

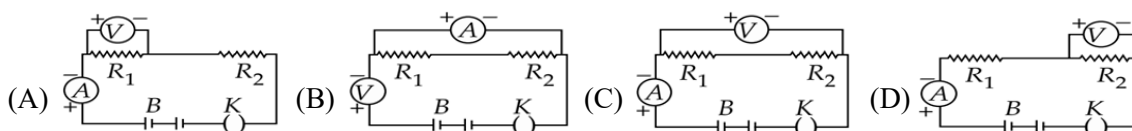
General Instructions:

1. This question paper consists of 39 questions in 5 sections.
2. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
3. Section A consists of 20 Objective Type questions carrying 1 mark each.
4. Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.
5. Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.
6. Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.
7. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

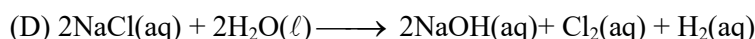
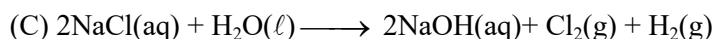
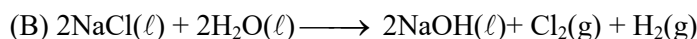
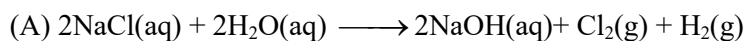
Section - A

Section A consists of 20 questions of 1 mark each.

1. Which of the following is a natural phenomenon which is caused by the dispersion of sunlight in the sky?
 (A) Twinkling of stars (B) Stars seem higher than they actually are
 (C) Advanced sunrise and delayed sunset (D) Rainbow
2. In an experiment on finding equivalent resistance of two resistors in series, four students draw up circuits. Which one is correct?



3. Identify the correct representation of reaction occurring during chlor-alkali process:



4. Which of the following are used as an antacid to reduce acidity in stomach?

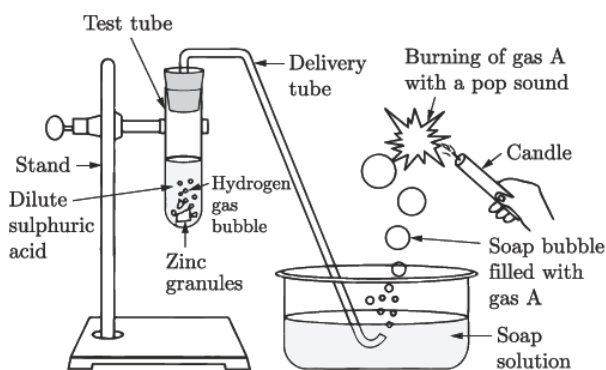
(A) Sodium carbonate and magnesium hydroxide

(B) Magnesium hydroxide and sodium hydroxide

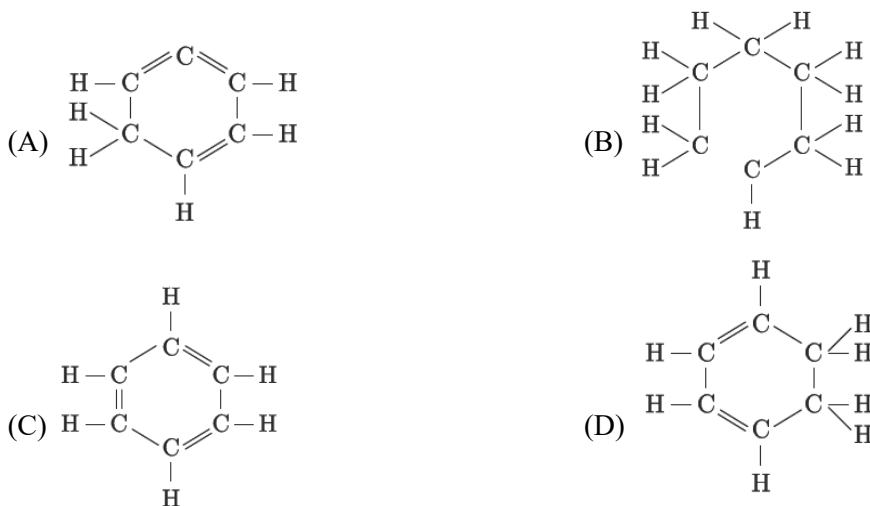
(C) Sodium bicarbonate and calcium hydroxide

