

Introduction

AIMS sample tests are provided to give students experience in taking AIMS. The samples are not meant to be practice tests, but they offer a sample of the kinds of questions students will find on AIMS. The best way to make sure you have the knowledge necessary to Meet and Exceed on AIMS is to *be in class, be prepared, and be on time to class* each day. Learning in class and through homework is the basis of meeting proficiency on AIMS.

It is understandable that sometimes students get nervous when taking tests. They may need some help with test-taking strategies. In this document, you will not only be able to take an AIMS sample test for mathematics, but you will also find that some of the items have explanations of the process used for solving them. This will help you think through the problems, just like you do in class. There will also be more application problems, like the ones explained, so you can try them on your own.

As you go through the sample test, please remember a few important facts.

- The AIMS Mathematics Sample Tests follow the AIMS mathematics blueprints for the 2008 Mathematics Academic Standards, but only represent half the number of items that are on the actual AIMS 3-8 and AIMS HS assessments.
- The best way to study for AIMS is to be sure you know and are able to do the grade-level performance objectives in each content area tested. Your teacher creates your lessons based on all of these grade-level mathematics standards.
- The activities contained in this document will give you experience in taking AIMS. It is not a practice test. Practice by doing your homework.
- Work through the sample test as if it is the AIMS – don't use a calculator or any other support materials. The reference sheets for formulas at the back of this guide are the same as those that are included in actual AIMS testing. Use the reference sheets to become familiar with them.

When you look at the sample problems that show the solution process, you will also see listed on the answer key the Strand, Concept, and Performance Objective that is being measured. This is listed so you can see how it connects to the lessons your teacher creates from the AZ Academic Standards. Read through the samples and see how your thoughts and answers compare.

The guide will help you make better response choices based on the knowledge that mastery of the grade-level standard provides.

Good luck and have fun!

Mathematics Sample Test

Grade HS

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.

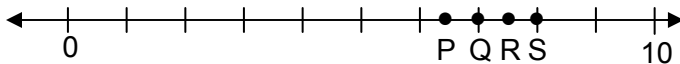
$$A_1 = 6$$

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

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 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?

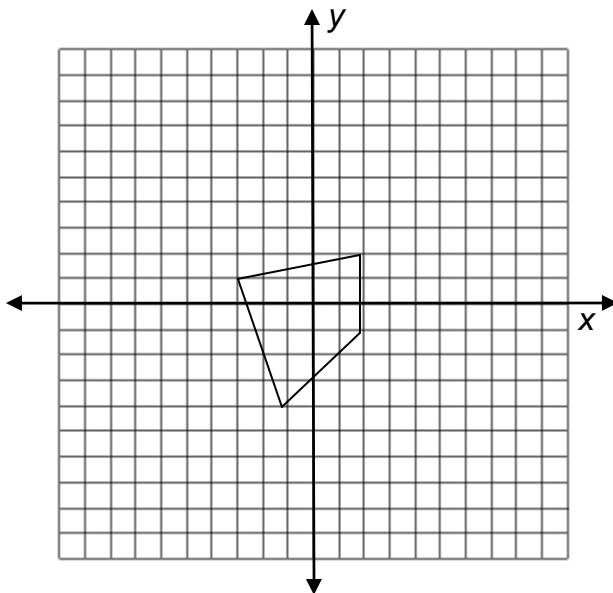
A $b_2 = \frac{2A}{h} - b_1$

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

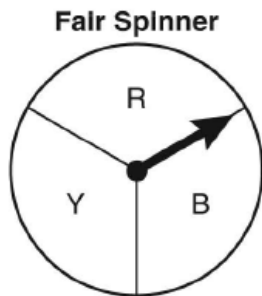
B $\left(-\frac{3}{2}, \frac{1}{2}\right)$

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.

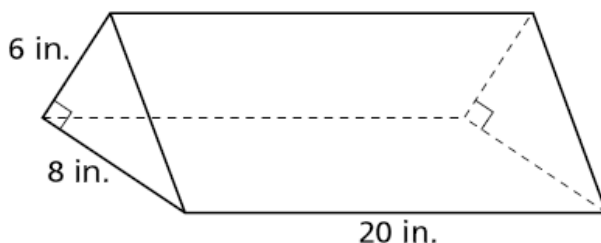


Spin	1	2	3	4	5	6	7	8	9	10	11	12
Debbie's Results	R	Y	B	R	Y	B	R	Y	B	Y	Y	Y
Jamal's Results	B	Y	B	R	Y	R	R	B	R	R	B	Y

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.

