ENGLISH – HINDI

13-15

Code

Roll No. रोल नम्बर

Booklet Number पुस्तिका संख्या

152553

# SCHOLASTIC APTITUDE TEST

(For Students of Class X)

Time: 90 Minutes Max. Marks: 100

## INSTRUCTIONS TO CANDIDATES

**Read the following instructions carefully before you open the question booklet.**

1. Answers are to be given on a **separate answer sheet.**
2. There are 100 questions in this test. All are compulsory. The question numbers 1 to 40 belong to Sciences, 41 to 60 pertain to Mathematics and 61 to 100 are on Social Science subjects.
3. Please **follow the instructions** given on the answer sheet for marking the answers.
4. Write your **seven-digit Roll Number** as allotted to you in the admission card very clearly on the **test-booklet** and darken the appropriate circles on the **answer sheet** as per instructions given.
5. Write down and darken **Booklet Number** in the appropriate circles on the **answer sheet as per instructions given.**
6. Since the time allotted for this question paper is very limited and all questions carry equal marks, you should make the best use of it by not spending too much time on any one question.
7. **Rough work** can be done **anywhere in the booklet** but not on the answer sheet/loose paper.
8. Every correct answer will be awarded one mark.
9. **THERE WILL BE A DEDUCTION OF 1/3 MARKS FOR EVERY WRONG ANSWER AND NO MARKS WILL BE DEDUCTED FOR UNATTEMPTED QUESTIONS.**
10. **Please return only the answer sheet to the invigilator after the test.**
11. English version of the question paper will be considered as final in case of any dispute arising out of variation in translation.

**Please turn over the page and start answering immediately after you are asked to do so.**

# शैक्षिक अभिक्षमता परीक्षा

(कक्षा X के विद्यार्थियों के लिए)

समय: 90 मिनट अधिकतम अंक: 100

## परीक्षार्थियों के लिए अनुदेश

**प्रश्न पुस्तिका खोलने से पहले, निम्न अनुदेशों को ध्यान से पढ़िए।**

1. उत्तर एक अलग उत्तर-पत्रक में देने हैं।
2. इस परीक्षा में 100 प्रश्न हैं। सभी प्रश्न अनिवार्य हैं। प्रश्न 1 से 40 विज्ञान, 41 से 60 गणित और 61 से 100 सामाजिक विज्ञान के विषयों पर आधारित हैं।
3. कृपया उत्तर चिह्नित करने के लिए उत्तर-पत्रक पर दिए गए अनुदेशों का अनुपालन कीजिए।
4. कृपया अपना सात-अंकीय रोल नम्बर, जैसा कि आपके प्रवेश पत्र पर दिया गया है, अनुदेशानुसार प्रश्न-पुस्तिका और उत्तर-पत्रक पर बहुत स्पष्ट रूप से लिखिए और दिए गए उपयुक्त गोलों को काला कीजिए।
5. कृपया उत्तर-पत्रक में उपयुक्त खाने में निर्देशानुसार पुस्तिका संख्या लिखिए।
6. क्योंकि इस प्रश्न पत्र के लिए निर्धारित समय बहुत सीमित है, इसलिए इसका अधिकतम उपयोग कीजिए और किसी प्रश्न पर बहुत समय न लगाइए।
7. रफ कार्य पुस्तिका में कहीं भी किया जा सकता है, किन्तु उत्तर-पत्रक/अलग कागज पर नहीं।
8. प्रत्येक सही उत्तर का एक अंक प्रदान किया जाएगा।
9. प्रत्येक गलत उत्तर के लिए 1/3 अंक काटा जाएगा और किसी प्रश्न का उत्तर न देने पर उसके लिए कोई अंक नहीं काटा जाएगा।
10. कृपया परीक्षा के पश्चात केवल उत्तर-पत्रक ही निरीक्षक को वापस कर दीजिए।
11. अनुवादित विवरण में अंतर से उठे किसी भी विवाद की स्थिति में, प्रश्न पत्र के अंग्रेजी विवरण को निर्णायक माना जाएगा।

