

# Mathematics Assessment Changes for 2010 and Beyond



## Measurements of Student Progress (Grades 3-8)

## High School Proficiency Exam

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## Introduction

This document, *Changes for 2010 and Beyond*, includes changes in the mathematics assessment system, a summary of mathematics assessment updates, and sample items to familiarize teachers and students with the item types on the assessments. Most of this information pertains to the grades 3-8 mathematics assessments. Some information on changes to the high school assessment for 2010 is also included, while potential high school changes in 2011 and beyond have yet to be determined.

Superintendent Dorn has directed the assessment department to design questions that assess the standard algorithm in order to more explicitly address Senate Bill 6534 that states “the revised mathematics standards should restructure the standards to make clear the importance of all aspects of mathematics: Mathematics content including the standard algorithms, conceptual understanding of the content, and the application of mathematical processes within the content.” Revisions have been made to the Test and Item Specifications documents to reflect this change. Likewise, an example of the way these algorithms may be piloted in Spring 2010 is included. Beyond this there are examples of the format of the multiple-choice, completion, and short-answer items that are part of the new assessments. Given that there are no released items available for the Spring 2010 Measurements of Student Progress, this document is a valuable resource for teachers.

In 2008, the State Board of Education voted to approve the revised K-8 Mathematics Standards and 9-12 Mathematics Standards for adoption by the Office of Superintendent of Public Instruction (OSPI). Along with the new standards, the legislature provided direction for redesign of the assessment system.

## Washington State K-12 Mathematics Learning Standards

### Overview

The *Washington State K–12 Mathematics Learning Standards* outline the mathematics learning expectations for all students in Washington. These standards describe the mathematics content, procedures, applications, and processes that students are expected to learn. The topics and mathematical strands represented across grades K–12 constitute a mathematically complete program that includes the study of numbers, operations, geometry, measurement, algebra, data analysis, and important mathematical processes.

*The Washington State K-12 Mathematics Learning Standards* are organized by grade level for grades K-8 and by course for grades 9-12, with each grade/course consisting of three elements: *Core Content*, *Additional Key Content*, and *Core Processes*. Core Content areas describe the major mathematical focuses of each grade level or course. Additional Key Content contains important expectations that do not warrant the same amount of instructional time as the Core Content areas. Core Process include expectations that address reasoning, problem solving, and communication. At the beginning of each of these elements, is an introductory paragraph that conveys the essence of the content in a way that should help readers get a clear “sense” of that content.

View the new Washington State K-12 Mathematics Learning Standards at:

<http://www.k12.wa.us/Mathematics/Standards.aspx>

## Test and Item Specifications

The Test and Item Specifications provide guidelines to develop large-scale assessments to assess the level of mathematics proficiency that Washington students have achieved based on the Washington State K-12 Mathematics Learning Standards. The specifications assist in writing test items that match the performance expectations with their associated restrictions. Restrictions are necessary to construct a valid and reliable statewide on-demand assessment. These restrictions are not necessary in classroom based assessments.

### **Grades 3-8 Test and Item Specifications**

Available at: <http://www.k12.wa.us/Mathematics/TestItemSpec.aspx>

### **High School Spring 2010 Test and Item Specifications**

Available at: <http://www.k12.wa.us/Mathematics/TestItemSpec.aspx>

### **High School End-of-Course Spring 2011 Test and Item Specifications**

Coming Fall 2010

## Assessment Changes for Spring 2010

### Mathematics Measurements of Student Progress (Grades 3-8)

Alignment to Content Standards	2010 Math MSP aligned to new (2008) math content standards New cut scores and scales established by State Board in Summer 2010
Reduced Testing Time	Grades 3-5: Single testing session about 75 min. Total administration time about 2 hours Grades 6-8: Single testing session about 90 min. Total administration time about $2\frac{1}{2}$ hours
Fewer Constructed Response Items	No 4-point constructed response items Limit of 25% of points from 2-point items
New Item Types	Introduction of 1-point "Completion" items in <b>2010</b>
Later Test Window	5-week window for online Grades 6-8 Math MSP (May 3-June 4) 2-1/2 week window for paper/pencil Math MSP (May 12-28) 2010 score reports delayed due to standard setting
Online testing	Voluntary online testing in Grades 6-8 in 2010 Voluntary online testing in Grade 5 and 4 in 2011 and 2012, respectively