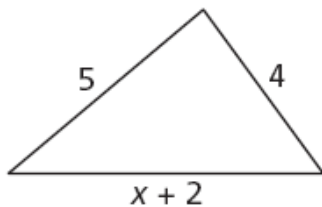
20 Look at the 3-dimensional figure.



What is the total surface area of the figure?

- A** 328 in²
- B** 480 in²
- C** 504 in²
- D** 528 in²

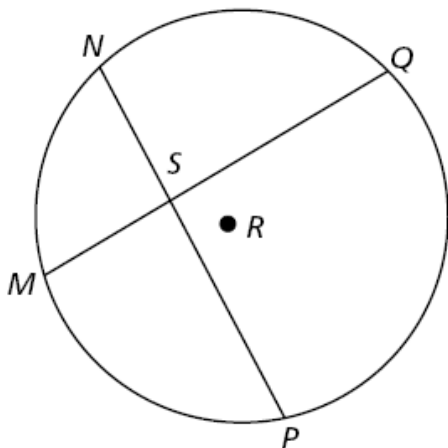
21 Look at the triangle.



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

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

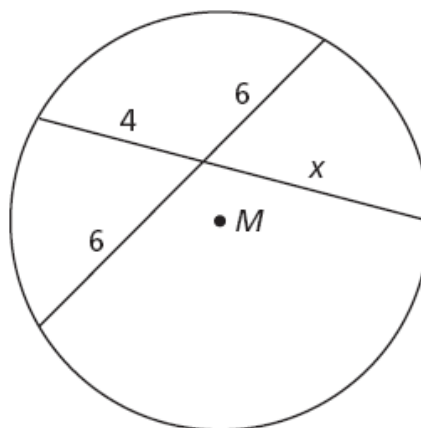
22 Chords \overline{NP} and \overline{MQ} intersect at point S in circle R .



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

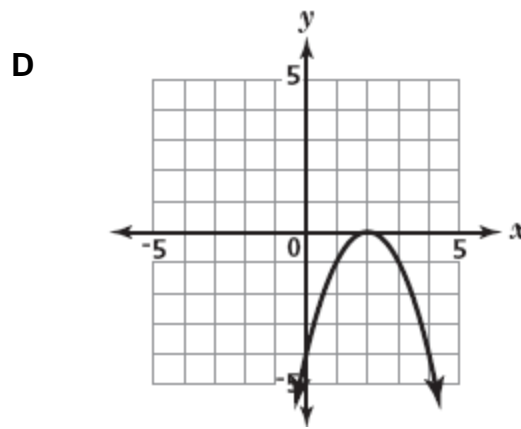
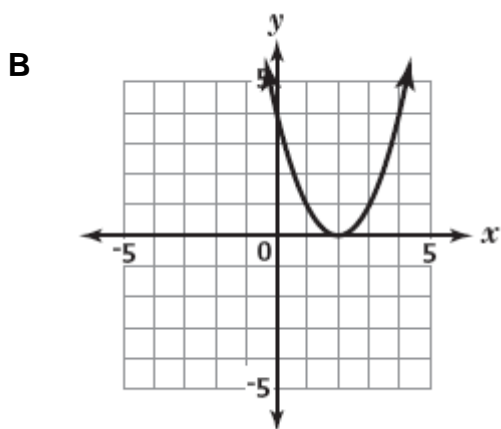
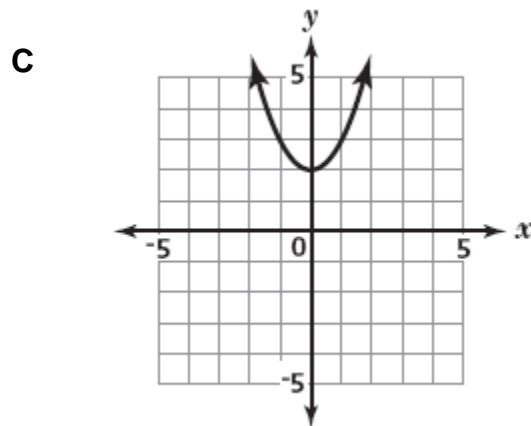
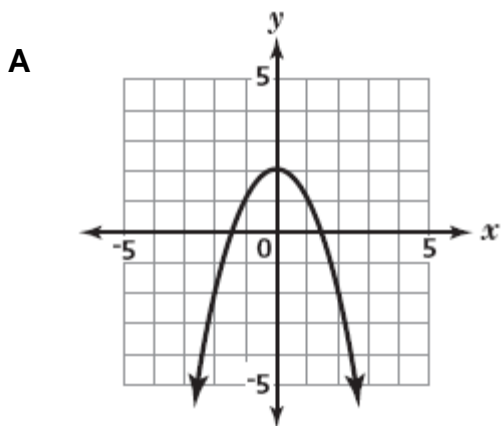
x	8	7	6	5	4
y	-1	2	-1	2	-1

