

# Section I

Q#04

## Earthquakes

Earthquakes represent natural occurrences characterized by the sudden movement or trembling of the Earth's surface. It results from the release of energy within the Earth's crust, causing seismic waves that propagate through the planet.

The generation of earthquakes is primarily linked to the dynamics of the Earth's tectonic plates. These plates, which compose the Earth's outer shell, continually shift due to the movement of the underlying semi-fluid mantle. The movement of these plates creates stress within the Earth's crust, leading to seismic activity.

Earthquake occurs due to three primary types of plate movements:

## 1. Divergent Boundaries

When plates move apart at divergent boundaries, it generates tension, causing faults and leading to earthquakes.

## 2. Convergent Boundaries

Plates moving towards each other at convergent boundaries result in compression, creating significant pressure and seismic activity.

## 3. Transform Boundaries

At transform boundaries where plates slide past each other, friction builds stress, eventually causing sudden releases and earthquakes.

The point of origin within the earth's crust where seismic energy is initially released is known as the focus or hypocenter, with the epicenter being the surface point directly above it.

Seismic waves spread outward from this point, causing ground shaking that diminishes in intensity as distance from the epicenter increases.

## Distinguish with Tsunami

Tsunami are large ocean waves generated by underwater disturbances, often triggered by seismic events. These disturbances could be earthquakes, volcanic eruptions or landslides occurring beneath or near the ocean.

When such events displace a large volume

of water, it sets off a series of powerful waves that travels across the ocean. As these waves approaches shallower coastal regions, they can grow in height and intensity, causing massive destruction when they hit the shoreline.

Cause: • earthquake stem from the sudden release of energy due to tectonic plate movement within the earth's crust.

• While, Tsunami are cause by displacement of water due to underwater disturbance triggered by seismic events.

Nature: Earthquakes involves ground shaking or tremors on the earth's surface caused by the movement of earth's crust.

While Tsunami are characterized by the movement of large volume of water in the ocean resulting in powerful waves.

b)

The Coriolis force is an effect caused by the rotation of the earth. As the earth spins on its axis, it causing moving objects such as air or water, to be deflected to the right in the Northern Hemisphere and to the left in Southern Hemisphere.

This deflection is due to the difference in velocities between points on the rotating earth's surface and is known as the Coriolis effect.

## Hurricanes:

Hurricanes are also known as cyclones or typhoons ~~depending~~ depending on the region, are powerful tropical storms characterized by strong winds and heavy rainfall. They form

over warm ocean water near the equator. Several conditions need to be met for a hurricane to develop:

① Warm Ocean water: ( $26^{\circ}\text{C}$ ) → the warm water provides the energy needed for the storm to intensify

② Moisture

③ Coriolis effect

④ Low pressure

⑤ Structure



Solar and lunar eclipses are celestial events but they differ in their occurrences, appearance and the position of the sun, earth and moon during these phenomena.

Solar eclipse: occurs when the moon passes between the earth and the sun, blocking the sunlight from reaching earth partially or entirely.

Lunar Eclipse occurs when the earth passes between the sun and the moon, causing earth's shadow to fall on the moon, darkening it partially or entirely.

## (d) Doping in Semi-conductors

Doping in the semiconductor is the process of intentionally introducing impurities into a semiconductor material to ~~study~~ modify its electrical properties. Semiconductors are intrinsic materials but by adding specific impurities known as dopants, the conductivity and other properties of the semiconductor can be controlled.

There are two primary types of semiconductor doping.

- ① N-Type Doping: elements from group V of the periodic table are introduced into semiconductor material.
- ② P-Type Doping: involves element from group III of the periodic table.



# Section II

Q NO # 06

(a) data:

current age of father =  $x$  ?

current age of son = 30 years

Solution:

let the son's age five years ago =  $y$

$$y = 30 - 5$$

$$y = 25 \longrightarrow (i)$$

$\therefore$  as father's age five years ago was:

$$5 \times y = \text{age of father (5 years ago)}$$

$\therefore$  putting the value of  $y$  from eq (i)

$$5 \times 25 = 75 \text{ years old} \longrightarrow (ii)$$

$\therefore$  now adding 5 in eq (ii) for current age

$$75 + 5 = x$$

$$x = 80 \text{ years old}$$

Hence the current age of father is 80 year.  
Ans

(b)

Data

$$x_1 = 10$$

$$x_2 = 30$$

$$x_3 = y$$

$$x_4 = 50$$

$$n = 4$$

$$\text{mean} = 50$$

Sol

$$\therefore \text{as we know that } \text{mean} = \frac{x_1 + x_2 + \dots}{n}$$

putting the value:

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

solving it for  $y$

$$50 \times 4 = 10 + 30 + y + 50$$

$$200 = 90 + y$$

$$200 - 90 = y$$

$$y = 110$$

Hence the value of  $y = 110$  Ans

(c)

Sol:

$$\begin{aligned} \text{(i)} \quad 2 \times 3 &= 6 \\ 6 \times 3 &= 18 \\ 18 \times 3 &= 54 \\ 54 \times 3 &= 162 \end{aligned}$$

So the sequence is

$$6, 18, 54, 162$$

(ii)

Ans

$$\begin{aligned} 1^2 &= 1 \\ 2^2 &= 4 \\ 3^2 &= 9 \dots \\ 4^2 &= 16 \\ 5^2 &= 25 \end{aligned}$$

