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. $\frac{3}{5}$ of a number

   $\frac{3}{5}y$

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

8. Five times the sum of 2w and 2y

   5(2w + 2y)

9. Divide twice the difference between 3n and 5.

$$\frac{(3n-5)}{2}$$

Activity

1. Express the following phrases as expressions.
2. Double the difference between 3k and 16
3. The difference between 3m and 6 divided by k
4. The sum of 3p and 10 multiplied by y
5. Triple the difference between 3m and r
6. Divide the difference between d and f by the product of w and 5c
7. Half the sum of m and 19 plus thrice the difference of m and 36
8. Third the sum of m and d plus half the product of n and k.
9. Half the difference between k and 8.
10. Square the sum of 7 and p and add it to the sum of y and 17.

11. Thrice the difference between n and 18.
12. Four times the sum of r and 3k
13. Subtract the sum of r and p from the sum of 2p and w
14. Add the sum of 4a and 3b times five to twice the difference between b and c.
15. Multiply the difference between 2d and c by 5b.

EXPRESSING ALGEBRAIC EXPRESSIONS AS PHRASES.
Examples

Express the following as expressions

1. (18 – W)
   <u>The difference of 18 and w</u>.

2. 4n + 3

<u>The sum of 4n and 3</u>

3. 4(4m + p)
<u>Four times the sum of 4m and p.</u>
4. $\frac{1}{3}$ (4m + n)

Ref: Old MK pupils' book6 pages 375

<u>A third of the sum of 4m and n</u>
5. y^2
<u>The square of y</u>
6. k^3
<u>The cube of k</u>
7. $\frac{n}{5} - 3$
<u>Divide a number by five and subtract 3 from the quotient</u>
8. $\frac{x-4}{5}$
<u>Divide the difference between x and 4 by five</u>
9. $(p+8)^2$
<u>Square the sum of p and 8</u>
10. $\frac{5(y+2)}{6}$
<u>Five times the sum of y and 2 divided by six.</u>
11. $\frac{3+6m+5k+7w}{4}$
<u>The average of 3, 6m, 5k and 7w</u>

ACTIVITY

Express the following expressions as phrases.
  a) n-19
  b) 3k +20
  c) 3(a - 8)
  d) w^2
  e) $\frac{m}{3} + 5$
  f) 4(5b + 7)
  g) $\frac{k}{9}$
  h) $\frac{3k+3+y+3r}{4}$
  i) $\frac{w+8}{2}$
  j) $W^2 -10$
  k) $(P- 6)^2$
  l) $\frac{3q+18}{3}$
  m) $\frac{5a-9}{2}$

COLLECTING LIKE TERMS
Examples
1. Write in short: a + a + a
(a + a) + a
2a + a
<u>3a</u>
2. Simplify: x + y + 2x + 3y
(x + 2x) + (y + 3y)
<u>3x + 4y</u>
3. Simplify: 5a + b + a – 2b + 3b + 4a
(5a + a + 4a) + (3b + b) – 2b
10a + 4b – 2b
<u>10a – 2b</u>
4. Simplify 7y – 8m + y + 10m – 6
   7y + y + 10m – 8m – 6
   <u>8y -2m – 6</u>

5. Simplify: 2ab + ab + 5ab
        3ab + 5ab
           <u>8ab</u>
6. Simplify: $7a^2b^2c- 3a^2b^2$
        <u>$4a^2b^2c$</u>
7. Simplify: 13y – ⁻3y- 6y
(13y – ⁻3y)- 6y
(13y +3y)- 6y
16y – 6y
<u>10y</u>
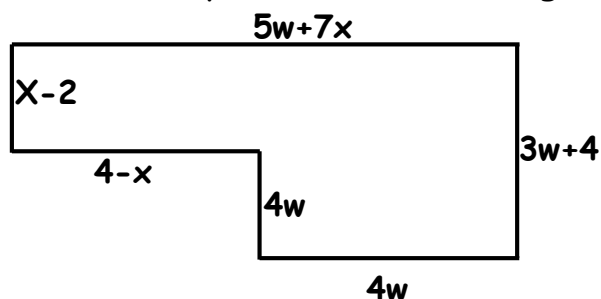8. Simplify: 4w -9k + 2 + 3k – 8w
4w – 8w + 3k – 9k + 2
<u>-4 - 6 + 2</u>
8. Simplify: -b+4p+2b-6p
-6p + 4p + 2b – b
<u>-2b + b</u>

9. Find the perimeter of the figure below.

5w+7x

X-2

4-x

4w

3w+4

4w

P= 5w + 7x + 3w + 4 + 4w + 4w + 4 −x + x-2

P= 5w + 3w + 4w + 4w + 7x + x − x + 4 +4 − 2

P= 16w +7x + 6

Activity

1. Simplify the following

a) 6y − 4 + 3y +13

b) 6p + 4x - 8p + x

c) 14k − 3w -7k

d) m + 4n +3m − 5n +6n

e) 7ac − 5ad − 10ac + 3ad
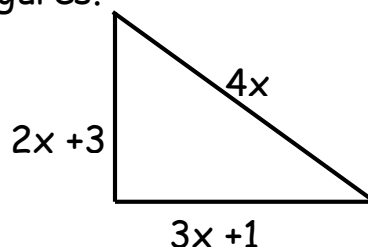
f) 3xy + 4xy − 5ac + 6ac

g) 6ab − 2ab − 3ab

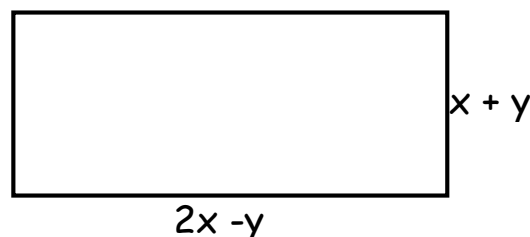h) 8x + 7y − 3x + 3y

i) $Ab^2 + 3ab^2 + 5ab^2$

j) $3ap^2 + 4ap^2$

k) $11x^2y - 6xyz + 4x^2y - 2xyz$
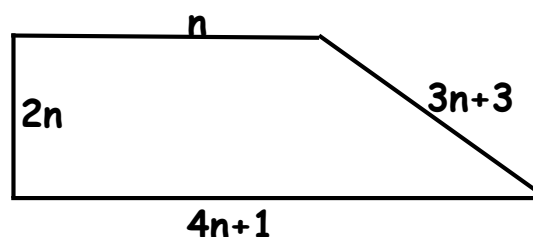
2. Find the perimeter of the following figures.

