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OB - 55 Isb.

QNo 2: a - Discuss different parts of eye. How far-sightedness and short-sightedness can be corrected?

## INTRODUCTION

Human eye is a delicate organ. It is the most sensitive part of the body. It performs vital function of vision. Eye has two types of parts. Internal parts, which are not visible and external parts which are visible externally. Short-sightedness and far-sightedness are abnormalities concerned with vision and can be corrected by using concave and convex lens and other methods.

### External parts of Eye:

External parts of eye includes the parts which are visible externally.

1) **Sclera:** Sclera is the outer white portion of the eye. It is made up of many connective tissues. Its function is to protect the inner parts of the eye.

2) **Conjunctiva:** Conjunctiva is the lining of

the sclera. It is made up of epithelial cells. It keeps the eye moist and clear. It lubricates the eye by producing mucus and tears.

**3) Cornea:** Cornea is the transparent anterior part of the eye which covers the lens and Iris. It is responsible for refraction of light along with lens.

**4) Iris:** It is the pigmented, coloured part of human eye, which is visible externally. It is mainly responsible to maintain the diameter of pupil according to the light source.

**5) Pupil:** It is a small aperture in the center of Iris. It is responsible to enter light into the eye to focus on retina to get visual perception from the brain.

### External parts of Eye

**1) Lens:** It is transparent, biconvex lens of eye. Its main function is to refract the light onto the retina.

**2) Retina:** Retina is the innermost layer of the eye. Three layers of cells are present on retina - The ganglion, Bipolar and photo-receptor cells. It converts the image into electrical impulses so that the image can be visually perceived by Brain.

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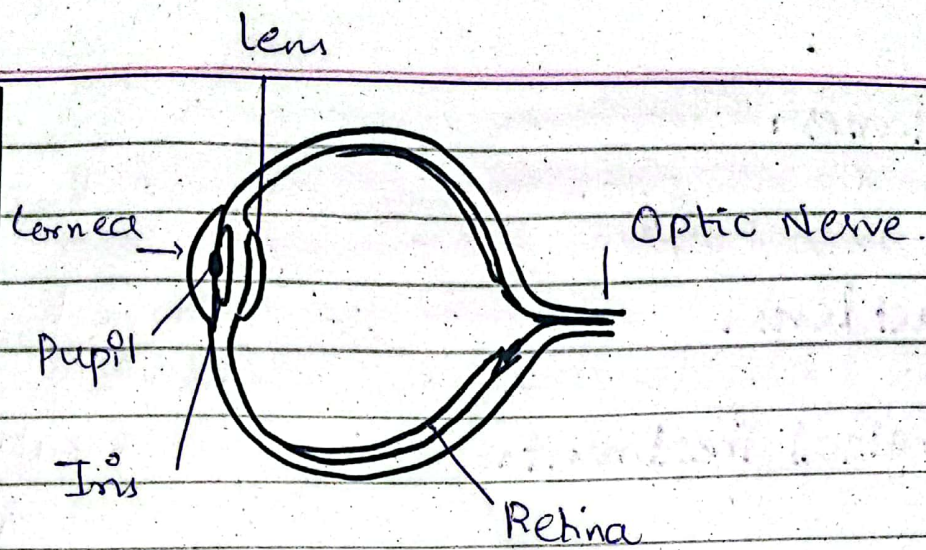
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## Far-Sightedness (Hyperopia)

Far-sightedness is a condition where near vision of a person is affected. It can be corrected by:

**i) Glasses:** Eyeglasses containing convex lens can be used to correct hyperopia.

They help to focus light on to the retina.

**ii) Optical lens:** Specialized optical lens can also fix the problem by enhancing the focus of light onto the retina.

**iii) Surgical Treatment:** Surgical treatments such as LASIK, or implanted lens can also fix the problem.

## Short-Sightedness (Myopia)

Short-sightedness is also called myopia.

It is the condition which impact the far vision of a person. It can be fixed by

(i) **Eyeglasses**: Eyeglasses containing concave lens can fix the problem. They diverge the light before it enters into the eye.