कृपया पृष्ठ पलटिए और अपना कार्य तुरन्त आरम्भ कीजिए

# NTSE STAGE_II SCHOLASTIC APTITUDE TEST (SAT)-2016

**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 cells (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 cytoplasm, 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 symbiotic 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 tropic 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 (4) 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 progency 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) $3.011 \times 10^{24}$ (2) $2.409 \times 10^{25}$ (3) $3.111 \times 10^{25}$ (4) $2.711 \times 10^{25}$

**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 $\alpha$-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 $9.033 \times 10^{23}$ 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

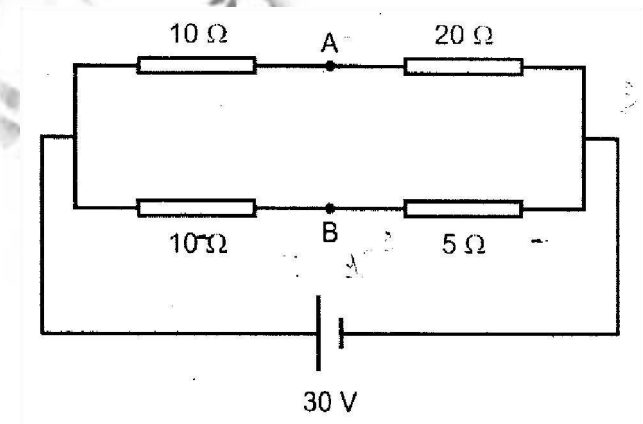
**26.** The molecular formula of carboxylic acid that differs from the rest is
(1) $C_{13}H_{26}O_2$ (2) $C_2H_4O_2$ (3) $C_9H_{18}O_2$ (4) $C_7H_{12}O_2$

**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 $4.8 \times 10^{18}$ $Ne^+$ ions move towards the right through a croos -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) $1.8 \times 10^{18}$ (2) $2.2 \times 10^{18}$ (3) $2.4 \times 10^{19}$ (4) $2.8 \times 10^{19}$

**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) –10V (2) –20V (3) 0V (4) 10V

**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 (2) III & IV (4) I, III, & IV

**33.** A ray of light in air is incident on an equilateral glass prism at an angle $\theta_i$ to the normal. After refraction, the light travelled parallel to the base of prism and emerged in air at an angle $\theta_e$ to the normal. If the angle between the incident and the emergent rays is 60º, then the refractive index of glass with repect 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) 60º (2) 30º (3) 45º (4) 41.5º

**36.** A person can see clearly only the objects situated in the range 50 cm to 300cm. 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 45º 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 $m_1$ and $m_2$ respectively are moving with equal kinetic energies. Equal stopping forces are applied and they come to a halt after travelling further distances $x_1$ and $x_2$ 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 numner 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 $0.\overline{34} + 0.3\overline{4}$ as a single decimal , we get

(1) $0.67\overline{88}$ (2) $0.6\overline{89}$ (3) $0.\overline{6878}$ (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 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 $\alpha$ and $\beta$ are the roots of the quadratic equation $x^2 – 6x – 2 = 0$ and if

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

(1) 6.0 (2) 5.2 (3) 5.0 (4) 3.0

**46.** If $S_1, S_2, S_3, ....., S_r$ are the sum of first n terms of r arithmetic progression whose first terms are 1,2,3, .....and whose common differences are 1,3,5, ..... respectively, then the value of $S_1 + S_2 + S_3 + .....S_r$ 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,

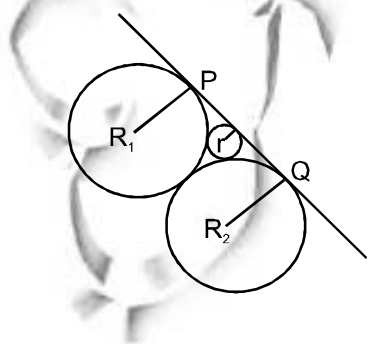
(1) PT and RS are of equal length (2) PT and RS are perpendicular to each other

