Question 5

(a) Schematic Diagram of a Computer System

Arithmetic Logic Unit

Control Unit

Input Devices

Output Devices

Memory

Storage

Input Devices : Permit the computer to communicate with the user

Input Devices

| Keyboard | Pointing Devices | Voice Input Devices | Digital Camera | Scanning Devices |

Mouse   Joystick
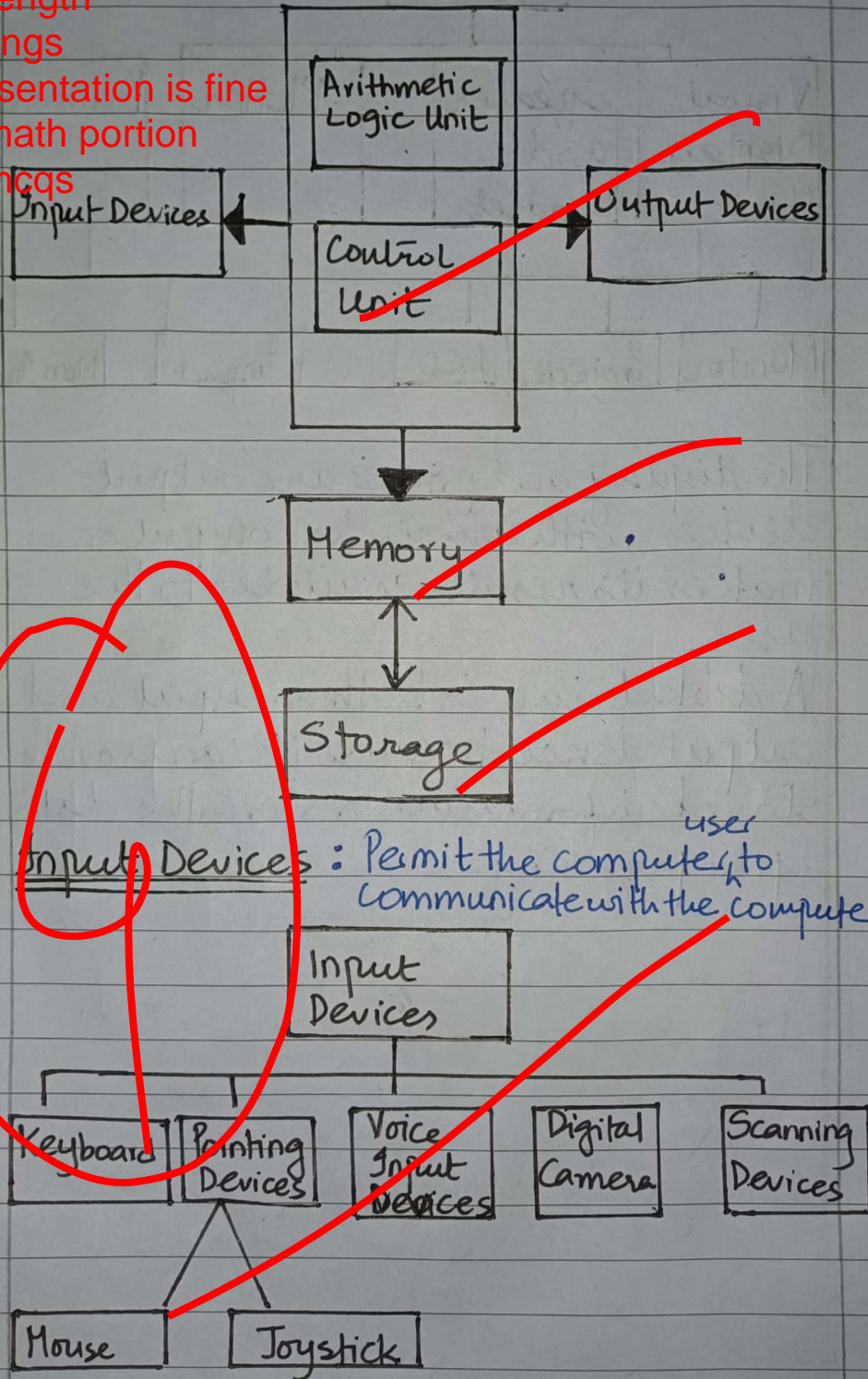
Output Devices : can be in hard or soft copy

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                    ┌──────────┐
                    │ Output   │
                    │ Devices  │
                    └────┬─────┘
        ┌────────┬───────┼──────────┬──────────┐
   ┌─────────┬─────────┐      ┌────────┬────────┐
   │ Visual  │ Speaker │      │ Plotter│ Printer│
   │ Display │ and     │      │        │        │
   │ Unit    │ Headset │      │        │        │
   └────┬────┴─────────┘      └────────┴───┬────┘
   ┌────┼──────────┐              ┌─────────┼─────────┐
┌────────┬──────────┬──────┐   ┌────────┐ ┌───────────┐
│Monitor │Projector │ LCD  │   │ Impact │ │Non Impact │
└────────┴──────────┴──────┘   └────────┘ └───────────┘
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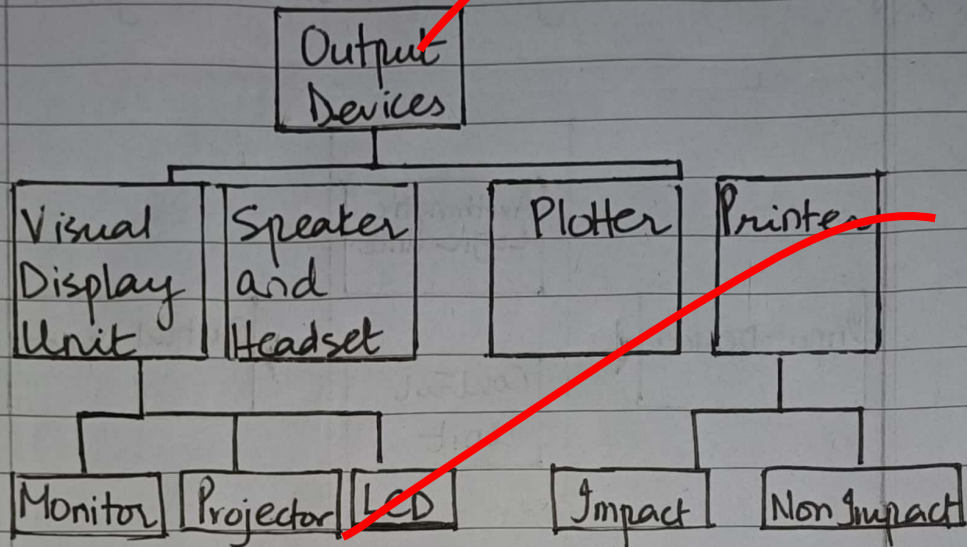
The display and printer are output devices with which the computer makes its results available to the user.

A disk drive is both an input and output device because it can provide stored information or store the data after processing.

(b) Define optics. How does an optical fibre work?

I ## OPTICS

It is the branch of physics that studies the behaviour and properties of light, including its interactions with matter and the construction of instruments that use or detect it.
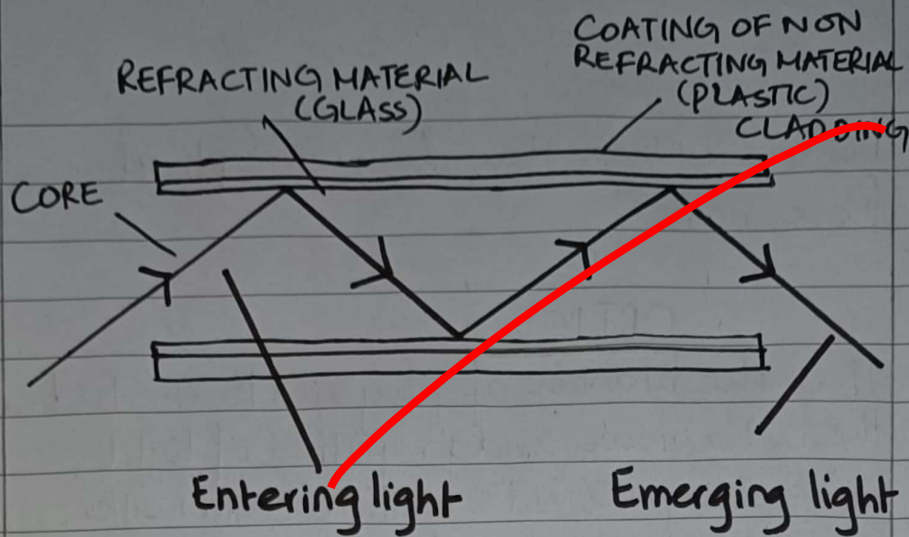
Optics
↓
Branch of physics

