

GENERAL SCIENCE AND ABILITY

SECTION B

Q6

(a)

Given:

rate of depreciation per year = 10%
present value = Rs. 8748

To Find:

price of washing machine three years ago = ?

Solution:

let the price three years ago = x

According to the given condition

$$0.9(0.9(0.9x)) = 8748$$

$$\left(\frac{9 \times 9 \times 9}{1000}\right)x = 8748$$

$$\frac{81}{729}$$

$$\left(\frac{729}{1000}\right)x = 8748$$

$$x = \frac{8748}{729} \times 1000$$

$$\begin{array}{r} 729 \\ \times 12 \\ \hline 1458 \\ 729 \times \\ \hline 8748 \end{array}$$

$$\boxed{x = 12000}$$

Therefore, the price three years ago was
Rs. 12000.

(b)

Given:

- father is four times the age of daughter
- after 5 yrs, he is three times the daughter's age

To Find:

father's age in terms of daughter's age after 10 yrs = ?

Solution:

let the daughter's age be x
let the father's age be y

According to the given condition:

$$4x = y \quad \text{--- (1)}$$

$$3(x+5) = y+5 \quad \text{--- (2)}$$

Solving (2) by inserting the value of y from (1)

$$3x + 15 = 4x + 5$$

$$15 - 5 = 4x - 3x$$

$$x = 10$$

Putting the value in (1)

$$y = 4(10) = 40$$

After 10 years:

$$\text{daughter's age} = x + 10 = 20$$

$$\text{father's age} = y + 10 = 50$$

$$\frac{x+10}{y+10} = \frac{20}{50}$$

$$\frac{y+10}{x+10} = \frac{50}{20} = 2.5$$

$$\begin{array}{r} 2.5 \\ 25 \overline{) 50} \\ \underline{50} \\ 0 \end{array}$$

Therefore, after 10 years the father's age would be 2.5 times the daughter's age.

(c)

Given:

diameter of football = 12 cm

To Find:

volume of football = ?

Solution:

As the volume of football (sphere) is given by:

$$V = \frac{4}{3} \pi r^3$$

$$\text{radius} = \frac{\text{diameter}}{2} = 6 \text{ cm}$$

$$\therefore V = \frac{4}{3} \times 3.142 \times (6)^3$$

$$= \frac{4 \times 3.142 \times 36 \times 8}{3}$$

$$= 8 \times 36 \times 3.142$$

$$= 288 \times 3.142$$

$$= 904.896 \text{ cm}^3$$

Therefore, the volume of football is 904.896 cm^3

$$\begin{array}{r} 4368 \\ \underline{288} \\ 3142 \\ \underline{288} \\ 3142 \\ \underline{1152} \\ 1152 \\ \underline{288} \\ 864 \\ \underline{864} \\ 0 \end{array}$$

(d)

Given:

- trains in opposite directions cross a man in 27 and 17s
- they cross each other in 23 sec

To find:

ratio of their speeds = ?

Solution:

Let the velocity of first train = v_1

Let the velocity of second train = v_2

$$t_1 = 27s$$

$$\text{and } t_2 = 17s$$

As $\text{velocity} = \frac{\text{distance}}{\text{time}}$

$$v = \frac{d}{t}$$

as both trains cover equal distance

$$v_1 t_1 = v_2 t_2$$

$$\frac{v_1}{v_2} = \frac{t_2}{t_1}$$

$$\frac{v_1}{v_2} = \frac{17}{27}$$

Therefore, the ratio of their speeds

$$\text{is } \frac{17}{27}$$

Q1

(a)

Given:

Average of 7 consecutive numbers = 20

To Find:

Largest number = ?