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



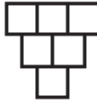
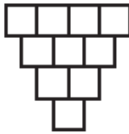
B $-2, \frac{14}{3}$

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

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

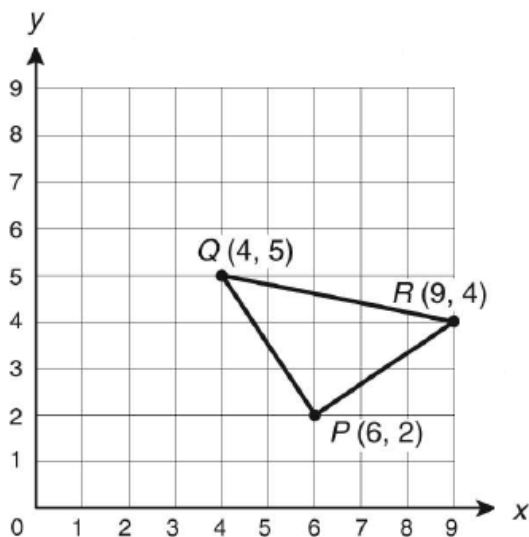
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- 27** The table shows a sequence of figures, the number of squares in each figure, and the perimeter of each figure.

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.

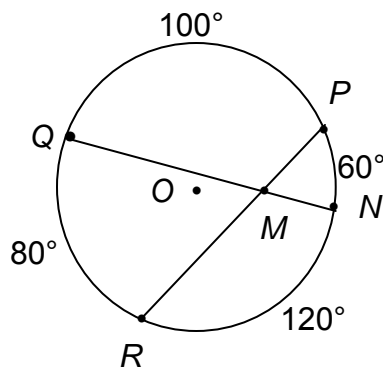
$$8p = 12 - 2q$$

$$q + 4p = 6$$

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.

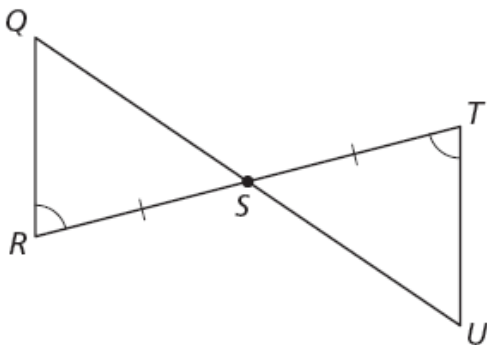
33 Points N , P , R , and Q lie on circle O .



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

- A 30°
- B 60°
- C 70°
- D 140°

- 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 $-2a [4a^2 + 8ab + 3ab + 18b]$
 $-2a [4a^2 + 11ab + 18b]$
 $-8a^3 - 22a^2b - 36ab$

