

## **Sample Items for CMT-3 Strand 25: Mathematical Applications**

**Strand 25 of the 3<sup>rd</sup> Generation of the Connecticut Mastery Test is called Mathematical Applications. The items that assess this strand are 4-point open-ended items that require students to solve a complex problem, show their work and explain their reasoning.**

**4<sup>th</sup> graders are given one numerical and one statistical problem. 6<sup>th</sup> and 8<sup>th</sup> graders are given one numerical, one statistical, and one spatial problem.**

**These items are designed to assess integrated understanding of key mathematical ideas as well as student's ability to communicate their understanding and demonstrate their reasoning.**

**The generic rubric used to create task specific rubrics for these items is:**

**Score of 3: Student shows a correct and/or appropriate answer and shows work and/or an explanation that demonstrates full and complete understanding.**

**Score of 2: Student has minor flaws in the answer, but the work and/or explanation is acceptable and the reasoning is appropriate.**

**Score of 1: Student does not have a reasonable answer or does not provide a reasonable explanation or show sufficient work, resulting in a demonstration of only limited understanding.**

**Score of 0: Student shows no understanding of the problem or how to arrive at a solution.**

## Grade 8 Sample Mathematical Applications Items

### Sample Item 8-1 (Statistical): School Growth

The table below shows the student enrollment at Eastside High School for five different years from 1960 to 2000.

<u>Year</u>	<u>Enrollment</u>
1960	185
1970	315
1980	577
1990	930
2000	1362

- a. Construct a scatter plot of the data in the table.
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- b. Based on the pattern in your graph, what do you predict the school's enrollment will be in 2001?

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- c. Explain how you arrived at your prediction.

### Sample Item 8-2 (Numerical): Shirt Order

Last month, a store had the following inventory of shirts.

<u>Type of Shirt</u>	<u>Number at the beginning of the month</u>	<u>Number at the end of the month</u>
Dress shirts	375	191
Polo shirts	610	288
T-shirts	158	60

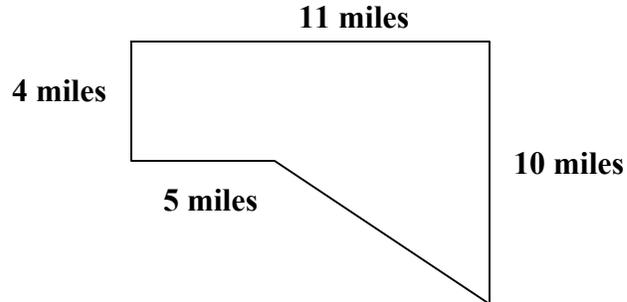
The factory where these shirts are manufactured, has set a minimum number of shirts that can be ordered at 1000 shirts.

In the space below, explain how you could use the data in the table to decide how many of each type of shirt you should order to reach the 1000 shirt minimum. Be sure that your order reflects the sales of each type of shirt during the last month. Show or explain how you arrived at your answer.



**Sample Item 8-4 (Spatial): How Big?**

A town planner sketches the map of his community shown below.



Use the distances on the map to make an estimate of the number of square miles in the community.

Your estimate: \_\_\_\_\_

Show or explain how you arrived at your estimate.

**Sample Item 8-5 (Numerical): Buying Tickets**

The carnival offers you two different options for buying tickets.

**OPTION A: \$2.00 per person plus \$0.75 per ride**

**OR**

**OPTION B: \$5.00 per person plus \$0.25 per ride**

If your uncle gave you \$10 for the carnival, which option – A or B - would you choose. Show the mathematics you used to determine your answer.

**OPTION CHOSEN: \_\_\_\_\_**

**Explanation:**

**Sample Item 8-6 (Statistical): Constructing a Bookcase**

A bookcase you are building uses 4 boards that are each 42” long for the shelves and 2 boards that are each 65” long for the sides.

The wood you need can be purchased in 3 difference lengths and can be cut to the length you need:

- 4 foot boards for \$2.75
- 6 foot boards for \$3.50
- 8 foot boards for \$4.75

Complete the chart below to show how many of each length of board you would buy in order to construct the bookcase for the LEAST amount of money. Show how you cut the boards to get the 6 boards you need for the bookcase. Show your work and explain how you know you have spent the least amount of money.

