

ALGEBRA

MATHEMATICAL PHRASES

In algebra, we often use symbols to translate word phrases into algebraic expressions.

- \ Mathematical expression is made up of a coefficient and a variable
- .n an expression 3p, 3 is a coefficient and P is a variable

Word phrases used for each of the four operations in algebra.

(a) Addition (+)

- sum
- total
- altogether
- increased by
- add
- plus
- more than
- older than

(b) Subtraction (-)

- minus
- subtract
- take away
- difference
- decrease by
- less than
- deduct
- range

(a) Multiplication (x)

- | | |
|-------------|-----------|
| - multiply | - times |
| - product | - of |
| - twice | - thrice |
| - Square of | - cube of |

(b) Division (÷)

- divide
- share
- distribute
- quotient

Examples

Write the mathematical expression for these phrases.

(i) 3 more than t.

Add 3 to t

$$\underline{t + 3}$$

(ii) 4 less than y

Subtract 4 from y

$$\underline{y - 4}$$

(iii) Divide n by 2 and add 3 to its results.

$$\frac{n}{2} + 3$$

(iv) Square k.

$$k^2$$

(v) Square the sum of e and 8.

$$(e+8)^2$$

(vi) Add 5 to a number and triple the result.

$$3(a+5)$$

(vii) Square the product of y and 5.

$$(y \times 5)^2$$

$$\underline{(5y)^2}$$

viii) Add 2 to $\frac{5}{6}$ of a number.

Let the number be a.

$$\frac{5}{6} \text{ of } a + 2$$

$$\frac{5}{6} \times a + 2$$

$$\frac{5a}{6} + 2$$

$$\frac{5a}{6} + 2$$

(ix) y multiplied by 3.
 $y \times 3$ OR $3y$

(x) Add a and b.
 $a+b$ or $b+a$

Activity

1. Triple the difference between a and b.

2. Subtract 7 from x and double result.

6. Add 8 to d and multiply the result by a half.

7. The product of m and n

8. Subtract b from a.

9. Add 5 to n.

10. Multiply b by a.

11. Multiply n by 2 and then add 3 to the result.

12. Add 3 to x and then multiply by 2.

13. Multiply 4 by p and then subtract 7 from the result.

14. 5 less than k

15. A quarter the difference between u and y.

16. Subtract y from 10.

17. The sum of twice n and thrice b.

18. Multiply the difference between P and 2 by 3.

19. The quotient of x and y.

20. Subtract q from p

Meaning of algebraic expressions.

$a+b$ means $(a) + (b)$

ab means $(a) \times (b)$

$ab+ac$ means $(a \times b) + (a \times c)$

$a(b-c)$ means $a \times (b-c)$

$4p^2$ means $4 \times p^2$ or $4 \times p \times p$

mn^2 means $m \times n \times n$

$(5k)^3$ means $5k \times 5k \times 5k$

$m-n$ means $(m) - (n)$

ab means $(a) \times (b)$

$ax-by$ means $(a \times x) - (b \times y)$

$2pq$ means $2 \times p \times q$

$(4q)^2$ means $4q \times 4q$

p^3 means $p \times p \times p$

Square root of p mean:

SUBSTITUTION

❖ The word substitution is the same as to replace.

Examples

Given that $p = 3$, $q = 5$ and $r = 2$. Find the value of

(i) $pq + 2r$	(ii) $pq + r$	(iii) $p + q + r$
$p \times q + 2 \times r$	$3 \times 5 + 2$	$3 + 5 + 2$
$3 \times 5 + 2 \times 2$	$15 + 2$	$3 + 2$
$15 + 4$		$= 10$
$= 19$	$= 17$	

If $a=5$, $b=4$ and $c=0$. Find the value of,

i) abc	(ii) $bc-a$	(iii) a^2+bc
$a \times b \times c$	$b \times a - c$	$(a \times a) + b \times c$
$(5 \times 4) \times 0$	$(4 \times 0) - 5$	$5 \times 5 + 4 \times 0$
20×0	$0 - 5$	$25 + 0$
0	-5	25

Given that $x=2$ and $y=-3$. Find the value of,

(a) $y-x$	(b) y^3+2x	(c) x^2+3y
$(y)-(x)$	$(-3)^3+2 \times 2$	$(x \times x)+3 \times y$
$(-3)-(2)$	$(-3 \times -3) \times -3+4$	$2 \times 2+3 \times -3$
$-3-2$	$(9 \times -3)+4$	$4+(-9)$
-5	$-27+4$	$4-9$
$-$	-23	-5

If $m=5$, $n=m$, and $p=-2$, Find the value,

$$\begin{array}{l} \text{(a) } mnp \\ \quad m \times n \times p \\ \quad (5 \times 5) \times -2 \\ \quad 25 \times -2 \\ \quad -50 \end{array}$$

$$\begin{array}{r} \text{(b) } \frac{m+n+p}{2} \\ \quad \underline{5+5+(-2)} \\ \quad \underline{\underline{2}} \\ \quad 10-2 \\ \quad \underline{\underline{2}} \\ \quad \underline{\underline{8}}^4 \\ \quad \underline{\underline{2}}_1 \\ \quad \underline{\underline{4}} \end{array}$$

$$\begin{array}{r} \text{(d) } \frac{pm-3}{2n} \\ \quad \underline{(p \times m)-3} \\ \quad \underline{\underline{2 \times n}} \\ \quad \underline{\underline{(-2 \times 5)-3}} \\ \quad \underline{\underline{2 \times 5}} \\ \quad \underline{\underline{-10-3}} \\ \quad \underline{\underline{10}} \\ \quad \underline{\underline{-13}}^1 \text{ rem } 3 \\ \quad \underline{\underline{10}}_1 \end{array} = -1\frac{3}{10}$$

Given that $m=5$, $n=6$ and $p=3m$, Work out the value of,

$$\begin{array}{l} \text{(i) } 2m+p^2 \\ \quad (2 \times m)+(p \times p) \\ \quad (2 \times 5)+(15 \times 15) \\ \quad 10+225 \\ \quad 235 \end{array}$$

$$\begin{array}{r} \text{(b) } mp+n \\ \quad (m \times p)+n \\ \quad 5 \times (5 \times 3)+6 \\ \quad (5 \times 15)+6 \\ \quad 75+6 \\ \quad 81 \end{array}$$

$$\begin{array}{r} np^2 \\ n \times p \times p \\ 6 \times (15 \times 15) \\ 6 \times 225 \\ 1350 \end{array}$$

ACTIVITY

Given that $a = 3$, $b = 7$. Find the value of

$$\begin{array}{llll} \text{(i) } 2a + 2b & \text{(ii) } 2b - 3a & \text{(iii) } a + b & \text{(iv) } ab \end{array}$$

2. Given that $c = 4$, $d = -2$, $e = 3$. Find the value of,

$$\begin{array}{llll} \text{(i) } c + d & \text{(ii) } cde & \text{(iii) } \frac{d \times d \times e}{c} & \text{(iv) } 4d + c \div e \end{array}$$

Simplifying algebraic terms.

Note:

Terms are separated by a comma, a plus and a minus.

Multiplication, division and brackets make single terms.

Like terms have exactly the same letters(variables)

When collecting like terms, we group the same terms together before adding or subtracting.

Examples.

Simplify the following.

$$\begin{array}{l} (a) \quad 3p+2p+p \\ \quad (3p+2p)+p \\ \quad 5p+p \\ \quad 6p \end{array}$$

$$\begin{array}{l} (b) \quad 2ab+ab+5ab \\ \quad (2ab+ab)+5ab \\ \quad 3ab+5ab \\ \quad 8ab \end{array}$$

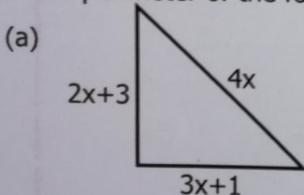
$$\begin{array}{l} (c) \quad 7a^2b^2c-3a^2b^2c+3abc \\ \quad (7a^2b^2c-3a^2b^2c)+3ab \\ \quad 4a^2b^2c+3ab \end{array}$$

$$\begin{array}{l} (d) \quad x+y+x+y+x \\ \quad x+x+x+y+y \\ \quad 3x+2y \end{array}$$

$$\begin{array}{l} (e) \quad 3ab+5a-2ab+2a \\ \quad 3ab-2ab+5a+2a \\ \quad ab+7a \end{array}$$

$$\begin{array}{l} (f) \quad 3x+2x^2-x+x^2 \\ \quad 3x-x+2x^2+x^2 \\ \quad 2x+3x^2 \end{array}$$

Find the perimeter of the following figures.

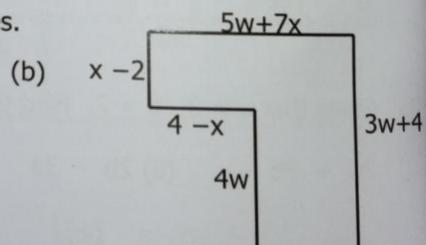


Perimeter

$$2x+3+4x+3x+1$$

$$2x+4x+3x+3+1$$

$$9x+4$$

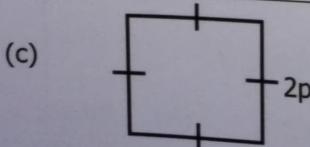


Perimeter

$$4w+3w+4+4w+5w+7x+x-2+4-x+4w$$

$$(4w+3w+4w+4w+5w)+(7x+x-x)-(2+4)$$

$$16w+7x+6$$



Perimeter = $S+S+S+S$

$$(2p+2p)+(2p+2p)$$

$$4p + 4p$$

(d) Simplify; $3m-p-4m-3p$

$$3m-4m-p-3p$$

$$-m-4p$$

ACTIVITY

simplify the following.

