NS7-2 Order of Operations

We add and subtract the way we read: from left to right.

1. Add or subtract from left to right.

a) $7 + 3 - 2$
$= 10 - 2$
$= 8$

b) $7 - 3 + 2$

c) $8 + 4 + 2$

d) $6 + 4 - 5$

2. a) Do the addition in brackets first.

i) $(4 + 6) + 5$
$= \underline{\quad} + 5$
$= \underline{\quad}$

ii) $4 + (6 + 5)$
$= 4 + \underline{\quad}$
$= \underline{\quad}$

b) Does the answer change depending on which addition you did first?

_____

3. a) Do the subtraction in brackets first.

i) $(7 - 4) - 2$
$= \underline{\quad} - \underline{\quad}$
$= \underline{\quad}$

ii) $7 - (4 - 2)$
$= \underline{\quad} - \underline{\quad}$
$= \underline{\quad}$

b) Does the answer change depending on which subtraction you did first?

_____

If there are brackets in an equation, do the operations in brackets first.

Example: $7 - 3 + 2 = 4 + 2 = 6$ but $7 - (3 + 2) = 7 - 5 = 2$

4. a) Calculate each expression using the correct order of operations.

i) $(15 + 7) - 3 - 1$

ii) $15 + (7 - 3) - 1$

iii) $15 + 7 - (3 - 1)$

iv) $(15 + 7 - 3) - 1$

v) $15 + (7 - 3 - 1)$

vi) $(15 + 7) - (3 - 1)$

b) How many different answers did you get in part a)? _____

5. a) Add brackets in different ways to get as many different answers as you can.

i) $15 + 7 + 3 + 1$ ii) $15 - 7 + 3 - 1$ iii) $15 + 7 - 3 + 1$ iv) $15 - 7 - 3 - 1$

b) How many different answers did you get in part a)? i) ____ ii) ____ iii) ____ iv) ____

c) Check all that apply. The order of operations affects the answer when the expression consists of...

☐ addition only   ☐ subtraction only   ☐ addition and subtraction

Multiplication and division are also done from left to right. If there are brackets, do the operations in brackets first. Example: $15 \div 5 \times 3 = 3 \times 3 = 9$ but $15 \div (5 \times 3) = 15 \div 15 = 1$

6. Evaluate each expression.

   a) $4 \times 3 \div 6 \times 7$
   b) $6 \times 4 \div 2 \div 3$
   c) $30 \div 5 \div (2 \times 3)$
   d) $16 \times 2 \div (4 \times 2)$

7. a) Add brackets in different ways to get as many different answers as you can.

   i) $2 \times 3 \times 2 \times 5$
   ii) $64 \div 8 \div 4 \div 2$
   iii) $90 \div 5 \times 6 \div 3$

   b) Which expression in part a) gives the same answer, no matter where you place the brackets?

8. Do the operation in brackets first.

   a) $10 + (4 \times 2)$
   b) $(10 + 4) \times 2$
   c) $(10 + 4) \div 2$
   d) $10 + (4 \div 2)$

   $= 10 + 8$

   $= 18$

   e) $10 - (4 \times 2)$
   f) $(10 - 4) \times 2$
   g) $(10 - 4) \div 2$
   h) $10 - (4 \div 2)$

9. Check all that apply. The order of operations affects the answer when the expression combines...

   ☐ addition and multiplication   ☐ addition and division

   ☐ subtraction and multiplication   ☐ subtraction and division

   ☐ addition and subtraction   ☐ multiplication and division

Mathematicians have ordered the operations to avoid writing brackets all the time. The order is:
1. Operations in brackets.
2. Multiplication and division, from left to right.
3. Addition and subtraction, from left to right.

Example: $3 \times 5 + 3 \times 6 = (3 \times 5) + (3 \times 6)$ but $3 \times (5 + 3) \times 6$

$= 15 + 18$ $= 3 \times 8 \times 6$

$= 33$ $= 24 \times 6$

                                   $= 144$

10. Evaluate each expression. Use the correct order of operations.

   a) $4 \times 2 - 7$
   b) $2 + 4 \div 2$
   c) $6 - 2 \times 3$
   d) $20 \div 2 + 8$

   e) $4 + 3 \times 6 - 5$
   f) $6 + 6 \div 3 - 7$
   g) $4 \times 3 \div 6 + 5$
   h) $3 \times 7 - 6 \div 2$

   i) $4 \div (2 - 1)$
   j) $(5 - 1) \times 3$
   k) $20 - (14 - 7)$
   l) $(12 - 4) \div 4$

11. Turn the written instructions into mathematical expressions.

a) Add 8 and 3.

   Then subtract 4.

   Then multiply by 3.

   $(8 + 3 - 4) \times 3$

b) Subtract 6 from 9.

   Then multiply by 2.

   Then add 4.

   _____

c) Multiply 6 and 5.

   Then subtract from 40.

   Then add 5.

   _____

   BONUS▶

   Divide 8 by 4 and then add 2.

   Add 5 and 3 together.

   Multiply the two results.

d) Divide 4 by 2.

   Then add 10.

   Then subtract 4.

   _____

e) Divide 6 by 3.

   Then add 5.

   Then subtract 3.

   _____

   _____

12. Write the mathematical expressions in words.

a) $(6 + 2) \times 3$ _Add 6 and 2. Then multiply by 3._ _____

b) $(6 + 1) \times 2$ _____

c) $4 \times (3 - 1 + 5)$ _____

d) $(5 - 2) \times (4 + 17)$ e) $(24 - 2 \times 6) \div 4$ f) $24 - 2 \times 6 \div 4$

13. a) Add brackets in different ways to get as many different answers as you can.

   i) $3 + 1 \times 7 - 2$ ii) $16 - 4 \times 2 + 8$ iii) $16 \div 4 \times 2 + 8$

   b) How many different answers did you get in part a)?   i) _____ ii) _____ iii) _____

14. a) Calculate the expression in the box. Which expression without brackets gives the same answer?

   i) $\boxed{8 - (5 + 2)} = 8 - 5 - 2$ or $8 - 5 + 2$ ii) $\boxed{7 - (3 - 2)} = 7 - 3 - 2$ or $7 - 3 + 2$

   iii) $\boxed{7 + (5 - 2)} = 7 + 5 - 2$ or $7 + 5 + 2$ iv) $\boxed{6 + (2 + 4)} = 6 + 2 + 4$ or $6 + 2 - 4$

15. Rewrite each expression without brackets by changing only operations symbols.
Keep the answer the same.

   a) $24 \div (6 \times 2)$ b) $5 \times 8 \div (4 \div 2)$ c) $5 \times 8 \div (4 \times 2)$

16. a) The expressions on the left have brackets and the expressions on the right do not.
Calculate the expressions, then match by the same answer.

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

   $4 \times (6 + 3) \times 2$ $4 \times 3 + 4 \times 2 + 6 \times 3 + 6 \times 2$

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

   b) Which expression with brackets from part a) needs the most writing to write without brackets

   and still get the same answer? _____