Answer on Question #82613, Physics / Mechanics | Relativity

Question:

A boy drags a wooden crate with a mass of 20.0 kg, a distance of 12.0 m, across a rough level floor at a constant speed of 1.50 m/s by pulling on the rope tied to the crate with a force of 50.0 N. The rope makes an angle of 25.0 ° with the horizontal.

a. What are the horizontal and vertical components of the applied force?

b. What is the magnitude of each of the forces?

Applied=

Weight =

Normal =

Frictional=

. How much work is done by each of the forces?

d. What is the total amount of work done on the crate?

e. What is the coefficient of friction of the crate on the floor?

Solution:

a. According to definitions $F_h = F\cos\alpha = 50\cos 25° = 50\cdot 0.91 = 45.5(N)$,

$F_v = F\sin\alpha = 50\sin 25° = 50\cdot 0.42 = 21(N)$.

b. Applied force equals to 50 N; Weight (W) equals to mg = 20*10 = 200(N); Normal force equals to W - F_v = 200 - 21 = 179 (N); Frictional force equals to F_h = 45.5 N. Works done by Normal and Weight forces are equal to 0 because they act perpendicular to the movement; works done by friction and applied forces are equals to 12(m)·45.5 (N) = 546 (J); the total amount of work done on the crate is equal to 0 (the movement with a constant speed). The coefficient of friction equals to

$\mu = \frac{F_h}{W - F_v} = \frac{45.5}{200 - 21} = 0.25$.

The answer:

a. F_h = 45.5 N, F_v = 21 N

b. Applied= 50N;

Weight = 200N;

Normal = 179 N;

Frictional=45.5 N.

c. Works done by listed forces are: 546 J; 0; 0; 546 J.

d. The total amount of work done on the crate equals to 0.

e. Coefficient of friction equals to 0.25.