[Do now using like terms]

Write this in your book
WALT - Multiply algebraic terms
Success Criteria - To multiply algebraic terms I know I need to multiply numbers and multiply the numerals By taking the following steps

1. Leave or remove the multiplication sign between the pronumerals or variables
2. Remove the multiplication sign between the numbers and vaiables (coefficient and variable)
3. Separate numbers and variables and arrange them number first and then variable (group them together)
4. Multiply the numbers and then write the variables in alphabetical order

Checking your understanding

1 Are the following true (T) or false (F)?

a $3 \times a$ can be written as $3a$.
b $k \times 5$ can be written as $5k$.
c $2x$ is short for $2 + x$.
d $4ab$ could also be written as $4a \div b$.
e $q \times q$ can be written as q^2.

EXAMPLE 1

Simplify the following.
a $p \times s$ **b** $p \times p$ **c** $3p \times s$ **d** $5 \times 2k$ **e** $3p \times 2s$ **f** $4pq \times 3ps$

a $p \times s = ps$ (leave out the multiplication sign between the pronumerals)
b $p \times p = pp$ or p^2
c $3p \times s = 3 \times p \times s = 3ps$ (leave out the multiplication sign between the numbers and pronumerals)
d $5 \times 2k = 5 \times 2 \times k$ (split into numerical and pronumeral parts)
$= 10 \times k = 10k$
e $3p \times 2s = 3 \times p \times 2 \times s$ (split into numerical and pronumeral parts)
$= 3 \times 2 \times p \times s$ (group the numbers together and the pronumerals together)
$= 6 \times ps = 6ps$
f $4pq \times 3ps = 4 \times p \times q \times 3 \times p \times s$ (split into numerical and pronumeral parts)
$= 4 \times 3 \times p \times q \times p \times s$ (group the numbers and pronumerals together)
$= 4 \times 3 \times p \times p \times q \times s$
$= 12 \times p^2qs = 12p^2qs$

1 Complete the following to simplify.

a $5t \times w = \_\_\_ \times \_\_\_ \times w = \_\_\_$

b $4 \times 3m = 4 \times \_\_\_ \times \_\_\_ = \_\_\_$

c $7y \times 2 = \_\_\_ \times y \times \_\_\_$
$= \_\_\_ \times \_\_\_ \times y = \_\_\_$

d $3p^2 \times 7q = \_\_\_ \times p^2 \times \_\_\_ \times q$
$= \_\_\_ \times \_\_\_ \times p^2 \times q = \_\_\_$

e $2ab \times 3a = \_\_\_ \times a \times b \times \_\_\_ \times a$
$= \_\_\_ \times \_\_\_ \times a \times a \times b = \_\_\_$

2 Simplify the following.

a $4x \times y$	**b** $3k \times m$	**c** $x \times 5y$	**d** $4 \times 7w$
e $5 \times 4k$	**f** $6 \times 10p$	**g** $2x \times 8$	**h** $6z \times 3$
i $3m \times 4n$	**j** $6v \times 2w$	**k** $4p^2 \times 7q$	**l** $5a \times 6b^2$
m $4ab \times 5c$	**n** $3xz \times 6xy$	**o** $10pq \times 2qr$	**p** $5bc \times 7bc$
q $2 \times 3a \times 4b$	**r** $2a \times 3b \times 4c$	**s** $4p \times 5q \times 2r$	**t** $3a \times 4a \times 3c$

EXAMPLE 2

Simplify the following.

a $-5 \times 3t$

b $-2m \times -3n$

Remember: When multiplying two integers:
If the signs are the same, the answer is positive.
If the signs are different, the answer is negative.

a $-5 \times 3t = -5 \times 3 \times t$
$= -15t$

b $-2m \times -3n = -2 \times m \times -3 \times n$
$= -2 \times -3 \times m \times n$
$= 6mn$

3 Simplify the following.

a $-2 \times 5x$	**b** $-5 \times 4y$	**c** $-6 \times -2w$	**d** $-4 \times -8z$
e $4 \times -3m$	**f** $10 \times -8p$	**g** $-3m \times 2n$	**h** $4a \times -5b$
i $-6x \times -2y$	**j** $-9s \times -2t$	**k** $-4p^2 \times 6q$	**l** $-5a \times 8a$
m $-2p \times -5p$	**n** $4mn \times -2mp$	**o** $-5abc \times -6b$	**p** $-7mn \times 4kn$

