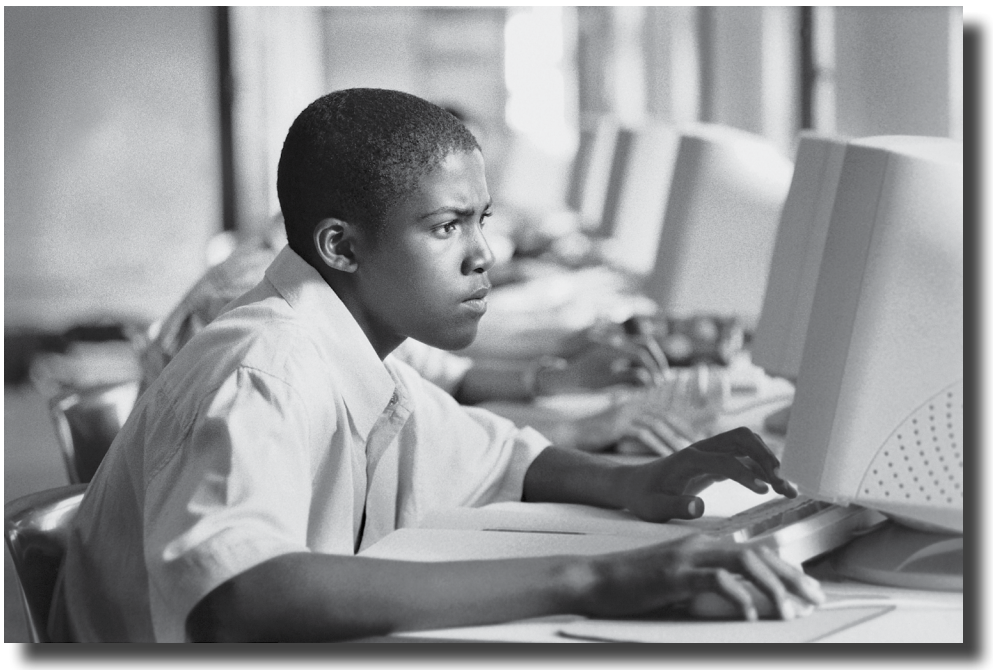
pennsylvania
DEPARTMENT OF EDUCATION

The Pennsylvania System of School Assessment

Mathematics
Item and Scoring Sampler



2018–2019
Grade 7

Pennsylvania Department of Education Bureau of Curriculum, Assessment and Instruction—September 2018

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INTRODUCTION

General Introduction

The Pennsylvania Department of Education (PDE) provides districts and schools with tools to assist in delivering focused instructional programs aligned with the Pennsylvania Core Standards (PCS). These tools include Academic Standards, Assessment Anchor documents, assessment handbooks, and content-based item and scoring samplers. This Item and Scoring Sampler is a useful tool for Pennsylvania educators in preparing local instructional programs. It can also be useful in preparing students for the statewide assessment.

This Item and Scoring Sampler is available in Braille format. For more information regarding Braille call (717) 901-2238.

Pennsylvania Core Standards (PCS)

This sampler contains examples of test questions designed to assess the Pennsylvania Assessment Anchors and Eligible Content aligned to the Pennsylvania Core Standards. The Mathematics, Reading, and Writing PSSA transitioned to PCS-based operational Mathematics and English Language Arts assessments starting with the spring 2015 PSSA administration.

The 2013 PCS-aligned Assessment Anchor and Eligible Content documents are posted on this portal:

- *www.education.pa.gov* [Roll over 'DATA AND REPORTING' in the dark blue bar across the top of the page. Select 'ASSESSMENT AND ACCOUNTABILITY.' Click on the link that reads 'Pennsylvania System of School Assessment (PSSA).' Then click on 'Assessment Anchors/Eligible Content.']

What Is Included

This sampler contains test questions (items) that have been written to align to the Assessment Anchors that are based on the Pennsylvania Core Standards (PCS). The test questions provide an idea of the types of items that will appear on an operational, PCS-based PSSA. Each sample test question has been through a rigorous review process to ensure alignment with the Assessment Anchors.

Purpose and Uses

The items in this sampler may be used as examples for creating assessment items at the classroom level, and they may also be copied and used as part of a local instructional program.[1] Classroom teachers may find it beneficial to have students respond to the open-ended item in this sampler. Educators can then use the sampler as a guide to score the responses either independently or together with colleagues within a school or district.

Item Format and Scoring Guidelines

The multiple-choice (MC) items have four answer choices. Each correct response to an MC item is worth one point.

Each open-ended (OE) item is designed to take approximately ten to fifteen minutes to complete. During the administration of the PSSA, students are given additional time as necessary to complete the test items. Each OE item in mathematics is scored using an item-specific scoring guideline based on a 0–4-point scale. In this sampler, every item-specific scoring guideline is combined with examples of student responses that represent each score point to form a practical, item-specific scoring guide.

This sampler also includes the *General Description of Scoring Guidelines for Mathematics Open-Ended Questions* that students will have access to during a PSSA mathematics administration. The general description of scoring guidelines can be distributed to students for use during local assessments and can also be used by educators when scoring local assessments.[1]

[1] The permission to copy and/or use these materials does not extend to commercial purposes.

Item Alignment

All PSSA items are aligned to statements and specifications included in the *Assessment Anchors and Eligible Content Aligned to the Pennsylvania Core Standards*. The mathematics content, process skills, directives, and action statements included in the PSSA mathematics questions align with the Assessment Anchor Content Standards. The Eligible Content statements represent the limits of the content of the mathematics questions.

Testing Time and Mode of Testing Delivery for the PSSA

The PSSA is delivered in traditional paper-and-pencil format as well as in an online format. The estimated time to respond to a test question is the same for both methods of test delivery. During an official testing administration, students are given additional time as necessary to complete the test questions. The following table shows the estimated response time for each item type.

