NPS Learning in Place

Algebra I
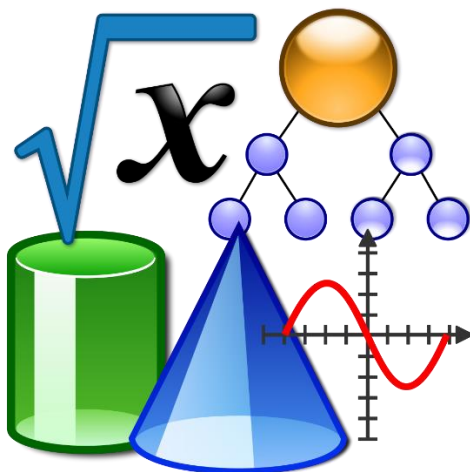
Week 1 **April 6 - 10**	**Factoring** **Day 1- 5**
Week 2 **April 20 - 24**	**Factoring** **Day 6 - 10**

Name _____ School _____ Teacher _____

Day 1: Factoring Using the GCF

Notes

Factoring:
GCF: The greatest common factor is the largest factor that divides all terms evenly
Step 1: Look at the coefficient: determine the GCF and write it down.
Step 2: Look at the variable. The variable must be common to all term to be a GCF
Step 3: If variable is common to all terms, take the one with the smallest exponent
Step 4: Divide all terms by the GCF to get the remainder in parenthesis and simplify
Step 5: Check the result by using the distributive property

Example 1: Factor the following polynomials by finding the greatest common factor.

$$15x^2y + 5xy^2 - 25x^3$$

Step 1: (15, 5, 25) GCF: **5**
Step 2: x is the only variable common to all terms
Step 3: x

GCF: 5x

Step 4: $5x\left(\dfrac{15x^2y}{5x} + \dfrac{5xy^2}{5x} - \dfrac{25x^3}{5x}\right)$

Answer: $5x(3xy + y^2 - 5x^2)$

Step 5: Check

$$5x(3xy + y^2 - 5x^2)$$

$$5x(3xy) + 5x(y^2) - 5x(5x^2)$$

$$15x^2y + 5xy^2 - 25x^3$$

✔

Example 2: Factor the following polynomials by finding the greatest common factor.

$$6a^3b - 8a^4 + 10a^2b$$

Step 1: (6, 8, 10) GCF: **2**
Step 2: a is the only variable common to all terms
Step 3: a^2 is the a with the smallest exponent

GCF: $2a^2$

Step 4: $2a^2\left(\dfrac{6a^3b}{2a^2} - \dfrac{8a^4}{2a^2} + \dfrac{10a^2b}{2a^2}\right)$

Answer: $2a^2(3ab - 4a^2 + 5b)$

Step 5: Check

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

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

$$6a^3b - 8a^4 + 10a^2b$$

✔

Day 1: Factoring Using the GCF

Factor each expression by factoring out the GFC		
1. $xy - xz$	**2.** $9x^2 - 3x$	**3.** $21b - 15a$
4. $27y^3 + 18y^2$	**5.** $12x^2 - 16x$	**6.** $28x^5 - 7x^2$
7. $2x^2y - 2xy$	**8.** $8m^3 + 16m^2n$	**9.** $4b^3 + 2b^2 + 8b$
10. $4xy^2 + 24x^2y^6 - 36x^4y$	**11.** $14c^2d - 2cd^2 + 10cd$	**12.** $6x^2y^3 + 9xy^4 + 18y^5$
13. $2a^2 + 12ab + 6b^2$	**14.** $8x^4 - 28x^3y^3 - 6x^2y^2$	**15.** $6a^4b - 10a^3b^2 - 6a^2b^3$
16. $24ab^4 + 12ab^3 - 18ab^2$	**17.** $25x^3 - 40x^2 + 10x$	**18.** $49x^5y - 14x^3y^2 - 28x^2y^3$

