



Tenacity Challenge Math Quiz Bowl Subject Matter Concepts and Instructions

Subject Matter Concepts:

Math questions for the quiz bowl will be organized into four conceptual categories based on the SAT: The Heart of Algebra, Problem Solving and Data Analysis, the Passport to Advanced Math, and Additional Topics.

[Full length practice tests can be found at the College Board.](#)

Questions will be drawn *primarily* from the subject matter concepts listed below. **However, some questions may drawn be from outside of the subject matter concepts, but this not our intent.**

Some questions will be multiple choice and others you will need to determine the final answer yourself. In 60 minutes and approximately 20 questions, it will be impossible to ask questions about every topic below.

[The Heart of Algebra \[click this link\]¹](#): A focus on linear equations and systems of equations.

1. Create, solve, or interpret a linear expression or equation in one variable.
2. Create, solve, or interpret linear inequalities in one variable.
3. Build a linear function that models a linear relationship between two quantities.
4. (+)Create, solve, and interpret systems of linear inequalities in two variables.
5. Create, solve, and interpret systems of two linear equations in two variables.
6. Algebraically solve linear equations (or inequalities) in one variable.
7. Algebraically solve systems of two linear equations in two variables.
8. Interpret the variables and constants in expressions for linear functions within the context presented.
9. Understand connections between algebraic and graphical representations.

[Problem Solving and Data Analysis](#): A focus on quantitative literacy.

1. Use ratios, rates, proportional relationships, and scale drawings to solve single- and multistep problems.
2. Solve single- and multi step problems involving percentages.
3. Solve single- and multi step problems involving measurement quantities, units, and unit conversion.
4. Given a scatter plot, use linear, quadratic, or exponential models to describe how the variables are related.
5. Use the relationship between two variables to investigate key features of the graph.
6. Compare linear growth with exponential growth.
7. Use two-way tables to summarize categorical data and relative frequencies, and calculate conditional probability.

¹ These standards are taken verbatim from the College Board.

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8. (+) Make inferences about population parameters based on sample data.
9. Use statistics to investigate measures of center of data and analyze shape, center, and spread.
10. (+) Evaluate reports to make inferences, justify conclusions, and determine appropriateness of data collection methods.

Passport to Advanced Math: Work with complex equations

1. Create a quadratic or exponential function
2. (+) Determine the most suitable form of an expression
3. Create equivalent expressions involving rational exponents
4. Create an equivalent form of an algebraic expression
5. Solve a quadratic equation
6. Add, subtract, and multiply polynomial expressions
7. Solve an equation in one variable that contains radicals or contains the variable in the denominator of a fraction.
8. Solve a system of one linear equation and one quadratic equation.
9. Rewrite simple rational expressions.
10. (+) Interpret parts of nonlinear expressions in terms of their context.
11. Understand the relationship between zeros and factors of polynomials,
12. (+) Understand a nonlinear relationship between two variables
13. Use function notation, and interpret statements using function notation.
14. Use structure to isolate or identify a quantity of interest

Additional Topics: Geometric and trigonometric concepts

1. Solve problems using volume formulas.
2. Use trigonometric ratios and the Pythagorean theorem.
3. Add, subtract, multiply, divide, and simplify complex numbers.
4. (+) Convert between degrees and radians and use radians to determine arc lengths; use trigonometric functions of radian measure.
5. Apply theorems about circles to find arc lengths, angle measures, chord lengths, and areas of sectors.
6. Use concepts and theorems about congruence and similarity to solve problems about lines, angles, and triangles.
7. (+) Use the relationship between similarity, right triangles, and trigonometric ratios; use the relationship between sine and cosine of complementary angles.
8. Create or use an equation in two variables to solve a problem about a circle in the coordinate plane.

(+) Will not be covered in Quiz Bowl.

Please note: all four categories have links to the College Board for more information.

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Instructions:

Team Formation

Math quiz bowl teams will consist of three members. The team determines the division of responsibilities.

Materials

- The use of scientific calculators will be permitted. You may bring your own scientific calculator and we will also have at least one (1) scientific calculator available per team, if needed.
- There may be questions that calculators are not permitted.
- No cell phones or electronic devices will be permitted on the competition floor. Possession of a cell phone or electronic device may result in disqualification.
- Teams will be provided with answer sheets and scrap paper for calculations. Teams are only allowed to bring pencils or pens and calculators.
- Teams will be provided standard MCAS math formula sheets for reference purposes as well as the SAT formula sheet.

Event Procedures

- All teams will compete at the same time and will have an equal opportunity to answer all questions.
- The moderator will read the question. After the question is read, teams will have a designated amount of time to answer each question. Times will vary depending on the difficulty of the question and the amount of calculation required.
- Questions will be classified into three difficulty levels, which will have a corresponding time range for answering questions and a corresponding point value. Incorrect answers or unanswered questions are awarded 0 points.

Question Level	Difficulty	Time	Points
I	Least Difficult	½ to 1 minute	2.5
II	Moderate Difficulty	1½ – 2 minutes	5
III	Most Difficult	2 ½ to 3 minutes	10

- Questions will be in either multiple choice or open response format.
- Questions will be projected on a screen as well as read by the moderator.
- When a question is read, a timekeeper will start the time. When the time limit is reached, the timekeeper will announce that time is up. The timekeeper will announce when 15 seconds remain verbally, with a chime, an audible tone, or by ringing a bell.

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- When time is announced, team members are to immediately place their writing utensils down. Failure to place utensils down will result in response being scored a 0.
- Team responses must be written on a designated device or form, which will be either a white board or answer sheet.
- Each team will be assigned a judge that will record responses to each question and submit team scores to the scorekeeper after each question.
- A maximum of 20 questions will be asked. However, time will be limited to at most 60 minutes. In the event that the maximum time for the event is reached, the competition will conclude and team scores at that time will become final. If the maximum time limit is reached while the moderator is reading a question or while teams are in the process of answering a question, teams will be allowed to finish answering. The responses will be scored, and the event will conclude after scores for that question are submitted.
- The team with the highest cumulative point total will be declared the winner of the competition.

Tie Breaker

In the event of a tie for first place, teams will participate in an elimination-style tie breaker. Unlike the quiz bowl, the tie-breaker will utilize buzzers.

- The moderator will read the question. The first team to signal will have the opportunity to answer the question.
- If a team answers incorrectly, the next fastest team will have the opportunity to answer the question.
- If a team member signals before a question is read completely, the moderator will stop reading the question, and the team must answer.
- Teams will have 3 seconds to answer the question after they have signaled.
- A total of five questions will be asked. The team with the highest score after five questions are asked will be declared the winner.
- In the event of a tie, there will be a sudden death round. The first team to answer a question correctly wins.
- If there are multiple teams tied for first place that cannot be accommodated in one tie-breaker round. Teams will be grouped into heats. The winner of each heat will compete against the winner of the other heats until an overall winner is determined.