

# SOLVING EQUATIONS

## A DEFINITIONS

### A.1 MATH ESCAPE ROOM: LEVEL 1

**MCQ 1:** For this Math escape room, the code is:

$$\bigcirc + 5 = 9$$

Which code do you use to enter?

☐  $\bigcirc = 2$

☐  $\bigcirc = 4$

☐  $\bigcirc = 5$

☐  $\bigcirc = 9$

**MCQ 2:** For this Math escape room, the code is:

$$\triangle + 10 = 1 + 2 \times 6$$

Which code do you use to enter?

☐  $\triangle = 3$

☐  $\triangle = 5$

☐  $\triangle = 8$

☐  $\triangle = 10$

**MCQ 3:** For this Math escape room, the code is:

$$\square + 5 = 2 \times 4 + 1$$

Which code do you use to enter?

☐  $\square = 6$

☐  $\square = 8$

☐  $\square = 5$

☐  $\square = 4$

**MCQ 4:** For this Math escape room, the code is:

$$\bigcirc - 4 = 3 \times 2 - 1$$

Which code do you use to enter?

☐  $\bigcirc = 7$

☐  $\bigcirc = 6$

☐  $\bigcirc = 5$

☐  $\bigcirc = 9$

### A.2 MATH ESCAPE ROOM: LEVEL 2

**MCQ 5:** For this Math escape room, the code is:

$$2 \times \bigcirc - 2 = \bigcirc + 10$$

Which code do you use to enter?

☐  $\bigcirc = 8$

☐  $\bigcirc = 10$

☐  $\bigcirc = 12$

☐  $\bigcirc = 14$

**MCQ 6:** For this Math escape room, the code is:

$$3x + 7 = x + 19$$

Which code do you use to enter?

☐  $x = 2$

☐  $x = 4$

☐  $x = 6$

☐  $x = 8$

**MCQ 7:** For this Math escape room, the code is:

$$2x - 2 = x + 10$$

Which code do you use to enter?

☐  $x = 6$

☐  $x = 8$

☐  $x = 10$

☐  $x = 12$

**MCQ 8:** For this Math escape room, the code is:

$$x \times (x - 2) = 24$$

Which code do you use to enter?

☐  $x = 6$

☐  $x = 7$

☐  $x = 8$

☐  $x = 9$

### A.3 MATH ESCAPE ROOM: LEVEL 3

**MCQ 9:** For this Math escape room, the code is:

$$x^2 - 4 = 0$$

Which code do you use to enter?

- ☐  $x = 2$   
☐  $x = 3$   
☐  $x = 4$   
☐  $x = 5$

**MCQ 10:** For this Math escape room, the code is:

$$x^2 - 2x + 1 = 0$$

Which code do you use to enter?

- ☐  $x = 0$   
☐  $x = 1$   
☐  $x = 2$   
☐  $x = 3$

**MCQ 11:** For this Math escape room, the code is:

$$\frac{2x+1}{x-1} = 3$$

Which code do you use to enter?

- ☐  $x = 2$   
☐  $x = 3$   
☐  $x = 4$   
☐  $x = 5$

## B SOLVING BY TRIAL AND ERROR

### B.1 FINDING A SOLUTION: LEVEL 1

**Ex 12:** Consider the equation  $2x + 3 = 11$ .  
Use the trial-and-error method to find a solution (try  $x = 2, 3, \dots$ ).

$$x = \boxed{\phantom{00}}$$

**Ex 13:** Consider the equation  $3x - 5 = 10$ .  
Use the trial-and-error method to find a solution (try  $x = 4, 5, \dots$ ).

$$x = \boxed{\phantom{00}}$$

**Ex 14:** Consider the equation  $x(x - 1) = 6$ .  
Use the trial-and-error method to find a solution (try  $x = 2, 3, \dots$ ).

$$x = \boxed{\phantom{00}}$$

**Ex 15:** Consider the equation  $2x - 3 = 5x - 9$ .  
Use the trial-and-error method to find a solution (try  $x = 0, 1, \dots$ ).

