

# **Arizona's Instrument to Measure Standards (AIMS HS)**

## **Mathematics**

### **Released Items**

November 15, 2006

## AIMS Mathematics Released Items for 2006

As part of Superintendent Tom Horne's ongoing efforts to improve the communication of academic expectations, the Arizona Department of Education is releasing High School reading, writing, and mathematics items to the public. This release is intended to provide students, parents, teachers, and the community with specific examples of the types of skills being assessed on the AIMS tests. The release is divided into a reading/writing form and a mathematics form, similar to the AIMS test.

This release is from the 2004 AIMS administration which includes three reading passages, directions, and the items associated with each passage in the form of a mini-test. The reading section is followed by the writing section that includes the prompt and directions used in the AIMS assessments. The final section will contain the individual items with the correct answers and statistical information about each item.

The mathematics section consists of a mini-test with fourteen items from the 2002, 2003, 2004, and 2005 AIMS administrations, followed by the individual items and their statistics.

The statistical information provided includes:

- 1) Item identification number;
- 2) Correct answer;
- 3) Response probability (P-Value), which represents the percentage of students who answered the question correctly;
- 4) Rasch difficulty, which measures the difficulty of the item on a scale in which -3 indicates a very easy item and +3 indicates an extremely difficult item;
- 5) The performance objective as the item aligns to the 2003 standards.

The items are reproductions of the actual items as they appeared on the AIMS tests. If you have any questions, please contact Frank Brashear, Director of Test Item Development, at (602) 542-5031.

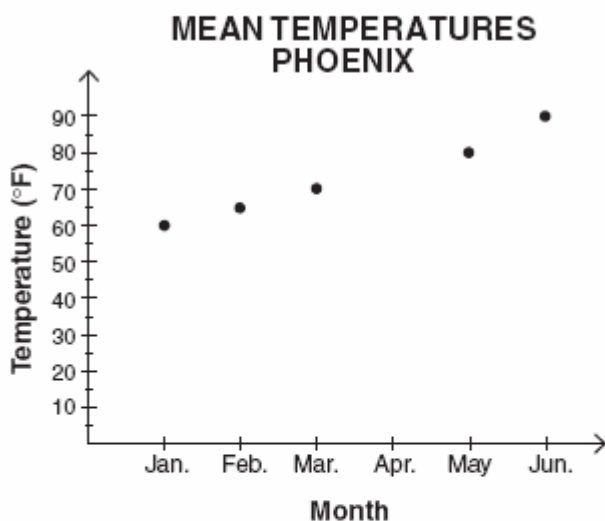
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# MATHEMATICS

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**Mathematics****DIRECTIONS:** Read each question and choose the best answer.

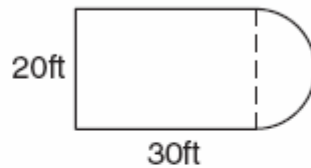
1. The graph below shows some monthly mean temperatures for Phoenix.



Which of these is the most likely mean temperature for the month of April in Phoenix?

- A 80°F
  - B 75°F
  - C 60°F
  - D 55°F
2. Which equation represents “the sum of three  $x$  and four  $y$  equals ten”?
- A  $3x + 4y = 10$
  - B  $3 + x + 4 + y = 10$
  - C  $7xy = 10$
  - D  $3(x + 4y) = 10$

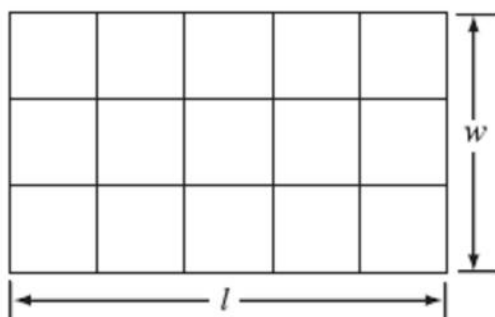
3. The figure below represents the top view of an area taken up by a fountain at a shopping mall. The figure consists of a rectangle with a semi circle at its end as shown.



Which is closest to the total area taken up by the fountain?

