

Constructed Response Lesson
Smarty's Deli
January, 2006

- I. Objectives:** Students will do a constructed response problem. Students will look at other student's examples and learn how to score them using a rubric. Students will revise their constructed response and score it using a rubric. Students will journal comparing and contrasting different solutions to the constructed response problem.
- II. MT Content and Performance Standard/s Addressed in This Lesson:** MT Content Standard 1, Benchmarks 1 & 3, MT Content Standard 2, Benchmarks 1 & 3. MT Performance Standard Grade 8 Mathematics; Proficient b, c & e.
- III. Materials Needed:** Copies and overhead of Grade 8 Mathematics Released Item #25, "Smarty's Deli" from Measured Progress, copies and overhead of the rubric and scoring information for the problem, copies and overhead of student samples B, E, G, and M, copies and overhead of student scoring worksheet.
- IV. Lesson Plan:**
- a. State the lesson objectives.
 - b. Discuss the 4-Step problems solving process that we studied earlier. Remind students of how we read the problem, then we talked it out to make a plan before we even started to write. Then we wrote out the problem in words and numerically to solve it. Finally, we check our work. Use this process while working on the following problem.
 - i. Read and Understand
 - ii. Make a Plan (Look for a pattern, draw a diagram, act it out, work backward, guess, check and revise, make a table, or solve a simpler problem.)
 - iii. Solve the Problem
 - iv. Look Back
 - c. Hand out the problem "Smarty's Deli" and ask the students to solve it to the best of their ability. Ask students to write on their own paper and not on the problem. We will be returning to the problem later. Give the students about 10 minutes to work on their solutions. Collect the students work to use later. We will come back to their solutions to self-grade their work.
 - d. Hand out the rubric and scoring information.
 - i. Ask students to read over the scoring information. Talk about the correct solution and how the answer was obtained. Discuss how the points are assigned for each solution. The students appear to be given points for the correct answer and showing correct work toward their solution.
 1. What should be in the complete list for part a?
 2. Is it important to label your answers? Why?
 3. Is it important to show your strategy or work? Why?
 4. What is meant by "evidence of correct strategy through partially complete list that demonstrates systematic approach or correct total (10)" on the scoring information for 1 point for part a?
 5. Notice on the scoring information part b, "correct number of combinations (30) with explanation or work shown indicating correct strategy (3x5x2)" the students only earn both points if the answer is correct and their strategy or work is shown. Why do

you think this is the case? Why not 2 points for just the correct answer?

- e. Ask students to read of the rubric. Discuss how the **points** earned translate into the **score** they would receive.
- f. Hand out the student samples of solutions to the problem.
 - i. Explain that students will work with a partner to score the student samples. Please don't write on the samples because we will be collecting them back. Write the score given on the provided worksheet and the reason for the score you gave.
 - ii. Do student sample B together as a class to demonstrate how to score, record score and give reason.
 - iii. Ask students to work in pairs to score the remaining 4 student samples.
 1. Suggested scores for each sample are as follows.
 - a. Sample B, Score 3
 - b. Sample E, Score 1
 - c. Sample G, Score 4
 - d. Sample M, Score 2
 - iv. Compile the class results by asking each group for their score for each student and recording them on an overhead.
- g. Have a class discussion on the results of the scoring for the student samples.
 - i. Have the class look at the compiled scores for each sample. Look for any discrepancies in the scores and have the groups share how they scored the item.
 - ii. Ask pairs of students to demonstrate how they scored student examples and their reasons for the scores. If there is a large variation in scores given, ask each pair to present their scoring and why. Have a class discussion to reach an agreement on the final score and why.
 - iii. Discuss why the scores end up being fairly consistent by each group. Why is this important to the persons scoring the problems?
 - iv. Why is it important to discuss scores with large variations?
 - v. Is it important for you, the person trying to answer the problem, to know the scoring rubric? Why?
 - vi. What attributes do the student solutions have that make scoring the easiest?
 - vii. Put each student work example up on the overhead one at a time. Ask students what did the person do to make it easier for you as the scorer and what made it hard?
 1. Nice penmanship.
 2. Easy to read and clearly labeled.
 3. Showed all their work.
 4. Wrote clear explanations of their work.
 5. Answered every part of the question being asked.
- h. Hand out the student's original solution. Ask students to score their original solution to the problem "Smarty's Deli". Write down reasons for your score and what do you need to do to improve your score.
- i. Now that students have practiced scoring, ask them to return to the original problem "Smarty's Deli". Redo the problem on the back of your original solution to try to improve your original score.
- j. Switch papers with your partner and have your partner score your second solution to the problem. Write down the score and the reasons for the points you gave your partner.

