

SKILL 1: Factors and Divisibility

Student pages 1-2

Name _____ Date _____ Class _____



SKILL 1: Factors and Divisibility

Numbers that are multiplied are called **factors**. In $3 \times 8 = 24$, 3 and 8 are the factors. The product, 24, is divisible by each of its factors. When you divide a whole number by one of its factors, the remainder is 0.

To find the factors of a number, you can use divisibility rules. A divisibility rule is a shortcut for determining when one number is divisible by another.

A whole number is divisible by:

- 2 if the ones digit is 0, 2, 4, 6, or 8.
- 3 if the sum of the digits is divisible by 3.
- 5 if the ones digit is 0 or 5.
- 6 if the number is divisible by both 2 and 3.
- 10 if the ones digit is 0.

Example 1

Find the factors of 24.

List all the ways that you could multiply two numbers to get 24.

$$1 \times 24 = 24 \quad 2 \times 12 = 24 \quad 3 \times 8 = 24 \quad 4 \times 6 = 24$$

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

Example 2

By which of these numbers is 78 divisible: 2, 3, 5, 6, or 10?

The ones digit is 8. So, 78 is divisible by 2.

Since $7 + 8 = 15$, and 15 is divisible by 3, 78 is divisible by 3.

Because 78 is divisible by 2 and 3, it is divisible by 6.

The ones digit is not 0 or 5, so it is not divisible by 5 or by 10.

Guided Practice

Find the missing factors of 36.

$$1. 1 \times \underline{36} = 36 \quad 2. 2 \times \underline{18} = 36 \quad 3. 3 \times \underline{12} = 36$$

$$4. 4 \times \underline{9} = 36 \quad 5. 6 \times \underline{6} = 36$$

6. The factors of 36 are: 1, 2, 3, 4, 6, 9, 12, 18, 36.

Write yes or no to indicate if 1,260 is divisible by the given number.

- 7. 2 yes 8. 3 yes 9. 4 yes 10. 5 yes

Section A: Factors and Multiples

Number Theory and Fraction Concepts 1

Name _____ Date _____ Class _____

SKILL 1: Practice

Answer each question.

1. Which of the following are factors of 16: 1, 2, 3, 4, 5, 6, 7, 8? 1, 2, 4, 8

2. Which of the following are factors of 20: 1, 2, 3, 4, 5, 6, 7, 8? 1, 2, 4, 5

3. List all factors of 28. 1, 2, 4, 7, 14, 28

4. List all factors of 48. 1, 2, 3, 4, 6, 8, 12, 16, 24, 48

5. List all factors of 100. 1, 2, 4, 5, 10, 20, 25, 50, 100

Complete the table. Write yes or no.

	Divisible by:				
	2	3	5	6	10
6. 28	yes	no	no	no	no
7. 40	yes	no	yes	no	yes
8. 72	yes	yes	no	yes	no
9. 144	yes	yes	no	yes	no
10. 225	no	yes	yes	no	no
11. 360	yes	yes	yes	yes	yes
12. 504	yes	yes	no	yes	no
13. 600	yes	yes	yes	yes	yes

14. There are 365 days in a non-leap year.

By which of these numbers is 365 divisible: 2, 3, 5, 6, 10? 5



15. Which is not a factor of 54? Skill 1

- A 6 C 9
- B 7** D 27

16. Which is not divisible by 6? Skill 1

- F 42 **H 123**
- G 132 J 522

SKILL 2: Primes and Composites

Student pages 3-4

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SKILL 2: Primes and Composites

Every whole number greater than 1 is either a **prime number** or a **composite number**. A prime number has exactly two factors: itself and 1. A composite number has more than two factors. The numbers 0 and 1 are neither prime nor composite.

Example 1

Is 48 a prime number or a composite number?

The factors of 48 are 1, 2, 3, 4, 6, 8, 12, 16, 24, and 48.
Since there are more than two factors of 48, it is a composite number.

Example 2

Is 57 prime or composite?

Use divisibility rules to decide whether 57 has factors other than 1 and 57.
Is 57 divisible by 2? No; it does not end in 0, 2, 4, 6, or 8.
Is 57 divisible by 3? Yes; $5 + 7 = 12$, and 12 is divisible by 3.
57 is composite.

Guided Practice

Tell whether the given number is prime or composite. The factors that follow the number should help you decide.

1. 25: 1, 5, 25 composite
2. 83: 1, 83 prime
3. 54: 1, 2, 3, 6, 9, 18, 27, 54 composite
4. 68: 1, 2, 4, 17, 34, 68 composite

5. Use divisibility rules to help you determine whether 89 is prime or composite.

- a. Is 89 divisible by 2? no
- b. Is 89 divisible by 3? no
- c. Is 89 divisible by 5? no
- d. Is 89 divisible by 7? no
- e. Is 89 divisible by 8? no
- f. Is 89 divisible by 9? no
- g. Is 89 prime or composite? prime

6. List the prime numbers less than 20. 2, 3, 5, 7, 11, 13, 17, 19
7. List the composite numbers less than 20. 4, 6, 8, 9, 10, 12, 14, 15, 16, 18

Name _____ Date _____ Class _____

SKILL 2: Practice

Tell whether the given number is prime or composite. The factors that follow the number should help you decide.

1. 92: 1, 2, 4, 23, 46, 92 composite
2. 121: 1, 11, 121 composite
3. 73: 1, 73 prime
4. 129: 1, 3, 43, 129 composite
5. 52: 1, 2, 4, 13, 26, 52 composite
6. 55: 1, 5, 11, 55 composite
7. 29: 1, 29 prime
8. 57: 1, 3, 19, 57 composite
9. 63: 1, 3, 7, 9, 21, 63 composite

Tell whether each number is prime or composite.

10. 93 composite
11. 145 composite
12. 79 prime
13. 280 composite
14. 69 composite
15. 59 prime
16. 102 composite
17. 43 prime
18. 86 composite
19. 123 composite

Solve.

20. The Brentwood Orchestra has 161 members. Is the number of members prime or composite? composite
21. The local Hiking Trails and Open Spaces organization has 49 members. If a committee of the organization has a prime number of members, and that number is a factor of 49, then how many members are on the committee? 7



22. Which of the following is a prime number?

- A 91
- B 75
- C 49
- D 97

Skill 2

23. Which of the following is not divisible by 4?

- F 1,264
- G 414
- H 1,332
- J 748

Skill 1

SKILL 3: Prime Factorization

Student pages 5-6

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SKILL 3: Prime Factorization

If a number is prime, then the only way it can be factored is "1 times itself." If a number is composite, it can be expressed as a product of prime factors. This is called its **prime factorization**.

Example 1

Find the prime factorization of 6.

The prime factorization of 6 is 2×3 , because 2 and 3 are prime and $2 \times 3 = 6$.

Example 2

Find the prime factorization of 50.

You can use **factor trees** to find prime factors of 50.

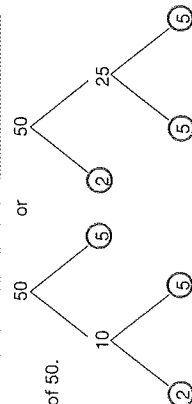
Write 50 as the product of two factors.
Is each factor prime or composite?

Circle each prime factor.

Write each composite factor as the product of two factors.

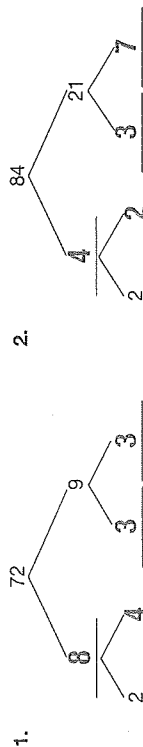
Continue until all the numbers are prime.

Both factor trees show that $2 \times 5 \times 5$ is the prime factorization of 50.



Guided Practice

Find the prime factorization of each number by writing the appropriate numbers in each blank.



Prime factorization of 72:

$$2 \times 2 \times 2 \times 3 \times 3$$

Prime factorization of 84:

$$2 \times 2 \times 3 \times 7$$

No; 6 is composite.

3. Is $2 \times 6 \times 5$ the prime factorization of 60? _____

$$2 \times 2 \times 3 \times 5$$

4. Write the prime factorization of 60. _____

No; 12 is composite.

5. Is 7×12 the prime factorization of 84? _____

Name _____ Date _____ Class _____

SKILL 3: Practice

Find the prime factorization.