Day 2: Finding Factors Sums and Differences

Example 1: Find two factor whose product is 12 and whose sum is 7
Step 1 factors of 12: 1, 2, 3, 4, 6, 12
Step 2 Product of 12: (1 ● 12), (2 ● 6), (3 ● 4)
Step 3 Sum of 7: (1 + 12), (2 + 6), (3 + 4)
Answer: 3 and 4

Example 2: Find two factors whose product is -6 and whose sum is 1
Step 1 Factors of -6: -3, -2, -1, 1, 2, 3
Step 2 Product of -6: (-3 ● 2), (-2 ● 3), (-1 ● 6), (1 ● -6), (2 ● -3), (3 ● -2)
Step 3 Sum of 1: (-3 + 2), (-2 + 3), (-1 + 6), (1 + (-6)), (2 + (-3)), (3 + (-2))
Answer: -2 and 3

Directions: Find two factors whose product and sum is as indicated:

Product	Sum	Factors
−6	1	
36	−13	
−16	−6	
−4	0	
−33	8	
20	9	
6	−7	
81	−18	
−12	−1	
55	−56	
48	14	
100	25	
−49	0	
7	8	
3	-4	
−28	3	
21	10	
56	15	
−22	9	

Product	Sum	Factors
−56	1	
35	12	
−32	−3	
−24	5	
−42	−1	
6	−5	
14	−9	
1	2	
−6	5	
−121	0	
−32	14	
25	−24	
−40	6	
−52	−9	
−6	−5	
1	−2	
54	−15	
16	10	
−27	6	

Day 3: Factoring a trinomial in the form ax² + bx + c

no "a"
a = 1

$x^2 + bx + c$

product

c

b

sum
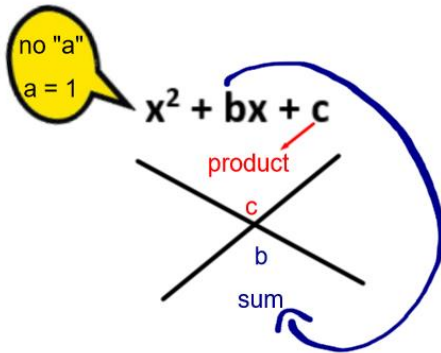
$(x \quad)(x \quad)$

Step 1: Set up parenthesis with your variable in front. (x   )(x)

Step 2: set up

product

c
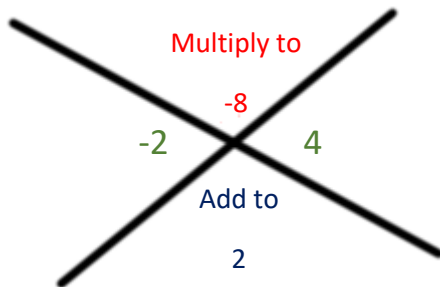
b

sum
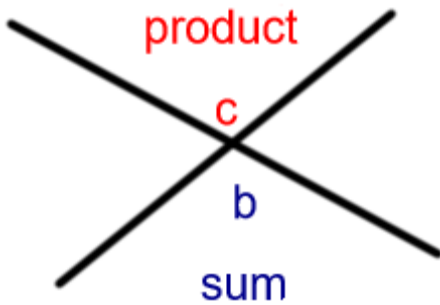
What numbers multiply to c and add up to b?

Step 3: Put the answers inside the parenthesis. **(Watch signs)**

Step 4: check your work by using the distributive property

Example: Factor x² + 2x − 8

Step 1: (x   ) (x   )

Step 2:

Multiply to

-8

-2   4

Add to

2

What numbers multiply to -8 and add up to 2?

-2 and 4

-2 • 4 = -8

-2 + 4 = 2

Step 3: (x − 2)(x + 4)

Step 4:
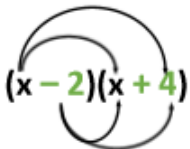
(x − 2)(x + 4)

x(x + 4) = x • x + x • 4 = x² + 4x

-2(x + 4) = -2• x -2• 4 = -2x -8

x² + 4x -2x -8

x² + 2x - 8

Day 3: Factoring a trinomial in the form ax² + bx + c

Multiply a & c in the trinomials & place the product on top. Place b on the bottom then factor.