- A 257 sq ft
  - B 757 sq ft
  - C 914 sq ft
  - D 1228 sq ft
4. John has 3 different flags to fly on his flagpole: red (R), yellow (Y), and blue (B). If all 3 flags are to be flown together, what is the outcome set of how they can be displayed?
- A {R, Y, B}
  - B {RY, RB, YB}
  - C {RYB, BRY, YBR}
  - D {RYB, RBY, BRY, BYR, YRB, YBR}

5. Four students each used a different method to find the area of the rectangle below.



Which of the following students used an INCORRECT method to find the area?

- A Student 1 counted the number of unit squares.
  - B Student 2 used  $l \cdot w$ .
  - C Student 3 multiplied the number of rows times the number of columns.
  - D Student 4 used  $2l \cdot 2w$ .
6. Which of the following real-world situations could best be modeled by the graph below?

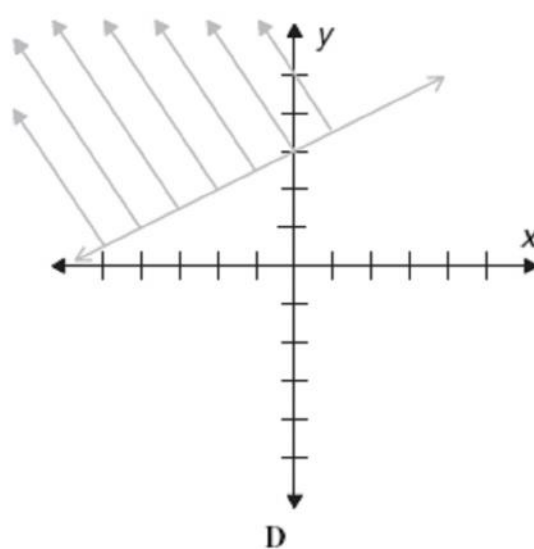
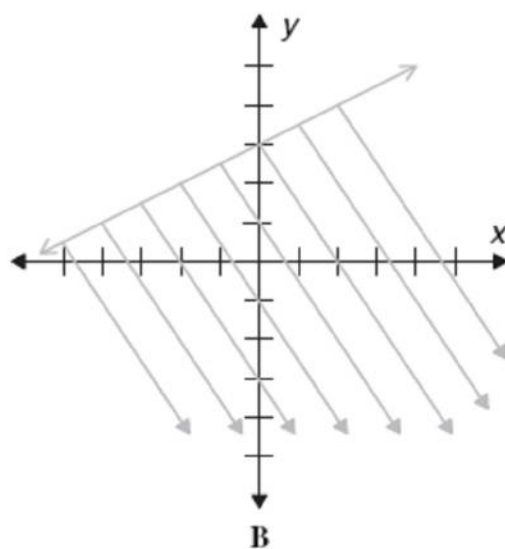
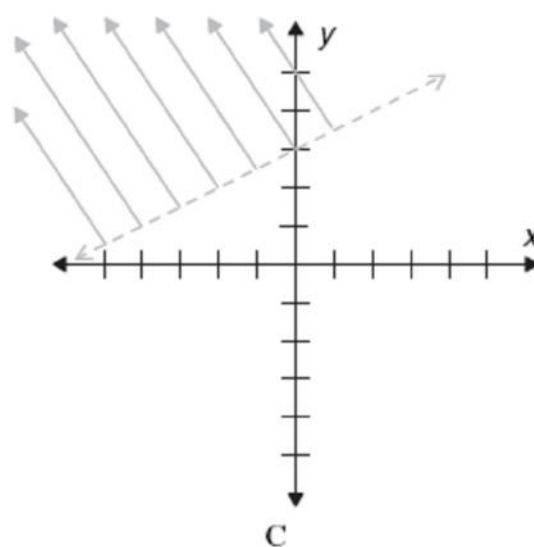
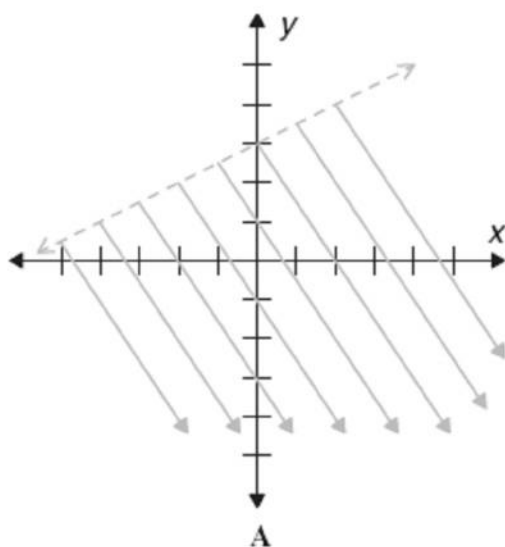


