SUPER 12s

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

2 ALGEBRA
2.8 REARRANGING EQUATIONS
2.8 LEVEL 3

NAME : _____

Skill description: Rearranging equations that involve multiplication and division of variables with subscripts and the scientific understanding of Δ.

Essential Revision

1. Solve for the unknown.

$$m - 4 = 7$$

2. Rearrange the equation to make m the subject.

$$p = mv$$

3. Rearrange the equation to make L the subject.

$$P = 2L + 2W$$

4. Solve for the unknown.

$$\frac{y}{4} = 6$$

5. Rearrange the equation to make s the subject.

$$W = Fs$$

6. Rearrange the equation to make x the subject.

$$2x + a = b$$

7. Solve for the unknown.

$$x + 2 = 31$$

8. Rearrange the equation to make f the subject.

$$v = f\lambda$$

9. Rearrange the equation to make x the subject.

$$x + y = z$$

10. Solve for the unknown.

$$3p = 15$$

11. Rearrange the equation to make T the subject.

$$f = \frac{1}{T}$$

12. Rearrange the equation to make a the subject.

$$a + b + c + d = T$$

Solutions can be found at the end of the booklet.

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

ALGEBRAIC CONVENTIONS

Subscripts

Subscripts are small numbers or letters attached to a variable to better identify the specifics of that variable. They are often used when two variables have the same letter but have slightly different meanings.

Example

An equation to determine the total time taken.

$$t_T = t_f - t_i$$

This is read as:
time (Total) = time (final) – time (initial)

Δ symbol

In mathematics and science, Δ represents the change in a variable.

For example:

Δt may represent the change in time.

ΔV may represent the change in volume.

When rearranging a formula, the Δ stays with the variable (as if they are one). See the examples below.

EQUATIONS

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

Equation	Explanation
$A = \frac{bh}{2}$	Area of a triangle.
$V = \frac{Ah}{3}$	Volume of a pyramid.
$I = PRT$	Simple interest.
$l = \frac{\theta}{180}\pi r$	Arc length.
$Q = mc\Delta T$	Energy in a substance changing temperature.
$E = mgh$	Potential energy.
$L = \frac{n\lambda}{2}$	Standing waves.
$v = \frac{2\pi r}{T}$	Velocity of an object orbiting.
$B = \frac{\mu_0 I}{2\pi r}$	Ampere's law.
$PV = nRT$	Ideal gas law.
$\lambda = \frac{h}{mv}$	De Broglie relationship.
$\Delta S = \frac{q}{T}$	Second law of entropy.

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 r the subject.

$$l = \frac{\theta}{180}\pi r$$

Step 1

It is worth re-writing the right-hand side as one fraction for clarity of understanding.

$$l = \frac{\theta}{180}\pi r$$

$$l = \frac{\theta \pi r}{180}$$

Step 2

Isolate the variable r by multiplying both sides of the equation by 180.

$$l = \frac{\theta\pi r}{180}$$

$$\times 180 = \times 180$$

$$180l = \theta\pi r$$

Step 3

To isolate the variable r, divide both sides by $\theta\pi$. We can group these variables as they are both mathematically related to the variable r in the same way (multiplication).

$$180l = \theta\pi r$$

$$\div \theta\pi = \div \theta\pi$$

$$\frac{180l}{\theta\pi} = r$$

QUESTIONS

1. Rearrange the equation to make h the subject.

$$A = \frac{bh}{2}$$

2. Rearrange the equation to make A the subject.

$$V = \frac{Ah}{3}$$

3. Rearrange the equation to make R the subject.

$$I = PRT$$

4. Rearrange the equation to make θ the subject.

$$l = \frac{\theta}{180}\pi r$$

5. Rearrange the equation to make m the subject.

$$Q = mc\Delta T$$

6. Rearrange the equation to make h the subject.

$$E = mgh$$

7. Rearrange the equation to make n the subject.

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

8. Rearrange the equation to make T the subject.

$$v = \frac{2\pi r}{T}$$

9. Rearrange the equation to make μ_0 the subject.

$$B = \frac{\mu_0 I}{2\pi r}$$

10. Rearrange the equation to make T the subject.

$$PV = nRT$$

11. Rearrange the equation to make v the subject.

$$\lambda = \frac{h}{mv}$$

12. Rearrange the equation to make T the subject.

$$\Delta S = \frac{q}{T}$$

SOLUTIONS CAN BE FOUND AT THE END OF THE BOOKLET.

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

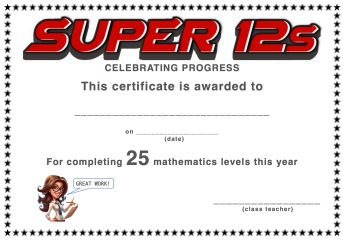
MASTERY TEST

Teacher's signature

I'VE COMPLETED

_____

LEVELS THIS YEAR



Solutions to Essential Revision

1. $m = 11$
2. $m = \frac{p}{v}$
3. $L = \frac{P}{2} - W$
4. $y = 24$
5. $s = \frac{W}{F}$
6. $x = \frac{b-a}{2}$
7. $x = 29$
8. $f = \frac{v}{\lambda}$
9. $x = z - y$
10. $p = 5$
11. $T = \frac{1}{f}$
12. $a = T - b - c - d$

Solutions to Questions

1. $h = \frac{2A}{b}$
2. $A = \frac{3V}{h}$
3. $R = \frac{I}{PT}$
4. $\theta = \frac{180l}{\pi r}$
5. $m = \frac{Q}{c\Delta T}$
6. $h = \frac{E}{mg}$
7. $n = \frac{2L}{\lambda}$
8. $T = \frac{2\pi r}{v}$
9. $\mu_0 = \frac{2\pi rB}{I}$
10. $T = \frac{PV}{nR}$
11. $v = \frac{h}{m\lambda}$
12. $T = \frac{q}{\Delta S}$