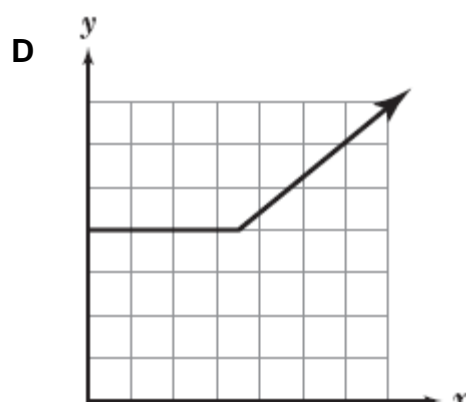
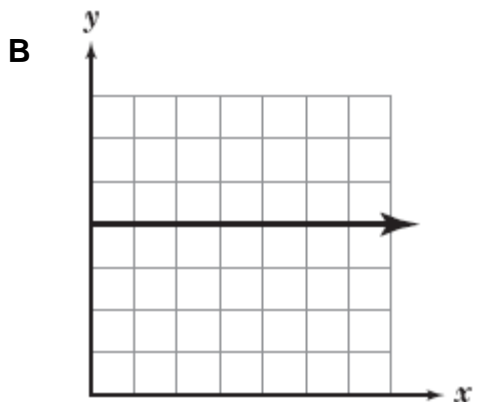
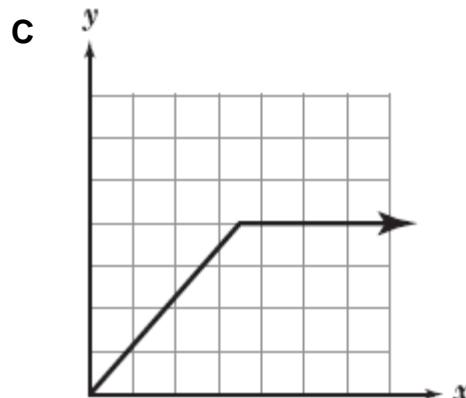
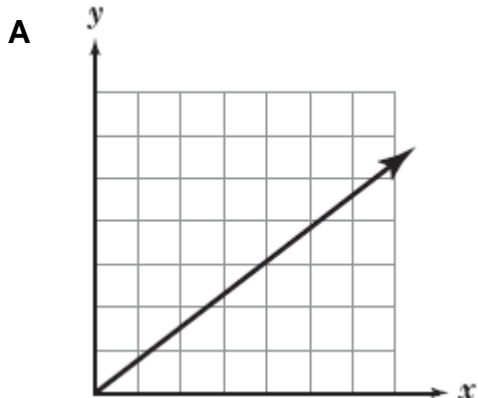
- 37** The statements below are out of order.

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?