Behavior of light   Properties of light
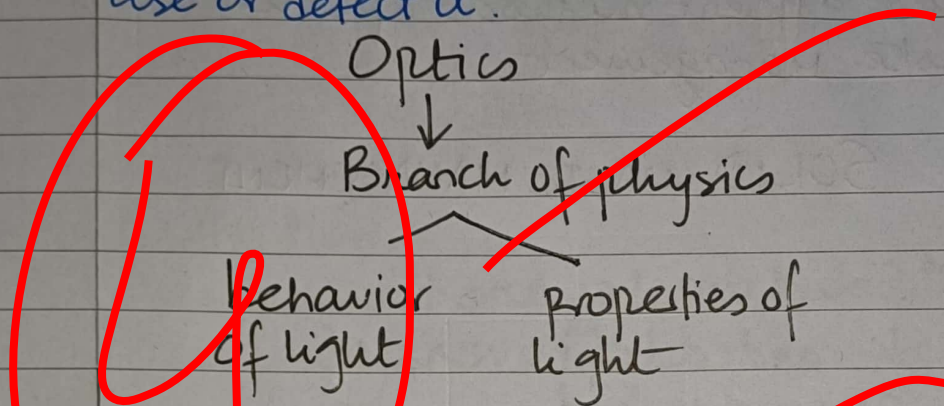
II (a) ## OPTICAL FIBRE

Optical Fibre refers to the medium and the technology associated with the transmission of information as light pulses along a hollow glass tube or plastic wire or fibre.

(b) Working of fibre Optics — Total Internal Reflection

When light enters or hits glass at a really shallow angle of less than 42 degrees, it reflects back in again.

REFRACTING MATERIAL (GLASS)
COATING OF NON REFRACTING MATERIAL (PLASTIC) CLADDING
CORE
Entering light   Emerging light

(C) Discuss different methods of solid waste Management.

SOLID WASTE MANAGEMENT

I   " Solid wastes are the discarded leftovers of our advanced consumer society ... "
                    [Jimmy Carter]

Solid Waste Management (SWM) refers to the systematic management of the generation, collection, transfer, treatment, recycling, recovery and disposal of solid waste.

II   The activities associated with the management of municipal solid waste can be grouped into the following;
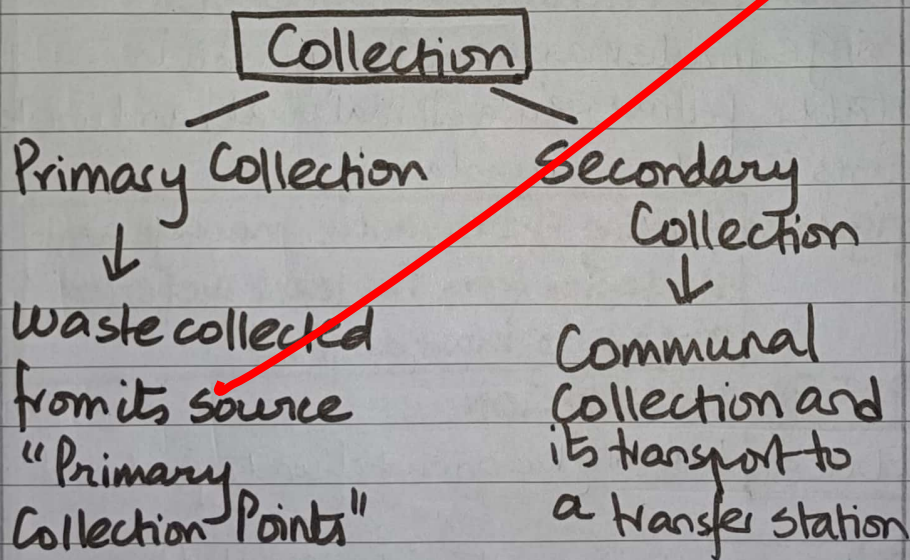
(a) Waste generation

Waste generation encompasses activities in which materials no longer considered of value are either thrown away or gathered together for disposal.

(b) Waste handling and sorting, storage and processing at the source
These are activities associated with the management of wastes until they are gathered or placed in bags or storage containers for collection.