(a) $a+2b+3a-b$

(b) $3m-n+2m-2n$

(c) $-2b+6b-b-3a$

(d) $3-y+2y+5$

(e) Subtract $-5x$ from x . (f) Simplify $3xy+6ac+4xy$

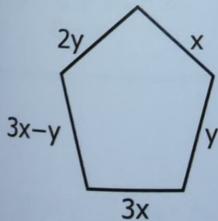
(g) Simplify $11x^2y-6xy+4x^2y-2xy$

(h) Collect like terms and simplify

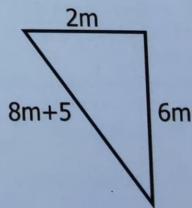
$$2wx^2 + 3wx^3 + wx^2 - wx^3$$

Find the perimeter of the figures.

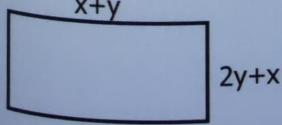
(a)



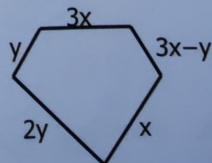
(b)



(c)



(d)



Simplifying terms involving brackets.

Examples

$$\begin{aligned}1. \quad & -2(x+y) \\& -2 \times x + -2 \times y \\& -2x + -2y\end{aligned}$$

$$2. \quad 4y(2a+b) \\ 4y \times 2a + 4y \times b \\ 8ya + 4yb$$

$$3. \quad (2x+3)+(x+4)$$

$$\begin{array}{r} 2x+3+x+4 \\ \hline 2x+x+3+4 \\ \hline 3x+7 \end{array}$$

$$4. \quad 6(k-3)$$
$$6 \times k - 6 \times 3$$
$$6k - 18$$

$$\begin{aligned}
 5. \quad & 6(y+1)-2(y-3) \\
 & 6y+6 - 2y - 6 \\
 & 6y - 2y + 6 + 6 \\
 & 4y + 12
 \end{aligned}$$

$$\begin{aligned}
 6. \quad & 2(q-1) + 3(q-2) \\
 & 2 \times q - 2 \times 1 + 3 \times q - 3 \times 2 \\
 & 2q - 2 + 3q - 6 \\
 & 2q + 3q - 2 - 6 \\
 & 5q - 8
 \end{aligned}$$

$$\begin{aligned}
 7. \quad & \text{Add } y+4 \text{ to } y+6 \\
 & (y+4)+(y+6) \\
 & y+4+y+6 \\
 & y+y+4+6 \\
 & 2y+10
 \end{aligned}$$

$$\begin{aligned} 8. \quad & \text{Subtract } x-1 \text{ from } 2x+2. \\ & (2x+2) - (x-1) \\ & 2x + 2 - x + 1 \\ & 2x - x + 2 + 1 \\ & x + 3 \end{aligned}$$

9. What should be added to $m-4$ to make $3m-7$.

$$\begin{aligned}(3m-7)-(m-4) \\ 3m-7-m+4 \\ 3m-m-7+4 \\ 2m-3\end{aligned}$$

$$\begin{aligned}
 & 10. \text{ Subtract. } 2(x + 3) \text{ from } 3(x + 1) \\
 & \quad 3(x + 1) - 2(x + 3) \\
 & \quad 3x + 3 - 2x - 6 \\
 & \quad 3x - 2x + 3 - 6 \\
 & \quad \quad \quad x - 3
 \end{aligned}$$

ACTIVITY.

Simplify the following.

1. $-3(m-5)-2(m-2)$ 2. $4(3x+4)+2(x-4)$ 3. Subtract $3p-1$ from $5p^2$

4. What must be added to $m-4$ in order to get $3m-4$?

Simplifying terms involving brackets.

Examples

$$\begin{aligned}1. \quad & -2(x+y) \\& -2 \times x + -2 \times y \\& -2x+-2y\end{aligned}$$

$$2. \quad 4y(2a+b) \\ 4y \times 2a + 4y \times b \\ 8ya + 4yb$$

$$\begin{aligned}
 3. \quad & (2x+3)+(x+4) \\
 & 2x+3+x+4 \\
 & 2x+x+3+4 \\
 & 3x+7
 \end{aligned}$$

$$4. \quad 6(k-3)$$
$$6 \times k - 6 \times 3$$
$$6k - 18$$

$$5. \quad 6(y+1) - 2(y-3)$$

$$6 \times y + 6 \times 1 - 2 \times y - 2 \times -3$$

$$6y + 6 - 2y + 6$$

$$6y - 2y + 6 + 6$$

$$4y + 12$$

$$\begin{aligned}
 6. \quad & 2(q-1) + 3(q-2) \\
 & 2 \times q - 2 \times 1 + 3 \times q - 3 \times 2 \\
 & 2q - 2 + 3q - 6 \\
 & 2q + 3q - 2 - 6 \\
 & 5q - 8
 \end{aligned}$$

$$\begin{aligned}
 7. \quad & \text{Add } y+4 \text{ to } y+6 \\
 & (y+4)+(y+6) \\
 & y+4+y+6 \\
 & y+y+4+6 \\
 & 2y+10
 \end{aligned}$$

$$\begin{aligned}
 8. \quad & \text{Subtract } x-1 \text{ from } 2x+2. \\
 & (2x+2) - (x-1) \\
 & 2x+2-x+1 \\
 & 2x-x+2+1 \\
 & x+3
 \end{aligned}$$

9. What should be added to $m-4$ to make $3m-7$.
 $(3m-7)-(m-4)$
 $3m-7-m+4$
 $3m-m-7+4$
 $2m-3$

$$\begin{aligned}
 10. \text{ Subtract } 2(x + 3) \text{ from } 3(x + 1) \\
 3(x + 1) - 2(x + 3) \\
 3x + 3 - 2x - 6 \\
 3x - 2x + 3 - 6 \\
 x - 3
 \end{aligned}$$

ACTIVITY.

Simplify the following.

$$1. -3(m-5)-2(m-2) \quad 2. 4(3x+4)+2(x-4) \quad 3. \text{Subtract } 3p-1 \text{ from } 5p-3$$

4. What must be added to $m-4$ in order to get $3m-4$?

Simplify $\frac{1}{3}(6x-9y) + \frac{2}{5}(15x+25y)$

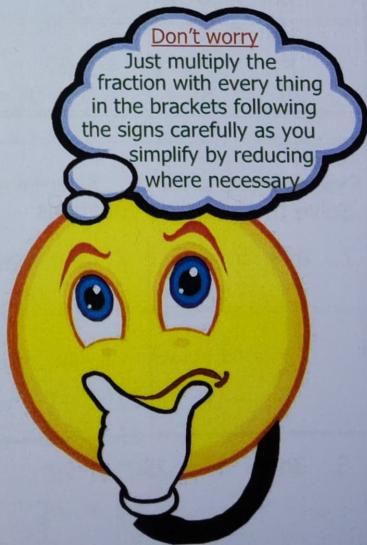
6. $\frac{1}{2}(2a-4b) - \frac{1}{3}(6a-12b)$

$\frac{1}{6}(6x-18y) - \frac{1}{4}(4x+12y)$

8. $\frac{2}{7}(7h+14k) + \frac{2}{9}(18h-36k)$

Half of $(4a-6b)$ plus a third of $(6a-9b)$.

10. Subtract $\frac{2}{3}(6a+9c)$ from $\frac{3}{4}(8b-12c)$.



EQUATIONS

A mathematical sentence with an equal sign to indicate that two expressions give the same value.

Solving equations involving addition

Steps taken

- ✓ Study the equation.
- ✓ Subtract from either side with the same value.
- ✓ Simplify correctly.

Examples

$$\text{Solve: } p + 4 = 9$$

$$P + 4 = 9$$

$$P + 4 - 4 = 9 - 4$$

$$P = 5$$

$$\text{Solve the equation: } k + 5 = 13$$

$$k + 5 = 13$$

$$k + 5 - 5 = 13 - 5$$

$$k = 8$$

$$\text{Solve for } m: 2m + 2 = 10$$

$$2m + 2 = 10$$

$$2m + 2 - 2 = 10 - 2$$

$$2m = 8$$

$$\frac{1}{2}2m = \frac{8}{2}$$

$$2_1 \quad 2_1$$

$$m = 4$$

$$\text{Solve for } w: 3w + 4 = 16$$

$$3w + 4 = 16$$

$$3w + 4 - 4 = 16 - 4$$

$$3w = 12$$

$$\frac{1}{3}3w = \frac{12}{3}$$

$$3_1 \quad 3_1$$

$$w = 4$$

ACTIVITY

Solve the following equations

$$1. \ a + 5 = 7$$

$$2. \ k + 7 = 11$$

$$3. \ 6 + y = 4$$

$$4. \ P + 3 = 9$$

$$5. \ 3q + 4 = 25$$

6. If the sum of $2x$ and 4 is 10.
Find the value of x .

The sum of two numbers is 18. If one of the number is 8.
Find the second number.

Solving equations involving subtraction

Steps taken

- ✓ Study the equation.
- ✓ Add the either side with the same value.
- ✓ Simplify correctly.

Examples:

Solve these equations.

$$\begin{array}{rcl} c - 3 & = & 7 \\ c - 3 + 3 & = & 7 + 3 \\ c & = & 10 \end{array}$$

$$\begin{array}{rcl} w - 17 & = & 14 \\ w - 17 + 17 & = & 4 + 17 \\ w & = & 21 \end{array}$$

$$\begin{array}{rcl} g - 14 & = & 6 \\ g - 14 + 14 & = & 6 + 14 \\ g & = & 20 \end{array}$$

$$\begin{array}{rcl} k - 20 & = & 13 \\ k - 20 + 20 & = & 13 + 20 \\ k & = & 33 \end{array}$$

When 5 is subtracted from a number the answer is 15. What is the number?

$$\begin{array}{rcl} p - 5 & = & 15 \\ p - 5 + 5 & = & 15 + 5 \\ p & = & 20 \end{array}$$

Solve for m: $2m - 2 = 10$

$$\begin{array}{rcl} 2m - 2 & = & 10 \\ 2m - 2 + 2 & = & 10 + 2 \\ 2m & = & 12 \\ \underline{2m} & = & \underline{12}^6 \\ \underline{2}_1 & & \underline{2}_1 \\ m & = & 6 \end{array}$$

Solve for w: $2 - 3w = 16$

$$\begin{array}{rcl} -3w - 2 & = & 16 \\ -3w - 2 + 2 & = & 16 + 2 \\ -3w & = & 18 \\ \underline{-3w} & = & \underline{18}^6 \\ \underline{-3}_1 & & \underline{-3}_1 \\ w & = & -6 \end{array}$$

ACTIVITY

Solve these equations

(a) $n - 2 = 3$

(d) $-3y - 17 = 13$

(g) $x - 2 = 19$

(i) Think of a number, take away 5 from it the result is 8. What is the number?