### Mathematics High School Proficiency Exam

Alignment to Content Standards	2010 Math HSPE aligned to old math content standards Scores and scales have same meaning as previous assessments End-of-Course tests begin in 2011; will be aligned to new content standards
Reduced Testing Time	Testing time of about 120 min. May be given in one or two sessions (single-day testing) Total administration time about 3 hours
Fewer Constructed Response Items	No 4-point constructed response items Limit of 25% of points from 2-point items
Test Window	Math HSPE given as paper/pencil test on April 13 No 9 <sup>th</sup> grade testing Student scores before June 10 (Seniors before earliest graduation)
Online Testing	No online testing with HSPE until <b>2011</b> Online test is "Comprehensive" make-up in April; End-of-Course is paper-and-pencil and given in intact classrooms

## Item and Point Totals: Spring 2010 and 2011

<b>Math 2010 and 2011*</b>							
<b>Item Type</b>	<b>Grade 3</b>	<b>Grade 4</b>	<b>Grade 5</b>	<b>Grade 6</b>	<b>Grade 7</b>	<b>Grade 8</b>	<b>HS*</b>
Multiple-Choice (1 point)	20	20	20	25	25	25	35
Completion Item (1 point)	6	6	6	5	5	5	0
Short-Answer (2 points)	4	4	4	5	5	5	5
Total Items (Questions)	30	30	30	35	35	35	40
Total Points	34	34	34	40	40	40	45
<b>*High school exams in 2011 are end-of-course assessments not shown in this table</b>							

## Item Types

	<b>Multiple-Choice</b>	<b>Completion</b>	<b>Short-Answer</b>
<b>Point Value</b>	<b>1</b>	<b>1</b>	<b>2</b>
<b>Distinguishing Feature(s)</b>	<ul style="list-style-type: none"> <li>In grades 3-5, each Multiple-Choice item has three answer choices, the correct answer and two distractors.</li> <li>In grades 6-8 and High School, each Multiple-Choice item has four answer choices, the correct answer and three distractors.</li> </ul>	<ul style="list-style-type: none"> <li>Each Completion item requires the student to enter a numerical answer.</li> </ul>	<ul style="list-style-type: none"> <li>Each Short-Answer item requires a constructed response.</li> <li>A Short-Answer item may ask the student to write a sentence or equation; complete a table, graph, or chart; draw a picture; construct a diagram; or perform a calculation.</li> <li>An Enhanced Multiple-Choice item will ask the student to select from a list of three or four answer choices and then show work to support or explain the reason(s) for choosing that answer.</li> </ul>

## Rollout Schedule for Online Testing

MATHEMATICS	Measurements of Student Progress						High School Proficiency Exams
	Gr 3	Gr 4	Gr 5	Gr 6	Gr7	Gr 8	
2010	P/P	P/P	P/P (*)	Online	Online	Online	P/P (*)
2011	P/P (*)	P/P (*)	Online	Online	Online	Online	P/P E-O-C
2012	P/P (*)	Online	Online	Online	Online	Online	Online Retest
							P/P E-O-C
							Online Retest

### Key

P/P	= Paper/Pencil
(*)	= Research Online
	= 25% Online
	= 80% Online
	= 100% Online

## Mathematics Formula Sheet for Grades 6-8

Figure	Formula	Variables
Circle	$A = \pi r^2$	A: Area r: radius
	$C = \pi d$ or $C = 2\pi r$	C: Circumference d: diameter r: radius
Cylinder	$SA = 2\pi r^2 + 2\pi rh$	SA: Surface Area r: radius h: height
	$V = \pi r^2 h$	V: Volume r: radius h: height
Cone	$V = \frac{1}{3}Bh$ or $V = \frac{1}{3}\pi r^2 h$	V: Volume r: radius h: height B: area of base
Rectangular Prism	$SA = 2lw + 2lh + 2wh$ or $SA = 2(lw + lh + wh)$	SA: Surface Area l: length w: width h: height
	$V = lwh$	V: Volume l: length w: width h: height
Pyramid	$V = \frac{1}{3}Bh$	V: Volume B: area of base h: height