$$x = \boxed{\phantom{00}}$$

### B.2 FINDING A SOLUTION: LEVEL 2

**Ex 16:** Consider the equation  $x^2 - 2x + 1 = 0$ .  
Use the trial-and-error method to find a solution (try  $x = 0, 1, \dots$ ).

$$x = \boxed{\phantom{00}}$$

**Ex 17:** Consider the equation  $x^2 - 9 = 0$ .  
Use the trial-and-error method to find a solution (try  $x = 2, 3, \dots$ ).

$$x = \boxed{\phantom{00}}$$

**Ex 18:** Consider the equation  $\frac{x+2}{x-2} = 2$ .  
Use the trial-and-error method to find a solution (try  $x = 6, 3, 4$ ).

$$x = \boxed{\phantom{00}}$$

## C EQUIVALENT EQUATIONS

### C.1 SOLVING EQUATIONS BY ADDING OR SUBTRACTING

**Ex 19:** Solve for  $x$ :

$$x + 10 = 80$$

$$x = \boxed{\phantom{00}}$$

**Ex 20:** Solve for  $x$ :

$$x + 20 = 36$$

$$x = \boxed{\phantom{00}}$$

**Ex 21:** Solve for  $x$ :

$$x + 1 = 100$$

$$x = \boxed{\phantom{00}}$$

**Ex 22:** Solve for  $x$ :

$$x + 0.5 = 3$$

$$x = \boxed{\phantom{00}} \text{ (write in decimal form)}$$

**Ex 23:** Solve for  $x$ :

$$x - 10 = -20$$

$$x = \boxed{\phantom{00}}$$

**Ex 24:** Solve for  $x$ :

$$x - 5 = -2$$

$$x = \boxed{\phantom{00}}$$

## C.2 SOLVING EQUATIONS BY MULTIPLYING OR DIVIDING

**Ex 25:** Solve for  $x$ :

$$2x = 16$$

$$x = \boxed{\phantom{00}}$$

**Ex 26:** Solve for  $x$ :

$$2x = 30$$

$$x = \boxed{\phantom{00}}$$

**Ex 27:** Solve for  $x$ :

$$3x = 27$$

$$x = \boxed{\phantom{00}}$$

**Ex 28:** Solve for  $x$ :

$$\frac{x}{4} = 5$$

$$x = \boxed{\phantom{00}}$$

**Ex 29:** Solve for  $x$ :

$$\frac{x}{3} = \frac{1}{2}$$

$$x = \boxed{\phantom{00}} \text{ (write in decimal form)}$$

$\square \xrightarrow{\div 2}$	$\square \xrightarrow{\div 2}$	$\square \xrightarrow{\div 2}$	$\square \xrightarrow{\div 2}$
$\square \xrightarrow{\times 2}$	$\square \xrightarrow{\times 2}$	$\square \xrightarrow{\times 2}$	$\square \xrightarrow{\times 2}$
$\square \xrightarrow{+3}$	$\square \xrightarrow{+3}$	$\square \xrightarrow{+3}$	$\square \xrightarrow{+3}$
$\square \xrightarrow{-3}$	$\square \xrightarrow{-3}$	$\square \xrightarrow{-3}$	$\square \xrightarrow{-3}$

**Ex 34:** Do the expression  $2 - 5x$

$\square \xrightarrow{\times(-5)}$	$\square \xrightarrow{\times(-5)}$	$\square \xrightarrow{\times(-5)}$	$\square \xrightarrow{\times(-5)}$
$\square \xrightarrow{\div(-5)}$	$\square \xrightarrow{\div(-5)}$	$\square \xrightarrow{\div(-5)}$	$\square \xrightarrow{\div(-5)}$
$\square \xrightarrow{+1}$	$\square \xrightarrow{+1}$	$\square \xrightarrow{+1}$	$\square \xrightarrow{+1}$
$\square \xrightarrow{-1}$	$\square \xrightarrow{-1}$	$\square \xrightarrow{-1}$	$\square \xrightarrow{-1}$

