



**NATIONAL ASSESSMENT  
OF EDUCATIONAL  
PROGRESS**

Math  
2009

Grade 8 Released Items

## NAEP 2009 Math – Grade 8 Released Items

|                                                                    |      |       |            |
|--------------------------------------------------------------------|------|-------|------------|
| Content: Algebra                                                   | Type | Grade | Difficulty |
| Description: <i>Identify equation equivalent to given equation</i> | MC   | 8     | Easy       |

1. Which of the following equations has the same solution as the equation  $2x + 6 = 32$ ?
- A.  $2x = 38$
  - B.  $x - 3 = 16$
  - C.  $x + 6 = 16$
  - D.  $2(x - 3) = 16$
  - E.  $2(x + 3) = 32$

| 2009 Percentage of 8 <sup>th</sup> Grade Students in Each Response Category |          |          |          |          |           |         |
|-----------------------------------------------------------------------------|----------|----------|----------|----------|-----------|---------|
| Public Schools                                                              | Choice A | Choice B | Choice C | Choice D | Choice E* | Omitted |
| National                                                                    | 13%      | 3%       | 9%       | 6%       | 68%       | 2%      |
| Delaware                                                                    | 9%       | 2%       | 8%       | 5%       | 75%       | 2%      |

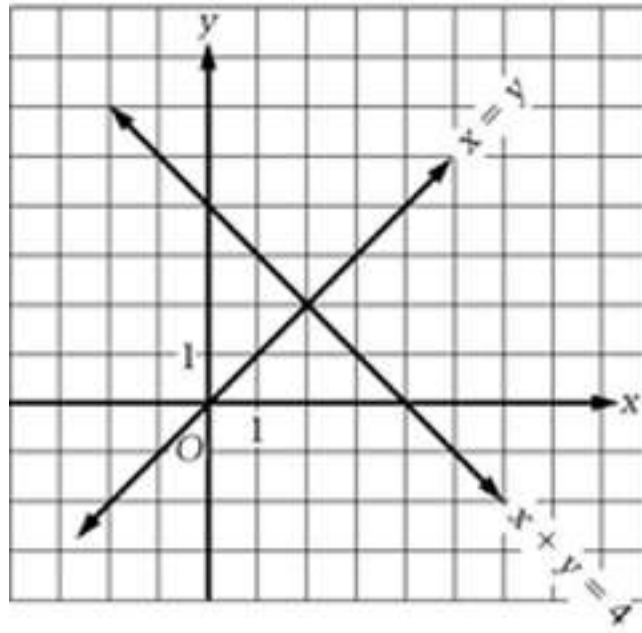
|                                                                     |      |       |            |
|---------------------------------------------------------------------|------|-------|------------|
| Content: Algebra                                                    | Type | Grade | Difficulty |
| Description: <i>Represent length of rectangle in terms of width</i> | MC   | 8     | Medium     |

2. The length of a rectangle is 3 feet less than twice the width,  $w$  (in feet). What is the length of the rectangle in terms of  $w$ ?
- A.  $3 - 2w$
  - B.  $2(w + 3)$
  - C.  $2(w - 3)$
  - D.  $2w + 3$
  - E.  $2w - 3$

| 2009 Percentage of 8 <sup>th</sup> Grade Students in Each Response Category |          |          |          |          |           |         |
|-----------------------------------------------------------------------------|----------|----------|----------|----------|-----------|---------|
| Public Schools                                                              | Choice A | Choice B | Choice C | Choice D | Choice E* | Omitted |
| National                                                                    | 21%      | 8%       | 13%      | 7%       | 49%       | 1%      |
| Delaware                                                                    | 20%      | 9%       | 20%      | 6%       | 42%       | 2%      |

## NAEP 2009 Math – Grade 8 Released Items

|                                                                     |      |       |            |
|---------------------------------------------------------------------|------|-------|------------|
| Content: Algebra                                                    | Type | Grade | Difficulty |
| Description: <i>Identify solution from graph of linear equation</i> | MC   | 8     | Easy       |

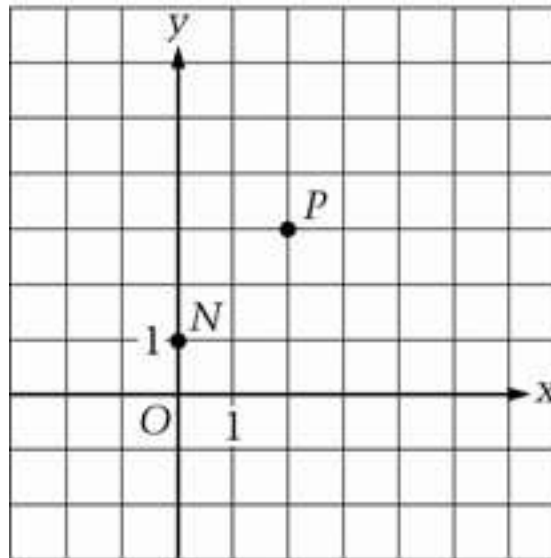


3. Which point is the solution to both equations shown on the graph above?
- A. (0, 0)
  - B. (0, 4)
  - C. (1, 1)
  - D. (2, 2)
  - E. (4, 0)