Mathematics Item Type	MC	OE
Estimated Response Time (minutes)	2	10 to 15

Mathematics Reporting Categories

The Assessment Anchors are organized into four classifications as listed below.

• A = Numbers and Operations	• C = Geometry
• B = Algebraic Concepts	• D = Data Analysis and Probability

These four classifications are used throughout the grade levels. In addition to these classifications, there are five Reporting Categories for each grade level. The first letter of each Reporting Category represents the classification; the second letter represents the Domain as stated in the Common Core State Standards for Mathematics. Listed below are the Reporting Categories for Grade 7.

- A-N = The Number System
- A-R = Ratios and Proportional Relationships
- B-E = Expressions and Equations
- C-G = Geometry
- D-S = Statistics and Probability

Examples of multiple-choice and open-ended items assessing these categories are included in this booklet.

General Description of Scoring Guidelines for Mathematics Open-Ended Questions

4— The response demonstrates a *thorough* understanding of the mathematical concepts and procedures required by the task.

The response provides correct answer(s) with clear and complete mathematical procedures shown and a correct explanation, as required by the task. Response may contain a minor "blemish" or omission in work or explanation that does not detract from demonstrating a *thorough* understanding.

3— The response demonstrates a *general* understanding of the mathematical concepts and procedures required by the task.

The response and explanation (as required by the task) are mostly complete and correct. The response may have minor errors or omissions that do not detract from demonstrating a *general* understanding.

2— The response demonstrates a *partial* understanding of the mathematical concepts and procedures required by the task.

The response is somewhat correct with *partial* understanding of the required mathematical concepts and/or procedures demonstrated and/or explained. The response may contain some work that is incomplete or unclear.

1— The response demonstrates a *minimal* understanding of the mathematical concepts and procedures required by the task.

0— The response has no correct answer and *insufficient* evidence to demonstrate any understanding of the mathematical concepts and procedures required by the task for that grade level.

Special Categories within zero reported separately:

Blank.....Blank, entirely erased, entirely crossed out, or consists entirely of whitespace

Refusal.....Refusal to respond to the task

Off Task.....Makes no reference to the item but is not an intentional refusal

Foreign Language.....Written entirely in a language other than English

Illegible .....Illegible or incoherent

Item and Scoring Sampler Format

This sampler includes the test directions and scoring guidelines that appear in the PSSA Mathematics assessments. Each multiple-choice item is followed by a table that includes the alignment, the answer key, the depth of knowledge (DOK) level, the percentage[2] of students who chose each answer option, and a brief answer-option analysis or rationale. The open-ended item is followed by a table that includes the item alignment, DOK level, and mean student score. Additionally, each of the included item-specific scoring guidelines is combined with sample student responses representing each score point to form a practical, item-specific scoring guide. The *General Description of Scoring Guidelines for Mathematics Open-Ended Questions* used to develop the item-specific scoring guidelines should be used if any additional item-specific scoring guidelines are created for use within local instructional programs.

Example Multiple-Choice Item Information Table

Item Information	
Alignment	Assigned AAEC
Answer Key	Correct Answer
Depth of Knowledge	Assigned DOK
p-value A	Percentage of students who selected each option
p-value B	Percentage of students who selected each option
p-value C	Percentage of students who selected each option
p-value D	Percentage of students who selected each option
Option Annotations	Brief answer-option analysis or rationale

Example Open-Ended Item Information Table

Alignment	Assigned AAEC	**Depth of Knowledge**	Assigned DOK	**Mean Score**	

[2] All *p*-value percentages listed in the item information tables have been rounded.

Grade 7 Formula Sheet

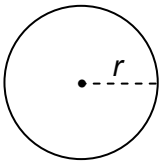
Formulas that you may need on this test are found below.
You may refer back to this page at any time during the mathematics test.
You may use calculator π or the number 3.14 as an approximation of π.

2018
Grade 7

Simple Interest

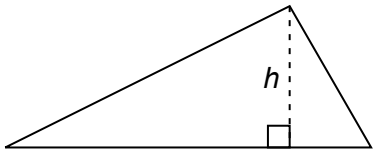
$I = Prt$

Circle



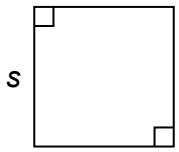
$C = 2\pi r$ $A = \pi r^2$

Triangle



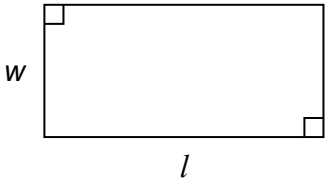
$A = \frac{1}{2}bh$

Square



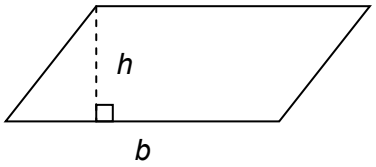
$A = s^2$

Rectangle



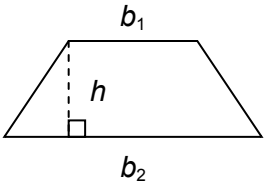
$A = lw$ $P = 2l + 2w$

Parallelogram



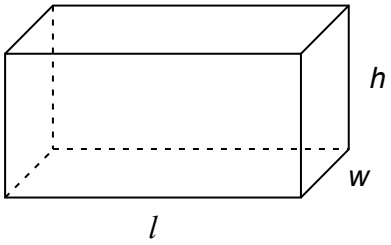
$A = bh$

Trapezoid



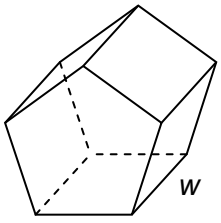
$A = \frac{1}{2}h(b_1 + b_2)$

Rectangular Prism



$V = lwh$ $SA = 2lw + 2lh + 2wh$

Polygonal Prism



$V = Bw$, where B = area of the base
$SA = Pw + 2B$, where P = perimeter of base

Mathematics Test Directions

On the following pages are the mathematics questions.

