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Worksheet 7.8: Find Dimensions Using Algebraic Modeling

1. Find the dimensions of each figure with the given expression for the area.

(a) Area = $x^2 - 32$ $b=12$ $c=32$

$$\begin{array}{r} x^2 \\ x \quad -8 \\ \hline x^2 \quad -32 \\ \hline \end{array}$$

$= (x-8)(x-4)$

The expression is $(x-8)(x-4)$.

(b) Area = $x^2 + 14x + 49$ $b=14$ $c=49$

$$\begin{array}{r} x^2 \\ x \quad +7 \\ \hline x^2 \quad +14x \quad +49 \\ \hline \end{array}$$

The expression is $(x+7)^2$

2. The area of a \$10 bill can be represented by the expression $x^2 - 25$.

(a) Find the expressions for the dimensions of the \$10 bill.

$x^2 - 25$ $b=0$ $c=-25$

$$\begin{array}{r} x^2 \\ x \quad -5 \\ \hline x^2 \quad -25 \\ \hline \end{array}$$

The expression is $(x+5)(x-5)$

$x+5 = 12+5 = 17 \text{ cm}$ $x-5 = 12-5 = 7 \text{ cm}$

The dimensions are 17cm by 7cm.

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3. The area of a rectangular parking lot can be represented by the expression $x^2 - 12x + 31$.

(a) Find the dimensions of the parking lot when $x=100$ m.

(b) What kind of a rectangle is the parking lot? Explain your answer.

4. The area of a rectangular room can be represented by the expression $x^2 + x - 12$. Find the dimensions of the room when $x=10$ m.

Answers: 3. (a) $(x-4)(x-8)$, (b) $(x+7)^2$; 4. (a) $x-5(x+5)$, (b) 17 cm by 7 cm; 5. (a) $(x-9)^2$, 91 m by 91 m, (b) Square; 4. $(y-3)(y+4)$, 14 m by 7 m

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Worksheet 7.9: Factoring Polys

#1: Factor out the common factor.

#2: Check if you have $x^2 + bx + c$ or $x^2 - a^2$

If yes: Factor $x^2 + bx + c$ as $(x+m)(x+n)$ or Factor $x^2 - a^2$ as $(x+a)(x-a)$

If no: Stop! You are done

Example 1: $3x^2 + 15x + 18$ $b=5$ $c=6$

$$3\left(\frac{3x^2}{3} + \frac{15x}{3} + \frac{18}{3}\right) = 3(x^2 + 5x + 6) = 3(x+2)(x+3)$$

(b) $x^2 - 7x + 10$ $b=-7$ $c=10$

$$x\left(\frac{x^2}{x} - \frac{7x}{x} + \frac{10x}{x}\right) = x(x^2 - 7x + 10) = x(x-2)(x-5)$$

$4 = \frac{4x}{1} - \frac{16}{4}$ $b=0$ $c=-4$

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

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Factor each polynomial fully.

2. $2x^2 + 12x + 16$

3. $x^2 - 7x^2 + 12x$

4. $4x^2 - 6x^2 - 60x$

5. $2y^2 - 98$

6. $2y^3 + 4y^2 - 48y$

Answers: 1. (a) $3(x+2)(x+3)$, (b) $x(x-2)(x-5)$, (c) $4(x-2)(x+2)$; 2. $2(x+1)(x+3)$; 3. $x(x-3)(x-4)$; 4. $4x(x-3)(x-5)$; 5. $2(y-7)(y+7)$; 6. $2y(y+6)(y-4)$

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#7 (a)

$(5x)^2 - (3)^2$

$$= (5x)(5x) - 9$$

$$= 25x^2 - 9$$

(b) $25x^2 - 9$

$\sqrt{25x^2} = 5x$

$\sqrt{9} = 3$

$\frac{x^2 - a^2}{(x+a)(x-a)}$

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#4 $4x^3 - 8x^2 + 9x$

$$= x(4x^2 - 8x + 9)$$

$x^2 + bx + c$

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