

Maine High School Assessment Mathematics Augmentation Released Items Taken from the 2007 Test

The following items appeared on the 2007 Maine High School Assessment Mathematics Augmentation. Items were written by the College Board in consultation with the Maine Department of Education. Some items were common items and some were some extra field test items testing indicators that will not be used after 2008. All items are aligned to standards tested in the 2008 MHSA.

Before each item is the performance indicator from the 1997 Maine Learning Results to which the item was written. Items may be related to more than one performance indicator, but the identified performance indicator is considered the most central to the item.

Items are in no particular order. Topics are mixed to reflect the overall design of the MHSA.

Questions about these items and the MHSA should be directed to Dan Hupp, (207) 624-6827, dan.hupp@Maine.gov or Tad Johnston, (207) 624-6829, tad.johnston@Maine.gov .

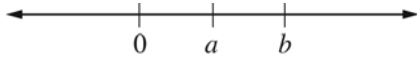
Item Key:

1. A
2. E
3. D
4. B
5. E
6. B
7. B
8. A
9. C
10. C
11. C
12. D
13. C
14. E
15. A
16. E
17. A
18. E

Maine High School Assessment Mathematics Augmentation Released Items
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A1 Describe the structure of the real number system and identify its appropriate applications and limitations.

1.

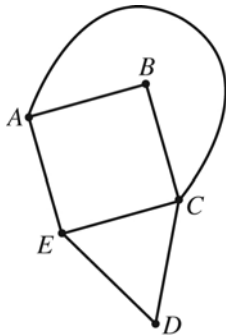


On the number line above, a and b are integers. There must be at least one of which of the following between a and b ?

- (A) An irrational number
- (B) An odd integer
- (C) An even integer
- (D) A multiple of 3
- (E) The square of an integer

I2 Use networks to find solutions to problems.

2.

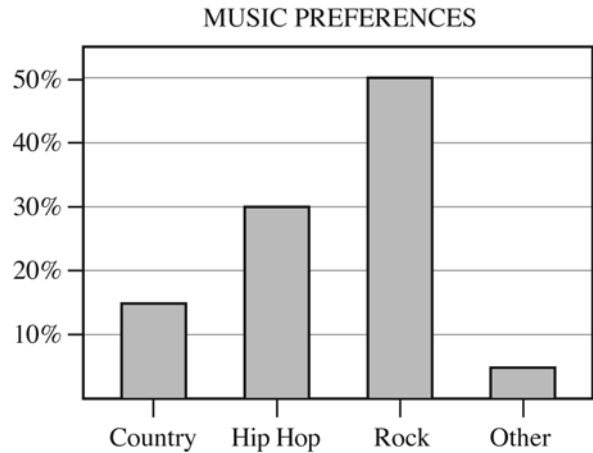


The figure above consists of 5 vertices and 7 edges. Karen put her pencil on vertex A and then traced over each of the 7 edges exactly once without lifting her pencil. At which vertex did she finish?

- (A) A
- (B) B
- (C) C
- (D) D
- (E) E

D2 Create and interpret probability distributions.

3.



The bar graph above shows the distribution of music preferences for eighteen-year-olds in Kansas City. If a random sample of 100 eighteen-year-olds in Kansas City were asked, “What is your favorite type of music — country, hip hop, rock, or other?” which of the following is most likely?

- (A) Exactly 50 would answer “Rock.”
- (B) Exactly 15 would answer “Country.”
- (C) More would answer “Hip Hop” than “Country.”
- (D) More would answer “Rock” than “Country.”
- (E) More would answer either “Country” or “Hip Hop” than “Rock.”

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A2 Explain what complex numbers (real and imaginary) mean and describe some of their many uses.

4.

Which of the following equations has no real-number solutions?

- (A) $x^2 - 5 = 0$
- (B) $x^2 + 5 = 0$
- (C) $5x^2 = 1$
- (D) $x^2 = 25$
- (E) $25x^2 = 1$

E3. Apply trigonometry to problem situations involving triangles and periodic phenomena.

5.

Triangle ABC has a right angle at C . Which of the following must be true?

- I. $\sin A = \cos B$
- II. $\sin A = \cos A$
- III. $\sin A = \frac{BC}{AB}$

- (A) None
- (B) I only
- (C) III only
- (D) I and II
- (E) I and III

B1 Use various techniques to approximate solutions, determine the reasonableness of answers, and justify the results.

