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Section II

Q6.

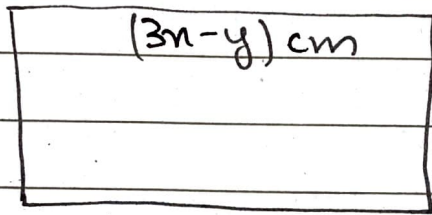
a)

i) 10, 100, 200, 310, 430

ii) 3, 7, 23, 95, 141

4
16
72

b)



$(2x - 3) \text{ cm}$

Perimeter : 114

Area : ?

① $3x - y = 2x + y$

$\rightarrow x = 2y$

② $2(2x + y) + 2(2x - 3) = 114$

$2(2(2y) + y) + 2(2(2y) - 3) = 114$

$2(4y + y) + 2(4y - 3) = 114$

$10y + 8y - 6 = 114$

$18y = 120$

$y = \frac{120}{18}$

$y = \frac{20}{3}$

$\frac{18}{3}$

$x = \frac{40}{3}$

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$$\left(3\left(\frac{40}{3}\right) - \frac{20}{3} \right) \times 2\left(\frac{40}{3}\right) - \frac{3^{13}}{3}$$

$$\frac{100}{3} \times \frac{71}{3} = \frac{7100}{3} \text{ cm}^2$$

Area: 2366.6 cm²

$$\begin{array}{r} 2366 \\ 3 \overline{) 7100} \\ \underline{6} \\ 11 \\ \underline{-9} \\ 20 \\ \underline{-18} \\ 20 \\ \underline{-18} \\ 2 \end{array}$$

c) Nisha = 15 + Romi

$$N = 15 + R$$

$$(15 + R - 5) = 3R$$

~~10 + R = 3R~~

$$10 + R = 3R$$

$$10 = 2R$$

$$R = 5$$

$$N = 15 + 5 = 20$$

Nisha's present age = 20

d) 210 O, 252 A, 294 P

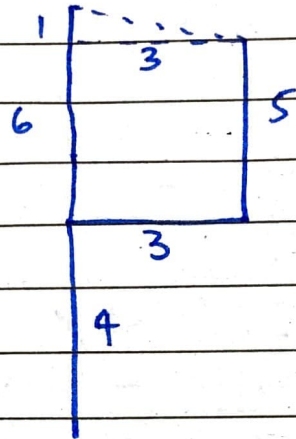
	210, 252, 294
2	105, 126, 147
3	35, 42, 49
5	7, 42, 49
7	1, 6, 7
6	1, 1, 7
7	1, 1, 1

$$\begin{array}{r} 6 \quad 30 \quad 210 \\ 2 \times 3 \times 5 \times 7 \\ \times 6 \times 7 \\ = 1260 \\ \begin{array}{r} 1260 \\ \times 7 \\ \hline 8820 \end{array} \end{array}$$

8820 cartons

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Q8. a)



$$\begin{aligned}3^2 + 4^2 &= x^2 \\x^2 &= 25 \\x &= \sqrt{25} \text{ km}\end{aligned}$$

Ans. He is in north west direction of the starting point at about $\sqrt{10}$ km away.

b) 1, 2, 3, 5, 7

$$\frac{1+2+3+5+7}{5} = \frac{18}{5} = \boxed{3.6}$$

c) 50 m 20 km 40 days
50 m x km 1 day

$$40x = 20$$

$$x = \frac{1}{2} \text{ km}$$

50 m $\frac{1}{2}$ km 1 day

70 m x 1 day

$$50x = 35 \quad x = \frac{35}{50} = 0.7$$

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$$\begin{aligned} 0.7 \text{ km} &= 1 \text{ day} \\ 20 \text{ km} &= n \text{ days} \end{aligned}$$

$$0.7n = 20$$

$$n = \frac{20}{0.7} = \frac{200}{7}$$

$$\boxed{28.6 \text{ days}}$$

$$\begin{array}{r} 28.57 \\ \overline{) 200} \\ - 14 \\ \hline 60 \\ - 56 \\ \hline 40 \\ - 35 \\ \hline 50 \\ - 49 \\ \hline 1 \end{array}$$

$$\begin{array}{r} \text{d) } 1750,000 \\ - 150,000 \\ \hline 1,600,000 \end{array} \quad D = 150,000$$

$$S = 2x \text{ Daughter}$$

$$D + 2D = 1600000$$

$$3D = 1600000$$

$$D = \frac{1600000}{3}$$

$$\boxed{\begin{aligned} \text{Daughter} &= \text{RS. } 533,333.3 \\ \text{Son} &= \text{RS. } 1,066,666.6 \end{aligned}}$$

