SUPER 12s

SUPER 12s CAN BE USED AS AN INDIVIDUALISED MASTERY LEARNING PROGRAM.

2 ALGEBRA
2.8 REARRANGING EQUATIONS
2.8 LEVEL 6

NAME : _____

Skill description: Rearranging equations that involve indices.

Essential Revision

1. Solve for the unknown.

$$p + 9 = 19$$

2. Rearrange the equation to make I the subject.

$$V = IR$$

3. Rearrange the equation to make r the subject.

$$n = p + r$$

4. Rearrange the equation to make h the subject.

$$E = mgh$$

5. Rearrange the equation to make V_p the subject.

$$\frac{V_p}{V_s} = \frac{n_p}{n_s}$$

6. Rearrange the equation to make x the subject.

$$a = 2(x - 3y)$$

7. Solve for the unknown.

$$4y = 16$$

8. Rearrange the equation to make a the subject.

$$F = ma$$

9. Rearrange the equation to make v the subject.

$$f + v - e = 2$$

10. Rearrange the equation to make n the subject.

$$L = \frac{n\lambda}{2}$$

11. Rearrange the equation to make V_1 the subject.

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

12. Rearrange the equation to make d the subject.

$$\frac{c}{d} = x(4a + 3)$$

Solutions can be found at the end of the booklet.

score $\frac{\quad}{12}$

EQUATIONS

At this level, you will be rearranging equations sourced from mathematics and science.

Equation	Explanation
$A = \pi r^2$	Area of a circle.
$S = 4\pi r^2$	Surface area of a sphere.
$V = \pi r^2 h$	Volume of a cylinder.
$E = mc^2$	Einstein's energy mass equation.
$P = I^2 R$	Physics - power related to current and resistance.
$a = \frac{v^2}{r}$	Physics - circular motion.

STRATEGIES TO SOLVE THE PROBLEMS

When rearranging equations, the goal is to:

Isolate the desired variable (unknown)
to one side of the equal sign.

We will see over the next few levels that we follow the order:

- **First:** isolate the term that contains the desired variable (unknown).
- **Second:** isolate the desired variable (unknown).

Example 1

Rearrange the equation to make b the subject.

$$x = \frac{ab^2}{5}$$

Step 1

To isolate the variable b multiply both sides by 5.

$$x = \frac{ab^2}{5}$$

$$\times 5 = \times 5$$

$$5x = ab^2$$

Step 2

To isolate the variable b divide both sides by a.

$$5x = ab^2$$

$$\div a = \div a$$

$$\frac{5x}{a} = b^2$$

Step 3

As the variable b is raised to the power 2, we need to apply the inverse operation to both sides of the equation, and this is to take the square root.

$$\frac{5x}{a} = b^2$$

$$\sqrt{\frac{5x}{a}} = \sqrt{b^2}$$

The $\sqrt{\ }$ and b^2 are inverse operations and cancel.

$$\sqrt{\frac{5x}{a}} = \sqrt{b^2}$$

$$\sqrt{\frac{5x}{a}} = b$$

Example 2

Rearrange the equation to make a the subject.

$$x = \frac{2b^2}{a^3}$$

Step 1

As a^3 is a denominator start by multiply both sides by a^3, this will convert a^3 to a numerator.

$$x = \frac{2b^2}{a^3}$$

$$\times a^3 = \times a^3$$

$$a^3x = 2b^2$$

Step 2

To isolate the variable a we need to divide both sides by x.

$$a^3x = 2b^2$$

$$\div x = \div x$$

$$a^3 = \frac{2b^2}{x}$$

Step 3

As the variable a is raised to the power 3, we need to apply the inverse operation, which is to take the cube root.

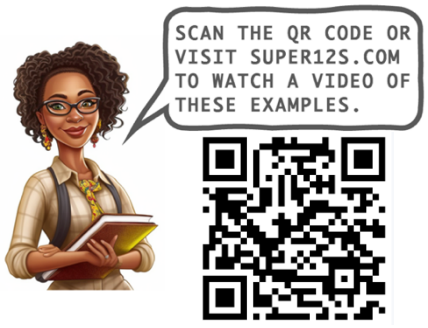
$$a^3 = \frac{2b^2}{x}$$

$$\sqrt[3]{a^3} = \sqrt[3]{\frac{2b^2}{x}}$$

The $\sqrt[3]{\ }$ and a raised to the power 3, are inverse operations and cancel each other out.

$$\sqrt[3]{a^3} = \sqrt[3]{\frac{2b^2}{x}}$$

$$a = \sqrt[3]{\frac{2b^2}{x}}$$



QUESTIONS

1. Rearrange the equation to make r the subject.

$$A = \pi r^2$$

2. Rearrange the equation to make r the subject.

$$S = 4\pi r^2$$

3. Rearrange the equation to make h the subject.

$$V = \pi r^2 h$$

4. Rearrange the equation to make m the subject.

$$E = mc^2$$

5. Rearrange the equation to make R the subject.

$$P = I^2R$$

6. Rearrange the equation to make r the subject.

$$a = \frac{v^2}{r}$$

7. Rearrange the equation to make a the subject.

$$x = \frac{5a^3}{p^2}$$

8. Rearrange the equation to make r the subject.

$$V = \pi r^2 h$$

9. Rearrange the equation to make c the subject.

$$E = mc^2$$

10. Rearrange the equation to make I the subject.

$$P = I^2R$$

11. Rearrange the equation to make v the subject.

$$a = \frac{v^2}{r}$$

12. Rearrange the equation to make p the subject.

$$x = \frac{5a^3}{p^2}$$

SOLUTIONS CAN BE FOUND AT THE END OF THE BOOKLET.

score $\frac{\quad}{12}$

MASTERY TEST

Teacher's signature

I'VE COMPLETED

_____

LEVELS THIS YEAR

Solutions to Essential Revision

1. $p = 10$	2. $I = \frac{V}{R}$
3. $r = n - p$	4. $h = \frac{E}{mg}$
5. $V_p = \frac{n_p V_s}{n_s}$	6. $x = \frac{a+6y}{2}$
7. $y = 4$	8. $a = \frac{F}{m}$
9. $v = 2 - f + e$	10. $n = \frac{2L}{\lambda}$
11. $V_1 = \frac{P_2 V_2 T_1}{P_1 T_2}$	12. $d = \frac{c}{x(4a+3)}$

Solutions to Questions

1. $r = \sqrt{\frac{A}{\pi}}$	2. $r = \sqrt{\frac{S}{4\pi}}$
3. $h = \frac{V}{\pi r^2}$	4. $m = \frac{E}{c^2}$
5. $R = \frac{P}{I^2}$	6. $r = \frac{v^2}{a}$
7. $a = \sqrt[3]{\frac{xp^2}{5}}$	8. $r = \sqrt{\frac{V}{\pi h}}$
9. $c = \sqrt{\frac{E}{m}}$	10. $I = \sqrt{\frac{P}{R}}$
11. $v = \sqrt{ar}$	12. $p = \sqrt{\frac{5a^3}{x}}$