(D) Sodium bicarbonate and magnesium hydroxide

5. 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
 (A) It has high melting point.
 (B) It is a good conductor of electricity in its pure solid state.
 (C) It breaks into pieces when beaten with hammer.
 (D) It is soluble in water
6. $Y + 2HCl \longrightarrow ZnCl_2 + H_2$. In the above reaction, Y is:
 (A) Aluminium (B) Copper (C) Sodium (D) Zinc
7. Which of the following correctly represents a balanced chemical equation?
 (A) $3Fe(s) + 4H_2O(g) \longrightarrow Fe_3O_4(s) + 4H_2(g)$ (B) $Fe(s) + 4H_2O(g) \longrightarrow Fe_3O_4(s) + 4H_2O(g)$
 (C) $3Fe(s) + 4H_2O(g) \longrightarrow Fe_3O_4(s) + H_2(g)$ (D) $3Fe(s) + H_2O(g) \longrightarrow Fe_3O_4(s) + H_2(g)$
8. Identify gas A in the following experiment.



- (A) Hydrogen (B) Nitrogen (C) Carbon dioxide (D) Oxygen
9. Structural formula of benzene is



10. The structure which prevents the entry of food into respiratory tract is
 (A) Pharynx (B) Larynx (C) Glottis (D) Epiglottis
11. Endosperm is formed during the double fertilization by .
 (A) Two polar nuclei & one male gamete (B) One polar nuclei & One male gamete
 (C) Ovum and male gamete (D) Two polar nuclei & two male gametes
12. What would happen if vasa differentia of man are cut?
 (A) Sperms are non nucleate (B) Spermatogenesis does not occur
 (C) Semen is without sperms (D) Sperm are non motile

13. The functional connection between two neurons is called
(A) Synapse (B) Axon (C) Dendrite (D) Chiasmata
14. Heterozygous purple flower is crossed with recessive white flower. The progeny has the ratio
(A) 75% purple and 25% white (B) 50% purple and 50% white
(C) All purple (D) All white
15. Which is correct food chain?
(A) Phytoplankton → Fishes → Zooplankton (B) Zooplankton → Phytoplankton → Fishes
(C) Phytoplankton → Zooplankton → Fishes (D) Fishes → Zooplankton → Phytoplankton
16. Name the hormone which controls basal metabolic rate in animals.
(A) Adrenaline (B) Thymosin (C) Oxytocin (D) Thyroxine

Direction: For question numbers 17 to 20, two statements are given- one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:

- (a) Both A and R are true, and R is correct explanation of the assertion.
(b) Both A and R are true, but R is not the correct explanation of the assertion.
(c) A is true, but R is false.
(d) A is false, but R is true.
17. Assertion: The near-point of a hypermetropic eye is more than 25 cm away.
Reason: Hypermetropia is corrected using spectacles containing concave lenses.
18. Assertion : When water is added to calcium oxide, a large amount of heat is produced.
Reason : It is an endothermic reaction.
19. **Assertion (A):** Decomposers keep the environment clean.
Reason (R): They recycle matter by breaking down the organic remains and waste products of plants and animals.
20. **Assertion (A):** There is no mixing of oxygenated and deoxygenated blood in the human heart.
Reason (R): Valves are present in the heart which allows the movement of blood in one direction only.

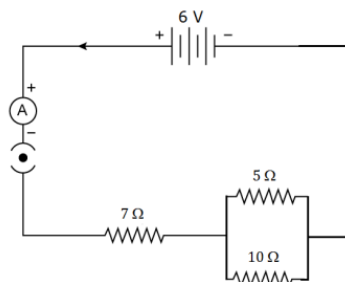
Section - B

Section B consists of 6 questions of 2 marks each.

21. (i) State Ohm's law.
(ii) Give the commercial unit of electrical energy.
22. Draw the magnetic field lines around a straight current carrying conductor.