(c) Collection
This includes the gathering and transport of solid wastes and recycable materials through two stages;

```
              ┌────────────┐
              │ Collection │
              └────────────┘
             ╱              ╲
Primary Collection        Secondary
        ↓                  Collection
Waste collected              ↓
from its source           Communal
"Primary                  Collection and
Collection Points"        its transport to
                          a transfer station
```

(d) Sorting, processing and transformation
(e) Transfer and Transport
(f) Waste Disposal — final placement of solid waste

| Transfer and Transport |

(i) Transfer of wastes from the secondary collection point to the larger transfer point

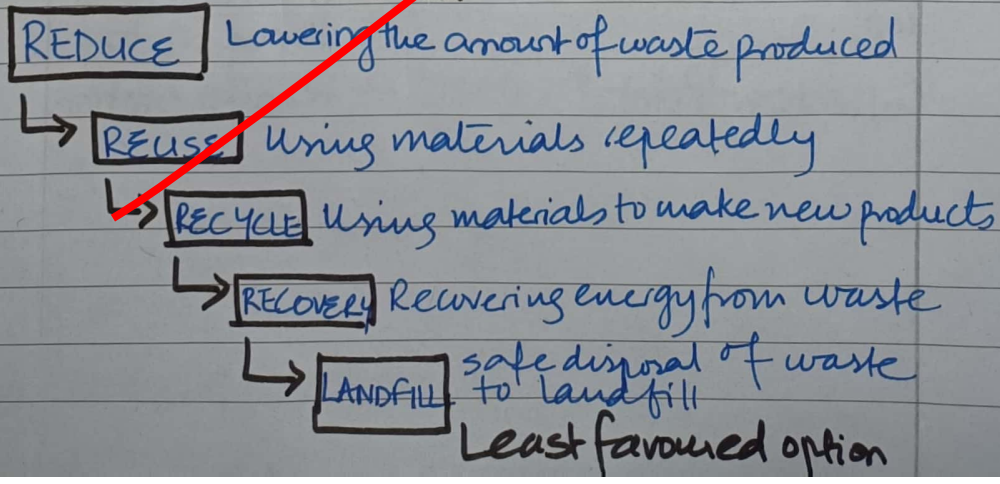(ii) Subsequent transport of the wastes, usually over long distances to a processing or disposal site

III Waste Hierarchy Concept

No single waste management approach is suitable for managing all materials and waste streams in all circumstances

figure: Ranking of the various management strategies from the least preferred at end to most at first

MOST FAVOURED OPTION

REDUCE — Lowering the amount of waste produced

↳ REUSE — Using materials repeatedly

↳ RECYCLE — Using materials to make new products

↳ RECOVERY — Recovering energy from waste

↳ LANDFILL — safe disposal of waste to landfill

Least favoured option

(d) Distinguish GPS & GIS.

GLOBAL POSITIONING SYSTEM (GPS)

It is a satellite based navigation system made up of a network of 24 satellites.

Working of GPS

GPS satellites circle the earth twice a day in a very precise orbit and transmit signal information to earth.

GIS is an Integrating Technology

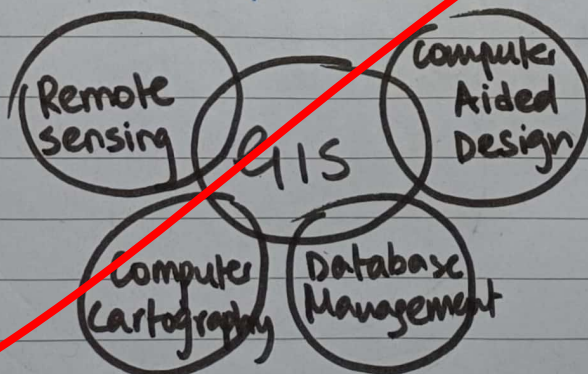Geographic information systems have served an important role as an integrating technology. With GIS it is possible to;

↓
map
↓
model
↓
query
↓
analyse large quantities of data in a single database.

Remote sensing — GIS — Computer Aided Design — Computer Cartography — Database Management

Question 4

(a). **Pesticides**

Pesticides are chemical substances that are meant to kill pests.

Herbicides

Herbicides are used to destroy unwanted vegetation; they are a substance that is toxic to plants.

Insecticides

An insecticide is a type of pesticide that is used to kill insects.

Ceramics

A ceramic is an inorganic, non metallic solid material comprising metal, non-metal or metalloid atoms primarily held in ionic and covalent bonds.