1. 12 $2 \times 2 \times 3$
2. 40 $2 \times 2 \times 2 \times 5$
3. 64 $2 \times 2 \times 2 \times 2 \times 2 \times 2$
4. 36 $2 \times 2 \times 3 \times 3$
5. 60 $2 \times 2 \times 3 \times 5$
6. 65 5×13
7. 20 $2 \times 2 \times 5$
8. 30 $2 \times 3 \times 5$
9. 56 $2 \times 2 \times 2 \times 7$
10. 21 3×7
11. 18 $2 \times 3 \times 3$
12. 16 $2 \times 2 \times 2 \times 2$
13. 630 $2 \times 3 \times 3 \times 5 \times 7$
14. 1,001 $7 \times 11 \times 13$
15. 625 $5 \times 5 \times 5 \times 5$
16. 400 $2 \times 2 \times 2 \times 2 \times 5 \times 5$
17. 2,000 $2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 5$
18. 560 $2 \times 2 \times 2 \times 2 \times 5 \times 7$

19. The prime factorization of a number is $2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5 \times 5$.
What is the number? 27,000

20. What number is in the prime factorization of all even numbers? 2

21. Could $2 \times 4 \times 5 \times 9 \times 11$ be the prime factorization of a number? Explain.
No, because 4 and 9 are not prime numbers.



22. Which is the prime factorization of 48?

Skill 3

☒ A $2 \times 2 \times 2 \times 2 \times 3$

☐ B $2 \times 2 \times 2 \times 6$

☐ C 4×12

☐ D 3×16

23. Which number is not composite? Skill 2

F 62

G 77

H 95

☒ I 53

SKILL 4: Exponents

Student pages 7-8

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SKILL 4: Exponents

In 5^4 , the 4 is the exponent. It tells that 5 is to be used as a factor 4 times.

$\nearrow 5^4$
base exponent

5^4 is read "5 to the fourth power."
 4^2 is read "4 to the second power."

To compare numbers in exponential form, first find the standard form. Then compare.

$5^4 = 5 \times 5 \times 5 \times 5 = 625$
exponential form expanded form standard form

Example

Compare: 5^3 ☐ 3^5 .

We know that $5^3 = 5 \times 5 \times 5$, and $3^5 = 3 \times 3 \times 3 \times 3 \times 3$.

$5 \times 5 \times 5$ ☐ $3 \times 3 \times 3 \times 3 \times 3$

Write in standard form and compare. $125 < 243$

So, $5^3 < 3^5$.

Guided Practice

- Write $7 \times 7 \times 7 \times 7 \times 7$ in exponential form.
 - What will the exponent be? 6
 - So, $7 \times 7 \times 7 \times 7 \times 7 \times 7 = 7^6$.
- Write 2^5 in standard form.
 - Write 2^5 in expanded form. $2 \times 2 \times 2 \times 2 \times 2$
 - Multiply the factors in your answer above. 32
- Compare: 3^4 ☐ $3 + 3 + 3 + 3$. Use $<$, $>$, or $=$.
 - Write 3^4 in expanded form. $3 \times 3 \times 3 \times 3$
 - Multiply the factors in the expanded form of 3^4 . 81
 - Find the value of $3 + 3 + 3 + 3$. 12
 - Compare: 3^4 ☐ $3 + 3 + 3 + 3$.

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SKILL 4: Practice

Write in exponential form.

- $3 \times 3 \times 3 \times 3 \times 3 \times 3$ 3^6
- 53×53 53^2
- $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$ 2^7
- $13 \times 13 \times 13$ 13^3
- $8 \times 8 \times 8 \times 8$ 8^4 or 2^{12}
- 17×17 17^2

Write in expanded form.

- 10^4 $10 \times 10 \times 10 \times 10$
- 6^5 $6 \times 6 \times 6 \times 6 \times 6$
- 3^2 3×3
- 7^3 $7 \times 7 \times 7$
- 12^4 $12 \times 12 \times 12 \times 12$
- 5^6 $5 \times 5 \times 5 \times 5 \times 5 \times 5$

Write in standard form.

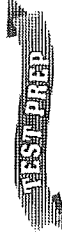
- 5^4 625
- 2^6 64
- 10^7 10,000,000
- 11^2 121
- 17^2 144
- 18^3 216

Compare using $<$, $>$, or $=$.

- 7^3 ☐ $7 + 7 + 7$
- 3^4 ☐ 4^3
- 4×10 ☐ 10^4

Solve.

- The highest point in Kentucky is Black Mountain. Its height is about 2^{12} feet. About how high is Black Mountain?
4,096 feet
- Celeste had 3¢ on Day 1. She had three times that much on Day 2. On Day 3 she had three times as much as she had on Day 2. If she continues this pattern, on what day will she have 2,187¢?
Day 7



- Which is 4^3 in standard form?
A 12 B 7 C 64 D 4

- Which shows a prime factorization?
F $2 \times 2 \times 3 \times 5$ G $2 \times 3 \times 5 \times 6$ H $3 \times 4 \times 5$ J 9×12

Skill 4

Skill 3

SKILL 5: Prime Factorization with Exponents

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SKILL 5: Prime Factorization with Exponents

You can use exponents to express prime factorization in a compact form. For example, 125 is equal to $5 \times 5 \times 5$ or 5^3 .

To write the prime factorization of 360 in exponential form, first write the factors in expanded form.

$$360 = 2 \times 2 \times 2 \times 3 \times 3 \times 5$$

Use exponents to show the number of identical factors.

$$2 \times 2 \times 2 \times 3 \times 3 \times 5 = 2^3 \times 3^2 \times 5^1$$

↑ ↑ ↑
three factors of 2 = 2^3 two factors of 3 = 3^2 5 = 5^1 , but you need not write the exponent.

So, the exponential form of the prime factorization of 360 is $2^3 \times 3^2 \times 5$.

Example

Write the prime factorization $3^3 \times 5^2$ in standard form.

$$\text{First write in expanded form. } 3^3 \times 5^2 = 3 \times 3 \times 3 \times 5 \times 5 = 675$$

Then multiply.

$$\begin{array}{r} 27 \\ \times 25 \\ \hline \end{array}$$

The standard form of the number $3^3 \times 5^2$ is 675.

Guided Practice

1. Write $2 \times 2 \times 3 \times 3 \times 3 \times 5 \times 5$ using exponents.

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

2. Write the prime factorization $2^3 \times 7^2$ in standard form.

$$\text{a. Write } 2^3 \text{ in expanded form. } 2 \times 2 \times 2$$

$$\text{b. Multiply the factors in part a. } 8$$

$$\text{c. Write } 7^2 \text{ in expanded form. } 7 \times 7$$

$$\text{d. Multiply the factors in part c. } 49$$

$$\text{e. Multiply the numbers you found in parts b and d. } 392$$

$$\text{f. So, } 2^3 \times 7^2 = 2 \times 2 \times 2 \times 7 \times 7 = 8 \times 49 = 392.$$

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SKILL 5: Practice

Write the prime factorization for each number in expanded form as a product of individual factors. Then write each prime factorization using exponents.

- | | | |
|---|---|---|
| 1. 144 | 2. 90 | 3. 1,925 |
| $2 \times 2 \times 2 \times 2 \times 3 \times 3$ | $2 \times 3 \times 3 \times 5$ | $5 \times 5 \times 7 \times 11$ |
| $2^4 \times 3^2$ | $2 \times 3^2 \times 5$ | $5^2 \times 7 \times 11$ |
| 4. 480 | 5. 405 | 6. 444 |
| $2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 5$ | $3 \times 3 \times 3 \times 3 \times 5$ | $2 \times 2 \times 3 \times 37$ |
| $2^5 \times 3 \times 5$ | $3^4 \times 5$ | $2^2 \times 3 \times 37$ |
| 7. 128 | 8. 225 | 9. 2,600 |
| $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$ | $3 \times 3 \times 5 \times 5$ | $2 \times 2 \times 2 \times 5 \times 5 \times 13$ |
| 2^7 | $3^2 \times 5^2$ | $2^3 \times 5^2 \times 13$ |

Write each prime factorization in expanded form. Then write the number in standard form.