(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, ∠ADB = 45° and ∠ACD = 30° then ∠BAD and ∠ABC are respectively equal to :

(1) 15°, 105° (2) 30°, 105° (3) 30°, 100° (4) 60°, 100°

**55.** Three circles with radii $R_1$, $R_2$ and r touch each other externally as shown in the adjoining figure. If PQ is their common tangent and $R_1 > R_2$, 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. | A tax levied by the Church |
| 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. | Unit of currency |

(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.

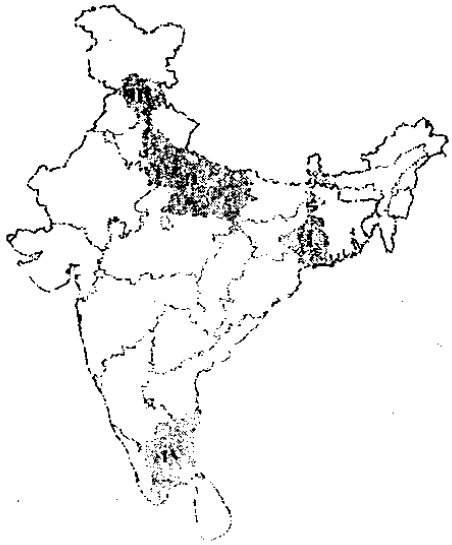
**74.** During the mid-eighteenth century
**Assertion (A):** Indian spinners and weavers were left without work and important centers of textile declined
**Reason (R):** Large number of people began boycotting British cloth and started adopting khadi.
(1) Both A and R are true and R is the correct explanation 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

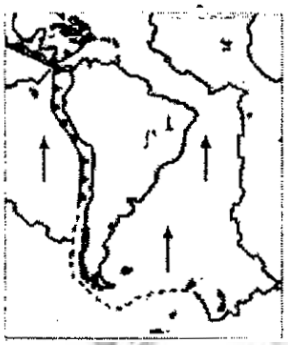
**77.** **Assertion (A):** Kharif crops are grown, with the onset of monsoon in different parts of India and harvested September-October.
**Reason (R):** Availability of precipitation due to the western temperate cyclones helps in growing of these crops.
(1) Both A and R are true and R explains A
(2) 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

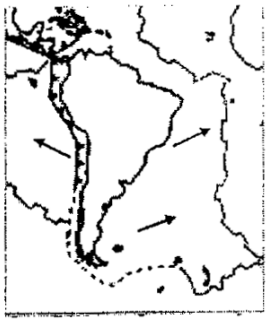
**78.** Arrange the shaded states shown on the map of India in descending order of population density and select the right code.



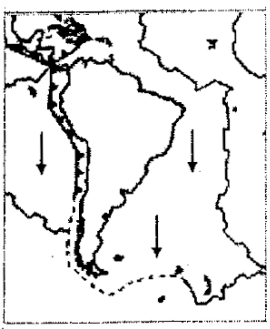
(1) II, I, IV, III (2) I, II, III, IV (3) I, II, IV, III (4) I,IV,II,III

**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:
(1) Periyar, (2) Dachiga.m, (3) gariska, (4) Kanha

**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 I (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 Highways 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 argumnets against prescribing educational qualification for elected representatives are true?
I. Educational qualification will deprive illiterate citicens 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 Amcndment 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 constitutionality 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, Rs.25, Rs. 28 and Rs. 77 respectively. The gross domestic product of the cconomy is
(1) Rs. 100 (2) Rs. 205 (3) Rs. 153 (4) Rs. 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

# NATIONAL TALENT SEARCH EXAMINATION
# NTSE STAGE-II (2016)
## CLASS-X [SAT]

# HINTS & SOLUTIONS

## ANSWER KEY

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

### CHEMISTRY

15. Ans. (2)
Neutrons present in one molecule of water = 8
$\left({}^{16}_{8}O\right)$
One mole of water contains = $8\ N_A$ neutrons
So in 5 moles of water = $5 \times 8 \times N_A$
$= 5 \times 8 \times 6.023 \times 10^{23}$
$= 2.409 \times 10^{25}$

16. Ans. (4)
Na & Fe both are more reactive than Cu but Fe is having more affinity to form sulphates so Fe is used to recover copper from copper sulphate solution.

