire carrying current consisting of closely packed loops is called solenoid whose magnetic field resembles that of a bar magnet.

30. (4) $\because$ 10Ω and 20Ω are in series $= (10 + 20)\Omega = 30\Omega$

and 10Ω and 5Ω are in series $= (10 + 5)\Omega = 15\Omega$

$$R_{eff} = \frac{30\times15}{15+30} = \frac{450}{45} = 10\Omega$$

So the total current $I = \frac{V}{R} = \frac{30}{10} = 3$ Ampere

In branch CA current $= 1$A

In branch CB current $= 2$A

$\therefore V_C - V_A = 10$ Volt ....(i)

& $V_C - V_A = 20$ Volt ....(ii)

Subtracting (i) from (ii), $V_A - V_B = 10$ volt.

31. (1) The energy of a charged particle moving in magnetic field alone does not change because it experiences a force in a direction perpendicular to its direction of motion. Due to which the speed of charged particle remains unchanged.

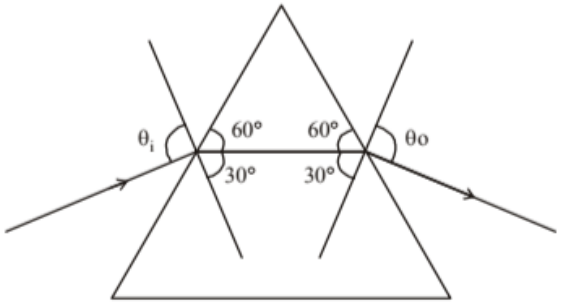
According to Lorentz's force, $F = qvB\sin\theta$

If $\theta = 0°$ or $180°$. Magnetic force $F = 0$

Hence magnetic forces do not have any component either along or opposite to the direction of motion of changed particle.

32. (3) Velocity changes and hence momentum ($p = mv$) also changes. But due to charge conservation, charge is unaltered and hence mass.

33. (3)



Minimum deviation condition, there is only one angle of incidence for which the angle of deviation is minimum.

When, $r_1 = r_2$

or $\theta_i = \theta_o$

So, Refractive index of glass with respect to air is

$$\mu = \frac{\sin\left(\frac{A+\delta m}{2}\right)}{\sin\left(\frac{A}{2}\right)} = \frac{\sin\left(\frac{60°+60°}{2}\right)}{\sin\left(\frac{60°}{2}\right)} = \frac{\sin 60°}{\sin 30°}$$

$$\therefore \mu = \frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}} = \sqrt{3} = 1.732.$$

34. (2) Spear should be aimed below the appearant position of the fish and laser should be aimed directly at the apparent position of the fish.

35. (3) According to question, reflected and refracted rays are perpendicular to each other hence

$i + r = 90°$

$$\mu_r = \frac{\sin i}{\sin r}$$

$$\sqrt{3} = \frac{\sin i}{\sin(90 - i)}$$

$$\sqrt{3} = \frac{\sin i}{\cos i} \qquad \therefore \tan i = \sqrt{3}$$

$i = 60°$ Angle of incidence

$\therefore r = 30°$ Angle of refraction.

36. (1) Given that, $v = -300$ cm.

When $u = -\infty$ (max. distance of vision to infinity)

$f = ?$

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{f} = -\frac{1}{300}$$

$f = -300$ cm.

When near point of his vision has shifted from 50 cm to a distance d.

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \quad -\frac{1}{300} = \frac{1}{-50} - \frac{1}{u}$$

$$\frac{1}{u} = -\frac{1}{50} + \frac{1}{300}$$

$$\frac{1}{u} = \frac{-6+1}{300}$$

$$\frac{1}{u} = -\frac{1}{60}$$

$u = -60$ cm.

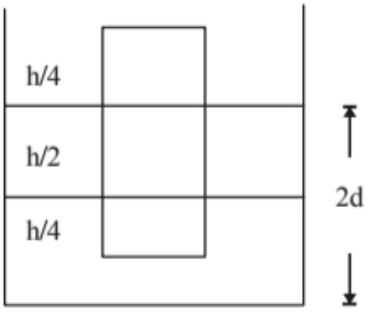
$d = u = -60$ cm.

37. (4) For the projectile motion, speed of ball after time t is given by

$$v = \sqrt{u^2 + g^2 t^2}$$

v is independent of angle of projection. Hence speed does not depend upon the initial direction of the ball thrown.