10. $2^3 \times 3 \times 5^3$ 11. $2^2 \times 3^3 \times 7^2 \times 11$
- $2 \times 2 \times 2 \times 3 \times 5 \times 5 \times 5$ $2 \times 2 \times 3 \times 3 \times 3 \times 7 \times 7 \times 11$
- 3,000 58,212

12. Luis used exponents to write this prime factorization for a number: $2^3 \times 3^3 \times 5^3$. What is the standard form for this number?

$$27,000$$



13. Which is the prime factorization for 720 using exponents?

Skill 5

A $2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5$

B $2^4 \times 3^2 \times 5$

C $2^3 \times 3^2 \times 5$

D $2 + 2 + 2 + 2 + 3 + 3 + 5$

14. Which is 7^3 in standard form?

Skill 4

F 21

G 37

H 73

J 343

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SKILL 6: Greatest Common Factor

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SKILL 6: Greatest Common Factor

Numbers often have common factors. The **greatest common factor** (GCF) of two numbers is the greatest number that is a factor of both of them.

Example 1

Find the greatest common factor (GCF) of 24 and 60.

List all factors of 24: 1, 2, 3, 4, 6, 8, 12, 24

List all factors of 60: 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60

1, 2, 3, 4, 6, and 12 are common factors. The **greatest** common factor is 12.

Example 2

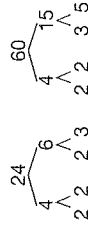
Find the greatest common factor of 24 and 60 by using the prime factorization of each number.

The greatest common factor is the product of the prime factors that the numbers have in common.

Prime factorization of 24: $2 \times 2 \times 2 \times 3$

Prime factorization of 60: $2 \times 2 \times 3 \times 5$

The common prime factors are 2, 2, and 3. So, the greatest common factor (GCF) is $2 \times 2 \times 3$, or 12.



Guided Practice

1. Find the GCF of 12 and 18 by listing all factors of each number.

a. Factors of 12: 1, 2, 3, 4, 6, 12

b. Factors of 18: 1, 2, 3, 6, 9, 18

c. GCF: 6

2. Find the GCF of 18 and 90 by using their prime factorizations.

a. Prime factorization of 18: $2 \times 3 \times 3$

b. Prime factorization of 90: $2 \times 3 \times 3 \times 5$

c. The common prime factors of 18 and 90 are: 2, 3, and 3.

d. The product of the common prime factors is 18.

e. So, the GCF of 18 and 90 is 18.

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SKILL 6: Practice

Find the GCF of each pair of numbers by listing all factors of each number.

1. 28: 1, 2, 4, 7, 14, 28 2. 16: 1, 2, 4, 8, 16

35: 1, 5, 7, 35 24: 1, 2, 3, 4, 6, 8, 12, 24

GCF: 7 GCF: 8

3. 30: 1, 2, 3, 5, 6, 10, 15, 30 4. 24: 1, 2, 3, 4, 6, 8, 12, 24

36: 1, 2, 3, 4, 6, 9, 12, 18, 36 42: 1, 2, 3, 6, 7, 14, 21, 42

GCF: 6 GCF: 6

Find the GCF of each pair of numbers by using their prime factorizations.

5. 14: 2×7 6. 18: $2 \times 3 \times 3$ 7. 48: $2 \times 2 \times 2 \times 2 \times 3$

35: 5×7 27: $3 \times 3 \times 3$ 54: $2 \times 3 \times 3 \times 3$

GCF: 7 GCF: 9 GCF: 6

8. 36: $2 \times 2 \times 3 \times 3$ 9. 40: $2 \times 2 \times 2 \times 5$ 10. 32: $2 \times 2 \times 2 \times 2 \times 2$

48: $2 \times 2 \times 2 \times 2 \times 3$ 80: $2 \times 2 \times 2 \times 2 \times 5$ 36: $2 \times 2 \times 3 \times 3$

GCF: 12 GCF: 40 GCF: 4

Solve.

11. Marcel's age is a common factor of both 48 and 72.

She is older than 12. How old is Marcel? 24



12. Which is the GCF of 24 and 36? Skill 6

A 3 C 2

B 24 D 12

13. Which is the prime factorization of 56 using exponents? Skill 5

F 7×8 H $2^2 \times 7$

G $2^3 \times 7$ J 2×28

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SKILL 7: Least Common Multiple

Student pages 13-14

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SKILL 7: Least Common Multiple

The least common multiple (LCM) of two or more whole numbers is the smallest number that is a common multiple of the given numbers.

Example 1

Find the least common multiple (LCM) of 6 and 8.

List the first several multiples of each number.

Multiples of 6: 6, 12, 18, 24, 30, 36, 42, 48

Multiples of 8: 8, 16, 24, 32, 40, 48, 56

common multiples

The least common multiple (LCM) of 6 and 8 is 24.

Example 2

Find the least common multiple of 15 and 30.

When one number is a multiple of the other, the larger number is the least common multiple.

30 is 2×15 , so 30 is a multiple of 15. The least common multiple of 15 and 30 is 30.

Example 3

Find the least common multiple of 30 and 21 by using prime factorization.

Write the prime factors of each number. Circle pairs of common factors as you did to find GCF.

$$30 = 2 \times \textcircled{3} \times 5$$

$$21 = \textcircled{3} \times 7$$

To find the LCM, multiply one number by the uncircled factors of the other number. The LCM of 30 and 21 is $30 \times 7 = 210$.

Guided Practice

- Find the least common multiple of 12 and 16.
a. List the first six multiples of 12: 12, 24, 36, 48, 60, 72
b. List the first six multiples of 16: 16, 32, 48, 64, 80, 96
c. LCM: 48

- Find the least common multiple of 24 and 48.
a. Is 48 a multiple of 24? yes
b. LCM: 48

- Find the least common multiple of 6 and 11.
a. Do 6 and 11 have a common factor? no
b. LCM: 66

Name _____ Date _____ Class _____

SKILL 7: Practice

Find the LCM of each pair of numbers by listing multiples of each number. **Number of multiples given may vary.**

1. 3: 3, 6, 9, 12, 15, 18 2. 3: 3, 6, 9, 12, 15, 18

2: 2, 4, 6, 8, 10, 12 4: 4, 8, 12, 16, 20, 24

LCM: 6 LCM: 12

3. 5: 5, 10, 15, 20, 25, 30 4. 2: 2, 4, 6, 8, 10, 12

4: 4, 8, 12, 16, 20, 24 8: 8, 16, 24, 32, 40, 48

LCM: 20 LCM: 8

Find the LCM of each pair.

5. 6, 5 30 6. 3, 21 21 7. 9, 5 45

8. 17, 3 51 9. 6, 23 138 10. 21, 7 21

11. 6, 28 84 12. 14, 18 126 13. 23, 2 46

14. 11, 33 33 15. 6, 10 30 16. 36, 45 180

17. 31, 5 155 18. 10, 14 70 19. 22, 4 44

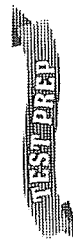
20. 20, 30 60 21. 29, 3 87 22. 16, 18 144

23. 12, 18 36 24. 20, 25 100 25. 15, 40 120

Solve.

26. Hot dogs come 8 to a package. Buns come 6 to a package. What is the fewest number of packages of each you would have to buy so that you have exactly as many hot dogs as buns?

3 packages of hot dogs; 4 packages of buns



27. Which is the LCM of 15 and 24?
Skill 7
A 3 C 9 D 360
B 120

28. Which is the GCF of 24 and 40?
Skill 6
F 960 G 120
H 8 J 4

SKILL 8: PROBLEM SOLVING: Draw a Diagram

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Name _____ Date _____ Class _____



SKILL 8: PROBLEM SOLVING: Draw a Diagram

Solving a problem can often be easier if you draw a diagram or picture to help you understand the problem.

Example

Marti has Sunday off, then works Monday through Saturday, so she has a day off once every 7 days. She needs to give her dog some medicine every 3 days. How often does she give her dog medicine on her day off?

Read Marti's days off occur every 7 days. Her dog needs medicine every 3 days.

Plan Draw a diagram of several weeks on a calendar. Label her days off with "Off." Label the days her dog needs medicine with "M."

Solve Start with a Sunday she is off and she gives medicine. Find the next day that this happens.

Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
Off/M			M			M
Off		M			M	
Off	M			M		
Off/M						

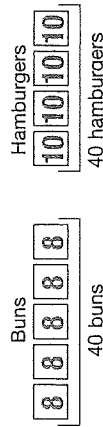
Twenty-one days later, Marti has a day off and her dog needs medicine. She gives her dog medicine on her day off every 21 days.