- A the altitude of a plane during a trip, from take-off to landing
- B the temperature of a pizza after it has been taken out of an oven
- C the height of a person growing from child to adult
- D the amount of gasoline in a car gas tank during a trip

7. Which of the following equations of a line has an  $x$ -intercept at 4 and a  $y$ -intercept at  $-2$ ?

- A  $2x - y = 8$
- B  $2x - y = 4$
- C  $x - 2y = 4$
- D  $2x - y = 10$

8. Which of the following best represents the graph of the inequality  $y < \frac{1}{2}x + 3$ ?



9. The following table represents  $C$ , an appliance repairman's charges based on  $t$ , the hours it takes to make a repair.

**APPLIANCE REPAIR TOTAL CHARGES**

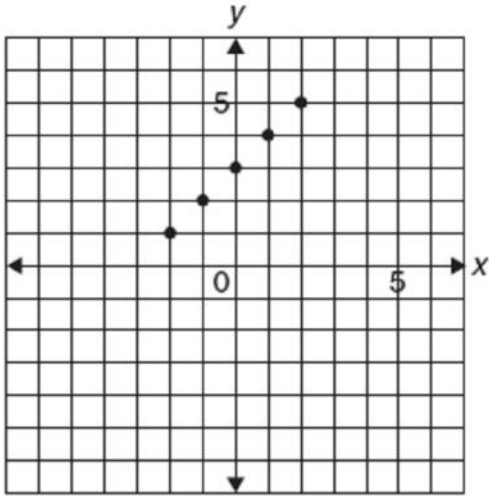
$t$ (hours)	$C$ (dollars)
1	75
3	145
5	215
7	285

Which of the following equations could be used to determine the repairman's charges for a repair?

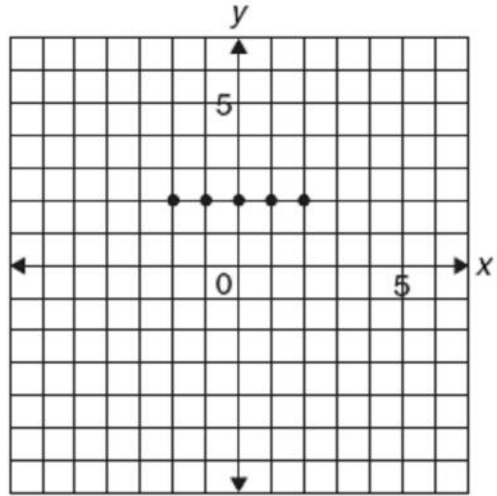
- A  $C = 35t + 40$   
B  $C = 40t + 35$   
C  $C = 75t$   
D  $C = 45t$
10. Which set of numbers is finite?
- A {even numbers between 1 and 89}  
B {real numbers greater than 1}  
C {rational numbers between 1 and 2}  
D {whole numbers with tens digits at zero}



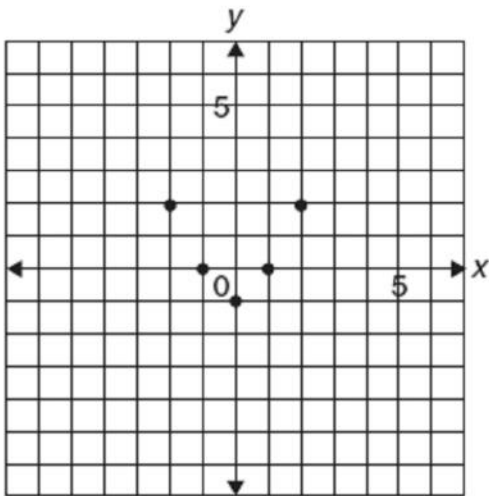
11. Which of the following functions of  $x$  has an apparent range of  $\{-1, 0, 2\}$ ?