- You may not use a calculator for question 1. You may use a calculator for all other questions on this test.

Directions for Multiple-Choice Questions:

Some questions will ask you to select an answer from among four choices.

For the multiple-choice questions:

- First solve the problem on scratch paper.
- Choose the correct answer and record your choice in the answer booklet.
- If none of the choices matches your answer, go back and check your work for possible errors.
- Only one of the answers provided is the correct response.

Directions for Open-Ended Questions:

Some questions will require you to write your response.

For the open-ended questions:

- These questions have more than one part. Be sure to read the directions carefully.
- You cannot receive the highest score for an open-ended question without completing all tasks in the question. For example, if the question asks you to show your work or explain your reasoning, be sure to show your work or explain your reasoning in the space provided.
- If the question does **not** ask you to show your work or explain your reasoning, you may use the space provided, but only those parts of your response that the question specifically asks for will be scored.
- Write your response in the appropriate location within the response box in the answer booklet. Some answers may require graphing, plotting, labeling, drawing, or shading. If you use scratch paper, be sure to transfer your final response and any needed work or reasoning to the answer booklet.

Question 1 in this sampler is to be solved without the use of a calculator.

MULTIPLE-CHOICE ITEMS

1. Subtract: $\frac{8}{9} - \frac{-2}{3}$

A. $\frac{2}{9}$

B. $\frac{5}{6}$

C. $\frac{6}{6}$

D. $\frac{14}{9}$

Item Information	
Alignment	A-N.1.1.1
Answer Key	D
Depth of Knowledge	1
p-value A	26%
p-value B	12%
p-value C	28%
p-value D	34% (correct answer)
Option Annotations	A. solves $\frac{2}{3} = \frac{6}{9}; \frac{8}{9} - \frac{6}{9} = \frac{2}{9}$ B. solves $\frac{(8+2)}{(9+3)} = \frac{10}{12} = \frac{5}{6}$ C. solves $\frac{(8-2)}{(9-3)} = \frac{6}{6}$ D. correct

A calculator is permitted for use in solving questions 2–17 in this sampler.

2. Three students request different lengths of string to use for science experiments.

- Jaime requests 3 pieces of string that are each 3.25 inches long and 1 piece that is $4\frac{1}{2}$ inches long.
- Priya requests 6 pieces of string that are each $5\frac{1}{8}$ inches long.
- Franco requests a piece of string that can be cut into 9 pieces that are each $\frac{1}{4}$ inch long.

The science teacher cuts the pieces of string for the three students' experiments from a spool containing 2 **yards** of string. How many **inches** of string remain on the spool?

A. 9

B. 20.7

C. $24\frac{3}{4}$

D. $47\frac{1}{4}$

Item Information	
Alignment	A-N.1.1
Answer Key	C
Depth of Knowledge	2
p-value A	16%
p-value B	20%
p-value C	49% (correct answer)
p-value D	15%
Option Annotations	A. converts $\frac{1}{4}$ to 4 in multiplication of Franco's length; finds the positive difference between 2 yards (72 inches) and total length used (81 inches) B. converts $5\frac{1}{8}$ to 5.8 for calculation C. correct D. finds total number of inches used, not remaining

3. What is the value of the expression $1\frac{1}{4} \bullet \left(\frac{-2}{3} \div \frac{-5}{8}\right)$?

A. $-3\frac{3}{4}$

B. $-1\frac{1}{15}$

C. $1\frac{11}{64}$

D. $1\frac{1}{3}$

Item Information	
Alignment	A-N.1.1.3
Answer Key	D
Depth of Knowledge	1
p-value A	7%
p-value B	11%
p-value C	9%
p-value D	73% (correct answer)
Option Annotations	A. attempts to distribute and uses $\frac{\left(\frac{5}{4}\right)}{\left(\frac{-2}{3}\right)} \times \frac{\left(\frac{5}{4}\right)}{\left(\frac{-5}{8}\right)}$; sign error B. attempts to distribute $\frac{5}{4}$ as $\left(\frac{5}{4} \times \frac{-2}{3}\right)$ divided by $\left(\frac{5}{4} \times \frac{-5}{8}\right)$; sign error C. inverts $\frac{-2}{3}$ instead of $\frac{-5}{8}$; uses $\left(\frac{5}{4}\right)\left(\frac{-3}{2} \times \frac{-5}{8}\right)$ D. correct

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4. One pound of pasta noodles can be made using the ingredients shown in the recipe below.

Recipe for Pasta Noodles

Ingredients

- $3\frac{1}{2}$ cups of flour
- 4 large eggs
- 2 teaspoons of olive oil

A chef uses $166\frac{1}{4}$ cups of flour each week to make noodles. How many pounds of noodles does the chef make each week?