38. (3) According to question,

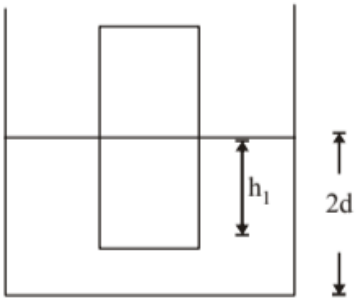


Archemedes' Principle

$$V d_{solid} g = \frac{V}{4}(2d)g + \frac{V}{2}dg$$

$d_{solid} = d$

Again another beaker is filled with denser of two liquids alone



$$V d_{solid} g = V_1 (2d) g$$

$$Ahdg = Ah_1 2dg$$

$$\boxed{h_1 = \frac{h}{2}}$$

39. (3) According to law of conservation of momentum, masses of three pieces are same so

$p_1 = mv_1, p_2 = mv_2, p_3 = mv_3$

$p_1 \perp p_2$, so magnitude of resultant

$$p = \sqrt{p_1^2 + p_2^2} = m\sqrt{v_1^2 + v_2^2}$$

$p = mv_3$ $\qquad \because v_3 = \sqrt{v_1^2 + v_2^2}$

$$v_3 = \frac{p}{m}$$

Hence $v_3 > v_1$ and v_2 so piece C will move fastest.

40. (1) A truck and a car is moving with equal kinetic energies

$K_f = K_i$

$F_1 x_1 = F_2 x_2$

Since equal stoping forces are applied

$F_1 = F_2$

So, $\boxed{x_1 = x_2}$

41. (1) **Given**: The natural number, when divided by 13 leaves remainder 3

The natural number, when divided by 21 leaves remainder 11

So, $13 - 3 = 21 - 11 = 10 = k$

Now, LCM $(13, 21) = 273$

But the number lies between 500 and 600

$\therefore$ $2\,\text{LCM}(13, 21) - k = 546 - 10 = 536$

$536 = 19 \times 8 + 4$ $\qquad \therefore$ remainder $= 4$

42. (4) $0.\overline{34} + 0.3\overline{4}$

$= 0.343434\ldots + 0.34444\ldots.$

$= 0.6878787\ldots.$

$= 0.6\overline{87}$ $\qquad (\because 87$ occurs repeatedly)

43. **(1)** $x = -1$ is the root of the quadratic polynomial $p(x)$

So, quadratic polynomial $p(x) = k(x+1)^2$

$p(-2) = k(-2+1)^2 = 2 \quad \Rightarrow k = 2$

$\therefore \quad p(x) = 2(x+1)^2$

Also, $p(2) = 2(2+1)^2 = 2 \times 3 \times 3 = 18$

44. **(4)** $x - y = 2 \quad \ldots.(1)$

$kx + y = 3 \quad \ldots.(2)$

Adding (1) and (2), we have

$kx + x = 5$

$$\Rightarrow \quad x(k+1) = 5 \Rightarrow \quad x = \frac{5}{k+1}$$

Putting the value of x in equation (1), we have

$$\frac{5}{k+1} - y = 2$$

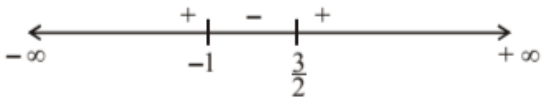
$$\Rightarrow \quad \frac{5}{k+1} - 2 = y \Rightarrow \frac{5-2k-2}{k+1} = y \Rightarrow \; y = \frac{3-2k}{k+1}$$

y should be positive as they intersect in 1st quadrant

Therefore,

$y > 0$

$$\frac{3-2k}{k+1} > 0 \Rightarrow \frac{2k-3}{k+1} < 0$$



$\therefore$ k should lie between -1 and $3/2$

45. **(4)** $x^2 - 6x - 2 = 0$

α and β are the roots of the above equation.

