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GENERAL SCIENCE AND ABILITY

Question No. 2 :-

- (a) On 18th December 2023 Volcano was erupted in Iceland after series of small earth quakes, discuss how Volcanoes are erupted?

Answer:-

Volcanic Eruption

A volcano is an opening or rupture in the earth's surface that allows magma (hot liquid and semi liquid rock), volcanic ash and gases to escape.

The molten rock is erupted due to the density variation and

reaches the surface as lava.

How Volcanoes are erupted?

Most volcanoes appear along the sides of the tectonic plates, plates that make up the surface of the world.

1. Movement of Plates

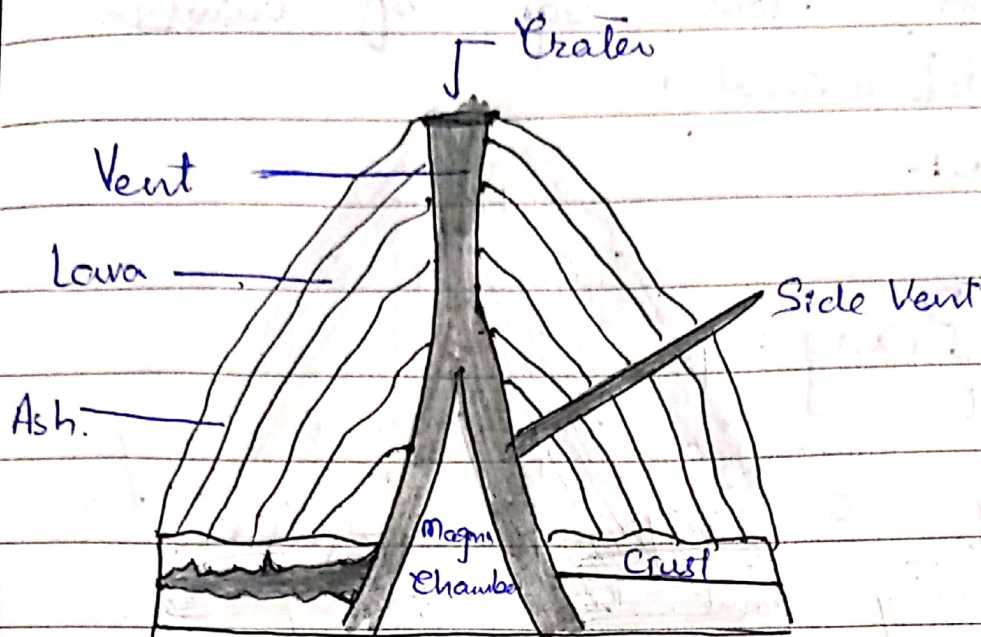
(a) Via Rifting

At diverging plate boundaries, where mantle beneath plates is hot but remains solid because it is under high pressure. As the hot mantle rises; sudden drop in pressure causes melting, such as taking the lid off a pressure cooker, causes the super heated water to flash to steam.

(b) Via Subduction

At convergent plate boundaries, as one plate dives (subducts) beneath the other, it heats up and releases hot fluid. The fluid (mostly water) rises, wetting hot rock in their path and

causing some of the rocks to melt.



Volcanic Eruption

- 2- The pressure from the saturated gases in the magma / via hotspot
- The magma, from the interior of the earth, is often saturated with gases like carbon dioxide and hydrogen sulfide. When the gases exert pressure together with water vapors, the highly explosive magma is forced out as lava in the form of hot spot on the surface of the earth.