1. $x^2 + 5x - 14$	2. $x^2 + 12x + 35$	3. $x^2 - 11x + 24$
-14 $\diagup$ 5 $(x \quad)(x \quad)$	$(x \quad)(x \quad)$	$(x \quad)(x \quad)$
4. $x^2 - 9x - 36$	5. $x^2 - 8x + 16$	6. $x^2 - 3x - 10$
$(\quad)(\quad)$	$(\quad)(\quad)$	$(\quad)(\quad)$
7. $x^2 - 12x + 27$	8. $x^2 + 7x - 8$	9. $x^2 - 7x - 18$
$(\quad)(\quad)$	$(\quad)(\quad)$	$(\quad)(\quad)$
10. $x^2 + 12x + 20$	11. $x^2 - 3x - 40$	12. $x^2 + x - 6$
13. $x^2 - 14x + 49$	14. $x^2 + x - 2$	15. $x^2 - 10x + 21$
16. $x^2 + 15x + 26$	17. $x^2 - 16x + 28$	18. $x^2 + 25x + 100$
19. $x^2 - 17x + 30$	20. $x^2 + x - 42$	21. $x^2 + \frac{2}{3}x + \frac{1}{9}$

Day 4: Factoring a trinomial in the form $ax^2 + bx + c$

Directions: Factor each trinomial		
1. $x^2 + 14x + 24$	2. $x^2 + 9x + 20$	3. $x^2 - 6x - 16$
4. $x^2 - 8x + 7$	5. $x^2 + 9x + 20$	6. $x^2 - 8x - 9$
7. $x^2 + 4x - 5$	8. $x^2 + 5x - 36$	9. $n^2 - 15n + 44$
10. $y^2 + y - 30$	11. $x^2 - 16x + 55$	12. $x^2 - 13x + 12$

Day 4: Factoring a trinomial in the form $ax^2 + bx + c$

Factor each quadratic. Find the matching answer in the word bank, then fill it in for the solution!

Don't _____ _____ on my _____ _____ _____, you _____ _____ of _____!
     #1   #2   #3   #4   #5   #6   #7   #8

1. $x^2 + 13x + 40$	2. $x^2 - 5x - 50$
3. $x^2 + x - 72$	4. $x^2 + 2x - 3$
5. $x^2 - 1x - 72$	6. $x^2 - 15x + 50$
7. $x^2 + 5x - 14$	8. $x^2 + 8x + 7$

Word Bank

basket	$(x + 7)(x - 2)$	blue	$(x + 9)(x - 8)$
bubble	$(x - 1)(x + 3)$	bald	$(x - 4)(x - 3)$
T-rex	$(x + 4)(x - 3)$	do	$(x + 8)(x + 5)$
hairy	$(x - 5)(x - 10)$	kittens	$(x + 7)(x + 1)$
playful	$(x - 6)(x + 1)$	gum	$(x - 9)(x + 8)$
Karate	$(x - 10)(x + 5)$	Trix	$(x + 8)(x + 6)$

Day 5: Factoring Polynomials with greatest common factors

Review Factoring using GCF

Example: 2x² + 2x – 4 **GCF: 2** **Divide by the GCF** $2(\frac{2x^2}{2} + \frac{2x}{2} - \frac{4}{2}) \rightarrow 2(x^2 + x - 2)$	**You Try! Example: 2x² + 10x + 12**

Factor using GFC

Example 1: 2x² + 2x - 4

Step 1 find GCF: 2

Step 2: Divide each term by the GCF

$2(\frac{2x^2}{2} + \frac{2x}{2} - \frac{4}{2}) \rightarrow 2(x^2 + x - 2)$

Step 3: Factor the trinomial inside the parenthesis

2(x – 1)(x + 2)

You Try!

