APRIL 20TH

Subtract Fractions

Getting the Idea

To subtract fractions that have like denominators, subtract the numerators. The denominator remains the same. Write the difference in simplest form.

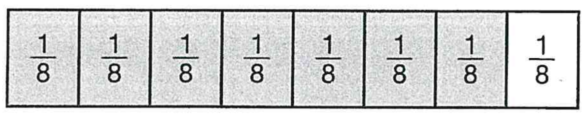
Example 1

Subtract.

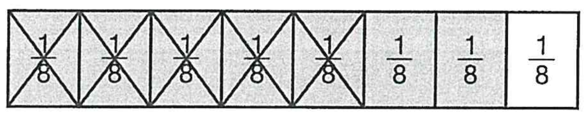
$\frac{7}{8} - \frac{5}{8} = \square$

Strategy **Use fraction strips to find the difference.**

Step 1 Shade fraction strips to show $\frac{7}{8}$.



Step 2 Cross out $\frac{5}{8}$ of the shaded parts.



Step 3 Count the remaining shaded parts.

There are 2 shaded parts.

Write 2 as the numerator. The denominator stays the same.

$\frac{7}{8} - \frac{5}{8} = \frac{2}{8}$

Step 4 Write the fraction in simplest form.

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

Solution $\mathbf{\frac{7}{8} - \frac{5}{8} = \frac{1}{4}}$

To subtract fractions with unlike denominators, rename one or both fractions so that they have like denominators.

Example 2

Subtract: $\frac{5}{9} - \frac{1}{6}$

Strategy **Write equivalent fractions using a common denominator. Then subtract.**

Step 1 Find a common denominator of $\frac{5}{9}$ and $\frac{1}{6}$.

$9 \times 6 = 54$

Step 2 Write equivalent fractions with 54 as the denominator.

$\frac{5}{9} = \frac{5 \times 6}{9 \times 6} = \frac{30}{54}$

$\frac{1}{6} = \frac{1 \times 9}{6 \times 9} = \frac{9}{54}$

Step 3 Subtract.

$\frac{30}{54} - \frac{9}{54} = \frac{21}{54}$

Step 4 Write the difference in simplest form.

$\frac{21}{54} = \frac{21 \div 3}{54 \div 3} = \frac{7}{18}$

Solution $\mathbf{\frac{5}{9} - \frac{1}{6} = \frac{7}{18}}$

You can use the least common denominator (LCD) to rename fractions. When the LCD is used, the difference will be in simplest form.

Example 3

Subtract: $\frac{5}{6} - \frac{3}{8}$

Strategy **Use the LCD to write equivalent fractions. Then subtract.**

Step 1 Find the LCD of $\frac{5}{6}$ and $\frac{3}{8}$.

Multiples of 6: 6, 12, 18, 24

Multiples of 8: 8, 16, 24

The LCD is 24.

Step 2 Write equivalent fractions with 24 as the denominator.

$\frac{5}{6} = \frac{5}{6} \times \frac{4}{4} = \frac{20}{24}$

$\frac{3}{8} = \frac{3}{8} \times \frac{3}{3} = \frac{9}{24}$

Step 3 Subtract.

$$\frac{20}{24} - \frac{9}{24} = \frac{11}{24}$$

Solution $\frac{5}{6} - \frac{3}{8} = \frac{11}{24}$

You can subtract mixed numbers by renaming them as improper fractions.

Example 4

Mr. Ramos bought two packages of chicken. One package weighed $2\frac{5}{8}$ pounds and the other weighed $4\frac{1}{2}$ pounds. How much more does the heavier package weigh?

Strategy **Rename the mixed numbers as improper fractions. Then subtract.**

Step 1 Find a common denominator for $\frac{5}{8}$ and $\frac{1}{2}$.

Since 8 is a multiple of 2, the LCD is 8.

Step 2 Rename $4\frac{1}{2}$ so that it has 8 as a denominator.

$$\frac{1}{2} = \frac{1}{2} \times \frac{4}{4} = \frac{4}{8}, \text{ so } 4\frac{1}{2} = 4\frac{4}{8}$$

Step 3 Rename both mixed numbers as improper fractions.

$$2\frac{5}{8} = \frac{2 \times 8 + 5}{8} = \frac{21}{8}$$

$$4\frac{4}{8} = \frac{4 \times 8 + 4}{8} = \frac{36}{8}$$

Step 4 Subtract. Write the difference as a mixed number.

$$\frac{36}{8} - \frac{21}{8} = \frac{15}{8} = 1\frac{7}{8}$$

Solution **The heavier package weighs $1\frac{7}{8}$ pounds more.**

You can subtract fractions with unlike denominators by multiplying the denominators to write a common denominator. For the numerators, you can multiply each numerator by the denominator of the other fraction and subtract the products.

Example 5

Subtract: $\frac{7}{9} - \frac{3}{5}$

Strategy **Use multiplication to subtract fractions.**

Step 1 Multiply the denominators to find a common denominator.

$9 \times 5 = 45$

Use 45 for the denominator.

Step 2 Multiply the numerator of one fraction by the denominator of the other fraction. These provide the numerators.

$\frac{7}{9} - \frac{3}{5} = \frac{(7 \times 5) - (3 \times 9)}{45}$

Step 3 Subtract.

$\frac{35}{45} - \frac{27}{45} = \frac{8}{45}$

Solution $\frac{7}{9} - \frac{3}{5} = \frac{8}{45}$

Remember, you can use benchmarks to make an estimate.

- If the fraction is less than $\frac{1}{4}$, round the fraction to 0.
- If the fraction is greater than or equal to $\frac{1}{4}$ and less than $\frac{3}{4}$, round to $\frac{1}{2}$.
- If the fraction is greater than or equal to $\frac{3}{4}$, round up to 1.

Example 6

Leo walked a total of $6\frac{1}{8}$ miles over the weekend. He walked $3\frac{7}{8}$ miles on Sunday. About how many miles did he walk on Saturday?

Strategy **Use benchmark numbers to estimate the solution.**

Step 1 Write an equation for the problem.

Let *w* represent how miles Leo walked on Saturday.

$6\frac{1}{8} - 3\frac{7}{8} = w$

Step 2 Use benchmark numbers.

Look at $6\frac{1}{8}$.

Think: $\frac{1}{8}$ is less than $\frac{1}{4}$, so round $6\frac{1}{8}$ to 6.

Look at $3\frac{7}{8}$.

$\frac{7}{8}$ is greater than $\frac{3}{4}$, so round $3\frac{7}{8}$ to 4.

Step 3 Estimate.

$6 - 4 = 2$

Solution **Leo walked about 2 miles on Saturday.**

Guided Practice

Jillian poured milk into a glass $\frac{9}{10}$ full. When she finished drinking, the glass was $\frac{1}{4}$ full. How much of the milk in the glass did she drink?

Find the difference.

Find the least common denominator (LCD).

Multiples of 10: ______________________

Multiples of 4: ______________________

The least number that is a common multiple of 10 and 4 is ________.