| 2009 Percentage of 8 <sup>th</sup> Grade Students in Each Response Category |          |          |          |           |          |         |
|-----------------------------------------------------------------------------|----------|----------|----------|-----------|----------|---------|
| Public Schools                                                              | Choice A | Choice B | Choice C | Choice D* | Choice E | Omitted |
| National                                                                    | 3%       | 10%      | 9%       | 70%       | 7%       | 1%      |
| Delaware                                                                    | 3%       | 11%      | 7%       | 72%       | 6%       | 1%      |

## NAEP 2009 Math – Grade 8 Released Items

|                                                                  |      |       |            |
|------------------------------------------------------------------|------|-------|------------|
| Content: Algebra                                                 | Type | Grade | Difficulty |
| Description: <i>Identify collinear point in coordinate plane</i> | MC   | 8     | Medium     |



4. For the figure above, which of the following points would be on the line that passes through points  $N$  and  $P$ ?
- A.  $(-2, 0)$
  - B.  $(0, 0)$
  - C.  $(1, 1)$
  - D.  $(4, 5)$
  - E.  $(5, 4)$

| 2009 Percentage of 8 <sup>th</sup> Grade Students in Each Response Category |          |          |          |           |          |         |
|-----------------------------------------------------------------------------|----------|----------|----------|-----------|----------|---------|
| Public Schools                                                              | Choice A | Choice B | Choice C | Choice D* | Choice E | Omitted |
| National                                                                    | 9%       | 3%       | 27%      | 54%       | 6%       | 2%      |
| Delaware                                                                    | 11%      | 3%       | 28%      | 50%       | 7%       | 2%      |

## NAEP 2009 Math – Grade 8 Released Items

|                                                                         |      |        |              |
|-------------------------------------------------------------------------|------|--------|--------------|
| Content: Algebra                                                        | Type | Grade  | Difficulty   |
| Description: <i>Determine the value of unknown in a number sentence</i> | CR   | 4<br>8 | Easy<br>Easy |

$$\square - 8 = 21$$

5. What number should be put in the box to make the number sentence above true?

Answer: \_\_\_\_\_

| 2009 Percentage of 4 <sup>th</sup> Grade Students in Each Response Category |         |           |         |
|-----------------------------------------------------------------------------|---------|-----------|---------|
| Public Schools                                                              | Correct | Incorrect | Omitted |
| Delaware                                                                    | 69%     | 30 %      | 1%      |
| National                                                                    | 68%     | 30%       | 1%      |

| 2009 Percentage of 8 <sup>th</sup> Grade Students in Each Response Category |         |           |         |
|-----------------------------------------------------------------------------|---------|-----------|---------|
| Public Schools                                                              | Correct | Incorrect | Omitted |
| Delaware                                                                    | 86%     | 12 %      | 2%      |
| National                                                                    | 85%     | 13 %      | 2%      |

### Scoring Guide

#### Sample Correct Responses:

29

OR  $29 - 8 = 21$

OR 29 in the box and response area blank.

#### Score & Description

##### Correct

Correct response

##### Incorrect

Incorrect response

## NAEP 2009 Math – Grade 8 Released Items

|                                                            |      |        |                  |
|------------------------------------------------------------|------|--------|------------------|
| Content: Algebra                                           | Type | Grade  | Difficulty       |
| Description: <i>Extend a number pattern and write rule</i> | CR   | 4<br>8 | Medium<br>Medium |

6. Write the next two numbers in the number pattern.

1    6    4    9    7    12    10    \_\_\_\_    \_\_\_\_

Write the rule that you used to find the two numbers you wrote.

| 2009 Percentage of 4 <sup>th</sup> Grade Students in Each Response Category |         |         |           |         |
|-----------------------------------------------------------------------------|---------|---------|-----------|---------|
| Public Schools                                                              | Correct | Partial | Incorrect | Omitted |
| Delaware                                                                    | 29%     | 16%     | 46%       | 10%     |
| National                                                                    | 37%     | 16%     | 39%       | 8%      |

| 2009 Percentage of 8 <sup>th</sup> Grade Students in Each Response Category |         |         |           |         |
|-----------------------------------------------------------------------------|---------|---------|-----------|---------|
| Public Schools                                                              | Correct | Partial | Incorrect | Omitted |
| Delaware                                                                    | 70%     | 14%     | 11%       | 4%      |
| National                                                                    | 66%     | 16%     | 14%       | 4%      |

### Question 6 Scoring Guide

#### Sample Correct Responses:

15, 13

Add 5 to previous number for even places and subtract 2 from previous number to get odd places,

OR

+5, -2

OR

The odd terms increase by 3 and the even terms increase by 3. ("Every other number skips 3" is acceptable.)

