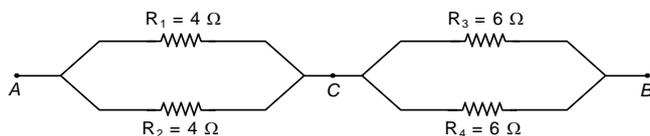


SCIENCE

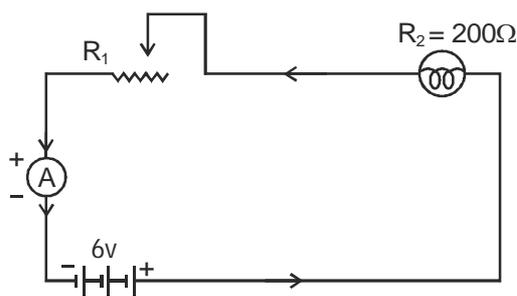
PHYSICS

Electricity

- Which one has more resistance 100 watt bulb or 60 watt bulb?
- Define the unit of current i.e., 1 ampere.
- Why are copper and aluminium wires usually used for electricity transmission?
- How does the resistance of a wire vary with its area of cross-section?
- What do you understand by the term-short-circuiting of an electric cell?
- Two lamps, one rated 100 W at 220 volts and the other 60 W at 220 volts are connected in parallel to a 220 V supply. What current is drawn from the supply line?
- Find the total resistance between the points A and B in the circuit diagram shown in figure.



- An electric refrigerator rated 400 W operates 8 hours per day. What is the cost of the energy to operate it for 30 days at Rs. 3.00 per KW h?
- Suppose a 6-volt battery is connected across a lamp, whose resistance is 20 ohm, through a variable resistor as shown in figure. If the current in the circuit is 0.25 A, calculate the value of the resistance from the resistor which must be used?



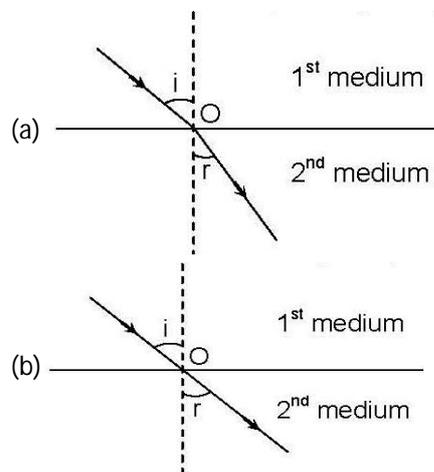
- On what factors does the resistance of a conductor depend?
- A piece of wire of resistance R is cut into five equal parts. These parts are then connected in parallel. If the equivalent resistance of this combination is R', then the ratio $\frac{R}{R'}$ is
- State Ohm's law. Draw a graph between voltage and current for a metallic conductor. Define resistivity. State its unit. What is the effect of temperature on the resistivity of metal?

Light Reflection and Refraction

- What type of image is formed:
 - in a plane mirror
 - on a cinema screen.
- What is the significance of +ve sign of magnification?
- Define power of a lens. Write its formula.
- The speed of light in water is 2.25×10^8 m/s. If the speed of light in vacuum be 3×10^8 m/s, calculate the refractive index of water.
- Name the type of mirror which is used as a reflector in the head-lights of a car. Why is it used for this purpose?
- An object is placed at the following distance from a convex lens of focal length 15 cm:

(a) 35 cm	(b) 30 cm
(c) 20 cm	(d) 10 cm

 Which position of the object amongst the above cases will produce:
 - a magnified real image.
 - a magnified virtual image.
 - a diminished real image.
 - an image of same size as the object.
- An object of height 4 cm is placed at distance of 25 cm in front of a concave mirror of focal length 15 cm. At what distance from the mirror a screen be placed in order to obtain a sharp image of the object? What is the nature and size of the image formed?
- Draw neat ray diagrams to illustrate the formation of images due to a beam of light incident parallel to the principal axis of a (i) concave mirror, (ii) convex mirror. What is the nature of image formed in each case?
- Observe carefully the figure (a) and (b) and tell, which media is optically denser and why?



22. Define the following terms in connection with spherical lenses:
- Centre of curvature
 - Principal axis
 - Principal focus
 - Optical centre
 - Focal length
 - Aperture.
23. Describe the formation of different types of images by a convex lens.
24. A ray of light travelling in air is incident on a rectangular glass block and emerges out into air from the opposite face. Draw a labelled ray diagram to show the complete path of this ray of light. Also explain the construction of this ray diagram.

Magnetic Effects of Electric Current

25. What is the frequency of A.C. (alternating current) in India?
26. How can you prepare an electromagnet - soft iron or hard steel?
27. What is the principle of an electric motor?
28. State the principle of an electric generator.
29. A circuit has a fuse of 5A. What is the maximum number of 100 watt (220V) bulbs that can be safely used in the circuit?
30. What are magnetic field lines? How is the direction of a magnetic field at a point determined? Mention two important properties of magnetic field lines.
31. What is the function of an earth wire? Why is it necessary to earth metallic appliances?
32. A coil of insulated copper wire is connected to a galvanometer. What will happen if a bar magnet is (i) pushed into the coil, (ii) withdrawn from inside the coil, (iii) held stationary inside the coil?
33. (a) What are magnetic field lines? How is the direction of a magnetic field at a point determined?
 (b) Draw two field lines around a bar magnet along its length on its two sides and point determined?
34. (a) Draw a schematic labelled diagram of a domestic wiring circuit which includes (i) a main fuse, (ii) a power meter, (iii) one light point, and (iv) a power plug.
 (b) Why is it necessary to connect an earth wire to electric appliances having metallic covers?

Sources of Energy

35. Name three forms of energy which are harnessed from the oceans.
36. Define ocean thermal energy.
37. Define Geothermal Energy.
38. Why is bio-gas a better fuel than animal dung-cakes?
39. Explain solar cell panel.
40. Give advantages and disadvantages of:
- Nuclear energy
 - Tidal energy
 - OTEC energy

Human Eye and Colourful World

41. What is angle of Prism?
42. State one way in which an eye differs from a camera.
43. What is meant by the 'persistence of vision'? A person is able to see the objects nearer than 1.5 m. He wants to read books at a distance of 30 cm. Find the nature, focal length and power of the lens he needs in his spectacles.
44. A myopic person has been using spectacles of power 1.00 D for class vision. During old age he also needs to use separate reading glasses of power + 2.00 D. Explain what may have happened to his eyesight?
45. The near point of a hypermetropic eye is 1 m. What is the nature and power of the lens required to correct this defect? (Assume that the near point of the normal eye is 25 cm)
46. What is spectrum? Draw a labelled diagram to show the formation of spectrum. Name the various colours of spectrum.
47. What is meant by power of accommodation of the eye?
48. Describe an experiment in detail to study refraction of light through a prism. Draw a neat diagram too. What do you mean by 'angle of deviation'?
49. Explain why, if we look at objects through the hot air over a fire, the objects appear to be wavering (moving slightly).
50. A person needs a lens of power, 5.5 diopters for correcting his distant vision. For correcting his near vision, he needs a lens of power, + 1.5 diopters. What is the focal length of the lens required for correcting (i) distant vision, and (ii) near vision?

