Mathematics & the PSAT

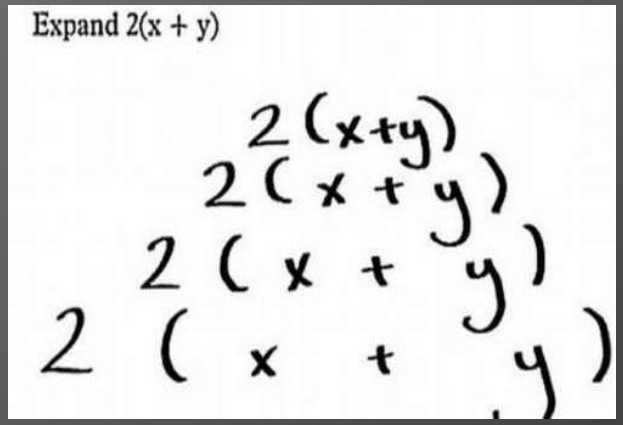
Mathematics

- 2 Sections – 25 minutes each
- Section 2
  - 20 multiple-choice questions
- Section 4
  - 8 multiple-choice PLUS 10 grid-in questions
- Calculators are permitted - BUT
  - You must think and set up problem first!
  - NO problems require the use of a calculator

Calculators

- No PSAT problem requires tedious calculations, but if you need to use the calculator **then just use it**. Don't waste time trying not to.
- A scientific or graphing calculator is recommended.
- Know how to clear your calculator's memory.
- Bring a familiar calculator, for test day is not the time to figure out how to use a new calculator.

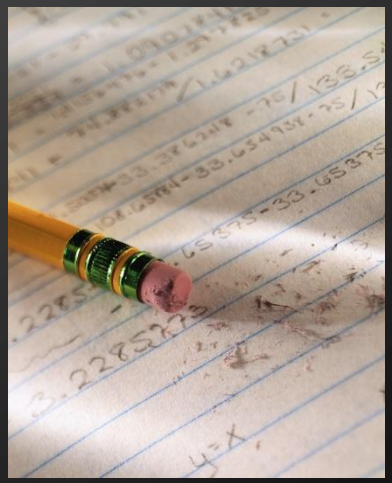
Mathematics

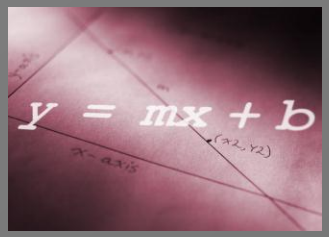


- Know the basic content
  - Basic Arithmetic
  - Basic Algebra
  - Basic Geometry
- Be familiar with PSAT-style math problems
  - *Take the practice test!*
- Know how to complete grid-in questions
- Have a plan
  - Know the Order of Difficulty
  - Pace yourself to get max points in time limit

Numbers & Operations (20-25%)

- **Basic Arithmetic**
- **Word Problems!**
- **Math Vocabulary**
- Even, odd, prime numbers, digits, integers
- Percent, ratio, proportion, fractions, divisibility
- Greatest common factor, least common multiple
- Rational numbers, sequences, series
- Sets – union, intersection, elements

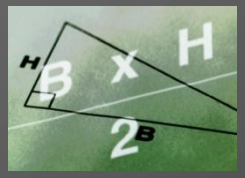




Algebra & Functions (35-40%)

