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ABSTRACT

This the fourth in a series of four guidebooks on minimum course content designed to develop geometric concepts intuitively, using the "slide, flips, and turns" approach developed by the University of Illinois Committee on School Mathematics. Topics covered are: area; ratio; similarity; construction using ruler, compass, and protractor; and work with directed numbers. Overall course goals are specified; a course outline, performance objectives and suggested teaching strategies are listed. A pretest and a posttest are also included. (JP)

AUTHORIZED COURSE OF INSTRUCTION FOR THE QUINMESTER PROGRAM

SFT MEASUREMENT AND CONSTRUCTION

5212.49, 5213.49

MATHEMATICS

DADE COUNTY PUBLIC SCHOOLS

DIVISION OF INSTRUCTION•1971

QUINMESTER MATHEMATICS

COURSE OF STUDY

FOR

SFT MEASUREMENT AND CONSTRUCTION

5212.49
5213.49

(EXPERIMENTAL)

DIVISION OF INSTRUCTION
Dade County Public Schools
Miami, Florida 33132
1971-72

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PREFACE

The following course of study has been designed to set a minimum standard for student performance after exposure to the material described and to specify sources which can be the basis for the planning of daily activities by the teacher.

The course sequence is suggested as a guide; an individual teacher should feel free to rearrange the sequence whenever other alternatives seem more desirable. Since the course content represents a mininum, a teacher should feel free to add to the content specified.

Any comments and/or suggestions which will help to improve the existing curriculum will be appreciated. Please direct your remarks to the Consultant for Mathematics.

All courses of study have been edited by a subcommittee of the Mathematics Advisory Committee.

CATALOGUE DESCRIPTION

The last of four quins designed to develop geometric concepts intuitively, using the "slides, flips, and turns" approach developed by the University of Illinois Committee on School Mathematics. Includes area; ratio; similarity; construction using ruler, compass, and protractor; and work with directed numbers.

Designed for the student who has successfully completed SFT Symmetry, 5212.48; 5213.48.

TABLE OF CONTENTS

GOALS

1. To correlate traditional geometric language with the motion geometry techniques and language developed in 5212.46; 5213.46 through 5212.48; 5213.48 and develop additional topics of Euclidean Plane Geometry.

2. To have the student "prove" geometric conjectures using manipulative devices.

3. To give the student positive, success-oriented experiences in mathematics, increase his motivation, and develop an experimental attitude.

4. To extend the treatment of the set of integers to include the four basic operations.

5. To increase the student's communication skills with computational and geometric concepts.

PERFORMANCE OBJECTIVES

The student will be able to:

1. Define: Area, Perimeter, Similar Triangles, Circle, Radius, ~~Π~~, and Ratio.

2. Given a triangle or quadrilateral and its dimensions, compute its perimeter and area.

3. Identify similar geometric figures.

4. Given two similar figures, the dimensions of one, and at least one dimension of the other, determine the similarity ratio, the missing dimensions, the perimenters and areas.

5. Divide a segment into any ratio determined by the numbers 1-10.

6. Given a circle and its radius, compute its area.

7. Perform basic geometric constructions.

8. Perform the basic operations on the set of rational numbers.

9. Solve simple equations involving the set of rationals.

STRATEGIES - GENERAL COMMENTS

Before beginning this quin, the teacher should read carefully the course description and comments contained in the Teacher's Edition and the Activities Handbook. This discussion provides an excellent and necessary overview of the content of the course.

In addition to this, the following general comments apply:

1. Entering competencies expected are: mastery of the skills and concepts presented in quin 5212.48;5213.48.

2. The concept of tracings and the resulting isometric mappings is central to the course. The students should attain and preserve skill in tracing figures and should realize that only position changes when a tracing is moved. Onionskin typing paper works very well for tracing and a good supply should be maintained.

3. The course is, in actuality, two courses interwoven: the Motion Geometry materials and the Directed Number Worksheets. The Lesson Maps give a good sequence but you may wish to use a different pattern for your class.

4. It might be helpful to require the students to keep all the directed number worksheets in a separate notebook, thus forming a book on integer operations.

5. The activities found in the Activities Handbook should be used to maintain an experimental tone in the classroom. The frequent and short quizzes help students gain confidence, while reviewing small blocks of material.

6. It is practically impossible to use all of the activities in the Handbook. Plan to use all the Directed Number Worksheets and pick out as many Motion Geometry Activities as are appropriate to your class and the time available.