#### Score & Description

**Correct** - Correct response

**Partial**

Gives 15 and 13 but not the rule

OR

Just gives evidence that they know the rule but omits or gets incorrect the 15 and/or 13

OR

Gives 8 and 13 with rule -2, + 5

**Incorrect** - Incorrect response

## NAEP 2009 Math – Grade 8 Released Items

|                                                                |      |       |            |
|----------------------------------------------------------------|------|-------|------------|
| Content: Algebra                                               | Type | Grade | Difficulty |
| Description: <i>Find the next term in a geometric sequence</i> | CR   | 8     | Hard       |

7. In the sequence below, the ratio of each term to the term immediately following it is constant. What is the next term of this sequence after 2240?  
 35, 280, 2240, \_\_\_\_\_

| 2009 Percentage of 8 <sup>th</sup> Grade Students in Each Response Category |         |           |         |          |
|-----------------------------------------------------------------------------|---------|-----------|---------|----------|
| Public Schools                                                              | Correct | Incorrect | Omitted | Off Task |
| Delaware                                                                    | 25 %    | 63 %      | 9%      | 3%       |
| National                                                                    | 29%     | 60%       | 7%      | 4%       |

## Scoring Guide

## Sample Correct Responses:

17,920

## Score &amp; Description

**Correct**

Correct response

**Incorrect**

Incorrect response

## NAEP 2009 Math – Grade 8 Released Items

|                                                                       |      |       |            |
|-----------------------------------------------------------------------|------|-------|------------|
| Content: <i>Data Analysis, Statistics and Probability</i>             | Type | Grade | Difficulty |
| Description: <i>Determine the probability of a particular outcome</i> | MC   | 8     | Easy       |

8. Marty has 6 red pencils, 4 green pencils, and 5 blue pencils. If he picks out one pencil without looking, what is the probability that the pencil he picks will be green?
- A. 1 out of 3
  - B. 1 out of 4
  - C. 1 out of 15
  - D. 4 out of 15

| 2009 Percentage of 8 <sup>th</sup> Grade Students in Each Response Category |          |          |          |           |         |
|-----------------------------------------------------------------------------|----------|----------|----------|-----------|---------|
| Public Schools                                                              | Choice A | Choice B | Choice C | Choice D* | Omitted |
| Delaware                                                                    | 4%       | 4%       | 8%       | 83%       | 1%      |
| National                                                                    | 4%       | 6%       | 12%      | 77%       | 1%      |

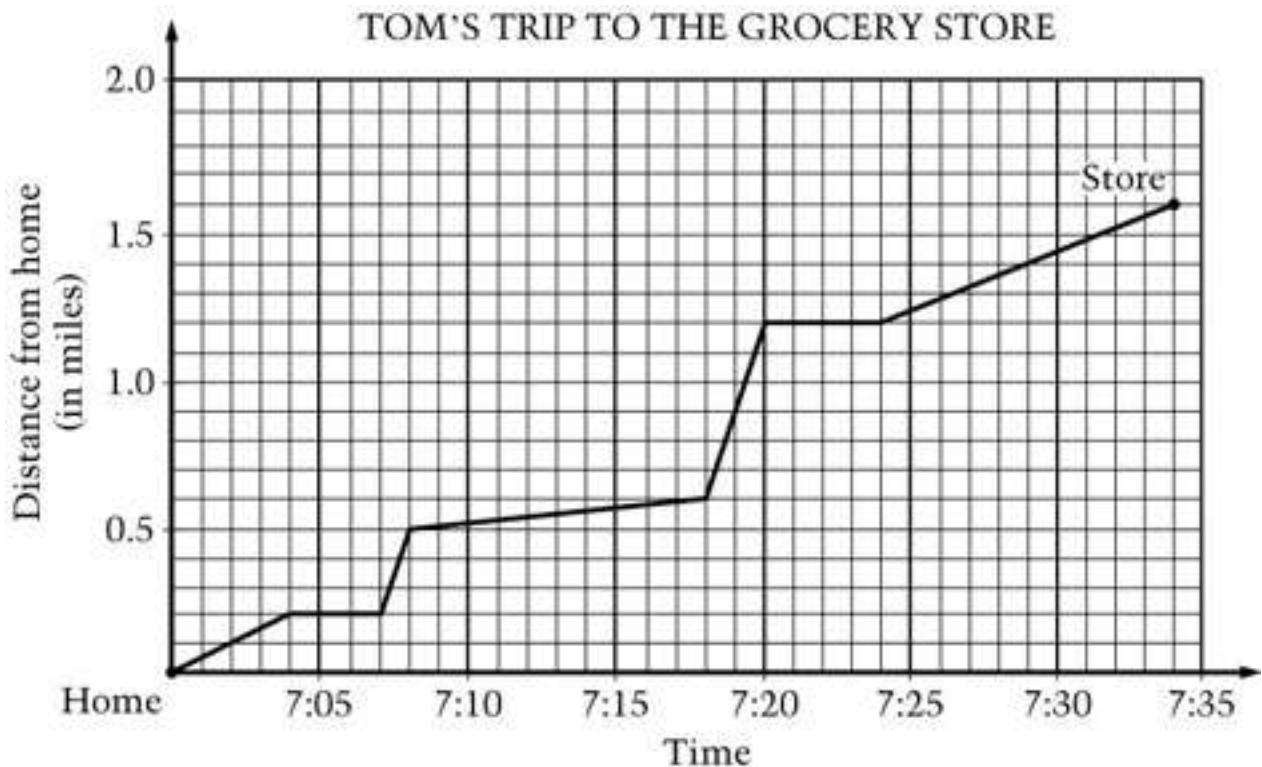
|                                                                         |      |       |            |
|-------------------------------------------------------------------------|------|-------|------------|
| Content: <i>Data Analysis, Statistics and Probability</i>               | Type | Grade | Difficulty |
| Description: <i>Identify which statistic is represented by response</i> | MC   | 8     | Medium     |

