June 8, 2022

Problems

U00T01T01: Simplify the fractions.

Problem 01:

$$\frac{9k/3p}{5q/3c}$$

Problem 02:

$$\frac{t/5w}{10w/10r}$$

U00T02T01: Solve for x.

Problem 03:

$$\frac{-5f}{-5z} = \frac{-7s}{x}$$

Problem 04:

$$\frac{-p}{8y} = \frac{x}{-9u}$$

U00T02T02: Solve for x

Problem 05:

$$-3gx + 20u = 18l$$

Problem 06:

$$-5wx + 20b = -17l$$

U01T01T01: Find the x- and y-components given the magnitude and direction of the vector.

Problem 07:

$$A = 7.81, \theta = 0.78\pi$$

Problem 08:

$$A = 8.25, \theta = 1.42\pi$$

U01T01T02: Find the magnitude and remaining component, given the angle and a component.

Problem 09:

$$\theta = 0.04\ \pi$$

$$A_x = 8.00$$

Problem 10:

$$A_y = 4.00$$

$$\theta = 0.87\ \pi$$

U01T01T03: Given the vector components, find the magnitude and direction. Specify angle in terms of cardinal directions, e.g. 30 degree north of east.

Problem 11:

$$A_x = 8.00$$
$$A_y = 9.00$$

Problem 12:

$$A_x = -6.00$$
$$A_y = -1.00$$

U01T02T01: Add the two vectors.

Problem 13:

$$A = 9.49$$
$$\theta_A = 0.60\pi$$
$$B = 9.49$$
$$\theta_B = 0.60\pi$$

Problem 14:

$$A = 2.83$$
$$\theta_A = 0.25\pi$$
$$B = 2.83$$
$$\theta_B = 0.25\pi$$

U01T02T02: Add the three vectors.

Problem 15:

$$A = 8.60$$
$$\theta_A = 0.80\pi$$
$$B_x = -7.00$$
$$B_y = 5.00$$
$$C_x = -7.00$$
$$C_y = 5.00$$

Problem 16:

$$A = 12.73$$
$$\theta_A = 0.25\pi$$
$$B_x = 9.00$$
$$B_y = 9.00$$
$$C_x = 9.00$$
$$C_y = 9.00$$

U01T02T03: Add the four vectors.

Problem 17:

$$A = 7.00$$
$$\theta_A = 1.00\pi$$
$$B = 7.00$$
$$\theta_B = 1.00\pi$$
$$C = 7.00$$
$$\theta_C = 1.00\pi$$
$$D_x = -7.00$$
$$D_y = 0.00$$

Problem 18:

$$A_x = -3.00$$
$$A_y = -8.00$$
$$B_x = -3.00$$
$$B_y = -8.00$$
$$C = 8.54$$
$$\theta_C = 1.39\pi$$
$$D_x = -3.00$$
$$D_y = -8.00$$

Solutions

U00T01T01: Multiple the top fraction by the reciprocal, i.e.

$$\frac{a/b}{c/d} = \left(\frac{a}{b}\right)\left(\frac{d}{c}\right) = \frac{ad}{bc}$$

Problem 01:

$$\frac{9ck}{5pq}$$

Problem 02:

$$\frac{rt}{5w^2}$$

U00T02T01: Cross multiply and then simplify.

Problem 03:

$$-5fx = 35sz \implies x = \frac{7sz}{-f}$$

Problem 04:

$$9pu = 8xy \implies x = \frac{9pu}{8y}$$

U00T02T02: Isolate x by first subtracting and then dividing by coefficient of x.

Problem 05:

$$-3gx = 18l - 20u \implies x = \frac{18l - 20u}{-3g}$$

Problem 06:

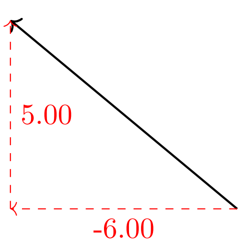
$$-5wx = -17l - 20b \implies x = \frac{17l + 20b}{5w}$$

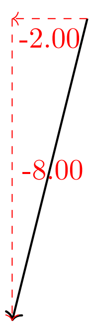
U01T01T01: Assuming standard convention for the angle $[0, 2\pi]$, the components of vector $\vec{A}$ can be found by

$$A_x = A\cos(\theta)$$
$$A_y = A\sin(\theta)$$

Problem 07:

$$A_x = A\cos(\theta) = -6.00$$
$$A_y = A\sin(\theta) = 5.00$$





Problem 08:

$$A_x = A\cos(\theta) = -2.00$$
$$A_y = A\sin(\theta) = -8.00$$

U01T01T02: Assuming standard convention for the angle $[0, 2\pi]$, the components of vector $\vec{A}$ can be found by