7. It is recommended that extensive use of the overhead projector be made. Many of the activities use transparencies, and transparencies of important workbook pages should be made to assist with discussion. The ideal demonstration ("proof" for our purposes) of congruence is to make two transparencies and maneuver one over the other to show that they match exactly. Transparencies of quizzes and tests are valuable so the students can either grade each other's papers and/or have immediate feedback and discussion opportunities.

8. Discretion should be used in deciding whether or not to allow books to leave the classroom. It has been found effective to have row leaders distribute and collect books each day, leaving the books in the room. A beginning activity on the board can be used to expand on and review material and to settle the students while the row leaders are distributing the books.

9. The course was designed to be a work-text type program. Much thought and planning should occur before the course is attempted using the texts as non-consumable materials.

10. The following materials will be required for this sequence of quins:

    Overhead projector and screen
    Overhead pens
    Thermofax duplicating masters and acetate film
    Duplicator paper
    Tracing paper (onionskin)
    Graph paper
    Scissors
    Protractors
    Standard foot rulers
    Centimeter rulers
    Coins or discs of different sizes
    Marking pencils
    Yardstick or tape measure
    Magic Mirror (provided by publisher with books)
    5 x 8 cards
    Storage space

TIME SCHEDULE

AREA, SIMILARITY AND CONSTRUCTIONS

	Chapter 3 (of book 3)	
143-160	Quadrilaterals	6 days
	Chapter 1	
1-55	Area 2 Quizes 1 Test	12 days
	Chapter 2	
56-125	Similarity 3 Quizes 1 Test	12 days
	Chapter 3	
126-160	Constructions 1 Test	12 days
		42 days

BOOK 3, CHAPTER 3: QUADRILATERALS

TEXT PAGES	TOPIC	OBJECTIVE
143-144	Two Diagonal Symmetries	Same objectives as for pp. 117-131, but for rhombuses, and for both 180°turn symmetry and two diagonal line symmetries.
147	Exploration	Same objectives as for pp. 117-131, but for rectangles, and for both 180° turn symmetry and two nondiagonal line symmetries.
148-149	Two Nondiagonal Symmetry Lines Rectangles	
150	Four Lines of Symmetry, Exercises	Same objectives as for pp. 117-131, but for squares, and for both 180° turn symmetry and four lines of symmetry.
151-159	Review Exercises	The student should now be able to identify and give properties of any quadrilateral.
160	Extra for Experts	Supplementary.

BOOK 4, CHAPTER 1: AREA

TEXT PAGES	TOPIC	OBJECTIVE
1-11	Exploration	Informal experiences.
12-13	Area	
14-17	Exercises	
18	Area of a Rectangle	Given a rectangle with length and width measures, the student is able to compute its area.
19-20	Exercises	
21	Area Formula for Rectangles	
22-28	Exploration	Given a parallelogram with base and height measures, the student is able to compute its area.
29-30	Area Formula for Parallelograms	
30-32	Exercises	
33-34	Exercises	
35-39	Exploration	Given a triangle with base and height measures, the student is able to compute its area.
40	Area Formula for Triangles	
41-45	Exercises	

(BOOK 4, CHAPTER 1: AREA) Continued

TEXT PAGES	TOPIC	OBJECTIVE
46 47	Exploration Area Formula for Trapezoids	a. Given a trapezoid with base and height measures, the student is able to compute its area.
48-49	Exercises	b. Given a description of a triangle or quadrilateral in terms of area and/or side measures, the student is able to draw the figure.
50-52	Review Exercises	Check the above objectives.
53	Test	Evaluation.
54-55	Extra for Experts	Supplementary.

BOOK 4, CHAPTER 2: SIMILARITY

TEXT PAGES	TOPIC	OBJECTIVE
56-65	Exploration	a. Given a pair of figures, the student is able to tell whether they are similar.
66	Similar Figures	
66-69	Exercises	b. Given a figure and part of a similar figure, the student is able to complete the second one. (Figures drawn on grids.)
70	Enlargements and Reductions	Given a grid, a figure, and a ratio, the student is able to construct a similar figure whose corresponding lengths have the given ratio to the given figure.
71-76	Exercises	
77-79	Exploration	Given a pair of similar figures, the student is able to supply missing side or angle measures wherever possible.
80	Ratio	
81-96	Exercises	
97-100	Scale Drawings	Given a scale drawing and the scale, the student is able to give either the actual length or the scale length when given the other of them.

