

# **Arizona's Instrument to Measure Standards**

## **High School Mathematics**

**Administered Spring, 2004**

**Released items**

**11.15.2004**

## AIMS Mathematics Released Items

As part of Superintendent 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 includes two Reading passages, directions, and the items associated with them, 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 test administered in the spring of 2004. This is followed by the individual items with the correct answers and statistical information.

The Mathematics section consists of eighteen items in the form of a mini-test, followed by the individual items and 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) Original performance objective (parent PO) that the item was used to measure; and
- 6) 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 Bryan Doyle at (602) 542-5031.

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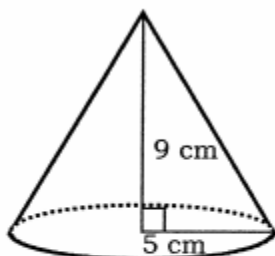
# **MATHEMATICS**

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**Mathematics**

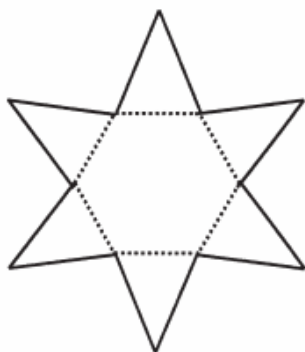
**DIRECTIONS:** Read each question and choose the best answer.

- 1 What is the *volume* of the given cone?

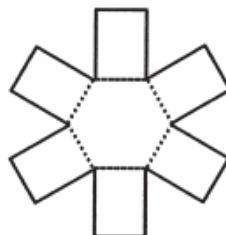


- A  $225\pi \text{ cm}^3$
  - B  $75\pi \text{ cm}^3$
  - C  $25\pi \text{ cm}^3$
  - D  $15\pi \text{ cm}^3$
- 2 If a hexagonal pyramid were laid flat on a plane, which of the following would represent its net?

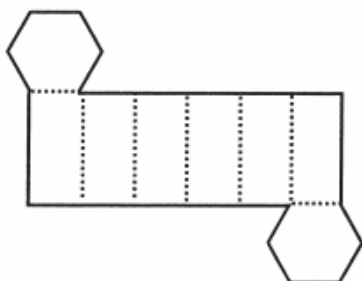
A



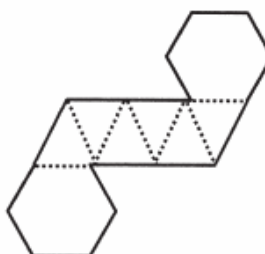
C



B



D

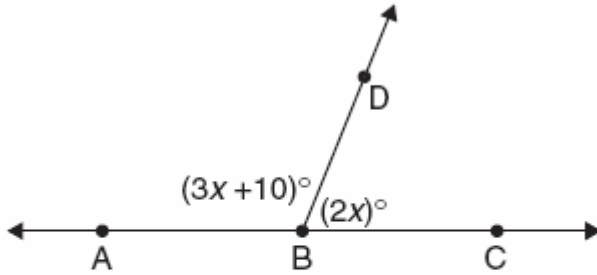


- 3 Joan is planning her summer vacation. She can choose to go to one of 7 different countries, using 4 different airlines, and three different departure dates. How many different vacation combinations consisting of one country, one airline and one departure date are possible?
- A 14  
B 28  
C 31  
D 84
- 4 A model of a house is built to a scale of 1:10. The original house has a height of 15 ft. What is the height of the model?
- A  $1\frac{1}{2}$  feet  
B  $\frac{2}{3}$  feet  
C 5 feet  
D 10 feet
- 5 Which of the linear equations below is derived from the following table of values?