CHEMISTRY

CHEMICAL REACTIONS AND EQUATIONS

1. Can we stir silver nitrate solution with a copper spoon? Why or why not?
2. Why should a magnesium ribbon be cleaned before burning in air?
3. What is rancidity?
4. What are redox reactions? Give two examples
5. Why is respiration considered as an exothermic reaction? Explain.
6. Why decomposition reactions are called the opposite of combination reactions? Write equations of both of these reactions.
7. Write an activity to show that electrolysis of water is an example of decomposition reaction.
8. Write the balanced equation for the following chemical reactions:
 - (i) Hydrogen + chlorine → hydrogen chloride
 - (ii) Barium chloride + aluminium sulphate → barium sulphate + aluminium chloride
 - (iii) Sodium + water → sodium hydroxide + hydrogen
9. You are given the following materials:
 - (i) Iron nails
 - (ii) Copper sulphate solution
 - (iii) Barium chloride solution
 - (iv) copper powder
 - (v) Ferrous sulphate crystals
 - (vi) Quick lime
 Identify the type of chemical reaction taking place when:
 - (a) Barium chloride solution is mixed with copper sulphate solution and a white precipitate is observed.
 - (b) On heating, copper powder in air in a china dish, the surface of copper powder becomes black.
 - (c) On heating green ferrous sulphate crystals, reddish brown solid is left and a gas having smell of burning sulphur is noticed.
 - (d) Iron nails when left dipped in blue copper sulphate solution become brownish in colour and blue colour of copper sulphate solution fades away.
 - (e) Quick lime reacts vigorously with water releasing a large amount of heat.
10.
 - (a) Why cannot a chemical change be normally reversed?
 - (b) Why is it always essential to balance a chemical equation?
 - (c) Why do diamond and graphite, the two allotropic forms of carbon evolve different amounts of heat of combustion?

- (d) Why does milkiness disappear when carbon dioxide is passed through lime water in excess?
- (e) Can rusting of iron take place in distilled water?

ACIDS, BASES AND SALTS

11. What is a universal indicator? What is its use?
12. What are antacids? Give examples.
13. A baker found that the cake prepared by him is hard and small in size. Which ingredient has he forgotten to add that would have made the cake fluffy? Give reason.
14. What are olfactory indicators? Name two substances which can be used as olfactory indicators.
15. What happens when carbon dioxide gas is passed through lime water? What happens when excess of carbon dioxide is passed? Give the reactions involved.
16. A milkman adds a very small amount of baking soda to fresh milk.
 - (i) Why does he shift the pH of the fresh milk from '6' to slightly alkaline?
 - (ii) What do you expect to observe when this milk comes to a boil?
 - (iii) Why does this milk take a long time to set as curd?
17. You have been provided with three test tubes. One of them contains distilled water and the other two contain an acidic and a basic solution respectively. If you are given only red litmus paper, how will you identify the contents of each test tube?
18. Compounds such as alcohols and glucose also contain hydrogen but are not categorized as acids. Describe an activity to prove it.
19.
 - (i) Name the raw materials used in the manufacture of sodium carbonate by Solvay process.
 - (ii) How is sodium hydrogen carbonate formed during Solvay process separated from a mixture of NH_4Cl and NaHCO_3 ?
 - (iii) How is sodium carbonate obtained from sodium hydrogen carbonate?
20. Explain why:
 - (i) Common salt becomes sticky during the rainy season
 - (ii) Blue vitriol change to white upon heating
 - (iii) Anhydrous calcium chloride is use in desiccators
 - (iv) If bottle full of concentrated sulphuric acid is left open in the atmosphere by accident, the acid starts flowing out of the bottle of its own.
 - (v) A tarnished copper vessel begins to shine again when rubbed with lemon.

METALS AND NON METALS

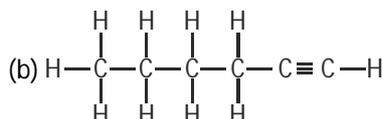
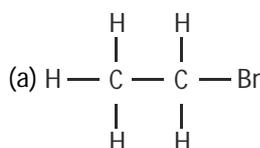
21. Define minerals and ores.
22. Aluminium is more reactive than iron, yet its corrosion is less than iron. Why?
23. Why metals are called electropositive elements while non-metals are known as electronegative elements?
24. An element reacts with oxygen to form an oxide which dissolves in dilute hydrochloric acid. The oxide also turns a solution of red litmus blue. Is the element a metal or non-metal? Explain with the help of a suitable example.
25. Write an activity to show the necessary conditions needed for corrosion (rusting) of iron metal.
26. How will you demonstrate that the ionic compounds do not conduct electricity in the solid state and can do so in solution.
27. Write chemical equation for the reactions taking place when :
 - (i) a piece of calcium metal is placed in water.
 - (ii) steam is passed over red hot iron.
 - (iii) Zinc sulphide is heated in air.
28. An ore on heating in air produces sulphur dioxide. Which process would you suggest for its concentration? Briefly describe any two steps involved in the conversion of this concentrated ore into related metal?
29. Give the steps of extraction of metals, which are low in the activity series, e.g., Hg and Cu.
30. Give reasons:
 - (i) Platinum, gold and silver are used to make jewellery.
 - (ii) Sodium, potassium and lithium are stored under kerosene oil.
 - (iii) Aluminium is a highly reactive metal, yet it is used to make utensils.
 - (iv) Carbonate and sulphide ores are usually converted into oxides during the process of extraction.
 - (v) An iron knife dipped in a blue copper sulphate solution turns the blue solution light green.

CARBON AND ITS COMPOUNDS

31. Write the general molecular formulae of alkanes, alkenes and alkynes.
32. Give the name and structural formula of one homologue of HCOOH.
33. What is glacial acetic acid?
34. Draw the structures for the following compounds:

(i) Ethanoic acid	(ii) Bromopentane
(iii) Butanone	(iv) Hexanal

35. What is hydrogenation? Write an industrial application of this process.
36. What are esters? How are they prepared? List two uses of esters.
37. Explain the formation of scum when hard water is treated with soap.
38. Explain the cleansing action of soaps.
39. (i) Why does carbon form a large number of compounds ?
 (ii) Why are some of these called saturated and other unsaturated compounds?
 (iii) Which of these two is more reactive ?
 (iv) Write the names of the compounds :



40. Identify the compounds (A - D) in the following reaction sequence :
 - (i) $\text{CH}_3\text{CH}_2\text{OH} \xrightarrow[\text{(ii) Dil. HCl}]{\text{(i) KMnO}_4 / \text{KOH, Heat}} \text{A} + \text{H}_2\text{O}$
 - (ii) $\text{CH}_3\text{CH}_2\text{OH} + \text{A} \xrightarrow[\text{Heat}]{\text{Conc. H}_2\text{SO}_4} \text{B} + \text{H}_2\text{O}$
 - (iii) $\text{B} + \text{NaOH} \longrightarrow \text{C} + \text{CH}_3\text{CH}_2\text{OH}$
 - (iv) $\text{A} + \text{NaHCO}_3 \longrightarrow \text{C} + \text{D} + \text{H}_2\text{O}$

PERIODIC CLASSIFICATION OF ELEMENTS

41. Name the scientist who proposed modern periodic law.
42. Is it possible to have an element with atomic number 1.5, placed between hydrogen and helium?
43. Name 3 elements which behave as metalloids?
44. Explain limitations or demerits of mendeleev's periodic table.
45. How could the modern periodic table remove various anomalies of mendeleev's periodic table?
46. (a) Atomic number is considered to be a more appropriate parameter than atomic mass for classification of elements in a periodic table. Why ?
 (b) How does atomic size of elements vary on moving from:
 - (i) left to right in a period
 - (ii) from top to bottom in a group

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| <p>47. Two elements X and Y have atomic numbers 12 and 16 respectively. Write the electronic configuration for these elements. To which period of the modern periodic table do these two elements belong? What type of bond will be formed between them and why?</p> <p>48. In the modern periodic table, calcium (atomic number 20) is surrounded by elements with atomic numbers 12, 19, 21 and 38. Which of these have physical and chemical properties resembling calcium?</p> <p>49. Which element has:</p> <p>(a) two shells, both of which are completely filled with electrons?</p> <p>(b) the electronic configuration 2, 8, 2?</p> | <p>(c) a total of three shells with four electrons in the valence shell?</p> <p>(d) a total of two shells with three electrons in the valence shell?</p> <p>(e) twice as many electrons in the second shell as in the first shell?</p> <p>50. What do you understand by the term periodicity? Are the properties of the elements placed in the same group similar? Illustrate.</p> |
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BIOLOGY

Control and Coordination

- (a) Name two systems which taken together perform the functions of control and coordination in human beings.

(b) What does the central nervous system in humans consist of? What is the job of the central nervous system?

(c) Give the various functions of brain.
- When you smell a favourite food your mouth begins to water (that is, you secrete saliva). Write down what the following are examples of :

(a) the smell of the food

(b) the cells in your nasal passages which perceive the smell

(c) the gland which is stimulated to secrete saliva.
- Name the plant hormones which are responsible for the following effects :

(a) falling of leaves

(b) opening of stomata

(c) bending of stem towards light

(d) closing of stomata
- Name one gland each :

(a) which acts only as an endocrine gland.

(b) which acts only as an exocrine gland.

(c) which acts both as an endocrine gland as well as an exocrine gland.
- (a) Name the hormones secreted by the following endocrine glands :

(i) Thyroid gland

(ii) Parathyroid glands

(iii) Pancreas

(iv) Adrenal glands

(b) Write the functions of testosterone and oestrogen hormones.

- Explain the difference between each of the following pairs of terms :

(a) receptor and effector

(b) cerebrum and cerebellum
- Which hormone :

(a) prepares the body for action ?

(b) controls the amount of glucose in blood ?

(c) gives boys a deep voice ?

(d) gives girls soft skin ?
- A person walks across a room in barefeet and puts his foot on a drawing pin lying on the floor. He lets out a cry. Explain what happens in his nervous system in bringing about this response.
- In what ways are puberty and adolescence result of the activity of some glands in the human body ?

Heredity and Evolution

- Bacteria have a simpler body plan when compared with human beings. Does it mean that human beings are more evolved than bacteria? Explain your answer.
- Define 'natural selection'.
- (a) State one advantage of variation to a species.

(b) What are sex chromosomes ? How many sex chromosomes are there ? Name them.

(a) The advantage of variation to a species is that it increases the chances of its survival in a changing environment.

(b) The chromosomes which determine the sex of a person are called sex chromosomes. There are two types of sex chromosomes ? X and Y chromosomes.
- Explain how, sex is determined in human babies.
- Why are the small numbers of surviving tigers a cause of worry from the point of view of genetics ?
- (a) What is meant by a species ? Give two examples of plant species and two of animals.

- (b) State the various factors which could lead to the formation of new species.
- 16. (a) Explain the terms 'analogous organs' and 'homologous organs' with examples.
- (b) In what way are analogous organs evidence for evolution ?
- 17. Define 'speciation'. Explain how speciation occurs.
- 18. "Only variations that confer an advantage to an individual organism will survive in a population". Do you agree with this statement ? Give reason for your answer.

Life Processes

- 19. What is hypertension ? Why is it caused ? What harm can it do ?
- 20. (a) Photosynthesis converts energy A into energy B. What are A and B ?
- (b) State the various steps involved in the process of photosynthesis.
- 21. (a) What is lymphatic system ? What are its functions ?
- (b) What is blood pressure ? What are the two factors used to express the blood pressure of a person ?
- (c) Name the main nitrogenous waste in the human blood. How is it removed from the blood ?
- 22. What are the different ways in which glucose is oxidised to provide energy in various organisms ? Give one example of each.
- 23. (a) Name the various organs of the human excretory system.
- (b) Draw a neat labelled diagram of the human excretory system.
- (c) What is the function of excretory system in humans ?
- 24. (a) What is the role of hydrochloric acid in our stomach ?
- (b) What is the function of enzymes in the human digestive system ?
- (c) What substances are contained in pancreatic juice ? What are their functions ?
- 25. (a) What would happen if all the green plants disappear from the earth ?
- (b) If a plant is releasing carbon dioxide and taking in oxygen during the day, does it mean that there is no photosynthesis occurring ? Justify your answer.
- 26. (a) Draw a labelled diagram of the human digestive system. With the help of this diagram, describe the process of digestion of food in man (humans).
- (b) Describe one way in which the small intestine is adapted for the absorption of digested food.
- (c) What is the special name of the contraction and expansion movement which pushes the food further in our digestive tract (or alimentary canal) ?

