

# Exam Guidance

**Feb 2015**

## **Highlight's of this booklet :**

- **Covers key concepts, formulae, theorems etc. of all the chapters as per CBSE requirements**
- **Helps students gain confidence and make them ready to face exams**
- **Covers important concepts from an examination perspective. Answers to Numerical problems are provided to help self-evaluation.**

If you have any doubts and need our help. Feel free to contact us at below mentioned address

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## **Capsule — Key Areas for Math's and Science Class X Board Exams**

Dear Student,

The Class X Board Examination is a crucial exam which determines the college you will attend and shapes the career path of your future. You must therefore study hard, concentrate and focus on ways to score well in this life-determining exam.

Last minute revision and cramming is never easy. Our Revision Notes summarise key points of a chapter in an easy to remember format. They provide students with an extra edge and help gain confidence before appearing for their examinations.

The booklet is intended to serve as a ready reckoner prepared by experts which provide a crisp and clear description of all important concepts that form part of the learning objectives of a specific chapter.

They include suitable illustrations, diagrams and images to aid visual memory. Solved examples and problems are added to elucidate concepts.

***Best of luck for your exams, study hard and come out successful.***



## **CAREER BLITZ**

**HELPING YOU IN REALIZING YOUR DREAMS**

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## ADMISSION ANNOUNCEMENT

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## EXAM GUIDANCE

## SCIENCE

## Carbon and its Compounds

## Things to remember

1. Covalent Bonding in carbon
2. Different types of bonding
3. Property of catenation and tetravalency
4. Homologous series and its relationship with physical and chemical properties
5. Different types of functional groups and their naming
6. Different kind of reaction which carbon compounds show and reaction conditions attached with them.
7. Action of soaps and detergents in different conditions.

1. Write chemical equations to represent what happens when:
    - a) Ethanol burns in air.
    - b) Ethanol reacts with sodium metal.
    - c) Ethanol is heated with alkaline  $\text{KMnO}_4$ .
    - d) Ethanol is heated with ethanoic acid in presence of few drops of concentrated sulphuric acid.
    - e) ethanol is heated with excess of concentrated  $\text{H}_2\text{SO}_4$  at 443K
  2. Identify the compounds A to E in the following reaction sequence:-
    - i)  $\text{CH}_3\text{CH}_2\text{OH} \xrightarrow{\text{KMnO}_4/\text{KOH} + \text{dil HCl}}$  A +  $\text{H}_2\text{O}$
    - ii)  $\text{CH}_3\text{CH}_2\text{OH} + \text{A} \xrightarrow{\text{conc. H}_2\text{SO}_4 + \text{Heat}}$  B +  $\text{H}_2\text{O}$
    - iii)  $\text{B} + \text{NaOH} \rightarrow \text{C} + \text{CH}_3\text{CH}_2\text{OH}$
    - iv)  $\text{A} + \text{NaHCO}_3 \rightarrow \text{C} + \text{D} + \text{H}_2\text{O}$
    - v)  $\text{CH}_3\text{CH}_2\text{OH} + \text{E} \rightarrow \text{CH}_3\text{CH}_2\text{ONa} + \text{H}_2$
  3. (a) What are hydrocarbons?  
 (b) Write the structural difference between saturated and unsaturated hydrocarbons.  
 (c) Name the products of combustion of fossil fuels like coal and petroleum. How do they affect our environment
- (d) Write chemical equation to represent each of the following type's reactions of organic substances:  
 i) Esterification    ii) saponification    iii) substitution
4. (a) List two reasons for carbon forming a large number of compounds.  
 (b) Write the chemical equation to represent Hydrogenation of Vegetable Oils.  
 (c) Why are detergents more effective in washing clothes with hard water than soaps?  
 (d) Explain the action of soap in removing an oily spot from a piece of cloth
  5. (a) Name the functional group present in each of the following compounds.  $\text{C}_3\text{H}_7\text{OH}$ ,  $\text{CH}_3\text{-CO-CH}_3$   
 (b) What are isomers? Draw the structures of two isomers of butane  
 (c) What are homologous series of carbon compounds ? Write the molecular formula of two consecutive members of homologous series of aldehydes. State which part of these compounds determines their  
 (i) physical and (ii) chemical properties.
  6. (a) List two medicinal use of ethanol.  
 (b) State the reason why carbon can neither form  $\text{C}^{4+}$  cations nor  $\text{C}^{4-}$  anions, but form covalent compounds. Also state the reasons to explain why covalent compounds:  
 i) are bad conductors of electricity?    ii) have low melting and boiling points?  
 (c) Write the name and general formula of a chain of hydrocarbons in which an addition reaction with hydrogen can take place. Stating the essential conditions required for an addition reaction to occur. Write the chemical equation giving the name of the reactant and the product of such a reaction

# SCIENCE

## Periodic Classification of Elements

### Things to remember

- ◆ Dobereiner's Triads:- atomic mass of middle element was roughly the average atomic mass of other two elements in triads.
- ◆ Newlands Law of Octaves:- properties of every 8th element is similar as that of 1st.
- ◆ Mendeleev's:- properties of elements are periodic function of their atomic masses.
- ◆ Modern periodic table:- properties of elements are periodic function of their atomic number.
- ◆ Down the group:- valency remain same. Atomic size, metallic character increases but electronegativity decreases.
- ◆ Along the period:- valency increases from 1-4 and then decreases from 4-0. atomic size and Metallic character decreases but electronegativity increases.
- ◆ Understanding of why valency, metallic character, atomic size and electronegativity increases is important for future aspect.

1. Make a comparison in tabular form of Dobereiner's Triads, Newlands law of octaves and Mendeleev's periodic table under the following heads.
  - (i) Concept (ii) Achievements (iii) abnormalities
  - (iv) examples for verifying the classification (v) examples of abnormalities.
2. An element X(atomic number 17) reacts with an element Y(atomic number 20) to form a compound.
  - (a) In which group and period of modern periodic table the elements X and Y are present?
  - (b) Classify X and Y as metal(s), non-metal(s) or metalloid(s)
  - (c) What will be the formula of oxide of element Y? identify the nature of the bond between the two elements in the oxide formed.
  - (d) Draw the electron dot structure of the cation and anion formed when X reacts with Y.
3. What are groups and periods in the periodic table? Two elements X and Y belong to group 1 and 2 respectively and are in the same period of the periodic table. How do the following properties of X and Y vary?
  - (i) Size of their atom (ii) Their metallic character
  - (iii) Their valences in forming oxides
  - (iv) Molecular formula of their chlorides
4. An element 'X' placed in 2<sup>nd</sup> group and 4<sup>th</sup> period of the periodic table burns in the presence of oxygen to form a basic oxide.
  - (a) Identify the element. (b) Write its electronic configuration.
  - (c) Write a balanced equation for the reaction when this oxide is dissolved in water.
5. The electronic configuration of an element is 2, 8, 8, 1.
  - (i) State its group number and period number in the modern periodic table.
  - (ii) State whether this element is a metal or a non-metal.

