**Assess Quizzes from the o-book – Explanations for the answers.**

**Chapter 2 Review – Support**

| Q | Reason |
|---|---|
| 1 | As the value of θ increases, the magnitude of cosθ **decreases**. This determines the component of the weight of the box (mg) perpendicular to the incline, that is, $F_{\perp}$. The magnitude of the normal force $F_N$ is equal to $F_{\perp}$. As the value of θ increases, the magnitude of sinθ **increases**. This determines the component of the weight of the box (mg) parallel to the incline, that is, $F_P$. |
| 2 | At constant speed there is no acceleration and hence no net force. The carton is sliding down the incline so the force of friction opposes motion so friction acts up the incline Because the net force $F_{net} = 0$, the force down the incline ($F_P$) is equal to the force of friction $F_f$ up the incline. Hence, the magnitudes: $F_P = F_f$. |
| 3 | The scales measure the force perpendicular to their surface, that is, $F_{\perp}$. When the scales are tilted, the angle of the scales relative to the floor is greater than zero (eg 10°) and so the component of your weight perpendicular to the surface of the scales ($F_{\perp}$) is given by the formula $F_{\perp} = F_W\cos\theta = mg\cos\theta$. For any angle greater than 0°, the value of cosθ will be less than 1.0 so the reading on the scales will be reduced by this amount. |
| 4 | $F_P = F_g \sin\theta$<br>$= mg\sin\theta$<br>$= 8.0 \times 9.8 \times \sin 37^\circ$<br>$= 47N$ |
| 5 | $F_N = mg\cos\theta$<br>$when\,\theta = 0^\circ, \cos\theta = 1.0$<br>Values of θ > 0° will reduced the value of cosθ to less than the maximum value of 1.0 |
| 6 | By definition, $F_P$ is the component of the weight down the incline. See Figure 1 page 80 of your NCPQ text. |
| 7 | 'Constant speed' means no acceleration, so the net force is zero. What would be happening is that the force down the incline ($F_P$) is equal and opposite to the force up the incline (usually friction $F_f$). I've tried to trap you in some of these questions by using the term 'stationary and saying a block is stationary on an incline. 'Stationary' means it is at constant speed (v = 0) so the net force $F_{net}$ also equals zero. Good trap. Don't fall for it. |
| 8 | Friction acts to oppose motion so if the box is moving up the incline friction acts down. It doesn't matter what is pulling it up the incline (or even pushing it up), and it doesn't matter if it is travelling at constant speed or accelerating up, friction will act in the opposite direction. |
| 9 | The bench top is frictionless so whatever speed the box had when it starts its horizontal journey, it will keep that same speed. There is no net force in the direction of motion so it will not decelerate (slow down). |

**Assess Quizzes from the o-book – Explanations for the answers.**

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|---|---|
| 10 | $F_{down} = F_{up}$ (constant speed)<br>$m_1 g \sin\theta = m_2 g$<br>$m_1 \sin\theta = m_2$<br>$m_1 \sin 30^\circ = m_2$<br>$m_1 \times 0.5 = m_2$<br>$m_1 = 2m_2$<br>The mass $m_1$ is twice the mass of $m_2$. Hence, $m_1$ is the greater mass. |

**Chapter 2 Review – Consolidate**

| Q | Reason |
|---|---|
| 1 | $F_{down} = F_P = mg\sin\theta = 3.0 \times 9.8 \times \sin 20^\circ = 10\,N$<br>$F_{up} = 16\,N$<br>$F_{net} = \lvert F_{up} - F_{down} \rvert$<br>$F_{net} = \lvert 16 - 10 \rvert$<br>$= 6\,N\,(up)$<br>$F_{net} = ma$<br>$a = \frac{F_{net}}{m} = \frac{6}{3.0}$<br>$= 2\,m\,s^{-2}\,(up)$ |
| 2 | $F_P = F_f$ (constant speed)<br>$F_W \sin\theta = F_f$<br>$W \sin\theta = F$ (replace the usual symbols with the new ones in the question) |
| 3 | Constant speed, so a = 0<br>$v = u + at$<br>$v = u$ (as $a = 0$)<br>Thus, the speed remains the same as it is independent of the time ***t***. |
| 4 | Constant speed, so $a = 0$<br>$v = u + at$<br>$v = u$ $(as\, a = 0)$<br>Thus, the speed remains the same as it is independent of the distance travelled ***s***. |