x	-3	-1	1	3
y	1	3	5	7

- A  $y = x + 4$   
B  $y = 2x + 7$   
C  $y = -x + 4$   
D  $y = 3x + 2$

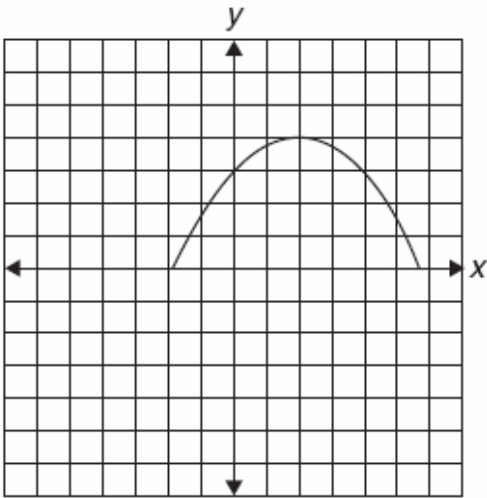
- 6 In the figure below,  $\overleftrightarrow{BD}$  intersects  $\overleftrightarrow{AC}$  at point  $B$ .



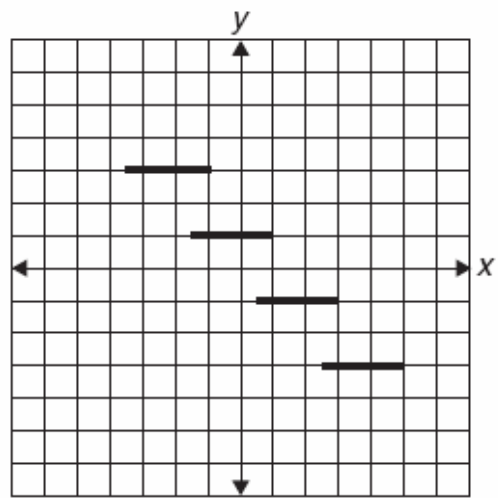
What is the measure of  $\angle ABD$ ?

- A  $68^\circ$
- B  $112^\circ$
- C  $124^\circ$
- D  $170^\circ$

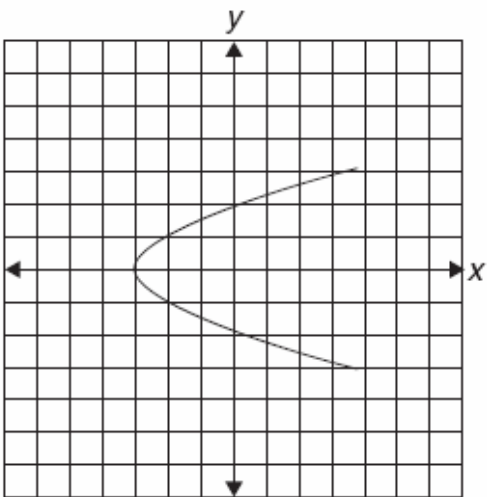
7 In which of the following graphs is  $y$  a function of  $x$ ?



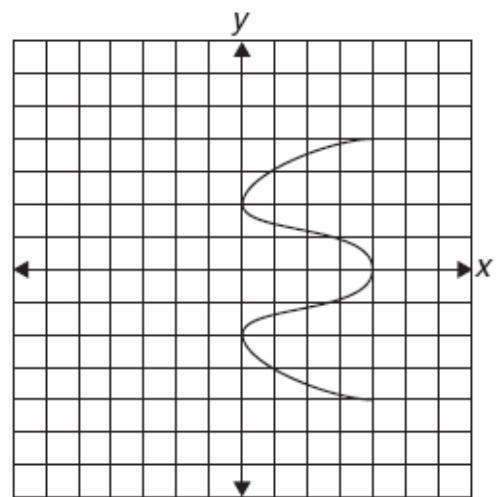
A



C



B



D

- 8 Lincoln High School is considering adding co-ed soccer to the sports program for the fall season. In order to get an unbiased sample of interest in soccer, the school should survey which group below?
- A all girls in dance class
  - B the varsity football team
  - C all students who were elected this year to the student council
  - D every third student entering second period classes
- 9 What is the distance between the points  $(4, -2)$  and  $(-5, 3)$ ?
- A  $D = \sqrt{106}$
  - B  $D = \sqrt{28}$
  - C  $D = \sqrt{26}$
  - D  $D = \sqrt{2}$
- 10 One night, the low temperature in Flagstaff was  $-5^{\circ}\text{F}$ . That same night in Phoenix the low temperature was  $40^{\circ}\text{F}$ . What is the absolute value of the difference between these two temperatures?
- A  $-45^{\circ}\text{F}$
  - B  $-35^{\circ}\text{F}$
  - C  $35^{\circ}\text{F}$
  - D  $45^{\circ}\text{F}$

