Section 6.2

1. 

\[ x \quad 5 \]

\[ 3 \]

\[ 3x \quad 15 \]

3.

\[ 5x \quad -3 \]

\[ 8x \]

\[ 8x(5x - 3) = 8x(5x + -3) \]

\[ = (8x + 5x) + (8x + -3) \]

\[ = 40x^2 + -24z \]

\[ = 40x^2 - 24z \]

5.

\[-x^3 \quad 9x \quad -5 \]

\[ -1 \]

\[ (-x^2 + 9x - 5) = 1(-x^2 + 9x + -5) \]

\[ = -1(-x^2 + 9x + -5) \]

\[ = x^2 + 9x + 5 \]

\[ = x^2 - 9x + 5 \]

7. a.

\[ 5x \quad -3 \]

\[ 2 \]

\[ 10x - 6 = 2(5x - 3) \]

\[ 10x - 6 = 10x + -6 \]

\[ = 2(5x + -3) \]

\[ = 2(5x - 3) \]

b. Factoring 54 and 72 with a factor tree, we have

\[ 54 \]

\[ 2 \quad 27 \]

\[ 3 \quad 9 \]

\[ 3 \quad 3 \]

\[ 72 \]

\[ 2 \quad 36 \]

\[ 2 \quad 18 \]

\[ 3 \quad 3 \]

54 = 2*3*3*3 = 2*3^3

72 = 2*2*3*3*3 = 2^2*3^3

The powers of 2 are 2^1 and 2^2. The smallest power is 2^1.

The powers of 3 are 3^3 and 3^2. The smallest power is 3^2.

Taking the smallest powers gives a GCF of 2^1*3^2 = 18

\[ \begin{array}{ccc} 54 & 72 \\ 18 & 4 \end{array} \]

\[ 54y + 72 = 18(3y + 4) \]

\[ 54y + 72 = 18(3y + 4) \]

c. The GCF of 14, 7, and 42 is 7.

Only the variable \( x \) appears in all three terms of the polynomial.

The powers of \( x \) are \( x^1, x^1, x^2 \). The smallest power is \( x \).

This gives a GCF of \( 7x^1 = 7x \). Factoring, we have

\[ 14x^1 + 7xy - 42x^2 = 7x(2x^1 + y - 6x) \]

\[ 7x \quad 14x \]

\[ 7xy \quad -42x^2 \]

d. \( 7x(2x^2 + y - 6x) = 14x^3 + 7xy - 42x^2 \) the factorization checks

9. a. The GCF of 18 and 6 is 6.

The powers of \( x \) are \( x^2 \) and \( x^3 \). The smallest power is \( x^2 \).

The GCF is \( 6x^2 \). Factoring the GCF from both terms gives

\[ 18x^2 + 6x^3 = 6x^2(3x^2 + 1) \]

b. The only common factor of 21 and 15 is 3.

The powers of \( x \) are \( x^1 \) and \( x^2 \). The smallest power is \( x^1 \).

The powers of \( y \) are \( y^1 \) and \( y^4 \). The smallest power is \( y^1 \).

The GCF is \( 3xy \). Factoring the GCF from both terms gives

\[ 21x^1y^3 - 15xy^4 = 3xy^3(7x - 5y) \]

11. surface area \( = 2\pi r h + 2\pi r^2 = 2\pi r(h + r) \)

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13. a. The terms of an expression are separated by addition or subtraction and we do not count extra terms inside grouping symbols. This gives two terms \((x + 3)(4y + 9)\) and \((x + 3)(x + 9)\). Common to both terms is the binomial \((x + 3)\).

b. \((x + 3)(4y + 9)\)

15. a. \(x^2 + 4x = 0\)
\(x(x + 4) = 0\)
\(x = 0\) or \(x = -4\)

b. \(x^2 - 11 = 0\)
\(x(x - 11) = 0\)
\(x = 0\) or \(x = 11\)

Skills and Review 6.2

17. \(\frac{6xy^4}{2x^2y^4} = \left(\frac{3x^{-1}y^{-4}}{x^{-2}y^4}\right)^2\)
\(= \left(3x^{1-4}y^{4-4}\right)^2\)
\(= \left(3x^{-3}y^0\right)^2\)
\(= \left(3x^{-3}\right)^2\)
\(= 3^2 \cdot x^{-6}\)
\(= \left(\frac{1}{3^2}\right)^{-6}\)
\(= x^6\)

19. 

<table>
<thead>
<tr>
<th>Alcohol</th>
<th>Solvent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>25%</td>
</tr>
</tbody>
</table>

\(0.25\times2\) \(L\) \(= 0.5\) \(L\); there is \(0.5\) \(L\) of alcohol in the solution.

21. 

3 in | Original | 3 \(\times\) | Enlargement | 5 in

\(\frac{\text{width of enlargement}}{\text{length of enlargement}} = \frac{\text{width of original picture}}{\text{length of original picture}}\)

This is one of several correct proportions. For help, see setting up proportions on page 180 of the text.

Let \(w = \) the width of the enlargement in inches, then \(w + 6 = \) length of the enlargement.
\(\frac{w}{3} = \frac{5}{5}\)
\(5w = 3(w + 6)\)
\(5w = 3w + 18\)
\(2w = 18\)
\(w = 9\)

The width of the enlargement is 9 inches and the length is 9 + 6 or 15 inches.

23. a. Solving the equation for \(y\) in terms of \(x\) puts the equation in slope-intercept form and this gives the slope and \(y\)-intercept.
\(5x + 6y = 70\)

\(6y = -5x + 70\)
\(\Rightarrow y = \frac{-5}{6}x + \frac{70}{6}\)

When an equation is in slope-intercept form the slope is the coefficient of \(x\). The slope = \(\frac{-5}{6}\).

b. To find the \(x\)-intercept substitute 0 for \(y\) and solve for \(x\).
\(5x + 6(0) = 70\)
\(5x + 0 = 70\)
\(5x = 70\)
\(x = 14\)

The \(x\)-intercept = (14, 0).

The constant is \(\frac{35}{3}\) so the \(y\)-intercept = \(\left(0, \frac{35}{3}\right) = \left(0, 11\frac{2}{3}\right)\).
25. distance = \( \sqrt{\text{run}^2 + \text{rise}^2} \) or
\[ \text{distance} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \]
Let \((x_1, y_1) = (6, 3)\) and \((x_2, y_2) = (6, 8)\)
\[ d = \sqrt{(6 - 6)^2 + (8 - 3)^2} \]
\[ = \sqrt{12^2 + 5^2} \]
\[ = \sqrt{144 + 25} \]
\[ = \sqrt{169} \]
\[ = 13 \]
The distance between the two points is 13.