

**AIMS HS Mathematics Sample Test and Think-Throughs**

**FOR STUDENTS**

<b>Introduction</b>	<b>page 2</b>
<b>Sample Mathematics Test</b>	<b>page 3</b>
<b>Answer Key</b>	<b>page 16</b>
<b>Think-Throughs and Applications</b>	<b>page 17</b>
<b>Applications Answer Key</b>	<b>page 39</b>
<b>HS AIMS Reference Sheet</b>	<b>page 40</b>

**HIGH SCHOOL**



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**Directions:****Read each problem and select the best answer.**

- 1 Sandra wrote the sequence below.

2, 5, 10, 17, . . .

Which equation represents the rule for finding the  $n$ th term of this sequence?

- A  $a_n = n + 1$   
 B  $a_n = 2n^2$   
 C  $a_n = n^2 + 1$   
 D  $a_n = 2n + 1$
- 2 A team has twelve 15-year-old players and eight 16-year-old players. The coach of the team is 43 years old. Which measure of central tendency best represents the ages of the team, including the coach, and why?
- A Mean, because it is not affected by the age of the coach.  
 B Median, because it is not affected by the age of the coach.  
 C Mean, because it includes the age of everyone on the team.  
 D Mode, because it includes the age of everyone on the team.
- 3 Which does **not** represent  $y$  as a function of  $x$ ?
- A  $x = y^2 + 2$   
 B  $y = x^2 + 2$   
 C  $x = y + 8$   
 D  $y = -x + 8$

- 4 Jessica deposits \$300 into a savings account that pays an annual interest rate of 2%, compounded twice a year. How much money will Jessica have in her account at the end of one year?

- A \$304.00  
 B \$306.00  
 C \$306.03  
 D \$312.12

- 5 A telephone company wants to create as many 7-digit phone numbers as possible without changing the first 3 digits. How many phone numbers can be created?

- A 21  
 B 40  
 C 6,561  
 D 10,000

- 6 How much greater is the volume of a cube when the length of each edge is multiplied by 3?

- A 3 times as great  
 B 6 times as great  
 C 9 times as great  
 D 27 times as great

**Go On ►**

- 7 The data below represents the scores for a soccer team in seven games.

0 0 0 1 1 2 10

Which measure of central tendency **best** represents the overall performance of the soccer team, and why?

- A Mean, because it shows the average scores.  
 B Median, because it is the average of all scores.  
 C Mean, because it not affected by an extreme score.  
 D Median, because it is not affected by an extreme score.
- 8 Look at the recursive formula.

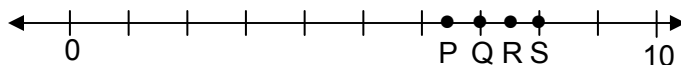
$$A_1 = 6$$

$$\text{For } n > 1, A_n = A_{(n-1)} + 4$$

What are the first 4 terms of this sequence?

- A 5, 6, 7, 8  
 B 6, 10, 14, 18  
 C 9, 12, 15, 18  
 D 10, 14, 18, 22
- 9 Which point on the number line shows the **best** estimate of the irrational number below?

$$\sqrt{57}$$



- A P  
 B Q  
 C R  
 D S

10 What is the value of  $x$ ?

$$3\sqrt{9+x} = 15$$

- A -4
- B 6
- C 16
- D 36

11 Figure  $EFGH$  has a perimeter of 40 cm and an area of  $96 \text{ cm}^2$ . It is dilated by a factor of  $\frac{1}{4}$  to create figure  $E'F'G'H'$ . What statement about the perimeter ( $P$ ) and the area ( $A$ ) of figure  $E'F'G'H'$  is true?

- A  $P = 10 \text{ cm}$ ;  $A = 6 \text{ cm}^2$
- B  $P = 10 \text{ cm}$ ;  $A = 24 \text{ cm}^2$
- C  $P = 160 \text{ cm}$ ;  $A = 192 \text{ cm}^2$
- D  $P = 160 \text{ cm}$ ;  $A = 384 \text{ cm}^2$

12 The area of a larger square is 16 times the area of a smaller square. How many times as long is the base of the larger square than the base of the smaller square?

