

# Common Core Sample Items



## Mathematics Grade 7

Assessments for the new standards will evaluate student proficiency in Mathematics dependent upon the foundation established in earlier grades. This will require a profound shift in teaching and learning as well as a renewed focus on students developing deeper conceptual understanding of math throughout their schooling.



# Common Core Sample Items, Mathematics Grade 7

At the middle school grade levels, the Common Core State Standards begin to de-emphasize number sense and computation and concentrate on more complex skills and concepts, especially in the areas of algebra and statistics.

This item asks students to select a simulation that matches a given probability situation (7.SP.8c). The item requires students to model with mathematics by analyzing the given situation, including reading a data table, and then determining which simulation will result in the same probability distribution. This item thus provides evidence of students' ability to determine the equivalency of different probability models, each presented in a different way (tabular vs. textual).

1. A bookstore runs a promotion in which a raffle ticket is given to every customer who makes a purchase on a particular afternoon. The person whose ticket number is drawn in the raffle wins a prize. The number of children, adults, and seniors who made purchases that afternoon are listed in the table.

**CUSTOMERS AT BOOKSTORE**

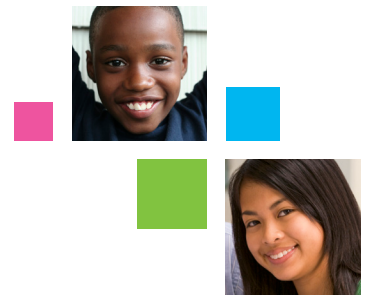
| Age Group | Frequency |
|-----------|-----------|
| Children  | 9         |
| Adults    | 33        |
| Seniors   | 8         |

Suppose you would like to design a simulation to determine the probability that a person in any given age group will win the prize.

Which is the **most** reasonable design for the simulation?

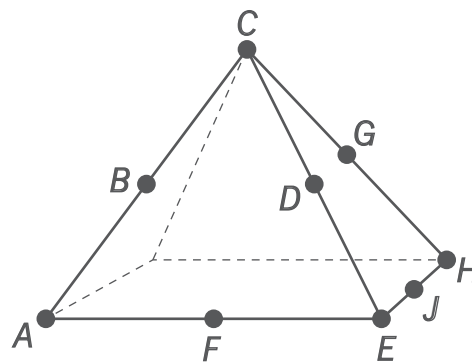
- A Use a program that generates random integers from 1 to 33 and assign the integers as follows: 1–9 represents children, 1–33 represents adults, and 1–8 represents seniors.
- B Use a program that generates random integers from 1 to 100 and assign the integers as follows: 1–9 represents children, 10–42 represents adults, and 43–50 represents seniors.
- C Use a program that generates random integers from 1 to 33 and assign the integers as follows: 1–11 represents children, 12–22 represents adults, and 23–33 represents seniors.
- D Use a program that generates random integers from 1 to 100 and assign the integers as follows: 1–18 represents children, 19–84 represents adults, and 85–100 represents seniors.

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This item also requires students to model with mathematics—in this case, by applying concepts of spatial visualization in two different ways. Students must first determine and explain how to create two given cross sections from a three-dimensional figure; students must then describe a cross section of the same figure, given its parameters (7.G.3). One of the two cross sections is easier to explain than the other, although both are more difficult to describe than the last prompt requiring students to identify a cross section. This item thus provides students with the opportunity to be placed at any one of several levels of mastery for this construct.

2. The figure below shows a right square pyramid. The points B, D, G, J, and F are the midpoints of the edges on which they lie.



Name three points on the pyramid that a plane could pass through in order to form a cross section that is a square and is not the base of the pyramid.

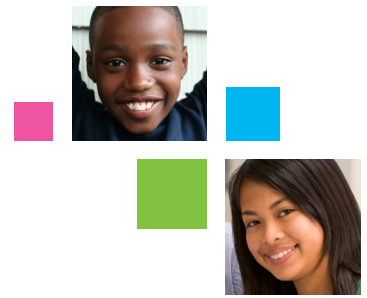
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Name three points on the pyramid that a plane could pass through in order to form a cross section that is a trapezoid.

