

THEME: ALGEBRA

TOPIC: ALGEBRA

EXPRESSING ALGEBRAIC PHRASES AS EXPRESSIONS

Examples

Express the following phrases as expressions

1. The sum of 9 and m.

$(9 + m)$

2. The difference of 10 and k.

$(10 - k)$

3. The sum of y and k

$(y + k)$

4. Thrice the difference of m and n.

$3(m + n)$

5. Double the sum of 3k and 4.

$2(3k + 4)$

6. Half of m.

$\frac{1}{2}m$

7. Square of a number.

Let the number be m

M^2

Activity

Express the following phrases as expressions.

- The sum of 5r and 12
- The difference of w and 6y.
- Three quarters of a number.
- Thrice the difference of 3c and 8d.
- Twice the sum of 10 and 8x.
- The average of 3, 7 and y
- Square the sum of k and 7.



*Ref: New MK pupils' book5
pages 181*

EXPRESSING ALGEBRAIC EXPRESSION AS PHRASES

Examples

Express the following as expressions

- 1.
- $(18 - W)$

The difference of 18 and w.

$$2.4n + 3$$

The sum of $4n$ and 3

$$3.4(4m + p)$$

Four times the sum of $4m$ and p .

$$4.\frac{1}{3}(4m + n)$$

A third of the sum of $4m$ and n

ACTIVITY

Express the following expressions as phrases.

I.) $n-19$

II.) $3k + 20$

III.) $3(a - 8)$

IV.) w^2

V.) $\frac{5a+8}{4}$



*Ref: New MK pupils' book5
pages 181*

COLLECTING LIKE TERMS

Examples

1. Write in short: $a + a + a$

$$(a + a) + a$$

$$2a + a$$

$$\underline{3a}$$

2. Simplify: $x + y + 2x + 3y$

$$(x + 2x) + (y + 3y)$$

$$\underline{3x + 4y}$$

3. Simplify: $5a + b + a - 2b + 3b + 4a$

$$(5a + a + 4a) + (3b + b) - 2b$$

$$10a + 4b - 2b$$

$$\underline{10a - 2b}$$

4. Simplify $7y - 8m + y + 10m - 6$

$$7y + y + 10m - 8m - 6$$

$$\underline{8y - 2m - 6}$$

5. Write in short:

$$5\text{balls} + 2\text{pens} + 1\text{ball} + 3\text{pens}$$

$$(5 + 1) \text{ balls} + (2 + 3) \text{ pens} = \underline{6\text{balls} + 5\text{pens}}$$

6. Juma had y books and Okoth had x books. How many books did they have altogether?

$(y + x)$ books

7. Simplify: $-b + 4p + 2b - 6p$

$-6p + 4p + 2b - b$

$-2b + b$

Activity

1. Write in short:

a.) $7\text{tables} + 5\text{chairs} + 3\text{tables} - 2\text{chairs}$.