- A 2 times as long
- B 4 times as long
- C 8 times as long
- D 16 times as long

13 What is the distance between  $-4$  and  $3$ ?

- A -7
- B -1
- C 1
- D 7

14 Six differently colored balls (red, blue, green, orange, purple, and white) are placed in a basket. Without looking, three balls are removed. What is the total number of combinations that include a red ball?

- A 3
- B 10
- C 20
- D 60

15 Which pair of events is dependent?

- A roll a fair cube; flip a coin
- B flip a coin; flip the coin again
- C select a card from a deck, then keep it; select another card
- D select a card from a deck, then put it back; select another card

16 Which statement has a false inverse?

- A If  $\sqrt{x} = 1$ , then  $x = 1$ .
- B If  $x^2 = 0$ , then  $x = 0$ .
- C If  $x = -2$ , then  $x^2 = 4$ .
- D If  $x + 3 = 5$ , then  $x = 2$ .

**17** Joe has the following information about a trapezoid.

Area: 14 square centimeters

Base lengths:  $b_1$  is 5 centimeters

$b_2$  is unknown

Height: 2 centimeters

Which equation can Joe write to find the unknown base length,  $b_2$ , for the trapezoid?

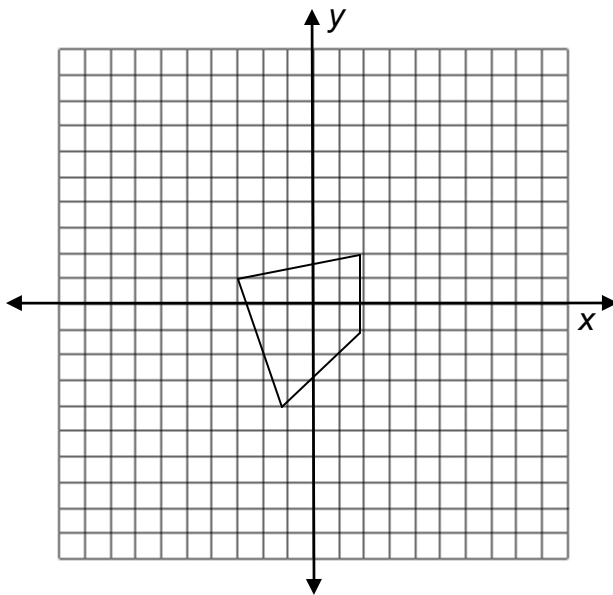
**A**  $b_2 = \frac{2A}{h} - b_1$

**B**  $b_2 = \frac{2A - b_1}{h}$

**C**  $b_2 = \frac{hb_1}{2} - A$

**D**  $b_2 = 2A - hb_1$

**18** The coordinates (2, 2) and (-3, 1) are two of the vertices of the figure on the coordinate plane.



What are the coordinates of the midpoint of the two vertices?

**A**  $\left(-\frac{1}{2}, \frac{3}{2}\right)$

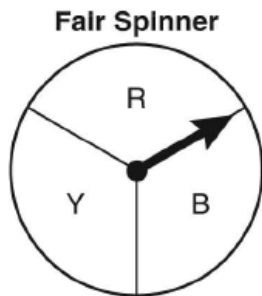
**B**  $\left(-\frac{3}{2}, \frac{1}{2}\right)$

**C**  $\left(\frac{1}{2}, \frac{3}{2}\right)$

**D**  $\left(\frac{3}{2}, \frac{1}{2}\right)$

**Go On ►**

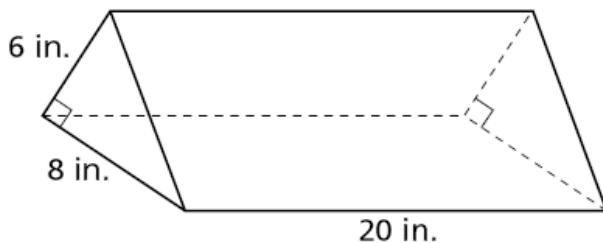
- 19** Debbie and Jamal each performed an experiment in which they spun a fair spinner 12 times. They recorded their results.