So, $\alpha^2 - 2 = 6\alpha$

Similarly, $\beta^2 - 2 = 6\beta$

We can see that, $\alpha + \beta = 6$ and $\alpha\beta = -2$

Given: $a_n = \alpha^n - \beta^n$

$$\text{So, } \frac{a_{10} - 2a_8}{2a_9} = \frac{\alpha^{10} - \beta^{10} - 2\left(\alpha^8 - \beta^8\right)}{2\left(\alpha^9 - \beta^9\right)}$$

$$= \frac{\alpha^{10} - \beta^{10} + \alpha\beta\left(\alpha^8 - \beta^8\right)}{2\left(\alpha^9 - \beta^9\right)}$$

$$= \frac{\alpha^{10} - \alpha^9\beta - \left(\alpha\beta^9 + \beta^{10}\right)}{2\left(\alpha^9 - \beta^9\right)}$$

$$= \frac{\alpha^9(\alpha+\beta) - \beta^9(\alpha-\beta)}{2\left(\alpha^9 - \beta^9\right)} = \frac{(\alpha+\beta)\left(\alpha^9 - \beta^9\right)}{2\left(\alpha^9 - \beta^9\right)}$$

$$= \frac{6}{2} = 3 \qquad (\because \alpha + \beta = 6)$$

46. **(2)** $S_1 = \frac{n}{2}[2(1) + (n-1)(1)]$

$S_2 = \frac{n}{2}[2(2) + (n-1)(3)]$

$S_3 = \frac{n}{2}[2(3) + (n-1)(5)]$

.....

.....

.....

$S_r = \frac{n}{2}[2(r) + (n-1)(2r-1)]$

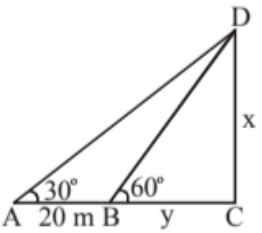
Adding $S_1, S_2, S_3, \ldots\ldots, S_r$, we have

$$S_1 + S_2 + \ldots + S_r = \frac{n}{2}\left[(2)\frac{r(r+1)}{2} + (n-1)\frac{r}{2}[1 + 2r - 1]\right]$$

$$= \frac{n}{2}\left[r(r+1) + (n-1)r^2\right]$$

$$= \frac{nr}{2}\left[r + 1 + nr - r\right] = \frac{nr}{2}\left[nr + 1\right]$$

47. **(2)**



In ΔDBC,

$$\tan 60^\circ = \frac{x}{y}$$

$$\Rightarrow \quad x = \sqrt{3}y \qquad \ldots.(1)$$

In ΔADC,

$$\tan 30^\circ = \frac{x}{20+y}$$

$$\Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{\sqrt{3}y}{20+y} \qquad (\because \text{From (1)})$$

$\Rightarrow \quad y + 20 = 3y$

$\Rightarrow \quad 2y = 20$

$\therefore \quad y = 10$

48. **(1)** $\text{cosec}\, x - \sin x = a \;\&\; \sec x - \cos x = b$

$$\text{cosec}\, x - \frac{1}{\text{cosec}\, x} = a \;\&\; \sec x - \frac{1}{\sec x} = b$$

$$\Rightarrow \quad \frac{\text{cosec}^2 x - 1}{\text{cosec}\, x} = a \;\&\; \frac{\sec^2 x - 1}{\sec x} = b$$

$$\Rightarrow \quad \frac{\cot^2 x}{\operatorname{cosec} x} = a \;\&\; \frac{\tan^2 x}{\sec x} = b$$

$$\frac{\cos^2 x}{\sin x} = a \;\&\; \frac{\sin^2 x}{\cos x} = b$$

Now, $a^2 b = \frac{\cos^4 x}{\sin^2 x} \cdot \frac{\sin^2 x}{\cos x} = \cos^3 x$

$\Rightarrow \cos x = (a^2 b)^{1/2} \Rightarrow \cos^2 x = (a^2 b)^{2/3}$

Similarly, $\sin^2 x = (ab^2)^{2/3}$

We know that, $\sin^2 x + \cos^2 x = 1$

$\Rightarrow (ab^2)^{2/3} + (a^2 b)^{2/3} = 1$

49. (3) Additional grassy area in which the calf can graze

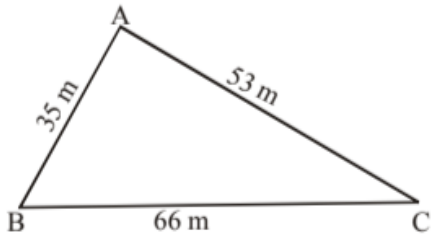
$$= \frac{\theta}{360^o} \times \pi (23)^2 - \frac{\theta}{360^o} \times \pi (12)^2$$

