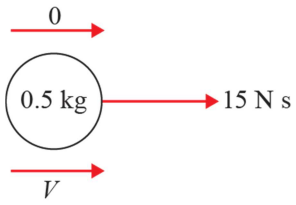
Momentum and impulse 1A

1 $(\rightarrow)$:

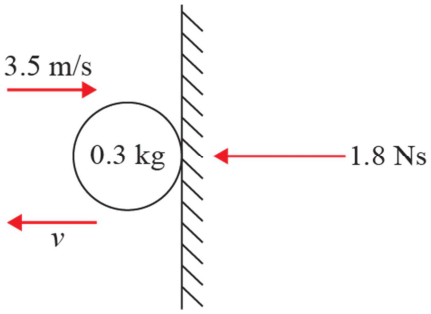
$15 = 0.5v$

$30 = v$

Its initial speed is 30 m s^{-1}



2



$(\leftarrow)$:

$I = mv - mu$

$1.8 = (0.3 \times v) - (0.3 \times (-3.5))$

$1.8 = 0.3v + 1.05$

$0.75 = 0.3v$

$v = 2.5$ m s^{-1}

The speed of the ball just after it rebounds is 2.5 m s^{-1}

3 $Ft = mv - mu$

$0.4 \times 1.5 = 0.2(v - 0)$

$0.6 = 0.2v$

$3 = v$

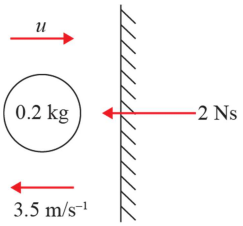
The speed of the toy car is 3 m s^{-1}

4 $(\leftarrow)$:

$2 = 0.2(3.5 - (-u))$

$10 = 3.5 + u$

$u = 6.5$



The speed of the ball before it hits the wall is 6.5 m s^{-1}

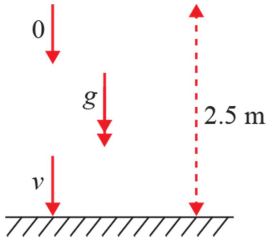
5 $u = 0,\ a = g,\ s = 2.5,\ v = ?$

$(\downarrow):\ v^2 = u^2 + 2as$

$v^2 = 0^2 + 2 \times 9.8 \times 2.5$

$= 49$

$v = 7$



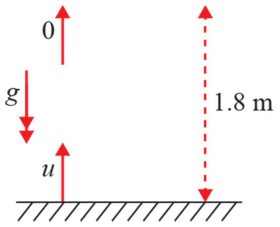
$(\uparrow): v = 0,\ a = -g,\ s = 1.8,\ u = ?$

$v^2 = u^2 + 2as$

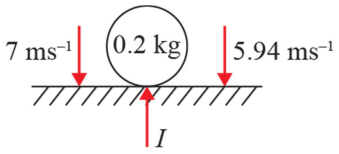
$0^2 = u^2 + 2(-9.8) \times 1.8$

$u^2 = 35.28$

$u = 5.94$



Take upwards as positive.



$(\uparrow): I = 0.2(5.94 - (-7))$

$= 2.588$

The magnitude of the impulse received by the ball is 2.59 N s (2 d.p.)