<b>Spin</b>	1	2	3	4	5	6	7	8	9	10	11	12
<b>Debbie's Results</b>	R	Y	B	R	Y	B	R	Y	B	Y	Y	Y
<b>Jamal's Results</b>	B	Y	B	R	Y	R	R	B	R	R	B	Y

Which outcome has a probability of 0?

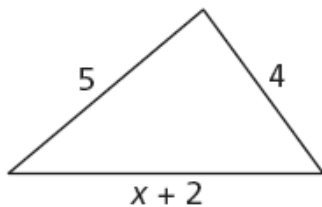
- A** After 3 more spins, Jamal will have a total of 8 results of R.
  - B** After 6 more spins, Debbie will have a total of 12 results of Y.
  - C** After 3 more spins, Debbie's results match the expected results based on theoretical probability.
  - D** After 6 more spins, Jamal's results match the expected results based on theoretical probability.
- 20** Look at the 3-dimensional figure.



What is the total surface area of the figure?

- A** 328 in<sup>2</sup>
- B** 480 in<sup>2</sup>
- C** 504 in<sup>2</sup>
- D** 528 in<sup>2</sup>

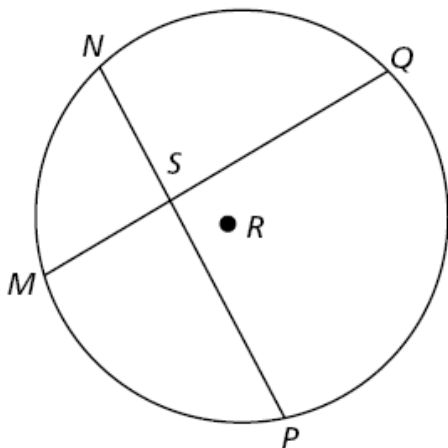
21 Look at the triangle.



What is **not** a possible value of  $x$ ?

- A 0
- B 3
- C 5
- D 7

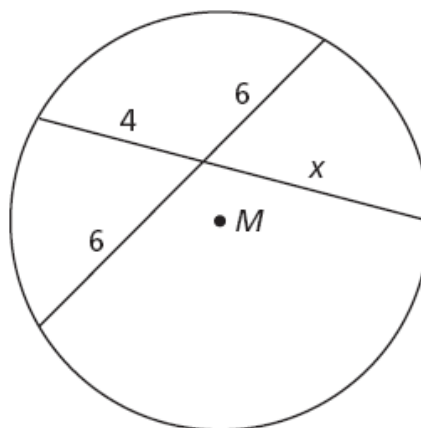
22 Chords  $\overline{NP}$  and  $\overline{MQ}$  intersect at point  $S$  in circle  $R$ .



If  $MS = 3$ ,  $NS = 2$ , and  $SQ = 8$ , what is the length of  $\overline{SP}$ ?

- A 9
- B 12
- C 14
- D 24

23 Look at circle  $M$ .



What is the value of  $x$ ?