(BOOK 4, CHAPTER 2: SIMILARITY) Continued

TEXT PAGES	TOPIC	OBJECTIVE
101-104	Similar Triangles	a. The student is able to demonstrate his knowledge of the properties of similar triangles by computing the length or height of an object which is not accessible for actual measuring.
105-106	Indirect Measurement	
107-112	Ratio and Parallel Lines	
		b. Given a segment of manageable size, the student is able to divide it in any ratio determined by the numbers 1-10 (i.e., a ratio such as 2 to 5, but not 2 to 13).
113-116	Areas of Similar Figures	Given a pair of similar figures, their ratio of similitude, and the area of one of them, the student is able to compute the area of the other.
117-120	Exploration	Given a circle and its radius, the student is able to compute its area.
121	Area Formula for Circles	
122	Exercises	
123-124	Test	Evaluation.
125	Extra for Fun	Motivation.

BOOK 4, CHAPTER 3: CONSTRUCTIONS

TEXT PAGES	TOPIC	OBJECTIVE
126	Constructions	The student is able to:
127-134	Exercises	a. construct the perpendicular bisector of a segment (not necessarily with just compass and straightedge). b. construct a segment congruent to a given one. c. construct a segment parallel to a given one. d. construct an angle with a particular vertex congruent to a given angle. e. bisect a given angle. f. construct a segment whose length is the sum of the lengths of two given segments. g. construct an angle with a particular vertex whose measure is the sum of the measures of two given angles.
135-136 137	Circles	The student is able to construct a circle with a given center and passing through a given point.

(BOOK 4, CHAPTER 3: CONSTRUCTIONS) Continued

TEXT PAGES	TOPIC	OBJECTIVE
138-139	Segment Constructions	Applications
140	Angle Constructions	
141-150	Triangle Constructions	The student is able to construct a triangle given: a. three side lengths b. three angle measures c. two side lengths and an angle measure d. one side length and two angle measures e. one side length and a symmetry line of the triangle
151	Parallelogram Constructions	The student is able to construct a parallelogram given: a. two side lengths b. one side length and an angle measure c. two side lengths and an angle measure.

TEXT PAGES	TOPIC	OBJECTIVE
152	Circle Constructions	a. The student is able to identify chords, arcs, and diameters of a circle.
153-156	Exercises	b. Given a circle, the student is able to find its center.
		c. Given a segment, the student is able to construct a circle with it as diameter.
		d. Given two points, the student is able to construct a circle through them.
		e. Given three points, the student is able to construct a circle through them.
157-160	Review Exercises	Check of above objectives.

PRETEST

Use the posttest for Symmetry 5212.48; 5213.48 as the pretest for this quin.

POSTTEST

Use the Test for Book 4, T29-T32 (teacher's edition) as the posttest for this quin.

SUGGESTED SOURCES OF ENRICHMENT AND PRACTICE ACTIVITIES

A. State adopted

1. Crouch, William H. Coordinated Cross Number Puzzles A, B, C. New York: McCormick-Mathers Publishing Co., 1970.

2. Denholm, R. A. and Blank, V. D. Mathematics Structure and Skills 1st Book. Chicago: Science Research Associates, 1968.

3. Foley, Jack; Jacobs, Wayne and Basten, Elizabeth. Individualizing Mathematics. Menlo Park, California: Addison Wesley Publishing Co., 1970.

   Skills and Patterns

   Whole Numbers
   Numbers - Patterns - Theory
   Sets
   Fractions -- Addition and Subtraction
   Fractions -- Multiplication and Division
   Decimals -- Meanings and Operations

4. Johnson, D. A., et al. Activities in Mathematics: First Course: Number-Patterns. Glenview, Illinois: Scott, Foresman and Co., 1971.

5. Sobel, Max A., et al. Essentials of Mathematics Series: Book 1. Boston: Ginn and Company, 1970.

6. Tucker and Wheeler. Mathematics Laboratory. New York: McCormick-Mathers Publishing Co., 1970.

7. Wirtz, Robert W., et al. Math Workshop Levels C, D, E. Chicago: Encyclopedia Britannica Educational Corp., 1964.

B. Non-state adopted

1. Brandes, Louis G. Yes, Math Can Be Fun. Portland, Maine: J. Weston Walch, 1960.

2. Dumas, Enoch. Arithmetic Games. Palo Alto, California: Fearon Publishers, Inc., 1960.

3. _____. A Collection of Cross Number Puzzles.

4. Larsen, Harold D. Games to Play.

5. _____. Guzintas.

6. _____. Ways to Multiply.

7. _____. Brain Teasers.

Evanston, Illinois: Harper and Row, 1961.

8. Meyer, Jerome S. Arithmetricks. Englewood Cliffs, N. J.: Scholastic Magazine, 1965.

9. Wagner, Guy, et al. Arithmetic Games and Activities. Darien, Connecticut, 1964.