Solution:

Let the 7 consecutive numbers be:

$x, x+1, x+2, x+3, x+4, x+5, x+6$

According to the given condition:

$$\text{Average} = 20$$

$$\frac{\text{sum of all numbers}}{\text{total numbers}} = 20$$

$$\frac{x+(x+1)+(x+2)+(x+3)+(x+4)+(x+5)+(x+6)}{7} = 20$$

$$7x + 1 + 2 + 3 + 4 + 5 + 6 = 20 \times 7$$

$$7x + 21 = 140$$

$$7x = 140 - 21$$

$$7x = 119$$

$$x = \frac{119}{7}$$

$$x = 17$$

Therefore, the largest number is:

$$x + 6 = 17 + 6$$

$$\boxed{x + 6 = 23}$$

(ii) 1, 2, 10, 37, 101, —

1, 2, 10, 37, 101, —
1 8 27 64 145
7 19 37 81
12 29 44
16 16

The next number is 246

1, 2, 10, 37, 101, 246

37
13
20
12
16
28
44
22
91
64
145
101
246

(iii) 11, 17, 39, 85, —

11, 17, 39, 85, 163
6 22 46 79
15 29 32
8 8

The next number is 163

11, 17, 39, 85, 163

29
17
22
13
85
39
46
22
16
424

(iv) 13, 24, 46, 90, 178, —

13, 24, 46, 90, 178, 354
11 22 44 88 176

The next number is 354

13, 24, 46, 90, 178, 354

90
178
90
88
88
160
176
178
354

(v) 4, —, 144, 400, 900, 1764

4, —, 144, 400, 900, 1764
↓ ↙ ↓ ↓
2² 6² 12² 20² 30²
+4 +8 +10 12

The missing number is 36

4, 36, 144, 400, 900, 1764

42
42
184
168x
1764

(d)

Given:

$$A : B = 1 : 2$$

$$B : C = 3 : 2$$

$$C : D = 3 : 4$$

$$|A - D| = 2240 \quad \text{--- (1)}$$

To Find:

Share of B = ?

Solution:

$$A : B = \frac{1}{2}$$

$$\Rightarrow 2A = B \Rightarrow A = \frac{B}{2}$$

$$\text{Similarly, } 2B = 3C \Rightarrow C = \frac{2B}{3}$$

$$4C = 3D$$

$$A, 4C = 3D$$

$$\Rightarrow 4\left(\frac{2}{3}\right)B = 3D$$

$$8B = 3D$$

$$\Rightarrow \frac{8}{3}B = \frac{3}{2}D \quad \text{or} \quad D = \frac{8}{9}B$$

Putting the values of A and D in (1)

$$A - D = 2240$$

$$\Rightarrow \left| \frac{B}{2} - \frac{8}{9} B \right| = 2240$$

$$\left| \frac{9B - 16B}{18} \right|$$

$$7B = 2240$$

$$18$$

$$B = \frac{18 \times 2240}{7}$$

$$= 18 \times 320$$

$$320$$

$$18$$

$$\hline 2560$$

$$320 \times$$

$$\hline 5760$$

$$\boxed{B = 5760}$$

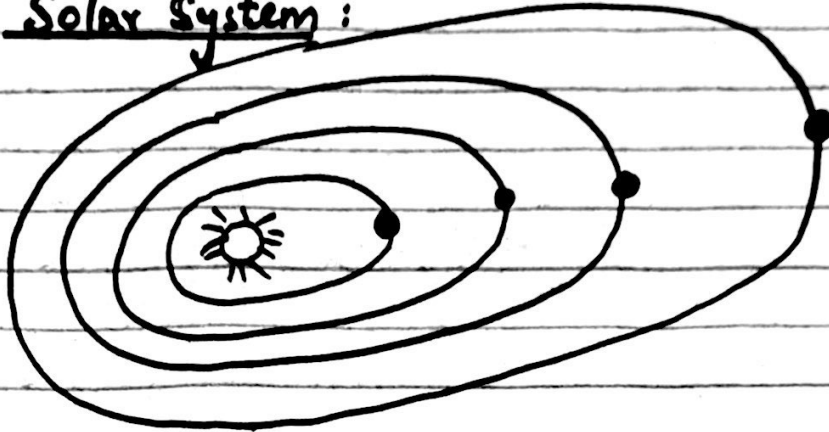
Therefore, the share of B is Rs. 5760

SECTION A

Q4

(a)