- A 4
- B 8
- C 9
- D 12

24 Which table represents  $y$  as a function of  $x$ ?

A

$x$	1	2	3	2	1
$y$	1	2	3	4	5

B

$x$	4	5	4	3	2
$y$	-6	-5	-4	-3	-2

C

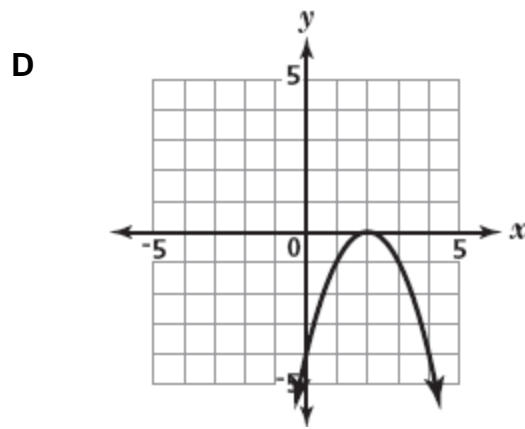
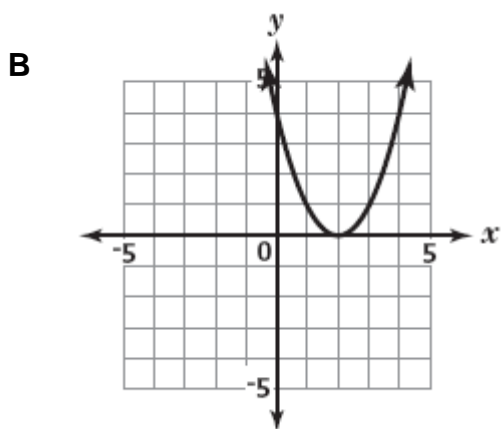
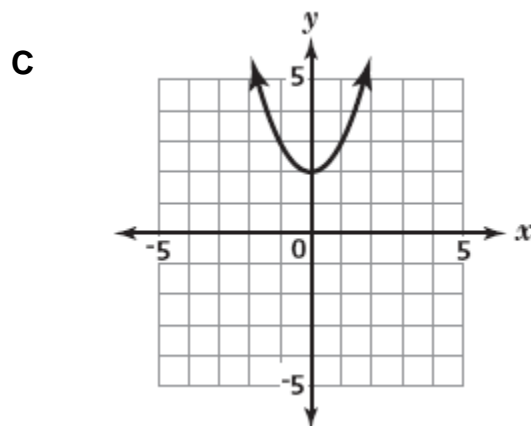
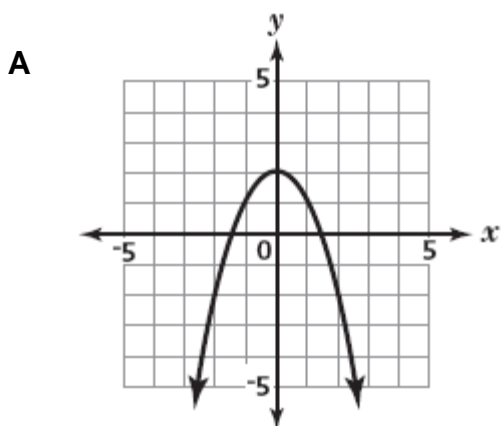
$x$	8	7	6	5	4
$y$	-1	2	-1	2	-1

D

$x$	3	4	3	2	3
$y$	0	1	2	1	3

25 What is the graph of the equation?

$$y = x^2 - 4x + 4$$



26 What are the values of  $x$  in the equation shown?

$$2|3x - 4| = 20$$

A  $-\frac{14}{3}, \frac{14}{3}$

B  $-2, \frac{14}{3}$



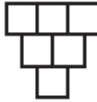
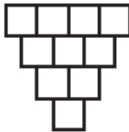
C  $-\frac{14}{3}, 2$

D  $-4, \frac{8}{3}$

**Go On** ►

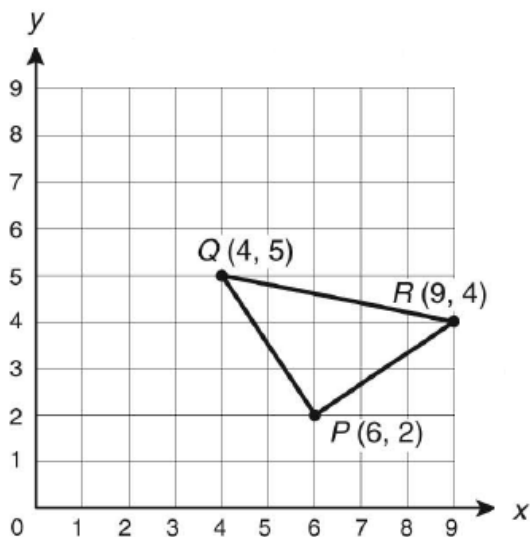


- 27** The table shows a sequence of figures, the number of squares in each figure, and the perimeter of each figure.

Figure				
Number of squares	1	3	6	10
Perimeter	4	8	12	16

Based on the pattern shown, which conjecture is valid?

- A** A figure with 4 squares has a perimeter of 10.  
**B** A figure with 8 squares has a perimeter of 14.  
**C** A figure with 20 squares has a perimeter of 14.  
**D** A figure with 28 squares has a perimeter of 28.
- 28** Triangle  $PQR$  is shown.



What are the coordinates of  $P'$  when  $\triangle PQR$  is dilated by a scale factor of 3 using the origin as the center?

