Value Based Questions

1. Rohan and Anirban are students of the same school that is 18 km away from their hostel. One day, they started from their hostel at the same time with an initial velocity of 29.8 km/h. At this speed, it would take 20 min for them to reach the school on time. After 5 min, Rohan stopped due to some problem in his cycle. Anirban didn't wait for him and moved forward. Rohan took another 5 min to repair his cycle. He again started with the same initial velocity as he started from the hostel.

Read the passage carefully and answer the following questions.

(i) What value is not shown by Anirban?

(ii) At what distance from their hostel did Rohan stop?

(ii) What is the required acceleration for Rohan to reach his school on time when he started the second time?

Ans. (i) Value of friendship and caring was not shown by Anirban towards Rohan.

(ii) Initial velocity of both (u_1) = 28.8 km/h = 28.8 x $\frac{5}{18}$ m/s = 8 m/s

$\therefore$ Distance of which Rohan stopped = u x t

= u x (5 min)

= 5 x 60 x 8 m = 2400 m = 2.4 km

(iii) Remaining distance that Rohan had to cover = 18 - 2.4

= 15.6 km = 1560 m

New initial velocity for Rohan (u_2) = 28.8 km/hr = 8 m/s

Time left = 20 - (5 + 5)

= 20 – 10 = 10 mins = 600 s.

According to the question,

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

$$\Rightarrow \quad \frac{1}{2}at^2 = s - ut$$

$$\Rightarrow \quad \frac{1}{2}a(600)^2 = 15600 - 4800$$

$$\Rightarrow \quad \frac{1}{2} \cdot a \times 360000 = 10800$$

$$\Rightarrow \quad a \times 180000 = 10800$$

$$\therefore \quad a = \frac{10800}{180000} = \frac{3}{5} \text{ m/s}$$

$\therefore$ Acceleration = 0.6 m/s^2

2. Two Express trains A and B start from two stations 250 km apart from each other with an initial velocity of 72 km/h and 90 km/h respectively. After 1.5 hours, due to some inconvenience, both the trains start running on the same track towards each other. A farmer passing by, watches both the trains coming towards each other and stand on the track and raises his red shirt. Both trains decelerate uniformly by 0.5 m/s^2 and finally stop and the mishap is averted.
Read the passage carefully and answer the questions.
(i) What is the distance between the trains after 1.5 hour?
(ii) How much time do the trains take to stop after applying brakes?
(iii) What values are promoted by the farmer?

Ans. (i) Velocity of train A = 72 km/h = 20 m/s

$\therefore$ Distance covered in 1.5 hours = 72 x 1.5 = 108 km

Velocity of train B = 90 km/h

= 90 x $\frac{5}{18}$ = 25 m/s

$\therefore$ Distance covered in 1.5 hours = 90 x 1.5 = 135 km.

Now total distance covered by both trains out of 250 km.

$\therefore$ Distance between the trains after 1.5 hours

= 250 - 243

= 7 km.

(ii) Initial velocity of train A, u_A = 20 m/s.

Final velocity of train A, u_A = o m/s.

Deceleration by train A, a = - 0.5 m/s^2 = - $\frac{1}{2}$ m/s^2

$\therefore$ $v = u_A + at$ …(i)

$\Longrightarrow$ $0 = 20 + \frac{(-)1}{2} \times t$

$\Longrightarrow$ t = 20 x 2 = 40s

Again, initial velocity of train B, u_B = 25 m/s

Final velocity of train B, v_B = o m/s

Deceleration by train B, a = - 0.5 m/s^2 = - $\frac{1}{2}$ m/s^2

From equation (i), $0 = u_B + at$

$= 25 + \left(-\frac{1}{2}\right) \times t$

$\therefore$ t = 25 x 2 = 50 s

Hence, train A takes 40 s and train B takes 50 s to stop after applying brakes.

(iii) Awareness, presence of mind, bravery, positive attitude to avoid any serious accident.

3. A bus is moving with a velocity of 60 km/h. The driver sees a child running across the road and he pressed the brakes. The time taken by him to react to the emergency was 1/15th of second. In a second case another bus was coming on the same road at the same speed 60 km/h and the driver also perceives another child passing the road. In this case, the 2nd driver took 0.5 s to respond to the emergency, $i.e.,$ he applied brakes after 0.5s.

Read the passage carefully and answer the following questions:

(i) How much distance did the bus move in the 1st case before the driver could press the brakes?

(ii) How much distance did the bus move in the 2nd case before the driver could apply the brakes?

(iii) What could be the probable reasons that reaction time increases in the case of second driver?

(iv) State two traffic rules which should be followed by the drivers of heavy vehicle.

Ans. (i) Initial velocity of the bus, u = 60 km/h = $\frac{60 \text{ x } 1000}{60 \text{ x } 60}$ = 16.67 m/s

Distance moved by the bus in Is $\frac{1}{15}$s = Velocity of the bus x Time interval

= 16.67 $\frac{1}{15}$ = 1.1 m

Thus the bus would have moved 1.1 m before the driver under normal conditions could press the brakes.

(ii) In the 2nd case distance covered by the bus in 0.5s

= Velocity of the bus x Time interval

= 16.67 x 0.5

= 8.3m

Thus, the bus would have moved 8.3 m before the driver could press the brakes.

(iii) Reaction time, $i.e.,$ the time taken by a person to react to an emergency increases while driving vehicle if the driver is intoxicated under the influence of alcohol.

(iv) Two rules which should be strictly followed are:

(a) The driver should not be drunk.

(b) The vehicle should not carry the load more than the capacity of the vehicle.

4. In a long distance race, five athletes were expected to take four rounds of the track such that the line of finish was same as the line of start. When the athletes were half the way, one athlete fell down unfortunately. Another athelete slows down to help his pear and takes him out of the field.

If the length of the track is 200 m, answer the following questions:

(i) Is the motion of the athletes uniform or non-uniform?

(ii) Is the displacement of the athletes and the distance moved by them at the end of the race equal?

(iii) If the referee is eligible to take any relevant decision, what decision he might have taken about the above said event?
(iv) Which value is shown here by the second athlete?

Ans. (i) Athletes move at different speeds and the speed may be different at different points of time. So, the motion of the athletes is non-uniform.
(ii) The distance and displacement of athletes at the end of the race are not equal. The distance is 200 m while the displacement will be zero.
(iii) If the referee is quite sympathetic in his attitude, he might have postponed the event for the time being.
(iv) We get a valuable lesson from the athlete here that without caring about the academic aspect he is more dutiful and responsible to a person who is in trouble.