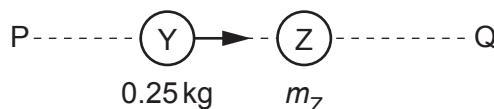
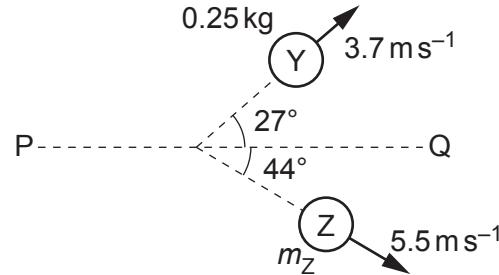


- 4 (a) A ball Y moves along a horizontal frictionless surface and collides with a ball Z, as illustrated in the views from above in Fig. 4.1 and Fig. 4.2.



BEFORE COLLISION

Fig. 4.1 (not to scale)



AFTER COLLISION

Fig. 4.2 (not to scale)

Ball Y has a mass of 0.25 kg and initially moves along a line PQ.
Ball Z has a mass m_Z and is initially stationary.

After the collision, ball Y has a final velocity of 3.7 m s^{-1} at an angle of 27° to line PQ and ball Z has a final velocity of 5.5 m s^{-1} at an angle of 44° to line PQ.

- (i) Calculate the component of the final momentum of ball Y in the direction perpendicular to line PQ.

$$\text{component of momentum} = \dots \text{Ns} \quad [2]$$

- (ii) By considering the component of the final momentum of each ball in the direction perpendicular to line PQ, calculate m_Z .

$$m_Z = \dots \text{kg} \quad [1]$$

- (iii) During the collision, the average force exerted on Y by Z is F_Y and the average force exerted on Z by Y is F_Z .

Compare the magnitudes and directions of F_Y and F_Z . Numerical values are not required.

magnitudes:

directions:

[2]

- (b) Two blocks, A and B, move directly towards each other along a horizontal frictionless surface, as shown in the view from above in Fig. 4.3.



Fig. 4.3

The blocks collide perfectly elastically. Before the collision, block A has a speed of 4 ms^{-1} and block B has a speed of 6 ms^{-1} . After the collision, block B moves back along its original path with a speed of 2 ms^{-1} .

Calculate the speed of block A after the collision.

speed = ms^{-1} [1]