## Sample Items for Assessing the Standard Algorithms in Grades 3-5

The following performance expectations in the new mathematics standards address the use of “the standard algorithm”:

- 3.1.C** Fluently and accurately add and subtract whole numbers using the standard regrouping algorithms.
- 4.1.F** Fluently and accurately multiply up to a three-digit number by one- and two-digit numbers using the standard multiplication algorithm.
- 5.1.C** Fluently and accurately divide up to a four-digit number by one- or two-digit divisors using the standard long-division algorithm.

OSPI will be piloting items on the 2010 assessment that assess these performance expectations in a variety of ways. Some new ways these performance expectations will be assessed are included in the following examples.

### Sample item for performance expectation 3.1.C

Look at the subtraction problem.

$$\begin{array}{r} 4735 \\ - 2684 \\ \hline \end{array}$$

Which is a correct way to solve the problem?

O A. 
$$\begin{array}{r} \overset{3}{4} \overset{6}{7} \overset{12}{3} \overset{15}{5} \\ - 2684 \\ \hline 1049 \end{array}$$

O B. 
$$\begin{array}{r} \overset{6}{4} \overset{12}{7} \overset{15}{3} \overset{15}{5} \\ - 2684 \\ \hline 2041 \end{array}$$

O C. 
$$\begin{array}{r} \overset{6}{4} \overset{13}{7} \overset{15}{3} \overset{15}{5} \\ - 2684 \\ \hline 2051 \end{array}$$

Sample item for performance expectation 4.1.F

There is one number missing in the work shown for this multiplication problem.

$$\begin{array}{r} 275 \\ \times 93 \\ \hline 825 \\ +24\boxed{\phantom{0}}50 \\ \hline ***** \end{array}$$

Find the missing number that belongs in the box.

Write your answer on the line.

**What is the missing number that belongs in the box? \_\_\_\_\_**

Sample item for performance expectation 5.1.F

There is one number missing in the work shown for this division problem.

$$\begin{array}{r} 5\boxed{1} \text{ R1} \\ 8 \overline{)4329} \\ \underline{-40} \phantom{00} \\ 32 \phantom{00} \\ \underline{-32} \phantom{00} \\ 09 \phantom{00} \\ \underline{-8} \phantom{00} \\ 1 \end{array}$$

Determine the missing number that belongs in the box.

Write your answer on the line.

**What is the missing number that belongs in the box? \_\_\_\_\_**

Please note that other items assessing these performance expectations will ask students to determine the correct answer. For an example see page 15 in this document.

## Sample Items for Grades 3-8 & High School

These sample items provide teachers and students an opportunity to become familiar with the format of the three item types on the mathematics assessments. All items are aligned to the new performance expectations.

The multiple-choice and short-answer items are released items that align to the new standards. The items that align to Performance Expectations can be used to inform classroom instruction and assessment of the new standards. The Released Item Documents (RIDs) include common student errors and misconceptions that can help teachers plan and evaluate instruction.

The sample completion items have not been previously piloted. These samples highlight important features of the new item type and illustrate differences between completion, multiple-choice, and short-answer items.

### Grade 3

#### Multiple-Choice Item

##### Sample item for performance expectation 3.1.A

Amber, Lilly, Kayla, and Nikia each have a bag of buttons. They counted the buttons. Amber has 35 buttons. Lilly has 126 buttons. Kayla has 44 buttons. Nikia has 89 buttons.

What is the order of the numbers from least to greatest?

- O A. 126, 89, 44, 35
- O B. 44, 35, 126, 89
- O C. 35, 44, 89, 126

**Completion Items**

Sample item for performance expectation 3.1.B

There are 8,499 people who live in the city of Laketown.