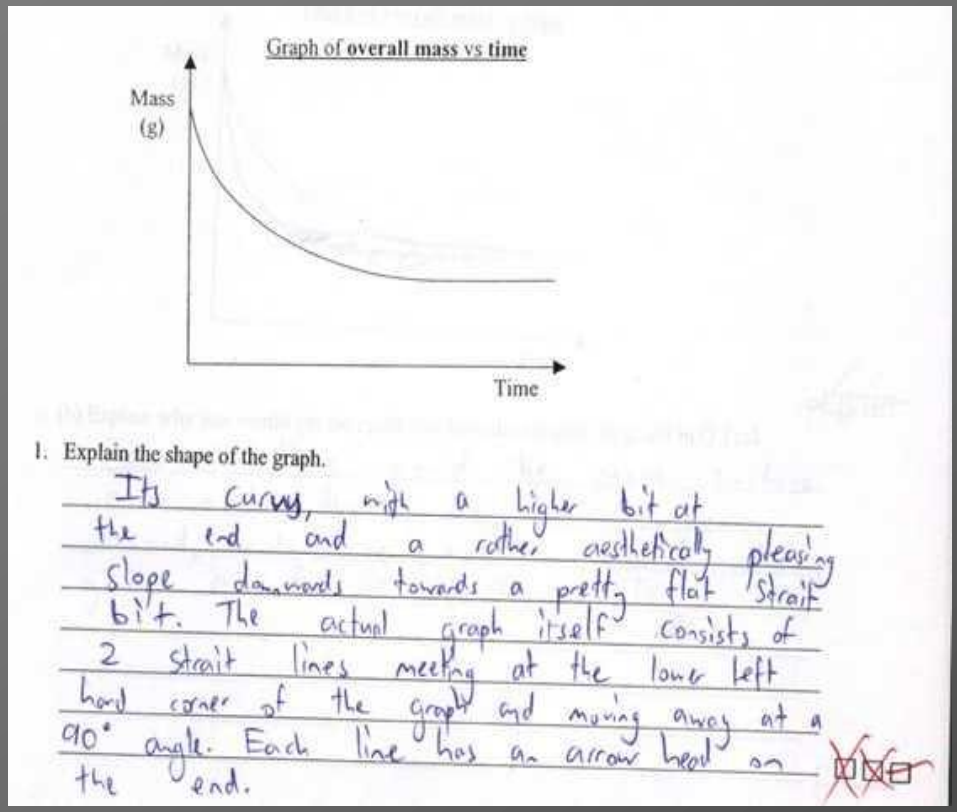
- Simplify algebraic expressions
- Properties of exponents, absolute value
- Algebraic word problems
- Linear equations & inequalities
- Systems of equations & inequalities
- Quadratic equations
- Rational & radical equations
- Equations of lines
- Newly defined symbols based on commonly used operations

Geometry (25-30%)



- **Be familiar with FORMULAS** (even though they're given)
- **Geometry terms** - line, angle, point, congruent, complementary, supplementary, corresponding, etc.
- Parallel & perpendicular lines
- Similarity, transformations
- Area & perimeter of a polygon
- Area & circumference of a circle
- Volume of a box, cube, cylinder
- Triangles – Pythagorean Theorem, properties of isosceles, equilateral & right triangles
- Coordinate geometry, Slope

Data Analysis, Probability (10-15%)



1. Explain the shape of the graph.

It's curvy, with a higher bit at the end and a rather aesthetically pleasing slope downwards towards a pretty flat straight bit. The actual graph itself consists of 2 straight lines meeting at the lower left hand corner of the graph and moving away at a 90° angle. Each line has an arrow head on the end.

- Data interpretation
  - Tables
  - Graphs
- Statistics
  - Average
  - Mean, median, mode
- Probability

Math Section – Multiple Choice

- If you need to “backsolve” (plug in an answer choice to solve), then begin with choice C.
- If choice C doesn’t work, you should know whether you need to test a larger number or a smaller one.
- This eliminates 2-3 choices! If choice C is too small, a larger number is needed and A and B are out. If choice C is too large, a smaller number is needed and D and E are omitted.

Example of Backsolving

If the average (arithmetic mean) of 5, 6, 7, and *x* is 10, what is the value of *x*?

(A) 8

(B) 13

(C) 18

(D) 22

(E) 28

-Plug in 18 for x and calculate average.

$$\frac{5 + 6 + 7 + 18}{4} = \frac{36}{4} = 9$$

-9 is too small, so x must be larger than 18

Math Section – Multiple Choice

- Replace variables with easy to use numbers, then solve. Be sure the easy to use numbers are appropriate to the context of the math problem. (For example, if it's a problem with percents, use hundreds.)
- Then, look at the choices to see if one matches.