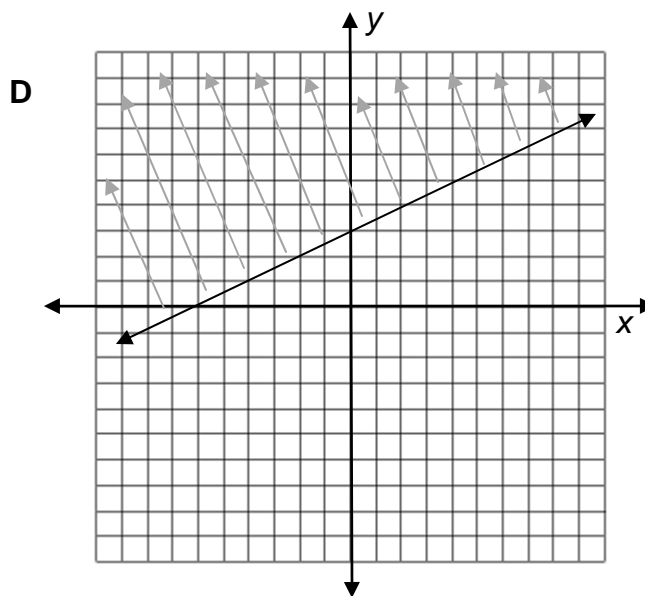
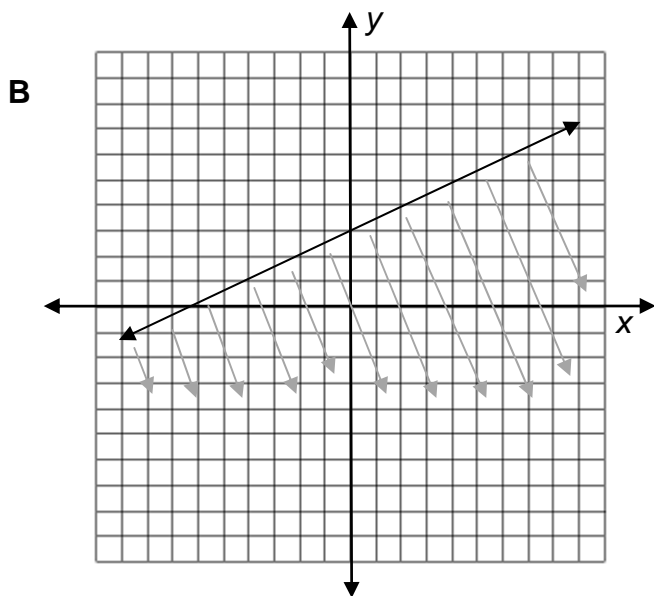
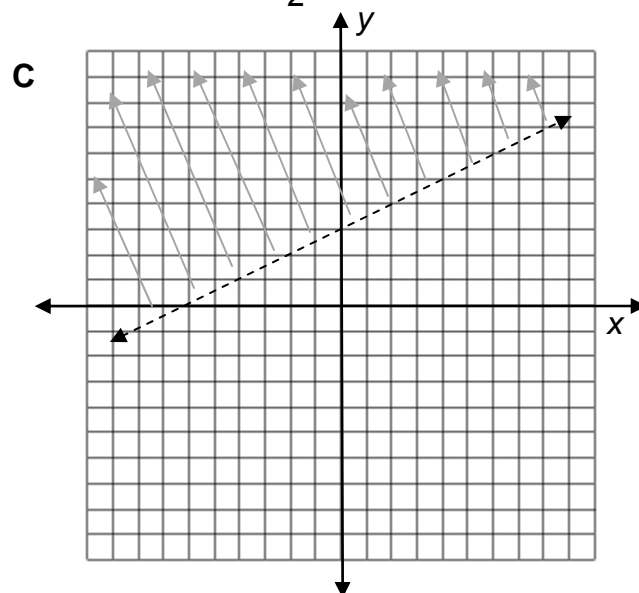
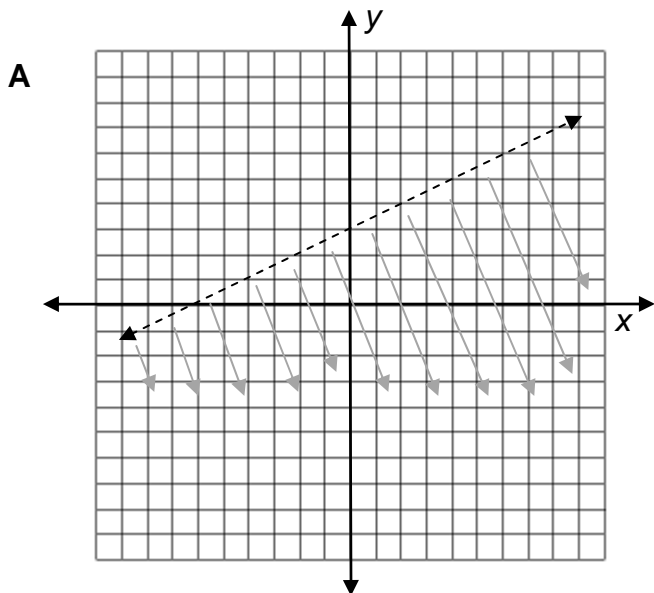
- 39** What are the y-intercept and the slope of the graph of the following equation?

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

- 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: $\frac{1}{2}$

Go On ►

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.

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

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

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

AIMS HS Mathematics Think-Throughs & Practice Applications

The problems on the following pages are from the sample test you just finished. They have been worked out for you to show the thought process behind finding the answers.

As you go through them, see how your thoughts compare to the ones given. Not every problem from the sample test will be shown in this same manner.

The number for each problem matches the same number that it is in the sample test. This way, if you got the problem incorrect you can compare your answers and go back to see what you may have done differently.

Then, after each Think-Through problem, you will find two more problems to apply what you just learned from the Think-Through problems. These will be very similar to the Think-Through problem. They are also testing the same academic performance objective. This will give you even more practice to think through your own problem solving process.

As you read through the solution process of the problems, you may notice that some of the words are *italicized*. This indicates some mathematics terms that would be helpful to know.