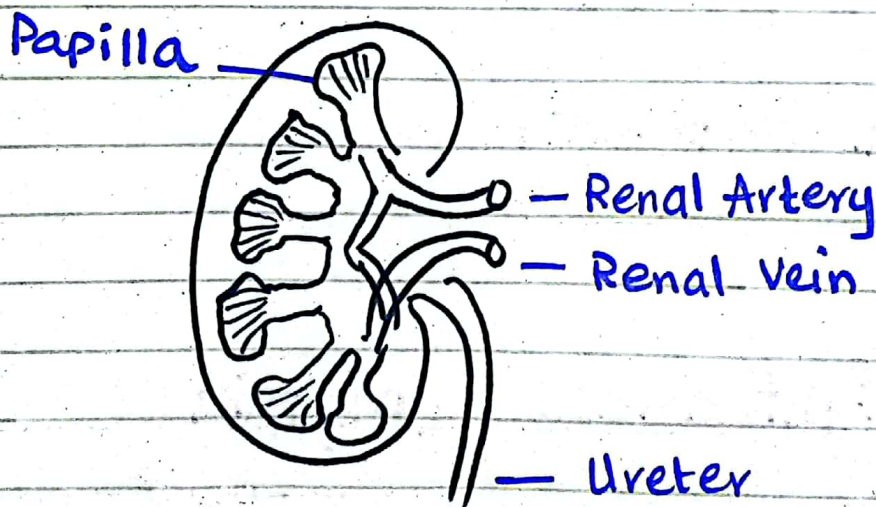
(ii) **Contact lens**: Use of specially designed contact lens can also fix the problem.

(iii) **Surgical Treatment**: Surgical treatments such as LASIK and implantable lens can be used to resolve this condition.

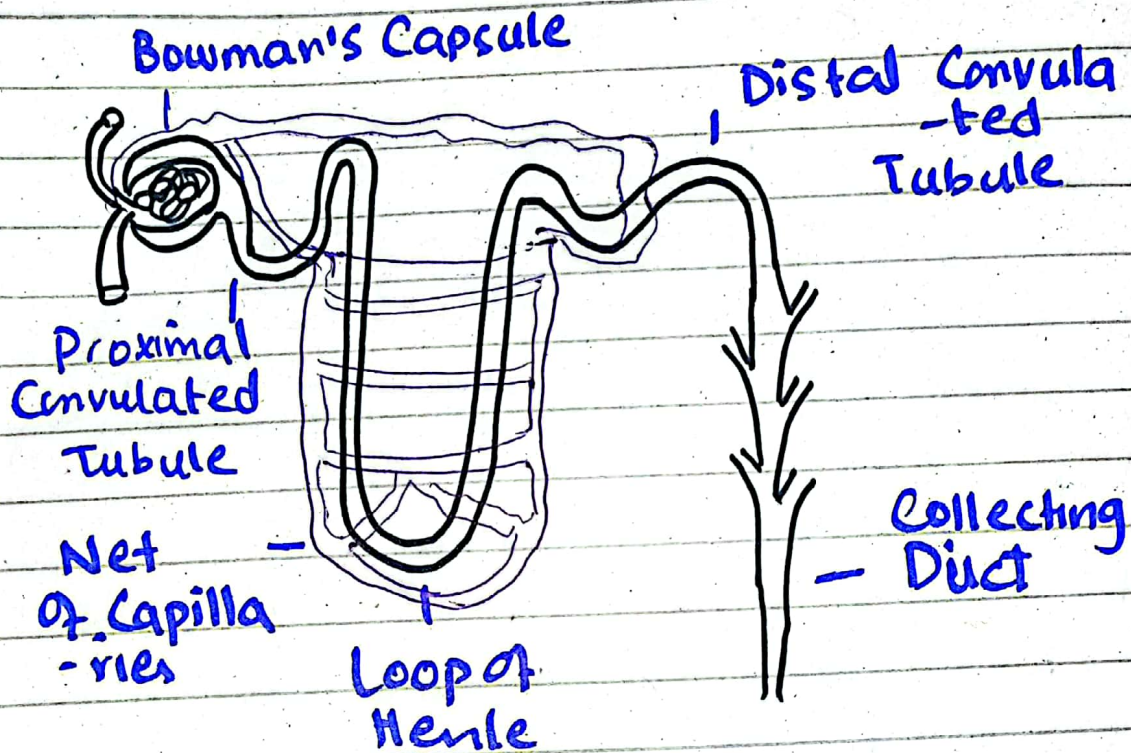
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**Q No 2 b: How a kidney works. Explain with diagram**

**KIDNEY**: kidney is the vital organ of body. It purifies the blood from all kinds of wastes and toxins and help survive a human throughout his life.