Look Back Does your answer make sense? The least common multiple of 7 and 3 is 21. It makes sense that an event occurring every 7 days and another event occurring every 3 days will occur together on the LCM of 7 and 3.

Guided Practice

Ari is buying buns and hamburgers for a picnic. Buns come 8 to a package. Hamburgers come 10 to a package. Ari would like to buy exactly as many hamburgers as buns.

1. Fill in the diagram with the number of items per package to illustrate the fewest number of packages of each item Ari should buy.



2. How many buns and hamburgers will he buy? 40 buns; 40 hamburgers

3. How many packages of each will this be?
5 packages of buns; 4 packages of hamburgers

Section A: Factors and Multiples

Number Theory and Fraction Concepts 15

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SKILL 8: Practice

Solve each problem.

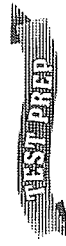
1. The bookstore sells packages of 15 pens each and 12 pencils each. They want the same number of pens and pencils in their next order. Find the smallest number of packages of each they can buy.
4 packages of pens;
5 packages of pencils

2. Ms. Ling's chemistry class uses 10-gram weights and 25-gram weights on a balance scale. What is the smallest number of each needed to balance the scale?
five 10-gram; two 25-gram

3. Freida wants to use the same number of black beads and white beads for a project. Black beads come in bags of 20. White beads come in bags of 15. What is the least number of bags of each color she can use?
3 black; 4 white

4. All Sport Outdoor Store sells fruit energy bars in 6-bar packages. They also sell nut energy bars in 4-bar packages. If the store wants to order the same number of bars of both kinds, what is the least number of packages of each they can order?
two 6-bar; three 4-bar

5. The traffic signal at 4th and Main turns green every 6 minutes. The signal at 5th and Broadway turns green every 4 minutes. If both turned green at 12:15 P.M., when are the next three times that both will turn green at the same time?
12:27 P.M.; 12:39 P.M.;
12:51 P.M.



6. Boxes that are 10 inches tall are stacked next to boxes that are 12 inches tall. Find the least number of each size box that could be stacked next to each other so that the stacks are the same height.
A two 10-in. and two 12-in.
B twelve 10-in. and ten 12-in.
C six 10-in. and five 12-in.
D five 10-in. and six 12-in.

7. Find the GCF of 14 and 24.

F 168
G 3

H 2
J 38

Skill 6

Skill 7

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Section A: Factors and Multiples

Number Theory and Fraction Concepts

SKILL 9: Writing a Fraction as Part of a Set or Part of a Whole

Student pages 19–20

Name _____ Date _____ Class _____

SKILL 9: Writing a Fraction as Part of a Set or Part of a Whole

Fractions can be used to indicate a part of a set or a part of a whole.

Example 1

In the set of four triangles at the right, three of them are shaded. One of them is not shaded.



- a. What fraction of the set is shaded? $\frac{3}{4}$

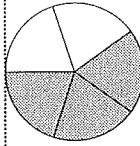
number of shaded triangles $\rightarrow 3$
total number of triangles $\rightarrow 4$

- b. What fraction of the set is not shaded? $\frac{1}{4}$

number of triangles not shaded $\rightarrow 1$
total number of triangles $\rightarrow 4$

Example 2

The circle at the right is divided into five equal parts. Three of the parts are shaded.



- a. What fraction of the circle is shaded? $\frac{3}{5}$

number of shaded parts $\rightarrow 3$
total number of parts $\rightarrow 5$

- b. What fraction of the circle is not shaded? $\frac{2}{5}$

number of parts not shaded $\rightarrow 2$
total number of parts $\rightarrow 5$

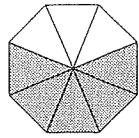
Guided Practice

1. What fraction of the cards at the right show odd numbers?

number of odd-numbered cards $\rightarrow 4$
total number of cards $\rightarrow 6$

2. What fraction of the figure at the right is shaded?

number of shaded sections $\rightarrow 5$
total number of sections $\rightarrow 8$



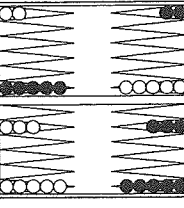
Name _____ Date _____ Class _____

SKILL 9: Practice

Write a fraction to tell what part is shaded.

- $\frac{1}{3}$
- $\frac{2}{5}$
- $\frac{6}{7}$
- $\frac{4}{4}$
- $\frac{9}{12}$
- $\frac{5}{6}$
- $\frac{6}{10}$
- $\frac{3}{8}$
- $\frac{4}{9}$

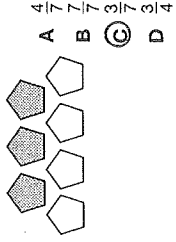
The picture at the right shows how to set up the game of backgammon. The 24 triangular-shaped spaces on the board are called points.



- What fraction of the points have five black playing pieces? $\frac{2}{24}$
- What fraction of the white playing pieces are on the point shown at the upper left corner of the board? $\frac{5}{15}$



12. Which fractional part is shaded? Skill 9



13. An office supply store sells packages of 6 folders each and 9 labels each. Which is the least number of packages of folders you should buy if you want to buy the same number of folders and labels?

F 2 H 36
G 3 J 18

SKILL 10: Estimating Fractional Amounts

Student pages 21-22

Name _____ Date _____ Class _____



SKILL 10: Estimating Fractional Amounts

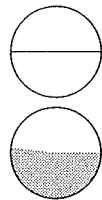
You can estimate fractional amounts by imagining the whole being divided into equal parts.

Example 1

About how much of the circle at the right is shaded?

Imagine a line through the middle of the circle dividing it in half as shown.

Since the amount shaded is slightly more than $\frac{1}{2}$ of the circle, you can estimate that about $\frac{1}{2}$ of the circle is shaded.



Example 2

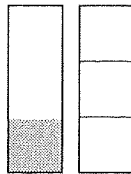
About how much of the figure at the right is shaded?

Imagine lines dividing the rectangle into thirds.

Since the amount shaded is slightly less than

$\frac{1}{3}$ of the rectangle, you can estimate that about

$\frac{1}{3}$ of the rectangle is shaded.



Guided Practice

1. About how much of the rectangle at the right is shaded?

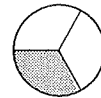


a. The lines divide the rectangle into how many equal parts? 4

b. About how many parts are shaded? 3

c. How much of the rectangle would you estimate is shaded? About $\frac{3}{4}$

2. About how much of the circle at the right is shaded?



a. The lines divide the circle into how many equal parts? 3

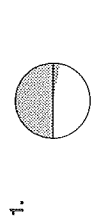
b. About how many parts are shaded? 1

c. How much of the circle would you estimate is shaded? About $\frac{1}{3}$

Name _____ Date _____ Class _____

SKILL 10: Practice

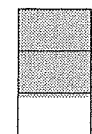
About how much is shaded?



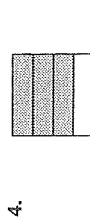
$\frac{1}{2}$



$\frac{1}{2}$



$\frac{2}{3}$



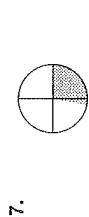
$\frac{3}{4}$



$\frac{2}{3}$



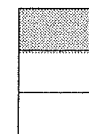
$\frac{1}{2}$



$\frac{1}{4}$

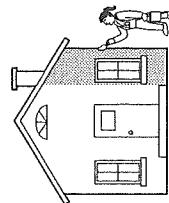


$\frac{1}{2}$



$\frac{1}{3}$

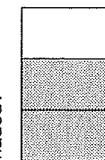
10. The picture at the right shows Anita painting her playhouse. About how much of the front of the playhouse is painted?



$\frac{1}{4}$



11. Which tells about how much is shaded?



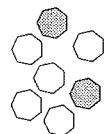
A $\frac{1}{3}$

C $\frac{3}{3}$

B $\frac{4}{3}$

D $\frac{2}{3}$

12. Which fractional part is shaded?



F $\frac{7}{7}$

H $\frac{2}{7}$

G $\frac{2}{5}$

J $\frac{5}{7}$

Skill 10

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SKILL 11: Equivalent Fractions

Student pages 23-24

Name _____ Date _____ Class _____



SKILL 11: Equivalent Fractions

If two fractions represent the same quantity, they are equivalent.

