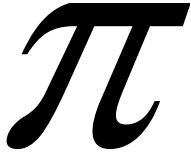
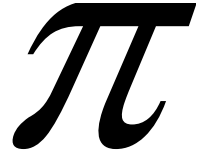


Section 6.5 A General Factoring Strategy

As Easy as Pi !



The number pi, symbolized as π , is a special number that denotes the ratio of a circle's circumference to its diameter. Pi is necessary when calculating the area of a circle.



In the Exercise Set for this section of the textbook, we will use π , and factoring, to write an expression that represents the area of a circular ring.




First Steps:

- Take comprehensive notes** from your instructor's lecture and insert your notes into this section of the *Learning Guide*. Be sure to write down all examples, definitions, and other key concepts. Additional learning resources include the *Lecture Series on DVD*, the *PowerPoints*, and Section 6.5 of your textbook which begins on page 454.
- Complete the *Concept and Vocabulary Check* on page 459 of the textbook.

Guided Practice:

- Review each of the following *Solved Problems* and complete each *Pencil Problem*.

Objective #1: Recognize the appropriate method for factoring a polynomial.

 Solved Problem #1	 Pencil Problem #1 
<p>1a. Name the appropriate factoring method: $24y^2 - 36y$</p> <p>Common factoring</p>	<p>1a. Name the appropriate factoring method: $-7x^2 + 35x$</p>
<p>1b. Name the appropriate factoring method: $w^2 - 100$</p> <p>Difference of two squares</p>	<p>1b. Name the appropriate factoring method: $25x^2 - 49$</p>
<p>1c. Name the appropriate factoring method: $y^3 + 125$</p> <p>Sum of two cubes</p>	<p>1c. Name the appropriate factoring method: $27x^3 - 1$</p>
<p>1d. Name the appropriate factoring method: $3xy - y + 6x - 2$</p> <p>Factor by grouping</p>	<p>1d. Name the appropriate factoring method: $5x + 5y + x^2 + xy$</p>

Objective #2: Use a general strategy for factoring polynomials.
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Solved Problem #2

2a. Factor: $5x^4 - 45x^2$

First use common factoring.

$$5x^4 - 45x^2 = 5x^2(x^2 - 9)$$

Then use the difference of two squares.

$$\begin{aligned} 5x^4 - 45x^2 &= 5x^2(x^2 - 9) \\ &= 5x^2(x+3)(x-3) \end{aligned}$$

Pencil Problem #2

2a. Factor: $7x^3 + 7x$

2b. Factor: $4x^2 - 16x - 48$

First use common factoring.

$$4x^2 - 16x - 48 = 4(x^2 - 4x - 12)$$

Then use trial and error or grouping.

$$\begin{aligned} 4x^2 - 16x - 48 &= 4(x^2 - 4x - 12) \\ &= 4(x-6)(x+2) \end{aligned}$$

2b. Factor: $5x^2 - 5x - 30$

2c. Factor: $4x^5 - 64x$

First use common factoring.

$$4x^5 - 64x = 4x(x^4 - 16)$$

Then use the difference of two squares.

$$\begin{aligned} 4x^5 - 64x &= 4x(x^4 - 16) \\ &= 4x(x^2 + 4)(x^2 - 4) \end{aligned}$$

Finally, use the difference of two squares again.

$$\begin{aligned} 4x^5 - 64x &= 4x(x^4 - 16) \\ &= 4x(x^2 + 4)(x^2 - 4) \\ &= 4x(x^2 + 4)(x+2)(x-2) \end{aligned}$$

2c. Factor: $2x^4 - 162$

2d. Factor: $x^3 - 4x^2 - 9x + 36$

Use factor by grouping.

$$\begin{aligned}x^3 - 4x^2 - 9x + 36 &= x^2(x - 4) - 9(x - 4) \\ &= (x - 4)(x^2 - 9)\end{aligned}$$

Then use the difference of two squares.

$$\begin{aligned}x^3 - 4x^2 - 9x + 36 &= x^2(x - 4) - 9(x - 4) \\ &= (x - 4)(x^2 - 9) \\ &= (x - 4)(x + 3)(x - 3)\end{aligned}$$

2d. Factor: $xy - 7x + 3y - 21$

2e. Factor: $3x^3 - 30x^2 + 75x$

First use common factoring.

$$3x^3 - 30x^2 + 75x = 3x(x^2 - 10x + 25)$$

The trinomial is a perfect square trinomial.

$$\begin{aligned}3x^3 - 30x^2 + 75x &= 3x(x^2 - 10x + 25) \\ &= 3x(x - 5)^2\end{aligned}$$

2e. Factor: $7y^4 + 14y^3 + 7y^2$

2f. Factor: $2x^5 + 54x^2$

First use common factoring.

$$2x^5 + 54x^2 = 2x^2(x^3 + 27)$$

The binomial is the sum of two cubes.

$$\begin{aligned}2x^5 + 54x^2 &= 2x^2(x^3 + 27) \\ &= 2x^2(x + 3)(x^2 - 3x + 9)\end{aligned}$$

2f. Factor: $2x^5 + 2x^2$

2g. Factor: $3x^4y - 48y^5$

First use common factoring.

$$3x^4y - 48y^5 = 3y(x^4 - 16y^4)$$

Then use the difference of two squares.

$$\begin{aligned} 3x^4y - 48y^5 &= 3y(x^4 - 16y^4) \\ &= 3y(x^2 + 4y^2)(x^2 - 4y^2) \end{aligned}$$

Finally, use the difference of two squares again.

$$\begin{aligned} 3x^4y - 48y^5 &= 3y(x^4 - 16y^4) \\ &= 3y(x^2 + 4y^2)(x^2 - 4y^2) \\ &= 3y(x^2 + 4y^2)(x + 2y)(x - 2y) \end{aligned}$$

2g. Factor: $48x^4y - 3x^2y$ **2h.** Factor: $12x^3 + 36x^2y + 27xy^2$

First use common factoring.

$$12x^3 + 36x^2y + 27xy^2 = 3x(4x^2 + 12xy + 9y^2)$$

The trinomial is a perfect square trinomial.

$$\begin{aligned} 12x^3 + 36x^2y + 27xy^2 &= 3x(4x^2 + 12xy + 9y^2) \\ &= 3x(2x + 3y)^2 \end{aligned}$$

2h. Factor: $2bx^2 + 44bx + 242b$ **Answers for Pencil Problems (Textbook Exercise references in parentheses):****1a.** common factoring (6.5 #1) **1b.** difference of two squares (6.5 #3) **1c.** difference of two cubes (6.5 #5)**1d.** factor by grouping (6.5 #7) **2a.** $7x(x^2 + 1)$ (6.5 #19) **2b.** $5(x + 2)(x - 3)$ (6.5 #21)**2c.** $2(x^2 + 9)(x + 3)(x - 3)$ (6.5 #23) **2d.** $(y - 7)(x + 3)$ (6.5 #83) **2e.** $7y^2(y + 1)^2$ (6.5 #35)**2f.** $2x^2(x + 1)(x^2 - x + 1)$ (6.5 #29) **2g.** $3x^2y(4x + 1)(4x - 1)$ (6.5 #91) **2h.** $2b(x + 11)^2$ (6.5 #99)**Homework:** **Review the Section 6.5 summary** on page 477 of the textbook. **Insert your homework** into this section of the *Learning Guide*. Show all work neatly and check your answers. Strive to work through difficulties when possible, making note of any exercises where you need additional help. Remember, even if your instructor assigns homework through *MyMathLab*, you should still write out your work.