

5.4 Skill Builder

Subtracting Integers Symbolically

To subtract an integer without tiles, we add the opposite integer.

-3 and 3 , -6 and 6 , and -15 and 15 are opposite integers.

To subtract: $(-4) - (-3)$

Add the opposite integer.

The opposite of -3 is 3 .

And, $(-4) + 3 = -1$

So, $(-4) - (-3) = -1$

We can use algebra tiles to check:

Model -4:

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Take away -3 :

Diagram illustrating a linked list structure with 4 nodes. The first node is a single square. The next three nodes are grouped in a rounded rectangle. An arrow points from the last node in the group to the value -3 .

One ■ remains.

So, $(-4) - (-3) = -1$

We omit the + sign when the integer is positive.

Check

1. Subtract.

a) $6 - (-2)$:

The opposite of -2 is _____.

Add the opposite: $6 + \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$

So, $6 - (-2) =$ _____

b) $3 - (4)$:

The opposite of 4 is .

Add the opposite:

So, $3 - (4) =$ _____

c) $(-8) - (-5)$:

The opposite of -5 is _____.

Add the opposite:

So,

d) $(-9) - (4)$:

The opposite of 4 is _____.

Add the opposite: _____

So, _____

5.4 Subtracting Polynomials

FOCUS Use different strategies to subtract polynomials.

To subtract a polynomial, we subtract each term of the polynomial.

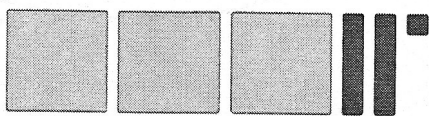
Example 1 Subtracting Polynomials with Algebra Tiles




Use algebra tiles to model $(3b^2 - 2b - 1) - (-2b^2 - b + 2)$.

Write a subtraction sentence.

Solution

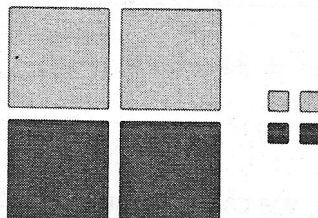
Model: $3b^2 - 2b - 1$



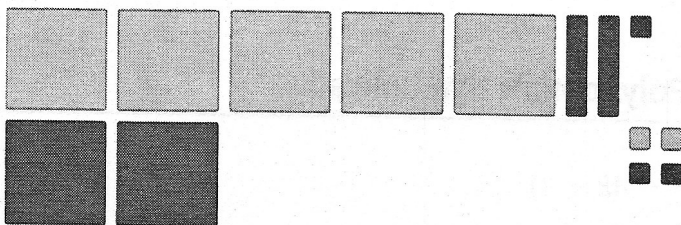
To subtract $-2b^2 - b + 2$, take away 2 , 1 , and 2 .

There are no  or  to take away.

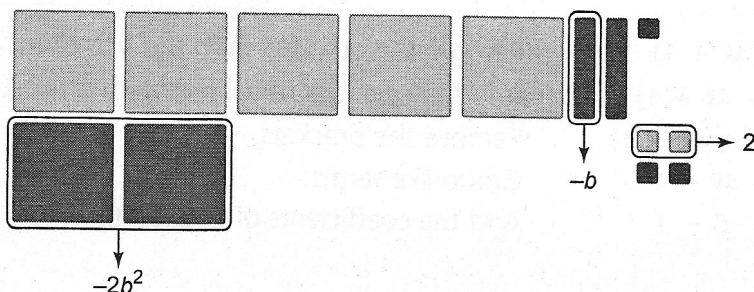
So, add 2 zero pairs of each tile:



So, these tiles also model $3b^2 - 2b - 1$.



Take away the tiles for $-2b^2 - b + 2$.



The remaining tiles represent: $5b^2 - b - 3$

The subtraction sentence is: $(3b^2 - 2b - 1) - (-2b^2 - b + 2) = 5b^2 - b - 3$

Check

1. Use algebra tiles to model each difference.

Sketch the tiles that remain, then write the difference.

a) $(4p + 3) - (2p + 1)$

Remaining tiles: _____

So, $(4p + 3) - (2p + 1) =$ _____

b) $(5t + 1) - (-2t + 3)$

Remaining tiles: _____

So, $(5t + 1) - (-2t + 3) =$ _____

c) $(3e^2 + 2e - 4) - (4e^2 + 3e - 2)$

Remaining tiles: _____

So, $(3e^2 + 2e - 4) - (4e^2 + 3e - 2) =$ _____

Remember to add zero pairs when there are not enough tiles to subtract.