Name _____

Constructed Response Problem "Smarty's Deli"

Student Solution	Score	Reason
1st Solution		
2nd Solution		

Write a paragraph comparing and contrasting your two solutions to the problem "Smarty's Deli".
What did you leave the same and what did you change? Why?
What would you tell another student is the most important thing(s) to do when answering a word problem so you achieve the highest score possible?

Mathematics

Session 1 (Calculator)

You may use a calculator during this session.

25. A regular sandwich at Smarty's Deli consists of bread, one kind of meat, and one kind of cheese. The choices are listed in the table below.

Bread	Meat	Cheese
white (w) oatmeal (o) pita (p)	turkey (t) ham (h) roast beef (r) corned beef (c) bologna (b)	American (A) Swiss (S)

- Sandra always orders white bread, but she will order any of the meats or cheeses. Make an organized list or diagram to show all of the possible meat-and-cheese regular sandwich combinations that Sandra could order.
- Lew likes all of these breads, meats, and cheeses. How many different regular sandwiches can Lew order? Show or explain how you found your answer.
- Smarty's offers a "Three-Meat Special," which is a sandwich with three different kinds of meat. How many different ways can a person choose three different meats from the five kinds listed? Show or explain how you found your answer.

Scoring Guide

Score	Description
4	6 points
3	5 points OR Correct totals to all three parts.
2	3 or 4 points
1	1 or 2 points OR Minimal understanding of systematic counting principles.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Training Notes

Part a:

- 2 points for correct and complete list or diagram (see Solution Notes)
OR
- 1 point for evidence of correct strategy through partially complete list that demonstrates systematic approach **or** correct total (10)

Part b:

- 2 points for correct number of combinations (30) with explanation or work shown indicating correct strategy ($3 \times 5 \times 2$)
OR
- 1 point for correct answer **or** correct strategy (including list or diagram that, if complete, would result in correct answer)

Part c:

- 2 points for correct answer (10, or 30 with indication that it is based on different breads, or 60 with indication that answer is based on different breads and cheeses) with explanation or work shown indicating correct strategy ($3c5 = \frac{5!}{3! \times 2!}$ or systematic list)
OR
- 1 point for correct answer **or** correct strategy (including list or diagram that, if completed, would result in correct answer)

Solution Notes

- **Part a:** tA, tS, hA, hS, rA, rS, cA, cS, bA, bS
- **Part c:** thr, thc, thb, trc, trb, tcb, hrc, hrb, hbc, rcb

Score Point 4

Sample 1

25. (A.)

American: t, h, r, c
Swiss: t, h, r, c

A. 10 combos.

(B.)

W: A, S, B, O, P
A: t, h, r, c
S: t, h, r, c
B: t, h, r, c
O: A, S, B, O, P
P: A, S, B, O, P
A: t, h, r, c
S: t, h, r, c
B: t, h, r, c

B. 30 combos.

(C.)

W: t, h, r, c
O: t, h, r, c
P: t, h, r, c

P. 30 Combos not including Cheese
60 combos including Cheese choices

Score Point 4

Sample 2

25. A.

- w-t-a
- w-t-s
- w-h-a
- w-h-s
- w-r-a
- w-r-s
- w-c-a
- w-c-s
- w-b-a
- w-b-s

10 different combinations

B.

