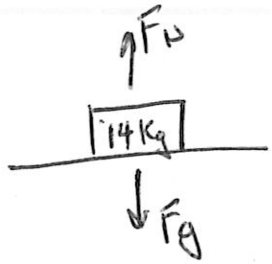
Normal and Frictional Forces
Solutions

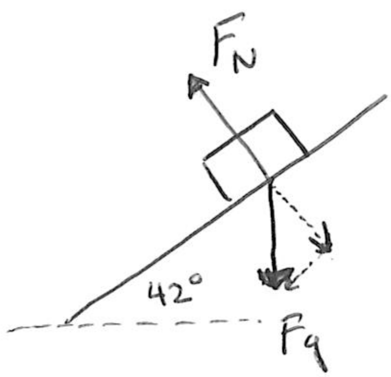
1.



$$F_N = F_g$$
$$= mg$$
$$= 14(9.8)$$
$$= 137.2$$

$$\boxed{F_N = 137\ N}$$

2.



The normal force is always perpendicular to the contact surface so you see $F_N \neq F_g$

but F_N would equal the perpendicular component of F_g

$mg = F_g$

This is the perpendicular component of F_g $(F_{g\perp})$

Use SOH CAH TOA to solve for it

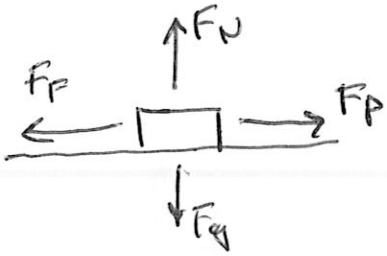
$$\cos 42° = \frac{F_{g\perp}}{F_g}$$

$$F_{g\perp} = \cos 42° (F_g)$$
$$= \cos 42° \, mg$$
$$= \cos 42° (20.0)\, 9.8$$
$$= 145$$

$$F_N = F_{g\perp}$$

$$\boxed{F_N = 145\ N}$$

3. Assume V = constant so all forces are <u>balanced</u>!



y	$F_N = F_g$
x	$F_F = F_P$

Equations generated from diagram.

equation for friction → $F_F = \mu F_N$

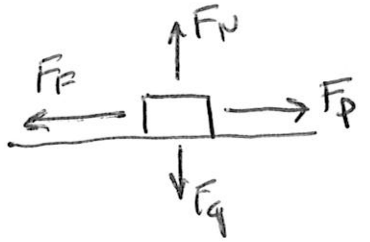
$F_F = \mu F_g$

$= 0.11\,(m)(g)$

$= 0.11\,(9.6)(9.8)$

$F_F = 10\text{ N}$

4.



$F_P = 3.0\text{ N}$

y	$F_N = F_g$
x	$F_P = F_F$

$F_P = F_F$

$= \mu F_N$

$= \mu F_g$

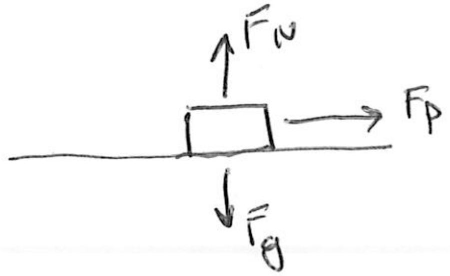
$F_P = \mu m g$

$\mu = \dfrac{F_P}{mg}$

$= \dfrac{3.0}{(20.0)(9.8)}$

$\mu = 0.015$

5.



$$F_N = F_g$$
$$F_p = F_{net}$$

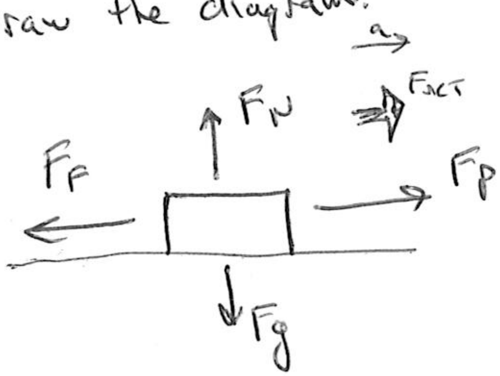
$F_N = F_g$
$= mg$
$= (16.2)\,9.8$

$$F_N = 159\text{ N}$$

Note: F_p is the net force so this object is accelerating (along x-axis)

$F_{net} = 10.2$ N is not required to solve this problem

6. Draw the diagram.



$F_p = 22.0$ N

The object is accelerating so there is a F_{net} in the x-dimension

Solve for μ

$F_F = F_p - F_{net}$

$\mu F_N = 22.0 - ma$

$\mu = \dfrac{22.0 - ma}{F_g}$

$= \dfrac{22.0 - (6.2)(1.1)}{mg}$

equations

y: $F_N = F_g$
x: $F_{net} = F_p - F_F$

$\mu = \dfrac{22.0 - 6.82}{(6.2)(9.8)}$

$$\mu = 0.25$$