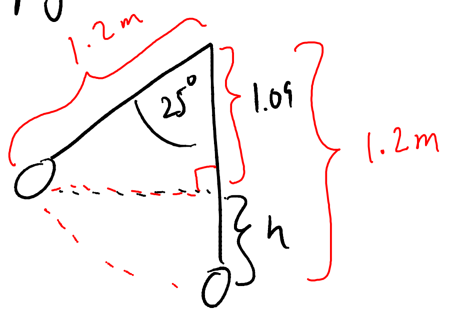
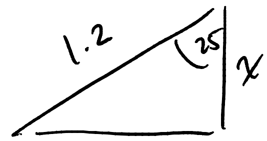
November-04-10
1:04 PM

# #11 pg 229




$$\cos 25 = \frac{x}{1.2}$$

$$x = 1.2\cos 25$$
$$= 1.09$$

$$h = 1.2 - 1.09 = .11\,m$$

1 mark

$$\Delta E_p + \Delta E_k = 0$$

$$\frac{mgh_f}{m} - \frac{mgh_i}{m} + \frac{\frac{1}{2}mv_f^2}{m} - \frac{\frac{1}{2}mv_i^2}{m} = \frac{0}{m}$$ } divide by m

since h=0

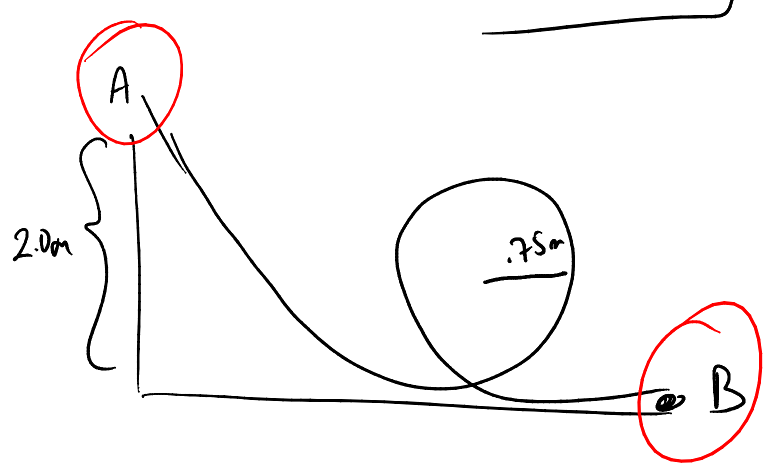
$$-(9.8)(0.11m) + \frac{1}{2}v_f^2 = 0$$

$$\frac{1}{2}v_f^2 = 9.8\frac{m}{s^2} \cdot .11\,m$$

$$\sqrt{v_f^2} = \sqrt{2 \cdot 9.8\frac{m}{s^2} \cdot .11\,m}$$

$$= 1.47\frac{m}{s}$$

13)



$\Delta E_p + \Delta E_k = 0$

$\frac{mgh_f}{m} - \frac{mgh_i}{m} + \frac{\frac{1}{2}mv_f^2}{m} - \frac{\frac{1}{2}mv_i^2}{m} = \frac{0}{m}$  divide by m

$gh_f - gh_i + \frac{1}{2}v_f^2 - \frac{1}{2}v_i^2 = 0$

$\frac{1}{2}v_f^2 = gh_i$

$v_f^2 = 2gh_i$

$v_f = \sqrt{2gh_i}$

---

Power = amount of work per unit of time

$= \frac{\text{work}}{\text{time}} = \frac{J}{s}$ or Watts "W" uppercase

$= \frac{F \cdot d}{t} = F \cdot \frac{d}{t} = F \cdot v$

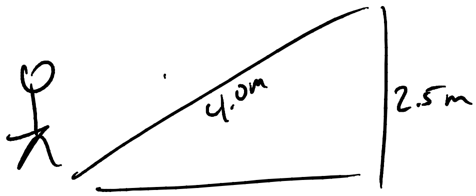
ex I lift 3kg block 1m in 2s, How much Power did I generate

