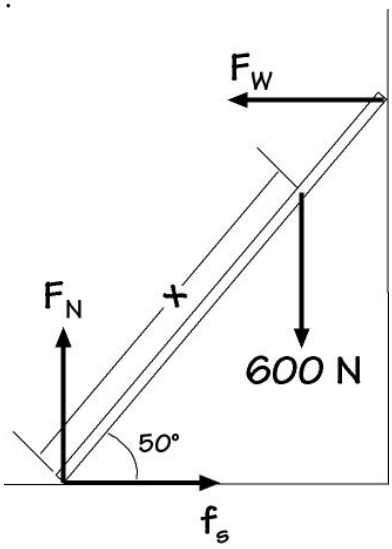
1. B
2. B
3. B
4. A
5. C
6. D
7. D
8. B
9. (a) .



(b)

$$\Sigma F_y = F_N - 600\ N = 0$$
$$\Sigma F_x = f_s - F_W = 0$$

(c)

$$\Sigma\tau = F_W(10.0m)\sin 50^\circ - (600\ N)x\cos 50^\circ = 0$$

(d) The ladder slips if the required friction force exceeds f_s^{MAX}. This threshold occurs when

$$F_W = f_s^{MAX} = \mu_s F_N = (0.7)(600\ N) = 420\ N$$

and so

$$(420\ N)(10.0\ m)\sin 50^\circ = (600\ N)x\cos 50$$
$$x = 8.3\ m$$

10. (a)

$$L_1 = I\omega = \frac{1}{2}(155\ kg)(2.63\ m)^2(2\pi \times 0.641 rad/s) = 2160\ J\cdot s$$

(b)

$$L_2 = mvr_\perp = (59.4\ kg)(3.5\ m/s)(2.63\ m) = 547\ J\cdot s$$

(c) Angular momentum is conserved in the process:

$$L_f = L_1 + L_2 = I_{total}\omega$$
$$(\frac{1}{2}(155\ kg)(2.63\ m)^2 + (59.4\ kg)(2.63\ m)^2)\omega = 2707\ J\cdot s$$
$$\omega = 2.86\ rad/s$$

11. (a) The violin string could be 2 Hz above or below the tuning fork. The string frequency could be 438 Hz or 442 Hz.
    (b) Since the beat frequency increases when the string is tightened, we know the string was at a higher frequency than the tuning fork to begin with and is now at the even higher frequency of 445 Hz.
12. The lowest frequency, 180 Hz, is the fundamental. The second harmonic, 360 Hz, is not allowed, but 540 Hz = 3(180 Hz) is allowed. The missing 2nd harmonic means the pipe must be a closed pipe with

$$f_1 = \frac{v}{4L}$$

$$L = \frac{v}{4f_1} = \frac{343\ m/s}{(4)(180Hz)} = 0.476\ m$$

13. (a) 3 cm
    (b) 3 s
    (c) 2 m
    (d) 2/3 m/s
    (e) C