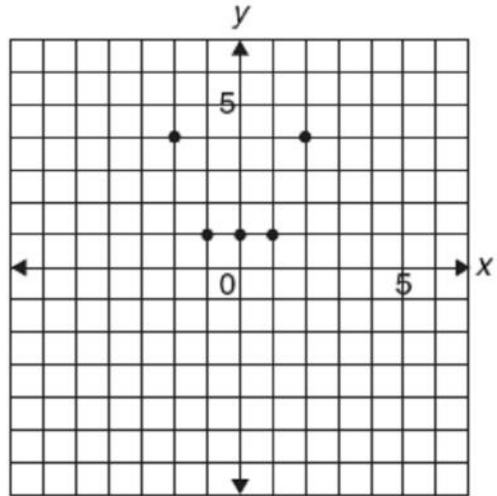
A



C

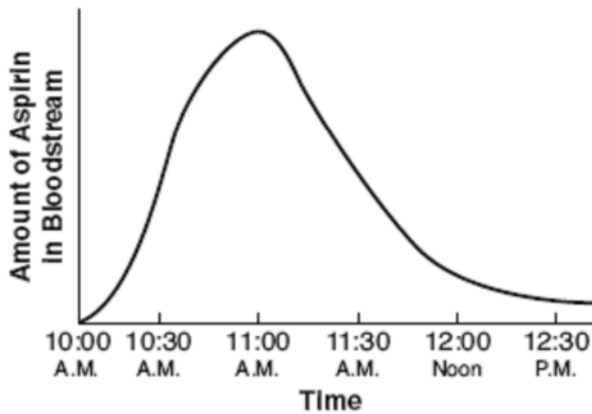


B



D

12. Chris took an aspirin at 10:00 A.M. The graph shows the concentration of aspirin in his bloodstream over time.



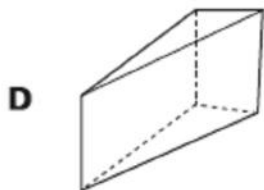
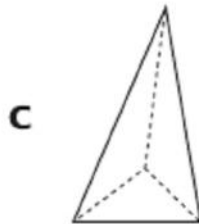
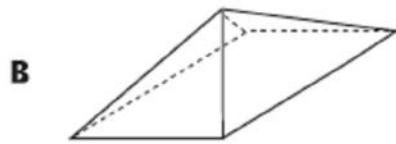
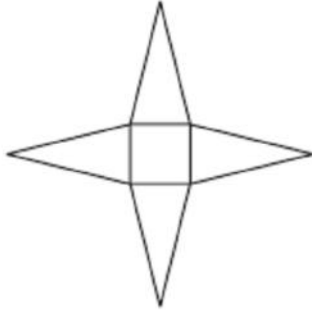
What appears to be the time the concentration was highest?

- A 10:00 A.M.
  - B 11:00 A.M.
  - C 11:30 A.M.
  - D 12:30 A.M.
13. The set of real numbers shown below is a subset of which of the following?