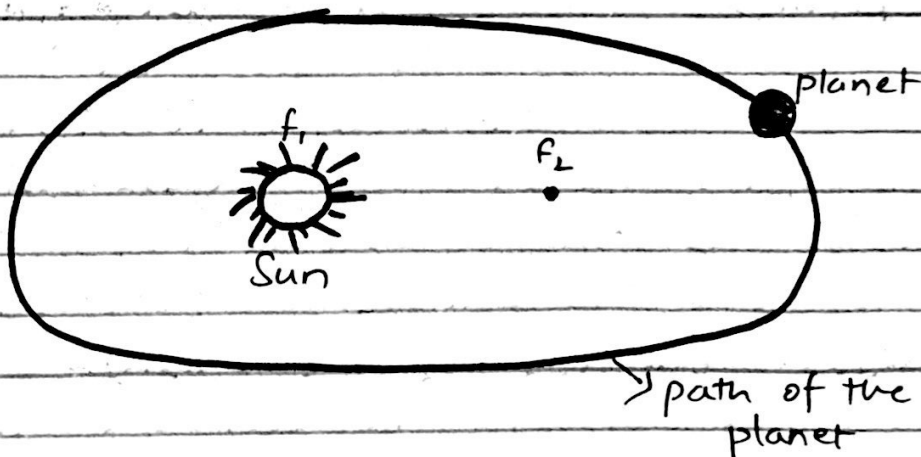
1) Solar System:



Solar system consists of multiple planets including Earth, Jupiter, Mercury, Mars, Neptune, etc. and one star (Sun). The motion of planets is defined by Kepler's laws.

2) Kepler's First law:

The planets revolve around the Sun in an elliptical orbit with Sun at one of the foci.



3) Kepler's Second law:

It is also known as law of areas. According to this law, the line joining the Sun and the planet describe equal area in equal intervals of time.



4) Kepler's Third law:

According to this law the square of Time period is inversely proportional to cube of semi-major axis a .

$$T^2 \propto \frac{1}{a^3}$$

(b)

1) Pituitary gland:

It is located in the ~~kidney~~ throat.

2) Function: It releases special enzymes that play a crucial role in digestion of fatty acid and lipid.

Importance: Without these glands, proper digestion of fats and lipids cannot be possible.

(C)

RAM

RAM stands for Random Access Memory. It is a temporary storage. It functions when the computer is turned on and vanishes as soon as the computer is turned off. The contents of RAM can be edited by the user.

ROM

ROM stands for Read Only Memory. It is a permanent storage of a computer. Its contents come in by default and cannot be edited by the user.

Nibble

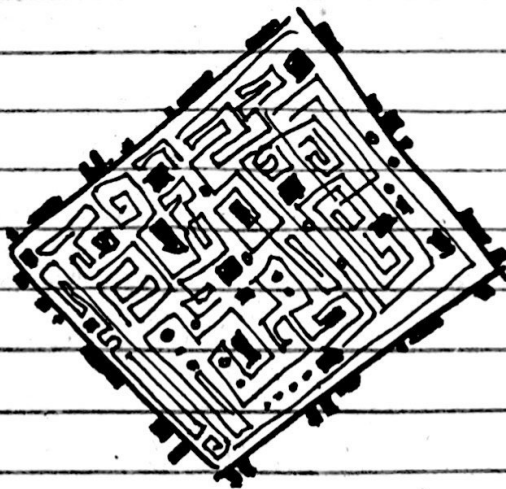
Nibble is a small storage component of a computer. It plays an essential role during execution of a task.

USB

USB is a small hand-held device. It acts as an additional storage unit. User can attach USB into a computer and transfer essential data. USB allows the user to carry important documents in a USB without taking along the whole computer system. Additionally, it can be utilized for keeping extra copies of documents in USB for safety purposes.