Find equivalent fractions with ________ as the denominator.

$$\frac{9}{10} = \frac{9 \times 2}{10 \times 2} = \frac{\square}{\square}$$

$$\frac{1}{4} = \frac{1 \times \square}{4 \times \square} = \frac{\square}{\square}$$

Subtract.

$$\frac{\square}{20} - \frac{\square}{20} = \frac{\square}{\square}$$

Jillian drank ________ of the milk in the glass.

Lesson Practice • Part 1

Choose the correct answer.

1. What is $\frac{5}{8} - \frac{1}{8}$ in simplest form?

   A. $\frac{1}{2}$

   B. $\frac{3}{4}$

   C. $\frac{7}{8}$

   D. 1

2. What is $\frac{2}{3} - \frac{5}{12}$ in simplest form?

   A. $\frac{1}{12}$

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

   C. $\frac{1}{4}$

   D. $\frac{1}{3}$

3. Which is the best estimate for $8\frac{9}{10} - 4\frac{3}{5}$?

   A. 4

   B. $4\frac{3}{10}$

   C. $4\frac{1}{2}$

   D. 6

4. Jessica is typing a report. She typed $\frac{5}{8}$ of the pages in the report in the morning and $\frac{1}{4}$ of the pages in the afternoon. What fraction more of the pages did she type in the morning?

   A. $\frac{3}{8}$

   B. $\frac{1}{2}$

   C. $\frac{3}{4}$

   D. $\frac{7}{8}$

5. Wally took $\frac{1}{6}$ of the stickers from the pack. Alex took $\frac{1}{2}$ of the stickers. How much more of the pack did Alex take?

   A. $\frac{4}{3}$

   B. $\frac{2}{3}$

   C. $\frac{1}{3}$

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

6. Callie spent $\frac{3}{4}$ hour on a science report and $\frac{1}{3}$ hour on a social studies report. What fraction of an hour longer did she spend on the science report?

   A. $\frac{1}{12}$ hour

   B. $\frac{5}{12}$ hour

   C. $\frac{1}{2}$ hour

   D. $1\frac{1}{12}$ hours

7. Jordan bought $6\frac{4}{5}$ yards of pink ribbon and $3\frac{1}{4}$ yards of purple ribbon. How much more pink ribbon than purple ribbon did she buy?

A. $3\frac{1}{5}$ yards

B. $3\frac{11}{20}$ yards

C. $4\frac{1}{6}$ yards

D. $10\frac{1}{20}$ yards

8. Of the students in Ms. Martinez's class, $\frac{11}{24}$ walk to school. Another $\frac{3}{8}$ of the students ride their bikes to school. What fraction more of the students walk than ride their bikes to school?

A. $\frac{5}{24}$

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

C. $\frac{1}{8}$

D. $\frac{1}{12}$

9. Of the pizzas sold at a pizzeria, $\frac{1}{2}$ were cheese, $\frac{1}{4}$ were sausage, and $\frac{1}{6}$ were pepperoni.

A. What fraction more of the pizzas were cheese than sausage and pepperoni combined?

____

B. Explain how you found your answer.

____

____

____

Lesson Practice • Part 2

Choose the correct answer.

1. Find the difference.

$\frac{7}{12} - \frac{3}{8} = \square$

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

B. $\frac{5}{24}$

C. $\frac{1}{4}$

D. $\frac{7}{24}$

2. Stella has completed $\frac{13}{16}$ of a painting. She had completed $\frac{1}{2}$ of the painting before starting today. What fraction of the painting did Stella complete today?

A. $\frac{3}{16}$

B. $\frac{1}{4}$

C. $\frac{5}{16}$

D. $\frac{3}{8}$

3. A race is $3\frac{1}{10}$ miles. Lincoln's shoelaces untied after $1\frac{3}{4}$ miles, but he kept running. How many miles did Lincoln run with his shoelaces undone?

A. $1\frac{7}{20}$ miles

C. $1\frac{9}{20}$ miles

B. $1\frac{2}{5}$ miles

D. $2\frac{13}{20}$ miles

4. Carson drew a rectangle that has a length of $7\frac{3}{8}$ inches and a width of $3\frac{4}{5}$ inches. About how much greater is the length than the width?

A. 5 inches

B. 4 inches

C. $3\frac{23}{40}$ inches

D. 3 inches

5. Of the CDs in Mr. Bijur's collection, $\frac{7}{10}$ are rock and $\frac{1}{8}$ are classical. What fraction of Mr. Bijur's CDs are something other than rock or classical?

A. $\frac{3}{20}$

B. $\frac{7}{40}$

C. $\frac{1}{5}$

D. $\frac{9}{40}$

6. Find the difference.

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

A. $3\frac{7}{30}$

C. $3\frac{1}{7}$

B. $3\frac{1}{5}$

D. $2\frac{23}{30}$

7. There are $5\frac{3}{4}$ pounds of recycling in a bin collected over 3 days. On Monday, $2\frac{1}{2}$ pounds of recycling went into the bin. Another $1\frac{7}{8}$ pounds went in on Tuesday. How much recycling went in the bin on Wednesday?

A. 1 pound

B. $1\frac{1}{8}$ pounds

C. $1\frac{1}{4}$ pounds

D. $1\frac{3}{8}$ pounds

8. Tani wrote thank-you cards after her birthday party. She wrote $\frac{2}{5}$ of the cards on Thursday, $\frac{1}{4}$ of the cards on Friday, and the rest on Saturday. What fraction of the cards did Tani write on Saturday?

A. $\frac{1}{4}$

B. $\frac{3}{10}$

C. $\frac{7}{20}$

D. $\frac{2}{5}$

9. Autumn rode her bike $7\frac{1}{2}$ miles this week. She biked $2\frac{1}{4}$ miles on Sunday, $1\frac{7}{10}$ miles on Monday, and the rest on Friday.

A. How many more miles did Autumn bike on Sunday than on Monday? Show your work.

B. How many miles did Autumn bike on Friday? Show your work.

Lesson 11 Answers

Lesson 11

Guided Practice

Multiples of 10: **10, 20, 30, 40, 50, 60**

Multiples of 4: **4, 8, 12, 16, 20, 24**

The least number that is a common multiple of 10 and 4 is **20**.

Find equivalent fractions with **20** as the denominator.

$\frac{9}{10} = \frac{9 \times 2}{10 \times 2} = \frac{18}{20}$

$\frac{1}{4} = \frac{1 \times 5}{4 \times 5} = \frac{5}{20}$

$\frac{18}{20} - \frac{5}{20} = \frac{13}{20}$

Jillian drank $\frac{13}{20}$ of the milk in the glass.

