Testing Sampler: Trying Out TIMSS and PISA

December 11, 2015
Washington D.C.
Presented by
Lydia Malley and Dana Kelly, NCES
NCES International Assessments

- 4th grade PIRLS, TIMSS
- 8th grade TIMSS
- 15-year-olds PISA
- 12th grade TIMSS Advanced
- Adults 16-65 PIAAC
- Middle grades TALIS
What is TIMSS?

- The Trends in International Mathematics and Science Study (TIMSS) is an international large-scale student assessment sponsored by the International Association for the Evaluation of Educational Achievement (IEA).
- Assessment of students in grades 4 and 8
  - Grade 12 also assessed in 2015 in TIMSS Advanced
- Mathematics and science
- Every 4 years, beginning in 1995
What is PISA?

- The Program for International Student Assessment (PISA) is an international large-scale student assessment sponsored by the Organization for Economic Cooperation and Development (OECD).
- Assessment of 15-year-old students
- PISA assesses applied knowledge/literacy:
  - “How well can students nearing the end of compulsory schooling apply their knowledge to real-life situations?”
- Mathematics, reading, science literacy
  - Other subjects: collaborative problem solving and financial literacy
- Every 3 years, beginning in 2000
## TIMSS and PISA

<table>
<thead>
<tr>
<th></th>
<th>TIMSS</th>
<th>PISA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subjects</strong></td>
<td>Mathematics and science</td>
<td>Mathematics, reading, and science literacy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Collaborative problem solving and financial literacy</td>
</tr>
<tr>
<td><strong>Year of first assessment</strong></td>
<td>1995</td>
<td>2000</td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>Every 4 years</td>
<td>Every 3 years</td>
</tr>
<tr>
<td><strong>Target population</strong></td>
<td>4&lt;sup&gt;th&lt;/sup&gt;- and 8&lt;sup&gt;th&lt;/sup&gt;-graders</td>
<td>15-year-old students</td>
</tr>
<tr>
<td></td>
<td>12&lt;sup&gt;th&lt;/sup&gt;-graders in 2015</td>
<td></td>
</tr>
<tr>
<td><strong>Participation in 2015</strong></td>
<td>65 education systems (incl. 1 U.S. state (FL))</td>
<td>77 education systems (incl. 2 U.S. states (MA, NC))</td>
</tr>
<tr>
<td><strong>Context questionnaires</strong></td>
<td>Student, school, teacher, curriculum</td>
<td>Student, school, teacher (2015)</td>
</tr>
<tr>
<td><strong>Format</strong></td>
<td>Paper-based until 2019</td>
<td>Computer-based as of 2015</td>
</tr>
</tbody>
</table>
Sample Math Items from TIMSS and PISA
TIMSS 8th Grade Math Content and Cognitive Areas

Content domains:
- Number
- Algebra
- Geometry
- Data and Chance

Cognitive domains:
- Knowing
- Applying
- Reasoning
PISA Math Content Areas and Processes

Content domains:
- Change and relationships
- Space and shape
- Quantity
- Uncertainty and data

Processes:
- Formulating situations mathematically
- Employing mathematical concepts, facts, procedures and reasoning
- Interpreting, applying and evaluating mathematical outcomes
There are 10 marbles in a bag: 5 red, and 5 blue.
Sue draws a marble from the bag at random. The marble is red.
She puts the marble back into the bag.
What is the probability that the next marble she draws at random is red?

A. \( \frac{1}{2} \)
B. \( \frac{4}{10} \)
C. \( \frac{1}{5} \)
D. \( \frac{1}{10} \)

Percentage of 8th-graders answering correctly:
US: 66%
Int’l Avg: 45%

Correct Answer: A

Content Domain | Cognitive Domain
--- | ---
Data and Chance | Reasoning

Source: TIMSS 2011
The length of side of each of the small squares represents 1 cm. Draw an isosceles triangle with a base of 4 cm and a height of 5 cm.

Correct Answer:
Correct triangle drawn (any orientation)

Percentage of 8th-graders answering correctly:
US: 27%
Int’l Avg: 48%

Content Domain | Cognitive Domain
--- | ---
Geometry | Applying

Source: TIMSS 2011
What is the area of this rectangle?