9. For a school report, Luke contacted a car dealership to collect data on recent sales. He asked, "What color do buyers choose most often for their car?" White was the response. What statistical measure does the response "white" represent?
- A. Mean
  - B. Median
  - C. Mode
  - D. Range
  - E. Interquartile range

| 2009 Percentage of 8 <sup>th</sup> Grade Students in Each Response Category |          |          |           |          |         |
|-----------------------------------------------------------------------------|----------|----------|-----------|----------|---------|
| Public Schools                                                              | Choice A | Choice B | Choice C* | Choice D | Omitted |
| Delaware                                                                    | 19%      | 10%      | 58%       | 8%       | 5%      |
| National                                                                    | 18%      | 10%      | 59%       | 8%       | 4%      |

|                                                               |      |       |            |
|---------------------------------------------------------------|------|-------|------------|
| Content: <i>Data Analysis, Statistics and Probability</i>     | Type | Grade | Difficulty |
| Description: <i>Read and interpret information in a graph</i> | MC   | 8     | Medium     |

10. Tom went to the grocery store. The graph below shows Tom's distance from home during his trip.



Tom stopped twice to rest on his trip to the store. What is the total amount of time that he spent resting?

- A. 5 minutes
- B. 7 minutes
- C. 8 minutes
- D. 10 minutes
- E. 25 minutes

| 2009 Percentage of 8 <sup>th</sup> Grade Students in Each Response Category |          |           |          |          |          |         |
|-----------------------------------------------------------------------------|----------|-----------|----------|----------|----------|---------|
| Public Schools                                                              | Choice A | Choice B* | Choice C | Choice D | Choice E | Omitted |
| Delaware                                                                    | 10%      | 43%       | 20%      | 18%      | 7%       | 1%      |
| National                                                                    | 12%      | 43%       | 18%      | 19%      | 8%       | 1%      |

## NAEP 2009 Math – Grade 8 Released Items

|                                                                       |      |       |            |
|-----------------------------------------------------------------------|------|-------|------------|
| Content: <i>Data Analysis, Statistics and Probability</i>             | Type | Grade | Difficulty |
| Description: <i>Solve and explain a problem involving probability</i> | ECR  | 8     | Hard       |

11. Leroy has one quarter, one dime, one nickel, and one penny. Two of the coins are in his left pocket and the other two coins are in his right pocket. The coins have been randomly placed in the two pockets.

What is the probability that Leroy will be able to purchase a 30-cent candy bar with the two coins in his left pocket?

Using the coins, explain your reasoning.

| 2009 Percentage of 8 <sup>th</sup> Grade Students in Each Response Category |          |              |         |         |           |         |
|-----------------------------------------------------------------------------|----------|--------------|---------|---------|-----------|---------|
| Public Schools                                                              | Extended | Satisfactory | Partial | Minimal | Incorrect | Omitted |
| Delaware                                                                    | 6%       | 12%          | 5%      | 22%     | 40%       | 15%     |
| National                                                                    | 6%       | 6%           | 5%      | 20%     | 52%       | 10%     |

### Scoring Guide

#### Sample Correct Responses:

QP Not able to purchase candy bar with these

QN Able to purchase candy bar with these

QD Able to purchase candy bar with these

PN Not able to purchase candy bar with these

PD Not able to purchase candy bar with these

ND Not able to purchase candy bar with these

The probability is  $\frac{2}{6}$  or  $\frac{1}{3}$  because there are 6 different possible combinations for the two coins but only 2 of these have a combined value of 30 cents or more.

