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**Indiana  
Department of Education**

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Indiana Superintendent of Public Instruction

# ISTEP+ Part 1 Item Sampler for Mathematics Grade 10

Updated September 2016



# Purpose of the Item Sampler

- To describe the item types found in ISTEP+ Part 1 Mathematics
- To provide and explain exemplary responses for the item types found in ISTEP+ Part 1
- To explain how open-ended math items are scored
- To provide model items that teachers may use when constructing items for classroom assessments

Note: Item Samplers are not practice tests.



# Scoring

- Constructed Response
  - Content: 2 points
  - Process: 2 points
- Extended Response
  - Content: 3 points
  - Process: 3 points

<http://www.doe.in.gov/assessment/istep-grade-10>



# Important Process Standards

- PS.1: Make sense of problems and persevere in solving them.
- PS.2: Reason abstractly and quantitatively.
- PS.3: Construct viable arguments and critique the reasoning of others.
- PS.4: Model with mathematics.
- PS.5: Use appropriate tools strategically.
- PS.6: Attend to precision.
- PS.7: Look for and make use of structure.
- PS.8: Look for and express regularity and repeated reasoning.



# Sample Constructed-Response Grade 10

**Content Standard:**

**A1.QE.5:** Represent real-world problems using quadratic equations in one or two variables and solve such problems with and without technology. Interpret the solution and determine whether it is reasonable.

**Process Standard: 4**

Item Type: Constructed Response

Pts: 4

DOK: 2

Grade: 10

**The Grade 10 item is shown on the next slide.**



# Sample Constructed-Response Grade 10

A rectangle with an area of 104 square inches has a width that is 5 inches less than its length.

## **Part A**

Write an equation representing the area of the rectangle. Use  $x$  to represent the length of the rectangle. Solve your equation for all values of  $x$ .

## **Show All Work**

## **Part B**

Use your solution to the equation to identify the width and length of the rectangle. Explain how you determined which value(s) of  $x$  to use.

## **Show All Work**



# Sample Constructed-Response Grade 10

## Exemplary Response:

Part A

$$\text{Area} = (\text{length}) * (\text{width})$$

$$\text{Let } x = \text{length, then width} = x - 5$$

$$\text{Area} = x(x - 5)$$

$$104 = x(x - 5)$$

AND

Part B

The length is 13 inches and the width is 8 inches.



# Sample Constructed-Response Grade 10

## Exemplary Response:

Part A

$$104 = x(x - 5)$$

$$x(x - 5) = 104$$

$$x^2 - 5x - 104 = 0$$

$$(x - 13)(x + 8) = 0$$

$$x = -8 \text{ or } 13$$

AND

A distance or length cannot be negative. So the result  $x = -8$  can be excluded. Since the length equals 13, the width equals 8.

- Other valid process

# Sample Extended-Response Grade 10

**Content Standard:****8.AF.6:**

Construct a function to model a linear relationship between two quantities given a verbal description, table of values, or graph. Recognize in  $y = mx + b$  that  $m$  is the slope (rate of change) and  $b$  is the y-intercept of the graph, and describe the meaning of each in the context of a problem.

**Process Standards:** 2, 3, 4

Item Type: Extended Response

Pts: 6

DOK: 2

Grade: 10

**The Grade 10 item is shown on the next slide.**

# Sample Extended-Response

## Grade 10

The table shows the price,  $P$ , for renting a car for  $d$  days from a car-rental company.

### Part A

Construct a linear function that models the relationship between the price,  $P$ , and the number of days,  $d$ , for which the car is rented. Show the steps that are required in order to construct the model.

| Number of Days,<br>$d$ | Price,<br>$P$ |
|------------------------|---------------|
| 1                      | \$115         |
| 2                      | \$150         |
| 3                      | \$185         |
| 4                      | \$220         |

### Part B

What is the slope of the line in Part A? What does it represent in the context of the problem?

**Show All Work**

### Part C

What is the value of this function when  $d = 0$ ? What does this value represent in the context of the problem?

**Show All Work**



# Sample Extended-Response Grade 10

## **Exemplary Response:**

### **Part A**

$$P = 35d + 80$$

And

### **Part B**

$$\text{Slope} = 35$$

Or other valid response or value based on an incorrect linear function in Part A.

And

### **Part C**

\$80

Or other valid response or value based on an incorrect linear function in Part A.



# Sample Extended-Response Grade 10

## Exemplary Response:

### Sample Process:

#### Part A

$$m = (150 - 115)/(2 - 1) = 35/1 = 35$$

$$P = 35d + b$$

$$115 = 35(1) + b$$

$$115 = 35 + b$$

$$80 = b$$

$$P = 35d + 80$$

or other valid process

And

#### Part B

The slope (35) represents the cost per day to rent the car.

And

#### Part C

Because someone will not rent a car for 0 days, the value when  $d = 0$  represents cost/fees that all customers pay regardless of the number of days they rent the car or other valid explanation.



# Best Practices

- Teachers use the Item Samplers as models for the creation of their own math items.
- Students use them to learn to show their work and develop strategies for responding to different math item types.



# Frequently Asked Questions

- Responses outside of the given lines (paper-and-pencil test)
- Scoring multiple-part items
- Grammar and spelling



# Resources

- <http://www.doe.in.gov/assessment>
  - Item Samplers
  - Testing Windows
  - Program Manual
  - Blueprints
  - Experience Online
  - Instructional and Assessment Guidance
  - Released Items and Scoring Notes
  - Rubrics

# Questions

- Please contact Joe Staten for questions related to Mathematics assessments at [jstaten@doe.in.gov](mailto:jstaten@doe.in.gov).
- For other questions, please contact the Office of Student Assessment by calling (317) 232-9050 or via email at [INassessments@doe.in.gov](mailto:INassessments@doe.in.gov).



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