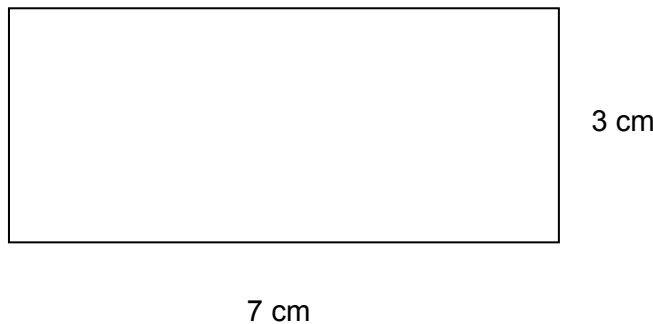
Round 8,499 to the nearest thousand.

Write your answer on the line.

<p><b>What is 8,499 rounded to the nearest thousand?_____</b></p>
---

Sample item for performance expectation 3.4.D

Look at the rectangle.



Find the perimeter of the rectangle.

Write your answer on the line.

<p><b>What is the perimeter of the rectangle?_____ cm</b></p>
---

*Please note that labels will be provided for completion items. Students will be scored on the numeric answer.*

**Short-Answer Item**

Sample item for performance expectation 3.1.E

Janet and her family are planning a boat ride.

The table shows boat-ride prices.

**Boat-Ride Prices**

<b>Time on Boat</b>	<b>Adult</b>	<b>Child</b>
One-hour ride	\$ 9	\$ 3
Two-hour ride	\$18	\$ 6
Four-hour ride	\$36	\$12

What is the total price for a two-hour boat ride for two adults and one child?

Show your work using words, numbers, or pictures.

<p><b>What is the total price for a two-hour boat ride for two adults and one child? \$ _____</b></p>

## Grade 4

### Multiple-Choice Item

Sample item for performance expectation 4.4.E

A town had very cold temperatures during a week in January 2004.

#### Temperatures for a Town in January 2004

Date	Temperature (in Fahrenheit)
January 4	11 degrees
January 5	2 degrees
January 6	6 degrees
January 7	1 degree
January 8	3 degrees
January 9	8 degrees
January 10	2 degrees

What was the median of the temperatures during that week?

- A. 1 degree
- B. 2 degrees
- C. 3 degrees

## Completion Items

Sample item for performance expectation 4.1.F

Find the product.

$$\begin{array}{r} 483 \\ \times 27 \\ \hline \end{array}$$

Write your answer on the line.

**What is the product?** \_\_\_\_\_

Sample item for performance expectation 4.2.F

Write a fraction with a denominator of 18 that is equivalent to  $\frac{5}{6}$ .

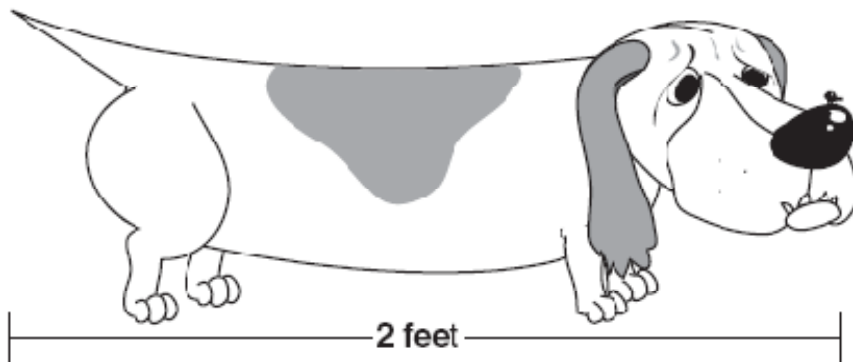
Write your answer on the line.

**What is a fraction with a denominator of 18 that  
is equivalent to  $\frac{5}{6}$ ?** \_\_\_\_\_

**Short-Answer Item**

Sample item for performance expectation 4.4.B

A flea jumps about 3 inches with each hop. The dog is 2 feet long. About how many hops will it take the flea to jump from the tip of the dog's nose to the tip of the tail?



Show your work using words, numbers, or pictures.

