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SECTION-II

(Question 8)

(part a)

Answer / Solution:

The man travels over a path of a right-angl triangle with base 4 km and hypotenuse 5 km.

→ Finding height (h) of the triangle first:

Using Pythagorean Theorem:

$\Rightarrow h = \sqrt{c^2 - b^2}$ ∵ c = hypotenuse, ∵ b = base

$= \sqrt{5^2 - 4^2}$

$= \sqrt{25 - 16}$

$= \sqrt{9} = \sqrt{(3)^2}$

$\boxed{h = 3\text{km}}$

→ Total distance travelled around the triangle:

⇒ Perimeter of the triangle = 4km (base) + 3km (height) + 5km (hypotenuse)

= 12 km

→ After completing one round the man continues for 6km and then 8 km after a 90-degree turn. The total distance travelled will be:

⇒ 12km + 6km + 8km = 26km.

→ Finding how far he is from the starting point

Considering the final two legs of journey i.e., 6km and 8km, which form another right-angle triangle. The distance from the starting point is the hypotenuse of this triangle.

⇒ Distance from starting point $= \sqrt{6^2 + 8^2}$

$= \sqrt{36 + 64}$

$= \sqrt{100} = \sqrt{(10)^2}$

$= 10\text{km}$

⇒ Hence, the man is 10km far from his starting point.

(part b)

Let's denote the pocket money as follows:

i- Hassan (H)
ii- Ali (A)
iii- Akbar (R)
iv- Nasir (N)
v- Shahbaz (S)

Given

i- $H = 1/3\,(A)$
ii- $A = 5\,(R)$
iii- $R = 3N$
iv- $S = N + A$
v- $H + A + R + N + S = 8000$

Substituting values; the total sum equation becomes.

$$\Rightarrow \frac{1}{3}(A) + A + \frac{A}{5} + \frac{A}{15} + \frac{16A}{15} = 8000$$

Let Common denominator be 15 and simplifying

$$\Rightarrow \frac{5}{15}A + \frac{15}{15}A + \frac{3}{15}A + \frac{A}{15} + \frac{16A}{15} = 8000$$

$$\Rightarrow \frac{(15)}{15}(5A + 15A + 3A + A + 16A) = 8000\,(15)$$

$$\Rightarrow \frac{40A}{15} = 8000 \quad \Rightarrow 40A = 8000 \times 15$$

$$= A = \frac{8000 \times 15}{40} \quad \Rightarrow \boxed{A = 3000.}$$

⇒ Now, finding values for each:

$$H = \frac{1}{3}(A) = \frac{1}{3}(3000) = 1000\ Rs.$$

$R = 3 \times N = 3 \times 200$.

$\boxed{R = 600}$, $N = \frac{A}{15} = \frac{3000}{15} = 200$ Rs

$S = \frac{16A}{15} = \frac{16}{15}(3000) = 3200$

$\boxed{S = 3200}$

=> Hence, the pocket money distribution is:

Hassan = 1000 Rs.
Ali = 3000 Rs.
Akbar = 600 Rs.
Nasir = 200 Rs.
Shahbaz = 3200 Rs.

(part c)

Given:
Sphere of radius = 7m.

Solution:
Surface area (A) of sphere = $A = 4\pi r^2$
Volume of sphere = $V = \frac{4}{3}\pi r^3$

Since $r = 7m$, then

$A = 4\pi(7)^2$
$= 4\pi \times 49$
$= 196\pi \approx 616\ m^2$
$\boxed{A = 616\ m^2}$

$V = \frac{4}{3}\pi(7)^3$
$= \frac{4}{3}\pi(343)$
$= \frac{1372}{3}\pi$
$\boxed{V \approx 1436\ m^3}$

(part d)

Distributing Rs. 4320 among Zain, Aslam, and Ashraf in ratio of 2 : 3 : 7.