Two types of Ceramics

Crystalline	Non crystalline
↓	↓
not amenable to a great range of processing	Glass, tend to be formed from melts

Green House Effect

Greenhouse gases (GHGs) like water vapour (H_2O), Carbon Dioxide (CO_2) and Methane (CH_4) absorb energy slowing or preventing the loss of heat to space. In this way,

GHS
↓
act like a blanket
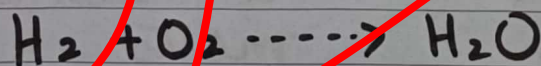↓
making earth warmer than it would otherwise be.
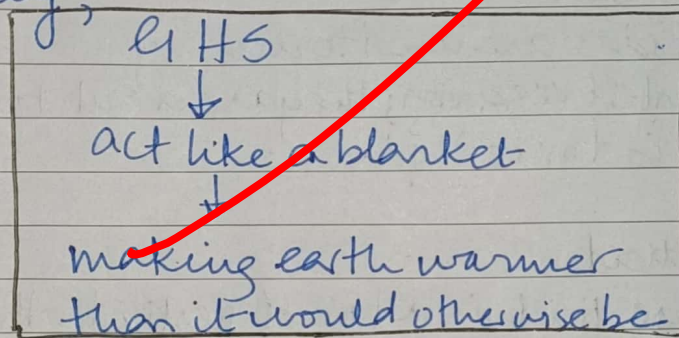
This process is known as greenhouse effect.

(b) Explain the bonding in water molecule

Elements that make water

Water is formed when two atoms of hydrogen combine with one atom of oxygen.

$$H_2 + O_2 \dashrightarrow H_2O$$

Covalent Bonds

Covalent bonding joins the elements that make water. This involves the sharing of a pair of valence electrons by 2 atoms.
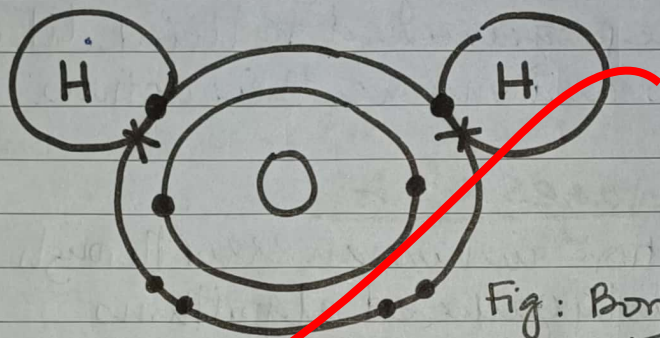

Fig: Bonding in water molecule

Each hydrogen atom is covalently bonded to oxygen through a shared pair of electron.

(C). What types of waves are used in RADAR, SONAR, LIDAR, Mobile Phone and Thermistors?

RADAR
Uses radio waves in its object - detection system.

SONAR
Uses sound waves to explore and map the ocean.

(d) Advantages and disadvantages of AI

Artificial Intelligence - Machine Learning based

Artificial Intelligence is the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions.

Advantages of AI

(i) Reduction in human error through previously gathered algorithms

The decisions taken by AI in every step is decided by information previously gathered and a set of algorithms that are specific. When programmed properly, these errors can be reduced to null.

(ii) Digital Assistance to deliver user-requested content

AI helps some of the most technologically advanced companies engage with users using digital assistants which eliminates the need for human personnel.

(iii) New Inventions

In practically every field, AI is the driving force behind numerous

innovations that will aid humans in resolving majority of challenging issues.

Example - Detecting breast cancer at an early age through AI tools

Disadvantages of AI

(i) The data stored in AI database is mostly biased
Studies show that a significant amount of data stored in AI machines and ~~its~~ their processing is skewed to a certain discourse.

Example - Western discourse and data which can lead to racial discrimination and unsatisfactory solutions for the "rest of the world"

(ii) Replacing human resource means hampering employment opportunities
It is said that every AI machine replaces 4 human personnel. This leads to jobs lost and difficulties for human survival.

