1.1) Momentum in one direction

Worked example

Momentum = Mass x Velocity

Mass	Velocity	Momentum
6 kg	5 m/s	
	13 ms^{-1}	65 kgms^{-1}
523 kg		0 Ns
3kg	4i + 7j ms^{-1}	

Your turn

Momentum = Mass x Velocity

Mass	Velocity	Momentum
523 kg	0 ms^{-1}	0 Ns
0.2 kg	7i + 7j ms^{-1}	1.4i + 1.4j kgms^{-1}
0.002 tonnes	3i + 9j ms^{-1}	6i + 18j Ns
600g	36 km/h	6 Ns

Worked example	Your turn
Calculate the impulse exerted on the object:	Calculate the impulse exerted on the object:
• A force of 30 N exerted on an object for 0.5 seconds	• A rocket of mass 100 kg travelling at 2000 ms^{-1} hits the ground and stops. 200000 Ns
• A ball of mass 3 kg was travelling at 10 ms^{-1}, is hit, and slows to 6 ms^{-1} without changing direction	• A ball of mass 3 kg was travelling at 10 ms^{-1}, is hit and returns in the opposite direction at a speed of 6 ms^{-1} 48 Ns
• The momentum before impact is 6**i** + 3**j** Ns and the momentum after impact is 10**i** + 5**j** Ns	• The momentum before impact is 6**i** - 5**j** Ns and the momentum after impact is -10**i** + 5**j** Ns $-16\boldsymbol{i} + 10\boldsymbol{j}\ Ns$

Worked example	Your turn
A ball of mass 0.4 kg hits a vertical wall at right angles with a speed of 7 ms^{-1}. The ball rebounds with speed 5 ms^{-1}. Find the magnitude of the impulse exerted on the wall by the ball.	A ball of mass 0.2 kg hits a vertical wall at right angles with a speed of 3.5 ms^{-1}. The ball rebounds with speed 2.5 ms^{-1}. Find the magnitude of the impulse exerted on the wall by the ball. 1.2 Ns

Worked example	Your turn
Two particles A and B, of mass $0.6 \, kg$ and m kg respectively, are moving in opposite directions along the same straight horizontal line so that the particles collide directly. Immediately before the collision, the speeds of A and B are $4 \, ms^{-1}$ and $2 \, ms^{-1}$ respectively. In the collision the direction of motion of each particle is reversed and, immediately after the collision, the speed of each particle is $2 \, ms^{-1}$. Find the magnitude of the impulse exerted by B on A in the collision.	Two particles A and B, of mass $0.3 \, kg$ and m kg respectively, are moving in opposite directions along the same straight horizontal line so that the particles collide directly. Immediately before the collision, the speeds of A and B are $8 \, ms^{-1}$ and $4 \, ms^{-1}$ respectively. In the collision the direction of motion of each particle is reversed and, immediately after the collision, the speed of each particle is $2 \, ms^{-1}$. Find the magnitude of the impulse exerted by B on A in the collision. $3 \, Ns$