Work done is $(3kg)(9.8)(1m) = 29.4\ J$

$\text{Power} = \frac{W}{t} = \frac{29.4J}{2s} = 14.7\ W$

ex 60kg student runs up an incline at constant v, calculate power of student if it

of student 1+11
takes 4.5 s




$$Power = \frac{W}{t} = \frac{mgh}{t} = \frac{(65\,kg)(9.8\,\frac{m}{s^2})(2.5)}{4.5\,s}$$

$$= 330\ W$$

ex a $1.00 \times 10^3$ kg car accelerates from rest to a final velocity of 15.0 m/s in 4.00 s. Calc Power output of the engine.

$$P = \frac{W}{t} = \frac{F \cdot d}{t} = \frac{m a d}{t}$$

$$= 28000\ W$$

$V_i = 0$

$V_f = 15.0\ m/s$

$t = 4.00\ s$

$a = 3.75\ m/s^2$

$d = 30\ m$

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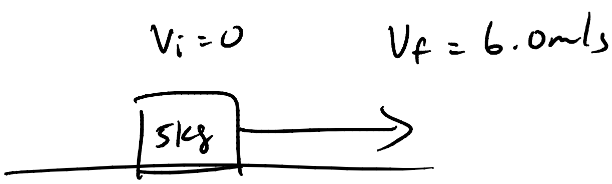
#5



$d = 2.0m$

$P = \frac{W}{t} = \frac{F \cdot d}{t} = \frac{m \cdot a\, d}{t}$ (F = Applied Force)

$m = 5kg$

$V_i = 0$

$V_f = 6.0m/s$

$d = 2.0\,m$

$a = ?$

$F_{FR} = 4N$

$V_f^2 = V_i^2 + 2ad$

$a = \frac{V_f^2 - V_i^2}{2d} = \frac{(6.0m/s)^2}{2(2m)}$

$= 9.0 \frac{m}{s^2}$

$F_{NET} = (5kg)(9.0m/s^2)$

$= 45.0N$

$F_{NET} = F_{App} + F_{FR}$

$45N = F_{app} + (-4N)$

$F_{app} = 49$

$P = \frac{F \cdot d}{t} = \frac{(49N)(2m)}{t}$

$a = \frac{V_f - V_i}{t}$ $\quad t = \frac{V_f - V_i}{a} = \frac{6.0\frac{m}{s} - 0}{9m/s^2}$

$t = .67\,s$

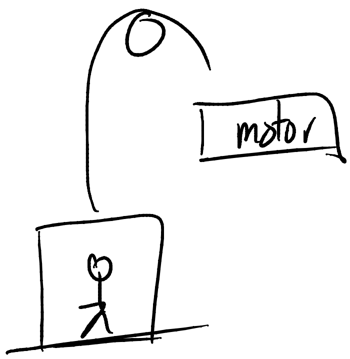
$P = \frac{98J}{.67s} = 146\,W$

**efficiency**

$$\frac{\text{Work out}}{\text{Work in}} \times 100\%$$

$$\frac{\text{Power out}}{\text{Power in}} \times 100\%$$

elevator




The motor is doing the work to lift Hanz

A motor uses 15000 J to lift Hanz and the elevator a height of 2m. If Hanz and the elevator have a combined mass of 300 kg How efficient is the motor

Work in 15000 J

Work out (PE gained by Hanz) $= mgh$

$= (300kg)(9.8)(2)$

$= 5880 J$

$$Eff = \frac{\text{Work out}}{\text{Work in}} \times 100\% = 39\%$$

$$= \frac{\text{Power out}}{\text{Power in}} \times 100\% =$$

the amount time used is 5s

in the previous problem the amount time used is 5s

$$Eff = \frac{\frac{5850J}{5s}}{\frac{15000J}{5s}} \times 100\% = 39\%$$

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$P_{in} = 1.00 \times 10^2$ kW $= 100$ kW, 100,000 W

eff = 82%

m = 50 kg

h = 8.00 m

$$\frac{\text{Power out}}{\text{Power in}} \times 100\% = 82\%$$

$$\text{Power in} \cdot \frac{\text{Power out}}{\text{Power in}} \times \frac{100\%}{100} = \frac{82\%}{100} \times \text{Power in}$$