A. $28\frac{1}{2}$

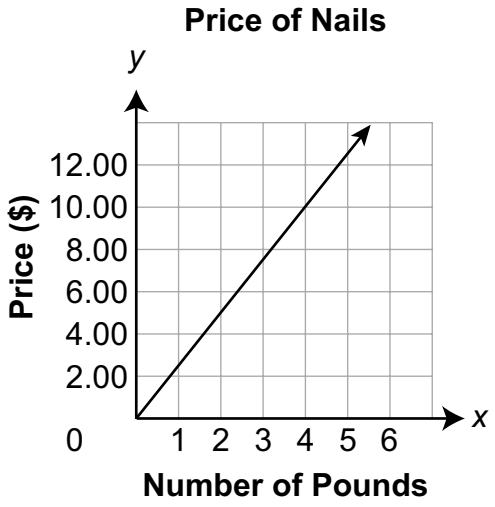
B. $47\frac{1}{2}$

C. $53\frac{1}{4}$

D. $55\frac{1}{2}$

Item Information	
Alignment	A-R.1.1.1
Answer Key	B
Depth of Knowledge	2
p-value A	11%
p-value B	70% (correct answer)
p-value C	10%
p-value D	9%
Option Annotations	A. adds numbers in numerators and denominators and adds each sum to the corresponding whole number; (1 + 4) added to 166 and (1 + 2) added to 3; divides resulting numbers, $\frac{171}{6}$ B. correct C. converts fractional parts of each value to decimals in a literal fashion; $\frac{166.14}{3.12}$ D. divides the whole number and fractional parts separately

5. A hardware store sells nails by the pound. The graph below represents the price of nails at the store.



What is the unit price of nails at the hardware store?

A. $0.40 per pound

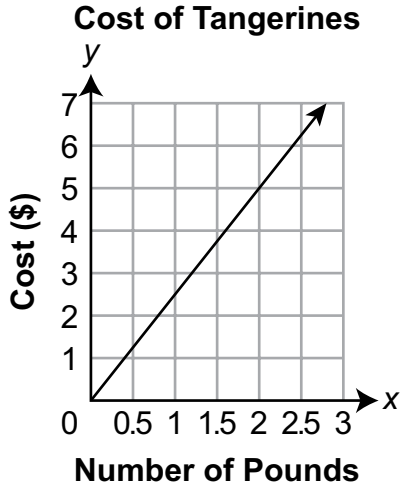
B. $2.50 per pound

C. $3.00 per pound

D. $5.00 per pound

Item Information	
Alignment	A-R.1.1.3
Answer Key	B
Depth of Knowledge	2
p-value A	11%
p-value B	76% (correct answer)
p-value C	7%
p-value D	6%
Option Annotations	A. divides pounds by cost; $\frac{2}{5}$ B. correct C. subtracts 5 – 2 from point (2, 5) D. uses $5.00 from point (2, 5)

6. The graph below shows the relationship between the number of pounds of tangerines purchased and the cost.



Based on the graph, which statement about the cost of tangerines is true?

A. The cost of 1 pound of tangerines is $2.

B. The cost of 2 pounds of tangerines is $1.

C. The cost of 2 pounds of tangerines is $5.

D. The cost of 5 pounds of tangerines is $2.

Item Information	
Alignment	A-R.1.1.5
Answer Key	C
Depth of Knowledge	2
p-value A	9%
p-value B	8%
p-value C	67% (correct answer)
p-value D	16%
Option Annotations	A. rounds down for *y*-value when $x = 1$ B. rounds down for *y*-value when $x = 1$; reverses definitions of *x* and *y* in relationship C. correct D. reverses definitions of *x* and *y* in relationship

7. The perimeter of a square is $28x - 4$. What is the length of one side of the square?

A. $x - 1$

B. $7x - 1$

C. $14x - 2$

D. $24x - 4$

Item Information	
Alignment	B-E.1.1
Answer Key	B
Depth of Knowledge	2
p-value A	6%
p-value B	63% (correct answer)
p-value C	15%
p-value D	16%
Option Annotations	A. divides 4 by 4 to get 1; does not include coefficient for variable B. correct C. represents the length of 2 sides of the square D. subtracts 4 from 28 to represent 4 sides of a square; does not change original perimeter value of 4

8. Which expression is equivalent to $3.5x + 4.8$?

A. $3 \bullet 0.5x + 4 \bullet 0.8$

B. $3x \bullet 0.5x + 4 \bullet 0.8$

C. $3 + 0.5x + 4 + 0.8$

D. $3x + 0.5x + 4 + 0.8$

Item Information	
Alignment	B-E.1.1.1
Answer Key	D
Depth of Knowledge	1
p-value A	11%
p-value B	9%
p-value C	40%
p-value D	40% (correct answer)
Option Annotations	A. thinks $(3)(0.5x) = 3.5x$; separates 4 and 0.8 by multiplication B. thinks $(3x)(0.5x) = 3.5x$; separates 4 and 0.8 by multiplication C. thinks $3 + 0.5x = 3.5x$ D. correct

9. Kelly has a savings account with a beginning balance of $800.

- She earns $340 a week at her job.
- For 8 weeks, she puts 15% of her weekly earnings into the savings account.
- Kelly makes 3 withdrawals of $45 each.

What is the account balance at the end of 8 weeks?

A. $785

B. $848

C. $1,073

D. $1,163

Item Information	
Alignment	B-E.2.1.1 A-R.1.1.6
Answer Key	C
Depth of Knowledge	2
p-value A	12%
p-value B	15%
p-value C	58% (correct answer)
p-value D	15%
Option Annotations	A. adds 15 × 8 to beginning balance and then subtracts 3 × 45 B. subtracts 8 × 45 instead of 3 × 45 C. correct D. subtracts 45 instead of 3 × 45

10. A group of adults and students buy tickets for a dance performance.

- Each ticket costs $4.65.
- The total cost of the tickets for the group is $93.00.
- There are exactly 3 adults in the group.

What is the number of students in the group?

A. 17

B. 20

C. 23

D. 31

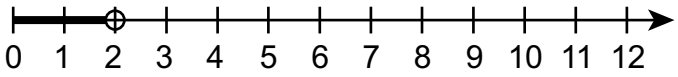
Item Information	
Alignment	B-E.2.2.1
Answer Key	A
Depth of Knowledge	2
p-value A	67% (correct answer)
p-value B	19%
p-value C	5%
p-value D	9%
Option Annotations	A. correct B. solves equation $4.65x = 93.00$ and finds total number in group C. starts with correct equation $4.65(s + 3) = 93.00$; gets $s + 3 = 20$, but then adds 3 to 20 D. ignores price of tickets and solves $3x = 93$

11. Walter is buying strawberries and grapes.

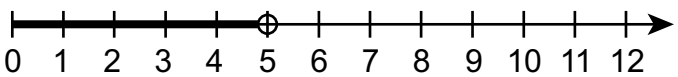
- The total amount he spends on the fruit must be less than $14.00.
- He spends $5.25 on a basket of strawberries.
- Grapes cost $1.75 per pound.