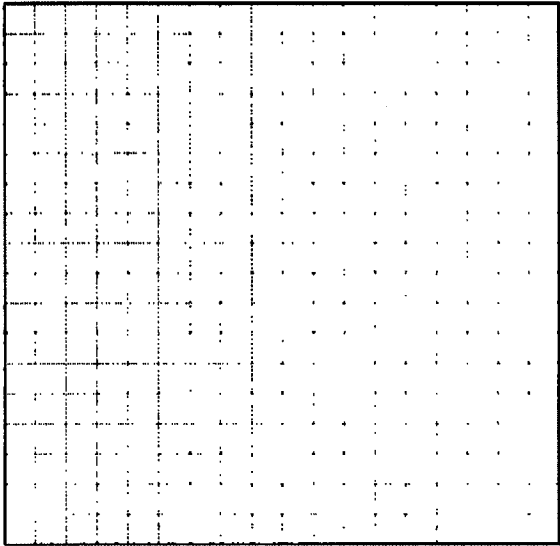
$w = 10$
 $o = 10 = 30$
 $p = 10$

different combinations

C.

- t-h-r
- t-h-c
- t-h-b
- t-r-c
- t-r-b
- r-c-b
- h-r-a
- h-c-b
- h-r-b
- r-c-b

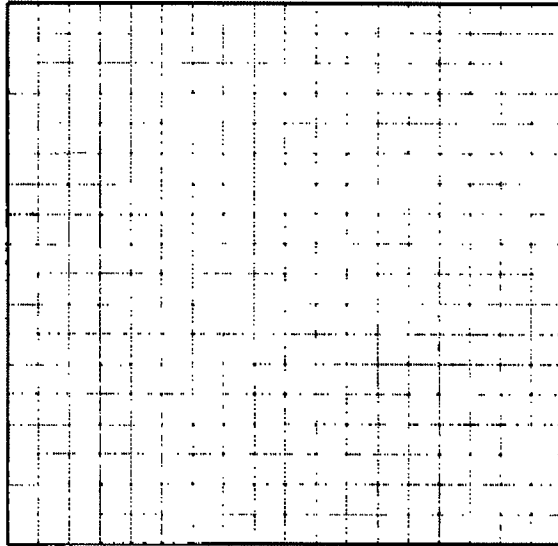
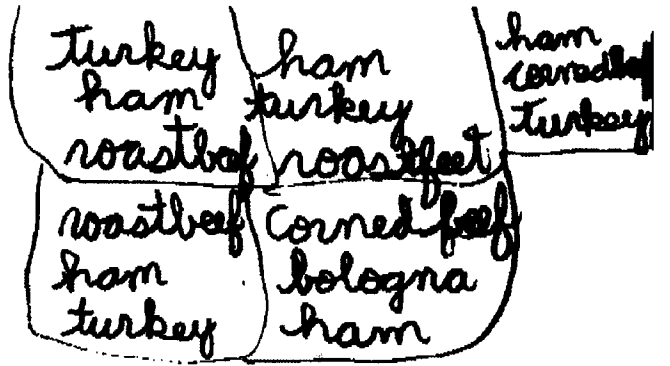
10 different meats



Score Point 3

Sample 1

25. white, turkey, American
white, turkey, Swiss
white, ham, American
white, ham, Swiss
white roastbeef, American
white roastbeef, Swiss
white corned beef, American
white corned beef, Swiss
white bologna, American
white bologna, Swiss
3 kinds of bread
5 kinds of meat
2 kinds of cheese
equals 30