- 27. (a) Give the main points of difference between respiration in plants and respiration in animals.
- (b) Describe the exchange of gases which takes place in the leaves of a plant (a) during daytime, and (b) at night.
- (c) Which contains more carbon dioxide : exhaled air or inhaled air ? Why ?
- 28. (a) Explain how, the air we breathe in gets cleaned while passing through the nasal passage.
- (b) Why do the walls of trachea not collapse when there is less air in it ?
- (c) How are oxygen and carbon dioxide exchanged in our body during respiration ?
- (d) How are lungs designed in human beings to maximise the exchange of gases ?

Management Of Natural Resources

- 29. Name the rivers with which the following dams are associated : Name the rivers with which the following dams are associated :
 - (a) Tehri Dam
 - (b) Sardar Sarovar Dam
 - (c) Bhakra Dam
- 30. (a) State the advantages of constructing dams across the rivers.
- (b) Describe some of the problems associated with the construction of dams.
- 31. (a) What is meant by rainwater harvesting ? Name some of the ancient structures used for rainwater harvesting by the rural people.
- (b) What are the various advantages of water stored in ground ?
- 32. Name the products of combustion of fossil fuels like coal and petroleum products. How do they affect us and our environment ?
- 33. (a) What is a natural resource ? Name three important natural resources.
- (b) Why do we need to manage our natural resources ?
- 34. Describe briefly the 'khadin' system of rainwater harvesting practised in Rajasthan.
- 35. (a) Name the major industries which are based on forest produce.
- (b) State the main aim of the management of forests and wildlife.
- (c) Name the four main stakeholders in the management of forest resources.
- 36. Write a short note on 'Chipko Andolan' (Hug the Trees Movement).

Our Environment

- 37. 'If we excessively use pesticides to protect the crops from diseases, then it may cause longterm damage to mankind'. Justify this statement.

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| <p>38. What is meant by biological magnification ? With the help of a food chain, explain how biological magnification of harmful chemicals can occur.</p> <p>39. (a) What is ozone ? How is it formed ?
 (b) How does ozone layer protect us from harmful effects in the environment ?
 (c) What is UNEP ? What step has been taken by UNEP in 1987 to prevent too much damage to the ozone layer ?</p> <p>40. (a) Name and state the law given by Lindeman which tells us how much energy entering a particular trophic level of organisms is available for transfer to the next higher trophic level.
 (b) How much energy will be available to hawks in the food chain comprising hawk, snake, paddy and mice, if 10,000 J of energy is available to paddy from the sun ?</p> <p>41. We do not clean ponds or lakes but an aquarium needs to be cleaned periodically. Why ?</p> <p>42. What would happen if the ozone layer in the atmosphere completely disappears ?</p> <p style="text-align: center;">How do Organisms Reproduce</p> <p>43. People who die from AIDS are not killed by the virus itself. Explain.</p> <p>44. (a) What is tissue culture ?
 (b) What is the importance of DNA copying in reproduction ? Explain with an example.
 (c) Why is variation during reproduction beneficial to the species but not necessarily for the individual ?</p> <p>45. What is the causative organism for the following diseases ?
 (i) Gonorrhoea (ii) Syphilis (iii) AIDS</p> | <p>46. (a) What are the male and female gonads in human beings ? Mention their functions.
 (b) State the advantages of sexual reproduction over asexual reproduction.</p> <p>47. (a) What is meant by contraception ? What are the different methods of contraception ?
 (b) What is done in the contraception method known as
 (i) vasectomy, and (ii) tubectomy ?
 (c) If a woman is using copper-T for contraception, will it protect her from sexually transmitted diseases ?</p> <p>48. (a) What changes are seen in boys at the time of puberty ?
 (b) Draw a labelled diagram of the human male reproductive system. With the help of this diagram, describe the working of human male reproductive system ?
 (d) What is the role of seminal vesicles and prostate gland in human male reproductive system ?</p> <p>49. In pea plant, the male gametes have 7 chromosomes.
 (i) What is the number of chromosomes in the female gamete ?
 (ii) What is the number of chromosomes in the zygote ?</p> <p>50. The diagram shows female reproductive system. Name the parts labelled A to D.
 (a) In which part do the sperms enter ?
 (b) Which part releases the egg ?
 (c) In which part does fertilisation take place ?
 (d) In which part does the foetus develop ?</p> |
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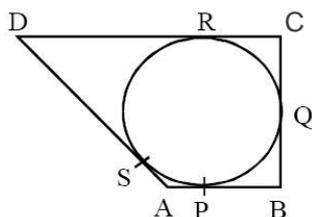
MATHEMATICS

Quadratic Equations

- Solve by completing the square:-
 $a^2x^2 - 3abx + 2b^2 = 0$
- Solve :-
 $\frac{2x+3}{3x-2} - 4\left(\frac{3x-2}{2x+3}\right) = 3$
- Solve :-
 $\sqrt{3x+7} + 4x = 16$
- Find the value of 'k' for which the quadratic eq. $(K + 4)x^2 + (K + 1)x + 1 = 0$ has equal roots.
- Find the value of 'k' for which the equation $x^2 + 7Kx + 8 = 0$ has real roots
- Solve :- $\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}$
- An express train takes one hour less than a passenger train to travel 132 km. If the average speed of the express train is 11 km/hr more than that of passenger train. Find average speed of express train.
- Two pipes running together can fill a tank in $\frac{100}{9}$ minutes. If one pipe takes 5 min more than the other to fill the tank separately, find the time in which each pipe would fill the tank separately.
- If the equation $(1 + m^2)x^2 + 2mcx + c^2 - a^2 = 0$ has equal roots, prove that $c^2 = a^2(1 + m^2)$
- Solve $4^x - 3 \times 2^{x+3} + 128 = 0$

Circle

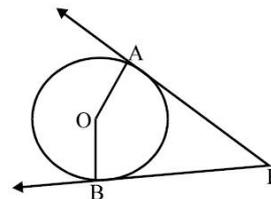
- Prove that the tangent at any point of a circle is perpendicular to the radius through the point of contact.
- Prove that the lengths of tangents drawn from an external point to a circle are equal.
- Prove that the tangents drawn at the ends of a diameter of a circle are parallel.
- A quadrilateral ABCD is drawn to circumscribe a circle, as shown in the figure.



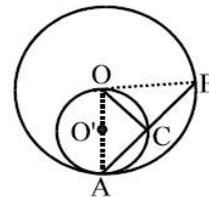
Prove that $AB + CD = AD + BC$

- Prove that the parallelogram circumscribing a circle, is a rhombus.

- ABC is a right triangle, right angled at B. A circle is inscribed in it. The lengths of the two sides containing the right angle are 6 cm and 8 cm. Find the radius of the incircle.
- PA and PB are tangents from P to the circle with centre O. At point M, a tangent is drawn cutting PA at K and PB at N. Prove that $KN = AK + BN$.
- In fig., O is the centre of the circle, PA and PB are tangent segments. Show that the quadrilateral AOBP is cyclic.