## Nephron; the functional Unit of Kidney



### Functioning of Kidney:

Renal artery brings a large amount of blood from the heart to the kidney for filtration. The kidney purifies the blood by a billion number of nephrons. Nephrons are functional unit of kidney. The blood enters the Nephron through afferent arteriole reaches the Bowman's capsule where all the minerals and other materials like sugar etc. which

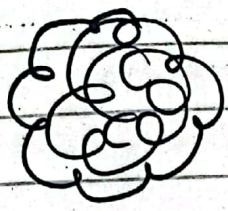
are not meant to be excreted in urine are reabsorbed in the blood. The blood moves forwards in proximal convoluted tubule and loop of henle where again the excess water and salts like NaCl are reabsorbed and further the blood moves throughout this structure in small capillaries and all the wastes are absorbed in the nephron and finally reach the collecting duct. All the collecting ducts empty into the ureters from where they reach bladder and finally out of the body through urethra.

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## QNO2C: How Black Holes are formed?

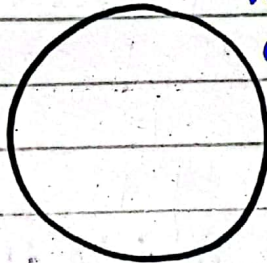
**Black Hole:** Black hole is a region in the space from where, nothing, not even light, can escape. It is formed as a result of gravitational collapse of massive stars, which collapse and form extremely dense core known as singularity, which have event-horizon around it which do not allow anything to escape from it.

## Steps involved in formation of a Black Hole:

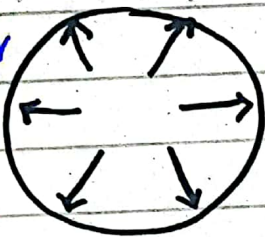


Nebula

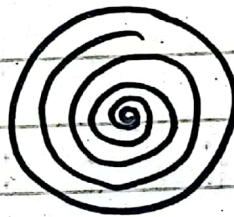
Formation of massive Star



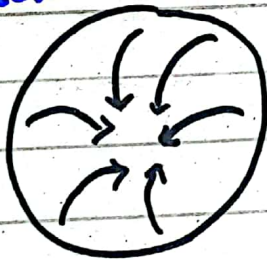
Nuclear Fusion



Depletion of Nuclear Fuel



Collapse of Star



Super Nova



Event Horizon



Black Hole



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**1. Formation of massive star:** Super massive stars form the dense black holes when they collapse due to their own gravitational pull. Black holes are formed from the remnants of giant stars which are hundreds of times larger than the sun.

**2. Fusion inside the giant stars; Nuclear Fusion:** Throughout their life span giant stars keep converting hydrogen into heavy metals through the process of fusion. The energy formed in this process counteracts the gravitational pull of the center of star and balance both forces.

**3. Depletion of Nuclear Fuel:** Ultimately, the fuel of the star ends and the process of fusion ceases. It creates an imbalance between the outward energy and the inward gravitational pull.

**4. Collapse of Star:** The surrounding of star and the heavy metals starts collapsing inside the gravitational pull.

**5. Super Nova:** Sudden collapse of such heavy matter cause a super nova. The outer parts of the star disperse in the space while the inner part compress in core.

**6. Formation of Singularity:** The core of



the star becomes so dense that it converts all the matter into singularity - The single point of extreme density and zero volume from which nothing can escape.

**7- Event Horizon:** The Singularity point creates a boundary around itself from where return is impossible. Anything which crosses this boundary cannot escape from it.

**8- Black Hole:** The region inside the event horizon is the mysterious Black Hole, never allowing anything to escape from its gravitational pull.

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**Q No 2 d:** What are isotopes, isobars, and isotones? Give examples of isotopes of Hydrogen?

**ISOTOPES:** Isotopes are the atoms of a single element having same atomic number, count of proton, but different mass number, sum of neutron and proton.

**Example:** Hydrogen have three isotopes, Protium, Deuterium and Tritium - Having same atomic number '1' but different mass numbers '1', '2', '3'.