Section II

Question 6

a.   Let, x be the length of shorter piece.
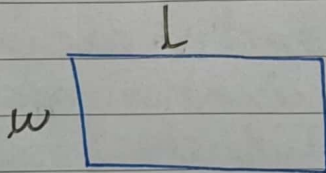
Longer piece, will be $4x$.

$$x + 4x = 300$$
$$5x = 300$$
$$x = 60$$

$$\boxed{\text{Shorter piece} = 60 \text{ ft}}$$

Longer piece $= 60(4)$
$$\boxed{\text{Longer piece} = 240 \text{ ft}}$$

b.

$$l = 3 + 2(w) \quad - \text{(1)}$$

Perimeter $= 20$-inches

Perimeter of a rectangle $= 2l + 2w$
$$20 = 2l + 2w \quad - \text{(2)}$$

→   So we have 2 simultaneous equations and will solve them for the dimensions.

$$l = 3 + 2w$$

$$20 = 2(3 + 2w) + 2w$$

$$20 = 6 + 4w + 2w$$
$$20 = 6 + 6w$$
$$14 = 6w$$
$$w = \frac{14}{6}$$

$$\boxed{w = \frac{7}{3}}$$

$$l = 3 + 2\left(\frac{7}{3}\right)$$

$$l = 3 + \frac{14}{3}$$

$$l = \frac{9 + 14}{3}$$

$$\boxed{l = \frac{23}{3}}$$

dimensions of the rectangle are:
length = $\frac{23}{3}$ err inches

width = $\frac{7}{3}$ inches

3.6 3

c. Let total matches
   played = x

   won : $\dfrac{60}{100} \times x$

   lost : 24 matches

   $x - \dfrac{60x}{100} = 24$

   $\dfrac{100x - 60x}{100} = 24$

   $40x = 2400$

   $x = \dfrac{2400}{40}$

   $x = \dfrac{\overset{60}{\cancel{2400}}}{\cancel{40}}$

   $\boxed{x = 60 \text{ matches} \\ \text{were played in total}}$

d.   3 : 2
       $3x : 2x$
      $3x + 2 : 2x + 6 = \dfrac{4}{5}$

      $\dfrac{3x+2}{2x+6} = \dfrac{4}{5}$

      $5(3x+2) = 4(2x+6)$
      $15x + 10 = 8x + 24$
      $15x - 8x = 24 - 10$
      $7x = 14$
      $x = 2$

First number is $2(x)$
$= 2(2)$
$= 4$

Second number is $3(x)$
$= 3(2)$
$= 6$

Question 7

a. Percentage $= \dfrac{\text{Occupied seats} \times 100}{\text{total seats}}$

$= \dfrac{325}{400} \times 100$

$= \dfrac{325}{400} \times 100$

$= 325$

b. 30 persons — 40 kg — 10 days
80 persons — 320 kg — x.

$30 \times 320 \times x = 80 \times 40 \times 320 \times 10$

$9600 x = 10240$

$x = \dfrac{10240}{9600}$

$x = \dfrac{10240}{9600}$

$x = \dfrac{1024}{960}$

$$x = \frac{1024}{960}$$

$$x = \frac{512}{480}$$

$$x = \frac{256}{240}$$

$$x = \frac{128}{120}$$

$$x = \frac{32}{30}$$

$$x = \frac{16}{15}$$

$$x =$$

(C.)

N

W   2km   E

5km

4km

3km   S
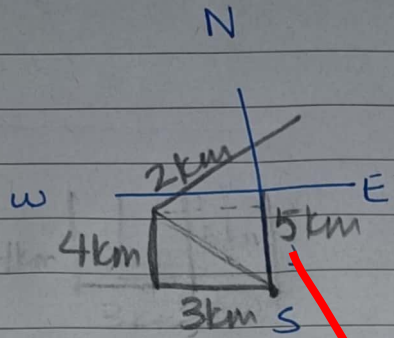
Pythagoras theorem $(\text{hypotenuse})^2 = (\text{base})^2 + (\text{perpendicular})^2$

$$4^2 + 3^2 = x^2$$
$$16 + 9 = x^2$$
$$25 = x^2$$
$$\boxed{x = 5\ km}$$

(d)   Volume of cylinder $= \pi r^2 h$

$$\text{Volume} = \pi (10)^2 (36)$$

$$\text{Volume} = \frac{22}{7} (10)^2 (36)$$

$$\text{Volume} = \frac{22}{7} (100)(36)$$

$$= \frac{22(3600)}{7}$$

$$\boxed{= \frac{79200}{7}}$$

$$
\begin{array}{r}
10 3 1 \\
7\ \overline{)79200} \\
7\!\downarrow \\
09 \\
7\!\downarrow \\
22 \\
2\!\downarrow \\
10 \\
7 \\
30
\end{array}
$$