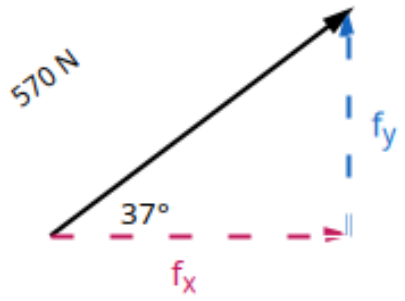
4.5 Resolution of Vectors into Rectangular Components Worksheet with solutions

This document was composed and formatted by Annie Bernatchez.

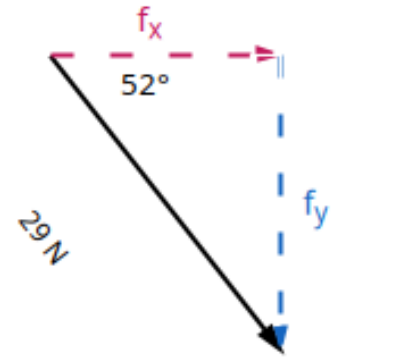
The course material originated from www.jensenmath.ca

1) Determine the magnitudes of the horizontal and vertical components of each force.

a) magnitude of 570 N, $\theta = 37°$ counterclockwise from the horizontal

$\lvert\vec{f_x}\rvert = 570\cos(37)$ $\lvert\vec{f_x}\rvert \approx 455.2$ N $\lvert\vec{f_y}\rvert = 570\sin(37)$ $\lvert\vec{f_y}\rvert \approx 343.0$ N	

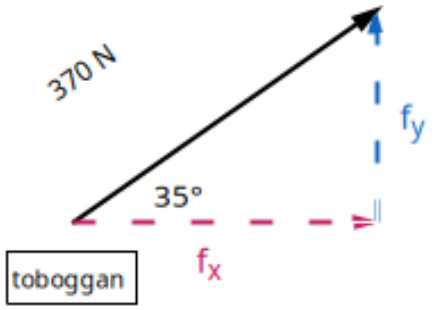
b) magnitude of 29 N, $\theta = 52°$ clockwise from the horizontal

$\lvert\vec{f_x}\rvert = 29\cos(52)$ $\lvert\vec{f_x}\rvert \approx 17.9$ N $\lvert\vec{f_y}\rvert = 29\sin(52)$ $\lvert\vec{f_y}\rvert \approx 22.9$ N (downward)	

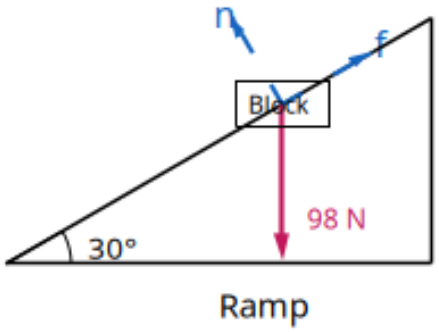
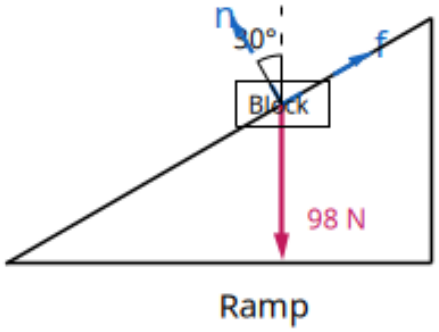
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2) A woman is pulling on a rope attached to a toboggan with a 370 N force at an angle of 35° to the horizontal. Find the magnitude of the force pulling the sled forward and the magnitude of the force pulling the sled upward.

$|\vec{f_x}| = 370\cos(35)$
$|\vec{f_x}| \approx 303.1$ N (forward)
$|\vec{f_y}| = 370\sin(35)$
$|\vec{f_y}| \approx 212.2$ N (upward)



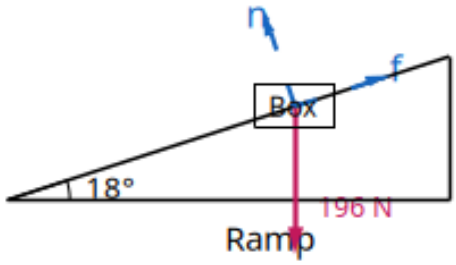
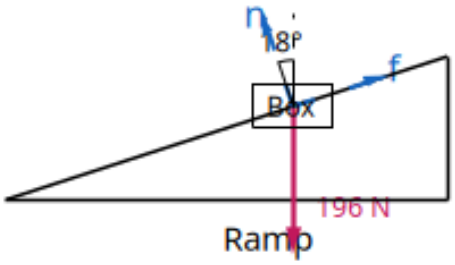
3) A 10 kg block lies on a smooth ramp that is inclined at 30°. What force, parallel to the ramp, would prevent the block from moving. (Assume that 1 kg exerts a force of 9.8 N)

Position Diagram	Vector Diagram
	

$|\vec{f}| = 10(9.8)\sin(30) = 49$ N

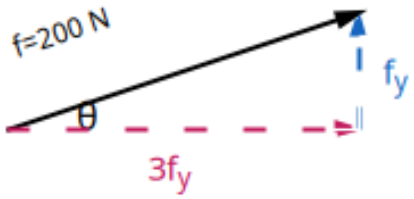
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4) A 20 kg box rests on a ramp that is inclined 18°. Resolve the weight into rectangular vector components that keep the box at rest.

Position Diagram	Vector Diagram
	
$\lvert\vec{n}\rvert = 196\cos(18)$ $\lvert\vec{n}\rvert \approx 186.41$ N	$\lvert\vec{f}\rvert = 196\sin(18)$ $\lvert\vec{f}\rvert \approx 60.57$ N

186.41 N perpendicular to the ramp, 60.57 N parallel to the ramp.

5) Resolve a 200 N force into two rectangular vector components such that the ratio of their magnitudes is 3:1. Calculate the angle between the greater component and the 200 N force.

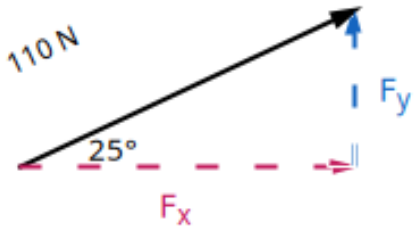
$\tan\theta = \frac{\lvert\vec{f_y}\rvert}{3\lvert\vec{f_y}\rvert}$ $\tan\theta = \frac{1}{3}$ $\theta \approx 18.43°$	

6) A sign is supported as shown in the diagram. The tension in the slanted rod supporting the sign is 110 N at an angle of 25° to the horizontal.



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a) Draw a vector diagram showing the vector components of the tension vector.



b) What are the vertical and horizontal vector components of the tension?

$\lvert\vec{F_x}\rvert = 110\cos(25)$ $\lvert\vec{F_x}\rvert \approx 99.7$ N	$\lvert\vec{F_y}\rvert = 110\sin(25)$ $\lvert\vec{F_y}\rvert \approx 46.5$ N

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