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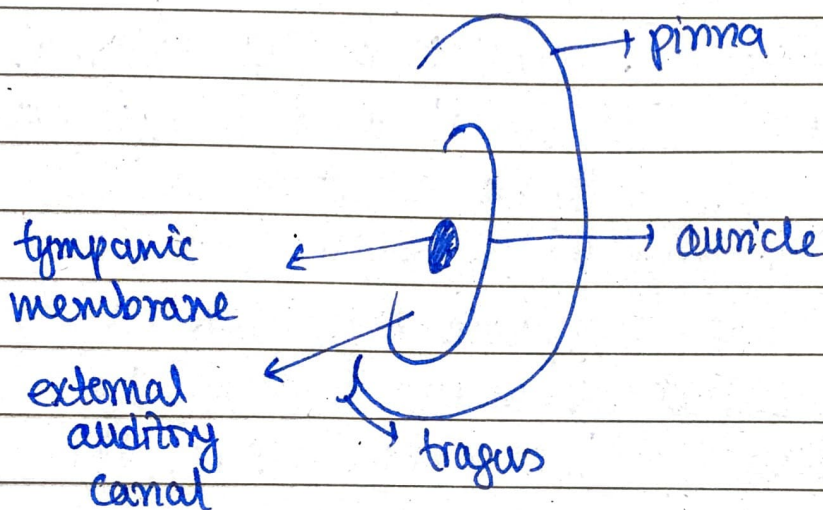
Section I

Q5. a) The human ear comprises of 3 parts. These include external ear, middle ear and inner ear. As an organ which functions to assist our auditory perception, each of its part has an essential role. The outer structure of the ear consists of the external auditory canal. This canal help transmit the sound waves to a structure called tympanic membrane. Once the sound waves hit the tympanic membrane a series of oscillations occurs through the bones present in the middle ear. The oscillations of these bones then takes the sound waves to the inner ear. The inner ear consists of the cochlea. It helps to convert the mechanical/kinetic energy of the sound waves to the electrical energy so that the auditory nerve can carry the signals to the brain for the perception of sound.

Other than the function of hearing, the role of ears is present in maintaining the vestibular function of our body. The semicircular canals present within

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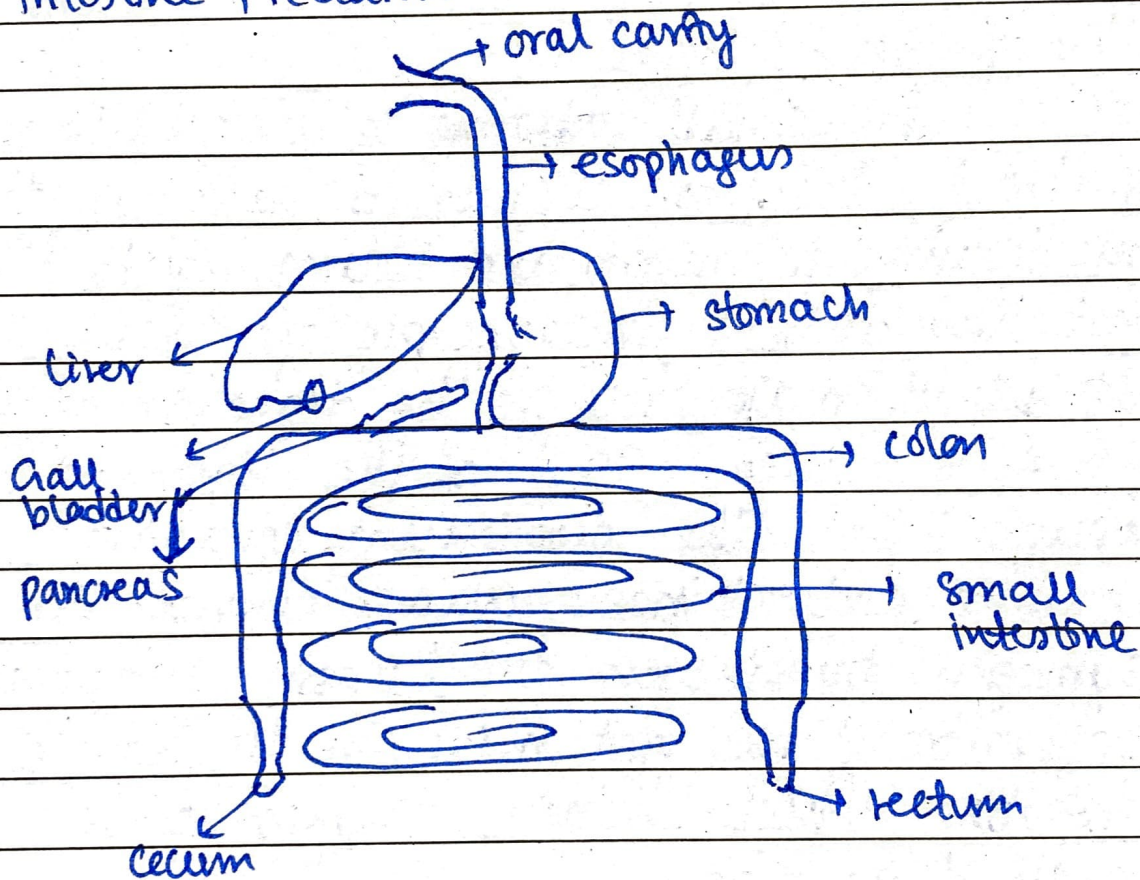
Our inner ear help in maintaining the balance of our body. Moreover, the nerve going from the ear to the brain, vestibulo-cochlear nerve, carries perceptions for both the hearing and the balance.