**ISOBARS:** Isobars are the atoms of different

1.

elements having same mass number but different atomic number.

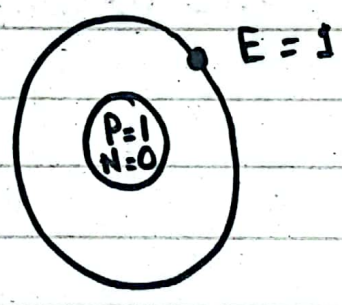
**Example:** Argon and calcium have same mass number 40 but different atomic number 18 and 20.

**ISOTONES:** Isotones are the atoms of different elements having same number of neutrons but different mass number and atomic number.

**Example:** Silicon and phosphorus have same ~~mass~~ neutrons 16 but different mass numbers 30, 31 and different atomic numbers 14, 15.

## ISOTOPES OF HYDROGEN

**Protium**



No of proton = 1

No of Neutron = 0

Atomic number = No. of proton = 1

mass Number = Sum of proton + Neutron = 1

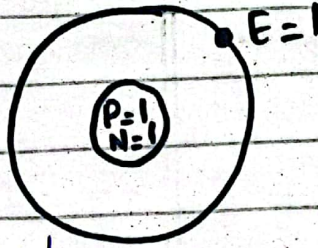
## Deuterium

Number of  
proton = 1

Number of Neutron = 1

Atomic number = 1

mass number = 2



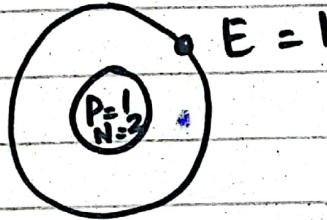
## Tritium :

Protons = 1

Neutrons = 2

Atomic number = 1

mass number = 3



**Q NO 3 a: Distinguish between RAM and ROM. Also define Nibble and USB.**

### RAM

- Ram stands for Random Access memory -
- It is a volatile memory -
- It only retains

### ROM

- Rom stands for Read Only memory.
- Rom is a non-volatile memory which retains

the data only when the power supply is connected. It loses the data if the power supply is cut.

- It stores the data for a temporary period of time.

- It is costlier as compared to ROM.

- It allows read, write and modify the data.

- It has large space and more capacity and is larger in size.

- It is used in CPU cache and primary memory.

- It is very fast and requires a lot of power.

the data whether the power is connected or not. It does not lose data after disconnecting power supply.

- It stores data permanently -

- It is a cheaper storage than RAM.

- It only allows to read the data. So, it is read only memory.

- It has less space and capacity and is smaller in size.

- It is used in firmware and microcontrollers.

- It is fast but requires very low power.

**Nibble:** In computing or IT technology, nibble is four consecutive binary digits or half of a 8-bit byte. While referring to byte, it is either the first four digits or the last four consecutive binary digits.

**Example:** In a byte of 10100110, the first nibble is 1010 and the second nibble is 0110.

## USB : Universal Serial Bus:

USB is called Universal Serial Bus. It is a standard to connect devices to a computer.

It is a hardware interface that can connect upto 127 peripheral devices to a computer, including keyboard, mouse, printer etc.

USB provides plug and play functionality. It is also used in charging of devices like mobiles and tablets.

**Example:** USB A, USB B, USB C and Micro USBs.

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## Q No 3 b: How AI has revolutionized the world? Justify.

Artificial Intelligence (AI) has revolutionized the world in numerous ways. It has transformed the industries like healthcare, Finance and transportation through automation, predictive analytics and improved decision making. It has also improved the personalized recommendations in entertainment, shopping, enhanced cyber security, and has also transformed the way people interact with technology.

### Examples:

**Healthcare:** AI aids and assists in diagnosing diseases more accurately and quickly. It aids in personalized treatment plans. Analyzes a vast medical data to predict outbreaks.

**Finance:** It aids in trade through optimization algorithms, detect frauds, and also provides personalized financial advices to the individuals.

**Transportation:** Auto-driving cars and automated systems has transformed the system of transportation. It provides more safety and efficiency through the GPS systems.

**Cyber-Security:** It is used to enhance cyber-security by detecting and responding to cyber threats through observing the patterns in the network and behaviours. It enhances the digital security measures.