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If any plane passes through point C and the base of the pyramid, what kind of cross section will be formed?

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# Common Core Sample Items, Mathematics Grade 7

This performance task uses the context of airplanes in flight, with each part of the task related to various aspects of the context.

Part A of the performance task requires students to explain the mathematical meaning of the variables in an equation in terms of the given context (7.EE.4a). Understanding the contextual meaning of variables is a key concept that is necessary if students are to solve the equation by substituting for one of the variables, as they are expected to in the second prompt. This provides students with an opportunity to demonstrate their understanding of solving equations on two levels—first via a written explanation and then by algebraic substitution and manipulation of the equation itself.

3. Look at the equation below relating to an airplane.

$$n = 10 + 0.6h$$

where  $n$  is the number of quarts of engine oil and  $h$  is the number of flight hours.

**PART A**

In the space below, explain in words what this equation means.

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An airplane requires 12.1 quarts of engine oil for a flight.  
How long, in hours, is the flight?

*Show your work.*

*Answer* \_\_\_\_\_ hours



# Common Core Sample Items, Mathematics Grade 7

Part B of the performance task requires students to refer back to the equation given in Part A. This part of the performance task brings an increase in cognitive demand over Part A by requiring students to analyze the mathematical validity of a statement and then use their own words to explain why the statement is invalid (7.EE.3). This type of open-ended response enables students to demonstrate their knowledge of the concept using any mathematically valid explanations or arguments.

Part C of the performance task further assesses students' knowledge of expressions and equations. Students are asked to model a solution by analyzing information and first creating, then simplifying, an expression that matches the given information (7.EE.2). Whereas Parts A and B asked students to use their own words to explain mathematical concepts, Part C elicits evidence of students' ability to express information symbolically. This is a key concept at the middle school grade levels and will only grow in importance as students progress to high school mathematics.

## **PART B**

Megan claims a 4.9 hour flight will require 14.5 quarts of engine oil.  
Explain why this is not a reasonable claim on the lines below.

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## **PART C**

It normally takes an airplane  $t$  hours to fly from Boston to San Francisco.  
Due to the effect of the jet stream winds, it normally takes the same airplane 20% less time to fly from San Francisco to Boston.

On the line below, write an expression to show how long it normally takes to fly from San Francisco to Boston and then simplify your answer.

*Expression* \_\_\_\_\_



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Part D of the performance task requires students to first solve an equation by substituting given values for two of the variables; they must then apply that solution to the expression created in Part C (7.EE.4a). This integration of the parts of the performance task increases the cognitive demand that merely solving an equation would require.

Part E represents the culminating activity of the performance task. Students must integrate the equation from Part A with the work they performed in Parts C and D in order to answer Part E—specifically, by substituting the values they obtained in Part D into the equation from Part A (7.EE.4a). This culminating activity represents a high level of cognitive demand for students as they must first make sense of the problem, determining what exactly they are expected to do. They must employ critical thinking skills in order to pull together the various components of the performance task that are required to provide a solution to Part E. The general concept of solving equations that is assessed in Part E is not, in and of itself, overly complex; however, when placed in the context of this performance task, this item clearly targets the advanced levels of the learning trajectory for this construct.

## PART D

Look at this equation relating distance, rate, and time.

$$d = rt$$

where  $d$  is distance,  $r$  is rate of speed, and  $t$  is time.

The flight distance between Boston and San Francisco is 4,400 km. The airplane flies at an average speed of 800 km per hour.

How much time does this flight take?

*Answer* \_\_\_\_\_ hours

Using your results from Part C, how much time does the flight from San Francisco to Boston take?

*Answer* \_\_\_\_\_ hours

## PART E

Recall the equation from Part A,  $n = 10 + 0.6h$ .

How much engine oil is required to fly from Boston to San Francisco?

How much engine oil is required to fly from San Francisco to Boston?

*Show your work.*

From Boston to San Francisco: \_\_\_\_\_ quarts

From San Francisco to Boston: \_\_\_\_\_ quarts