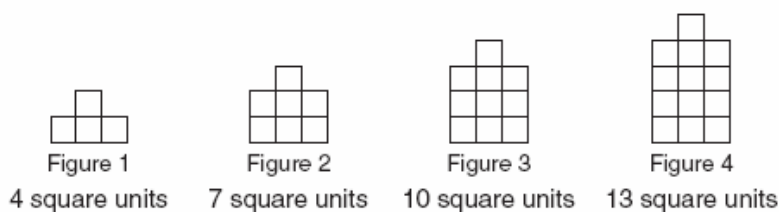


11 What is the solution to the equation below?

$$6x + 4 = 2x - 12$$

- A  $x = -4$
- B  $x = 4$
- C  $x = 2$
- D  $x = -2$

12 Look at the figures below.



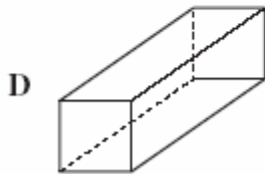
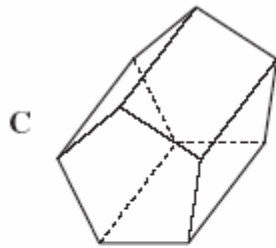
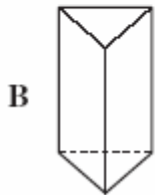
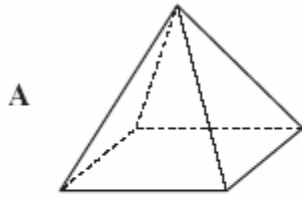
If the number of square units in the pattern of figures continues to increase arithmetically as shown, how many square units will be in the 9th figure?

- A 9
  - B  $3^9 + 1$
  - C  $9(3 + 1)$
  - D  $1 + (3 \cdot 9)$
- 13 What value of  $x$  would make the following proportion true?

$$\frac{6}{x - 4} = \frac{3}{4}$$

- A 12
- B  $\frac{28}{3}$
- C 4
- D  $\frac{1}{8}$

14 Which figure below has bases that are triangles and lateral faces that are rectangles?



15 Which of the following quadratic equations is solved correctly?

A  $x^2 - 2x - 35 = 0$   
 $(x - 7)(x + 5) = 0$   
 $x = 7, x = -5$

B  $x^2 + 7x + 6 = 0$   
 $(x + 1)(x + 6) = 0$   
 $x = 1, x = 6$

C  $x^2 - 9x - 18 = 0$   
 $(x - 6)(x - 3) = 0$   
 $x = -6, x = -3$

D  $x^2 - 9x + 20 = 0$   
 $(x + 4)(x + 5) = 0$   
 $x = -4, x = -5$

16 What is the y-value of the solution to the following system of linear equations?

$$y = x + 8$$
$$x + 2y = 1$$

- A -7  
B -5  
C 3  
D 13

**17** On June 1, Mary had a balance of \$50 in her bank account. During June she made the four transactions below.

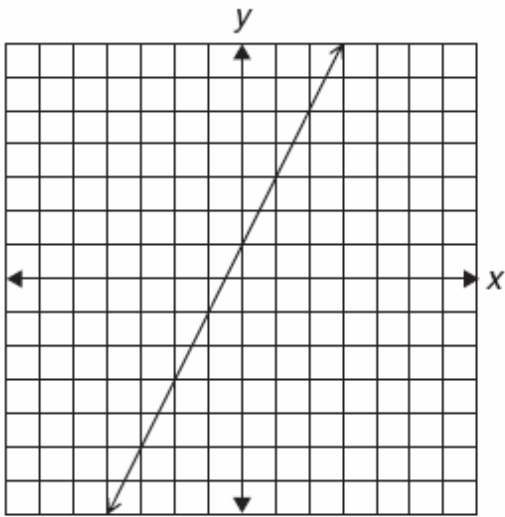
- deposited \$25
- withdrew \$30
- wrote a check for \$60
- paid a bank fee of \$25

If there were no other transactions, what was the balance in Mary's bank account on July 1?

