LESSON NOTES

| Strand	MECHANICS
Sub Strand	MOMENTUM
Content Learning Outcome	At the end of the lesson students should be able to • demonstrate an understanding of the concept of momentum and its vector nature. • calculate the magnitude of the momentum of a moving mass. • demonstrate an understanding of the law of conservation of momentum in simple one dimensional collision.

Lesson Notes

Conservation of momentum

Provided no external forces are acting momentum of a system will always be conserved. Ie **initial momentum of a system will always be equal to the final momentum of the system.**

➢ **Always write an expression for the initial momentum of the system depending on the number masses in the system.**

➢ **Common velocity of the masses means If the masses move off together with the same velocity**

Eg A 2000kg car travelling at 5m/s hits 90kg man who is standing on the road. After the collision both the car and the person move off with a common velocity.

5m/s

Stationery so v =0m/s

Common velocity V_C
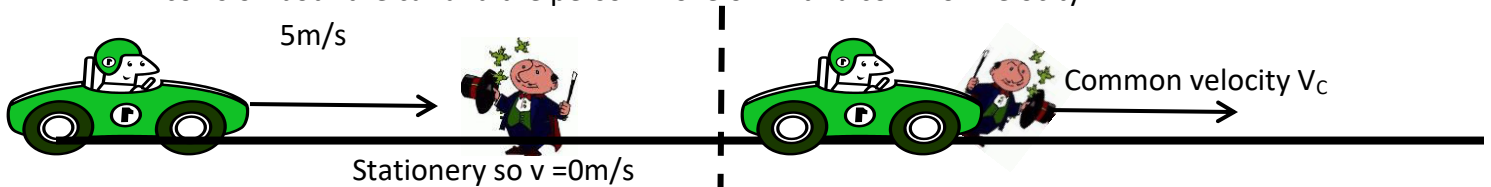
Find

i.   The initial momentum of the car

P = mv

= 2000 (5)

= 10,000kgm/s

ii.   The initial momentum of the person

P = mv

= 90 (0)

= 0kgm/s

iii.   The initial momentum of the system

$$P_{i\,system} = P_{CAR} + P_{PERSON}$$

$$= \overrightarrow{10,000} + 0$$

$$= \overrightarrow{10,000}$$

iv.   Final momentum of the system
The final momentum of the system should be equal to the initial momentum of the system

$$P_{f\,system} = \overrightarrow{10,000}$$

v.   The common velocity after the collision

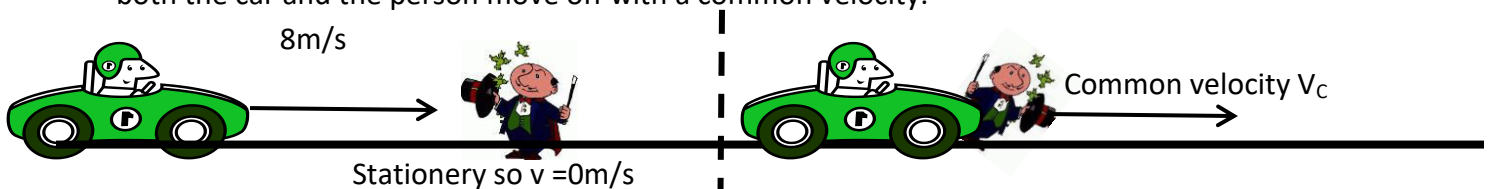$$P = m\,v$$

$$10,000 = (2000 + 90)\,v$$

$$10,000 = 2090\,v$$

$$V = 2090/10,000$$

$$= 2.09m/s$$

> Since both the masses are moving together put the total mass in the formula

Exercise

A 3000kg car travelling at 8m/s hits 50kg man who is standing on the road. After the collision both the car and the person move off with a common velocity.

8m/s

Common velocity V_C

Stationery so v =0m/s

Find
i.   The initial momentum of the car
ii.   The initial momentum of the person
iii.   The initial momentum of the system
iv.   Final momentum of the system
v.   The common velocity after the collision