A. $x^2 + 2$
B. $x^2 + 2x$
C. $2x + 2$
D. $4x + 4$

Correct Answer: B

Percentage of 8th-graders answering correctly:

US: 37%
Int’l Avg: 40%
PISA Math Item #1 (paper-based)

REVOLVING DOOR

A revolving door includes three wings which rotate within a circular space. The inside diameter of this space is 2 meters (200 centimeters). The three door wings divide the space into three equal sectors. The plan below shows the door wings in three different positions viewed from the top.

Question 1: REVOLVING DOOR

Question intent: Space and shape

What is the size in degrees of the angle formed by two door wings?

Size of the angle: ..................°

Correct Answer: 120

Percentage of students answering correctly in PISA 2012

US: 47%
OECD avg: 58%

Content Domain | Process
--- | ---
Space and Shape | Employ

Source: PISA 2012
Question 2: REVOLVING DOOR

Question intent: Space and shape

The two door openings (the dotted arcs in the diagram) are the same size. If these openings are too wide the revolving wings cannot provide a sealed space and air could then flow freely between the entrance and the exit, causing unwanted heat loss or gain. This is shown in the diagram opposite.

What is the maximum arc length in centimeters (cm) that each door opening can have, so that air never flows freely between the entrance and the exit?

Maximum arc length: .................. cm

Correct Answer: Answers in the range from 103 to 105

Source: PISA 2012

Percentage of students answering correctly in PISA 2012

US: 2%
OECD avg: 4%

Content Domain | Process
--- | ---
Space and Shape | Formulate
Question 3: REVOLVING DOOR

Question intent: Quantity

The door makes 4 complete rotations in a minute. There is room for a maximum of two people in each of the three door sectors.

What is the maximum number of people that can enter the building through the door in 30 minutes?

A 60
B 180
C 240
D 720

Correct Answer: 720

Percentage of students answering correctly in PISA 2012

US: 45%
OECD avg: 46%

<table>
<thead>
<tr>
<th>Content Domain</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>Formulate</td>
</tr>
</tbody>
</table>
Sample Science Items from TIMSS and PISA
TIMSS 8th Grade Science Content and Cognitive Areas

Content domains:
- Biology
- Chemistry
- Physics
- Earth Science

Cognitive domains:
- Knowing
- Applying
- Reasoning
PISA Science Knowledge Areas and Competencies

Knowledge:
- Content
  - Physical systems
  - Living systems
  - Earth and space systems
- Procedural
- Epistemic

Competencies:
- Identifying scientific issues
- Explaining phenomena scientifically
- Using scientific evidence
The diagram shows water flowing from a tank and rotating a wheel.

A. What kind of energy does the water have when it is in the tank?

Correct Answer: Potential energy or gravitational energy or stored energy

Percentage of 8th-graders answering correctly:

US: 32%
Int’l Avg: 17%

Content Domain | Cognitive Domain
--- | ---
Physics | Knowing

Source: TIMSS 2011
TIMSS 8th Grade Science Item #2

The diagram shows water flowing from a tank and rotating a wheel.

B. What kind of energy does the water have just before it hits the wheel?

<table>
<thead>
<tr>
<th>Content Domain</th>
<th>Cognitive Domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>Knowing</td>
</tr>
</tbody>
</table>

Percentage of 8th-graders answering correctly:

US: 37%
Int’l Avg: 24%

Correct Answer: Kinetic energy

Source: TIMSS 2011
The diagram shows water flowing from a tank and rotating a wheel.

C. Write one change to the system that will make the wheel rotate faster.

Correct Answer: reason related to increasing the flow of water. Example: More water coming out at once; a bigger opening.

Percentage of 8th-graders answering correctly:
US: 28%
Int’l Avg: 27%

Source: TIMSS 2011
ACID RAIN

Below is a photo of statues called Caryatids that were built on the Acropolis in Athens more than 2500 years ago. The statues are made of a type of rock called marble. Marble is composed of calcium carbonate.

In 1980, the original statues were transferred inside the museum of the Acropolis and were replaced by replicas. The original statues were being eaten away by acid rain.