To subtract integers without tiles, we can add the opposite integer.

To subtract polynomials without tiles, we can add the opposite terms.

Example 2 Subtracting Polynomials Symbolically

Subtract: $(-5k^2 + 2k - 6) - (3k^2 - 4k + 1)$

Solution

$$\begin{aligned} & (-5k^2 + 2k - 6) - (3k^2 - 4k + 1) \\ &= -5k^2 + 2k - 6 - (3k^2 - 4k + 1) \\ &= -5k^2 + 2k - 6 + (-3k^2 + 4k - 1) \\ &= -5k^2 + 2k - 6 - 3k^2 + 4k - 1 \\ &= -5k^2 - 3k^2 + 2k + 4k - 6 - 1 \\ &= -8k^2 + 6k - 7 \end{aligned}$$

Remove the brackets from the first term.
Add the opposite of each term in brackets.
Remove the brackets.
Group like terms.
Add the coefficients of like terms.

Check

1. Subtract.

a) $(8f - 3) - (7f + 5)$
 $= \underline{\hspace{2cm}} - (7f + 5)$
 $= 8f - 3 + \underline{\hspace{2cm}}$
 $= \underline{\hspace{2cm}}$
 $= \underline{\hspace{2cm}}$
 $= \underline{\hspace{2cm}}$

Remove the brackets from the first term.

The opposite of $7f$ is: $\underline{\hspace{2cm}}$

The opposite of 5 is: $\underline{\hspace{2cm}}$

Add the opposites.

Remove the brackets.

Group like terms.

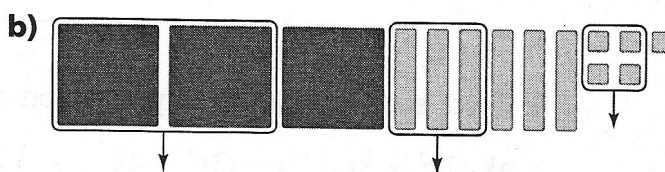
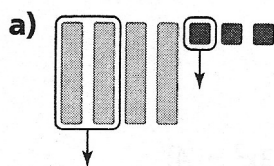
Add the coefficients of like terms.

b) $(2 + 5g - 7g^2) - (9g - 4g^2 + 2)$
 $= \underline{\hspace{2cm}}$
 $= \underline{\hspace{2cm}}$
 $= \underline{\hspace{2cm}}$
 $= \underline{\hspace{2cm}}$
 $= \underline{\hspace{2cm}}$
 $= \underline{\hspace{2cm}}$

Remember to write the polynomial in descending order.

Practice

1. Write the subtraction sentence modelled by each set of tiles.



2. Use algebra tiles to model each difference.

Sketch the tiles that remain, then write the difference.

a) $(3r + 2) - (-2r + 3)$

b) $(-4v^2 + 5v - 1) - (-3v^2 + 4v - 2)$

Remaining tiles: $\underline{\hspace{2cm}}$

So, $(3r + 2) - (-2r + 3) = \underline{\hspace{2cm}}$

Remaining tiles: $\underline{\hspace{2cm}}$

So, $(-4v^2 + 5v - 1) - (-3v^2 + 4v - 2) = \underline{\hspace{2cm}}$

$= \underline{\hspace{2cm}}$

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3. Write the opposite of each term.

a) -9 : _____

b) $3r$: _____

c) $-2s^2$: _____

d) t : _____

4. Subtract.

a) $(4p + 1) - (p + 10)$

$=$ _____ $-(p + 10)$

$= 4p + 1 +$ _____

$=$ _____

$=$ _____

$=$ _____

Remove the brackets from the first term.

The opposite of p is: _____

The opposite of 10 is: _____

Add the opposites.

Remove the brackets.

Group like terms.

Add the coefficients of like terms.

b) $(3h^2 + 5h - 4) - (h^2 - 4h + 6)$

$=$ _____

$=$ _____

$=$ _____

$=$ _____

$=$ _____

Remove the brackets from the first term.

Add the opposites.

Remove the brackets.

Group like terms.

Add the coefficients of like terms.

c) $(4q^2 + 3) - (3q - q^2 + 3)$

$=$ _____

$=$ _____

$=$ _____

$=$ _____

$=$ _____

5. Check each solution. Identify any errors and correct them.

a) $(7x^2 + 3x + 7) - (3x^2 - 4)$

$= 7x^2 + 3x + 7 - 3x^2 - 4$

$= 7x^2 - 3x^2 + 3x + 7 - 4$

$= 4x^2 + 3x + 3$

$(7x^2 + 3x + 7) - (3x^2 - 4)$

$=$ _____

$=$ _____

$=$ _____

b) $(3a^2 - 2a + 4) - (2a^2 + 3)$

$= 3a^2 - 2a + 4 - 2a^2 - 3$

$= 3a^2 - 2a^2 - 2a + 4 - 3$

$= a^2 + 2a - 3$

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

$=$ _____

$=$ _____

$=$ _____



Can you ...

