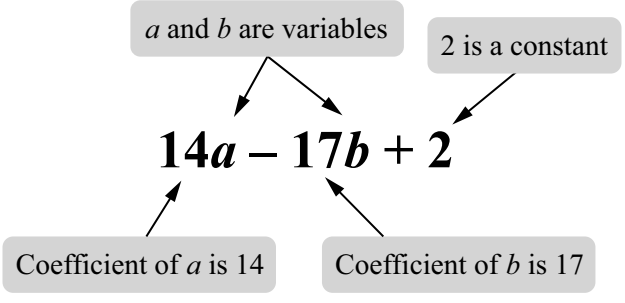
# Contents

# 1 Introduction to Algebra

## 1.1 Let's Recap Algebra Skills from Secondary 1

### Basics of Algebra

- Algebra is the use of symbols to represent an unknown variable.
- A constant has a fixed value whereas a variable has a value that is not fixed.




- Like and unlike terms

| Algebraic Expressions | Like terms |
|---|---|
| $14a + 2a + 5$ | $14a,\ 2a$ |
| $7x - 25y - 12x$ | $7x,\ -12x$ |
| $\frac{1}{6}t + 10st - 3st$ | $10st,\ -3st$ |
| $yx + 3y - 10xy + 23 - 10$ | $yx,\ -10xy$<br>$23,\ -10$ |

**Note!**

$xy$ and $y$ are unlike terms! $xy$ and are like terms!

### 1.2.5 Four Operations in Algebra

- Just like numbers, we follow the same rules when it comes to algebraic expressions.
- We can use the acronym BODMAS to solve algebraic expression involving more than one operations. The table below summarises the use of BODMAS.

| | |
|---|---|
| B | Solve the operations within the **B**rackets first. If there are more than one bracket, solve the innermost bracket first. Apply BODMAS within the bracket. |
| O | Evaluate indices and p**O**wers. Example, square, square root etc |
| DM | Evaluate **D**ivision and **M**ultiplication. Do it from left to right. |
| AS | Evaluate **A**ddition and **S**ubtraction. Do it from left to right. |

- Examples of BODMAS application in algebraic expressions

| | |
|---|---|
| $3m+n-2m+5(m-3n)$<br>$=3m+n-2m+5m-15n$<br>$=6m-14n$ | $(2f-4g)-(f-4g+3f)$<br>$=2f-4g-(4f-4g)$<br>$=2f-4g-4f+4g$<br>$=-2f$ |
| $11(xy^2-2y)-27x^2y\div 3x^2$<br>$=11xy^2-22y-9y$<br>$=11xy^2-31y$ | $(-45s^2t)\div 9t-(3s)(4s)+4t^2$<br>$=-5s^2-12s^2+4t^2$<br>$=-17s^2+4t^2$ |
| $18y+7[10x-4(y-3x)]$<br>$=18y+7[10x-4y+12x]$<br>$=18y+7[22x-4y]$<br>$=18y+154x-28y$<br>$=154x-10y$ | $(-42s^2t)\div 6t-(7s)(4s)+4t^2$<br>$=-7s^2-28s^2+4t^2$<br>$=-35s^2+4t^2$ |


## Quiz A

1. State the constants, co-efficient of the algebraic terms in the following algebraic expression $2x - \frac{1}{2}xy$.

   Constant =
   Co-efficient of $xy$ =
   Co-efficient of $x$ =

2. Simplify the following algebraic expression.
   $8m + 16n + 2mn + 10mn + 3n$

3. Simplify the following algebraic expression.
   $22mn - m - 12m - 4nm$

4. Simplify the following algebraic expression.
   $-5(16n - 20p)$

5. Simplify the following algebraic expression.
   $39b \div 3b^3$

6. Write algebraic expression for this phrase:
   the difference of 5 and $k$ square divided by the product of $m$ and $n$.

