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ABSTRACT

This teacher guide is part of the materials prepared for an individualized program for ninth-grade algebra and basic mathematics students. Materials written for the program are to be used with audiovisual lessons recorded on tape cassettes. For an evaluation of the program, see ED 086 545. In this guide, the teacher is provided with objectives for each topic area and guided to materials written for a given topic. Three short criterion tests are included for each topic covered. The work for this package covers prime numbers, prime factorization, number multiples, least common multiple, and tests for divisibility. This work was prepared under an ESEA Title III contract. (JP)

PACKAGE 01-04

FACTORING, PRIME NUMBERS AND DIVISIBILITY

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FACTORING, PRIME NUMBERS, AND DIVISIBILITY

You should now be able to perform the operations of arithmetic (addition, subtraction, multiplication, and division) using whole numbers. You should also be able to translate applied problems into number sentences and solve those sentences.

We now want to get ready for the next step in arithmetic operations, operations involving fractions.

The goal of this package is to build ideas necessary for work with fractions, which is found in later packages.

PACKAGE OBJECTIVES:

1. Given a natural number, write some of its factors and multiples.

2. Given a natural number write its prime factorization.

3. Given two or more natural numbers, find their least common multiple.

4. Given a number, find its prime factorization by the tests for divisibility.

I.U. # 01-04-01

Factors and Multiples

You will need to recall that until now we have been working with whole numbers. The whole numbers include zero. Zero is a whole number.

In this package we will be working with natural numbers. The natural numbers do not include zero. Zero is not a natural number.

OBJECTIVES:

1. Given a natural number, make a list of its factorizations.
2. Given a natural number, find some of its multiples.
3. Given a natural number, write some of its factors and multiples.

ACTIVITIES:

1. Study page 127 in AAMA, and do margin exercises 1 through 4. (Objective 1)
2. Study pages 127-128, and do margin exercises 5 through 10. (Objective 2)
3. Write exercise set 1, the odd numbered problems. (Objective 3)

Criterion Test 01-04-01-01

1. List the factorizations for
   (A) 8 (B) 9 (C) 10

2. List the three smallest multiples.
   (A) 4 (B) 5 (C) 6

3. Write two of the factorizations.
   (A) 12 (B) 14 (C) 16

   Write three multiples of
   (D) 2 (E) 3 (F) 4

Criterion Test 01-04-01-02

1. List the factorizations for

   (A) 6 (B) 12 (C) 15

2. List the three smallest multiples.

   (A) 5 (B) 6 (C) 7

3. Write three of the factorizations for:

   (A) 16 (B) 18 (C) 24
   Write three multiples of:
   (D) 5 (E) 10 (F) 15

Criterion Test 01-04-01-03

1. List the factorizations.

   (A) 11 (B) 12 (C) 13

2. Write the three smallest multiples.

   (A) 11 (B) 12 (C) 13

3. Write two of the factorizations.

   (A) 24 (B) 25 (C) 26

   Write three multiples.

   (A) 3 (B) 6 (C) 9
   D E F

Answers to Criterion Tests

Criterion Test 01-04-01-01

1. (A) 1 x 8
   2 x 4
   2 x 2 x 2
   (B) 1 x 9
   3 x 3
   (C) 1 x 10
   2 x 5
2. (A) 4,8,12 (B) 5,10,15 (C) 6,12,18
3. (A) 1 x 12
   2 x 6
   3 x 4
   2 x 2 x 3
   (B) 1 x 14
   2 x 7
   (C) 1 x 16
   2 x 8
   4 x 4
   2 x 2 x 4
   2 x 2 x 2 x 2
   (D) 2,4,6,8,10 (E) 3,6,9,12,15 (F) 4,8,12,16,20,24

Criterion Test 01-04-01-02

1. (A) 1 x 6
   2 x 3
   (B) 1 x 12
   2 x 6
   2 x 3 x 2
   4 x 3
   (C) 1 x 15
   5 x 3
2. (A) 5,10,15 (B) 6,12,18 (C) 7,14,21
3. (A) 1 x 16
   2 x 8
   2 x 2 x 4
   2 x 2 x 2 x 2
   (B) 1 x 18
   2 x 9
   2 x 3 x 3
   6 x 3
   (C) 1 x 24
   2 x 12 = 2 x 3 x 4
   4 x 6 = 3 x 2 x 2 x 2
   3 x 8
   2 x 2 x 6
   (D) 5,10,15 (E) 10,20,30 (F) 15,30,45

