Example

For which value of k is the following system consistent?

$$2x - 3y = 15$$
$$-6x + 9y = k$$

We can solve this by comparison.

Let's solve for x in both equations

$2x - 3y = 15 \Rightarrow 2x = 15 + 3y \Rightarrow x = \frac{1}{2}(15 + 3y)$

$-6x + 9y = k \Rightarrow -6x = k - 9y \Rightarrow x = -\frac{1}{6}(k - 9y)$

$\frac{1}{2}(15 + 3y) = -\frac{1}{6}(k - 9y)$

$\frac{15}{2} + \frac{3}{2}y = -\frac{1}{6}k + \frac{9}{6}y$

$\frac{15}{2} = -\frac{1}{6}k$ Multiply both sides by -6

$-6\left(\frac{15}{2}\right) = k$

$-45 = k$.

For the system to be consistent $k = -45$

Example The sum of two numbers is 22. One number is 5 less than 2 times the other. Find the numbers

Let the numbers be x and y.

$x + y = 22$

$y = 2x - 5 \Rightarrow x + (2x - 5) = 22$

$3x = 27 \Rightarrow x = 9, y = 13$