p. 128 17. $F_A = 36\ N$, $F_g = 52\ N$

$F_F = 36\ N$ ← • → $F_A = 36\ N$

(because constant speed)

$\mu_k = \frac{F_F}{F_N}$ $F_N = -F_g$ $= -(-52)$ $= 52$ $\mu_k = \frac{36}{52} = \boxed{.69}$

19. $F_g = 134\ N$, $\mu_s = .55$

$\mu_s = \frac{F_F}{F_N}$ $F_N = -F_g = 134\ N$ $F_F = \mu_s F_N = (.55)(134)$

$\boxed{= 74\ N}$

20. $\mu_k = .12$

$F_N = -F_g = -(-52 - 650) = 702\ N$

$\mu_k = \frac{F_F}{F_N}$ $F_F = \mu_k F_N = (.12)(702)$

$\boxed{= 84\ N}$

21. $\mu_{k(dry)} = .58$ $\mu_{k(oil)} = .06$

$\mu_k = \frac{F_F}{F_N}$ $F_N = \frac{F_F}{\mu_k} = \frac{5.8}{.58} = 10.\ N$ $F_F = \mu_k F_N = (.06)(1.0)$

$\boxed{= .6\ N}$

22. $M = 1.4\ kg$, $a = -1.25\ m/s^2$

the only force acting is kinetic friction

$\Sigma F = ma = (1.4)(-1.25) = 1.8\ N$ ← F_F

$F_N = mg = (1.4)(-9.80) = 14\ N$ $\mu_k = \frac{F_F}{F_N} = \frac{1.8}{14}$

$\boxed{= .13}$

24. $V_i = 5.8\ m/s$, $V_f = 0$, $\mu_k = .31$

Friction acts on the disk

$\Sigma F = -F_F = ma$

Remember $F_F = \mu_k F_N$ and $F_N = mg$

$= 0$ $F_F = \mu_k mg$

$-F_F = \mu_k mg$ taking $\Sigma F = -F_F = ma$

$-\mu_k mg = ma$

$a = -\mu_k g$

$\Delta d = \frac{V_f^2 - V_i^2}{2a} = \frac{0 - (5.8)^2}{2(-.31)(9.80)}$

$\boxed{= 5.6\ m}$

26. $V_i = 23\ m/s$, $V_f = 0\ m/s$, $\Delta d_{max} = 60.0\ m$, $\mu_k = .41$, $m = 2400\ kg$

using the same reasoning as above

$\Delta d = \frac{V_f^2 - V_i^2}{2a} = \frac{0 - (23)^2}{2(-.41)(9.80)} = \boxed{66\ m}$ No, will hit the branch

28. $M = 25\ kg$, $\mu_k = .15$

$F_F = \mu_k F_N = (.15)(25)(9.80)$

$\boxed{= 37\ N}$

29. $m = .0023\ kg$, $\Delta d = .35\ m$, $\mu_k = .24$, $V_f = 0\ m/s$

$F_F = \mu_k F_N = \mu_k mg = (.24)(.0023)(9.80) = .0054\ N$

$\Sigma F = -F_F = ma$

$-.0054 = .0023a$

$a = -2.35\ m/s^2$

$V_i = \sqrt{V_f^2 - 2a\Delta d} = \sqrt{-2(-2.35)(.35)} = \boxed{1.3\ m/s}$

91. $m = 225\ kg$

$F_A = 710\ N$

$\mu_k = .20$

$\Sigma F = F_A + F_F = ma$

$F_F = \mu_k F_N$

$= \mu_k mg$

$= (.20)(225)(9.80)$

$= 440\ N$

$F_A + F_F = ma$

$a = \frac{F_A + F_F}{m}$

$= \frac{710 + (-440)}{225}$

$= 1.2\ m/s^2$

93. $m = 180\ kg$

$\mu_k = .13$

$\mu_s = .21$

$\mu_s = \frac{F_F}{F_N}$

$F_F = \mu_s F_N$

$= \mu_s mg$

$= (.21)(180)(9.80)$

$= 370\ N$

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$m = 2500.0\ kg$

$v_i = 14.0\ m/s$

$\Delta d = 25.0\ m$

$v_f = 0\ m/s$

$a = \frac{v_f^2 - v_i^2}{2\Delta d} = \frac{-(14.0)^2}{2(25.0)} = -3.92\ m/s^2$

$\Sigma F = -F_F = ma$

Remember $F_F = \mu_k F_N = \mu_k mg$

$-\mu_k mg = ma$

$-\mu_k = \frac{a}{g} = \frac{-3.92}{9.80}$

$\mu_k = .400$

104. $m = 50.0\ kg$

$\mu_s = .30$

$\mu_k = .10$

a) $F_S = mg$

$= (50.0)(9.80)$

$= 490.\ N$

b) $F_F = \mu_s F_N$

$= (.30)(490.)$

$= 150\ N$

c) $F_F = \mu_k F_N$

$= (.10)(490.)$

$= 49\ N$

d) $a = 3.0\ m/s^2$

$\Sigma F = F_A + F_F = ma$

$F_A = ma - F_F$

$= (50.0)(3.0) - (-49)$

$= 150 - (-49)$

$= 2.0 \times 10^2\ N$