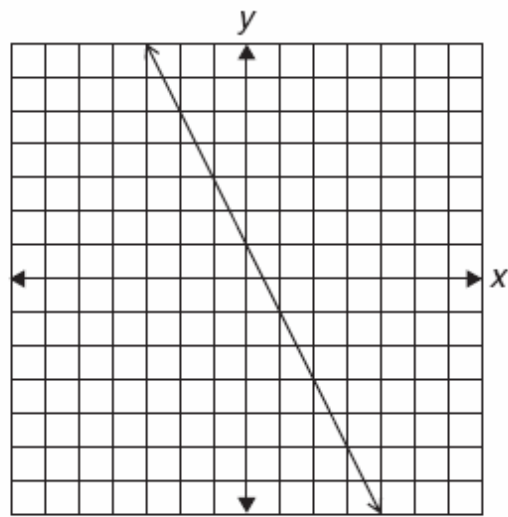
- A -\$90
- B -\$40
- C +\$10
- D +\$190

18 Which line graph appears to contain the points on the table below?

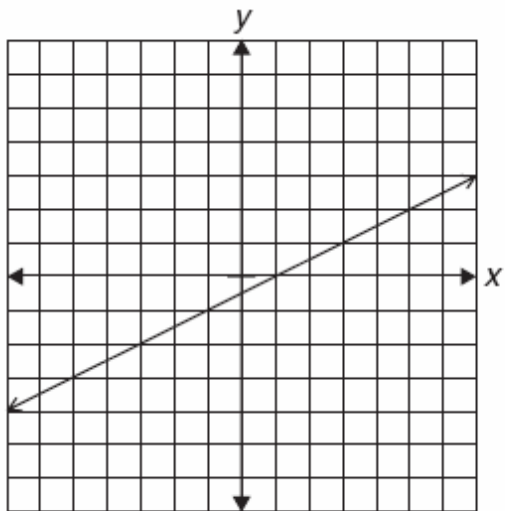
$x$	-1	0	1	2
$y$	-1	1	3	5



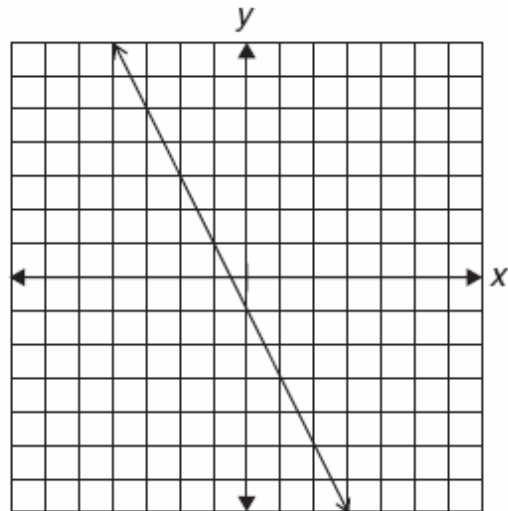
A



C

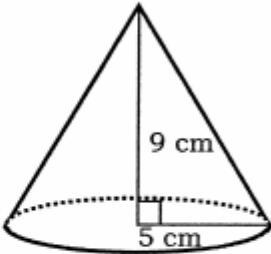


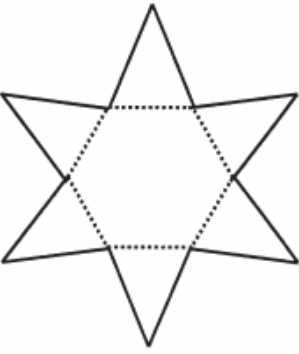
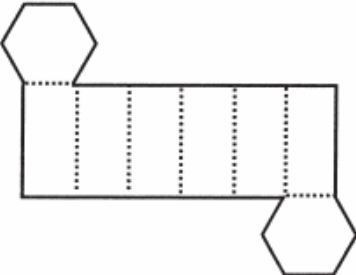
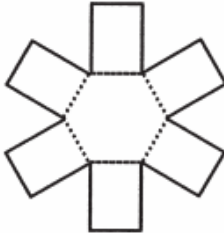
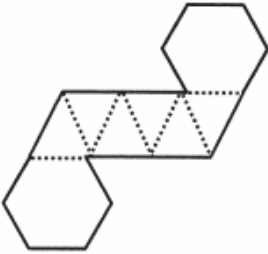
B



D



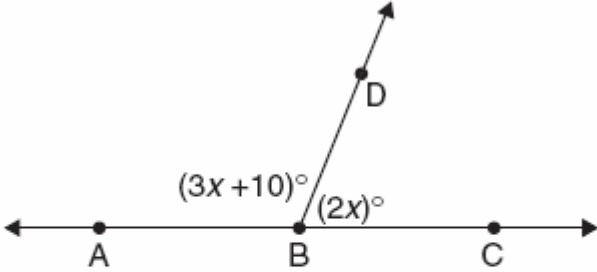
Item	Item Data							
<b>1</b>	Item Number	2019623	Correct Answer	B	p-value	.563	Equated Rasch value	.5915
Parent PO		4M-P2-PO1			2003 Aligned PO		MHS-S4C4-PO2	
<p>What is the <i>volume</i> of the given cone?</p>								
								
<p>A <math>225\pi \text{ cm}^3</math>            B <math>75\pi \text{ cm}^3</math>            C <math>25\pi \text{ cm}^3</math>            D <math>15\pi \text{ cm}^3</math></p>								

Item	Item Data							
2	Item Number	2019627	Correct Answer	A	p-value	.712	Equated Rasch value	-.2577
	Parent PO	4M-P1-PO3			2003 Aligned PO	MHS-S4C1-PO3		
	<p>If a hexagonal pyramid were laid flat on a plane, which of the following would represent its net?</p>							
A								
B								
C								
D								

AIMS Mathematics Released Items Statistics

Item	Item Data							
3	Item Number	2019626	Correct Answer	D	p-value	.68	Equated Rasch value	-.0686
	Parent PO	5M-P4-PO4			2003 Aligned PO	MHS-S2C3-PO1		
	<p>Joan is planning her summer vacation. She can choose to go to one of 7 different countries, using 4 different airlines, and three different departure dates. How many different vacation combinations consisting of one country, one airline and one departure date are possible?</p> <p>A 14                      B 28                      C 31                      D 84</p>							
4	Item Number	2019605	Correct Answer	A	p-value	.562	Equated Rasch value	.4239
	Parent PO	4M-P2-PO4			2003 Aligned PO	MHS-S4C4-PO9		
	<p>A model of a house is built to a scale of 1:10. The original house has a height of 15 ft. What is the height of the model?</p> <p>A <math>1\frac{1}{2}</math> feet                      B <math>\frac{2}{3}</math> feet                      C 5 feet                      D 10 feet</p>							