$$\{\sqrt{8}, \pi\}$$

- A rationals
- B irrationals
- C integers
- D whole numbers

14. Which object is represented by the following net?



Item	Item Data																					
<b>1</b>	Item Number	3015156	Correct Answer	B	P-Value	.9007	Equated Rasch Value	-1.8179														
	2003 Mathematics Standard Alignment is Strand <b>2</b> – Concept <b>1</b> – Performance Objective <b>7</b>																					
<p>The graph below shows some monthly mean temperatures for Phoenix.</p>																						
<p style="text-align: center;"><b>MEAN TEMPERATURES PHOENIX</b></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <caption>Data from Mean Temperatures Phoenix Graph</caption> <thead> <tr> <th>Month</th> <th>Temperature (°F)</th> </tr> </thead> <tbody> <tr> <td>Jan.</td> <td>60</td> </tr> <tr> <td>Feb.</td> <td>65</td> </tr> <tr> <td>Mar.</td> <td>70</td> </tr> <tr> <td>Apr.</td> <td>75</td> </tr> <tr> <td>May</td> <td>80</td> </tr> <tr> <td>Jun.</td> <td>90</td> </tr> </tbody> </table>									Month	Temperature (°F)	Jan.	60	Feb.	65	Mar.	70	Apr.	75	May	80	Jun.	90
Month	Temperature (°F)																					
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<p>Which of these is the most likely mean temperature for the month of April in Phoenix?</p>																						
<p>A 80°F                  B 75°F                  C 60°F                  D 55°F</p>																						
<b>2</b>	Item Number	3015277	Correct Answer	A	P-Value	.8556	Equated Rasch Value	-1.5713														
	2003 Mathematics Standard Alignment is Strand <b>3</b> – Concept <b>3</b> – Performance Objective <b>4</b>																					
<p>Which equation represents “the sum of three <math>x</math> and four <math>y</math> equals ten”?</p>																						
<p>A <math>3x + 4y = 10</math>                  B <math>3 + x + 4 + y = 10</math>                  C <math>7xy = 10</math>                  D <math>3(x + 4y) = 10</math></p>																						

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<b>3</b>	Item Number	3015011	Correct Answer	B	P-Value	.584	Equated Rasch Value	0.3920		
	2003 Mathematics Standard Alignment is Strand <b>4</b> – Concept <b>4</b> – Performance Objective <b>1</b>									
<p>The figure below represents the top view of an area taken up by a fountain at a shopping mall. The figure consists of a rectangle with a semi circle at its end as shown.</p> <div style="text-align: center;"> </div> <p>Which is closest to the total area taken up by the fountain?</p> <p>A 257 sq ft          B 757 sq ft          C 914 sq ft          D 1228 sq ft</p>										
<b>4</b>	Item Number	2019641	Correct Answer	D	P-Value	.720	Equated Rasch Value	-0.7801		
	2003 Mathematics Standard Alignment is Strand <b>2</b> – Concept <b>3</b> – Performance Objective <b>1</b>									
<p>John has 3 different flags to fly on his flagpole: red (R), yellow (Y), and blue (B). If all 3 flags are to be flown together, what is the outcome set of how they can be displayed?</p> <p>A {R, Y, B}          B {RY, RB, YB}          C {RYB, BRY, YBR}          D {RYB, RBY, BRY, BYR, YRB, YBR}</p>										

<b>5</b>	Item Number	3015170	Correct Answer	D	P-Value	.785	Equated Rasch Value	-0.7264
	2003 Mathematics Standard Alignment is Strand <b>5</b> – Concept <b>1</b> – Performance Objective <b>4</b>							

Four students each used a different method to find the area of the rectangle below.

Which of the following students used an **INCORRECT** method to find the area?

