# New England Common Assessment Program

## Released Items
## 2009

## Grade 8
## Mathematics

# Mathematics

Items with this symbol were selected from Session One—no calculators or other mathematics tools allowed.

**1** Look at this inequality.

$$\boxed{?} > |-15|$$

Which expression makes the inequality true?

A. $|-16|$

B. $|-14|$

C. $-|16|$

D. $-|14|$

**2** Look at these numbers.

$$\mathbf{1^{20},\ 2^{7},\ 5^{3}}$$

In which set are the numbers ordered from **greatest to least**?

A. $1^{20},\ 2^{7},\ 5^{3}$

B. $2^{7},\ 1^{20},\ 5^{3}$

C. $2^{7},\ 5^{3},\ 1^{20}$

D. $5^{3},\ 2^{7},\ 1^{20}$

**3** Which set of measures can be the lengths of the sides of a triangle?

A. 1 cm, 2 cm, 3 cm

B. 2 cm, 2 cm, 5 cm

C. 3 cm, 5 cm, 7 cm

D. 4 cm, 6 cm, 12 cm

**4** To make a poster, Jeff will enlarge the length and width of a photograph by a scale factor of 5. The photograph is 8 inches wide and 10 inches long. What will be the **area** of the **poster**?

A. 80 square inches

B. 195 square inches

C. 400 square inches

D. 2000 square inches

**5** Look at this pattern.

$$\frac{1}{9},\ \frac{1}{3},\ 1,\ 3,\ ?$$

What number comes next in the pattern?

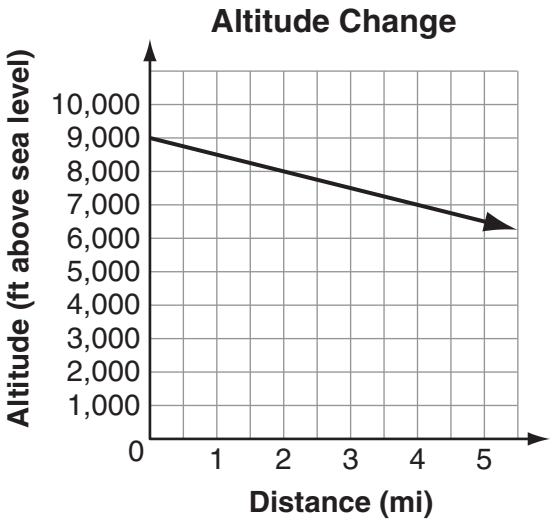
A. 5

B. 6

C. 9

D. 12

**6** This graph shows the relationship between the altitude of an airplane and the distance it travels while it is descending.




Which statement describes the slope of this line?

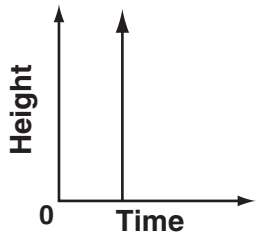
A. The altitude decreases by 500 feet every mile.

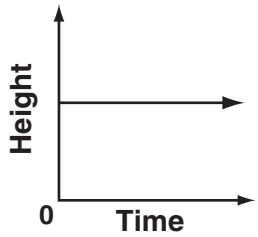
B. The altitude decreases by 1000 feet every mile.

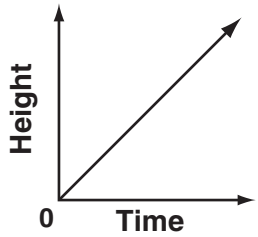
C. The altitude decreases by 1 foot every 500 miles.

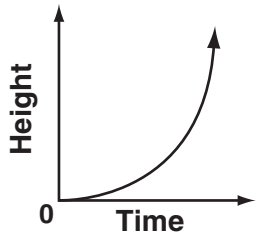
D. The altitude decreases by 1 foot every 1000 miles.

**7** A hot-air balloon rises at a **constant** rate. Which graph could show the relationship between the balloon's height above the ground and the amount of time that has passed since it left the ground?

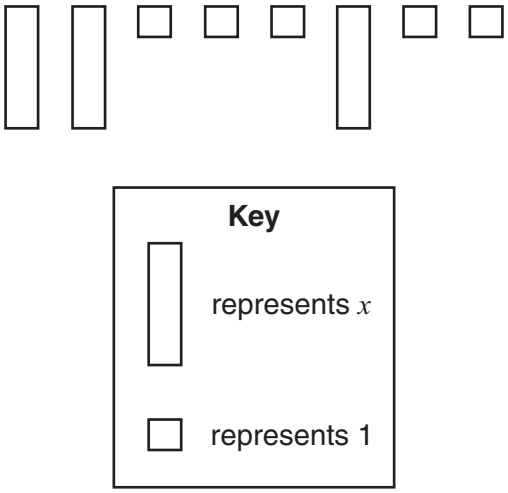
A.



B.



C.



D.



**8** Look at this model.




Which expression is shown by the model?