- In fig., circles $C(O, r)$ and $C(O', r/2)$ touch internally at a point A and AB is a chord of the circle C (O, r) intersecting $C(O', r/2)$ at C. Prove that $AC = CB$.



- In two concentric circles, prove that all chords of the outer circle which touch the inner circle are of equal length.

Co-ordinate Geometry

- Show that the points (1, - 1), (5, 2) and (9, 5) are collinear.
- Show that four points (0, - 1), (6, 7), (-2, 3) and (8, 3) are the vertices of a rectangle. Also, find its area.
- If P and Q are two points whose coordinates are $(at^2, 2at)$ and $(\frac{a}{t^2}, \frac{2a}{t})$ respectively and S is the point (a, 0). Show that $\frac{1}{SP} + \frac{1}{SQ}$ is independent of t.
- Find the coordinates of the circumcentre of the triangle whose vertices are (8, 6), (8, - 2) and (2, - 2). Also, find its circum radius.
- If the opposite vertices of a square are (1, - 1) and (3, 4), find the coordinates of the remaining angular points.
- Prove that the points (-3, 0), (1, -3) and (4, 1) are the vertices of an isosceles right angled triangle. Find the area of this triangle.

27. Determine the ratio in which the line $3x + y - 9 = 0$ divides the segment joining the points (1, 3) and (2, 7).
28. If the points A (6, 1), B (8, 2), C(9, 4) and D (p, 3) are vertices of a parallelogram, taken in order, find the value of p.
29. Find the area of the triangle formed by joining the mid-point of the sides of the triangle whose vertices are (0, -1), (2, 1) and (0, 3). Find the ratio of area of the triangle formed to the area of the given triangle.
30. For what value of k are the points (k, 2 - 2k) (-k + 1, 2k) and (-4 - k, 6 - 2k) are collinear ?

Application of Trigonometry

31. A vertical tower stands on a horizontal plane and is surmounted by a flagstaff of height 7m. At a point on the plane, the angle of elevation of the bottom of the flagstaff is 30° and that of the top of the flagstaff is 45° . Find the height of the tower.
32. From the top of a cliff 25 m high the angle of elevation of a tower is found to be equal to the angle of depression of the foot of the tower. Find the height of the tower.
33. A balloon of radius γ makes an angle α at the eye of an observer and the angle of elevation of its centre is β . Find the height of its centre from the ground level?
34. A man on a cliff observes a fishing trawler at an angle of depression of 30° which is approaching the shore to the point immediately beneath the observer with a uniform speed. 6 minutes later, the angle of depression of the trawler is found to be 60° . The time taken by the trawler to reach the shore is -
35. Two stations due south of a leaning tower which leans towards the north are at distance a and b from its foot. If α, β be the elevations of the top of the tower from these stations, prove that its inclination θ to the horizontal is given by

$$\cot \theta = \frac{bc \cot \alpha - a \cot \beta}{b - a}$$
36. If the angle of elevation of a cloud from a point h metres above a lake is α and the angle of depression of its reflection in the lake is β , prove that the height of the cloud is

$$\frac{h(\tan \beta + \tan \alpha)}{\tan \beta - \tan \alpha}$$
37. There is a small island in the middle of a 100 m wide river and a tall tree stands on the island. P and Q are points directly opposite to each other on two banks, and in line with the tree. If the angles of elevation of the top of the tree from P and Q are respectively 30° and 45° , find the height of the tree.
38. The angle of elevation of a cliff from a fixed point is θ . After going up a distance of k metres towards the top of cliff at an angle of ϕ , it is found that the angle of elevation is α . Show that the height of the cliff is

39. The angles of elevation of the top of a tower from two points at distances a and b metres from the base and in the same straight line with it are complementary. Prove that the height of the tower is \sqrt{ab} metres.
40. At a point on level ground, the angle of elevation of a vertical tower is found to be such that its tangent is $5/12$. On walking 192 metres towards the tower, the tangent of the angle of elevation is $3/4$. Find the height of the tower.

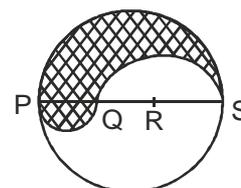
Arithmetic Progression

41. Which term of the sequence -1, 3, 7, 11, , is 95 ?
42. If five times the fifth term of an A.P. is equal to 8 times its eighth term, show that its 13th term is zero.
43. If the mth term of an A.P. be $1/n$ and n^{th} term be $1/m$, then show that its $(mn)^{\text{th}}$ term is 1.
44. If pth, qth and rth terms of an A.P. are a, b, c respectively, then show that
 (i) $a(q - r) + b(r - p) + c(p - q) = 0$
 (ii) $(a - b)r + (b - c)p + (c - a)q = 0$
45. Find four numbers in A.P. whose sum is 20 and the sum of whose squares is 120.
46. Find the sum of all natural numbers between 250 and 1000 which are exactly divisible by 3.
47. The sum of n, 2n, 3n terms of an A.P. are S_1, S_2, S_3 respectively. Prove that $S_3 = 3(S_2 - S_1)$.
48. The sum of the first p, q, r terms of an A.P. are a, b, c respectively. Show that

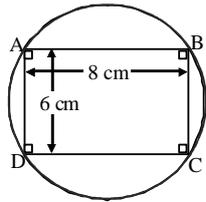
$$\frac{a}{p}(q - r) + \frac{b}{q}(r - p) + \frac{c}{r}(p - q) = 0$$
49. The ratio of the sum use of n terms of two A.P.'s is $(7n + 1) : (4n + 27)$. Find the ratio of their mth terms.
50. Which term of the sequence $20, 19\frac{1}{4}, 18\frac{1}{2}, 17\frac{3}{4}, \dots$ is the first negative terms ?

Area Related to Circle

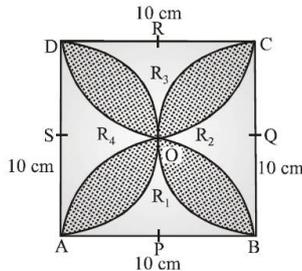
51. Find the area of the segment of a circle, given that the angle of the sector is 120° and the radius of the circle is 21 cm. (Take $\pi = 22/7$)
52. PQRS is a diameter of a circle of radius 6 cm. The lengths PQ, QR and RS are equal. Semi-circles are drawn on PQ and QS as diameters as shown in Fig. Find the perimeter and area of the shaded region.