Answers to Criterion Tests

Criterion Test 01-04-01-03

1. (A) 1 x 11 (B) 1 x 12
2 x 6
3 x 4
3 x 2 x 2
(C) 1 x 13

2. (A) 11,22,33 (B) 12,24,36 (C) 13,26,39

3. (A) 1 x 24
2 x 12 = 2 x 6 x 2
3 x 8 = 3 x 4 x 2
4 x 6
2 x 2 x 2 x 3
(B) 1 x 25
5 x 5

(C) 1 x 26
2 x 13

(D) 3,6,9,12,15

(E) 6,12,18,24,30

(F) 9,18,27,36,45

I.U. #01-04-02

PRIME NUMBERS AND PRIME FACTORIZATIONS

OBJECTIVES:

1. Given a natural number between 1 and 50 inclusive, tell whether it is prime, composite, or neither.

2. Given a problem in which you are asked to find all primes less than a given natural number, solve it by use of the sieve of Eratosthenes.

3. Given a natural number write its prime factorization.

ACTIVITIES:

1. Study page 129, AAMA, and do margin exercises 11, 12 (Objective 1).

2. Study pages 129, 130, and do margin exercise 13. (Objective 2)

3. Study pages 130, 131 and do margin exercises 14 - 23 (Objective 3).

4. Write the odd numbered exercises on pages 141, 142. (Objectives 1, 2, 3)

Criterion Test 01-04-02-01

1. Are the following prime, composite, or neither?

   (A) 1 (B) 2 (C) 4

2. Make a Sieve of Eratosthenes to find all the primes smaller than 20.

3. Find the prime factorization.

   (A) 8 (B) 14 (C) 22

Criterion Test 01-04-02-02

1. Label the following as prime, composite or neither.

   (A) 2 (B) 19 (C) 27

2. Use the Sieve of Eratosthenes to find all primes less than 30. (Show your work.)

3. Write the prime factorization for:

   (A) 25 (B) 32 (C) 15

Criterion Test 01-04-02-03

1. Label the following as prime, composite, or neither.

   (A) 27 (B) 29 (C) 49

2. Construct a Sieve of Eratosthenes to find all primes less than 40.

3. Write the prime factorizations.

   (A) 100 (B) 35 (C) 77

Answers to Criterion Tests

Criterion Test 01-04-02-01

1. (A) neither (B) prime (C) composite
2. (A) Top two lines of Figure 4-1, page 130---4 primes
3. (A) 2 x 2 x 2 (B) 2 x 7 (C) 2 x 11

Criterion Test 01-04-02-02

1. (A) prime (B) prime (C) composite
2. Top three lines of Figure 4-1, page 130---9 primes
3. (A) 5 x 5 (B) 2 x 2 x 2 x 2 x 2 (C) 3 x 5

Criterion Test 01-04-02-03

1. (A) composite (B) prime (C) composite
2. Top four lines of Figure 4-1, page 130---11 primes
3. (A) 5 x 5 x 2 x 2 (B) 7 x 5 (C) 11 x 7

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LEAST COMMON MULTIPLE

OBJECTIVE:

1. Given two or more natural numbers, find their least common multiple.

ACTIVITIES:

1. Study pages 132-133 AAMA, and do margin exercises 24 through 37. (Objective 1)

2. Write odd numbered exercises on pages 143-44. (Objective 2)

Criterion Test 01-04-03-01

1. Find the least common multiple.

   (A) 3, 10 (B) 10, 15 (C) 8, 12

Criterion Test 01-04-03-02

1. Find the least common multiple.

   (A) 9, 11 (B) 24, 36 (C) 13, 23

Criterion Test 01-04-03-03

1. Find the least common multiple.

   (A) 12, 18 (B) 35, 45 (C) 2, 3, 5

ANSWERS TO CRITERION TESTS

Criterion Test 01-04-03-01

1. (A) 30 (B) 30 (C) 24

Criterion Test 01-04-03-02

1. (A) 99 (B) 72 (C) 299

Criterion Test 01-04-03-03

1. (A) 36 (B) 315 (C) 30

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DIVISIBILITY

YOU WILL NEED TO RECALL THAT:

1. One number is a multiple of another if it can be found by multiplying the first number by a natural number. Thus 6 x 5 = 30, so 30 is a multiple of 6 because the product of 6 and 5 gives us 30. 30 is also a multiple of 5 because the product of 5 and 6 is 30, or 5 x 6 = 30.