Give reason for the justification of your answer in each case.
6. What is meant by 'group' in the modern periodic table? How do the following change on moving from top to bottom in a group?
  - (i) Number of valence electrons. (ii) Number of occupied shells.
  - (iii) Size of atoms. (iv) Metallic character of elements.
  - (v) Effective nuclear charge experienced by valence electrons.

# SCIENCE

## Light – Reflection and Refraction

### Things to remember

- ◆ Spherical mirrors and terms related to them like focal length, center of curvature, pole and principal axis
- ◆ Laws of reflection:-
  1.  $\angle i = \angle r$
  2. incident, normal and reflected ray all lie on same plane
- ◆ To draw ray diagrams:-
  1. incident ray parallel to principal axis after reflection pass through focus.
  2. incident ray through focus after reflection becomes parallel to principal axis
  3. incident ray through focus bounce back on same path
  4. rays should follow laws of reflection
- ◆ For concave mirror:- object placed anywhere except between P and F will form real and inverted image it means magnification sign is negative
- ◆ For convex mirror:- image formed is always diminished, virtual and erect (means magnification sign is positive)
- ◆ For convex lens:- Object placed anywhere except between optical center and principal focus will form real and inverted image.
- ◆ For concave lens:- image formed is always virtual and erect (means magnification sign is positive)
- ◆ General Sign Convention:-
  1. Distances in direction of incident ray are taken positive and opposite to it is taken negative.
  2. Distance above principal axis is taken positive and below it is taken negative.
- ◆ Formula for mirror:-
 
$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u} \quad m = \frac{h'}{h} = -\frac{v}{u}$$
- ◆ Formula for lens
 
$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \quad m = \frac{h'}{h} = \frac{v}{u}$$
- ◆ Bending of light ray depends upon refractive index which is ratio of speed of light in different medium.  $n_{12} = \frac{v_2}{v_1}$

1. (a) How far should one hold an object from a concave mirror of focal length 40cm so as to get a virtual image twice the size of the object?  
 (b) For a concave mirror draw ray diagram to show the reflected ray in following cases:
  - (i) A ray incident parallel to its principal axis.
  - (ii) A ray passing through its centre of curvature before being incident on mirror.
  - (iii) A ray incident obliquely on pole of mirror .
2. A real image,  $(1/5)^{\text{th}}$  the size of object is formed at a distance of 18cm from mirror. What is the nature of mirror? Calculate its focal length.
3. Draw a ray diagram in each of the following cases to show the formation of image, when the object is placed:
  - (i) between optical centre and principal focus of a convex lens.
  - (ii) Between F and 2F of a concave lens.
  - (iii) At 2F of a convex lens
 What can you say about sign and value of linear magnification ratio in, (i) and (ii) above?
4. (a) Define 1 dioptre of power. Find the focal length of a lens of power -2.0D.  
 (b) Why does a lemon kept in water in a glass tumbler appear to be bigger than its actual size?
5. (a) State the laws of refraction.  
 (b) What is meant by the term absolute refractive index? The speed of light in a transparent medium is 0.6 times that the speed in vacuum. Find refractive index of the medium.  
 (c) How should a ray of light be incident on a rectangular glass slab so that it comes out from the opposite side of the slab without being displaced? Draw a ray diagram to illustrate your answer.
6. (a) One half of a convex lens is covered with a black paper. Will such a lens produce image of the complete object? Support your answer with a ray diagram.  
 (b) An object 5cm high is held 25cm away from a converging lens of focal length 10cm.
  - (i) Draw the ray diagram
  - (ii) calculate the position and size of the image formed
  - (iii) what is the nature of image.
7. (a) A compound lens is made of two lenses in contact having powers +12.5D and -2.5D. Find the focal length and power of the combination.  
 (b) The magnification produced by a mirror is +1. What does this mean?
8. (a) If the image formed by a lens is diminished in size and erect, for all positions of the object, what type of lens is it?  
 (b) Name the point on the lens through which a ray of light passes undeviated.  
 (c) An object is placed perpendicular to the principal axis of a convex lens of focal length 20cm. the distance of the object from the lens is 30cm. find (i) the position (ii) the magnification and (iii) the nature of the image formed.

**Things to remember**

- ◆ Working of human eye and particular functions of its part
  1. retina– light sensitive screen.
  2. cornea– light enters through this thin membrane and most of refraction happens here.
  3. diameter of eyeball is 2.3cm
  4. crystalline lens provides finer adjustment of focal length and the size of crystalline lens is controlled by ciliary muscles
  5. iris control the size of pupil.
  6. pupil regulates the amount of light entering in eye.
- ◆ Change in curvature of eye lens changes its focal length which provides accommodation power
- ◆ Myopia– near sightedness. Far point is nearer than infinity.it is due to excessive curvature of eye lens or elongation of eyeball. Corrected by concave lens.
- ◆ Hypermetropia- far sightedness. Near point recedes back It is due to focal length of eyes is too long or eyeball becomes too small. Corrected by convex lens
- ◆ Presbyopia– near point recedes back due to decrease in power of accommodation of eye lens with ageing.
- ◆ Dispersion– splitting of white light into a band of colours  
Ex– formation of rainbow due to dispersion of light and total internal reflection.
- ◆ Atmospheric refraction– have different refractive indexes due to physical atmospheric conditions which leads to fluctuation  
Ex– twinkling of stars and change in their apparent Position, advance sunrise and delayed sunset.
- ◆ Tyndall effect/scattering of light– colour of the scattered light depends on the size of the scattering particles.to scatter light particle size should be greater than its wavelength. If particle size is large enough, scattered light may appear white.  
Ex– Colour of clear sky is blue.  
Colour of sunrise and sunset.

