Chapter 3: Framing the Problem

Math Tasks by Rigor/Relevance Quadrant (ES, MS, HS)

Learning Experiences in the Rigor/Relevance Framework

Mathematics	Elementary Examples

Quadrant C Assimilation

6
- Predict and analyze patterns of sides of three-dimensional boxes.
- Use pattern blocks to construct desired shapes.

5
- Identify next numbers in a sequence.
- Find values in number sentences when represented by unknowns.
- Round off numbers and estimate answers.

4
- Use a balance to predict and determine equivalent value.
- Create math word problems for younger students.

Quadrant D Adaptation

- Develop formula for determining a large quantity without counting, such as beans in a jar.
- Calculate change of values to double or halve a recipe.
- Discover similar characteristics of different geometric solids.
- Collect data on an event and compare to expected results (e.g., the number of faulty parts manufactured).
- Evaluate situations when estimates are acceptable and unacceptable.
- Create a measurement scale (e.g., hand span, book, length of string) and measure objects in classroom.

3

Quadrant A Acquisition

- Explore likenesses and differences of objects (color, shape, size).

2
- Sort and classify objects, such as buttons, blocks, and bottle tops.
- Use color counters to solve simple computational problems.
- Divide objects to illustrate whole, half, third, and quarter.

1
- Construct shapes and patterns with craft sticks.
- Memorize multiplication tables.
- Find the lines of symmetry in letters of the alphabet and numerals.
- Use pegboards to discover multiplied values.

Quadrant B Application

- Divide quantities of objects into equal groups.
- Calculate the area of objects.
- Make a graph comparing characteristics of two groups.
- Find patterns outdoors and indoors.
- Collect temperatures at different times of day for several days and make a graph to display recorded data.
- Use rulers to measure objects.
- Sort quantities to discover fractions of the whole.

1 2 3 4 5

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Learning Experiences in the Rigor/Relevance Framework

	Mathematics	Middle Level Examples
6	**Quadrant C Assimilation** • Measure interior angles of polygons and discover the relationship between number of sides and sum of angles. • Graph the perimeters and areas of squares of different sizes.	**Quadrant D Adaptation** • Hold a competition to determine when using a calculator or doing mental math is most efficient. • Obtain historical data about local weather to estimate amount of snow, rain, or sun during a given season of the current year.
5	• Express probabilities as fractions, percents, or decimals. • Evaluate equivalency and the relationship of decimal and fractions. • Determine the largest area for a fixed perimeter.	• Use graphing calculators and computer spreadsheets to organize and analyze data. • Test consumer products, such as absorbency of paper towels, devise a scale, and illustrate data graphically.
4	• Fill in missing numbers for ordered pairs for an algebraic function. • Evaluate objects for similarity and congruence. • Estimate sums of complex fractions.	• Plan a large school event and calculate resources (e.g., food, decorations) needed and costs.
3	**Quadrant A Acquisition** • Select computational operation to solve word problems. • Calculate volume of regular solids.	**Quadrant B Application** • Make a scale drawing of the classroom. • Calculate percents of daily requirements met through a typical school lunch.
2	• Measure angles with a protractor. • Find and measure the sides and angles of a right triangle using the Pythagorean theorem and trigonometric ratios.	• Calculate potential combinations of a group of variables, such as wardrobe components, and estimate the probability of any one combination being picked at random.
1	• Organize and display collected data, using tables, charts, or graphs. • Use basic properties of equality to solve equations with one variable. • Plot the coordinates for quadrilaterals on a grid.	• Calculate percentages of advertising in a newspaper. • Play a simulated baseball game and calculate statistics. • Calculate paint needed for a summer business painting houses.
	1 2 3 4 5	

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Learning Experiences in the Rigor/Relevance Framework

Mathematics	High School Examples

Quadrant C Assimilation

6
- Solve interdisciplinary problems with signed numbers, such as molecules with a charge of protons and electrons.
- Identify congruence of shapes from expressions and truth statements.

5
- Complete Euclidean proofs in geometry.
- Construct truth tables as a shorthand method for discussing logical sentences.
- Analyze factors in difference between theoretical empirical probability.

4
- Select best measures of central tendency to support a particular point of view.
- Solve quadratic equations and linear inequalities.

Quadrant D Adaptation

- Determine types of measurements/ calculations involved in designing everyday items.
- Make calculations of electrical load of appliances based on usage in homes in the community.
- Examine the different elements, visual effects, and features found in a computer game, and use mathematics to design some of these elements.
- Create formulas to predict changes in stock market values.
- Design support posts of different materials and size to handle stress load in a building.
- Develop a sampling plan for a public opinion poll.
- Design a roller coaster ride.

3

Quadrant A Acquisition

- Distinguish rational from irrational numbers.

2
- Simplify, factor, and compute polynomials.
- Solve and graph linear equations.
- Create and solve factorial expressions for permutation problems.
- Construct and solve for unknowns in ratio problems.

1
- Compute numbers with scientific notation.
- Predict the probability of events using ratios.
- Bisect line segments and angles.
- Provide examples to illustrate properties of real numbers.

Quadrant B Application

- Draw Venn diagrams to represent a set of real conditions (e.g., common characteristics of students in class).
- Find length of line segments without measuring.
- Take measurements using calipers and micrometers.
- Calculate measurement error in real observations.
- Calculate frequency of vibration of various piano strings.
- Calculate medical dosages for different weight animals.
- Plot changes in temperature at different altitudes from a NASA space flight.

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