| 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.

Conservation of momentum

➢ **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**

Let's look at an example when both the masses are moving

1. During a rugby match Alipate of mass 60kg runs at 7m/s as shown. From the opposite side Wilson of mass 50kg runs at 6m/s. Wilson makes the tackle and after the collision both slide with a common velocity. Find

Alipate   Wilson   Common velocity V$_C$?

7m/s   6m/s
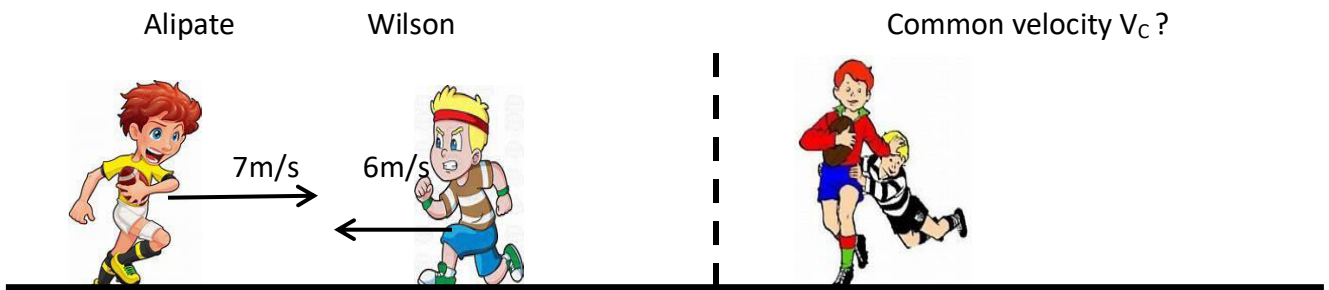
Find
i.   The initial momentum of Alipate
       P = mv
         = 60 (7)
         = 420kgm/s
ii.   The initial momentum of the Wilson
        P = mv
         = 50 (6)
         = 300kgm/s

iii. The initial momentum of the system

$$P_{i\ system} = P_{ALIPATE} + P_{WILSON}$$

$\longrightarrow$ $\longleftarrow$

= 420 + 300

$\longrightarrow$

= 120 kgm/s   using vector addition rules

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

$$P_{f\ system} =$$

$\longrightarrow$
120 kgm/s

v. The common velocity after the collision

$$P = m\ v$$

$$120 = (60 + 50)\ v$$

$$120 = 110\ v$$

$$V = 120/110$$

$\longrightarrow$
= 1.09m/s

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

Exercise

A car of mass 1000kg is moving at 5m/s towards the right. A truck of mass 2000kg travelling at 20m/s from the opposite side hits the car as shown.

Before Collision   **After Collision**

20 m/s   Vc
$\longleftarrow$ $\longleftarrow$

5m/s
$\longrightarrow$

1000 kg   2000 kg
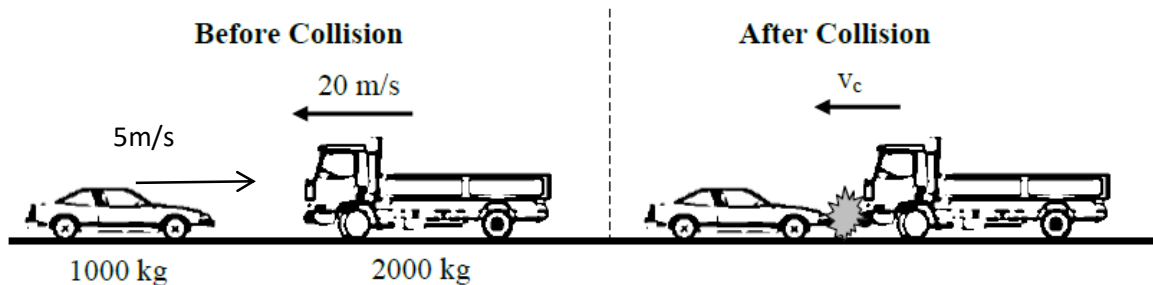
Find

i. initial momentum of car
ii. initial momentum of truck
iii. initial momentum of system
iv. final momentum of system
v. the common velocity of the two vehicles if they stick together after the collision
vi. find out if the collision is elastic or not.