1. State in brief the functions of following parts of human eye:
  - (a) Iris (b) Cornea (c) Ciliary Muscles (d) Pupil.
2. (a) What is myopia? State two causes of myopia. With the help of a labelled ray diagram show the correction of myopia using appropriate lens.
  - (b) The near point of a hypermetropic eye is 1m. Find the power of the lens required to correct this defect.  
Assume that near point of the normal eye is 25cm.
3. (a) What is meant by dispersion of light?
  - (b) Describe the formation of rainbow in the sky.
  - (c) What is meant by accommodation of eye? Name the part of eye which helps in this phenomenon and state how does it help.
4. Give reasons for the following:
  - (a) Danger signals are red.
  - (b) The sun can be seen about 2 minutes before actual sunrise.
  - (c) We cannot see an object clearly if it is placed very close to eyes.
  - (d) Why does the sun appear reddish clearly in the morning? Explain with a diagram.
  - (e) Why does the sky appears dark instead of blue to astronauts?
5. A person unable to see objects nearer than 50cm. he wants to read a book placed at a distance of 25cm. Name the defect of vision he is suffering from. How can it be corrected? Draw ray diagrams for
  - (i) the defective eye,
  - (ii) its correction using a suitable corrective lens.
 And find out the focal length of the corrective lens.
6. What eye defect is hypermetropia? Describe with a ray diagram how this defect of vision can be corrected by using an appropriate lens.
  7. (a) What is “power of accommodation of the eye”?
  - (b) What happens to the image distance when the object being viewed is moved away from the eye.

# SCIENCE

## How do Organisms Reproduce?

### Things to remember

- ◆ DNA copying is important since it contains information about proteins and if this information changes we have different body design and functions.
- ◆ DNA copying is not identical but its similar to parent which ultimately leads to variation which help in survival of species.
- ◆ Modes of reproduction  
Single organism– aexual
  1. Fission– bacteria, protozoa, Amoeba  
In Lesihmania which cause Kala Azar, fission happens in specific orientation .  
In plasmodium multiple fission occurs
  2. Fragmentation– spirogyra
  3. Regeneration– hydra and Planaria. Whole organism can regenerate from any body part.
  4. Budding– Hydra, a bud develops as out growth
  5. vegetative propagation– Bryaophyllum.
  6. Spore formation– Rhizopus.
- ◆ Sexual reproduction  
Reproductive body cells have only half number of Chromosomes and half amount of DNA which solves the problem of accumulation of DNA in consecutive generation.
- ◆ Reproduction in flowering plants.– pollen grain from anther reaches to stigma and then pollen tube extend upto ovary. Zygote develops into ovule which develops a tough coat and convert into seed.  
Imp– diagrams of longitudinal section of flower, germination Process
- ◆ Reproduction in Human Beings  
Information about male and female reproductive organs and their diagrams and what happens if egg is not fertilized.
- ◆ Bacterial infections– Gonorrhoea and Syphills
- ◆ Viral infections– Warts and HIV-AIDS

1. Write any two differences between binary fission and multiple fission in a tabular form observed in cells of organisms.
2. What will happen when:
  - (a) a mature spirogyra filament attains considerable length?
  - (b) Planaria gets cut into two pieces?
3. Differentiate between:
  - (a) Asexual and sexual reproduction.
  - (b) plumule and radicle.
  - (c) pollination and fertilization.
4. (a) Draw a neat labelled diagram of pistil showing fertilization of pollen on stigma.  
(b) Give the functions of: (i) stigma (ii) ovary  
(c) State in brief the formation of seed in a flower.
5. (a) Draw longitudinal section of a flower and label on it the following:
  - (i) Ovary           (ii) Style
  - (iii) stigma       (iv) anther
 (b) Why is vegetative propagation practised for growing some plants? Give two examples of plants grown by this method
6. (a) Draw a neat diagram of the reproductive system of human female and label on It the following:
  - (i) Reproductive part that produces the female hormone.
  - (ii) Site of fertilization.
  - (iii) Organ where growth and development of the embryo takes place
 (b) How does the growing embryo meet with its nutritional requirements?  
(c) What happens if the ovum is not fertilized?  
(d) Mention a contraceptive method that can be used by the human female.  
(e) What is copper-T? In which part of the reproductive system is it placed?
7. (a) How does reproduction occur in
  - (i) Malarial parasite
  - (ii) Leishmania?
 (b) Make a labelled sketch of the male reproductive system and label on it
  - (i) the part which secretes testosterone,
  - (ii) the duct which delivers the sperm,
  - (iii) the structure which serves as a common passage for sperms and urine
8. (a) Which part of Bryophyllum develops into a new plant?  
(b) List two basic differences between male and female germ cell?  
(c) State two functions performed by testis in human male.
9. (a) With the help of diagram show asexual reproduction in Rhizopus.  
(b) How is this method advantageous for Rhizopus?  
(c) How is mode of reproduction in unicellular organism differ from multicellular organisms?

# SCIENCE

## Heredity and Evolution

### Things to remember

- ◆ Selection of variants by environmental factors forms the basis of evolution.
- ◆ Study of Heredity and variation is known as genetics
- ◆ Characters are governed by factors known as genes.
- ◆ Law of segregation— pair of contrasting factors or genes remains together without being contaminated but when gametes are formed they separate out.
- ◆ Law of independent assortment Genes for each pair of characters assort independently
- ◆ Ratio of monohybrid cross over two generations— 3:1
- ◆ Ratio for dihybrid cross— 9:3:3:1
- ◆ Characters which can be seen through naked eyes are termed as phenotypes while characters at gene level are known as genotypes of that plant.
- ◆ Gene set is not present as a single long thread of DNA but as separate independent pieces each called as chromosome.
- ◆ Sex is not genetically determined Ex— snails can change sex. But in humans its mostly genetically determined.
- ◆ In humans one pair of sex determines the sex of new individual. And crossing result into 50:50 ratio of male and female offspring.
- ◆ Evolution— unrolling or unfolding and base for this process is continuous variations.
- ◆ Variations can be inherited or acquired .
- ◆ Diversity without any adaptation is known as genetic drift.
- ◆ Speciation means emergence of new species due to reproduction barriers which may be changes in DNA or environmental conditions
- ◆ Homologous— similar structure but different function
- ◆ Analogous— same function but different structure
- ◆ Fossils are the remains of remote past
- ◆ Evolution is a stage by stage process but we can't equate it with the progress.