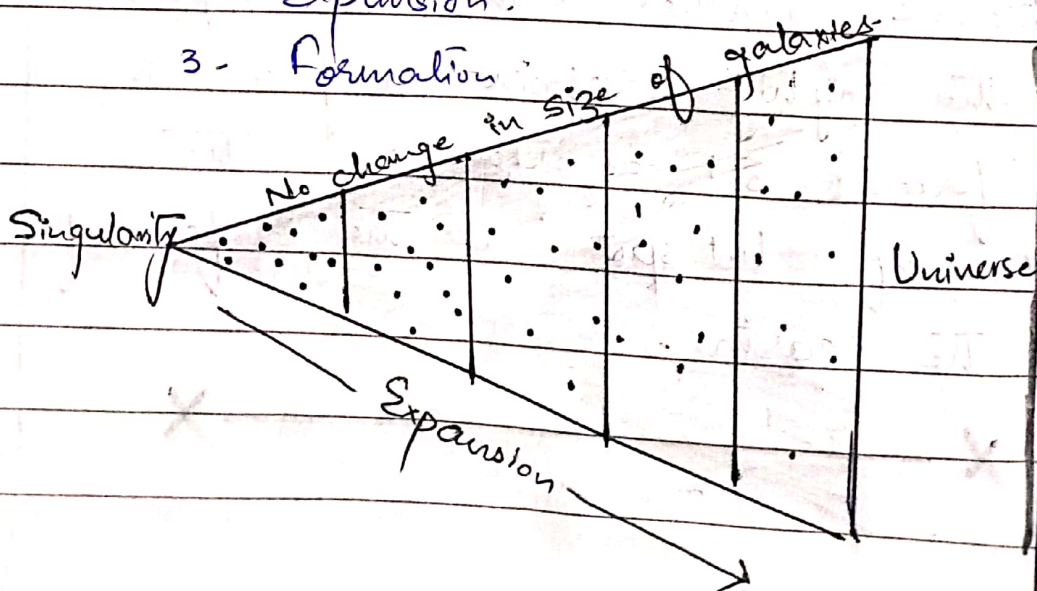
(b) What is big bang and big crunch? How age of universe is determined?

Answer:-

Big Bang :-

The universe began with every speck of its energy jammed into a very tiny point. This extremely dense point exploded with unimaginable force, creating matter and propelling it outward to make billions of galaxies of our vast universe. Thus according to big bang theory, formulated by George Lemaitre, the universe originated in the following steps.

- 1- Singularity
- 2- Expansion.
- 3- Formation



Big Crunch

The theory dates back to 1922, with Russian physicist Alexander Friedmann creating an equation showing that the end of universe depends on its density. It could either expand or contract rather than stay stable. Thus, the Big Crunch is a hypothetical scenario for the ultimate fate of the universe.

The expansion of the universe eventually reverses and the universe recollapses, ultimately causing the cosmic scale factor to reach zero. Thus, big crunch is the recollapsing of the universe on itself.

Methods To Find The Age of The Universe.

To estimate the age of the universe scientists rely on two main methods.

- 1- Calculating the expansion rate of the universe.

This is done by using the Hubble's constant. let us assume that universe is expanding at a constant speed. Hubble noted that the farther a galaxy was, the fast it was moving. Scientists were then able to use Hubble Constant to estimate the age of the universe by working backward, all the way back to Big Bang.

2- Determining the age of the oldest stars

Astronomers determine the age of stars by observing the spectrum, luminosity, mass and motion through the space. Blue stars have high energy and burn fuel easily while red stars have low energy. From this, they can determine how old a star is and how much longer it has to live.



(c) Discuss any five sources of Renewable energy.

Answer:

Sources of Renewable Energy

1. Wind energy

Wind energy is the fastest spreading renewable energy in the areas with strong wind speed. In wind energy projects wind is used to harness the power through the kinetic energy created by the air in the motion. Thus, power is transformed into electrical energy through the large scale wind turbines and wind energy conversion system. Since it is a renewable source of energy, it is inexhaustible and sustainable source of power generation with negligible effect on the environment.

2. Solar energy

Solar radiations are used to produce thermal or electrical energy. Solar energy

is the cleanest and the most abundant renewable source of energy. The radiations from the sun, collide with photovoltaic cells of especially designed solar panels, resulting in the generation of electric power. The direct energy from the sun can be utilized only during day time; however, storage batteries attached to the system to be used at night.

3- Biofuels

Any fuel obtained from the biomass i.e. plants, algae, animal waste etc is called biofuel. It is used as a cheap and environment friendly alternative to fossil fuels. Biomass is combusted at high pressure and temperature to produce steam. The steam drives the power generation through rotation of turbines. Particularly, liquid biofuels like ethanol are preferred as they are easier to use and transport.