$$A_x = A\cos(\theta)$$
$$A_y = A\sin(\theta)$$

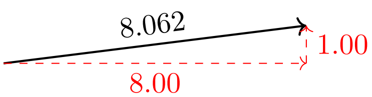
So this means that

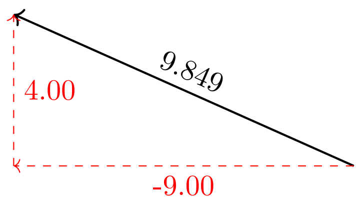
$$A = \frac{A_x}{\cos\theta} = \frac{A_y}{\sin\theta}$$
$$A_x = \sqrt{A^2 - A_y^2}$$
$$A_y = \sqrt{A^2 - A_x^2}$$

as the case may be.

Problem 09:

$$A = A_x/\cos(\theta) = 8.06$$
$$A_y = \sqrt{A^2 - A_x^2} = 1.00$$





Problem 10:

$$A = A_y/\sin(\theta) = 9.85$$
$$A_x = \sqrt{A^2 - A_y^2} = -9.00$$

U01T01T03: Assuming standard convention for the angle $[0, 2\pi]$, the components of vector $\vec{A}$ can be found by

$$A_x = A\cos(\theta)$$
$$A_y = A\sin(\theta)$$

So this means that

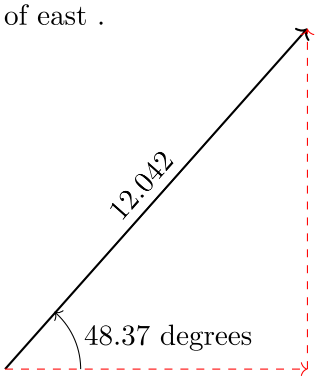
$$A = \sqrt{A_x^2 + A_y^2}$$
$$\tan\theta = \frac{A_y}{A_x}.$$

With the signs of the components you get the correct angle from $[0, 2\pi)$. Then convert that to cardinal directions.

Problem 11:

$$A = 12.04$$

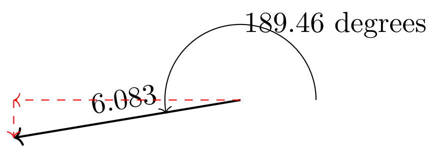
The direction is 48.366 degrees north of east .



Problem 12:

$$A = 6.08$$

The direction is 9.462 degrees south of west .



U01T02T01: Assuming standard convention for the angle $[0, 2\pi]$, the components of vector $\vec{A}$ can be found by

$$A_x = A\cos(\theta)$$
$$A_y = A\sin(\theta)$$

We get the sum of a vector by adding together the components as

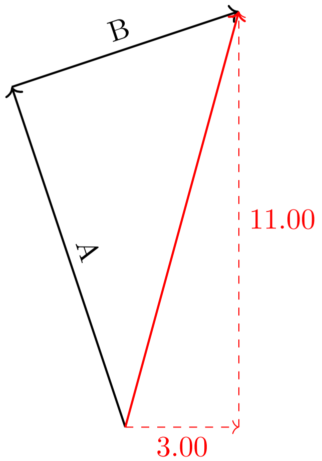
$$\vec{A}+\vec{B}=\begin{pmatrix}A_x+B_x\\A_y+B_y\end{pmatrix},$$

for the number of vectors we have.

Problem 13:

$R_x = 3.00$

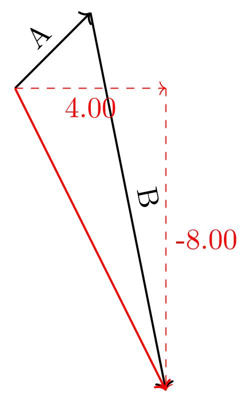
$R_y = 11.00$



Problem 14:

$R_x = 4.00$

$R_y = -8.00$



U01T02T02: Assuming standard convention for the angle $[0, 2\pi]$, the components of vector $\vec{A}$ can be found by

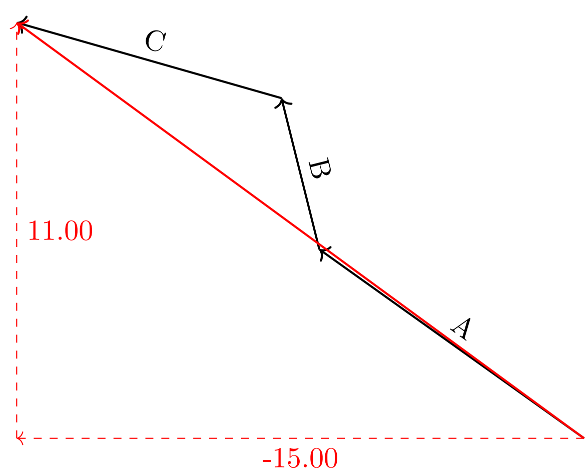
$$A_x = A\cos(\theta)$$
$$A_y = A\sin(\theta)$$

We get the sum of a vector by adding together the components as

$$\vec{A}+\vec{B}=\begin{pmatrix}A_x+B_x\\A_y+B_y\end{pmatrix},$$

for the number of vectors we have.