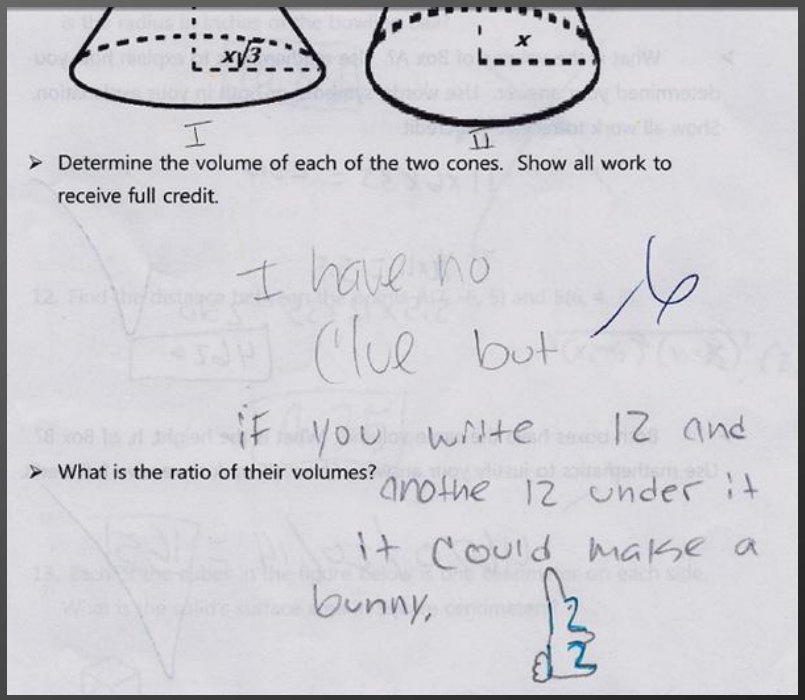
Let's try it!

If n is an odd integer, which of the following must be an odd integer?

(A) $n - 1$
(B) $n + 1$
(C) $2n$
(D) $3n + 1$
(E) $4n + 1$

Math Section – Multiple Choice

- For geometry problems, if a figure is not provided then draw one.
- Pay attention if the diagram is drawn to scale or not!
  - If it's drawn to scale, it may help you eliminate answer choices (i.e. bond angles)
  - If it's **not** drawn to scale, then redraw it to scale.



Let's try it!

ABCD is a quadrilateral such that AB = BC, AD = 1/2CD, and AD = 1/4AB. If BC = 12, what is the perimeter of ABCD?