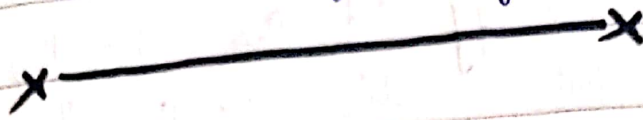
4. Geothermal energy

Geothermal energy is the heat generated within the earth. Thermal energy in the earth's crust originates either from the formation of planets or from the radioactive decay of materials. Since it is a renewable source of energy, some form of energy can be accessed and harvested anywhere in the world and is environment friendly as it only emits water vapours.

5. Hydro-electricity

It is the form of electricity produced through hydropowers. It is produced either by the use of flowing water or water that is stored in vast reservoirs. It is most used and most beneficial clean form of energy. The process of installing the hydroelectric power plant is also beneficial for fish breeding, flood control and acids

in methods of irrigation -



(d) 820km of optical fiber is laid down between Khunjerab Pass and city of Rawalpindi under CPEC, how optical fiber work?

Answer

Working of Optical Fibers

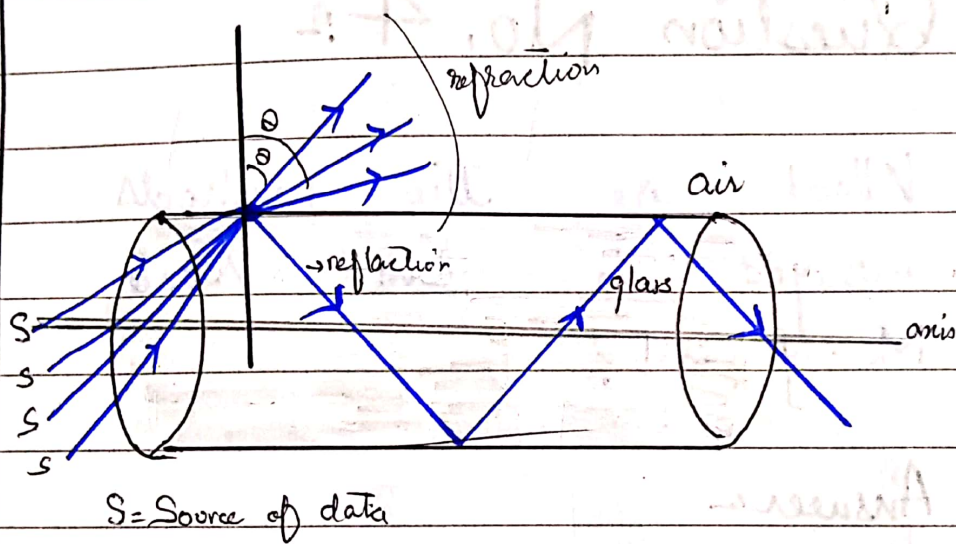
The optical fiber works on the principle of Total internal reflection. Thin, flexible strand of glass or plastic transmit data using light signals.

1- Light Transmission

A light source generates light signals that enter one end of optical fiber.

2. Total Internal Reflection

The core of the fiber, where light travels, has a higher refractive index than the surrounding cladding. This causes light to reflect off the core-cladding interface, preventing significant loss of signals.



3. Propagation

The light signal travels down the fiber by continually reflecting off the core's boundaries.

4. Data Encoding

Information is encoded in the

light signals using the technique
like modulation.

5. Signal Reception

At the receiving end, a detector detect the light signals and convert them into the electrical signals.

x ————— x

Question No. 4:-

(a) What are the methods employed in Solid Waste Management?

Answer:-

Methods of Solid Waste Management.

To dispose off the solid waste, there are some techniques available.

1- Open Dumping

It is all about an open deposition of waste in the outskirts of the cities. However, open dumping is highly discouraged. As per RIO Declaration on Environment and Development "Open dumping must be prevented or discouraged because it is an unsafe practice -"

But if doing open dumping - then two things must be considered -

- 1 - Dumping sites must be away from the residential areas, institutions, water bodies, forests, crop lands.
- 2 - Choose barren land for dumping sites.

