Work Work Work Work Work

$$W = F \cdot d$$

Force (N)

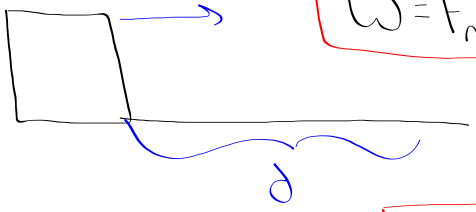
distance/displacement (M)

Units: N·m
Joule (J)

Note: Force & displacement must be in the SAME DIRECTION

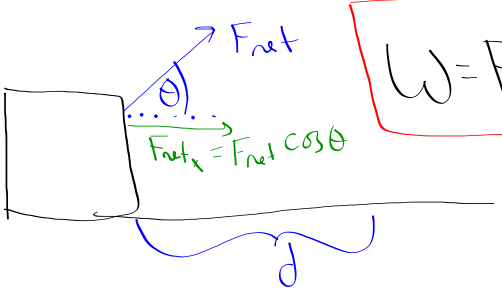
Work Against Inertia/Friction

1.)



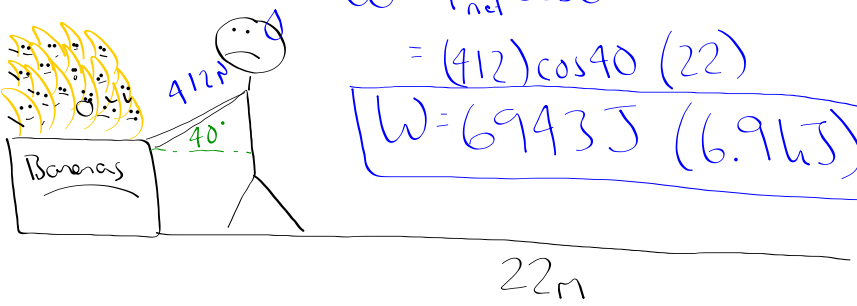
$$W = F_{net} \cdot d$$

2.)



$$W = F_{net} \cos\theta \cdot d$$

Ex. How much work is done to pull a box of dancing bananas with a force of 412N over a distance of 22m at an angle of inclination of 40 degrees?