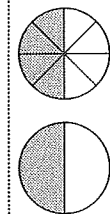
Example 1

Use a model to show that $\frac{1}{2}$ and $\frac{4}{8}$ are equivalent fractions.

Draw a circle divided into two parts and shade $\frac{1}{2}$.

Draw more lines to divide each half into 4 parts. This shows $\frac{4}{8}$.

$$\frac{1}{2} = \frac{4}{8}$$



Example 2

Find two fractions that are equivalent to $\frac{5}{10}$.

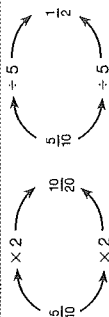
Multiply or divide the numerator and the denominator by the same nonzero number. This is the same as multiplying or dividing the fraction by 1.

$$\begin{array}{lcl} \text{numerator} & \rightarrow & 5 \times 2 = 10 \\ \text{denominator} & \rightarrow & 10 \times 2 = 20 \end{array}$$

$$\text{So, } \frac{5}{10} \text{ is equivalent to } \frac{10}{20}.$$

$$\begin{array}{lcl} \text{numerator} & \rightarrow & 5 \div 5 = 1 \\ \text{denominator} & \rightarrow & 10 \div 5 = 2 \end{array}$$

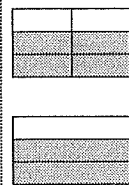
$$\text{So, } \frac{5}{10} \text{ is equivalent to } \frac{1}{2}.$$



Guided Practice

- Find a fraction equivalent to $\frac{2}{3}$. Use the models at the right.

$$\frac{2}{3} = \frac{4}{6}$$



- Multiply to find an equivalent fraction. **Answers will vary.**

$$\frac{2}{6} = \frac{2 \times \boxed{2}}{6 \times \boxed{2}} = \frac{\boxed{4}}{\boxed{12}}$$

- Divide to find an equivalent fraction.

$$\frac{6}{8} = \frac{6 \div \boxed{2}}{8 \div \boxed{2}} = \frac{\boxed{3}}{\boxed{4}}$$

Name _____ Date _____ Class _____

SKILL 11: Practice

Use the models to find an equivalent fraction.

- $\frac{2}{5} = \frac{4}{10}$
- $\frac{1}{3} = \frac{2}{6}$
- $\frac{1}{2} = \frac{2}{4}$

Multiply numerator and denominator by the given number to find an equivalent fraction.

- $3; \frac{4}{7} = \frac{12}{21}$
- $5; 2; \frac{1}{6} = \frac{2}{12}$
- $6; \frac{2}{3} = \frac{10}{15}$
- $7; \frac{5}{8} = \frac{30}{48}$
- $10; \frac{2}{11} = \frac{20}{110}$
- $8; \frac{3}{5} = \frac{24}{40}$

Divide numerator and denominator by the given number to find an equivalent fraction.

- $2; \frac{10}{12} = \frac{5}{6}$
- $6; \frac{36}{42} = \frac{6}{7}$
- $5; \frac{20}{30} = \frac{4}{6}$
- $9; \frac{27}{45} = \frac{3}{5}$
- $10; \frac{50}{80} = \frac{5}{8}$
- $15; \frac{44}{64} = \frac{11}{16}$

- Find an equivalent fraction for $\frac{10}{18}$ that has a smaller denominator.

- Find an equivalent fraction for $\frac{9}{14}$ that has a larger denominator.

- Find an equivalent fraction for $\frac{30}{36}$ that has a smaller denominator. Then find one with a larger denominator.

Answers will vary.

Answers will vary.



- Which is equivalent to $\frac{4}{5}$? **Skill 11**

- A $\frac{6}{7}$ C $\frac{4}{10}$
 B $\frac{12}{15}$ D $\frac{2}{10}$

- Which tells about how full the glass is? **Skill 10**

- H $\frac{3}{4}$ J $\frac{1}{8}$



SKILL 12: Simplest Form

Student pages 25-26

Name _____ Date _____ Class _____



SKILL 12: Simplest Form

A fraction is in simplest form when the only common factor of the numerator and the denominator is 1.

Example 1

Write $\frac{8}{24}$ in simplest form.

Divide the numerator and the denominator by a common factor.

$$\frac{8 \div 4}{24 \div 4} = \frac{2}{6}$$

not in simplest form

Continue dividing if there are still common factors (other than 1).

$$\frac{2 \div 2}{6 \div 2} = \frac{1}{3}$$

in simplest form

The fraction is in simplest form because the only common factor of 1 and 3 is 1.

$$\frac{1}{3} = \frac{1}{3}$$

Example 2

Write $\frac{36}{42}$ in simplest form.

To write a fraction in simplest form, you can divide the numerator and the denominator by their greatest common factor (GCF).

Factors of 36: 1, 2, 3, 4, 6, 9, 12, 18, 36

Factors of 42: 1, 2, 3, 6, 7, 14, 21, 42

The GCF is 6.

$$\frac{36 \div 6}{42 \div 6} = \frac{6}{7}$$

$\frac{6}{7}$ is in simplest form.

Guided Practice

1. Write $\frac{4}{10}$ in simplest form.

a. What is the GCF of 4 and 10? 2

b. Divide numerator and denominator by your answer to part a.

$$\frac{4 \div 2}{10 \div 2} = \frac{2}{5}$$

2. Write $\frac{32}{40}$ in simplest form.

$$\frac{32 \div 8}{40 \div 8} = \frac{4}{5}$$

Name _____ Date _____ Class _____

SKILL 12: Practice

Find the GCF of the numerator and denominator in each fraction. Then write the fraction in simplest form.

1. $\frac{6}{9}$

GCF: 3

Simplest form: $\frac{2}{3}$

2. $\frac{10}{40}$

GCF: 10

Simplest form: $\frac{1}{4}$

3. $\frac{28}{48}$

GCF: 4

Simplest form: $\frac{7}{12}$

Write in simplest form.

4. $\frac{12}{24}$

$\frac{1}{2}$

$\frac{3}{5}$

$\frac{6}{10}$

$\frac{7}{14}$

8. $\frac{18}{20}$

$\frac{9}{10}$

$\frac{30}{38}$

$\frac{15}{19}$

$\frac{2}{5}$

12. $\frac{14}{32}$

$\frac{7}{16}$

$\frac{8}{12}$

$\frac{2}{3}$

$\frac{3}{4}$

16. $\frac{9}{15}$

$\frac{3}{5}$

$\frac{6}{12}$

$\frac{1}{2}$

$\frac{2}{5}$

20. $\frac{6}{10}$

$\frac{3}{5}$

$\frac{6}{12}$

$\frac{1}{2}$

$\frac{3}{4}$

24. $\frac{14}{24}$

$\frac{7}{12}$

$\frac{36}{48}$

$\frac{4}{13}$

$\frac{2}{9}$

28. A kilometer is about $\frac{6}{10}$ of a mile.

Write this fraction in simplest form.

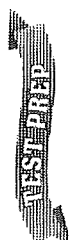
$\frac{3}{5}$

29. Last week, $\frac{25}{30}$ of the students in Mr. Lim's class went on a field trip. Write this fraction in simplest form.

$\frac{5}{6}$

30. The band members make up $\frac{35}{100}$ students at Winfield Middle School. Write this fraction in simplest form.

$\frac{7}{20}$



31. Which is in simplest form?

A $\frac{9}{16}$

Skill 12

C $\frac{9}{18}$

F $\frac{6}{10}$

H $\frac{3}{4}$

Skill 11

B $\frac{6}{15}$

G $\frac{10}{14}$

J $\frac{20}{32}$

SKILL 13: Writing Fractions with the Least Common Denominator

Student pages 27–28

Name _____ Date _____ Class _____

SKILL 13: Writing Fractions with the Least Common Denominator

The least common denominator (LCD) of two or more fractions is the number that is the LCM of their denominators.

Once you have found the least common denominator, write equivalent fractions with this denominator.

Example

Find the least common denominator for $\frac{5}{8}$ and $\frac{1}{12}$. Then write an equivalent fraction for each, using the least common denominator.

The denominators are 8 and 12.

Multiples of 8: 8, 16, 24, 32, 40

Multiples of 12: 12, 24, 36, 48

The LCM of 8 and 12 is 24.

Write an equivalent fraction of $\frac{5}{8}$ and $\frac{1}{12}$, using 24 as the denominator.