- A** (6,18)  
**B**  $\left(3, \frac{2}{3}\right)$   
**C**  $\left(\frac{2}{3}, 3\right)$   
**D** (18,6)

**Go On ►**

29 What is the value of the expression?

$$\sqrt{64x^{16}y^4}$$

- A  $8x^4y^2$
- B  $8x^8y^2$
- C  $32x^4y^2$
- D  $32x^8y^2$

30 What is the solution to the equation shown?

$$\sqrt{3x-1} = 8$$

- A 3
- B  $\frac{17}{3}$
- C  $\frac{65}{3}$
- D 27

31 What is the complete factorization of the polynomial shown?

$$5x^3 - 20x^2 - 25x$$

- A  $x(5x^2 - 20) - 25$
- B  $5x(x+5)(x-1)$
- C  $5x(x-5)(x+1)$
- D  $x(5x^2 - 20x - 25)$

32 Look at the following equations.

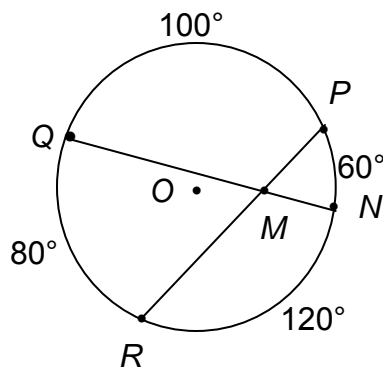
$$8p = 12 - 2q$$

$$q + 4p = 6$$

Which statement is true about the lines graphed from the equations?

- A They coincide.
- B They are parallel.
- C They are perpendicular.
- D They intersect but are not perpendicular.

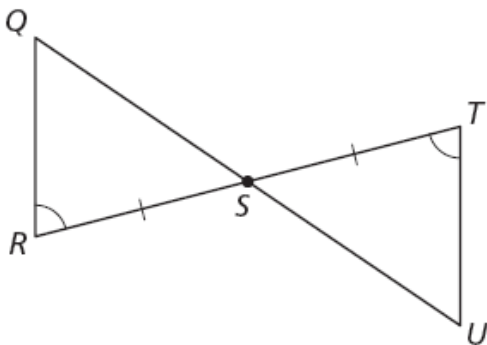
33 Points  $N$ ,  $P$ ,  $R$ , and  $Q$  lie on circle  $O$ .



In circle  $O$ , what is the  $m\angle PMN$ ?

- A  $30^\circ$
- B  $60^\circ$
- C  $70^\circ$
- D  $140^\circ$

- 34** In the diagram below,  $\overline{RT}$  intersects  $\overline{QU}$  at point  $S$ .



Which postulate should be used to prove that  $\triangle RQS \cong \triangle TUS$ ?

- A Side-Side-Side
  - B Angle-Side-Angle
  - C Angle-Side-Side
  - D Side-Angle-Side
- 35** Assume the statement shown below is true.

“If  $P$ , then  $Q$ .”

Based on this assumption, which of the following must be true?

- A If  $Q$ , then  $P$ .
- B If  $P$ , then not  $Q$ .
- C If not  $P$ , then not  $Q$ .
- D If not  $Q$ , then not  $P$ .

- 36** Look at the expression.

$$-2a[-2a(-2a + 4b) + 3b(-a - 6)]$$

Which of the following correctly simplifies the expression?

- A  $-2a[4a^2 - 8ab - 3ab - 18b]$   
 $-2a[4a^2 - 5ab - 18b]$   
 $-8a^3 + 10a^2b + 36b$
- B  $-2a[4a^2 - 8ab - 3ab - 18b]$   
 $-2a[4a^2 - 5ab - 18b]$   
 $-8a^2 + 10ab + 36ab$
- C  $-2a[4a^2 - 8ab - 3ab - 18b]$   
 $-2a[4a^2 - 11ab - 18b]$   
 $-8a^3 + 22a^2b + 36ab$
- D  $-2a[4a^2 + 8ab + 3ab + 18b]$   
 $-2a[4a^2 + 11ab + 18b]$   
 $-8a^3 - 22a^2b - 36ab$