**Education:** AI-powered platforms like ChatGPT and many more facilitate the personalized learning. It plays a vital role in online learning through Zoom. It eases the content gathering process for the students.

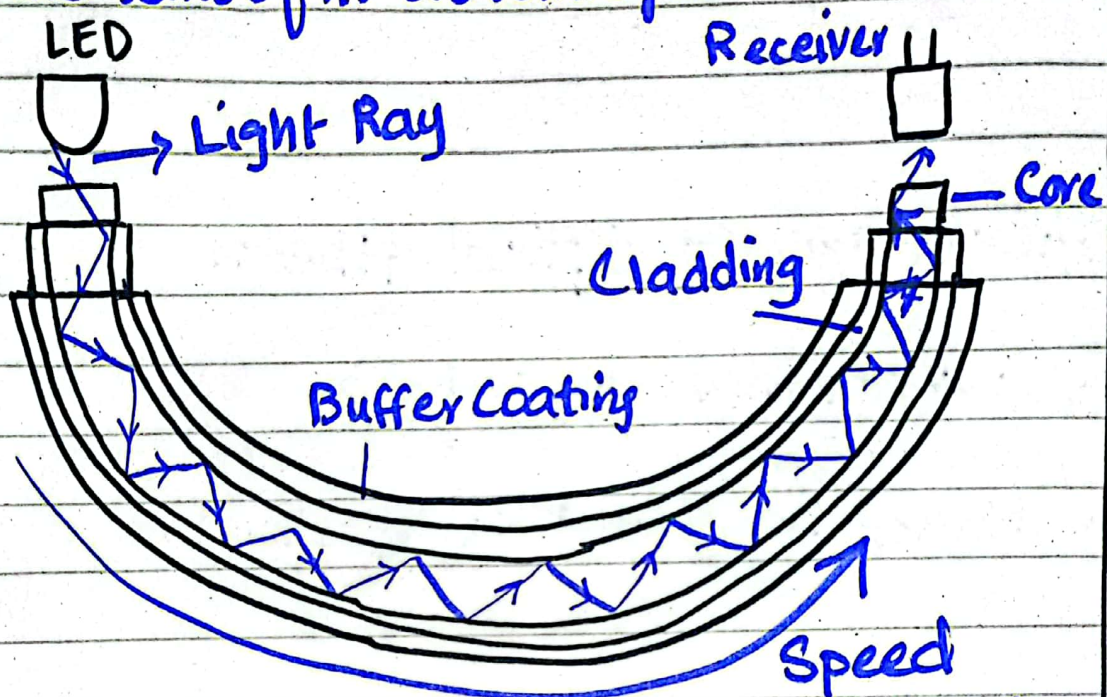
**Customer Services:** Chatbots and virtual customer assistants use AI to address customer inquiries, improving the user experience and reducing the human workload.

### **Conclusion:**

Following the above-mentioned examples justify the pivotal role of AI in revolutionizing the world. Fundamentally, how the industries operate and how the humans interact with technology.

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Q.No 3 C : How does an optical fiber works?  
Write some of its advantages.



### Working of Optical Fiber

Optical fiber transmits the data from one place to another through light pulses. It is made up of core which is mostly of glass or plastic. It guides the light. It is surrounded by cladding which reflect back the light inside the core. This process continues on the principle of total internal reflection inside the core-cladding boundary. The phenomenon of total internal reflection keeps the light signals within the fiber and transmit them over long distances without any loss and interference. The digital



data can also be modified into light to transmitted through optical fibers which is the significant need of modern day world.

## Advantages of Optical fibers

- 1, **Lower signal degradation** Signal degradation is least; No loss of signal occur.
- 2, **Higher Bandwidth:** Optical fibers have a higher capacity to carry data. Both types of data digital and Analog.
- 3, **Light signals:** The signals of optical fibers are light. No interference occur with those of other fibers within the cable.
- 4, **Light weight fiber** Optical fibers are lighter in weight than other wires. It also takes less space under ground.
- 5, **Thinner than other wires** Optical fiber can be reduced in diameter in contrast with other wires.
- 6, **Secure data transmission** Data transmitted by optical fibers is transmitted securely. As it avoids any electric, electromagnetic or radars interference into the data.

## 7) Require low-power transmitters:

As the signals of the optical fibers are light, so it require low-power transmitters.