OR

Consider the following electric circuit:



Calculate:

- (i) Resultant resistance (ii) Total current

23. You might have noted that when copper powder is heated in a China dish, the surface of copper powder becomes coated with a black colour substance.
- How has this black-coloured substance formed?
 - What is that black substance?
 - Write the chemical equation of the reaction that takes place.

OR

You have four solutions A, B, C and D. The pH of solution A is 6, B is 9, C is 12 and D is 7.

- Identify the most acidic and most basic solutions.
 - Arrange the above four solutions in the increasing order of H^+ ion concentration.
24. (i) Newly formed DNA copies may not be identical at times. Give reason.
(ii) Name the organism which reproduces by spore formation and multiple fission respectively.
25. (i) How is the wall of small intestine adapted for performing the function of absorption of food?
(ii) What is the role of saliva in the digestion of food?

OR

Name the process and explain the type of nutrition found in green plants. List the raw materials required for this process.

26. Why bacteria and fungi are called decomposers? List any two advantages of decomposers to the environment?

Section - C

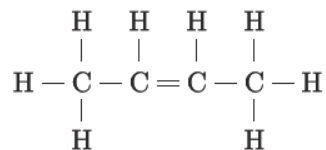
Section C consists of 7 questions of 3 marks each.

27. Refractive indices of media A, B, C & D are given below

Media	Refractive Index
A	1.33
B	1.44
C	1.52
D	1.65

- In which of these four media, is the speed of light minimum
 - In which of these four media, is the speed of light maximum
 - Find the refractive index of medium C with respect to medium B
28. Draw a ray diagram to show why a distant object is not seen by a myopic eye and how this defect is corrected.
29. We wish to obtain an equal sized inverted image of a candle flame on a screen kept at distance of 4 m from the candle flame.
- Name the type of lens that should be used.
 - What should be the focal length of the lens and at what distance from the candle flame from the lens be placed.
 - Draw a labelled diagram to show the image formation in this case.
30. Of the three metals X, Y and Z. X reacts with cold water. Y with hot water and Z with steam only. Identify X, Y and Z and also arrange them in order of increasing reactivity.

31. A hydrocarbon molecule has the structure given below:



- (i) Write the equation for the combustion of this hydrocarbon molecule in oxygen.
 (ii) The given molecule can be hydrogenated to produce an alkane molecule. Name it.
 (iii) Give the reaction conditions for the above conversion.
32. (a) An old man is advised by his doctor to take less sugar in his diet. Name the disease from which the man is suffering. Mention the hormone due to imbalance of which he is suffering from this disease. Which endocrine gland secretes this hormone?
 (b) Name the endocrine gland which secretes growth hormone. What will be the effect of the following on a person:
 (i) Deficiency of growth hormone.
 (ii) Excess secretion of growth hormone.
33. What is reflex arc? Draw a flow chart showing the sequence of events which occurs on withdrawing hand on touching a hot object.

Section - D

Section D consists of 3 questions of 5 marks each.

34. (a) State snell's laws of refraction.
 (b) Two lenses of power + 1.5 D and – 2.5 D are placed in contact. Find the power and focal length of the lens combination.
 (c) Define the principal focus of a concave mirror.

OR

- (a) The far point of a myopic person is 80 cm in front of the eye. Determine the nature of corrective lens, Focal length, Power of the correcting lens?
 (b) What is Hypermetropia? How can it be cured?
35. A metal M is stored under kerosene. It vigorously catches fire, if a small piece of this metal is kept open in air. Dissolution of this metal in water releases great amount of energy and the metal catches fire. The solution so formed turns red litmus blue.
 (i) Name the metal M.
 (ii) Write formula of the compound formed when this metal is exposed to air.
 (iii) Why is metal M' stored under kerosene?
 (iv) If oxide of this metal is treated with hydrochloric acid, what would be the products?
 (v) Write balanced equations for:
 (a) Reaction of 'M' with air.
 (b) Reaction of 'M' with water.
 (c) Reaction of metal oxide with hydrochloric acid.