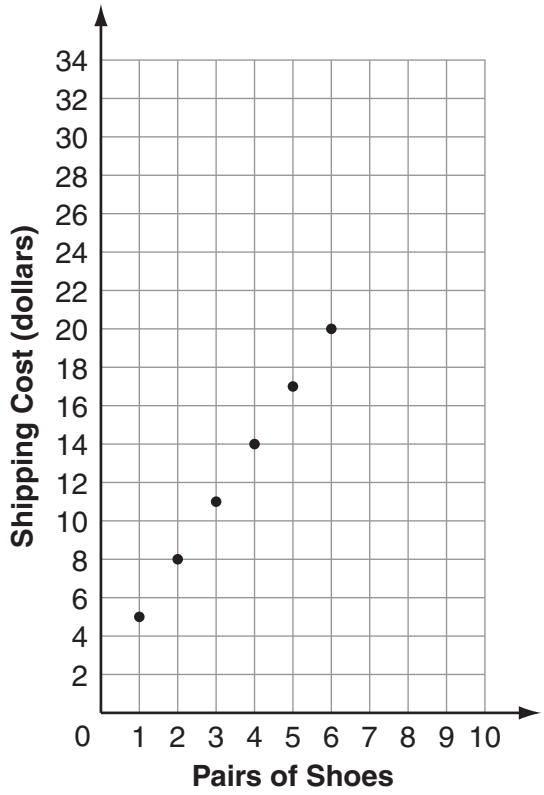
A. $8x$

B. $x^3 + 5$

C. $3x^5 + x^5$

D. $3x + 5$

**9** This scatter plot shows the relationship between the shipping costs and the number of pairs of shoes ordered.




Based on this scatter plot, what is the shipping cost for 10 pairs of shoes?

A. $34
B. $32
C. $30
D. $28

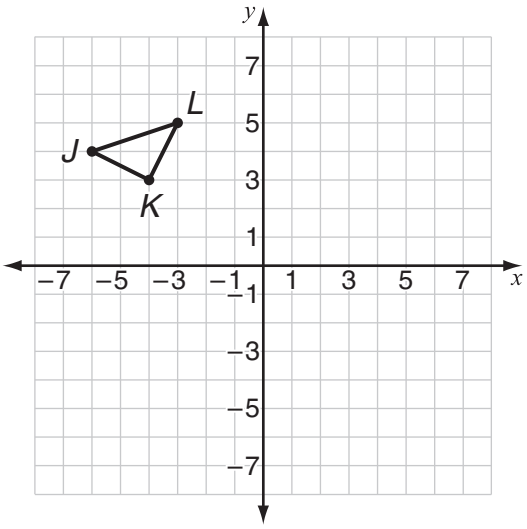
**10** The chart below shows the weights and lengths of some fish John caught.

| Length (in inches) | Weight (in pounds) |
|---|---|
| 20 | 3.3 |
| 28 | 7.7 |
| 28 | 8.4 |
| 35 | 15.4 |
| 35 | 16.8 |
| 20 | 3.1 |
| 20 | 2.9 |
| 33 | 10.8 |
| 33 | 22.5 |
| 20 | 5.5 |

To show a relationship between the fishes' lengths and weights, which type of graph is **best** to display the data?

A. histogram
B. circle graph
C. line plot
D. scatter plot

**11** Look at $\Delta JKL$.




After a reflection over the $y$-axis, the image of $\Delta JKL$ is $\Delta J'K'L'$. What are the coordinates of point $K'$?

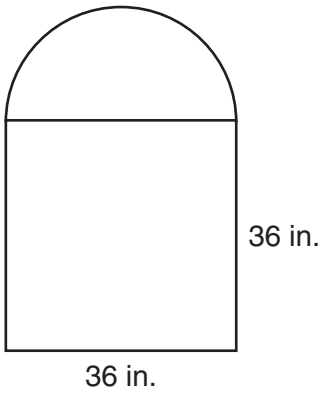
**12** Steve wants to know what type of music most teenagers prefer. He surveyed 50 teenagers who were attending a jazz concert. Explain why Steve's data may be biased.

**13** This chart shows the percent of students who are athletes at each of two schools.

| School | Percent of Students Who Are Athletes |
|---|---|
| Edgemont | 30% |
| Bayville | 50% |