After the two application problems, there will be a Summary Statement which explains the basic concept that the problems are testing. This will help you to understand which concepts you may need more work on or which concepts you may have mastered.

13 What is the distance between -4 and 3 ?

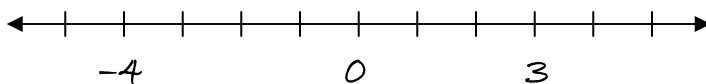
- A** -7
- B** -1
- C** 1
- D** 7

When I see that the question asks for *distance*, I know it is asking how far apart the numbers are. There are a couple of ways that I can solve this problem.

First, I can solve this problem is using one of the rules that I have learned: *the distance between two numbers is the absolute value of their difference*.

When I write that out, I get $|-4 - 3|$. This then equals $|-7|$. I know that absolute value is then simply 7 . I also know that the answer cannot be negative because I am looking for the distance from one point to another, which must be positive. So, since the answer is 7 , I would choose answer choice **D**.

Another way that I could solve this problem is that I can think about the numbers on a number line. I need to draw a number line and locate the two points on it.



Then, I can count how many spaces are between -4 and 3 .



I counted 7 spaces. Therefore, the distance between -4 and 3 is 7 , which again is answer choice **D**.

13a What is the distance between 2 and -6 ?

- A** -8
- B** -4
- C** 4
- D** 8

13b What is the distance between -4 and -10 ?

- A** -14
- B** -6
- C** 6
- D** 14

Summary Statement:

These problems involve expressing that the distance between two numbers is the absolute value of their difference. The absolute value is a number's distance from zero on a number line.

- 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

The question is asking which pair of events is *dependent*. The key word is *dependent*. I know that means that one thing relies on another. So, *dependent* events are when one takes place, it will affect the probability of the second event. Since there is no real problem to work out, I have to read each answer choice and decide; in which situation does the first listed event affect the outcome of the second listed event?

A roll a fair cube; flip a coin

For choice A, I can already see that these two events are *independent* of each other because they are completely separate. Rolling a cube and flipping a coin have no effect on each other.

B flip a coin; flip the coin again

For choice B, I flip a coin and then flip it again. The result of one coin flip has no effect on a second flip, or on a 99th flip for that matter. These events are *independent*.

C select a card from a deck, then keep it; select another card

For choice C, first I take a card from a deck, keep it, and then take another card. In this case, the outcome of the second event relies on the first one. Since I kept the first card I took, when I select another one, I can no longer pick the same card. There are fewer cards to choose from when I select the second card. This means that these events are *dependent* on each other. This looks like the correct answer, but I will check the last answer choice to be sure.

D select a card from a deck, then put it back; select another card

If I first take a card from a deck, then I put it back and take another card, the second event is really not affected by the first one. I still can choose from any card in the deck since I put back the first card I took.

After carefully going through each answer choice, I see that the correct answer is choice **C**.

15a Which pair of events is dependent?

- A** select a marble from a bag and keep it; select another marble
- B** select a marble from a bag and keep it; flip a coin
- C** roll a fair cube; roll the fair cube again
- D** flip a coin; flip the coin again

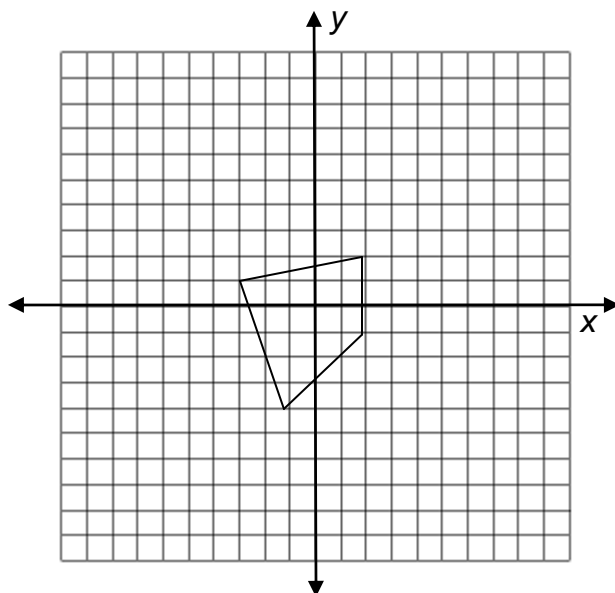
15b Which pair of events is independent?

