1.When Rafiq was going to school by his father's car, he took the reading of speed from the speedo-meter of the car every 10 second and put it into the table below:

Time t (s)	0	10	20	30	40	50	60
Velocity v (ms^{-1})	0	20	40	60	80	100	120

①

(a) What is called UNIFORM speed?

(b) Your journey to school and returning home is displacement or distance?

(c) Plot a velocity-time graph by Rafique's collected data.

(d) The plotted graph represents a linear acceleration — Explain with mathematical logic.

c)

1 SD = 10m/s
$\uparrow$ v (m/s)

$\rightarrow$ 1 SD = 10s

$\rightarrow$ time (s)
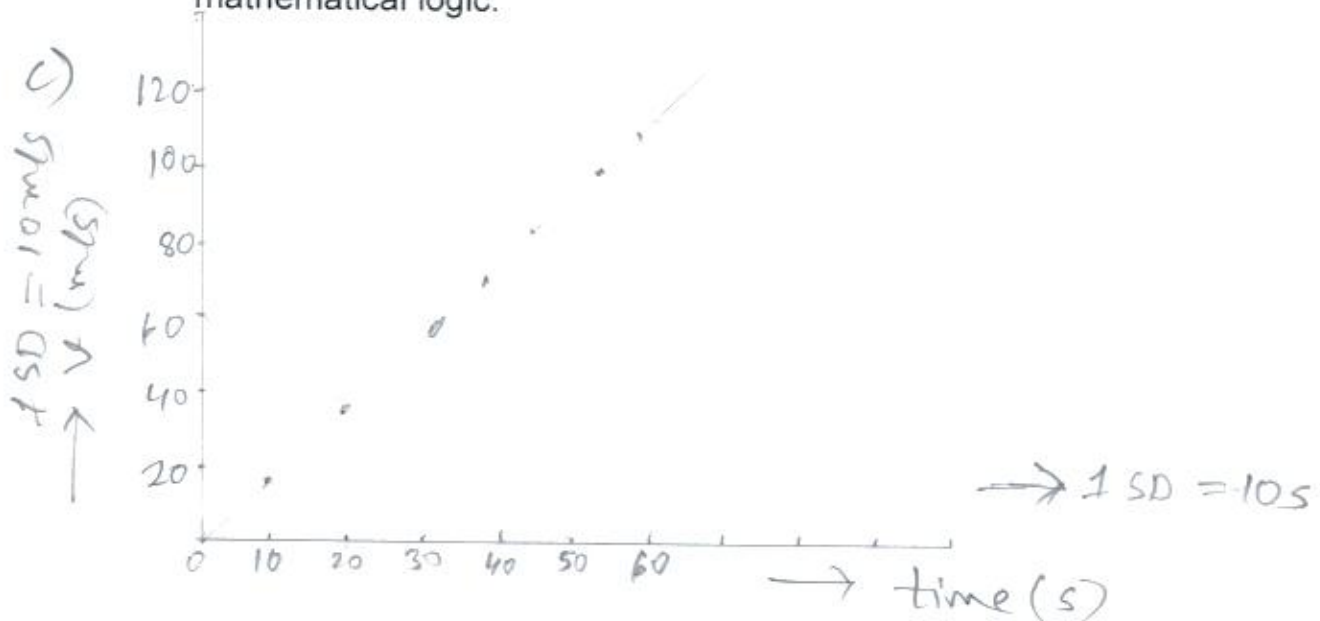
d) Linear acceteration means gradients are same.

$a_1 = a_2 = a_3$ etc.

$$a_1 = \frac{40-20}{20-10} = 2 m/s^2 \qquad a_2 = \frac{80-60}{40-30} = 2 m/s^2$$

1

$$a_3 = \frac{120-80}{60-40} = \frac{40}{20} = 2 m/s^2$$

So the accelecration is linear.

The velocities at different time of car on a plane road are given in the table below.

Time t (min)	0	5 300s	10 600s	15 900s	20 1200s	25 1500s
Velocity, v (ms⁻¹)	2	4	6	6	4	0

(2) a. What is called vector quantity?

b. The motion of earth is uniform speed or velocity?-Explain.

c. Find out the distance travelled in first 10 minutes by the car?

d. Drawing the velocity-time graph from the above table give your opinion about the velocity of the car.

c) $S = \left(\dfrac{u+v}{2}\right) t$

$10 \, min = 600s$

$= \left(\dfrac{2+6}{2}\right) 10 \times 60 = 4 \times 10 \times 60 = 40 \times 60 = 2400 \, m$

