Algebra 2 5.2

Divide polynomials using long division

Divide polynomials using synthetic division

simplify (a fraction)

quotient

divisor

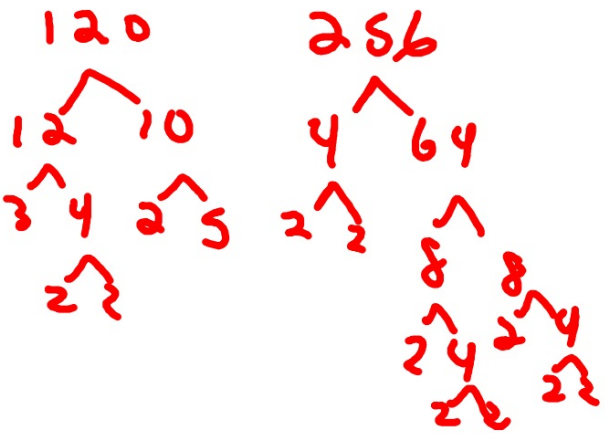
remainder

long division algorithm

square puzzle

$$\frac{120}{256} \quad \frac{120 \div 2}{256 \div 2} \quad \frac{60 \div 2}{128 \div 2} \quad \frac{30 \div 2}{64 \div 2} \quad \frac{15}{32}$$

$$\frac{120}{256} = \frac{2 \cdot 2 \cdot 2 \cdot 3 \cdot 5}{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2} = \frac{15}{32}$$



Long division algorithm

$$
\begin{array}{r}
205\ \tfrac{15}{23} \\
23\overline{)\,4730} \\
-46 \\
\hline
130 \\
-115 \\
\hline
15
\end{array}
$$

$$\begin{array}{r} 23 \\ \times\ 2 \\ \hline 46 \end{array} \qquad \begin{array}{r} 23 \\ \times\ 5 \\ \hline 115 \end{array}$$

eyeball
mult
Subtr.
bring down

$\frac{2}{3}$

simplify a fraction

54/81 $\quad \frac{2\cdot 3\cdot 3\cdot 3}{3\cdot 3\cdot 3\cdot 3}$

64/212

$8x^2/24x^4$

$\frac{2\cdot 2\cdot 2\,x\,x}{2\cdot 2\cdot 2\cdot 3\,x\,x\,x\,x} = \frac{1}{3x^2}$

$= 3x^2$

54 → 6 · 9 $\qquad$ 81 → 9 · 9

Simplify

Example 1 Divide a Polynomial by a Monomial

Simplify $\dfrac{6x^4y^3 + 12x^3y^2 - 18x^2y}{3xy}$.

$$\frac{6x^4y^3}{3xy} + \frac{12x^3y^2}{3xy} - \frac{18x^2y}{3xy}$$

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

GuidedPractice **Simplify.**

1A. $(20c^4d^2f - 16cdf^2 + 4cdf) \div (4cdf)$

$$\frac{20c^4d^2f - 16cdf^2 + 4cdf}{4cdf}$$

$$\frac{4cdf}{4cdf}$$

$5c^3d - 4f + 1$

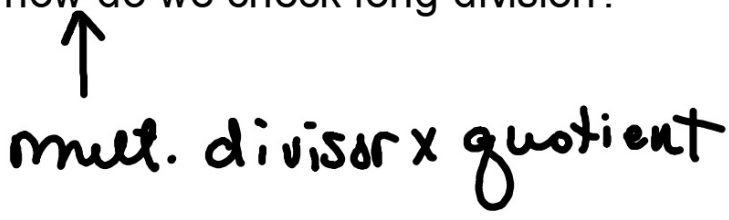
What is the code?

1B. $(18x^2y + 27x^3y^2z)(3xy)^{-2}$

$\frac{1}{(3xy)^2}$

$$\frac{18x^2y + 27x^3y^2z}{3xy}$$

Long division algorithm
96/6
144/6
150/13
how do we check long division?



$$
\begin{array}{r}
24 \\
6\overline{)144} \\
12 \\
\hline
24 \\
24 \\
\hline
0
\end{array}
$$

6×2

24×6

How is this problem different?

Example 2 Division Algorithm

Use long division to find $(x^2 + 3x - 40) \div (x - 5)$.

$x \cdot ? = x^2$

$$\begin{array}{r} x + 8 \\ x - 5 \overline{)\, x^2 + 3x - 40} \\ -\,(x^2 - 5x) \\ \hline 8x - 40 \\ -(8x - 40) \\ \hline 0 \end{array}$$

$x - 5$

x

$x^2 - 5x$

$x \cdot ? = 8x$

$x - 5$

8

$8x - 40$

$x - 5$

$x + 8$

$x^2 + 8x - 40$

$x^2 - 5x$

GuidedPractice Use long division

2A. $(x^2 + 7x - 30) \div (x - 3)$

$x + 10$ R 0

$x - 3 \overline{)\, x^2 + 7x - 30}$

$-x^2 + 3x$

$10x - 30$

$-10x + 30$

$x - 3$

$x + 10$

$10x - 30$

$x^2 - 3x$

$x \cdot ? = x^2$

$x(x - 3)$

$x \cdot ? = 10x$

$10(x - 3)$

$(x^2 - 13x + 12) \div (x - 1)$

$$
\begin{array}{r|l}
x-1 & x^2-13x+12 \\
 & -x^2+x \\
\hline
 & -12x+12 \\
 & +12x+\overline{12} \\
\hline
 & 0
\end{array}
\qquad
\begin{array}{l}
x-12 \\
\\
x(x-1) \\
-12(x-1) \\
\\
\\
\end{array}
$$

What is the code?

Standardized Test Example 3 Divide Polynomials

Which expression is equal to $(a^2 + 7a - 11)(3 - a)^{-1}$?

A $a + 10 - \frac{19}{3 - a}$

B $-a + 10$

C $-a - 10 + \frac{19}{3 - a}$

D $-a - 10 - \frac{19}{3 - a}$

$3-a$

$-1(-a+3)$

$-a-10+\frac{19}{3-a}$

$-a+3 \;\overline{)\; a^2+7a-11}$

$-a \cdot ? = a^2$

$-a(-a+3)$

$-a^2+3a$

$10a-11$

$-a \cdot ? = 10a$

$-10a+30$

19

GuidedPractice

3. Which expression is equal to $(r^2 + 5r + 7)(1 - r)^{-1}$?

F $-r - 6 + \frac{13}{1 - r}$

G $r + 6$

H $r - 6 + \frac{13}{1 - r}$

J $r + 6 - \frac{13}{1 - r}$

"synthetic division"... leave for next time...