Rearranging Equations

LLE – Mathematics and Statistics
ECO-5007A

Skills - Rearranging Equations

In each of the following expressions, make x the subject of the equation.

1. $x + y = 12$
2. $5x - 4 = y$
3. $ax - 3by = 9$
4. $y = mx + c$
5. $2 + 5xy = 6$
6. $9x + 6y = 4x + 1$

Tip: Gather all terms containing x on one side of the equation and all other terms on the opposite side. Then, factor out x.

7. $ax + by = 4x + 1$
8. $ax - by = bx - 8$
9. $\dfrac{2ty + mx}{ty - mx} = 1$

10. $\dfrac{ty + mx}{ty - 3mx} = k$

11. $9x^2 = 4y$

12. $x^3 - 5m = t$

13. $x^2 - 2x = 15$

Tip: Rearrange this into the standard quadratic form $ax^2 + bx + c = 0$ and then consider using the quadratic formula or factoring.

14. $x^2 = 2 - qx$

15. $x^2 - 8 = kx$

Rearranging with Indices

Recall the rules of indices:

$$x^a x^b = x^{a+b}$$
$$\frac{x^a}{x^b} = x^{a-b}$$
$$(x^a)^b = x^{ab}$$

It also useful to note that a number multiplied by its reciprocal is 1, e.g. $\frac{3}{4} \times \frac{4}{3} = 1$

Examples:

Arrange to make x the subject of $x^{\frac{4}{9}} = y^{\frac{1}{3}}$

Solution:

$$x^{\frac{4}{9}\times\frac{9}{4}} = y^{\frac{1}{3}\times\frac{9}{4}}$$
$$x = y^{\frac{3}{4}}$$

Arrange to make x the subject of $x^{\frac{2}{3}} - y = 10$

Solution:

$$x^{\frac{2}{3}} = 10 + y$$
$$x = (10 + y)^{\frac{3}{2}}$$

Practice Problems:

Rearrange the following to make x the subject:

1. $x^{\frac{3}{4}} = y^{\frac{1}{2}}$
2. $x^{\frac{3}{4}} = y^{\frac{1}{2}} - 2$
3. $5x^8 - y = 0$
4. $x^{\frac{3}{4}}y = 8my$
5. $2x^{2.5} = 64$
6. $x^2y^3x^5y^2 = a$

7. $0.5x^{-0.5}y^{-0.5} \times 0.5x^{-0.5}y^{0.5} = 4$

8. $0.8y^{-0.2}x^{0.2} \times 0.2y^{0.8}x^{-0.8} = 10$

9. $\dfrac{\alpha y^{\alpha-1}x^{\beta}}{\beta y^{\alpha}x^{\beta-1}} = k$