Which graph **best** represents all the numbers of pounds of grapes Walter can buy?

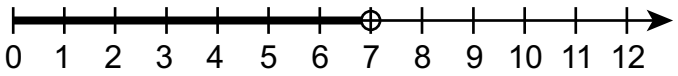
A.



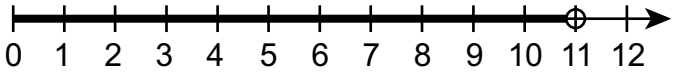
B.



C.



D.



Item Information	
Alignment	B-E.2.2.2
Answer Key	B
Depth of Knowledge	2
p-value A	12%
p-value B	58% (correct answer)
p-value C	22%
p-value D	8%
Option Annotations	A. sets up inequality correctly as $1.75x + 5.25 < 14$; adds 1.75 + 5.25, gets 7 and divides into 14 B. correct C. does not use an inequality; calculates 14 – 5.25 – 1.75 D. sets up inequality correctly as $1.75x + 5.25 < 14$; adds 5.25 to 14, gets $1.75x < 19.25$ and then $x < 11$

12. A club plans to spend no more than 85% of the $1,200.00 in its activity budget to buy as many radio-controlled helicopters as possible. The price of a helicopter is $110.99 plus sales tax of 6%. What is the **greatest** number of helicopters the club can buy?

A. 8

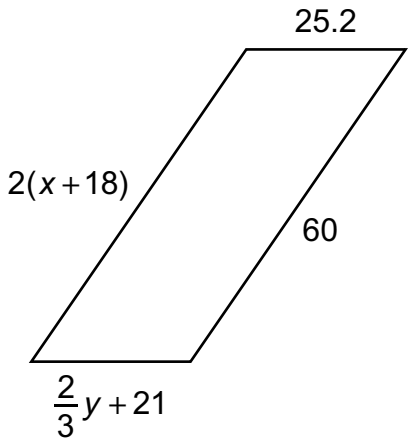
B. 9

C. 10

D. 11

Item Information	
Alignment	B-E.2.3
Answer Key	A
Depth of Knowledge	2
p-value A	42% (correct answer)
p-value B	24%
p-value C	24%
p-value D	10%
Option Annotations	A. correct B. solves $\frac{(0.85 \times 1{,}200.00)}{(110.99 \times 1.065)}$ and rounds up C. solves $\frac{(1{,}200.00)}{(110.99 \times 1.065)}$ and rounds down D. solves $\frac{(1{,}200.00)}{(110.99 \times 1.065)}$ and rounds up

13. A quadrilateral is shown below.



What values of x and y make the quadrilateral a parallelogram?

A. $x = 12$ and $y = 6.3$

B. $x = 21$ and $y = 16.8$

C. $x = 60$ and $y = 25.2$

D. $x = 5.4$ and $y = 58.5$

Item Information	
Alignment	C-G.1.1 B-E.2
Answer Key	A
Depth of Knowledge	2
p-value A	58% (correct answer)
p-value B	15%
p-value C	18%
p-value D	9%
Option Annotations	A. correct B. solves $2x + 18 = 60$ for x and $\frac{2}{3}(y + 21) = 25.2$ for y C. uses measures of opposite sides as lengths, but does not use in equations D. thinks consecutive sides must be congruent; solves $2(x + 18) = 25.2$ with a sign error in solution; solves $\left(\frac{2}{3}\right)y + 21 = 60$ correctly

14. Lee will conduct a survey at his school. He will select a random sample of students at the school to take the survey. Which sample is the **best** random sample for Lee to use?

A. every other student in the drama club

B. every fifth student who enters the school

C. every student who rides the same bus as Lee

D. every fourth student in Lee's homeroom class

Item Information	
Alignment	D-S.1.1.1
Answer Key	B
Depth of Knowledge	2
p-value A	7%
p-value B	73% (correct answer)
p-value C	11%
p-value D	9%
Option Annotations	A. selects a sample, but not the best random sample B. correct C. selects a sample, but not the best random sample D. selects a sample, but not the best random sample

15. As of 2012, there have been 8 players in the history of professional baseball who have each hit more than 600 home runs in his career. There have been over 15,000 professional baseball players throughout the history of professional baseball. Which term **best** describes the likelihood that a randomly chosen professional baseball player has hit more than 600 home runs in his career?

A. impossible

B. unlikely

C. neither unlikely nor likely

D. likely

Item Information	
Alignment	D-S.3.1.1
Answer Key	B
Depth of Knowledge	2
p-value A	7%
p-value B	67% (correct answer)
p-value C	13%
p-value D	13%
Option Annotations	A. thinks since the probability is so small, it is “virtually” impossible B. correct C. thinks that since there are only two possibilities (i.e., they’ve hit 600 home runs or they haven’t), the probability is 50% D. misunderstands the terms likely and unlikely

16. A chair can be purchased in one of four colors: red, white, green, or blue. The number of chairs purchased in each color is listed below.

- red: 150
- white: 450
- green: 225
- blue: 375

Based on the information shown in the list, what is the probability that the next chair purchased will be red?

