1.1 Part 1

Two students each apply a force of 750 N to a car and push it a distance of 12 meters across the parking lot. What is the total amount of work done on the car?

$$F_{NET} = 2F = 2 \cdot 750 = 1500 \text{ N}$$

$$W = F \cdot d = (1500)(12) = \boxed{18000 \text{ J}}$$

1.1 Part 2

If the students use 35 seconds to perform their work, how much power do they exert?

$$P = \frac{W}{t} = \frac{18000\ J}{35\ s} = 514.286\ W$$

1.2 Part 1

It takes 2.8 seconds for Erik to lift a 1581 N barbell 1 meter off his chest. How much work does he do?

F d

$W = Fd = 1581 \cdot 1 = 1581\ J$

1.2 Part 2

How much power does he exert?

$$P = \frac{W}{t} = \frac{1501\ J}{2.8} = 564.643\ W$$

1.3

How high is a 500 N boulder raised if it takes 4.6 seconds to use 1200 Watts of power?

$P = \frac{W}{t} \rightarrow W = Pt = 1200 \cdot 4.6 = 5520\ J$

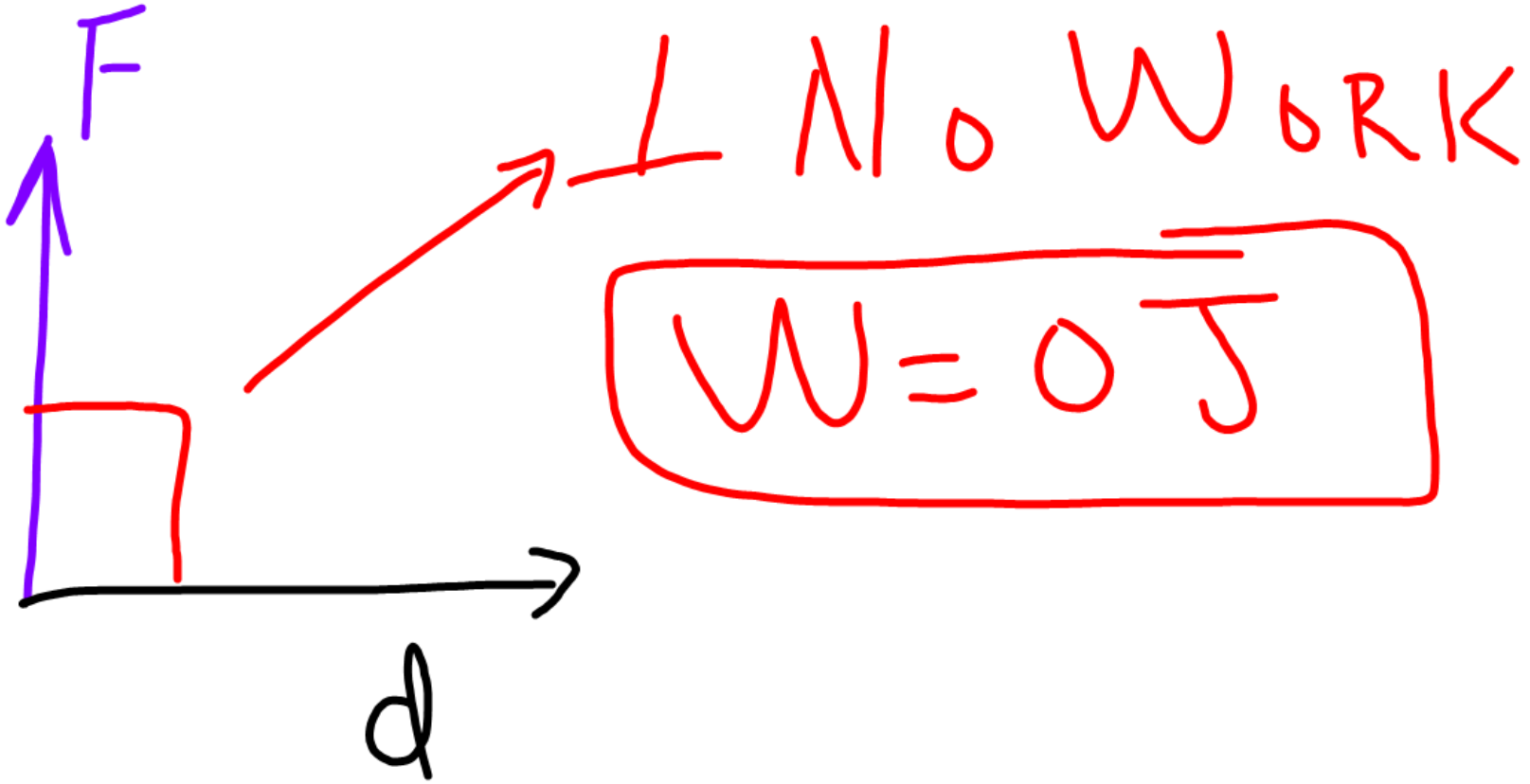
(t: 4.6 seconds; P: 1200 Watts)