Example 2: 3x² – 18x + 15

You Try!

Example 3: 6x² + 6x – 36

Day 5: Factoring Polynomials with greatest common factors

Factor each completely. (Remember to pull out the GCF first.)	
1. $3r^2 + 21r + 30$	**2.** $2p^2 + 14p + 24$
3. $2x^2 - 16x + 30$	**4.** $3n^2 - 9n + 6$
5. $3b^2 - 3b - 36$	**6.** $2n^2 + 2n - 12$
7. $5x^2 - 35x + 60$	**8.** $2y^2 + 10y - 28$

Day 6: Review

Directions: Factor each polynomial. Check your answers by FOIL.

1. $x^2 + 5x + 6$	**2.** $a^2 + 11a + 30$	**3.** $m^2 + 18m + 56$
4. $w^2 + 4w + 4$	**5.** $y^2 + 9y + 8$	**6.** $k^2 + 17k + 66$
7. $y^2 - 6y + 8$	**8.** $x^2 - 11x + 28$	**9.** $n^2 - n - 90$
10. $p^2 - 14p + 40$	**11.** $x^2 + 3x - 70$	**12.** $w^2 - 12w + 36$
13. $m^2 + 5m - 6$	**14.** $b^2 - 15b + 56$	**15.** $x^2 - 10x - 39$
16. $a^2 + 11ab + 18b^2$	**17.** $x^2 - 14xy - 51y^2$	**18.** $m^2 - 8mn + 7n^2$

Directions: Factor each polynomial. Look for a GCF first.

19. $2k^2 - 8k - 90$	**20.** $x^3 + 2x^2 - 48x$	**21.** $4w^2 - 52w - 120$
22. $2x^2 + 10x + 8$	**23.** $3y^2 + 24y + 48$	**24.** $5m^2 + 30m - 35$

Name:_____   Factoring Quadratic Expressions, a= 1

What Polynomial Tries Harder Than All The Rest?

Directions: Factor each of the quadratic expressions. Use your answer to solve the riddle!

O. $x^2 - 7x - 18$

M. $x^2 + 9x + 14$

R. $x^2 + 6x + 8$

A. $x^2 - 16x + 63$

L. $x^2 - 9x + 8$

I. $x^2 - 15x + 36$

-   $x^2 + 5x + 6$

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

N. $x^2 - 8x + 15$

! $x^2 - 9x + 14$

___ ___   ___ ___ ___ ___ ___ ___ ___ ___
(x-9)(x-7)   (x+5)(x-2) (x+4)(x+2) (x-12)(x-3) (x+2)(x+3)

          ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___
          (x-5)(x-3) (x-9)(x+2) (x+7)(x+2) (x-12)(x-3) (x-9)(x-7) (x-8)(x-1) (x-7)(x-2)

Day 7: Factoring Difference of Squares

Perfect Squares: can take $\sqrt{}$

$$a^2 - b^2$$

$(a + b)(a - b)$

$a^2 - ab + ab - b^2$

$a^2 - b^2$

*** Check first for a GCF
Step 1: Take the square root of the perfect squares to find a and b
Step 2: Plug a and b in (a + b)(a − b)
Step 3: Check to see if you eliminated the middle term

Example1:   **$81x^2 - 36$**
GCF: 9
$9(9x^2 - 4)$ →(Notice 9, x^2, and 4 are all perfect squares inside the parenthesis: **Don't take the square root of the GCF****)
Step 1: $9(\sqrt{9x^2} - \sqrt{4})$→ a = 3x and b = 2

Step 2: $9(3x + 2)(3x - 2)$

Step 3 Check: $9(9x^2$ -6x + 6x $- 4)$
         $9(9x^2 - 4)$
          $81x^2 - 36$

