![pennsylvania DEPARTMENT OF EDUCATION logo]

The Pennsylvania System of School Assessment

Mathematics
Item and Scoring Sampler

2023–2024
Grade 5

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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 Anchors and Eligible Content (AAEC) 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 by providing samples of test item types and scored student responses. The item sampler is not designed to be used as a pretest, a curriculum, or any other benchmark for operational testing.

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 PCS. 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 PCS-aligned Assessment Anchors and Eligible Content documents are posted on this portal:

> ➢ *www.education.pa.gov* [Hover over "Data and Reporting," select "Assessment and Accountability," and select "PSSA-PA System of School Assessment." Then select "Assessment Anchors/Eligible Content" on the right side of the screen.]

What Is Included

This sampler contains test questions, or test "items," that have been written to align to the Assessment Anchors that are based on the PCS. The sample test questions model the types of items that may appear on an operational PSSA. Each sample test question has been through a rigorous review process to ensure alignment with the Assessment Anchors prior to being piloted in an embedded field test within a PSSA assessment and then used operationally on a PSSA assessment. Answer keys, scoring guidelines, and any related stimulus material are also included. Additionally, sample student responses are provided with each open-ended (OE) item to demonstrate the range of responses that students provided in response to these items.

Purpose and Uses

The items in this sampler may be used[1] as examples for creating assessment items at the classroom level. Classroom teachers may find it beneficial to have students respond to the open-ended item in this sampler. Educators may then use the sampler as a guide to score the responses either independently or together with colleagues within a school or district. This sampler also includes the *General Description of Scoring Guidelines for Mathematics Open-Ended Items* that students will have access to during a PSSA mathematics administration. The general description of scoring guidelines may be distributed to students for use during local assessments and may also be used by educators when scoring local assessments.

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 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.

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.

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

Testing Time and Mode of Testing Delivery for the PSSA

The PSSA is delivered in a 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. 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

During an official test administration, students are given as much additional time as is necessary to complete the test questions.

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 5.

- A-T = Numbers and Operations in Base Ten

- A-F = Numbers and Operations—Fractions

- B-O = Operations and Algebraic Thinking

- C-G = Geometry

- D-M = Measurement and Data

Examples of MC and OE items assessing these categories are included in this sampler.

Item and Scoring Sampler Format

This sampler includes the test directions and scoring guidelines that appear in the PSSA Mathematics assessments. Each MC item is followed by a table that includes the item 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 OE item is followed by a table that includes the item alignment, the DOK level, and the 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 Items* 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. The student responses in this item and scoring sampler are actual student responses; however, the handwriting has been changed to protect the students' identities and to make the item and scoring sampler accessible to as many people as possible.

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 option A
p-value B	Percentage of students who selected option B
p-value C	Percentage of students who selected option C
p-value D	Percentage of students who selected option D
Option Annotations	Brief answer-option analysis or rationale

Example Open-Ended Item Information Table

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

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

General Description of Scoring Guidelines for Mathematics Open-Ended Items

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. The 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.

The response may show only information copied from the question.

Special Categories within zero reported separately:

BLK (blank)..............Is blank, is entirely erased, or gives a written refusal to respond

OT...........................Is off-task

LOE.........................Is in a language other than English

IL.............................Is illegible

Grade 5 Formula Sheet

Formulas and conversions that you may need on this test are found below. You may refer back to this page at any time during the mathematics test.

2023
Grade 5

Standard Conversions

1 mile (mi) = 1,760 yards (yd)
1 mile = 5,280 feet (ft)
1 yard (yd) = 3 feet (ft)
1 foot = 12 inches (in.)

1 ton (T) = 2,000 pounds (lb)
1 pound = 16 ounces (oz.)

1 gallon (gal) = 4 quarts (qt)
1 quart = 2 pints (pt)
1 pint = 2 cups (c)
1 cup = 8 fluid ounces (fl oz.)
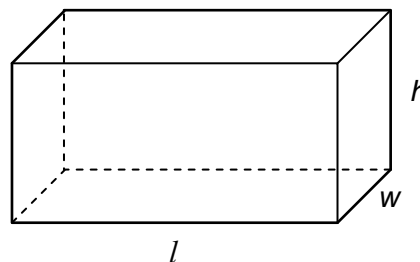
Metric Conversions

1 kilometer (km) = 1,000 meters (m)
1 meter = 100 centimeters (cm)
1 centimeter = 10 millimeters (mm)