<b>Board Length</b>	<b>Number of boards to be purchased</b>	<b>Cost</b>	<b>Bookcase board lengths to be cut</b>
4 feet			
6 feet			
8 feet			

**Total Cost:** \_\_\_\_\_

**Show your work here:**

### **Sample Item 8-7 (Spatial): Ordering Topsoil**

**The park foreman decides that there is a need for a 4-inch layer of topsoil on the soccer field to get it ready for the upcoming soccer season. He knows that:**

- **The soccer field measures 100 feet by 250 feet**
- **Topsoil is ordered by the truckload**
- **One truckload contains 5 cubic yards of topsoil**

**How many truckloads of topsoil should the park foreman order to have enough topsoil for this job. Show your work and explain how you arrived at your answer.**

### Sample Item 8-8 (Numerical): Ordering Pizza

Pizza House sells two types of pizza that each come in three sizes. The chart below shows the price of each type of pizza and how many people each serves.

**Pizza Sizes and Servings**

<b>Size/Type</b>	<b>Small (1 serving)</b>	<b>Medium (3 servings)</b>	<b>Large (8 servings)</b>
<b>Thin crusted</b>	<b>\$2.50</b>	<b>\$4.95</b>	<b>\$8.50</b>
<b>Thick crusted</b>	<b>\$2.95</b>	<b>\$5.45</b>	<b>\$9.75</b>

Place an order that meets the following conditions:

- The order serves exactly 30 people;
- Half the servings must be thin crusted and half thick crusted;
- Costs the LEAST.

a. Show how many of what size and what type you would order to meet these conditions.

b. What is the total cost of your order?

Show your work here:

**Sample Item 8-9 (Statistical): Making Change**

**You pay for a \$3.75 item with a \$5.00 bill.**

**How many different ways could get your change using nickels, dimes and quarters and dollar bills? \_\_\_\_\_**

**In the space below, show each of these combinations of bills and coins.**

**Sample Item 8-10 (Numerical): Buying Sneakers**

**You need a new pair of sneakers and find the following two ads in the newspaper for the same type of sneaker.**

<b>Sneaker City</b>	<b>Active Feet</b>
<b>New sneakers \$45.95</b>	<b>New sneakers \$54.50</b>
<b>On sale this week take 10% off (plus 6% sales tax)</b>	<b>On sale this week take 20% off (plus 6% sales tax)</b>

**At which store would you pay LESS for the sneakers? Show your work and explain how you arrived at your answer.**

### Sample Item 8-11: Coin Toss

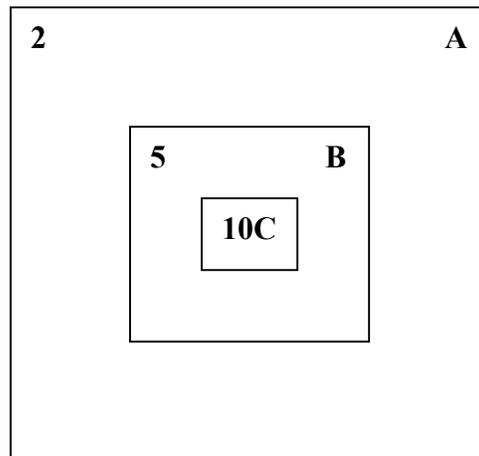
On the game board for the coin toss shown below:

- the area of region A is 70 square inches,
- the area of region B is 20 square inches, and
- the area of region C is 5 square inches.

As shown on the game board, you get:

- 2 points for landing in region A,
- 5 points for landing in region B, and
- 10 points for landing in region C.

If your coin lands on a border line, you get to toss the coin again.



If there is an equal chance of landing anywhere on the board, and if you make 25 tosses onto the board, where none of the tosses lands on a border line, how many points would you expect to get?

\_\_\_\_\_

Show your work and explain how you arrived at your answer.