**HIGH SCHOOL/SECONDARY SKILLS MASTERY SERIES**

*For 12 to 17 Year Olds Who Want to Master Algebra FAST!*

# 208 ALGEBRA PROBLEMS

**FREE**

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## PROVEN TO IMPROVE ALGEBRA SKILLS

Stepwise **confidence** building through guided examples
14 specific **Algebra Sections** including Critical Thinking type questions
**Commonly** tested questions and review sections
**Samurai Man** method to remember algebraic graphs
**Test** your Algebra skills at the end of this book

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MasterAlgebraNOW!

## Welcome

Dear Student

Firstly, I would like to thank you for picking up this book. Your interest keeps me inspired to do more.

I have authored this *208 Algebra Problems* book as part of the *High School/Secondary Skills Mastery Series* where I include concepts and tips from topics such as Trigonometry, Geometry & Measurement, Numbers and Statistics & Probability.

This book consists 208 Algebra questions spread across 83 pages, from the different sections of Algebra. I list these sections here : **Substituting Values, Expansion, Factorisation, Simplification, Completing the Square, Solving both Linear and Quadratic Equations, Quadratic Graph Sketching, Indices, Subject of Formula, Linear Inequalities, Simultaneous Equations and Word Problems.** I have also included review practices after every few sections to allow you to have a solid grasp of these sections before moving on. There is also a test right at the end where you can assess your newfound algebra skills.

The best way to approach this book is to do questions section by section in a sequential manner. I provide guided examples in each section for you to take reference from, and subsequent similar practice questions to improve your algebra abilities. It is best not to skip sections as you will need mastery of the section before moving on. If you have a school test coming up, then feel free to jump to the sections that you need improvements.

I wish you all the best in your pursuit for progress, excellence and your dreams.

Your desire to improve inspires me to help more students like you.

All the very best in your attempts, have patience and keep believing in yourself.

Irfan Musthapa

Founder at *Master Algebra Now !*

## Table of Contents



*8 Hacks Anyone Can Use to Achieve Consistent Maths Distinctions* on Page 84

## SECTION 1 : SUBSTITUTING VALUES

**Objective :** To determine the overall value of an algebraic expression, given a specific value assigned to an algebra term.

**Hot Tip :** Replace algebra with known value and apply BODMAS/PEMDAS rules.

**Pre-requisite knowledge :** Order of Mathematical operations, BODMAS/PEMDAS.

*Example 1*

Find the value of $3g - 5$ if $g = 8$

$$3(8) - 5$$

$= 24 - 5$

$= 19$

*Example 2*

Determine the value of $\frac{2x^3}{3} + x$ for $x = -3$

$\frac{2(-3)^3}{3} + (-3)$

$= \frac{2(-27)}{3} - 3$

$= \frac{-54}{3} - 3$

$= -18 - 3$

$= -21$

*Practice 1*

Determine the value of $7 - 5y$ when $y = 8$.

*Practice 2*

Determine the value of $\frac{4p^3}{5}$ when $p = 5$.

*Practice 3*

Determine the value of $ab - 8$ if $a = 5$ and $b = -2$.

*Practice 4*

Find the value of $p^2 + 4p - 8$ when $p = -3$.

*Practice 5*

Find the value of $4(5 - 7p)$ when $p = \frac{2}{21}$

*Practice 6*

Determine the value of the algebraic expression $(2 - 3p)^2$ if $p = -1$.

*Practice 7*

Determine the value of the algebraic expression $(4a + b)^2$ if $a = -1$ and $b = 4$.

*Practice 8*

Find the value of $(-1 + 8x)(5 + 7x)$ when $x = 3$

*Practice 9*

Find the value of $\sqrt{\frac{3x-4}{2}} + 2x$ when $x = 18$

*Practice 10*

Determine the value of $\sqrt[3]{4m^2} - m$ when $m = 2$

## SECTION 2 : EXPANSION

**Objective :** To remove brackets from an algebraic expression and combine any like terms.

**Hot Tip :** Apply formulas and a step by step process to expand.

**Pre-requisite knowledge :** Multiplication of algebra and application of expansion formulas.

*Some students often prefer the rainbow method but employing the formulas help a great deal when it comes to speed of doing and minimises carelessness.*

**Formula List for Expansion Problems**

$$Formula\ 1: (a+b)^2 = a^2 + 2ab + b^2$$

$$Formula\ 2: (a-b)^2 = a^2 - 2ab + b^2$$

$$Formula\ 3: (a+b)(a-b) = a^2 - b^2$$

$$Formula\ 4: Rainbow\ Method$$

*Example 1*

Expand $(2+p)^2$

$(2+p)^2$

$= 2^2 + 2(2)(p) + p^2$

$=4 + 4p + p^2$

*Example 2*

Expand $(3x-4)^2$

$(3x-4)^2$

$= (3x)^2 - 2(3x)(4) + 4^2$

$=9x^2 - 24x + 16$

*Example 3*

Expand the following algebraic expression $(3x-4)(3x+4)$

$(3x-4)(3x+4)$

$= (3x)^2 - 4^2$

$= 9x^2 - 16$

*Example 4*

Expand and simplify the following algebraic expression $(1-2p)(4p+5)$

$(1-2p)(4p+5)$

$= (1-2p)(4p+5)$

$= (1)(4p) + (1)(5) + (-2p)(4p) + (-2p)(5)$

$= 4p + 5 - 8p^2 - 10p$

$= -8p^2 - 6p + 5$

*Practice 1*

Expand $3(2a-7)$

*Practice 2*

Expand $-4(8-5x)$

*Practice 3*

Expand $(2p+5)^2$

*Practice 4*

Expand $(4x-3)^2$

*Practice 5*

Expand and simplify $(4x - 3)(6 - 11x)$

*Practice 6*

Expand and simplify $-2(4x - 3)(6 - 11x)$

*Practice 7*

Expand and simplify $(x + 2)(5 - 8x) + (5 - 4x)(2x - 1)$

*Practice 8*

Expand and simplify $(x - 2)(1 - 7x) - (2 - 3x)(2x + 11)$

*Practice 9*

Expand and simplify $(4p + 3)(3 - p) - 2(1 - 2p)^2$

*Practice 10*

Given that the value of $x^2 + \frac{1}{x^2} = 10$, find the value(s) of $x - \frac{1}{x}$

## SECTION 3 : FACTORISATION

**Objective :** Opposite to expansion and to include brackets for an algebraic expression.

**Hot Tip :** Follow the Five Golden Steps to Factorisation

**Pre-requisite knowledge :** Finding common factors for numerical values and algebraic terms.

5 Golden Steps to Factorisation

1. Factorise out common terms from all terms
2. Check for number of terms
3. Identify right technique
    a. For 2 terms factorisation, attempt to apply the formula $a^2 - b^2 = (a + b)(a - b)$
    b. For 3 terms factorisation, use the cross method
    c. For 4 terms factorisation, use pairing and factoring method
4. Apply technique
5. Check answer by expanding and checking against question's expression.

*Example 1*

Factorise $10p^2 + 5p$

$10p^2 + 5p$

$= 5p(2p + 1)$

*Example 2*

Factorise $32 - 8x^2$

$32 - 8x^2$

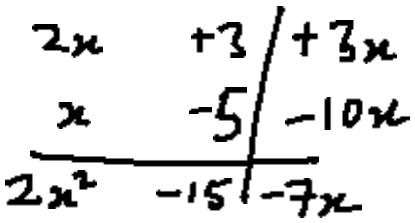
$= 8(4 - x^2)$

$= 8(2^2 - x^2)$

$= 8(2 + x)(2 - x)$

*Example 3*

Factorise $2x^2 - 7x - 15$




$$(2x + 3)(x - 5)$$

*Example 4*

Factorise $2pq - 3p + 8q - 12$

$2pq - 3p + 8q - 12$

$= p(2q - 3) + 4(2q - 3)$

$= (p + 4)(2q - 3)$

*Practice 1*

Factorise $8w - 24$

*Practice 2*

Factorise $8aw^2 - 24a^3w$

*Practice 3*

Factorise $6p^2 + 13p - 8$

*Practice 4*

Factorise $24x^2 + 16x - 14$

*Practice 5*

Factorise $6x^2 + 5xy - 6y^2$

*Practice 6*

Factorise $2y^2 + 3y - 5$ and hence factorise $2(x + 1)^2 + 3(x + 1) - 5$

*Practice 7*

Factorise $16 - p^2$

*Practice 8*

Factorise $4 - 16a^2$

*Practice 9*

Factorise $4x^3 + x^2 - 4x - 1$

*Practice 10*

Factorise $6ap - 5q + 15p - 2aq$

## SECTION 4 : SIMPLIFICATION

**Objective :** To combine algebraic expressions into one.

**Hot Tip :** Identify family of terms and group them together. For algebraic fractions, ensure the terms are fully factorised before combining the fractions.