Item	Item Data																	
5	Item Number	2019583	Correct Answer	A	p-value	.535	Equated Rasch value	.6991										
	Parent PO	3M-P7-PO1			2003 Aligned PO	MHS-S3C3-PO6												
	<p>Which of the linear equations below is derived from the following table of values?</p> <table border="1" data-bbox="316 506 618 594"> <tr> <td><math>x</math></td> <td>-3</td> <td>-1</td> <td>1</td> <td>3</td> </tr> <tr> <td><math>y</math></td> <td>1</td> <td>3</td> <td>5</td> <td>7</td> </tr> </table> <p>A <math>y = x + 4</math>                      B <math>y = 2x + 7</math>                      C <math>y = -x + 4</math>                      D <math>y = 3x + 2</math></p>									$x$	-3	-1	1	3	$y$	1	3	5
$x$	-3	-1	1	3														
$y$	1	3	5	7														
6	Item Number	3014987	Correct Answer	B	p-value	.676	Equated Rasch value	-.0466										
	Parent PO	4M-P2-PO8			2003 Aligned PO	MHS-S3C3-P08												
	<p>In the figure below, <math>\overline{BD}</math> intersects <math>\overline{AC}</math> at point <math>B</math>.</p>  <p>What is the measure of <math>\angle ABD</math>?</p> <p>A <math>68^\circ</math>                      B <math>112^\circ</math>                      C <math>124^\circ</math>                      D <math>170^\circ</math></p>																	



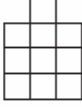

Item	Item Data						
7							
Item Number	3015140	Correct Answer	A	p-value	.512	Equated Rasch value	.8152
Parent PO	3M-P2-PO3			2003 Aligned PO		MHS-S3C2-PO1	
In which of the following graphs is $y$ a function of $x$ ?							
<p style="text-align: center;">A</p>				<p style="text-align: center;">C</p>			
<p style="text-align: center;">B</p>				<p style="text-align: center;">D</p>			

AIMS Mathematics Released Items Statistics

Item	Item Data							
8	Item Number	3015174	Correct Answer	D	p-value	.745	Equated Rasch value	-.4602
	Parent PO	2M-P4-PO2			2003 Aligned PO	MHS-S2C1-PO17		
	<p>Lincoln High School is considering adding co-ed soccer to the sports program for the fall season. In order to get an unbiased sample of interest in soccer, the school should survey which group below?</p> <p>A all girls in dance class</p> <p>B the varsity football team</p> <p>C all students who were elected this year to the student council</p> <p>D every third student entering second period classes</p>							
9	Item Number	3015209	Correct Answer	A	p-value	.512	Equated Rasch value	.8144
	Parent PO	4M-P7-PO6			2003 Aligned PO	MHS-S4C3.PO7		
	<p>What is the distance between the points (4, -2) and (-5, 3)?</p> <p>A <math>D = \sqrt{106}</math></p> <p>B <math>D = \sqrt{28}</math></p> <p>C <math>D = \sqrt{26}</math></p> <p>D <math>D = \sqrt{2}</math></p>							

AIMS Mathematics Released Items Statistics

Item	Item Data								
<b>10</b>	Item Number	3015295	Correct Answer	D	p-value	.497	Equated Rasch value	.8925	
	Parent PO	1M-P2-PO3			2003 Aligned PO		M07-S1C2-PO4		
	<p>One night, the low temperature in Flagstaff was <math>-5^{\circ}\text{F}</math>. That same night in Phoenix the low temperature was <math>40^{\circ}\text{F}</math>. What is the absolute value of the difference between these two temperatures?</p> <p>A <math>-45^{\circ}\text{F}</math>                      B <math>-35^{\circ}\text{F}</math>                      C <math>35^{\circ}\text{F}</math>                      D <math>45^{\circ}\text{F}</math></p>								
<b>11</b>	Item Number	3015210	Correct Answer	A	p-value	.665	Equated Rasch value	.0127	
	Parent PO	3M-P6-PO9			2003 Aligned PO		MHS-S3C3-PO8		
	<p>What is the solution to the equation below?</p> $6x + 4 = 2x - 12$ <p>A <math>x = -4</math>                      B <math>x = 4</math>                      C <math>x = 2</math>                      D <math>x = -2</math></p>								

