

Sample Items for CMT-3 Strand 25: Mathematical Applications

Strand 25 of the 3rd 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.

4th graders are given one numerical and one statistical problem. 6th and 8th 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 6 Sample Mathematical Applications Items

Sample Item 6-1 (Statistical): The Relay Race

Tom, Bob and Vic are racing against each other in a 100 meter dash. In how many different orders could they finish the race, assuming that ties are possible. That is, one finishing order could be Bob, then Tom and then Vic; another could be Tom and Vic in a tie and then Bob.

Show all the different orders in which the race could end – including possible ties.

Sample Item 6-2 (Statistical): Making Change

You pay for an item costing 40¢ item with a \$1.00 bill. Show all the different ways you could get your 60¢ change with combinations of only nickels, dimes and quarters.

Sample Item 6-3 (Statistical): The Jewelry Store

A jewelry designer makes bracelets, necklaces, pins and earrings. The chart below shows the number of items made, the cost of materials and the selling price for each type of jewelry.

Type of jewelry	Number made	Cost of materials	Selling price
Bracelets	25	\$4	\$8
Necklaces	15	\$2.50	\$6
Pins	10	\$5	\$9
Earrings (pairs)	30	\$1.50	\$4

One day last week the designer made a profit (the difference between the selling price and the cost of the materials) of ABOUT \$200.

Show how many of each type of jewelry could have been sold that day. Show or explain how you arrived at your solution and how you calculated the profit.

Sample Item 6-4 (Spatial): The Jewelry Display

A jewelry store displays some of the items it sells in a 3 by 6 rectangular display box. The store owner wants to display several of each of the following items that the store sells:

- Gold bracelets (G) that cost \$8 each**
- Silver necklaces (S) that cost \$6 each**
- Copper pins (C) that cost \$9 each**
- Pairs of wire earrings (E) that cost \$4 each pair**

The display must meet the following conditions:

- There are at least two of each item;
- The total cost of the items in the display is more than \$120; and
- No two display boxes that share a side can have the same item.

Show how the jewelry can be displayed in the 18 display boxes and show the total cost of the items in the display.

TOTAL COST OF THE ITEMS DISPLAYED _____

Sample Item 6-5 (Numerical): Feeding the Horses

Ben's barn is the home for two horses and one pony. The chart below shows how much hay these animals eat each day:

Large horse	1 ½ bales of hay per day
Small horse	1 bale of hay per day
Pony	½ a bale of hay per day

How many bales of hay should Ben purchase for a 30-day supply for his three animals?

If hay costs \$1.25 per bale, how much will the 30-day supply cost?

Show or explain how you arrived at your answer.

Sample Item 6-6 (Numerical): Picnic Order

You are planning a picnic for your neighbors.

You estimate that:

- 30 of the people who come will have two hot dogs with buns;**
- 20 of the people who come will have one hot dog with a bun;**
- 10 of the people who come will have a hot dog without a bun.**

**You find that hot dogs come in packages of 6 for \$1.59 and packages of 10 for \$1.99
You also find that buns come in packages of 8 for \$0.99 and packages of 12 for \$1.29.**