$Fe_{(s)} + CuSO_{4(aq)} \longrightarrow FeSO_{4(aq)} + Cu_{(s)}$

17. Ans. (2)
In solution **A** path of light is visible and particles settle down at bottom, so it is **suspension**.
In solution **B** & **D** light path is visible and particles do not settle at bottom so these are **colloids**.
In solution **C** light path is invisible and particles do not settle down at bottom, so it is a **true solution**.

18. Ans. (2)
Both (A) & (R) are correct statement. But as Gold is most malleable, so it was used in $\alpha$ - particle scattering experiment.

19. Ans. (3)
Magnesium gets corrode with the layer of oxide. In order to remove the layer of oxide, it is rubbed

$2Mg + O_2 \longrightarrow 2MgO$

20. Ans. (2)

(i) $CaCO_3 \xrightarrow{\Delta} CaO + CO_2$

(ii) $2Al_2O_3 \xrightarrow{\text{electrolysis}} 4Al + 3O_2$

(iii) $2NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + CO_2 + H_2O$

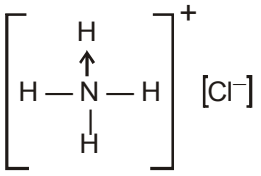
(iv) $2HgO \xrightarrow{\Delta} 2Hg + O_2$

Eq.(i),(iii),(iv) are example of thermal decompostion but eq. (ii) is an example of electrolytic decompostion.

21. Ans. (1)
Oxide of X is amphoteric in nature so it can react with acids & bases both. Only metals can form amphoteric oxides so X is electropositive in nature

22. Ans. (2)
$X \rightarrow 2, 8, 1 \Rightarrow Na$
$Y \rightarrow 2, 8, 7 \Rightarrow Cl$
Compound $\Rightarrow NaCl \Rightarrow$ It is good conductor of electricity in molten and fused state but not in solid state

23. Ans. (4)
Structure of $NH_4Cl$ is



$NH_4Cl$ contains, ionic, covalent bond & coordinate bond.

24. Ans. (3)
Sulphur is a non metal so it does not have tendency to lose electrons so it can not be used as reducing agent.

25. Ans. (4)
Given no. of oxygen atoms = $9.033 \times 10^{23}$

(i) moles of oxygen atoms = $\frac{9.033 \times 10^{23}}{6.023 \times 10^{23}}$

= 1.499 moles $\simeq$ 1.5 moles
(ii) mass of oxygen atoms
= 1.5 moles × 16 gm = 24 grams

(iii) $2H_2 + O_2 \longrightarrow 2H_2O$
2 moles of oxygen atoms requires
= 4 gm of $H_2$

1.5 moles of oxygen atoms requires = $\frac{1.5 \times 4}{2}$

= 3 moles of Hydrogen atom

26. Ans. (4)

$C_{13}H_{26}O_2$, $C_2H_4O_2$, $C_9H_{18}O_2 \longrightarrow$ Acids Contain (C–C) Single Bond ($C_nH_{2n}O_2$)

$C_7H_{12}O_2 \longrightarrow$ This acid contains (C = C) double bond.($C_nH_{2n-2}O_2$)

27. Ans. (3)

Foam of soap is a large bunch of bubbles which are made of very thin film of soap solution and some air. Bubbles allow some light to pass through them and scatter the rest. If no specific colour is reflected, we consider this state of colourlessness as white.