**Pre-requisite knowledge :** Expansion and Factorisation

*Example 1*

Simplify $3x - 5 + 8x - 9$

$3x - 5 + 8x - 9$

$= 3x + 8x - 9 - 5$

$= 11x - 14$

*Example 2*

Simplify $\frac{x}{2} + \frac{3x}{5}$

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

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

$= \frac{5x}{10} + \frac{6x}{10}$

$= \frac{5x+6x}{10} = \frac{11x}{10}$

*Example 3*

Simplify $\frac{4}{x^2-16} + \frac{1}{4-x}$

$\frac{4}{x^2-16} + \frac{1}{4-x}$

$= \frac{4}{x^2-4^2} + \frac{1}{4-x}$

$= \frac{4}{(x+4)(x-4)} + \frac{1}{4-x}$

$= \frac{4}{(x+4)(x-4)} - \frac{1}{x-4}$

$= \frac{4}{(x+4)(x-4)} - \frac{1 \times (x+4)}{(x-4) \times (x+4)}$

$$= \frac{4}{(x+4)(x-4)} - \frac{x+4}{(x-4)(x+4)}$$

$$= \frac{4-(x+4)}{(x+4)(x-4)}$$

$$= \frac{4-x-4}{(x+4)(x-4)}$$

$$= \frac{-x}{(x+4)(x-4)}$$

*Example 4*

Simplify $\frac{3x-9}{2x^2-3x-9} \div \frac{6}{4x^2-9}$

$$\frac{3x-9}{2x^2-3x-9} \div \frac{6}{4x^2-9}$$

$$= \frac{3x-9}{2x^2-3x-9} \div \frac{6}{4x^2-9}$$

$$= \frac{3(x-3)}{(2x+3)(x-3)} \times \frac{4x^2-9}{6}$$

$$= \frac{3(x-3)}{(2x+3)(x-3)} \times \frac{(2x)^2-3^2}{6}$$

$$= \frac{3(x-3)}{(2x+3)(x-3)} \times \frac{(2x+3)(2x-3)}{6}$$

$$= \frac{(2x-3)}{2}$$

*Practice 1*

Simplify $4x - 9 + x - 10$

*Practice 2*

Simplify $3p-9p^2 + p - 10p^2 - 1 + 8$

*Practice 3*

Simplify $\frac{6}{3p-1}+\frac{2}{1-3p}$

*Practice 4*

Simplify $\frac{6}{3p-1}-\frac{2}{1-3p}$

*Practice 5*

Simplify $\frac{6}{3p-1}-\frac{2}{(1-3p)^2}$

*Practice 6*

Simplify $\frac{4}{2x-1}-\frac{3}{(1+2x)(1-2x)}$

*Practice 7*

Simplify $\frac{3w}{4} - \frac{2w}{5}$

*Practice 8*

Simplify $\frac{3}{16x^2-9} - \frac{1}{8x^2-2x-3}$

*Practice 9*

Simplify $\frac{4x+2}{2x^2-9x-5} \div \frac{8}{2x^2-50}$

*Practice 10*

Simplify $\frac{7p}{4-16p} - \frac{2}{16p^2-1}$

## REVIEW PRACTICE 1

### (Substitution, Expansion, Factorisation and Simplification)

Q1. Find the value of the following algebraic expression if the value of $g = -7$

$$\frac{3g^2}{7} + 8$$

Q2. Expand and simplify $-3(4x - 1) + 5(2 + 7x)$

Q3. Factorise the following expression completely

$$18p^2 - 24p - 64$$

Q4. Simplify the following algebraic expression

$$\frac{4a}{5} - \frac{8}{10a}$$

Q5. Factorise the following algebraic expression completely $(x - 1)^3 - 100x + 100$

Q6. Expand and simplify $-2(3x + 1)^2$

Q7. Factorise the following algebraic expression completely

$$2a - 8a^3$$

Q8. Factorise $6x^3 - 16x^2 + 3x - 8$

Q9. Given that $x^2 + 10x = -25$, find the value of $x + 5$ without solving for $x$.

Q10. Simplify the following algebraic expression completely.

$$\frac{2}{4x^2 - 1} - \frac{5}{1 - 2x}$$

## SECTION 5 : COMPLETING THE SQUARE

**Objective :** To convert any quadratic equation into a perfect square form to either solve the quadratic equation(note that not all quadratic equations can be solved) or retrieve it's maxima/minima points.

**Hot Tip :** All quadratic equations can undergo the completing the square method.

**Pre-requisite knowledge :** Basic understanding of a quadratic equation.

*Example 1*

Complete the square for the following quadratic equation $x^2 - 10x + 8$

$x^2 - 10x + 8$

$= (x - \frac{10}{2})^2 - (-\frac{10}{2})^2 + 8$

$= (x - 5)^2 - 25 + 8$

$= (x - 5)^2 - 17$

*Example 2*

Express the quadratic equation $-x^2 + 2x - 5$ in the form $a(x - h)^2 + k$. Hence, state it's turning point.

$$-x^2 + 2x - 5$$

$= -[x^2 - 2x + 5]$

$= -\left[\left(x - \frac{2}{2}\right)^2 - \left(-\frac{2}{2}\right)^2 + 5\right]$

$= -[(x - 1)^2 - 1 + 5]$

$= -[(x - 1)^2 + 4]$

$= -(x - 1)^2 - 4$

Turning point = $(1, -4)$

*Example 3*

Complete the square for $10x^2 - 20x + 5$

$$10x^2 - 20x + 5$$

$= 10\left[x^2 - 2x + \frac{1}{2}\right]$

$= 10\left[(x - \frac{2}{2})^2 - (-\frac{2}{2})^2 + \frac{1}{2}\right]$

$= 10\left[(x-1)^2 - 1 + \frac{1}{2}\right]$

$= 10\left[(x-1)^2 - \frac{1}{2}\right]$

$= 10(x-1)^2 - 5$

*Practice 1*

Complete the square for $x^2 + 4x - 1$

*Practice 2*

Complete the square for $x^2 + x$

*Practice 3*

Express $x^2 - 12x + 8$ in the form $a(x-h)^2 + k$. Hence, state the values of $a, h \; and \; k$.

*Practice 4*

Complete the square for the quadratic equation $-x^2 + x - 1$. Hence, state the maxima coordinates of this equation.

*Practice 5*

If $3x^2 - 12x + 6 = p(x + h)^2 + k$, state the values of $p, h \text{ and } k$.

*Practice 6*

Complete the square for the quadratic equation $x^2 - x$. Hence, state the minima coordinates of this equation.

*Practice 7*

Express $x^2 - \frac{1}{2}x + \frac{1}{2}$ in the form $(x + h)^2 - k$.