OR

- (i) Write the steps involved in the extraction of pure metals in the middle of the activity series from their carbonate ores.
 (ii) How is copper extracted from its sulphide ore? Explain the various steps supported by chemical equations. Draw labelled diagram for the electrolytic refining of copper.

36. (i) Explain the process of urine formation in human beings.
 (ii) Draw a well labelled diagram of nephron.

OR

- (i) Name the plant Mendel used for his experiment. What type of progeny was obtained by Mendel in F_1 and F_2 generations when he crossed the tall and short plants? Write the ratio he obtained in F_2 generation plants.
 (ii) What is the importance of variations?

Section - E

Case study based questions are compulsory.

Question no. 37 to 39 are case-based/data-based questions with 2 to 3 short sub-parts. Internal choice is provided in one of these sub-parts.

37. Case Study-1:

Read the following and answer any four questions from 4(i) to 4(v)

Resistance of a conductor depends on the length, area of cross-section and nature of the material of the conductor. When a conductor is stretched (increased in its length), then its area of cross-section decreases accordingly but the volume (i.e. area \times length) of the conductor remains same. Resistivity of conductor,

$$\rho = \frac{RA}{l}$$

Where, A = area of cross-section of conductor

l = length of conductor

- (a) What do you mean by resistivity ?
 (b) What is the SI unit of resistivity of conductor ?
 (c) Write one difference between resistance and resistivity.
 (d) The resistance (R) of a wire of length is halved and area of cross-section (A) is doubled, what is the new resistance (R')

OR

The resistance of a wire of length 80 cm and of uniform area of cross-section 0.025 cm^2 , is found to be 1.50 ohm. Calculate the resistivity of the wire.

38. Case Study-2:

The table shows some information about compounds in homologous series.

Name of Compound	Molecular Formula	Molecular Mass	Boiling Point
Methanoic acid	HCOOH	46	100.8°C
Ethanoic acid	CH_3COOH	60	118°C
Propanoic acid	$\text{C}_2\text{H}_5\text{COOH}$	74	141°C
Butanoic acid	$\text{C}_3\text{H}_7\text{COOH}$	88	163°C
Pentanoic acid	$\text{C}_4\text{H}_9\text{COOH}$	102	186°C

- (i) Predict the molecular mass of the compound in the same series which has six carbon atoms in one molecule. Write the general formula for a compound in this homologous series.
 (ii) Draw the structural formula of propanoic acid. Why ethanoic acid is called glacial acetic acid?

OR

- (iii) Draw the electron dot structure of ethanoic acid.

39. Case Study-3:

Read the following and answer the following questions given below:

When a girl is born, the ovaries already contain thousands of immature eggs. On reaching puberty, some of these start maturing. One egg is produced every month by one of the ovaries. The egg is carried from the ovary to the womb through a thin oviduct of fallopian tube. The two oviducts unite into an elastic bag-like structure known as the uterus. The uterus opens into the vagina through the cervix.

- (i) What is fertilization?
- (ii) Where does fertilization occur?
- (iii) What is placenta?
- (iv) What are the different parts of female reproductive system?

OR

What happens when egg is not fertilized and what is the function of uterus in females?

Space For Rough Work

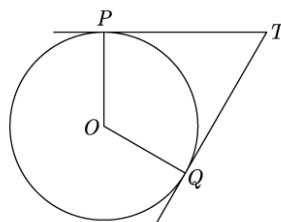
General Instructions:

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

Section - A

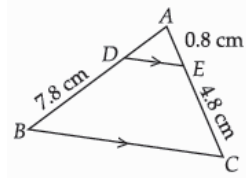
Section A consists of 20 questions of 1 mark each.