Note: Explanation must include correct number of total possible combinations as well as an indication of those combinations that satisfy 30-cent criteria.

**Question 11 Score & Description****Extended**

Complete correct solution that indicates correct probability with a complete explanation. Must indicate the 2 successful combinations (May use conditional probabilities).

**Satisfactory**

Response indicates an incorrect probability but explanation implies correct reasoning (sample space of 6).

OR

Response has correct probability for incomplete number of total possible combinations of coins or incomplete explanation. (Probability agrees with sample space.) For a score of 4, sample space must contain at least 4 different, correct pairs.

**Partial**

Response gives a correct probability and no explanation.

OR

Less than 4 pairs with agreeing probability.

OR

A correct probability that is based on an incorrect explanation.

**Minimal**

Response contains evidence that student knows that there is more than one possible combination for the coins in the left pocket. Probability is missing or incorrect.

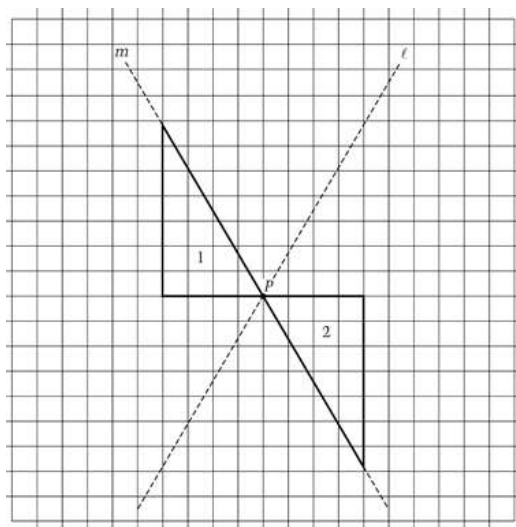
**Incorrect**

Incorrect response

|                                                        |      |       |            |
|--------------------------------------------------------|------|-------|------------|
| Content: <i>Geometry</i>                               | Type | Grade | Difficulty |
| Description: <i>Identify steps in a transformation</i> | MC   | 8     | Easy       |

Question 1 refers to additional materials at end of booklet. For this question, you may want to use your pieces labeled X.

The figure below shows two triangles, labeled 1 and 2.



12. Which one of the following describes a way to move triangle 1 so that it completely covers triangle 2?
- A. Turn (rotate) 180 degrees about point P.
  - B. Flip (reflect) over line  $\ell$ .
  - C. Slide (translate) 5 units to the right followed by 8 units down.
  - D. Flip (reflect) over line  $m$ .
  - E. Slide (translate) 10 units to the right followed by 16 units down.

**2009 Percentage of 8<sup>th</sup> Grade Students in Each Response Category**

| Public Schools | Choice A* | Choice B | Choice C | Choice D | Choice E | Omitted |
|----------------|-----------|----------|----------|----------|----------|---------|
| Delaware       | 66%       | 14%      | 7%       | 9%       | 2%       | 2%      |
| National       | 65%       | 15%      | 7%       | 8%       | 2%       | 2%      |

## NAEP 2009 Math – Grade 8 Released Items

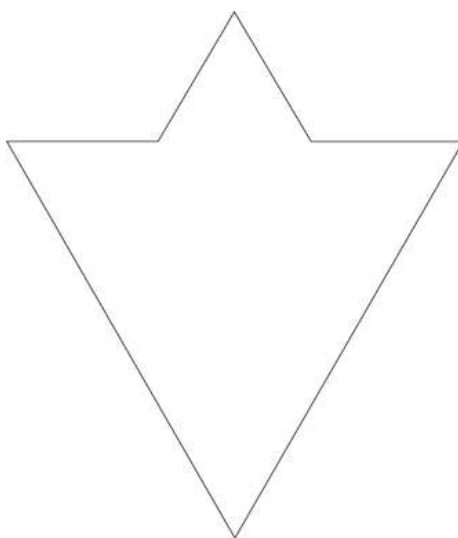
|                                                            |      |       |            |
|------------------------------------------------------------|------|-------|------------|
| Content: <i>Geometry</i>                                   | Type | Grade | Difficulty |
| Description: <i>Arrange given pieces to cover a figure</i> | CR   | 8     | Easy       |

*Question 2 refers to additional materials at end of booklet. You will need four pieces labeled  $R$  and two pieces labeled  $T$  to answer this question.*

13. Use these pieces to cover the figure below.

Draw the lines to show where the pieces meet.