*Practice 8*

Find the minima value of $x^2 - 2x + 1$

*Practice 9*

Find the maxima value of $-2x^2 + 8x$

*Practice 10*

Find the maxima value of $-10x^2 - x + 5$

## SECTION 6 : SOLVING (LINEAR)

**Objective :** To find the value of an unknown algebraic term with a power of 1(linear algebraic terms).

**Hot Tip :** Shift the unknown algebraic terms to the left side and the numbers to the right.

**Pre-requisite knowledge :** Understanding of BODMAS/PEMDAS, fractions and simplification of algebraic expressions.

*Example 1*

Find the value of the unknown in the expression $5a - 12 = 4 + 7a$

$5a - 12 = 4 + 7a$

$5a - 7a = 4 + 12$

$-2a = 16$

$a = \frac{16}{-2}$

$a = -8$

*Example 2*

Solve the following : $-8(x - 5) = 2(4 - 3x)$

$-8x + 40 = 8 - 6x$

$-8x + 6x = 8 - 40$

$-2x = -32$

$x = \frac{-32}{-2}$

$x = 16$

*Example 3*

Solve $\frac{3p-5}{8} + \frac{4-p}{3} = 1$

$\frac{(3p - 5) \times 3}{8 \times 3} + \frac{(4 - p) \times 8}{3 \times 8} = 1$

$\frac{9p - 15}{24} + \frac{32 - 8p}{24} = 1$

$\frac{9p - 15 + 32 - 8p}{24} = 1$

$\frac{p + 17}{24} = 1$

$p + 17 = 24$

$p = 24 - 17$

$p = 7$

*Practice 1*

Solve $5p + 25 = 0$

*Practice 2*

Solve $2a + 2 = 8a - 4$

*Practice 3*

Solve the following : $-(x+6)=3(4+5x)$

*Practice 4*

Solve the following : $4(a-6)-2(4+a)=6a+7$

*Practice 5*

Find the value of the unknown in $\frac{2x-1}{3}=5$

*Practice 6*

Solve $\frac{3p}{2}+25=0$

*Practice 7*

Solve $\frac{2(x-8)}{3}-7=0$

*Practice 8*

Find the value of the unknown in $\frac{5+x}{2}+\frac{4-x}{3}=0$

*Practice 9*

Solve for *b* in the following equation $\frac{3b-1}{4}-\frac{4-b}{3}=2$

*Practice 10*

Solve $\frac{3(x+1)}{2}-\frac{4(3-2x)}{5}=-3$

# SECTION 7 : SOLVING (QUADRATIC)

**Objective : To solve a quadratic equation using various algebraic methods**

**Hot Tip :** Attempt to use factorisation whenever possible and move on to the quadratic formula if the equation is not factorisable.

**Pre-requisite knowledge** : Factorisation, quadratic formula, completing the square and algebraic simplification.

**Methods at our disposal for solving quadratic equations**

1) **Factorisation** (works only when quadratic equation is factorisable)
2) **Quadratic Formula** (works all the time if the equation has solutions)
3) **Completing the Square** (works all the time if the equation has solutions)
4) **Graphical Method** (works all the time if the equation has solutions but may be inaccurate)

*Example 1*

Solve the following quadratic equation $x^2 - 5x + 6 = 0$

| | | |
|---|---|---|
| $x$ | $-3$ | $-3x$ |
| $x$ | $-2$ | $-2x$ |
| $x^2$ | $+6$ | $-5x$ |

$$(x-3)(x-2) = 0$$

$$(x-3) = 0 \; or \; (x-2) = 0$$

$x = 3$ $\quad\quad$ $x = 2$

*Example 2*

Solve the following quadratic equation $x^2 - 4x + 2 = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(2)}}{2(1)}$$

$$= \frac{4 \pm \sqrt{8}}{2}$$

$$= \frac{4+\sqrt{8}}{2} \text{ or } \frac{4-\sqrt{8}}{2}$$

= 3.4142 or 0.5857

≈ 3.41 or 0.586 (3 s.f.)

*Example 3*

Solve the following quadratic equation using completing the square $x^2 - 10x + 1 = 0$

$x^2 - 10x + 1 = 0$

$(x - \frac{10}{2})^2 - (-\frac{10}{2})^2 + 1 = 0$

$(x - 5)^2 - 25 + 1 = 0$

$(x - 5)^2 - 24 = 0$

$(x - 5)^2 = 24$

$(x - 5) = \pm\sqrt{24}$

$x = 5 \pm \sqrt{24}$

$x = 5 + \sqrt{24}$ or $x = 5 - \sqrt{24}$

$x = 9.8989$ or $x = 0.1010$

$x \approx 9.90$ or $x \approx 0.101$ (3 s.f.)

*Example 4*

Solve the following quadratic equation $x^2 + 5x = 0$

$x^2 + 5x = 0$

$x(x + 5) = 0$

$x = 0$ or $(x + 5) = 0$

$x = -5$

*Practice 1*

Solve the following $x^2 - 3x - 10 = 0$

*Practice 2*

Solve the following quadratic equation $x^2 - 10x + 25 = 0$

*Practice 3*

Solve by using the quadratic formula $2x^2 - 8x + 3 = 0$

*Practice 4*

By completing the square, solve $x^2 - 3x + 2 = 0$

*Practice 5*

Solve $(3x - 2)^2 = 9$

*Practice 6*

Solve the following algebraic expression

$$\frac{5}{x} - \frac{x}{5} = 1$$

*Practice 7*

Solve $6x^2 - 7x - 20 = 0$

*Practice 8*

The length of a rectangular garden is 6 *m* more than it's width .

The area of the garden is 27 $m^2$. Find the dimensions of the garden.

*Practice 9*

Express *x* in terms of *y* for $81x^2 - 144xy + 64y^2 = 0$

*Practice 10*

Solve this equation by completing the square

$$-3x^2 + 5x + 10 = 0$$

# SECTION 8 : QUADRATIC GRAPH SKETCHING

**Objective : To sketch a quadratic graph.**

**Hot Tip :** Write down the 5 pointers' checklist for a proper sketch.

**Pre-requisite knowledge** : Completing the Square, Solving, Coordinate Geometry

**Five Pointers' Checklist**

1) **Shape** (is dependent on coefficient of $x^2$)
2) ***y*-intercept** (occurs when value of $x = 0$ )
3) ***x*-intercept** (occurs when value of $y = 0$)
4) **Turning point** (either a maximum or minimum point. two methods to determine this)
5) **Line of symmetry** (vertical line that passes through *x*-coordinate of turning point)

*Example 1*

Sketch the graph of $y = x^2 - 5x + 6$, stating clearly all intercepts and the turning point.

**Five Pointers' Checklist**

1) **Shape** (is dependent on coefficient of $x^2$)

Since coefficient of $x^2$ is positive, quadratic graph will have a minimum point i.e. smile face graph.

2) ***y*-intercept** (occurs when value of $x = 0$ )

When $x = 0$, $y = 0^2 - 5(0) + 6 = 6$

3) ***x*-intercept** (occurs when value of $y = 0$)

When $y = 0$, $x^2 - 5x + 6 = 0$

$(x - 3)(x - 2) = 0$

$x - 3 = 0$ or $x - 2 = 0$

$x = 3$ or $x = 2$

4) **Turning point** (either a maximum or a minimum point)

Two methods to determine turning point

Method 1 : Midpoint of *x*-intercepts (can be used only for equations with *x*-intercepts)

*x*-coordinate of turning point = $\frac{(2+3)}{2} = 2.5$

*y*-coordinate of turning point = $2.5^2 - 5(2.5) + 6 = -0.25$

Therefore minimum point = $(2.5, -0.25)$

Method 2 : Completing the Square (can be used for any type of quadratic equations)

$$x^2 - 5x + 6$$

$= (x - 2.5)^2 - (-2.5)^2 + 6$

$= (x - 2.5)^2 - 6.25 + 6$

$= (x - 2.5)^2 - 0.25$

*y*-coordinate of turning point = $-0.25$

$(x - 2.5) = 0$ $\quad x = 2.5$ → *x*-coordinate of turning point

Therefore minimum point = $(2.5, -0.25)$

5) **Line of symmetry** (vertical line that passes through *x*-coordinate of turning point)

Equation of line of symmetry : $x = 2.5$

$y = x^2 - 5x + 6$

**Five-Pointers' Checklist**

**Shape**

∪

***y*-intercept (when *x*=0)**

$y = 6$

***x*-intercept (when *y*=0)**

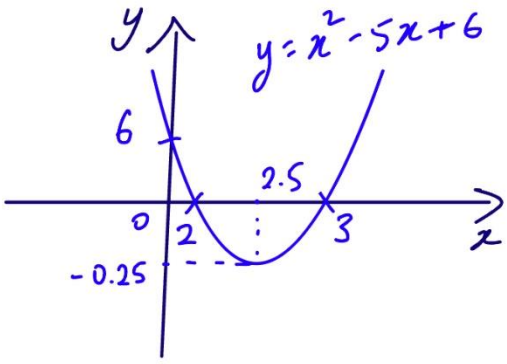
$x = 2$ or $x = 3$

**Turning Point**

$(2.5, -0.25)$

**Line of Symmetry**

$x = 2.5$



*Practice 1*

Sketch the graph of $y = x^2 - 4x + 3$, stating clearly all intercepts and the turning point.

*Practice 2*

Sketch the graph of $y = x^2 - 2x + 24$, stating clearly all intercepts and the turning point.

*Practice 3*

Sketch the graph of $y = (x - 5)(x + 5)$, stating clearly all intercepts and the turning point.

*Practice 4*

Sketch the graph of $y = -(x - 5)(x + 5)$, stating clearly all intercepts and the turning point.

