



**THIRD SPACE
LEARNING**

Math Intervention Pack

Factoring linear expressions

Grade 7

How To Use This Resource

1. Title Slide

Use this slide to activate prior knowledge needed for lesson. Students should be encouraged to initially attempt the question presented independently.

2. Prior Learning

Use this slide to review the knowledge that will be required to be successful in this lesson. If students feel confident on the prior learning section of the Title Slide then this slide can be skipped

3. Let's Learn

Use this slide to introduce the concept. Tutors should work with the student to explore the concept together, usually using diagrams to support understanding.

4. Follow Me + Your Turn

The tutor should work through the follow me slide, modeling the process and explaining their thinking out loud.

Students should use the your turn slide as an opportunity to work through a question similar to the follow me questions. They should apply the method modeled by the tutor in the follow me slide. Students should be encouraged to explain their thinking out loud.

5. You Do

Students should work through a range of questions that build in complexity.

Tutors can offer support but students should initially be encouraged to attempt these questions independently.

6. Go Further

Use this slide to allow students to apply their understanding to a more challenging question in an unfamiliar context.

How To Use This Resource

7. Support for Slides

The support slide is used to support students during the lesson. In the tutor notes, there will be guidance as to when to use the support slide.

8. Check Your Understanding

Tutors should use this slide to assess the student's knowledge and whether or not they have mastered the concept within the lesson.

Standard

7.EE.A.1 - Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

Key Mathematical Ideas

1. Apply properties of operations to factor and expand linear expressions with rational coefficients.

Overview

Terminology

- **Factor (as a verb)**: To break down into the terms that multiply to make the quantity to be factored.
- **Greatest common factor (GCF)**: The largest factor shared by two or more numbers.
- **Coefficient**: A number or variable used to multiply a variable; in $3x + 7$, 3 is the numerical coefficient; in $y = mx + b$, x is the variable and m is the variable coefficient.
- **Distributive property**: The property that states that multiplying a sum by a number is the same as multiplying each addend by the number and then adding the products. For example: $a \times (b + c) = (a \times b) + (a \times c)$
- **Expression**: A value expressed as numbers and/or variable, and operation symbols grouped together.
- **Simplify**: To change an expression into its lowest terms.

Sentence Stems

- ____ can be factored out of all terms.
- I know the expression is fully factored, because...
- The expressions are equivalent, because...

Overview

Common Misconceptions

Common Misconceptions	Tutoring Strategies	Checks for Understanding
Confusing whether a term is positive or negative.	Always the sign in front of the term with the term and explain why.	Ask students to explain why a term is positive or negative as they solve.
Students confuse greatest common factor (GCF) with least common multiple (LCM).	Remind students the difference between a factor and a multiple.	What are the factors of ___? What are the multiples of ___?

Title Slide

If students...

- get both sections correct:
 - start at You do
- miss the learning goal section only:
 - start at Let's Learn
- miss the prior learning section:
 - start at Prior Learning

Prior Learning

If stuck

- Have students list the factors of each of the terms.
- Remind students the definition of a factor and greatest common factor (GCF).
- Encourage students to make connections between the area model and equations.

Let's Learn

If stuck

- Remind students the definition of a factor and greatest common factor (GCF).
- Make connections back to the area model and equations used in the Prior learning slide.
- Encourage students to make connections between the area model and equations.

Questions

- a) What factors do 4 and 12 have in common? (1, 2, and 4.)
- a) How does the area model connect the equation? (Both show the expression $4x + 12$ can be represented by 4 groups of $x + 3$.)
- b) Compare the factored expressions of a and b ? (They are both equivalent to $4x + 12$, but since 2 was factored out in b , the coefficients are twice as large as the ones in the expression that factored out 4.)

Watch out for

- Students confusing greatest common factor (GCF) with least common multiple (LCM).
- Students who memorize the procedure, but do not understand why the final expression is equivalent.

Let's Learn

Answers

- a) 4 times x is $4x$ 4 times 3 is 12

\times	x	3
4	$4x$	+12

$$4x + 12 = 4(x + 3)$$

- b)

\times	$2x$	6
2	$4x$	+12

$$4x + 12 = 4(2x + 6)$$

Follow me

Modeling prompts

- List all the factors of -6 and -9 .
- Identify $+3$ as the GCF.
- Explain that while we can factor out $+3$, since both terms are negative, we typically factor out -3 .
- Fill in the area model.
- Use the area model to complete the equation.
- Discuss how the area model and equation show factors of $-6y - 9$.