1. Give the respective scientific terms used for studying:-
  - (i) The mechanism by which variation are created and inherited and
  - (ii) the development of new type of organism from the existing ones.
2. In tobacco plant, the male gametes have 24 chromosomes. State the number of chromosomes in
  - (i) egg nucleus,                      (ii) zygote,
  - (iii) endosperm                      (iv) leaf cell.
3. A pea plant with tall plant and violet flowers (TtVv) were crossed to short plant with white flowers (ttvv). Find out the phenotypes and genotypes of offspring obtained as result of this cross.
4. What is the importance of DNA copying in reproduction? Why is variation beneficial to the species but not necessary for the individual? Explain.
5. Give appropriate terms for the following:
  - (a) The trait which can express itself in next generation.
  - (b) The trait an organism have due to inheritance.
  - (c) Origin of a few species from pre-existing one.
6. Briefly explain the role of natural selection and genetic drift in speciation by citing an example.
7. How do proteins control the characteristics that are inherited? Explain with the help of an example.
8. What are sex chromosomes? What role do they play in determining genetically the sex of an individual in human beings?
9. (a) Differentiate between homologous organs and analogous organs.  
(b) Mention any one method to find out the age of fossil.
10. "The chromosome number of the sexually reproducing parents and their offspring is the same." Justify this statement.
11. (a) What are fossils?  
(b) Explain the importance of fossils in evolutionary relationship.
12. A cross was made between pure breeding pea plants, one with round and green seeds and the other with wrinkled and yellow seeds.
  - (a) Write the phenotype of F<sub>1</sub> progeny. Give reason for your answer.
  - (b) Write the different types of F<sub>2</sub> progeny obtained along with their ratio when F<sub>1</sub> progeny was selfed.
13. Differentiate between inherited traits and acquired traits. The traits acquired during lifetime of an individual are not inherited. State reason.

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**Things to remember**

- ◆ The total group of living things and environmental factors present in particular place is called as ecosystem. It means any structural and functional unit of environment that can be identified and studied.
- ◆ Ecosystem can be temporary or permanent which consist biotic and abiotic components
- ◆ Generally biotic complements are of three type: produces, consumers and decomposers.
- ◆ Consumers are of various types: herbivores, carnivores, omnivores, and parasites.
- ◆ The chain of organisms which involves transfer of energy from one trophic level to next trophic level is called as food chain.
- ◆ Producers are able to use only 1% of sunlight that falls their leaves.
- ◆ When energy is transferred from producers to higher trophic levels and average of 10% energy is transferred.
- ◆ The flow of energy in food chain is unidirectional.
- ◆ On moving up the trophic levels chemicals get accumulated and these are non degradable. This phenomenon is known as biological magnification
- ◆ Ozone is a deadly poison which shields earth from UV radiation. Higher energy so UV radiation breaks the oxygen molecule which combine with molecular oxygen and form ozone. synthetic chemicals like CFC are cause of depletion.
- ◆ 3R's(reduce, recycle and reuse)
- ◆ Sustainable development implies change in all aspects of life.
- ◆ Forests are diversity hotspots and many stakeholder depends on these forests. Stakeholder means those who depend of them.
- ◆ Amrita Devi Bishnoi national award for wildlife conservation
- ◆ Chipko Andolan and story of Arabari forests.
- ◆ Dams and other water harvesting techniques implied in India.

1. What will happen if we kill all the organisms in one trophic level?
2. Mention the percentage of the solar energy trapped and utilized by plants.
3. In a certain study conducted on occurrence of DDT along food chains in an ecosystem, the concentration of DDT in grass was found to be 0.5ppm(parts per million), in sheep it was 2ppm and in man it was 10ppm. Why was the concentration of DDT maximum in case of man?
4. "Energy flow in a food chain is unidirectional." Justify this statement. Explain how the pesticides enter a food chain and subsequently get into our body.
5. What is a food chain? State the basic relationship between the different trophic levels of a food chain. Why do all food chains start with plants and have a limited number of trophic levels? Explain in brief.
6. Observe the food chain  
Plant(1000kj)--à goat--à lion  
(a) If autotrophs occupying the first trophic level are called produces what are herbivores called as?  
(b) How much energy does the lion get in the above food chain?
7. What is meant by biological magnification?
8. What will happen if we kill all the organisms in one trophic level?
9. (a) Name the radiation from the sun that are absorbed by ozone layer. Mention one harmful effect caused by them.  
(b) Why did united nations act to control the reproduction of chorofluorocarbons(CFCs) used in refrigerators?
10. State the meaning of "sustainable management". Reuse is better than recycling. How?
11. What is meant by biodiversity? List two advantages of conserving forest and wild life.
12. (a) How did the Chipko movement ultimately benefit the local population?  
(b) List the stake holders in conservation of forests and mention their stakes too
13. State the purpose for which 'khadin' technique is used in Rajasthan. Mention one of its advantage.
14. What are non-renewable resources of energy? Give two examples of such resources.
15. (a) List any four characteristics of a good fuel.  
(b) Give two examples to emphasis the concept of REUSE.

# MATHEMATICS

## Quadratic Equations

### Things to remember

- ◆ A quadratic equation in the variable  $x$  is of the form  $ax^2 + bx + c = 0$ , where  $a, b, c$  are real numbers and  $a \neq 0$
- ◆ A real number  $\alpha$  is said to be a root of the quadratic equation  $ax^2 + bx + c = 0$ , if  $a\alpha^2 + b\alpha + c = 0$ . The zeroes of the quadratic polynomial  $ax^2 + bx + c$  and the roots of the quadratic equation  $ax^2 + bx + c = 0$  are the same.
- ◆ Quadratic formula: The roots of a quadratic equation  $ax^2 + bx + c = 0$  are given by

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Provided  $b^2 - 4ac \geq 0$

- ◆ A quadratic equation  $ax^2 + bx + c = 0$  has
  - two distinct real roots, if  $b^2 - 4ac > 0$ ,
  - two equal roots (i.e., coincident roots), if  $b^2 - 4ac = 0$ , and
  - no real roots, if  $b^2 - 4ac < 0$ .