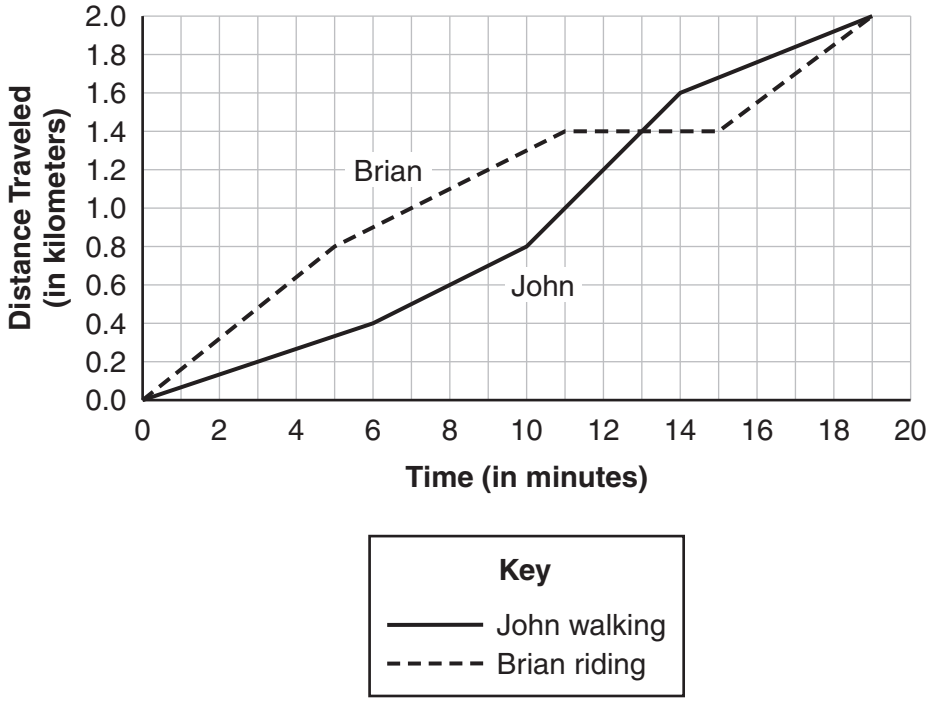
There are 400 students at Edgemont School. Bayville School has fewer athletes than Edgemont School. What is one possibility for the total number of students who go to Bayville School? Show your work or explain how you know.

**14** The shape of the window shown below is made up of a square and a semicircle.




What is the area of the window to the nearest square inch? Show your work or explain how you know.

**15** John and Brian each live 2 kilometers from their school. John walks to school and Brian rides his bicycle. These graphs show the distance each boy travels to school.




a. How many kilometers does John walk between minutes 3 and 8?

b. What is the speed that Brian is riding his bicycle between minutes 11 and 15?

c. Between which minutes do John and Brian travel at the same speed? Explain how you know.

# New England Common Assessment Program

## Released Items Support Materials 2009

## Grade 8 Mathematics

**N&O 7.2** **Demonstrates understanding of the relative magnitude of numbers** by ordering, comparing, or identifying equivalent rational numbers across number formats, numbers with whole number bases and whole number exponents (e.g., $3^3$, $4^3$), integers, absolute values, or numbers represented in scientific notation using number lines or equality and inequality symbols.

**1** Look at this inequality.

$$\boxed{?} > |-15|$$

Which expression makes the inequality true?

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B. $|-14|$
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**2** Look at these numbers.

$$\mathbf{1^{20},\ 2^7,\ 5^3}$$

In which set are the numbers ordered from **greatest to least**?

A. $1^{20}$, $2^7$, $5^3$
B. $2^7$, $1^{20}$, $5^3$
C. $2^7$, $5^3$, $1^{20}$
D. $5^3$, $2^7$, $1^{20}$

**G&M 7.2** **Applies theorems or relationships** (triangle inequality or sum of the measures of interior angles of regular polygons) to solve problems.

**3** Which set of measures can be the lengths of the sides of a triangle?

A. 1 cm, 2 cm, 3 cm
B. 2 cm, 2 cm, 5 cm
C. 3 cm, 5 cm, 7 cm
D. 4 cm, 6 cm, 12 cm

**G&M 7.5** **Applies concepts of similarity** by solving problems involving scaling up or down and their impact on angle measures, linear dimensions and areas of polygons, and circles when the linear dimensions are multiplied by a constant factor. Describes effects using models or sc explanations.

**4** To make a poster, Jeff will enlarge the length and width of a photograph by a scale factor of 5. The photograph is 8 inches wide and 10 inches long. What will be the **area** of the **poster**?

A. 80 square inches
B. 195 square inches
C. 400 square inches
D. 2000 square inches

**F&A 7.1** **Identifies and extends to specific cases a variety of patterns** (linear and nonlinear) represented in models, tables, sequences, graphs, or in problem situations; **and generalizes** a linear relationship using words and symbols; generalizes a linear relationship to find a specific case; or writes an expression or equation using words or symbols to express the **generalization** of a nonlinear relationship.

**5** Look at this pattern.

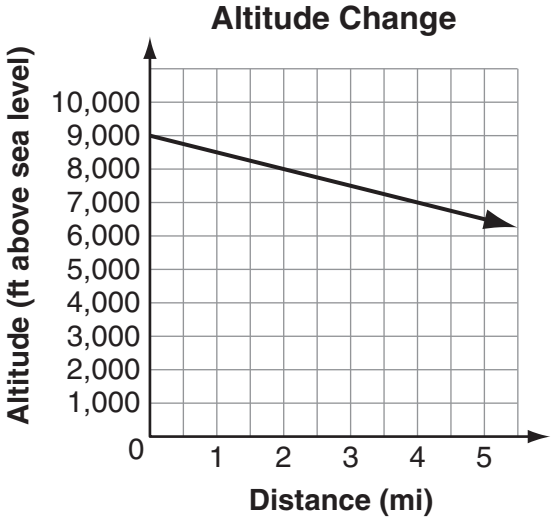
$$\frac{1}{9},\ \frac{1}{3},\ 1,\ 3,\ ?$$

What number comes next in the pattern?