OBJECTIVES:

1. Given a number, tell if it is divisible by 2.
2. Given a number, tell if it is divisible by 3.
3. Given a number, tell if it is divisible by 4.
4. Given a number, tell if it is divisible by 5.
5. Given a number, tell if it is divisible by 6.
6. Given a number, tell if it is divisible by 9.
7. Given a number, tell if it is divisible by 10.
8. Given a number, find its prime factorization by the tests for divisibility.

ACTIVITIES:

1. Study page 134, AAMA, and do margin exercises 38 through 53. (Objective 1)

2. Study "Divisibility by 9", page 135, and do margin exercises 54 through 65. (Objective 6)

3. Study "Divisibility by 3", pages 135 through 136, and do margin exercises 66 through 77. (Objective 2)

4. Study "Divisibility by 4", page 136, and do margin exercises 78 through 89. (Objective 3)

5. Study "Divisibility by 6", pages 136 through 137, and do margin exercises 90 through 101. (Objective 5)

6. Study "Divisibility by 10", page 137, and do margin exercises 102 through 107. (Objective 7)

7. Study "Divisibility by 5", page 138, and do margin exercises 108 through 113. (Objective 4)

8. Write the odd numbered exercises in exercise set 4, pages 145-146. (Objectives 1 - 8)

CRITERION TEST 01-04-04-01

To answer exercises 1 through 7, consider the following numbers:

(A) 24 (B) 270 (C) 720

1. Which of the above numbers are divisible by 2?
2. Which of the above numbers are divisible by 3?
3. Which of the above numbers are divisible by 4?
4. Which of the above numbers are divisible by 5?
5. Which of the above numbers are divisible by 6?
6. Which of the above numbers are divisible by 9?
7. Which of the above numbers are divisible by 10?
8. Find the prime factorization for:

(A) 24 (B) 270 (C) 720

CRITERION TEST 01-04-04-02

To answer exercises 1 through 7, consider the following numbers:

(A) 48 (B) 135 (C) 30

1. Which of the above numbers are divisible by 2?
2. Which of the above numbers are divisible by 3?
3. Which of the above numbers are divisible by 4?
4. Which of the above numbers are divisible by 5?
5. Which of the above numbers are divisible by 6?
6. Which of the above numbers are divisible by 9?
7. Which of the above numbers are divisible by 10?
8. Find the prime factorization for:

(A) 48 (B) 135 (C) 30

CRITERION TEST 01-04-04-03

To answer exercises 1 through 7, consider the following numbers:

(A) 80 (B) 60 (C) 54

1. Which of the above numbers is divisible by 2?
2. Which of the above numbers is divisible by 3?
3. Which of the above numbers is divisible by 4?
4. Which of the above numbers is divisible by 5?
5. Which of the above numbers is divisible by 6?
6. Which of the above numbers is divisible by 9?
7. Which of the above numbers is divisible by 10?
8. Find the prime factorization for:

(A) 80 (B) 60 (C) 54

ANSWERS TO CRITERION TESTS

Criterion Test 01-04-04-01

1. A,B,C
2. A,B,C
3. A,C
4. B,C
5. A,B,C
6. B,C
7. B,C
8. (A) 2 x 2 x 2 x 3
   (B) 2 x 3 x 3 x 3 x 5
   (C) 2 x 2 x 2 x 2 x 3 x 3 x 5

Criterion Test 01-04-04-02

1. A,C
2. A,B,C
3. A
4. B,C
5. A,C
6. B
7. C
8. (A) 2 x 2 x 2 x 2 x 3
   (B) 3 x 3 x 3 x 5
   (C) 2 x 3 x 5

Criterion Test 01-04-04-03

1. A,B,C
2. B,C
3. A,B
4. A,B
5. B,C
6. C
7. A,B
8. (A) 2 x 2 x 2 x 2 x 5
   (B) 2 x 3 x 2 x 5
   (C) 2 x 3 x 3 x 3

THE END

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