<p><b>About how many hops will it take the flea to jump from the tip of the dog's nose to the tip of the tail? _____</b></p>

## Grade 5

### Multiple-Choice Items

Sample item for performance expectation 5.4.C

Hannah is 1.65 meters tall. Nathan is 1.57 meters tall.

Which expression can be used to find the difference in their heights?

O A.  $1.65 \times 1.57$

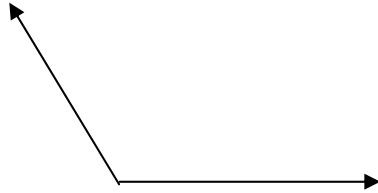
O B.  $1.65 + 1.57$

O C.  $1.65 - 1.57$

### Completion Items

#### Sample item for performance expectation 5.3.B

Look at the angle.



Use a protractor to measure the angle.

Write your answer on the line.

**What is the measure of the angle? \_\_\_\_\_ ° (degrees)**

#### Sample item for performance expectation 5.5.B

Students at Sunny Side School recorded the height, in centimeters, of six students on a math team.

Student A	Student B	Student C	Student D	Student E	Student F
152	170	168	175	151	168

Find the mean height of the students on the math team.

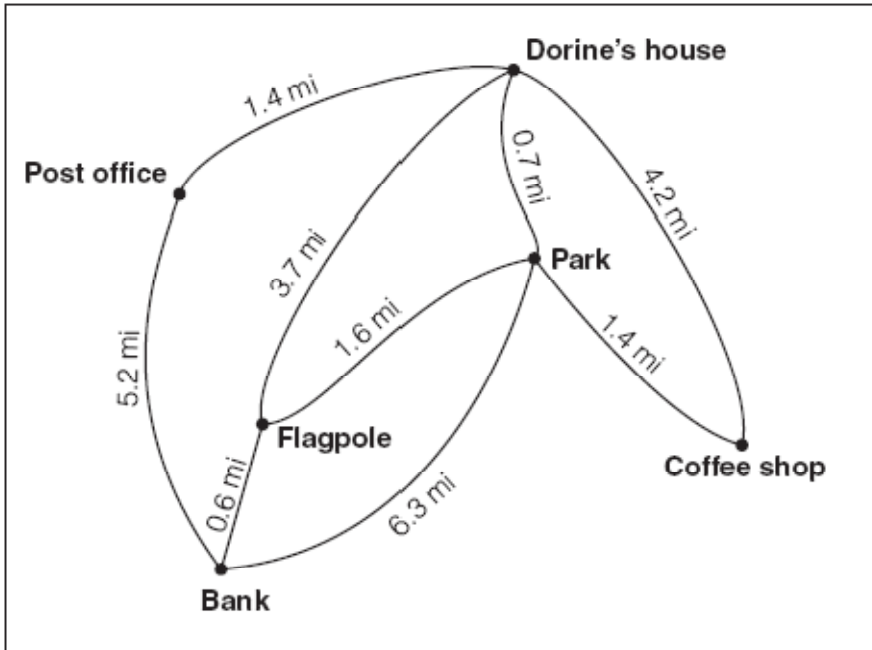
Write your answer on the line.

**What is the mean height of the students on the math team? \_\_\_\_\_**

**Short-Answer Item**

Sample item for performance expectation 5.6.E

Dorine is training for a race. She wants to run between 10 and 12 miles each day. She uses this map to find possible routes. Each route must start and end at Dorine's house.



Describe a route with a distance between 10 and 12 miles.

Show that the total distance of the route is between 10 and 12 miles.


## Grade 6

### Multiple-Choice Item

#### Sample item for performance expectation 6.3.D

Driving to a family reunion, the Schmitts traveled 810 miles in 15 hours. Returning home, they traveled at a mean speed of 6 miles per hour faster than the mean speed they had traveled to the reunion.

How long did it take the Schmitts to drive home?

- O A. 9.0 hours
- O B. 13.5 hours
- O C. 15.0 hours
- O D. 16.9 hours

## Completion Items

### Sample item for performance expectation 6.1.D

Determine the product.

$$\frac{1}{2} \times \frac{2}{3}$$

Write your answer on the line.