Question 1: ACID RAIN

Question intent: Explaining phenomena scientifically

Normal rain is slightly acidic because it has absorbed some carbon dioxide from the air. Acid rain is more acidic than normal rain because it has absorbed gases like sulphur oxides and nitrogen oxides as well.

Where do these sulphur oxides and nitrogen oxides in the air come from?

<table>
<thead>
<tr>
<th>Content Knowledge</th>
<th>Competency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical Systems</td>
<td>Explaining Phenomena Scientifically</td>
</tr>
</tbody>
</table>

Source: PISA 2006
Scoring for PISA Science Item #1 (paper-based)

**Correct**

Answers that mention any one of: car exhausts, factory emissions, *burning* fossil fuels such as oil and coal, gases from volcanoes or other similar things.

Answers that include an incorrect as well as a correct source of the pollution.

Answers that refer to “pollution” but do not give a source of pollution that is a significant cause of acid rain.

**Scoring Comment:** Just mentioning “pollution” is sufficient for Full Credit.

**Incorrect**

Other responses, including responses that do not mention “pollution” *and* do not give a significant cause of acid rain.

---

Percentage of students answering correctly in PISA 2006

**US:** 54%

**OECD avg:** 58%

Source: PISA 2006
The effect of acid rain on marble can be modelled by placing chips of marble in vinegar overnight. Vinegar and acid rain have about the same acidity level. When a marble chip is placed in vinegar, bubbles of gas form. The mass of the dry marble chip can be found before and after the experiment.

**Question 2: ACID RAIN**

**Question intent: Using scientific evidence**

A marble chip has a mass of 2.0 grams before being immersed in vinegar overnight. The chip is removed and dried the next day. What will the mass of the dried marble chip be?

A. Less than 2.0 grams  
B. Exactly 2.0 grams  
C. Between 2.0 and 2.4 grams  
D. More than 2.4 grams

**Correct Answer: A**

### Percentage of students answering correctly in PISA 2006

- **US:** 66%
- **OECD avg:** 67%

**Content Knowledge Area** | **Competency**
---|---
Physical Systems | Using Scientific Evidence

Source: PISA 2006
Question 3: ACID RAIN

Question intent: Identifying scientific issues

Students who did this experiment also placed marble chips in pure (distilled) water overnight. Explain why the students include this step in their experiment.

**Fully Correct**

Answers such as:

- To show that the acid (vinegar) is necessary for the reaction.
- To make sure that rainwater must be acidic like acid rain to cause this reaction.
- To see whether there are other reasons for the holes in the marble chips.
- Because it shows that the marble chips don’t just react with any fluid since water is neutral.

**Partially Correct**

Answers which compare with the test of vinegar and marble, but it is not made clear that this is being done to show that the acid (vinegar) is necessary for the reaction.

**Incorrect**

Other responses.

---

**Percentage of students answering correctly in PISA 2006**

US: 35%
OECD avg: 36%

---

**Knowledge Area** | **Competency**
---|---
Scientific Inquiry | Identifying Scientific Issues

Source: PISA 2006
RUNNING IN HOT WEATHER

During long-distance running, body temperature rises and sweating occurs.

If runners do not drink enough to replace the water they lose through sweating, they can experience dehydration. Water loss of 2% of body mass and above is considered to be a state of dehydration. This percentage is labeled on the water loss meter shown below.

If the body temperature rises to 40°C and above, runners can experience a life-threatening condition called heat stroke. This temperature is labeled on the body temperature thermometer shown below.
**Running in Hot Weather**

**Introduction**

This simulation is based on a model that calculates the volume of sweat, water loss, and body temperature of a runner after a one-hour run.

To see how all the controls in this simulation work, follow these steps:

1. Move the slider for **Air Temperature**.
2. Move the slider for **Air Humidity**.
3. Click on either "Yes" or "No" for **Drinking Water**.
4. Click on the "Run" button to see the results. Notice that a water loss of 2% and above causes dehydration, and that a body temperature of 40°C and above causes heat stroke. The results will also display in the table.

Note: The results shown in the simulation are based on a simplified mathematical model of how the body functions for a particular individual after running for one hour in different conditions.