Lesson Practice Part 1

1. A
2. C
3. C
4. A
5. C
6. B
7. B
8. D
9. A. $\frac{1}{12}$

   B. Possible explanation: I found the fraction of the pizzas that were sausage and pepperoni combined. $\frac{1}{4} + \frac{1}{6} = \frac{3}{12} + \frac{2}{12} = \frac{5}{12}$. Then I subtracted that sum from the fraction of pizzas that were cheese. $\frac{1}{2} - \frac{5}{12} = \frac{6}{12} - \frac{5}{12} = \frac{1}{12}$

Lesson Practice Part 2

1. B
2. C
3. A
4. D
5. B
6. A
7. D
8. C
9. A. $\frac{11}{20}$; Possible work:

   $2\frac{1}{4} - 1\frac{7}{10} = 2\frac{5}{20} - 1\frac{14}{20} =$

   $1\frac{25}{20} - 1\frac{14}{20} = \frac{11}{20}$

   B. $3\frac{11}{20}$; Possible work:

   $7\frac{1}{2} - \left(2\frac{5}{20} + 1\frac{14}{20}\right) =$

   $7\frac{1}{2} - 3\frac{19}{20} = 7\frac{10}{20} - 3\frac{19}{20} =$

   $6\frac{30}{20} - 3\frac{19}{20} = 3\frac{11}{20}$

APRIL 21ST

Order of Operations

Getting the Idea

When evaluating an expression with more than one operation, use the **order of operations.** The order of operations is a set of rules used for evaluating an expression with more than one operation.

Order of Operations

1. Operate inside the grouping symbols.
2. Multiply and divide from left to right.
3. Add and subtract from left to right.

Example 1

Evaluate this expression: $14 - 6 \div 3$

Strategy **Use the order of operations.**

Step 1 There are no grouping symbols, so multiply and divide from left to right.

$14 - 6 \div 3$

$14 - 2$

Step 2 Add and subtract from left to right.

$14 - 2$

12

Solution $\mathbf{14 - 6 \div 3 = 12}$

Example 2

Evaluate this expression: $2 + 3 \times 8 \div 2$

Strategy **Use the order of operations.**

Step 1 There are no grouping symbols, so multiply and divide from left to right.

Multiply.

$2 + 3 \times 8 \div 2$

$2 + \quad 24 \quad \div 2$

Divide.

$2 + 24 \div 2$

$2 + \quad 12$

Step 2 Add and subtract from left to right.

Add.

$2 + 12$

14

Solution $\mathbf{2 + 3 \times 8 \div 2 = 14}$

Example 3

Evaluate this expression: $64 \div 8 + 15 \times 3 - 16$

Strategy **Use the order of operations.**

Step 1 There are no grouping symbols, so multiply and divide from left to right.

Divide.

$64 \div 8 + 15 \times 3 - 16$

$8 \quad + 15 \times 3 - 16$

Multiply.

$8 + 15 \times 3 - 16$

$8 + \quad 45 \quad - 16$

Step 2 Add and subtract from left to right.

Add.

$8 + 45 - 16$

$53 \quad - 16$

Subtract.

$53 - 16$

37

Solution **64 ÷ 8 + 15 × 3 − 16 = 37**

You can use the order of operations to evaluate an expression with grouping symbols. First operate in parentheses ( ), then brackets [ ], then braces { }.

Example 4

Evaluate this expression: [(2 + 3) × 8] ÷ 2

Strategy **Use the order of operations. Work inside the grouping symbols first.**

Step 1 Operate within the parentheses.

$[(2 + 3) \times 8] \div 2$

$[\quad 5 \quad \times 8] \div 2$

Step 2 Operate within the brackets.

$[5 \times 8] \div 2$

$40 \quad \div 2$

Step 3 Multiply and divide from left to right.

$40 \div 2$

20

Solution **[(2 + 3) × 8] ÷ 2 = 20**

You can use the properties of operations to write equivalent expressions.

The **commutative property of addition** states that the order of the addends can be changed. The sum does not change.

$a + b = b + a$

The **associative property of addition** states that the way in which three numbers are grouped does not change the sum.

$(a + b) + c = a + (b + c)$

The **commutative property of multiplication** states that the order of the factors can be changed. The product does not change.

$a \times b = b \times a$

The **associative property of multiplication** states that the way in which three numbers are grouped does not change the product.

$(a \times b) \times c = a \times (b \times c)$

Example 5

Use the commutative property of addition to write an equivalent expression for 12 + 17.

Strategy **Use the commutative property of addition.**

The commutative property of addition states that numbers can be added in any order.

So, 12 + 17 results in the same sum as 17 + 12.

Solution **An equivalent expression for 12 + 17 is 17 + 12.**

Example 6

Use the associative property of multiplication to write an equivalent expression for $(4 \times 9) \times 5$.

Strategy **Use the associative property of multiplication.**

The associative property of multiplication states that numbers can be multiplied in any order.

So, $(4 \times 9) \times 5$ results in the same sum as $4 \times (9 \times 5)$.

Solution **An equivalent expression for $(4 \times 9) \times 5$ is $4 \times (9 \times 5)$.**

You can use the **distributive property** to write equivalent expressions.

Example 7

Write an equivalent expression for 62×43 using the distributive property.

Strategy **Use the distributive property.**

Step 1 Write the factor 43 as a sum of each place value.

$43 = 40 + 3$

Step 2 Multiply each addend by 62.

$62 \times (40 + 3) = (62 \times 40) + (62 \times 3)$

Solution **An equivalent expression for 62×43 using the distributive property is $(62 \times 40) + (62 \times 3)$.**

Guided Practice

What is the value of the expression shown below?

$100 - 60 \div 5 \times 8 + 17$

Use the order of operations.

Divide, then multiply.

$100 - 60 \div 5 \times 8 + 17$

100 − ____________ × 8 + 17

100 − ____________ + 17

Subtract, then add.

____________ + 17

____

100 − 60 ÷ 5 × 8 + 17 = ____________

Lesson Practice • Part 1

Choose the correct answer.

1. Evaluate: $8 + 12 \div 4 - 3$

A. 2
B. 8
C. 14
D. 44

2. Evaluate: $5 \times [16 - (4 + 2)] \div 2$

A. 20
B. 25
C. 35
D. 40

3. Evaluate: $9 \times 5 - 16 \div 2$

A. 7
B. 9
C. 37
D. 39

4. Which of the following shows an equivalent expression for 58×29?

A. $(58 + 20) + (58 + 9)$
B. $(50 \times 20) + (8 \times 9)$
C. $(58 \times 20) + (8 \times 9)$
D. $(58 \times 20) + (58 \times 9)$

5. Evaluate: $3 + 2 \times 4 + 36$

A. 47
B. 56
C. 60
D. 290

6. Evaluate: $3 + 2 \times (4 + 36)$

A. 83
B. 60
C. 47
D. 40

7. What is the value of the expression below?

$$5 \times 16 - 4 + 2 \div 2$$

A. 77
B. 61
C. 40
D. 39

8. Which is **not** an equivalent expression for $36 + (72 + 24)$?

A. $(36 + 72) + 24$
B. $108 + 24$
C. $36 + 96$
D. $(36 \times 72) + 24$

9. John's answer to the test question below was 10.

Evaluate: $11 + 7 - 2 \times 3 + 8 \div 2$

A. Evaluate the expression. Show your work.

B. Is John's answer correct? Explain.

____

10. Geraldine's classmates collected 75 canned items and 25 boxed items for a food bank. Her classmates in the other fifth grade classes collected the same number of items.