<b>What is the product?</b> _____
-----------------------------------

### Sample item for performance expectation 6.4.E

Sally wanted to cover her stamp box. The box was 3.5 inches long, 6 inches wide, and 2.5 inches high.

Determine the surface area, in square inches, of the stamp box.

Write your answer on the line.

<b>What is the surface area, in square inches, of the stamp box?</b> _____
--

**Short-Answer Item**

Sample item for performance expectation 6.1.H

Maria is making 6 badges. Each badge uses  $4\frac{1}{2}$  inches of ribbon. She wants to buy the exact amount of ribbon needed to make the badges.

How much ribbon should she buy?

O A.  $\frac{1}{2}$  yard

O B.  $\frac{2}{3}$  yard

O C.  $\frac{3}{4}$  yard

O D.  $\frac{5}{6}$  yard

Show your work using words, numbers, and/or pictures.


## Grade 7

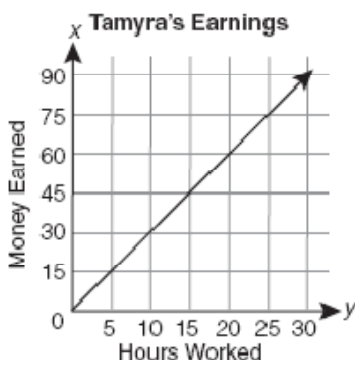
### Multiple-Choice Item

#### Sample item for performance expectation 7.2.D

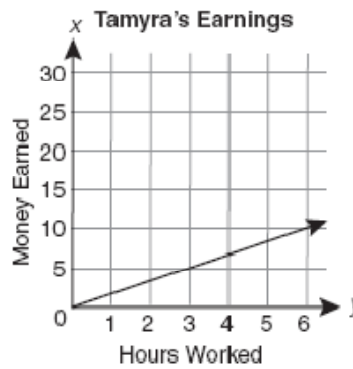
Tamyra is babysitting to earn money to visit her aunt. She earns \$3.00 for each hour of babysitting.

Which graph represents Tamyra's earnings from babysitting?

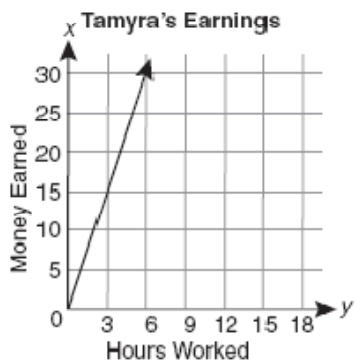
A.



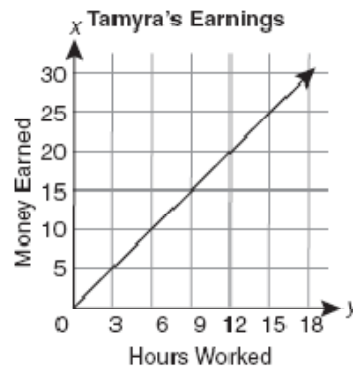
C.



B.



D.



## Completion Items

### Sample item for performance expectation 7.1.E

Solve the equation for  $x$ .

$$36 = 4x - 10$$

Write your answer on the line.

<b>What is the value of <math>x</math>? _____</b>
---

### Sample item for performance expectation 7.4.B

Anton has a 10-sided regular polyhedron with a different number on each face, starting with 0 and ending with 9.

Use theoretical probability to predict the number of times a prime number would be rolled when Anton rolls the polyhedron 80 times.

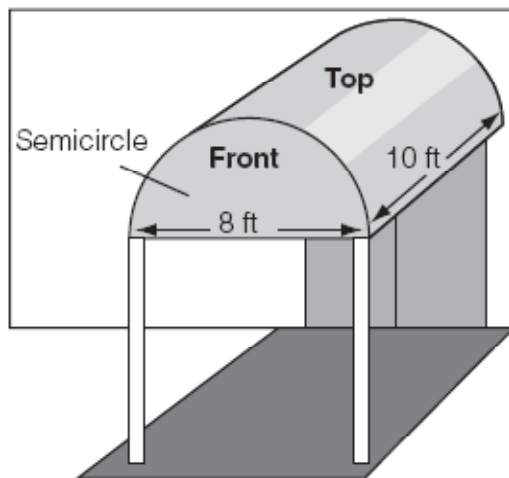
Write your answer on the line.