**Table:**

<table>
<thead>
<tr>
<th>Air Temperature (°C)</th>
<th>Air Humidity (%)</th>
<th>Drinking Water</th>
<th>Sweat Volume (Litres)</th>
<th>Water Loss (%)</th>
<th>Body Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>20</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: PISA 2015
Running in Hot Weather
Question 1 / 6

How to Run the Simulation

Run the simulation to collect data based on the information below. Select from the drop-down menus to answer the question.

A runner runs for one hour on a hot, dry day (air temperature 40°C, air humidity of 20%). The runner does not drink any water.

What health danger does the runner encounter by running under these conditions?

The health danger that the runner encounters is select [ ] of the runner after a one-hour run.

This is shown by the select [ ] of the runner.

<table>
<thead>
<tr>
<th>Knowledge Area</th>
<th>Competency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedural</td>
<td>Interpret Data and Evidence Scientifically</td>
</tr>
</tbody>
</table>

Source: PISA 2015
Running in Hot Weather
Question 2 / 6

How to Run the Simulation

Run the simulation to collect data based on the information below. Click on a choice and then select data in the table to answer the question.

A runner runs for an hour on a hot and humid day (air temperature 35°C, air humidity of 60%) without drinking any water. This runner is at risk of both dehydration and heat stroke.

What would be the effect of drinking water during the run on the runner’s risk of dehydration and heat stroke?

- Drinking water would reduce the risk of heat stroke but not dehydration.
- Drinking water would reduce the risk of dehydration but not heat stroke.
- Drinking water would reduce the risk of both heat stroke and dehydration.
- Drinking water would not reduce the risk of either heat stroke or dehydration.

Select two rows of data in the table to support your answer.

### Content Knowledge
- Living Systems

### Competency
- Explain Phenomena Scientifically

Source: PISA 2015
Running in Hot Weather
Question 3 / 6
How to Run the Simulation

Run the simulation to collect data based on the information below. Click on a choice, select data in the table, and then type an explanation to answer the question.

When the air humidity is 60%, what is the effect of an increase in air temperature on sweat volume after a one-hour run?
- ☐ Sweat volume increases
- ☐ Sweat volume decreases

Select two rows of data in the table to support your answer.

What is the biological reason for this effect?

<table>
<thead>
<tr>
<th>Air Temperature (°C)</th>
<th>Air Humidity (%)</th>
<th>Drinking Water</th>
<th>Sweat Volume (Litres)</th>
<th>Water Loss (%)</th>
<th>Body Temperature (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Knowledge Area | Competency
---|---
Procedural | Evaluate and Design Scientific Enquiry

Content Knowledge | Competency
---|---
Living Systems | Explain Phenomena Scientifically

Source: PISA 2015
Sample Reading Items from PISA
# PISA Reading Situation, Text, and Aspect Areas

<table>
<thead>
<tr>
<th>Situation:</th>
<th>Text:</th>
<th>Aspects:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal</td>
<td>Medium: print and digital</td>
<td>Access and retrieve</td>
</tr>
<tr>
<td>Educational</td>
<td>Environment: authored, message-based and mixed</td>
<td>Integrate and interpret</td>
</tr>
<tr>
<td>Occupational</td>
<td>Text format: continuous, non-continuous, mixed and multiple</td>
<td>Reflect and evaluate</td>
</tr>
<tr>
<td>Public</td>
<td>Text type: description, narration, exposition, argumentation, instruction and transaction</td>
<td></td>
</tr>
</tbody>
</table>
TELECOMMUTING

The way of the future

Just imagine how wonderful it would be to "telecommute" to work on the electronic highway, with all your work done on a computer or by phone! No longer would you have to jam your body into crowded buses or trains or waste hours and hours travelling to and from work. You could work wherever you want to – just think of all the job opportunities this would open up!

Molly

Disaster in the making

Cutting down on commuting hours and reducing the energy consumption involved is obviously a good idea. But such a goal should be accomplished by improving public transportation or by ensuring that workplaces are located near where people live. The ambitious idea that telecommuting should be part of everyone's way of life will only lead people to become more and more self-absorbed. Do we really want our sense of being part of a community to deteriorate even further?