The expression, $3 \times (75 + 25)$, represents this situation. Use the distributive property to write equivalent expression. Then evaluate the expression to determine the number of items the classmates collected. Show your work.

Lesson Practice • Part 2

Choose the correct answer.

1. Evaluate: (32 − 8) ÷ 4 × 2

A. 3
B. 12
C. 28
D. 60

2. Evaluate: 2 × [6 ÷ (9 − 8)] − 6

A. 12
B. 9
C. 6
D. 3

3. Which of the following shows an equivalent expression for 94 × 56?

A. (90 × 50) + (90 × 6)
B. (94 × 50) + (4 × 6)
C. (90 × 50) + (4 × 6)
D. (94 × 50) + (94 × 6)

4. Evaluate: 10 × 6 + 24 ÷ 4

A. 14
B. 66
C. 75
D. 120

5. Evaluate: [(7 + 5) × 9 − 6] ÷ 3

A. 20
B. 34
C. 50
D. 106

6. Evaluate: [(15 − 3) × 12] ÷ 4

A. 42
B. 36
C. 27
D. 6

7. Which is an equivalent expression for 15 × (5 × 4)?

A. (15 × 5) + 4
B. 75 + 4
C. 15 + 20
D. (15 × 5) × 4

8. What is the value of the expression below?

24 − 8 × (6 ÷ 2) + 4

A. 4
B. 16
C. 52
D. 112

9. Helen and Josie evaluated the same expression but got different answers. Who is correct? Explain.

Josie's Work	Helen's Work
$32 - 2 \times 8 + 5$	$32 - 2 \times 8 + 5$
$32 - 16 + 5$	$30 \times 8 + 5$
$16 + 5$	$240 + 5$
21	245

____

____

____

10. Nelle writes the numerical expression $(84 + 20) + 10$ in her notebook. Write the expression a different way using the associative property of addition, and then evaluate the expression.

____

____

11. Darla spent $4 on Saturday and $5 on Sunday. She spent the same amount for 8 weeks. The expression $8 \times (4 + 5)$ represents the amount Darla spent in 8 weeks. How much did Darla spend in 8 weeks? Write and evaluate an equivalent expression.

____

____

Lesson 12 Answers

Lesson 12

Guided Practice

100 − 60 ÷ 5 × 8 + 17

100 − **12** × 8 + 17

100 − **96** + 17

4 + 17

21

100 − 60 ÷ 5 × 8 + 17 = **21**

Lesson Practice Part 1

1. B
2. B
3. C
4. D
5. A
6. A
7. A
8. D
9. A. Possible work:

   11 + 7 − 2 × 3 + 8 ÷ 2

   11 + 7 − 6 + 8 ÷ 2

   11 + 7 − 6 + 4

   18 − 6 + 4

   12 + 4

   16

   B. No. Possible explanation: John did not use the order of operations correctly.

10. 300 items; Sample work:

    (3 × 75) + (3 × 25)

    225 + 75

    300

Lesson Practice Part 2

1. B
2. C
3. D
4. B
5. B
6. B
7. D
8. A
9. Josie; Sample answer: Josie is correct. She used the order of operations and multiplied 2 times 8 first. Helen subtracted 2 from 32, which is not the first step.
10. Possible expression: 84 + (20 + 10) = 84 + 30, Evaluate: 84 + 30 = 114
11. $72; Possible expression: 8 × 4 + 8 × 5; Evaluate: 8 × 4 + 8 × 5 = 32 + 40 = 72

APRIL 22ND

'atterns

Getting the Idea

A **pattern** is a series of numbers or figures that follows a **rule**. The rule of the pattern tells you how to get from each number in the pattern to the next number. The rule can also help you find a missing number in a pattern.

The pattern below is an increasing pattern. The rule is add 3.

5, 8, 11, 14, 17, ...

The pattern below is a decreasing pattern. The rule is subtract 5.

100, 95, 90, 85, ...

You can create a new pattern using a rule and a starting number. Each number in a pattern is called a **term**.

Example 1

Write a new pattern that starts with 3, has 6 terms, and uses the rule add 4.

Strategy **Use the rule to write a new pattern.**

Step 1 Start with the first term.

The first term is 3.

Step 2 Use the rule to extend the pattern.

Add 4 to the first term to find the second term.

$3 + 4 = 7$

The second term is 7.

Step 3 Continue to extend the pattern until there are 6 terms.

Add 4 to each sum.

$7 + 4 = 11$

$11 + 4 = 15$

$15 + 4 = 19$

$19 + 4 = 23$

Step 4 Write the terms in the pattern.

3 7 11 15 19 23

Solution **The new pattern is 3, 7, 11, 15, 19, 23.**

Example 2

Write a new pattern starting with 3 that has 6 terms and uses the rule multiply by 4.

Strategy **Use the rule to write a new pattern.**

Step 1 Start with the first term.

The first term is 3.

Step 2 Use the rule to extend the pattern.

Multiply the first term by 4 to find the second term.

$3 \times 4 = 12$

The second term is 12.

Step 3 Continue to extend the pattern until there are 6 terms.

Multiply each product by 4.

$12 \times 4 = 48$

$48 \times 4 = 192$

$192 \times 4 = 768$

$768 \times 4 = 3{,}072$

Step 4 Write the terms in the pattern.

3 12 48 192 768 3,072

Solution **The new pattern is 3; 12; 48; 192; 768; 3,072.**

Look back at Examples 1 and 2. Even though they start with the same term, the multiplication pattern increases much faster than the addition pattern.

You can create two patterns to form a relationship between the corresponding terms.

Example 3

Create two patterns with 5 terms that both start with 0. Pattern A uses the rule add 2. Pattern B uses the rule add 8. Make a table to show the corresponding terms. How are the terms in the two patterns related?

Strategy **Use the rules to write two new patterns.**

Step 1 Write the terms for Pattern A.

Use the rule add 2. Start with 0.

0, 2, 4, 6, 8

Step 2 Write the terms for Pattern B.

Use the rule add 8. Start with 0.

0, 8, 16, 24, 32

Step 3 Make a table to show the corresponding terms.

Pattern A	0	2	4	6	8
Pattern B	0	8	16	24	32

Step 4 Compare the terms.

$8 \div 2 = 4$

$16 \div 4 = 4$

$24 \div 6 = 4$

$32 \div 8 = 4$

Each term in Pattern B is 4 times the value of the corresponding terms in Pattern A.

Solution **The terms in Pattern B are always 4 times the value of the corresponding terms in Pattern A.**

Guided Practice

Create two patterns each with 5 terms that both start with 0. Pattern A uses the rule add 4 and Pattern B uses the rule add 12. What is the relationship between the patterns?

Create the pattern with the rule add 4.

0, 0 + 4 = ________, ________, ________, ________.