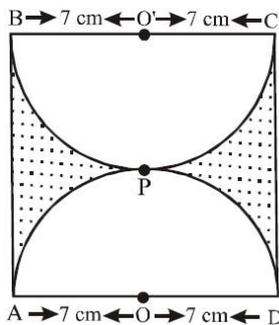
53. A horse is placed for grazing inside a rectangular field 70 m by 52 m and is tethered to one corner by a rope 21 m long. On how much area can it graze ?
54. In figure, find the area of the shaded region [Use $\pi = 3.14$]



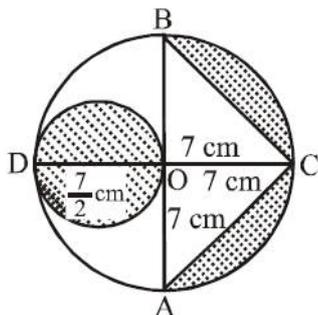
55. Find the area of the shaded region in Fig. where ABCD is a square side 10 cm. [Use $\pi = 3.14$]



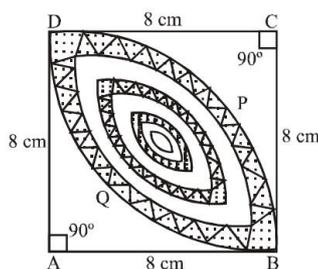
56. Find the area of the shaded region in Fig. If ABCD is a square of side 14 cm and APD and BPC are semi-circles.



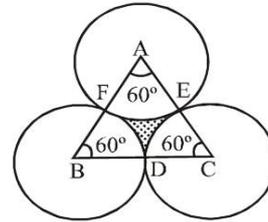
57. In Fig. AB and CD are two diameters of a circle (with centre O) perpendicular to each other and OD is the diameter of the smaller circle. If OA = 7 cm, find the area of shaded region.



58. Calculate the area of the designed region in Fig. common between two quadrants of circles of radius 8 cm each.



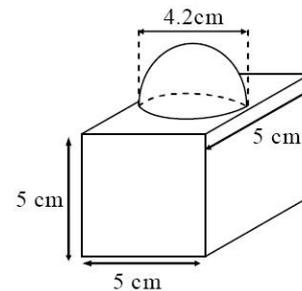
59. The area of an equilateral triangle is $49\sqrt{3}$ cm². Taking each angular point as centre, a circle is described with radius equal to half the length of the side of the triangle as shown in Fig. Find the area of the triangle not included in the circle.



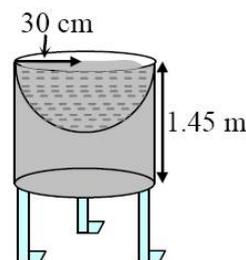
60. Four equal circles, each of radius 5 cm, touch each other, as shown in the figure. Find the area included between them. Take $\pi = 3.14$.

Surface Area of Volume

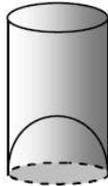
61. A circus tent is in the shape of a cylinder, upto a height of 8 m, surmounted by a cone of the same radius 28 m. If the total height of the tent is 13 m, find:
 (i) total inner curved surface area of the tent.
 (ii) cost of painting its inner surface at the rate of Rs. 3.50 per m².
62. The radius of a sphere increases by 25%. Find the percentage increase in its surface area.
63. Three solid spheres of radii 1 cm, 6 cm and 8 cm are melted and recasted into a single sphere. Find the radius of the sphere obtained.
64. The decorative block shown in figure is made of two solids - a cube and a hemisphere. The base of the block is a cube with edge 5 cm, and the hemisphere fixed on the top has a diameter of 4.2 cm. Find the total surface area of the block. [Take $\pi = 22/7$]



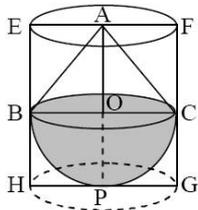
65. A bird bath for garden in the shape of a cylinder with a hemispherical depression at one end (see figure). The height of the cylinder is 1.45 m and its radius is 30 cm. Find the total surface area of the bird-bath. [Take $\pi = 22/7$]



66. A juice seller was serving his customers using glasses as shown in figure. The inner diameter of the cylindrical glass was 5 cm, but the bottom of the glass had a hemispherical raised portion which reduced the capacity of the glass. If the height of a glass was 10 cm. Find the apparent capacity of the glass and its actual capacity. [Take $\pi = 3.14$]



67. A solid toy is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 2 cm and the diameter of the base is 4 cm. Determine the volume of the toy. If a right circular cylinder circumscribes the toy, find the difference of the volume of the cylinder and the toy. [Take $\pi = 3.14$]



68. A hollow metallic cylindrical tube has an internal radius of 3 cm and height 21 cm. The thickness of the metal of the tube is $\frac{1}{2}$ cm. The tube is melted and cast into a right circular cone of height 7 cm. Find the radius of the cone correct to one decimal place.
69. A bucket made up of a metal sheet is in the form of a frustum of a cone. Its depth is 24 cm and the diameters of the top and the bottom are 30 cm and 10 cm respectively. Find the cost of milk which can completely fill the bucket at the rate of Rs. 20 per litre and the cost of the metal sheet used, if it costs Rs. 10 per 100 cm^2 . (Use $\pi = 3.14$).
70. Water flows out through a circular pipe whose internal radius is 1 cm, at the rate of 80 cm / sec into an empty cylindrical tank, the radius of whose base is 40 cm. By how much will the level of water rise in the tank in half an hour ?

Constructions

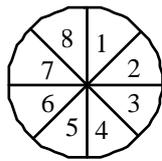
71. Construct a $\triangle ABC$ in which $AB = 4$ cm, $BC = 5$ cm and $AC = 6$ cm. Now, construct a triangle similar to $\triangle ABC$ such that each of its sides is two-third of the corresponding sides of $\triangle ABC$. Also, prove your assertion.
72. Draw a triangle ABC with side $BC = 7$ cm, $\angle B = 45^\circ$, $\angle A = 105^\circ$. Then construct a triangle whose sides are $(\frac{4}{3})$ times the corresponding sides of $\triangle ABC$.

73. Construct a triangle similar to a given triangle ABC such that each of its sides is $(\frac{6}{7})$ th of the corresponding sides of ABC . It is given that $AB = 5$ cm, $AC = 6$ cm and $BC = 7$ cm.
74. Construct a $\triangle ABC$ in which $AB = 4$ cm, $\angle B = 60^\circ$ and altitude $CL = 3$ cm. Construct a $\triangle ADE$ similar to $\triangle ABC$ such that each side of $\triangle ADE$ is $\frac{3}{2}$ times that of the corresponding side of ABC .
75. Take a point O on the plane of the paper. With O as centre draw a circle of radius 3 cm. Take a point P on this circle and draw a tangent at P .
76. Draw a circle of radius 4 cm with centre O . Draw a diameter POQ . Through P or Q draw tangent to the circle.
77. Draw a circle of radius 3 cm. Take a point at a distance of 5.5 cm from the centre of the circle. From point P , draw two tangents to the circle.
78. Construct a tangent to a circle of radius 4 cm from a point on the concentric circle of radius 6 cm and measure its length. Also verify the measurement by actual calculation.
79. Draw a pair of tangents to a circle of radius 5 cm which are inclined to each other an angle of 60° .
80. Draw a circle of radius 3 cm. Draw a pair of tangents to this circle, which are inclined to each other at an angle of 60° .