(A) 33

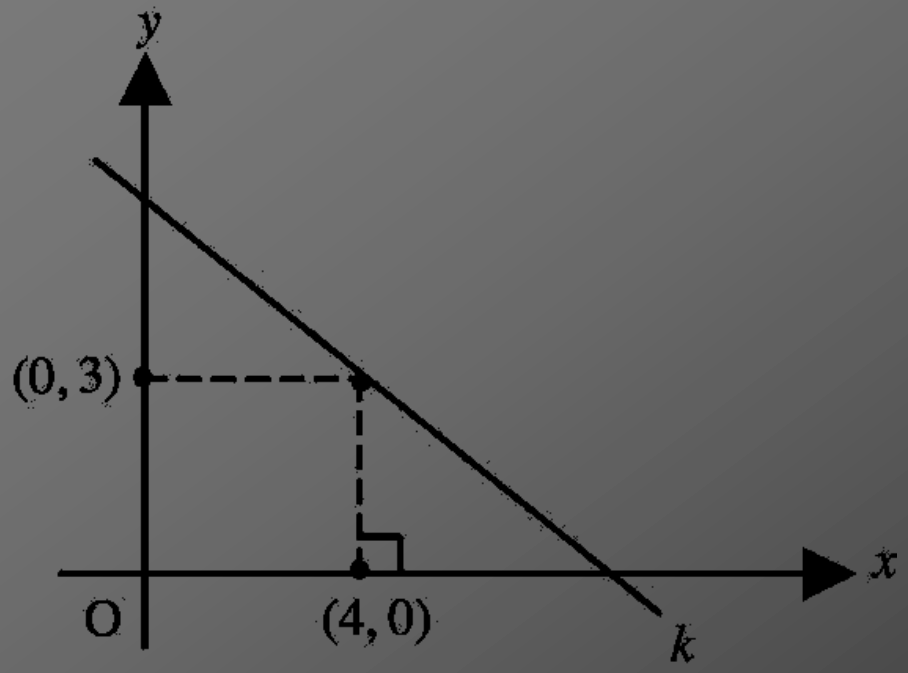
(B) 36

(C) 40

(D) 42

(E) 44

Let's try it!



Note: Figure not drawn to scale

In the figure, if line *k* has a slope of -1, what is the *y*-intercept of *k*?

(A)	6
(B)	7
(C)	8
(D)	9
(E)	10

Math Section – Multiple Choice

- If you get stuck on a math problem, don't give up! You may be able to still eliminate absurd choices and make an educated guess. For example:
  - the answer is supposed to be positive, but some choices are negative;
  - the answer is supposed to be even, but some choices are odd;
  - a ratio has to be less than 1, but some choices are greater than or equal to 1.

Let's try it!

If 50% of *x* is 20, what is 10% of *x*?

(A) 4

(B) 16

(C) 20

(D) 40

(E) 80

If 50% of x is 20, then 10% of the same number HAS to be less than 20. If it's a 40%, then only being 4 less just doesn't make sense. One should be able to easily determine that 4 is the only answer that makes sense.

Math Section – Multiple Choice

- For problems involving strange symbols such as ⊕, ☺, or ✠ just do what the corresponding directions tell you to do to solve.

If ☺ is defined for all positive numbers a and b by a ☺ b = $ab/(a+b)$, then 10 ☺ 2 =