QNO3 d: what is critical speed of a satellite? Differentiate Geostationary and polar satellite.

### CRITICAL SPEED / CRITICAL VELOCITY

Critical speed or critical velocity of a satellite is the minimum speed required to put a motion of satellite in a stable circular orbit. It is also called orbital velocity.

of a satellite. The orbital velocity or critical velocity / speed is independent of the mass of the satellite. It is constant for every planet. The critical speed for the Earth is  $7.9 \text{ km/h}$ .

### Difference between Geostationary and polar satellite:

**Orbits:** The geostationary satellite orbits in the equatorial orbit around the equator of the earth. It has equal distance from every point on earth.

while the polar satellites orbits in the polar orbit around the Earth which are not circular in shape nor they have equal distance from Earth on each point.

### Distance from the Earth:

Geostationary satellites are mostly 20,000 to 36,000 km away from the Earth.

Polar satellites are about 700-800 km away from the Earth.

### Completion of Revolution:

Geostationary completes its one revolution in 24 hours.

Polar satellites complete a revolution around its orbit in less than a day time.

### Functions of the Satellite

Geo-stationary satellites are used to telecommunication, navigation and weather forecasting.

while the polar satellites are used for Earth mapping and observing.

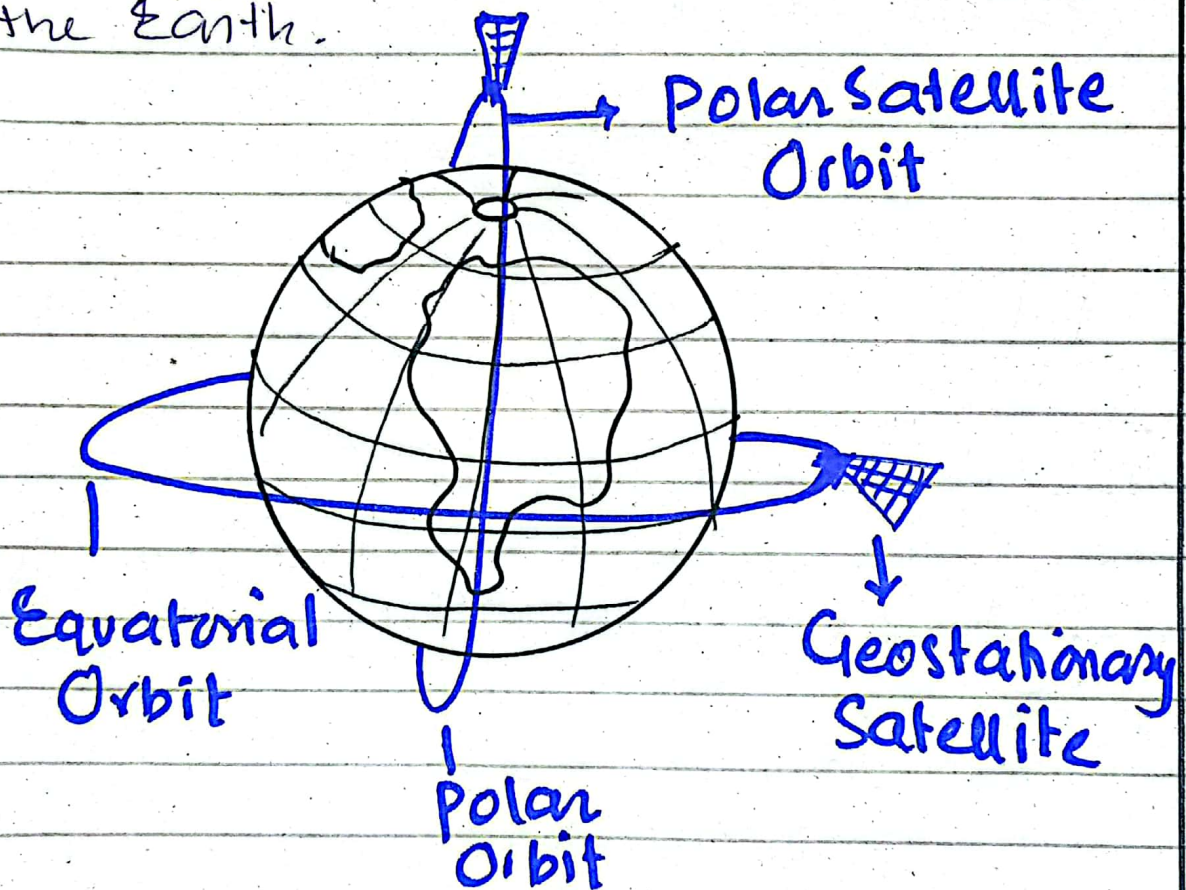
### Number of satellites required to cover whole Earth.