(b) $-2t - 24 = 8$

(e) $2P - 1 = 9$

(c) $m - 12 = 8$

(f) $d - 7 = 25$

(h) When 10 is subtracted from a number, the answer is 9. What is the number?

Solving simple equations with multiplication

Steps taken

- ✓ Divide either side by the co-efficient of the unknown.
- ✓ The quotient is the answer

Examples

Solve for P

$$2p = 4$$

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

$$p = 2$$

Find the value of x

$$3x = 9$$

$$\frac{3x}{3} = \frac{9}{3}$$

$$x = 3$$

Solve for y:

$$5y = 25$$

$$\frac{5y}{5} = \frac{25}{5}$$

$$y = 5$$

ACTIVITY

Solve for the unknown letter

$$(a) 2p = 6$$

$$(b) 4p = 8$$

$$(c) 5m = 10$$

$$(d) 3y = 156$$

$$(e) 7k = 14$$

$$(f) 10y = 100$$

$$(g) 13m = 182$$

$$(h) 15k = 135$$

Solving equations by dividing

Steps taken

- ✓ Study the equation.
- ✓ Divide both sides by same value.
- ✓ Simplify correctly.

Examples

Solve for the unknown letters in the following

$$\frac{m}{2} = 8$$

$$\text{LCM} = 2$$

$$\frac{m}{2} \times 2^1 = 8 \times 2$$

$$m = 16$$

$$\frac{x}{2} + 3 = 15$$

$$\frac{x}{2} + 3 - 3 = 15 - 3$$

$$\frac{x}{2} = 12$$

$$\text{LCM} = 2$$

$$\frac{x}{2^1} \times 2^1 = 12 \times 2$$

$$x = 24$$

ACTIVITY

Solve the equations

(a) $\frac{k}{3} = 9$

(b) $\frac{x}{4} + 7 = 19$

(c) $\frac{2x}{5} + 6 = 16$

(d) $\frac{m}{5} - 7 = 11$

(e) $\frac{2y}{3} - 7 = 3$

- (f) Opio is k years old; James is 4 times as old as Opio. If their total age is 30 years. How old is each?

- (g) The three sides of a triangle are $2y$, $3y$ and $4y$. If the perimeter of the triangle is 36cm. Find the value of y .

Collecting like terms and solving equations

Examples

Solve: $m + 4m = 20$
 $+ 4m = 20$

$$\frac{5m}{5} = \frac{20}{5}$$

$$\underline{m = 4}$$

Musa is as twice as Mugabi. Their total age is 18 years. How old is Mugabi?

Musa	Mugabi	Total
2x	x	18 yrs

$$2x + x = 18$$

$$\frac{3x}{3} = \frac{18}{3}$$

$$\underline{x = 6 \text{ years}}$$

Nakayenga is twice the age of Nakaye. Their total age is 24. Find their ages

Nakaye	Nakayenga	Total
p	2p	24 yrs

$$p + 2p = 24$$

$$\frac{3p}{3} = \frac{24}{3}$$

$$\underline{p = 8}$$

Nakaye is p = 8 years

Nakayenga is $2p = 2 \times 8$

$$= \underline{16}$$

ACTIVITY

1. Collect like terms and solve.

(a) $3y + y = 12$

(b) $y + y + 2y = 24$

(c) $p + 5p + 2p = 40$

A mother is 4 times as old as her daughter. Their total age is 30 years.
Find the daughter's age.

Opio weighs $3x$ (kg) and Wasswa weighs $4k$ (kg). if their total weight
40 kg. Find Opio's weight.

A father is 3 times the age of his son. Their total age is 48 years.
How old is the daughter?

Mumukasa is twice the age of her son. Their total age is 36years.
How old is the son?

Mubiru is twice the age of his brother. Their total age is 42 years.
How old is each now?

Makalu is 4 times the age of his daughter. Their total age is 60 years.
How old is each?

Solving equations with opening brackets.

Examples

1. Solve: $3(x-2) = x + 4$

$$3 \times x - 3 \times 2 = x + 4$$

$$3x - 6 = x + 4$$

$$3x - x = 4 + 6$$

$$2x = 10$$

$$\frac{1}{2}x = \frac{10}{2}$$

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

2. Simplify: $3+2(n-1) = 8$

$$3+2 \times n - 2 \times 1 = 8$$

$$3+2n-2 = 8$$

$$3+2n = 8$$

$$1+2n = 8$$

$$1-1+2n = 8-1$$

$$2n = 7$$

$$\frac{1}{2}n = \frac{7}{2}$$

$$\frac{1}{2}n = \frac{7}{2} \text{ rem } 1$$

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

3. Solve for n: $3(-n-1) = 6$

$$3(-n)-(-1) = 6$$

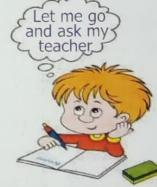
$$3+n+1 = 6$$

$$3+1+n = 6$$

$$4+n = 6$$

$$4-4+n = 6-4$$

$$n = 2$$



Activity

Open the brackets well, collect like terms and simplify the following

1. $5(m+4) = 30$

2. $7(3m-1)-11(m+1) = 12$

3. $5(4-m) = 50$

4. $3(x-3) = 21$

5. $2(x+1)+3(x+1) = 10$

6. $3(3p-1)-6(p-2) = 24$

7. $5(2-3y) - 7(3y+2) = -40$

8. $\checkmark 2(n-1)-(n-4)=8$

9. $3(y+2)-(y-4) = 1$

10. $4 - 2(2x+3) = 10$

11. $3-(2m-1)+2=-12$

12. $2+3(p-2) = 5$

Equations involving fractions.

examples

a) Simplify: $\frac{2}{3}(x-1) = 5$ Eliminate the denominator by multiplying it on both sides of the equation.

$$\frac{1}{3} \times \frac{2}{3}(x-1) = 5 \times 3$$

$2(x-1) = 5 \times 3$ Now open the brackets well following the signs

$$(2x-x) - (2 \times 1) = 15$$

$$2x - 2 = 15$$

$$2x - 2 + 2 = 15 + 2$$

$$2x = 17$$

$$\frac{1}{2}x = \frac{17}{2}$$
 rem 1

$$\frac{2}{1} \quad \frac{2}{1}$$

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



b) Simplify: $0.2(p-1) = 4$ first change 0.2 into
 $\frac{2}{10}(p-1) = 4$ a fraction

$$\frac{1}{10} \times \frac{2}{1}(p-1) = 4 \times 10$$

$$\frac{2}{10} = 40$$

$$(2 \times p) - (2 \times 1) = 40$$

$$2p - 2 = 40$$

$$2p - 2 + 2 = 40 + 2$$

$$2p = 42$$

$$\frac{1}{2}p = \frac{42}{2}$$

$$\frac{2}{1}p = \frac{42}{2}$$

$$p = 21$$

3. Solve: $\frac{4-2p}{3} = p+1$

$$3 \times (4-2p) = 3 \times (p+1)$$

$$4 - 2p = 3(p+1)$$

$$4 - 2p = 3p + 3$$

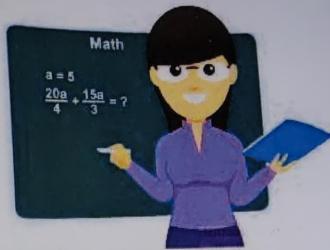
$$4 - 2p + 2p = 3p + 3 + 2p$$

$$4 - 3 = 3p + 2p + 3 - 3$$

$$1 = 5p$$

$$\frac{15p}{5} = \frac{1}{5}$$

$$p = \frac{1}{5}$$



4. Solve: $\frac{2m-2}{3} = \frac{m+1}{2}$ Get the LCD of the denominators
LCD = 6

$$6 \times \frac{(2m-2)}{3} = 6 \times \frac{(m+1)}{2}$$
 Multiply the LCD on both sides of the equation

$$\frac{2}{3} \times \frac{(2m-2)}{1} = \frac{3}{2} \times \frac{(m+1)}{1}$$
 Simplify by reducing the dominator by the LCD

$$2(2m-2) = 3(m+1)$$
 First open the brackets correctly.

$$(2m \times 2) - (2 \times 2) = (3 \times m) + (1 \times 3)$$

$$4m - 4 = 3m + 3$$
 Collect like terms by putting the unknown on one side

$$4m - 3m = 3 + 4$$

$$m = 7$$

Activity

Solve well, collect like terms and simplify the following

a) $\frac{2y-1}{3} = y+1$

(b) $\frac{1}{3}(x-2) = \frac{1}{2}$

(c) $\frac{1}{3}(2x-1) = 3$

$$(d) \frac{3n-2}{2} - \frac{2n+4}{3} = n + 1$$

$$(e) \frac{2p}{5} + p = 7$$

$$(f) \frac{2b+8}{3} = 6$$

$$(g) 3x - 7 + \frac{3}{4} = 23$$

$$(h) \frac{x-2}{7} = \frac{4-8x}{28}$$

$$(i) \frac{3m+1}{4} = \frac{m+3}{2}$$

$$(j) 4x + 7 - \frac{4x}{7} = 31$$

$$(k) \frac{3x+1}{9} = \frac{11x-8}{7}$$

$$(l) m - \frac{2m}{3} = 7$$

Equations involving Square root and cube roots.