a)

4x

2x +3

3x +1

b)

x + y

2x -y

c)

n

2n

3n+3

4n+1

SUBSTITUTION

Examples

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

a) Find abc

a x b x c

5 x 4 x 2

40 2

40

b) Find a + b + c

(a + b) + c

(5 + 4) + 2

9 + 2

11

c.) 6a -3bc

    (6 × a) – (3 × b × c)

    (6 × 5) – (3 × 4 × 2)

    30 – (12 × 2)

      30 -24

       <u>6</u>

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

  a.) Find pqr

    p × q × r

    -3 × 4 × 5

    -12 × 5

     <u>-60</u>

  b.) Find p + q + r

    p + q + r

    -3 + 4 + 5

    (4 + 5) - 3

    9 – 3

      <u>6</u>

  c.) Find r (q + p)

    5(4 -3)

     5 × 1

     <u>5</u>

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

    6(p x p) – (2 × r × q)

    $6(-3 \, x - 3)$ – (2 × 5 × 4)

    6 × 9 – 40

     54 – 40

      <u>14</u>

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

  a.) Find m ÷ w

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

Activity

1. Given that a=5, b=7, c=9,d=4,f=6 and e=2.Find the value of;

   i)   a+b+c   ii) (a+b)+cd   iii) 4(a+e)   iv) $\frac{a(a-d)}{a}$ v) $\frac{bf}{e}$

2. Given that x=2, y=-3 and z=-5.Find the value of xzy

3. Given that y=10,z=15.Find $\frac{yz}{y+z}$

4. Given that x=$\frac{2}{3}$ and y=$\frac{1}{3}$.Find x + y

5. If m=$\frac{4}{5}$ and n=$\frac{1}{5}$, find the value of $\frac{m}{n}$.

6. If p=$\frac{1}{8}$, y=$\frac{2}{3}$ and z=$\frac{4}{5}$.Find the value of $\frac{xy}{z}$.

7. If p=1$\frac{1}{3}$,q=2$\frac{1}{2}$, find the value of pq-$\frac{1}{3}$

8. Given that x=$\frac{2}{3}$,y=$\frac{1}{4}$ and z=$\frac{-1}{2}$, find the value of x+y+z

9. If m=$\frac{3}{4}$ and n=$\frac{1}{5}$, find the value of 12m -10n

10.   If x=$\frac{1}{2}$,y=$\frac{3}{4}$ and z=$\frac{1}{4}$, find the value of x(y-z)

REMOVING BRACKETS

Examples

Simplify the following:

a).3(x + y)

<u>3x + 3y</u>

b) -4(m + 3w)

<u>-4m -12w</u>

c) -5(2p – 7)

<u>-10p + 35</u>

d) -p(3p - 5ap)
(-p x 3p) + (p x 5ap)
<u>3p^2 + 5ap^2</u>

Simplify the following:

a) -2(x + y)
b) -3(-x + y)
c) –(p – y + z)
d) g(2a + w)
e) (3d + b)(y)
f) (3 + b + c)d
g) (-2k + y -y)-h
h) -4h(3x + 5h)

Ref: New MK pupils' book 6
Pages 380 - 382

REMOVING BRACKETS
Examples
1. Simplify the following

a) $(x + 2) + (x + 3)$

   $x + 2 + x + 3$

   $x + x + 2 + 3$

   <u>$2x + 5$</u>

b) $3(x + 2) + 2(x-1)$

  $3x + 6 + 2x -2$

  $3x + 2x + 6 - 2$

  <u>$5x + 4$</u>

c) $3(x + 1) - 2(x - 1)$

   $3x + 3 - 2x + 2$

   $3x - 2x + 3 + 2$

   <u>$x + 5$</u>

d) $2(y - 2) - 3(y - 1)$

  $2y - 4 - 3y + 3$

  $2y - 3y + 3 - 4$

  <u>$-y -1$</u>

e) Subtract $3p - 1$ from $5p - 3$

   $5p - 3 - (3p - 1)$

   $5p - 3 - 3p + 1$

   $5p - 3p + 1 - 3$

  <u>$2p - 2$</u>

f) Subtract $y+1$ from $2y + 1$

  $2y + 1 - (y + 1)$

  $2y + 1 - y - 1$

  $2y - y + 1 - 1$

  $y + 0$

  <u>y</u>

g) $\frac{1}{3}(3a + 9b)$

$$\frac{1}{3} \times \overset{a}{\cancel{3a}} + \frac{1}{3} \times \overset{3b}{\cancel{9b}}$$

     <u>$a + 3b$</u>

h) $\frac{1}{2}(2x + 8y) + \frac{1}{3}(6x + 9y)$

$$\frac{1}{2} \times \overset{x}{\cancel{2x}} + \frac{1}{2} \times \overset{4y}{\cancel{8y}} + \frac{1}{3} \times \overset{2x}{\cancel{6x}} + \frac{1}{3} \times \overset{3y}{\cancel{9y}}$$