Richard

"Telecommuting" is a term coined by Jack Nilles in the early 1970s to describe a situation in which workers work on a computer away from a central office (for example, at home) and transmit data and documents to the central office via telephone lines.

Source: PISA 2009
**Question 1: TELECOMMUTING**

*Question intent: Integrate and interpret*

*Text format: Multiple*

What is the relationship between “The way of the future” and “Disaster in the making”?

A. They use different arguments to reach the same general conclusion.
B. They are written in the same style but they are about completely different topics.
C. They express the same general point of view, but arrive at different conclusions.
D. They express opposing points of view on the same topic.

Correct Answer: D

---

**Percentage of students answering correctly in PISA 2009**

US: 55%

OECD avg: 52%

**Source:** PISA 2009
Question 2: TELECOMMUTING

Text format: Continuous

What is one kind of work for which it would be difficult to telecommute? Give a reason for your answer.

Correct

Answers which identify a kind of work and give a plausible explanation as to why a person who does that kind of work could not telecommute. Responses MUST indicate (explicitly or implicitly) that it is necessary to be physically present for the specific work.

- Building. It’s hard to work with the wood and bricks from just anywhere.
- Sportsperson. You need to really be there to play the sport.
- Plumber. You can’t fix someone else’s sink from your home!
- Digging ditches because you need to be there.
- Nursing – it’s hard to check if patients are ok over the Internet.

Incorrect

Answers which identify a kind of work but include no explanation OR provide an explanation that does not relate to telecommuting.

- Digging ditches.
- Fire fighter.
- Student.
- Digging ditches because it would be hard work. [Explanation does not show why this would make it difficult to telecommute.]

Source: PISA 2009

Percentage of students answering correctly in PISA 2009

US: 60%
OECD avg: 56%
PISA Reading Item #3 (paper-based)

Question 3: TELECOMMUTING

Question intent: Integrate and interpret

Text format: Multiple

Which statement would **both** Molly and Richard agree with?

A. People should be allowed to work for as many hours as they want to.
B. It is not a good idea for people to spend too much time getting to work.
C. Telecommuting would not work for everyone.
D. Forming social relationships is the most important part of work.

Percentage of students answering correctly in PISA 2009

**US:** 52%

**OECD avg:** 60%

Source: PISA 2009
Sample items from TIMSS Advanced
L16. Find all real values of $x$ which satisfy the following equation:

$$\sqrt{x} - \frac{2}{\sqrt{x}} = 1$$

Show all your work.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Item Key</th>
<th>Content Category</th>
<th>Performance Expectation</th>
<th>International Average Percent of Students Responding Correctly</th>
<th>International Difficulty Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Mathematics</td>
<td>next page</td>
<td>Numbers, Equations and Functions</td>
<td>Solving Problems</td>
<td>24%</td>
<td>664</td>
</tr>
</tbody>
</table>

Source: TIMSS Advanced 1995
Scoring TIMSS Advanced Math Item #1

L16. Find all real values of \( x \) which satisfy the following equation:

\[
\sqrt{x} - \frac{2}{\sqrt{x}} = 1
\]

Show all your work.