6.

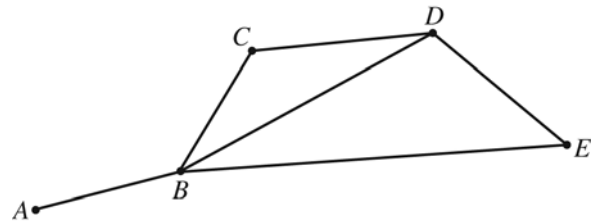
**Four more than twice a number is 12.5.
What is the number?**

Which of the following gives justification that a number x is a solution to the problem above?

- (A) When x is multiplied by 4 and 2 is added to the product, the result is 12.5.
- (B) When x is multiplied by 2 and 4 is added to the product, the result is 12.5.
- (C) When 4 is added to x and the sum is multiplied by 2, the result is 12.5.
- (D) When 2 is added to x and the sum is multiplied by 4, the result is 12.5.
- (E) When 12.5 is multiplied by 2 and 4 is added to the product, the result is x .

I2 Use networks to find solutions to problems.

7.



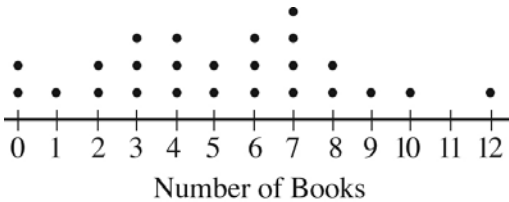
In the graph above, what is the least number of edges in a path from A to E ?

- (A) One
- (B) Two
- (C) Three
- (D) Four
- (E) Five

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C2. Predict and draw conclusions from charts, tables, and graphs that summarize data from practical situations.

8.



The dot plot above shows the number of books read by 25 students over the summer. If one of the students is selected at random, which of the following is most likely?

- (A) The student read fewer than 3 books.
- (B) The student read exactly 7 books.
- (C) The student read more than 8 books.
- (D) The student read more than 10 books.
- (E) The student read the median number of books.

A1 Describe the structure of the real number system and identify its appropriate applications and limitations.

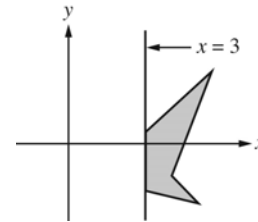
9.

If a , b , and c are nonzero integers, then $\frac{ab}{c}$ must be

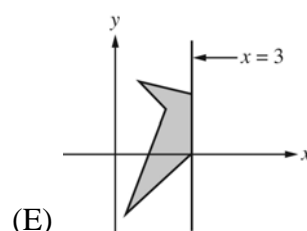
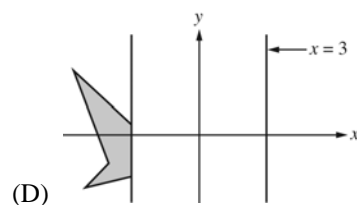
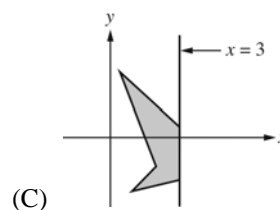
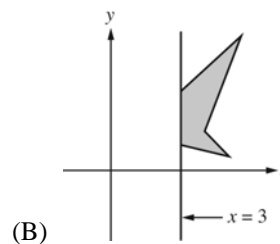
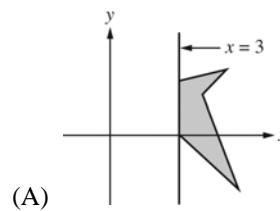
- (A) an integer
- (B) the square root of an integer
- (C) a rational number
- (D) an irrational number
- (E) a positive real number

E1. Draw coordinate representations of geometric figures and their transformations.

10.