Examples

Simplify: $\frac{3}{9} m^2 = 3$ Eliminate the denominator by multiplying it on both sides

$$19 \times \frac{3}{9} m^2 = 3 \times 9$$

9_1

$3m^2 = 27$ divide both sides by the co-efficient

$$\frac{1}{3} 3m^2 = \frac{27}{3}$$

$3_1 \quad 3_1$

$m^2 = 9$ Find the square root to eliminate $(^2)$

$$\begin{aligned} \sqrt{m^2} &= \sqrt{9} \\ m &= 3 \end{aligned}$$

Remember!!
We already learnt about how we get the square roots of numbers



Simplify: $x^3 - 3 = 24$ collect like terms ✓

$$\begin{aligned}x^3 - 3 + 3 &= 24 + 3 \\x^3 &= 27 \text{ Find the cube root to eliminate } (3) \\3\sqrt{x^3} &= 3\sqrt{27} \\x &= 3\end{aligned}$$

3	27
3	9
3	3
1	

Note: Even if a number gives you a fraction after simplifying, use the formula of finding the square root or cube roots of fractions and mixed numbers to solve

Activity

Solve well, collect like terms and simplify the following

(a) $\frac{x^3}{2} + 3 = 35$

(b) $4(k^2 - 1) = 21$

(c) $x^2 + 4 = 20$

(d) $9x^2 = \frac{16}{9}$

(e) $n^3 + 3 = 11$

(f) $m^2 + 4 = 40$

(g) $\frac{x^2}{3} = \frac{27}{9}$

(h) $p^2 + 1 = 101$

(i) $w^2 - 3 = 46$

Solving simple word problems involved in algebra.

Steps taken

- ✓ Read the question.
- ✓ Interpret
- ✓ Form the equation.
- ✓ Solve the equation.

Examples

2. Amooti had some mangoes and his brother added him more 5 mangoes, if he got 12 mangoes in total, how many mangoes did he have at first?

Let the number of mangoes he had be x .

$$\begin{aligned}x + 5 &= 12 \\x + 5 - 5 &= 12 - 5 \\x &= 7\end{aligned}$$

He had 7 mangoes at first.

2. Think of a number, multiply it by 3 and the answer is 12.

What is the number?

Let the number be P

$$3 \times p = 12$$

$$3p = 12$$

$$\underline{3}p = \underline{12}^4$$

$$\underline{3}_1 \quad \underline{3}_1$$

$$P = 4$$

The number is 15

3. What number is divided by 3 to give 5?

Let the number be k

$$\frac{k}{3} = 5$$

$$3^1 \times \frac{k}{3^1} = 5 \times 3$$

$$k = 15$$

The number is 15

ACTIVITY

1. Okello had some oranges and his brother Opio gave him 3 more oranges. If he had 10 oranges in total, how many oranges did he have at first?
2. Think of a number, subtract 5 from it and the answer is 2. What is the number?

James thought of a number, multiplied it by 5 and the product was 20.
What was the number?

4. What no. divided by 2 and gives 7 as the answer?

5. Find the number which Kakande added to 12 to get 25.

6. The sum of a number and 7 is 12. What is the number?

7. The product of x and 7 is 21. Find x .

Forming and solving equations

Examples

Namuswa has 7 more cows than Kakonge. Altogether they have 47 cows.
How many cows does each one have?

Namuswa	Kakonge	Total
$P + 7$	P	47 cows

$$\begin{aligned} p + p + 7 &= 47 \\ (p + p) + 7 &= 47 \\ 2p + 7 - 7 &= 47 - 7 \\ 2p &= 40 \end{aligned}$$

$$\frac{1}{2}p = \frac{40}{2}$$

$$p = 20$$

$$\begin{aligned} \text{Kakonge} &= p \\ &= 20 \text{ cows} \end{aligned}$$

$$\begin{aligned} \text{Namuswa} &= p + 7 \\ &= 20 + 7 \\ &= 27 \text{ cows} \end{aligned}$$

boy is 5 years older than his sister. Their total age is 19 years. Find their ages.

Sister	Boy	Total
m	m+5	19yrs

$$\begin{aligned}m + m+5 &= 19 \\(m + m)+5 &= 19 \\2m + 5-5 &= 19 - 5 \\2m &= 14 \\\underline{2m} &= \underline{14} \\2_1 &= 2_1 \\m &= 7\end{aligned}$$

$$\begin{aligned}\text{Sister} &= m \\&= \underline{7 \text{ years}} \\\text{Boy} &= m + 5 \\&= 7 + 5 \\&= \underline{12 \text{ years}}\end{aligned}$$

ACTIVITY

Namuwonge got 6 more books than her brother Mulika. Altogether they got 24 books. How many books did Mulika got?

Ntungo is 4 years older than Nwya. Their total age is 22 years. How old is Ntunga?

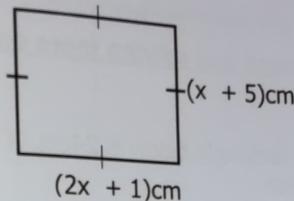
Nalumunye got 96 more pupils than Bandwe. Their total number is 960 pupils. How many pupils are in Bandwe?

Ntuyo is 8 years older than the sister. Their total age is 48 years. Find their ages

Solving equations formed from polygons

Examples

1. The square below has all its sides equal. Use it to answer the questions that follow



- b) Find the value of x

$$\text{Side} = \text{Side}$$

$$2x + 1 = x + 5$$

$$2x - x = 5 - 1$$

$$\underline{x = 4}$$

- c) Work out its area,

$$\text{Area} = \text{Side} \times \text{Side}$$

$$\text{Area} = 9\text{cm} \times 9\text{cm}$$

$$\text{Area} = 81\text{cm}^2$$

- (b) Find the actual length of its side:

$$(2x + 1)\text{cm}$$

$$(2 \times 4) + 1$$

$$8 + 1$$

$$\underline{9\text{cm}}$$

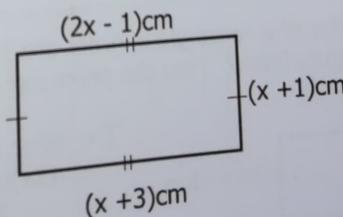
- (d) Work out its perimeter.

$$\text{Perimeter} = S + S + S + S$$

$$\text{Perimeter} = (9 + 9 + 9 + 9)\text{cm}$$

$$\text{Perimeter} = 36\text{cm}$$

2. Find the value of x in the figure below.



- (a) Find the value of x.

(Opposite sides of a rectangle are equal)

$$\text{Length} = \text{Length}$$

$$2x - 1 = x + 3$$

$$2x - x = 3 + 1$$

$$\underline{x = 4}$$

- (b) Find the actual its length and width

Actual Length

$$(x + 3)\text{cm}$$

$$(4 + 3)\text{cm}$$

$$7\text{cm}$$

Actual Width

$$(x + 1)\text{cm}$$

$$(4 + 1)\text{cm}$$

$$5\text{cm}$$

Work out its area and perimeter

(c) Area = Length x Width
Area = 7cm x 5cm
Area = 35cm²

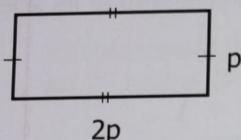
(d) Perimeter = 2L + 2W
Perimeter = (2x7)cm + (2x5)cm
Perimeter = 14cm + 10cm
Perimeter = 24cm

Forming and solving more equations

Examples

1. The perimeter of the rectangle below is 24cm. If its length is two times its width. Calculate its area

Let its width be p



Find the actual length and width.

<u>Actual Length</u>	<u>Actual Width</u>
(2p)cm	(p)cm
(2 x 4)cm	<u>4cm</u>
<u>8cm</u>	

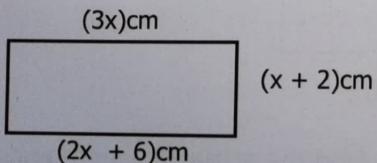
The value of p using the perimeter

$$\begin{aligned} L + W + L + W &= \text{Perimeter} \\ (2p + p) + (2p + p) &= 24\text{cm} \\ 3p + 3p &= 24\text{cm} \\ 6p &= 24\text{cm} \\ \underline{6p} &= \underline{24^4} \\ 6_1 &= 6_1 \\ p &= 4 \end{aligned}$$



Area = Length x Width
= 8cm x 4cm
= 32cm²

2. Three of the sides of a rectangle in order are $3x$, $x + 2$ and $2x + 6$ as shown in the figure below. Find the perimeter and area.



The value of x using, Length = Length

$$\begin{aligned} (3x)cm &= (2x + 6)cm \\ 3x &= 2x + 6 \\ 3x - 2x &= 2x - 2x + 6 \\ x &= 6 \end{aligned}$$

Find the actual length and width.

<u>Actual Length</u>	<u>Actual Width</u>
(3x)cm	(x + 2)cm
(3 x 6)cm	(6 + 2)cm
<u>18cm</u>	<u>8cm</u>

Perimeter

$$\begin{aligned} P &= 2(L + W) \\ P &= 2(18 + 8)\text{cm} \\ P &= 2(26)\text{ cm} \\ P &= 52\text{cm} \end{aligned}$$

Area

$$\begin{aligned} A &= L \times W \\ A &= 18\text{cm} \times 8 \\ A &= \underline{\underline{144\text{cm}^2}} \end{aligned}$$

✓
ACTIVITY

1. The length of a rectangle is 2cm more than its width.
Find its area if the perimeter is 20cm.

The length of a rectangle is twice its width. The perimeter of the rectangle is 300cm. Find its area.

The width of a rectangle is 3cm less than its length.
Its perimeter is 22cm. Find its area.

The sides of a square are $(4x + 4)$ cm and $(3x + 6)$ cm.
Find its perimeter and area.

5. Three sides of a rectangle are in order as $(5x + 7)$ cm, $(2x)$ cm and $(x + 19)$ cm.

(a) Find its area.

(b) Work out its perimeter.

