Factor Linear Expressions

Lesson 5-8
**Vocabulary:**

**Monomial** - a number, variable, or product of a number and one or more variables

ex: 25 \( \times \) 40xy

**Factor** - to write a number as a product of its factors (prime numbers that multiply to equal the value)

**Factored Form** - when a linear expression is written as a product of its factors
Find the GCF of each pair of monomials.

1. \( 4x, 12x \)

a) List the factors of each monomial
(\text{use only prime #'s - 2, 3, 5, 7, ...})

\[
4x = 2 \cdot 2 \cdot x \\
12x = 2 \cdot 2 \cdot 3 \cdot x
\]

b) Circle all common factors

\[
4x = \underline{2} \cdot \underline{2} \cdot x \\
12x = \underline{2} \cdot \underline{2} \cdot 3 \cdot x
\]

c) Multiply circled factors of top row only for GCF

\[
GCF = 2 \cdot 2 \cdot x = \boxed{4x}
\]
Examples

Find the GCF of each pair of monomials.

2. 18a, 20ab

a) List the factors of each monomial (use only prime #’s - 2, 3, 5, 7, ...)

\[ 18a = 2 \cdot 3 \cdot 3 \cdot a \]
\[ 20ab = 2 \cdot 2 \cdot 5 \cdot a \cdot b \]

b) Circle all common factors

\[ 18a = \textbf{(2)} \cdot 3 \cdot 3 \cdot \textbf{(a)} \]
\[ 20ab = \textbf{(2)} \cdot 2 \cdot 5 \cdot \textbf{(a)} \cdot b \]

GCF = \[ 2 \cdot a = \boxed{2a} \]

c) Multiply circled factors of top row only for GCF
Find the GCF of each pair of monomials.

3. \(12cd, 36cd\)

a) List the factors of each monomial
(use only prime #'s - 2, 3, 5, 7, ...)

\[
12cd = 2 \cdot 2 \cdot 3 \cdot c \cdot d
\]
\[
36cd = 2 \cdot 2 \cdot 3 \cdot 3 \cdot c \cdot d
\]

b) Circle all common factors

\[
12cd = \boxed{2 \cdot 2 \cdot 3 \cdot c \cdot d}
\]
\[
36cd = \boxed{2 \cdot 2 \cdot 3 \cdot 3 \cdot c \cdot d}
\]

c) Multiply circled factors of top row only for GCF

\[
GCF = 2 \cdot 2 \cdot 3 \cdot c \cdot d = \boxed{12cd}
\]
Find the GCF of each pair of monomials.

a. 12, 28c

\[
12 = 2 \cdot 2 \cdot 3
\]
\[
28c = 2 \cdot 2 \cdot 7 \cdot c
\]

GCF = 4

b. 25x, 15xy

\[
25x = 5 \cdot 5 \cdot x
\]
\[
15xy = 3 \cdot 5 \cdot x \cdot y
\]

GCF = 5x

c. 42mn, 14mn

\[
42mn = 2 \cdot 3 \cdot 7 \cdot m \cdot n
\]
\[
14mn = 2 \cdot 7 \cdot m \cdot n
\]

GCF = 14mn
4. Factor $3x + 9$.

a) Find the GCF for each term

$$3x = 3 \cdot x$$
$$9 = 3 \cdot 3$$

GCF = 3

b) Write each term as a product of the GCF and its remaining factors

$$3x + 9 = 3(x) + 3(3)$$
$$= 3(x + 3)$$
$$= 3(x + 3)$$
5. Factor $12x + 7y$.

a) Find the GCF for each term

$$12x = 2 \cdot 2 \cdot 3 \cdot x$$
$$7y = 1 \cdot 7 \cdot y$$

No GCF because there are no common factors

b) The expression cannot be factored into an equivalent expression

Can’t be factored
Factor each expression. If the expression cannot be factored, write *cannot be factored*. Use algebra tiles if needed.

d. \(4x - 28\)
\[
4x = 2 \cdot 2 \cdot x \\
28 = 2 \cdot 2 \cdot 7 \\
\text{GCF} = 4
\]
\[
4(x) - 4(7) \\
4(x - 7)
\]

e. \(3x + 33y\)
\[
3x = 3 \cdot x \\
33y = 3 \cdot 11 \cdot y \\
\text{GCF} = 3
\]
\[
3(x) + 3(11y) \\
3(x + 11y)
\]

f. \(4x + 35\)
\[
4x = 4 \cdot x \\
35 = 5 \cdot 7 \\
\text{GCF} = \text{none}
\]
\[
\text{Can’t be factored}
\]
The drawing of the garden at the right has a total area of $(15x + 18)$ square feet. Find possible dimensions of the garden.

a) Find the GCF for each term

$15x = 3 \cdot 5 \cdot x$
$18 = 2 \cdot 3 \cdot 3$

GCF = 3

b) Write each term as a product of the GCF and its remaining factors

$15x + 18 = 3(5x) + 3(6) = 3(5x + 6)$

So, the possible dimensions are 3 feet by $(5x + 6)$ feet.
Mr. Phen’s monthly income can be represented by the expression $25x + 120$ where $x$ is the number of hours worked. Factor the expression $25x + 120$. (Example 6)

\[
\begin{align*}
25x &= 5 \cdot 5 \cdot x \\
120 &= 2 \cdot 2 \cdot 2 \cdot 3 \cdot 5 \\
\text{GCF} &= 5
\end{align*}
\]

\[
5(5x) + 5(24) = 5(5x + 24)
\]
Homework:

Pg. 419-420

#1-17 (all)