Here, $\theta = 90^o$

So, additional area $= \frac{90^o}{360^o} \times \pi [(23)^2 - (12)^2]$

$$= \frac{121 \times 5}{2} = \frac{605}{2} = 302.5\, m^2$$

50. (1)



Here, $a = 66$ m, $b = 53$ m & $c = 35$ m

$$s = \frac{a+b+c}{2} = \frac{66+53+35}{2} = 77$$

Area of $\Delta = \sqrt{s(s-a)(s-b)(s-c)}$

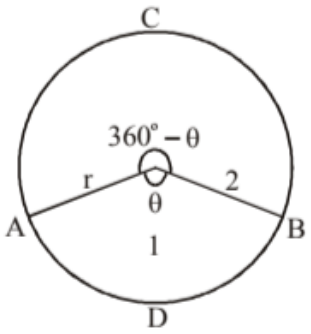
So, Area of $\Delta = \sqrt{77(11)(24)(42)} = 924$

$\pi r^2 = 2(924)$

$$r^2 = \frac{2 \times 924 + 7}{22} \Rightarrow r^2 = 588$$

$r = 14\sqrt{3}$ m

51. (3)



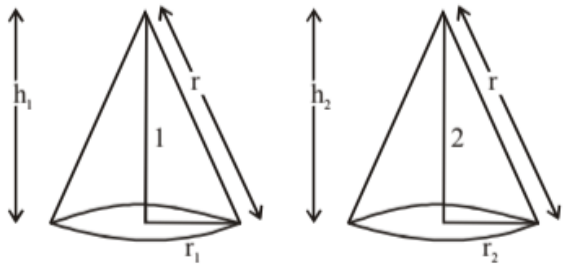
$$\frac{\text{Area of sector ADB}}{\text{Area of sector ACB}} = \frac{\frac{\theta}{360^o} \times \pi r^2}{\frac{360^o - \theta}{360^o} \times \pi r^2}$$

$$\Rightarrow \quad \frac{1}{2} = \frac{\theta}{360^o - \theta}$$

$$\Rightarrow \quad \theta = 120^o$$

$$\therefore \quad \overset{\frown}{ADB} = \frac{\theta}{360^o} \times 2\pi r = \frac{2\pi r}{3}$$

$$\Rightarrow \quad \overset{\frown}{ACB} = \frac{4\pi r}{3}$$



$\overset{\frown}{ADB}$ = circumference of base $= 2\pi r_1$

$$\frac{2\pi r}{3} = 2\pi r_1 \Rightarrow r_1 = \frac{r}{3}$$

Similarly, $r_2 = \frac{2r}{3}$

$$h_1 = \sqrt{r^2 - r_1^2} = \sqrt{r^2 - \frac{r^2}{9}} = \frac{2\sqrt{2}r}{3}$$

Similarly, $h_2 = \sqrt{r^2 - r_2^2} = \sqrt{r^2 - \left(\frac{2r}{3}\right)^2} = \frac{\sqrt{5}r}{3}$

$$\frac{V_1}{V_2} = \frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2} = \left(\frac{r_1}{r_2}\right)^2 \left(\frac{h_1}{h_2}\right) = \frac{1}{4} \times \frac{2\sqrt{2}}{\sqrt{5}} = \frac{1}{\sqrt{10}}$$

52. (4) Volume of metallic block $= 1\ m^3$ ...(1)

Let the side of the square base be x m

So, volume of the rectangular bar $= x^2 \times 9$ .....(2)

Volume of metallic block = Volume of rectangular bar

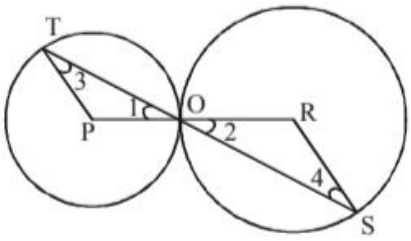
So, $9x^2 = 1 \Rightarrow x^2 = \frac{1}{9} \Rightarrow x = \frac{1}{3}$ m

Side of biggest cube possible $= \frac{1}{3}$ m

So, weight of the cube = weight of block $\times \left(\frac{1}{3}\right)^3$

$= 90 \times \frac{1}{27} = \frac{10}{3}\text{kg} = 3\frac{1}{3}\text{kg}$

53. (4)



$\angle 1 = \angle 2$ (Vertically Opposite Angles)

$PO = PT$ (Radii of same circle)