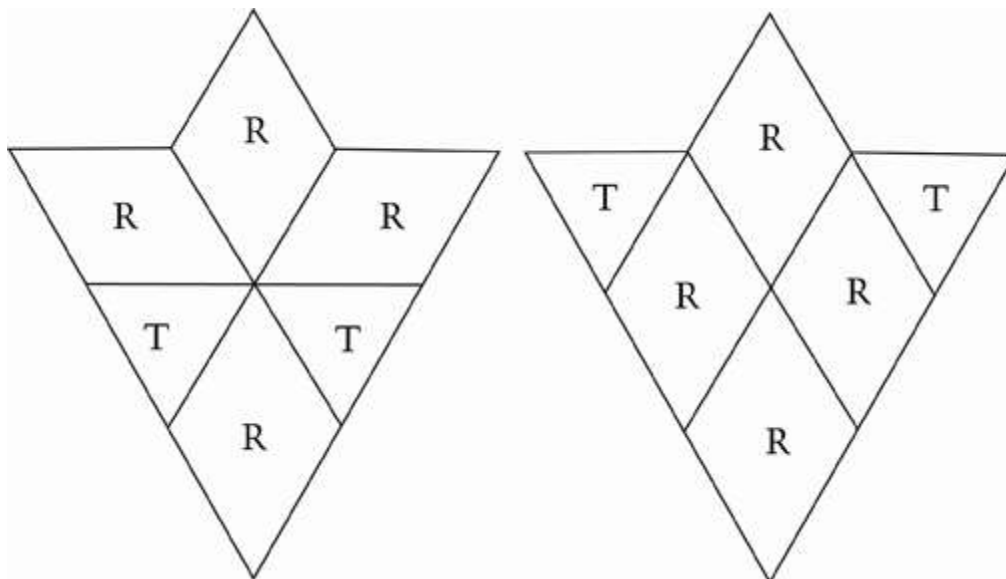
Label the pieces on the figure.



| 2009 Percentage of 8 <sup>th</sup> Grade Students in Each Response Category |         |         |           |         |
|-----------------------------------------------------------------------------|---------|---------|-----------|---------|
| Public Schools                                                              | Correct | Partial | Incorrect | Omitted |
| Delaware                                                                    | 71%     | 24%     | 4%        | 1%      |
| National                                                                    | 60%     | 31%     | 7%        | 2%      |

**Question 13 Scoring Guide**

Sample Correct Responses:

**Score & Description****Correct**

Correct response

**Partial**

Uses any combination of at least one R and at least one T (but not four R's and two T's) to cover the figure. No labels are necessary (and mislabels may be present), but lines must be shown.

Somewhat poor tracing OK.

OR

Draws lines correctly but does not label.

OR

Writes labels only for four R's and two T's in correct locations, but does not draw lines.

**Incorrect**

Incorrect response

## NAEP 2009 Math – Grade 8 Released Items

|                                                                            |      |       |            |
|----------------------------------------------------------------------------|------|-------|------------|
| Content: <i>Geometry</i>                                                   | Type | Grade | Difficulty |
| Description: <i>Use given pieces to make shape with certain properties</i> | CR   | 8     | Medium     |

*Question 3 refers to additional materials at end of booklet. You will need two pieces labeled X to answer this question.*

14. Use the pieces to make a shape that has these properties.

- It has four sides.
- No pieces overlap.
- No two sides are parallel.

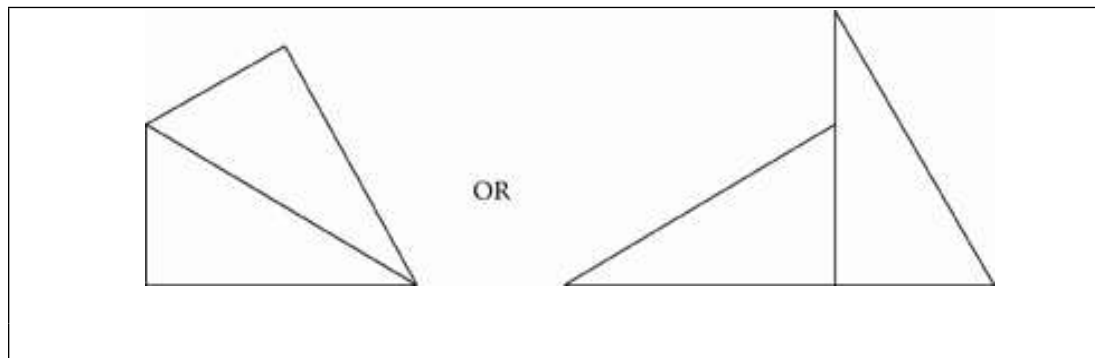
In the space below, trace the shape.

