Today’s Learning Objectives

• Identify similarities and differences between the 2002 and 2014 GED® test for Mathematics

• Explore essential mathematical practices and behaviors

• Discuss beginning strategies for the classroom

• Identify resources that support the transition to the next generation assessment
The 2014 GED® test will . . .

• Align with *college and work expectations*

• Provide *evidence of readiness*

• Provide information about a candidate’s *strengths and areas of developmental need*

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Exploring the Mathematical Reasoning module of the 2014 GED® test
Tools for Content/Context/Comparison
### 2002 Series GED® test

- One test with two parts, one of which allowed use of calculator
- Content
  - 25-30% Number Operations, Number Sense
  - 25-30% Measurement and Geometry
  - 25-30% Data, Statistics, and Probability
  - 25-30% Algebra, Functions and Patterns
- Casio fx260-Solar

### 2014 GED® test

- One test with calculator allowed on most items
- Content
  - 45% - Quantitative Problem Solving
    - Number operations
    - Geometric thinking
  - 55% - Algebraic Problem Solving
- Texas Instruments - TI 30XS
- Integration of mathematical practices
Item Types

2002 Series GED® test

- Item types
  - Multiple choice
  - Gridded response
  - Coordinate plane grid

2014 GED® test

- Technology-Enhanced Items
  - Multiple choice
  - Fill-in-the-blank
  - Hot-spot
  - Drag-and-drop
  - Drop-down
Mathematical Reasoning

- Some items require
  - procedural skill
  - fluency
  - problem solving
- Presented in academic and workforce contexts
- Statistics and data interpretation standards are also included in other tests
# Mathematical Reasoning: Similarities between the 2002 and 2014 Tests

<table>
<thead>
<tr>
<th>2002 GED® test</th>
<th>2014 GED® test</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Represent and use numbers in a variety of forms</td>
<td>• Apply number sense concepts with rational numbers</td>
</tr>
<tr>
<td>• Calculate mentally, on paper, and with a calculator</td>
<td>• Perform operations on rational number</td>
</tr>
<tr>
<td>• Represent, analyze, and apply whole numbers, decimals, fractions, percents in a wide variety of situations.</td>
<td>• Solve multistep, arithmetic, real-world problems with rational numbers, ratios or proportions, percents.</td>
</tr>
<tr>
<td>• Use Pythagorean Theorem</td>
<td>• Use Pythagorean Theorem</td>
</tr>
</tbody>
</table>
Mathematical Reasoning: Similarities between the 2002 and 2014 Tests

<table>
<thead>
<tr>
<th>2002 GED® test</th>
<th>2014 GED® test</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Solve and estimate solutions to problems involving, length, perimeter, area, surface area, volume</td>
<td>• Compute surface area and volume of composite 3-D geometric figures, given formulas as needed</td>
</tr>
<tr>
<td>• Evaluate formulas</td>
<td>• Evaluate linear, polynomial, and rational expressions by substituting integers for unknown quantities</td>
</tr>
</tbody>
</table>
What’s new on the 2014 Mathematical Reasoning Test?

- Identify absolute value of a rational number
- Determine when a numerical expression is undefined
- Factor polynomial expressions
- Solve linear inequalities
- Identify or graph the solution to a one variable linear inequality
- Solve real-world problems involving inequalities
- Write linear inequalities to represent context
- Represent or identify a function in a table or graph
What’s not on the 2014 Mathematical Reasoning Test?

• Select the appropriate operations to solve problems
• Relate basic arithmetic operations to one another
• Use estimation to solve problems and assess the reasonableness of an answer
• Identify and select appropriate units of metric and customary measures
• Read and interpret scales, meters, and gauges
• Compare and contrast different sets of data on the basis of measures of central tendency
• Recognize and use direct and indirect variation
Ms. Nguyen is a real estate agent. One of her clients is considering buying a house in the Silver Lakes area, where 6 houses have recently sold for the following amounts: $160,000; $150,000; $185,000; $180,000; $145,000; $190,000. What should Ms. Nguyen report as the *Median* price of these houses?

1) $160,000  
2) $170,000  
3) $180,000  
4) $190,000  
5) Not enough information is given.

*Note:* Method for determining median provided in the test booklet.
A speech pathologist collects data from 10 people for an experiment. Each person answers 6 questions. The speech pathologist records the number of questions that each person correctly answered and puts each person’s data in the line plot. The median of the data is 3.5, and the mode of the data is 2. Complete the line plot so that the plot matches the pathologist’s data.

Click on the red X and drag it onto the graph as many times as necessary to represent the data.
A scientist is studying red maple tree growth in a state park. She measured the trunk diameter of a sample of trees in the same month every other year and recorded the data for two of the trees.