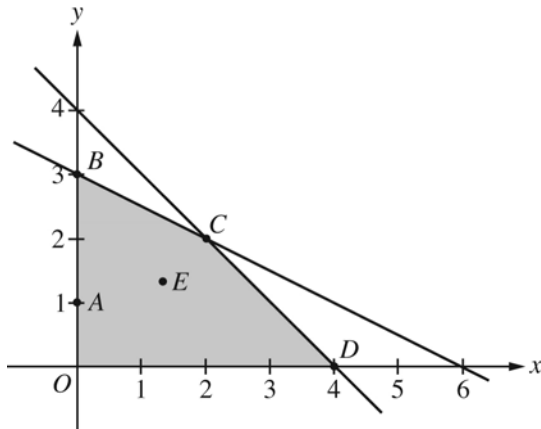
The shaded figure in the xy -plane above is to be reflected about the line $x = 3$. Which of the following is the reflection of the figure?



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I1 Use linear programming to find optimal solutions to a system.

11.



The shaded region in the xy -plane above represents all pairs (x, y) that satisfy $x + y \leq 4$, $x + 2y \leq 6$, $0 \leq x$, and $0 \leq y$. At which of the five labeled points is the quantity $3x + 4y$ greatest?

- (A) A
- (B) B
- (C) C
- (D) D
- (E) E

B2 Explain operations with number systems other than base ten.

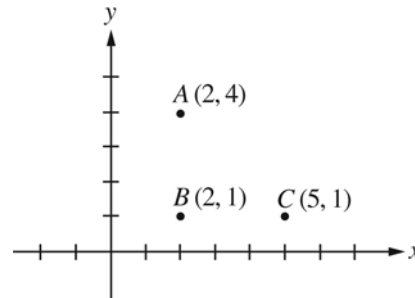
12.

In a factory, a machine assembles a chair every 13 minutes 40 seconds. At this rate, how long will it take this machine to assemble 8 chairs?

- (A) 21 minutes 40 seconds
- (B) 1 hour 7 minutes 20 seconds
- (C) 1 hour 46 minutes 20 seconds
- (D) 1 hour 49 minutes 20 seconds
- (E) 10 hours 7 minutes 20 seconds

E1 Draw coordinate representations of geometric figures and their transformations.

13.



In the xy -plane above, points A , B , and C are three of the vertices of a square. What are the coordinates of the fourth vertex of the square?

- (A) $(4, 4)$
- (B) $(4, 5)$
- (C) $(5, 4)$
- (D) $(5, 5)$
- (E) $(6, 6)$

C1 Determine and evaluate the effect of variables on the results of data collection.

14.

For a group of 100 people, the mean age is 30 years. If 60 people in the group who are 32 years old are replaced by 60 people who are 34 years old, which of the following statistics must change?

- I. The mean
- II. The median
- III. The mode

- (A) I only
- (B) III only
- (C) I and II only
- (D) I and III only
- (E) I, II, and III

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K1 Restate, create, and use definitions in mathematics to express understanding, classify figures, and determine the truth of a proposition or argument.

15.

Two integers a and b are called a “5-pair” if $|a - b| = 5$. If 3 and the integer n are a 5-pair, which of the following could be the value of n ?

- (A) -2
- (B) 2
- (C) 5
- (D) 10
- (E) 13

B1 Use various techniques to approximate solutions, determine the reasonableness of answers, and justify the results.

16.

A store manager is deciding on a pricing strategy. She wants to price items so that even if she has to reduce an item’s price by 30%, the reduced sale price will still be 40% more than the store’s cost for the item. What approximation method for pricing best matches this strategy?

- (A) Multiply the item cost by 1.4.
- (B) Multiply the item cost by 1.6.
- (C) Multiply the item cost by 1.7.
- (D) Multiply the item cost by 1.8.
- (E) Multiply the item cost by 2.0.

B1 Use various techniques to approximate solutions, determine the reasonableness of answers, and justify the results.

17.

$$S = \left\{ \frac{3}{800}, \frac{6}{800}, \frac{9}{800}, \frac{12}{800}, \dots, \frac{795}{800}, \frac{798}{800} \right\}$$

The set S above consists of all fractions that have a denominator of 800 and a numerator that is a positive multiple of 3 and less than 800. Of the following, which is closest to the sum of all elements of S ?

- (A) 133
- (B) 200
- (C) 267
- (D) 400
- (E) 800

A1 Describe the structure of the real number system and identify its appropriate applications and limitations.

18.

How many rational numbers are there between $\frac{1}{4}$ and

$$\frac{3}{4}?$$

- (A) None
- (B) One
- (C) Two
- (D) Ten
- (E) More than ten