A. $\frac{1}{8}$

B. $\frac{1}{7}$

C. $\frac{1}{4}$

D. $\frac{2}{5}$

Item Information	
Alignment	D-S.3.2.1
Answer Key	A
Depth of Knowledge	2
p-value A	55% (correct answer)
p-value B	7%
p-value C	31%
p-value D	7%
Option Annotations	A. correct B. chooses red out of not red C. chooses 1 color out of 4 D. focuses on two least amounts to calculate probability; red out of red + green or $\frac{150}{375}$, since red is least

OPEN-ENDED QUESTION

17. Archie has a bag of grass seed that he will use to cover a new field. The bag contains information about the area of the ground to be covered and the number of scoops of grass seed needed, as shown in the table below.

Grass Seed

Area of Ground to Be Covered (square yards)	50	100	150	200
Number of Scoops	2	4	6	8

A. What is the constant of proportionality between the number of square yards of ground to be covered and the number of scoops of grass seed needed?

The field Archie will cover with grass seed is rectangular and measures 100 yards long by 60 yards wide.

B. Write an equation that describes the relationship between the number of square yards (x) of ground to be covered and the number of scoops (y) of grass seed needed. Use the equation to determine the number of scoops of grass seed Archie needs to cover the entire field. Show or explain all your work.

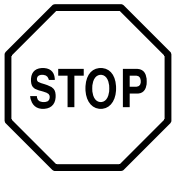
Go to the next page to finish question 17.

17. ***Continued.*** Please refer to the previous page for task explanation.

Archie has a goal to finish covering the field before $1\frac{2}{3}$ hours have elapsed. He will use any remaining time to water the field. After 1 hour has elapsed, he has covered 4,000 square yards of the field.

C. Explain why Archie will be able to meet his goal by working at this rate. As part of the explanation, determine the amount of time, in hours, Archie will have to water the field.

After you have checked your work, close your answer booklet and test booklet so your teacher will know you are finished.



Item-Specific Scoring Guideline

#17 Item Information

Alignment	A-R.1	**Depth of Knowledge**	2	**Mean Score**	1.15

Assessment Anchor this item will be reported under:

M07.A-R.1—Demonstrate an understanding of proportional relationships.

Specific Assessment Anchor Descriptor addressed by this item:

M07.A-R.1.1—Analyze, recognize, and represent proportional relationships and use them to solve real-world and mathematical problems.

Item-Specific Scoring Guideline

Score	In this item, the student . . .
4	Demonstrates a thorough understanding of proportional relationships by correctly solving problems and clearly explaining procedures.
3	Demonstrates a general understanding of proportional relationships by correctly solving problems and clearly explaining procedures with only minor errors or omissions.
2	Demonstrates a partial understanding of proportional relationships by correctly performing a significant portion of the required task.
1	Demonstrates minimal understanding of proportional relationships.
0	The response has no correct answer and insufficient evidence to demonstrate any understanding of the mathematical concepts and procedures as required by the task. Response may show only information copied from the question.

Top-Scoring Student Response and Training Notes

Score	Description
4	Student earns 4 points.
3	Student earns 3.0–3.5 points.
2	Student earns 2.0–2.5 points.
1	Student earns 0.5–1.5 points. OR Student demonstrates minimal understanding of proportional relationships.
0	Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured.

Top-Scoring Response

Part A (1 point):

1 point for correct answer

What?	Why?
$\frac{1}{25}$ **OR** 25 **OR EQUIVALENT**	

Part B ($1\frac{1}{2}$ points):

$\frac{1}{2}$ point for correct equation

$\frac{1}{2}$ point for correct answer

$\frac{1}{2}$ point for correct and complete support

What?	Why?
$y = \frac{1}{25}x$ **OR EQUIVALENT** **AND** 240 (scoops)	**Sample Work:** $y = \frac{1}{25}x$ $100 \bullet 60 = 6{,}000$ $y = \frac{1}{25} \bullet 6{,}000$ $y = 240$ **OR** **Sample Explanation:** The equation relating x and y is $y = \frac{1}{25}x$. Multiply 100 by 60 to determine the number of square yards that need to be covered, which is 6,000. Substitute 6,000 into the equation for x and multiply to determine 240 scoops are needed. **OR EQUIVALENT**

Part C ($1\frac{1}{2}$ points):

$\frac{1}{2}$ point for correct answer

1 point for correct and complete explanation

OR $\frac{1}{2}$ point for correct but incomplete explanation

What?	Why?
$\frac{1}{6}$ (hour)	**Sample Explanation:** At the rate Archie is working, he will be able to meet his goal because a rate of 4,000 square yards covered per 1 hour is equivalent to $6{,}666\frac{2}{3}$ square yards covered per $1\frac{2}{3}$ hours. Since he only has to cover 6,000 square yards, he will meet his goal. A rate of 4,000 square yards covered per 1 hour is equivalent to 6,000 square yards covered per $1\frac{1}{2}$ hours. Archie will finish $\frac{1}{6}$ hour before $1\frac{2}{3}$ hours have elapsed since $1\frac{2}{3} - 1\frac{1}{2} = \frac{1}{6}$. **OR EQUIVALENT**

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STUDENT RESPONSE

Response Score: 4 points

PARTS A AND B

Question 17
Page 1 of 2

Line Guide

Item ID

Archie has a bag of grass seed that he will use to cover a new field. The bag contains information about the area of the ground to be covered and the number of scoops of grass seed needed, as shown in the table below.

Grass Seed

Area of Ground to Be Covered (square yards)	50	100	150	200
Number of Scoops	2	4	6	8

A. What is the constant of proportionality between the number of square yards of ground to be covered and the number of scoops of grass seed needed?

EQ

$\frac{50}{2} = 25$

The response provides a correct answer.

The field Archie will cover with grass seed is rectangular and measures 100 yards long by 60 yards wide.

B. Write an equation that describes the relationship between the number of square yards (x) of ground to be covered and the number of scoops (y) of grass seed needed. Use the equation to determine the number of scoops of grass seed Archie needs to cover the entire field. Show or explain all your work.