Since $8 \times 3 = 24$, multiply 5 by 3 to obtain the numerator.

$$\frac{5}{8} = \frac{5 \times 3}{8 \times 3} = \frac{15}{24}$$

So, using the LCD of 24, $\frac{5}{8} = \frac{15}{24}$ and $\frac{1}{12} = \frac{2}{24}$.

Guided Practice

1. Write $\frac{1}{3}$ and $\frac{3}{4}$ as equivalent fractions with the least common denominator.

a. What is the LCM for 3 and 4? 12

b. By what number will you multiply the numerator and denominator of $\frac{1}{3}$? 4

$$\frac{1}{3} \times \frac{4}{4} = \frac{4}{12}$$

c. By what number will you multiply the numerator and denominator of $\frac{3}{4}$? 3

$$\frac{3}{4} \times \frac{3}{3} = \frac{9}{12}$$

2. Write $\frac{1}{2}$ and $\frac{1}{3}$ as equivalent fractions with the least common denominator.

$$\frac{3}{6}, \frac{2}{6}$$

Name _____ Date _____ Class _____

SKILL 13: Practice

Find the LCM for each pair of numbers.

1. 4, 5 20 2. 6, 9 18 3. 8, 10 40 4. 6, 8 24
5. 9, 12 36 6. 4, 8 8 7. 6, 7 42 8. 5, 10 10

Find the least common denominator for each pair of fractions. Then write an equivalent fraction for each, using the least common denominator.

9. $\frac{3}{5}, \frac{1}{2}$ LCD: 10 LCD: 42 LCD: 8
 $\frac{6}{10}, \frac{5}{10}$ $\frac{7}{42}, \frac{24}{42}$ $\frac{6}{8}, \frac{3}{8}$

Write an equivalent fraction for each, using the least common denominator.

12. $\frac{7}{9}, \frac{1}{6}$ 13. $\frac{1}{2}, \frac{9}{10}$ 14. $\frac{5}{8}, \frac{3}{7}$ 15. $\frac{3}{9}, \frac{10}{10}$ 16. $\frac{4}{7}, \frac{1}{2}$ 17. $\frac{3}{8}, \frac{5}{5}$
 $\frac{14}{18}, \frac{3}{18}$ $\frac{50}{90}, \frac{27}{90}$ $\frac{8}{14}, \frac{7}{14}$ $\frac{2}{5}, \frac{7}{5}$ $\frac{14}{35}, \frac{10}{35}$
18. $\frac{5}{12}, \frac{6}{6}$ 19. $\frac{1}{4}, \frac{7}{8}$ 20. $\frac{2}{5}, \frac{7}{7}$ 21. $\frac{11}{15}, \frac{9}{5}$ 22. $\frac{5}{12}, \frac{7}{16}$ 23. $\frac{13}{18}, \frac{24}{24}$
 $\frac{5}{12}, \frac{10}{12}$ $\frac{2}{8}, \frac{7}{8}$ $\frac{20}{48}, \frac{21}{48}$ $\frac{52}{72}, \frac{51}{72}$

24. Keri keeps her computer CDs on two shelves. One shelf is $\frac{3}{4}$ full. The other is $\frac{5}{6}$ full. Write an equivalent fraction for each, using the least common denominator.



25. What is the least common denominator for $\frac{5}{6}$ and $\frac{3}{8}$?

- A 48 B 24 C 12 D 16

26. Which is the simplest form?

- F $\frac{10}{12}$ G $\frac{4}{6}$ H $\frac{9}{14}$ J $\frac{7}{21}$

SKILL 14:

Improper Fractions and Mixed Numbers

Student pages 31-32

Name _____

Date _____

Class _____



SKILL 14: Improper Fractions and Mixed Numbers

An improper fraction has a numerator that is greater than or equal to its denominator. So, it has a value greater than or equal to 1. A mixed number shows the sum of a whole number and a fraction.

Example 1

Write an improper fraction and a mixed number to describe the picture at the right.



The shapes are divided into fifths, so the denominator of the fraction will be 5. There are 12 shaded parts, so the numerator will be 12.
There are 2 wholes shaded.
The third shape has 2 fifths shaded.
The improper fraction $\frac{12}{5}$ and the mixed number $2\frac{2}{5}$ are equivalent.

Example 2

Write $3\frac{1}{4}$ as an improper fraction.

Step 1: Multiply the denominator by the whole number.

$$3 \times 4 = 12$$

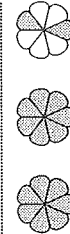
Step 2: Add the numerator.

Step 3: Use the sum from Step 2 as the numerator of the improper fraction. Use the denominator of the fraction.

$$\text{So, } 3\frac{1}{4} = \frac{13}{4}. \text{ The improper fraction is } \frac{13}{4}.$$

Guided Practice

1. Write an improper fraction and a mixed number to describe the picture at the right.



2. Write $3\frac{4}{5}$ as an improper fraction.

a. How many fifths are in 3 wholes? 15

b. How many total fifths? 19

c. Improper fraction: $\frac{19}{5}$

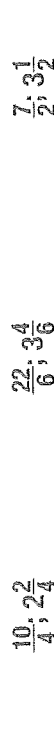
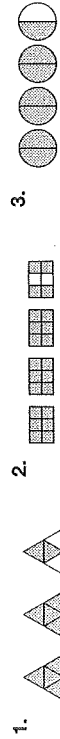
Name _____

Date _____

Class _____

SKILL 14: Practice

Write an improper fraction and a mixed number to describe each picture.



Write each mixed number as an improper fraction.

7. $2\frac{1}{6}$ $\frac{13}{6}$ 8. $5\frac{1}{5}$ $\frac{26}{5}$ 9. $1\frac{2}{5}$ $\frac{7}{5}$ 10. $13\frac{1}{2}$ $\frac{27}{2}$

11. $8\frac{3}{4}$ $\frac{35}{4}$ 12. $2\frac{2}{3}$ $\frac{11}{3}$ 13. $14\frac{2}{9}$ $\frac{128}{9}$ 14. $12\frac{2}{3}$ $\frac{38}{3}$

15. $3\frac{5}{8}$ $\frac{29}{8}$ 16. $9\frac{1}{9}$ $\frac{82}{9}$ 17. $7\frac{4}{5}$ $\frac{39}{5}$ 18. $8\frac{1}{3}$ $\frac{25}{3}$

19. $4\frac{1}{4}$ $\frac{17}{4}$ 20. $9\frac{1}{2}$ $\frac{19}{2}$ 21. $12\frac{1}{3}$ $\frac{37}{3}$ 22. $2\frac{4}{7}$ $\frac{18}{7}$

Solve.

23. Muriel counted 17 quarters in her bank. Write the amount of money she has in her bank as a mixed number.

$4\frac{1}{4}$ dollars

24. Which shows the improper fraction for $6\frac{4}{7}$?

- A $\frac{10}{7}$ B $\frac{42}{7}$ C $\frac{46}{7}$ D $\frac{64}{7}$

Skill 14

25. Which shows equivalent fractions for $\frac{5}{6}$ and for $\frac{11}{15}$ using the least common denominator?

- F $\frac{25}{30}, \frac{22}{30}$ G $\frac{75}{90}, \frac{66}{90}$ H $\frac{5}{30}, \frac{11}{30}$ J $\frac{50}{60}, \frac{44}{60}$

Skill 13

SKILL 15: Improper Fractions, Quotients, and Mixed Numbers

Student pages 33-34

Name _____ Date _____ Class _____

SKILL 15: Improper Fractions, Quotients, and Mixed Numbers

A fraction shows division. The numerator is the dividend and the denominator is the divisor.

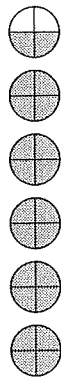
Example 1

Write $\frac{22}{4}$ as a whole or mixed number.

Divide 22 by 4. $\begin{array}{r} 5 \text{ R}2 \\ 4 \overline{)22} \\ \underline{-20} \end{array}$

The 2 in the remainder represents $\frac{2}{4}$, or $\frac{1}{2}$ in simplest form.

$$\frac{22}{4} = 5\frac{2}{4} = 5\frac{1}{2}$$



$$\frac{22}{4} = 5\frac{1}{2}$$

Example 2

Write $\frac{18}{3}$ as a whole or mixed number.

Divide 18 by 3. $\begin{array}{r} 6 \\ 3 \overline{)18} \end{array}$

$$\frac{18}{3} = 6$$



$$\frac{18}{3} = 6$$

Guided Practice

Answer each question.