Draw the line to show where the two pieces meet.

| 2009 Percentage of 8 <sup>th</sup> Grade Students in Each Response Category |         |         |           |         |
|-----------------------------------------------------------------------------|---------|---------|-----------|---------|
| Public Schools                                                              | Correct | Partial | Incorrect | Omitted |
| Delaware                                                                    | 31%     | 54%     | 11%       | 4%      |
| National                                                                    | 28%     | 52%     | 17%       | 4%      |

**Question 3 Scoring Guide**

Sample Correct Responses:

**Score & Description****Correct**

Correct response

**Partial**

A four-sided figure with parallel sides with meeting lines drawn.

OR

A correct shape but meeting line is incorrect.

OR

A 3-sided figure or a figure with more than four sides, and the sides are not parallel with meeting lines drawn.

OR

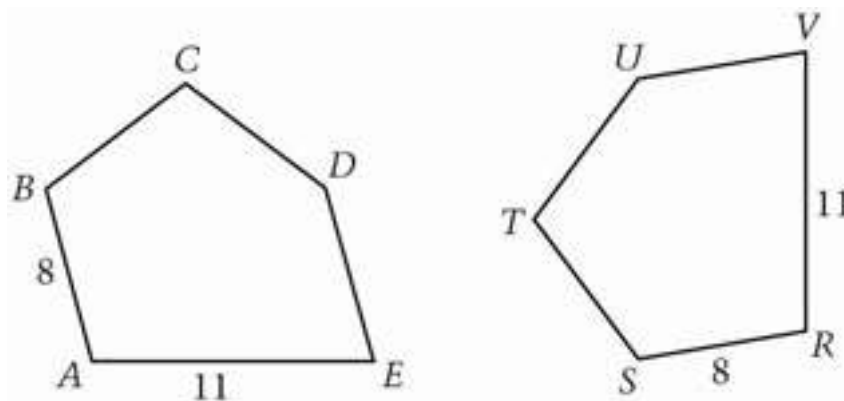
Either of the correct shapes is drawn without the line where the pieces meet.

**Incorrect**

Incorrect response

## NAEP 2009 Math – Grade 8 Released Items

|                                                                         |      |       |            |
|-------------------------------------------------------------------------|------|-------|------------|
| Content: <i>Geometry</i>                                                | Type | Grade | Difficulty |
| Description: <i>Identify side with same length in congruent figures</i> | MC   | 8     | Easy       |



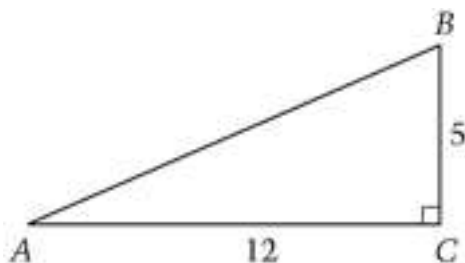
15. In the figure above, polygons  $ABCDE$  and  $RSTUV$  are congruent. Which side must have the same length as side  $BC$  ?
- A.  $CD$
  - B.  $DE$
  - C.  $ST$
  - D.  $TU$
  - E.  $UV$

2009 Percentage of 8<sup>th</sup> Grade Students in Each Response Category

| Public Schools | Choice A | Choice B | Choice C* | Choice D | Choice E | Omitted |
|----------------|----------|----------|-----------|----------|----------|---------|
| Delaware       | 7%       | 3%       | 69%       | 16%      | 4%       | 1%      |
| National       | 6%       | 3%       | 69%       | 17%      | 5%       | 1%      |

## NAEP 2009 Math – Grade 8 Released Items

|                                               |      |       |            |
|-----------------------------------------------|------|-------|------------|
| Content: <i>Geometry</i>                      | Type | Grade | Difficulty |
| Description: <i>Find length of hypotenuse</i> | MC   | 8     | Easy       |



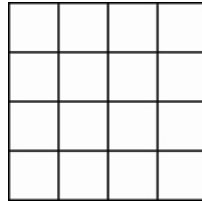
16. In the right triangle above, what is the length of  $AB$  ?

- A. 8.5
- B. 12
- C. 13
- D. 17
- E. 30

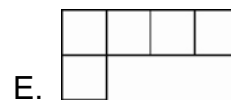
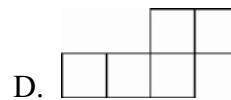
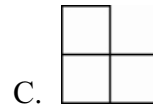
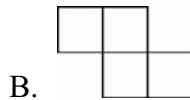
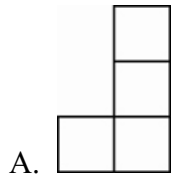
| 2009 Percentage of 8 <sup>th</sup> Grade Students in Each Response Category |          |          |           |          |          |         |
|-----------------------------------------------------------------------------|----------|----------|-----------|----------|----------|---------|
| Public Schools                                                              | Choice A | Choice B | Choice C* | Choice D | Choice E | Omitted |
| Delaware                                                                    | 6%       | 14%      | 43%       | 30%      | 6%       | 2%      |
| National                                                                    | 7%       | 17%      | 40%       | 30%      | 5%       | 1%      |

