Student Guide

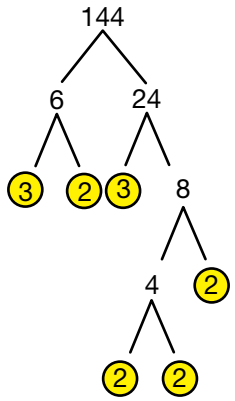
Find Prime Factors (SG pp. 442–444)
Questions 1–10

1. **A.** 1×144, 2×72; 3×48; 4×36; 6×24; 8×18; 9×16; 12×12

   B. 1, 2, 3, 4, 6, 8, 9, 12, 16, 18, 24, 36, 48, 72, 144

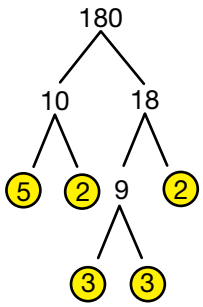
2.* Answers will vary. Two possible solutions are: $2 \times 3 \times 3 \times 8$; $2 \times 2 \times 2 \times 3 \times 6$

3. **A.*** Answers will vary. One possible solution is given below.



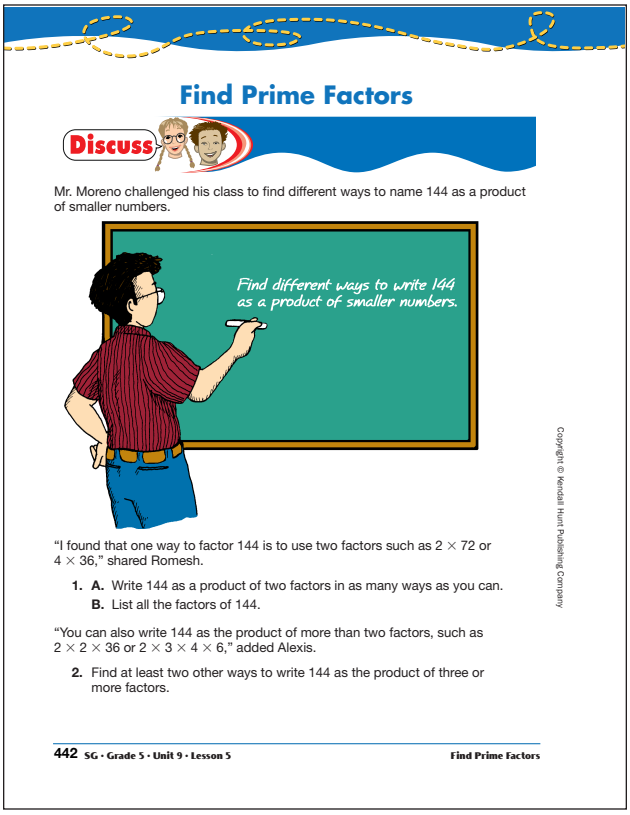
   B. $3 \times 2 \times 3 \times 2 \times 2 \times 2 = 144$

4. **A.** Answers will vary. One possible solution is given below.



   B. $2 \times 2 \times 3 \times 3 \times 5 = 180$

   C. $2^2 \times 3^2 \times 5 = 180$



Find Prime Factors

Discuss

Mr. Moreno challenged his class to find different ways to name 144 as a product of smaller numbers.

"I found that one way to factor 144 is to use two factors such as 2×72 or 4×36," shared Romesh.

1. **A.** Write 144 as a product of two factors in as many ways as you can.
   B. List all the factors of 144.

"You can also write 144 as the product of more than two factors, such as $2 \times 2 \times 36$ or $2 \times 3 \times 4 \times 6$," added Alexis.

2. Find at least two other ways to write 144 as the product of three or more factors.

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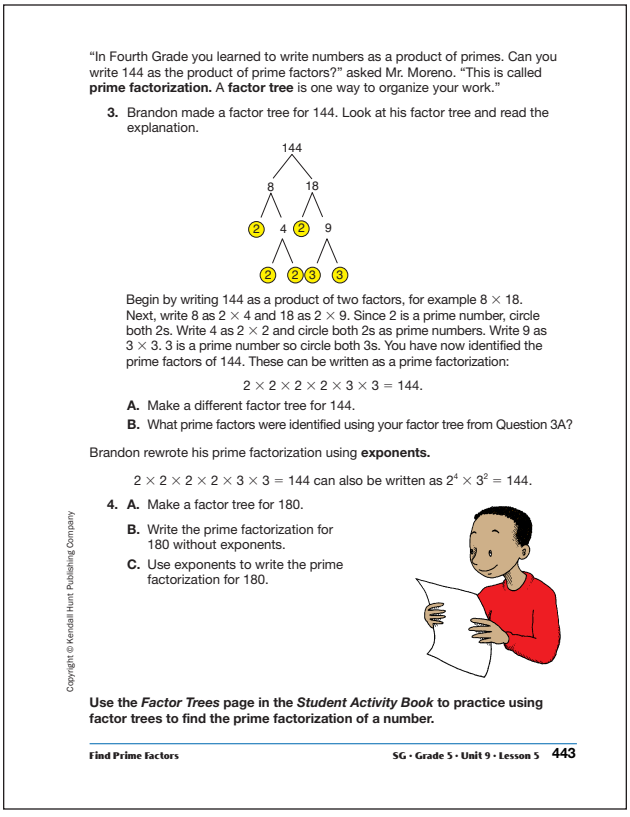

"In Fourth Grade you learned to write numbers as a product of primes. Can you write 144 as the product of prime factors?" asked Mr. Moreno. "This is called **prime factorization.** A **factor tree** is one way to organize your work."