*Practice 5*

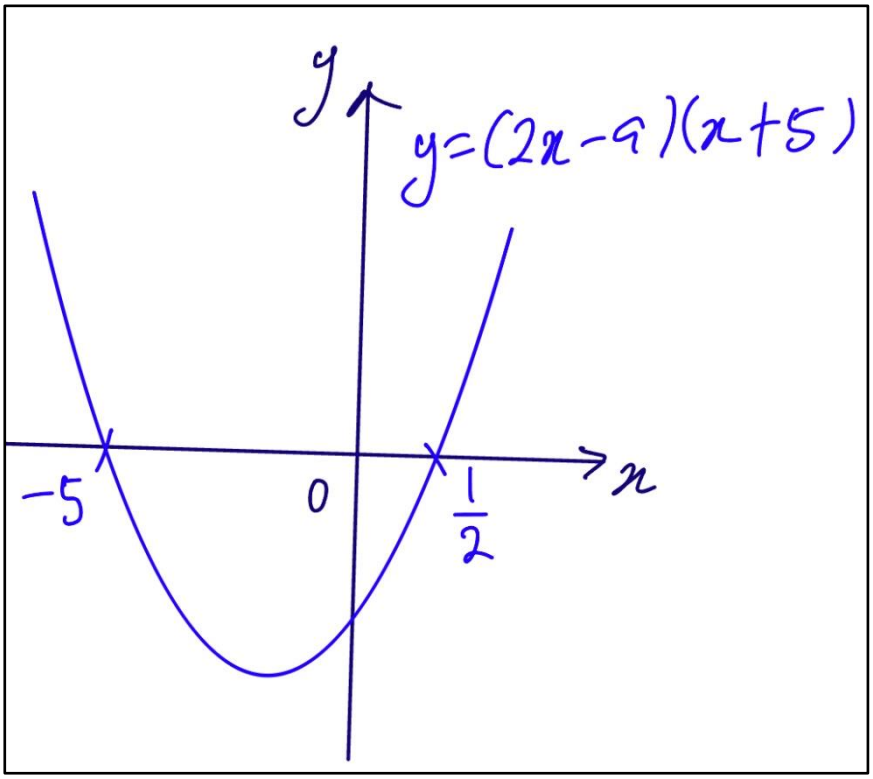
Sketch the graph of $y = x^2 - 2x + 1$, stating clearly all intercepts and the turning point.

*Practice 6*

Sketch the graph of $y = -x^2 + 13x - 40$, stating clearly all intercepts and the turning point.

*Practice 7*

The following sketch is for the equation $y = (2x - a)(x + 5)$. Find the value of $a$.



*Practice 8*

Sketch the equation $y = (-x - 4)(x + 5)$.

*Practice 9*

The quadratic equation $y = (-x - 4)(x + h)$ has a maximum point of $(-2.5\,, 2.25)$. Find the value of $h$.

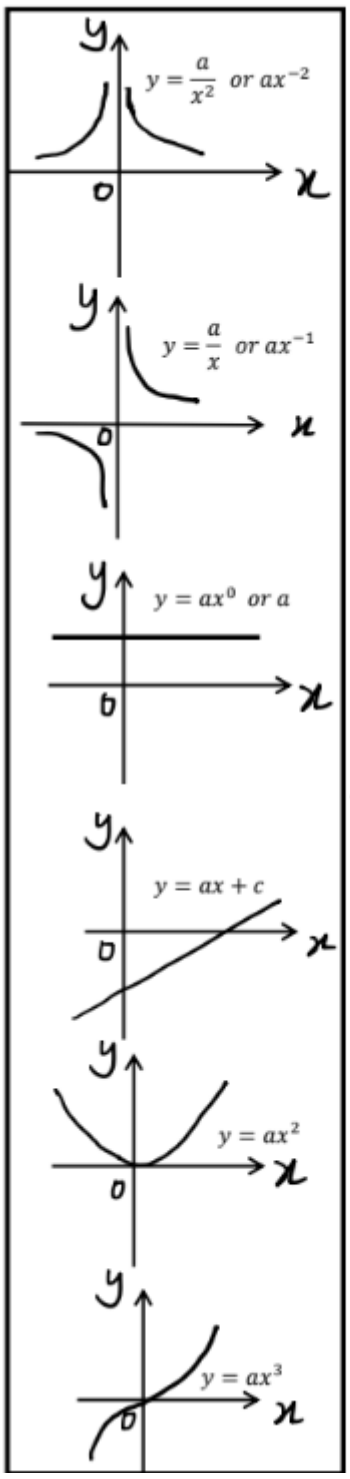
*Practice 10*

The quadratic equation $y = ax^2 - 3x + c$ has *y*-intercept of $-40$ and passes through $(1\ , -42)$.

Find the values of *a* and of *c*.