ROUND-UP EXERCISE

Solve the following equations.

1. $6+y=10$

2. $y-2=7$

3. $2-k=0$

4. $3k-9=12$

5. $3-m=8$

6. $x^2+4=20$

7. $w^2-3=46$

8. $x^3+3=11$

9. $-8-2x=6$

10. $3p-2=6-p$

11. $4(k^2-1) = 21$

12. $2m+4=m+6$

samples

APPLICATION OF ALGEBRA

- I think of a number, add 5 to it. If my answer is 13, what is the number?
Let the number be a

$$a+5 = 13$$

$$a+5-5 = 13-5$$

$$a = 8$$

The number is 8

- Paul had 7 seven mangoes, he ate some mangoes and remained with 4 mangoes. How many mangoes did he eat?

Let the eaten mangoes be m.

$$7-m = 4$$

$$7-7-m = 4-7$$

$$-m = -3$$

$$\underline{-m} = \underline{-3}$$

$$\underline{-1} = \underline{-1}$$

$$m = 3$$

He ate 3 mangoes

- Peter is 5 years older than his sister Apio. If their total age is 27 years. How old is each now?

Let Apio's age be x

$$\text{Apio} = (x) \text{ years}$$

$$\text{Peter} = (x+5) \text{ years}$$

$$x + x + 5 = 27$$

$$2x + 5 = 27$$

$$2x + 5 - 5 = 27 - 5$$

$$2x = 22$$

$$\underline{2}_1 x = \underline{22}^{11}$$

$$\underline{2}_1 = \underline{2}_1$$

$$x = 11$$

Apio is 11 years old

$$\begin{aligned}\text{Peter's age } & (x+5) \text{ yrs} \\ & (11+5) \text{ yrs} \\ & \underline{\underline{16 \text{ years}}}\end{aligned}$$

- (b) How old will Peter be in 7 years to come?

$$\begin{aligned}16 \text{ years} + 7 \text{ years} \\ = 23 \text{ years}\end{aligned}$$

3. A daughter is 18 years younger than her mother. If their total age is 58 years, how old is the mother now?

Let the mother's age be m

Mother	Daughter	Total
m	$m - 18$	58 yrs

$$m + m - 18 = 58$$

$$2m - 18 = 58$$

$$2m - 18 + 18 = 58 + 18$$

$$2m = 76$$

$$\underline{2}_1 m = \underline{76}^{38}$$

$$\underline{2}_1 = \underline{2}_1$$

$$m = 38$$

The mother is 38 years old now.

- (b) How old will the daughter be in 10 years to come?

Daughter now

(m-18) years

(38-18) years

20 years

Daughter in 10 years to come

(20 + 10) years

30 years

A father is 12 years older than his son now. In 5 years' time, their total age will be 76 years.
How old is each of them now?

Let the son's age be s

Now

Son = (s) yrs.

Father = $(s+12)$ yrs.

Five years' time

Son = $(s+5)$ yrs.

Father = $(s+12+5)$ yrs.

$(s+17)$ yrs.

Total age = 76 yrs.

$$s+5+s+17 = 76$$

$$2s+22 = 76$$

$$2s+22-22 = 76-22$$

$$2s = 54$$

$$\underline{2}^1 s = \underline{54}^{27}$$

$$\underline{2}^1 \underline{2}^1$$

$$s = 27$$

Son's age now

(s) Years

= 27 years



Father's age now.

$(s+12)$ yrs.

$(27+12)$ yrs.

= 39 years

(b) How old will the father be then?

Then

$(s+17)$ yrs

$27+17$

44 years

The father will be 44 years then.

5. I thought of a number, added 4 to it and my answer was 13. What was the number I thought of?

Let the number be a

$$a+4 = 13$$

$$a+4-4 = 13-4$$

$$a = 9$$

The number was 9.

6. A mother is 18 years older than her son. If their total age is 52 years, how old is the son now?

Let the son's age be k

son	mother	Total age
k	$K+18$	52

$$K+k+18 = 52$$

$$2k+18 = 52$$

$$2k+18-18 = 52-18$$

$$2k = 34$$

$$\underline{2}^1 k = \underline{34}^{17}$$

$$\underline{2}^1 \underline{2}^1$$

$$k = 17$$

The son is 17 years old now.

7. Jane is 5 years older than Abdul. In 7 years' time, their total age will be 33 years.

(a) How old is Abdul now?

	Abdul	Jane	Total age
Now	r	$r+5$	
future	$r+7$	$r+5+7$	33 yrs

$$r+7+r+12 = 33$$

$$r+r+7+12 = 33$$

$$2r+19 = 33$$

$$2r+19-19 = 33-19$$

$$2r = 14$$

$$\underline{2}^1 r = \underline{14}^7$$

$$\underline{2}^1 \underline{2}^1$$

$$r = 7$$

Abdul is 7 years old now.

- (b) How old will Jane be then
Jane then
 $(r+12)$ yrs
 $(7+12)$ yrs
19 yrs.

- 3 (a) Cynthia is twice as old as Kamau. Their total age is 24 years. How old is Kamau?

Activity.

- 1 (a) John is 4 years older than Mary. In 20 years' time, their total age will be 80 years. How old is John?

- (b) How old will Cynthia be 21 years to come?

- b) How old will John be in 20 years time?

4. A mother is three times as old as Her daughter. In 7 years time, their total age will be 74 years.

- (a) How old is each now?

2. A number multiplied by 6 gives 42.
Find the number.

- (b) Find the difference in their age in seven years time.

Jane is twice as old as Sara. If their total age is 30 years, how old is Sarah?

Tonny is thrice as old as Annet, if their total age 44 .How old is Annet?

Forming and solving equations involving brackets

Examples

Akello is 3 times as old as Abbey. The difference in their age is 30 years. How old is each of them?

Let Abbey's age be (h) yrs.

Abbey	Akello	Total age
h	3h	30

Difference

$$3h - h = 30$$

$$2h = 30$$

$$\underline{2} \underline{h} = \underline{30} \underline{15}$$

$$\underline{2} \underline{1}$$

$$\underline{h} = \underline{15}$$

$$\begin{aligned} \text{Abbey} &= (h) \text{ yrs} \\ &= \underline{15} \text{ yrs.} \end{aligned}$$

$$\begin{aligned} \text{Akello} &= (3h) \text{ yrs} \\ &= 15 \times 3 \\ &= 45 \text{ yrs} \end{aligned}$$

2. Ben is 11 years older than Kigozi. In 4 years' time, Ben will be twice as old as Kigozi.

- (a). How old is Kigozi?

Let Kigozi's age be (z) yrs.

	Kigozi	Ben
Now	z	$z+11$
Future	$2(z+4)$	$(z+15)$

$$2(z+4) = z+15$$

$$2z+8 = z+15$$

$$2z-z = 15-8$$

$$z = 7$$

Ben is 7 years old now.

- (b). Find the difference in their age.

Ben	kigozi	difference
$(z+11)$ yrs	(z) yrs	18 yrs
$(7+11)$ yrs	7 yrs	- 7 yrs
18 yrs		11 yrs

3. Michelle is 10 years younger than Julius. In 5 years' time, Julius will be twice as old as Michelle. How old is Michelle now?

Let Julius' age be (y) years.

	Julius	Michelle
Now	y	$y-10$
Future	$y+5$	$2(y-10+5)$ $2(y-5)$

$$2(y-5) = y+5$$

$$2y-10 = y+5$$

$$2y-y = 5+10$$

$$\underline{y} = \underline{15}$$

Julius	Michelle
(y) yrs	$(y-10)$ yrs
15 yrs	$(15-10)$ yrs 5 yrs

Michelle is 5 years old now.

Tr.Mike is 15 years older than Tr.Simon. In 4 years' time, Tr.Mike will be twice as old as Tr.Simon. How old is Tr.Mike now?

Let Tr.Simon's age be (h) yrs.

	Tr.Simon	Tr.Mike
Now	h	$h+15$
Future	$2(h+4)$	$h+19$

$$2(h+4) = h+19$$

$$2h+8 = h+19$$

$$2h-h = 19-8$$

$$\underline{h} = 11$$

Tr. Mike

($h+15$) yrs

($11+15$) yrs

26 years

Tr.Mike is 26 years old.

b) How old will Tr.Simon be then?

($h+4$) yrs

($11+4$) yrs

15 years

Tracy is 5 times as old as her son. In 6 years' time; she will be three times as old as her son.

How old is each of them now?

Let the son's age be (m) yrs.

	Son	Tracy
Now	m	$mx5$
Future	$m+6$	$5m+6$

$$3(m+6) = 5m+6$$

$$3m+18 = 5m+6$$

$$3m-5m = 6-18$$

$$-2m = -12$$

$$\underline{-2m} = \underline{-12}$$

$$\underline{-2m} = \underline{-2}$$

$$\underline{m} = \underline{6}$$

Son
(m) yrs
6 years

Tracy
(5m) yrs
(5×6) yrs
30 years

6. Mutabaazi is 5 years old and Kabaazi is 7 years old. In how many years ago was Kabaazi twice as old as Mutabaazi?

Let the number of years be (w) years

(w) years ago

Mutabaazi \rightarrow ($5-w$) yrs.

Kabaazi \rightarrow ($7-w$) yrs.

$$2(5-w) = 7-w$$

$$10-2w = 7-w$$

$$-2w+w = 7-10$$

$$-w = -3$$

$$-w \times -1 = -3 \times -1$$

$$\underline{W} = \underline{3} \text{ yrs}$$

(b). How old was Kabaazi then?

($7-w$) yrs

($7-3$) yrs

4 years

Activity

1. Betty is 3 times as old as Agnes. If their total age is 28 years, how old is Agnes now?

(b) How old will Betty be in five years to come?

