

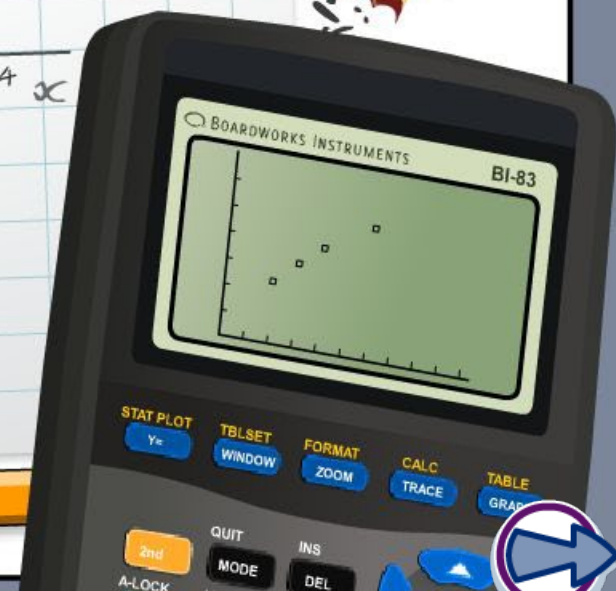
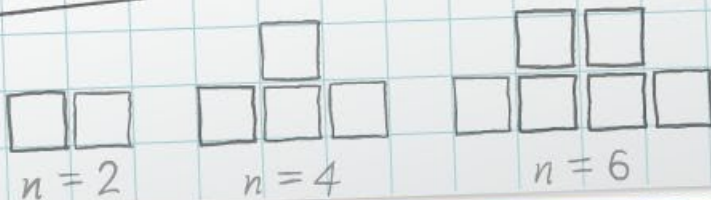
Factoring

x	-2	-1	0	1	2	3	4
y	5	0	-3	-4	-3	0	5

$$x^2 - 2x - 3 = 0$$

$$(x+1)(x-3) = 0$$

$$x = -1 \text{ or } x = 3$$



Common core icons



This icon indicates a slide where the Standards for Mathematical Practice are being developed. Details of these are given in the Notes field.



Slides containing examples of mathematical modeling are marked with this stamp.



This icon indicates an opportunity for discussion or group work.

The **Standards for Mathematical Practice** outlined in the Common Core State Standards for Mathematics describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

They are:

- 1) **Make sense of problems and persevere in solving them.**
- 2) **Reason abstractly and quantitatively.**
- 3) **Construct viable arguments and critique the reasoning of others.**
- 4) **Model with mathematics.**
- 5) **Use appropriate tools strategically.**
- 6) **Attend to precision.**
- 7) **Look for and make use of structure.**
- 8) **Look for and express regularity in repeated reasoning.**



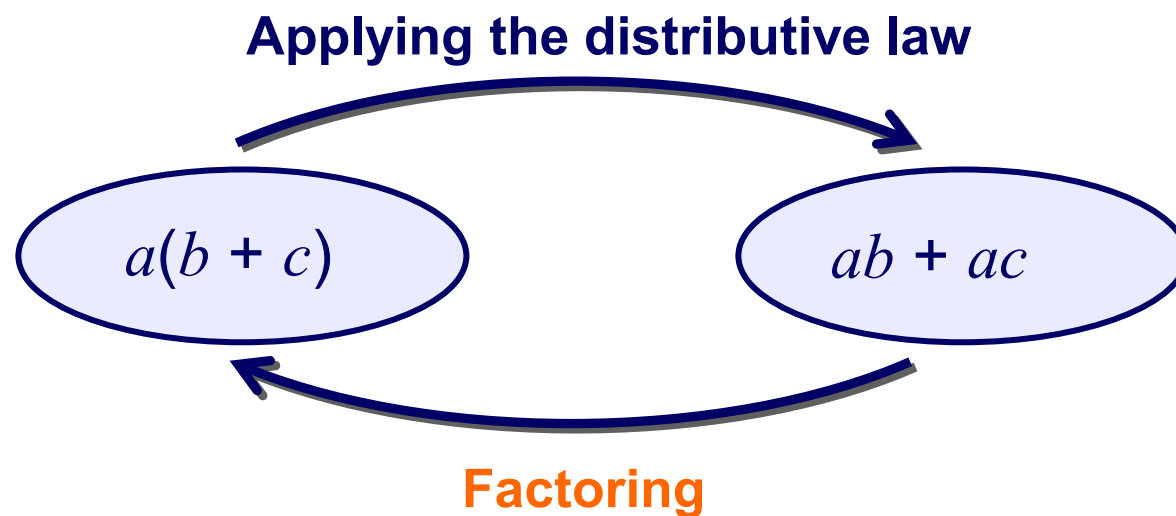
This icon indicates that the slide contains activities created in Flash. These activities are not editable.



