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WALT adding and subtracting algebraic terms

Success Criteria I know that terms that are alike can be added

[Basics of algebraic expressions](#)

EXAMPLE 1

Simplify the following by adding or subtracting.

a $4k + 6k$ **b** $7w - 3w$ **c** $4k + 7w$

a If k represents the number of marbles in a cup, then $4k$ or $4 \times k =$ number of marbles in 4 cups and $6k$ or $6 \times k =$ number of marbles in 6 cups.
Thus $4k + 6k =$ number of marbles in $(4 + 6)$ cups $= 10 \times k$ or $10k$.

b If w represents the number of marbles in a box, then $7w$ or $7 \times w =$ number of marbles in 7 boxes and $3w$ or $3 \times w =$ number of marbles in 3 boxes.
Thus $7w - 3w =$ number of marbles in $(7 - 3)$ boxes $= 4 \times w$ or $4w$.

c If k represents the number of marbles in a cup and if w represents the number of marbles in a box, then $4k + 7w =$ number of marbles in 4 cups plus the number of marbles in 7 boxes.
Because the units (cups and boxes) are different, we cannot simplify this algebraic expression.

Important notes

Algebraic terms with different pronumerals (different units) are called unlike terms. Unlike terms cannot be added or subtracted. For example:

- $5a$, $14a$ and $23a$ are like terms (same pronumeral a)
- $5a$ and $14a^2$ are unlike terms (different pronumeral forms, a and a^2)
- $5p$, $14a^2q$ and $73d$ are unlike terms (different pronumerals p , a^2q , d)

Now give answers to this

Write an algebraic expression for each of the following.

- | | |
|--|---|
| a The sum of 2 and x | b The sum of ab and y |
| c 5 less than x | d 7 subtracted from $2y$ |
| e The product of x and 3 | f Three times the value of p |
| g Four more than twice x | h The sum of x and y is divided by 5 |
| i 10 less than the product of 4 and x | j 3 lots of x subtracted from 1 |
| k The sum of 3 and y is divided by 2 | l Half of 1 more than x |
| m The square of the sum of m and n | n The sum of the squares of m and n |

Sum (+)
Product (\times)
Twice ($\times 2$)



EXAMPLE 2

Simplify where possible.

a $7x + 3x$

d $8y - y$

b $9w - 3w$

e $6k + 7$

c $7x + 9w$

a $7x + 3x = 7 \times x + 3 \times x$
 $= (7 + 3) \times x$
 $= 10 \times x = 10x$

b $9w - 3w = 9 \times w - 3 \times w$
 $= (9 - 3) \times w$
 $= 6 \times w = 6w$

c $7x + 9w$ cannot be simplified as $7x$ and $9w$ are unlike terms.

d $8y - y = 8 \times y - 1 \times y$
 $= (8 - 1) \times y$
 $= 7 \times y = 7y$

e $6k + 7$ cannot be simplified as $6k$ and 7 are unlike terms.

1 Complete the following to simplify.

a $6a + 9a = \underline{\quad} \times a + \underline{\quad} \times a$
 $= (\underline{\quad} + \underline{\quad}) \times a$
 $= \underline{\quad} \times a = \underline{\quad}$

b $14y - 6y = \underline{\quad} \times y - \underline{\quad} \times y$
 $= (\underline{\quad} - \underline{\quad}) \times y$
 $= \underline{\quad} \times y = \underline{\quad}$

2 Evaluate the expressions $3y + 6y$ and $9y$ using the following values.

a $y = 1$

b $y = 5$

c $y = -2$

Are the values of $3y + 6y$ and $9y$ always the same?

3 Evaluate the expressions $7k - 3k$ and $4k$ using the following values.

a $k = 5$

b $k = 8$

c $k = -3$

Are the values of $7k - 3k$ and $4k$ always the same?

The order of pronumerals in the like terms may be different, for example xy and yx are like terms.

