# Warm-up 2-20

**Factor each expression.**

1. $7x(y + 9) - 12x^2(y + 9)$

2. $8x^4 + 4x^3 - 2x^2$

3. $12a^3 - 9a^2 + 20a - 15$

# Warm-up 2-20

**Factor each expression.**

1. $7x(y + 9) - 12x^2(y + 9)$

$(y+9)(7x - 12x^2)$

2. $8x^4 + 4x^3 - 2x^2$

$2 \cdot 2 \cdot 2 \cdot x \cdot x \cdot x \cdot x$
$2 \cdot 2 \cdot x \cdot x \cdot x$
$-2 \cdot x \cdot x$

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

$8x^4 + 4x^3 - 2x^2 \checkmark$

3. $(12a^3 - 9a^2) + (20a - 15)$

$2 \cdot 2 \cdot 3 \cdot a \cdot a \cdot a$
$- 3 \cdot 3 \cdot a \cdot a$

$2 \cdot 2 \cdot 5 \cdot a$
$- 3 \cdot 5$

$3a^2(4a - 3) + 5(4a - 3)$

$(4a-3)(3a^2+5)$

$2 \underline{)12}$
$2 \underline{)6}$
$\quad 3$

$20$
$4 \quad 5$
$2 \quad 2$
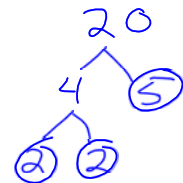
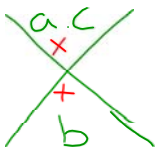|        | $4a$     | $-3$    |
|--------|----------|---------|
| $3a^2$ | $12a^3$  | $-9a^2$ |
| $5$    | $20a$    | $-15$   |

$12a^3 - 9a^2 + 20a - 15 \checkmark$

# Section 9.3: Factoring Trinomials

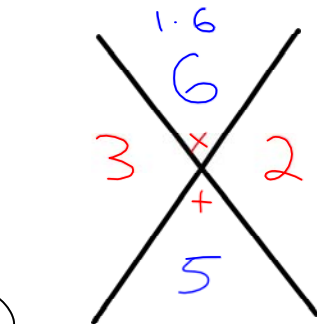Factoring a trinomial in the form $ax^2 + bx + c$. (no leading coefficient.)

$\dfrac{a \cdot c}{\overset{\times}{\underset{+}{b}}}$

$x^2 + 5x + 6$

$(x^2 + 3x) + (2x + 6)$

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

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

$\dfrac{1 \cdot 6}{6}$   $3 \overset{\times}{\underset{+}{\phantom{X}}} 2$   $5$

$(x^2 + 2x) + (3x + 6)$

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

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

$\dfrac{6}{6 \cdot 1}$   $3 \cdot 2$

| | $x$ | $3$ |
|---|---|---|
| $x$ | $x^2$ | $3x$ |
| $2$ | $2x$ | $6$ |

$x^2 + 2x + 3x + 6$

$x^2 + 5x + 6 \checkmark$

$x^2 - 8x + 15$

$(x^2 - 5x)(-3x + 15)$

$x \cdot x \qquad -3x$
$-5x \qquad 3 \cdot 5$

$x(x-5) + 3(-x+5)$

$x(x-5) - 3(x-5)$

$(x-5)(x-3)$

$1 \cdot 15$
$15$

$-5 \qquad \times \qquad -3$
$+$
$-8$

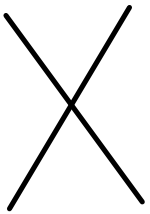|   | $x$ | $-5$ |
|---|-----|------|
| $x$ | $x^2$ | $-5x$ |
| $-3$ | $-3x$ | $+15$ |

$x^2 - 5x - 3x + 15$
$x^2 - 8x + 15 \checkmark$

# Practice

Factor each trinomial. Check your answer.
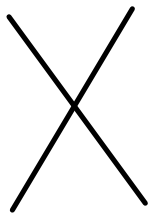
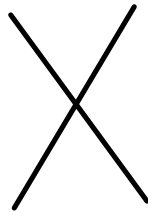$x^2 + 6x + 9$                                    $m^2 + m - 20$

$a^2 - 8a + 15$                                    $y^2 - 3y - 18$

# Practice

Factor each trinomial. Check your answer.