1 kilogram (kg) = 1,000 grams (g)

1 liter (L) = 1,000 milliliters (mL)

Time Conversions

1 century = 10 decades
1 decade = 10 years (yr)
1 year (yr) = 12 months (mo)
1 year = 52 weeks (wk)
1 year = 365 days
1 week = 7 days
1 day = 24 hours (hr)
1 hour = 60 minutes (min)
1 minute = 60 seconds (sec)

Rectangular Prism

Volume = length × width × height
$V = l \times w \times h$

Volume = area of the base × height
$V = B \times h$

Volume = area of the base × width
$V = B \times w$

Volume = area of the base × length
$V = B \times l$

MATHEMATICS TEST DIRECTIONS

On the following pages are the mathematics questions.

- You may <u>not</u> 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 <u>without</u> the use of a calculator.

MULTIPLE-CHOICE ITEMS

1. Subtract: 1.76 – 0.9

   A. 0.86
   B. 1.26
   C. 1.67
   D. 1.73

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

2. The expression below represents the mass, in grams, of a mineral sample.

$$7 \times 10 + 3 \times 0.1 + 9 \times 0.001$$

What is the mass, in grams, of the mineral sample?

A. seventy and thirty-nine hundredths

B. seventy-three and nine hundredths

C. seventy-three and nine thousandths

D. seventy and three hundred nine thousandths

3. Which statement correctly compares $2 \times 100 + 4 \times 1 + 5 \times 0.1$ and 204.05?

    A.   204.5 < 204.05

    B.   204.5 > 204.05

    C.   204.05 = 204.05

    D.   204.005 < 204.05

4. A bakery owner orders 6 cases of chocolate. Each case contains 4 blocks of chocolate. Each block weighs 13.2 pounds. How many pounds of chocolate does the bakery owner order?

  A. 58.8

  B. 83.2

  C. 103.2

  D. 316.8

5. A farmer has 10 packages of corn seeds. Each package contains 300 seeds. He plants all the seeds in 20 rows with an equal number of seeds in each row. How many seeds are in each row?

    A.   150

    B.   600

    C.   1,500

    D.   60,000

6. Which expression is equivalent to $\frac{1}{3} + \frac{1}{30} - \frac{1}{5}$?

A. $\frac{1}{3} + \frac{6}{30} - \frac{1}{30}$

B. $\frac{5}{15} - \frac{3}{15} + \frac{1}{30}$

C. $\frac{1}{30} + \frac{1}{30} - \frac{1}{5}$

D. $\frac{5}{15} + \frac{3}{15} - \frac{1}{30}$

7. Mrs. Brown has a package containing *n* pounds of cereal. Every day she puts $\frac{1}{8}$ pound of cereal into her son's lunchbox and $\frac{1}{8}$ pound of cereal into her daughter's lunchbox. Which expression represents the number of days Mrs. Brown can do this before she runs out of cereal?

A. $(n \times 2) \times \frac{1}{8}$

B. $(n \times 2) \div \frac{1}{8}$

C. $n \times \left(2 \times \frac{1}{8}\right)$

D. $n \div \left(2 \times \frac{1}{8}\right)$

8. Keira has 8 cups of juice. She pours the juice into 5 glasses, pouring the same amount of juice into each glass. How many cups of juice are in each glass?

A. $\frac{5}{8}$

B. $1\frac{3}{8}$

C. $1\frac{3}{5}$

D. 3

9. Alli and Bert each have some money. Bert has $\frac{5}{4}$ as many dollars as Alli has. Which statement about the amount of money Alli and Bert each have is true?

    A.   Alli has more money than Bert has.

    B.   Bert has more money than Alli has.

    C.   Alli and Bert have the same amount of money.

    D.   There is not enough information to compare the amount of money Alli and Bert each have.

10. A relay race is $\frac{1}{8}$ mile long. Each relay team has 4 members. Each team member runs the same distance. How many miles does each team member run?