4 Simplify where possible.

a $4a + 7a$

b $6t + 5t$

c $8m + m$

d $10p - 3p$

e $8x - 5x$

f $4b - b$

g $6a + 3b$

h $7y - 4z$

i $11t^2 + 6t^2$

j $8m^2 - 4m^2$

k $9k + 5m$

l $5ab + 6ab$

m $5ab + 2bc$

n $6ab^2 - 4ab^2$

o $3a^2b + 5ab^2$

p $9pq - 9qp$

q $6g^3 + g^3$

r $p + p$

s $9x + 24$

t $24st^2 - 15t^2s$

u $7mn^2 - 3n^2m$

v $32x^2y - 21yx^2$

w $8f - 7f$

x $11c - c$

Check Your Answers

1 a $6 \times a + 9 \times a = (6 + 9) \times a$
 $= 15 \times a = 15a$
b $14 \times y - 6 \times y = (14 - 6) \times y$
 $= 8 \times y = 8y$
2 a $3y + 6y = 3 + 6 = 9, 9y = 9$
b $3y + 6y = 15 + 30 = 45, 9y = 45$
c $3y + 6y = -6 + (-12) = -18, 9y = -18$
 Yes

4

3 a $7k - 3k = 35 - 15 = 20, 4k = 20$
b $7k - 3k = 56 - 24 = 32, 4k = 32$
c $7k - 3k = -21 - (-9) = -12, 4k = -12$
 Yes
4 a $11a$ **b** $11t$ **c** $9m$
d $7p$ **e** $3x$ **f** $3b$
g $6a + 3b$ **h** $7y - 4z$ **i** $17t^2$
j $4m^2$ **k** $9k + 5m$ **l** $11ab$
m $5ab + 2bc$ **n** $2ab^2$ **o** $3a^2b + 5ab^2$
p 0 **q** $7g^3$ **r** $2p$
s $9x + 24$ **t** $9st^2$ **u** $4mn^2$
v $11x^2y$ **w** f **x** $10c$

EXAMPLE 4

Simplify the following.

a $-4f - 5f + 6f$

a $-4f - 5f + 6f = -9f + 6f$
 $= -3f$

b $qr - 8rq + 3rq$

b $qr - 8rq + 3rq = -7qr + 3qr$
 $= -4qr$

The term rq can be rearranged to qr . 

7 Complete the following to simplify.

a $-3x - 5x + 4x$
 $= \underline{\quad} + 4x$
 $= \underline{\quad}$

b $2pq + 4pq - 3pq$
 $= \underline{\quad} - 3pq$
 $= \underline{\quad}$

c $2z - 6z + 3z$
 $= \underline{\quad} + 3z$
 $= \underline{\quad}$

8 Simplify by collecting like terms.

a $7d + 3d - 4d$

d $9q^2 + 5q^2 - q^2$

g $-a + 2a - 5a$

j $-17x^2y - 5x^2y + 3x^2y$

b $8pq - 5pq - 6pq$

e $-4m + m - 2m$

h $-3r + 2r - r$


k $-d^2 + 7d^2 - 13d^2$

c $c + 3c - 5c$

f $18r - 2r - 7r$

i $4a^2b - 3a^2b - ba^2$

l $k^2m - 5k^2m + mk^2$

When collecting like terms remember to include the + or - sign in front of the like terms. 

EXAMPLE 5

Simplify the following by collecting like terms.

a $6m - 7 + 2m$

b $4x^2y + 5p - 3yx^2$

$$\begin{aligned} \mathbf{a} \quad 6m - 7 + 2m &= (6m + 2m) - 7 \\ &= 8m - 7 \end{aligned}$$

$$\begin{aligned} \mathbf{b} \quad 4x^2y + 5p - 3yx^2 &= (4x^2y - 3x^2y) + 5p \\ &= x^2y + 5p \end{aligned}$$

