Mathematics: The Language of STEM Lesson 2 Year 3
"Painting by the Numbers"

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CONTENT AND TASK DECISIONS

Grade Level(s): 6th Grade

Description of the Task: The student is the owner and operator of their very own painting company. Students will develop a business plan that includes: naming the business, cost of materials, an advertising plan, a budget for the business and for each project, and a matrix/graphic organizer for estimating how much to charge customers.

For the purposes of this lesson, the student will see a diagram and be given the dimensions of a building that needs painted. The measurements will be provided. Students will need to use the measurements and their business plan to offer an estimate to paint this building. There will be interior and exterior walls to paint.

The goal of the lesson is to complete the tasks listed above and finish the project (after all expenses are paid) with a 25% profit.

Additional Considerations:

- Students can work in partners to form a company
- Students can work in small groups
- Students can work alone
- One company designs a building to be painted and the other company provides the estimate to paint the building.

Indiana Mathematics Content Standards:

6.NS.5: Know commonly used fractions (halves, thirds, fourths, fifths, eighths, tenths) and their decimal and percent equivalents. Convert between any two representations (fractions, decimals, percents) of positive rational numbers without the use of a calculator.

6.C.1: Divide multi-digit whole numbers fluently using a standard algorithmic approach.

6.GM.4: Find the area of complex shapes composed of polygons by composing or decomposing into simple shapes; apply this technique to solve real-world and other mathematical problems.

Indiana Mathematics Process Standards:

PS.1: Make sense of problems and persevere in solving them.
PS.3: Construct viable arguments and critique the reasoning of others.
PS.6: Attend to precision.

Mathematics Content Goals:

- Use fractions and percents correctly

- Identify Surface Area correctly
- Use problem solving and computation correctly

Language Objectives:
- Students will be able to orally describe surface area
- Students will be able to read descriptions and directions
- Students will be able to summarize in writing how they arrived at their answers

Materials:
- Graphic organizers
- Graph Paper (optional)
- Paper and Pencil

Before: This phase of the lesson should be designed to get students ready for problem solving. It also provides an opportunity for you to find out what they already know about the topic. Describe how you will accomplish each of the following in this phase of the lesson:

- **Activate prior knowledge**
  - Pre-assessment Q & A on Area

- **Be sure the problem is understood**
  - Problem: The student is the owner and operator of their very own painting company. Students will develop a business plan that includes: cost of materials, an advertising plan, a budget for the business and for each project, a matrix/graphic organizer for estimating how much to charge customers. For the purposes of this lesson, the student will see a diagram of a building that needs painted. The measurements will be provided. Students will need to use the measurements and their business plan to offer an estimate to paint this building. There will be interior and exterior walls to paint.

  - Check for understanding through questioning

  - Thumbs up, thumbs down

- **Establish clear expectations (**including the specific expectations you have for students to record their mathematical thinking in writing or drawing).
  - Set the climate and culture for the learning
  - Present the protocols of the lesson: 1. active/attentive listening, 2. appreciation, no put downs, 3. mutual respect and 4. right to participate.
  - Write your answer on the paper provided
  - Explain your thinking in words (on the paper) and to your partner.
  - Present and defend you answer/findings

During:
TEACHER ACTIONS:
- Teacher will actively "Praise the Process"

- Teacher allows think time, work time
- Teacher will let go
- Teacher will provide appropriate support
- Teacher will listen accurately
- Teacher will monitor groups / turn and talks

STUDENT ACTIONS:
- Solve the problem
- Write down their answers
- Students will share their answers within the group
- Students will defend and question answers while honoring the lesson protocols

After:
TEACHER ACTIONS:
- Teacher will listen accurately
- Teacher will provide guiding questions to struggling learning teams
- Teacher will make and state connections

STUDENT ACTIONS:
- Students will share their answers with their tablemates
- Students will defend and question answers while honoring the lesson protocols
- Students will make and state connections
- Students will state and summarize their findings

ASSESSMENT
- Assessment will be formative
- Did the students arrive at the correct answer for their painting estimate?

Observe: Teacher will circulate around the room, asking questions and making sure students are on task.

Ask:
- Tell me about your answer and your thinking.
- Describe how you came to your solution.
- It is correct?
- Ask- What?, So What?, Now What?

"Painting by the Numbers"

Your Name:_____ **Date:**_____ **HR:**_____

Business Name: _____

Business Motto: _____

Business Logo: _____

Advertising plan (How will you advertise?):

Square footage to paint (1 coat): _____ Number of coats needed: _____

Total Square Footage to Paint: _____

Basic Business Materials:
Brushes, rollers, buckets and tarps per job: $125.00

Paint Options: 1 gallon of paint will cover 400 square feet
Elite Paint- $45 per gallon
Premium Paint- $35 per gallon
Classic Paint- $25 per gallon

Questions to answer:
How much will you charge your customer per square feet? _____

How much paint will you need for the job? _____

How much will you charge for incidentals? These would be things that do not fall within the square footage formula? What do you think these items would be?

"Painting by the Numbers"

Description of the building you are painting (Choose 1):

BUILDING #1

Type of Building:
- Warehouse

Interior:
- 4 walls that measure 10 feet by 15 feet

Exterior:
- 4 walls that measure 10 feet by 15 feet

TASK: You will be painting the interior and the exterior of this Warehouse.

BUILDING #2

Type of Building:
- Backyard Shed

Interior:
- 2 walls that measure 8 feet by 12 feet
- 2 walls that measure 10 feet by 12 feet
- 1 ceiling that measures 8 feet by 10 feet

Exterior:
- 2 walls that measure 8 feet by 12 feet
- 2 walls that measure 10 feet by 12 feet

TASK: You will be painting the interior and the exterior of this backyard shed.

"Painting by the Numbers"

Final Business Report

Original Estimate: _____

Actual Cost of the Project: _____

Did you have a profit or a loss?: _____

Profit Amount: _____

Loss Amount: _____

Percent of Profit or Loss: _____

Noticings and/or Comments: