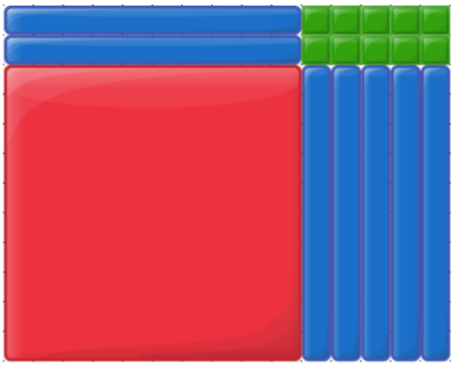
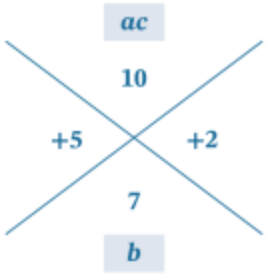
Part A: Factoring $x^2 + bx + c$

Practice 1

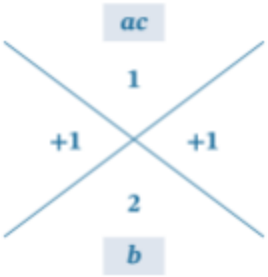
1.





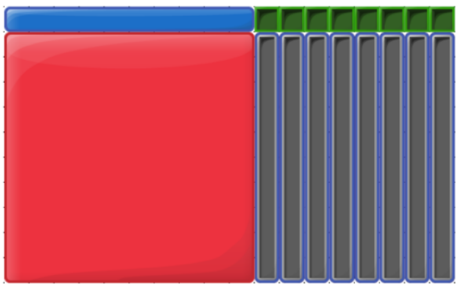
$(x^2 + 5x) + (2x + 10)$
$x(x + 5) + 2(x + 5)$
$(x + 2)(x + 5)$

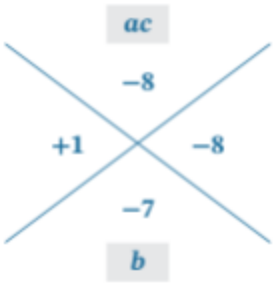
2.



$(x^2 + 1x) + (1x + x)$
$x(x + 1) + 1(x + 1)$
$(x + 1)(x + 1) = (x + 1)^2$

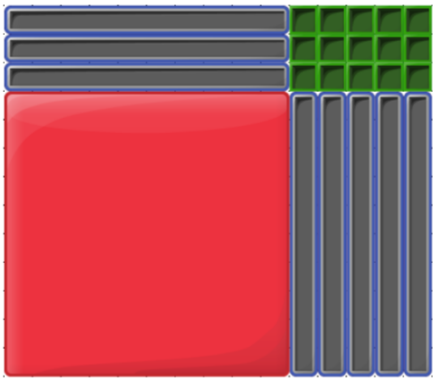
3.

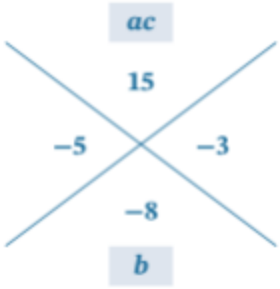




$(x^2 + 1x) + (-8x - 8)$
$x(x + 1) - 8(x + 1)$
$(x - 8)(x + 1)$

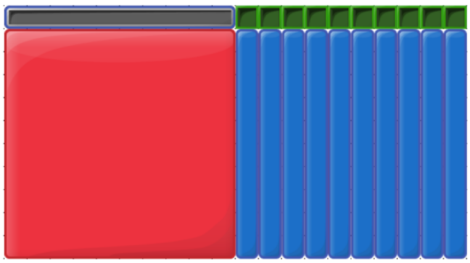
4.

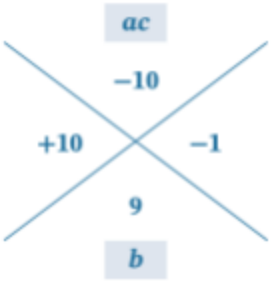




$(x^2 - 5x) + (-3x + 15)$
$x(x - 5) - 3(x - 5)$
$(x - 5)(x - 3)$

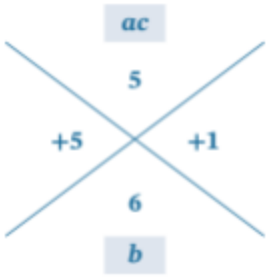
5.





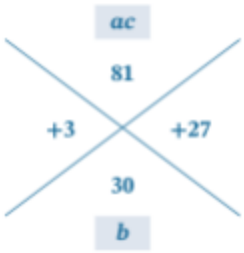
$(x^2 - 1x) + (10x - 10)$
$x(x - 1) + 10(x - 1)$
$(x - 1)(x + 10)$

6.



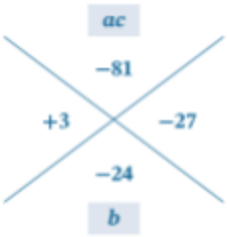
$(x^2 + 5x) + (1x + 5)$
$x(x + 5) + 1(x + 5)$
$(x + 5)(x + 1)$

7.



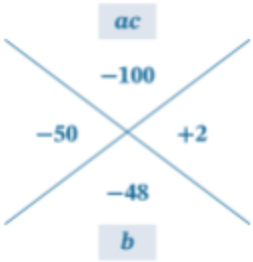
$(x^2 + 3x) + (27x + 81)$
$x(x + 3) + 27(x + 3)$
$(x + 3)(x + 27)$

8.



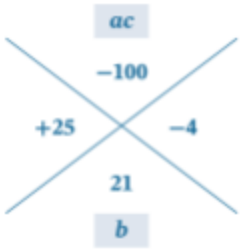
$(x^2 + 3x) + (-27x - 81)$
$x(x + 3) - 27(x + 3)$
$(x + 3)(x - 27)$

9.



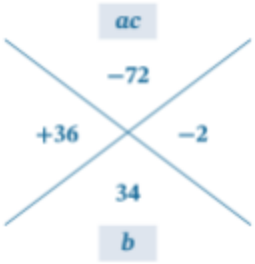
$(x^2 - 50x) + (2x + 100)$
$x(x - 50) + 2(x - 50)$
$(x - 50)(x + 2)$

10.



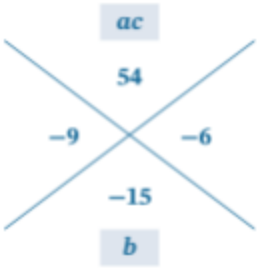
$(x^2 + 25x) + (-4x - 100)$
$x(x + 25) - 4(x + 25)$
$(x + 25)(x - 4)$

11.



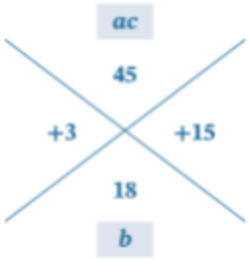
$(x^2 + 36x) + (-2x - 72)$
$x(x + 36) - 2(x + 18)$
$(x + 36)(x - 2)$

12.



$(x^2 - 9x) + (-6x + 54)$
$x(x - 9) - 6(x - 9)$
$(x - 9)(x - 6)$

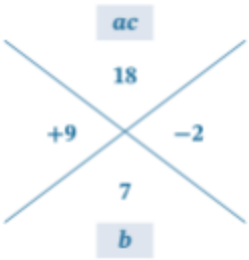
13.



$(x^2 + 3x) + (15x + 45)$
$x(x + 3) + 15(x + 3)$
$(x + 3)(x + 15)$

The side lengths are $x + 3$ units and $x + 15$ units.

14.