The first 5 terms of Pattern A are 0, ________, ________, ________, ________.

Create the pattern with the rule add 12.

0, 0 + 12 = ________, ________, ________, ________.

The first 5 terms of Pattern B are 0, ________, ________, ________, ________.

Complete the table.

Pattern A	0				
Pattern B	0				

Find the relationship between the patterns.

Divide each term in Pattern B by the corresponding term in Pattern A.

________ ÷ ________ = ________

________ ÷ ________ = ________

________ ÷ ________ = ________

________ ÷ ________ = ________

The relationship is that each term in Pattern B is ________ the value as each corresponding term in Pattern A.

Lesson Practice • Part 1

Choose the correct answer.

1. What is the next term in the pattern below?

45, 36, 27, 18, __?__

A. 10
B. 9
C. 8
D. 7

2. What is the rule for the pattern below?

32, 36, 40, 44, ...

A. add 8
B. subtract 4
C. add 4
D. subtract 8

3. What is the missing term in the pattern below?

2, __?__, 18, 54, 162

A. 3
B. 6
C. 8
D. 9

4. The pattern below uses the rule subtract 7.

77, 70, 63, __?__, 49

What is the missing term?

A. 58
B. 57
C. 56
D. 55

5. Look at the number pattern below.

2, 4, 8, 16, 32, ...

If n represents a number in this pattern, which rule could be used to find the next number in the pattern?

A. $n + 2$
B. $n \times 4$
C. $n + 4$
D. $n \times 2$

6. What is the next term in the pattern below?

1, 2, 3, 4, 5, 6, __?__

A. 7
B. 8
C. 9
D. 10

7. What is the missing term in the pattern below?

24, 26, __?__, 30, 32

A. 27

B. 28

C. 29

D. 31

8. Look at the number pattern below.

5, 10, 15, 20, 25

If b represents a number in this pattern, which rule could be used to find the next number in the pattern?

A. $b \times 2$

B. $b + 10$

C. $b \times 3$

D. $b + 5$

9. Create two patterns starting with the term 45 and ending with the term 5.

A. Use the rule subtract 5.

____

____

____

____

____

B. Use the rule divide by 3.

____

____

____

Lesson Practice • Part 2

Choose the correct answer.

1. Lilly wrote two rules that both have 0 for the first number. The first rule was add 3 and the second rule was add 15. Which sentence is true about the numbers in Lilly's patterns?

   A. The second rule has a number that is always 5 more than the corresponding number of the first term.

   B. The second rule has a number that is always 5 times as many than the corresponding number of the first term.

   C. The second rule has a number that is always 12 more than the corresponding number of the first term.

   D. The second rule has a number that is always 12 times as many than the corresponding number of the first term.

2. Two patterns start at 0. The rule for Pattern A is add 2. The rule for Pattern B is add 3. What is the value of Pattern B when Pattern A has a value of 12?

   A. 13 **C.** 18
   B. 15 **D.** 21

3. Aaron wrote two rules. The first rule is add 3 and starts at 0. The second rule is multiply by 3 and starts at 3. Which sentence is true about the numbers in Aaron's patterns?

   A. The number from the second rule is always 3 times as many as the corresponding number from the first rule.

   B. The difference between the second number and the first number remains the same as the pattern continues.

   C. The number from the second rule is always 3 more than the corresponding number from the first rule.

   D. The difference between the second number and the first number increases as the pattern continues.

4. Two patterns start at 0. The rule for Pattern C is add 6. The rule for Pattern D is add 4. Which number is a term in both patterns?

   A. 12 **C.** 18
   B. 16 **D.** 20

5. Pattern E starts at 2 and uses the rule add 4. Pattern F starts at 6 and uses the rule add 3. Which is the first term in which the number in Pattern E is greater than the corresponding term in Pattern F?

A. fourth term

B. fifth term

C. sixth term

D. seventh term

6. Pattern G starts at 12 and uses the rule multiply by 4. Pattern H starts at 6 and uses the rule multiply by 6. Which is the first term in which the number in Pattern H is greater than the corresponding term in Pattern G?

A. fifth term

B. fourth term

C. third term

D. second term

7. Two patterns start at 0. Pattern J uses the rule add 12. Pattern K uses the rule add 6.

A. Write the first 6 terms of Pattern J.

____

____

B. Write the first 6 terms of Pattern K.

____

____

C. What is the relationship between Patterns J and K? Explain your reasoning.

____

____

Lesson 13 Answers

Lesson 13

Guided Practice

0, 4, 8, 12, 16

The first 5 terms of Pattern A are 0, 4, 8, 12, 16.

0, 12, 24, 36, 48

The first 5 terms of Pattern B are 0, 12, 24, 36, 48.

Pattern A	0	4	8	12	16
Pattern B	0	12	24	36	48

$12 \div 4 = 3$

$24 \div 8 = 3$

$36 \div 12 = 3$

$48 \div 16 = 3$

The relationship is that each term in Pattern B is **3 times** the value as each corresponding term in Pattern A.

Lesson Practice Part 1

1. B
2. C
3. B
4. C
5. D
6. A
7. B
8. D
9. A. 45, 40, 35, 30, 25, 20, 15, 10, 5

   B. 45, 15, 5

Lesson Practice Part 2

1. B
2. C
3. D
4. A
5. C
6. C
7. A. 0, 12, 24, 36, 48, 60

   B. 0, 6, 12, 18, 24, 30

   C. Each term in Pattern J is twice as many as the corresponding term in Pattern K because $12 \div 6 = 2$, $24 \div 12 = 2$, $36 \div 18 = 2$, $48 \div 24 = 2$, and $60 \div 30 = 2$.

APRIL 23RD

·aph Patterns

Getting the Idea

You can show the relationship between two values in a graph. You can graph the values as **ordered pairs** on a **coordinate plane.**

An ordered pair (x, y) is a pair of numbers used to locate a point on a coordinate plane.

The first number in an ordered pair is called the ***x*-coordinate.**

The second number in an ordered pair is called the ***y*-coordinate.**

For example, in (3, 5), the x-coordinate is 3 and the y-coordinate is 5.

Example 1

Nina ran 6 miles each hour she ran in a long-distance race. She ran for 4 hours. Make a graph that shows the pattern.

Strategy **Translate the pattern into a graph.**

Step 1 Write the relationship between hours and miles run.

She ran 6 miles each hour.

1 hour = 6 miles

2 hours = 12 miles

3 hours = 18 miles

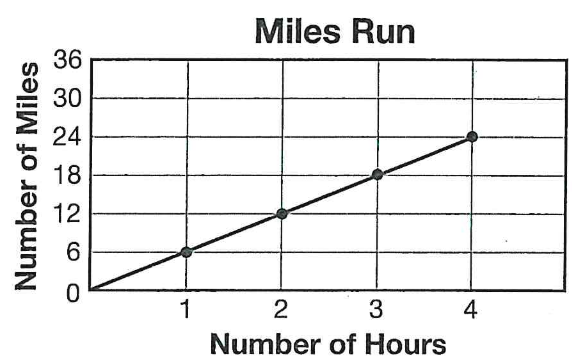
4 hours = 24 miles

Step 2 Make a table of values. List the ordered pairs.