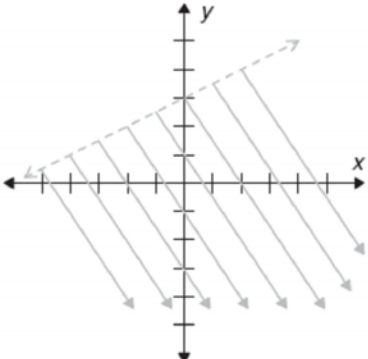
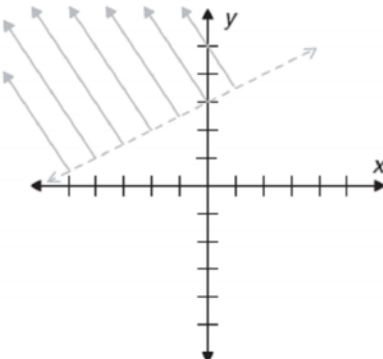
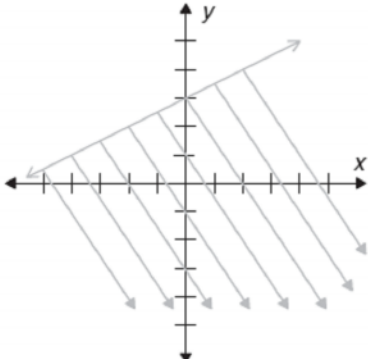
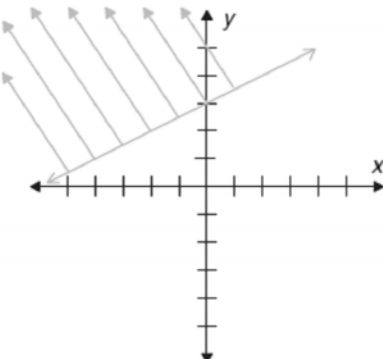
- A Student 1 counted the number of unit squares.
- B Student 2 used  $l \cdot w$ .
- C Student 3 multiplied the number of rows times the number of columns.
- D Student 4 used  $2l \cdot 2w$ .

<b>6</b>	Item Number	3015138	Correct Answer	A	P-Value	.883	Equated Rasch Value	-1.5575
	2003 Mathematics Standard Alignment is Strand <b>3</b> – Concept <b>2</b> – Performance Objective <b>2</b>							

Which of the following real-world situations could best be modeled by the graph below?

- A the altitude of a plane during a trip, from take-off to landing
- B the temperature of a pizza after it has been taken out of an oven
- C the height of a person growing from child to adult
- D the amount of gasoline in a car gas tank during a trip

<b>7</b>	Item Number	2019572	Correct Answer	C	P-Value	.544	Equated Rasch Value	0.6522
	2003 Mathematics Standard Alignment is Strand <b>3</b> – Concept <b>4</b> – Performance Objective <b>1</b>							
<p>Which of the following equations of a line has an <math>x</math>-intercept at 4 and a <math>y</math>-intercept at <math>-2</math>?</p> <p>A <math>2x - y = 8</math>          B <math>2x - y = 4</math>          C <math>x - 2y = 4</math>          D <math>2x - y = 10</math></p>								

<b>8</b>	Item Number	3015143	Correct Answer	A	P-Value	.413	Equated Rasch Value	1.3230
	2003 Mathematics Standard Alignment is Strand <b>4</b> – Concept <b>3</b> – Performance Objective <b>3</b>							
<p>Which of the following best represents the graph of the inequality <math>y &lt; \frac{1}{2}x + 3</math>?</p> <div style="display: flex; flex-wrap: wrap; justify-content: space-around;"> <div style="text-align: center;">  <p>A</p> </div> <div style="text-align: center;">  <p>C</p> </div> <div style="text-align: center;">  <p>B</p> </div> <div style="text-align: center;">  <p>D</p> </div> </div>								

<b>9</b>	Item Number	3015282	Correct Answer	A	P-Value	.456	Equated Rasch Value	1.1011												
	2003 Mathematics Standard Alignment is Strand <b>3</b> – Concept <b>3</b> – Performance Objective <b>6</b>																			
<p>The following table represents <math>C</math>, an appliance repairman's charges based on <math>t</math>, the hours it takes to make a repair.</p> <p style="text-align: center;"><b>APPLIANCE REPAIR TOTAL CHARGES</b></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th><math>t</math> (hours)</th> <th><math>C</math> (dollars)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>75</td> </tr> <tr> <td>3</td> <td>145</td> </tr> <tr> <td>5</td> <td>215</td> </tr> <tr> <td>7</td> <td>285</td> </tr> </tbody> </table> <p>Which of the following equations could be used to determine the repairman's charges for a repair?</p> <p>A <math>C = 35t + 40</math>            B <math>C = 40t + 35</math>            C <math>C = 75t</math>            D <math>C = 45t</math></p>											$t$ (hours)	$C$ (dollars)	1	75	3	145	5	215	7	285
$t$ (hours)	$C$ (dollars)																			
1	75																			
3	145																			
5	215																			
7	285																			
<b>10</b>	Item Number	3140835	Correct Answer	A	P-Value	.2748	Equated Rasch Value	2.0809												
	2003 Mathematics Standard Alignment is Strand <b>1</b> – Concept <b>1</b> – Performance Objective <b>3</b>																			
<p>Which set of numbers is finite?</p> <p>A {even numbers between 1 and 89}            B {real numbers greater than 1}            C {rational numbers between 1 and 2}            D {whole numbers with tens digits at zero}</p>																				