## PHYSICS

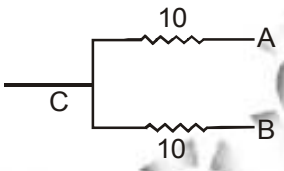
28. Ans. (2)
$(4.8 \times 10^{18} + x)1.6 \times 10^{-19} = 1.12$

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

$4.8 \times 10^{18} + x = 7 \times 10^{18}$
$x = 7 \times 10^{18} - 4.8 \times 10^{18}$
$= 2.2 \times 10^{18}$

29. Ans. (3)

30. Ans. (4)



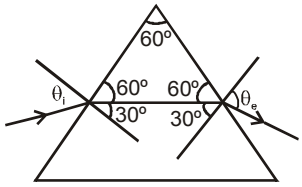

$R_{eff} = \frac{30 \times 15}{3 \times 15} = \frac{30 \times 15}{45} = 10\Omega$

i = 3A
In branch CA current = 1A
In branch CB current = 2A
$\therefore V_C - V_A = 10V$ ... (i)
& $V_C - V_B = 20V$ ... (ii)
Subtracting (i) from (ii)
$V_A - V_B = 10V$

31. Ans. (1)

32. Ans. (3)

33. Ans. (3)



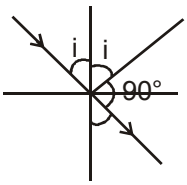

$r_1 = r_2 \therefore$ min deviation condition

$\mu = \frac{\sin\left(\frac{A(\delta_m)}{2}\right)}{\sin\frac{A}{2}}$

$\mu = \frac{\sin\left(\frac{60+60}{2}\right)}{\sin\frac{60}{2}} = \frac{\sin 60}{\sin 30} = \sqrt{3}$

34. Ans. (1)

35. Ans. (2)




$i + r = 90^\circ$

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

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

$\sqrt{3} = \tan i$

$i = 60^\circ \ \therefore r = 30^\circ$

36. Ans. (1)

(i) $V = -300$

Case : $u = -\infty$

$f = ?$

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

$$\frac{1}{f} = -\frac{1}{300} - 0$$

$f = -300$ cm

Case : II

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

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

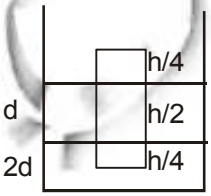
$$\frac{1}{u} = \frac{-1}{50} + \frac{1}{300}$$

$$\frac{1}{u} = \left(\frac{-6+1}{300}\right)$$

$$\frac{1}{u} = -\frac{1}{60} \qquad u = -60 \text{ cm}$$

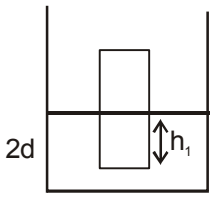
37. Ans. (4)

38. Ans. (3)




$$Vd_{Solid}\, g = \frac{V}{4}2dg + \frac{V}{2}dg$$

$d_{solid} = d$




$Vd_{Solid}\, g = V_1 2dg$

$Ahdg = Ah_1 2dg$

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

39. Ans. (3)

40. Ans. (1)

$w = K_f - K_i = Fx$

since $K_f$ and $K_i$ are same in both case and stopping force is also so x will be same for both.

## MATHEMATICS

**41.** When Divided by 13 leaves remainder 3

When Divided by 21 leaves remainder 3

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

LCM (13,21) – k = 546 – 10 = 536

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

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

0.343434... + 0.34444....

0.6878787....

