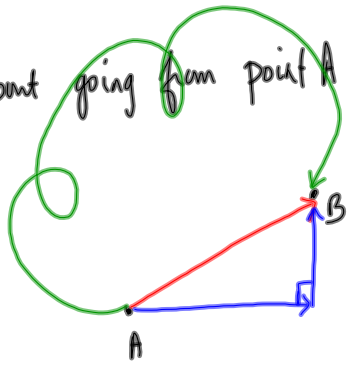
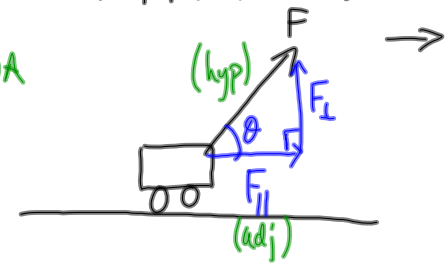
What happens if the force is not parallel to the motion, but it is also not perpendicular? Does this mean that no work is done?

Think about going from point A to point B:



So now think of this in terms of a Force acting at an angle?

SOHCAHTOA



$$\cos\theta = \frac{F_{||}}{F}$$

$$F_{||} = F\cos\theta$$

Recall: $W = F_{||}\Delta d$

$$W = F\Delta d\cos\theta$$

If $\theta = 0°$ (), maximum work (+)

$\theta = 90°$ (), no work (0)

$\theta = 180°$ (), maximum work (−)

(Forces like air resistance + friction do negative work)

MP|233

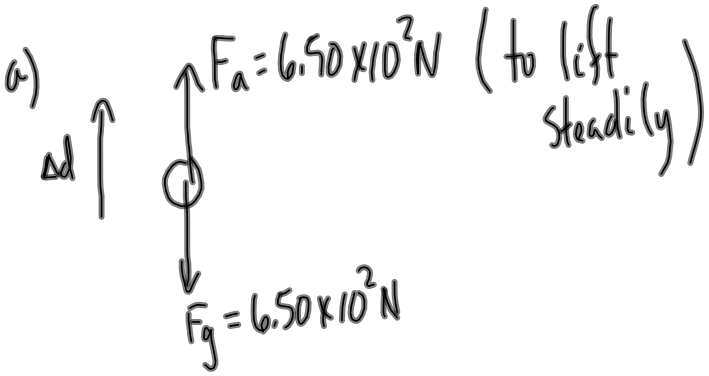
$F_g = 6.50 \times 10^2 N$

$\Delta d = 0.55 m$

a) $W = ?$ (lifting)

b) $W = ?$ (lowered)

a)

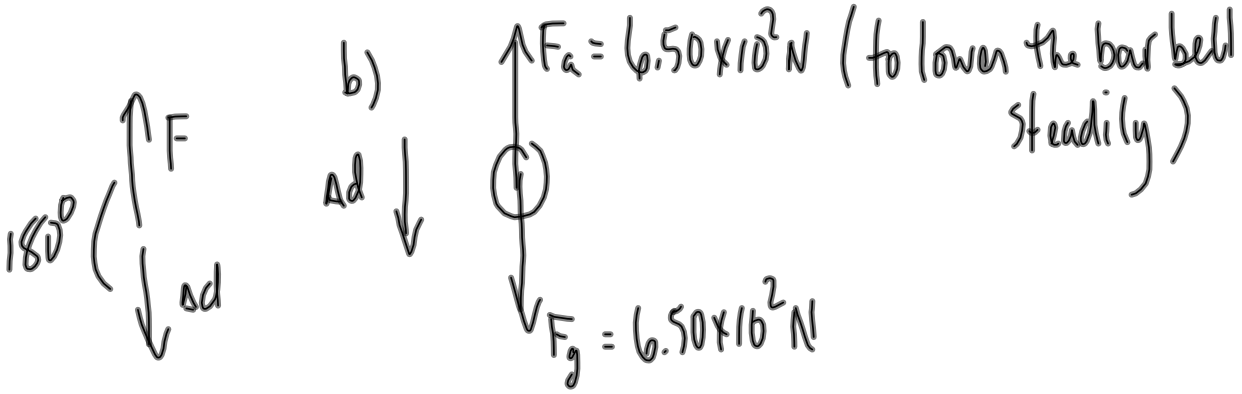


$W = F_{||} \Delta d$

$W = (6.50 \times 10^2 N)(0.55 m)$

$W = +3.6 \times 10^2 J$

b)



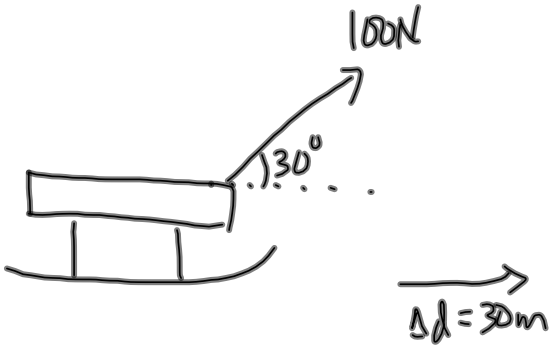
$W = F \Delta d \cos\theta$ $\quad -1$

$W = (6.50 \times 10^2 N)(0.55 m)(\cos 180)$

negative work done to lower $\longrightarrow$ $W = -3.6 \times 10^2 J$

Example

Calculate the work done by a horse that exerts an applied force of 100N on a sleigh, if the harness makes an angle of 30° with the ground, and the sleigh moves 30m across a flat level, ice surface.



$W = F\Delta d\cos\theta$

$W = (100N)(30m)\cos 30°$

$W = 2.6 \times 10^3 J$

TO DO:

PP | 235

Assignment p275 | 15 - 22

Note about #15

a) Name all the forces acting on the car & draw a FBD

b) say which forces do positive work / negative work / zero work