d)
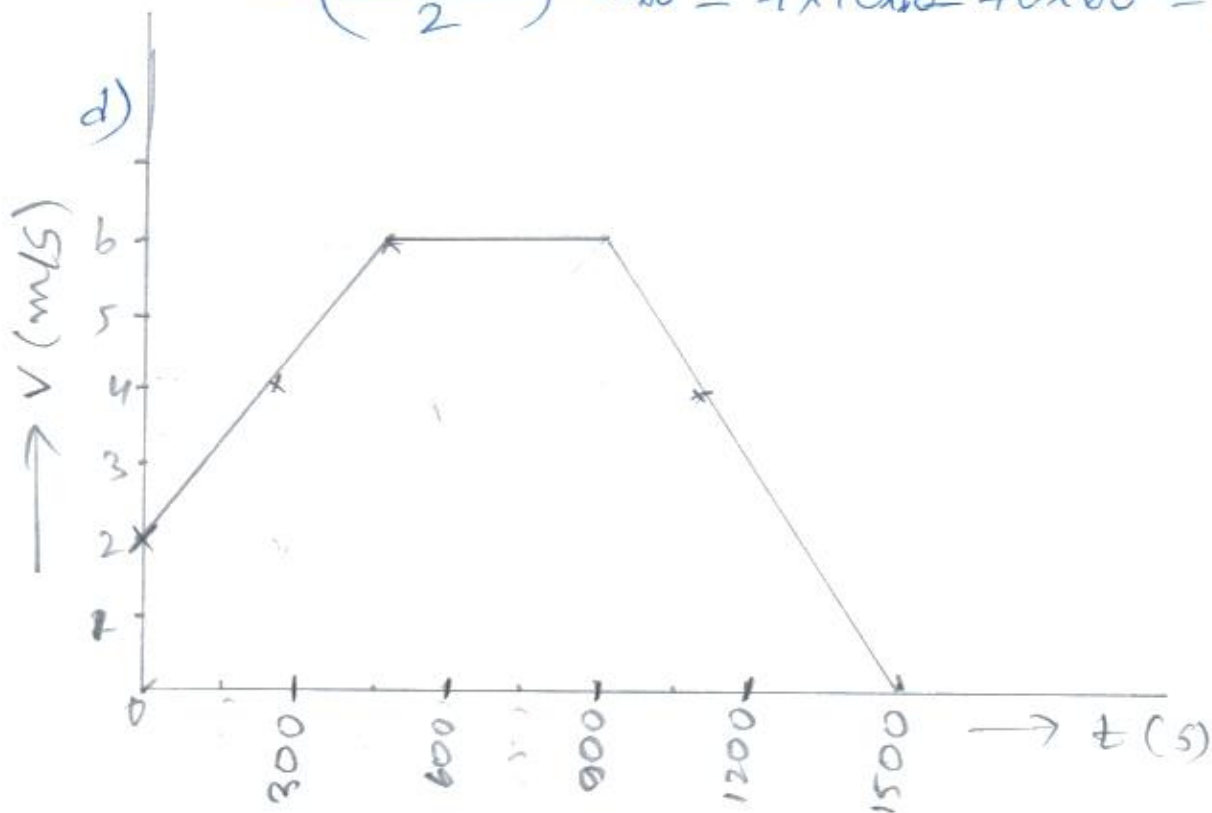
The car accelerates for first 10 mins then moves with uniform velocity for next 5 mins and finally come to rest by decelerating for 10 mins.

The velocity of a car with time is given in the table below

Time(s)	0	10	20	30	40	50	60	70
Velocity(ms⁻¹)	0	2	4	6	8	10	12	14

③   a. What is called displacement?   1
       b. "Acceleration due to gravity is a derived quantity".— Explain.   2
       c. Calculate the distance travelled by the car after first 1mm 10 sec. min 3
       d. From the stem, with the help of velocity-time graph, explain the rate of change of velocity at the time of 30 sec instant.   4

c)   1 min 10s = 70 s

$$S = \left(\frac{u+v}{2}\right)t = \left(\frac{0+14}{2}\right)70 \text{ m}$$

$$= 35 \times 14 = 490 \text{ m}$$
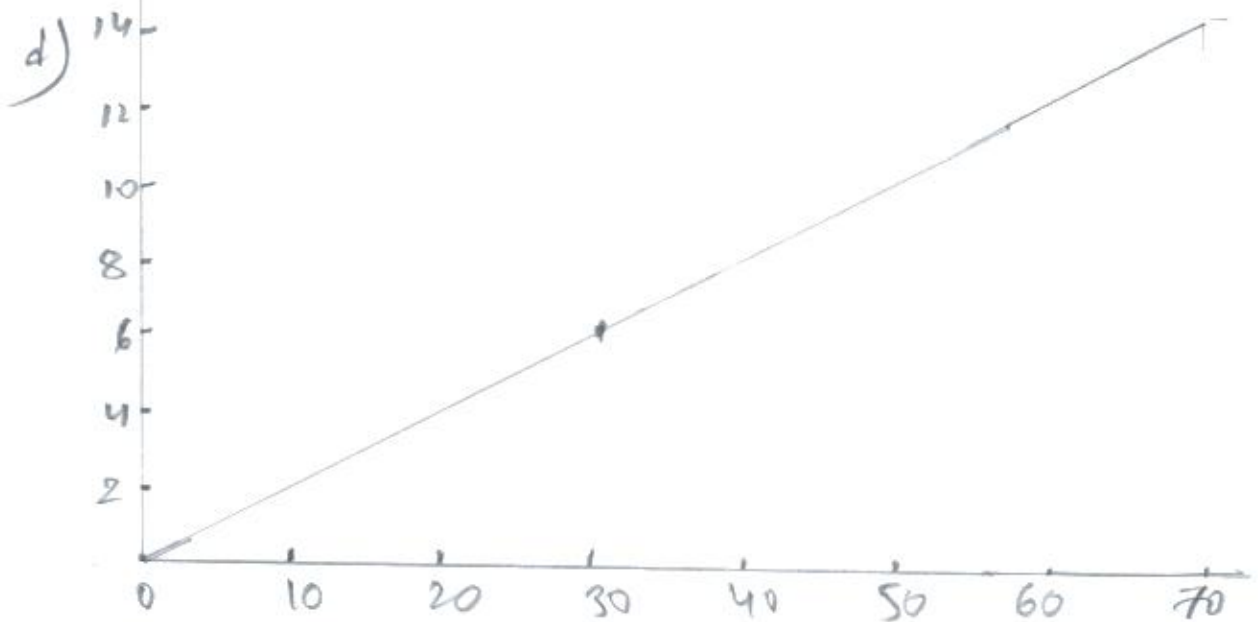
d)

