Long Division of Polynomials

1. Set up the polynomial division – leave spaces for any missing terms in the dividend.

$$3x+2\overline{)\ 6x^2+16x+15}$$

2. Look at the first term in the divisor ($3x+2$ in this case), and determine what to multiply by to get the first term in the dividend. In this example, it is $2x$, since $3x\cdot 2x = 6x^2$. Multiply $2x$ by the divisor and write the answer below the dividend – line up the corresponding exponents.

$$\begin{array}{r} 2x \\ 3x+2\overline{)\ 6x^2+16x+15} \\ 2x(3x+2)\ \rightarrow\ 6x^2+\ 4x \end{array}$$

3. Subtract (change the sign of your result in the previous step).

$$\begin{array}{r} 2x \\ 3x+2\overline{)\ 6x^2+16x+15} \\ \overset{(-)}{\ } \quad \overset{(-)}{\ } \\ \underline{6x^2+\ 4x} \\ 12x \end{array}$$

4. Bring down the next term from the dividend.

$$\begin{array}{r} 2x \\ 3x+2\overline{)\ 6x^2+16x+15} \\ \overset{(-)}{\ } \quad \overset{(-)}{\ } \\ \underline{6x^2+\ 4x} \quad \downarrow \\ 12x+15 \end{array}$$

5. Repeat steps 2-4 as necessary.

$$\begin{array}{r} 2x+4 \\ 3x+2\overline{)\ 6x^2+16x+15} \\ \overset{(-)}{\ } \quad \overset{(-)}{\ } \\ \underline{6x^2+\ 4x} \\ 12x+15 \\ 4(3x+2)\ \rightarrow\ 12x+8 \end{array}$$

$$\begin{array}{r} 2x+4 \\ 3x+2\overline{)\ 6x^2+16x+15} \\ \overset{(-)}{\ } \quad \overset{(-)}{\ } \\ \underline{6x^2+\ 4x} \\ 12x+15 \\ \overset{(-)}{\ } \quad \overset{(-)}{\ } \\ \underline{12x+8} \\ 7 \end{array}$$

6. In this case, there are no further terms to drop down, so 7 is the remainder. Write the solution as the quotient on top of the division sign plus the remainder over the divisor.

$$\frac{6x^2+16x+15}{3x+2} = 2x+4+\frac{7}{3x+2}$$