b.) $9\text{caps} + 18\text{hens} - 3\text{caps} - 7\text{hens}$

2. Collect like terms and simplify.

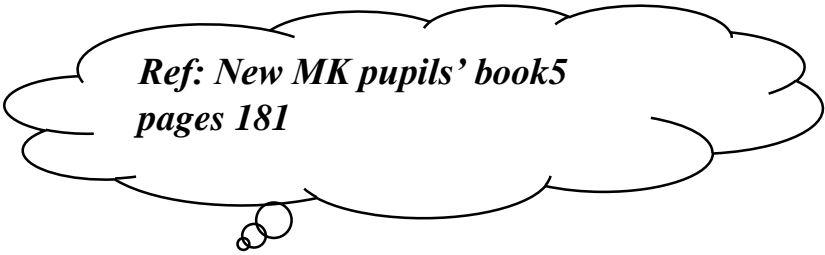
i.) $6y - 4 + 3y + 13$

ii.) $6p + 4x - 8p + x$

iii.) $14k - 3w - 7k$

iv.) $m + 4n + 3m - 5n + 6n$

3. A fruit seller had $6c$ fruits. She sold m fruits. How many fruits



*Ref: New MK pupils' book5
pages 181*



*Ref: New MK pupils' book5
page 180*

SUBSTITUTION

Examples

1. Given that $a=5$, $b=4$ and $c=2$.

a) Find abc

$a \times b \times c$

$5 \times 4 \times 2$

40 2

40

b) Find $a + b + c$

$(a + b) + c$

$(5 + 4) + 2$

$9 + 2$

11

c.) $6a - 3bc$

$$(6 \times a) - (3 \times b \times c)$$

$$(6 \times 5) - (3 \times 4 \times 2)$$

$$30 - (12 \times 2)$$

$$30 - 24$$

$$\underline{\underline{6}}$$

2. Given that $p = -3$, $q = 4$ and $r = 5$

a.) Find pqr

$$p \times q \times r$$

$$-3 \times 4 \times 5$$

$$-12 \times 5$$

$$\underline{\underline{-60}}$$

b.) Find $p + q + r$

$$p + q + r$$

$$-3 + 4 + 5$$

$$(4 + 5) - 3$$

$$9 - 3$$

$$\underline{\underline{6}}$$

c.) Find $r(q + p)$

$$5(4 - 3)$$

$$5 \times 1$$

$$\underline{\underline{5}}$$

d.) Find $6p^2 - 2rq$

$$6(p \times p) - (2 \times r \times q)$$

$$6(-3 \times -3) - (2 \times 5 \times 4)$$

$$6 \times 9 - 40$$

$$54 - 40$$

$$\underline{\underline{14}}$$

2. Given that $m = \frac{2}{9}$ and $w = \frac{1}{3}$

a.) Find $m \div w$

$$\frac{2}{9} \div \frac{1}{3} = \frac{2}{9} \times \frac{3}{1} = \frac{2}{3}$$

Activity

1. Given that $x = 5$, $y = 7$ and $k = 4$. Find;

- a) $x + y + k$
- b) $x y k$
- c) $3x - y + k$
- d) $y^2 - xk$

2. Given that $c = -5$, $d = 6$ and $e = 4$.

Find;

- a) $C d e$
- b) $d + c + e$
- c) $c(d + e)$
- d) $\frac{cd}{e-2}$

*Ref: New MK pupils' book 6
page 376*

2. Given that $m = \frac{4}{5}$ and $n = \frac{1}{5}$. Find $\frac{m}{n}$.

FORMING AND SOLVING EQUATIONS BY SUBTRACTING

Examples

1. Solve $\square + 6 = 20$
 $\square + 6 - 6 = 20 - 6$
 $\square = 14$

2. $11 + a = 23$
 $11 - 11 + a = 23 - 11$
 $a = 12$

3. Solve for y : $y + 12 = 48$
 $y + 12 = 48$
 $y + 12 - 12 = 48 - 12$
 $y = 36$

4. $16 + y = 20$
 $16 - 16 + y = 20 - 16$
 $y = 4$

5. I think of a number, add 9 on it, the result is 14. What is the number?

Let the number be m

$$m + 9 = 14$$

$$m + 9 - 9 = 14 - 9$$

$$m = 5$$

Therefore the number is 5.

6. Jane had some money, her father added her more sh.1500 in total she has sh. 2300. How much money did she have at first?

Let the money she had be z .

$$z + \text{sh.1500} = \text{sh.2300}$$

$$z + \text{sh.1500} - \text{sh.1500} = \text{sh.2300} - \text{sh.1500}$$

$$z = \text{sh. } 800$$

Therefore she had sh.800 at first.

Exercise

1. Solve the following equations:

a) $\square + 3 = 9$

b) $\square + 13 = 35$

b) $g + 7 = 13$

d) $v + 34 = 62$

e) $15 + x = 38$

f) $16 + m = 35$

2. I think of a number, add 16 to it the answer is 25. What is the number?

3. Think of a number; add 25 to it the result is 40. What is the number?

4. Tom had some eggs, his mother added him more 16 eggs, he has 29 eggs now. How many eggs did he have at first?

5. What number must be added to 69 to get 90?

SOLVING EQUATIONS BY ADDING

*Ref: New MK pupils' book 5
Pages 182 - 183*

Examples

1. Solve $\square - 34 = 7$

$$\square - 34 + 34 = 7 + 34$$

$$\square = 41$$

2. Solve for y: $y - 11 = 54$

$$y - 11 + 11 = 54 + 11$$

$$y = 65$$

3. I think of a number subtract 9 from it, the result is 6. What is the number?

Let the number be z

$$Z - 9 = 6$$

$$Z - 9 + 9 = 6 + 9$$

$$Z = 15$$

Therefore the number is 15.

4. Anne had some books; the teacher took away 13 books from her, she remained with 5 books. How many books did she have at first?

Let the books she had at first be w

$$W - 13 = 5$$

$$W - 13 + 13 = 5 + 13$$

$$W = 18$$

Therefore she had 18 books at first.