Hence, the ear performs major function of hearing alongwith maintenance of balance and it comprises of 3 distinct portions namely external, middle and inner ear, that play their roles for the performance of its tasks.

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b) Digestive system is the system which plays its role in the mechanical and chemical breakdown of food into simpler molecules to be able to absorb them into the bloodstream. Its parts include: oral cavity, esophagus, stomach, small intestine, large intestine, rectum.



The food bolus being ingested from mouth begins its journey with mechanical breakdown in the oral cavity, then food goes through the food pipe, esophagus, and it reaches the stomach. Stomach starts digestive process and breaks down

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bolus to a chyme. The digestion then gets completed in small intestine. The large intestine helps in absorption of nutrients and water and then the remaining matter is stored in rectum before being passed through the anus as feces.

Role of small intestine :

The small intestine is a coiled loop of about 6 metres. It has 3 parts namely duodenum, jejunum and ileum. Each part has distinct microscopic features. It plays major role in the digestion of the food matter. 90% of the digestion occurs here. The duodenum contains enzyme enterokinase which converts the zymogen trypsinogen to trypsin. Moreover, pancreatic juices get mixed in the small intestine which contain enzymes to break down food.

Fats $\xrightarrow{\text{lipase}}$ Fatty acids

Proteins $\xrightarrow{\text{trypsin}}$ Polypeptides

Starch $\xrightarrow{\text{amylase}}$ Maltose

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After the breakdown by pancreatic juices further breakdown occurs through intestinal enzymes.

Polypeptides $\xrightarrow{\text{Amino peptidase}}$ Dipeptides

Dipeptides $\xrightarrow{\text{Trypsin}}$ Amino acids

Maltose $\xrightarrow{\text{Maltase}}$ Glucose

Lactose $\xrightarrow{\text{Lactase}}$ Glucose

Fats $\xrightarrow{\text{Lipase}}$ Fatty acids

Hence, small intestine breaks the polymers in the food to basic monomers so that these can be absorbed in the bloodstream for utilisation.

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c) Vitamins assist in the growth and nourishment of our body. They are essential components and are needed for the effective functioning of various organs and various processes in our body.

A deficiency of vitamins can result in dire consequences for our body. Even though the quantity required is minimal, the intake of these vitamins is very important.

Vitamins can be categorized as either fat soluble or water soluble. Fat soluble vitamins include Vit A, D, E, K. Water soluble vitamins are much more in quantity and the common ones include Vit C, B₁, B₁₂ etc.