A. 5
B. 6
C. 9
D. 12

**F&A 7.2** **Demonstrates conceptual understanding of linear relationships** ($y = kx$; $y = mx + b$) **as a constant rate of change** by solving problems involving the relationship between slope and rate of change, by describing the meaning of slope in concrete situations, or informally determining the slope of a line from a table or graph; **and distinguishes between constant and varying rates** of change in concrete situations represented in tables or graphs; **or describes how change in the value of one variable relates to change in the value of a second variable** in problem situations with constant rates of change.

**6** This graph shows the relationship between the altitude of an airplane and the distance it travels while it is descending.




Which statement describes the slope of this line?

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C. The altitude decreases by 1 foot every 500 miles.

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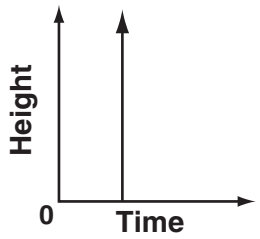


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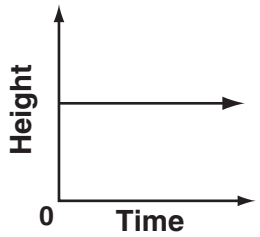


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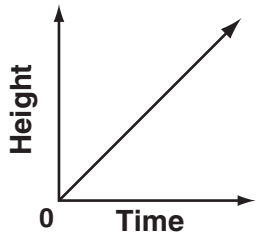
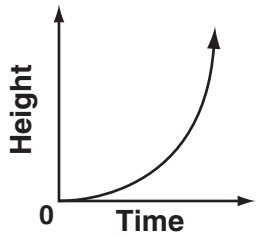
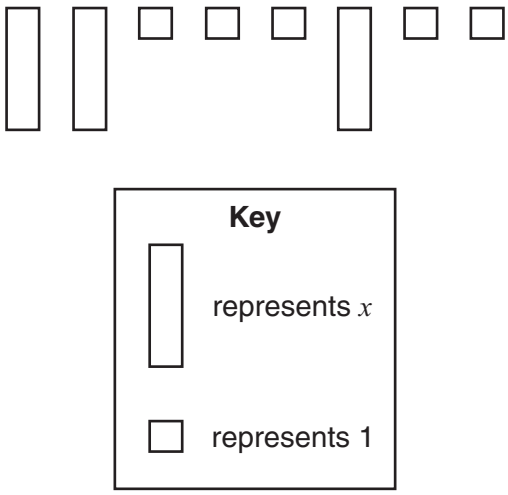



D.


**F&A 7.3** **Demonstrates conceptual understanding of algebraic expressions** by using letters to represent unknown quantities to write algebraic expressions (including those with whole number exponents or more than one variable); or by evaluating algebraic expressions (including those with whole number exponents or more than one variable); or by evaluating an expression within an equation (e.g., determine the value of $y$ when $x = 4$ given $y = 5x^3 - 2$).

**8** Look at this model.




Which expression is shown by the model?

A. $8x$

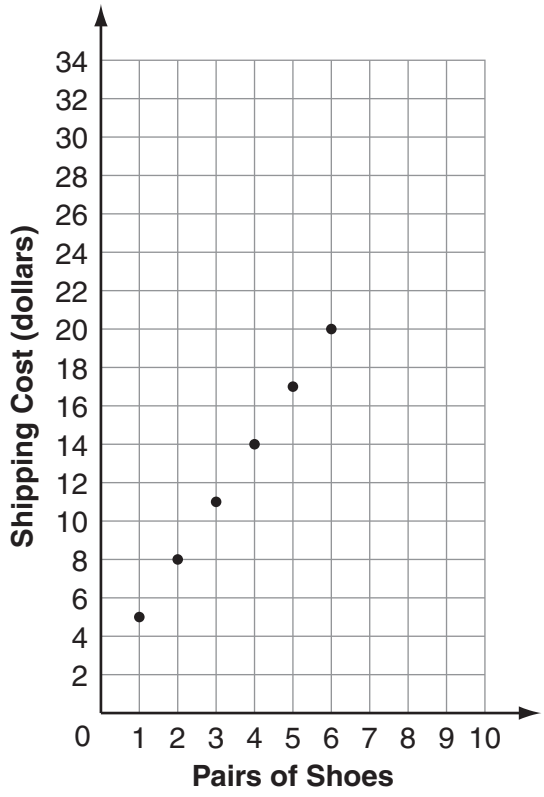
B. $x^3 + 5$

C. $3x^5 + x^5$

D. $3x + 5$

**DSP 7.1** **Interprets a given representation** (circle graphs, scatter plots that represent discrete linear relationships, or histograms) to analyze the data to formulate or justify conclusions, to make predictions, or to solve problems. (IMPORTANT: Analyzes data consistent with concepts and skills in M(DSP)-7-2.)