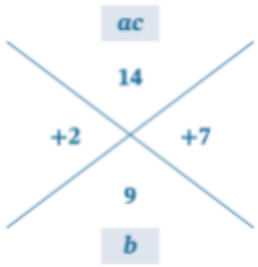
$(x^2 + 9x) + (-2x - 18)$
$x(x + 9) - 2(x + 9)$
$(x + 9)(x - 2)$

The side lengths are $x + 9$ feet and $x - 2$ feet.

15.
$(8) + 9 = 17$ ft
$(8) - 2 = 6$ ft

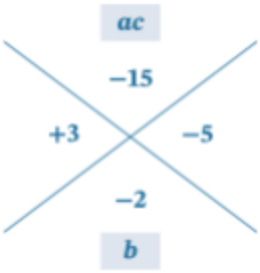
Practice 2

1.



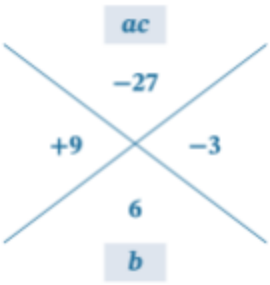
$(x^2 + 2x) + (7x + 14)$
$x(x + 2) + 7(x + 2)$
$(x + 2)(x + 7)$

2.



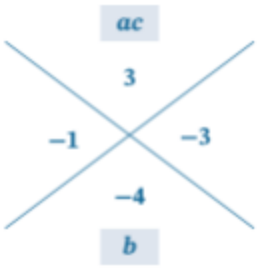
$(x^2 + 3x) + (-5x - 15)$
$x(x + 3) - 5(x + 3)$
$(x + 3)(x - 5)$

3.



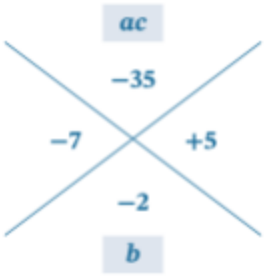
$(x^2 + 9x) + (-3x - 27)$
$x(x + 9) - 3(x + 9)$
$(x + 9)(x - 3)$

4.



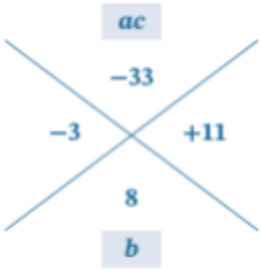
$(x^2 - 1x) + (-3x + 3)$
$x(x - 1) - 3(x - 1)$
$(x - 1)(x - 3)$

5.



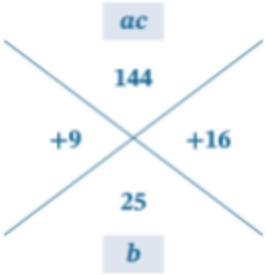
$(x^2 - 7x) + (5x - 35)$
$x(x - 7) + 5(x - 7)$
$(x - 7)(x + 5)$

6.



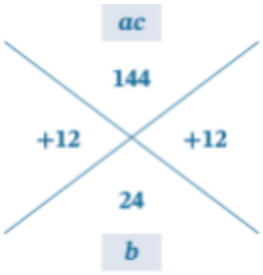
$(x^2 - 3x) + (11x - 33)$
$x(x - 3) + 11(x - 3)$
$(x - 3)(x + 11)$

7.



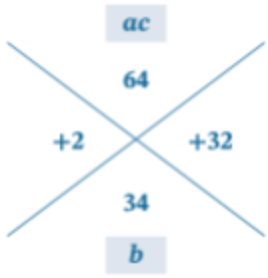
$(x^2 + 9x) + (16x + 144)$
$x(x + 9) + 16(x + 9)$
$(x + 9)(x + 16)$

8.



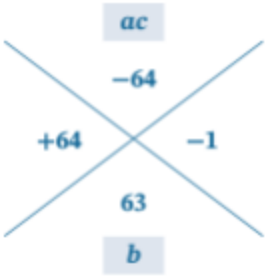
$(x^2 + 12x) + (12x + 144)$
$x(x + 12) + 12(x + 12)$
$(x + 12)(x + 12)$

9.



