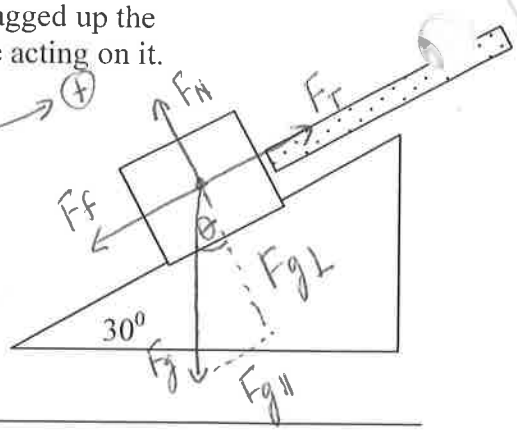
4. a. Calculate the tension in the rope when this 50. N box is being dragged up the hill at a constant speed of 5.0 m/s if there is a 10. N frictional force acting on it.

$\Sigma F = F_f + F_T + F_{g\parallel} = \emptyset N$ $\quad F_T = +35N$

$F_T + -10N + -25N = \emptyset N$

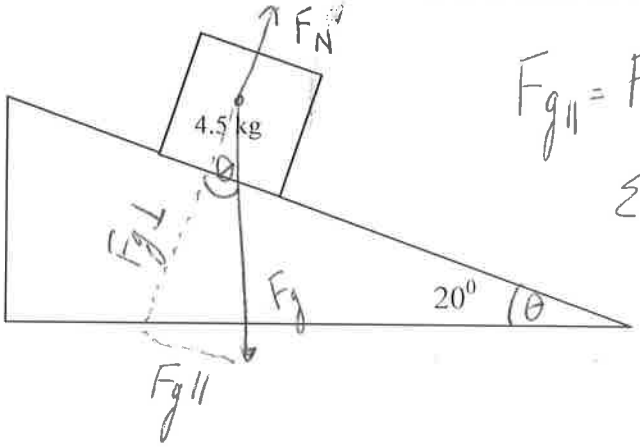


$F_N = mg\cos\theta$
$= 43N$

b. what is the coefficient of kinetic friction between these surfaces?

$F_f = \mu F_N$ $\quad \mu = \frac{F_f}{F_N} = \frac{10N}{43N} = 0.23$

5. Calculate how fast this box will accelerate down the hill if the hill is frictionless.



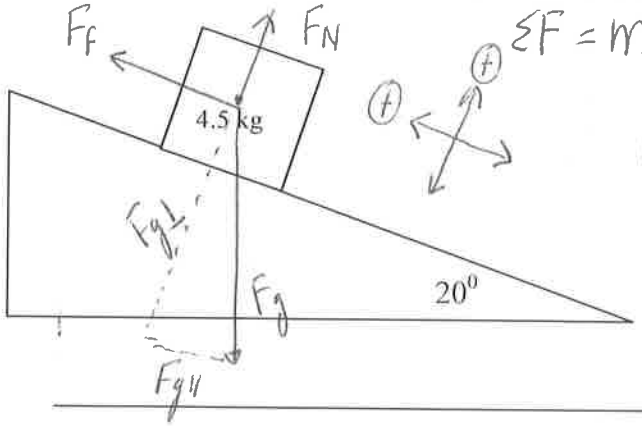
$F_{g\parallel} = F_g \sin\theta = mg\sin\theta$ $\quad a = \frac{F}{m} = \frac{mg\sin\theta}{m}$

$\Sigma F = ma$

$\Sigma F = F_{g\parallel}$

$ma = mg\sin\theta$ $\quad 3.4\frac{m}{s^2} = a$

6. Calculate the force of friction acting on the box if it now accelerates down the incline at a rate of 0.67 m/s^2.



$\Sigma F = ma$

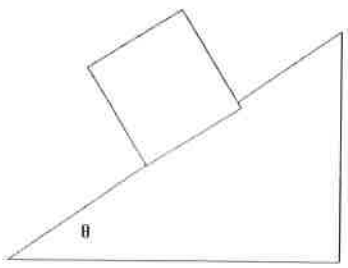
a

$F_{g\parallel} + F_f = ma$

$F_f = ma - F_{g\parallel}$

$F_f = (4.5kg)(0.67m/s^2) - mg\sin\theta = 12N$

7. As the angle θ increases, what happens to the . . .



weight? stays the same

normal force? decreases $\quad F_f = \mu F_N$

force of friction? decreases

coefficient of friction? stays the same