Let, 2x, 3x and 7x be amounts received by Zain, Aslam and Ashraf, respectively.
Then the total sum is:

$\Rightarrow 2x + 3x + 7x = 12x = 4320$

$\Rightarrow 12x = 4320$

$\Rightarrow x = \frac{4320}{12} = 360$

$\Rightarrow \boxed{x = 360}$

Thus,

Zain: $2x = 2(360) = 720$ Rs

Aslam: $3x = 3(360) = 1080$ Rs

Ashraf: $7x = 7(360) = 2520$ Rs

(Question 7)

(part a)

Given:

Radius of Cylinder $= r = 30$ cm

Height of Cylinder $= h = 1$ m

To find its volume of cylinder $= V = ?$

Solution:

$V = \pi r^2 h$

$= \pi (30)^2 (1)$ cm x m $\quad \because r = 30$ cm

$= 3.14159 \times 900 \times \frac{\text{cm}}{\text{cm}} \times \frac{100\text{cm}}{\text{m}}$ $\quad \because h = 1$ m

$= \quad \quad \because \pi = 3.14159$

$= 3.14159 \times 900 \times 100\text{cm}^2 \quad \because 1\text{cm} = \frac{1}{100}$ m

$V \approx 282743\ \text{cm}^3$

(part b)

Finding the age of youngest boy:

Let the ages be $3x$, $5x$, $7x$

The averge age is 15 years,

So.

$$\frac{3x + 5x + 7x}{3} = 15$$

$$\Rightarrow \frac{15x}{3} = 15 \Rightarrow \frac{5x}{5} = \frac{15}{5} \Rightarrow \boxed{x = 3}$$

Hence, age of youngest boy is $3x = 3(3)$

$\boxed{\text{age} = 9 \text{ years}}$

(part c)

Identifying the series:

i- 8, 19, 52, 151, 447, ____

Given is increasing pattern, 19 is wrong number, as other ratios increase gradually while 19 does not fit in this pattern. It should likely to be closer to a number that fits a smoother exponential or multiplicative increase.

ii- 11, 13, 17, 19, 23, ____

The series is a sequence of prime numbers and next prime number after 23 is 29

(part d)

Sides of triangle: 5cm, 4cm, 6cm

what is ~~each~~ angle of each side

For this we are using Cosine rule:

cosine rule = $c^2 = \frac{a^2 + b^2 - 2ab}{\cos(C)}$

where $a = 5$, $b = 4$, & $c = 6$

→ Solving for angle opposite to 6cm side:

$$6^2 = \frac{5^2 + 4^2 - 2(5)(4)}{\cos(C)}$$

$$\Rightarrow 36 = \frac{25 + 16 - 40}{\cos(C)} \quad \Rightarrow 36 = \frac{41 - 40}{\cos(C)} \quad \Rightarrow -5 = \frac{-40}{\cos(C)}$$

$$\Rightarrow \cos(C) = \frac{1}{8} \quad \Rightarrow C = \cos^{-1}\left(\frac{1}{8}\right)$$

$$\Rightarrow \boxed{C \approx 82.82}$$

→ Solving for other angles using similar method.

For angle opposite to 5cm side:

$$\cos(A) = \frac{4^2 + 6^2 - 5^2}{2 \times 4 \times 6} = \frac{16 + 36 - 25}{48} = \frac{27}{48} = \frac{9}{16}$$

$$\Rightarrow A = \cos^{-1}\left(\frac{9}{16}\right) \Rightarrow A \approx 56.25$$

Similarly the third angle.

$$B = 180 - 82.82 - 56.25 = 40.93$$

So, approximately the angles are:

$A \approx 56.25$

$B \approx 40.93$

$C \approx 82.82$.

SECTION - I

(Question 4)

(parta)

Bile:

Bile is a digestive fluid produced by liver and stored in the gallbladder. It plays a crucial role in the digestion of fats in small intestine.

Components:

Bile contains bile acids, which are critical for emulsifying fats and aiding in their absorption by forming micelles. It also contains bilirubin, a byproduct of the breakdown of hemoglobin and cholesterol

Functions.

The presence of bile in intestine helps neutralize stomach acids and provides an optimal PH for the action of pancreatic enzymes.

