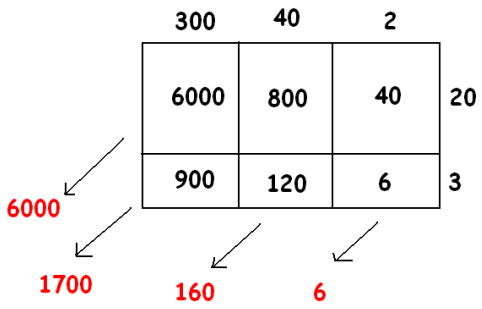
Lesson 9: Multiplying Polynomials

Classwork

Exercise 1

a. Gisella computed 342×23 as follows:



Can you explain what she is doing? What is her final answer?

Use a geometric diagram to compute the following products:

b. $(3x^2 + 4x + 2)(2x + 3)$

c. $(2x^2 + 10x + 1)(x^2 + x + 1)$

d. $(x-1)(x^3+6x^2-5)$

Exercise 2

Multiply the polynomials using the distributive property: $(3x^2+x-1)(x^4-2x+1)$.

Exercise 3

The expression $10x^2+6x^3$ is the result of applying the distributive property to the expression $2x^2(5+3x)$. It is also the result of applying the distributive property to $2(5x^2+3x^3)$ or to $x(10x+6x^2)$, for example, or even to $1\cdot(10x^2+6x^3)$.

For (a) to (j) below, write down an expression such that if you applied the distributive property to your expression, it would give the result presented. Give interesting answers!

a. $6a+14a^2$

b. $2x^4+2x^5+2x^{10}$

c. $6z^2 - 15z$

d. $42w^3 - 14w + 77w^5$

e. $z^2(a + b) + z^3(a + b)$

f. $\frac{3}{2}s^2 + \frac{1}{2}$

g. $15p^3r^4 - 6p^2r^5 + 9p^4r^2 + 3\sqrt{2}p^3r^6$

h. $0.4x^9 - 40x^8$

i. $(4x + 3)(x^2 + x^3) - (2x + 2)(x^2 + x^3)$

j. $(2z + 5)(z - 2) - (13z - 26)(z - 3)$

Exercise 4

Sammy wrote a polynomial using only one variable, x, of degree 3. Myisha wrote a polynomial in the same variable of degree 5. What can you say about the degree of the product of Sammy's and Myisha's polynomials?

Extension

Find a polynomial that, when multiplied by $2x^2 + 3x + 1$, gives the answer $2x^3 + x^2 - 2x - 1$.

Problem Set

1. Use the distributive property to write each of the following expressions as the sum of monomials.

   a. $3a(4+a)$
   b. $x(x+2)+1$
   c. $\frac{1}{3}(12z+18z^2)$
   d. $4x(x^3-10)$
   e. $(x-4)(x+5)$
   f. $(2z-1)(3z^2+1)$
   g. $(10w-1)(10w+1)$
   h. $(-5w-3)w^2$
   i. $16s^{100}\left(\frac{1}{2}s^{200}+0.125s\right)$
   j. $(2q+1)(2q^2+1)$
   k. $(x^2-x+1)(x-1)$
   l. $3xz(9xy+z)-2yz(x+y-z)$
   m. $(t-1)(t+1)(t^2+1)$
   n. $(w+1)(w^4-w^3+w^2-w+1)$
   o. $z(2z+1)(3z-2)$
   p. $(x+y)(y+z)(z+x)$
   q. $\frac{x+y}{3}$
   r. $(20f^{10}-10f^5)\div 5$
   s. $-5y(y^2+y-2)-2(2-y^3)$
   t. $\frac{(a+b-c)(a+b+c)}{17}$ sd
   u. $(2x\div 9+(5x)\div 2)\div(-2)$
   v. $(-2f^3-2f+1)(f^2-f+2)$

2. Use the distributive property (and your wits!) to write each of the following expressions as a sum of monomials. If the resulting polynomial is in one variable, write the polynomial in standard form.

   a. $(a+b)^2$
   b. $(a+1)^2$
   c. $(3+b)^2$
   d. $(3+1)^2$
   e. $(x+y+z)^2$
   f. $(x+1+z)^2$
   g. $(3+z)^2$
   h. $(p+q)^3$
   i. $(p-1)^3$
   j. $(5+q)^3$

3. Use the distributive property (and your wits!) to write each of the following expressions as a polynomial in standard form.

   a. $(s^2+4)(s-1)$
   b. $3(s^2+4)(s-1)$
   c. $s(s^2+4)(s-1)$
   d. $(s+1)(s^2+4)(s-1)$
   e. $(u-1)(u^5+u^4+u^3+u^2+u+1)$
   f. $\sqrt{5}(u-1)(u^5+u^4+u^3+u^2+u+1)$
   g. $(u^7+u^3+1)(u-1)(u^5+u^4+u^3+u^2+u+1)$

4. Beatrice writes down every expression that appears in this problem set, one after the other, linking them with + signs between them. She is left with one very large expression on her page. Is that expression a polynomial expression? That is, is it algebraically equivalent to a polynomial?

   What if she wrote − signs between the expressions instead?

   What if she wrote × signs between the expressions instead?