

# 14. [Algebra - Expressions]

## Skill 14.1 Writing expressions to represent word problems.

MMMauve 11 22 33 44  
MMLime 11 22 33 44

- Write the expression using the variables and/or the numbers mentioned in the word problem.
- Decide about the operation or operations needed in the expression.

Example:  $a + b$  (sum of  $a$  and  $b$ ),  $4n$  (product of 4 and  $n$ ),  $m - 20$  (20 less than  $m$ )

Hint: "Sum, all together, in total, more than"  $\Rightarrow$  addition  $\Rightarrow +$

"Difference, less than, change"  $\Rightarrow$  subtraction  $\Rightarrow -$

"Product, times, lots of"  $\Rightarrow$  multiplication  $\Rightarrow \cdot$

"A fraction (half, third, quarter) of"  $\Rightarrow$  division  $\Rightarrow \div$

**Q.** Lisa earns a weekly wage of  $w$  dollars. How much money did she earn in a fortnight, if she received a \$300 bonus?

**A.**  $w$  dollars a week  
2 weeks in a fortnight }  $\Rightarrow 2$  times  $w$   
\$300 bonus  $\Rightarrow +$   
 $\Rightarrow 2 \cdot w + 300$  or  $2w + 300$

The  $\cdot$  sign can be left out

**a)** Write as an expression:  
The sum of  $d$  and 20.

$sum \Rightarrow + \Rightarrow \boxed{d + 20}$

**c)** Write as an expression:  
The number 15 less than  $p$ .

$\Rightarrow \boxed{\phantom{000}}$

**e)** Write as an expression:  
The product of  $-8$  and  $t$ .

$\Rightarrow \boxed{\phantom{000}}$

**g)** Lily had  $d$  dollars and spent a third of her money. How much money did she spend?

$a$  third of  $\Rightarrow \div \Rightarrow \boxed{\frac{d}{3}}$   
or  $d \div 3$

**i)** You pay \$50 dollars at the gas station. How much change do you get if the gas was  $p$  dollars?

$\Rightarrow \boxed{\phantom{000}}$

**k)** Write as an expression:  
Twice the product of  $p$  and  $q$ .

$\Rightarrow \boxed{\phantom{000}}$

**b)** Write as an expression:  
The number seven times  $y$ .

$\Rightarrow \boxed{\phantom{000}}$

**d)** Write as an expression:  
Nine lots of  $s$ .

$\Rightarrow \boxed{\phantom{000}}$

**f)** Write as an expression:  
The sum of  $2u$  and  $3v$ .

$\Rightarrow \boxed{\phantom{000}}$

**h)** Out of the  $t$  tickets for sale, a quarter remained unsold. How many tickets remained unsold?

$\Rightarrow \boxed{\phantom{000}}$

**j)** There are  $a$  local and  $b$  imported products at the supermarket. How many products are there all together?

$\Rightarrow \boxed{\phantom{000}}$

**l)** Write as an expression:  
The number 6 less than the product of  $a$  and  $b$ .

$\Rightarrow \boxed{\phantom{000}}$

- Leave out the multiplication sign between letters or between letters and numbers.  
Example:  $1 \cdot a = 1a = a$
- Write the number first, followed by the letters.  
Example:  $m \cdot 3 = 3m$
- Write the letters in alphabetical order.  
Example:  $c \cdot a \cdot b = abc$
- Replace the division sign with a fraction line.  
Example:  $m \div n = \frac{m}{n}$
- Use the sign rules:  $++=+$ ,  $--=+$ ,  $+-=-$ ,  $-+=-$  (see skill 8.3, page 87)

Q. Rearrange  $p \cdot 3 \cdot m$

A.  $p \cdot 3 \cdot m =$  *The  $\cdot$  signs can be left out*

$= 3mp$

*number first*

*alphabetical order*

a) Rearrange  $j \cdot 5$  *number first*  
*The  $\cdot$  sign can be left out*

b) Rearrange  $y \cdot 7$

c) Rearrange  $n \cdot m \cdot o$

d) Rearrange  $h \cdot g \cdot f$

e) Rearrange  $6 \cdot z \cdot y$

f) Rearrange  $4 \cdot u \cdot r$

g) Rearrange  $3 \cdot x \div 2$   *$\div$  becomes fraction line*  
*The  $\cdot$  sign can be left out*

h) Rearrange  $6 \cdot z \div 5$

i) Rearrange  $4 \cdot b \cdot d \cdot c$

j) Rearrange  $y \cdot 3 \cdot x \cdot z$

k) Rearrange  $w \cdot (-z) \cdot 5 \cdot m$

l) Rearrange  $c \cdot 8 \cdot d \cdot (-b)$

m) Rearrange  $s \cdot r^2 \cdot 2$

n) Rearrange  $j \cdot k^2 \cdot (-1)$

o) Rearrange  $r \cdot 5 \cdot s \div t$

p) Rearrange  $x \cdot 5 \cdot y \div (-z)$

### Skill 14.3 Finding like terms.

- Look at the combination of letters in all terms.

EITHER

- Find the **like terms**, terms that have the same combination of letters.