Item	Item Data							
<b>12</b>	Item Number	3015281	Correct Answer	D	p-value	.629	Equated Rasch value	.2109
Parent PO		6M-P1-PO2			2003 Aligned PO		MHS-S5C2-PO5	
Look at the figures below.								
<div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  <p>Figure 1 4 square units</p> </div> <div style="text-align: center;">  <p>Figure 2 7 square units</p> </div> <div style="text-align: center;">  <p>Figure 3 10 square units</p> </div> <div style="text-align: center;">  <p>Figure 4 13 square units</p> </div> </div>								
<p>If the number of square units in the pattern of figures continues to increase arithmetically as shown, how many square units will be in the 9th figure?</p> <p>A 9            B <math>3^9 + 1</math>            C <math>9(3 + 1)</math>            D <math>1 + (3 \cdot 9)</math></p>								
<b>13</b>	Item Number	3015247	Correct Answer	A	p-value	.746	Equated Rasch value	-.4672
Parent PO		3M-P6-PO13			2003 Aligned PO		MHS-S3C3-PO11	
What value of $x$ would make the following proportion true?								
$\frac{6}{x - 4} = \frac{3}{4}$								
<p>A 12            B <math>\frac{28}{3}</math>            C 4            D <math>\frac{1}{8}</math></p>								

Item	Item Data							
<b>14</b>	Item Number	3015262	Correct Answer	B	p-value	.892	Equated Rasch value	-1.6641
	Parent PO	4M-P1-PO2			2003 Aligned PO	M06-S4C1-PO3		
Which figure below has bases that are triangles and lateral faces that are rectangles?								
<b>A</b>								
<b>B</b>								
<b>C</b>								
<b>D</b>								

AIMS Mathematics Released Items Statistics

Item	Item Data							
<b>15</b>	Item Number	3015273	Correct Answer	A	p-value	.443	Equated Rasch value	1.1667
	Parent PO	6M-P5-PO2			2003 Aligned PO	MHS-S5C1-PO2		
	<p>Which of the following quadratic equations is solved correctly?</p> <p><b>A</b> <math>x^2 - 2x - 35 = 0</math>  <math>(x - 7)(x + 5) = 0</math>  <math>x = 7, x = -5</math></p> <p><b>B</b> <math>x^2 + 7x + 6 = 0</math>  <math>(x + 1)(x + 6) = 0</math>  <math>x = 1, x = 6</math></p> <p><b>C</b> <math>x^2 - 9x - 18 = 0</math>  <math>(x - 6)(x - 3) = 0</math>  <math>x = -6, x = -3</math></p> <p><b>D</b> <math>x^2 - 9x + 20 = 0</math>  <math>(x + 4)(x + 5) = 0</math>  <math>x = -4, x = -5</math></p>							
<b>16</b>	Item Number	3015253	Correct Answer	C	p-value	.515	Equated Rasch value	.7992
	Parent PO	3M-P6-PO15			2003 Aligned PO	MHS-S3C3-PO12		
	<p>What is the y-value of the solution to the following system of linear equations?</p> $y = x + 8$ $x + 2y = 1$ <p><b>A</b> -7  <b>B</b> -5  <b>C</b> 3  <b>D</b> 13</p>							

AIMS Mathematics Released Items Statistics

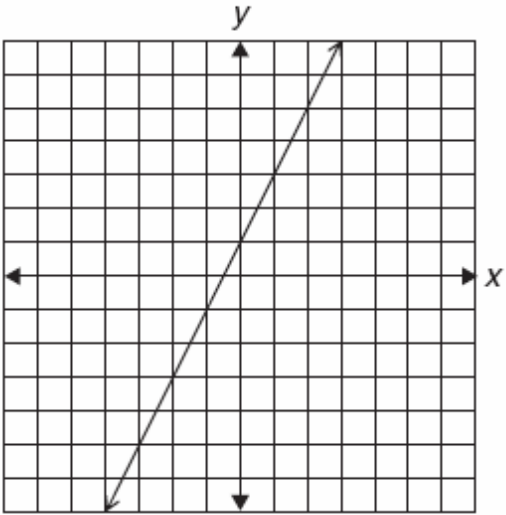
Item	Item Data						
<b>17</b>							
Item Number	3015296	Correct Answer	B	p-value	.516	Equated Rasch value	.7927
Parent PO	1M-P2-PO4			2003 Aligned PO		M07-S1C2-PO4	
<p>On June 1, Mary had a balance of \$50 in her bank account. During June she made the four transactions below.</p>							
<ul style="list-style-type: none"> <li>• deposited \$25</li> <li>• withdrew \$30</li> <li>• wrote a check for \$60</li> <li>• paid a bank fee of \$25</li> </ul>							
<p>If there were no other transactions, what was the balance in Mary's bank account on July 1?</p>							
<p>A -\$90</p>							
<p>B -\$40</p>							
<p>C +\$10</p>							
<p>D +\$190</p>							