Score Point 3

Sample 2

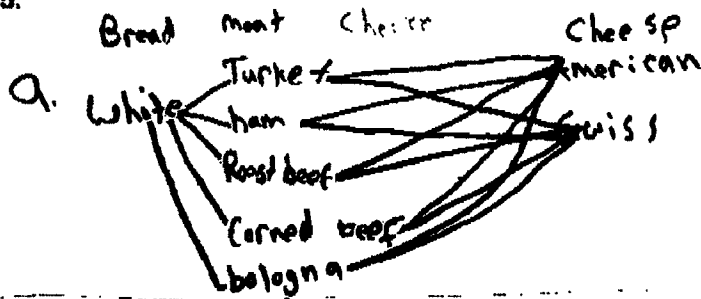
25. 10 different	Sandra	Lew		
	WtA	WtA	WtS	
	WhA	WhA	WhS	
	WrA	WrA	WrS	
	WcA	WcA	WcS	
	WbA	WbA	WbS	
	WtS	OtA	OtS	
	WhS	OhA	OhS	
	WrS	OrA	OrS	
	WcS	OcA	OcS	← 30 different sandwiches
	WbS	ObA	ObS	
		PtA	PtS	
	Smarty	PhA	PhS	
	ThR	PrA	PrS	
TRC	PcA	PcS		
TcB	PbA	PbS		
Tbh				
TbR				
ThC				
CRb				
CRb				
CDR				

9 different meats

Score Point 2

Sample 1

25.

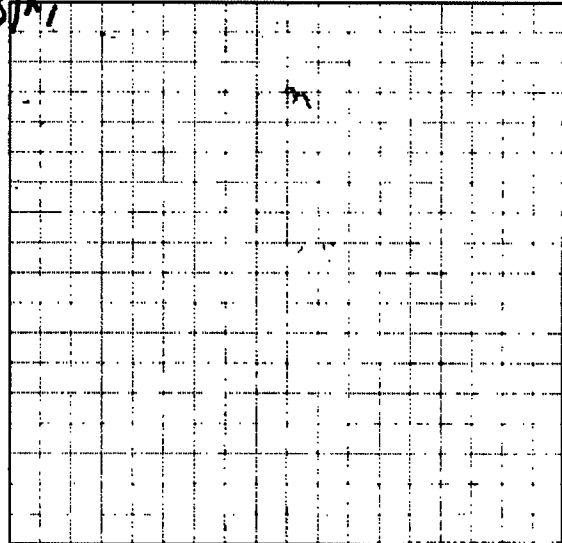


There are 10 different possibilities.

B. He can have 30 different sandwiches. Take breads (3) x meats (5) x cheese (2) $3 \times 5 \times 2 = 30$

C. A person could have 15 different combinations.

3×5
meats / # of meats available.



Score Point 2

Sample 2

25.

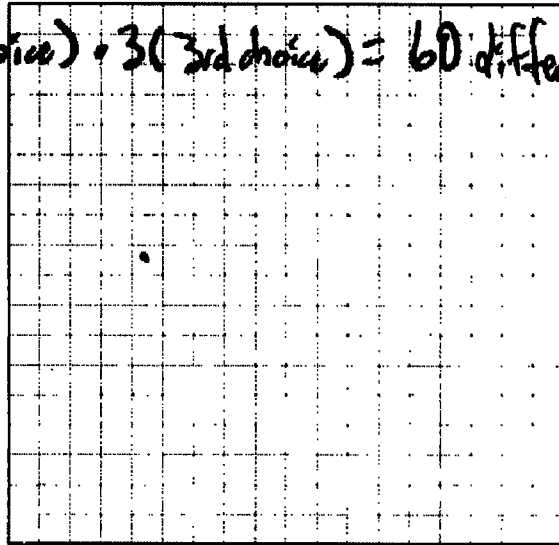
A w t A w h A w r A w c A w b A
w t s w h s w r s w c s w b s