3. Brandon made a factor tree for 144. Look at his factor tree and read the explanation.

Begin by writing 144 as a product of two factors, for example 8×18. Next, write 8 as 2×4 and 18 as 2×9. Since 2 is a prime number, circle both 2s. Write 4 as 2×2 and circle both 2s as prime numbers. Write 9 as 3×3. 3 is a prime number so circle both 3s. You have now identified the prime factors of 144. These can be written as a prime factorization:

$2 \times 2 \times 2 \times 2 \times 3 \times 3 = 144$.

   A. Make a different factor tree for 144.
   B. What prime factors were identified using your factor tree from Question 3A?

Brandon rewrote his prime factorization using **exponents.**

$2 \times 2 \times 2 \times 2 \times 3 \times 3 = 144$ can also be written as $2^4 \times 3^2 = 144$.

4. **A.** Make a factor tree for 180.
   B. Write the prime factorization for 180 without exponents.
   C. Use exponents to write the prime factorization for 180.

Use the *Factor Trees* page in the *Student Activity Book* to practice using factor trees to find the prime factorization of a number.

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***Answers and/or discussion are included in the lesson.**

Brandon wanted to check that he wrote 144 correctly using exponents.
He decided to use his calculator. Scientific calculators have an exponent key. They are shown with different symbols such as [^], [Y^x], and [X^y].
Find the exponent key on your calculator. To calculate $2^4 \times 3^2$, Brandon recorded his keystrokes as follows:

[2] [^] [4] [×] [3] [^] [2] [=]

5. Use your calculator to check Brandon's keystrokes.
   A. What does your display read? **B.** Are Brandon's keystrokes correct?
6. Use your calculator to check the prime factorization you wrote for 180 in Question 4C. Record your keystrokes.
7. Maya and Nicholas each started a prime factorization tree for 120. Finish each of their trees. Write a number sentence showing each number as a product of its prime factors using exponents.

8. Linda said she found the prime factorization for 485.

   $97 \times 5 = 485$

   Did Linda find the prime factorization? How do you know? If not, find the prime factorization.
9. Maria said she found the prime factorization for 846.

   $3 \times 141 \times 2 = 846$

   Did Maria find the prime factorization? How do you know? If not, find the prime factorization.

Check-In: Question 10

10. Find all the factors and the prime factorization of each number.

    Example: All the factors of 36 are 1, 2, 3, 4, 6, 9, 12, 18, and 36. The prime factorization is $36 = 2^2 \times 3^2$.

    A. 54 **B.** 24

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5.* A. [144]

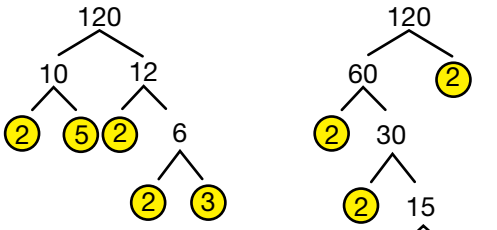
B. Yes; since the display reads 144, Brandon's keystrokes are correct.

6.* [2] [y^x] [2] [×] [3] [y^x] [2] [×] [5] [=]

[180]

Calculator symbols may vary.

7.*

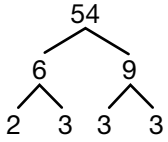


$2^3 \times 3 \times 5 = 120$ $2^3 \times 3 \times 5 = 120$

8. Yes, Possible response: 5 and 97 are both prime. I checked my chart and 5 and 97 are both listed as prime.

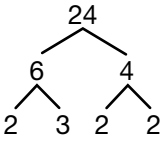
9. No, 3 and 2 are prime but 141 is not. 141 is divisible by 3.

