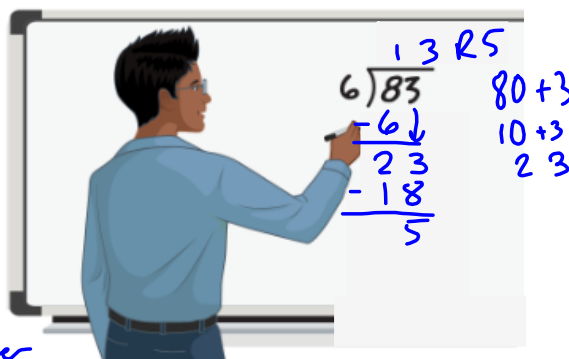


Benson recalls how to divide whole numbers by solving a problem with 6 as the divisor and 83 as the dividend. He determines that the quotient is 13 with remainder 5.

Workbook
pg. 73

A. Explain the process of long division using Benson's example.



how many times does divisor (6) go into the 1st number. Write it on top, multiply, write product under, subtract and bring down leftovers. Repeat

B. How can you express the remainder as a fraction?

Divide remainder by divisor $\frac{5}{6}$ how to write as a mixed # $\frac{83}{6} = 13\frac{5}{6}$

C. Use Structure Use the results of the division problem to write two expressions for 83 that include the divisor, quotient, and remainder.

$$83 = (13\frac{5}{6})(6) \quad 83 = 13 \cdot 6 + 5$$

$$83 = (6)(13\frac{5}{6})$$

Divisor · Quotient

$$83 = 6 \cdot 13 + 5$$

Divisor · Whole part + Remainder

Long Division...Also, Can we do this in 2 different ways?

$$128 \div 4 \quad \text{Divisor}$$

$$\begin{array}{r} 32 \\ 4 \overline{)128} \\ \underline{-12} \\ 08 \\ \underline{-8} \\ 0 \end{array}$$

$$(4)(32) = 128$$

Factor

$$128 \div 5$$

$$\begin{array}{r} 25 \text{ R } 3 \\ 5 \overline{)128} \\ \underline{-10} \\ 28 \\ \underline{-25} \\ 3 \end{array}$$

$$128 \div 5$$

Dividing
Polynomials by
Binomials

$$\frac{10}{5} = \frac{5 \cdot 2}{5} = 2$$

Option 1: First try factoring the first polynomial and cancel the common factors.

ex.1

$$\frac{(x-5)(x+3)}{(x-5)} = \boxed{x+3}$$

ex.2

$$\frac{a^2 + 7a + 12}{a-5} \div \underline{a-5}$$

$$\frac{(a+4)(a+3)}{a-5}$$

can't cancel

Option 2: If nothing cancels, then use long division

Quotient

Dividend

Divisor

Starting Polynomial under

Answer to a ÷ problem

$$a-5 \overline{) a^2 + 7a + 12}$$

thing doing dividing

Long Division with Polynomials

Long Division of Polynomials

1. Set up long division (decending order, every term needs to be accounted for)
* Fill in missing terms with 0
2. Focus on the first term only and what you need to multiply it by to get the first term of the polynomial, write that up top
3. Subtract and bring down terms, repeat step 2
* put in () + distribute subtract
4. When the divisor can no longer go in (its degree is bigger than the remainder polynomial) write and add the leftovers in a fraction over the divisor.

set it up!

$$(-5m + m^2 - 7) \div (m-6)$$

$$\begin{array}{r} 1 \overline{) 183} \\ -16 \downarrow \\ \hline 23 \\ -16 \\ \hline 7 \end{array}$$

$$\begin{array}{r} m-6 \overline{) m^2-5m-7} \\ \underline{-(m^2-6m)} \\ 11m-7 \\ \underline{-(11m-66)} \\ 59 \end{array}$$

Answer:

$$\frac{m^2-5m-7}{m-6} = m+1 + \frac{-1}{m-6}$$

$$\text{or } m^2-5m-7 = (m-6)(m+1) - 1$$

1. Set up long division (decending order, every term needs to be accounted for)
* Fill in missing terms with 0

2. Focus on the first term only and what you need to multiply it by to get the first term of the polynomial, write that up top

3. Subtract and bring down terms, repeat step 2

* Use () distribute subtraction

4. When the divisor can no longer go in (its degree is bigger than the remainder polynomial) write and add the leftovers in a fraction over the divisor.

Try It! example 1

Workbook pg. 74

1. use long division to divide the polynomials

$$\text{a. } (x^3 - 6x^2 + 11x - 6) \div (x^2 - 4x + 3)$$

$$\begin{array}{r} x-2 \overline{) x^3-6x^2+11x-6} \\ \underline{-(x^3-4x^2+3x)} \\ -2x^2+8x-6 \\ \underline{+(2x^2-8x+6)} \\ 0 \end{array}$$

Factors it!
 $(x-3)(x-1)(x-2)$
 $x=3 \quad x=1 \quad x=2$
means it factors perfectly

$$\text{b. } 16x^4 - 85 \text{ divided by } 4x^2 + 9$$

$$\begin{array}{r} 4x^2+9 \overline{) 16x^4+0x^3+0x^2+0x-85} \\ \underline{-(16x^4+0x^3+36x^2)} \\ -36x^2+0x-85 \\ \underline{+(36x^2+0x+81)} \\ -4 \end{array}$$

$$16x^4 - 85 = (4x^2 + 9)(4x^2 - 9) - 4$$

$$16x^4 - 85 = (4x^2 + 9)\left(4x^2 - 9 - \frac{4}{4x^2 + 9}\right)$$

pg. 76 #4)

$$\begin{array}{r}
 x^2 - 4x + 4 + \frac{29x - 26}{x^2 + 8} \\
 \underline{x^2 + 0x + 8} \overline{) x^4 - 4x^3 + 12x^2 - 3x + 6} \\
 - (x^4 + 0x^3 + 8x^2) \quad \downarrow \downarrow \\
 \hline
 -4x^3 + 4x^2 - 3x + 6 \\
 - (-4x^3 + 0x - 32x) \quad \downarrow \\
 \hline
 4x^2 + 29x + 6 \\
 - (4x^2 + 0x + 32) \\
 \hline
 29x - 26
 \end{array}$$

$$x^4 - 4x^3 + 12x^2 - 3x + 6$$

$$\begin{aligned}
 &= (x^2 + 8) \left(x^2 - 4x + 4 + \frac{29x - 26}{x^2 + 8} \right) \\
 \text{or} \quad &= (x^2 + 8)(x^2 - 4x + 4) + 29x - 26
 \end{aligned}$$