$$\text{Power out} = \frac{82\%}{100\%} \times \text{Power in}$$

$$= 82000 \text{ W}$$

$$\text{Power out} = \frac{PE}{t}$$

$$= \frac{mgh}{t} = 82000 \text{ W}$$

$$t = \frac{mgh}{82000 \text{ W}} = 0.048 \text{ s}$$

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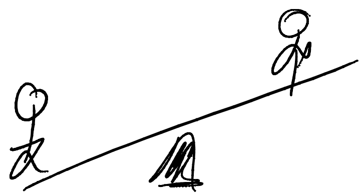
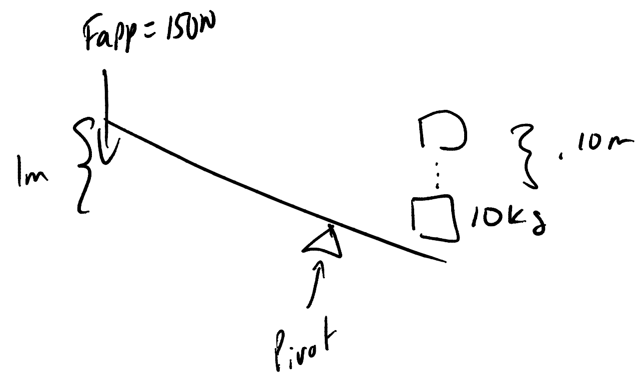
#4 83%

#6 36%

ex See-Saw (lever)



Simple machine




Using a lever we can lift objects

How efficient is this lever?

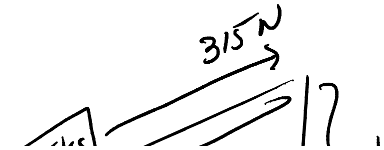
$$\text{Work in} = F \cdot d = (150N)(1m) = 150\,J$$

$$\text{Work out} = (10kg)(g)(.1) = 9.8\,J$$

$$Eff = \frac{\text{Work out}}{\text{Work in}} \times 100\% = 6.5\%$$

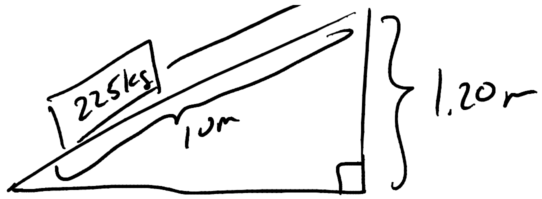
a wedge is another simple machine (incline)

ex




lets assume a motor is exerting 315N of tension force.

ex




force.

Calc efficiency

Work in $= (315N)(10m)$
$= 3150J$

Work out $= mgh$
$= (225)(9.8)(1.2)$
$= 2646\ J$

Eff $= 84\%$

Ideal mechanical Advantage

If we were 100% efficient
Work out = Work in

$$W_o = W_i$$

$$F_r d_r = F_e d_e$$

where $F_r$ = Force resistance
$d_r$ = distance experienced by the resistance
$F_e$ = Force applied by the person or motor
$d_e$ = distance experienced by the person or motor

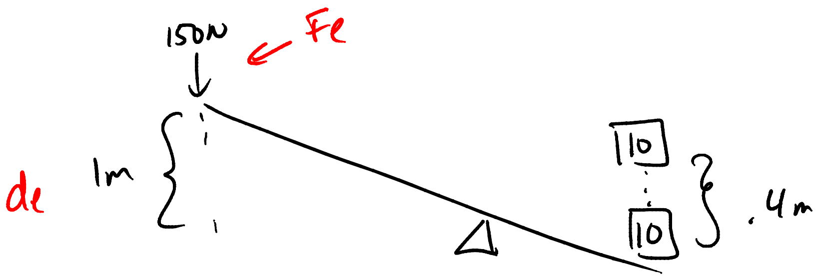
$$\frac{F_r}{F_e} = \frac{d_e}{d_r}$$

$\frac{F_r}{F_e}$ ← Mechanical Advantage (MA)

$\frac{d_e}{d_r}$ ← Ideal Mechanical advantage (IMA)

$$Eff = \frac{MA}{IMA} \times 100\%$$

back to see-saw ex.




$F_r = 10 \cdot 9.8$

$d_r = .4\,m$

$$MA = \frac{F_R}{F_E} = \frac{98\,N}{150\,N} = .65$$

$$IMA = \frac{d_e}{d_r} = \frac{1m}{.4m} = 2.5$$

$$Eff = \frac{MA}{IMA} = \frac{.65}{2.5} = 26\%$$

Pg # 239 #2-6 all

Add ex. 242 #1-21 odd