Answers

- Factors of -6 : $-1, -2, -3, -6$
- Factors of -9 : $-1, -3, -9$
- a) GCF of -6 and $-9 = -3$

\times	$2y$	3
-3	$-6y$	-9

$$-6y - 9 = -3(2y + 3)$$

Your turn

If stuck

- Use similar guidance given in the Modeling prompts.

Questions

- b) How can you factor out -5 from each term? (Think about what times -5 is equal to the term. That is what will be factored out.)
- b) How does the area model connect the equation? (Both show the expression $-10x - 15$ can be represented by -5 groups of $2x + 3$.)
- b) How would the factored expression be different if we had factored out 5 instead of -5 ? (All coefficients would be opposites - positives would be negatives and negatives would be positives.)

Watch out for

- Students confusing greatest common factor (GCF) with least common multiple (LCM).
- Students who memorize the procedure, but do not understand why the final expression is equivalent.

Answers

- Factors of -10 : $-1, -2, -5, -10$
- Factors of -15 : $-1, -3, -5, -15$
- b) GCF of -10 and $-15 = -5$

\times	$2x$	3
-5	$-10x$	-15

$$-10x - 15 = -5(2x + 3)$$

You do

If stuck

- Encourage students to list the factors of each number.
- Use the Support slide for question 2.

Questions

- a) What factors do 6 and 18 have in common? (1, 2, 3, and 6.)
- a) What times 6 is equal to $6y$? (y .)
- a) What times 6 is equal to 18? (+3.)
- a) How does the area model connect the equation? (Both show the expression $6y + 18$ can be represented by 6 groups of $y + 3$.)
- c) Are $9d$ and $18a$ like terms? (No, so they cannot be combined and the variables cannot be factored out.)
- c) What factors do 9 and 18 have in common? (1, 3, and 9.)

Watch out for

- Students confusing greatest common factor (GCF) with least common multiple (LCM).
- Students who memorize the procedure, but do not understand why the final expression is equivalent.

Answers

- a) GCF of 6 and 18 = 6

\times	y	3
6	$6y$	18

$$6y + 18 = 6(y + 3)$$

- b) $-16 - 18y = -2(8 + 9y)$
- c) $9d + 18a = 9(d + 2a)$

Go further

If stuck

- Encourage students to list the factors of each number.

Questions

- How does the fully factored expression compare to the second one you wrote?
(Answers will vary.)

Answers

- a) $6y + 18 = 2(3y + 9)$
or $3(2y + 6)$
- b) $-16 - 18y = 2(-8 - 9y)$
- c) $9d + 18a = 3(3d + 6a)$

Support for Slide(s)

Questions

- b) Should we factor out +8 or -8? (We can factor out either, but since both terms are negative, we will factor out -8.)
- c) How can you factor out -8 from each term? (Think about what times -8 is equal to the term. That is what will be factored out.)
- d) How does the area model connect the equation? (Both show the expression $-16 - 8y$ can be represented by -8 groups of $2 + y$.)
- b) How would the factored expression be different if we had factored out 8 instead of -8? (All coefficients would be opposites - positives would be negatives and negatives would be positives.)

Answers

- a) Factors of -16: -1, -2, -4, -8, -16
- Factors of -8: -1, -2, -4, -8
- b) GCF of -16 and -8 = -8
- c) -8 times 2 is -16,

\times	2	y
-8	-16	$-8y$

- -8 times y is -8
- d) $-16 - 8y = -8(2 + y)$

Check your Understanding

Correct answer:

$$-4(2 - a)$$

or

$$4(-2 + a)$$

Today you will learn about

Factoring linear expressions



Learning Goal

Factor the following expression.

$$6x + 14$$

.....

Prior Learning

Use the GCF of 78 and 36 to factor the expression.

