Name _______________________

Lesson 3

Factor Trees

Essential Question: How can you factor numbers using a factor tree?

Mr. Shu gives this puzzle to his math students.

“Write 24 as a product of factors that are prime. Remember that a prime number must be greater than 1 and can have only 1 and itself as factors.”

You can use a diagram called a factor tree to find the factors of a number.

Use a factor tree to find the prime number factors that have a product of 24.

**STEP 1**
Write the number to be factored at the top of the factor tree.

- 24

**STEP 2**
Write it as a product of any two factors.

Think: $4 \times 6 = 24$

- 24
  - 4
  - 6

**STEP 3**
Write each factor as the product of two factors.

Think: $2 \times 2 = 4$
Think: $2 \times 3 = 6$

- 24
  - 4
    - 2
    - 2
  - 6
    - 2
    - 3

So, $24 = 2 \times 2 \times 2 \times 3$.

**STEP 4**
Continue until each factor is a prime number.

Think: $2 \times 1 = 2$ and $3 \times 1 = 3$

Write the factors that are prime numbers from least to greatest.

- 2
- 2
- 2
- 3

Possible answers: 2, 3, 5

Check students’ factor trees. Possible answer is given.

Try This! Make a different factor tree for 24.

- Is the product of factors the same as in the Example? Explain.

See Planning Guide, pg. 81.

**Math Talk**
Explain how you can use factored numbers to find common factors.

Possible explanation: You can see what factors are the same for the two numbers; these would be common factors.
Share and Show ▶ MATH BOARD ◀

1. Use a factor tree to find the prime number factors that have a product of 210.
   - Write 210 as a product of any two factors.
     \[ 210 = 10 \times 21 \]
   - Write each factor as the product of factors.
     \[ 10 = 2 \times 5 \quad 21 = 3 \times 7 \]
   
   Now each factor has only 1 and itself as factors.
   
   So, \[ 210 = 2 \times 3 \times 5 \times 7 \]

Use a factor tree to find the prime number factors.

Check students’ factor trees.

2. \[ \begin{array}{c}
\times \\
\times
\end{array} \]
   \[ 2 \times 2 \times 2 \]

3. \[ \begin{array}{c}
\times \\
\times
\end{array} \]
   \[ 3 \times 3 \times 5 \]

4. \[ \begin{array}{c}
\times \\
\times
\end{array} \]
   \[ 2 \times 5 \times 5 \times 7 \]

On Your Own

Use a factor tree to find the prime number factors.

Check students’ factor trees.

5. \[ \begin{array}{c}
\times \\
\times
\end{array} \]
   \[ 2 \times 2 \times 3 \times 3 \]

6. \[ \begin{array}{c}
\times \\
\times
\end{array} \]
   \[ 2 \times 2 \times 2 \times 3 \times 3 \]

7. \[ \begin{array}{c}
\times \\
\times
\end{array} \]
   \[ 2 \times 2 \times 3 \times 3 \times 5 \]

Problem Solving ▶ REAL WORLD ◀

Mr. Shu gave these problems to his math students. Solve.

8. Write 500 as a product of prime number factors. Each factor must be greater than 1 and can have only 1 and itself as factors.
   \[ 2 \times 2 \times 5 \times 5 \times 5 \]

9. Find a number that has four identical even factors. Each factor must be greater than 1 and can have only 1 and itself as factors.
   \[ 2 \times 2 \times 2 \times 2 = 16 \]