$W = F \cdot d \rightarrow d = \frac{W}{F} = \frac{5520\ J}{500\ N}$

$d = 11.04\ m$

1.4

How much work is performed in carrying a 900 Newton box 10 meters across a room?



NO WORK

$W = 0\ J$

1.5

What is the weight of a box if it takes 3.9 Watts of power to lift it 2 meters in 0.7 seconds?

t P d

$$P = \frac{W}{t} \rightarrow W = Pt = 3.9 \cdot .7 = 2.735$$

$$W = F \cdot d \rightarrow F = \frac{W}{d} = \frac{2.73}{2} = \boxed{1.365\,N}$$

6.1 Quick Poll

A 3 kg book is sitting on top of a 1.2 meter high shelf. How much GPE does it have?

$$GPE = mgh = (3\,kg)(9.8\,m/s^2)(1.2\,m)$$

$$GPE = 35.28\,J$$

Quick Poll 7.1

A 75 kg runner sprints at 8.3 m/s for 9 seconds. How much KE does he have?

$$KE = \frac{1}{2}mv^2 = \frac{1}{2}(75)(8.3)^2$$

$$KE = 2583.375\ J$$

Quick Poll 8.1
What 2 types of energy add together to make up the catagory of Mechanical Energy?

1) Potential Energy

2) Kinetic Energy

Quick Poll 9.1 Part 1

A 25 kg puma is standing on top of a 5 meter high rock. How much GPE does he have as he sits on the rock?

$GPE = mgh = 25 \cdot 9.8 \cdot 5$

$GPE = 1225\ J$

Quick Poll 9.1 Part 2
How much KE does he have as he sits on the rock?

$KE = 0$ No Motion!

Quick Poll 9.1 Part 3
What is his total Mechanical Energy?

$ME = KE + PE = 0 + 1225 = \boxed{1225\ J}$

Quick Poll 10.1 Part 1

A 25 kg puma jumps down from the top of a 5 meter high rock. How much KE does he have as he reaches the ground?

$ME_i = ME_f$ PE at ground level is zero.

$1225\ J = KE + PE$

$1225\ J = KE$

Quick Poll 10.1 Part 2
How much GPE does he have as he reaches the ground?

$h = 0 \rightarrow GPE = 0\ J$

PE at ground level is zero.

Quick Poll 10.1 Part 3
What is his total Mechanical Energy?

His total mechanical energy remains unchanged which is 1225J.

Quick Poll 11.1 Part 1

How much KE did the puma have as he reached the ground?

$$ME_f = KE_f + PE_f \Rightarrow KE_f = ME_f = 1225\,J$$

Quick Poll 11.1 Part 2

How fast is the puma moving as he reaches the ground?

$$KE = \tfrac{1}{2}mv^2 \rightarrow v = \sqrt{\frac{2KE}{m}} = \sqrt{\frac{2 \cdot 1225}{75}}$$

$$v = 9.899\ m/s$$