**Assess Quizzes from the o-book – Explanations for the answers.**

| | |
|---|---|
| 5 | The questions says 'constant speed' thus $a = 0$.<br>The acceleration will remain constant (the same) at 0. |

**Chapter 2 Review – Extend**

| Q | Reason |
|---|---|
| 1 | $F_{net} = mg\sin\theta = mg\sin 10^\circ$<br>$F_{net} = ma$<br>$ma = mg\sin 10^\circ$<br>$a = g\sin 10^\circ = 9.8\sin 10^\circ$<br>$= 1.70\, m\, s^{-2}$ directed down the incline<br>$v^2 = u^2 + 2as$<br>$0^2 = 19^2 + 2\times 1.70\times s$<br>$s = -106\ m$<br>$\approx 110\, m$ distance (to 2 sf)<br>As distance is not a vector quantity, we can disregard the negative ***s*** which just means the truck moves 110 m in the upwards (negative) direction. This is because we have treated acceleration as positive and as the net force is down the incline, this must be the positive direction.<br>If you let ***a*** be negative, then ***s*** will be positive. |
| 2 | $s = ut + \frac{1}{2}at^2$<br>$20 = 3\times 4 + \frac{1}{2}a\times 4^2$<br>$20 = 12 + 8a$<br>$a = 1.0\, m\, s^{-2}$<br>$F_{net} = ma$<br>$F_{net} = F_P$<br>$ma = mg\sin\theta$<br>$a = g\sin\theta$<br>$\sin\theta = \frac{a}{g} = \frac{1.0}{9.8} = 0.102$<br>$\theta = \sin^{-1} 0.102$<br>$= 5.9^\circ$ |

**Assess Quizzes from the o-book – Explanations for the answers.**

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|---|---|
| 3 | $F_{net} = F_P$<br>$ma = mg\sin\theta$<br>$a = g\sin\theta$<br>$a = 9.8\sin 40^\circ$<br>$v^2 = u^2 + 2as$<br>$0 = 5.5^2 + 2\times -6.3\times s$<br>$s = 2.4\,m$ |
| 4 | $F_P = mg\sin\theta = 10\times 9.8\times\sin 35^\circ = 56.2\,N$<br>The force applied up the incline parallel to the surface is the component of the tension force $F_T$ parallel to the incline. We can call this $F_A$ for 'applied'.<br>$F_A = F_T\cos 25^\circ$<br>These two forces are equal because the box is at rest ($F_{net} = 0$), so:<br>$F_A = F_P$<br>$F_T\cos 25^\circ = 56.2$<br>$F_T = \frac{56.2}{\cos 25^\circ} = 62\,N$ |
| 5 | Because the truck is moving up the incline, friction must act down the incline (opposes motion):<br>$F_{down} = F_P + F_f$<br>$= F_f + m_1 g\sin\theta$<br>$= F_f + m_1\times g\times\sin 30^\circ$<br>$F_{up} = m_2 g$<br>$F_{net} = \lvert F_{up} - F_{down}\rvert = 0\ (no\ acceleration)$<br>$F_{up} = F_{down}$<br>$m_2 g = F_f + m_1\times g\times\sin 30^\circ$<br>$m_2 = F_f + m_1\times\frac{1}{2}$<br>$m_2 > \frac{1}{2}m_1$<br>We can see that $m_2 = ½\, m_1$ plus $F_f$. So, $m_2$ is greater than just ½ $m_1$. |