B. He can have thirty different sandwiches.

I took 3 (bread) \cdot 5 (meat) \cdot 2 (cheese) = 30 sandwiches

C. You can choose 3 meats 60 ways.

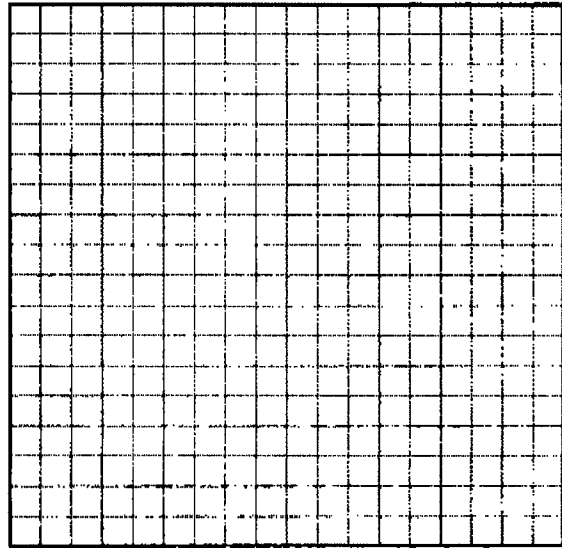
I took 5 (1st choice) \cdot 4 (2nd choice) \cdot 3 (3rd choice) = 60 different ways



Score Point 1

Sample 1

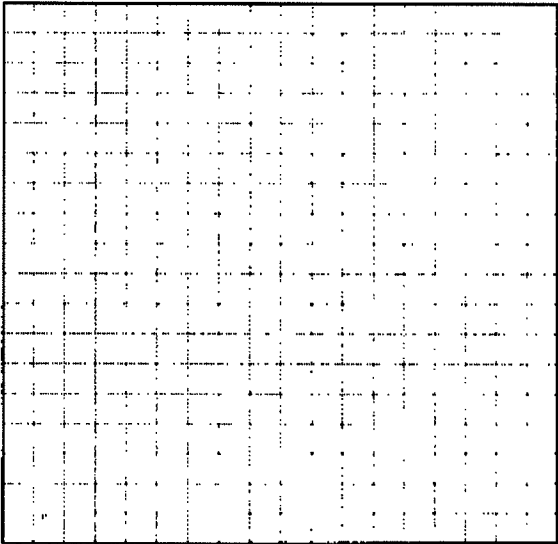
25. A. 10
B. 40
C. 6



Score Point 1

Sample 2

Bread	meat	cheese
W	t	A
W	t	S
W	h	A
W	h	S
W	r	A
W	r	S
W	c	A
W	c	S
W	b	A
W	b	S



Mathematics

Session 3 (No Calculator)

You may NOT use a calculator during this session.

68. Scientists have discovered that the length of a person's tibia (t) provides a good estimate of his or her height (h). For an adult woman, with measurements given in centimeters, the relationship between h and t is given by the model $h = 3t + 62$.
- The length of a woman's tibia is 32 cm. Use the model to estimate her height.
 - A woman is 176 cm tall. Based on the model, how long is her tibia? Show or explain how you found your answer.
 - One woman's tibia is 2 cm longer than another woman's tibia. Based on the model, how much taller would the woman with the longer tibia be? Show or explain how you found your answer.

Scoring Guide

Score	Description
4	5 points
3	4 points OR Correct answers to all three parts.
2	2 or 3 points
1	1 point OR Minimal understanding of evaluating expressions and/or solving linear equations.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.
Blank	No response.

Training Notes

Part a:

- 1 point for correct height [158 (cm)] or correct estimate [within range of 150 – 160 (cm)]

Part b:

- 2 points for correct tibia length [38 (cm)] with explanation or work shown indicating correct strategy
OR
- 1 point for correct answer **or** correct strategy

Part c:

- 2 points for correct answer [6 (cm)] with explanation or work shown indicating correct strategy
OR
- 1 point for correct answer **or** correct strategy

Note: If work is shown, answer is correct only if correct strategy was used.