   $x + 4y + 2x + 3y$

   $x + 2x + 4y + 3y$

<u>   3x + 7y</u>

i)) $\frac{1}{2}(4a + 6ab)$ - $\frac{2}{3}(9a - 12ab)$

$$\frac{1}{2} \times \overset{2a}{\cancel{4a}} + \frac{1}{2} \times \overset{3ab}{\cancel{6ab}} - \frac{2}{3} \times \overset{3a}{\cancel{9a}} - \frac{2}{3} \times \overset{4ab}{\cancel{12ab}}$$

2a + 3ab - 6a + 8ab

2a - 6a + 3ab + 8ab

<u>-4a +11ab</u>

j) What is difference between $\frac{1}{7}(7ab - 14pq)$ and $\frac{1}{5}(10ab + 15pq)$

$$\frac{1}{7} \times \overset{ab}{\cancel{7ab}} + \frac{1}{7} \times \overset{2pq}{\cancel{14pq}} - \frac{1}{5} \times \overset{2ab}{\cancel{10ab}} + \frac{1}{5} \times \overset{3pq}{\cancel{15pq}}$$

ab + 2pq - 2ab + 3pq

ab - 2ab + 2pq + 3pq

<u>-ab+5pq</u>

Activity

Simplify the following:

   a) (x + 2) - (x + 3)
   b) (2x + 3) + (x + 4)
   c) 6(y + 1) - 2(y - 3)
   d) -2(x - 4) - 2(x - 1)
   e) 5(t - 3) + (2t - 4)
   f) 3(m + 2) + 4(m - 1)
   g) 2(q - 1) + 3(q - 2)
   h) Add 4(p + w) to 5(p - w)
   i) $\frac{3}{4}(8m - 12p)$
   j)) $\frac{1}{2}(2x + 8y)$ - $\frac{1}{3}(6x - 9y)$

2. What is the difference between $\frac{1}{10}(20t + 50p)$ and $\frac{1}{9}(18t - 36p)$?

SOLVING EQUATIONS INVOLVING BRACKETS

Examples

Solve the following equations:

a) $3(Y + 4) = 21$

$3Y + 12 = 21$

$3Y + 12 - 12 = 21 - 12$

$3Y = 9$

$$\frac{3Y}{3} = \frac{9^{\,3}}{3}$$

$Y = 3$

b) $4(y - 3) = 16$

$4y - 12 = 16$

$4y - 12 + 12 = 16 + 12$

$4y = 28$

$$\frac{4y}{4} = \frac{28^{\,7}}{4}$$

$Y = 7$

c) $2y^2 = 18$

$$\frac{2y^2}{2} = \frac{18^{\,9}}{2}$$

$\sqrt{Y^2} = \sqrt{9}$

$Y = 3$

d) $4(x^2 - 1) = 32$

$4x^2 - 4 = 32$

$4x^2 - 4 + 4 = 32 + 4$

$4x^2 = 36$

$$\frac{4x^2}{4} = \frac{36^{\,9}}{4}$$

$\sqrt{x^2} = \sqrt{9}$

$x = 3$

Activity

Solve the following equations

1. $y2 + 3 = 28$

2. $q2 - 7 = 18$

3. $5x^2 = 45$

4. $7x^2 = 567$

5. $2(m + 3) = 18$

6. $6(3x - 2) = 50$

7. $6(x^2 + 2 = 306$

8. $4(x^2 - 1) = 21$

Ref: New MK pupils' book 6
Page

SOLVING EQUATIONS INVOLVING

Examples

Solve the following equations

1. $4x - 3 = x + 6$

$4x - x = 6 + 3$

$3x = 9$

$\dfrac{3x}{3} = \dfrac{9^{3}}{3}$

$x = 3$

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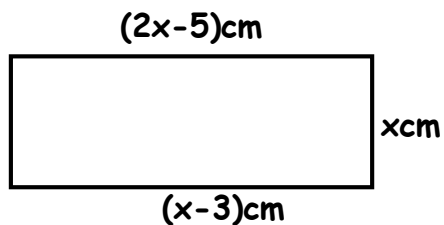
$2m - m = 6 - 4$

$m = 2$

3. $4n - 9 = 15 - 2n$

$4n + 2n = 15 + 9$

$6n = 24$

$\dfrac{6n}{6} = \dfrac{24^{4}}{6}$

$n = 4$

1. Study the rectangle below and find the value of x

(2x-5)cm / (x-3)cm / xcm

Length = length

$2x - 5 = x - 3$

$2x - x = -3 + 5$

$X = 2$

Ref: New MK pupils' book 6
Pages 393 -394

Activity

1. Solve the following equations

a) $9 + 5x = 4 + x$

b) $11n + 6 = 2n + 19$

c) $13 + 3x = 25 - 3x$

d) $5a - 3 = 2a + 3$
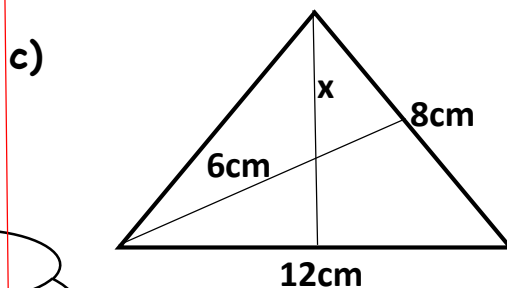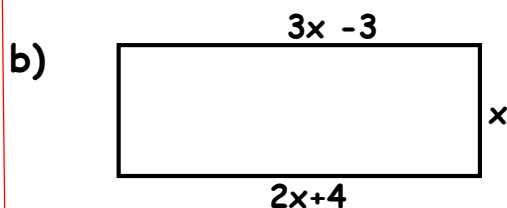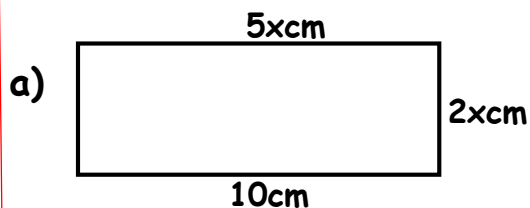
e) $5n + 5 = 8n - 4$

f) $10x - 12 = 9x - 2$

g) $11x + 3 = x + 33$

h) $6x - 8 = 4x + 4$

2. Find the value of x in the figures below;

a)
5xcm / 10cm / 2xcm

b)
3x -3 / 2x+4 / x

c)
x / 8cm / 6cm / 12cm

SOLVING EQUATIONS INVOLVING FRACTIONAL TERMS

Examples

Solve the following equations:

1. $\frac{1}{2}P = 6$ Multiply each term by the reciprocal of the fraction.