<table>
<thead>
<tr>
<th>Year</th>
<th>Trunk Diameter (inches)</th>
<th>Year</th>
<th>Trunk Diameter (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>18.6</td>
<td>1</td>
<td>11.4</td>
</tr>
<tr>
<td>3</td>
<td>19.2</td>
<td>3</td>
<td>12.0</td>
</tr>
<tr>
<td>5</td>
<td>19.8</td>
<td>5</td>
<td>12.6</td>
</tr>
<tr>
<td>7</td>
<td>20.4</td>
<td>7</td>
<td>13.2</td>
</tr>
<tr>
<td>9</td>
<td>21.0</td>
<td>9</td>
<td>13.8</td>
</tr>
<tr>
<td>11</td>
<td>21.6</td>
<td>11</td>
<td>14.4</td>
</tr>
<tr>
<td>13</td>
<td>22.2</td>
<td>13</td>
<td>15.0</td>
</tr>
</tbody>
</table>

This is the final year in which she will collect data. When her data collection is complete, she will predict future red maple tree growth.

In year 13, the scientist wants to put tree wrap around the trunk to protect it from winter snow. The height of the tree is 45 inches. The wrap is priced by the square foot. To the nearest square foot, how many square feet of wrap does she need?

- A. 22
- B. 44
- C. 121
- D. 261
Formula Sheet

2014 GED® Test Mathematics Formula Sheet

Area of a:
- parallelogram \( A = bh \)
- trapezoid \( A = \frac{1}{2}h(b_1 + b_2) \)

Surface Area and Volume of a:
- rectangular/right prism \( SA = ph + 2B \), \( V = Bh \)
- cylinder \( SA = 2\pi rh + 2\pi r^2 \), \( V = \pi r^2h \)
- pyramid \( SA = \frac{1}{2}ps + B \), \( V = \frac{1}{3}Bh \)
- cone \( SA = \pi rs + \pi r^2 \), \( V = \frac{1}{3}\pi r^2h \)
- sphere \( SA = 4\pi r^2 \), \( V = \frac{4}{3}\pi r^3 \)

Algebra
- slope of a line \( m = \frac{Y_2 - Y_1}{X_2 - X_1} \)
- slope-intercept form of the equation of a line \( y = mx + b \)
- point-slope form of the equation of a line \( y - Y_1 = m(x - X_1) \)
- standard form of a quadratic equation \( y = ax^2 + bx + c \)
- quadratic formula \( x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \)
- Pythagorean Theorem \( a^2 + b^2 = c^2 \)
- simple interest \( I = prt \)

Foundational Formulas
- Area
  - Square
  - Rectangle
- Perimeter
- Circumference
- Measures of Central Tendency
- Distance
- Total Cost

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## Calculator

### Calculator Reference

#### Percentages

To calculate with percentages, enter the number, then $\text{2nd} \quad \%$.

**EXAMPLE**

40% × 560 =

| 4 | 0 | 2nd | 5 | 6 | 0 | enter |

The correct answer = 224

#### Scientific Notation

To perform calculations with scientific notation, use the $\times 10^n$ key.

**EXAMPLE**

7.8 × $10^8$ – 1.5 × $10^8$ =

| 7 | . | 8 | 8 | 8 | 1 | 5 | 8 | enter |

The correct answer = 630000000

#### Fractions

To perform calculations with fractions, use the $\text{frac} \quad \text{a} \quad \text{b}$ key. The answer will automatically be formatted in reduced form.

**EXAMPLE**

$\frac{2}{3} \times \frac{3}{7}$ =

| 2 | 9 | 3 | 7 | enter |
Mathematical Practices: behaviors that are essential to the mastery of mathematical content
Mathematical Practices

• Practices
  – Building solution pathways and lines of reasoning
  – Abstracting problems
  – Furthering lines of reasoning
  – Mathematical fluency
  – Evaluating reasoning and solution pathways

• Most practices are not specific to any one particular area of mathematics content
Solution Pathways = Problem Solving

Polya’s Four Steps to Problem Solving

1. Understand the problem
2. Devise a plan
3. Carry out the plan
4. Look back (reflect)

Teaching of mathematics requires
- the use of the language of mathematics
- a concrete-to-representational-to-abstract sequence of instruction to ensure conceptual understanding
- a recognition that students must have mathematical fluency in basic operations

It’s not just about teaching how, but rather why!
A Review of the Research
Algebraic Thinking in Adult Education
Algebraic Thinking in Adult Education

- Create opportunities for algebraic thinking as a part of regular instruction
- Integrate elements of algebraic thinking into arithmetic instruction
  - Acquiring symbolic language
  - Recognizing patterns and making generalizations
- Reorganize formal algebra instruction to emphasize its applications

Adapted from National Institute for Literacy, *Algebraic Thinking in Adult Education*, Washington, DC 20006

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The Challenge Ahead!

• Move past basic arithmetic instruction
• Increase instruction in problem solving strategies
• Increase emphasis on geometric and algebraic thinking
• Provide instruction in higher order mathematics
• Shift focus from “rules or processes” of mathematics to deeper understanding of “why”
A Few Strategies to Get Started

- Model, explain, and provide guided assistance, but move towards self-regulation.
- Provide opportunities for algebraic thinking.
- Keep it real – demonstrate how skills/concepts are used in real-world situations.
- Teach often to the whole class, in small groups, and with individual students.
- Set high expectations.

strategy
(strā't-e-jē) n.
1. Plan of action designed to achieve a particular goal.
GEDTS Resources

http://www.gedtestingservice.com/
Questions, insights, suggestions
We appreciate your participation!