Dividing a Polynomial by a Polynomial:

Dividing one polynomial by another is very similar to long division.

Example 3: Divide $(6x^2 + 8x + 8)$ by $(3x + 1)$.

$$\text{Step 1:} \quad 3x+1\overline{)6x^2+8x+8}$$

$$\underline{}\,2x+2$$

Step 1: Write the problem as a long division problem. The binomial belongs on the outside of the division symbol because it is the term we are <u>dividing by</u>.

Step 2: Now, we can begin dividing.
$(3x)(2x) = 6x^2$ So, 2x belongs above the 8x.

Step 3: The next step is to multiply 2x by $(3x + 1)$.
$(2x)(3x + 1) = 6x^2 + 2x$ Subtract that product from   Now, bring the + 8 straight down beside the 6x.

Step 4: $(3x)(2) = 6x$, so we place the 2 above the 8 in the answer.

Step 5: Multiply 2 by $(3x + 1)$ to get 6x + 2. Subtract $(6x + 2)$ from $(6x + 8)$. There is a remainder of 6, so we write the remainder as a fraction with the binomial as the denominator.

Answer: $2x + 2 + \dfrac{6}{3x + 1}$