$\frac{1}{\cancel{2}}P \times \frac{\cancel{2}}{1} = 6 \times \frac{2}{1}$

$\underline{\underline{\quad\quad P = 12\quad}}$

2. $\frac{m}{3} + 6 = 10$

$\frac{m}{\cancel{3}} \times \frac{\cancel{3}}{1} + 6 \times \frac{3}{1} = 10 \times \frac{3}{1}$

     m + 18 = 30

m + 18 - 18 = 30 – 18

$\underline{\underline{\quad\quad\quad m = 12\quad}}$

3. $\frac{3m}{4} + 7 = 40$

$\frac{3m}{4} + 7 = 40$

$\frac{\cancel{3m}}{4} \times \frac{4}{\cancel{3}} + 7 \times \frac{4}{3} = 40 \times \frac{4}{3}$

m + $\frac{28}{3}$ = $\frac{160}{3}$

m + $\frac{28}{3}$ − $\frac{28}{3}$ = $\frac{160}{3}$ − $\frac{28}{3}$

     m = $\frac{\cancel{132}}{\cancel{3}}$

$\underline{\underline{\quad\quad m = 11\quad}}$

4. $4\frac{1}{3}p + 2 = 15$

$\frac{13p}{3} + 2 = 15$

$\frac{\cancel{13p}}{\cancel{3}} \times \frac{\cancel{3}}{\cancel{13}} + 2 \times \frac{3}{13} = 15 \times \frac{3}{13}$

     P $+\frac{6}{13}$ = $\frac{45}{13}$

     P + $\frac{6}{13}$ − $\frac{6}{13}$ = $\frac{45}{13}$ − $\frac{6}{13}$

       P = $\frac{\cancel{39}}{\cancel{13}}$

$\underline{\underline{\quad\quad P = 3\quad}}$

5. 0.4p +0 .5 = 2.1

0.4p + 0.5 - 0.5 = 2.1 - 0.5

0.4p = 1.6

$$\frac{4p}{10} = \frac{16}{10}$$

$$\frac{4p}{10} \times \frac{10}{4} = \frac{16}{10} \times \frac{10}{4}$$

$$\underline{\quad\quad P = 4 \quad\quad}$$

6. $3x + 7 - \frac{3x}{4} = 10$

$3x \times 4 + 7 \times 4 - \frac{3x}{4} \times 4 = 10 \times 4$

$12x + 28 - 3x = 40$

$12x - 3x + 28 = 40$

$9x + 28 - 28 = 40 - 28$

$$9x = 12$$

$$\frac{9x}{9} = \frac{12}{9}$$

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

7. $\frac{2q^2}{6} = 12$

$$\frac{2q^2}{6} \times \frac{6}{2} = 12 \times \frac{6}{2}$$

$$\sqrt{q^2} = \sqrt{36}$$

$$\underline{\quad\quad q = 6 \quad\quad}$$

8. $\frac{9q^2}{11} = 11$

$$\frac{9q^2}{11} \times \frac{11}{9} = 11 \times \frac{11}{9}$$

$$\sqrt{q^2} = \sqrt{\frac{121}{9}}$$

$$q = \frac{11}{3}$$

$$q = 3\frac{2}{3}$$

Ref: New MK pupils' book 7
Pages 393 -394

Activity

Solve the following equations:

1. $\frac{1}{3}x = 20$
2. $2\frac{1}{5}y = 22$
3. $p - \frac{2}{3}p = 7$
4. $P + \frac{p}{5} = 6$
5. $1\frac{1}{2}p + 3 = 12$
6. $0.9p + 0.5 = 5.7$

7. $0.3t - 5 = 0.2p = 8.1$

8. $\frac{m}{5} + 7 = 11$

9. $4 - \frac{3t}{4} = -2$

10. $\frac{3m}{8} + 2 = 7$

10. $\quad .\frac{3m^2}{9} = 3$

12. $3\frac{1}{8}w^2 = 8$

SOLVING EQUATIONS INVOLVING FRACTIONAL TERMS

Examples

Solve the following equations;

a) $\frac{m+1}{3} + \frac{m}{4} = 2$ LCD=12

$(\frac{m+1}{3}) \times 12 + \frac{m}{4} \times 12 = 2 \times 12$

$\qquad 4(m+1) + 3m = 24$

$4m + 4 + 3m = 24$

$\qquad 7m + 4 = 24$

$7m + 4 - 4 = 24 - 4$

$\qquad 7m = 20$

$\qquad \frac{7m}{7} = \frac{20}{7}$

$\qquad m = 2\frac{6}{7}$

a) $\frac{x-5}{2} + \frac{x}{8} = 13$ LCD = 8

$(\frac{x-5}{2}) \times 8 + \frac{x}{8} \times 8 = 13 \times 8$

$\qquad 4x - 20 + x = 104$

$\qquad 5x - 20 = 104$

$5x - 20 + 20 = 104 + 20$

$\qquad 5x = 124$

$\qquad \frac{5x}{5} = \frac{124}{5}$

$\qquad X = 22\frac{4}{5}$

b) $.\frac{a+4}{3} - \frac{a}{5} = 8$ LCD = 15

$(\frac{a+4}{3}) \times 15 - \frac{a}{5} \times 15 = 8 \times 15$

$\qquad 5a + 20 - 3a = 120$

$\qquad 2a + 20 = 120$

2a +20 - 20 = 120 - 20

2a = 100

$$\frac{2a}{2} = \frac{100}{2}$$

X = 50

d) $\frac{3x+1}{4} = \frac{x+2}{2}$

2(3x+1) = 4(x+ 2)