**Ex 35:** Do the expression  $2(x - 3)$

$\square \xrightarrow{-3}$	$\square \xrightarrow{-3}$	$\square \xrightarrow{-3}$	$\square \xrightarrow{-3}$
$\square \xrightarrow{\times 2}$	$\square \xrightarrow{\times 2}$	$\square \xrightarrow{\times 2}$	$\square \xrightarrow{\times 2}$
$\square \xrightarrow{+3}$	$\square \xrightarrow{+3}$	$\square \xrightarrow{+3}$	$\square \xrightarrow{+3}$
$\square \xrightarrow{\div 2}$	$\square \xrightarrow{\div 2}$	$\square \xrightarrow{\div 2}$	$\square \xrightarrow{\div 2}$

**Ex 36:** Do the expression  $\frac{x - 3}{2}$

$\square \xrightarrow{-3}$	$\square \xrightarrow{-3}$	$\square \xrightarrow{-3}$	$\square \xrightarrow{-3}$
$\square \xrightarrow{\div 2}$	$\square \xrightarrow{\div 2}$	$\square \xrightarrow{\div 2}$	$\square \xrightarrow{\div 2}$
$\square \xrightarrow{+3}$	$\square \xrightarrow{+3}$	$\square \xrightarrow{+3}$	$\square \xrightarrow{+3}$
$\square \xrightarrow{\times 2}$	$\square \xrightarrow{\times 2}$	$\square \xrightarrow{\times 2}$	$\square \xrightarrow{\times 2}$

## D DOING AND UNDOING EXPRESSIONS

### D.1 DOING EXPRESSIONS

**Ex 30:** Do the expression  $3 + 5x$

$\square \xrightarrow{\times 5}$	$\square \xrightarrow{\times 5}$	$\square \xrightarrow{\times 5}$	$\square \xrightarrow{\times 5}$
$\square \xrightarrow{\div 5}$	$\square \xrightarrow{\div 5}$	$\square \xrightarrow{\div 5}$	$\square \xrightarrow{\div 5}$
$\square \xrightarrow{+3}$	$\square \xrightarrow{+3}$	$\square \xrightarrow{+3}$	$\square \xrightarrow{+3}$
$\square \xrightarrow{-3}$	$\square \xrightarrow{-3}$	$\square \xrightarrow{-3}$	$\square \xrightarrow{-3}$

**Ex 31:** Do the expression  $2x + 1$

$\square \xrightarrow{\times 2}$	$\square \xrightarrow{\times 2}$	$\square \xrightarrow{\times 2}$	$\square \xrightarrow{\times 2}$
$\square \xrightarrow{\div 2}$	$\square \xrightarrow{\div 2}$	$\square \xrightarrow{\div 2}$	$\square \xrightarrow{\div 2}$
$\square \xrightarrow{+1}$	$\square \xrightarrow{+1}$	$\square \xrightarrow{+1}$	$\square \xrightarrow{+1}$
$\square \xrightarrow{-1}$	$\square \xrightarrow{-1}$	$\square \xrightarrow{-1}$	$\square \xrightarrow{-1}$

**Ex 32:** Do the expression  $5x - 1$

$\square \xrightarrow{\times 5}$	$\square \xrightarrow{\times 5}$	$\square \xrightarrow{\times 5}$	$\square \xrightarrow{\times 5}$
$\square \xrightarrow{\div 5}$	$\square \xrightarrow{\div 5}$	$\square \xrightarrow{\div 5}$	$\square \xrightarrow{\div 5}$
$\square \xrightarrow{+1}$	$\square \xrightarrow{+1}$	$\square \xrightarrow{+1}$	$\square \xrightarrow{+1}$
$\square \xrightarrow{-1}$	$\square \xrightarrow{-1}$	$\square \xrightarrow{-1}$	$\square \xrightarrow{-1}$