10. A. 1, 2, 3, 6, 9, 18, 27, 54 are factors of 54



$2 \times 3^3 = 54$

B. 1, 2, 3, 4, 6, 8, 12, 24 are factors of 24.



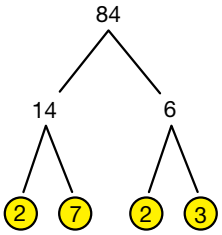
$2^3 \times 3 = 24$

***Answers and/or discussion are included in the lesson.**

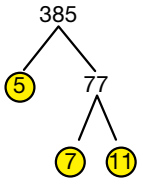
Homework (SG p. 445)
Questions 1–5

1. Factor trees will vary. One possible tree is shown for each.

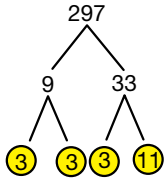
A. $2^2 \times 3 \times 7 = 84$



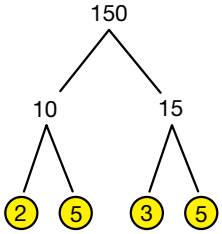
B. $5 \times 7 \times 11 = 385$



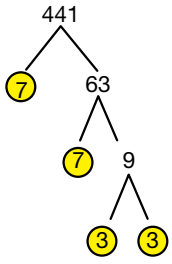
C. $3^3 \times 11 = 297$



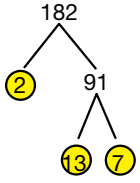
D. $2 \times 3 \times 5^2 = 150$

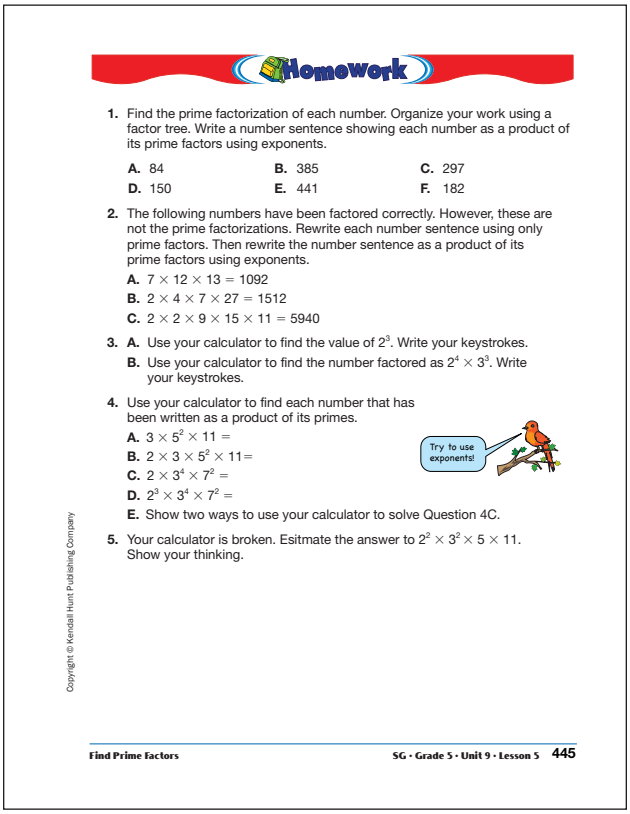


E. $3^2 \times 7^2 = 441$



F. $2 \times 7 \times 13 = 182$





Homework

1. Find the prime factorization of each number. Organize your work using a factor tree. Write a number sentence showing each number as a product of its prime factors using exponents.
   - **A.** 84
   - **B.** 385
   - **C.** 297
   - **D.** 150
   - **E.** 441
   - **F.** 182
2. The following numbers have been factored correctly. However, these are not the prime factorizations. Rewrite each number sentence using only prime factors. Then rewrite the number sentence as a product of its prime factors using exponents.
   - **A.** $7 \times 12 \times 13 = 1092$
   - **B.** $2 \times 4 \times 7 \times 27 = 1512$
   - **C.** $2 \times 2 \times 9 \times 15 \times 11 = 5940$
3. **A.** Use your calculator to find the value of 2^3. Write your keystrokes.
   B. Use your calculator to find the number factored as $2^4 \times 3^3$. Write your keystrokes.
4. Use your calculator to find each number that has been written as a product of its primes.
   - **A.** $3 \times 5^2 \times 11 =$
   - **B.** $2 \times 3 \times 5^2 \times 11 =$
   - **C.** $2 \times 3^4 \times 7^2 =$
   - **D.** $2^3 \times 3^4 \times 7^2 =$
   - **E.** Show two ways to use your calculator to solve Question 4C.

5. Your calculator is broken. Esitmate the answer to $2^2 \times 3^2 \times 5 \times 11$. Show your thinking.

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2. A. $2 \times 2 \times 3 \times 7 \times 13 = 1092$

$2^2 \times 3 \times 7 \times 13 = 1092$

B. $2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 7 = 1512$

$2^3 \times 3^3 \times 7 = 1512$

C. $2 \times 2 \times 3 \times 3 \times 3 \times 5 \times 11 = 5940$

$2^2 \times 3^3 \times 5 \times 11 = 5940$

3. A. [2] [y^x] [3] [=] [8.]

B. [2] [y^x] [4] [×] [3] [y^x] [3] [=]

[432]

4. A. 825

B. 1650

C. 7938

D. 31752

E. [2] [×] [3] [^] [4] [×] [7] [x^2] [=] [7938.];

[2] [×] [81] [×] [49] [=] [7938.]

5. Possible response: I did some calculations in my head and used ten to estimate calculations.

$2^2 \times 3^2 \times 5 \times 11$

$4 \times 9 \times 5 \times 11$

$40 \times 5 \times 11$

200×11

about 2000