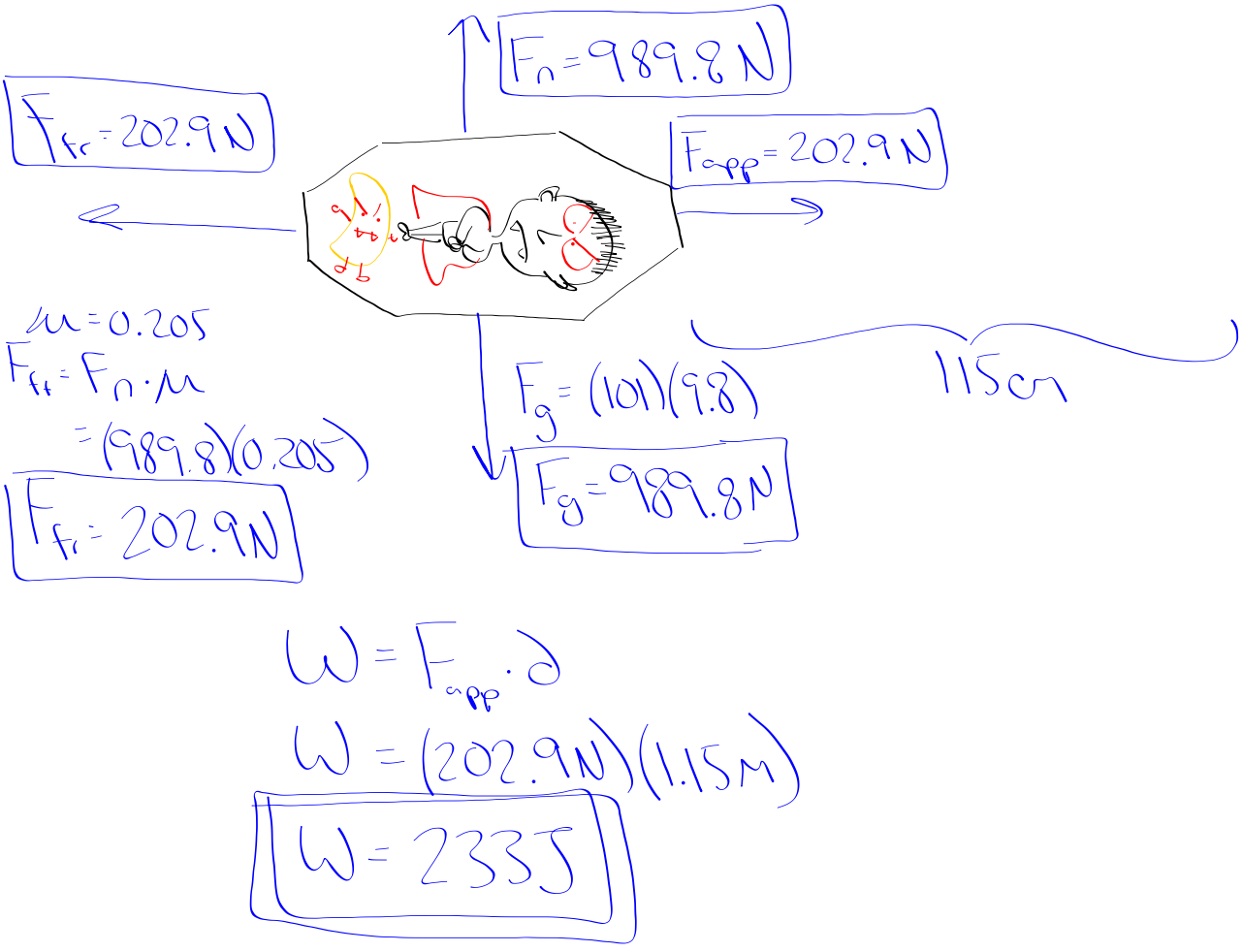


$W = F_{net} \cos\theta \cdot d$

$= (412)\cos 40\,(22)$

$W = 6943\,J\ (6.9kJ)$

Ex. How much work against friction will it take to move Dracula's coffin weighing 101kg over a surface with a friction coefficient of 0.205 for 115cm?



$W = F_{app} \cdot d$

$W = (202.9\,N)(1.15\,m)$

$W = 233\,J$

July 25, 2019

Springs

Not every spring is designed the same.
Some are easier to expand/contract than others.
This is because of what we call the Spring Constant

In springs $F_{spring} \propto X$ — X = distance stretched or compressed of spring

* Hookes Law

$$F_{spring} = k \cdot X$$

k → Spring constant $\left(\frac{N}{M}\right)$

Ex. A spring requires 12N of force to stretch it 4cm. What is the value of the spring constant?

F_{spring} $\quad x = 0.04\,m$ $\quad k = ?$

$F_{spring} = k \cdot x$

$\frac{F_{spring}}{x} = k$

$k = \frac{12\,N}{0.04\,m}$

$\boxed{k = 300\,N/m}$

Ex. A spring holds a barrel of dancing bananas with a weight of 325N and is stretched 1.4m. If we wanted to stretch the spring a further 0.4m, what must the barrel of dancing bananas weigh?

① $F_{spring} = k\,x$

$k = \frac{F_{spring}}{x} = \frac{325\,N}{1.4\,m}$

$\boxed{k = 232\,N/m}$

$\frac{325}{1.4} = \frac{x}{1.8}$

$\boxed{x = 418\,N}$

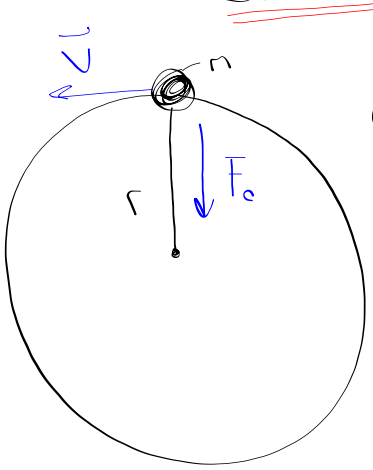
② $F_{spring} = k \cdot x$

$= (232\,N/m)(1.8\,m)$

$\boxed{F_{spring} = 418\,N}$

July 25, 2019

Circular Motion



Centripetal Force (F_c)

Force present when an object is moving in a circle

$$F_c = \frac{mv^2}{r}$$

For cars → When turning
→ Friction from road → supplies Centripetal Force
→ If no friction, the car will skid.

Note: Centrifugal force

- When spinning in circle it may feel we are being propelled to the outside of the circle.
- force we feel is a reaction to the centripetal force exerted by the object we are in.

Back to Springs

Recall: Hookes Law : $F_{spring} = kx$

Recall Work $= F \cdot d$

Work in Spring

$$W = \frac{1}{2}kx^2$$

Work Against Gravity

$W = F \cdot d$

$$W = mgh$$

height (m)

Work By An Accelerating Force

$$W = \frac{1}{2}mv^2$$