6x + 2 = 4x + 8

6x − 4x = 8 − 2

2x = 4

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

X = 2

f) $\frac{3x-1}{2} = \frac{7x+1}{6}$

2(7x + 1) = 6(3x-1)

14x + 2 = 18x − 6

14x − 18x = -6 − 2

-4x = -8

$$\frac{-4x}{-4} = \frac{-8}{-4}$$

x = 2

Activity

Solve the following equations

a) $\frac{d-2}{3} + \frac{d}{3} = 4$

b) $\frac{2n+5}{5} + \frac{n}{5} = 8$

c) $\frac{k+3}{4} + \frac{k}{2} = 6$

d) $\frac{x+5}{4} + \frac{x}{5} = 2$

e) $\frac{d+3}{3} = \frac{5d+1}{9}$

f) $\frac{4x-9}{3} = \frac{3x+5}{7}$

g) $\frac{6p+4}{9} = \frac{4p-3}{7}$
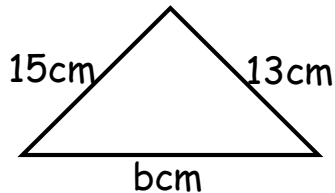
h) $\frac{m+2}{5} = \frac{m+1}{20}$

Ref: New MK pupils' book 7
Pages 461-462

FORMING AND SOLVING EQUATIONS BY SUBTRACTING
SOLVING EQUATIONS (GIVEN PERIMETER OF SHAPES)

Examples:

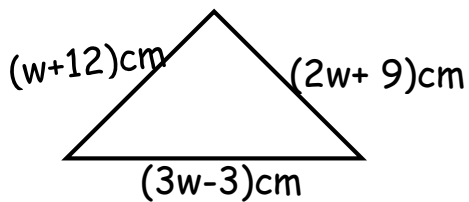1. The perimeter of the figure below is 37cm. Find the value of b.

$S + S + S = P$

$b + 15cm + 13cm = 37cm$

$b + 28cm \quad\quad = 37cm$

$b + 28cm - 28cm = 37cm - 28cm \quad\quad b = 12cm$

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

$S + S + S = P$

$(w + 12) + (2w + 9) + (3w - 3) = 48cm$

$w + 2w + 3w + 12 + 9 - 3)cm = 48cm$

$6w + 18cm \quad\quad = 48cm$

$6w + 18cm - 18cm = 48cm - 18cm$

$6w = 30cm$

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

$W = 5$

3. The perimeter of a square below is 44m. Find the value of k.
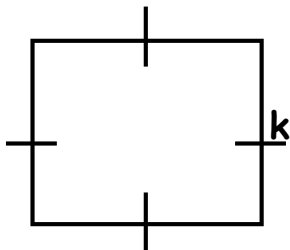
$4S = p$

$4k = 44m$

$\dfrac{4k}{4} = \dfrac{44m}{4}$ **11**

$k = 11m$

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

(Y-3) dm
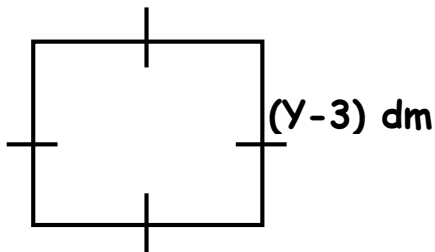
$S + S + S + S = P$

$Y - 3 + y - 3 + y - 3 = 64dm$

$4y - 12 \quad\quad = 64dm$

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

$4y = 76$

$\dfrac{4y}{4} = \dfrac{76}{4}$ **19**

$Y = 19$

Activity

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

3n   28cm

5n
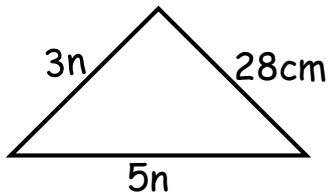
2. The perimeter of the rectangle below is 38cm.Find the width.

┤├Width

12cm
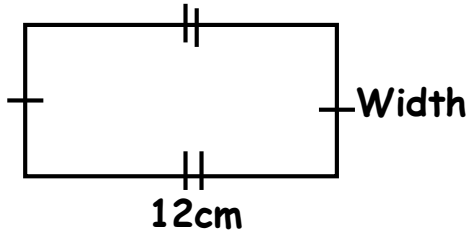
3. The perimeter of an isosceles triangle is 36cm.Find the value of m.

m

m+6
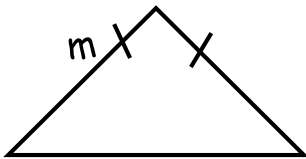
4. The p $^{m+6}$ er of the figure below is 44dm.Find the value of x .

2x

(x +3dm   2x

(3x +1)dm
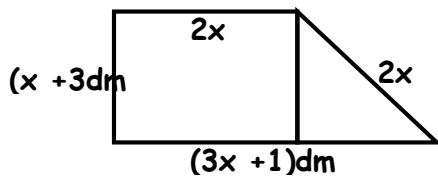
1. The perimeter of a rectangle is 40dm.Its length is (x + 4)cm and width is xdm.Find the value.

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

n
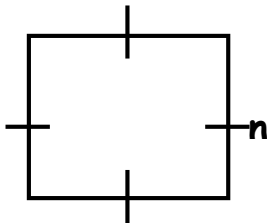
Ref: New MK pupils' book 6
Page 391

FINDING MISSING SIDE OF SHAPES GIVEN AREA.

