

16. [Expressions]

Skill 16.1 Writing expressions to represent word problems.

MM5.2 11 22 33 44
MM10 1 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, altogether, in total, more than" \Rightarrow addition $\Rightarrow +$

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

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

"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 $\Rightarrow +$
 $\Rightarrow 2 \times w + 300$ or $2w + 300$

The \times sign can be left out

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

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

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

$\Rightarrow \boxed{7y}$

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

$\Rightarrow \boxed{p - 15}$

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

$\Rightarrow \boxed{9s}$

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

$\Rightarrow \boxed{-8t}$

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

$\Rightarrow \boxed{2u + 3v}$

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

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

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

$\Rightarrow \boxed{\frac{t}{4}}$

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

$\Rightarrow \boxed{50 - p}$

j) There are a local and b imported products at the supermarket. How many products are there altogether?

$\Rightarrow \boxed{a + b}$

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

$\Rightarrow \boxed{2pq}$

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

$\Rightarrow \boxed{ab - 6}$

Skill 16.2 Simplifying expressions.

MM5.2 1 1 2 2 3 3 4 4
MM10 1 1 2 2 3 3 4 4

- Leave out the multiplication sign between letters or between letters and numbers.
Example: $1 \times a = 1a = a$
- Write the number first, followed by the letters.
Example: $m \times 3 = 3m$
- Write the letters in alphabetical order.
Example: $c \times a \times b = abc$
- Replace the division sign with a fraction line.
Example: $m \div n = \frac{m}{n}$
- Use the sign rules: $++=+$ $--=+$ $+-=-$ $-+=-$ (see skill 9.1, page 91)

Q. Simplify $p \times 3 \times m$

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

$= 3mp$

number first

alphabetical order

a) Simplify $j \times 5$

number first

The \times sign can be left out

$5j$

b) Simplify $y \times 7$

c) Simplify $n \times m$

d) Simplify $h \times g$

e) Simplify $6 \times z \times y$

f) Simplify $4 \times u \times r$

g) Simplify $3 \times x \div 2$

\div becomes fraction line

The \times sign can be left out

$\frac{3x}{2}$

h) Simplify $6 \times z \div 5$

i) Simplify $4 \times b \times b$

$b \times b = b^2$

j) Simplify $3 \times a \times -a$

$+ \times - = -$

k) Simplify $w \times z \times w$

l) Simplify $c \times d \times -c$

m) Simplify $s \times r^2 \times 2$

n) Simplify $j \times k^2 \times -1$

m) Simplify $s \times r^2 \times 2$

n) Simplify $j \times k^2 \times -1$

o) Simplify $r \times 5 \times s \div t$

p) Simplify $2 \times a \times b \div c$

q) Simplify $u \times 10 \times v \div -w$

r) Simplify $g \times 6 \times h \div -i$

Skill 16.3 Finding like terms.

MM5.2 11 2 2 33 44
MM10 11 2 2 33 44

- 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 do not have the same combination of letters.

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

Hint: The order of the letters in a term does not 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 , $3m^2$, $3m$

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:

$-5w$, $-5w^4$, -5 , w^4

p) Choose the like terms:

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

q) Choose the like terms:

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

r) Choose the like terms:

$3t^2u^2$, $3tu$, $-tu^2$, $3u^2t$

Skill 16.4 Simplifying expressions by adding and subtracting like terms.

MM5.2 11 22 3 3 4 4
MM10 11 22 3 3 4 4

- Group like terms. (see skill 16.3, page 165)
- 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.

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

A. $3x^2 - 6x + x^2 + 7x =$ group like terms

$= 3x^2 + 1x^2 - 6x + 7x$ $3+1=4$ $x^2 = 1x^2$ $-6+7=1$

$= 4x^2 + 1x$

$= 4x^2 + x$

a) Simplify $2m + m$

$= 2m + 1m =$ 3m

b) Simplify $5cd + dc$

$= 5cd + 1cd =$

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

$=$

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

$=$

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

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

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

$=$

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

$= 6ad - 5ad + 2d + 3d =$

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

$=$

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

$=$

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

$=$

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

$=$

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

$=$

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

$=$

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

$=$

Skill 16.5 Simplifying expressions by multiplying terms.

MM5.2 11 22 33 44
MM10 11 22 33 44

- Read the sign in front of each term.
- Multiply the coefficients.
- Multiply the letters.
- Use the sign rules: $++=+$ $--=+$ $+--=-$ $-+-=-$ (see skill 9.1, page 91)

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

(Annotations: "coefficients" points to 2 and -3; "+ x - = -" points to the signs)

- Write coefficient 1 in front of any pronumeral.

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

Hint: Any terms can be multiplied.

Q. Simplify $-3cd \times 4c \times -d$

(Annotation: "x the coefficients" points to -3, 4, and -1)

A. $-3cd \times 4c \times -d =$

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

(Annotation: "- x - = +" points to the signs)

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

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

$= 12c^2d^2$

(Annotation: "x the letters" points to c, d, c, d)

a) Simplify $4 \times 3v$

$= (4 \times 3) \times v$

(Annotation: "x the coefficients" points to 4 and 3)

$= 12v$

b) Simplify $3xy \times 5$

$=$

$=$

c) Simplify $2m \times 7n$

$=$

$=$

d) Simplify $-8j \times 5k$

$=$

$=$

e) Simplify $-4d \times -5e$

$= (-4 \times -5) \times (d \times e)$

(Annotation: "- x - = +" points to the signs)

$= 20de$

f) Simplify $3b \times 6b$

$=$

$=$

(Annotation: "b x b = b^2" points to the letters)

g) Simplify $2v \times -12w$

$=$

$=$

h) Simplify $-4ab \times 7b$

$=$

$=$

i) Simplify $-10xz \times 3z$

$=$

$=$

j) Simplify $-4gh \times 5g$

$=$

$=$

k) Simplify $2s \times -5t \times 3s$

$= (2 \times -5 \times 3) \times (s \times t \times s) =$

$=$

$=$

l) Simplify $-4p \times 2q \times 3p$

$=$

$=$

m) Simplify $3jk \times -5k \times -j$

$=$

$=$

n) Simplify $-bc \times -5c \times 5c$

$=$

$=$

Skill 16.6 Simplifying expressions by dividing terms.

MM5.2 11 22 33 44
MM10 11 22 33 44

- 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 9.1, page 91)
- Write coefficient 1 in front of any pronomeral.
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: $\div 3$

$$= -\frac{10x^2y}{y}$$

Simplify: $\div y$

$$= -10x^2$$

a) Simplify $12y \div 3$

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

b) Simplify $24pq \div 4$

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

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

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

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

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

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

$$= -\frac{15z^2}{3z} = \boxed{-5z}$$

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

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

g) Simplify $18x \div 15x$

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

h) Simplify $20cd \div cd$

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

i) Simplify $-24t^2 \div 8t$

$$= \frac{-24t^2}{8t} = \boxed{-3t}$$

j) Simplify $11ab \div -11b$

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

k) Simplify $-25v^2w \div 5w$

$$= -\frac{25v^2w}{5w} = \boxed{-5v^2}$$

l) Simplify $-45ab^2 \div 9b$

$$= \frac{-45ab^2}{9b} = \boxed{-5ab}$$

m) Simplify $20xy \div 4x \times xz$

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

n) Simplify $27gh \div 9g \times gi$

$$= \frac{27gh}{9g} \times gi = 3h \times gi = \boxed{3ghi}$$