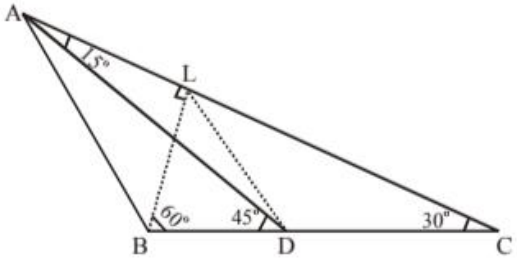
So, $\angle 1 = \angle 3$ (Angles opposite to equal sides are equal)

Similarly, $\angle 2 = \angle 4$

$\therefore \quad \angle 3 = \angle 4$

As alternate interior angles are equal, we can say that $PT \parallel RS$

54. (2)



Draw $BL \perp AC$ and join L to D.

In right ΔBLC,

$\angle CBL = 60^\circ$ ($\because \angle BCL = 30^\circ$)

Also, $\sin 30^\circ = \frac{BL}{BC} \Rightarrow BL = \frac{BC}{2}$

But, $BD = \frac{BC}{2}$ ($\because$ D is mid-point of BC)

So, $BL = BD$

$\therefore \quad \angle BLD = \angle BDL$ (Angles opposite to equal sides are equal)

In ΔBDL,

$\angle DBL + \angle BLD + \angle BDL = 180^\circ$

$\Rightarrow \quad 60^\circ + 2\angle BLD = 180^\circ \quad (\because \angle BLD = \angle BDL)$

$\therefore \quad \angle BLD = \angle BDL = 60^\circ$

So, $\angle ADL = \angle BDL - \angle BDA = 60^\circ - 45^\circ = 15^\circ$

Thus, we have $LD = LA = LB$

$\Rightarrow$ L is the circumcentre of ΔBDA

$\therefore \quad \angle BAD = \frac{1}{2}\angle BLD = \frac{1}{2} \times 60^\circ = 30^\circ$

Now, in ΔABD,

$30^\circ + 45^\circ + \angle ABC = 180^\circ$

Hence, $\angle ABC = 105^\circ$

55. (4) Here, PQ is the common tangent to the three circles

So, $PR = \sqrt{(R_1 + r)^2 - (R_1 - r)^2} = \sqrt{4R_1 r}$ ..... (1)

$RQ = \sqrt{4R_2 r}$ ..... (2)

$PQ = \sqrt{4R_1 R_2}$ ..... (3)

We know that,

$PQ = PR = RQ$

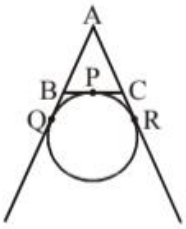
$\Rightarrow \sqrt{4R_1R_2} = \sqrt{4R_1r} + \sqrt{4R_2r}$

($\because$ From (1), (2) and (3))

$\Rightarrow \sqrt{R_1R_2} = \sqrt{R_1r} + \sqrt{R_2r}$

$\therefore \frac{1}{\sqrt{r}} = \frac{1}{\sqrt{R_2}} + \frac{1}{\sqrt{R_1}}$

56. (2)



Perimeter of $\Delta ABC = AB + BC + CA$

$\Rightarrow \quad 15 = (AQ - BQ) + (BP + PC) + (AR - CR)$

$\Rightarrow \quad 15 = 2AQ$

($BQ = BP$, $PC = RC$, $AQ = AR$ as tangents from external point to a circle are equal)

$\therefore \quad AQ = 7.5$ cm

57. (3) $(x-6)^2 + (y+6)^2 = (x-3)^2 + (y+7)^2$ ...(1)

Also, $(x-3)^2 + (y-3)^2 = (x-3)^2 + (y+7)^2$

$y^2 - 6y + 9 = y^2 + 14y + 49$

$-20y = 40 \Rightarrow y = -2$

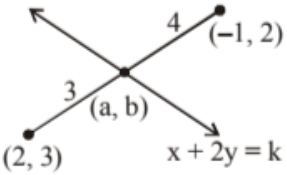
Putting $y = -2$ in equation (1), we have

$(x-6)^2 + (4)^2 = (x-3)^2 + (5)^2$

$x^2 - 12x + 36 + 16 = x^2 - 6x + 9 + 25$

$-6x = -18 \Rightarrow x = 3$

58. (4)