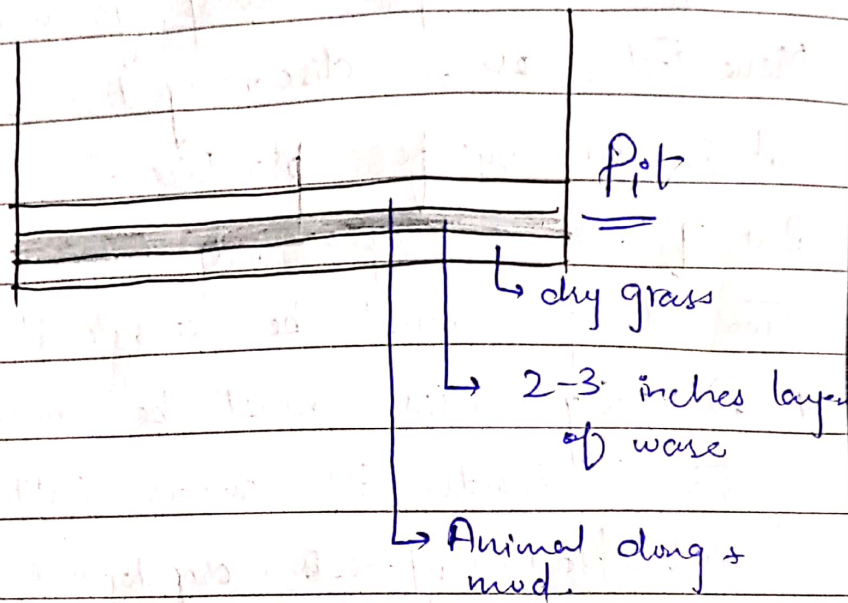
2- Composting

It is a controlled, biological decomposition of waste i.e., organic waste. This technique is specifically for the organic waste.

The process of composting needs controlled conditions; ensuring

: 25

nitrogen-carbon ratio, moisture, pH and temperature. As a result of composting, all the waste is converted into a product called compost (a fertilizer).



3- Incineration

It is the technique for the waste other than the organic. This technique is used for hospital waste, industrial waste and municipal waste. Incineration is all about burning of waste with the help of incinerators.

However, burning also produce by products like smoke, CO_2 , heat, ash, and monoxide. Thus, it is not an environment friendly process.

4- Land filling

land filling is about burying of waste. However, some controlled conditions are needed.

land fill sites should be

1 - 300-500 meters away from the hospitals

2 - 500-700 meters away from the highways and motor ways.

3 - 1500-2000 meters away from the residential area.

4 - 300-500 meters away from the industries.



(c) What is myopia and hyperopia? Enlist the major parts of human eye.