# SECTION 9 : POWER FUNCTION GRAPHS

**for values of $a > 0$**



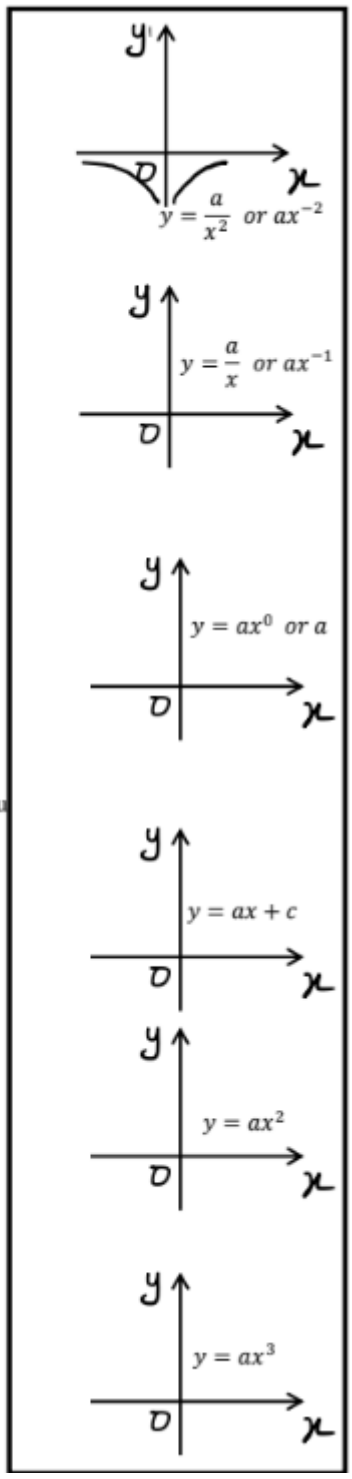

**Hot Tip: Use Samurai Man(next page) to remember graphs' shapes**

For $a < 0$, reflect the same graph for $a > 0$, about the $x$-axis

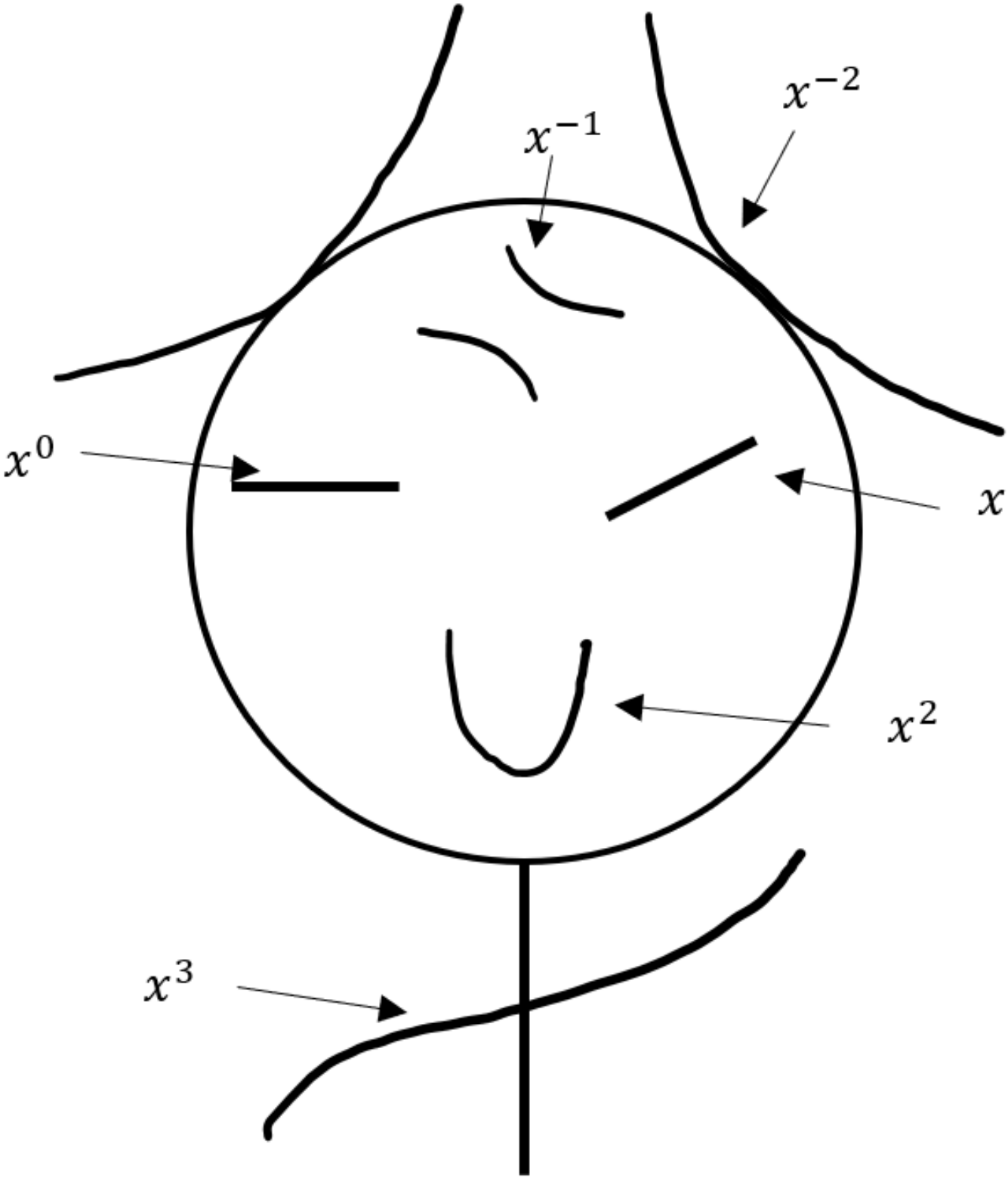
TRY sketching for $a < 0$

The first one has been done for you

**for values of $a < 0$**



**Hot tip : For values of *a* > 0, the Samurai Man helps in remembering the general shapes of the graphs.**




***Try drawing the Samurai Man for values of a < 0.***

## REVIEW PRACTICE 2

### (Completing the Square, Solving, Quadratic Sketching and Power Function Graphs)

Q1. By completing the square, solve $x^2 - 5x + 2 = 0$

Q2. Sketch the graph of $y = (-x + 9)(x - 2)$, indicating clearly, if any, both axes' intercepts and turning point.

Q3. Solve the following algebraic expression

$$\frac{8}{x} - \frac{x}{8} = 0$$

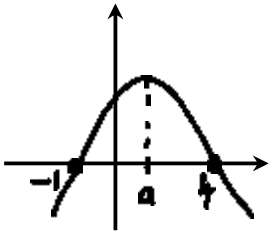
Q4. Solve $\frac{3x-5}{2} - \frac{5-x}{3} = 2$

Q5. Sketch the graph of $y = \frac{3}{x}$

Q6. Given that $x^2 - 8x + 1 = (x + a)^2 - b$, find the values of $a$ and of $b$.

Q7. By completing the square, explain if $x^2 - 10x + 25$, is a perfect square.

Q8. Determine the value of *a* for the following quadratic graph.




Q9. Solve $\frac{4}{2x+1} + \frac{5}{2x-1} = 2$

Q10. Find the turning point of $y = x^2 - 4x - 21$, and state if it's a maximum or minimum point.

## SECTION 10 : INDICES

**Objective :** To understand and apply the laws of indices

**Hot Tip :** Master the laws of indices before trying out questions

**Pre-requisite knowledge** : Algebraic simplification

Laws of Indices (You do not need to remember which law belongs to which law number, but you need to know how to apply the laws)

1) $a^m \times a^n = a^{m+n}$
2) $\frac{a^m}{a^n} = a^{m-n}$
3) $(a^m)^n = a^{mn}$
4) $a^0 = 1$
5) $a^{-m} = \frac{1}{a^m}$
6) $a^{\frac{1}{m}} = \sqrt[m]{a}$
7) $a^{\frac{m}{n}} = \sqrt[n]{a^m}$

*Example 1*

Simplify the following algebraic expressions, leaving your answer in positive index notation.

**(i)** $p^{-2}q \times p^6q^{-3}$

$= p^{-2+6}q^{1+(-3)}$

$= p^4q^{-2}$

$= \frac{p^4}{q^2}$

**(ii)** $\left(\frac{27}{x^{12}}\right)^{-\frac{1}{3}}$

$= \left(\frac{27^{-\frac{1}{3}}}{x^{-4}}\right)$

$= \left(\frac{\frac{1}{27^{\frac{1}{3}}}}{\frac{1}{x^4}}\right)$

$= \left(\frac{\frac{1}{3}}{\frac{1}{x^4}}\right)$

$= \frac{1}{3} \div \frac{1}{x^4}$

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

$= \frac{x^4}{3}$

Is there a shortcut you can think of here?

*Example 2*

Solve $2^k \div 128 = 2^{29}$

$2^k \div 128 = 2^{29}$

$2^k \div 2^7 = 2^{29}$

$2^{k-7} = 2^{29}$

$k - 7 = 29$

$k = 29 + 7$

$k = 36$

*Practice 1*

Simplify the following algebraic expressions, leaving your answer in positive index notation.

(i) $a^2b \times a^3b^{-3}$

(ii) $3p^2q^{-3} \times 4p^{-4}q^{-1}$

(iii) $(a^3b)^2 \div a^5b^3$

(iv) $\left(\frac{5}{a}\right)^{-3}$

(v) $\left(\frac{x^{-2}}{y}\right)^3 \div \sqrt{\frac{x}{y}}$

*Practice 2*

Solve the following

(i) $3^k \div 81 = 3$

(ii) $9^{x-1} = 243(3^x)$

(iii) $\frac{1}{8} \div \sqrt{4^m} = 1$

(iv) $\frac{10^{p^2}}{1000} \div \left(\frac{1}{10^{2p}}\right) = 1$

(v) $3^p + 3^p + 3^p + 3^p = 36$

# SECTION 11 : SUBJECT OF FORMULA

**Objective :** To express a specified algebraic term in terms of others

**Hot Tip :** Attempt to bring the subject of formula to the left side of the equation

**Pre-requisite knowledge** : Algebraic simplification

*Example 1*

Express *h* as the subject of the formula

$$3h + 5 = p - h$$

$$3h + 5 = p - h$$

$$3h + h = p - 5$$

$$4h = p - 5$$

$$h = \frac{p - 5}{4}$$

*Example 2*

Express *T* as the subject of the formula

$$5 = \frac{\sqrt{T}}{a}$$

$$5 = \frac{\sqrt{T}}{a}$$

$$5a = \sqrt{T}$$

$$\sqrt{T} = 5a$$

$$T = (5a)^2$$

$$T = 25a^2$$

*Example 3*

Express *p* as the subject of the formula

$$8k = \frac{3 - 2p}{p + 2}$$

$$8k = \frac{3 - 2p}{p + 2}$$

$$8k(p + 2) = 3 - 2p$$

$$8kp + 16k = 3 - 2p$$

$$8kp + 2p = 3 - 16k$$

$$p(8k + 2) = 3 - 16k$$

$$p = \frac{3 - 16k}{8k + 2}$$

$$p = \frac{3 - 16k}{2(4k + 1)}$$

*Practice 1*

Express *w* as the subject of the formula

$$-2w + 3 = r - w$$

*Practice 2*

Express *x* as the subject of the formula

$$3(3 - x) = x(2 - 5b)$$

*Practice 3*

Make *v* the subject of the formula

$$3v^2 = x - 5v^2 + 8$$

*Practice 4*

Make *x* the subject of the formula

$$m + \sqrt{x} = n$$

*Practice 5*

Express *p* as the subject of the formula

$$\sqrt{\frac{1-p}{p}} = x$$

*Practice 6*

Make *u* the subject of the formula

$$v^2 = u^2 + 2as$$

*Practice 7*

Make *x* the subject of the formula

$$\frac{3-x^2}{2+bx^2} = k$$

*Practice 8*

Express *a* in terms of *s*, *u* and *t*.

$$s = ut + \frac{1}{2}at^2$$

*Practice 9*

Make *b* the subject of the formula.