7. Factorise the algebraic expression completely.
   $-15q^2p^3 - 80q^3p^2$

8. Solve the equation.
   $22 - 7b = 48 - 3b$

9. Solve the equation.
   $12(4 - 17x) = 84(8x - 10)$

10. Solve the equation.
    $\frac{1}{2+x} + \frac{1}{4} = 12$

## Quiz B

1. Write algebraic expression for this phrase:
   Half of $xy$ plus $u$.

2. Simplify the following algebraic expression.
   $10mn - m + 12m - nm$

3. Simplify the following algebraic expression.
   $9v - 9v^2 - 19v^2 - 9v$

4. Write an algebraic expression for this phrase:
   Subtract $efg$ from $10xyz$.

5. Simplify the following algebraic expression.
   $(14b - d)(10b - 20d)$

6. Write an algebraic expression for this phrase:
   $4h$ divided by $2k$.

7. Simplify the following algebraic expression.
   $\frac{2(2x-3y)}{5} - \frac{(x-3y)}{15} + 1$

8. Factorise the algebraic expression completely.
   $24p + 16pqr - 32pr$

9. Solve the equation.
   $0.6x + 17.4 = 2(1.7 + 1.8x)$

10. Solve the equation.
    $3.4(5h - 2.5) = 2.4(1.3 - 0.8h)$.

11. Solve the equation.
    $\frac{4x-3}{5} + \frac{x-2}{6} = 0$

End of Quizzzzzzzzzzzz

## Examples

| Simplify the Quadratic Expressions | Notes |
|---|---|
| $\frac{8}{9}x^2 - \frac{7}{9}x^2$<br>$= \frac{8x^2 - 7x^2}{9}$<br>$= \frac{x^2}{9}$ or $\frac{1}{9}x^2$ | Like terms:<br>$\frac{8}{9}x^2, -\frac{7}{9}x^2$<br>Since both fractions have the same denominators, there is no need to change into a common denominator.<br>**Note!**<br>$\frac{8}{9}x^2$ is the same as $\frac{8x^2}{9}$ |
| $\frac{8}{9}x^2 - \frac{7}{27}x^2$<br>$= \frac{24}{27}x^2 - \frac{7}{27}x^2$<br>$= \frac{24x^2 - 7x^2}{27}$<br>$= \frac{17x^2}{27}$ or $\frac{17}{27}x^2$ | Like terms:<br>$\frac{8}{9}x^2, -\frac{7}{27}x^2$<br>LCM of 9 and 27 will be the common denominator. |
| $-3x^2 - \frac{8}{11}xy + x^2 - \frac{7}{11}xy$<br>$= -3x^2 + x^2 - \frac{8}{11}xy - \frac{7}{11}xy$<br>$= -2x^2 - \frac{15}{11}xy$ or $= -2x^2 - 1\frac{4}{11}xy$ | Like terms:<br>$-3x^2, x^2$<br>$-\frac{8}{11}xy, -\frac{7}{11}xy$ |
| $22x - \frac{8}{19}x^2y + x^2 + \frac{13}{19}x^2y$<br>$= -\frac{8}{19}x^2y + \frac{13}{19}x^2y + x^2 + 22x$<br>$= \frac{5}{19}x^2y + x^2 + 22x$ | Like terms<br>$-\frac{8}{19}x^2y, \frac{13}{19}x^2y$<br>Always try to put the quadratic terms at the beginning, even if it has a negative co-efficient. |
| $5a^2 - \left(4a^2 + \frac{8}{11}ab + a^2 - \frac{7}{22}ab\right)$<br>$= 5a^2 - \left(4a^2 + a^2 + \frac{8}{11}ab - \frac{7}{22}ab\right)$<br>$= 5a^2 - \left(5a^2 + \frac{16}{22}ab - \frac{7}{22}ab\right)$<br>$= 5a^2 - 5a^2 - \frac{9}{22}ab$<br>$= -\frac{9}{22}ab$ | Firstly, simplify the terms within the parenthesis. Next, remove the parenthesis. |