<b>How many times would a prime number be rolled when Anton rolls the polyhedron 80 times? _____</b>
--

**Short-Answer Item**

Sample item for performance expectation 7.3.D

Bella Restaurant is building a curved awning for the entrance to their restaurant. They need material for only the top and the front of the awning.



**Area of a circle =  $\pi r^2$**   
**Circumference of a circle =  $\pi d$**

Find the surface area of the awning to determine the total amount of canvas necessary to make the awning.

Show your work using words, numbers and/or pictures.

Be sure to label your answer.

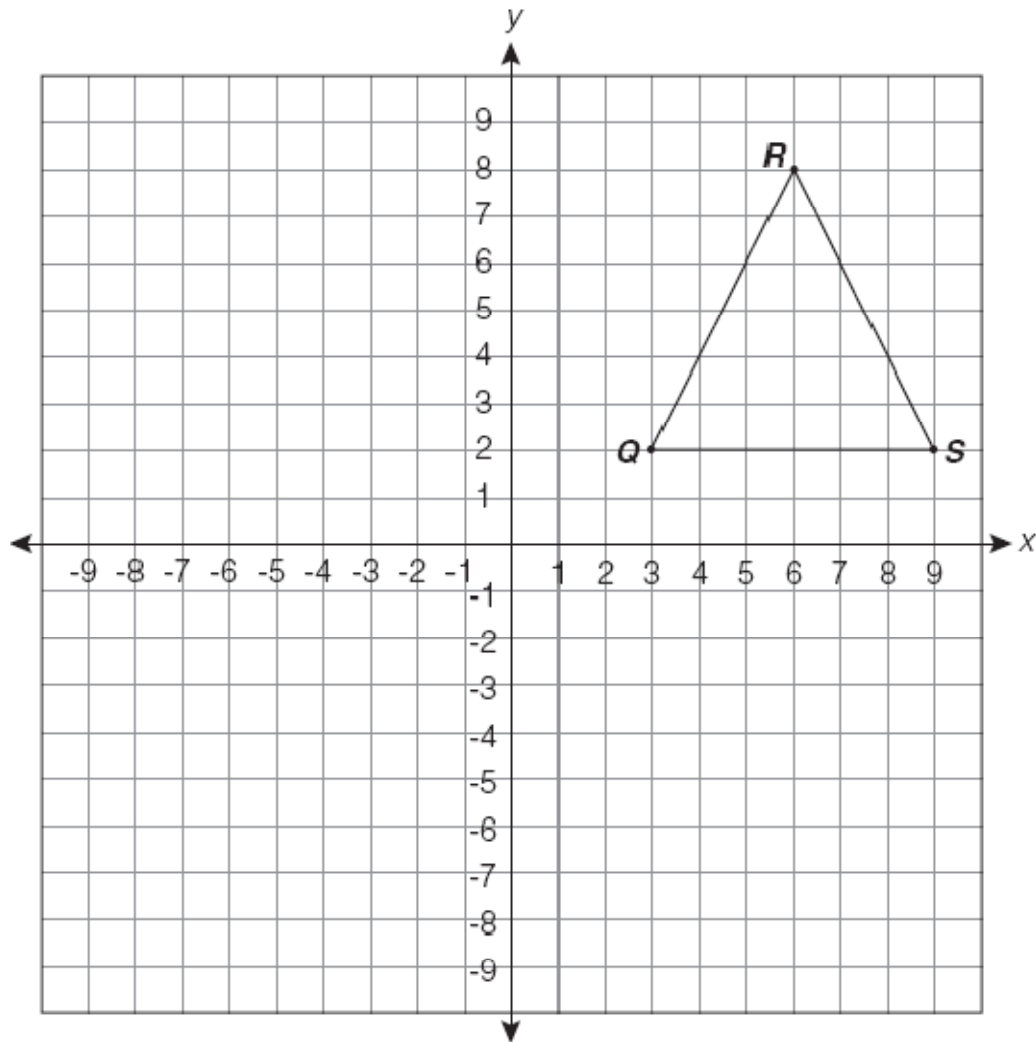
<b>How much canvas is necessary to make the awning? _____</b>

## Grade 8

### Multiple-Choice Item

Sample item for performance expectation 8.2.D

Look at the triangle in the graph.