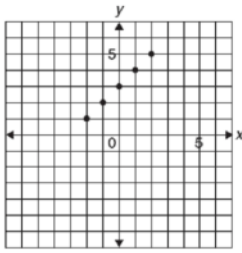


11

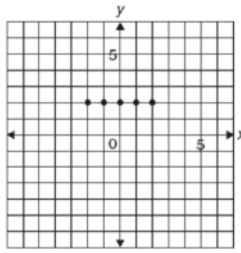
Item Number	3015280	Correct Answer	B	P-Value	.514	Equated Rasch Value	0.8061
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2003 Mathematics Standard Alignment is Strand 3 – Concept 2 – Performance Objective 5

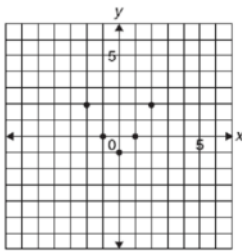
Which of the following functions of  $x$  has an apparent range of  $\{-1, 0, 2\}$ ?



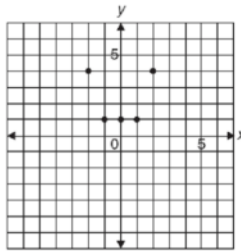
A



C



B



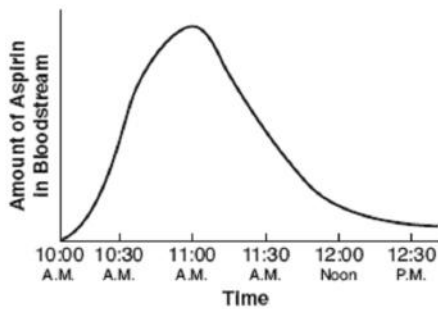
D

12

Item Number	3140659	Correct Answer	B	P-Value	.953	Equated Rasch Value	-2.8849
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2003 Mathematics Standard Alignment is Strand 3 – Concept 2 – Performance Objective 6

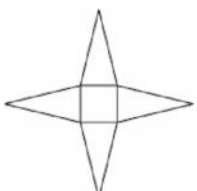
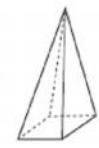
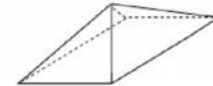

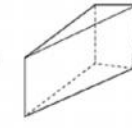
Chris took an aspirin at 10:00 A.M. The graph shows the concentration of aspirin in his bloodstream over time.



What appears to be the time the concentration was highest?

- A 10:00 A.M.
- B 11:00 A.M.
- C 11:30 A.M.
- D 12:30 A.M.

AIMS Mathematics Released Items for 2006

<b>13</b>	Item Number	3140724	Correct Answer	B	P-Value	.6097	Equated Rasch Value	.3490		
	2003 Mathematics Standard Alignment is Strand 1 – Concept 1 – Performance Objective 1									
<p>The set of real numbers shown below is a subset of which of the following?</p> <p style="text-align: center;"><math>\{\sqrt{8}, \pi\}</math></p> <p>A rationals          B irrationals          C integers          D whole numbers</p>										
<b>14</b>	Item Number	3140763	Correct Answer	A	P-Value	.8967	Equated Rasch Value	-1.8514		
	2003 Mathematics Standard Alignment is Strand 4 – Concept 1 – Performance Objective 4									
<p>Which object is represented by the following net?</p> <div style="text-align: center;">  </div> <p>A </p> <p>B </p> <p>C </p> <p>D </p>										