Number of Hours (x)	Number of Miles (y)	Ordered pairs (x, y)
1	6	(1, 6)
2	12	(2, 12)
3	18	(3, 18)
4	24	(4, 24)

Step 3 Graph the ordered pairs on a coordinate plane.

Draw a straight line that connects the points.



Solution **The graph in Step 3 shows the pattern.**

You can make ordered pairs of corresponding terms from two patterns and then graph the ordered pairs.

Example 2

Create two patterns with 5 terms that both start with 0. Use two different rules: add 3 and add 6. Form ordered pairs of corresponding terms from the two patterns and graph them. How do the terms in the two patterns seem to be related?

Strategy **Use the rules to write two new patterns.**
Write ordered pairs of corresponding terms, then graph.

Step 1 Write the pattern for the x terms.

Use the rule add 3. Start with 0.

0, 3, 6, 9, 12

Step 2 Write the pattern for the y terms.

Use the rule add 6. Start with 0.

0, 6, 12, 18, 24

Step 3 Write (x, y) ordered pairs using the corresponding terms from each pattern.

(0, 0)

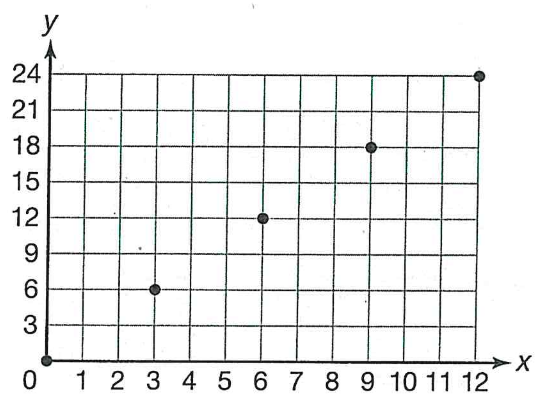
(3, 6)

(6, 12)

(9, 18)

(12, 24)

Step 4 Graph the ordered pairs on a coordinate plane.



Step 5 Compare the terms to see how they are related.

$y = x \times 2$

$6 = 3 \times 2$

$12 = 6 \times 2$

$18 = 9 \times 2$

$24 = 12 \times 2$

The value of the y-coordinate is always 2 times the value of the x-coordinate.

Solution **The graph is shown in Step 4. The value of the y-coordinate is 2 times the value of the x-coordinate.**

Guided Practice

Create two patterns with 5 terms that both start at 0. Use two different rules: add 1 and add 4. Form ordered pairs of corresponding terms from the two patterns and graph them. How do the terms in the two patterns seem to be related?

Write the first 5 terms for the *x*-coordinate.

0, _____, _____, _____, _____

Write the first 5 terms for the *y*-coordinate.

0, _____, _____, _____, _____

Write ordered pairs of corresponding terms.

(0, 0)

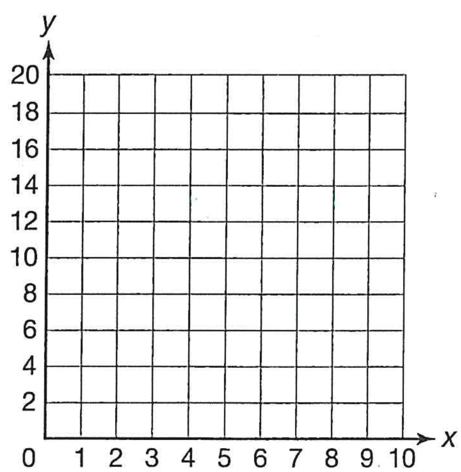
(1, _______)

(2, _______)

(_______, _______)

(_______, _______)

Graph the ordered pairs on the coordinate plane below.



Compare the terms to see how they are related.

$y = x \times 4$

$4 = 1 \times 4$

$8 = 2 \times$ _______

$12 = 3 \times$ _______

$16 =$ _______ $\times$ _______

The value of the *y*-coordinate is _______ times the value of the *x*-coordinate.

Lesson Practice • Part 1

Choose the correct answer.

Use this information for questions 1–4.

Two patterns start at 0. The first pattern uses the rule add 1 and the second pattern uses the rule add 5.

1. Which shows the first five terms for the *x*-coordinates?

   A. 0, 1, 2, 3, 4

   B. 0, 2, 4, 6, 8

   C. 1, 2, 3, 4, 5

   D. 5, 6, 7, 8, 9

2. Which shows the first five terms for the *y*-coordinates?

   A. 0, 1, 2, 3, 4

   B. 0, 5, 10, 15, 20

   C. 1, 2, 3, 4, 5

   D. 5, 10, 15, 20, 25

3. Which shows the ordered pairs of corresponding terms of the patterns?

   A. (0, 0), (1, 0), (2, 0), (3, 0), (4, 0)

   B. (0, 0), (1, 2), (2, 3), (3, 4), (4, 5)

   C. (0, 0), (1, 5), (2, 10), (3, 15), (4, 20)

   D. (0, 0), (5, 1), (10, 2), (15, 3), (20, 4)

4. Which best describes how the corresponding terms are related?

   A. The value of the *y*-coordinate is 2 times the value of the corresponding *x*-coordinate.

   B. The value of the *y*-coordinates is 3 times the value of the corresponding *x*-coordinate.

   C. The value of the *y*-coordinates is 4 times the value of the corresponding *x*-coordinate.

   D. The value of the *y*-coordinates is 5 times the value of the corresponding *x*-coordinate.

5. Keisha planted a plant with seeds inside the ground. The plant's growth can be described by two rules. The first rule is that Keisha checked the plant height once a week. The second rule is the plant grew 2 centimeters each week. Which table matches the patterns?

A. **Plant Height**

Week	1	2	3	4
Height (cm)	1	2	3	4

B. **Plant Height**

Week	1	2	3	4
Height (cm)	2	4	6	8

C. **Plant Height**

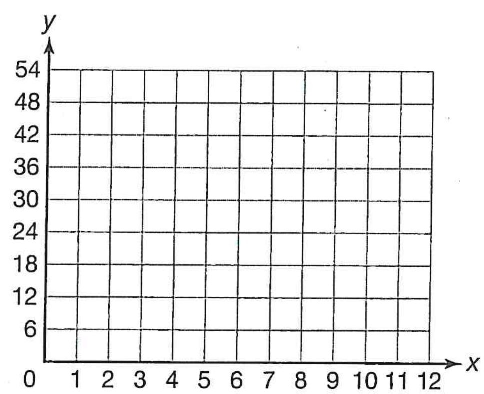
Week	2	4	6	8
Height (cm)	1	2	3	4

D. **Plant Height**

Week	1	2	3	4
Height (cm)	4	8	12	16

6. Jerry wrote two patterns that both start with 0. The first pattern uses the rule add 3. The second pattern uses the rule add 12.