- ✓
2. Namugga is 37 years old. Magezi is 14 years. After how many years will Namugga be twice as old as Magezi?
3. A mother is four times as old as her son. If their total age is 50 years, how old is the son?
4. A father is 5 times as old as his son. In 5 years, their difference in age will be 32 years. How old is each of them now?
5. Tony is thrice as old as his son. The difference between their ages is 24. How old is the son now?
6. Rose is twice as old as Tom. The product of their age is 32 years. How old is Rose?

A son is 30 years younger than his mother. In 20 years the mother will be twice as old as the son. How old is the son now?

Mary is thrice as old as Justine. Five years ago. Their total age was 30 years. How old will Mary be 8 years from now?

Application of algebra involving costs of items

amples.

Mango had 5 books more than Sifuna. Mango and Sifuna had 27 books altogether .Find the number of books each had.

Let Sifuna's book be k

Sifuna	Mango	Total
k	$k+5$	27

$$k+k+5 = 27 \text{ books}$$

$$2k+5 = 27$$

$$2k+5-5 = 27-5$$

$$2k = 22$$

$$\underline{2}^{\underline{1}} k = \underline{2}^{\underline{2}} \underline{1}^{\underline{1}}$$

$$\underline{2}^{\underline{1}} \quad \underline{2}^{\underline{1}}$$

$$k = 11$$

Sifuna
(k)books
11 books

Mango
($k+5$)
(11+5)
16 books

2. A parent distributed sh.10,000 among his three children A, B and C, such that B got twice as much as A and C got sh.1,000 more than B. How much did each get?

Let A's share be (w)

A	B	C	Total share
w	$2w$	$2w+sh.1,000$	sh.10,000

$$\begin{aligned}
 w + 2w + 2w + sh.1,000 &= sh.10,000 \\
 5w + sh.1,000 &= sh.10,000 \\
 5w + sh.1000 - 1000 &= 10,000 - 1,000 \\
 5w &= sh.9,000 \\
 \underline{5}^{\underline{1}} w &= sh.9^{\underline{1}} \underline{000} \\
 w &= sh.1,800
 \end{aligned}$$

A	B	C
Sh.1,800	sh1,800 $\times 2$ Sh.3,600	sh.3,600 + sh. 1000 sh. 4600

(b) In what ratio did they share the money?

$$\begin{array}{ccc}
 A & : & B & : & C \\
 \underline{1,800} & & \underline{3,600} & & \underline{4,600} \\
 100 & & 100 & & 100 \\
 \underline{18^9} & : & \underline{36^{18}} & : & \underline{46^{23}} \\
 2_1 & & 2_1 & & 2_1 \\
 9 & : & 18 & : & 23
 \end{array}$$

i. Otieno bought y mangoes and Maria bought 6 mangoes less than Otieno. Katuku bought half as many mangoes as Maria and Otieno bought. If they altogether bought 63 mangoes, how many mangoes did each get?

Otieno	Maria	Katuku	Total
y	$y-6$	$\frac{y+y-6}{2}$ $\frac{(2y-6)}{2}$	63

$$y + \frac{y-6 + 2y-6}{2} = 63$$

$$(2y-6) + \frac{(2y-6)}{2} = 63$$

$$2 \times (2y-6) + \frac{(2y-6) \times 2}{2} = 63 \times 2$$

$$2(2y-6) + 2y-6 = 63 \times 2$$

$$4y - 12 + 2y - 6 = 126$$

$$4y + 2y - 12 - 6 = 126$$

$$6y - 18 + 18 = 126 + 18$$

$$6y = 144$$

$$\frac{6y}{6} = \frac{144}{6}$$

$$y = 24$$

Otieno
(y)
24 mangoes

Maria
($y-6$)
24 - 6
18 mangoes

✓ 3. Jane bought 3 books at sh. ($x+200$) each and 2 pens at sh. ($x-100$) each. If she spent sh. 2400 altogether, How much did she spend on pens?

$$3(x+200) + 2(x-100) = \text{sh.} 2400$$

$$3x + 600 + 2x - 200 = \text{sh.} 2400$$

$$5x + 400 = 2400$$

$$5x + 400 - 400 = 2400 - 400$$

$$5x = 2000$$

$$\frac{5x}{5} = \frac{2000}{5}$$

$$x = \text{sh.} 400$$

Pens.

$$2(x-100)$$

$$2(400-100)$$

$$2(300)$$

$$\text{Sh.} 600$$

She spent sh. 600 on pens.

NOTE: For application of Algebra,

- First read the question three times, interpret it in your local language,
- Identify the person or item whose age or quantity has not been given.
- Let it be any letter of your choice.
- Form a suitable equation.
- Solve the equation accordingly.
- Substitute the unknown letter value into the equations you formed to get the value of each of the asked item.
- You may prove your work accordingly.



$\frac{48-6}{2}$
$\frac{42}{2}$
$\frac{21}{2}$

21 mangoes

Application of Algebra involving commodities

Examples

1. Samson had $4y$ pancakes which was twice as much as Asumpta's. Gloria had four pancakes more than Samson while Maria had half as many pancakes as Gloria. If the four shared 54 pancakes, How many pancakes did each get?

Samson	Asumpta	Gloria	Maria	Sum
$4y$	$\frac{4y}{2} = 2y$	$4y + 4$	$\frac{1}{2}(4y+4)$	54

$$4y + 2y + 4y + 4 + \frac{1}{2}(4y+4) = 54$$

$$10y + 4 + \frac{1}{2} \times 4y + \frac{1}{2} \times 4 = 54$$

$$10y + 4 + 2y + 2 = 54$$

$$12y + 6 = 54$$

$$12y + 6 - 6 = 54 - 6$$

$$12y = 48$$

$$\frac{12y}{12} = \frac{48}{12}$$

$$y = 4$$

SAMSON's pancakes

$$\begin{array}{r} 4y \\ 4 \times 4 \\ = 16 \text{ pancakes} \end{array}$$

ASUMPUTA's pancakes

$$\begin{array}{r} 2y \\ 2 \times 4 \\ = 8 \text{ pancakes} \end{array}$$

GLORIA's pancakes

$$\begin{array}{r} 4y + 4 \\ 16 + 4 \\ = 20 \text{ pancakes} \end{array}$$

MARIA's pancakes

$$\begin{array}{r} 4y + 4 \\ 2 \\ (4 \times 4) + 4 \\ 2 \\ 16 + 4 \\ 2 \\ \underline{\underline{20}}^{\text{10}} \\ 2 \\ = 10 \text{ pancakes} \end{array}$$



2. At Mulago Hospital, there are 50 more COVID 19 positive cases than negative cases. There are 4 times as many negative cases than positive asymptomatic cases. If there are x positive cases and the total number of cases at the hospital is 530. How many more negative than positive asymptomatic COVID 19 cases are at Mulago?

Negative cases	Positive cases	Total
$x - 50$	x	530

$$\text{Positive asymptomatic cases} = \frac{x - 50}{4}$$

$$\begin{aligned}
 x + x - 50 &= 530 \\
 2x - 50 &= 530 \\
 2x + 50 - 50 &= 530 + 50 \\
 2x &= 580 \\
 \underline{2x} &= \underline{\underline{580}} \\
 \underline{2} &= \underline{2} \\
 x &= 290
 \end{aligned}$$

$$\text{Positive cases} = x = 290 \text{ cases}$$

$$\begin{aligned}
 \text{Negative cases} = x - 50 &= 290 - 50 \\
 &= 240 \text{ cases}
 \end{aligned}$$

$$\text{Positive asymptomatic cases} = \frac{x - 50}{4}$$

$$\text{Positive asymptomatic cases} = \frac{240}{4}$$

$$\text{Positive asymptomatic cases} = 60 \text{ cases}$$

$$\begin{array}{r}
 \text{Difference} \\
 \underline{1} \\
 \underline{2} \ 4 \ 0 \text{ cases} \\
 - \\
 \underline{6} \ 0 \text{ cases} \\
 \hline
 \underline{\underline{1 \ 8 \ 0 \text{ more negative cases}}}
 \end{array}$$

Key Points to note

- Most of us must now will be wondering why the positive asymptomatic cases are not put in the distribution table, it is simply because asymptomatic cases are a subset of positive cases so, they are not included since positive cases are represented.
- Since we already know the number of positive cases to be x there is no need for letting any cases be any unknown.
- Why are they dividing the number of negative cases by 4 in order to get the total number of asymptomatic cases instead of multiplying as we usually do when they use the statement 'times' ?

This is just because the number of negative cases is already known and the asymptomatic are not and in the question, they are 4 times lesser than the positives that's why we can't multiply but rather to divide.

3. Baagala had y tomatoes while Kalibbala had five times as many tomatoes as Baagala. They decided to put them together and divide into three equal heaps. If each heap had ten tomatoes, how many such tomatoes did each have to begin with?

Names	Baagala	Kalibbala
Number of tomatoes	y	$5y$

$$\begin{aligned}
 Y + 5y &= 10 \\
 3 \\
 6y &= 10 \\
 3 \\
 13 \times 6y &= 10 \times 3 \\
 3 \\
 6y &= 30
 \end{aligned}$$

$$\begin{aligned}
 16y &= 30^5 \\
 -6_1 & \\
 y &= 5
 \end{aligned}$$

$$\begin{aligned}
 \text{Baagala} &= y \\
 &= 5 \text{ tomatoes}
 \end{aligned}$$

$$\begin{aligned}
 \text{Kalibbala} &= 5y \\
 &= 5 \times y \\
 &= 5 \times 5 \\
 &= 25 \text{ tomatoes}
 \end{aligned}$$

ROUND UP ACTIVITY

1. A cup costs twice as much as a plate, a spoon costs sh.400 more than a cup, a fork costs sh.200 less than a plate. If the total cost of all items is sh.6,200. Find the cost of 3 spoons.

2. Reyn
Patr
many sweets did each have?

3. Agatha had sh.30,000 less than Florence and Mary had twice as much as Florence. If they had sh.240,000 altogether, how much did each have?

4. In a village the number of men was half the number of women. The number of children was one third the number of women. Altogether, there were 52,800 people in the village. How many more women than men and children were in that village?