Ref: New MK pupils' book 5
Page 184

Exercise

1. Solve the following equations:

a) $\square - 12 = 13$ b) $\square - 7 = 6$ c) $24 - \square = 13$

d) $y - 23 = 12$ e) $m - 14 = 33$

2. I think of a number, subtract 20 from it, the result is 14. What is the number?

3. There were some eggs in the basket. 27 eggs got broken. 17 eggs remained. How many eggs were in the basket at first?

4. Mr. Balikudembe had some cows in the farm. He sold 19 cows and remained with 23 cows. How many cows did he have at first?

5. After selling 49 eggs, the farmer remained with 64 eggs. How many eggs did the farmer have at first?

6. Akiiki harvested some sacks of potatoes. She sold 15 of them and kept 2 for the family. Find the number of sacks she harvested?

SOLVING EQUATIONS BY MULTIPLYING

Examples

1. Find the missing number; $\square \div 3 = 6$

$$\square \div 3 \times 3 = 6 \times 3$$

$$\square = \underline{18}$$

2. Find the value of b. $b \div 4 = 20$

$$b \div 4 \times 4 = 20 \times 4$$

$$b = \underline{80}$$

2. Find the value of p. $\frac{p}{5} = 10$

$$\frac{p}{5} \times \overset{1}{5} = 10 \times 5$$

$$p = \underline{50}$$

4. Solve for y: $2y \div 3 = 8$

$$2y \div 3 \times 3 = 8 \times 3$$

$$= \underline{24}$$

$$\begin{array}{r} y \quad 12 \\ 2y = \frac{24}{2} \\ \underline{\underline{y = 12}} \end{array}$$

4. A man equally divided his money among 5 children and each got sh.450.How much money did he give out?

Let k be the amount he gave out

$$k \div 5 = \text{sh.450}$$

$$k \div 5 \times 5 = \text{sh.450} \times 5$$

$$k = \text{sh.2250}$$

He gave out sh.2250 altogether.

5. Find the number of apples that can be divided among 8 girls such that each girl gets 12 apples.

Let the number of apples be m

$$m \div 8 = 12$$

$$m \div 8 \times 8 = 12 \times 8$$

$$m = 96 \text{ apples}$$

The number is 96 apples.

6. What amount of money is needed to pay 15 workers if each worker earns sh.3000?

Let the amount needed be m

$$m \div 15 = \text{sh.3000}$$

$$m \div 15 \times 15 = \text{sh.3000} \times 15$$

$$m = \text{sh.45000}$$

Sh.45000 is needed to pay 15 workers

Activity

1. Find the missing number in each of the following:

a) $\square \div 5 = 30$

b) $\square \div 9 = 12$

2. Solve the following equations:

i) $k \div 6 = 13$

ii) $\frac{w}{12} = 6$

iii) $3k \div 5 = 6$

iv) $\frac{2k}{9} = 10$

3. Four pupils shared x books equally. Each pupils received 16 books. How many books were there?
4. What number when divided by 7 gives 6?
5. When a number is divided by 8, the result is 15. What is the number?
6. Trailers were loaded with equal bags of cotton. Each trailer loaded 120 bags. How many bags were there altogether?
7. A farmer distributed x cows among 12 women. Each woman got 8 cows. How many cows did the farmer have?
8. A trade hired 8 trucks to carry bags of salt. Each truck carried 96 bags. How many bags were there altogether?

FORMING AND SOLVING EQUATIONS BY DIVIDING

Examples

1. Solve the following equations.

a) $\square \times 8 = 48$

$$\square \times 8 \div 8 = 48 \div 8$$

$$\square = 6$$

b). $7b = 28$

$$\begin{array}{r} \textcolor{red}{b} \\ 7b = 28 \\ \hline 7 \quad \textcolor{red}{7} \quad \textcolor{red}{1} \\ \hline b = 4 \end{array}$$

c) $2y \div 3 = 8$

$$\begin{array}{l} 2y \div 3 \times 3 = 8 \times 3 \\ = 24 \end{array}$$

$$\begin{array}{r} \textcolor{red}{y} \quad \textcolor{red}{12} \\ 2y = 24 \\ \hline 2 \quad \textcolor{red}{2} \quad \textcolor{red}{1} \\ \hline y = 1 \end{array}$$