1. If the roots of the quadratic equation  $2x^2 + 8x + k = 0$  are equal, then the value of  $k$  is
2. If one root of the quadratic equation  $3x^2 - 10x + k = 0$  is reciprocal of the other, then the value of  $k$  is
3. Solve the following quadratic equation for  $x$  :  
 $\sqrt{3}x^2 + 10x - 8\sqrt{3} = 0$
4. If  $-5$  is a root of the quadratic equation  $2x^2 + px - 15 = 0$ , whereas the quadratic equation  $p(x^2 + x) = -k$  has equal roots, find the values of  $p$  and  $k$ .
5. If the quadratic equation  $(1 + m^2)x^2 + 2mcx + c^2 - a^2 = 0$  has equal roots, prove that  $c^2 = a^2(1 + m^2)$ .
6. Solve for  $x$ :  
$$\frac{x-2}{x-3} + \frac{x-4}{x-5} = \frac{10}{3}; x \neq 3, 5$$
7. Find the roots of the quadratic equation  $12abx^2 - (9a^2 - 8b^2)x - 6ab = 0$  in the variable  $x$ .
8. Solve the following for  $x$  :  
$$\frac{1}{2a+b+2x} = \frac{1}{2a} + \frac{1}{b} + \frac{1}{2x}$$
9. If  $1$  is a root of the equation  $ay^2 + ay + 3 = 0$  and  $y^2 + y + b = 0$ , then  $ab$  equals.

10. Solve for  $x$ :  $4x^2 - 4ax + (a^2 - b^2) = 0$

11. If shopkeeper buys some books for Rs. 80. If he had brought 4 more books for the same amount, each book would have cost Rs. 1 less. Find the number of books he bought.

12. In a class of 32 students, each student is either disciplined or hard-working. If two more students were hard-working instead of disciplined, the product of the number of two types of students is 240. Find the number of two types of students if the class has more hard-working students than the disciplined ones. Which of the two given values is more important in personality development of a student? Explain.



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# MATHEMATICS

## Arithmetic Progressions

### Things to remember

- ◆ The general form of an AP is  $a, a+d, a+2d, a+3d, \dots$ .
- ◆ In an AP with first term  $a$  and common difference  $d$ , the  $n$ th term (or the general term) is given by  $a_n = a + (n-1)d$ .
- ◆ The sum of the first  $n$  terms of an AP is given by:

$$S = \frac{n}{2}[2a + (n-1)d]$$

- ◆ If  $l$  is the last terms on the finite AP, say the  $n$ th term, then the sum of all terms of the AP is given by:

$$S = \frac{n}{2}(a + l)$$

- ◆ The  $n$ th term of an AP is the difference of the sum to first  $n$  terms and the sum to first  $(n-1)$  terms of it, i.e.  $a_n = S_n - S_{n-1}$

1. If 5,  $a$ ,  $b$  and 11 are in A.P., the value of  $(a + b)$  is \_\_\_\_\_.
2. The common difference of the  $\frac{1}{p}, \frac{1-p}{p}, \frac{1-2p}{p}, \dots$  AP is \_\_\_\_\_.
3. The sum of the first  $n$  terms of an A.P. is  $5n - n^2$ . Find the  $n$ th term of this A.P.
4. Show that the sequence whose  $n$ th term is,  $a_n = 7n - 9$  an AP and hence find its 9th term.
5. The sum of the first seven terms of an AP is 182. If its 4th and the 17th terms are in the ratio 1: 5, find the AP.
6. How many terms of the A.P. 48, 42, 36, ... be taken so that the sum is 216? Explain the double answer.
7. Find the number of terms of the AP  $15\frac{1}{2}, 13, \dots, -49\frac{1}{2}$  and find the sum of all its terms.
8. Divide 32 into four parts which are the four terms of an A.P, such that the product of the first and the fourth terms is to the product of the second and the third terms as 7: 15.
9. In an AP of 50 terms, the sum of first 10 terms is 210 and the sum of its last 15 terms is 2565. Find the AP.
10. Prove that the  $n$ th term of an AP cannot be  $n^2 + 1$ . Justify your answer.

11. 150 workers were engaged to finish a piece of work in a certain number of days. Four workers dropped the second day, four more workers dropped the third day and so on. It took 8 more days to finish the work. Then find the number of days in which the work was completed.
12. If  $S_n$  denotes the sum of the first  $n$  terms of an A.P., prove that  $S_{30} = 3(S_{20} - S_{10})$ .
13. Find the sum of the two middle most terms of the AP  $-\frac{4}{3}, -1, -\frac{2}{3}, \dots, 4\frac{1}{3}$
14. The 6th term of an AP is 0. Prove that its 21st term is triple its 11th term.
15. In a school, students decided to plant trees in and around the school to reduce air pollution. It was decided that the number of trees, that each section of each class will plant, will be double of the class in which they are studying. If there are 1 to 12 classes in the school and each class has two sections, find how many trees were planted by the students. Which value is shown in this question?

EVERY CHAMPION WAS  
ONCE A CONTENDER THAT  
REFUSED TO GIVE UP

JOIN CAREER BLITZ  
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# MATHEMATICS

## Coordinate Geometry

### Things to remember

- The distance between  $P(x_1, y_1)$  and  $Q(x_2, y_2)$  is

$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

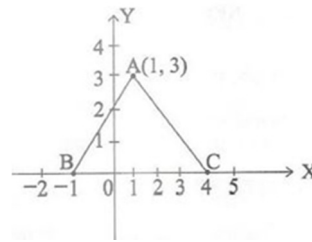
- The coordinates of the point  $P(x, y)$  which divides the line segment joining the points  $A(x_1, y_1)$  and  $B(x_2, y_2)$  internally in the ratio  $m_1 : m_2$  are

$$\left( \frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2} \right)$$

- The area of the triangle formed by the points  $(x_1, y_1)$ ,  $(x_2, y_2)$  and  $(x_3, y_3)$  is the numerical value of the expression

$$\frac{1}{2} [x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$$

1. In fig., the area of triangle ABC (in sq. units) is : \_\_\_\_\_.



2. The distance of the point  $(-3, 4)$  from the x-axis is \_\_\_\_\_.
3. If the points  $A(-2, 1)$ ,  $B(a, b)$  and  $C(4, -1)$  are collinear and  $a - b = 1$ , find the values of 'a' and 'b'.
4. Prove that the points  $(7, 10)$ ,  $(-2, 5)$  and  $(3, -4)$  are the vertices of an isosceles right triangle.
5. A point P divides the line segment joining the points  $A(3, -5)$  and  $B(-4, 8)$  such that  $\frac{AP}{PB} = \frac{K}{1}$ . If P lies on the line  $x + y = 0$ , then find the value of K.
6. For what value of k, ( $k > 0$ ), is the area of the triangle with vertices  $(-2, 5)$ ,  $(k, -4)$  and  $(2k+1, 10)$  equal to 53 sq. units?
7. Find the coordinates of the centroid of a triangle, whose vertices are  $A(2\sqrt{5}, \sqrt{2})$ ,  $B(5\sqrt{5}, \sqrt{8})$  and  $C(\sqrt{125}, -2\sqrt{2})$ .