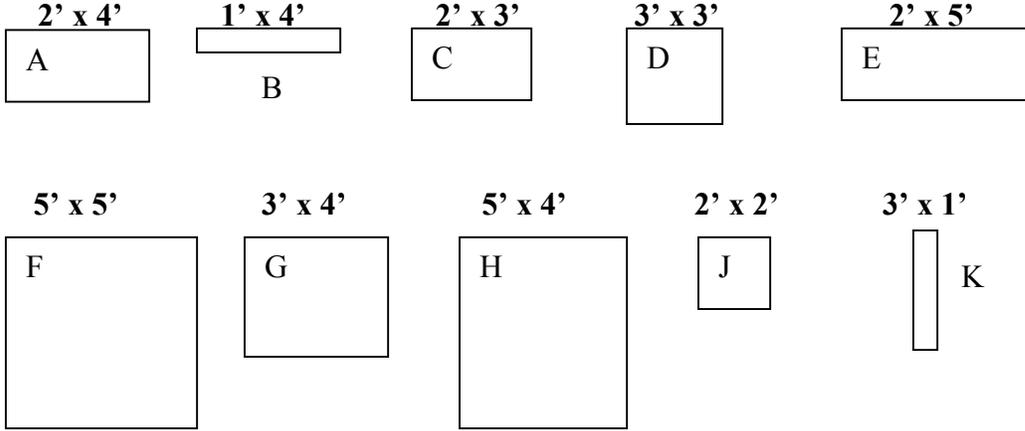
Use this information to order enough hot dogs and hot dog buns for the people coming to the picnic. Show how many packages of each size you will purchase and compute the total cost of these items. Show how you arrived at your answers.

YOUR ORDER:

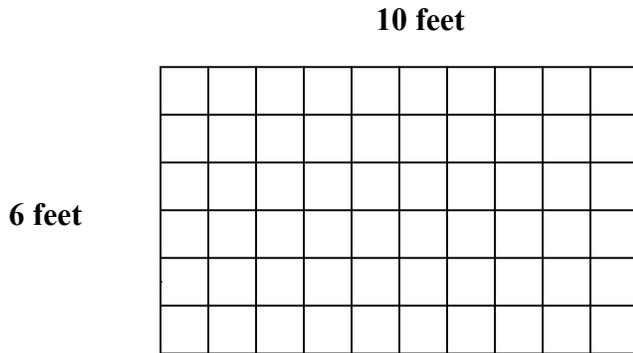
TOTAL COST:

Sample Item 6-7 (Spatial): Making a Quilt

A quilt maker has the 10 scraps of material shown below:



Draw on the grid below to show how the quilt maker could use some of these pieces to complete a section of a quilt that is 6' x 10'. Label each piece with its letter.



Sample Item 6-8 (Statistical): A Day at the Science Center

The brochure for the City Science Center describes the following activities at the museum:

Demonstrations:

Gravity on the Moon – 15 minutes at 10:00, 11:30 and 1:00

Physics of Light – 20 minutes at 10:30, 12:30 and 1:30

Lectures:

Famous Scientists – 30 minutes at 11:00 and 2:00

The DNA mystery – 15 minutes at 9:30 and 11:00

Movies:

Volcanoes – 45 minutes at 9:15 and 2:15

Whales and Dolphins – 25 minutes at noon and 1:30

Exhibits:

Space Travel

Dinosaurs

Energy

Use the information above, including taking a 45 minute lunch break, to plan a day at the science center that includes at least 2 hours in the exhibits and at least one demonstration, one lecture and one movie. Complete a schedule that shows your plan.

TIME	ACTIVITY
9:00	Arrive at the science center
	Lunch
3:00	Depart from Science Center

Sample Item 6-9 (Numerical): Fruit Punch for a Party

A recipe for fruit punch calls for the following ingredients:

Orange juice	4 cups
Lemon juice	½ cup
Club Soda	3 cups
Serves 6	

The chart below shows the ingredients you have in your kitchen. It also shows how you can purchase these ingredients, and their cost.

What you have		How it's sold and what it costs	
Orange juice	½ gallon	Orange juice	\$3.95/gallon
Lemon juice	1 ½ quarts	Lemon juice	\$1.25/pint
Club Soda	1 gallon	Club Soda	\$1.00/2 quarts

You know that there are:

- 2 cups in 1 pint
- 2 pints in 1 quart
- 4 quarts in one gallon

In order to make enough fruit punch for 60 people, how much of each ingredient will you need to buy and how much will these ingredients cost? Complete the table below to show your answers and show how you arrived at your answers in the space below the table.

Ingredient	How much do you need to buy?	What will this cost?
Orange juice		
Lemon juice		
Club Soda		

Total Cost: _____

Show your work here: