



INSTITUTE FOR THE PROFESSIONAL
DEVELOPMENT OF ADULT EDUCATORS

CALCULATOR-PROHIBITED INDICATORS

Part 2

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Facilitator



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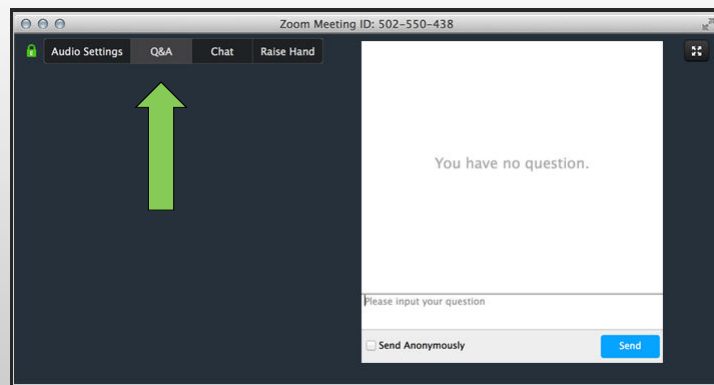
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- I. Housekeeping Reminders
- II. Objectives
- III. Q2 Indicators (Q.2)
 - Operations on Rational Numbers
 - Squares and Square Roots of Positive Rational Numbers
 - Cubes and Cube Roots of Rational Numbers
 - Undefined Value Over the Set of Real Numbers
- IV. The IPDAE Website
- V. Summary
- VI. Evaluation



- If you have question, please type it into the **Q&A** option.



- Attendee microphones will be muted. You will be in **listen only** mode.
- Today's presentation is being **recorded** and it will be archived and available on the IPDAE website within 48 hours.

At the end of this webinar, participants are expected to:

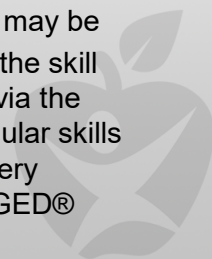
- Increase students' performance by incorporating the Test-Taker Recommendations for Calculator-Prohibited Indicators in daily classroom instruction.
- Review pertinent math concepts and skills tested on the non-calculator section of the GED Math Module through sample problems.
- Discuss best practices and explore resources that will help in developing lessons when covering GED's calculator-prohibited indicators.



Q.2.a. Perform addition, subtraction, multiplication, and division on rational numbers.

This indicator involves pure computation (items contain no context, just computation only).

Calculations may involve one or more operations, and items may require calculation with integers, decimals, and/or fractions (including mixed numbers), all of which may be positive or negative. This indicator also includes the skill known as order of operations (frequently taught via the acronym PEMDAS). This is a wide range of granular skills (e.g., multiply integers, add fractions) and not every individual skill is assessed on every form of the GED® Mathematical Reasoning test.



Recommendations for Test-Takers:

Be able to

- Multiply and divide with decimals, and
- Compute
 - with fractions
 - using order of operations
 - with mixed numbers
 - with negative numbers



Sample Problems:

- Solve: $\frac{3(4-5^2)}{6} - 6 =$
- Solve: $-2\left(2 - \frac{3}{4}\right) + 3^0 =$
- Solve: $3\left(\frac{1}{2}\right) \div 3\frac{1}{2} =$



Q.2.b. Perform computations and write numerical expressions with squares and square roots of positive, rational numbers.

This indicator tests one or more of a number of skills, all involving numerical squares or square roots (without the use of variables).

Skills that test takers can expect to encounter include

- squaring a number,
- taking the root of a perfect square,
- simplifying and computing with non-perfect square roots, and
- computing with squares, roots, and other rational numbers in combination.

While test takers do fairly well with simple squares and square roots, there is a sharp drop-off in performance on items involving additional or more complex computations.

Recommendations for Test-Takers:

- Memorize the first 12 perfect squares (1, 4, 9, ..., 144),
- Understand the inverse relationship between pairs of squares and square roots; i.e., $12^2 = 144$ and $\sqrt{144} = 12$.
- Understand the difference in squaring a negative number, such as $(-3)^2 = 9$, and the negative of a square number, such as $-(3)^2 = -9$.
- Practice computing with squares and square roots that include fractions and decimals.
- Strengthen skills at simplifying, and computing with, non-perfect square roots (e.g., $\sqrt{12} = 2\sqrt{3}$).



Sample Problems:

Find

- $\sqrt{9} =$

- $\sqrt{24} =$

- $-4^2 =$

- $4^{\frac{3}{2}} =$

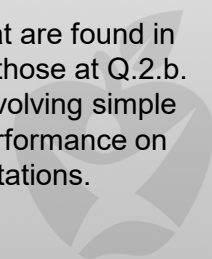
- $\left(-\frac{3}{4}\right)^2 =$



Q.2.c. Perform computations and write numerical expressions with cubes and cube roots of rational numbers.

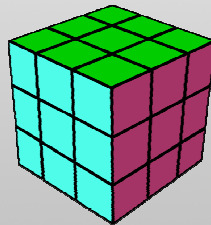
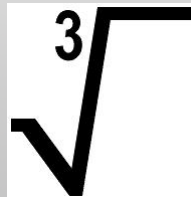
This indicator is quite similar to Q.2.b, with the difference being the degree—cubes and cube roots instead of squares and square roots.

Beyond that difference, the type of calculations that are found in items at this indicator are essentially the same as those at Q.2.b. As with Q.2.b, test takers do fairly well on items involving simple cubes and cube roots, with a similar drop-off in performance on items involving additional or more complex computations.



Recommendations for Test-Takers:

- Memorize the first 6 perfect cubes (1, 8, 27, ..., 216).
- Perform/understand the recommendations for Q.2.b but with cubes rather than squares, noting that there is no difference between the cube of a negative and the negative of a cube, e.g., $(-3)^2 = -3^3 = -27$.



Sample Problems:

- Find 6^3 .
- Find $(-4)^3$.
- Find $\sqrt[3]{8}$.
- Find $\sqrt[3]{16}$. Express your answer in simplest radical form.
- Find $(-8)^{\frac{2}{3}}$.

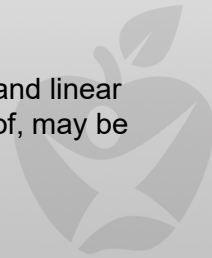


Q.2.d. Determine when a numerical expression is undefined.

This indicator covers expressions that are undefined over the set of real numbers.

There are two types of such expression — fractions with zero in the denominator (or an expression equivalent to zero); and square roots of negative numbers (or expressions which, when simplified, result in negative numbers).

In both types of expression, the use of variables and linear expressions, and the substitution of values thereof, may be required.



Recommendations for Test-Takers:

Reinforce skills on questions involving

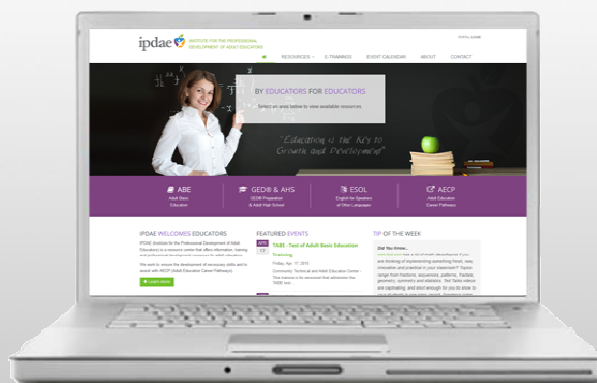
- Zero in the denominator
- Fractions with expressions equivalent to zero in the denominator
- Square roots of negative numbers
- Expressions which, when simplified, result in square roots of negative numbers
- Substitution with linear expressions

$$\frac{\#}{0} \div \frac{\#}{\#}, \frac{\#}{\#} \div \frac{0}{\#}, \frac{\#}{\#} \div \frac{\#}{0}$$



Sample Problems:

- Solve $\frac{-3}{(8-2^3)}$ over the set of real numbers.
- Solve $\sqrt{2^3 - 3^2}$ over the set of real numbers.
- Evaluate $\sqrt{x - 3x}$ over the set of real numbers if $x = 1$.
- Evaluate $\frac{x}{x^2-9}$ over the set of real numbers if $x = -3$.



In this webinar, participants:

- Explored on incorporating Test-Taker Recommendations for Calculator-Prohibited Indicators in daily classroom instruction.
- Reviewed pertinent math concepts and skills tested on the non-calculator section of the GED Math Module through sample problems.
- Discussed best practices and explored resources that will help in developing lessons when covering GED's calculator-prohibited indicators.



Webinar Evaluation

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