In a meeting, there were twice as many men as women. The number of children was half the number of adults. If there were 90 women in the meeting, how many more men than children were there?

Nambuye is four years older than Kasiim and seven years younger than Ongeri. If the sum of their age is 45 years. Find Nambuye's age.

7. Henry bought some oranges and Doreen bought 10 more oranges than Henry. Collins bought twice as many oranges as Doreen. If they bought 110 oranges altogether, how many oranges did each buy?

In a meeting, there were 500 men and 200 more women than men. If the number of adults was four times the number of children, what was the total number of people in the meeting?

8. If Adiye sold a skirt for sh.6,000, she would make a profit, but if she sold it at sh.4,500, she would make a loss. If the profit is two times the loss, what is the cost price of the skirt?

10. Tracy is now five times as old as her son. In six years time, she will be three times as old as her son. How old is each of them now?

11. In Nassaka's farm, there are 5 more cows than bulls. There are 4 times as many goats as bulls. If there are y cows and the total number of animals on the farm is 53. Find the number of cows, bulls and goats on the farm.
12. A mother is 18 years older than her son. In ten years time, she will be twice as old as the son. How old is the mother and the son now?
13. A father is five times as old as his son. After five years, the difference in their age will be 32 years. How old are they now?
14. I think of a number, if you take away sixteen and take away three quarters of the difference, you get 30. What number do I think about?

APPLICATION OF ALGEBRA INVOLVING POLYGONS

NOTE:

- ❖ Polygons are named according to their number of sides.
- ❖ Polygons are simple closed shapes joined by segments.
- ❖ They are either regular or irregular shapes.
- ❖ Regular shapes have equal angles and equal shapes.

Types of Regular polygons			
Types	Sides	Shapes	Angles
Triangle	3		60°
Square	4		90°
Pentagon	5		108°
Hexagon	6		120°
Heptagon	7		128.571
Octagon	8		135°
Nonagon	9		140°
Decagon	10		144°
Nuo-decagon	11		147.273
Duo-decagon	12		150°

Facts: Ico-sagon

20 sides

- ❖ The number of exterior, interior and centre angles is always equal for a particular shape.
- ❖ The number of sides of a regular polygon affects the sizes of each exterior, interior and centre angles.

Relationship between number of sides and exterior angles of regular polygons

- ❖ The sum of the exterior angles is always 360° .
- ❖ For a regular polygon, the exterior angles are equal.
- ❖ Therefore exterior angles = $\frac{360^{\circ}}{\text{number of sides}}$

$$\text{OR } \frac{\text{number of sides}}{\text{exterior } \angle} = \frac{360^{\circ}}{\text{exterior } \angle}$$

$$\text{OR } 360^{\circ} = \text{number of sides} \times \text{exterior } \angle$$

- ❖ Ext \angle + Int \angle = 180°
- ❖ No. of sides is represented by letter n
- ❖ No. of triangles = $n-2$
- ❖ No. of right angles $2(n-2)$ or $(2n-4)$

ALGEBRA INVOLVING POLYGONS

An interior angle of a regular polygon is twice its exterior angle, how many sides has the polygon?

Let the ext \angle be y

$$\text{ext } \angle = y$$

$$\text{int } \angle = 2y$$

$$y+2y = 180^\circ$$

$$3y = 180^\circ$$

$$\underline{3}^1 y = \underline{180}^\circ \quad 60^\circ$$

$$\underline{3}_1 \quad \underline{3}_1$$

$$\underline{y} = 60^\circ$$

$$\text{ext } \angle = 60^\circ$$

$$\begin{aligned} \text{no. of sides} &= \frac{360^\circ}{\text{ext } \angle} \\ &= \frac{360^\circ}{60^\circ_1} \\ &= 6 \text{ sides.} \end{aligned}$$

(b) What is the name of the polygon?

Hexagon

(c) Find the interior angle sum .

$$\begin{aligned} \text{int } \angle \text{ sum} &= 180^\circ(n-2) \\ &= 180^\circ(6-2) \\ &= 180^\circ(4) \\ &= 720^\circ \end{aligned}$$

2. An exterior angle of a regular polygon is 90° less than its interior angle. Find the interior angle sum of the polygon.

Let the interior int \angle be k

$$\text{int } \angle = k$$

$$\text{ext } \angle = (k-90)^\circ$$

$$k+k-90^\circ = 180^\circ$$

$$2k-90^\circ = 180^\circ$$

$$2k-90^\circ+90^\circ = 180^\circ+90^\circ$$

$$2k = 270^\circ$$

$$\underline{2}^1 k = \underline{270}^\circ \quad 135^\circ$$

$$\underline{2}_1 \quad \underline{2}_1$$

$$K = 135^\circ$$

$$\begin{aligned} \text{Ext } \angle &= k-90^\circ \\ &= 135^\circ - 90^\circ \\ &= 45^\circ \end{aligned}$$

$$n = \frac{360^\circ}{\text{ext } \angle}$$

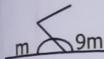
$$\begin{aligned} n &= \frac{360^\circ}{45^\circ_1} \\ &= 8 \text{ sides} \end{aligned}$$

$$\begin{aligned} \text{Int } \angle \text{ sum} &= 180^\circ(n-2) \\ &= 180^\circ(8-2) \\ &= 180^\circ(6) \\ &= 180^\circ \times 6 \\ &= 1080^\circ \end{aligned}$$

3. The interior angle of a regular polygon is 9 times the exterior angle.

(a) Find the exterior angle.

Let the ext \angle be m



Or

Ext \angle	Int \angle	sum
m	$9m$	180°

$$m + 9m = 180^\circ$$

$$10m = 180^\circ$$

$$\underline{10} \frac{1}{1} m = \underline{180} \frac{0}{0} \frac{18}{30}$$

$$\underline{10} \frac{1}{1} \quad \underline{10} \frac{1}{1}$$

$$m = 18^\circ$$

(b) How many sides has the above polygon?

$$\text{No. of sides} = \underline{360} \frac{0}{0}$$

$$\text{Ext } \angle$$

$$= \underline{360} \frac{0}{0} \frac{20}{30}$$

$$\underline{18} \frac{0}{0} \frac{1}{1}$$

$$= \underline{20} \text{ sides}$$

(C) How many triangles are in the above polygons?

$$\begin{aligned}\text{No. of triangles} &= (n-2) \\ &= (20-2) \\ &= \underline{18} \text{ triangles.}\end{aligned}$$

(d) Calculate the interior angle sum of the polygon.

$$\begin{aligned}\text{Int } \angle \text{ sum} &= 180^\circ(n-2) \\ &= 180^\circ(20-2) \\ &= 180^\circ(18) \\ &= \underline{3240}^\circ\end{aligned}$$

4. The interior angle and the exterior angle of a regular polygon are in the ratio 5:1

(a) Find the interior and exterior angle of the polygon.

Int \angle	Ext \angle	Total ratio
5	1	5+1 = 6

Int \angle

$$\underline{5} \times 180^\circ \frac{30}{30}$$

$$\underline{6} \frac{1}{1}$$

$$5 \times 30^\circ$$

$$150^\circ$$

Ext \angle

$$\underline{1} \times 180^\circ \frac{30}{30}$$

$$\underline{6} \frac{1}{1}$$

$$1 \times 30^\circ$$

$$30^\circ$$

(b) Name the polygon.

No. of sides

$$\underline{360} \frac{0}{0} \frac{12}{12}$$

$$30$$

= 12 sides.

Duo-decagon

(c) Calculate the interior angle sum.

$$\begin{aligned}\text{Int } \angle \text{ sum} &= 180^\circ(n-2) \\ &= 180^\circ(12-2) \\ &= 180^\circ(10) \\ &= \underline{1800}^\circ\end{aligned}$$

5. The interior angle sum of a polygon is 900° . Find the number of sides of the polygon.

$$\begin{aligned}180^\circ(n-2) &= \text{int } \angle \text{ sum} \\ 180^\circ(n-2) &= 900^\circ \\ 180^\circ n - 360^\circ &= 900^\circ \\ 180^\circ n - 360^\circ + 360^\circ &= 900^\circ + 360^\circ \\ 180^\circ n &= 1260^\circ \\ \underline{180} \frac{0}{0} \frac{1}{1} n &= \underline{1260} \frac{0}{0} \frac{7}{7} \\ \underline{180} \frac{0}{0} \frac{1}{1} n &= \underline{180} \frac{0}{0} \frac{1}{1} \\ n &= 7 \text{ sides.}\end{aligned}$$

(b) Name the polygon.
Septagon

(c) How many triangles are in the above polygon

$$\begin{aligned}\text{No.of triangles} &= (n-2) \\ &= (7-2) \\ &= 5\end{aligned}$$

(d) Find the number of right angles.

$$\begin{aligned}\text{No.of right angles} &= 2(n-2) \\ &= 2n-4 \\ &= (2 \times 7)-4 \\ &= 14-4 \\ &= 10 \text{ right angles}\end{aligned}$$

(e) Each of the ext \angle of the regular polygon is 60° . Find the int \angle sum of the polygon.

$$\text{Int } \angle \text{ sum} = 180^\circ (n-2)$$

No.of sides

$$360^\circ 6$$

$$60^\circ 1$$

6 sides

$$\begin{aligned}180^\circ (n-2) \\ 180^\circ (6-2) \\ 180^\circ (4) \\ 180^\circ \times 4 \\ = 720^\circ\end{aligned}$$

Activity

4. Calculate the int \angle sum of a polygon with 9 sides

1. Name the polygon whose exterior angle is 40° .

2. The size of each int \angle of a regular polygon is 144° . Find the ext \angle of the polygon.

(b) Name the polygon.

(c) Calculate its int \angle sum

3. The int \angle and ext \angle of a polygon are in the ratio 3:2. Calculate the number of right angles in the polygon.

MORE ABOUT POLYGONS

Examples

Calculate the exterior angle of a regular decagon.