(A) 5/3

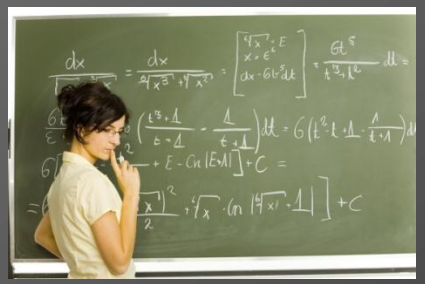
(B) 5/2

(C) 5

(D) 20/3

(E) 20

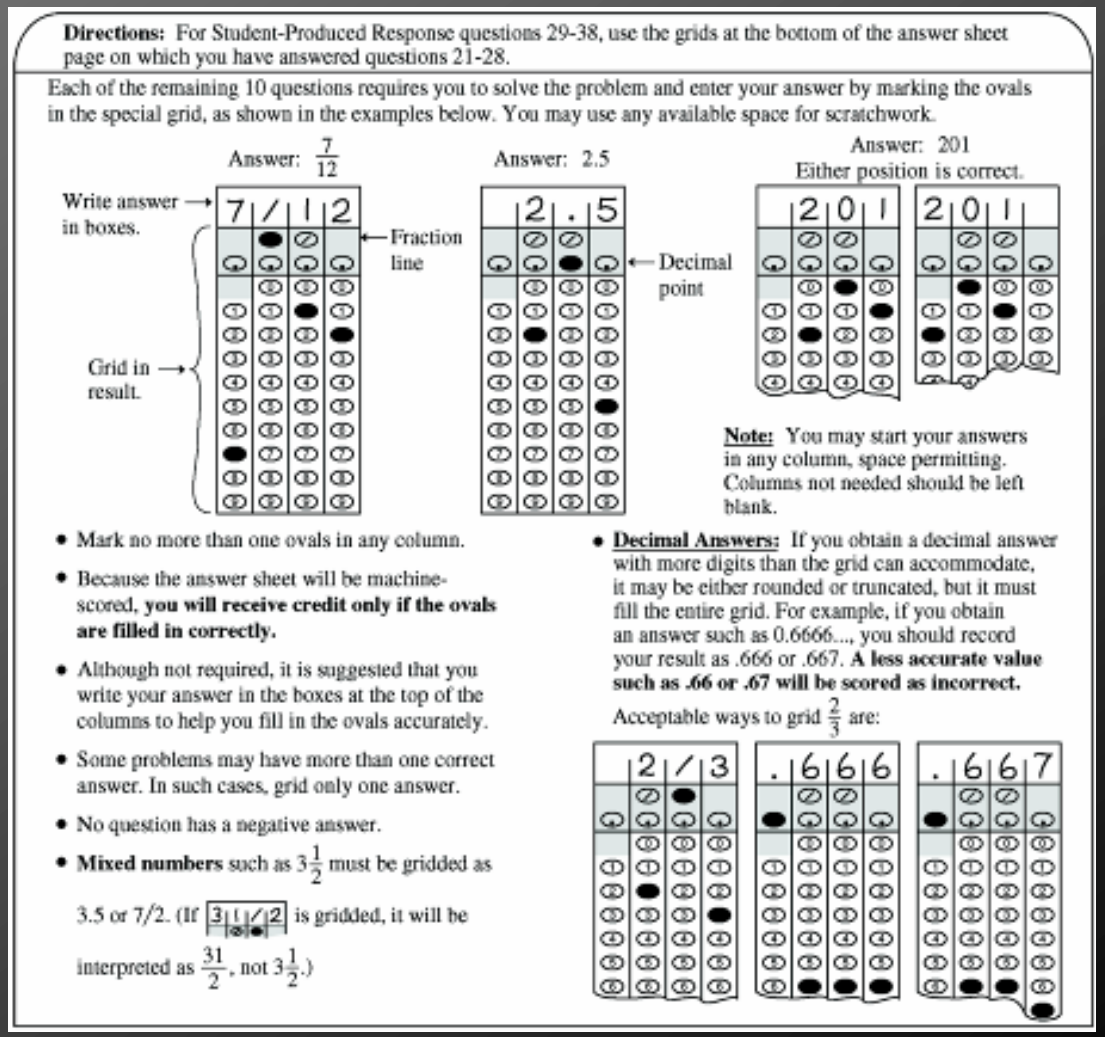
Section 4 – Math Grid-ins



- ***Learn the gridding rules!***
- Mark only ONE circle per column
- Write answers in boxes at top of columns to help you fill in circles accurately.
- Machine-scored
  - You only receive credit for answers in grid circles. *Answers in boxes will not be scored.*
  - Fill in circles completely and darkly
  - Erase completely.
  - Be sure no other marks get on the answer sheet. *(transfer from notes in test booklet, etc.)*

Math Section
Know the Student-Produced Response Directions

- Read and understand the directions ahead of time.
- IMPORTANT: The correct answer must be ***gridded*** correctly to receive credit. What is written in the boxes cannot be scored.



Directions: For Student-Produced Response questions 29-38, use the grids at the bottom of the answer sheet page on which you have answered questions 21-28.

Each of the remaining 10 questions requires you to solve the problem and enter your answer by marking the ovals in the special grid, as shown in the examples below. You may use any available space for scratchwork.

Answer: $\frac{7}{12}$ — Write answer in boxes. — Fraction line — Grid in result.