$$78 + 36 = \text{.....} \times \text{.....} + \text{.....} \times \text{.....}$$

$$= \text{.....} \times (\text{.....} + \text{.....})$$

Prior learning

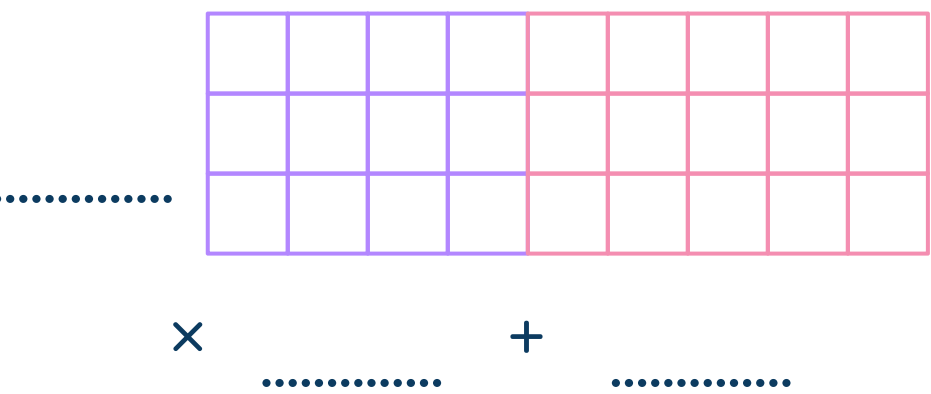
Before we can factor linear expressions, we need to be able to **factor expressions** by their **greatest common factor (GCF)**.

12 + 15

a Find the greatest common factor (GCF) of 12 and 15.

12 = × 15 = × GCF (12, 15) =

b Use the GCF and the model to factor the expression.



To **factor an expression** use a common factor to rewrite the expression with multiplication.

c Write the equivalent expressions.

12 + 15 = × + ×
= × (..... +)

Let's learn

Factoring is the reverse process of expanding **brackets**.
We put the expression into brackets by taking out a **common factor**.

a Fully factor: $4x + 12$

Find the common factors of the numbers 4 and 12.

Factors of 4:

1, 2, 4

Factors of 12:

1, 2, 3, 4, 6, 12

Use the GCF to fully factor an expression.

4 times is $4x$ 4 times is 12

×
.....	$4x$	$+12$

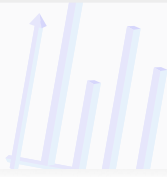
$$4x + 12 = \text{.....} (\text{.....} + \text{.....})$$

b If we are not fully factoring, we can use any factor to create an equivalent expression.

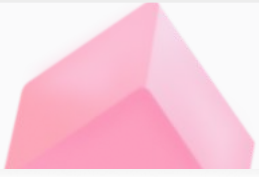
The common factor is the value outside the bracket.

×
.....	$4x$	$+12$

$$4x + 12 = \text{.....} (\text{.....} + \text{.....})$$



Follow me



a Fully factor: $-6y - 9$

Factors of -6 :

Factors of -9 :

Always include the symbol before the number or variable.

GCF of -6 and $-9 =$

Use the GCF to find the missing factors.

Expressions can also be factored by a negative.

×
.....	$-6y$	-9

$-6y - 9 =$ (..... )



Your turn



b Fully factor: $-10x - 15$

Factors of -10 :

Factors of -15 :

GCF of -10 and $-15 =$

Use the GCF to find the missing factors.

×
.....	$-10x$	-15

$-10x - 15 =$ (..... )

Fully factor the following expressions.

a $6y + 18$

GCF of 6 and 18 =

Use the GCF to find the missing factors.

×
.....	$6y$	18

$6y + 18 =$ (..... +)

b $-16 - 18y$

.....

c $9d + 18a$

.....

Go further

Factor each expression from the **You Do** with a different factor besides the GCF.

a $6y + 18$

.....

b $-16 - 18y$

.....

c $9d + 18a$

.....

Let's look at the steps needed to factor this expression.

Fully factor: $-16 - 8y$

a Find the GCF of -16 and -8 :

Factors of -16 :

Factors of -8

b GCF of -16 and -8 =

c Now convert the fraction to a decimal.

-8 times is -16 -8 times is $-8y$

↓ ↓

×
.....	-16	$-8y$

d $-16 - 8y =$ (..... +)

Check your understanding

Fully factor the following expression.

$$-8 + 4a$$

.....

Why do I need to try this question on my own first?

- To show your tutor what you understand
- To give you more practice
- To show your teacher how you are doing



Classroom Tools

x	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

Do you have a group of students who need a boost in math?

Each student could receive personalized lessons every week from our specialist one-on-one math tutors.




- ✓ Differentiated instruction for each student
- ✓ Aligned to your state's standards
- ✓ Scaffolded learning to close gaps

“We just had our first session and it went great! The kids really liked it and felt like they were learning! One even said he finally felt like math was making sense.”



Michelle Craig, Instructional Coach,
Sherwood Forest Elementary, Washington

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