- A** select a card from a deck and keep it; select another card
- B** select a marble from a bag and keep it; select another marble
- C** select a marble from a bag and put it back; select another marble
- D** select a card from a deck and put it on a table; select another card

Summary Statement:

These problems look at using simulations that model situations involving independent and dependent events. With *dependent* events, the outcome of the second event is affected by the first event. With *independent* events, neither event relies on the other.

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

This question is asking me to find the *midpoint* of a line segment. *Midpoint* means the middle point of a line, or of two coordinates in a coordinate plane. I look at the graph and see the figure, but that really has nothing to do with helping me to solve for midpoint. It does help me to visualize the line.

As soon as I see the given coordinates and the word *midpoint*, I know that I am going to need a formula for the solution. When I flip to the HS AIMS Reference Sheet, I see the different formulas that I can use. I go to the section for Coordinate Geometry, since I have given coordinates, and I look for the one that has to do with *midpoint*. The formula is:

$$\text{Midpoint between two points} = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

In order to solve for *midpoint*, I need to plug the values given into the midpoint formula. This formula is asking me to add the values of like coordinates and then divide that answer by 2. This also looks like I am averaging like coordinates to make new coordinates for the *midpoint*.

(continued on page 23)

I see that in the formula, I am going to be adding the x values together and the y values together. The coordinates given are $(2, 2)$ and $(-3, 1)$.

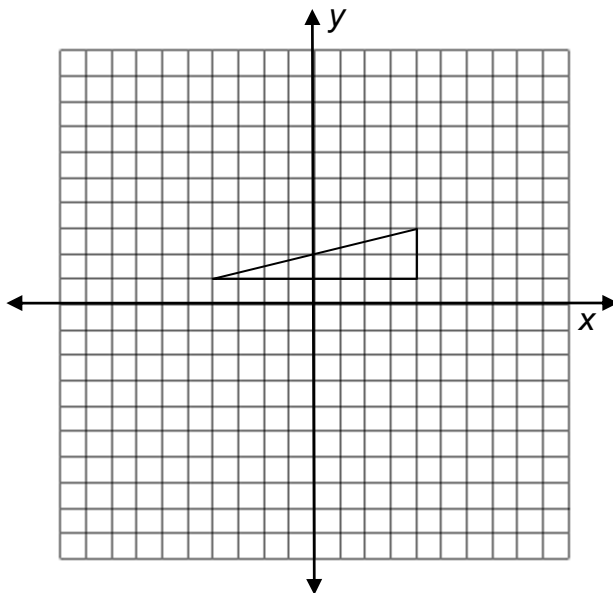
$$\begin{array}{cccc} & \uparrow & \uparrow & & \uparrow & \uparrow \\ & x_1 & y_1 & & x_2 & y_2 \end{array}$$

Now, when I plug the coordinate values into the formula, I get:

$$\begin{aligned} \text{Midpoint between two points} &= \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \\ &= \left(\frac{2 + (-3)}{2}, \frac{2 + 1}{2} \right) \\ &= \left(\frac{-1}{2}, \frac{3}{2} \right) \end{aligned}$$

I see that $\left(-\frac{1}{2}, \frac{3}{2}\right)$ are the coordinates of the midpoint, which is answer choice **A**.

- 18a** The coordinates $(-4, 1)$ and $(4, 3)$ are two vertices of a right triangle on a coordinate plane.



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

- A $(4, 1)$
- B $(0, 2)$
- C $(2, 0)$
- D $(1, 4)$

- 18b** Coordinates $A(-2, 4)$ and $B(-4, 1)$ lie on a coordinate plane. What is the midpoint of line segment AB ?

- A $\left(\frac{5}{2}, -3\right)$
- B $\left(-\frac{5}{2}, 3\right)$
- C $\left(-3, \frac{5}{2}\right)$
- D $\left(3, \frac{5}{2}\right)$

Summary Statement:

These problems involve determining how to find the midpoint between two points in the coordinate plane. It is important to also understand how to use the midpoint formula.