By using section formula, we have

$a = \frac{-3+8}{3+4} = \frac{5}{7}$

$b = \frac{6+12}{3+4} = \frac{18}{7}$

Putting the value of a and b in the equation $x + 2y = k$, we have

$$\frac{5}{7}+2\times\frac{18}{7}=k$$

$$\Rightarrow \quad \frac{5}{7}+\frac{36}{7}=k \quad \Rightarrow \quad \frac{41}{7}=k$$

59. (4) Let the three numbers be a, b and c such that $a > b > c$
According to the given condition

$$\frac{a+b+c}{3}=c+10=a-15=k$$

$\Rightarrow c=k-10$

Also, $a=k+15$

$b=5$ ($\because$ Median = 5)

We know that, $a+b+c=3k$

$\Rightarrow k+15+5+k-10=3k$

$\Rightarrow 10=k$

Thus, $a=25, b=5, c=0$

$\therefore$ Mean of squares of the numbers

$$=\frac{25^2+5^2+0^2}{3}=\frac{650}{3}=216\frac{2}{3}$$

60. (4) P (sum at least 5) = 1 – P (Getting sum 3 or 4)
Number of ways of getting sum 3 = 1 i. e. (1, 1, 1)
Number of ways of getting sum 4 = 3 i. e. (1, 1, 2), (1, 2, 1), (2, 1, 1)
Total number of possible outcomes = $6^3 = 216$

$$\therefore \quad P(\text{sum at least 5})=1-\frac{1+3}{216}=\frac{212}{216}=\frac{53}{54}$$

61. (Bonous) The correct match will be
A-(iv), B-(ii), C-(iii), D-(i). There is no such option in the answer key hence it will regarded as Bonous.

62. (3) Though a newly elected consultative parliament came into existence after the revolution occurred in 1905 in Russia, it couldn't over throw the power of Tsar from the region. Rather Tsar managed to suppress the opponent and as a result they were able to bring down riots, thereby saving the region from collapse.

63. (4) The events in chronological order were -
(iii) Birth of Weimar Republic : Weimar Republic was an unofficial designation for the German state which started in the year 1919.
(i) Dawes Plan was formulated in 1924 for taking Weimar Germany out of hyper-inflation and to return Weimar's economy to some form of stability.
(ii) The wall street crash of the United States, otherwise known as Great Stock Market crash or Black Tuesday was occurred in 1929.
(iv) The Gestapo or the Secret State Police was the official secret state police.

64. (1) Both Assertion and Reason are true and in co-ordination with each other.

65. (1) Both Assertion and Reason are true and in co-ordination with each other.

66. (3) The assertion is true but the reason is false, because the Colonial Forest Act prohibits the villagers to use the forest resources comfortably for everyday needs.

67. (2) The Events in ascending order -
(iv) Vienna Peace Settlements started in 1814.
(ii) The Greek struggle of Independence started in 1821 and continued upto 1829.
(iii) The movement of Italian Unification started in the year 1948 and continued upto 1870.
(i) The movement of German Unification started in 1850 and continued upto 1871.

68. (4) The events in descending order with regards to Nationalist movement in Indo-China.
(i) Creation of Indo-China Union - 1887.
(ii) Formation of Communist Party in Vietnam - 1930.
(iii) Declaration of Independence by Ho Chi Minh - 1945.
(iv) Paris Peace Treaty - 1975.

69. (4) Rowlatt Act was a legislative act passed by the Imperial Legislative Council in Delhi on March 18, 1919. So only (i) and (ii) statements are correct.

70. (3) The assertion is true that Britain in late eighteen century was under the increasing demand of food grains due to population growth but the reason is not true because the Corn Law did not help in reducing the price of food rather it imposed restrictions and tariffs on imported grain which were designed to keep the grain price high to favour domestic producers.

71. (4)

A → Galley	(iii) Metal frame in which types laid and text composed.
B → Edo	(i) Old name of Tokyo
C → Vellur	(iv) A parchment made from skin of animal
D → Diamond Sutra	(ii) Contained six sheets of text and wood cut illustration.

72. (1) (v), (iii), (ii), (iv), (i)

73. (3) Hitler's ideology related to geopolitical concept of Lebensraum referred to living space for population implied that new territory had to be acquired for settlement to increase the area of mother country.

74. (2) Indian spinner and weavers left without work and important centres of textile declined as cheap textiles were imported from England during mid-eighteenth century.

75. (1) Both the assertion and reason are true and the reason gives the correct explanation for the assertion.