$0.6\overline{8}\overline{7}$

**43.** Quadratic polynomial $p(-2) = k(x + 1)^2$

$p(-2) = k(-2 + 1)^2 = 2$

$k = 2$

$p(x) = 2(x + 1)^2$

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

**44.** $x - y = 2$ ..(1)

$kx + y = 3$ ..(2)

by adding (1) and (2)

$kx + x = 5$

$x(k + 1) = 5$

$$x = \frac{5}{k+1}$$

putting value of x in equation (1)

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

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

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

$$y = \frac{3 - 2k}{k+1}$$

y should be positive as they intersect in 1st quadrant therfore

$y > 0$

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

\+ – +

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

$\therefore$ Ans 4

**45.** $x^2 - 6x - 2 = 0$

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

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

$\alpha + \beta = 6\ \alpha\beta = -2$

$d_n = \alpha^n - \beta^n$

$$\frac{a_{10} - 2a_8}{2a_9} = \frac{\alpha^{10} - \beta^{10} - 2(\alpha^8 - \beta^8)}{2(\alpha^9 - \beta^9)}$$

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

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

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

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

$$\frac{6}{2} = 3$$

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

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

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

. .

. .

.

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

(+) (+)

$S_1 + S_2 + .....+ S_r = \frac{n}{2}$

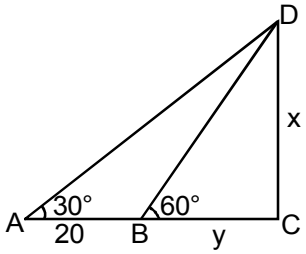
$$\left[(2)\frac{r(r+1)}{2} + (n-1)\frac{r}{2}[1 + 2r - 1]\right]$$

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

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

$$= \frac{nr}{2}[nr + 1]$$

**47.**




In $\Delta DBC$

$\tan 60° = \frac{x}{y}$

$x = \sqrt{3}\, y$ ..(1)

In $\Delta ADC$

$\tan 30° = \frac{x}{20 + y}$

$\frac{1}{\sqrt{3}} = \frac{\sqrt{3}y}{20 + y}$

$y + 20 = 3y$

$2y = 20$

$y = 10$

**48.** $\text{cosec}x - \sin x = a$ ; $\sec x - \cos x = b$

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

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

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

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

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

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

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

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

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

**49.** increase in area

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

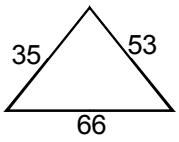
$\theta = 90°$

$= \frac{90°}{360°} \times \pi[(23)^2 - (12)^2]$

$= \frac{121 \times 5}{2}$

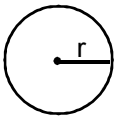
$= \frac{605}{2} = 302.5$

**50.**




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

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

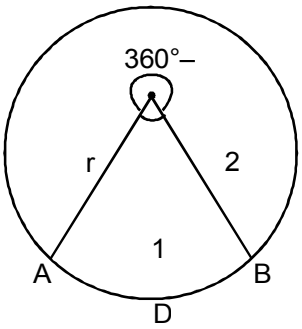



$r^2 = \frac{2 \times 924 \times 7}{22}$

$r^2 = 588$

$r = 14\sqrt{3}$

**51.**



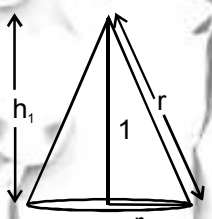

$$\frac{\text{Area of sec tor ADB}}{\text{Area of sec tor ACD}} = \frac{\frac{\theta}{360°} \times \pi r^2}{\frac{360° - \theta}{360°} \times \pi r^2}$$

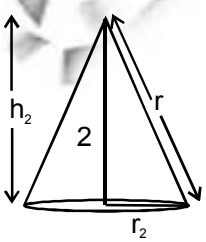
$\Rightarrow \frac{1}{2} = \frac{\theta}{360° - \theta}$

$\Rightarrow q = 120°$

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

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




$\overset{\frown}{ADB}$ = 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, $h_2 = \frac{\sqrt{5}r}{3}$

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

$= \frac{1}{\sqrt{10}}$

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

let the side of the square base is x m

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

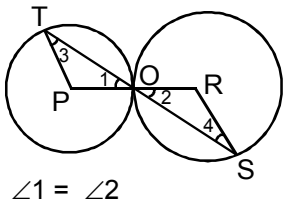
$9x^2 = 1 \Rightarrow x^2 = \frac{1}{9} \Rightarrow x = \frac{1}{3}$ m

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

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

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

**53.**




$\angle 1 = \angle 2$ (V.O.A.)