EQ

$y = \frac{x}{25} = \frac{hw}{25} = \frac{100 \bullet 60}{25} = \frac{6000}{25} = 240$

240 scoops of grass seed

The response provides a correct equation and answer. The support is correct and complete.

48 / 1000

Review/End Test | Pause | Flag | Options | Next

Question 17
Page 2 of 2

Line Guide | Item ID | ?

Archie has a bag of grass seed that he will use to cover a new field. The bag contains information about the area of the ground to be covered and the number of scoops of grass seed needed, as shown in the table below.

Grass Seed

Area of Ground to Be Covered (square yards)	50	100	150	200
Number of Scoops	2	4	6	8

Archie has a goal to finish covering the field before $1\frac{2}{3}$ hours have elapsed. He will use any remaining time to water the field. After 1 hour has elapsed, he has covered 4,000 square yards of the field.

C. Explain why Archie will be able to meet his goal by working at this rate. As part of the explanation, determine the amount of time, in hours, Archie will have to water the field.

EQ

Archie will be able to meet his goal working at this rate because in 2/3 hours more he would have covered 6666.666... square yards and he only has 6000 square yards to cover. archie only needs half of an hour to finish at this rate so he has 1/6 of an hour to water the field.

The response provides a correct answer and a complete explanation.

276 / 1000

Review/End Test | Pause | Flag | Options | Back | Next

STUDENT RESPONSE

Response Score: 3 points

17. Archie has a bag of grass seed that he will use to cover a new field. The bag contains information about the area of the ground to be covered and the number of scoops of grass seed needed, as shown in the table below.

Grass Seed

Area of Ground to Be Covered (square yards)	50	100	150	200
Number of Scoops	2	4	6	8

A. What is the constant of proportionality between the number of square yards of ground to be covered and the number of scoops of grass seed needed?

The constant number of proportionality is 25 sq. yd. per scoop.

$2\overline{)50}^{25}$ $4\overline{)100}^{25}$ $6\overline{)150}^{25}$ $8\overline{)200}^{25}$

The response provides a correct answer.

The field Archie will cover with grass seed is rectangular and measures 100 yards long by 60 yards wide.

B. Write an equation that describes the relationship between the number of square yards (x) of ground to be covered and the number of scoops (y) of grass seed needed. Use the equation to determine the number of scoops of grass seed Archie needs to cover the entire field. Show or explain all your work.

$x \div y = 240$ scoops

$x = [100 \cdot 60]$ 6000 sq yd.

$y = [6000 \text{ sq yd} / 25 \text{ sq yd}]$ 240 scoops

The response provides a correct answer. The equation provided is incorrect. The support is correct and complete.

Go to the next page to finish question 17.

GO ON

17. ***Continued.*** Please refer to the previous page for task explanation.

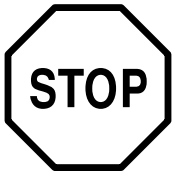
Archie has a goal to finish covering the field before $1\frac{2}{3}$ hours have elapsed. He will use any remaining time to water the field. After 1 hour has elapsed, he has covered 4,000 square yards of the field.

C. Explain why Archie will be able to meet his goal by working at this rate. As part of the explanation, determine the amount of time, in hours, Archie will have to water the field.

If it takes Archie 1 hour out of an 1hr and 40 min to cover $66\frac{2}{3}$ % of the field, he'd have 40min left to cover $33\frac{1}{3}$ % of the field Archie covers $33\frac{1}{3}$ % of the feild in 30 min. So, out of 40 min, Archie has 30 min to cover the rest of the field and $\frac{1}{6}$ hr to water it.

The response provides a correct answer and a complete explanation.

After you have checked your work, close your answer booklet and test booklet so your teacher will know you are finished.



STUDENT RESPONSE

Response Score: 2 points

PARTS A AND B

Question 17
Page 1 of 2

Item ID

Archie has a bag of grass seed that he will use to cover a new field. The bag contains information about the area of the ground to be covered and the number of scoops of grass seed needed, as shown in the table below.

Grass Seed

Area of Ground to Be Covered (square yards)	50	100	150	200
Number of Scoops	2	4	6	8

A. What is the constant of proportionality between the number of square yards of ground to be covered and the number of scoops of grass seed needed?

EQ

25

The response provides a correct answer.

The field Archie will cover with grass seed is rectangular and measures 100 yards long by 60 yards wide.

B. Write an equation that describes the relationship between the number of square yards (x) of ground to be covered and the number of scoops (y) of grass seed needed. Use the equation to determine the number of scoops of grass seed Archie needs to cover the entire field. Show or explain all your work.

EQ

$(x \div 25) = y$ --> The constant porpnality is 25, so we have to divide it with the area ground to be covered.
$6{,}000 \div 25 = y$ --> Since the area is a rectangle and it provides us with the length and width we multiply 100 yd by 60 yd and get 6,000.
$y = 240$ scoops --> divide it by 25 to get the amount of scoops

The response provides a correct equation and answer. The support is correct and complete.

294 / 1000

Review/End Test | Pause | Flag | Options | Next

PART C

Question 17
Page 2 of 2
Line Guide
Item ID
Archie has a bag of grass seed that he will use to cover a new field. The bag contains information about the area of the ground to be covered and the number of scoops of grass seed needed, as shown in the table below.
Grass Seed
Area of Ground to Be Covered (square yards) 50 100 150 200
Number of Scoops 2 4 6 8
Archie has a goal to finish covering the field before $1\frac{2}{3}$ hours have elapsed. He will use any remaining time to water the field. After 1 hour has elapsed, he has covered 4,000 square yards of the field.
C. Explain why Archie will be able to meet his goal by working at this rate. As part of the explanation, determine the amount of time, in hours, Archie will have to water the field.
EQ
Why Archie will acheive this goal by wirking at this rate is he's not taking breaks and in 1 hour he has already covered 4,000 sq yds of the field. What remaining Archie will have is 2/3 of a hour.
The response provides an incorrect answer and incorrect explanation.
197 / 1000
Review/End Test
Pause
Flag
Options
Back
Next

STUDENT RESPONSE

Response Score: 1 point

17. Archie has a bag of grass seed that he will use to cover a new field. The bag contains information about the area of the ground to be covered and the number of scoops of grass seed needed, as shown in the table below.

