A 25 kg box is pushed across a floor with horizontal force of 55 N for 13 m. What work was done?

data

diagram

A 25.0 kg box is pushed across a floor with horizontal force of 55.0 N for 13.0 m. What work was done? What is μ?

m_r = 25.0 kg
F_r = 245 N
55.0 N → [25.0] kg

F_h = 55.0 N
d_h = 13.0 m
W = ?
μ = ?

W = Fd = 55.0 N x 13.0 m = 715 J

A 25.0 kg box is pushed across a floor with horizontal force of 55.0 N for 13.0 m. What work was done? What is μ?

m_r = 25.0 kg
F_r = 245 N
55.0 N → [25.0] kg

F_h = 55.0 N
d_h = 13.0 m
W = ?
μ = ?

W = Fd = 55.0 N x 13.0 m = 715 J

$F_N = -F_w$
$F_f = -F_h$

$\mu = F_f/F_N$ = 55.0 N/245N = .22

A 25.0 kg box is pulled across a floor with a force of 110. N directed along a rope at a 27.0^0 for 13.0 m. What work was done?

A 25.0 kg box is pulled across a floor with a force of 110. N directed along a rope at a 27.0^0 for 13.0 m. What work was done?

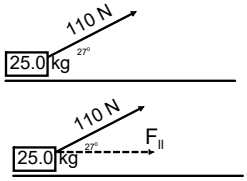
m_r = 25.0 kg

F_r = 245 N

F_a = 110. N at 27^0

d_h = 13.0 m

W = ?



$F_{||}$ = cos 27^0 (110 N) = 98.0 N

W = $F_{||}$ x d = 98.0 N x 13.0 m = 1270 J

A 25.0 kg box is pulled across a floor with a force of 110. N directed along a rope at a 27.0^0 for 13.0 m. What work was done?

m_r = 25.0 kg

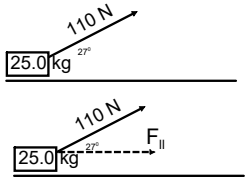
F_r = 245 N

F_a = 110 N at 27^0

d_h = 13.0 m

W = ?

μ = ?



$F_{||}$ = cos 27^0 (110 N) = 98.0 N

W = $F_{||}$ x d = 98.0 N x 13.0 m = 1250 J

A 25.0 kg box is pulled across a floor with a force of 110. N directed along a rope at a 27.0^0 for 13.0 m. What work was done?

m_r = 25.0 kg

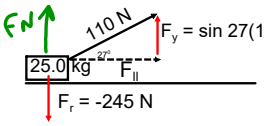
F_r = 245 N

F_a = 110 N at 27^0

d_h = 13.0 m

W = ?

μ = ?



F_N + Fr + Fy = 0

F_N = -Fr - Fy = -(-245 N) - (+50 N) = 195 N

$\mu = F_f/F_N$ = 98.0 N/195 N = .50

Hey! if P = W/t and W = Fd

Well, then- P = Fd/t

and, rumor has it that d/t is *v*

so P = F*v* .....

so, let's do #1 again!

A 25 kg box is pushed across a floor with horizontal force of 55 N for 13 m. What work was done?

consumed

at 4.0 m/s

Power

data

diagram

m_r = 25 kg

$F_{||}$ = 55 N

$d_{||}$ = 13 m

v = 4.0 m/s

P = ?

P = F*v*

P = 55.0 N (4.0 m/s)

P = 220 W

.22 kW

A lever has an efficiency of 95%. a) What work(w_i) is needed to lift a 45 kg mass 0.55 m? b) If 110 N of force are applied to the lever, how far is the effort force exerted? C) What is the AMA and IMA?

A lever has an efficiency of 95%. a) What work(w_i) is needed to lift a 45 kg mass 0.55 m? b) If 110 N of force are applied to the lever, how far is the effort force exerted? C) What is the AMA and IMA?

Eff. = 95%
a) W_i = ?
m_r = 45 kg
F_r = 440 N
d_r = 0.55 m
b) F_e = 110 N
d_e = ?

A lever has an efficiency of 95%. a) What work(w_i) is needed to lift a 45 kg mass 0.55 m? b) If 110 N of force are applied to the lever, how far is the effort force exerted? C) What is the AMA and IMA?

Eff. = 95%
W_i = ?
m_r = 45 kg
F_r = 440 N
d_r = 0.55 m
b) F_e = 110 N
d_e = ?
c) AMA?
IMA?

a) $Eff = \frac{W_o}{W_i} \times 100$

$W_i = W_o/Eff = (440\ N \times 0.55\ m)/.95 = 250\ J$

b) $W_i = F_e d_e$

$d_e = W_i/F_e = 250\ J/110\ N = 2.3\ m$

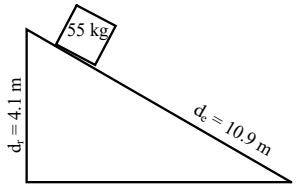
c) $AMA = F_r/F_e = 440\ N/110\ N = 4$

$IMA = d_e/d_r = 2.3\ m/0.55\ m = 4.2$

A ramp is 10.9 m long and 4.1 m high.. a) What force is needed to slide a 55 kg box to the top if friction is ignored?…b) What is the IMA of the ramp?…c) What is the AMA if the efficiency is 79%?…d) What would the new F_e be with the efficiency of 79%?