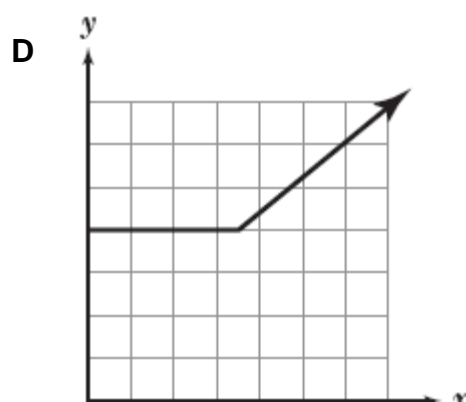
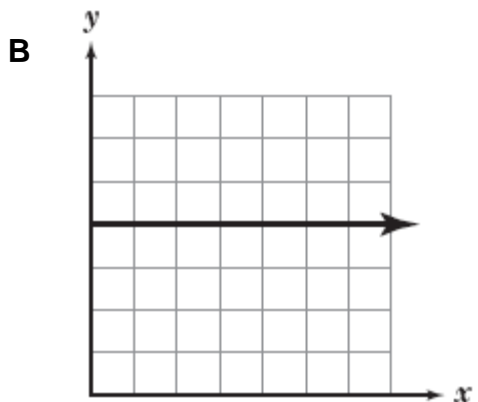
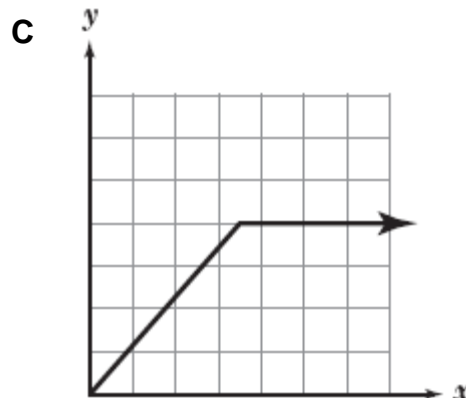
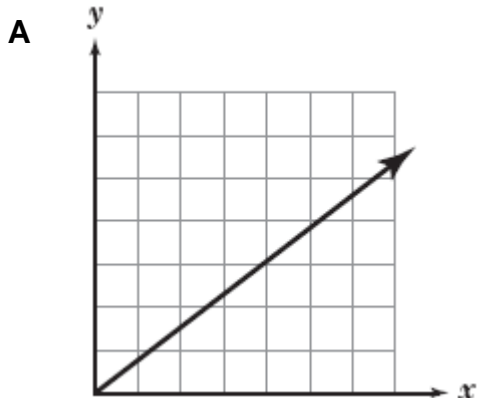
- 37** The statements below are out of order.

W: If blitz, then kerd.  
 X: If mot, then det.  
 Y: If kerd, then mot.  
 Z: If toc, then blitz.

Which list shows the *if...then* statements in logical order?

- A  $W \rightarrow Z \rightarrow X \rightarrow Y$
- B  $Z \rightarrow W \rightarrow Y \rightarrow X$
- C  $W \rightarrow Y \rightarrow X \rightarrow Z$
- D  $Z \rightarrow X \rightarrow Y \rightarrow W$

- 38** Janelle's cell phone company charges a monthly fixed rate for the first 1,000 minutes, and then charges for each additional minute. Which graph **best** represents Janelle's monthly cell phone plan?