9 Complete the following to simplify.

a $5y - 3 + 4y$
 $= (\underline{\quad} + \underline{\quad}) - 3$
 $= \underline{\quad} - 3$

b $7p + 3q + 5p$
 $= (\underline{\quad} + \underline{\quad}) + 3q$
 $= \underline{\quad} + 3q$

10 Simplify by collecting like terms.

a $7 + 10 - 5m$

b $3a + 6 + 5a$

c $4 + 2n - n$

d $6 - 7q + 12$

e $9 - 5k + 4$

f $3f + 12 + 8f$

g $x^2y - 5 + 2yx^2$

h $13w - 6 - 4w$

i $a^2b + 9 + 11a^2b$

j $5q^2 - 6 + q^2$

k $5x - 4x - 2$

l $p + 3p - 9$

m $6t + 4 - 5t$

n $7k - k - 6l$

o $d^2 + 5d^2 - 3d$

p $4n - n + 2n^2$

q $3c + 2c^2 + 5c$

r $6 + 8n^2 - 5n^2$

s $11mn - 2m + 4nm$

t $5a^2b + 2ab^2 - 4a^2b$

EXAMPLE 6

Simplify by collecting like terms.

a $8 + 4z - 10$

b $-2w - 9t - 5w$

c $-6x - 3y + 2x$

$$\begin{aligned} \mathbf{a} \quad 8 + 4z - 10 &= 4z + 8 - 10 \\ &= 4z - 2 \end{aligned}$$

or $8 + 4z - 10 = -2 + 4z$
 $= 4z - 2$

$$\begin{aligned} \mathbf{b} \quad -2w - 9t - 5w &= -2w - 5w - 9t \\ &= -7w - 9t \end{aligned}$$

or $-2w - 9t - 5w = -9t - 2w - 5w$
 $= -9t - 7w$

$$\begin{aligned} \mathbf{c} \quad -6x - 3y + 2x &= -6x + 2x - 3y \\ &= -4x - 3y \text{ (or } -3y - 4x) \end{aligned}$$

11 Simplify by collecting like terms.

a $6 + 5k - 9$

b $3 - 4s - 7$

c $5m + 2n - 7m$

d $2x - 8y - 5x$

e $5t - 9t + 7u$

f $2a - 4b - 7a$

g $-5d + 4e + 3d$

h $-8z - 4w + 2z$

i $-a - 3b - 2a$

j $6m - 8n - 2m$

k $-3y - 2w - y$

l $-6k + m + 2k$

EXAMPLE 7

Simplify by collecting like terms.

a $9x + 7 - 3x + 10$

b $5a + 7b - 3a + 2b$

a $9x + 7 - 3x + 10 = 9x - 3x + 7 + 10$
 $= 6x + 17$

b $5a + 7b - 3a + 2b = 5a - 3a + 7b + 2b$
 $= 2a + 9b$

12 Complete the following.

a $5x + 9 - 2x - 7$
 $= 5x - 2x + 9 - 7$
 $= \underline{\quad} + \underline{\quad}$

b $7w - 4z - 3w + 2z$
 $= 7w - 3w - 4z + 2z$
 $= \underline{\quad} - \underline{\quad}$

c $-3 + 4d + 7 - d$
 $= -3 + 7 + 4d - d$
 $= \underline{\quad} + \underline{\quad}$