$$\frac{3-2b}{b+9} = \frac{5}{8x}$$

*Practice 10*

Make *x* the subject of the formula

$$z = \sqrt{\frac{x}{x+y}}$$

## SECTION 12 : LINEAR ALGEBRAIC INEQUALITY

**Objective :** To solve an algebraic expression that includes one or two inequalities

**Hot Tip :** Treat the inequality sign like an equal sign.

**Pre-requisite knowledge** : Algebraic Solving

*Example 1*

Solve $2x - 1 > 3x + 5$

*Move x to the side that makes it positive(in this question, it's to the right side), and retain the position of the inequality sign.*

$$-1 - 5 > 3x - 2x$$

$$-6 > x$$

$$x < -6$$

*Example 2*

Solve the inequality $-\frac{17-8x}{4} < 2 - \frac{4-3x}{2} < 5\frac{1}{3}$

$-\frac{17-8x}{4} < 2 - \frac{4-3x}{2}$ & $2 - \frac{4-3x}{2} < 5\frac{1}{3}$

$\frac{-17+8x}{4} < \frac{4-(4-3x)}{2}$ $\frac{4-(4-3x)}{2} < \frac{16}{3}$

$\frac{-17+8x}{4} < \frac{3x}{2}$ $\frac{3x}{2} < \frac{16}{3}$

$2(-17 + 8x) < 4(3x)$

$-34 + 16x < 12x$ $x < \frac{32}{9}$

$16x - 12x < 34$ $x < 3\frac{5}{9}$

$4x < 34$

$x < \frac{34}{4}$

$x < 8\frac{1}{2}$

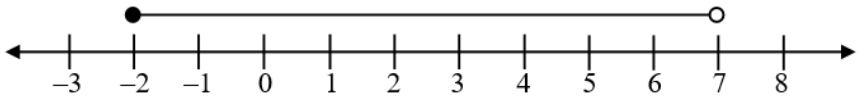
**Therefore,** $x < 3\frac{5}{9}$

*Practice 1*

Solve $5a - 2 > -2(a - 10)$

*Practice 2*

Write down the inequalities of *x* that satisfies this number line.




*Practice 3*

Solve $2(3 - 4x) < -(x - 9)$

*Practice 4*

Solve the inequalities $-6 < 3 - 2x \leq 9$ and write down all prime numbers that is satisfied by the inequality.

*Practice 5*

Solve $1 + \frac{4-8y}{3} \geq 5(y-5)$

*Practice 6*

Solve $2 + \frac{-8a+2}{3} \leq -(4a+1)$

*Practice 7*

Solve the inequalities $\frac{7}{3} < \frac{x}{2} - \frac{x}{3} + 2 \leq 3$ and represent the solution on a number line.

*Practice 8*

Solve the inequalities $8 + x < 10 + \frac{3}{2}x \leq 15.5 - 2x$

*Practice 9*

Solve the following inequality $6 < 2x + \frac{3x-5}{4} \leq 4x + 2$

*Practice 10*

Solve the inequality $2x - 1 < 3x \leq \frac{2+3x}{3}$

# SECTION 13 : SIMULTANEOUS EQUATIONS

**Objective** : To solve for two unknown algebraic terms, with two equations.

**Hot Tip :** Use either elimination or substitution to solve using algebraic methods. Graphical method is also available. Check your solutions by inserting the values into both equations.

**Pre-requisite knowledge** : Algebraic Solving and simplification

*Example 1*

*Let's practise using Elimination method*

Solve the following set of simultaneous equations

$3p - 4q = -13$……Eqn.1

$2p + 5q = 22$……..Eqn.2

Step 1 : choose term to eliminate. Easier option will be to eliminate term with the same number in both equations. If there is no such term, then choose the term which is closest to each other in numerical value.

Step 2 : let's eliminate $p$

Step 3 : ensure numerical value of $p$ is same by multiplying both equations to reach the lowest common multiple for $p$. Since LCM of 3 and 2 is 6, we multiply each equation to achieve $6p$.

$3p - 4q = -13$……Eqn.1 $\times$ 2 : $6p - 8q = -26$……Eqn.3

$2p + 5q = 22$……..Eqn.2$\times$ 3 : $6p + 15q = 66$……Eqn.4

**Eqn. 3 – Eqn. 4 [subtract when signs of *p* are same, add when it is different]**

$6p - 8q - (6p + 15q) = -26 - 66$

$-23q = -92$

$q = \frac{-92}{-23} = 4$

Insert $q = 4$ into Eqn. 1

$3p - 4(4) = -13$

$3p - 16 = -13$

$3p = -13 + 16 = 3$

$p = \frac{3}{3} = 1$

*Check by inserting $q = 4$ & $p = 1$ into Eqn.1 and Eqn.2*

*Eqn.1 :* $3p - 4q = 3(1) - 4(4) = -13$

*Eqn.2 :* $2p + 5q = 2(1) + 5(4) = 22$

*Example 2*

*Let's practise using Substitution method*

Solve the following set of simultaneous equations

$x + y = 14$……Eqn.1

$x - y = 8$……Eqn.2

Step 1 : Choose term to make a subject from either of the equations. Choose terms with smallest/friendly coefficient.

Step 2 : Substitute this term into the other equation and solve for the other term.

Step 3 : Complete solving and check.

From Eqn.1, $x = 14 - y$

Substitute $x = 14 - y$ into Eqn.2

$14 - y - y = 8$

$14 - 2y = 8$

$14 - 8 = 2y$

$2y = 14 - 8$

$2y = 6$

$y = \frac{6}{2} = 3$

$x = 14 - 3$

$= 11$

*Check by inserting $x = 11$ & $y = 3$ into Eqn.1 and Eqn.2*

*Eqn.1 :* $x + y = 11 + 3 = 14$

*Eqn.2 :* $x - y = 11 - 3 = 8$

*Practice 1*

Solve the following sets of simultaneous equations

(a) $x + y = 3$
$x - y = -1$

(b) $x + y = 5$
$x - y = 1$

(c) $3p + 8q = 27$
$2p + 4q = 14$

(d) $2a + 3c = 16$
$a + c = 7$

(e) $3x - 2y = -9$
$x = 4 - 4y$

(f) $2y = x - 8$
$3x - 4y = 19$

(g) $3m + 2n = 7$
$m = 5 - 4n$

(h) $\frac{y-4}{2} = x$
$\frac{y}{x} = 3$

(i) $\frac{2}{x} + \frac{1}{y} = 25$
$\frac{1}{x} - \frac{1}{y} = 5$

*Practice 2*

Jona goes to FOFULAR to buy 2 pencils and 3 erasers at a total cost of $3.50.

Dewi goes to the same FOFULAR to buy 3 pencils and 5 erasers at $5.50.

Find the cost of 1 pencil.

Find the cost of 1 eraser.

# SECTION 14 : WORD PROBLEMS

**Objective :** To solve algebraic word problems using algebraic simplification and solving techniques.

**Hot Tip :** Replace algebra with real world numbers and attempt.

**Pre-requisite knowledge** : Algebraic Solving and simplification

*Example 1*

Gilbert cycled at a speed of ($x$ + 4) km/h for 2$x$ hours. He then jogged at a speed of ($x$ – 7) km/h for $x$ hours. The total distance travelled is 4 km.

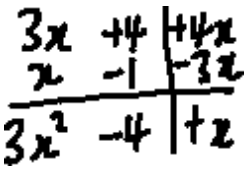
(a) Find an expression for the distance he cycled.
(b) Form an equation in $x$ and show that it reduces to $3x^2 + x - 4 = 0$.
(c) Solve the equation $3x^2 + x - 4 = 0$.
(d) Find the average speed for Gilbert's journey and state the reason why one of the values of $x$ is rejected.

(a) Distance cycled → Speed × Time = $(x + 4) \times 2x$
$= 2x^2 + 8x$

(b) Distance jogged → Speed × Time = $(x - 7) \times x$
$= x^2 - 7x$

Total Distance → $2x^2 + 8x + x^2 - 7x = 4$
$3x^2 + x - 4 = 0$

(c) $3x^2 + x - 4 = 0$




$(3x + 4)(x - 1) = 0$

$(3x + 4) = 0 \quad or \quad (x - 1) = 0$

$x = -\frac{4}{3} \quad or \quad x = 1$

(d)

$x = -\frac{4}{3}$ (rejected since time cannot be negative)

Total Time→ $2x + x = 3x$

$= 3(1)$

$= 3\ hours$

Average Speed → $\frac{Total\ Distance}{Total\ Time} = \frac{4}{3} = 1\frac{1}{3}\ km/h$

*Practice 1*

Rajesh bought *m* kiwi fruits for $87. Find an expression, in terms of *m*, for the cost of one kiwi fruit, in cents.