2. The cost of 12 pens is sh.6000. What is the cost of each pen?

Let h be the cost of each pen

*Ref: New MK pupils' book 5
Pages 185- 186*

$$12h = \text{sh.}6000$$

$$\frac{12h}{12} = \frac{\overset{500}{\text{sh}6000}}{12}$$

$$h = \text{sh.}500$$

Each pen costs sh.500

3. A number multiplied by 7 gives 42. What is the number?

Let r be the number

$$r \times 7 = 42$$

$$r \times 7 \div 7 = 42 \div 7$$

$$r = 6$$

The number is 6

4. Nine buses carried k passengers each. Altogether they carried 540 passengers. How many passengers did each bus carry?

$$K \times 9 = 540$$

$$K \times 9 \div 9 = 540 \div 9$$

$$K = 60$$

Each bus carried 60 passengers

Activity

1. Solve the following equations:

a) $\square \times 4 = 36$

b) $5n =$

c) 256

2. A number multiplied by 15 gives 90. Find the number.

3. The product of two numbers is 120. One of the numbers is 8. Find the second number.

4. A school received 980 pens in 7 equal boxes. How many pens were in each box?

5. I think of a number, multiply it by 9. The result is 108, what number have I thought of?

MORE SOLVING EQUATIONS BY DIVIDING

Examples

1. Solve for m .

$$m + m + m = 45$$

$$3m = 45$$

$$\frac{3m}{3} = \frac{45}{3}$$

$$\underline{m = 15}$$

*Ref: New MK pupils' book 5
Pages 186*

2. Jane is m years old, Matthew is three times as old as Jane. If their total age is 40 years. Find Jane's age.

$$m + 3m = 40$$

$$4m = 40$$

$$\frac{4m}{4} = \frac{40}{4}$$

$$m = 10$$

Jane is 10 years.

Activity

1. Solve the equations below:

a) $4y + y = 200$

b) $7p + 8p = 60$

c) $7k - 3k = 32$

2. Teddy is h years, her father is four times as old as Teddy. If their total age is 60 years. How old is each of them?

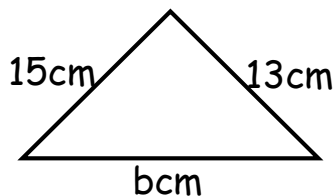
3. A mother is $5x$ years old and daughter $2x$ years. Their total age is 56 years. How old is each now?

4. Kent has thrice as many books as Batte. If both have 36 books, how many books does Batte have?

SOLVING EQUATIONS (GIVEN PERIMETER OF SHAPES)

Examples:

1. The perimeter of the figure below is 37cm. Find the value of b .



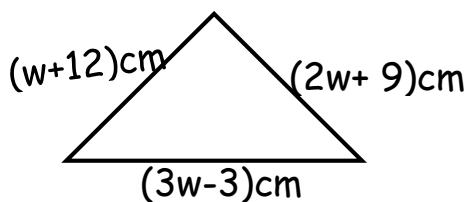
$$S + S + S = P$$

$$b + 15\text{cm} + 13\text{cm} = 37\text{cm}$$

$$b + 28\text{cm} = 37\text{cm}$$

$$b + 28\text{cm} - 28\text{cm} = 37\text{cm} - 28\text{cm} \quad b = 12\text{cm}$$

2. The perimeter of the figure below is 48cm. Find the value of w



$$S + S + S = P$$

$$(w + 12) + (2w + 9) + (3w - 3) = 48\text{cm}$$

$$w + 2w + 3w + 12 + 9 - 3\text{cm} = 48\text{cm}$$

$$6w + 18\text{cm} = 48\text{cm}$$

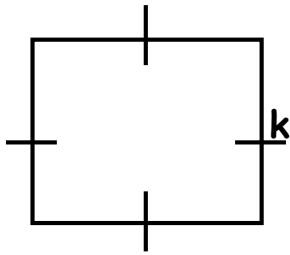
$$6w + 18\text{cm} - 18\text{cm} = 48\text{cm} - 18\text{cm}$$