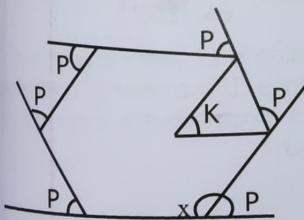
❖ A decagon has 10 sides equal.

$$\begin{aligned}\text{Ext } \angle &= \frac{360^\circ}{\text{No. of sides}} \\ &= \frac{360^\circ}{10} \\ &= 36^\circ\end{aligned}$$

(b) Find the interior angle of the regular Polygon

$$\begin{aligned}\text{Ext } \angle &= \frac{360^\circ}{\text{No. Of sides}} \\ &= \frac{360^\circ}{5} \\ &= 72^\circ\end{aligned}$$

(C) Find the value of k, p and x in degrees



Value of P

$$\begin{aligned}p+p+p+p+p+p &= 360^\circ \\ 6p &= 360^\circ \\ \underline{6}_1 p &= \underline{360}^\circ \quad 60^\circ \\ p &= 60^\circ\end{aligned}$$

Value of K

$$K = p \\ \underline{6}_1 = 60^\circ$$

❖ Each centre angle of a polygon is equal to each exterior angle.

Value of x

$$\begin{aligned}\text{Int } \angle + \text{ext } \angle &= 180^\circ \\ x+p &= 180^\circ \\ x + 60^\circ &= 180^\circ \\ x+60^\circ - 60^\circ &= 180^\circ - 60^\circ \\ \underline{x} &= 120^\circ\end{aligned}$$

The interior angle of a regular polygon is 100° more than the exterior angle.

(a). Calculate the size of each exterior and interior angle.

Let the ext \angle be x

Ext \angle	int \angle	sum
x	$x+100^\circ$	180°
$x + x+100^\circ$	$= 180^\circ$	
$2x + 100^\circ$	$= 180^\circ$	
$2x + 100^\circ - 100^\circ$	$= 180^\circ - 100^\circ$	
$2x$	$= 80^\circ$	
$\underline{\underline{2}}_1 x$	$= \underline{80}^\circ \quad 40^\circ$	
$\underline{2}_1$	2_1	
x	$= 40^\circ$	

(b) . What is the name of the polygon?

$$\frac{360^\circ}{\text{Ext } \angle}$$

$$\frac{360^\circ}{9}$$

$$40^\circ_1$$

9 sides.

Nonagon

APPLICATION OF ALGEBRA USING RATIOS

Examples

1. Sandra is 12 years older than Alice. If the ratio of their age is 5:8 respectively .Find their age

$$\begin{array}{rcl}
 \text{Alice} & & \text{Sandra} \\
 y & & y+12 \\
 y : y+12 & = & 5:8 \\
 \frac{y}{y+12} & = & \frac{5}{8} \\
 8y & = & 5(y+12) \\
 8y & = & 5y+60 \\
 8y-5y & = & 60 \\
 3y & = & 60 \\
 \frac{1}{3}y & = & \frac{60}{3} \\
 y & = & 20
 \end{array}$$

2. Cheptegei is 10 yrs older than Cheboy.If the ratio of their age is 3:2

- (a) How old is Cheboy now?

$$\begin{array}{rcl}
 \text{Cheboy} & : & \text{Cheptegei} \\
 m & & m+10 \\
 m:m+10 & = & 2:3 \\
 \frac{m}{m+10} & = & \frac{2}{3} \\
 3m & = & 2(m+10) \\
 3m & = & 2m+20 \\
 3m-2m & = & 2m-2m+20 \\
 m & = & 20
 \end{array}$$

Cheboy is 20 years

- (b) How old was Cheptegei 12 years ago?

Cheptegei's current age

$$\begin{array}{l}
 (m+10) \text{ years} \\
 20+10 \\
 \underline{= 30 \text{ years}}
 \end{array}$$

To get the age Cheptegei had 12 years ago, We shall subtract 12 years ago from his current

Cheptegei's age 12 years ago

$$\begin{aligned}
 \text{Current age} - 12 \text{ years before} \\
 30 \text{ years} - 12 \text{ years ago} \\
 = 18 \text{ years.}
 \end{aligned}$$

Cheptegei was 18 years.

3. Ambrose is 18 years younger than James, if the ratio of their age is 2:3 respectively, how old is each?

$$\begin{array}{rcl}
 \text{James} & & \text{Ambrose} \\
 n & : & n-18 \\
 3 & : & 2 \\
 n:n-18 & = & 3:2 \\
 \frac{n}{n-8} & = & \frac{3}{2} \\
 3(n-8) & = & 2n \\
 n-34 & = & 2n \\
 3n-2n & = & 54 \\
 n & = & 54
 \end{array}$$

Activity

1. Amina is 12 years older than Benita .If the ratio of their age is 4:3 respectively, how old is each?

2. Joshua is 6 years older than Samson. If the ratio of their age is 3:4 respectively

Joshua is 6 years older than Samson.
If the ratio of their age is 3:4
respectively

) How old is Samson?

- b) How old will Joshua be in 7 years time?

3. Tom is 8 years younger than Andrew.
How old is each of them given that
their age ratio is 3:5 respectively.

4. Father is 24 years older than his son. If the ratio of their age is 5:2 respectively, how old was each 6 years ago?

More about application of algebra using ratios

1. Tom is 8 years older than Kamya. Four years ago, the ratio of their age was 4:3 respectively, how old is Kamya now?

	Kamya	Tom
Now	m	$m+8$
4 years ago	$m-4$	$m+8-4$
Ratio	3	4

Kamya's age Tom's age

years ago = their resp

$$\frac{m-4}{m+4} = \frac{3}{4}$$

$$4(m-4) = 3(m+4)$$

$$4m - 16 = 3m + 12$$

$$4m - 16 + 16 = 3m + 12 + 16$$

$$4m - 3m = 28$$

$$4m - 3m = 3m - 3m + 28$$

$$m = 28$$

Kamya is 28 years old.

2. Alice is 12 years older than Joan. Eight years ago, the ratio of their age was 10:7 respectively.
(a) How old is Joan now?

Note: Always begin with the younger or youngest person.

	Joan	Alice
Now	x	$x+12$
8 years ago	$x-8$	$(x+12)-8$
Ratio	7	10

$$x-8 : x+12 - 8 = 7 : 10$$

$$\frac{x - 8}{12} = \frac{7}{10}$$

$$\frac{x+12}{10(x-8)} = 7(x+4)$$

$$10x - 80 = 7x + 28$$

$$10x - 7x = 28 + 80$$

$$3x = 108$$

$$\underline{3}x = \underline{108}^{36}$$

$$\underline{3}_1 \quad \underline{3}_1$$

$$x = 36$$

Joan is 36 years old.

How old will Alice be in 2 years time?

$$(x+12) + 2 \text{ years}$$

$$36+12+2 = 50 \text{ years.}$$

Mubiru is 3 years older than Sadam. In five years time, the ratio of their age will be 4:5 respectively. How old is Sadam?

	Sadam	Mubiru
Now	n	n+3
5years time	n+5	n+3+5
Ratio	4	5

$$n+5:n+3+5=4:5$$

$$\frac{n+5}{n+3+5} = \frac{4}{5}$$

$$5(n+5) = 4(n+8)$$

$$5n+25 = 4n+32$$

$$5n-4n = 32-25$$

$$n = 7$$

Sadam is 7 years old.

Aisha is 4 years younger than Zaina. In six years time, the ratio of their ages will be 9:7 respectively. How old is Aisha?

	Aisha	Zaina
Now	k	k+4
6 yrs	k+6	(k+4) + 6
Ratio	7	9

$$k+6:k+4+16 = 7:9$$

$$\frac{k+6}{k+4+6} = \frac{7}{9}$$

$$9(k+6) = 7(k+4+6)$$

$$9k+54 = 7(k+10)$$

$$9k+54 = 7k+70$$

$$9k-7k = 70-54$$

$$2k = 16$$

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

$$k = 8$$

Aisha's age

$$k = 8$$

Aisha is 8 years



ROUND UP ACTIVITY

The breadth of a rectangle is one third of its length. If the perimeter of the rectangle is 32cm, find its area.

A quarter of Edgar's salary is equal to two fifth of Edwin's salary.
If Edgar's salary is sh.1,500,000. What is Edwin's salary?

Abdul and Hamidu shared some money in the ratio 5:8. Abdul got sh.12,000 less than Hamidu. How much money did Hamidu get?

The length of one side of a rectangle is $(2m - 1)$ cm, the other side is $(m + 3)$ cm. if the rectangle has a perimeter of 28cm, what is its area?

5. The angles of a triangle are $(2m - 1)^\circ$, $(2m - 1)^\circ$ and $(2m - 1)^\circ$. What is the difference between the largest and the smallest angle of the triangle?
6. The heights of the two boys are in the ratio of 2:3. If the height of the shorter boy is 108cm. what is the difference in the heights of the two boys
7. On a day when a sixth of the pupils in the class were absent, 35 pupils were present. How many pupils were present when a seventh of the pupils in the class were absent?

1. Annet is 15 years older than her daughter. In 10 years from now, Annet will be twice as old as Annet. How old is Annet now?
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
8. Joseph is 20 years younger than Jacob. In 10 years, Jacob will be twice as old as Joseph. How old will Jacob be then?
9. Aminah is four times as old as Timothy. In 10 years' time, Aminah will be twice as old as Timothy. How old is Timothy now?
10. Kafeero is 25 years old. Joshua is 4 years old. In how many years will Kafeero be twice as old as Joshua?
11. (a) Barbra is 12 years old. Christine is 38 years now. At what age will Christine be twice as old as Barbra?

- (b) How old will each be by then?
12. (a) Sandra is 5 times old as James. The difference between their age is 36 years. How old is Sandra?
- (b) In how many years will Sandra be twice as old as James?
3. A father is 20 years older than his son. In 5 years, the father will be twice as old as the son. How old will the son be then ?
14. John is 19 years old, Sarah is 6 year old. At what age will John be twice as old as Sarah?