Lesson 3.1.1

3-1. See below:

a. The 100th figure has 10,506 tiles; expressions vary but are equivalent to $(x + 2)(x + 3)$ or $(x + 2)^2 + (x + 1) + 1$.

b. If you move the single tile from the upper left to fill in the space, then in $(x + 2)(x + 3)$, $(x + 2)$ represents the base and $(x + 3)$ represents the height of the figure. In $(x + 2)^2 + (x + 1) + 1$, $(x + 2)^2$ represents the square in the middle, $(x + 1)$ represents the bottom row, and 1 represents the tile in the upper left corner.

c. Figure 6 has 72 tiles; different expressions make no difference.

3-2. See below:

a. They are equivalent because evaluating for any particular value of x results in the same volume in either expression. Some students may input both expressions as functions on their graphing calculator and verify that the y values in both tables are the same for any x value.

b. Methods vary, but typically students will multiply out Jill's expression to show that it is equivalent to Terrell's.

c. They are all equivalent, but methods vary. For example, students may show that $(20 – 2x)x = (10 – x)2x$ or that $(15 – 2x)(10 – x)2x$ multiplies out to $4x^3 – 70x^2 + 300x$ using the Distributive, Commutative, and Associative Properties, or that the tables of all three functions have the same y value for any x value.

3-3. Possible responses listed below:

a. $x^2 + 6x + 5$, $x^2 + 3x + 3x + 9 – 4$, $(x + 5)(x + 1)$

b. $8a^6b^9$, $\frac{16a^6b^9}{2}$, $(2a^2b^3)(2a^2b^3)(2a^2b^3)$

c. m^3n^9, $m \cdot m \cdot n \cdot n \cdot n \cdot n \cdot n \cdot m \cdot n \cdot n \cdot n \cdot n$, $(mn^3)^3$

d. $x + \frac{(x+1)(2x-1)}{x+2} - x$, $\frac{2x^2+x-1}{x+2}$, $\frac{5(x+1)(2x-1)}{5(x+2)}$

Review & Preview

3-5. See below:

a. $4x^2 - 12x + 14$

b. $\frac{81y^4}{x^4}$

3-6. See below:

a. 3

b. 4

c. 1

d. 5

e. 2

3-7. They are both correct: $\frac{x^{12}y^3}{64}$. Preferences vary.

3-8. See below:

a. Horizontal line through (0, 3), domain: all real numbers, range: 3

b. Vertical line through (–2, 0), domain: –2, range: all real numbers

c. (–2, 3)

3-9. $m = 15$, $b = -3$

3-10. See below:

a. $(4, 8, 4\sqrt{3})$, $(5, 10, 5\sqrt{3})$

b. The long leg is $\sqrt{3}n$ units long, and the hypotenuse is $2n$ units long.

3-11. See below:

a. 15, 21, 27, 33, $t(n) = 6n - 3$

b. 27, 81, 243, 729, $t(n) = 3^n$

c. Sequences and equations vary.

3-12. See below:

a. $\frac{1}{5}$

b. 3

c. 27

d. $\frac{1}{8}$