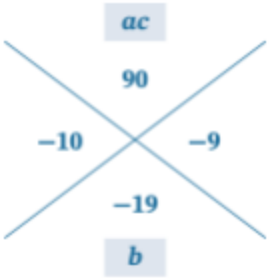
$(x^2 + 2x) + (32x + 64)$
$x(x + 2) + 32(x + 2)$
$(x + 2)(x + 32)$

10.



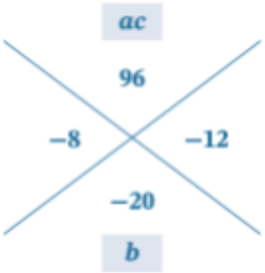
$(x^2 + 64x) + (-1x - 64)$
$x(x + 64) - 1(x + 64)$
$(x + 64)(x - 1)$

11.



$(x^2 - 10x) + (-9x + 90)$
$x(x - 10) - 9(x - 10)$
$(x - 10)(x - 9)$

12.



$(x^2 - 8x) + (-12x + 96)$
$x(x - 8) - 12(x - 8)$
$(x - 8)(x - 12)$

13.

a. Jess is correct

b. Cam remembered that when the last term is negative, the binomials need one of each sign but did not check that the middle term would be negative when multiplied back together.

$(x + 14)(x - 2) = x^2 - 2x + 14x - 28 = x^2 + 12x - 28$

Cam's answer has a positive middle term instead of a negative middle term.

14.

$A = \frac{1}{2}bh$ $\quad (x^2 - 13x) + (3x - 39)$

$A = \frac{x^2 - 10x - 39}{2}$ $\quad x(x - 13) + 3(x - 13)$

$(x - 13)(x + 3)$

The formula and the given area are multiplied by one half. The triangle's base and height can be determined if the numerator is factored. The base and height are $(x - 13)$ and $(x + 3)$ units.

15.

$(15) - 13 = 2$ in

$(15) + 3 = 18$ in

$A = \frac{1}{2}(2)(18) = 18$ in^2

Part B: Factoring $ax^2 + bx + c$

Practice 1

1.

$(5x^2 + 20x) + (-2x - 8)$

$5x(x + 4) - 2(x + 4)$

$(x + 4)(5x - 2)$

2.

$(2x^2 + 7x) + (-8x - 28)$

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

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

3.

$(10x^2 - 16x) + (5x - 8)$

$2x(5x - 8) + 1(5x - 8)$

$(5x - 8)(2x + 1)$

4.

$(15x^2 - 1x) + (-15x + 1)$
$x(15x - 1) - 1(15x - 1)$
$(15x - 1)(x - 1)$

5.

$(15x^2 + 3x) + (-20x - 4)$
$3x(5x + 1) - 4(5x + 1)$
$(5x + 1)(3x - 4)$

6.

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

7.

$(4x^2 - 5x) + (-8x + 10)$
$x(4x - 5) - 2(4x - 5)$
$(4x - 5)(x - 2)$

8.

$(12x^2 + 16x) + (-15x - 20)$
$4x(3x + 4) - 5(3x + 4)$
$(3x + 4)(4x - 5)$

9.

$(18x^2 + 12x) + (21x + 14)$
$6x(3x + 2) + 7(3x + 2)$
$(3x + 2)(6x + 7)$

10.

$(3x^2 + 5x) + (12x + 20)$
$x(3x + 5) + 4(3x + 5)$
$(3x + 5)(x + 4)$
The side lengths are $(3x + 5)$ and $(x + 4)$ feet.

11.

$(4x^2 + 5x) + (12x + 15)$
$x(4x + 5) + 3(4x + 5)$
$(4x + 5)(x + 3)$
The side lengths are $(4x + 5)$ and $(x + 3)$ feet.

12.

Rectangle A

$3x + 5$

$3(6) + 5 = 23$ ft

$x + 4$

$(6) + 4 = 10$ ft

Rectangle B

$4x + 5$

$4(6) + 5 = 29$ ft

$x + 3$

$(6) + 3 = 9$ ft

Rectangle B has the longest side of 29 feet.