13 Simplify the following expressions by collecting like terms.

a $4a + 6 + 2a + 5$

b $11c^2 + c - 2c^2 + c$

c $x + y + x + y$

d $q^2 + 5 + q^2 - 3$

e $6t + 3v - 2v + 3t$

f $q + 4d + 3q - d$

g $12p + p^2 + 5p^2 - 8p$

h $-8l + 4 - 5l + 6$

i $-n - 2 - 5n - 1$

j $m^2 - m - m^2 - 3m$

k $-d^2 - 7d + 3d^2 - 4d$

l $25 + 8m - 9 + 2m$

m $-13 + 6n - n + 5$

n $6p - 3m + 6p - 3m$

o $7x^2 + 4xy + 8yx - 2x$

14 Simplify by collecting like terms.

a $3c - 7 + 2d - 9 + 6c$

b $n - dc + 3cd + 5n - 8 + 2$

c $-4q - 2 + r - q + 8 + 2q$

d $7e + e^2 + 3 - e^2 - 5e + 6$

e $8 - 3c + 9 - 6 - 4c + 2d - d$

f $15l + 2 - 3l + 7c - 12c + 6$

g $-7 - c + a + 10 + c - 11 - a - c - 8$

h $d - qr + r - q - qr + 6r - 3q + 4d$

i $-12r + s + 6 - t + 5 - 9s + 12r + 7t - 3$

j $ac + 2pa - 6a + 7 - 5ap + 9ac + 12$

Check your answers

- $v \ 11xy$ $w \ j$ $x \ 10c$
5 a $(4 - 7) \times k = -3k$ b $(-2 + 5) \times w = 3w$
 c $(-3 - 2) \times t = -5t$
- 6** a $-n$ b $-2p$ c $-2c$ d $-6q$
 e $3d$ f $-9ac$ g $-3q$ h $7c$
 i $-4yz$ j $5l$ k $-p^2$ l $-2x^2$
 m $-2xy^2$ n $-11pq^2$ o $-3t^2$ p $-2b$
- 7** a $-8x + 4x = -4x$ b $6pq - 3pq = 3pq$
 c $-4z + 3z = -z$
- 8** a $6d$ b $-3pq$ c $-c$ d $13q^2$
 e $-5m$ f $9r$ g $-4a$ h $-2r$
 i 0 j $-19x^2y$ k $-7d^2$ l $-3k^2m$
- 9** a $(5y + 4y) - 3 = 9y - 3$
 b $(7p + 5p) + 3q = 12p + 3q$
- 10** a $17 - 5m$ b $8a + 6$
 c $4 + n$ d $18 - 7q$
 e $13 - 5k$ f $11f + 12$
 g $3x^2y - 5$ h $9w - 6$
 i $12a^2b + 9$ j $6q^2 - 6$
 k $x - 2$ l $4p - 9$
 m $t + 4$ n $6k - 6l$
 o $6d^2 - 3d$ p $3n + 2n^2$
 q $2c^2 + 8c$ r $6 + 3n^2$
 s $15mn - 2m$ t $a^2b + 2ab^2$
- 11** a $-3 + 5k$ or $5k - 3$ b $-4 - 4s$ or $-4s - 4$
 c $-2m + 2n$ or $2n - 2m$ d $-3x - 8y$ or $-8y - 3x$
 e $-4t + 7u$ or $7u - 4t$ f $-5a - 4b$ or $-4b - 5a$
 g $-2d + 4e$ or $4e - 2d$ h $-6z - 4w$ or $-4w - 6z$
 i $-3a - 3b$ or $-3b - 3a$ j $4m - 8n$
 k $-4v - 2w$ or $-2w - 4v$ l $-4k + m$ or $m - 4k$
- 12** a $3x + 2$ b $4w - 2z$
 c $4 + 3d$
- 13** a $6a + 11$ b $9c^2 + 2c$
 c $2x + 2y$ d $2q^2 + 2$
 e $9t + v$ f $4g + 3d$
 g $4p + 6p^2$ h $-13l + 10$
 i $-6n - 3$ j $-4m$
 k $2d^2 - 11d$ l $16 + 10m$
 m $5n - 8$ n $12p - 6m$
 o $7x^2 + 12xy - 2x$
- 14** a $9c + 2d - 16$ b $6n + 2cd - 6$
 c $-3q + r + 6$ d $2e + 9$
 e $11 - 7c + d$ f $12l - 5c + 8$
 g $-16 - c$ h $5d - 2qr + 7r - 4q$
 i $-8s + 6t + 8$ j $10ac - 3ap - 6a + 19$