8. If the point  $P(x, y)$  is equidistant from the points  $A(a+b, b-a)$  and  $B(a-b, a+b)$ , then prove that  $bx = ay$ .
9. If  $(3, 2)$  and  $(-3, 2)$  are two vertices of an equilateral triangle which contains the origin, find the third vertex.
10. Find the area of  $\Delta ABC$  with vertices  $A(0, -1)$ ,  $B(2, 1)$  and  $C(0, 3)$ . Also find the area of the triangle formed by joining their mid-points. Show that the ratio of the areas of the two triangles is 4 : 1.
11. Point A, B and C are collinear, taken in that order, such that the coordinates of A, B, C are  $(-3, 10)$ ,  $(-1, 6)$  and  $(6, -8)$  respectively. Find the ratio of AB:BC and verify that  $AB + BC = CA$ .

# MATHEMATICS

## Heights and Distances

### Things to remember

- ◆ The **line of sight** is the line drawn from the eye of an observer to the point in the object viewed by the observer.
- ◆ The **angle of elevation** of an object viewed, is the angle formed by the line of sight with the horizontal when it is above the horizontal level, i.e., the case when we raise our head to look at the object.
- ◆ The **angle of depression** of an object viewed, is the angle formed by the line of sight with the horizontal when it is below the horizontal level, i.e., the case when we lower our head to look at the object.

1. The angle of elevation of the top of a building from the foot of the tower is  $30^\circ$  and the angle of elevation of the top of the tower from the foot of the building is  $60^\circ$ . If the tower is 50 m high, find the height of the building.
  2. Observed from the top of a 75 m high lighthouse (from sea level), the angles of depression of two ships are  $30^\circ$  and  $45^\circ$ . If one ship is exactly behind the other on the same side of the lighthouse, find the distance between the two ships.  
[Use  $\sqrt{3} = 1.73$ ]
  3. From a point on the ground, the angle of elevation of an aeroplane is  $60^\circ$ . After a flight of 15 seconds, it becomes  $30^\circ$ . If the aeroplane is flying at a constant height of  $1200\sqrt{3}$  m, then find the speed of the aeroplane in km/hour.
  4. The angle of elevation of a cloud from a point 60 m above a lake, is  $30^\circ$  and the angle of depression of the reflection of the cloud in the lake is  $60^\circ$ . Find the height of the cloud above the lake.
  5. The angle of elevation of the top of a tower at a distance of 120 m from a point A on the ground is  $45^\circ$ . If the angle of elevation of the top of a flagstaff fixed at the top of the tower, at A is  $60^\circ$ , then find the height of the flagstaff.  
[Use  $\sqrt{3} = 1.73$ ]
6. The angle of elevation of the top of a chimney from the foot of a tower is  $60^\circ$  and the angle of depression of the foot of the chimney from the top of the tower is  $30^\circ$ . If the height of the tower is 40 m, find the height of the chimney. According to pollution control norms, the minimum height of a smoke emitting chimney should be 100 m. State if the height of the above mentioned chimney meets the pollution norms. What value is discussed in this question?
  7. A man on a cliff observes a boat at an angle of depression of  $30^\circ$  which is approaching the shore to the point immediately beneath the observer with a uniform speed. Six minutes later the angle of depression of the boat is found to be  $60^\circ$ . Find the total time taken by the boat to reach the shore.
  8. The angle of elevation of the top of a building from the foot of the tower is  $30^\circ$  and the angle of elevation of the top of the tower from the foot of the building is  $60^\circ$ . If the tower is 60m high, find the height of the building.
  9. The angle of elevation and depression of the top and the bottom of a tower from the top of a building, 60m high, are  $30^\circ$  and  $60^\circ$  respectively. Find the difference between the heights of the building and the tower and the distance between them.
  10. The angle of depression from the top of a tower of a point A on the ground is  $30^\circ$ . On moving a distance of 20m from the point A towards the foot of the tower to a point B, the angle of elevation of the top of the tower from the point B is  $60^\circ$ . Find the height of the tower and its distance from the point A.

# MATHEMATICS

## Circles and construction

### Things to remember

- ◆ The tangent to a circle is perpendicular to the radius through the point of contact.
- ◆ The lengths of the two tangents from an external point to a circle are equal.

1. In fig 1, QR is a common tangent to the given circles, touching externally at the point T. the tangent at T meets QR at P. if  $PT=3.8$  cm, then the length of QR (in cm) is:
2. In fig.2, PA and PB are two tangents drawn from an external point P to a circle with centre C and radius 4cm. If  $PA \perp PB$ , then the length of each tangent is:
3. In fig.3, AP, AQ and BC are tangents to the circle. If  $AB=5$  cm,  $AC=6$  cm and  $BC=4$  cm, then the length of AP (in cm) is.
4. In Fig. 4, common tangents AB and CD to the two circles with centres  $O_1$  and  $O_2$  intersect at E. Prove that  $AB = CD$
5. In fig.5, if  $\angle AOD=135^\circ$ , then  $\angle BOC$  is equal to
6. Tangents PA and PB are drawn from an external point P to two concentric circles with centre O and radii 8cm and 5cm respectively, as shown in fig. 6 if  $AP=15$ cm, then find the Length of BP.
7. In fig.7, a right triangle ABC, circumscribes a circle of radius r. If AB and BC are of lengths 8cm and 6cm respectively, find the value of r.
8. In fig.8, the radii of two concentric circles are 13 cm and 8 cm. AB is a diameter of the bigger circle and BD is a tangent to the smaller circle touching it at D. Find the length of AD.

9. In fig.9, XY and  $X'Y'$  are two parallel tangents to a circle with centre O and another tangent AB with point of contact C intersecting XY at A and  $X'Y'$  at B. Prove that  $\angle AOB = 90^\circ$ .
10. In fig.10, PQ is a chord of length 16 cm, of a circle of radius 10 cm. The tangents at P and Q intersect at a point T. Find the length of TP.