**9** This scatter plot shows the relationship between the shipping costs and the number of pairs of shoes ordered.




Based on this scatter plot, what is the shipping cost for 10 pairs of shoes?

A. $34
B. $32
C. $30
D. $28

**DSP 7.3** **Identifies or describes representations or elements of representations that best display a given set of data or situation**, consistent with the representations required in M(DSP)–7–1.

**10** The chart below shows the weights and lengths of some fish John caught.

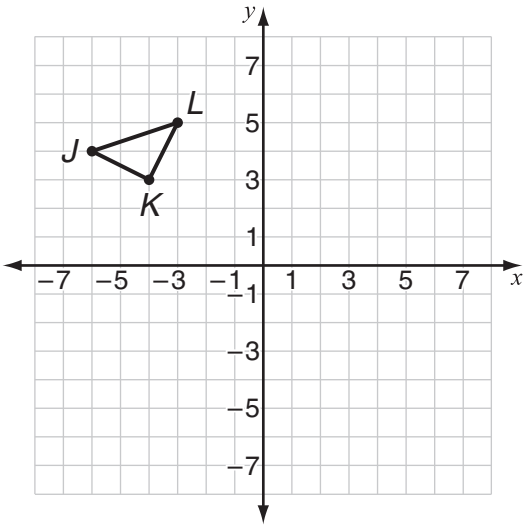
| Length (in inches) | Weight (in pounds) |
|---|---|
| 20 | 3.3 |
| 28 | 7.7 |
| 28 | 8.4 |
| 35 | 15.4 |
| 35 | 16.8 |
| 20 | 3.1 |
| 20 | 2.9 |
| 33 | 10.8 |
| 33 | 22.5 |
| 20 | 5.5 |

To show a relationship between the fishes' lengths and weights, which type of graph is **best** to display the data?

A. histogram
B. circle graph
C. line plot
D. scatter plot

**G&M 7.4** **Applies the concepts of congruency** by solving problems on a coordinate plane involving reflections, translations, or rotations.

**11** Look at $\Delta JKL$.




After a reflection over the $y$-axis, the image of $\Delta JKL$ is $\Delta J'K'L'$. What are the coordinates of point $K'$?

## Scoring Guide

| Score | Description |
|---|---|
| **1** | for correct answer, **(4, 3)** |
| **0** | Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured. |
| **Blank** | No response |

## Score Point 1
## (Example A)

11

(4, 3)

The student's response is correct.

## Score Point 1
## (Example B)

11

y = 3 x = 4

The student's response is correct.

## Score Point 0
## (Example A)

11

L = (5, 6) L = (4, 3)
K = (3, 5)

The student's response is incorrect.

## Score Point 0
## (Example B)

11

The cordinates of point K 3 up 4 over.

The student's response is incorrect.

| | |
|---|---|
| **DSP 7.2** | **Analyzes patterns, trends, or distributions in data in a variety of contexts by solving problems using** measures of central tendency (mean, median, or mode), dispersion (range or variation), or outliers to analyze situations to determine their effect on mean, median, or mode; and evaluates the sample from which the statistics were developed (bias). |

**12** Steve wants to know what type of music most teenagers prefer. He surveyed 50 teenagers who were attending a jazz concert. Explain why Steve's data may be biased.

## Scoring Guide

| Score | Description |
|---|---|
| **1** | for correct explanation (e.g., "The teenagers at a jazz concert would be likely to all like jazz music.") |
| **0** | Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured. |
| **Blank** | No response |

## Score Point 1
## (Example A)

12

His data may be wrong because if the 50 teenagers are at a jazz concert that means they probably perfer jazz.

The student's explanation is correct.

## Score Point 0
## (Example A)

12

Steve's data may be biased because he is surveyi in one spot.

The student's explanation is incorrect.

## Score Point 0
## (Example B)

12

steves data may be biased because he only survered 50 teenagers. If he survered 100 he could have gotten an exact answer.

The student's explanation is incorrect.

**N&O 7.1** **Demonstrates conceptual understanding of rational numbers with respect to percents** as a means of comparing the same or different parts of the whole when the wholes vary in magnitude (e.g., 8 girls in a classroom of 16 students compared to 8 girls in a classroom of 20 students, or 20% of 400 compared to 50% of 100); and percents as a way of expressing multiples of a number (e.g., 200% of 50) **using models, explanations, or other representations**.

**13** This chart shows the percent of students who are athletes at each of two schools.

| School | Percent of Students Who Are Athletes |
|---|---|
| Edgemont | 30% |
| Bayville | 50% |

There are 400 students at Edgemont School. Bayville School has fewer athletes than Edgemont School. What is one possibility for the total number of students who go to Bayville School? Show your work or explain how you know.