76. (2) Both the assertion and reasons are true but here the reason does not explain the assertion.

77. (3) Kharif crops are grown, with the onset of monsoon in different parts of India and harvested during October but the precipitation during this season is the result of monsoon wind instead of western temperate cyclone.

78. (3) The states shown in the map of India in descending order of population density are

(i) West Bengal - 1029/km^2
(ii) Uttar Pradesh - 828/km^2
(iv) Tamil Nadu - 555 /km^2
(iii) Himachal Pradesh - 123 /km^2

79. (3)

80. (4) Leh is situated at an elevation of 3500 m and at 34°N.

81. (4) From South to North the wildlife sanctuaries are -

(i) Periyar in Kerala
(iv) Kanha in Madhya Pradesh
(iii) Sariska in Rajasthan
(ii) Dachigram National Park in Srinagar.

82. (4) Blue Revolution - Fisheries Development.
Green Revolution - Food Production
White Revolution - Dairy Development
Yellow Revolution - Silk Production

83. (1) Both the sentence A and R are true and 'R' is the correct explanation for 'A'.

84. (3) Resources on the basis of classification

A.	Biotic and abiotic	(ii)	Origin
B.	Renewable and Non renewable	(iv)	Exhaustibility
C.	Individual, community, national and international	(iii)	Ownership
D.	Potential, developed, stock and reserves	(i)	Status of Development

85. (2) The correct order of rivers from North to South are Indus, Jehlum, Chenab, Ravi.

86. (3) A-II, B-I, C-IV, D-III

A. National Highway Number 1 is called as Shershah Suri Marg.
B. National Highway Number 15 covers most of Rajasthan.
C. National Highway 7 is the longest running highway in India which connects Srinagar with Kanyakumari.
D. National Highway Number 8 connect Delhi and Mumbai.

87. (4) Mawsynram is not located near Myanmar Border.

88. (2) The major uranium producing state of India is Andhra Pradesh, not Nagaland.

89. (4) The Tropic of cancer passess through both Chotanagpur Plateau of Jharkhand and Malwa Plateau of Madhya Pradesh.

90. (2) Both the Assertion and Reason are true but reason does not provide any explanation for the phenomena occuring in the Assertion. Because both the phenomena occur due to two separate functionality of the earth.

91. (4) there is no such standard educational qualification is required for any elected representatives and this is supported by the first, second and fifth statement only.

92. (3) The three terms, socialism, secularism and the integrity were inserted in the Preamble to the Indian constitution by the 42nd Amendment Act, 1976, for making the directive principles more comprehensive and give them precedence over fundamental rights.

93. (1) The Genral Assembly of the United Nations has a more democratic way of decision-making on the matters of global importance.

94. (1) The factors such as economic development, education and election have contributed to the changes in the caste system.

95. (2) A-II, B-III, C-IV, D-I.

(A) The President supervises the overall functioning of all the political institutions in the country.
(B) The Prime Minister distributes and redistributes works to the minister.
(C) The cabinet ministers may have different views but have to own up every decision.
(D) The Supreme Court determines the constitutionality of any contentious action.

96. (3) 340 literate females are there in 580 females. So the female literacy rate will be

$$\frac{340}{580}\times 100 = 0.586\times 100 = 58.6\%.$$

97. (3) Both third and fourth activities contribute towards India's national income as the citizen of India need to pay some amount of service tax for this activities.

98. (2) The Gross Domestic Product in the given imaginary economy can be calculated as
Primary Sector + Secondary Sector + Service Sector
$= 100 + 28 + 77 = 205.$

99. (2 & 3)

Family	Food Requirement in Kg.	Food grain Price/Kg.	Money Available	Money Required	Money Surplus
A	50	10	600	50 × 10 = 500	600 – 500 = 100
B	30	10	330	30 × 10 = 300	330 – 300 = 30
C	20	10	180	20 × 10 = 200	180 – 200 = –20 (Deficit)
D	40	10	400	40 × 10 =400	400 – 400 = 0 (No Surplus, No Deficit)

From the above four families, family B does not have ration card. Hence though they are having a surplus of ` 30/- they can not be considered to have food security alongwith family C and D.

100. (3) A-III, B-I, C-IV, D-II

The factors of production as per the given table is -

A. Knowledge of fishing is considered as human capital.
B. Net is considered as physical capital.
C. Sea is considered as land factor of production.
D. Swimming is considered as the labour factor.