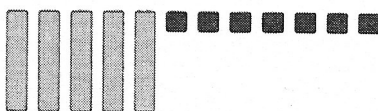
- Recognize, write, describe, and classify polynomials?
- Represent polynomials using tiles, pictures, and algebraic expressions?
- Simplify polynomials by combining like terms?
- Add and subtract polynomials?

5.1 1. Is the polynomial a monomial, binomial, or trinomial?

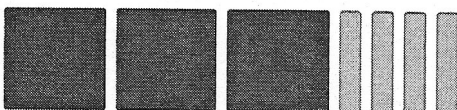
- a) -9 The polynomial has _____ term, so it is a _____.
- b) $3f - 5$ The polynomial has _____ terms, so it is a _____.
- c) $2s^2 - s + 1$ The polynomial has _____ terms, so it is a _____.
- d) $-a^2 + 2a$ The polynomial has _____ terms, so it is a _____.

2. Write the polynomial represented by each set of tiles.

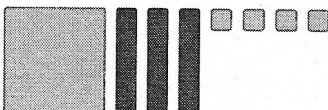
a) Use the variable g .



b) Use the variable r .



c) Use the variable w .

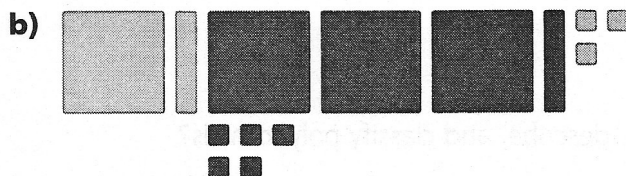


5.2 3. Simplify each tile model.

Write the polynomial that the remaining tiles represent.



Remaining tiles: _____ . Polynomial: _____



Remaining tiles: _____ Polynomial: _____

4. Simplify each polynomial.

a) $8e - 9 - 5e + 4$

Group like terms.

= _____
= _____

Add the coefficients of like terms.

b) $4d^2 - 3d + 11 - d^2 + 5d - 13$

= _____
= _____

5.3 5. Sketch tiles to model each sum.

Then write the sum.

a) $(4v - 4) + (-2v + 7)$

Remaining tiles: _____

So, $(4v - 4) + (-2v + 7) =$ _____

b) $(6u^2 - 5u - 7) + (-3u^2 + 3u + 7)$

Remaining tiles: _____

So, $(6u^2 - 5u - 7) + (-3u^2 + 3u + 7) =$ _____

6. Add.

a) $(3t + 11) + (-7t - 4)$

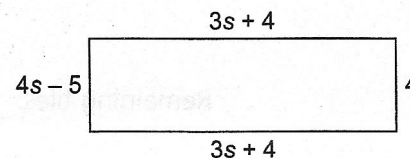
$$\begin{array}{r} 3t + 11 \\ + -7t - 4 \\ \hline \end{array}$$

b) $(10y^2 - 9) + (-3y^2 + 4y - 2)$

$$\begin{array}{r} 10y^2 - 9 \\ + -3y^2 + 4y - 2 \\ \hline \end{array}$$

7. Find the perimeter of this rectangle.

Perimeter = _____
= _____
= _____
= _____



5.4 8. Use algebra tiles to model each difference.

Sketch the tiles that remain, then write the difference.

a) $(5n - 6) - (-n - 3)$

Remaining tiles: _____

So, $(5n - 6) - (-n - 3) =$ _____

b) $(-v^2 + 3v - 5) - (-v^2 + 4v + 2)$

Remaining tiles: _____

So, $(-v^2 + 3v - 5) - (-v^2 + 4v + 2) =$ _____

9. Subtract.

a) $(11h + 3) - (9h - 2)$

$=$ _____ $- (9h - 2)$

$=$ _____ $+ ($ _____ $)$

$=$ _____

$=$ _____

$=$ _____

Remove the brackets from the first term.

Add the opposites.

Remove the brackets.

Group like terms.

Add the coefficients of like terms.

b) $(7j^2 - 11j - 7) - (12j^2 - 8j - 3)$

$=$ _____

$=$ _____

$=$ _____

$=$ _____

$=$ _____