This icon indicates teacher's notes in the Notes field.



Factoring an expression is the opposite of multiplying.



Often:

- When we **apply the distributive law** to an expression, we remove the parentheses.
- When we **factor** an expression we write it with parentheses to indicate the factors.



Expressions can be factored by dividing each term by the **greatest common factor** and writing this outside of a set of parentheses.

For example, in the expression $5x + 10$ the terms $5x$ and 10 have the greatest common factor 5 .

We write the 5 outside of a set of parentheses:

$$5(x + 2)$$

Mentally divide $5x + 10$ by 5 :

$$(5x + 10) \div 5 = x + 2$$

This is written inside the parentheses.



Writing $5x + 10$ as $5(x + 2)$ is called **factoring the expression**.

Factor $8a + 2$

The greatest common factor of $8a$ and 2 is **2**.

$$(8a + 2) \div 2 = 4a + 1$$

$$8a + 2 = 2(4a + 1)$$

Factor $7n^2 - 21n$

The greatest common factor of $7n^2$ and $21n$ is **$7n$** .

$$(7n^2 - 21n) \div 7n = n - 3$$

$$7n^2 - 21n = 7n(n - 3)$$



Basic factoring

Question 1/5: Can you factor $6a + 8$?

Click the "=" button to show the work step by step.

$$3(2a + 3)$$

$$3a + 4$$

$$2(3a + 4)$$

$$2a(3a + 4)$$



Can you correctly factor these expressions?

$$8yz^2 - 36y^2z = \text{[blank sticky note]} (\text{[blank sticky note]} - \text{[blank sticky note]})$$



Some expressions containing four terms can be factored by regrouping the terms into pairs that share a common factor. For example:

$$\text{Factor } 4a + ab + 4 + b$$

Two terms share a common factor of 4 and the remaining two terms share a common factor of b .

$$\begin{aligned} 4a + ab + 4 + b &= 4a + 4 + ab + b \\ &= 4(a + 1) + b(a + 1) \end{aligned}$$

$4(a + 1)$ and $+ b(a + 1)$ share a common factor of $(a + 1)$ so we can factor the expression further as:

$$(a + 1)(4 + b)$$



Factor $xy - 6 + 2y - 3x$

We can regroup the terms in this expression into two pairs of terms that share a common factor.

$$\begin{aligned} xy - 6 + 2y - 3x &= xy + 2y - 3x - 6 \\ &= y(x + 2) - 3(x + 2) \end{aligned}$$

When we take out a negative factor, the signs of the factored terms change.

$y(x + 2)$ and $-3(x + 2)$ share a common factor of $(x + 2)$ so we can write this as:

$$(x + 2)(y - 3)$$



Practice questions: factoring

1.	Factor $-9b^2 + b$.	<input data-bbox="1282 287 1721 436" type="text" value="?"/>	<input data-bbox="1734 311 1831 411" type="radio"/>
2.	Factor $10a + 2a^4 - 4a^2$.	<input data-bbox="1282 454 1721 604" type="text" value="?"/>	<input data-bbox="1734 478 1831 578" type="radio"/>
3.	Factor $6a - 3ab - 3a^2$.	<input data-bbox="1282 621 1721 771" type="text" value="?"/>	<input data-bbox="1734 645 1831 745" type="radio"/>
4.	Factor $4ab^3 + 2ab$.	<input data-bbox="1282 788 1721 938" type="text" value="?"/>	<input data-bbox="1734 812 1831 912" type="radio"/>
5.	Factor $-5b^2 - 15b + 50b^3$.	<input data-bbox="1282 955 1721 1105" type="text" value="?"/>	<input data-bbox="1734 979 1831 1079" type="radio"/>





This plan shows a rectangular yard containing a circular pool. The yard has a width of $5x$ meters and a length of $7x$ meters. The pool has a radius of x meters. What is the area of the grass? Write your answer in factored form. Why might the factored form of the answer be useful?

Grass area = yard area – pool area

Yard area = width \times length

$$= 5x \times 7x = 35x^2 \text{ meters}$$

Pool area = $\pi \times \text{radius}^2$

$$= \pi x^2 \text{ meters}$$

$$\text{Grass area} = 35x^2 - \pi x^2 = x^2(35 - \pi) \text{ meters}$$