Answer

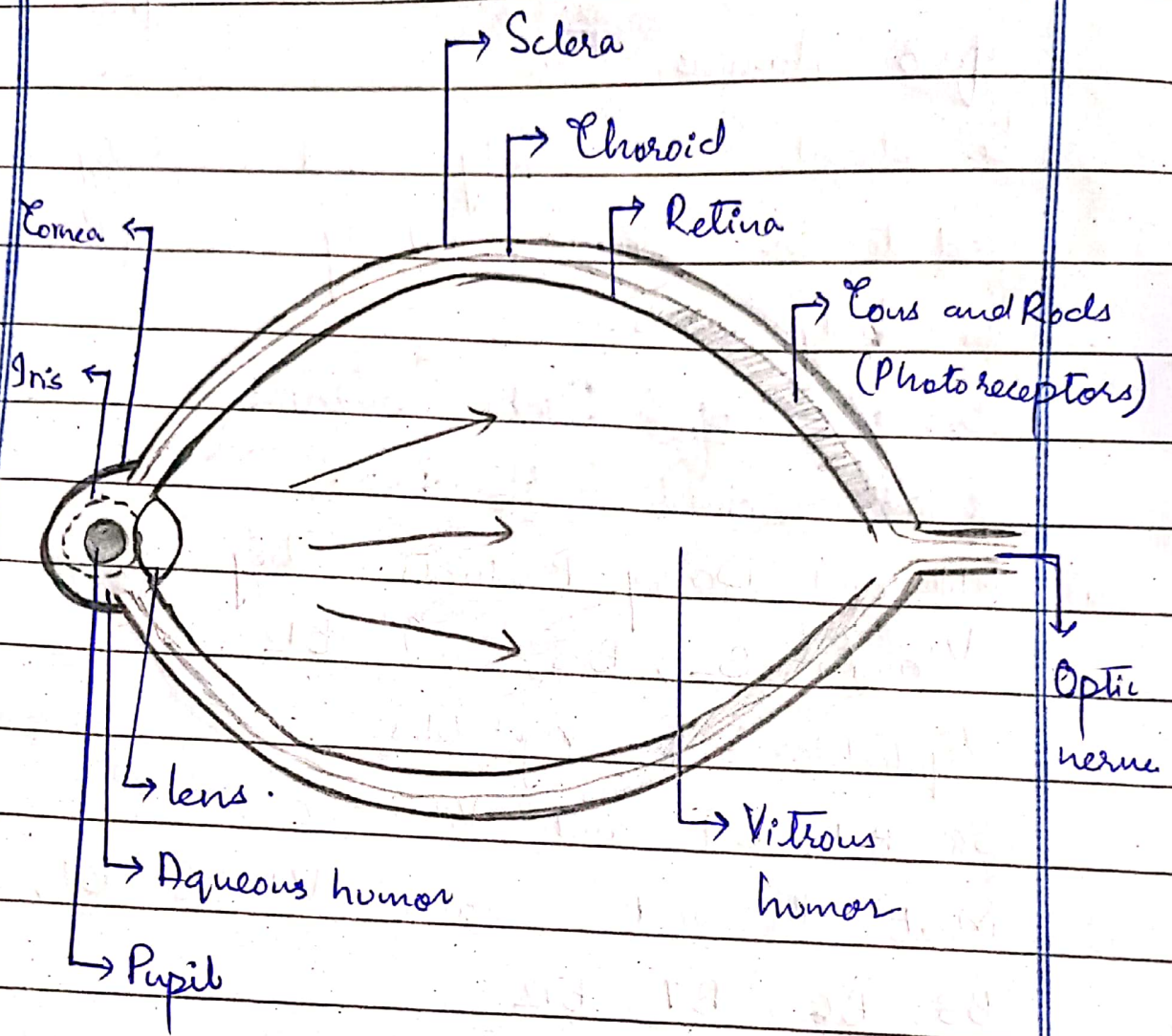
Myopia

Myopia or nearsightedness is a common vision condition in which near objects appear clear, but the objects farther away look blurry.

Hyperopia

Hyperopia or farsightedness is a common vision condition in which distant objects appear clear but the object near by look blurry.

Structure of Eye



Human eye is a sensory organ. It provides sensory information to the individuals in the form of visuals.

1. Sclera:

It is the outermost layer that protects the eye.

2- Choroid

It is present beneath the sclera.

It is little thicker and reddish as well due to the presence of capillaries.

The choroid is responsible for the nourishment of the eye.

3- Cornea

It is the outermost and transparent layer. The light waves interact with the cornea first and it is responsible for the bending of light waves.

4- Iris:

It is the pigmented muscle which controls the movement of pupil.

5- Pupil

A small hole from where the light enters into the eye.

6- lens

The reception and the focusing of light occurs at the lens.

7- Retina

The retina is the innermost and the most sensitive region.

The retina has small extensions called cones and rods.

8- Cones and Rods

Cones and rods have photoreceptors in them. Photoreceptors convert the light waves into an action potential i.e. image formation. So, the image forms at the retinal region.

9. Optic nerves

Optic nerve transmits the image towards the brain. The brain then recognizes the image.

10- Aqueous humor and Vitreous humor

Aqueous humor is at the frontal side i.e. between the iris and the cornea while vitreous humor is in the inner side. These are the fluid filled regions/parts. They are involved in the maintenance of fluid balance.

SECTION - II

Question No. 6 :-

- (a) Three candidates contested elections in a constituency of Islamabad and received votes 15000, 10000 and 8000 respectively. What is the percentage of total votes of winning candidates?