(part b)

Role of Kidney in Excretion:-

Kidneys are essential organ in excretory system responsible for filtering blood to remove waste products and excess substances, which are then excreted as urine. The main functions of the kidneys include:

i- **Filteration:**
Blood enters the kidneys through renal arteries and is filtered in the glomeruli, where waste products and excess ions are removed

ii- **Reabsorption:**
Essential nutrients, water and electrolytes are reabsorbed into bloodstream

iii- **Secretion:**
Additional waste products and ions are secreted into the tubules for excretion.

iv- **Regulation:**
Kidneys help regulate blood pressure, electrolyte balance and acid-base balance.

v- **Hormone Production:**
They produce hormones such as erythropoietin (stimulates red blood cell production) and renin (regulates blood pressure)

(part c)

Different methods of Solid waste Management:

1- **Landfills:**
Waste is buried in large sites. Modern landfills are designed to minimize environmental impact by lining them with protective layers and managing leachate and methane emissions.

ii- Incineration:
Waste is burried at high temperature, reducing its volume and generating energy. This method, however, can release pollutants unless properly managed.

iii- Recycling:
Materials such as paper, plastic, glass and metals are processed and reused. Recycling reduces the need for raw materials and decreases waste.

iv- Composting:
Organic waste is decomposed by microorganisms to produce compost, which can be used as a natural fertilizer.

v- Anaerobic Digestion:
Organic waste is broken down by bacteria in the absence of oxygen, producing biogas (used for energy) and digestate (used as fertilizer).

vi- Waste-to-Energy (WtE):
This energy converts non-recyclable waste into usable forms of energy, such as electricity, heat or fuel.

vii- Mechanical Biological Treatement (MBT)
Waste is mechanically sorted and biologically treated to recover materials and reduce the volume of waste sent to landfills.

(part d)

i. Anaemia:
A condition in which there is a deficiency of red blood cells or hemoglobin in the blood, leading to reduced oxygen transport and causing symptoms such as fatigue, weakness and shortness of breath.

ii- Appendicitis:
Inflammation of appendix, a small pouch

attached to the large intestine. Symptoms include abdominal pain, nausea and fever. It often requires surgical removal of the appendix.

iii- Spleen:
An organ located in the upper left part of the abdomen, responsible for filtering blood, recycling old red blood cells, storing WBC and aiding in the immune response

iv- Myopia:
Also known as near-sightedness, it is a common vision condition where close objects appear clear, but distant objects are blurry. This occurs when the eye shape causes light rays to bend incorrectly focusing images in front of the retina.

v- Isotopes:
Atoms of different elements that have the same number of neutrons but different numbers of protons for example, carbon-14 and nitrogen-15 both have 7 neutrons.

(Question 3)

(part a)

Atoms form chemical bonds to achieve a more stable electron configuration. Most atoms are more stable when they have a full outer electron shell, often achieved by gaining, losing or sharing electrons to satisfy the octet rule. This results in lower energy and greater stability for atom.

In a water molecule (H_2O), the oxygen atom forms covalent bonds with two hydrogen atoms. Each hydrogen atom shares one electron with the oxygen atom, and the oxygen atom shares

one electron with each hydrogen atom. This sharing of electrons allows each hydrogen atom to achieve a full outer shell (with 2 electrons, which is the full shell for hydrogen) and the oxygen atom to achieve a full outer shell (with 8 electrons). The result is a molecule where the atoms are held together by shared pairs of electrons, known as covalent bonds.

(part b)

Doping refers to the intentional introduction of impurities into a pure semiconductor to modify its electrical properties. By adding atoms of another element (dopants), the number of charge carriers (electrons or holes) in the semiconductor can be increased, thus enhancing its conductivity.

→ Types of Ceramics:

i- Traditional Ceramics:- These are made from natural raw materials like clay and include products such as bricks, pottery and tiles. They are typically characterized by their brittleness and high thermal stability.

ii- Advanced Ceramics:-
Also known as technical, engineered, or high-performance ceramics, these are made from highly purified and refined raw materials.
Examples include alumina (Al_2O_3), silicon carbide (SiC), and zirconia (ZrO_2). They are used in applications that require materials with high wear resistance, thermal stability, and chemical inertness such as in electronics, medical devices and aerospace components.