Factoring Trinomials: The Preparation, Part 1

The Factor Game

The ***Factor Game*** is a numbers game with these rules:

- You are given two numbers, a **product number** and a **sum number**.
- You must find a factor pair of the product number that add to the sum number.

The correct factor pair is called the **winning combination.**

Special Notes: In a single factor game

1. it is possible that there is no winning combination, no factor pair that works, and

2. if there is a winning combination, there will be only *one* winning combination.

Note: It does not matter in which order the numbers of the winning combination are written.

Example 1: Find the winning combination for the given product and sum numbers.

a) Product = 18 and Sum = 9

b) Product = 36 and Sum = 20

c) Product = 40 and Sum = 15

Procedure: Use a factor pair table to generate possible winning combinations.

Answer:

a) Product = 18 and Sum = 9

18		**Sum**	
1	18	19	← Too large.
2	9	11	← Closer, but not quite.
3	6	9	← This is it!

The winning combination is **3 and 6**.

b) Product = 36 and Sum = 20

36		**Sum**	
1	36	37	← Too large.
2	18	20	← This is it!

There are more factor pairs of 36, but ...

The winning combination is **2 and 18**.

c) Product = 40 and Sum = 15

40		**Sum**	
1	40	41	← Too large.
2	20	22	← Closer, but not quite.
4	10	14	← Nope.
5	8	13	← Nope.

There is **no winning combination.**

Group Exercise 1 Find the winning combination for the given product and sum numbers.

a) Product = 20 and Sum = 12

b) Product = 30 and Sum = 12

c) Product = 36 and Sum = 15

If the product number is positive and the sum number is negative, then the factors in the winning combination will both be negative

Example 2: Find the winning combination for the given product and sum numbers.

a) Product = 18 and Sum = -11

b) Product = 36 and Sum = -12

Procedure: Use a factor pair table to generate possible winning combinations.

Answer:

a) Product = 18 and Sum = -11

18		**Sum**	
-1	-18	-19	← Too large.
-2	-9	-11	← This is it!
-3	-6	-9	← This isn't needed.

The winning combination is **-2 and -9**.

b) Product = 36 and Sum = -12

36		**Sum**	
-1	-36	-37	← Too large.
-2	-18	-20	← Still too large.
-3	-12	-15	← Again, too large.
-4	-9	-13	← Hmmm. What's going on?
-6	-6	-12	← Aha. This is it!

The winning combination is **-6 and -6**.

Group Exercise 2 Find the winning combination for the given product and sum numbers.

a) Product = 24 and Sum = -11

b) Product = 30 and Sum = -11

If the product number is *negative*, the factors in the winning combination will be opposite in sign.

The larger valued factor will have the same sign as the sum number.

Example 3: Find the winning combination for the given product and sum numbers.

a) Product = -24
and Sum = 5

b) Product = -36
and Sum = -5

Procedure: Use a factor pair table to generate possible winning combinations.

Answer:

a) Product = -24 and Sum = 5
Because the Sum number is positive,
the larger factor is positive.

-24		**Sum**	
-1	+24	+23	← Too large.
-2	+12	+10	← Not quite.
-3	+8	+5	← This is it!.
-4	+6	+2	← This isn't needed.

The winning combination is **-3 and +8**.

b) Product = -36 and Sum = -5
Because the Sum number is negative,
the larger factor is negative.

36		**Sum**	
+1	-36	-35	← Too large.
+2	-18	-16	← Still too large.
+3	-12	-9	← Closer.
+4	-9	-5	← This is it!

The winning combination is **+4 and -9**.

Group Exercise 3 Find the winning combination for the given product and sum numbers.

a) Product = -30
and Sum = 1

b) Product = -40
and Sum = -6

c) Product = -36
and Sum = -1

d) Product = -60
and Sum = 4

Focus Exercises

Find the winning combination for the given Product number and Sum number.

1. Product # = 18, Sum # = 11

2. Product # = 20, Sum # = 21

3. Product # = 30, Sum # = 12

4. Product # = 36, Sum # = 20

5. Product # = 25, Sum # = -10

6. Product # = -24, Sum # = 8

7. Product # = -6, Sum # = 1

8. Product # = -36, Sum # = 0

9. Product # = -40, Sum # = -18

10. Product # = -90, Sum # = -1

11. Product # = 60, Sum # = -17

12. Product # = -60, Sum # = -17