Given Data :-

$$\text{Votes of Candidate 1} = 15000$$

$$\text{Votes of Candidate 2} = 10000$$

$$\text{Votes of Candidate 3} = 8000$$

To find :-

Percentage of Total votes of
winning candidates = ?

Formula :

$$\therefore \text{Percentage of votes of winning candidates} = \frac{\text{Votes of winning candidate}}{\text{Total votes}} \times 100$$

Solution:-

$$\begin{aligned} \text{Votes of winning candidate} &= 15000 \\ \text{Total votes} &= 15000 + 10000 + 8000 \\ &= 33000 \end{aligned}$$

By applying formula.

$$\therefore \text{Percentage of votes of winning candidate} = \frac{\text{Votes of winning candidate}}{\text{Total votes}} \times 100$$

$$= \frac{15000}{33000} \times 100$$

$$= \frac{1500}{33}$$

$$\text{Percentage of votes of winning candidate} = 45.45\%$$

Answer.

Thus, the percentage of votes of winning candidate is 45.45%.



(b) The ratios of the angles of a triangle are 3:4:5 in total distribution. Find the each angle.

Given data :-

Ratio of the angle of triangle = 3:4:5

To find :-

Each angle = ?

Solution :-

The sum of all the angles in a triangle is 180° .

Ratio of angles = 3:4:5

Total parts = $3+4+5$
 $= 12$

Formula

$\therefore \text{Angle} = \frac{\text{Ratio of the angle}}{\text{Total parts}} \times 180^\circ$

Thus,

$$\text{Angle 1} = \frac{3}{12} \times 180^\circ = 45^\circ \text{ Answer}$$

$$\text{Angle 2} = \frac{4}{12} \times 180^\circ = 60^\circ \text{ Answer}$$

$$\text{Angle 3} = \frac{5}{12} \times 180^\circ = 75^\circ \text{ Answer}$$

Thus, the angles in triangle are.
Angle 1 = 45° , Angle 2 = 60° and
Angle 3 = 75°



(C) In a sports meet, group of boys and girls are to be formed. Each group consists of 4 boys and 6 girls. How many boys are required if 102 girls are available for such grouping.

Given Data :-

~~Ratio of~~ boys and girls in each group = 4 boys, 6 girls
Total girls = 102

To find :-

Total boys = x = ?

Solution :

Ratio between boys and girls in a group = 4 : 6

Ratio between boys and girls = x : 102

Thus: $4 : 6 = x : 102$

$$\frac{4}{6} = \frac{x}{102}$$

$$6x = 4 \times 102$$

$$x = \frac{4 \times 102}{6}$$

$$\frac{34}{2} = 68$$

$x = 68$ Answer.

Thus, 68 boys are required if 102 girls are available for such grouping.

————— x

(d) The ratio of present ages of A and B is 6:7. After 5 years this ratio would become 7:8. Find the present age of A and B.

Given data :-

$$\text{Ratio of present age} = 6:7$$

$$\text{After 5 years ratio} = 7:8$$

To find :-

$$\text{Present age of A and B} = ?$$

Solution :-

$$\text{let the present age of A} = 6x$$

$$\text{present age of B} = 7x$$

According to the given situation,
after 5 years, the ratio would
become.

$$\frac{6x+5}{7x+5} = \frac{7}{8}$$

$$8(6x+5) = 7(7x+5)$$

$$48x + 40 = 49x + 35$$

$$49x - 48x = 40 - 35$$

$$x = 5$$

Thus, the present age of A = $6x$

$$= 6(5)$$

$$= 30 \text{ years.}$$

The present age of B = $7x$

$$= 7(5)$$

$$= 35 \text{ years}$$

Thus, the present age of A is 30 years
and present age of B is 35 years.



Question No. 8 :-

- (a) The sum of three consecutive odd numbers is 273. What are the three odd numbers?

Given data :-

The sum of three consecutive odd numbers = 273.

To find :-

Three odd numbers = ?

