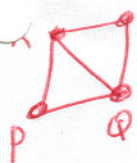


5. Find the area of the triangle with vertices $P = (1, 2, 4)$, $Q = (2, 1, 2)$, and $R = (2, 4, 6)$.



$$\text{area} = \frac{1}{2} \|\vec{PQ} \times \vec{PR}\|$$

$$= \frac{1}{2} \left\| \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & -1 & -2 \\ 1 & 2 & 2 \end{vmatrix} \right\|$$

$$= \frac{1}{2} \| (-2+4)\vec{i} - (2+4)\vec{j} + (2+1)\vec{k} \|$$

$$= \frac{1}{2} \| 2\vec{i} - 4\vec{j} + 3\vec{k} \|$$

$$= \frac{1}{2} \sqrt{4 + 16 + 9}$$

6. Find the intersection of the two lines:

$$\frac{x-8}{3} = \frac{y-7}{4} = \frac{z-6}{1} \quad \text{and} \quad \frac{x-5}{1} = \frac{y-5}{2} = \frac{z-13}{3}$$

Check your answer.



I walk on the line on the left.
At time t I stand on

$$x = 8 + 3t$$

$$y = 7 + 4t$$

$$z = 6 + t$$

When do I stand on the other
line?

$$\text{need } \frac{8+3t-5}{1} = \frac{7+4t-5}{2} = \frac{6+t-13}{3}$$

I need

$$\begin{cases} 3t+3 = \frac{2+4t}{2} \\ 3t+3 = \frac{t-7}{3} \end{cases}$$

$$\begin{cases} 3t+3 = 1+2t \\ 9t+9 = t-7 \end{cases}$$

$$\begin{cases} t = -2 \\ 8t = -16 \end{cases}$$

$$\text{so } t = -2$$

The point is

$$x = 8 + 3(-2) = 2$$

$$y = 7 + 4(-2) = -1$$

$$z = 6 + (-2) = 4$$

$$(2, -1, 4)$$

check:

$(2, -1, 4)$ is on the
left line because:

$$-\frac{6}{3} = -\frac{8}{4} = -\frac{2}{1} \quad \checkmark$$

right line:

$$-\frac{3}{1} = -\frac{6}{2} = -\frac{9}{3} \quad \checkmark$$