Answer: 2.5 — Decimal point

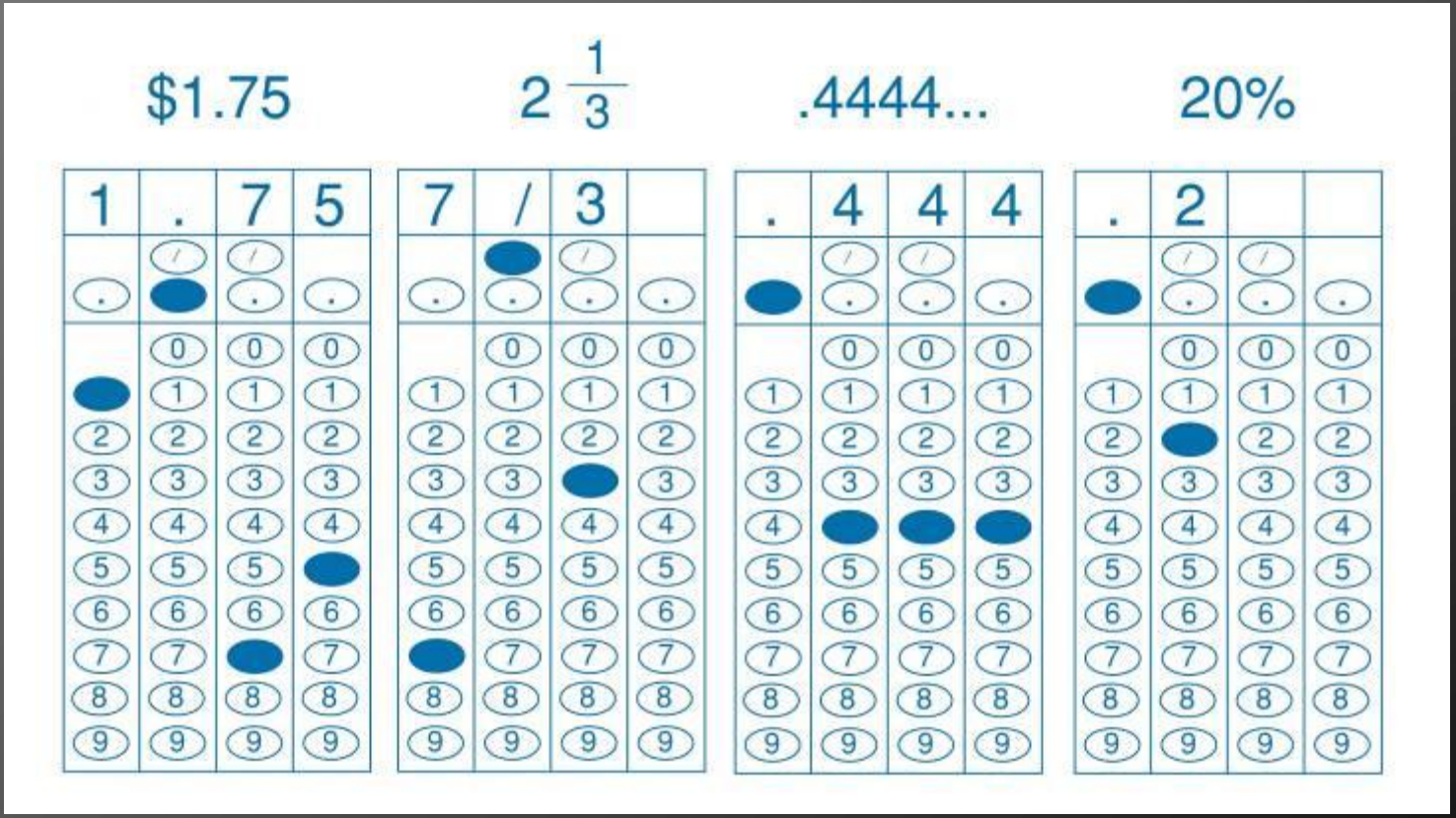
Answer: 201 — Either position is correct.

Note: You may start your answers in any column, space permitting. Columns not needed should be left blank.