Mother board

Mother board is the most essential component of a computer system. It is like a brain of a computer. It consists of entire circuit system on a flat board with billions of transistors. Motherboard provides a path for the electrical signals to follow.



(d)

According to Intergovernmental Panel on Climate Change (IPCC), the global temperature has risen by 1.1°C in the post-industrial era. Without adequate measures, this temperature is likely to rise beyond 1.5°C or 2°C , which will result into catastrophic damage. Therefore, scientists have advised to limit the temperature rise upto 1.5°C to ensure safe future for humanity. Consequently, COP-29 has set the target of limiting temperature rise upto 1.5°C . Staying in this limit would allow the countries to manage the effects of global warming efficiently.

Q5

(a)

1) Rise in Sea Surface Temperature

The IPCC reports a 1.5°C rise in global temperature post-industrial era. This rise in global temperature has led to warming the sea water and consequently, increasing the sea surface temperature. This can have grave consequences for humanity as well as the sea organisms as it can result into

increased intensity of natural disasters and loss of biodiversity.

2) Formation of Tropical Cyclones

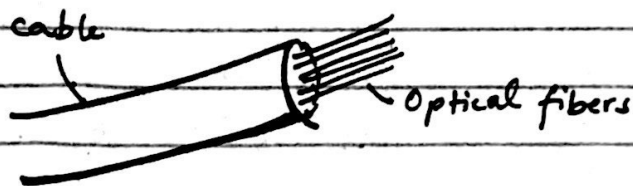
Cyclones are formed by the movement of wind from the land to the sea and vice versa.

The rise in sea surface temperature will increase the energy of cyclones, making them more intense and deadly.

(b)

1) Optical Fiber

Optical fiber consists of thin fiber made of glass. Multiple fibers are bundled together to form a cable.

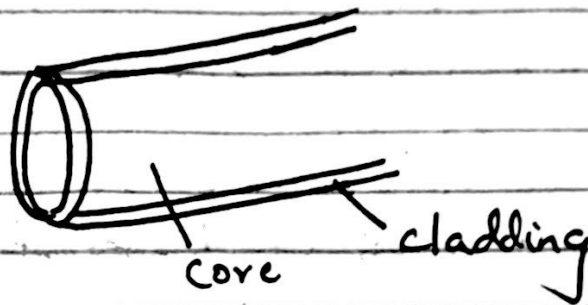


Optical fiber cables are extensively being used in communication sector due to their fast speed and low rate of attenuation.

2. Composition of Optical fibre

(a) Core The inner portion of fibre is known as core.

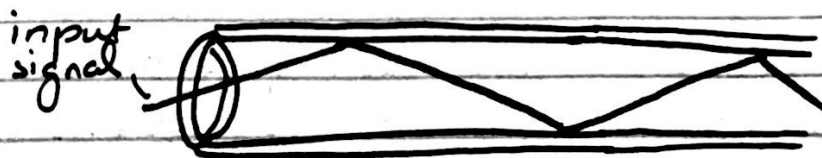
(b) Cladding The outer covering is known as cladding. It prevents signal loss.



3. Working

Total Internal Reflection

Fiber optics work on the principle of total internal reflection. The signal enters the fiber at an angle greater than the critical angle and then travels through the cable as a result of total internal reflection.



(c)

Bio-thermal fuel

Bio-thermal energy is a renewable energy source. Micro-organisms can be utilized to make bio-thermal fuel to meet the current fuel shortages. To make bio-thermal fuel, animal dung along with micro-organisms is thrown into a large container. The container is then covered and left to rest for a few months. The sludge can then be used to make fuel.



(d)

Food Additives

Food additives are added to enhance the flavor and to make the food more nutritious. Adding artificial flavors can be harmful for health while adding natural flavors pose no harm.

Food Preservatives

Food preservatives are added into the food to preserve the food for long periods of time and to prevent it from going bad. Chemicals are used for food preservatives which are harmful for health and hence should be avoided.