Example 2: $32x^2 - 72$
GCF: 8
$8(4x^2 - 9)$ →(Notice 4, x^2, and 9 are all perfect squares inside the parenthesis: **Don't take the square root of the GCF****)
Step 1: $8(\sqrt{4x^2} - \sqrt{9})$→ a = 2x and b = 3

Step 2: $8(2x + 3)(2x - 3)$

Step 3 Check: $8(4x^2$ -6x + 6x $- 9)$
         $8(4x^2 - 9)$
          $32x^2 - 72$

You Try! $9x^2 - 16$

Day 7: Factoring Differences of Squares

State whether each polynomial is a difference of two squares. If it is, factor the expression.

1.) $n^2 - 81$

2.) $a^2 - 121$

3.) $n^2 + 16$

4.) $9x^2 - 144$

5.) $2x^2 - 9$

6.) $4w^2 - 9$

7.) $4n^2 - 1$

8.) $1 - 16x^2$

9.) $x^4 - y^2$

10.) $9 - c^2$

11.) $n^3 - 25$

12.) $16x^2 - 6y^2$

13.) $49 - 4a^2$

14.) $a^2b^2 - c^4$

15.) $4x^2y^2 - 9z^2$

Day 8: Factoring Trinomials

$$ax^2 + bx + c$$

If "a cannot be factored out by GCF, we use the Slip and Slide Method
Step 1: "Slip" <u>a</u> to the end of the trinomial and **multiply by c**
Step 2: Factor the new basic trinomial
Step 3: Divide both your factors by the value you "slipped" over in step 1
Step 4: Reduce fractions and "slide" any denominators up next to the variable.

Example: Factor $2x^2 + x - 6$
Step 1: Slip" <u>a</u> to the end of the trinomial and **multiply by c**

      $x^2 + x - 6(2)$
      $x^2 + x - 12$

Step 2: Factor the new basic trinomial

(a)(c)
Multiply to
-12

-3   4

Add to b
1

> **What numbers multiply to -12 and add up to 1?**
>
> **-3 and 4**
>
> **-3 ● 4 = -12**
>
> **-3 + 4 = 1**

Step 3: Divide both your factors by the value you "slipped" over in step 1

    $(x - \frac{3}{2})(x + \frac{4}{2})$

Step 4: Reduce fractions and "slide" any denominators up next to the variable.

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

Example 2: Factor $7x^2 + 29x + 4$
Step 1: Slip" <u>a</u> to the end of the trinomial and **multiply by c**

      $x^2 + 29x + 4(7)$
      $x^2 + 29x + 28$

Step 2: Factor the new basic trinomial

(a)(c)
Multiply to
28

1   28

Add to b
29
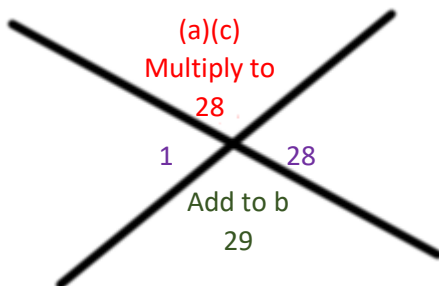
Step 3: Divide both your factors by the value you "slipped" over in step 1

    $(x + \frac{1}{7})(x + \frac{28}{7})$

Step 4: Reduce fractions and "slide" any denominators up next to the variable.

      $(7x + 1)(x + 4)$

Day 8: Factoring Trinomials

Factor each completely: Use slip and slide method	
1. $5r^2 + 6r + 1$	**2.** $2p^2 + 11p + 5$
3. $3x^2 - 8x + 4$	**4.** $5n^2 - 11n -12$
5. $5b^2 + 19b + 12$	**6.** $2n^2 + 5n + 2$
7. $4x^2 - 15x - 25$	**8.** $5y^2 - 18y + 9$

FACTORING TRINOMIALS

ax² + bx + c

If 'a' cannot be factored out by GCF, we use a method called Slip & Slide.