**Ex 33:** Do the expression  $\frac{x}{2} + 3$

### D.2 UNDOING EXPRESSIONS

**Ex 37:** Undo the expression  $2x + 1$

$\square \xrightarrow{\times 2}$	$\square \xrightarrow{\times 2}$	$\square \xrightarrow{\times 2}$	$\square \xrightarrow{\times 2}$
$\square \xrightarrow{\div 2}$	$\square \xrightarrow{\div 2}$	$\square \xrightarrow{\div 2}$	$\square \xrightarrow{\div 2}$
$\square \xrightarrow{+1}$	$\square \xrightarrow{+1}$	$\square \xrightarrow{+1}$	$\square \xrightarrow{+1}$
$\square \xrightarrow{-1}$	$\square \xrightarrow{-1}$	$\square \xrightarrow{-1}$	$\square \xrightarrow{-1}$

**Ex 38:** Undo the expression  $3x - 2$

$\square \xrightarrow{\times 3}$	$\square \xrightarrow{\times 3}$	$\square \xrightarrow{\times 3}$	$\square \xrightarrow{\times 3}$
$\square \xrightarrow{\div 3}$	$\square \xrightarrow{\div 3}$	$\square \xrightarrow{\div 3}$	$\square \xrightarrow{\div 3}$
$\square \xrightarrow{+2}$	$\square \xrightarrow{+2}$	$\square \xrightarrow{+2}$	$\square \xrightarrow{+2}$
$\square \xrightarrow{-2}$	$\square \xrightarrow{-2}$	$\square \xrightarrow{-2}$	$\square \xrightarrow{-2}$

**Ex 39:** Undo the expression  $\frac{x}{3} + 2$

$\square \xrightarrow{\times 3}$	$\square \xrightarrow{\times 3}$	$\square \xrightarrow{\times 3}$	$\square \xrightarrow{\times 3}$
$\square \xrightarrow{\div 3}$	$\square \xrightarrow{\div 3}$	$\square \xrightarrow{\div 3}$	$\square \xrightarrow{\div 3}$
$\square \xrightarrow{+2}$	$\square \xrightarrow{+2}$	$\square \xrightarrow{+2}$	$\square \xrightarrow{+2}$
$\square \xrightarrow{-2}$	$\square \xrightarrow{-2}$	$\square \xrightarrow{-2}$	$\square \xrightarrow{-2}$

**Ex 40:** Undo the expression  $\frac{x+2}{5}$

<input type="checkbox"/> $\frac{(x+2)}{5}$	<input type="checkbox"/> $\xrightarrow{\times 5}$	<input type="checkbox"/> $\frac{(x+2)}{5}$	<input type="checkbox"/> $\xrightarrow{\times 5}$
<input type="checkbox"/> $\frac{x+2}{5}$	<input type="checkbox"/> $\xrightarrow{\div 5}$	<input type="checkbox"/> $\frac{x+2}{5}$	<input type="checkbox"/> $\xrightarrow{\div 5}$
<input type="checkbox"/> $x+2$	<input type="checkbox"/> $\xrightarrow{+2}$	<input type="checkbox"/> $x+2$	<input type="checkbox"/> $\xrightarrow{+2}$
<input type="checkbox"/> $x$	<input type="checkbox"/> $\xrightarrow{-2}$	<input type="checkbox"/> $x$	<input type="checkbox"/> $\xrightarrow{-2}$
	<input type="checkbox"/> $\frac{(x+2)}{5}$		
	<input type="checkbox"/> $x+2$		
	<input type="checkbox"/> $x$		