Three geostationary satellites are needed to cover the whole Earth while more than three polar satellites are

needed to cover the whole Earth.

## Sight of the Satellite

The geostationary satellite seems stationary from the Earth because it is in motion exactly similar to the motion of Earth itself. While the polar satellite seems oscillating from the Earth.



## PART TWO

Q No 4 a: Five year ago age of father was thrice the age of son - If son is 30 years old now - what is current age of father?

Current age of son = 30 years

So

Five years ago the son's age was

$$= 30 - 5 \text{ years}$$

$$= 25 \text{ years}$$

Father's age 5 years ago was  $(3 \times \text{son's age})$

So,

$$\text{Father's age 5 years ago} = 3 \times 25$$

$$= 75 \text{ years}$$

So, the current age of father would be

$$= 75 \text{ years} + 5 \text{ years}$$

$$= 80 \text{ years}$$

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QNO 84 b: Mean of 10, 30, y, and 50 is 50. what is value of y?

Formula for mean

$$\text{mean} = \frac{\text{Sum of all values}}{\text{no. of values}}$$

Putting the values in the formula

$$50 = \frac{10 + 30 + y + 50}{4}$$

$$50 = \frac{90 + y}{4}$$

$$50 \times 4 = 90 + y$$

$$200 = 90 + y$$

$$200 - 90 = y$$

$$\boxed{110} = y$$

Hence, the value of y is 110.

QNO4 C: Find the missing terms.

(i) 2, 6, 18, 54, 162

$$2 \times 3 = 6$$

$$6 \times 3 = 18$$

$$18 \times 3 = 54$$

$$54 \times 3 = 162$$

Hence, the missing term is 162

(ii) 3125, 256, \_\_\_\_\_, 4, 1

QNO4 d: If the product of two numbers is 320 and their ratio is 1:5. What is the difference between the squares of these two numbers?

Suppose the first number is  $x$  and the second is  $5x$ .

Accordingly to the statement given

$$x \times 5x = 320$$

$$5x^2 = 320$$

$$x^2 = \frac{320}{5}$$

$$x^2 = 64$$

$$x = 8$$

The first number is 8

The second number is  $5x$

So,

$$5 \times 8 = 40$$

Second number is 40

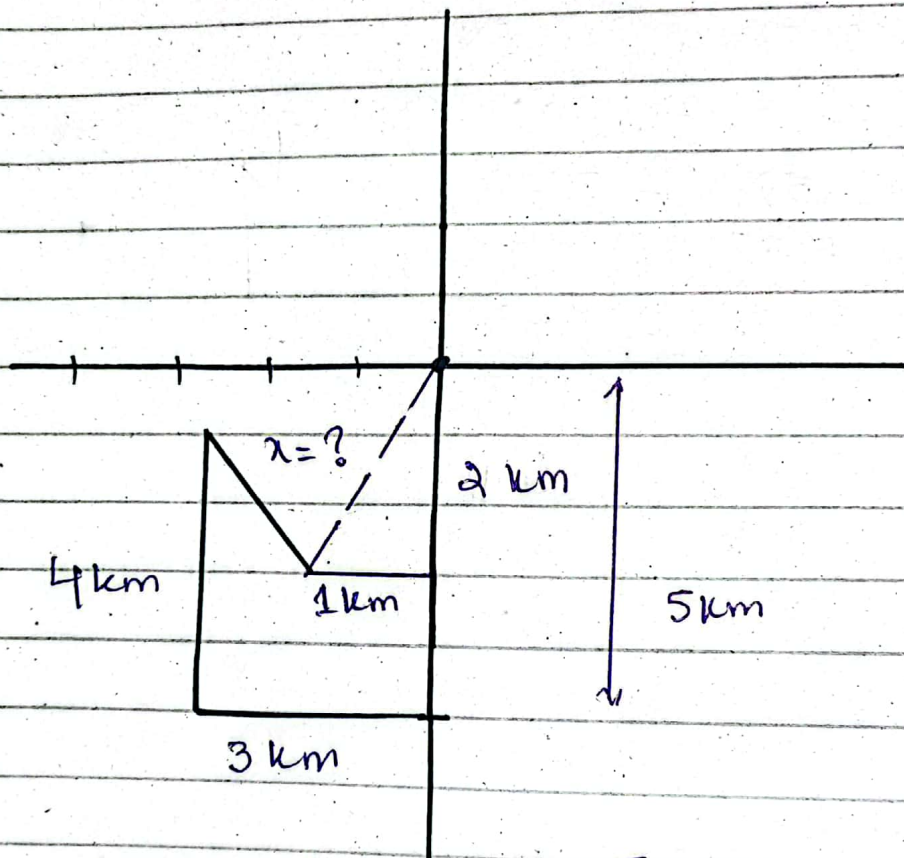
Difference between the squares of these two will be