Rate of change of

velocity, $a = \dfrac{v-u}{t}$ 3

$$= \frac{6-0}{30} = \frac{1}{5} = 0.2 \text{ m/s}^2$$

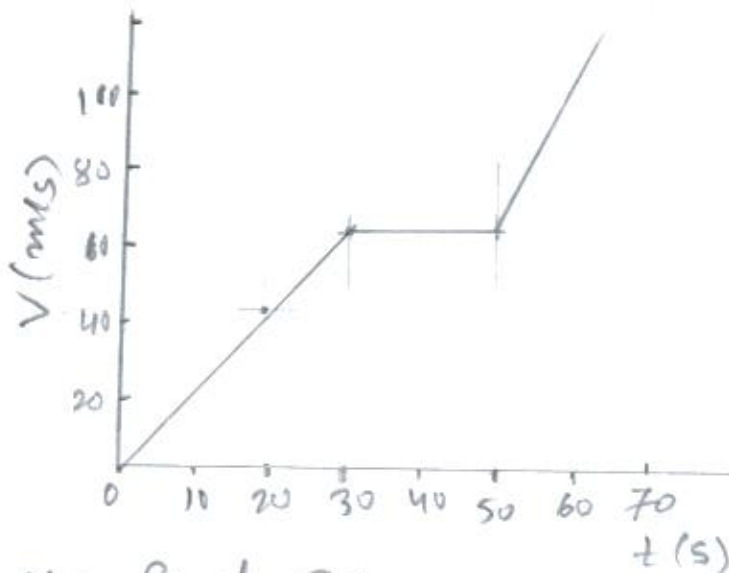| Velocity(ms⁻¹)	0	20	40	60	60	60	80	100
Time(sec)	0	10	20	30	40	50	60	70

(4)

a. What is called MOTION?   1
b. What is the difference between velocity and acceleration?   2
c. With the help of the given data draw a graph.   3
d. Analyze the nature of velocity from given data by mathematical arguments.
4

c)

d) For the first 30s,

$$a = \frac{60-0}{30} = \frac{60}{30} = 2 \ m/s^2$$

From 30s to 50s,

$$a = \frac{60-60}{50-30} = 0 \ m/s^2$$

For the last 20 s,

$$a = \frac{100-60}{70-50} = \frac{40}{20} = 2 \ m/s^2$$

For the first 30s it accelerates   4
at 2 m/s², then moves for 20s at
Const speed and finally again acce-
lerates with 2m/s² for last 20s.

⑤ A car starts from rest with constant acceleration of 2m/sec² for 6 sec. After that it moves with constant speed for 1 min.
a. What is deceleration?   1
b. Show that force is a derived-quantity?   2
c. Calculate the distance travelled with constant acceleration.   3
d. If the car travelled the whole distance mentioned in the above path with constant acceleration 3m/sec², what would be that total time?
                                4

c)

$a = 2m/s^2$ $v = ?$ $\longrightarrow v \longrightarrow$

$u = 0$ $t = 6s$ $t = 60s$

S_1 S_2

$S_1 = \dfrac{\sqrt{v^2 / u^2}}{2a}$ ∴ t is given.

$S_1 = ut + \frac{1}{2}at^2$

$= 0(6) + \frac{1}{2}(2)(6^2)$

$\boxed{S = 36m}$

d) What would be the total distance.

$S = S_1 + S_2$ $S_2 = vt$

$= 36 + 720$ $= (u + at)t$

$= 756$ $= (0 + 2 \times 6)60$

                            $= 12 \times 60$

                            $= 720$

So, with the acceleration of 3m/s² the car has to travel 756 m.

$S = ut + \frac{1}{2}at^2$ 5

or, $756 = 0(t) + \frac{1}{2}(3)t^2$ $\boxed{t = 6\sqrt{14}\,s}$

or, $\frac{3}{2}t^2 = 756$

or, $t^2 = 756 \div (3/2) = 504$