<table>
<thead>
<tr>
<th>Code</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Correct Response</strong></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>( x = 4 ). Method:</td>
</tr>
<tr>
<td></td>
<td>1. Original equation transformed to quadratic equation, ( x^2 - 5x + 4 = 0 ).</td>
</tr>
<tr>
<td></td>
<td>2. Two roots, ( x=4 ) and ( x=1 ) found and checked in original equation.</td>
</tr>
<tr>
<td></td>
<td>3. ( x=1 ) is rejected as a solution of the original equation; ( x=4 ) is accepted.</td>
</tr>
<tr>
<td></td>
<td><strong>Note:</strong> Since the original equation is squared, it is necessary to check both roots in the original equation.</td>
</tr>
<tr>
<td>31</td>
<td>( x = 4 ). Method:</td>
</tr>
<tr>
<td></td>
<td>1. Substitution (e.g., ( \sqrt{x} = a )) used and the original equation transformed, without squaring, into the quadratic equation ( a^2 - a - 2 = 0 ).</td>
</tr>
<tr>
<td></td>
<td>2. Two roots found, ( a = 2 ) and ( a = -1 ).</td>
</tr>
<tr>
<td></td>
<td>3. ( a = -1 ) rejected since ( a = -1 \neq \sqrt{x} ), ( \sqrt{x^2} ).</td>
</tr>
<tr>
<td></td>
<td>4. By substitution reversed, ( a = 2 ) implies ( \sqrt{x} = 2 ), thus ( x = 4 ). Checking in original equation is not necessary.</td>
</tr>
<tr>
<td>32</td>
<td>( x = 4 ). Method:</td>
</tr>
<tr>
<td></td>
<td>1. Graphs ( y = \sqrt{x} - \frac{2}{\sqrt{x}} - 1 ) for ( x &gt; 0 ) correctly.</td>
</tr>
<tr>
<td></td>
<td>2. ( x )-coordinate of ( y )-intercept is found to be 4.</td>
</tr>
<tr>
<td></td>
<td>3. Justifies that graph is increasing and thus ( x = 4 ) is an unique solution.</td>
</tr>
<tr>
<td></td>
<td>4. ( x = 4 ) is <strong>checked in original equation</strong>.</td>
</tr>
<tr>
<td>39</td>
<td>Other completely correct solutions.</td>
</tr>
</tbody>
</table>

Source: TIMSS Advanced 1995
## Scoring TIMSS Advanced Math Item #1 – cont.

### Partial Response

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Uses code 30 to find $x = 4$ and $x = 1$ and states both are roots.</td>
</tr>
<tr>
<td>21</td>
<td>Uses code 31 to find $a = 2$ and $a = -1$ and then either goes no further or makes an incorrect statement such as 4 and 1 or 2 and 1 are roots of the original equation.</td>
</tr>
<tr>
<td>22</td>
<td>Uses code 32 showing graph, states $x = 4$ is a root and $x = 4$ is checked in the original equation.</td>
</tr>
<tr>
<td>29</td>
<td>Other solutions with correct overall method but with minor error(s).</td>
</tr>
</tbody>
</table>

### Minimal Response

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>$x = 4$. No work shown or some work shown, such as checking $x = 4$ in original equation but no argument given for why there are no other roots.</td>
</tr>
<tr>
<td>11</td>
<td>Solution as in codes 30 or 31: Original equation is transformed correctly into a quadratic equation, by any method, but quadratic equation either is not solved or incorrectly solved.</td>
</tr>
<tr>
<td>12</td>
<td>Solution as in code 22 (graphical) except that except that $x = 4$ is NOT checked in original equation.</td>
</tr>
<tr>
<td>19</td>
<td>Other minimally correct or incomplete solutions such as a simplification of the equation to $x - 2 = \sqrt{x}$.</td>
</tr>
</tbody>
</table>

### Incorrect Response

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>Solution as in codes 30 or 31 except original equation is transformed into an incorrect quadratic equation or to a non-quadratic equation.</td>
</tr>
<tr>
<td>79</td>
<td>Other incorrect responses.</td>
</tr>
</tbody>
</table>

### Nonresponse

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>90</td>
<td>Crossed-out, illegible, or impossible to interpret.</td>
</tr>
<tr>
<td>99</td>
<td>BLANK</td>
</tr>
</tbody>
</table>
Two particles have charges $q$ and $2q$, respectively. Which figure BEST describes the electric forces acting on the two particles?

- **A**
- **B**
- **C**
- **D**

Source: TIMSS Advanced 2008
Coming Soon

TIMSS 2015 and TIMSS Advanced Results – Released November 29th, 2016

PISA 2015 Results – Released December 6th, 2016
Resources at NCES

For more information about TIMSS and PISA, data, and publications:

http://nces.ed.gov/timss/
http://nces.ed.gov/surveys/pisa/

TIMSS: Lydia Malley (lydia.malley@ed.gov)
and Stephen Provasnik (stephen.provasnik@ed.gov)

PISA: Patrick Gonzales (patrick.gonzales@ed.gov)
And Dana Kelly (dana.kelly@ed.gov)