## NAEP 2009 Math – Grade 8 Released Items

|                                                        |      |       |            |
|--------------------------------------------------------|------|-------|------------|
| Content: <i>Geometry</i>                               | Type | Grade | Difficulty |
| Description: <i>Identify piece used to form figure</i> | MC   | 8     | Medium     |



17. Identical puzzle pieces have been put together to form the large square shown above. Which of the following could be the shape of each puzzle piece?



| 2009 Percentage of 8 <sup>th</sup> Grade Students in Each Response Category |           |          |          |          |          |         |
|-----------------------------------------------------------------------------|-----------|----------|----------|----------|----------|---------|
| Public Schools                                                              | Choice A* | Choice B | Choice C | Choice D | Choice E | Omitted |
| Delaware                                                                    | 48%       | 9%       | 20%      | 7%       | 13%      | 3%      |
| National                                                                    | 46%       | 9%       | 22%      | 7%       | 14%      | 2%      |

|                                                                        |      |       |            |
|------------------------------------------------------------------------|------|-------|------------|
| Content: <i>Geometry</i>                                               | Type | Grade | Difficulty |
| Description: <i>Draw floor plan given conditions and compute areas</i> | ECR  | 8     | Hard       |

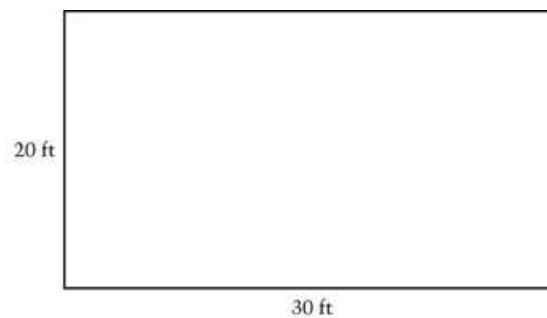
18. The Morrisons are going to build a new one-story house. The floor of the house will be rectangular with a length of 30 feet and a width of 20 feet.

The house will have a living room, a kitchen, two bedrooms, and a bathroom. In part (a) below create a floor plan that shows these five rooms by dividing the rectangle into rooms.

Your floor plan should meet the following conditions.

Be sure to label each room by name (living room, kitchen, bedroom, etc.) and include its length and width, in feet. (Do not draw any hallways on your floor plan.)

- (a) Draw your floor plan on the figure below. Remember to label your rooms by name and include the length and width, in feet, for each room.



- (b) Complete the table below by filling in the floor area, in square feet, for each room in your floor plan.

| Room             | Floor Area<br>(in square feet) |
|------------------|--------------------------------|
| Living           |                                |
| Kitchen          |                                |
| Bedroom          |                                |
| Bedroom          |                                |
| Bathroom         |                                |
| Total Floor Area | 600                            |

| 2009 Percentage of 8 <sup>th</sup> Grade Students in Each Response Category |          |              |         |         |           |         |
|-----------------------------------------------------------------------------|----------|--------------|---------|---------|-----------|---------|
| Public Schools                                                              | Extended | Satisfactory | Partial | Minimal | Incorrect | Omitted |
| Delaware                                                                    | 5%       | 4%           | 11%     | 52%     | 17%       | 9%      |
| National                                                                    | 5%       | 2%           | 15%     | 51%     | 19%       | 7%      |

## Question 18 Scoring Guide

### Sample Correct Responses:

There are many possible correct responses. All should contain square or rectangular rooms, a bathroom with an area of 50 square feet, and meet the other required conditions.

For a table to be correct, it must:

- have entries that add up to 600, and
- have an area of 50 for the bathroom, and
- have dimensions for other rooms of at least 10 by 10.

For labeling of the drawing to be considered correct, it must:

- have name of room, and
- have room dimensions.

### Question 18 Score & Description

#### Extended

Correct response (complete and correctly labeled)

#### Satisfactory

Correct table and correct drawing (in correct proportion) but drawing is missing some or all labels.

OR

Correct drawing (in correct proportion) with all labels correct but table is missing or incomplete.

#### Partial

Correct table but drawing is not presented in proportion that is consistent with table (may be because drawing includes an incorrect label).

OR

Correct drawing (in correct proportion) with some correct labeling but table may be incomplete and/or not in agreement with drawing in some respect.

OR

Table adds to 600, rooms are in proportion to table, but bathroom area may not necessarily be 50.

#### Minimal

Correct table only.

OR

50 sq. ft. for bathroom represented in some way.

OR

Obtains room areas in table that total to 600.

OR

Drawing contains 5 rooms, each with at least one outside wall, and no hallways.

#### Incorrect

Incorrect response