A. $\frac{1}{2}$
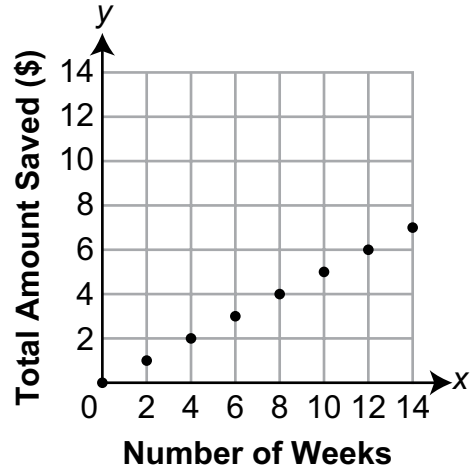
B. $\frac{1}{4}$

C. $\frac{1}{12}$

D. $\frac{1}{32}$

11. Bruce saves $1 each week. His brother Len saves $2 each week. They combine their savings each week. Which coordinate grid represents the total amount of money, in dollars, Bruce and Len save over time?
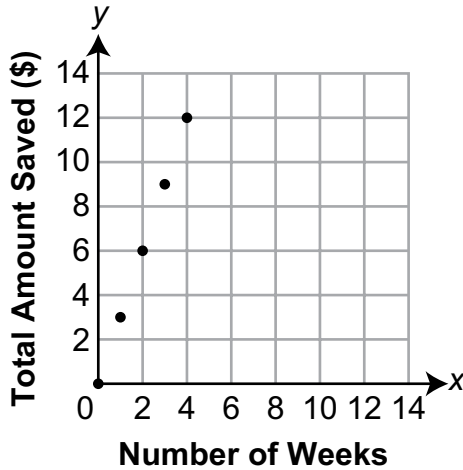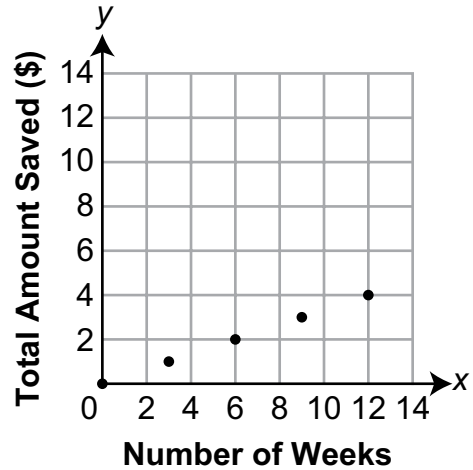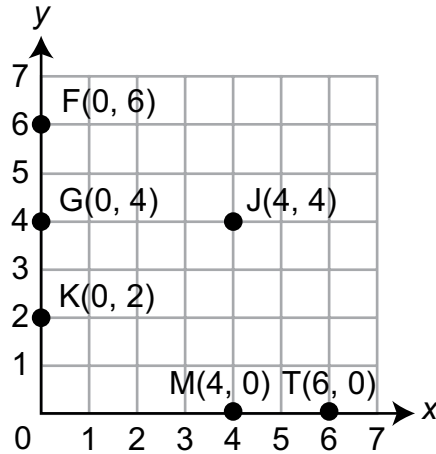
A.

Combined Savings
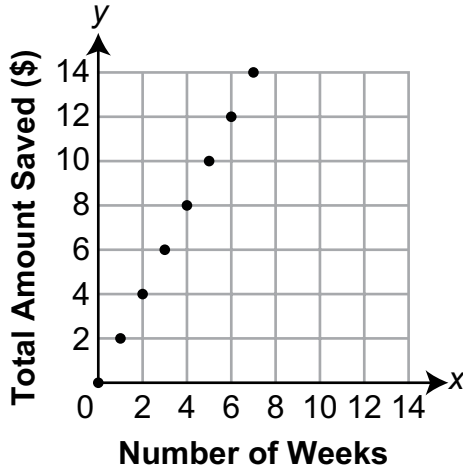
B.

Combined Savings

C.

Combined Savings


D.

Combined Savings

12. A coordinate grid is shown below.

Which two points on the coordinate grid have the same *y*-coordinate?

A.   point G and point K

B.   point J and point M

C.   point G and point J

D.   point F and point T

13. The graph below represents the amount of coffee brewed (y), in ounces, based on the amount of time (x), in minutes, for which the coffee maker has been brewing coffee.