Practice 2

1.

$(2x^2 + 11x) + (-16x - 88)$

$x(2x + 11) - 8(2x + 11)$

$(2x + 11)(x - 8)$

2.

$(14x^2 - 4x) + (-21x + 6)$

$2x(7x - 2) - 3(7x - 2)$

$(7x - 2)(2x - 3)$

3.

$(30x^2 + 25x) + (-12x - 10)$

$5x(6x + 5) - 2(6x + 5)$

$(6x + 5)(5x - 2)$

4.

$(9x^2 + 15x) + (-24x - 40)$

$3x(3x + 5) - 8(3x + 5)$

$(3x + 5)(3x - 8)$

5.

$(9x^2 + 2x) + (-99x - 22)$

$x(9x + 2) - 11(9x + 2)$

$(9x + 2)(x - 11)$

6.

$(6x^2 + 2x) + (9x + 3)$

$2x(3x + 1) + 3(3x + 1)$

$(3x + 1)(2x + 3)$

7.

$(2x^2 - 1x) + (6x - 3)$
$x(2x - 1) + 3(2x - 1)$
$(2x - 1)(x + 3)$

8.

$(5x^2 + 10x) + (-1x - 2)$
$5x(x + 2) - 1(x + 2)$
$(x + 2)(5x - 1)$

9.

$(8a^2 + 34a) + (-4a - 17)$
$2a(4a + 17) - 1(4a + 17)$
$(4a + 17)(2a - 1)$

10.

$(4c^2 + 4c) + (-3c - 3)$
$4c(c + 1) - 3(c + 1)$
$(c + 1)(4c - 3)$

11.

$(3n^2 - 27n) + (-5n + 45)$
$3n(n - 9) - 5(n - 9)$
$(n - 9)(3n - 5)$

12.

$(6z^2 - 10z) + (-21z + 35)$
$2z(3z - 5) - 7(3z - 5)$
$(3z - 5)(2z - 7)$

Targeted Review

Problem	1	2	3	4	5	6	7	8	9	10	11	12
Lesson Origin	22	22	22	22	21	21	22	20	20	2	20	21

1. $(\frac{7}{12}c + \frac{1}{3})(\frac{7}{12}c - \frac{1}{3})$

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

3. $(11b - 12a)(11b + 12a)$

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

5.
$(5m^2 + 5m) + (-3mn - 3n)$
$5m(m + 1) - 3n(m + 1)$
$(m + 1)(5m - 3n)$

6.
$(6a^2 - 21a) + (-10a + 35)$
$3a(2a - 7) - 5(2a - 7)$
$(2a - 7)(3a - 5)$

7.
The factored answer will have one addition (+) and one subtraction (–) sign. When the last term is negative, there will always be one of each symbol in the factored answer.

8.
a. quadratic trinomial
b. cubic polynomial with 4 terms
c. linear binomial

9.
$P = (5x + 6) + 3x + 3x + (x + 2) + (x^2 + 8x - 1) + (2x - 1)$
$P = x^2 + 22x + 6\text{units}$

10.
$8(x - 3) - 2(x - 5) = 0$
$8x - 24 - 2x + 10 = 0$
$6x - 14 = 0$
$6x = 14$
$x = \frac{14}{6}$
$x = \frac{7}{3}$

11. D
A) $10x^2 - 4x + 12x - 14$
B) $10x^2 + 10x + 35x - 14$
C) $10x^2 + 4x - 35x - 14$
D) $10x^2 + 35x - 4x - 14$
Distractor Rationale:
A) Added inner terms rather than multiplying them.
B) Multiplied the numbers from the first terms instead of the outer terms.
C) Switched the signs of the inner and outer terms.

12. A
A) $2x$
B) 2
C) $(x + 5)$
D) $(x - 11)$
Distractor Rationale:
B) A common factor but not the GCF.
C) A binomial factor but not the GCF of all terms.
D) A binomial factor but not the GCF of all terms.