Examples

1. The area of a rectangle is 42cm² and its width is 6cm.Find the length.

L × W = Area

L × 6cm = 42cm²

6cmL = 42cm²

$$\frac{6cm\ L}{6cm} = \frac{42cm\ \times cm}{6cm}$$

L = 6cm

2. The area of a triangle is 36cm² and base is 9cm.Find its height.

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

$\frac{1}{2} \times$ 9cm × h = 36cm²

$$\frac{9hcm}{2} = 36cm^2$$

$$\frac{9hcm}{2} \times \frac{2}{9} = \overset{4}{\cancel{36}}cm^2 \times \frac{2}{9}$$

h = 4cm × 2

h = 8cm

1. A cuboid is 4cm long and 3cm wide. If its volume is 48cm³, find its width.

l × w × h = vol.

4cm × 3cm × h = 48cm³

12cm²h = 48cm³

$$\frac{12cm \times 12cmh}{12cm \times cm} = \frac{48cm \times cm \times cm}{12cm \times cm}$$

h = 4cm

Ref: New MK pupils' book 6 Page 391

Activity

1. The area of a rectangle is 60cm² and length is 15cm.Work out width.
2. The area of a triangle is 40cm² and its height is 8cm.Find its base.
3. The area of a triangle is 30cm² and its base is 12cm. Work out its height.
4. A rectangle has an area of 50dm² 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 90cm³, calculate its width.

FORMING AND SOLVING ALGEBRAIC EQUATIONS

Examples

2. A boy is 2years older than his sister. Their total age is 20years. How old is the sister?

   Let r be the sister's age

Sister's age	Boy's age	Total age
R	r+2	20

   r + r + 2 = 20

   2r+ 2 = 20

   2r + 2 – 2 =20 -2

   2r = 18

   $$\frac{2r^1}{2_1} = \frac{18^9}{2}$$

   r = 9 years

3. A girl is 20years younger than the mother. The sum of their age is 70yeras. How old is the mother?

   Let p be the mother's age

mother's age	girl's age	Total age
P	P -20	70

   p + p - 20 = 70

   2p - 20 = 70

   2p - 20 + 20 =70 +20

   2p = 90

   $$\frac{2p^1}{2_1} = \frac{90^{45}}{2}$$

   p = 45 years

4. Kampi weighs 10kg heavier than Betty. If their total weight is 64kg. Find the weight of Kampi.

   Let p be Betty's weight

Betty	Kampi	Total weight
P	P +10	64

   p + p + 10 = 64

   2p + 10 = 64

$2p + 10 - 10 = 64 - 10$

$2p = 54$

$$\frac{\overset{1}{\cancel{2p}}}{\underset{1}{\cancel{2}}} = \frac{\overset{27}{\cancel{54}}}{\cancel{2}}$$

<u>p = 27 kg</u>

Kampi's weight = (27+10) kg

                   = 37kg

5. Jane is twice as old as Jack. Their total age is 66years. How old is Jane in 4years time?

Let k be Jack's age

Jack	Jane	Total age
K	2k	66

k + 2k = 66

    3k = 66

$$\frac{\overset{1}{\cancel{3k}}}{\underset{1}{\cancel{3}}} = \frac{\overset{11}{\cancel{66}}}{\cancel{3}}$$

<u>k = 11years</u>

Jane's age = (2x11) years

                   = 22years

Activity

1. Okum has 7 more goats than Martin. Altogether they have 29 goats. How many goats does Martin have?
2. Nakamatte got 8 more pens than the sister. The sum of their pens is 22. How many pens did the sister get?
3. Kiku is 9 years older than Kapere. Their total age is 29years. How old is Kapere?
4. Muto is 8 years younger than Ongom. If the sum of their age is 24 years. How old is Ongom?
5. A woman earns sh.3000 less than the husband. Their wage is sh.9000.
   a) How much does the man earn?
   b) How much does the woman earn?
6. Sarah has 400 less birds on the farm than Sauda. The sum of the birds on the farm is 2000. How many birds does each have?

7. Ahmed is three times as old as Aminah.Their total age is 60years .How old is Ahmed?

8. Alex is 5 times as old as Anna. Their total age is 90 years. How old is will Ann be in 10 years' time?

9. A book costs thrice as much as a pen. The cost of pen and a book is sh.2400.Find the cost of a pen.

10. A hen costs sh.4500 less than the cost of a cock.If their total cost is sh.45000.Find the cost of a hen?

11. Jane is 10yrs younger than Juma. Their total age 70yrs. How old was Juma 6yrs ago?

MORE APPLICATION OF ALLGEBRA

Examples

1. Ketty is as half as old as Babirye, Their total age is 30 years. How old is Babirye?

Let Babirye's age be y

Babirye's age	Ketty's age	Total age
2y	y	30

$2y + y = 30$

$3y = 30$

$$\frac{3y}{3} = \frac{30}{3}$$

$Y = 10$

Babirye's age = 2x 10 years

                = 20 years

Or

Let Ketty's age be y

Babirye's age	Ketty's age	Total age
$\frac{1}{2}y$	y	30

$$\frac{1}{2}y + y = 30$$

$$\frac{1}{2}y \times \frac{2}{1} + y \times \frac{2}{1} = 30 \times \frac{2}{1} \qquad\qquad \underline{Y= 20}$$

$Y + 2y = 60$

$3y = 60$

$$\frac{3y}{3} = \frac{60}{3}$$

2. A daughter is a quarter her mother's age. The sum of their age is 50 years. How old is the mother?

Let the mother's age be k

Daughter	Mother	Total age
4k	k	50

$4k + k = 50$

$5k = 50$

$$\frac{5k}{5} = \frac{50}{5}$$

$K = 10$

Mother's age = 4x 10 years

= 40 years   OR

Let Mother's age be y

Daughter's age	mother's age	Total age
$\frac{1}{4}y$	y	50

$$\frac{1}{4}y + y = 50$$

$$\frac{1}{4}y \times \frac{4}{1} + y \times \frac{4}{1} = 50 \times \frac{4}{1}$$