$$6w = 30\text{cm}$$

$$\frac{6w}{6} = \frac{30}{6}$$

$$w = 5$$

3. The perimeter of a square below is 44m. Find the value of k.



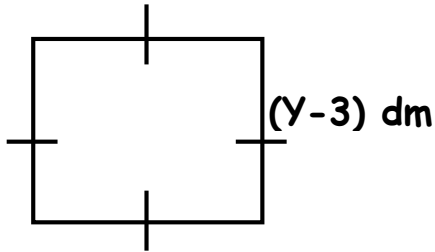
$$4S = p$$

$$4k = 44\text{m}$$

$$\frac{4k}{4} = \frac{44\text{m}}{4}$$

$$k = 11\text{m}$$

4. The perimeter of the figure below is 64dm. Work out the value of y.



$$S + S + S + S = P$$

$$y - 3 + y - 3 + y - 3 + y - 3 = 64\text{dm}$$

$$4y - 12 = 64\text{dm}$$

$$4y - 12 + 12 = 64 + 12$$

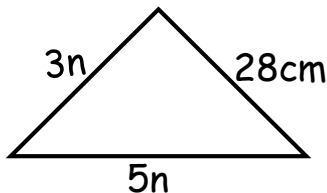
$$4y = 76$$

$$\frac{4y}{4} = \frac{76}{4}$$

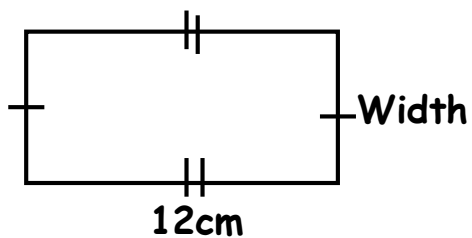
$$y = 19$$

Activity

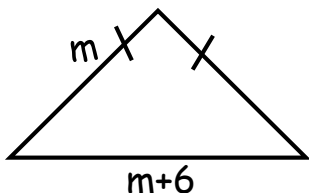
1. The perimeter of the triangle below is 70cm. Find the value of n.



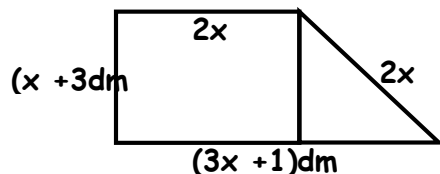
2. The perimeter of the rectangle below is 38cm. Find the width.



3. The perimeter of an isosceles triangle is 36cm. Find the value of m.

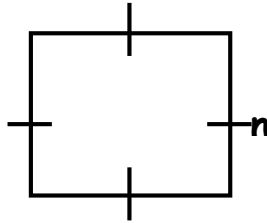


4. The perimeter of the figure below is 44dm. Find the value of x .



5. The perimeter of a rectangle is 40dm. Its length is $(x + 4)$ cm and width is x dm. Find the value.

6. The perimeter of the square below is 24mm. Find the value of n .



*Ref: New MK pupils' book 5
Page 188*

FINDING MISSING SIDE OF SHAPES GIVEN AREA.

Examples

1. The area of a rectangle is 42cm^2 and its width is 6cm. Find the length.

$$L \times W = \text{Area}$$

$$L \times 6\text{cm} = 42\text{cm}^2$$

$$6\text{cm}L = 42\text{cm}^2$$

$$\frac{6\text{cm}L}{6\text{cm}} = \frac{42\text{cm}^2 \times \text{cm}}{6\text{cm}}$$

$$\underline{\underline{L = 6\text{cm}}}$$

2. The area of a triangle is 36cm^2 and base is 9cm. Find its height.

$$\frac{1}{2} \times \text{base} \times \text{height} = \text{Area}$$

$$\frac{1}{2} \times 9\text{cm} \times h = 36\text{cm}^2$$

$$\frac{9h\text{cm}}{2} = 36\text{cm}^2$$

$$\frac{9h\text{cm}}{2} \times \frac{2}{9} = 36\text{cm}^2 \times \frac{2}{9}$$

$$h = 4\text{cm} \times 2$$

$$\underline{\underline{h = 8\text{cm}}}$$

3. A cuboid is 4cm long and 3cm wide. If its volume is 48cm^3 , find its width.

$$l \times w \times h = \text{vol.}$$

$$4\text{cm} \times 3\text{cm} \times h = 48\text{cm}^3$$

$$12\text{cm}^2 h = 48\text{cm}^3$$

$$\frac{12\text{cm} \times 12\text{cm} h}{12\text{cm} \times \text{cm}} = \frac{48\text{cm} \times \text{cm} \times \text{cm}}{12\text{cm} \times \text{cm}}$$

$$h = 4\text{cm}$$

Activity

1. The area of a rectangle is 60cm^2 and length is 15cm. Work out width.
2. The area of a triangle is 40cm^2 and its height is 8cm. Find its base.
3. The area of a triangle is 30cm^2 and its base is 12cm. Work out its height.
4. A rectangle has an area of 50dm^2 and width of 5cm. Find its length.
5. The area of a parallelogram is 28cm. If its base is 7cm, work out the height.
6. A cuboid is 9cm long and 5cm high. If its volume is 90cm^3 , calculate its width.

Ref: New MK pupils' book 5
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