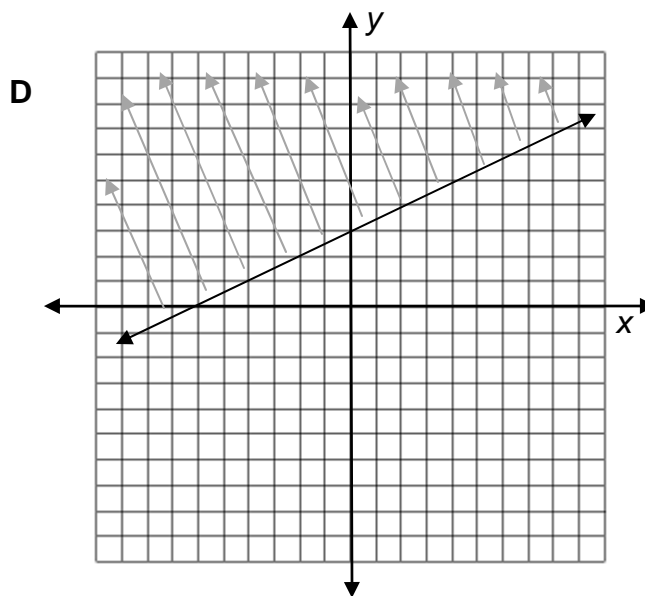
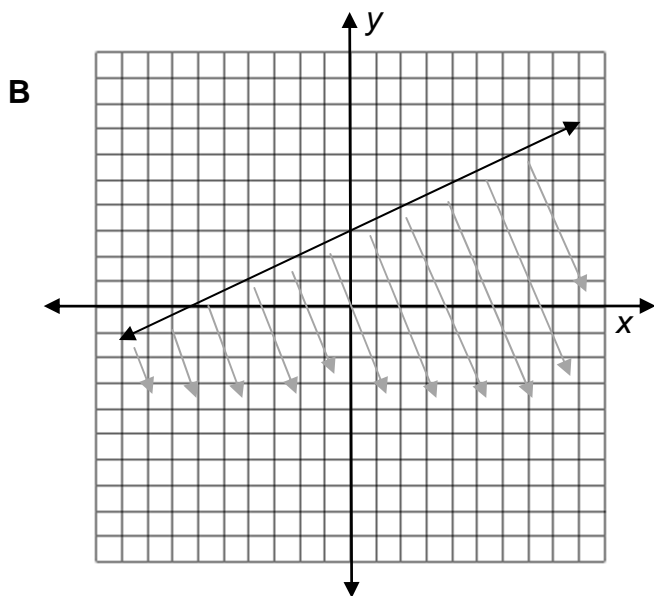
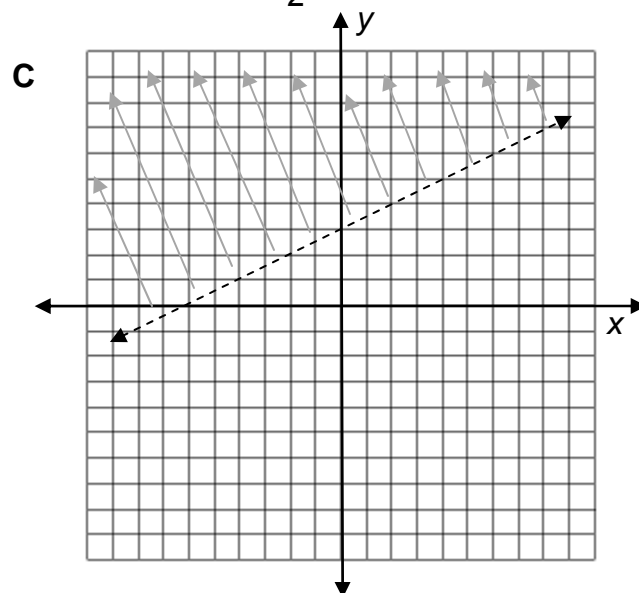
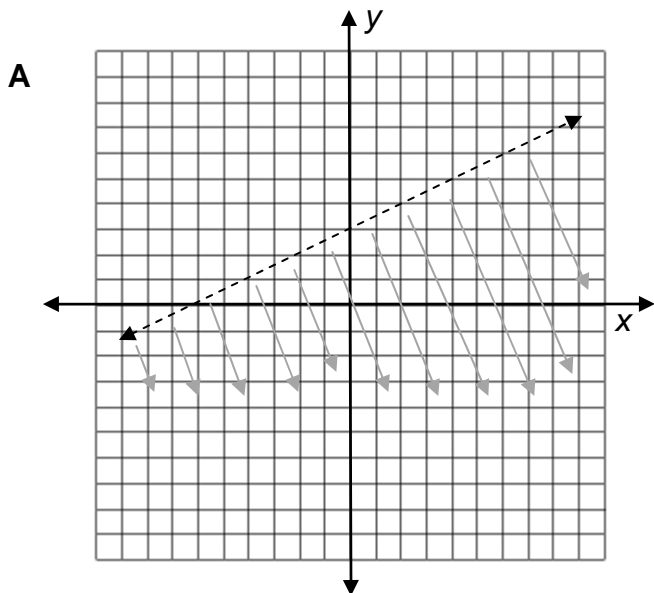