## Scoring Guide

| Score | Description |
|---|---|
| **2** | for correct answer, **any positive even integer less than 240**, with sufficient explanation or work shown to indicate correct strategy |
| **1** | for correct answer, with insufficient explanation or work shown<br>OR<br>for appropriate strategy with incorrect or no answer |
| **0** | Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured. |
| **Blank** | No response |

## Sample Response:

$0.3 \times 400 = 120$

$120 \times 2 = 240$

Any number less than 240. So, 200.

OR

There are 120 athletes at Edgemont. Since there are fewer athletes at Bayville, there can be 100 athletes and a total of 200 students.

## Score Point 2
## (Example A)

13

30% - 100 - 30
30% - 400 - 120

50% - 200 - 100

There could be 200 students at Bayville because 50% of 200 is 100, which is less than 120.

The student's answer is correct, with sufficient work shown to indicate correct strategy.

## Score Point 2
## (Example B)

13

$\frac{x}{400} = \frac{30}{100}$ $x=120$ Number of athletes at Edgemont school

So the highest number of athletes at Bayville could be 119.
$119 \cdot 2 = 238$ Since the number of athletes at Bayville is 50%, multiply 119 by 2. You get 238, so 238 is one possible amount of students at Bayville.

The student's answer is correct, with sufficient work shown to indicate correct strategy.

## Score Point 1
## (Example A)

13

A possible amount for the Bay Feild school to have for student is 238.

The student's answer is correct, with no explanation or work shown.

## Score Point 1
## (Example B)

13

Edgemont has 120 athletes,
Bayville has 239 kids or less.

219
x .10
21.90
x 5
109

400
x .10
40.00
x 5
120.00

239
x .10
23.90
x 5
119.50

The student's strategy is appropriate, but the student did not identify one possible answer.

## Score Point 0
## (Example A)

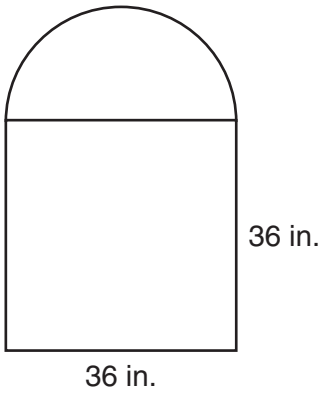
13

400 = E.M. School - 30% are athletes.
133 are athletes.
X = B.V. School - 50% are athletes
x=250 students or less because if half are athletes, there can't be too many students in the school.

The student's strategy is incorrect.

**G&M 7.6** **Demonstrates conceptual understanding of the area** of circles or the area or perimeter of composite figures (quadrilaterals, triangles, or parts of circles), **and the surface area of** rectangular prisms, **or volume of** rectangular prisms, triangular prisms, or cylinders using models, formulas, or by solving related problems. Expresses all measures using appropriate units.

**14** The shape of the window shown below is made up of a square and a semicircle.




What is the area of the window to the nearest square inch? Show your work or explain how you know.

## Scoring Guide

| Score | Description |
|---|---|
| **2** | for correct answer, **1805**, with sufficient explanation or work shown to indicate correct strategy |
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| **Blank** | No response |

**Note:** Answers may vary depending on student's rounding of $\pi$.

## Sample Response:

Area of square: $36 \times 36 = 1296$ sq. in.

Area of semicircle: $0.5 \times \pi \times 18^2 = 509$ sq. in.

So the total area is $1296 + 509 = 1805$ sq. in.

## Score Point 2
## (Example A)

**14**

36
·36
1296

area square = 1,296
area semi = $\frac{\pi r^2}{2}$

$\frac{3.14 \cdot 18^2}{2}$

$\frac{3.14 \cdot 324}{2} = 508.68$

area = 1805

1296
+ 508.68
1804.68

The student's answer is correct, with sufficient work shown to indicate correct strategy.

## Score Point 2
## (Example B)

**14**

$36 \cdot 36 = 1296$

$18^2 \cdot \pi = 1017.87602$

Answer: 1805 in.²

$1017.87602 \div 2 = 508.9380099$

1296
+ 508.9380099
1804.93801 in.²

The student's answer is correct, with sufficient work shown to indicate correct strategy.

## Score Point 1
## (Example A)

**14**

36
×36
1296

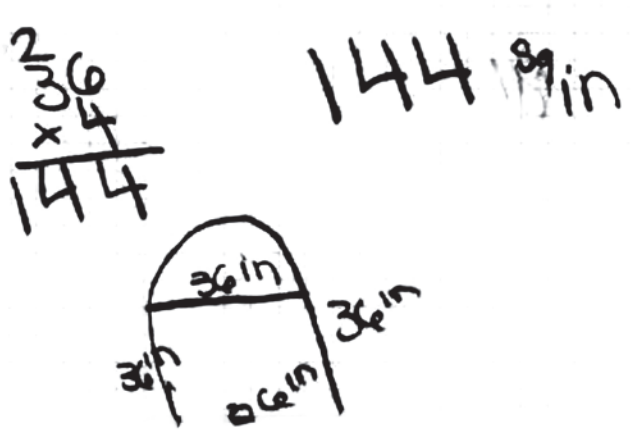
36
× 3.14
113.04

113.04
+1296.00
1409.04

The student correctly calculated the area of the square.