The following table highlights the importance of fat soluble vitamins and the result of their deficiencies:

Vitamin	Function(s)	Deficiency can cause
Vitamin A (retinol)	Vitamin A plays a vital role in maintenance of our eyesight	Night blindness

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Vitamin	Function	Deficiency can cause
Vitamin D (cholecalciferol)	It has important role in maintaining the strength of our bones.	In children, it can lead to rickets. In adults, it can lead to osteoporosis.
Vitamin E	It plays a role in our immunity.	It can make the body more prone to infections.
Vitamin K	It plays a role in clotting of blood.	Many clotting disorders and excessive bleeding post trauma can occur

The following table elaborates the significance of other important vitamins:

Vitamin	Function	Deficiency can cause
Vitamin C	Helps to maintain the health of our gums	Scurvy

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Vitamin	Function	Deficiency can cause
Vitamin B ₁	Helps maintaining of neurological functions and health	Neurological disorders
Vitamin B ₁₂	Important for health of blood and nervous system	Peripheral neuropathies, Megaloblastic anemia

Hence, it can be said that vitamins are vital for proper functioning and nourishment of our bodies and a deficiency of them can cause harmful effects.

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d) Pituitary gland is an essential endocrine gland of our body. It is a master gland that secretes many vital hormones for our body. A damage to pituitary gland can lead to a disturbance of our entire endocrine system. It consists of two lobes. An anterior lobe and a posterior lobe. Each of these lobes secrete different hormones. The posterior pituitary gland secretes two hormones namely antidiuretic hormone (ADH) and oxytocin. ADH plays a role in water balance of the body and conserves water when body needs it. Oxytocin has different purposes. It plays a role in lactation as well as emotional responses. The anterior pituitary gland releases different hormones such as TSH (thyroid stimulating hormone), ACTH (adrenocorticotrophic hormone), growth hormone, FSH (follicle stimulating hormone) and LH (luteinizing hormone). Each of these hormones plays a significant role in the endocrine system of the body. These hormones go and affect their target organs where they stimulate the production of other hormones.

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TSH acts on the thyroid gland to produce the thyroid hormone necessary for our metabolism. FSH and LH are important hormones that act on female reproductive organs and play a key role in the menstrual cycle of women. Growth hormone allows for the normal growth of body. An imbalance of which can lead to acromegaly or dwarfism. Mesorexin ACTH helps to produce cortisol in the adrenal gland, which is important hormone for many crises situations of our body.

Other than production and secretion of hormones, the important function of pituitary gland is in the feedback mechanism of the endocrine system. That is to say that body requires different amount of hormones at different times. The levels of hormone in blood are controlled through feedback mechanism. For example, if the blood has excessive thyroid hormone, the pituitary gland will sense that and secrete less TSH so less thyroid hormone is produced. This way body maintains a homeostasis or

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balance.

Therefore, the pituitary gland is a major hormone centre of the body, which plays a key role in their secretion and regulation.

Q4.

a) Land pollution is one of the great menaces of the present times. The production of waste amounts of waste has degraded the environmental beauty. There is a plethora of causes for land pollution. The biggest component of land pollution is the presence of solid waste. Solid waste of different types such as bio-degradable waste, recyclable waste, inert waste and e-waste is present in the environment. The causes of the excessive solid waste contaminating our land are: i) excessive use of plastics: Items such as plastic take a long time to degrade. The use of plastics creates a great amount of waste each year. According to UNEP, Pakistan produces 15 million tonnes of plastic waste per annum and the worldwide ratio is 350 million tonnes; hence, it is important that use of plastics be controlled. ii) Lack of recycling: A major

cause of increased land pollution is that many recyclable items are thrown to waste. Moreover, government machineries do not play an effective role to segregate waste so that the recyclable items can be made to use and amount of waste be reduced.

iii) There is a lack of landfill sites: In countries such as Pakistan, there is a dearth of landfill sites. Where they are located, they are far out of reach of public and the limited number of landfill sites do not suffice to cover the waste that a magnanimous population of country like Pakistan produces.

iv) There is lack of effective solid waste management system: another cause of land pollution is that there is lack of effective collection, transfer and disposal of waste. Since, a working solid waste management is not present it can greatly contribute to the excessive land pollution.

v) Increased production of waste by agriculture and industries: The two greatest contributors to waste are agriculture and industry. They produce waste in million of tonnes

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and often they do not install mechanisms to dispose them effectively and safely, thereby contributing to land pollution. vi) Population boom:

It is a natural fact that the amount of pollution and waste is directly linked to the population. The greater the number of people there would be the greater will the quantity of waste. vii) Lack of policies to prevent and tackle land pollution:

If there is not given policy framework to prevent, minimise and regulate land pollution and it will continue to increase. The lack of attention to environment and laws for protection of land, results in increasing the amount of land pollution.