1. The quadratic equation $x^2 - 4x - 3\sqrt{2} = 0$ has
(A) two distinct real roots (B) two equal real roots
(C) no real roots (D) more than 2 real roots
2. If the square of difference of the zeroes of the quadratic polynomial $x^2 + px + 45$ is equal to 144, then the value of p is
(A) ± 9 (B) ± 12 (C) ± 15 (D) ± 18
3. In the adjoining figure, TP and TQ are the two tangents to a circle with centre O. If $\angle POQ = 110^\circ$, then $\angle PTQ$ is



4. The pair of equations $x = a$ and $y = b$ graphically represents lines which are
(A) Parallel (B) intersecting at (b,a) (C) coincident (D) intersecting at (a,b)
5. A set of numbers consists of three 4's, five 5's, six 6's, eight 8's and seven 10's. The mode of this set of numbers is
(A) 6 (B) 7 (C) 8 (D) 10
6. If $x^2 + y^2 = 25$, $xy = 12$, then x is
(A) (3, 4) (B) (3, -3) (C) (3,-2) (D) (4, -4)

7. ΔABC is an equilateral triangle with each side of length $2p$. If $AD \perp BC$ then the value of AD is
 (A) $\sqrt{3}$ (B) $\sqrt{3} p$ (C) $2p$ (D) $4p$
8. If figure, $DE \parallel BC$ Find the length of side AD , given that $AE = 0.8$ cm, $BD = 7.8$ cm and $CE = 4.8$ cm.



- (A) 2.4 cm (B) 1.6 cm (C) 2.8 cm (D) 1.3 cm
9. From an external point P , tangents PA and PB are drawn to a circle with center O , If CD is the tangent to the circle at a point E and $PA = 14$ cm. The perimeter of ΔPCD is
 (A) 14 cm (B) 21 cm (C) 28 cm (D) 35 cm
10. $(\cos^4 A - \sin^4 A)$ is equal to
 (A) $1 - 2 \cos^2 A$ (B) $2 \sin^2 A - 1$ (C) $\sin^2 A - \cos^2 A$ (D) $2 \cos^2 A - 1$
11. An observer, 1.5 m tall is 20.5 away from a tower 22m high, then the angle of elevation of the top of the tower from the eye of observer is
 (A) 30° (B) 45° (C) 60° (D) 90°
12. A tree casts a shadow 15 m long on the level of ground, when the angle of elevation of the sun is 45° . The height of a tree is
 (A) 10m (B) 14 m (C) 8 m (D) 15m
13. From a solid circular cylinder with height 10 cm and radius of the base 6 cm, a right circular cone of the same height and same base is removed, the volume of remaining solid is
 (A) $280 \pi \text{cm}^3$ (B) $330 \pi \text{cm}^3$ (C) $240 \pi \text{cm}^3$ (D) $440 \pi \text{cm}^3$
14. If median is 137 and mean is 137.05, then the value of mode is
 (A) 156.90 (B) 136.90 (C) 186.90 (D) 206.90
15. If a number x is chosen at random from the numbers $-2, -1, 0, 1, 2$. Then, the probability that $x^2 < 2$ is
 (A) $\frac{2}{5}$ (B) $\frac{4}{5}$ (C) $\frac{1}{5}$ (D) $\frac{3}{5}$
16. If the circumference of a circle increases from 4π to 8π , then its area is
 (A) halved (B) doubled (C) tripled (D) quadrupled
17. Which of the following relationship is the correct?
 (A) $P(E) + P(\bar{E}) = 1$ (B) $P(\bar{E}) + P(\bar{E}) = 1$ (C) $P(E) = 1 + P(\bar{E})$ (D) None of these
18. A chord of a circle of radius 10 cm, subtends a right angle at its centre. The length of the chord (in cm) is
 (A) $\frac{5}{\sqrt{2}}$ (B) $5\sqrt{2}$ (C) $10\sqrt{2}$ (D) $10\sqrt{3}$

DIRECTION: In the question number 19 and 20, a statement of **assertion (A)** is followed by a statement of **Reason (R)**.

Choose the correct option

- (A) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion(A)
- (B) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion(A)
- (C) Assertion (A) is true but reason (R) is false.
- (D) Assertion (A) is false but reason (R) is true.

19. **Statement A (Assertion):** $a_n - a_{n-1}$ is not independent of n then the given sequence is an AP.
Statement R(Reason): Common difference $d = a_n - a_{n-1}$ is constant or independent of n.