Grass Seed

Area of Ground to Be Covered (square yards) X	50	100	150	200
Number of Scoops Y	2	4	6	8

.04

A. What is the constant of proportionality between the number of square yards of ground to be covered and the number of scoops of grass seed needed?

The constant proportionality is .04.

The response provides a correct answer (answer is equivalent).

The field Archie will cover with grass seed is rectangular and measures 100 yards long by 60 yards wide.

B. Write an equation that describes the relationship between the number of square yards (x) of ground to be covered and the number of scoops (y) of grass seed needed. Use the equation to determine the number of scoops of grass seed Archie needs to cover the entire field. Show or explain all your work.

Archie will need 4 scoops of grass to cover the feild completley.

The response provides an incorrect answer. No equation or support are given.

Go to the next page to finish question 17.

GO ON

17. ***Continued.*** Please refer to the previous page for task explanation.

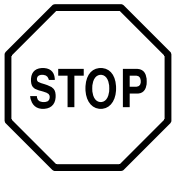
Archie has a goal to finish covering the field before $1\frac{2}{3}$ hours have elapsed. He will use any remaining time to water the field. After 1 hour has elapsed, he has covered 4,000 square yards of the field.

C. Explain why Archie will be able to meet his goal by working at this rate. As part of the explanation, determine the amount of time, in hours, Archie will have to water the field.

Archie will be able to meet his goal because he has already covered 4,000 sq yards in 1 hour and only needs to cover a little bit more to be done.

The response provides an incorrect answer and incorrect explanation.

After you have checked your work, close your answer booklet and test booklet so your teacher will know you are finished.



STUDENT RESPONSE

Response Score: 0 points

PARTS A AND B

Question 17
Page 1 of 2

Item ID

Archie has a bag of grass seed that he will use to cover a new field. The bag contains information about the area of the ground to be covered and the number of scoops of grass seed needed, as shown in the table below.

Grass Seed

Area of Ground to Be Covered (square yards)	50	100	150	200
Number of Scoops	2	4	6	8

A. What is the constant of proportionality between the number of square yards of ground to be covered and the number of scoops of grass seed needed?

EQ

200 and 8

The response provides an incorrect answer.

The field Archie will cover with grass seed is rectangular and measures 100 yards long by 60 yards wide.

B. Write an equation that describes the relationship between the number of square yards (x) of ground to be covered and the number of scoops (y) of grass seed needed. Use the equation to determine the number of scoops of grass seed Archie needs to cover the entire field. Show or explain all your work.

EQ

The number 100 and 60 go by tens.

The response provides an incorrect answer and incorrect support. No equation is given.

33 / 1000

Review/End Test | Pause | Flag | Options | Next

Question 17
Page 2 of 2

Line Guide | Item ID | ?

Archie has a bag of grass seed that he will use to cover a new field. The bag contains information about the area of the ground to be covered and the number of scoops of grass seed needed, as shown in the table below.

Grass Seed

Area of Ground to Be Covered (square yards)	50	100	150	200
Number of Scoops	2	4	6	8

Archie has a goal to finish covering the field before $1\frac{2}{3}$ hours have elapsed. He will use any remaining time to water the field. After 1 hour has elapsed, he has covered 4,000 square yards of the field.

C. Explain why Archie will be able to meet his goal by working at this rate. As part of the explanation, determine the amount of time, in hours, Archie will have to water the field.

EQ

$1\frac{2}{3} + 4{,}000 = 5\frac{2}{3}$ is the answer

The response provides an incorrect answer and no explanation.

24 / 1000

Review/End Test | Pause | Flag | Options | Back | Next

MATHEMATICS—SUMMARY DATA

MULTIPLE-CHOICE

Sample Number	Alignment	Answer Key	Depth of Knowledge	*p*-values A	*p*-values B	*p*-values C	*p*-values D
1	A-N.1.1.1	D	1	26%	12%	28%	34%
2	A-N.1.1	C	2	16%	20%	49%	15%
3	A-N.1.1.3	D	1	7%	11%	9%	73%
4	A-R.1.1.1	B	2	11%	70%	10%	9%
5	A-R.1.1.3	B	2	11%	76%	7%	6%
6	A-R.1.1.5	C	2	9%	8%	67%	16%
7	B-E.1.1	B	2	6%	63%	15%	16%
8	B-E.1.1.1	D	1	11%	9%	40%	40%
9	B-E.2.1.1 A-R.1.1.6	C	2	12%	15%	58%	15%
10	B-E.2.2.1	A	2	67%	19%	5%	9%
11	B-E.2.2.2	B	2	12%	58%	22%	8%
12	B-E.2.3	A	2	42%	24%	24%	10%
13	C-G.1.1 B-E.2	A	2	58%	15%	18%	9%
14	D-S.1.1.1	B	2	7%	73%	11%	9%
15	D-S.3.1.1	B	2	7%	67%	13%	13%
16	D-S.3.2.1	A	2	55%	7%	31%	7%

OPEN-ENDED

Sample Number	Alignment	Points	Depth of Knowledge	Mean Score
17	A-R.1	4	2	1.15

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PSSA Grade 7 Mathematics
Item and Scoring Sampler

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