



Advanced Mathematics
Support Programme®

Double Brackets

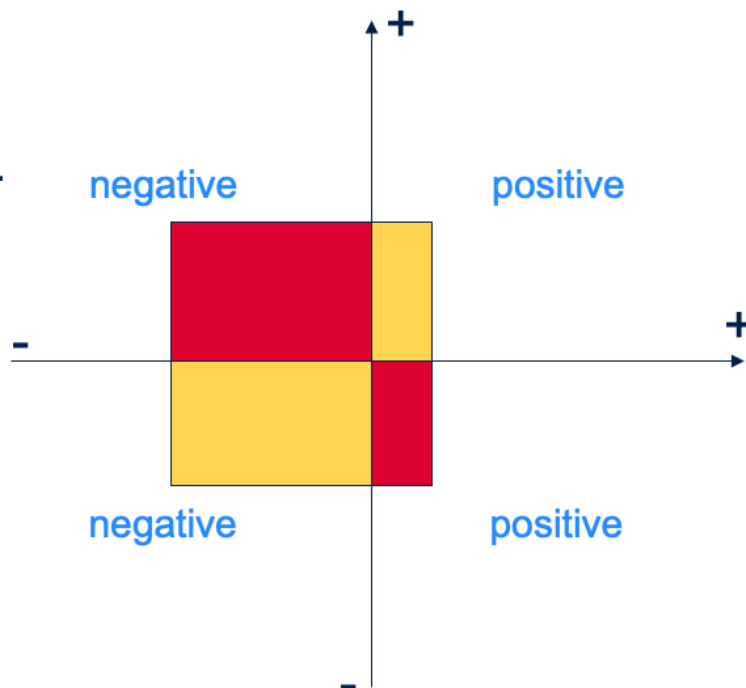
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Did you know?

We use a 2D co-ordinate plane to develop understanding regarding multiplication and also a *lot* of algebra.

How can the diagram help us understand what happens when we multiply negative numbers?





Dealing with Negative Numbers



1. $4 \times (-7) \times 6$

2. $3 \times 9 \times (-6)$

3. $2 \times (-3) \times (-4)$

4. $2 \times (-2) \times (-2) \times (-5)$

5. $a \times 7 \times a$

6. $ab \times 3 \times 6b$

7. $(-4a) \times 7a \times (-6a)$

8. Use what you have noticed to fill in the gaps in the sentences below:

positive

negative

ODD

EVEN

With an number of negative numbers then value will be

With an number of negative numbers then value will be



Expanding 1



1. Without doing the calculation, will the answer to this calculation be positive or negative? Give a reason.

a. $2 \times (-3) \times (-4) \times 6 \times (-6) \times (-1) \times 7 \times (-2)$

2. 24×17 is the same as which of the following

$2 \times 3 \times 17 \times 2 \times 2$

$(20 + 4)(10 + 7)$

$(30 - 5)(20 - 2)$

$20(10 + 7) + 4(10 + 7)$

3. Expand $3(\sqrt{3} - 6)$

4. Expand and simplify

1. $(x + 2)(x + 5)$

5. Expand and simplify

a. $(x + 6)(x - 2)$

6. Expand and simplify

a. $(\sqrt{2} + 3)(\sqrt{2} + 1)$

7. Expand and simplify

a. $(x^2 + 2)(x^2 + 6)$

8. Expand and simplify

a. $(x^2 + 3)(x^3 + 7)$



What's gone wrong?



- Here is a student's work on expanding brackets.
- Take a look and decide if they have done the work correctly or not.
- If they have made a mistake can you say why ?
- What are the correct answers?

$$(x+3)(x-1)$$

$$x^2 + 2x - 3$$

$$\frac{2x+3}{4} + \frac{3}{x}$$

$$\frac{2x^2+3}{4x} + \frac{12}{4x}$$

$$\Rightarrow \frac{2x^2+15}{4x}$$

$$(x+4)(x-5)$$

$$x^2 + 9x - 20$$

$$(\sqrt{2}+3)(\sqrt{2}-3)$$

$$\sqrt{2} + 6\sqrt{2} + 9$$

$$(x+2)(x+3)$$

$$x^2 + 6x + 5$$



Expand and Simplify



- Expand the expressions below, then find the matching expression in the grid.
- When completed there should be four answers unmatched.
- Find the sum of these four expressions and simplify it