$x^2 + 6x + 9$

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

| × | x | 3 |
|---|---|---|
| x | $x^2$ | 3x |
| 3 | 3x | 9 |

$m^2 + m - 20$

$(m+5)(m-4)$

| | m | -4 |
|---|---|---|
| m | $m^2$ | -4m |
| 5 | 5m | -20 |

$a^2 - 8a + 15$

$(a-3)(a-5)$

| | a | -3 |
|---|---|---|
| a | $a^2$ | -3a |
| -5 | -5a | 15 |

$y^2 - 3y - 18$

$(y-6)(y+3)$

| | y | 3 |
|---|---|---|
| y | $y^2$ | 3y |
| -6 | -6y | -18 |

## Section 9.4: Factoring Trinomials with a leading coefficient

**Remember:**

$(3x + 2)(2x + 5) = 6x^2 + 19x + 10$

## "Grouping" Method

$$3x^2 + x - 10$$

$$(3x^2 - 5x) + (6x - 10)$$

$3 \times x$
$-5 \times$

$2 \quad 3x$
$-2 \quad 5$

$$x(3x-5) + 2(3x-5)$$

$$(3x-5)(x+2)$$

$3(-10)$

$-30$

$-5 \quad\times\quad 6$

$1$

## "Grouping" Method

$5x^2 + 19x + 12$

$5x^2 + 15x + 4x + 12$

$5 \cdot 12$

$60$

$15 \quad 4$

$19$

# "Grouping" Method

$5x^2 + 19x + 12$     $(5x+4)(x+3)$

$(5x^2 + 15x) + (4x + 12)$

$5x \cdot x$
$3 \cdot 5x$

$2 \cdot 2 \cdot x$
$2 \cdot 2 \cdot 3$

$5(12)$
$60$

$15 \diagdown 4$

$19$

$5x(x+3) + 4(x+3)$

$(x+3)(5x+4)$

## Examples

$3n^2 - 8n + 4$

$2m^2 + 5m + 2$

$7a^2 + 53a + 28$

$9k^2 + 66k + 21$

# Examples
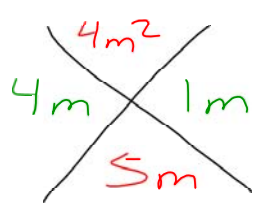
$3n^2 - 8n + 4$

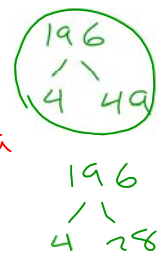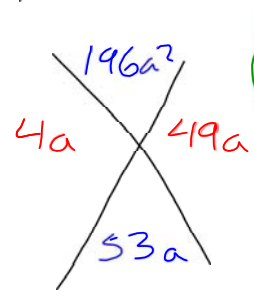$(3n-2)(n-2)$

$3n^2 - 6n - 2n + 4$

$3n^2 - 8n + 4 \checkmark$

$12n^2$

$-6n \times -2n$

$-8n$
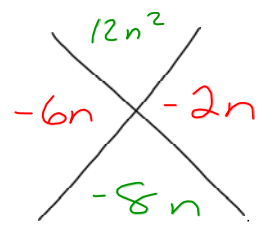
| | $3n$ | $-2$ |
|---|---|---|
| $n$ | $3n^2$ | $-2n$ |
| $-2$ | $-6n$ | $+4$ |

$2m^2 + 5m + 2$

$(2m+1)(m+2)$

$2m^2 + 4m + 1m + 2$

$2m^2 + 5m + 2 \checkmark$

$4m^2$

$4m \times 1m$

$5m$

| | $2m$ | $1$ |
|---|---|---|
| $m$ | $2m^2$ | $1m$ |
| $2$ | $4m$ | $2$ |

$7a^2 + 53a + 28$

$(7a+4)(a+7)$

$7a^2 + 49a + 4a + 28$

$7a^2 + 53a + 28 \checkmark$

$196a^2$

$4a \times 49a$

$53a$

$196$
$4 \quad 49$

$196$
$4 \quad 28$

| | $a$ | $7$ |
|---|---|---|
| $7a$ | $7a^2$ | $49a$ |
| $4$ | $4a$ | $28$ |

$9k^2 + 66k + 21$

$3(3k^2 + 22k + 7)$
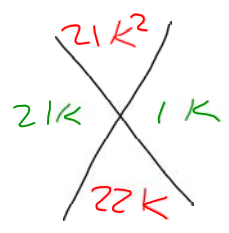
$3(3k+1)(k+7)$

$3(3k^2 + 21k + k + 7)$

$3(3k^2 + 22k + 7)$

$9k^2 + 66k + 21 \checkmark$

$21k^2$

$21k \times 1k$

$22k$

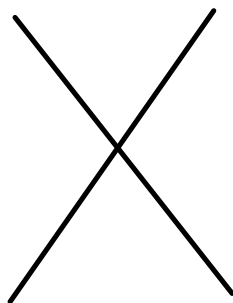| | $3k$ | $1$ |
|---|---|---|
| $k$ | $3k^2$ | $1k$ |
| $7$ | $21k$ | $7$ |

# Section 9.3: Factoring Trinomials

Factoring a trinomial in the form $ax^2 + bx + c$. (no leading coefficient.)
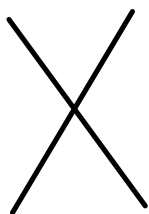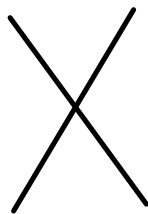
$x^2 + 5x + 6$

$x^2 - 8x + 15$

# Practice

Factor each trinomial. Check your answer.
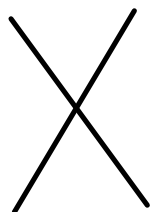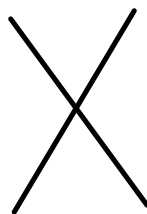
$x^2 + 6x + 9$

$m^2 + m - 20$

$a^2 - 8a + 15$

$y^2 - 3y - 18$

# Practice

Factor each trinomial. Check your answer.

$x^2 + 6x + 9$

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

|   | $x$ | $3$ |
|---|-----|-----|
| $x$ | $x^2$ | $3x$ |
| $3$ | $3x$ | $9$ |

$m^2 + m - 20$

$(m+5)(m-4)$

|   | $m$ | $-4$ |
|---|-----|------|
| $m$ | $m^2$ | $-4m$ |
| $5$ | $5m$ | $-20$ |

$a^2 - 8a + 15$

$(a-3)(a-5)$

|   | $a$ | $-3$ |
|---|-----|------|
| $a$ | $a^2$ | $-3a$ |
| $-5$ | $-5a$ | $15$ |

$y^2 - 3y - 18$

$(y-6)(y+3)$

|   | $y$ | $3$ |
|---|-----|-----|
| $y$ | $y^2$ | $3y$ |
| $-6$ | $-6y$ | $-18$ |

# Homework

Worksheet #1-6