So the sequence is

$$3125, 256, 27, 4, 1$$

(d)

Data

$$b^2 - a^2 = ? \times$$

$$a \times b = 320$$

$$a : b = 1 : 5$$

Sol:

Let  $a \times b = a \times 5b$  (since their ratio is 1:5)  
∴ according to the question

$$a \times 5b = 320$$

$$\text{let } \therefore a = b$$

$$a \times 5a = 320$$

$$5a^2 = 320$$

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

$$a^2 = 64$$

∴ applying  $\sqrt{\quad}$  on b.s

$$\sqrt{a^2} = \sqrt{64}$$

$$\boxed{a = \pm 8} \rightarrow (i)$$

∴ as we know that  $b = 5a$

$$\text{so } b = 5 \times 8$$

$$\boxed{b = 40} \rightarrow (ii)$$

Now finding difference of (i) & (ii) squares

$$b^2 - a^2 = x$$

$$(40)^2 - (8)^2 = x$$

$$1600 - 64 = x$$

$$\boxed{x = 1536}$$



# Q# 07

(a)

Data:

$$x_1 \times x_2 = 96000 \times 96000$$

$$x_1 \text{ profit} = 20\% = \frac{20}{100} \Rightarrow 0.2$$

$$x_2 \text{ loss} = 20\% = \frac{20}{100} \Rightarrow 0.2$$

ss)

cost price of scooter  $x_1 = ?$

$$\text{selling price } x_1 = 96000$$

$$\text{profit \%} = 20\% \text{ or } 0.2$$

$\therefore$  Selling price = cost price + profit

~~96000 = cost price + 0.2 \times cost price~~

$$96000 = \left(1 + \frac{20}{100}\right) \times CP_1$$

$$96000 = \frac{120}{100} \times CP_1$$

$$\frac{96000}{1.2} = CP_1$$

$$\boxed{CP_1 = 80000}$$

∴ Now finding cost price of 2<sup>nd</sup> scooter  $x_2$

$$\text{Selling price} = 96000$$

$$\text{loss \%} = 20\% \therefore (100 - 20) = 80\%$$

$$\text{Selling price} = 0.8 \times \text{cost price}$$

$$\frac{96000}{0.8} = \text{cost price}$$

$$\text{cost price} = 120000$$

∴ Total ~~selling~~ price

$$\text{Total cost price} = \text{cost price}_1 + \text{cost price}_2$$

$$\begin{aligned} &= 980000 = 120000 \\ &= 200000 \end{aligned}$$

∴ Total selling price

$$\begin{aligned} &= 96000 + 96000 \\ &= 192000 \end{aligned}$$

$$\begin{aligned} \therefore \text{Total gain} &= \text{Total selling price} - \text{Total cost price} \\ &= 192000 - 200000 \\ &= -8000 \end{aligned}$$

∴ calculating the % gain or loss %

$$\frac{\text{Total gain/loss}}{\text{Total cost price}} \times 100$$

$$\frac{-8000}{200000} \times 100$$

$$\Rightarrow -4\%$$

Therefore, the total loss percentage in the sale of both scooters is 4% loss.

Ans

(b)

SD

$$\text{Total work} = \text{Men} \times \text{hours} \times \text{Days}$$

Scenario 1

$$\therefore \text{Men}_1 = 195$$

$$\text{Hour}_1 = 10$$

$$\text{Days}_1 = 20$$

$$\text{Total work} = 195 \times 10 \times 20$$

$$= 39000 \text{ man-hour}$$

Scenario 2

$$\text{Men} = x$$

$$\text{Hours} = 13$$

Days = 15

$$\text{Total work} = x \times 13 \times 15$$

ii as they are supposed to finish = 39000 man-hour

$$39000 = 195x$$

$$\frac{39000}{195} = x$$

$$\boxed{x = 200} \rightarrow \text{men}$$

Therefore to complete the job in 15 day  
by working 13 hours a day, 200  
men are needed

(C)

$$A = \{a, e, i, o, u\}$$

$$U = \{a, b, c, \dots, z\}$$

$$A' = U - A$$

$$A' = \{a, \dots, z\} - \{a, e, i, o, u\}$$



$$A' = \left\{ \begin{array}{l} b, c, d, f, g, h, j, k, l, m, n, p, q \\ x, s, t, v, w, x, y, z \end{array} \right\}$$

A

(d)

SDI

$$\text{Volume} = \frac{1}{3} \text{ base area} \times \text{height}$$

$$\therefore \text{Base area} = \frac{3 \times \text{Volume}}{\text{Height}} \rightarrow (a)$$

$\therefore$  let's convert height from ~~km to cm~~ km to

$$3 \text{ km} = 3 \times 1000 \times 100 \text{ cm}$$

$$3 \text{ km} = 300000 \text{ cm} \rightarrow (i)$$

Now putting (i) in (a)

$$\text{Base area} = \frac{3 \times 372}{300000} \text{ cm}$$

$$\text{Base area} = \frac{1116}{300000} \text{ cm}^2$$

$$= 0.00372 \text{ cm}^2$$

∴ squaring root base

$$\text{Area} = 0.00372$$

$$\text{side length} = \sqrt{0.00372 \text{ cm}^2}$$

$$= 0.061 \text{ cm}$$

$$\text{Perimeter} = 4 \times \text{sides}$$

$$\text{perimeter} = 4 \times 0.061 \text{ cm}$$

$$= 0.244 \text{ cm}$$

A