$$(40)^2 - (8)^2 = ?$$
$$1600 - 64 = \boxed{1536}$$

$$\begin{array}{r} 40 \\ 40 \\ \hline 00 \\ 1600 \\ \hline 1600 \\ 64 \\ \hline 1536 \end{array}$$



Q. NO 5 a. A crow travels south 5 km, and then 3 km west, and then 4 km north - Finally travels 2 km south-east. How far is the crow from initial point?



Using the pythagorean Theorem.

$$(\text{Hyp})^2 = (\text{Base})^2 + (\text{perp})^2$$

$$(x)^2 = (1)^2 + \left(\frac{2}{2}\right)^2$$

$$(x)^2 = 1 + 4$$

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$$x^2 = 5$$
$$\sqrt{x^2} = \sqrt{5}$$
$$x = 2.25$$

The Crow is 2.25 km away from the initial point.

Q. No 5b: A pizza is divided into 8 slices. In which 3 slices contain raisin in it. Shiza picks a slice, what is the probability that she will pick a slice with raisin?

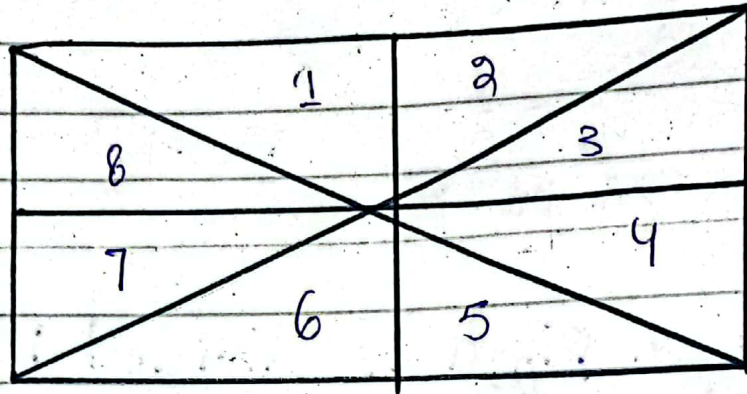
Formula

$$\text{Probability} = \frac{\text{Favourable outcomes}}{\text{Total outcomes}}$$

$$(P) \text{ of raisin piece} = \frac{3}{8}$$

So, the probability that the piece Shiza took contain raisin is  $\frac{3}{8}$ .

QNO5 c: what is the number of triangles in the given figure



$$\begin{aligned} \text{Visible triangles} &= 8 \\ \text{Triangle on each side} &= 2 \\ \text{Total Triangles} &= 8 \times 2 \\ &= 16 \end{aligned}$$

QNO5 d: what factors can affect the IQ?

IQ stands for Intelligence Quotient - It is a complex trait that defines the level of intelligence of a person in contrast with others. This trait is affected by a number of factors including hereditary, environmental, socioeconomic status, education, nutrition and linguistic and cultural factors.

mental Health.

a) Physical Health

Health Condition (5)

① Hereditary Factors

Factors affecting IQ

② Environmental factors

a) Initial stimulation

b) Nutrition

c) Toxins inhaled etc.

④ Socio Cultural Influence

a) Diverse Culture more intellectual.

③ Education

a) Quality Education

b) Education system.