1. Write $\frac{34}{3}$ as a whole or mixed number.

a. What is the quotient? $\underline{11}$

b. What is the remainder? $\underline{1}$

c. Write the result as a mixed number. $\underline{11\frac{1}{3}}$

2. Write $\frac{62}{9}$ as a whole or mixed number.

a. What is the quotient? $\underline{6}$

b. What is the remainder? $\underline{8}$

c. Write the result as a mixed number. $\underline{6\frac{8}{9}}$

Write each number as a whole or mixed number in simplest form.

3. $\frac{28}{7}$ $\underline{4}$ $\frac{4}{3}$ $\underline{1\frac{1}{3}}$ $5\frac{7}{4}$ $\underline{1\frac{3}{4}}$

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SKILL 15: Practice

Write each fraction as a whole or mixed number.

Express fractions in simplest form. $\frac{61}{7}$

1. $\frac{30}{6}$ $\underline{5}$ 2. $\frac{43}{7}$ $\underline{6\frac{1}{7}}$ 3. $\frac{14}{7}$ $\underline{2}$
4. $\frac{24}{6}$ $\underline{4}$ 5. $\frac{32}{16}$ $\underline{2}$ 6. $\frac{48}{8}$ $\underline{6}$
7. $\frac{72}{9}$ $\underline{8}$ 8. $\frac{80}{10}$ $\underline{8}$ 9. $\frac{16}{5}$ $\underline{3\frac{1}{5}}$
10. $\frac{56}{7}$ $\underline{8}$ 11. $\frac{90}{9}$ $\underline{10}$ 12. $\frac{68}{11}$ $\underline{6\frac{2}{11}}$
13. $\frac{76}{12}$ $\underline{6\frac{2}{3}}$ 14. $\frac{45}{5}$ $\underline{9}$ 15. $\frac{38}{19}$ $\underline{2}$
16. $\frac{88}{10}$ $\underline{8\frac{4}{5}}$ 17. $\frac{122}{11}$ $\underline{11\frac{1}{11}}$ 18. $\frac{96}{6}$ $\underline{16}$
19. $\frac{144}{12}$ $\underline{12}$ 20. $\frac{56}{3}$ $\underline{18\frac{2}{3}}$ 21. $\frac{39}{9}$ $\underline{4\frac{1}{3}}$
22. $\frac{120}{8}$ $\underline{15}$ 23. $\frac{87}{3}$ $\underline{29}$ 24. $\frac{67}{4}$ $\underline{16\frac{3}{4}}$
25. $\frac{94}{3}$ $\underline{31\frac{2}{3}}$ 26. $\frac{135}{9}$ $\underline{15}$ 27. $\frac{91}{7}$ $\underline{13}$

Show each dinosaur measurement as a mixed number.

28. A geranosaurus was $\frac{6}{5}$ m long. $\underline{1\frac{1}{5}\text{m}}$

29. Each arm of a deinocerius was $\frac{17}{2}$ ft long. $\underline{8\frac{1}{2}\text{ft}}$

30. A hypsilophodon was $\frac{23}{10}$ m long. $\underline{2\frac{3}{10}\text{m}}$



31. Write $\frac{31}{7}$ as a whole or mixed number.

- A 4 C $\frac{4}{7}$ Skill 15
B $3\frac{4}{7}$ D $4\frac{3}{7}$

32. Which shows the mixed number for $\frac{53}{7}$?

- F $8\frac{4}{7}$ H $7\frac{5}{7}$ Skill 14
G $7\frac{4}{7}$ J $6\frac{11}{7}$

SKILL 16: Comparing and Ordering Fractions and Mixed Numbers

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SKILL 16: Comparing and Ordering Fractions and Mixed Numbers

When ordering mixed numbers, first order using the whole number part. However, sometimes it is necessary to compare or order fractions. One way to do this is to write each fraction with a common denominator.

Example 1

Compare $\frac{3}{4}$ and $\frac{5}{6}$.

To compare the fractions, write them with a common denominator.

Multiples of 4: 4, 8, 12, 16
Multiples of 6: 6, 12, 18, 24

The least common denominator of 4 and 6 is 12. Using the LCD, write equivalent fractions.

$9 < 10$, so $\frac{3}{4} < \frac{5}{6}$.

$$\frac{3}{4} \downarrow \frac{9}{12} < \frac{10}{12} \leftarrow \frac{5}{6}$$

Since the denominators are the same, compare the numerators.

Example 2

Write the mixed numbers $2\frac{5}{8}$, $2\frac{3}{4}$, and $2\frac{7}{10}$ in order from least to greatest.

Multiples of 8: 8, 16, 24, 32, 40
Multiples of 4: 4, 8, 12, 16, 20, 24, 28, 32, 36, 40
Multiples of 10: 10, 20, 30, 40

The least common denominator for 8, 4, and 10 is 40. Write equivalent fractions.

$25 < 28 < 30$, so the order of the mixed numbers is $2\frac{5}{8}$, $2\frac{7}{10}$, $2\frac{3}{4}$.

$$\frac{5}{8} \downarrow \frac{25}{40} \quad \frac{3}{4} \downarrow \frac{30}{40} \quad \frac{7}{10} \downarrow \frac{28}{40}$$

Guided Practice

1. Compare $5\frac{1}{4}$ and $5\frac{1}{6}$.

a. What is the least common denominator? 12

b. Write equivalent fractions using the least common denominator. $5\frac{3}{12}$ and $5\frac{2}{12}$

c. Compare. $5\frac{1}{4} > 5\frac{1}{6}$

2. Order $1\frac{5}{6}$, $1\frac{3}{4}$, and $1\frac{2}{3}$ from least to greatest. $1\frac{2}{3}$, $1\frac{3}{4}$, $1\frac{5}{6}$

a. Write equivalent fractions using the LCD. $\frac{60}{60}$, $\frac{45}{60}$, $\frac{36}{60}$

b. Order the mixed numbers. $1\frac{2}{3}$, $1\frac{3}{4}$, $1\frac{5}{6}$

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SKILL 16: Practice

Compare using $<$, $>$, or $=$.

1. $\frac{3}{12} < \frac{5}{12}$ 2. $\frac{2}{3} > \frac{1}{2}$ 3. $\frac{5}{8} > \frac{3}{8}$ 4. $\frac{4}{5} < \frac{9}{10}$

5. $\frac{2}{4} = \frac{10}{20}$ 6. $\frac{1}{4} < \frac{4}{13}$ 7. $\frac{5}{7} < \frac{6}{7}$ 8. $\frac{5}{12} < \frac{3}{5}$

9. $4\frac{2}{9} > 4\frac{1}{5}$ 10. $4\frac{1}{7} > 3\frac{3}{18}$ 11. $6\frac{3}{7} < 6\frac{4}{9}$

12. $8\frac{4}{6} < 8\frac{12}{16}$ 13. $9\frac{2}{6} = 9\frac{4}{12}$ 14. $7\frac{2}{5} > 6\frac{5}{11}$

Order from least to greatest.

15. $\frac{3}{4}$, $\frac{3}{5}$, $\frac{3}{10}$ 16. $3\frac{4}{5}$, $3\frac{3}{4}$, $3\frac{5}{6}$ 17. $\frac{7}{10}$, $\frac{18}{25}$, $\frac{3}{5}$

18. $5\frac{1}{5}$, $5\frac{1}{6}$, $4\frac{7}{30}$ 19. $\frac{33}{100}$, $\frac{3}{10}$, $\frac{33}{1000}$ 20. $\frac{49}{56}$, $\frac{23}{28}$, $\frac{12}{14}$

21. $4\frac{7}{30}$, $5\frac{1}{6}$, $5\frac{5}{5}$ 22. $\frac{33}{1000}$, $\frac{3}{10}$, $\frac{33}{100}$ 23. $\frac{23}{28}$, $\frac{12}{14}$, $\frac{49}{56}$

Solve.

21. Raoul has $2\frac{1}{3}$ cups of milk. Does he have enough to prepare a recipe that uses $2\frac{1}{2}$ cups of milk? No

22. Fanelli's Hardware stocks wooden dowels in the following widths: $\frac{3}{16}$ in., $\frac{1}{8}$ in., $\frac{3}{8}$ in., $\frac{1}{4}$ in., $\frac{1}{2}$ in. Write these widths in order from smallest to largest.