Coffee Brewed by Coffee Maker
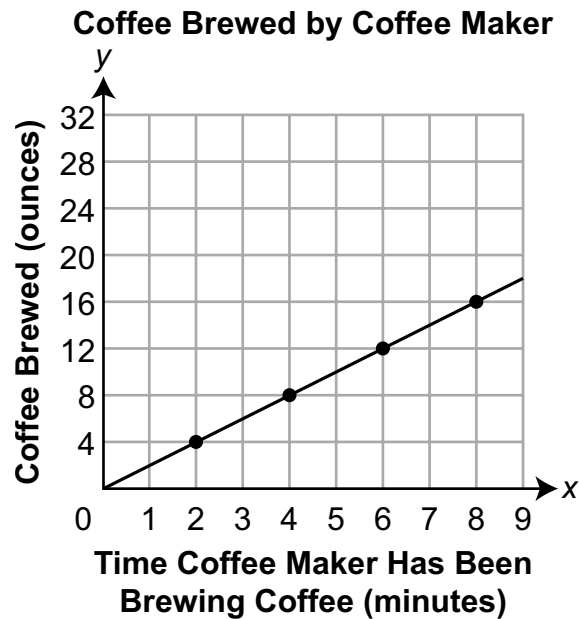
Which ordered pair represents the number of ounces of coffee brewed when the coffee maker has been brewing coffee for 5 minutes?

A.   (5, 10)

B.   (5, 11)

C.   (10, 5)

D.   (11, 5)

14. Which term does **not** describe a square?

    A.   parallelogram

   B.   rectangle

    C.   rhombus

    D.   trapezoid

15. Tracy needs a **gallon** of water, but she has only **quart**-sized, **pint**-sized, and **cup**-sized containers.

- She first fills one **quart**-sized container with water.
- She then fills some **pint**-sized containers and some **cup**-sized containers with water.

How many **pint**-sized containers and **cup**-sized containers could Tracy fill to have a total of 1 **gallon** of water in all the containers?

A. 1 pint-sized container and 2 cup-sized containers

B. 2 pint-sized containers and 1 cup-sized container

C. 2 pint-sized containers and 5 cup-sized containers

D. 5 pint-sized containers and 2 cup-sized containers

16. A toy company makes solid game pieces out of plastic. Each game piece is made by connecting two right rectangular prisms as shown in the picture below.
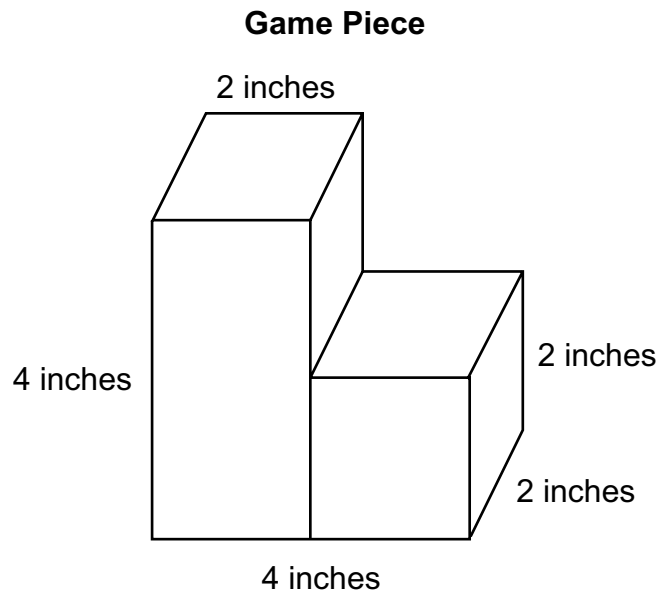
Game Piece

What is the volume, in cubic inches, of plastic needed to make each game piece?

A.   14

B.   24

C.   32

D.   48

OPEN-ENDED QUESTION

17. Every week, Patrick attends basketball practice for 2 hours on Tuesday and 3 hours on Thursday. Patrick has been attending practice for 6 weeks.

A. Write a numerical expression with at least one operation symbol to represent the total amount of time Patrick has spent at basketball practice the past 6 weeks.

The expression below represents the number of points Patrick scored in his last basketball game.

$$2 \times (4 + 3) + 3 \times (1 + 2) + 2$$

B. How many points did Patrick score in his last game? Show or explain all your work.

Go to the next page to finish question 17.

GO ON ⇨

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

During another game, Patrick scored points by making 2-point shots and by making 3-point shots. The two expressions below represent the number of points he scored from making 2-point shots and the number of points he scored from making 3-point shots.

2-point shots: $2 \times (4 + 6)$

3-point shots: $3 \times (2 + 3)$

Patrick claims he scored twice as many points from making 2-point shots as from making 3-point shots since $4 + 6$ is twice as large as $2 + 3$.

C. Explain why Patrick's claim is **not** correct even though $4 + 6$ is twice as large as $2 + 3$.

After you have finished your work, close this booklet so your teacher will know you are finished.

STOP