Step 1: "Slip" _____ to the end of the trionomial and multiply by _____.

Step 2: Factor this new basic trinomial.

Step 3: Divide both your factors by the value you "slipped" over in Step 1.

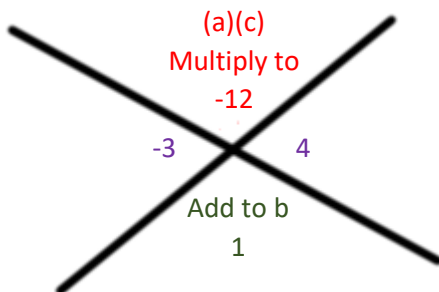Step 4: Reduce fractions and "slide" any denominators up next to the variable.

Example 1	$2x^2 + 5x + 3$	Example 2	$5m^2 - 17m + 6$
Example 3	$6y^2 - 5y - 4$	Example 4	$12c^2 + 11c - 5$

Now you try!

Factor the following trinomials.

1. $4x^2 - 19x - 5$	2. $6k^2 + 7k + 2$	3. $8y^2 - 10y - 3$

Day 9: Factoring Trinomials more Practice

Factor each trinomial		
1. $3n^2 + 7n - 20$	**2.** $7a^2 + 48a + 36$	**3.** $5x^2 - 41x - 36$
4. $3b^2 - b - 10$	**5.** $5y^2 - 49y + 72$	**6.** $6n^2 - x - 12$
7. $9v^2 - 3v - 2$	**8.** $4r^2 - 16r - 15$	**9.** $7x^2 + 15x - 18$

Factoring Quadratics Word Search #7

Answer the questions below, match your answers to the corresponding words and find them in the word search. **Don't try to be sneaky** – some words are deliberately hidden in the word search but don't need to be found.

K	E	L	J	B	I	C	Y	C	L	E	L	K	Z	T	C	L	F	R	J
A	E	Z	O	I	T	O	P	S	H	O	P	O	U	G	U	P	B	E	I
W	Y	R	Z	C	V	Q	I	A	W	H	B	Y	N	N	H	T	U	V	R
U	I	K	R	B	K	D	I	Z	X	M	X	S	G	D	P	V	S	S	W
U	I	P	O	H	U	E	A	G	S	B	L	S	T	F	O	A	R	H	C
I	P	I	J	O	B	F	R	H	S	E	W	Z	A	S	T	N	R	J	A
Q	A	N	S	L	T	Z	R	T	W	N	F	R	M	E	G	M	A	E	C
V	D	T	J	L	R	Y	T	R	E	X	Q	Y	L	W	J	S	T	M	T
V	T	E	N	Y	O	K	Z	O	U	W	D	L	Q	N	X	S	I	A	U
Z	Q	R	W	W	B	S	A	N	E	H	I	A	N	H	X	O	U	I	S
Z	F	E	T	O	O	I	U	N	U	T	E	P	P	X	P	B	G	L	G
B	O	S	S	O	T	U	D	A	E	Y	F	I	T	O	P	S	I	R	I
J	Q	T	C	D	Q	Y	E	B	E	A	C	H	G	G	G	D	H	V	Z
C	D	I	P	B	S	V	A	V	O	C	A	D	O	K	U	I	T	Z	K
T	D	R	A	Z	Z	I	L	B	E	U	T	N	R	E	M	A	E	Y	N

Factor

Q1) $x^2 + 8x + 15$ **Q2)** $2x^2 + 5x + 3$ **Q3)** $x^2 - 3x - 10$ **Q4)** $x^2 - 5x + 6$

Q5) $3x^2 - 7x + 2$ **Q6)** $4x^2 + 8x - 5$ **Q7)** $x^2 + 9x + 14$ **Q8)** $5x^2 - 29x - 6$

Q9) $x^2 - 64$ **Q10)** $4x^2 + 12x + 9$ **Q11)** $2x^2 + 13x + 20$ **Q12)** $x^2 + 2x + 1$

