Use mental math to simplify.

1. $35 + 20 + 5$
2. $15 \cdot 7 \cdot 2$
3. $1 + 5 + 4 + 8$
4. $5 \cdot 9 \cdot 3 \cdot 2$
5. $6 \cdot 8 \cdot 5$
6. $2 + 5 + 6 + 12$

Warm Up

* Student warm up!

Evaluate the expression.

1. $64^{1/6}$
2. $(-27)^{2/3}$
3. $(256)^{3/8}$
4. $\left(\sqrt{4}\right)^2$
5. $(-64)^{4/3}$
6. $216^{1/3}$

Cumulative Warm Up

* review from ch. 6 sect. 1 + 2

Essential Question

How can you factor a polynomial completely?

Essential Question

- always check to make sure you can not factor any further
- Use ac method!

Work with a partner. Write the product represented by the algebra tiles. Then multiply to write the polynomial in standard form.

a. 

b. 

c. 

d. 

e. 

f. 

Exploration 1

Skip

Work with a partner. Match the standard form of the polynomial with the equivalent factored form. Explain your strategy.

a. $x^3 + x^2$	A. $x(x + 1)(x - 1)$
b. $x^3 - x$	B. $x(x - 1)^2$
c. $x^3 + x^2 - 2x$	C. $x(x + 1)^2$
d. $x^3 - 4x^2 + 4x$	D. $x(x + 2)(x - 1)$
e. $x^3 - 2x^2 - 3x$	E. $x(x - 1)(x - 2)$

Exploration 2a-e

Skip

f. $x^3 - 2x^2 + x$	F. $x(x + 2)(x - 2)$
g. $x^3 - 4x$	G. $x(x - 2)^2$
h. $x^3 + 2x^2$	H. $x(x + 2)^2$
i. $x^3 - x^2$	I. $x^2(x - 1)$
j. $x^3 - 3x^2 + 2x$	J. $x^2(x + 1)$

Exploration 2f-j

Skip

k. $x^3 + 2x^2 - 3x$	K. $x^2(x - 2)$
l. $x^3 - 4x^2 + 3x$	L. $x^2(x + 2)$
m. $x^3 - 2x^2$	M. $x(x + 3)(x - 1)$
n. $x^3 + 4x^2 + 4x$	N. $x(x + 1)(x - 3)$
o. $x^3 + 2x^2 + x$	O. $x(x - 1)(x - 3)$

Exploration 2k-o

Skip

Core Concept

Factoring by Grouping

To factor a polynomial with four terms, group the terms into pairs. Factor the GCF out of each pair of terms. Look for and factor out the common binomial factor. This process is called **factoring by grouping**.

Core Concept

* do you have 4-terms?
* factor by grouping
- may need to move terms around to factor correctly

Factor each polynomial by grouping.

a. $x^3 + 3x^2 + 2x + 6$

$x^2(x+3)+2(x+3)$

$(x^2+2)(x+3)$

b. $x^2 + y + x + xy$

$(x^2+x)(+y+xy)$

$x(x+1)+y(1+x)$

$x(x+1)+y(x+1)$

$(x+1)(x+y)$

Example 1

- when moving terms, watch signs.

Factor the polynomial by grouping.

1. $a^3 + 3a^2 + a + 3$ 2. $y^2 + 2x + yx + 2y$

$a^2(a+3)+1(a+3)$

$(a^2+1)(a+3)$

$(y^2+2y)+2x+yx)$

$y(y+2)+x(2+y)$

$y(y+2)+x(y+2)$

$(y+2)(y+x)$

Monitoring Progress 1-2

- Can always factor out a 1 if there are no other factors.

Factor (a) $3x^3 + 6x^2 - 18x$ and (b) $7x^4 - 28x^2$.

$3x(x^2+2x-6)$

$7x^4 - 28x^2$

$7x^2(x^2-4)$ ← diff of squares

$7x^2(x-2)(x+2)$

Example 2

- always start with a GCF.
- Check after GCF to see if you can factor further

Solve $2x^3 + 8x^2 = 10x$.

$2x^3+8x^2-10x=0$

$2x(x^2+4x-5)=0$

$2x[(x^2-x)+(5x-5)]=0$

$2x[x(x-1)+5(x-1)]=0$

$2x(x-1)(x+5)=0$

-5 sum 4

$-1\ 5$ 4

$-5+1$ -4

Example 3

- begin by setting polynomial equal to 0
- take out a GCF
- Zero Product Property

$2x=0$ $x-1=0$ $x+5=0$

$x=0$ $x=1$ $x=-5$

Factor the polynomial completely.

3. $3x^3 - 12x$ **4.** $2y^3 - 12y^2 + 18y$ **5.** $m^3 - 2m^2 - 8m$

Solve the equation.

6. $w^3 - 8w^2 + 16w = 0$ **7.** $x^3 - 25x = 0$ **8.** $c^3 - 7c^2 + 12c = 0$

Monitoring Progress 3-8

A terrarium in the shape of a rectangular prism has a volume of 4608 cubic inches. Its length is more than 10 inches. The dimensions of the terrarium in terms of its width are shown. Find the length, width, and height of the terrarium.

$(w + 4)$ in.

w in.

$(36 - w)$ in.

Example 4

9. A box in the shape of a rectangular prism has a volume of 72 cubic feet. The box has a length of x feet, a width of $(x - 1)$ feet, and a height of $(x + 9)$ feet. Find the dimensions of the box.

Monitoring Progress 9

* Student Practice

- Exit Ticket: Solve $3x^5 - 6x^4 - 45x^3 = 0$.

Closure