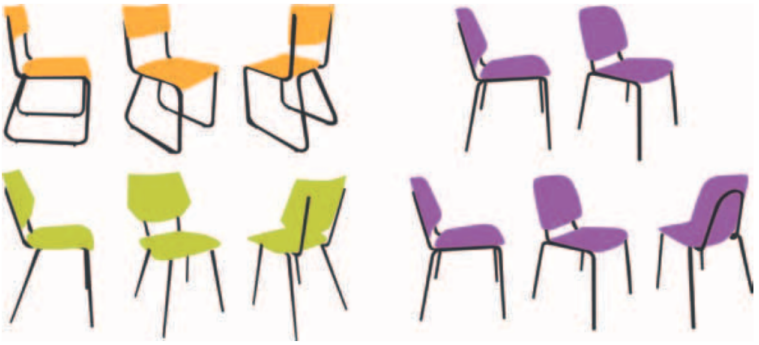
WALT
Success Criteria

When combining the operations of addition, subtraction, multiplication and division, a special order needs to be followed. Multiplication and division sit higher in the order than addition and subtraction. This affects how we might make sense of simple mathematical problems put into words.

Consider these two statements.

- 2 groups of 3 chairs plus 5 chairs
- 5 chairs plus 2 groups of 3 chairs



In both cases, there are $2 \times 3 + 5 = 11$ chairs. This means that $2 \times 3 + 5 = 5 + 2 \times 3$.
This also suggests that for $5 + 2 \times 3$, the multiplication should be done first.

Let's start: Make it true!

Can you insert a pair of brackets to make the following true?

- $2 + 3 \times 5 = 25$
- $3 \times 2 + 6 = 24$
- $20 \div 8 - 3 = 4$
- $7 - 1 \div 3 = 2$

Discuss whether you think the following need brackets to make them true.

- $2 + 6 \times 1 = 8$
- $10 \div 2 + 3 = 2$

- When working with more than one operation:
  - Deal with **brackets** first.
  - Do **multiplication** and **division** next, working from left to right.
  - Do **addition** and **subtraction** last, working from left to right.

$7 \div (4 + 3)$

1st: $4 + 3 = 7$

2nd: $7 \div 7 = 1$

$4 \times (2 + 3) - 12 \div 6$

1st: $2 + 3 = 5$

2nd: $4 \times 5 = 20$

3rd: $12 \div 6 = 2$

last: $20 - 2 = 18$

1 Which goes first?

a addition or multiplication
b brackets or division
c subtraction or brackets
d multiplication or subtraction

2 Which operation (addition, subtraction, multiplication or division) is done first in these problems?

a $2+5-3$ **b** $5\div5\times2$ **c** $2\times3\div6$
d $5\times2+3$ **e** $7\div7-1$ **f** $(6+2)\times3$
g $(8\div4)-1$ **h** $4+7\times2$ **i** $8-10\div5$
j $10-2+3$ **k** $6+2\times3-1$ **l** $5\times(2+3\div3)-1$

Teacher discussion

Use order of operations to answer these problems.

a $5+10\div2$ **b** $3\times(2+4)$ **c** $5\times2-8\div4$
d $6\times(2+10)-24$ **e** $18-2\times(4+6)\div5$

Solution	Explanation
a $5+10\div2=5+5$ $=10$	Do the division before the addition.
b $3\times(2+4)=3\times6$ $=18$	Deal with brackets before multiplication.
c $5\times2-8\div4=10-2$ $=8$	Do the multiplication and division before the subtraction.
d $6\times(2+10)-24=6\times12-24$ $=72-24$ $=48$	Deal with brackets first. Do the multiplication before subtraction. Do the subtraction last.
e $18-2\times(4+6)\div5=18-2\times10\div5$ $=18-20\div5$ $=18-4$ $=14$	Deal with brackets first. Do the multiplication and division next, working from left to right. Do the subtraction last.

3 Use order of operations to find the answers to these problems.

a $1+2\times3$ **b** $5+7\times2$ **c** $9-10\div5$
d $4\times(3+2)$ **e** $21\div(3+4)$ **f** $18\div(10-1)$
g $(7+2)\div3$ **h** $(10-4)\times4$ **i** $(6-5)\div1$
j $2+3\times7$ **k** $5+8\times2$ **l** $10-20\div2$
m $22-16\div4$ **n** $6\times3+2\times7$ **o** $1\times8-2\times3$
p $18\div9+60\div3$ **q** $2+3\times7-1$ **r** $40-25\div5+3$
s $63\div3\times7+2\times3$ **t** $78-14\times4+6$ **u** $300-100\times4\div4$

Remember that × and ÷ go before + and –. Work from left to right after you have chosen which operation goes first.

4 Use order of operations to find the answers to these problems.

a $2 \times (3 + 2)$
b $18 \div (10 - 4)$
c $(19 - 9) \div 5$
d $2 \times (3 + 2) - 1$
e $10 \div (3 + 2) + 6$
f $13 \times (10 \div 10) - 13$
g $(100 + 5) \div 5 + 1$
h $2 \times (9 - 4) \div 5$
i $50 \div (13 - 3) + 4$
j $16 - 2 \times (7 - 5) + 6$
k $(7 + 2) \div (53 - 50)$
l $14 - (7 \div 7 + 1) \times 2$
m $(20 - 10) \times (5 + 7) + 1$
n $3 \times (72 \div 12 + 1) - 1$
o $48 \div (4 + 4) \div (3 \times 2)$
p $20 - (3 \times 5 + 1) \div 4$


Deal with brackets first.

Problem-solving and Reasoning

5 Are these statements true or false?

a $5 \times 2 + 1 = (5 \times 2) + 1$
b $10 \times (3 + 4) = 10 \times 3 + 4$
c $21 - 7 \div 7 = (21 - 7) \div 7$
d $9 - 3 \times 2 = 9 - (3 \times 2)$

Find the result if 6 is multiplied by the sum of 2 and 7.