- 39** What are the y-intercept and the slope of the graph of the following equation?

$$-2x + 4y = 8$$

- A** y-intercept: 8  
slope:  $-2$
- B** y-intercept: 8  
slope:  $2$
- C** y-intercept: 2  
slope:  $-\frac{1}{2}$
- D** y-intercept: 2  
slope:  $\frac{1}{2}$

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



41 Which pair of figures is structurally similar?

- A cone and cube
- B cone and sphere
- C cone and rectangular prism
- D cone and triangular pyramid

42 Points  $(-1, 8)$  and  $(3, 5)$  lie on a coordinate plane. What is the distance between the two points?

- A  $\sqrt{7}$
- B 5
- C  $\sqrt{85}$
- D 25



## AIMS HS Mathematics Sample Test Answer Key

The answer key below shows you the Strand, Concept, and Performance Objective that each item is addressing. This will help you to identify which Concepts from the AZ Academic Mathematics Standards that you may need to study more.

<b>1</b>	<b>3.1.1</b>	<b>C</b>
<b>2</b>	<b>2.1.5</b>	<b>B</b>
<b>3</b>	<b>3.2.2</b>	<b>A</b>
<b>4</b>	<b>3.4.3</b>	<b>C</b>
<b>5</b>	<b>2.3.2</b>	<b>D</b>
<b>6</b>	<b>4.4.3</b>	<b>D</b>
<b>7</b>	<b>2.1.5</b>	<b>D</b>
<b>8</b>	<b>3.1.3</b>	<b>B</b>
<b>9</b>	<b>1.3.1</b>	<b>C</b>
<b>10</b>	<b>3.3.11</b>	<b>C</b>
<b>11</b>	<b>4.2.4</b>	<b>A</b>
<b>12</b>	<b>4.4.3</b>	<b>B</b>
<b>13</b>	<b>1.1.3</b>	<b>D</b>
<b>14</b>	<b>2.3.3</b>	<b>B</b>

<b>15</b>	<b>2.2.3</b>	<b>C</b>
<b>16</b>	<b>5.2.9</b>	<b>C</b>
<b>17</b>	<b>3.3.2</b>	<b>A</b>
<b>18</b>	<b>4.3.1</b>	<b>A</b>
<b>19</b>	<b>2.2.2</b>	<b>C</b>
<b>20</b>	<b>4.4.5</b>	<b>D</b>
<b>21</b>	<b>4.1.9</b>	<b>D</b>
<b>22</b>	<b>4.1.1</b>	<b>B</b>
<b>23</b>	<b>4.1.1</b>	<b>C</b>
<b>24</b>	<b>3.2.2</b>	<b>C</b>
<b>25</b>	<b>4.3.8</b>	<b>B</b>
<b>26</b>	<b>3.3.5</b>	<b>B</b>
<b>27</b>	<b>5.2.8</b>	<b>D</b>
<b>28</b>	<b>4.2.2</b>	<b>D</b>

<b>29</b>	<b>3.3.8</b>	<b>B</b>
<b>30</b>	<b>3.3.11</b>	<b>C</b>
<b>31</b>	<b>3.3.14</b>	<b>C</b>
<b>32</b>	<b>3.3.4</b>	<b>A</b>
<b>33</b>	<b>4.1.1</b>	<b>C</b>
<b>34</b>	<b>4.1.8</b>	<b>B</b>
<b>35</b>	<b>5.2.9</b>	<b>D</b>
<b>36</b>	<b>5.1.1</b>	<b>C</b>
<b>37</b>	<b>5.2.10</b>	<b>B</b>
<b>38</b>	<b>3.2.1</b>	<b>D</b>
<b>39</b>	<b>3.4.1</b>	<b>D</b>
<b>40</b>	<b>4.3.5</b>	<b>A</b>
<b>41</b>	<b>5.2.7</b>	<b>D</b>
<b>42</b>	<b>4.3.3</b>	<b>B</b>