A. Write ordered pairs using the corresponding terms from each pattern. Then graph the ordered pairs.



B. Explain how the corresponding terms in the patterns are related.

____

____

Lesson Practice • Part 2

Choose the correct answer.

1. Two patterns start at 0. The rule for the first pattern is to add 2. The rule for the second pattern is to add 5. Which is an ordered pair from the patterns?

   A. (0, 2)
   B. (4, 25)
   C. (5, 2)
   D. (6, 15)

2. Gina created two patterns. The first pattern starts at 0 and uses the rule add 4. The second pattern starts at 5 and uses the rule add 2. Which table shows Gina's patterns?

   A.

x	0	4	8	12	16
y	0	2	4	6	8

   B.

x	0	4	8	12	16
y	5	7	9	11	13

   C.

x	0	2	4	6	8
y	0	4	8	12	16

   D.

x	5	7	9	11	13
y	0	4	8	12	16

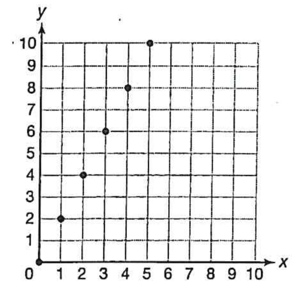
3. Two patterns start at 0. The rule for the first pattern is to add 4. The rule for the second pattern is to add 3. Which is an ordered pair from the patterns?

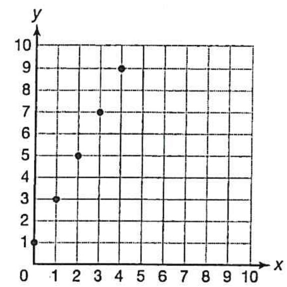
   A. (3, 4)
   B. (7, 7)
   C. (16, 12)
   D. (20, 16)

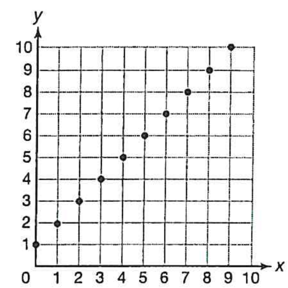
4. One pattern starts at 0 and has a rule to add 2. The second pattern starts at 2 and has a rule to add 2. Which is an ordered pair from the patterns?

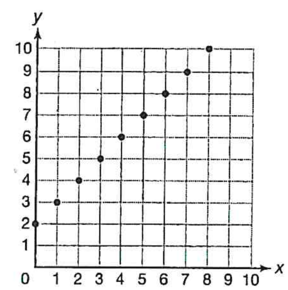
   A. (2, 4)
   B. (4, 8)
   C. (6, 10)
   D. (8, 16)

5. Jorge wrote two patterns. His first pattern starts at 0 and has the rule add 1. His second pattern starts at 2 and has the rule add 1. Which graph shows Jorge's patterns?

A. 

C. 

B. 

D. 

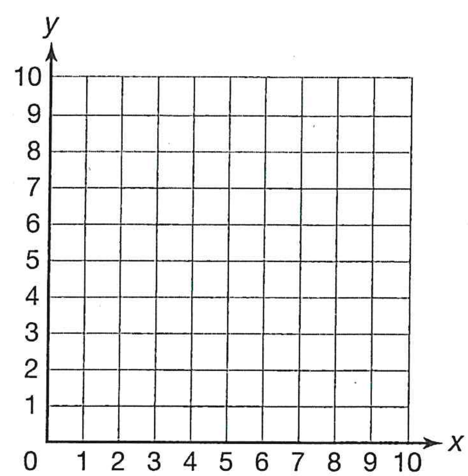
6. One pattern starts at 0 and uses the rule add 2. The second pattern starts at 10 and uses the rule subtract 1.

A. Write the ordered pairs formed by the first 5 terms of each pattern.

____

____

B. Graph the ordered pairs.



Lesson 14 Answers

Lesson 14

Guided Practice

0, 1, 2, 3, 4

0, 4, 8, 12, 16

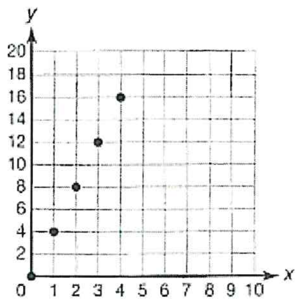
(0, 0)

(1, 4)

(2, 8)

(3, 12)

(4, 16)



$8 = 2 \times 4$

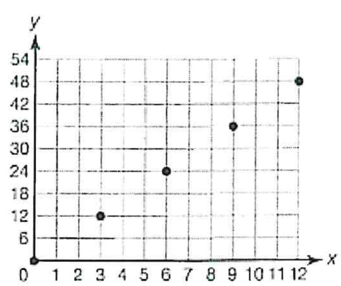
$12 = 3 \times 4$

$16 = 4 \times 4$

The value of the *y*-coordinate is 4 times the value of the *x*-coordinate.

Lesson Practice Part 1

1. A
2. B
3. C
4. D
5. B
6. A. (0, 0), (3, 12), (6, 24), (9, 36), (12, 48)

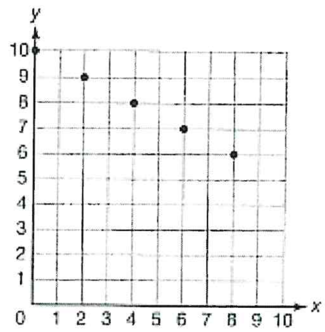


B. Possible answer: The *y*-coordinates are 4 times the corresponding *x* coordinates.

Lesson Practice Part 2

1. D
2. B
3. C
4. A
5. D
6. A. (0, 10), (2, 9), (4, 8), (6, 7), (8, 6)

B.



APRIL 24TH

pressions, Equations, and Inequalities

Getting the Idea

\n **expression** is a combination of numbers and operation signs.

\n **equation** is a mathematical statement that says two expressions are equal. An ·quation has an equal sign (=).

\n **inequality** is a mathematical statement that compares two expressions and ıcludes an inequality symbol.

'he symbol > means **is greater than.**

'he symbol < means **is less than.**

'he symbol = means **is equal to.**

\ **variable** can be used to represent an unknown number in an equation or an ıequality.

:xample 1

Vhat is the value of the expression $4 + 13 \times x$, when $x = 2$?

;trategy **Substitute the given value of *x* in the expression. Then evaluate.**

Step 1 Rewrite the expression, substituting 2 for x.

$4 + 13 \times x$

$4 + 13 \times 2$

Step 2 Use the order of operations to evaluate the expression.

Multiply, then add.

$4 + 13 \times 2$

$4 + 26$

30

olution **The value of the expression $4 + 13 \times x$, when $x = 2$ is 30.**

Example 2

Is the equation $x + 43 = 64$ true, when $x = 21$?

Strategy **Use substitution to solve.**

Step 1 Rewrite the expression, substituting 21 for x.

$$x + 43 = 64$$
$$21 + 43 = 64$$

Step 2 Evaluate the expression to see if it is true.

$$\begin{array}{r} 21 \\ +\ 43 \\ \hline 64 \end{array} \checkmark$$

Solution **The equation $x + 43 = 64$ is true, when $x = 21$.**

Example 3

Is the inequality $5 \times x < 60$ true, when $x = 8$?

