Teaching the Most Missed Items for the GED® Math Test

How can we help our students better prepare for and be more successful on the GED® Math test? Based on information from the GED® Testing Service, this interactive workshop will identify problem areas students struggle with and provide teaching suggestions to help our students achieve at an even higher level!

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Today's Objectives

At the end of today's workshop, I will be able to:

- Explain skills and knowledge gaps students have in math
- Describe teaching methods to improve students' math understanding
- Access appropriate math instruction resources

Evidence-Based Math Instruction in Action

The instructor has a student, Sam, who works at a small restaurant. Sam has told the class about the tasks he does on his job, so the instructor used that information to provide an activity for the class to explore and expand upon patterns and to connect patterns with rules.

The Problem
Sam has to make 50 hamburgers for the lunch run. Each burger should be a quarter pound (lb.). The ground beef comes in 3.5-lb. packages. He needs to figure out how much ground beef he needs to take out of the freezer to make 50 burgers.

Instructor:

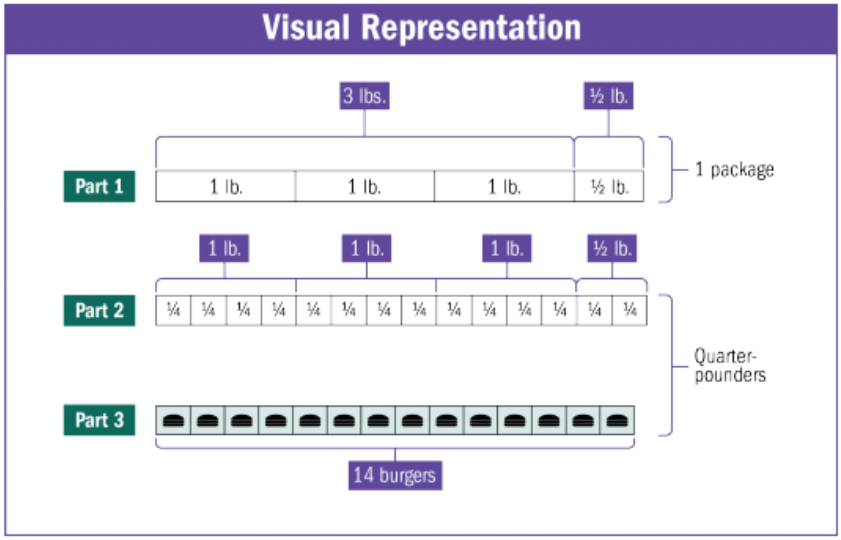
• What exactly are we trying to figure out in this problem? Do we need to find just one answer or multiple answers to solve the problem?

• Is this similar to problems we have worked on before? What approach did we use in those other problems?

• Can you think of ways to represent the information we have in front of us other than using words?

• Can anyone predict what they think a reasonable answer might be? We'll compare that to the final solution later.

The students used a visual strategy, developing the visual representation shown below:



Instructor: What does each part of the diagram represent?

Andrea:

- Part 1 shows that each package contains 3½ lbs. of ground beef.
- In Part 2, it shows that we know each burger has to be ¼ of a pound. And so, each pound can be divided into 4 equal parts that equals ¼ lb. of beef. Here we show the breakdown of each pound. You can get 4 quarter-pound patties out of each pound.
- Finally, in Part 3, by counting them out on the drawing, you can see that each package will make 14 burgers.

Instructor:

- Does anyone have ideas about other ways we could represent this information visually?
- Does it make sense that the number of burgers in a package would be higher than the number of pounds of beef in a package? Why or why not?
- Now that we have this information, do we have the answer to our problem? If not, what do we need to do next?

Andrea:

Next we need to figure out how many packages are needed to make 50 burgers. Let's make a chart to show the ratio of packages to burgers. She designed and populated the chart below:

Packages of Ground Beef	Number of Burgers
1	14
2	28
3	42
4	56

Instructor:

- Based on the chart, how many packages should Sam get out of the freezer? Why?
- Were you surprised that he would need this number of packages? Why or why not?
- Before you started to figure it out, did you think he would need more or less?
- So, the problem was represented in words first, and then with diagrams. What would it look like in symbols?

US Department of Education, 2014

Evidence Based Practices Shown in This Lesson

1. The instructor acted as a _____
2. The instructor taught using questions.

3. The lesson was taught in a _____ context.

4. The instructor never said, you're right or you're _____

5. The instructor taught math from concrete to _____

6. The lesson was primarily visual.

Developing Math Reasoning - UPS ✔ Problem Solving Method

1. Understand the problem

What are you asked to do?