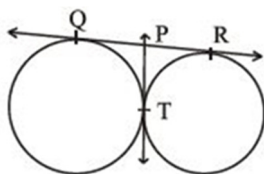


Fig. 1

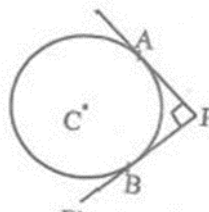


Fig. 2

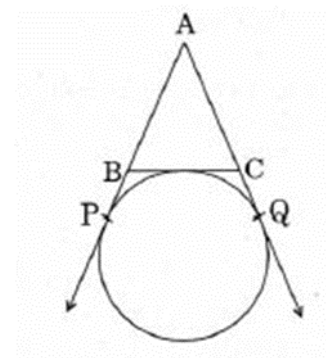


Fig. 3

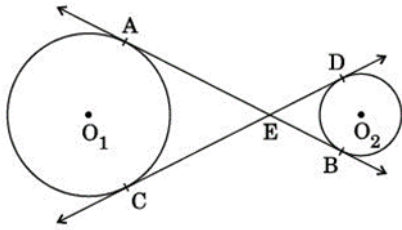


Fig. 4

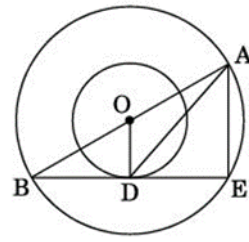


Fig. 8

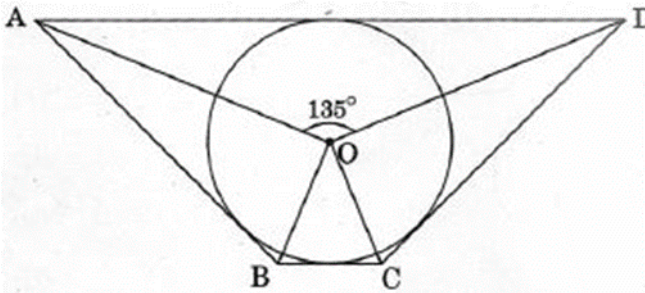


Fig. 5

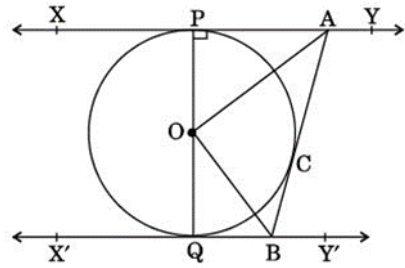


Fig. 9

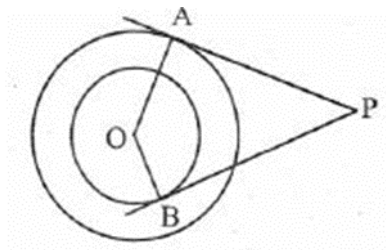


Fig. 6

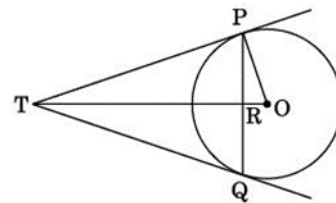


Fig. 10

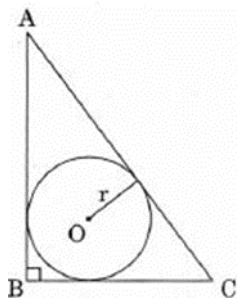


Fig. 7



# MATHEMATICS

## Things to remember

- ◆ Circumference of a circle =  $2\pi r$ .
- ◆ Area of a circle =  $\pi r^2$
- ◆ Length of an arc of a sector of a circle with radius  $r$  and angle with degree measure  $\theta$  is
 
$$\left(\frac{\theta}{360}\right) * 2\pi r$$
- ◆ Area of a sector of a circle with radius  $r$  and angle with degrees measure  $\theta$  is
 
$$\left(\frac{\theta}{360}\right) * \pi r^2$$
- ◆ Area of segment of a circle  
= Area of the corresponding sector – Area of the corresponding triangle
- ◆ Volume of a frustum of a cone
 
$$\frac{1}{3} \pi h (r_1^2 + r_2^2 + r_1 r_2)$$
- ◆ Curved surface area of a frustum of a cone
 
$$\pi l (r_1 + r_2)$$
 Where  $l$  is  $l = \sqrt{h^2 + (r_1 - r_2)^2}$

## Area Related to Circles and Mensuration

1. In fig 1, three sectors of a circle of radius 7cm, making angles of  $60^\circ$ ,  $80^\circ$ ,  $40^\circ$  at the centre are shaded. The area of the Shaded region (in  $\text{cm}^2$ ) is.
2. Two circular pieces of equal radii and maximum area, touch each other are cut from a rectangular card board of dimensions  $14\text{cm} \times 7\text{cm}$ . Find the area of the remaining card board. [use  $\pi = 22/7$ ]
3. A wire is bent to form a square enclosing an area of  $484 \text{ m}^2$ . Using the same wire, a circle is formed. Find the area enclosed by the circle. [Use  $\pi = 22/7$ ]
4. The rain water from a roof of  $44 \text{ m} \times 20 \text{ m}$  drains into a cylindrical tank having diameter of base 4 m and height 3.5 m. If the tank is just full, find the rainfall in cm. [Take  $\pi = 22/7$ ]
5. A solid metallic right circular cone 20 cm high and whose vertical angle is  $60^\circ$ , is cut into two parts at the middle of its height by a plane parallel to its base. If the frustum so obtained be drawn into a wire of diameter  $1/16 \text{ cm}$ , find the length of the wire.
6. A farmer connects a pipe of internal diameter 20 cm from a canal into a cylindrical tank which is 10m in diameter and 2 m deep. If the water flows through the pipe at the rate of 3 km/h, in how much time will the tank be filled completely?

7. Water in a canal, 6 m wide and 1.5 m deep, is flowing at a speed of 4 km/h. How much area will it irrigate in 10 minutes, if 8 cm of standing water is needed for irrigation ?
8. In fig 2, AB and CD are two diameters of a circle with centre O, which are perpendicular to each other. OB is the diameter of the smaller circle. If  $OA=7\text{cm}$ , find the area of the shaded region. [use  $\pi = 22/7$ ]
9. A housing society used to collect rain water from the roof of its building  $22\text{m} \times 20\text{m}$  to a cylindrical vessel having diameter of base 2m and height 3.5m and then pump this water into the main tank so that all members can use it. On a particular day the rain water collected from the roof just filled the cylindrical vessel. Then find the rainfall in cm.
10. In fig 3, ABCD is a field in the shape of a trapezium, AD parallel to BC,  $\angle ABC=90^\circ$  and  $\angle ADC=60^\circ$ . Four sectors are formed with centres A,B,C and d as shown in figure. The radii of each sector is 14 m, Find the following. (a) total area of the four sectors.  
(b) area of the remaining portion, given that  $AD=55 \text{ m}$ ,  $BC=45 \text{ m}$  and  $BA=30 \text{ m}$ .