## Score Point 0
## (Example A)

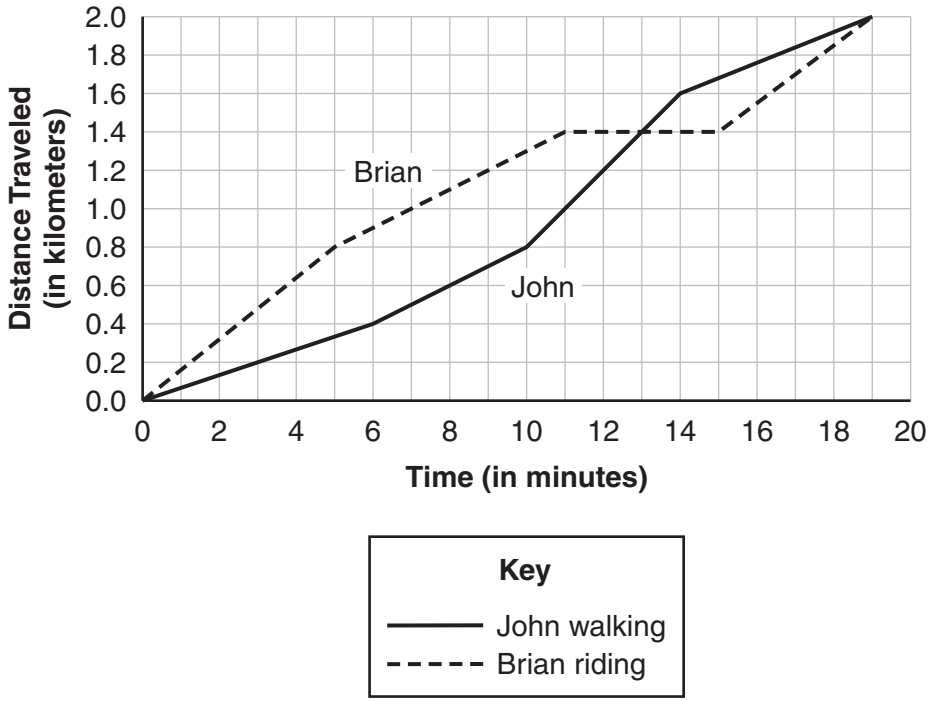
**14**




The student's response is incorrect.

**F&A 7.2** **Demonstrates conceptual understanding of linear relationships** ($y = kx$; $y = mx + b$) **as a constant rate of change** by solving problems involving the relationship between slope and rate of change, by describing the meaning of slope in concrete situations, or informally determining the slope of a line from a table or graph; **and distinguishes between constant and varying rates** of change in concrete situations represented in tables or graphs; **or describes how change in the value of one variable relates to change in the value of a second variable** in problem situations with constant rates of change.

**15** John and Brian each live 2 kilometers from their school. John walks to school and Brian rides his bicycle. These graphs show the distance each boy travels to school.




a. How many kilometers does John walk between minutes 3 and 8?

b. What is the speed that Brian is riding his bicycle between minutes 11 and 15?

c. Between which minutes do John and Brian travel at the same speed? Explain how you know.

## Scoring Guide

| Score | Description |
|---|---|
| **4** | 4 points |
| **3** | 3 points |
| **2** | 2 points |
| **1** | 1 point |
| **0** | Response is incorrect or contains some correct work that is irrelevant to the skill or concept being measured. |
| **Blank** | No response |

## Training Notes

Part a: 1 point for correct answer, **0.4** (km) **or equivalent**

Part b: 1 point for correct answer, **0** (km per min), **distance does not change, or equivalent**

Part c: 2 points for correct answer, between **6 and 10** minutes, with sufficient explanation given to indicate appropriate strategy

OR

1 point for correct answer with insufficient or no explanation given

or

for sufficient explanation with answer extending to 4 minutes

## Sample Responses:

Part c: The amounts are increasing at the same rate between 6 and 10 minutes.

Explanations could be:

This is when the graphs are parallel.

OR

Both graphs have the same steepness.

OR

The graphs do not change how far apart they are from each other.

## SCORE POINT 4
## (EXAMPLE A)

15

a. John walks 0.4 kilometers.

0.6 - 0.2 = 0.4

a) The student's answer is correct. (Showing work is not required.)

b. Brian is riding at a speed of 0 kilometers per minute.

b) The student's answer is correct.

c. Brian and John travel at the same speed between minutes 6 and 10.