Will a picture or diagram help you understand the problem?

Can you rewrite the problem in your own words?

2. Create a plan

Use a problem-solving strategy:

Guess and check	Solve an easier problem
Make a list	Experiment
Draw a picture or diagram	Act it out
Look for a pattern	Work backwards
Make a table	Change your viewpoint
Use a variable	

3. Solve

Be patient

Be persistent

Try different strategies

4. Check

Does your answer make sense?

Are all the questions answered?

What other ways are there to solve this problem?

What did you learn from solving this problem?

Understand
Plan
Solve
Check

Questions that Develop Math Reasoning

- What does this mean?
- What are you doing here? (Indicating something on student work)
- Tell me where you're getting each of your numbers from here.
- Why did you decide to…?
- I don't understand. Could you show me an example of what you mean?
- So, what are you going to try next?
- What are you thinking about?
- Is there another idea you might try?
- Why did you decide to begin with…?
- Do you have any ideas about how you might figure out…?
- You just wrote down ____. Tell me how you got that.
- What are you doing there with those numbers?
- Do you agree with _____'s answer? Why or why not?
- Is _____ always true, sometimes true, or never true?

Adapted from Hinds, 2012

Notice Wonder

By asking questions like "What do you notice? What do you wonder?" we help our students see problems in big-picture ways. Implement notice/wonder in the classroom by:

1. Display a math problem

2. Display the prompts, "What do you notice?" and then later "What do you wonder?"

3. Give wait time

4. Clarify and record responses

5. Validate and value all ideas

Another excellent technique is to show students a problem and ask them to come up with questions to answer. Albert Einstein said, "If I had an hour to solve a problem and my life depended on it, I would use the first 55 minutes determining the proper question to ask, for once I know the proper question, I could solve the problem in less than five minutes."

Math Anxiety Helps: Expressing Feelings

“An important strand of my teaching philosophy is to deal with emotions, my own and the students’, so they don’t get in the way of the learning . . . it will probably take less than a minute to acknowledge the emotions that come up in the moment; that if you leave it for an hour, it might take two minutes to deal with them; if you leave it until the next day it might take half an hour, and if you leave it for longer, who knows how long it will take?

“How does expressing our feelings help? It helps us keep control of our emotions, helps us identify problems, and helps us maintain clarity in our relationships with other people.

“Saying ‘I’m frustrated’ or ‘I’m mad’ or ‘I’m happy,’ releases the hold the emotion has on you a little, so that you can concentrate on other things, and think and act rather than just emote. Maintaining control over emotions is helpful in the classroom where so many people are working in a public space . . . I’d much rather someone say, ‘I’m really frustrated when I keep getting these questions wrong,’ instead of slamming his books down and stamping out, swearing under his breath, or out loud. Furthermore, a student who can say what is bothering him may be able to go on working, or ask for help, or use some strategy he has for dealing with stress or anger.

“Fight, flight, or freeze. I’ve learned to recognize all these responses by math students, and gone on from there to take it less personally when students attack me or run from me or disengage. I know it’s not so much me they are reacting to, but to the situation itself.

“For some years, I would go around the class, asking, ‘How are you doing? Do you need any help?’ and students would say, ‘Okay,’ or ‘No.’ Usually they kept their work hidden when they answered this way, but often I would find out later that indeed they did need help—they weren’t doing okay at all. Yet they shut me out by saying, ‘I’m okay.’ Why do they lie? Because they are running away from whatever mini-lesson I might give them if they admitted they needed help.

“Sometimes I would invite people to come to see me outside class time to get some extra help, and the answer might be, ‘No thanks, I’ll work with my tutor (or my father or my girlfriend or…’). But I would hear from the tutor that they didn’t show up for a scheduled tutoring session, and I would see no evidence that the alleged sessions with family members bore any fruit. Why would a student invent math learning at some other time? Because they are running away from my math lesson and from panic.

“For a while I took it personally, all this running away, but eventually I learned some tactics for heading it off. I no longer ask, ‘Do you need any help?’ Instead, I say, ‘What question are you working on? What can you tell me about your thinking about that question?’ or ‘You don’t look happy. What’s getting you down?’ The student can still avoid me if he wants to, but I don’t make it easy for him. If the student is not struggling, this technique invites the student to articulate their math thinking” (Nonesuch, 2006).