Solution	Explanation
a $6 \times (2 + 7) = 6 \times 9$ $= 54$	First, write the problem using symbols and numbers. Use brackets for the sum since this operation is to be completed first.

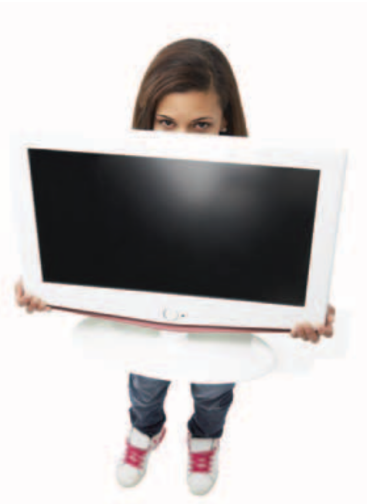
6 Find the answer to these worded problems by first writing the sentence using numbers and symbols.

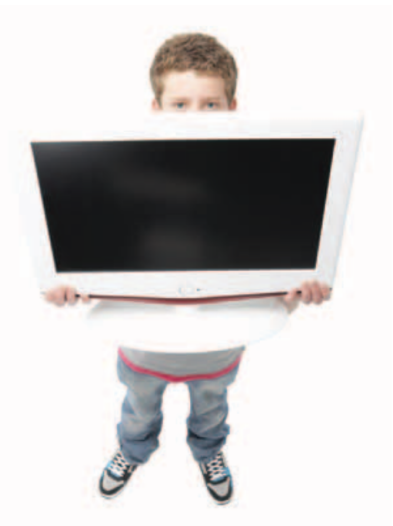

Sum means add.
Difference means subtract.
Product means multiply.
Quotient means divide.

a Triple the sum of 3 and 6.
b Double the quotient of 20 and 4.
c The quotient of 44 and 11 plus 4.
d 5 more than the product of 6 and 12.
e The quotient of 60 and 12 is subtracted from the product of 5 and 7.
f 15 less than the difference of 48 and 12.
g The product of 9 and 12 is subtracted from double the product of 10 and 15.

7 A delivery of 15 boxes of books arrives. Each box contains eight books. The bookstore owner removes three books from each box. How many books still remain in total?

8 In a class, eight students have three TV sets at home, four have two TV sets, 13 have one TV set and two students have no TV sets. How many TV sets are there in total?





9 Insert brackets into these problems to make them true.

a $4 + 2 \times 3 = 18$ **b** $9 \div 12 - 9 = 3$ **c** $2 \times 3 + 4 - 5 = 9$

d $3 + 2 \times 7 - 3 = 20$ **e** $10 - 7 \div 21 - 18 = 1$ **f** $4 + 10 \div 21 \div 3 = 2$

10 Decide if the brackets given in each problem are actually necessary. That is, do they make any difference to the problem?

a $2 + (3 \times 6) = 20$ **b** $(2 + 3) \times 6 = 30$ **c** $(20 \times 2) \times 3 = 120$

d $10 - (5 + 2) = 3$ **e** $22 - (11 - 7) = 18$ **f** $19 - (10 \div 2) = 14$

Extension

Brackets within brackets

11 These problems involve brackets within brackets. Make sure you work with the inner brackets first. (The first one has already been done.)

a $2 \times [(2 + 3) \times 5 - 1] = 2 \times [6 \times 5 - 1] = 2 \times [30 - 1] = 2 \times 29 = 58$

b $[10 \div (2 + 3) + 1] \times 6$

c $26 \div [10 - (17 - 9)]$

d $[6 - (5 - 3)] \times 7$

e $2 + [103 - (21 + 52)] - (9 + 11) \times 6 \div 12$

12 Insert brackets to make the following true. (You may need to use more than one pair.)

a $20 - 31 - 19 \times 2 = 16$

b $50 \div 2 \times 5 - 4 = 1$

c $25 - 19 \times 3 + 7 \div 12 + 1 = 6$

Check your answers

1 **a** multiplication **b** brackets
c brackets **d** multiplication

2 **a** addition **b** division
c multiplication **d** multiplication
e division **f** addition
g division **h** multiplication
i division **j** subtraction
k multiplication **l** division

3 **a** 7 **b** 19 **c** 7 **d** 20
e 3 **f** 2 **g** 3 **h** 24
i 1 **j** 23 **k** 21 **l** 0
m 18 **n** 32 **o** 2 **p** 22
q 22 **r** 38 **s** 153 **t** 28
u 200

4 **a** 10 **b** 3 **c** 2 **d** 9
e 8 **f** 0 **g** 22 **h** 2
i 9 **j** 18 **k** 3 **l** 10
m 121 **n** 20 **o** 1 **p** 16

5 **a** true **b** false **c** false **d** true

6 **a** 27 **b** 10 **c** 8 **d** 77
e 30 **f** 21 **g** 192

7 75 books

8 45 TV sets

9 **a** $(4 + 2) \times 3 = 18$ **b** $9 \div (12 - 9) = 3$
c $2 \times (3 + 4) - 5 = 9$ **d** $(3 + 2) \times (7 - 3) = 20$
e $(10 - 7) \div (21 - 18) = 1$
f $(4 + 10) \div (21 \div 3) = 2$

10 **a** no **b** yes **c** no
d yes **e** yes **f** no

11 **a** 48 **b** 18 **c** 13 **d** 28 **e** 22

12 **a** $[20 - (31 - 19)] \times 2 = 16$
b $50 \div (2 \times 5) - 4 = 1$
c $(25 - 19) \times (3 + 7) \div 12 + 1 = 6$