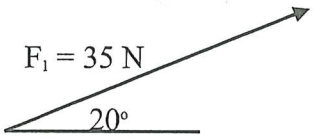
Dynamics Notes
2 – Forces in 2-D

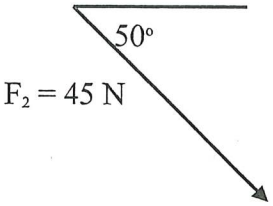
s with any vectors, forces must be resolved with consideration to both their _____ and _____.

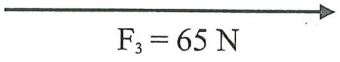
Ex
Two students push a crate across a frictionless surface.
Student A pushes with 75 N East and Student B pushes with 48 N South.
What is the resultant force acting on the box?

If there are more than two forces then it is best to solve for the resultant using the...

Ex
Resolve these force vectors into their x and y components and determine the total net force.



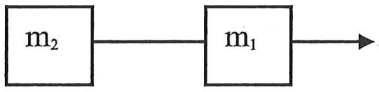




Ex: A boy pulls his 8.0 kg toboggan by a rope that angles 32° above the horizontal. If his 36.0 kg sister sits on the toboggan, how much force does he need to exert to accelerate them at 2.25 m/s²? Assume that friction is negligible.

Ex: A 1.12 kg textbook is pushed horizontally against a wall with a coefficient of friction of 0.465. What is the least amount of force required to keep the book from slipping?

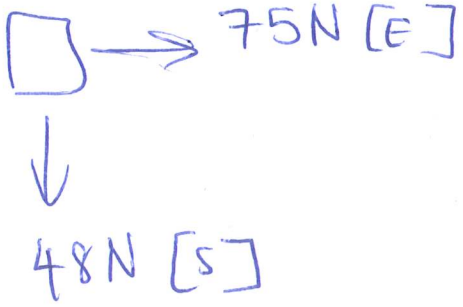
Ex: Two blocks ($m_1 = 2.0$ kg and $m_2 = 3.0$ kg) are connected by a rope as shown. m_1 is pulled to the right with a force of 18 N along a frictionless surface. What is the tension in the rope connecting the two masses?

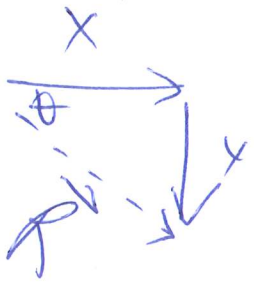


Ex: A 65 kg student stands on a bathroom scale in an elevator and notices that it reads 520 N. Determine the magnitude and direction of the acceleration of the elevator.

Dynamics Notes.

Ex. 1 : Two svdends.





$\vec{R}^2 = X^2 + Y^2$

$\vec{R} = \sqrt{75^2 + 48^2}$

$= 89N$

$\tan\theta = \frac{48}{75}$

$\theta = 32.6.$

Ex. 2

F_1 $F_x = 35\cos 20°$

$= 32.889...$

$F_y = 35 \times \sin 20°$

$= 11.9707...$

F_2 $F_x = 45 \times \cos 50$

$= 31.819...$

$F_y = 45 \times \sin 50°$

$= -34.4719...$

F_3 $F_x = 65N$

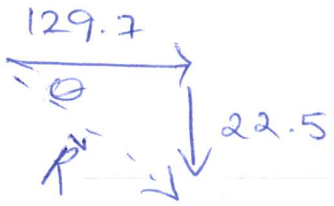
$F_y = 0N$

$R_x = 32.889... + 31.819... + 65$

$= 129.7$

$R_y = 11.9707 - 34.4719... + 0$

$= -22.5$



$$\vec{R} = \sqrt{129.7^2 + 22.5^2}$$

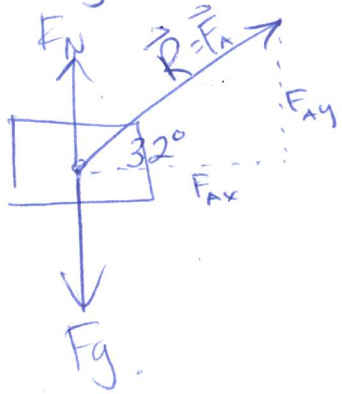
$$= 131.637...$$

$$= 132\ N$$

$$\tan\theta = \frac{22.5}{129.7} \quad \theta = 9.8°$$

$\vec{R} = 132N$ at $9.8°$

Ex. A boy...



$m_{tob} = 8.0kg$

$m_{sis} = 36.0kg$

$\vec{a} = 2.25m/s^2$ right

$\vec{F} = ?$

$F_x = (m_{total})(\vec{a})$

$= (8+36)\,\vec{a}$

$= (8+36)(2.25)$

$= 99N$

Need $\vec{R}$ / $\vec{F}_A$

$$\cos 32° = \frac{F_{Ax}}{F_A}$$

$$F_A = \frac{F_{Ax}}{\cos 32°} = \frac{99}{\cos 32°}$$

$F_A = 117\ N\ 32°$