Probability

81. One card is drawn from a well-shuffled deck of 52 cards. Find the probability of drawing:
- an ace
 - '2' of spades
 - '10' of black suit
82. What is the probability that a leap year, selected at random will contain 53 Sundays ?
83. Three unbiased coins are tossed together. Find the probability of getting :
- All heads,
 - Two heads
 - One head
 - At least two heads.
84. 17 Cards numbered 1, 2, 3 ... 17 are put in a box and mixed thoroughly. One person draws a card from the box. Find the probability that the number on the card is
- Odd
 - A prime
 - Divisible by 3
 - Divisible by 3 and 2 both.
85. A bag contains 5 red balls, 8 white balls, 4 green balls and 7 black balls. If one ball is drawn at random, find the probability that it is
- Black
 - Red
 - Not green.

86. A piggy bank contains hundred 50 p coins, fifty Re 1 coins, twenty Rs 2 coins and ten Rs 5 coins. If it is equally likely that one of the coins will fall out when the bank is turned upside down, what is the probability that the coin
- (i) will be a 50 p coin ?
 - (ii) will not be a Rs. 5 coin ?
87. A game of chance consists of spinning an arrow which comes to rest pointing at one of the number 1, 2, 3, 4, 5, 6, 7, 8 (see fig), and these are equally likely outcomes. What is the probability that it will point at



- (i) 8
 - (ii) an odd number ?
 - (iii) a number greater than 2 ?
 - (iv) a number less than 9 ?
88. It is given that in a group of 3 students, the probability of 2 students not having the same birthday is 0.992. What is the probability that the 2 students have the same birthday ?
89. Two customers Abbas and Shehla are visiting a particular shop in the same week (Tuesday to Saturday). Each is equally likely to visit the shop on any one day as on another. What is the probability that both will visit the shop on
- (i) the same day
 - (ii) different days
 - (iii) consecutive days ?
90. A box contains 12 balls out of which x are black.
- (i) If one ball is drawn at random from the box, what is the probability that it will be a black ball ?
 - (ii) If 6 more white balls are put in the bag, the probability of drawing a black ball will double than that in (i). Find x.

Real Numbers

91. Prove that $7-\sqrt{3}$ is irrational
92. Show that any positive odd integer is of the form $4q + 1$ or $4q + 3$, where q is some integer.
93. Show that one and only one out of n; $n + 2$ or $n + 4$ is divisible by 3, where n is any positive integer.
94. Use Euclid's Division Algorithm to show that the cube of any positive integer is either of the $9m, 9m + 1$ or $9m + 8$ for some integer m.
95. Consider the number 12^n , where n is a natural number. Check whether there is any value of $n \in N$ for which 12^n ends with the digit zero.

96. Explain why $7 \times 11 \times 13 + 13$ and $7 \times 6 \times 5 \times 4 \times 3 + 5$ are composite numbers.
97. Find the maximum number of students among whom 1001 pens and 910 pencils can be distributed in such a way that each student gets the same number of pens and the same number of pencils.
98. Three measuring rods are 64 cm, 80 cm and 96 cm in length. Find the least length of cloth that can be measured an exact number of times, using any of the rods.

Polynomials

99. Find the zeroes of the quadratic polynomial $4x^2 - 9$ and verify the relation between the zeroes and its coefficients.
100. If α and β are the zeroes of the polynomial $ax^2 + bx + c$. Find the value of
- (i) $\alpha - \beta$
 - (ii) $a^2 + b^2$
101. If α and β are the zeroes of the quadratic polynomial $ax^2 + bx + c$. Find the value of
- (i) $\alpha^2 - \beta^2$
 - (ii) $\alpha^3 + \beta^3$.
102. If α and β are the zeroes of the polynomials $ax^2 + bx + c$ then form the polynomial whose zeroes are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$.
103. Check whether the first polynomial is a factor of the second polynomial by applying the division algorithm. $t^2 - 3; 2t^4 + 3t^3 - 2t^2 - 9t - 12$.
104. Obtain all the zeroes of $3x^4 + 6x^3 - 2x^2 - 10x - 5$, if two of its zeroes are $\sqrt{\frac{5}{3}}$ and $-\sqrt{\frac{5}{3}}$.
105. On dividing $x^3 - 3x^2 + x + 2$ by a polynomial $g(x)$, the quotient and remainder were $x - 2$ and $-2x + 4$, respectively. Find $g(x)$.
106. If the zeroes of polynomial $x^3 - 3x^2 + x + 1$ are $a - b, a, a + b$. Find a and b.
107. If two zeroes of the polynomial $x^4 - 6x^3 - 26x^2 + 138x - 35$ are $2 \pm \sqrt{3}$, find other zeroes.
108. If the polynomial $x^4 - 6x^3 + 16x^2 - 25x + 10$ is divided by another polynomial $x^2 - 2x + k$, the remainder comes out to be $x + a$, find k & a.

Linear Equation in two Variables

109. Solve for x and y :
- $$\frac{ax}{b} - \frac{by}{a} = a + b; ax - by = 2ab$$
110. Solve the following system of linear equations :
- $$2(ax - by) + (a + 4b) = 0$$
- $$2(bx + ay) + (b - 4a) = 0$$

113. Solve, $\frac{2}{x+2y} + \frac{6}{2x-y} = 4$

$$\frac{5}{2(x+2y)} + \frac{1}{3(2x-y)} = 1$$

where, $x+2y \neq 0$ and $2x-2y \neq 0$

114. Solve the following system of equations by cross-multiplications method.

$$a(x+y) + b(x-y) = a^2 - ab + b^2$$

$$a(x+y) - b(x-y) = a^2 + ab + b^2$$

115. For what values of k will the following system of linear equations has no solution.

$$3x + y = 1; (2k-1)x + (k-1)y = 2k+1$$

116. Determine the value of k for each of the following given system of equations having unique/consistent solution.

(i) $2x + 3y - 5 = 0; kx - 6y = 8$

(ii) $2x + ky = 1; 5x - 7y - 5 = 0$

117. Two places A and B are 120 km apart from each other on a highway. One car starts from A and another from B at the same time. If they move in the same direction, they meet in 6 hours and if they move in opposite directions, they meet in 1 hour and 12 minutes. Find the speed of the cars.