## E SOLVING LINEAR EQUATIONS

### E.1 SOLVING LINEAR EQUATIONS: LEVEL 1

**Ex 41:** Solve for  $x$ :

$$2x + 1 = 7$$

$$x = \boxed{\phantom{00}}$$

**Ex 42:** Solve for  $x$ :

$$2x - 4 = 5$$

$$x = \boxed{\phantom{00}}$$

**Ex 43:** Solve for  $x$ :

$$4x - 7 = 9$$

$$x = \boxed{\phantom{00}}$$

**Ex 44:** Solve for  $x$ :

$$3x + 10 = 4$$

$$x = \boxed{\phantom{00}}$$

### E.2 SOLVING LINEAR EQUATIONS: LEVEL 2

**Ex 45:** Solve for  $x$ :

$$\frac{x-17}{3} = 10$$

$$x = \boxed{\phantom{00}}$$

**Ex 46:** Solve for  $x$ :

$$\frac{x-2}{6} = \frac{2}{3}$$

$$x = \boxed{\phantom{00}}$$

**Ex 47:** Solve for  $x$ :

$$4(x+2) = 40$$

$$x = \boxed{\phantom{00}}$$

**Ex 48:** Solve for  $x$ :

$$\frac{2x+5}{4} = 3$$

$$x = \boxed{\phantom{00}}$$

## F SOLVING PRODUCT OF LINEAR EQUATIONS

### F.1 SOLVING EQUATIONS USING THE NULL FACTOR LAW: LEVEL 1

**Ex 49:** Solve for  $x$ :

$$x(x+1) = 0$$

Give your answers in increasing order:

The set of solutions is  $\{\boxed{\phantom{00}}, \boxed{\phantom{00}}\}$ .

**Ex 50:** Solve for  $x$ :

$$(x+2)(x-1) = 0$$

Give your answers in increasing order:

The set of solutions is  $\{\boxed{\phantom{00}}, \boxed{\phantom{00}}\}$ .

**Ex 51:** Solve for  $x$ :

$$(x+6)(x-3) = 0$$

Give your answers in increasing order:

The set of solutions is  $\{\boxed{\phantom{00}}, \boxed{\phantom{00}}\}$ .

**Ex 52:** Solve for  $x$ :

$$(x-1)(x-2) = 0$$

Give your answers in increasing order:

The set of solutions is  $\{\boxed{\phantom{00}}, \boxed{\phantom{00}}\}$ .

### F.2 SOLVING EQUATIONS USING THE NULL FACTOR LAW: LEVEL 2

**Ex 53:** Solve for  $x$ :

$$(2x+6)(x+2) = 0$$

Give your answers in increasing order:

The set of solutions is  $\{\boxed{\phantom{00}}, \boxed{\phantom{00}}\}$ .

**Ex 54:** Solve for  $x$ :

$$(x+2)(2x-1) = 0$$

Give your answers in increasing order:

The set of solutions is  $\{\boxed{\phantom{00}}, \boxed{\phantom{00}}\}$ .

**Ex 55:** Solve for  $x$ :

$$\left(\frac{x}{2} - 1\right)(2x+2) = 0$$

Give your answers in increasing order:

The set of solutions is  $\{\boxed{\phantom{00}}, \boxed{\phantom{00}}\}$ .

**Ex 56:** Solve for  $x$ :

$$x(x-1)(x-2) = 0$$

Give your answers in increasing order:

The set of solutions is  $\{\boxed{\phantom{00}}, \boxed{\phantom{00}}, \boxed{\phantom{00}}\}$ .

## G SOLVING QUADRATIC EQUATIONS IN THE FORM $x^2 = k$

### G.1 SOLVING QUADRATIC EQUATIONS IN THE FORM $x^2 = k$

**Ex 57:** Solve for  $x$ :

$$x^2 = 9$$

Give your answers in increasing order:

The set of solutions is  $\{\square, \square\}$ .

**Ex 58:** Solve for  $x$ :

$$x^2 = 25$$

Give your answers in increasing order:

The set of solutions is  $\{\square, \square\}$ .

**Ex 59:** Solve for  $x$ :

$$x^2 = 10$$

Give your answers in increasing order:

The set of solutions is  $\{\square, \square\}$ .

**Ex 60:** Solve for  $x$ :

$$x^2 - 3 = 0$$

Give your answers in increasing order:

The set of solutions is  $\{\square, \square\}$ .