*Practice 2*

For a Volunteer  trip, some teachers and students walked 650 m from the school to a bus stop (so as to board a bus) at an average speed of *x* km/h. After the activity, they returned by the same route and walked from the same bus stop back to school, but at an average speed of 4 km/h slower than the earlier trip.

Express, in terms of *x*, the time in hours that the team took for the  return trip.

*Practice 3*

Ali and Ben jogged for a full marathon

Ali's speed was *x* km/h

Ben's speed was 2km/h faster than Ali.

Write down an expression for

(a) Ali's time taken
(b) Ben's time taken

[A full marathon is 42 km]

*Practice 4*

A rectangle has a length of $(x + 3)\ m$ and an area of $(x^2 + x - 6)\ m^2$. Find an expression for the breadth of the rectangle and simplify.

*Practice 5*

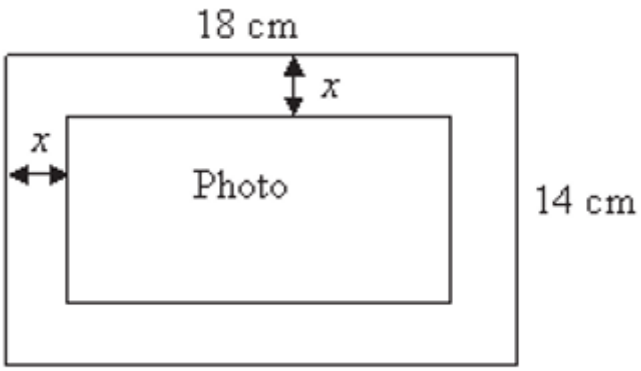
The distance between two towns, Alpha and Beta is 60 km. Initially, Mr Singh travelled from Alpha to Beta at *x* km/h.

(a) Write down the time taken to travel from Alpha to Beta.

(b) On the return journey from Beta to Alpha, Mr Singh travelled 7 km/h slower. Find the time taken for the return journey.

*Practice 6*

A photo of area 96 $cm^2$ is placed on a picture frame of 18 cm by 14 cm with a border of uniform width as shown.




Form an equation in *x* and show that it reduces to $x^2 - 16x + 39 = 0$

*Practice 7*

Amanda ran the 21 km of a half-marathon race at an average speed of *x* km/h.

(a) Write down, in terms of *x*, an expression for the number of hours it took her to complete the race.

(b) Deborah ran the same race at an average speed which is 3km/h faster than Amanda's speed. Write down, in terms of *x*, an expression for the number of hours which Deborah took.

(c) Given that the difference between the two times was 20 minutes, write down an equation in *x* and show that it reduces to $x^2 + 3x - 189 = 0$

*Practice 8*

A tank has a capacity of 1080 litres.

(a) Tap A fills the tank at a rate of *x* litres per minute.

Write an expression, in terms of *x*, the time taken in minutes, by Tap A to fill up the tank completely.

(b) Tap B fills the tank at a rate of 2 litres per minute slower than Tap A.

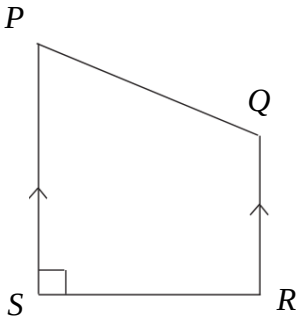
Write an expression, in terms of *x*, the time taken in minutes, by Tap B to fill up the tank completely.

(c) The difference in time taken by Tap A and Tap B to fill the tank completely is 40 minutes 36 seconds. Write down an equation in *x* to represent this information and show that it reduces to $203x^2 - 406x - 10800 = 0$

*Practice 9*

*PQRS* is a trapezium which PS is parallel to *QR* and angle *PSR* = 90°.

*PS* = 5*x* – 6 , *QR* = 3*x* – 8 and *SR* = 2*x* – 1




(a) Write down, in terms of *x*, an expression for the area of the trapezium.

(b) Given that the area of the trapezium is 33 cm$^2$, form an equation in *x*, and show that it reduces to $4x^2 - 9x - 13 = 0$

(c) Solve $4x^2 - 9x - 13 = 0$

(d) Hence find the length of *PS*.

*Practice 10*

Mr. Teo bought *x* thumbdrives for $1050 and intended to sell them at a profit of $6 per thumbdrive.

(a) Write down an expression in terms of *x*, the selling price of each thumbdrive.

(b) He received $1050 from selling the thumbdrives with 20 left unsold. Form an equation in terms of *x* and show that it reduces to $x^2 - 20x - 3500 = 0$.

(c) (i) Solve the equation $x^2 - 20x - 3500 = 0$ to find the number of thumbdrives he bought.

(ii) Hence, find the selling price of each thumbdrive.

## REVIEW PRACTICE 3

### (Word Problems, Simultaneous Equations, Inequality, Subject of Formula and Indices)

Q1. Given that $1 - \frac{a-b}{b+2c} = \frac{2a-1}{1}$, make $b$ the subject of the formula.

Q2. Solve the inequality $-5 \leq \frac{4x-3}{2} < 3$.

Q3. Solve the simultaneous equations below giving your answer in exact values.

$$1.5x - y = 3.5$$

$$6x + 1\frac{2}{3}y = 7$$

Q4. Solve the following equation

$$\frac{\sqrt{5^{4x}}}{25} = 1$$

Q5. Express $\frac{3a}{b^2} \div \sqrt{\frac{a^3}{b}}$ in positive index notation.

Q6. Alex bought some longans for \$360. He paid \$$x$ for each kilogram of longans.

(a) Write down an expression, in terms of $x$, for the number of kilogram of longans that he bought.

During the delivery, 5 kilogram of his longans were squashed. He sold the remainder of the longans at 60 cents more per kilogram than he paid for.

(b) Write down, in terms of $x$, for the sum of money he received for the remaining longans.

(c) He made a profit of \$171.

Write down an equation in $x$ to represent this information and show that it reduces to

$$5x^2 + 174x - 216 = 0$$

(d) Solve the equation and hence find the price that he paid for each kilogram of longans.

Q7. Solve for $m$

$$2^m + 2^m + 2^m = 24$$

Q8. Solve the inequality $3x - 1 \leq 2x + 9 < 7x + 4$

Q9. Simplify $\frac{5p^2}{6q^3} \div \frac{3p^2}{8q^4}$

Q10. Solve the simultaneous equations below giving your answer in exact values.

$\frac{3}{x} - \frac{2}{y} = -14$

$\frac{1}{x} - \frac{1}{y} = -8$

**ALGEBRA TEST**

Total Duration : 1 hour 15 minutes

Total Marks : 50 marks

Q1. Factorise $(x-7)^3 - 4x + 28$ completely [3]

Q2. Given that $\sqrt{\frac{r}{7+q^2}} - p = r$

(i) evaluate $p$ when $q = -3$ and $r = 36$ [1]

(ii) express $q$ in terms of $p$ and $r$ [3]

Q3. Solve the following equation [3]

$$\frac{\sqrt{3^{2x}}}{81} = \frac{1}{\sqrt[3]{9}}$$

Q4.

Julia works in a coffee café that pays her a wage of $\$x$ per hour. In January, her salary was \$2000.

(a) Write down an expression in terms of $x$, for the number of hours she worked in January.

[1]

(b) From February onwards, Julia's wage was increased by \$1.50per hour. If she also received \$2000 in February, write down an expression in terms of $x$, for the number of hours she worked in February.

[1]

(c) If Julia worked 13 hours less in February than in January, form an equation in $x$ and show that it reduces to $26x^2 + 39x - 6000 = 0$

[3]

(d) Solve the equation $26x^2 + 39x - 6000 = 0$, giving both answers correct to two decimal places. [3]

(e) Calculate the minimum number of hours Julia needs to work in March if she aims to earn a salary of at least \$3000. [1]

Q5. Solve this equation by completing the square [3]

$$-6x^2 + 15x - 6 = 0$$

Q6. Solve the inequalities $\frac{x}{2} - 5 \leq 3(x + 2) < 12$ and represent your solutions on a number line. [4]

Q7. Solve the following equations.