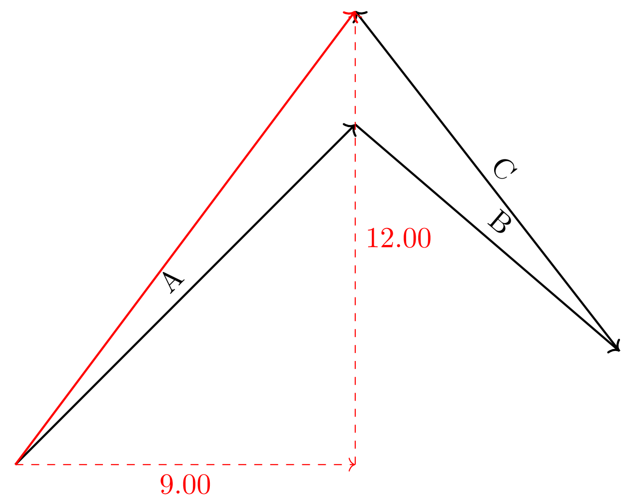
Problem 15:



$R_x = -15.00$

$R_y = 11.00$

Problem 16:



$$R_x = 9.00$$
$$R_y = 12.00$$

U01T02T03: Assuming standard convention for the angle $[0, 2\pi]$, the components of vector $\vec{A}$ can be found by

$$A_x = A\cos(\theta)$$
$$A_y = A\sin(\theta)$$

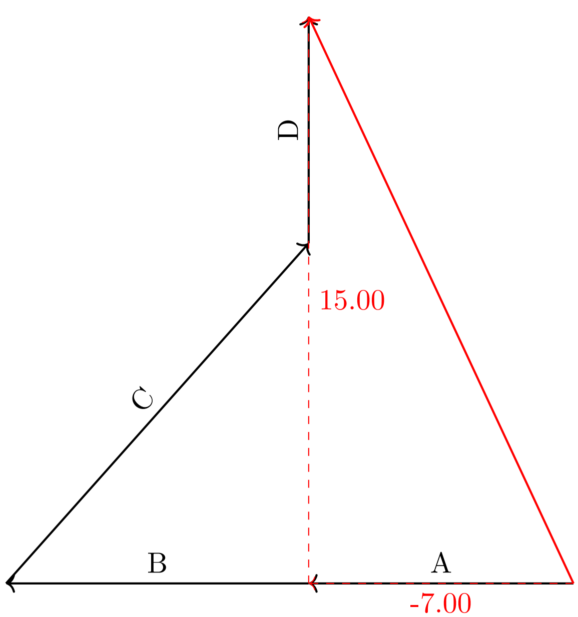
We get the sum of a vector by adding together the components as

$$\vec{A} + \vec{B} = \begin{pmatrix} A_x + B_x \\ A_y + B_y \end{pmatrix},$$

for the number of vectors we have.

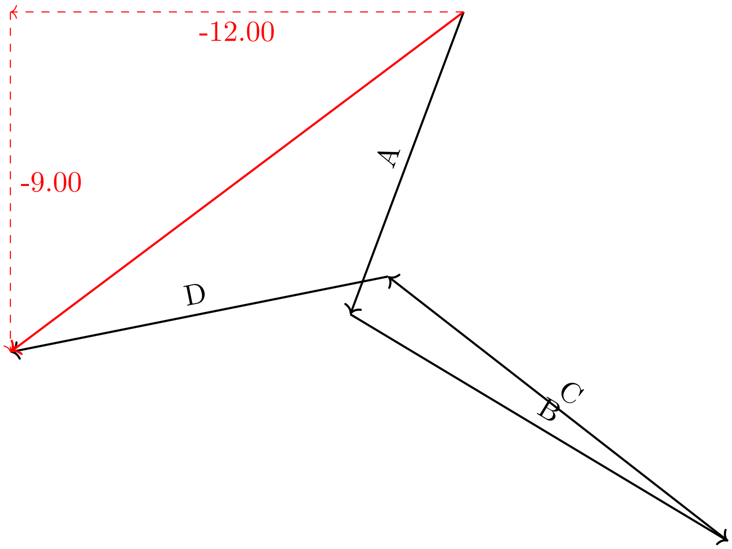
Problem 17:

$$R_x = -7.00$$
$$R_y = 15.00$$



Problem 18:

$$R_x = -12.00$$
$$R_y = -9.00$$


-12.00
-9.00
A
D
C
B