<u>Review</u>: Angelica rides her magical bike at a rate of 120 miles per hour. The angular speed of each wheel is 528 revoluons per minute. What is the radius of a wheel, in inches?

$$V = 120\frac{mi}{h} \quad ; \quad \omega = \frac{528\,rev}{min} \quad ; \quad r = ?\ in$$

$$\frac{V = r\omega}{\omega} \quad \frac{}{\omega}$$

$$r = \frac{V}{\omega} = \frac{V}{1} \cdot \frac{1}{\omega}$$

$$r = \frac{120\,mi}{h} \cdot \frac{1\ min}{528\,rev} \cdot \frac{1\,h}{60\,min} \cdot \frac{5280\,ft}{1\,mi} \cdot \frac{12\ in}{1\,ft} \cdot \frac{1\,rev}{2\pi}$$

$$= \boxed{\frac{120}{\pi}\ in}$$

Homework questions?

7.5

29.



$$\sin\alpha = \frac{25}{150}$$

$$\alpha = \sin^{-1}\left(\frac{25}{150}\right) = 10°$$

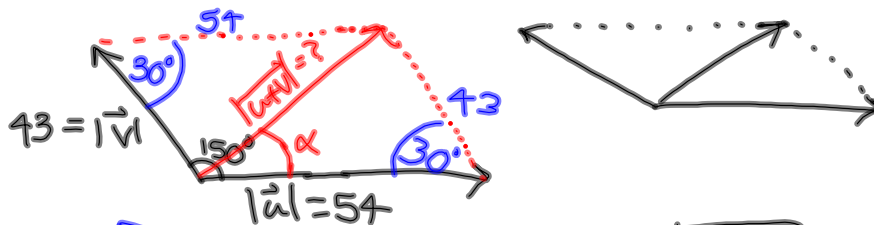$$\theta = 70° - 10°$$

$$= \boxed{60°}$$
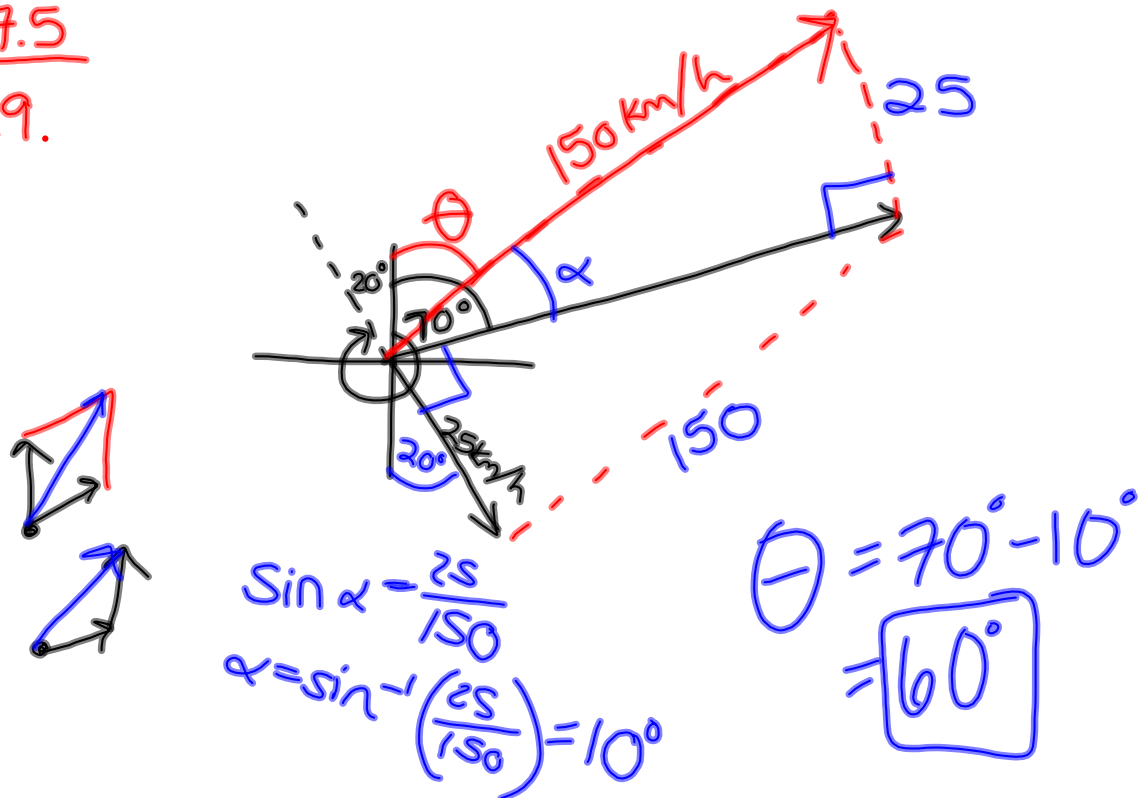
Applications from section 7.5