Solution :-

Let the 1st odd number = x

2nd odd number / next one = $x + 2$

3rd odd number / next one = $x + 4$

Thus, according to the given situation.

$$x + x + 2 + x + 4 = 273$$

$$3x + 6 = 273$$

$$3x = 273 - 6$$

$$3x = 267$$

$$x = \frac{267}{3}$$

89

$$x = 89 \text{ Answer}$$

The next consecutive odd number

$$x + 2 = 89 + 2$$

$$x + 2 = 91 \text{ Answer}$$

The third consecutive odd number.

$$x + 4 = 89 + 4$$

$$x + 4 = 93 \text{ Answer.}$$

Thus, the three consecutive odd numbers whose sum is 273 are 89, 91 and 93.



(b) Find the missing number in the given series.

(i) 4, 16, 36, ~~64~~, 100.

$$2^2 = 4$$

$$4^2 = 16$$

$$6^2 = 36$$

$$8^2 = 64$$

$$10^2 = 100$$

In this series each new number is obtained by taking the square of the consecutive even numbers. Thus the next number in this series is 100.

(ii) 30, 29, 27, ?, 20, 15

$$30 - 1 = 29$$

$$29 - 2 = 27$$

$$27 - 3 = 24$$

$$24 - 4 = 20$$

$$20 - 5 = 15$$

Thus, in this series, each new number is obtained by moving one step backward, two steps backwards, three steps backward and so on. Thus the missing number in this series is 24.

(iii) 1, 7, 15, 25, ?, 51

$$1 + 6 = 7$$

$$7 + 8 = 15$$

$$15 + 10 = 25$$

$$25 + 12 = 37$$

$$37 + 14 = 51$$

$$1 + 6 = 7$$

$$7 + 8 = 15$$

$$15 + 10 = 25$$

$$25 + 12 = 37$$

$$37 + 14 = 51$$

In this series, each new number is obtained by adding consecutive even numbers starting from the 6 in the previous number. Thus, the missing number in this number series is 37.

(iv) 0, 2, 6, 12, 20, 30, ?

$$0 + 2 = 2$$

$$2 + 4 = 6$$

$$6 + 6 = 12$$

$$12 + 8 = 20$$

$$20 + 10 = 30$$

$$30 + 12 = 42$$

In this series, each number is obtained by adding consecutive even number in the previous number.

Thus, the missing number in this series is 42.

(v) 48, 24, 72, 36, 108, ?

$$48 \div 2 = 24$$

$$24 \times 3 = 72$$

$$72 \div 2 = 36$$

$$36 \times 3 = 108$$

$$108 \div 2 = 54$$

In this number series, each new number is obtained by first dividing the previous number and then multiplying with 3 for the next number alternately. Thus, the next number in this number series is 54.



(c) Find out the correct number from the given jumbled spelling.

- | | | | |
|-------|---------|---|---------|
| (i) | THRSI | — | SHIRT |
| (ii) | GNDREA | — | GARDEN |
| (iii) | SCHAMOT | — | STOMACH |
| (iv) | ONLNDD | — | LONDON |
| (v) | HIDDALY | — | HOLIDAY |



(d) Sara's mother is 6 times older than Sara, where as her brother Ali is twice as old as Sara.

In three years' time, the sum of their ages will be 72. How old are Sara, Ali and their mother now?

Given data :-

let Sara's age = x

Age of Sara's mother = $6x$

Age of Sara's brother = $2x$

In three years, sum of their ages = 72

To find:-

Age of Sara, Ali and their mother = ?

Solution:-

According to the given situation, sum of their ages in three years' time.

$$x + 6x + 2x = 72$$

$$9x = 72$$

$$x = \frac{72}{9} = 8$$

$$\boxed{x = 8} \text{ Answer.}$$

Thus, Sara's age = 8 years.

$$\begin{aligned} \text{Sara's mother age} &= 6x \\ &= 6(8) \end{aligned}$$

$$\boxed{\text{Sara's mother age} = 48 \text{ years.}}$$

Answer

$$\begin{aligned} \text{And Ali's age} &= 2x \\ &= 2(8) \end{aligned}$$

$$\boxed{\text{Ali's age} = 16 \text{ years.}}$$

Answer.

Thus, Sara's age is 8 years, Sara's mother age is 48 years while Ali's age is 16 years.