Fig. 1

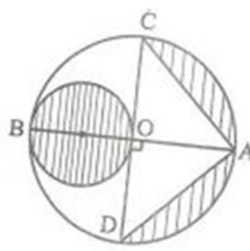


Fig. 2

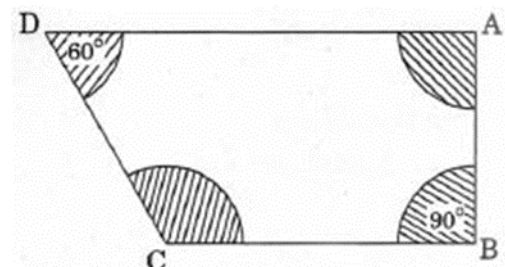


Fig. 3



# MATHEMATICS

## Probability

### Things to remember

- ◆ The theoretical (classical) probability of an event  $E$ , written as  $P(E)$ , is defined as 
$$P(E) = \frac{\text{Number of outcomes favourable to } E}{\text{Number of all possible outcomes of the experiment}}$$
 where we assume that the outcomes of the experiment are equally likely.
- ◆ The probability of a sure event (or certain event) is 1.
- ◆ The probability of an impossible event is 0.
- ◆ The probability of an event  $E$  is a number  $P(E)$  such that:  $0 \leq P(E) \leq 1$
- ◆ An event having only one outcome is called an elementary event. The sum of the probabilities of all the elementary events of an experiment is 1.

1. If two different dice are rolled together, the probability of getting an even number on both dice is.
2. If  $P(A)$  denotes the probability of an event  $A$ , then
 

(a) $P(A) < 0$	(b) $P(A) > 1$
(c) $0 \leq P(A) \leq 1$	(d) $-1 \leq P(A) \leq 1$
3. If an event occurs surely, then its probability is.
4. Two dice are thrown simultaneously. The probability of getting a sum at most four on the two dice is.
5. Two dice are thrown together. Find the probability that a multiple of 2 occurs on one dice and a multiple of 3 occurs on the other.
6. All the red face cards are removed from a pack of 52 playing cards. A card is drawn at random from the remaining cards, after reshuffling them. Find the probability that the drawn card is
 

(i) of red colour	(ii) a queen
(iii) an ace	(iv) a face card
7. A group consists of 12 persons, of which 3 are extremely patient, other 6 are extremely honest and rest are extremely kind. A person from the group is selected at random. Assuming that each person is equally likely to be selected, find the probability of selecting a person who is:
 

(i) Extremely patient	(ii) extremely kind or honest.
-----------------------	--------------------------------

 Which of the above values you prefer more.
8. Five cards – the ten, jack, queen, king and ace of diamonds, are well shuffled with their faces downwards. One card is then picked up at random.
 

(a) What is the probability that the drawn card is the queen?	(b) If the queen is drawn and put aside, and a second card is drawn, Find the probability that the second card is (i) an ace (ii) a queen.
---	--
9. A piggy bank contains hundred 50 p coins, fifty Rs 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, find the probability that the coin which fell:
 

(i) will be a 50 p coin.	(ii) will be of value more than Rs 1.
(iii) will be of value less than Rs 5.	(iv) will be a Rs 1 or Rs 2 coin
10. A pair of dice is thrown once. Find the probability that
 

(i) both have the same number (doublet)	(ii) a doublet of prime number
(iii) a doublet of odd number	(iv) a multiple of 3 as sum

## ANSWERS FOR NUMERICAL PROBLEM

## Periodic Classification of Elements

Que. No.	2		4	5
Answer	(A) X— G17, P3 Y—G2, P4	(B) X— Non Metal Y— Metal	(A) Calcium (B) 2,8,8,2	(A) G1, P4 (B) Metal

## Light – Reflection and Refraction

Que. No.	1	2	4	6	7	8
Answer	(A) 20 cm	15 cm	(A) 50 cm	(B) (ii)- V=16.6cm h'=3.3cm	P=10D F=10cm	(C) V=60cm m =- 2

## The Human Eye and the Colourful World

Que. No.	2	5
Answer	(B) 3 D	50cm

## Heredity and Evolution

Que. No.	2
Answer	(i) 24 (ii) 48 (iii) 72 (iv) 48

## Quadratic Equations

Q. No.	1	2	3	4	6	7	8	9	10	11	12
Ans	8	3	$-4\sqrt{3}$ , $2\sqrt{3}/3$	P=7 K=7/4	6, 7/2	$3a/4b$ , $-2b/3a$	$-b/2$ , $-a$	3	$a \mp b/2$	16	D=14 HW=18

## Arithmetic Progression

Q. No.	1	2	3	4	5	6	7	8	9	11	13	15
Ans	16	-1	$6-2n$	54	2,10,18,26	8 or 9	n=28 Sum= -441, -	2,6,10,14	3,7,11,15	25	3	312

## Coordinate Geometry

Q. No.	1	2	3	5	6	7	9	10	11
Ans	7.5 sq units	4 units	a=1, b=0	1/2	3	$4\sqrt{5}$ , $\sqrt{2}/3$ -	0, $2-3\sqrt{3}$	4 sq units, 1 sq unit	2 : 7

**ANSWERS FOR NUMERICAL PROBLEM****Heights and Distances**

Q. No.	1	2	3	4	5	6	7	8	9	10
Ans	50/3m	54.75m	576 km/h	120 m	87.6 m	120 m, yes	9 min	20 m	20 m, $20\sqrt{3}$ m	$10\sqrt{3}$ m, 30 m

**Circles and construction**

Q. No.	1	2	3	5	6	7	8	10
Ans	7.6 cm	4 cm	7.5 cm	$45^\circ$	$\sqrt{264}$ cm	2 cm	19 cm	$40/3$ cm

**Area Related to Circles and Menstruation**

Q. No.	1	2	3	4	5	6	7	8	9	10
Ans	$77 \text{ cm}^2$	$21 \text{ cm}^2$	$616 \text{ cm}^2$	5 cm	7964.4 m	100 min	$75000 \text{ m}^2$	$66.5 \text{ cm}^2$	2.5 cm	$616 \text{ m}^2$ , $884 \text{ m}^2$

**Probability**

Q. No.	1	2	3	4	5	6	7	8	9	10
Ans	$1/4$	C	1	$1/6$	$11/36$	$10/23, 1/23, 2/23, 3/23$	$1/4, 3/4$	$1/5, 1/4,$ 0	$10/18, 3/18, 17/18, 7/18$	$1/6, 1/12, 1/12,$ $1/3$

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