Therefore, it can be concluded that land pollution is a growing concern with many sources and causes and this need to be taken care of to mitigate the burden of land pollution.

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b) Climate change is a pressing concern of present times. The annual conference of parties lays down policy guidelines for states to follow and also sets goals and targets to reduce the burden of climate change. The COP 27 enlisted many goals to mitigate climate risks. These include i) Reiterating the fact that global temperatures be kept 1.5°C below the pre-industrial times. According to NASA the average temperatures over the past 120 years have risen by 1°C . If temperatures reach 3.5°C , 70% of the humanity will be extinct. Hence, countries should work to keep temperatures below 1.5°C . ii) Propagation of climate damage fund: There is a divide between the countries who contribute to climate change and who get affected. India is 4th largest emitter of carbon dioxide, being Pakistan's neighbour it risks Pakistan to the dangers of climate change as witnessed by 2022 flood. Hence, the countries who contribute greatly to climate change need to pay those who

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are affected by A. iii) Annual \$100 billion investments towards climate sustainability:

The developed ~~need~~ nations need to pool \$100 billion and assist the developing countries to develop climate sustainable energy programs.

iv) Emphasis on national policies for climate change and ensuring of transparency of nationally determined contributions (NDC's):

COP 27 had obligated countries to bolster their climate change policies and to draw effective measure to reduce the carbon emissions.

v) Explore more avenues for renewable energy: The world needs to make a measure shift towards renewable resources and phase out global fossil fuel consumption so that by 2030 the global carbon dioxide emissions can be reduced to half.

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c) Global information systems (GIS) plays a key role in environmental science. GIS is a tool that helps to collect data, run analysis and provides different interpretations. Hence, use of GIS can be a great use in environmental science.

i) To keep track of climate patterns: GIS can collect data over the climate patterns of a region and predict the possible changes in future. This can play a key role for agricultural sectors, as the impact of environment on crops can be analyzed and predicted and necessary measures be taken.

ii) To monitor the effects of pollution: GIS can be utilised to monitor the quality of air, the quality of water and further its impacts on the surrounding wildlife and the environment itself. A group in south west England uses GIS and integrated AI systems to monitor the water pollution in the rivers.

iii) To assess the impact of policy changes: GIS can be used to study an area where environmental policy has changed.

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For example, if a municipality decides to promote usage of cycling to reduce air pollution, then GIS systems can be utilised to compare the effects of this policy change on the environment. The before and after image will then assist the policy maker to decide whether these interventions was beneficial for environment.

iv) To navigate the possibility of natural hazards: GIS systems can be used to monitor the wind pattern, the weather changes, the precipitation changes and these all factors can help predict whether a natural hazard such as ~~holes~~ tornado or cyclone is around. Therefore, it can assist in the mitigation and preparedness towards natural hazards.

Hence, GIS is a useful tool that helps to collect, organise and interpret data related to environment and can help us protect the environment and in turn help ourselves in protecting against environmental dangers.

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d) Artificial intelligence (AI) has led to a dawn of new information and technological revolution. It is a vastly useful tool and allows humans to carry out many tedious and complex tasks with ease. The fundamentals of AI include:

i) It is based on large quantities of data: The foundation of AI is on data. AI has been incorporated with data worth billions of bytes. AI has the ability to utilise this data to answer our queries. It can sift out the data and respond to our queries.

ii) It analyses the patterns in the data to formulate responses:

AI has a comprehensive ability to analyse large amounts of information. From the datasets it can recognise patterns and trends and based on the queries of users, it utilises these patterns to develop its answers.

iii) It has the ability to learn from the prompts of the users:

The astonishing fact about AI is that not only does it utilise data from the past, it can learn from the new data too.

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While interacting with its users, it is not only solving their queries but also learning new things from the user. It is dynamic and evolving and with this ability to self learn, AI can soon reach the intellect of humans.

iv) It recognises its limitations:

AI is still at its nascent stages. There needs to be a lot more development in the world of AI. The good thing is that AI recognises its limitations. Large language models such as ChatGPT will often show precautionary warnings saying that some of the information given may be incorrect or bias. Hence, AI recognises its limitations.

v) AI is quick and efficient:

Like any other technological advancement, AI aims to be fast and effective in its proceedings. There needs to be a great deal of improvement in AI, yet it is still the most swift and potent piece of technology mankind ever created.

Thus, AI owing to the fundamental principles brings a new era of technological advancement for society.