- Mark no more than one ovals in any column.
- Because the answer sheet will be machine-scored, **you will receive credit only if the ovals are filled in correctly.**
- Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the ovals accurately.
- Some problems may have more than one correct answer. In such cases, grid only one answer.
- No question has a negative answer.
- **Mixed numbers** such as $3\frac{1}{2}$ must be gridded as 3.5 or 7/2. (If 3 1/2 is gridded, it will be interpreted as $\frac{31}{2}$, not $3\frac{1}{2}$.)
- **Decimal Answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid. For example, if you obtain an answer such as 0.6666..., you should record your result as .666 or .667. **A less accurate value such as .66 or .67 will be scored as incorrect.**

Acceptable ways to grid $\frac{2}{3}$ are: 2/3, .666, .667

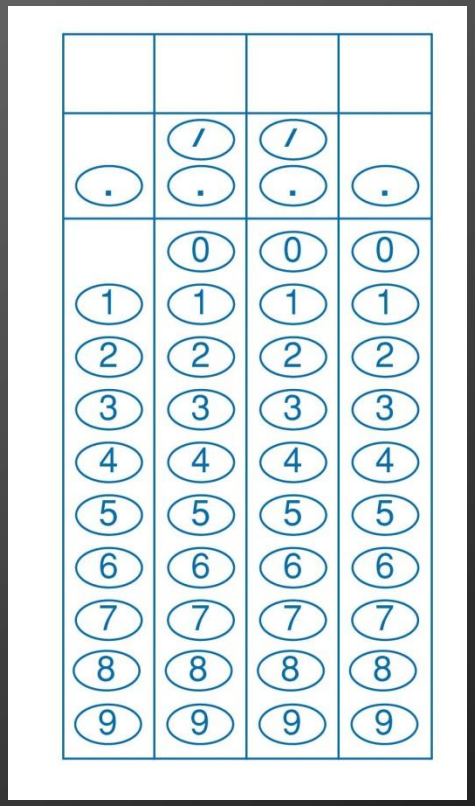
Math Section
Student-Produced Response Practice Grids



Math Section
Student-Produced Response

If $\frac{h}{4} + \frac{1}{3} = \frac{5h}{6}$

what is the value of h?

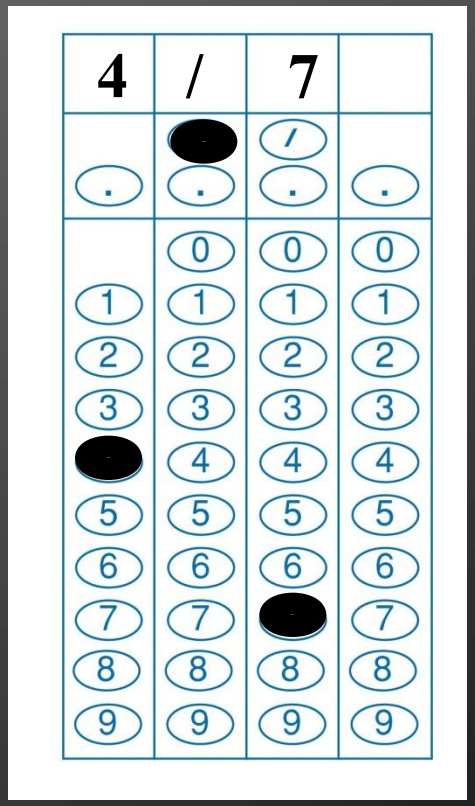


Math Section
Student-Produced Response

If $\frac{h}{4} + \frac{1}{3} = \frac{5h}{6}$

what is the value of *h*?

- Convert fractions to common denominator of 12 to get 3h + 4 = 10h
- Subtract 3h from both sides to get 7h = 4
- Divide by 7
- h = 4/7.



Tips for “grid-in” questions

- Be sure to use the slash mark to indicate a fraction bar
- It is not necessary to reduce fractions to their lowest terms if the answer will fit in the grid
- Answers can be entered as either a fraction or a decimal where appropriate
- Enter a mixed number as either an improper fraction or a decimal
- Some questions can have more than one answer; grid any one of the correct answers.
- Answers can be only positive numbers and zero.

Tips for “grid-in” questions

- All correct answers will be given credit
- ***Remember: 0 points are deducted for incorrect answers in this section***