Example:  $4c$  and  $-c$   
 $-2x^2$  and  $5x^2$  like terms  
 $-ab$ ,  $5ba$  and  $3ba$

OR

- Find the **unlike terms**, terms that don't have the same combination of letters.

Example:  $2k$  and  $2k^2$   
 $5w$  and  $vw$  unlike terms  
 $3xy$ ,  $x$  and  $y$

Hint: The order of the letters in a term doesn't matter.  
 $gh = hg$ ,  $mn^2 = n^2m$

**Q.** Choose the like terms:

$a^2b$ ,  $-ab$ ,  $4ba$

**A.**  $4ba = 4ab$

$-ab$  and  $4ab$  have the same combination of letters ( $ab$ )

$\Rightarrow -ab$  and  $4ba$  are like terms.

**a)** Choose the like terms:

$8a$ ,  $3$ ,  $5a$

like terms

$8a, 5a$

**b)** Choose the like terms:

$-2$ ,  $-2m$ ,  $3m$

**c)** Choose the like terms:

$m^2$ ,  $3m$ ,  $3m$

unlike terms

**d)** Choose the like terms:

$t^2$ ,  $2t$ ,  $-t^2$

**e)** Choose the like terms:

$3cd$ ,  $dc$ ,  $3c$

$3cd, dc$

**f)** Choose the like terms:

$-bc$ ,  $5c$ ,  $5cb$

**g)** Choose the like terms:

$3t^2$ ,  $-2t$ ,  $4$ ,  $3t$

**h)** Choose the like terms:

$-6w$ ,  $8$ ,  $w^2$ ,  $w$

**i)** Choose the like terms:

$3s$ ,  $2.3s$ ,  $s^2$ ,  $2.3$

**j)** Choose the like terms:

$-0.2y$ ,  $-0.2y^2$ ,  $2y$ ,  $2.2$

**k)** Choose the like terms:

$v^2$ ,  $-2v$ ,  $u^2$ ,  $-2v^2$

**l)** Choose the like terms:

$4k$ ,  $4k^2$ ,  $l^2$ ,  $-k^2$

**m)** Choose the like terms:

$z^2$ ,  $8z$ ,  $-8z^2$ ,  $z^3$

**n)** Choose the like terms:

$g$ ,  $g^2$ ,  $-4g^2$ ,  $g^3$

**o)** Choose the like terms:

$-xy$ ,  $x^2y$ ,  $2yx^2$ ,  $2xy^2$

**p)** Choose the like terms:

$a^2b$ ,  $2ab$ ,  $2ba^2$ ,  $-ab^2$

## Skill 14.4 Simplifying expressions by adding and subtracting like terms.

- Group like terms. (see skill 14.3, page 155)
- Read the sign in front of each term.
- Add and/or subtract only the like terms.
- Add and/or subtract the coefficients first, then copy the letter combination.

Example:  $3g + 5g = (3 + 5)g = 8g$

coefficients

- Write coefficient 1 in front of any pronumeral.

Example:  $a = 1a, -b = -1b, c^2 = 1c^2$

Hint: Unlike terms cannot be added or subtracted.

$x^2 = 1x^2$

Q. Simplify  $3x^2 - 6x + x^2 + 7x$

A.  $\frac{3x^2 - 6x + x^2 + 7x}{3+1=4} = \frac{3x^2 + 1x^2 - 6x + 7x}{x^2 = 1x^2} = \frac{4x^2 + 1x}{-6+7=1} = 4x^2 + x$

group like terms

a) Simplify  $2m + m$

$= 2m + 1m = \boxed{3m}$

b) Simplify  $5cd + dc$

$= 5cd + 1cd = \boxed{\phantom{000}}$

c) Simplify  $4j - 3j + 2j$

$= \phantom{000} = \boxed{\phantom{000}}$

d) Simplify  $7xy - 5xy + xy$

$= \phantom{000} = \boxed{\phantom{000}}$

e) Simplify  $5a + 3b - 2a$  group like terms

$= 5a - 2a + 3b = \boxed{\phantom{000}}$

f) Simplify  $t^2 + 3t + 2t^2$

$= \phantom{000} = \boxed{\phantom{000}}$

g) Simplify  $6ad + 2d - 5da + 3d$  group like terms

$= 6ad - 5ad + 2d + 3d = \boxed{\phantom{000}}$

h) Simplify  $3m + 5n - 4m - n$

$= \phantom{000} = \boxed{\phantom{000}}$

i) Simplify  $4p^2 - p^2 - 3p + 2p^2$

$= \phantom{000} = \boxed{\phantom{000}}$

j) Simplify  $3y^2 - 2yz - y^2 + 3zy$

$= \phantom{000} = \boxed{\phantom{000}}$

k) Simplify  $2r^2 + s^2 + r^2 - 4s^2$

$= \phantom{000} = \boxed{\phantom{000}}$

l) Simplify  $-3x - x^2 + x + 4x^2$

$= \phantom{000} = \boxed{\phantom{000}}$

m) Simplify  $3d - d^2e - 2ed^2 - 4d$

$= \phantom{000} = \boxed{\phantom{000}}$

n) Simplify  $3ab^2 - 2ab^2 - 4a^2b + a^2b$

$= \phantom{000} = \boxed{\phantom{000}}$

- Read the sign in front of each term.
- Multiply the coefficients.
- Multiply the letters.
- Use the sign rules:  $++=+$ ,  $--=+$ ,  $+--=-$ ,  $-+-=-$  (see skill 8.3, page 87)

Example:  $2u \cdot -3v = (2 \cdot -3) \cdot (u \cdot v) = -6 \cdot uv = -6uv$

coefficients

+---

- Write coefficient 1 in front of any letter.