Y + 4y   = 200

5y   = 200

$$\frac{5y}{5} = \frac{200}{5}$$

Y= 40 years

3. Alendu is twice as old as Amadu and Atiku is 5 younger than Amadu.Their total age is 55years.How old is Alendu?

Let Amadu's age be w

Amadu	Alendu	Atiku	Total
W	2w	w-5	55

$w + 2w + w - 5 = 55$

4w – 5   = 55

4w – 5 + 5 = 55 + 5   W = 15

4w = 60

$$\frac{4w}{4} = \frac{60}{4}$$

Alendu's age = (2 x 15) years

           = 30 years

4. A man weighs thrice as much as his son and the daughter weighs 5kg more than the son. Their total weight is 95kh.Find the father's weight?

Let the son's weight be w

son	daughter	man	Total
w	W + 5	3w	95kg

w + w + 5 + 3w = 95

    5w + 5   = 95

    5w +5 -5 = 95 - 5

        5w = 90

$$\frac{5w}{5} = \frac{90}{5}$$

     W = 18

Alendu's age = (3 x 18) kg

           = 54 kg

Activity

1. Amako is a third Agombe's age. Their total age is 60 years. How old is Amako?
2. Agnes is a fifth as heavy as Jamie. Their total weight is 9okg.How hold will Agnes be in 10 years' time?
3. A ruler costs a half as much as a pen. The cost of a ruler and a pen is sh.2400.Find the cost of a pen?
4. A chair costs sh.50000 less than the cost of a table and cupboard cost three times the cost of a table. Their total cost is sh.1050,000.Find the cost of a table.
5. Anita is twice as old as Babie and Hanna is 10 years younger than Anita. Their total age is 40 years. How old is Babie now?
6. Jamadah is thrice as old as Joan and Juma is 10years younger Jamadah.The sum of their age is 50 years. How old is Joan now?

APPLICATION OF ALGEBRA

Examples

1. Esau is 5 years older than Moses, in 10 years' time, the of their age will be 45years.

a) How old is Esau now?

Let Moses' age now be k

Period	Moses	Esau	Sum
Now	k	K+5	?
In 10yrs' time	(k+10)	(k+15)	45

K + 10 + k + 15 = 45

K + k + 10 + 15 = 45

$2k + 25 = 45$

$2k + 25 - 25 = 45 - 25$

$2k = 20$

$$\frac{2k}{2} = \frac{20}{2}$$

K = 10 years

Esau's age now = (10 + 5) years

= 15 years

b) How old was Moses 7 years ago?

(10 - 7) years

3 years

3. A man is 10 years older than the son. 5 years ago, the sum of their age was 40 years. How old is the man now?

Let son's age now be k

Period	Son	man	Sum
Now	K	K+10	?
4 years ago	(k - 4)	(k + 6)	40

K - 4 + k + 6 = 40

K + k + 2 = 40

$2k + 2 = 40$

$2k + 2 - 2 = 40 - 2$

$2k = 38$

$$\frac{2k}{2} = \frac{38}{2}$$

K = 19 years

Man's age now = (19 + 10) years

= 29 years

4. A daughter is 20 kg lighter than a father. In 8 years' time, the father will be twice as heavy as the daughter. How heavy is each now?

Let the father's weight now be k

Period	father	daughter
Now	K	K- 20
8years' time	(k + 8)	(k- 12)

K - 4 + k + 6 = 40

K + k + 2 = 40

2(k-12) = k + 8

2k – 24 = k + 8

2k – k = 8 + 24

__K = 32__

5. A man is four times as old as the grandson.10years ago, he was 6 times as old as the grandson. How old is the man now?

Let the grandson's age now be k

Period	grandson	man
Now	K	4k
6years ago	k - 10	4K - 10

6(k - 10) = 4k - 10

6K - 60 = 4k - 10

6k - 4k = -10 + 60

2K = 50

$$\frac{2k}{2} = \frac{50}{5}$$

K = 25

Man's age now = 4 x 25) years

__= 100 years__

Activity

1. In a church, the number of men was half the number of women. The number of children was a third the number of women. Altogether there were 220 people.

a) How many women attended the service?

b) How many more men than children attended the service?

2. A mother is 8kg heavier than the son. In ten years' time, she will be twice as heavy as the son. How old is each now?

3. Tracy is 5 times as old as her son. In 6 years' time, she will be three times as old as the son. How old is each of them now?

4. If Adyeke sold a shirt for sh.6000 she would make a profit, but if she sells it at sh.4500, she would make a loss. If the profit is two times the loss. Find cost price.

INEQUALITIES

Symbols used

$<$ Less than

$\leq$ Less than or equal to

$>$ Greater than

$\geq$ Greater than or equal to

SOLUTION SETS

Solution set is group of possible values that satisfy an inequality

Examples

1. If x is a negative integer, find the solution set for x>-6

    X = {-1,-2,-3,-4,-5}

2. Find the solution set for y<5 if y is a positive integer.

    Y={1,2,3,4,}

3. Find the solution set for x $>$ -4 when x is a negative integer.

    X={-1,-2,-3,-4}

4. Find the solution set for x $\leq$ 5 when x is a whole number.

    X = {0,1,2,3,4,5}

5. Find the solution set for -2<x<2

    X ={-1,0,1}

6. Find the solution set for -1 $\leq$ x $<$ 3

    X = {-1,0,1,2}

7. Find the solution set for -4 $<$ x $\leq$ 4

    X ={-3,-2,1,0,1,2,3,4}

8. Find the solution set for -3 $\leq$ x $\leq$ 3

    X ={-3,-2,-1,0,1,2,3}

Activity

If x is an integer, find the solution set for the following inequalities

   a)x>2   b) x>8   c)x<0   d)x<9   e)x $\geq$ 0   f) x $\leq$ -10 g)x $\geq$ 5   h)x $\geq$ 4

i) 2 $\geq$ x $\geq$ -3 j) 5 $>$ x $>$ 0 k) -3 $\leq$ p $\leq$ 4 l) -2 $<$ y $<$ 3