A ramp is 10.9 m long and 4.1 m high.. a) What force is needed to slide a 55 kg box to the top if friction is ignored?… b) What is the IMA of the ramp?…c) What is the AMA if the efficiency is 79%?…d) What would the new F_e be with the efficiency of 79%?

d_e = 10.9 m
d_r = 4.1 m
a) F_e = ?
Eff = 100%
m_r = 55 kg
↳ F_r = 540 N
b) IMA = ?
c) AMA = ?
if Eff = 79%
d) F_e = ?
if Eff = 79%



A ramp is 10.9 m long and 4.1 m high.. a) What force is needed to slide a 55 kg box to the top if friction is ignored?…b) What is the IMA of the ramp?…c) What is the AMA if the efficiency is 79%?…d) What would the new F_e be with the efficiency of 79%?

d_e = 10.9 m
d_r = 4.1 m
a) F_e = ?
Eff = 100%
m_r = 55 kg
↳ F_r = 540 N
b) IMA = ?
c) AMA = ?
if Eff = 79%
d) F_e = ?
if Eff = 79%

a) Eff = 100% Eff = W_o/W_i x 100 ∴ $W_i = W_o$
$F_e d_e = F_r d_r$
$F_e = F_r d_r/d_e$ = [540 J(4.1 m)]/10.9 m
F_e = 203 N

b) IMA = d_e/d_r = 10.9 m/4.1 m = 2.7

c) Eff = AMA/IMA x 100
AMA = EFF(IMA) = .79(2.7) = 2.1

d) AMA = F_r/F_e
$F_e = F_r$/AMA = 540 N/2.1 = 260 N

A lever is 90% efficient. a) What work does the machine do if you pushed with 67 N of force through a distance of 1.3 m? b) What was the mass of the object lifted if it moved 0.87 m?… (during the event in #a) c) What is the AMA and IMA of the lever?

A lever is 90% efficient. a) What work does the machine do if you pushed with 67 N of force through a distance of 1.3 m? b) What was the mass of the object lifted if it moved 0.87 m?… (during the event in #a) c) What is the AMA and IMA of the lever?

Eff = 90%
W_o = ?
if F_e = 67 N
d_e = 1.3 m
b) m_r = ?
d_e = 0.87 m
c) AMA = ?
IMA = ?

A lever is 90% efficient. a) What work does the machine do if you pushed with 67 N of force through a distance of 1.3 m? b) What was the mass of the object lifted if it moved 0.87 m?… (during the event in #a) c) What is the AMA and IMA of the lever?

Eff = 90%
W_o = ?
if F_e = 67 N
d_e = 1.3 m
b) m_r = ?
d_e = 0.87 m
c) AMA = ?
IMA = ?

a) $Eff = \frac{W_o}{W_i} \times 100$

W_o = Eff (W_i) = .90(67 N x 1.3 m) = 78 J

b) $W_o = F_r d_r$
$F_r = W_o/d_r$ = 78 J/.87 m = 90. N
m = 9.2 kg

c) AMA = F_r/F_e = 90 N/67 N = 1.3
IMA = d_e/d_r = 1.3 m/.87 m = 1.5

What speed is a 655 kg crate lifted at if 5.67 kW of power are consumed for a 67% efficient electric motor to turn the 86% efficient winch?

What speed is a 655 kg crate lifted at if 5.67 kW of power are consumed for a 67% efficient electric motor to turn the 86% efficient winch?

v = ?
m_r = 655 kg
F_r = 6400 N
P = 5.67 kW
Eff_1 = 67%
Eff_2 = 86%

Eff_T = 58%

$Eff_t = Eff_1 \times Eff_2$

What speed is a 655 kg crate lifted at if 5.67 kW of power are consumed for a 67% efficient electric motor to turn the 86% efficient winch?

v = ?
m_r = 655 kg
F_e = 6400 N
P = 5.67 kW
Eff_1 = 67%
Eff_2 = 86%

Eff_T = 58%

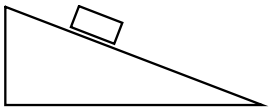
$Eff_t = Eff_1 \times Eff_2$

$P = W/t = Fv$
$v = P/F$

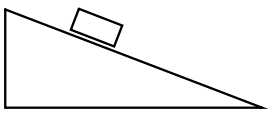
v = [5670 W(.58)]/6400 N = .51 m/s

only 58% of the Power is utilized!

A ramp is 3.5 m long and 1.2 m high. What is its efficiency if 120 N of force are needed to slide a 26 kg box up the ramp at a constant velocity?



A ramp is 3.5 m long and 1.2 m high. What is its efficiency if 120 N of force are needed to slide a 26 kg box up the ramp at a constant velocity?



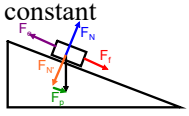
d_e = 3.5 m
d_r = 1.2 m
Eff = ?
F_e = 120 N
m_r = 26 kg
F_r = 255 N

$Eff = w_o / w_i \times 100$
$Eff = F_r\, d_r / F_e\, d_e \times 100$

Eff =[255 N(1.2 m)]/[120 N(3.5 m)] x 100

Eff = 73%

A ramp is 3.5 m long and 1.2 m high. What is its efficiency if 120 N of force are needed to slide a 26 kg box up the ramp at a constant velocity? μ = ?



d_e = 3.5 m
d_r = 1.2 m
Eff = ?
F_e = 120 N
m_r = 26 kg
F_r = 255 N
$\theta = 20.^0$

$Eff = w_o / w_i \times 100$
$Eff = F_r\, d_r / F_e\, d_e \times 100$

Eff =[255 N(1.2 m)]/[120 N(3.5 m)] x 100

Eff = 73%

$\sin\theta$ =1.2 m/3.5 m = $20.^0$

$F_{N'}$ = Cos 20(255 N) = -240 N
F_p = sin 20(255 N) = -87 N
$F_e + F_p + F_f = 0$
$F_f = -F_e - F_p$ = -(+120 N) - (-87 N) = -33 N
$F_N = -F_{N'}$ = -(-240 N) = 240 N

μ = ? $= F_f/F_N$ = -33 N/240 N = .14