$\angle 1 = \angle 3$ (Same radius)

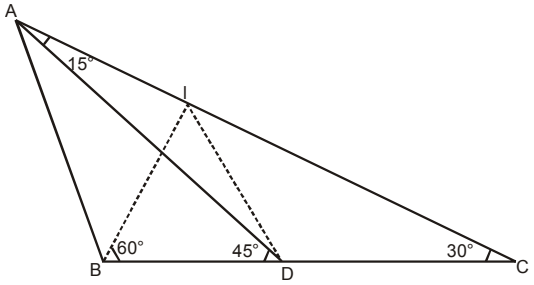
$\angle 2 = \angle 4$ (Same radius)

$\therefore \angle 3 = \angle 4$

As alternate interior angles are equal

$\therefore$ PT || RS

**54.**




Draw BL perpendicular to AC and join L to D.
Since $\angle BCL = 30°$. we get $\angle CBL = 60°$. Since BLC is a right triangle with $\angle BCL = 30°$, we have BL = BC/2 = BD. Thus in triangle BLD, we observe that BL = BD and $\angle DBL = 60°$ and $\angle ADB = 45°$, we get $\angle ADL = 15°$
But $\angle DAL = 15°$. Thus LD = LA. We hence have LD = LA = LB. This implies that L is the circumcentre of the triangle BDA. Thus

$$\angle BAD = \frac{1}{2}\angle BLD = \frac{1}{2}\times 60° = 30°$$

$30° + 45° + \angle ABC = 180°$
hence $\angle ABC = 105°$

**55.** $PR = \sqrt{(R_1+r)^2-(R_1-r)^2} = \sqrt{4R_1r}$ ...(1)

$RQ = \sqrt{4R_2r}$ ...(2)

$PQ = \sqrt{4R_1R_2}$ ...(3)

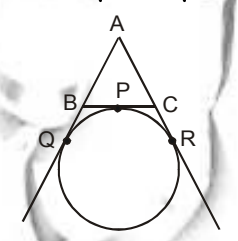
$PQ = PR + RQ$

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

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

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

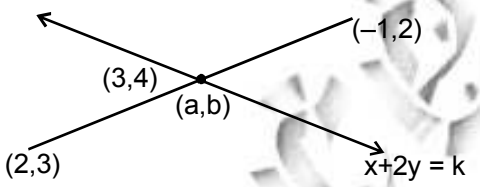
**56.**




Perimeter of triangle ABC = AB+BC+CA
15=(AQ–BQ)+(BP+PC)+(AR–CR)
15=2AQ
(BQ=BP, PC=RC,AQ=AR as tangent from extternal point to a circle are equal)
AQ=7.5 cm

**57.** $(x-6)^2+(y+6)^2 = (x-3)^2+(y+7)^2$
..(1)
$(x-3)^2+(y-3)^2 = (x-3)^2+(y+7)^2$
$y^2-6y+9 = y^2+14y+49$
$-20y = 40$
put y = –2 in equation (1)
$(x-6)^2+(4)^2 = (x-3)^2+(5)^2$
$x^2-12x+36+16 = x^2-6x+9+25$
$-6x = -18$
$x = 3$

**58.**




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

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

$x + 2y = k$

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

$$\frac{5}{7} + \frac{36}{7} = k$$

$$\frac{41}{7} = k$$

**59.** $a > b > c$

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

$b = 5$

$c = k - 10$
$a = k + 15$
$a + b + c = 3k$
$k + 15 + 5 + k - 10 = 3k$
$10 = k$
$a = 25$
$b = 5$
$c = 0$

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

**60.** P(sum at least 5)=1–P(Getting sum 3 or 4 )
no of ways getting sum 3 = 1 way i.e. (1,1,1,)
no of ways getting sum 4 = 3 ways i.e. (1,1,2,),(1,2,1),(2,1,1)

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