20. **Assertion (A):** The value of $\sin \theta = \frac{4}{3}$ is not possible.

Reason (R): Hypotenuse is the largest side in any right angled triangle.

Section - B

Section B consists of 5 questions of 2 marks each.

21. How many two digits numbers are divisible by 3 ?
22. From an external point P, tangents PA and PB are drawn to a circle with centre O. If $\angle PAB = 50^\circ$, then find $\angle AOB$.
23. Find the ratio in which the point $(-3, k)$ divides the line segment joining the points $(-5, -4)$ and $(-2, 3)$. Also find the value of k.
24. Write a rational number between $\sqrt{2}$ and $\sqrt{3}$.

OR

Explain why $(7 \times 13 \times 11) + 11$ and $(7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1) + 3$ are composite numbers.

25. Find the 7th term from the end of AP 7, 10, 13, 184.

OR

The fourth term of an AP is 11. The sum of the fifth and seventh terms of the AP is 34. Find the common difference.

Section - C

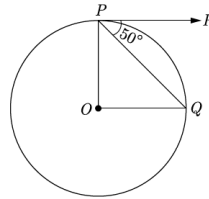
Section C consists of 6 questions of 3 marks each.

26. A fraction becomes $\frac{1}{3}$ when 2 is subtracted from the numerator and it becomes $\frac{1}{2}$ when 1 is subtracted from the denominator. Find the fraction.
27. Write the discriminant of the quadratic equation $(x + 4)^2 = 3(7x - 4)$.

28. Prove that the rectangle circumscribing a circle is a square.

OR

If O is centre of a circle, PQ is a chord and the tangent PR at P makes an angle of 50° with PQ, find $\angle POQ$.



29. An electric pole is 10 m high. A steel wire tied to top of the pole is affixed at a point on the ground to keep the pole up right. If the wire makes an angle of 45° with the horizontal through the foot of the pole, find the length of the wire. [Use $\sqrt{2} = 1.414$]

30. If the volume of a cube is 125 cm^3 , then what is the surface area of a cube ?

OR

A metallic cylinder has radius 3cm and height 5 cm. To reduce its weights, a conical hole is drilled in the cylinder. The conical hole has a radius of $\frac{3}{2}$ cm and its depth $\frac{8}{9}$ cm. Calculate the ratio of the volume of metal left in the cylinder to the volume of metal taken out in conical shape.

31. Two dice are tossed simultaneously. Find the probability of getting

- (i) an even number on both dice.
- (ii) the sum of two numbers more than 9.

Section - D

Section D consists of 4 questions of 5 marks each.

32. Find the zeroes of the quadratic polynomial $7y^2 - \frac{11}{3}y - \frac{2}{3}$ and verify the relationship between the zeroes and the coefficients.

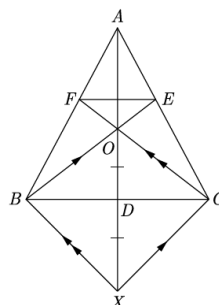
OR

If α and β are the zeroes the polynomial $2x^2 - 4x + 5$, find the values of

- (i) $\alpha^2 + \beta^2$
- (ii) $\frac{1}{\alpha} + \frac{1}{\beta}$
- (iii) $(\alpha - \beta)^2$
- (iv) $\frac{1}{\alpha^2} + \frac{1}{\beta^2}$
- (v) $\alpha^2 + \beta^2$

33. In $\triangle ABC$, AD is a median and O is any point on AD. BO and CO producing meet AC and AB at E and F respectively. Now AD is produced to X such that $OD = DX$ as shown in figure. Prove that

- (i) $EF \parallel BC$
- (ii) $AO : AX = AF : AB$

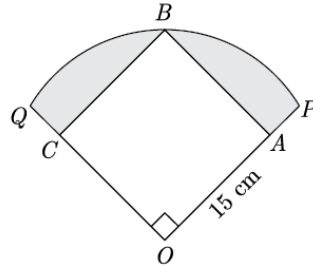


34. Prove the given identity $\frac{\sin^2 A}{\cos^2 A} + \frac{\cos^2 A}{\sin^2 A} = \frac{1}{\sin^2 A \cos^2 A} - 2$

OR

Evaluate : $4(\sin^4 30^\circ + \cos^4 60^\circ) - 3(\cos^2 45^\circ - \sin^2 90^\circ)$

35. In Figure : a square OABC is inscribed in a quadrant OPBQ. If OA = 15cm, find the area of the shaded region. (Use $\pi = 3.14$).