Check your answers

1 **a** $5 \times t \times w = 5tw$
b $4 \times 3 \times m = 12m$
c $7 \times y \times 2 = 7 \times 2 \times y = 14y$
d $3 \times p^2 \times 7 \times q = 3 \times 7 \times p^2 \times q = 21p^2q$
e $2 \times a \times b \times 3 \times a = 2 \times 3 \times a \times a \times b = 6a^2b$

2 **a** $4xy$ **b** $3km$ **c** $5xy$
d $28w$ **e** $20k$ **f** $60p$
g $16t$ **h** $18z$ **i** $12mn$
j $12vw$ **k** $28p^2q$ **l** $3ab^2$
m $20abc$ **n** $18x^2yz$ **o** $20pq^2r$
p $35b^2c^2$ **q** $24ab$ **r** $24abc$
s $40pqr$ **t** $36a^2c$

3 **a** $-10x$ **b** $-20y$ **c** $12w$
d $32z$ **e** $-12m$ **f** $-80p$
g $-6mn$ **h** $-20ab$ **i** $12xy$
j $18st$ **k** $-24p^2q$ **l** $-40a^2$
m $10p^2$ **n** $-8m^2np$ **o** $30ab^2c$
p $-28kmn^2$

Multiplying terms with squares

Simplify $3xy \times 5xz$.

Solution	Explanation
$3xy \times 5xz = 3 \times x \times y \times 5 \times x \times z$ $= 3 \times 5 \times x \times x \times y \times z$ $= 15x^2yz$	Write the expression with multiplication signs and bring the numbers to the front. Simplify, remembering that $x \times x = x^2$.

Simplify the following.

a $x \times x$ **b** $a \times a$ **c** $3d \times d$
d $5d \times 2d \times e$ **e** $7x \times 2y \times x$ **f** $5xy \times 2x$
g $4xy \times 2xz$ **h** $4abc \times 2abd$ **i** $12xy \times 4x$
j $9ab \times 2a$ **k** $3xy \times 2x \times 4y$ **l** $2ab \times 4a \times 3b$

Write each expression without a division sign.

a $k \div 4$ **b** $x \div 5$ **c** $2q \div 5$ **d** $3k \div 10$
e $5 \div a$ **f** $a \div b$ **g** $x \div y$ **h** $12 \div g$

$\frac{k}{4}$ is the same as $k \div 4$.

Check your answers

a x^2 **b** a^2 **c** $3d^2$ **d** $10d^2e$
e $14x^2y$ **f** $10x^2y$ **g** $8x^2yz$ **h** $8a^2b^2cd$
i $48x^2y$ **j** $18a^2b$ **k** $24x^2y^2$ **l** $24a^2b^2$
a $\frac{k}{4}$ **b** $\frac{x}{5}$ **c** $\frac{2q}{5}$ **d** $\frac{3k}{10}$
e $\frac{5}{a}$ **f** $\frac{a}{b}$ **g** $\frac{x}{y}$ **h** $\frac{12}{g}$

Extension Activities

12 Marcela buys 7 plants from the local nursery.

- **a** If the cost is \$10 for each plant, what is the total cost?
- **b** If the cost is \$$x$ for each plant, write an expression for the total cost in dollars.
- **c** If the cost of each plant is decreased by \$3 during a sale, write an expression for:
  - **i** the new cost per plant in dollars
  - **ii** the new total cost in dollars of the 7 plants.

13 Francine earns \$$p$ per week for her job. She works for 48 weeks each year. Write an expression for the amount she earns:

- **a** in a fortnight
- **b** in one year (of 48 weeks)
- **c** in one year if her wage is increased by \$20 per week after she has already worked 30 weeks in the year.

DVD Dilemma

14 Tom would like to purchase some DVDs of two television shows.

- **a** Write an expression for the total cost of:
  - **i** 4 seasons of Numbers
  - **ii** 7 seasons of Proof by Induction
  - **iii** 5 seasons of both shows
  - **iv** all 7 seasons of both shows, if the final price is halved in a sale.
- **b** If a is 20 and b is 30, how many DVDs could he buy for \$200?

\$ b per season

\$ a per season

Towels cost $\$c$ each at a shop.

a John buys 3 towels, Mary buys 6 towels and Naomi buys 4 towels. Write a fully simplified expression for the total amount spent on towels.

b On another occasion, Chris buys n towels, David buys twice as many as Chris and Edward buys 3 times as many as David. Write a simplified expression for the total amount they spent on towels.

a Make a substitution to prove that $4a + 3b$ is not equivalent to $7ab$.

b Is $4a + 3b$ ever equal to $7ab$? Try to find some values of a and b to make $4a + 3b = 7ab$ a true equation.

c Is $4a + 3a$ ever not equal to $7a$? Explain your answer.

Check your answers