

8.5 - 8.6 NEW METHOD

FACTORIZING $ax^2 + bx + c$

1. Factor $2x^2 + 11x + 5$.

STEP 1: Make a sum and product chart.

Multiply the coefficient and the constant to find the PRODUCT.

$$2x^2 + 11x + 5$$

The coefficient for the middle term is the SUM.

SUM 11	PRODUCT 10
1 + 10	1 · 10
	2 · 5
	-1 · -10
	-2 · -5

start
↓

STEP 2: Divide each number by the coefficient of the first term.

* If possible, reduce. * $\frac{1}{2}$

$$\frac{10 \div 2}{2 \div 2} = \frac{5}{1}$$

STEP 3: To put in factored form as two binomials, the denominator becomes the coefficient of the first term and the numerator becomes the coefficient of the last term.

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

2. Factor $3 + 10p + 3p^2$.

SUM 10	PRODUCT 9
1 + 9	<u>1 · 9</u>
	-1 · -9
	3 · 3
	-3 · -3

$$\frac{1}{3} \quad \frac{9 \div 3}{3 \div 3} = \frac{3}{1}$$

$$(3 + p)(1 + 3p)$$

3. Factor $5m^2 - 7mn + 2n^2$.

SUM -7	PRODUCT 10
	1 · 10
	2 · 5
	-1 · -10
-2 + -5	<u>-2 · -5</u>

$$\frac{-2}{5} \quad \frac{-5 \div 5}{5 \div 5} = \frac{-1}{1}$$

$$(5m - 2n)(m - n)$$

4. Solve $8k^2 - 16k + 6 = 0$.

$$2(4k^2 - 8k + 3) = 0$$

SUM -8	PRODUCT 12
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	1 · 12	-1 · -12
-2 + -6	2 · 6	<u>-2 · -6</u>
	3 · 4	-3 · -4

$$\frac{-2}{4}$$

$$\frac{-6}{4}$$

$$2(2k-1)(2k-3) = 0$$

$$\downarrow$$

$$-\frac{1}{2}$$

$$\downarrow$$

$$\frac{3}{2}$$

$$2 \neq 0$$

$$\frac{2k-1=0}{+1 \quad +1}$$

$$\frac{2k-3=0}{+3 \quad +3}$$

$$\frac{2k}{2} = \frac{1}{2}$$

$$\frac{2k}{2} = \frac{3}{2}$$

$$k = \frac{1}{2}$$

$$k = \frac{3}{2}$$

5. Solve $8h^3 - 6h^2 - 9h = 0$.

$$h(8h^2 - 6h - 9) = 0$$

SUM -6	PRODUCT -72
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	-1 · 72	1 · -72
	-2 · 36	2 · -36
6	-3 · 24	3 · -24
-12	-4 · 18	4 · -18
	-6 · 12	<u>6 · -12</u>
	-8 · 9	8 · -9

$$\frac{6}{8}$$

$$\downarrow$$

$$\frac{3}{4}$$

$$\frac{-12}{8}$$

$$\downarrow$$

$$-\frac{3}{2}$$

$$h(4h+3)(2h-3) = 0$$

$$h = 0$$

$$\frac{4h+3=0}{-3 \quad -3}$$

$$\frac{2h-3=0}{+3 \quad +3}$$

$$\frac{4h}{4} = \frac{-3}{4}$$

$$\frac{2h}{2} = \frac{3}{2}$$

$$h = -\frac{3}{4}$$

$$h = \frac{3}{2}$$

6. Factor $3w^2 + 3w^3 - 18w^4$.

SUM $3w^2$ 1	PRODUCT $(1 + w - 6w^2)$ -6
	$1 \cdot -6$
	$-1 \cdot 6$
	$2 \cdot -3$
$-2 + 3$	$-2 \cdot 3$
$\frac{-2}{1}$	$\frac{3}{1}$

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

7. Factor $6c^3 + 8c^2d - 14cd^2$.

SUM $2c$ 4	PRODUCT $(3c^2 + 4cd - 7d^2)$ -21
	$-1 \cdot 21$
	$1 \cdot -21$
$-3 + 7$	$-3 \cdot 7$
$\frac{-3}{3}$	$\frac{7}{3}$
$\frac{-1}{1}$	$\frac{7}{3}$

$2c(c-d)(3c+7d)$