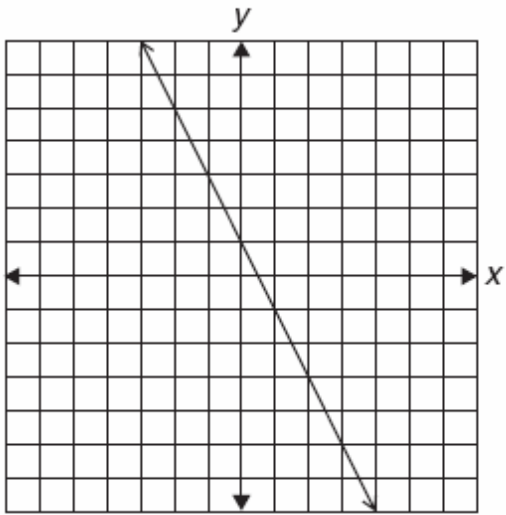
<b>Item 18</b>	<b>Item Data</b>						
Item Number	3015261	Correct Answer	A	p-value	.691	Equated Rasch value	-.1338
Parent PO	3M-P7-PO2			2003 Aligned PO	M07-S4C3-PO1		

Which line graph appears to contain the points on the table below?

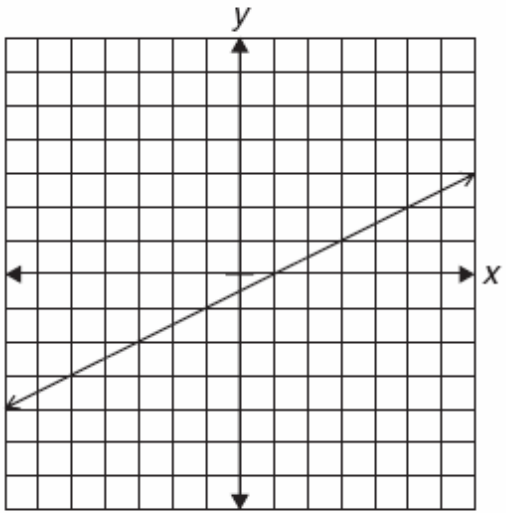
<i>x</i>	-1	0	1	2
<i>y</i>	-1	1	3	5



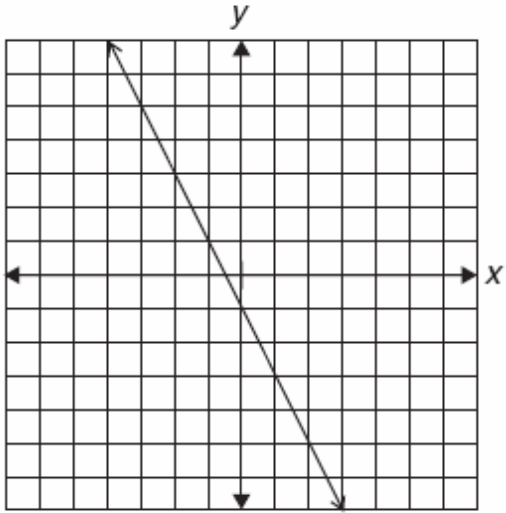
**A**



**C**



**B**



**D**