$x^2 + 6x - 16$	$x^2 + 6x + 9$	$x^2 + 6x + 8$	$x^2 + 9$
$x^2 + 7x + 12$	$x^2 - 9x + 8$	$x^2 - 5x + 12$	$x^2 - 8x + 14$
$9 - x^2$	$-x^2 + 6x + 36$	$x^2 + 10x + 28$	$x^2 + x - 12$

1. $(x+3)^2$
2. $(x+4)(x+3)$
3. $(x-4)^2 - 2$

5. $(x+5)^2 + 3$
6. $x(x+4) + 2(x+4)$
7. $(3-x)(3+x)$
8. $x(x-8) - (x-8)$



Quadratic Puzzles

- These are multiplication grids
- We can use these to expand quadratics such as $(x + 3)(x + 4)$

$$(x + 4) \begin{array}{|c|c|c|} \hline & \times & \\ \hline & x & +3 \\ \hline x & x^2 & 3x \\ \hline +4 & 4x & 12 \\ \hline \end{array}$$

$$x^2 + 3x + 4x + 12$$

There are 4 terms after expanding the brackets. That's why these expressions are called quadratics – as 'quad' means four.

Now we can simplify by collecting like terms to get this

$$x^2 + 7x + 12$$



Quadratic Puzzles (cont...)

- Fill in the blanks in the multiplication grids
- Do you notice anything?

$$(x - 4) \begin{array}{|c|c|c|} \hline & \times & \\ \hline & x & -4 \\ \hline x & & \\ \hline -4 & -4x & +16 \\ \hline \end{array}$$

$$x^2 \boxed{} + 16$$

$$(x + 2) \begin{array}{|c|c|c|} \hline & \times & \\ \hline & 2x & \\ \hline x & & \\ \hline +2 & & +2 \\ \hline \end{array}$$

$$2x^2 \boxed{}$$

$$(x + 3) \begin{array}{|c|c|c|} \hline & \times & \\ \hline & 3x & \\ \hline x & & \\ \hline & +9x & \\ \hline \end{array}$$

$$\boxed{}$$

$$(2x - 4) \begin{array}{|c|c|c|} \hline & \times & \\ \hline & & \\ \hline 2x & & \\ \hline & & \\ \hline \end{array}$$

$$\boxed{}$$

$$(2x - 3) \begin{array}{|c|c|c|} \hline & \times & \\ \hline & & \\ \hline & & \\ \hline & & \\ \hline \end{array}$$

$$\boxed{}$$

$$(5x + 2) \begin{array}{|c|c|c|} \hline & \times & \\ \hline & & \\ \hline & & \\ \hline & & \\ \hline \end{array}$$

$$\boxed{}$$



Expanding 2



1. Expand and simplify
a. $(2x + 3)(x - 2)$

2. Expand and simplify
i. $3x(x + 3) + 4(x + 3)$

3. Expand and simplify
i. $(x + 6)^2 + (x - 3)^2$

4. Expand and simplify $(2 - \sqrt{3})^2$

5. Simplify $\frac{2}{(x+3)} + \frac{x-3}{x}$

6. Expand and simplify $(x^3 - 7)(x^3 + 7)$

7. Expand and simplify
1. $(3x + 2)(4x^2 + 2x - 3)$

8. Simplify $\frac{2x-2}{(x+2)} - \frac{x-2}{3x}$



Prove It!



Write some digits in a circle. E.g.

3 5 4
8 6

- The sum of the squares of the two-digit numbers read clockwise is:
 $54^2 + 46^2 + 68^2 + 83^2 + 35^2 = 17770$
- The sum of the squares of the two-digit numbers read anti-clockwise is:
 $53^2 + 38^2 + 86^2 + 64^2 + 45^2 = 17770$

Prove that the two sums will always be equal for any circle of digits.