I know this is proved true because both are going at a speed of 0.1 kilometers per minute. On the graph, their lines are parallel to each other, meaning the rate at which they're traveling is the same.

c) The student's answer is correct, with sufficient explanation.

## SCORE POINT 3
## (EXAMPLE A)

**15**

a) John walks 0.4 kilometers during that time.

b) 0 is his speed. He just stays there for 4 minutes not moving.

c) Between 6 and 10 they are traviling at the same speed.

a) The student's answer is correct.

b) The student's answer is correct.

c) The student's answer is correct, with no explanation.

## SCORE POINT 3
## (EXAMPLE B)

**15**

A. .2+.6=.8
.8 kilometers walked from 3-8 minutes.
B. He is riding 0 kilometers per hour between 11 and 15 minutes. The line goes strait.
C. Between 6 minutes and 10 minutes the boys go the same speed. I know this because their lines are parralel. This means they traveld the same distace in the same amount of time while the lines were parralel. If they went different speeds, the lines would be closer together or farther apart and may be meet. That is how I know they went the same speed.

a) The student's answer is incorrect.

b) The student's answer is correct.

c) The student's answer is correct, with sufficient explanation.

## Score Point 2
## (Example A)

**15**

a. 0.6 - 0.2 = 0.4 km.

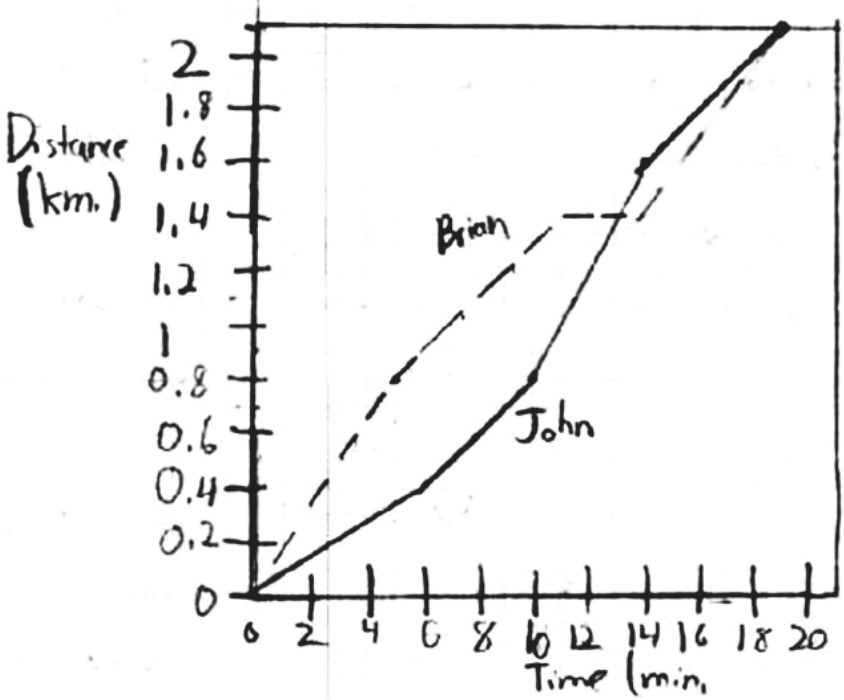
a) The student's answer is correct.

b. 1.4 km

b) The student's answer is incorrect.

c. Between minutes 6 to 10.

c) The student's answer is correct, with no explanation.



## Score Point 1
## (Example A)

15

A 3 min-0.2
8 min-0.6

a) The student's answer is incorrect.

B, speed is 0

b) The student's answer is correct.

C. between 13 and 18 because they are traveling at a constant speed.

c) The student's response is incorrect.

## Score Point 0
## (Example A)

15

a. 2.3 kilometers
b 1.4 miles per hour
c. at distance 13 because that is when they cross over each others path.

The student's response to each part is incorrect.

# Grade 8 Mathematics Released Item Information

| Released Item Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No Tools Allowed | ✓ | ✓ | | | | | | | ✓ | | ✓ | ✓ | | | |
| Content Strand[1] | NO | NO | GM | GM | FA | FA | FA | FA | DP | DP | GM | DP | NO | GM | FA |
| GLE Code | 7-2 | 7-2 | 7-2 | 7-5 | 7-1 | 7-2 | 7-2 | 7-3 | 7-1 | 7-3 | 7-4 | 7-2 | 7-1 | 7-6 | 7-2 |
| Depth of Knowledge Code | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 2 | 2 | 1 | 2 | 2 | 2 | 2 |
| Item Type[2] | MC | MC | MC | MC | MC | MC | MC | MC | MC | MC | SA | SA | SA | SA | CR |
| Answer Key | A | C | C | D | C | A | C | D | B | D | | | | | |
| Total Possible Points | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 4 |

[1]Content Strand: NO = Numbers & Operations, GM = Geometry & Measurement, FA = Functions & Algebra, DP = Data, Statistics, & Probability

[2]Item Type: MC = Multiple Choice, SA = Short Answer, CR = Constructed Response