Synthetic Long Divison

When a polynomial is divided by a binomial, the long division process can be replaced with synthetic long division.

This process involves using just the coefficients and simplifies the steps.

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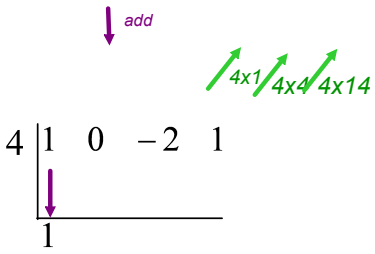
Example:

$$\left(x^3-2x+1\right)\div\left(x-4\right)$$



Steps
1/ for (*x*-4) , *k*=4
2/ bring down the first digit
3/ multiply 4 times the first number
4/ add
5/ multiply 4 times the second number
6/ add
7/ multiply 4 times the third number
8/ add

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Example: $\left(x^3+2x^2-6x+1\right)\div\left(x+2\right)$

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See Example 4 on page 166 for a case where the binomial is not in form (x-k) but in form (ax-d)

$6x^3+5x^2-16x-15$

$\div (2x+3)$

Step 1 - factor $2x+3 = 2\left(x+\frac{3}{2}\right)$

$$\frac{6x^3+5x^2-16x-15}{(2x+3)} = \frac{6x^3+5x^2-16x-15}{2\left(x+\frac{3}{2}\right)}$$

Now dividing by 2 and $\left(x+\frac{3}{2}\right)$

→ Synthetic division first + then divide answer by 2

$-\frac{3}{2}$

6	5	-16	-15
	-9	6	+15
6	-4	-10	0

Now divide by 2

$3x^2-2x-5$

factor quadratic using decomposition

$3x^2-2x-5$

$= 3x^2+3x-5x-5$

$= 3x(x+1)-5(x+1)$

$= (3x-5)(x+1)$

$\_\_ x \_\_ = -15$

$\_\_ + \_\_ = -2$

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Remember that we factored a quadratic function to find the zeros. The same is true for all polynomial functions.

-If a binomial divides evenly into a polynomial, it is a factor and will show a zero.

-If a binomial does not divide evenly into a polynomial, then it is not a factor and does not show a zero.

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