Q13) $4x^2 - x - 5$ **Q14)** $x^2 - 5x + 4$ **Q15)** $9x^2 - 49$ **Q16)** $x^2 + x - 42$

$(4x - 5)(x + 1) = Beach$ $(3x - 2)(x - 1) = Robot$ $(x - 1)(x - 4) = Avocado$

$(x + 1)(x + 3) = Spirit$ $(x + 2)(x + 7) = Locker$ $(2x + 3)(x + 1) = London$

$(2x - 1)(2x + 5) = Cactus$ $(5x - 6)(x + 1) = Elephant$ $(x - 6)(x + 7) = Ipad$

$(x + 3)(x + 5) = Topshop$ $(x + 8)(x - 8) = Wendys$ $(3x - 1)(x - 2) = Bicycle$

$(4x + 1)(x - 5) = Lungs$ $(3x + 7)(3x - 7) = Guitar$ $(x + 2)(x + 3) = Blizzard$

$(x + 2)^2 = Surfing$ $(x - 5)(x + 2) = Satellite$ $(2x - 5)(2x + 1) = Spotify$

$(x - 2)(x - 3) = Pinterest$ $(2x + 3)^2 = North$ $(5x + 1)(x - 6) = Hollywood$

$(2x + 5)(x + 4) = Boss$ $(x + 4)(x - 4) = Fireman$ $(x + 1)^2 = Email$

© Liam Hall

How Can Fishermen Save Gas ?

Factor each polynomial below. Find one of the factors in **each** column of binomials. Notice the letter next to one factor and the number next to the other. Write the letter in the box at the bottom of the page that contains the matching number.

① $4n^2 - 49$

② $n^2 + 8n + 12$

③ $n^2 - 9n + 20$

④ $n^2 + 16n + 64$

⑤ $n^2 + 2n - 15$

⑥ $3n^2 - 8n + 5$

③ $(n + 1)$ ⓞ $(n - 3)$
⑪ $(n + 2)$ ⓖ $(2n - 7)$
② $(n + 8)$ ⓟ $(n - 5)$
⑨ $(2n + 7)$ ⓢ $(3n - 5)$
④ $(n + 5)$ ⓨ $(n + 8)$
⑱ $(n - 1)$ ⓚ $(3n - 1)$
⑭ $(n - 4)$ ⓐ $(n + 6)$

---

⑦ $a^2 + 4a - 21$

⑧ $5a^2 + 9a - 2$

⑨ $2a^2 + 11a + 15$

⑩ $1 - 9a^4$

⑪ $a^2 - 11a + 30$

⑫ $10a^2 - 3a - 1$

① $(a - 5)$ ⓖ $(2a + 1)$
⑬ $(a + 7)$ ⓑ $(a - 6)$
⑤ $(5a + 1)$ ⓟ $(a - 3)$
⑦ $(a + 2)$ ⓞ $(a + 3)$
⑮ $(a - 1)$ ① $(5a - 1)$
⑧ $(1 - 3a^2)$ ⓡ $(2a - 1)$
⑯ $(2a + 5)$ ⓝ $(1 + 3a^2)$

---

⑬ $8u^2 + 19u + 6$

⑭ $25u^2 - 20u + 4$

⑮ $3u^2 - 11u - 14$

⑯ $u^2 - 4u - 21$

⑰ $6u^2 + 17u - 10$

⑱ $2u^2 + 5u - 18$

⑩ $(u + 3)$ ⓜ $(u + 1)$
⑫ $(2u + 9)$ ⓑ $(2u + 1)$
⑰ $(u - 3)$ ⓞ $(8u + 3)$
③ $(5u - 2)$ ⓛ $(2u - 1)$
⑥ $(3u - 14)$ ⓒ $(u - 7)$
⑮ $(u + 2)$ ⓡ $(u - 2)$
⑰ $(3u + 10)$ ⓕ $(5u - 2)$

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18