Example:  $a = 1a$ ,  $-b = -1b$ ,  $c^2 = 1c^2$

Hint: Any terms can be multiplied.

Q. Simplify  $(-3cd) \cdot 4c \cdot (-d)$

multiply the coefficients

A.  $(-3cd) \cdot 4c \cdot (-d) =$

multiply the letters

$= -3 \cdot 4 \cdot (-1) \cdot cd \cdot c \cdot d =$

---+

$= -12 \cdot (-1) \cdot c^2d \cdot d =$

$= 12 \cdot c^2d^2$

$= 12c^2d^2$

a) Simplify  $4 \cdot 3v$

$= 4 \cdot 3 \cdot v = 12v$

b) Simplify  $3xy \cdot 5$

$= \dots = \dots$

c) Simplify  $2m \cdot 7n$

$= \dots = \dots$

d) Simplify  $(-8j) \cdot 5k$

$= \dots = \dots$

e) Simplify  $(-4d) \cdot (-5e)$

$= \dots = \dots$

f) Simplify  $3b \cdot 6b$

$= \dots = \dots$

g) Simplify  $(-10xz) \cdot 3z$

$= \dots = \dots$

h) Simplify  $(-4gh) \cdot 5g$

$= \dots = \dots$

i) Simplify  $2s \cdot (-5t) \cdot 3s$

$= 2 \cdot (-5) \cdot 3 \cdot s \cdot t \cdot s = -30s^2t$

j) Simplify  $(-4p) \cdot 2q \cdot 3p$

$= \dots = \dots$

k) Simplify  $3jk \cdot (-5k) \cdot (-j)$

$= \dots = \dots$

l) Simplify  $(-bc) \cdot (-5c) \cdot 5c$

$= \dots = \dots$

- Read the sign in front of each term.
- Write the division as a fraction.
- Simplify by dividing the coefficients.
- Simplify by dividing the letters.
- Use the sign rules:  $++=+$ ,  $--=+$ ,  $+-=-$ ,  $-+=-$  (see skill 8.3, page 87)
- Write coefficient 1 in front of any letter.  
Example:  $a = 1a$ ,  $-b = -1b$ ,  $c^2 = 1c^2$

**Q.** Simplify  $(-30x^2y) \div (3y)$

**A.**  $(-30x^2y) \div (3y) =$   
 $= -\frac{30x^2y}{3y}$  *Simplify:  $\div 3$*   
 $= -\frac{10x^2y}{1y}$  *Simplify:  $\div y$*   
 $= -10x^2$

**a)** Simplify  $12y \div 3$

$= \frac{12y}{3}$   
 $= \frac{4y}{1}$  4y

**b)** Simplify  $24pq \div 4$

$= \frac{24pq}{4}$   
 $= \frac{6pq}{1}$  6pq

**c)** Simplify  $(14a) \div (2a)$   *$a \div a = 1$*

$= \frac{14a}{2a}$   
 $= \frac{7a}{1}$  7a

**d)** Simplify  $(-35mn) \div (-5n)$   *$--=+$*

$= \frac{-35mn}{-5n}$   
 $= \frac{7m}{1}$  7m

**e)** Simplify  $(-15z^2) \div (3z)$   *$-+=-$*

$= \frac{-15z^2}{3z}$   *$z^2 \div z = z$*   
 $= \frac{-5z}{1}$  -5z

**f)** Simplify  $(-12xy) \div (2y)$

$= \frac{-12xy}{2y}$   
 $= \frac{-6x}{1}$  -6x

**g)** Simplify  $(18x) \div (15x)$

$= \frac{18x}{15x}$   
 $= \frac{6}{5}$  6/5

**h)** Simplify  $(20cd) \div (cd)$

$= \frac{20cd}{cd}$   
 $= \frac{20}{1}$  20

**i)** Simplify  $(11ab) \div (-11b)$

$= \frac{11ab}{-11b}$   
 $= \frac{-a}{1}$  -a

**j)** Simplify  $(-25c^2d) \div (5c)$

$= \frac{-25c^2d}{5c}$  *Simplify:  $\div 5$  then  $\div c$*   
 $= \frac{-5c^2d}{1}$  -5c<sup>2</sup>d

**k)** Simplify  $(20xy) \div (4x) \cdot xz$

$= \frac{20xy}{4x} \cdot xz = 5y \cdot xz$   
 $= 5xyz$  5xyz

**l)** Simplify  $(27gh) \div (9g) \cdot gi$

$= \frac{27gh}{9g} \cdot gi = 3hi$  3hi