Strategy **Use substitution to solve.**

Step 1 Rewrite the expression, substituting 8 for x.

$$5 \times x < 60$$
$$5 \times 8 < 60$$

Step 2 Multiply.

$$5 \times 8 < 60$$
$$40 < 60$$

Step 3 Compare.

$$40 < 60 \checkmark$$

The expression is true.

Solution **The inequality $5 \times x < 60$ is true, when $x = 8$.**

Guided Practice

Is the inequality $144 \div x < 20$ true, when $x = 6$?

Rewrite the expression. Substitute __________ for x.

$144 \div$ __________ < 20

Divide.

__________ < 20

Compare. Is the expression true? __________

The inequality $144 \div x < 20$ is __________, when $x = 6$.

Lesson Practice • Part 1

Choose the correct answer.

1. What is the value of the expression $72 + 9 \div x$, when $x = 3$?
   A. 3
   B. 27
   C. 74
   D. 75

2. Which is a true statement?
   A. $x + 27 = 56$, when $x = 29$
   B. $x + 27 = 56$, when $x = 36$
   C. $x + 27 = 56$, when $x = 83$
   D. $x + 27 = 56$, when x = 84

3. Which is a true statement?
   A. $14 \times x < 130$, when $x = 9$
   B. $14 \times x < 130$, when $x = 11$
   C. $14 \times x < 130$, when $x = 12$
   D. $14 \times x < 130$, when $x = 15$

4. What is the value of the expression $(56 + 8) \times x$, when $x = 3$?
   A. 65
   B. 80
   C. 186
   D. 192

5. Which is a true statement?
   A. $72 - x > 47$, when $x = 24$
   B. $72 - x > 47$, when $x = 26$
   C. $72 - x > 47$, when $x = 27$
   D. $72 - x > 47$, when $x = 29$

6. Which is a true statement?
   A. $325 + x = 416$, when $x = 90$
   B. $325 + x = 416$, when $x = 91$
   C. $325 + x = 416$, when $x = 92$
   D. $325 + x = 416$, when $x = 741$

7. What is the value of the expression $451 + x \times 4$, when $x = 3$?
   A. 12
   B. 463
   C. 1,353
   D. 1,816

8. What is the value of the expression $72 \times 9 \div x$, when $x = 8$?
   A. 9
   B. 64
   C. 65
   D. 81

9. Is the equation $328 \div x = 83$ true, when $x = 4$? Explain.

____

____

10. Pauline says the inequality $437 + x > 501$, when $x = 65$ is true. Is Pauline correct? Explain.

____

____

11. Elias wrote the expression below.

$$165 - x \times 3$$

A. Evaluate the expression for $x = 25$. Show your work.

____

____

B. Evaluate the expression for $x = 35$. Show your work.

____

____

C. Evaluate the expression for $x = 45$. Show your work.

____

____

Lesson Practice • Part 2

Choose the correct answer.

1. What is the value of the expression $56 \div 8 - x$, when $x = 1$?
   - A. 0
   - B. 6
   - C. 8
   - D. 9

2. Which is a true statement?
   - A. $428 - x = 380$, when $x = 43$
   - B. $428 - x = 380$, when $x = 44$
   - C. $428 - x = 380$, when $x = 45$
   - D. $428 - x = 380$, when $x = 48$

3. Which is **not** a true statement?
   - A. $293 + x > 349$, when $x = 60$
   - B. $293 + x > 349$, when $x = 59$
   - C. $293 + x > 349$, when $x = 57$
   - D. $293 + x > 349$, when $x = 55$

4. What is the value of the expression $72 \div 9 - x$, when $x = 8$?
   - A. 0
   - B. 1
   - C. 8
   - D. 72

5. Which is a true statement?
   - A. $18 \times x = 126$, when $x = 6$
   - B. $18 \times x = 126$, when $x = 7$
   - C. $18 \times x = 126$, when $x = 8$
   - D. $18 \times x = 126$, when $x = 9$

6. Which is **not** a true statement?
   - A. $x - 69 < 294$, when $x = 359$
   - B. $x - 69 < 294$, when $x = 361$
   - C. $x - 69 < 294$, when $x = 362$
   - D. $x - 69 < 294$, when $x = 367$

7. Which is a true statement?
   - A. $864 \div x = 36$, when $x = 18$
   - B. $864 \div x = 36$, when $x = 22$
   - C. $864 \div x = 36$, when $x = 24$
   - D. $864 \div x = 36$, when $x = 26$

8. What is the value of the expression $(56 - 8) \times x$, when $x = 3$?
   - A. 65
   - B. 80
   - C. 144
   - D. 192

9. Angel says that the value of the expression $500 \div 20 + x$, when $x = 5$ is 20. Her work is shown below.

$500 \div 20 + x$

$500 \div 20 + 5$

$500 \div 25$

20

Is Angel correct? Explain your answer.

____

____

____

10. Is the equation $43 \times x = 258$ true, when $x = 6$? Explain.

____

____

11. Is the inequality $57 \times x < 228$, when $x = 4$ true? Explain.

____

____

Lesson 15 Answers

Lesson 15

Guided Practice

Is the inequality $144 \div x < 20$ true, when $x = 6$?

Rewrite the expression. Substitute **6** for x.

$144 \div \mathbf{6} < 20$

Divide.

$\mathbf{24} < 20$

Compare. Is the expression true? **No.**

The inequality $144 \div x < 20$ is **not true,** when $x = 6$.

Lesson Practice Part 1

1. D
2. A
3. A
4. D
5. A
6. B
7. B
8. D
9. No; Possible explanation: I substituted 4 for x and divided. $328 \div 4 = 82$, not 83.
10. Yes, Pauline is correct.; Possible explanation: I substituted 65 for x and added.
    $437 + 65 \overset{?}{>} 501$,
    $502 > 501$, so the inequality is true when $x = 65$.
11. A. 90;
    $165 - x \times 3$
    $165 - 25 \times 3$
    $165 - 75 = 90$
    B. 60;
    $165 - x \times 3$
    $165 - 35 \times 3$
    $165 - 105 = 60$
    C. 30;
    $165 - x \times 3$
    $165 - 45 \times 3$
    $165 - 135 = 30$

Lesson Practice Part 2

1. B
2. D
3. D
4. A
5. B
6. D
7. C
8. C
9. No. Possible explanation: Angel is not correct. She did not follow the order of operations. She should have divided before adding.
    $500 \div 20 + x$
    $500 \div 20 + 5$
    $25 + 5$
    30
10. Yes; Possible explanation: I substituted 6 for x and multiplied. $43 \times 6 = 258$.
11. No; Possible explanation: I substituted 4 for x and multiplied.
    $57 \times 4 \overset{?}{<} 228$,
    $228 = 228$, so the inequality is not true when $x = 4$.