Section - E

Case study based questions are compulsory.

36. **CASE STUDY 1:**

Heart Rate : The heart rate is one of the ‘vital signs,’ or the important indicators of health in the human body. It measures the number of times per minute that the heart contracts or beats. The speed of the heartbeat varies as a result of physical activity, threats to safety, and emotional responses. The resting heart rate refers to the heart rate when a person is relaxed. While a normal heart rate does not guarantee that a person is free of health problems, it is a useful benchmark for identifying a range of health issues. After the age of 10 years, the heart rate of a person should be between 60 and 100 beats per minute while they are resting.



Thirty women were examined by doctors of AIIMS and the number of heart beats per minute were recorded and summarised as follows.

Number of heart beats per minute	Number of women (f_i)
65-68	2
68-71	4
71-74	3
74-77	8
77-80	7
80-83	4
83-86	2

Based on the above information, answer the following questions.

- What is the mean heart beats per minute for these women ?
- What is the upper limit of median value of heart beats per minute for these women ?
- What is the lower limit of mode value of heart beats per minute for these women ?

OR

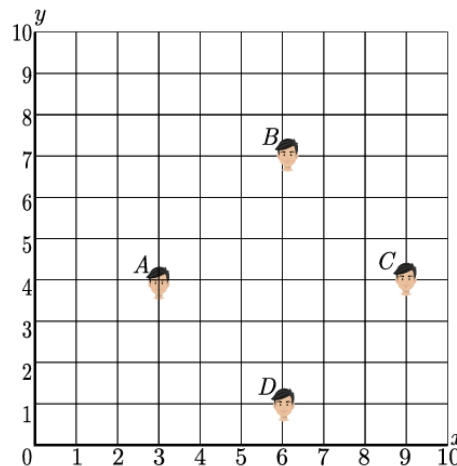
How many women are having heart beat in range 68-77?

37. CASE STUDY 2:

Morning assembly is an integral part of the school's schedule. Almost all the schools conduct morning assemblies which include prayers, information of latest happenings, inspiring thoughts, speech, national anthem, etc. A good school is always particular about their morning assembly schedule. Morning assembly is important for a child's development. It is essential to understand that morning assembly is not just about standing in long queues and singing prayers or national anthem, but it's something beyond just prayers. All the activities carried out in morning assembly by the school staff and students have a great influence in every point of life. The positive effects of attending school assemblies can be felt throughout life.



Have you noticed that in school assembly you always stand in row and column and this make a coordinate system. Suppose a school have 100 students and they all assemble in prayer in 10 rows as given below.



Here A,B,C and D are four friend Amar, Bharat, Colin and Draavid.

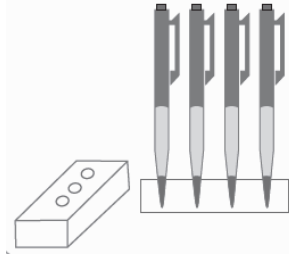
- (i) What is the distance between A and B ?
- (ii) What is the distance between C and D ?
- (iii) What is the distance between A and C ?

OR

What is the distance between D and B ?

38. CASE STUDY 3:

A carpenter made a wooden pen stand. It is in the shape of cuboid with four conical depressions to hold pens. The dimensions of the cuboid are 15 cm by 10 cm by 3.5 cm. The radius of each of the depressions is 0.5 cm and the depth is 1.4 cm. (See Figure).



- (i) What is the volume of cuboid?
- (ii) What is the volume of a conical depression?

OR

What is the total volume of conical depressions?

- (iii) What is the volume of wood in the entire stand?

Space For Rough Work