18. Find $|\vec{u} + \vec{v}|$ and the angle that $\vec{u} + \vec{v}$ makes with $\vec{u}$, given

$\alpha$

$|\vec{u}| = 54$, $|\vec{v}| = 43$, & the angle $\theta$ between $\vec{u}$ & $\vec{v}$ is 150°.

$|\vec{u}+\vec{v}| =$ "magnitude" or length of $\overrightarrow{u+v}$

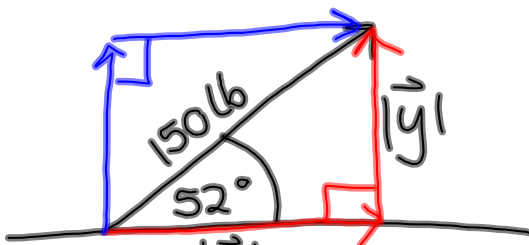$$|\vec{u}+\vec{v}| = \sqrt{43^2 + 54^2 - 2(43)(54)\cos 30°} = \boxed{27.3}$$

length of resultant

$$\frac{\sin \alpha}{43} = \frac{\sin 30°}{27.3}$$

$$\alpha = \sin^{-1}\left(\frac{43\sin 30°}{27.3}\right) = \boxed{52°}$$

# Resolving a vector into horizontal and vertical components

32. $|\vec{u}| = 150$ lb, inclined upward to the right at 52° from the horizontal.  Resolve $\vec{u}$ into horizontal and vertical components.

horizontal

$$\cos 52° = \frac{|\vec{x}|}{150}$$

$$|\vec{x}| = 150\cos 52°$$

$$\approx \boxed{92.3 \text{ lb}}$$
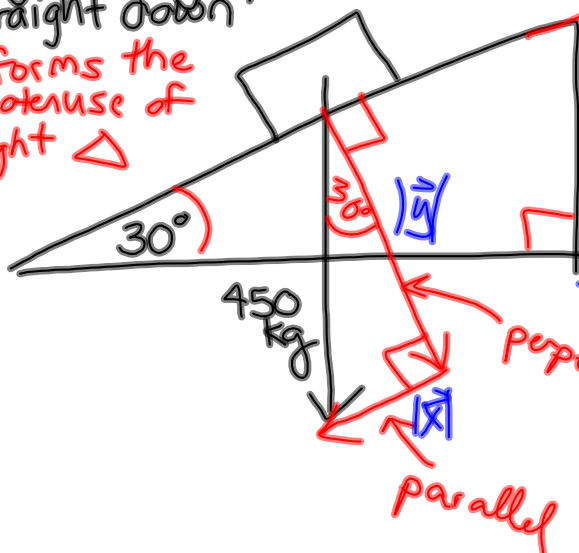
vertical:

$$\sin 52° = \frac{|\vec{y}|}{150}$$

$$|\vec{y}| = 150\sin 52° = \boxed{118.2 \text{ lb}}$$

### The object on a ramp problem

40. If a 450kg object is at rest on a ramp with a 30° incline, find the components of the force of the object's weight parallel and perpendicular to the ramp.

*weight always points straight down
& forms the hypotenuse of a right △

30°

450 kg

30° $|\vec{y}|$

Perpendicular

Parallel

$|\vec{x}|$

perpendicular:

$$\cos 30° = \frac{|\vec{y}|}{450}$$

$$|\vec{y}| = 450 \cos 30°$$

$$= \boxed{225\sqrt{3} \text{ kg}}$$

parallel

$$\sin 30° = \frac{|\vec{x}|}{450}$$

$$|\vec{x}| = 450 \sin 30° = \boxed{225 \text{ kg}}$$

### Homework:

Already assigned:
Ch 5 Test (book), Ch 6 Test (book);
7.5 #27,29; 7.6 #1-7odd

7.5# 19,21,31,33,39,41

7.3 Handout: #37-44 all

Due Friday