(a) $12 - 3x^2 = 16x$ [2]

(b) $(2x - 1)^2 = 3x + 11$ [2]

(c) $15^{x+2} = 1$ [2]

(d) $\frac{x+2}{x^2-5x+6} - \frac{x}{4x-12} = \frac{13}{8}$ [4]

Q8. Sketch the graph of $y = x^2 - 6x - 7$, indicating clearly any intercepts and the turning point. [2]

Q9. Expand and simplify $(x + 3)(4 - x) - 3(2 - 3x)^2$ [2]

Q10. Given that $\frac{z-x}{x-3z} = 5$, find the value of $\frac{z}{x}$ [2]

Q11. Simplify $\frac{2-r}{r-2}$ [2]

Q12. Express as a single fraction in its simplest form.

(a) $\frac{3x}{2-3y} + \frac{6x}{9y^2-4}$ [3]

(b) $\frac{x+2}{2x^2+x-6} \div \frac{3}{9-4x^2}$ [3]

- END OF MASTER ALGEBRA NOW! BOOK -

## About the Author, Irfan Musthapa

**What's Your Current Occupation?** I coach Mathematics to students aged 12 to 17 years old at the MasterMaths Education Centre in Singapore. To date, we have helped more than 3,500 + students love and enjoy Mathematics

**Did you grow up with a Silver Spoon?** No. I come from an average income family. I was from a typical government project neighbourhood and spent my childhood days mostly with my neighbours.

**Which Schools do you Hail From?** Zhonghua Primary, Beatty Secondary, Nanyang JC and Nanyang Technological University all in Singapore.

**What's Your Greatest Challenge for Maths?**

Studies were never my forte since Primary till my early Secondary days. Or at least, that was what I told myself. I failed Mathematics on numerous occasions and managed a bottom five in class position. Whilst other of my classmates were able to grasp my teacher's teachings, I was often lost. And due to this, my interest for the subject only continued dwindling. I could not see why I had to learn all these seemingly complex formulas.

I asked myself. Did doctors have to find $x$? How about the Businessman ? Pilots? Certainly celebrities did not have to find angles. Sportsman? Did they and many other jobs have to use whatever Mathematics sums they learnt? As an ignorant teen, I could not find the answers to this and it served to demotivate me even more. I was seeking for a purpose that I was quick to brush off.

**What's Your Maths Grades at the PSLE, N/O/A Levels?**

PSLE : A

Cambridge O Level : A1 for E.Maths, A1 for A.Maths

Cambridge A Level : A for H2 Maths

**Give your best advice to our young ones on how they can succeed for Maths and subsequently make a positive impact on our society :**

I have eight pointers for any student looking to achieve Mathematics success and your dreams. I have found that following these eight sequentially helps a great deal for consistent Mathematics distinctions.

**1. Inspiration and Purpose**

Seeing others succeed in Mathematics and wanting to compete with them is a short-sighted aim that will fade away with time. What got me started was seeing my classmate constantly topping the class for Maths and learning from him. Success stories should be used as inspiration for you to get started. Ultimate purpose is for us to become a better version of ourselves each day. It doesn't pay to be lazy. Maths is about developing good habits, as much as it is about formulas and quick thinking.

**2. Believe in Yourself**

"Believe you can and you're halfway there." Never truer words have been said about success and this applies to Mathematics too ! No one is going to believe in you more than yourself.

I am a football lover and just like scoring a goal, I started visualising myself performing for Mathematics. Imagine first and then make it your mission to turn the mental image into reality.

**3. Plan of Attack and Targets**

Set mini milestones and check progress. First, I targeted to do well in a class test. I still remember that test on Simultaneous Equation. And then in a term exam and then in the finals. **Warning : Do not set unrealistic targets. If it's too big for the moment, it may just scare you too much to take any meaningful action.**

**4. Daily Action and Sense of Urgency**

Nothing moves without effort. It is scientifically proven that grit, which means the power of persevering with effort is more important than talent when it comes to Maths achievements.

There were some days that I just couldn't put in the time needed for Maths. In those days, I ensure investing at least 15 minutes of reflection time for the concepts covered in school.

A sense of urgency to complete our tasks is also important. Develop a timetable and get the tasks completed. Setting aside time gives us that extra push to achieve. It's like a race. We try our best to reach the finish line in the fastest way possible. If there's no time limit, it's like there's no finish line.

**5. Review and Correct Gaps**

As a student, I used to work on the "comfortable" topics only. Those that I am good at. This is not good enough. Focus on those you are uncomfortable with. This is where you are losing marks. Seek to correct the gaps from teachers, guidebooks, YouTube etc.

**6. Do faster**

Have a topic that you're good at? Attempt to do the questions faster. This leaves more time for challenging problems and for checking your work in the exams. Doing it with speed builds confidence too.

**7. Test and Re-test**

Contrary to popular belief, there is no such thing as over preparing. Prepare to the maximum of your ability and your final preparation for a Mathematics exam can be done by testing yourself. Simulating the exam environment allows you to manage anxiety and have more control over your thoughts. Testing also allows us to find gaps in our concepts before the actual exam.

**8. A good sleep and nutrition**

Burning midnight oil for some last-minute revision? Not a good idea especially since brain cells need to regenerate, recharge and refresh. Avoid all nighters. Instead, work on a regular sleeping pattern. Mathematics is a subject that requires high levels of focus and the ability to think critically. Remember to take power naps in the day if you must. I once had a student who took 3 hours' of power nap in the day ! No good ! Again, scientifically proven for anyone to have between 20 and 60 minutes of nap time for maximum effectiveness for our brains.

Plus, minimise junk foods like chips, chocolate, ice-cream and plan your diet to include more healthy brain-friendly foods. Just like a good performing car, our body needs the right fuel to perform for the day.

To end off, I hope and trust that you will use the contents of this book to your advantage and never look back again. One thing that is common amongst top scorers is that Mathematics success is never impossible.

With the right action plans, anyone can achieve.

Put in your efforts and Great things await you…

Thank you for completing these practices.

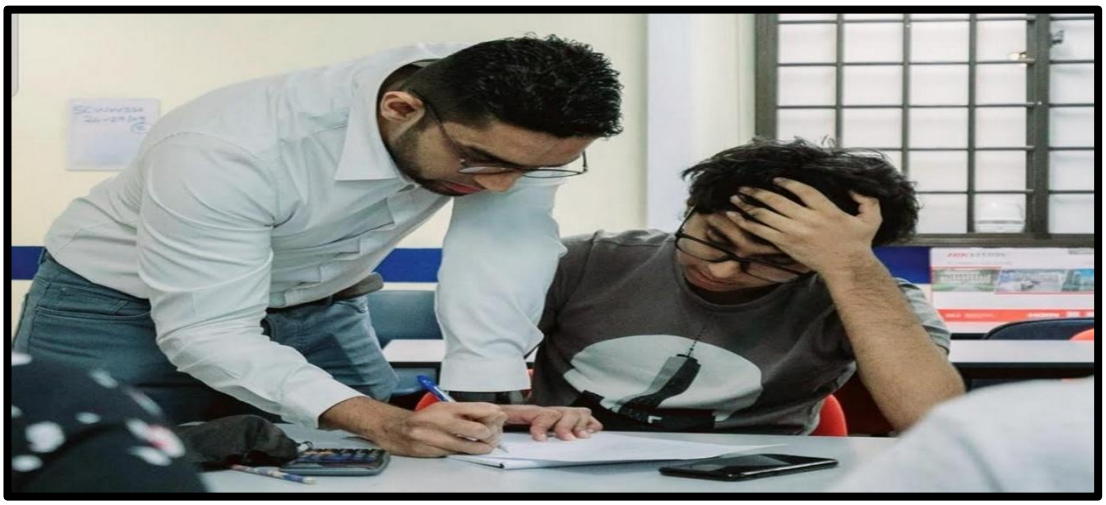
Feel free to re-attempt them and attempt more Algebra questions from your

school textbooks and school tests

## About Master Algebra Now…

Master Algebra Now started over a decade ago out of Irfan's desire to share his grade transformational journey with others.

Once a failing student, he transformed his grades around largely due to his study habits and techniques for Mathematics.



Even though many have regarded Mathematics to be a tough subject, Irfan has dispelled it to be a myth with easy to understand methods. Our students have gone on to achieve their dreams with their Mathematics achievements.

It is Irfan's goal to positively influence the lives of our youths for them to be impactful contributors to future society.

For more details about our Mathematics projects and other Mathematics Success programs and books authored by Irfan, visit **www.MasterAlgebraNow.com**