

Question 7 (Answer: **A**)

- Force is the rate of change of momentum, $F = \Delta p / \Delta t$.
- The momentum changes by $15\,000 - 10\,000 = 5000$ kg m/s.
- $F = 5000 / 8.0 = 630$ N.

Question 6 (Answer: **C**)

- Momentum is conserved, so the total before the collision equals the total after.
- Take one direction as positive, which makes the opposing velocity negative.
- Total before = $0.15(2.1) + m_Y(-0.4)$; set that equal to the total afterwards and solve.

Question 8 (Answer: **B**)

- Impulse equals the change in momentum: $Ft = mv$.
- $200 \times 0.040 = 8.0$ kg m/s.
- The ball starts at rest, so $mv = 8.0$ – divide by the ball's mass to get its speed.

2(a)	(–) 3.5 kgm / s
	$(\Delta p =) m(\Delta u)$ OR $m\{v - u\}$ OR $0.14 \times \{25 - 0\}$
2(b)	360 N
	0.0097 (s) OR 9.7×10^{-3} (s) OR 3.6×10^n
	$(F =) (\Delta)p / t$ OR $3.5 / 0.0097$

Question 6 (Answer: **C**)

- Momentum is a vector, so the direction matters.
- Taking downwards as positive, the momentum changes from $+mv_1$ to $-mv_2$.
- The change is $-mv_2 - mv_1$, whose magnitude is $m(v_1 + v_2)$ – the speeds add because the ball reverses.

2(a)(i)	0.16 m / s
	conservation of momentum OR $m_P v_P = m_Q v_Q$ OR $2.7 \times v_P = 1.2 \times 0.36$ OR $(m_Q v_Q =) 0.432$ seen
	$(v_P =) m_Q v_Q / m_P$ OR $1.2 \times 0.36 / 2.7$
2(a)(ii)	0.078 J
	(k.e. =) $\frac{1}{2}mv^2$ OR (k.e. =) $\frac{1}{2} \times 1.2 \times 0.36^2$
	(k.e. =) $\frac{1}{2} \times 1.2 \times 0.36^2$
2(b)	(from) elastic (energy store in the compressed spring)
	to kinetic (as final energy store of trolleys)

Question 7 (Answer: **B**)

- Impulse equals the change in momentum, $Ft = \Delta(mv)$.
- X's momentum before the collision is $0.15 \times 2.0 = 0.30$ kg m/s.
- Momentum is conserved, so whatever X loses Y gains – the impulse on Y is the momentum transferred to it.

1(a)	20 J
	$(\Delta.E_p =) mg(\Delta)h$ OR $0.2(0) \times 9.8 \times 10$
1(b)(i)	14 J
	$(E_k =) \frac{1}{2}mv^2$ OR $\frac{1}{2} \times 0.2(0) \times 12^2$
1(b)(ii)	$p = mv$ OR $(\Delta p =) mv - mu$
	$(\Delta p =) 0.2(0) \times \{14 + 12\}$ OR $0.2(0) \times \{14 - -12\}$
	OR $p_{\text{before}} = 0.2(0) \times 14$ AND $p_{\text{after}} = 0.2(0) \times (-)12$
	$(\Delta p =) 2.8 - \{-2.4\}$ (= 5.2 kg m / s) OR $(\Delta p =) 0.2(0) \times \{14 - -12\}$
1(b)(iii)	21 N
	$(F =) \Delta p / (\Delta)t$ OR $F = (\Delta)mv / (\Delta)t$ OR $5.2 / 0.25$