SOLVING AND FINDING SOLUTION SETS

Examples

Solve and find the solution for the following inequalities

a) K- 9 <5

   K-9+9<5+9

    k<14

   <u>k={13,12,11,10,9,8,7,6,5,4,3,2,1,0,-1…}</u>

b) P+4 <15

   P + 4 – 4 <15 – 4

   P < 11

   <u>P= {…,-2,-1,0,1,2,3,4,5,6,7,8,9,10}</u>

c) 2w -3 $\geqq$ 15

   2w – 3 + 3 $\geqq$ 15+3

   2w $\geqq$ 18

   $\dfrac{2w}{2}$ $\geqq$ $\dfrac{18}{2}$

    W $\geqq$ 9

<u>W={9,10,11,12,13,14,15,…}</u>

d) $\dfrac{2x}{4}$ -3 $\leqq$ 12

$\dfrac{2x}{4}$ -3+3 $\leqq$ 12+3

$\dfrac{2x}{4}$ × 4 $\leqq$ 15×4

2x $\leqq$ 60

$\dfrac{2x}{2}$ $\leqq$ $\dfrac{60}{2}$

  X $\leqq$ 30

<u>X = {…25, 26, 27, 28, 29, 30}</u>

Activity

Solve and find the solution set for the following inequalities

a) a + 4 $\geqq$ 8

b) y + 5 $\geqq$ 7

c) a + 6 $\leqq$ 9

d) w – 6 $\leqq$ 3

e) p – 3 $\geqq$ 2

f) 9k $\geqq$ 45

g) 7x – 3 $\leqq$ 18

> *Ref: New MK pupils' book 6*
> *Pages 461-462*

h) $\dfrac{n}{9}$ 3

i) $\dfrac{3t}{8}$ 8

SOLVING AND FINDING SOLUTION SETS

Examples

Solve and find the solution set for the following inequalities

a) $2(x+1) > 4$

$2x + 2 > 4$

$2x + 2 - 2 > 4 - 2$

$2x > 2$

$\dfrac{2x}{2} > \dfrac{2}{2}$

$X > 1$

$\underline{X = \{2,3,4,5,6,7,8...\}}$

b) $3(x-1) < 15$

$3x - 3 < 15$

$3x - 3 + 3 < 15 + 3$

$3x < 18$

$\dfrac{3x}{3} < \dfrac{18}{3}$

$X < 6$

$\underline{X = \{-2, -1, 0, 1, 2, 3, 4, 5\}}$

c) $8 > 2x > 2$

$\dfrac{8}{2} > \dfrac{2x}{2} > \dfrac{2}{2}$

$4 > x > 1$

$\underline{X = \{2,3\}}$

d) $3x - 5 \leq 8x + 10$

$3x - 8x \leq 10 + 5$

$-5x \leq 15$

$\dfrac{-5x}{-5} \geq \dfrac{15}{-5}$

$X \geq -3$

X= {-3,-2,-1, 0, 1, 2, 3, 4...}

Activity

Solve and find the solution set for the following

   a) $3(y+2) < 6$
   b) $4(a+1) \geq 12$
   c) $6(x-2) \geq 60$
   d) $5(a-3) \geq 10$
   e) $10 \geq 2x \geq -4$

   f) $8 \leq < 4x < 24$
   g) $-15 \leq 3x \leq 24$

Ref: New MK pupils' book 7
Pages 447-449

APPLICATION OF INEQUALITIES

Examples

1. The head teacher's car can maximally accommodate maximally 6 people. a) Show this information in an inequality.
   Let k be the range of people it accommodates
   $K \leq 6$

b) Write a solution set for the inequality.
   K= {1, 2, 3, 4, 5}

2. The interview panel can interview more than seven people but less than thirteen people a day. What possible number of people can the panel interview in a day?

   $7 < y < 13$

Y={8,9,10,11,12}

3. What number can be added to seven gives a number greater than 16?
   Let the number be k
  $K + 7 \geq 16$
  $K+7-7 \geq 16 - 7$
   $K \geq 9$

K={9,10,11,12,13,14,15}

Activity

1. Our room can accommodate people seated in sevens up to maximally 49 people.
   a) Write an inequality for the information

b) What possible number of people can be seated there?

2. What counting number can be added to four to give a number less than 6?

3. Okocha is 8years, Martin is 6 years, and Nakito is 3 years old. A school admits pupils from the age of 5 to 11 years. Which number of the pupils will not be accepted?

4. A ticket states that for children 8 years and below enter freely. Which of the following pupils will gain the entry to the show?

Kato 7years, Sarah 8years, Okoth 10 years and Abby 4 years.

5. Matthew scored 98 marks, otto scored 75 marks, Lillian 98 marks. The pass mark is more than 50.

    a) Which pupil passed the exams?
    b) If p is the pass mark, then which children form the solution set $P \leq 50$?

6. The temperature of a patient was taken.Peter was 36.5^{0c}.Akello 36.2^{0c}, Batte 37^{0c} and Mwesigye 38^{0c}.

a) Using T as the subject, write an inequality.

b) If the normal has a higher temperature possibly fever, which patient is normal?

7. A doctor prescribed a dosage for children. She said for children above 8 years but not less than 17 years take 2 spoonful a day. Write an inequality in which you express the age limit using D?

Ref: New MK pupils' book 7
Pages 450-4551