118. A boat goes 16 km upstream and 24 km downstream in 6 hours. It can go 12 km upstream and 36 km downstream in the same time. Find the speed of the boat in still water and the speed of the stream.

Trigonometry

119. In a $\triangle ABC$ right angled at C, if $\tan A = \frac{1}{\sqrt{3}}$ and $\tan B = \sqrt{3}$. Show that $\sin A \cos B = \cos A \sin B = 1$.

120. If $x = 30^\circ$, verify that

(i) $\tan 2x = \frac{2 \tan x}{1 - \tan^2 x}$

(ii) $\sin x = \sqrt{\frac{1 - \cos 2x}{2}}$

121. If A, B, C are the interior angles of a triangle ABC,

prove that $\tan \frac{B+C}{2} = \cot \frac{A}{2}$

122. Prove the following identities :

(i) $(\sin \theta + \operatorname{cosec} \theta)^2 + (\cos \theta + \sec \theta)^2 = 7 + \tan^2 \theta + \cot^2 \theta$

(ii) $(\sin \theta + \sec \theta)^2 + (\cos \theta + \operatorname{cosec} \theta)^2 = (1 + \sec \theta \operatorname{cosec} \theta)^2$

(iii) $\sec^4 \theta - \sec^2 \theta = \tan^4 \theta + \tan^2 \theta$

123. Prove the following identities :

(i) $2(\sin^6 \theta + \cos^6 \theta) - 3(\sin^4 \theta + \cos^4 \theta) + 1 = 0$

(ii) $(\sin^8 \theta - \cos^8 \theta) = (\sin^2 \theta - \cos^2 \theta) (1 - 2\sin^2 \theta \cos^2 \theta)$

124. If $(\sec A + \tan A)(\sec B + \tan B)(\sec C + \tan C) = (\sec A - \tan A)(\sec B - \tan B)(\sec C - \tan C)$ prove that each of the side is equal to ± 1 .

125. If $\sec \theta + \tan \theta = p$, show that $\frac{p^2 - 1}{p^2 + 1} = \sin \theta$

126. If $\cos \theta - b \sin \theta = c$, prove that $a \sin \theta + b \cos \theta = \pm \sqrt{a^2 + b^2 - c^2}$

127. If $\sin \theta + \sin 2\theta = 1$, prove that $\cos^2 \theta + \cos^4 \theta = 1$.

128. Prove that $\frac{\sin \theta - \cos \theta + 1}{\sin \theta + \cos \theta - 1} = \frac{1}{\sec \theta - \tan \theta}$, using the identity $\sec^2 \theta = 1 + \tan^2 \theta$.

Similar Triangles

129. Prove that if a line is drawn parallel to one side of a triangle intersecting the other two sides, then it divides the two sides in the same ratio.

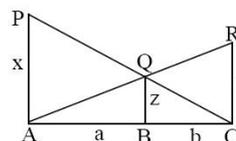
130. Prove that if a line divides any two sides of a triangle in the same ratio, then the line must be parallel to the third side.

131. D and E are points on the sides AB and AC respectively of a $\triangle ABC$ such that $DE \parallel BC$. Find the value of x, when

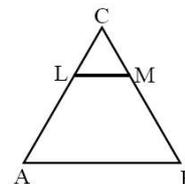
132. Prove that the line segment joining the midpoints of the adjacent sides of a quadrilateral form a parallelogram.

133. In the given figure PA, QB and RC each is perpendicular to AC such that $PA = x, RC = y, QB = z, AB = a$ and $BC = b$.

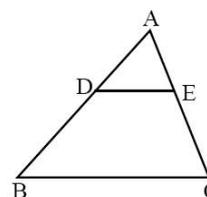
Prove that $\frac{1}{x} + \frac{1}{y} = \frac{1}{z}$.



134. In fig. $LM \parallel AB$. If $AL = x - 3, AC = 2x, BM = x - 2$ and $BC = 2x + 3$, find the value of x.



135. In a given $\triangle ABC$, $D \parallel BC$ and $\frac{AD}{DB} = \frac{3}{4}$.



136. The ratio of the areas of two similar triangles are equal to the ratio of the squares of any two corresponding sides.
137. If $\triangle ABC$ is similar to $\triangle DEF$ such that $\triangle DEF = 64 \text{ cm}^2$, $DE = 5.1 \text{ cm}$ and area of $\triangle ABC = 9 \text{ cm}^2$. Determine the area of AB .
138. In a right angled triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.
139. In a triangle, if the square of one side is equal to the sum of the squares of the other two sides, then the angle opposite to the side is a right angle.
140. In a right triangle ABC right-angled at C , P and Q are the points on the sides CA and CB respectively, which divide these sides in the ratio $2 : 1$. Prove that
 (i) $9 AQ^2 = 9 AC^2 + 4 BC^2$ (ii) $9 BP^2 = 9 BC^2 + 4 AC^2$
 (iii) $9 (AQ^2 + BP^2) = 13 AB^2$

Statistics

141. Write down less than type cumulative frequency and greater than type cumulative frequency.

Height (in cm)	Frequency
140 – 145	10
145 – 150	12
150 – 155	18
155 – 160	35
160 – 165	45
165 – 170	38
170 – 175	22
175 – 180	20

142. Draw ogive for the following frequency distribution by less than method

Marks:	0-10	10-20	20-30	30-40	40-50	50-60
No. of Students	7	10	23	51	6	3

143. The mean of 10 numbers is 20. If 5 is subtracted from every number, what will be the new mean?
144. If the mean of 5 observations is 15 and that of another 10 observations is 20, find the mean of all 15 observations
145. Find the missing frequencies in the following frequency distribution if it is known that the mean of the distribution is 1.46.

Number of accidents (x):	0	1	2	3	4	5	Total
Frequency (f):	46	?	?	25	10	5	200

146. The following data have been arranged in descending orders of magnitude 75, 70, 68, $x + 2$, $x - 2$, 50, 45, 40. If the median of the data is 60, find the value of x .
147. An incomplete frequency distribution is given as follows :

Variable	Frequency
10 – 20	12
20 – 30	30
30 – 40	?
40 – 50	65
50 – 60	?
60 – 70	25
70 – 80	18
Total	229

148. If the value of mode and mean is 60 and 66 respectively, then find the value of median.
149. Mean of 25 observations was found to be 78.4. But later on it was found that 96 was misread 69. Find the correct mean.
150. Find the mode of the data 3, 2, 5, 2, 3, 5, 6, 6, 5, 3, 5, 2, 5.