$\frac{1}{8}$ in., $\frac{3}{16}$ in., $\frac{1}{4}$ in., $\frac{3}{8}$ in., $\frac{1}{2}$ in.



23. Which comparison is correct? $\frac{2}{5} > \frac{1}{2}$ Skill 16

A $\frac{5}{6} < \frac{3}{5}$ C $\frac{2}{5} > \frac{1}{2}$ F $4\frac{3}{12}$ H $4\frac{4}{12}$
B $\frac{5}{6} > \frac{7}{9}$ D $\frac{8}{9} < \frac{4}{5}$ G $5\frac{5}{12}$ J $4\frac{5}{12}$

24. Write $\frac{53}{12}$ as a mixed number. Skill 15

F $4\frac{3}{12}$ H $4\frac{4}{12}$ G $5\frac{5}{12}$ J $4\frac{5}{12}$

SKILL 17: Writing Equivalent Fractions and Decimals

Student pages 37–38

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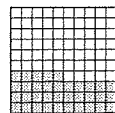


SKILL 17: Writing Equivalent Fractions and Decimals

You can use a fraction or a decimal to express the same number.

Example 1

Write a fraction for 0.35. Express your answer in simplest form.



number of shaded squares $\rightarrow 35$
total number of squares $\rightarrow 100$
 $\frac{35}{100} = \frac{35 \div 5}{100 \div 5} = \frac{7}{20}$ $0.35 = \frac{35}{100} = \frac{7}{20}$

Example 2

Write a decimal for $\frac{3}{5}$.

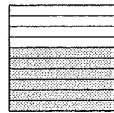
You will need to change $\frac{3}{5}$ to an equivalent fraction with 10 or 100 as the denominator.

$$\frac{3}{5} = \frac{3 \times 2}{5 \times 2} = \frac{6}{10}$$

The picture at the right shows tenths. 6 tenths are shaded.

The decimal for the picture is 0.6.

$$\frac{3}{5} = \frac{6}{10} = 0.6$$



Guided Practice

1. Write a fraction for 0.25 in simplest form. $\frac{25}{100}$

a. Write a fraction showing hundredths. $\frac{1}{4}$

b. Write the fraction in simplest form. $\frac{1}{4}$

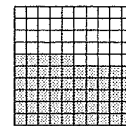
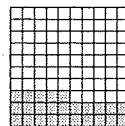
c. $0.25 = \frac{11}{4}$

2. Write a decimal for $\frac{11}{20}$.

a. Write the fraction with a denominator of 100. $\frac{55}{100}$

b. Write your answer as a decimal. 0.55

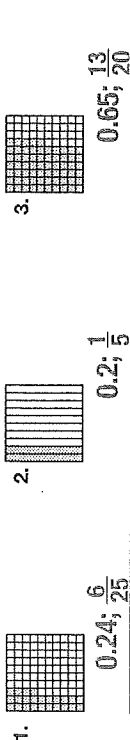
c. $\frac{11}{20} = 0.55$



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SKILL 17: Practice

Write a decimal and a fraction in simplest form for each picture.



Write a fraction in simplest form for each decimal.

4. $0.34 = \frac{17}{50}$ 5. $0.9 = \frac{9}{10}$ 6. $0.64 = \frac{16}{25}$
7. $0.12 = \frac{3}{25}$ 8. $0.72 = \frac{18}{25}$ 9. $0.65 = \frac{13}{20}$
10. $0.4 = \frac{2}{5}$ 11. $0.27 = \frac{27}{100}$ 12. $0.32 = \frac{8}{25}$

Write a decimal for each fraction.

13. $\frac{2}{5} = 0.4$ 14. $\frac{1}{2} = 0.5$ 15. $\frac{9}{20} = 0.45$
16. $\frac{12}{25} = 0.48$ 17. $\frac{3}{4} = 0.75$ 18. $\frac{42}{50} = 0.84$
19. $\frac{11}{20} = 0.55$ 20. $\frac{7}{25} = 0.28$ 21. $\frac{16}{25} = 0.64$

Solve.

22. A thumb tack is about 0.85 cm long. Write the length of the thumbtack as a fraction in simplest form. $\frac{17}{20}$ cm

23. Jason has a drill bit that is $\frac{21}{25}$ cm in diameter. Write the diameter of the drill bit as a decimal. 0.84 cm

24. Tonya's caulking gun handle is 0.98 ft long. Write the length of the handle as a fraction in simplest form. $\frac{49}{50}$ ft



25. What decimal is shown?



- A 0.52 C 0.13
B 0.25 D 1.3

Skill 17

26. Which set of fractions is in order from least to greatest?

- F $\frac{2}{3}, \frac{3}{5}, \frac{7}{10}$ H $\frac{2}{5}, \frac{3}{7}, \frac{1}{2}$
G $\frac{8}{9}, \frac{2}{3}, \frac{1}{6}$ J $\frac{5}{8}, \frac{1}{4}, \frac{7}{7}$

Skill 16

SKILL 18: Dividing to Change a Fraction to a Decimal

Student pages 39-40

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SKILL 18: Dividing to Change a Fraction to a Decimal

To change a fraction to a decimal, divide the numerator by the denominator.

Example 1

Write $\frac{2}{5}$ as a decimal.
 To write $\frac{2}{5}$ as a decimal, divide 2 by 5.
 The fraction $\frac{2}{5}$ and the decimal 0.4 name the same number.

We call 0.4 a terminating decimal because it terminates, or ends.

Example 2

Write $\frac{2}{9}$ as a decimal.
 To write $\frac{2}{9}$ as a decimal, divide 2 by 9.
 The fraction $\frac{2}{9}$ and the decimal 0.222... name the same number.
 The repeating digit can be shown with a bar as $0.\overline{2}$.
 2 ← If you keep dividing you always get a nonzero remainder.

We call this type of decimal a repeating decimal because a pattern of digits repeats.

Example 3

Write 0.12333... using the bar notation.
 Only the digit that repeats is shown with a bar, so 0.12333... is equal to 0.12 $\overline{3}$.

Guided Practice

- Rewrite 0.333... using bar notation. 0. $\overline{3}$
 - Rewrite 0.27 using the three dots. 0.272727...
- Convert each fraction to a decimal by dividing. Tell if it is terminating or repeating.
- $\frac{3}{8}$ 0.375; terminating
 - $\frac{7}{9}$ 0. $\overline{7}$; repeating

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SKILL 18: Practice

Rewrite using bar notation.

- 0.7777... 0. $\overline{7}$
 - 0.585858... 0. $\overline{58}$
 - 2.656565... 2. $\overline{65}$
 - 7.20222... 7. $\overline{202}$
 - 4.93333... 4. $\overline{93}$
 - 3.001001001... 3. $\overline{001}$
- Rewrite using the three dots.
- 0.25 0.252525...
 - 0.6 0.666...
 - 2.04 2.0444...
 - 3.027 3.027027027...
 - 4.71 4.7111...
 - 9.003 9.0030303...

Write each fraction as a decimal. Tell whether it is terminating or repeating.

- $\frac{2}{3}$ 0. $\overline{6}$; repeating
- $\frac{7}{10}$ 0.7; terminating
- $\frac{15}{6}$ 2.5; terminating
- $\frac{23}{33}$ 0. $\overline{69}$; repeating
- $\frac{1}{8}$ 0.125; terminating
- $\frac{6}{11}$ 0. $\overline{54}$; repeating
- $\frac{5}{6}$ 0. $\overline{83}$; repeating
- $\frac{21}{40}$ 0.525; terminating
- $\frac{49}{50}$ 0.98; terminating
- $\frac{14}{9}$ 1. $\overline{5}$; repeating

Solve.

- A computer word processing program allows users to select a font size of 8 point, 10 point, 12 point, or 16 point.

These sizes are equivalent to $\frac{1}{3}$ in., $\frac{5}{16}$ in., $\frac{1}{2}$ in., and $\frac{2}{3}$ in., respectively. Write each font size as a decimal.

0. $\overline{3}$ in.; 0.3125 in.; 0.5 in.; 0. $\overline{6}$ in.



- Which shows $\frac{4}{9}$ as a decimal?

A 0.4 C 0.44
 B 0.4 D 0.04

- What is the simplest form of the fraction shown by the picture?



F $\frac{95}{100}$ H $\frac{9}{10}$
 G $\frac{19}{20}$ J $\frac{1}{20}$