First reflect the isosceles triangle across the x-axis. Then translate it 12 units to the left.

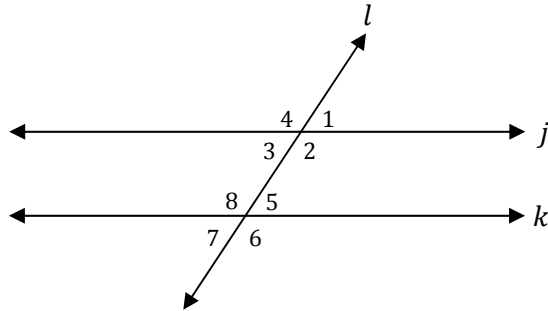
Which ordered pair represents the new coordinate for vertex S?

- A.  $(-3, -2)$
- B.  $(9, -2)$
- C.  $(-9, -2)$
- D.  $(-3, 2)$

**Completion Items**

Sample item for performance expectation 8.2.B

Line  $j$  and line  $k$  are parallel. Line  $l$  is a transversal. The measure of angle 4 is  $125^\circ$ .



Determine the measure of the angle 7.

Write your answer on the line.

<b>What is the measure of angle 7? _____ ° (degrees)</b>
--

Sample item for performance expectation 8.1.D

The equation shown represents a linear function.

$$x - 4y = 8$$

Determine the slope of the line that represents the function.

Write your answer on the line.

<b>What is the slope of the line that represents the function? _____</b>
--

**Short-Answer Item**

Sample item for performance expectation 8.1.F

The Acme Recycling Company has three salary options for its part-time summer employees. The total money earned is related to the amount of cans recycled and an optional hourly wage.

- Option 1: 25¢ a can plus \$1.00 an hour**
- Option 2: 5¢ a can plus \$5.00 an hour**
- Option 3: 40¢ a can and no hourly wage**

Jamal wrote an equation for each salary option to see what he could make per hour.

- Option 1:  $y = 0.25x + 1.00$**
- Option 2:  $y = 0.05x + 5.00$**
- Option 3:  $y = 0.40x$**

Jamal estimates that he can recycle a minimum of 20 cans per hour.

Based on these equations and Jamal’s estimate, which option will allow Jamal to make the most money?

Show your work to support your answer using words, numbers, and/or diagrams.

<b>Which option allows Jamal to make the most money? _____</b>

The Algebra 1/Mathematics 1 and Geometry/Mathematics 2 end-of-course assessments will include Multiple-Choice, Completion, and Short-Answer Items. Completion items aligned to the new performance expectations have been included to provide teachers and students an opportunity to become familiar with the format of the new item type. Educators are encouraged to examine the Released Item Documents (RIDs) for Multiple-Choice and Short-Answer items that may align with the new performance expectations.

## Algebra 1/Mathematics 1

### Completion Items

#### Sample item for performance expectation A1.1.B/M1.1.B

Dorian is saving money to buy a bicycle. Currently he has saved  $\frac{2}{3}$  of the money he needs to buy the bicycle. He earns \$14.50 more mowing lawns and now has  $\frac{4}{5}$  of the money he needs to buy the bicycle.

Determine the cost of the bicycle.

Write your answer on the line.

What is the cost of the bicycle? \$ \_\_\_\_\_

#### Sample item for performance expectation A1.2.C/M1.7.C

The expression  $\left(\frac{(x^3)^{-2}}{x^2 \cdot x^3}\right)^3$  simplifies to the form  $x^m$ , for all nonzero values of  $x$ .

Determine the value of  $m$ .

Write your answer on the line.

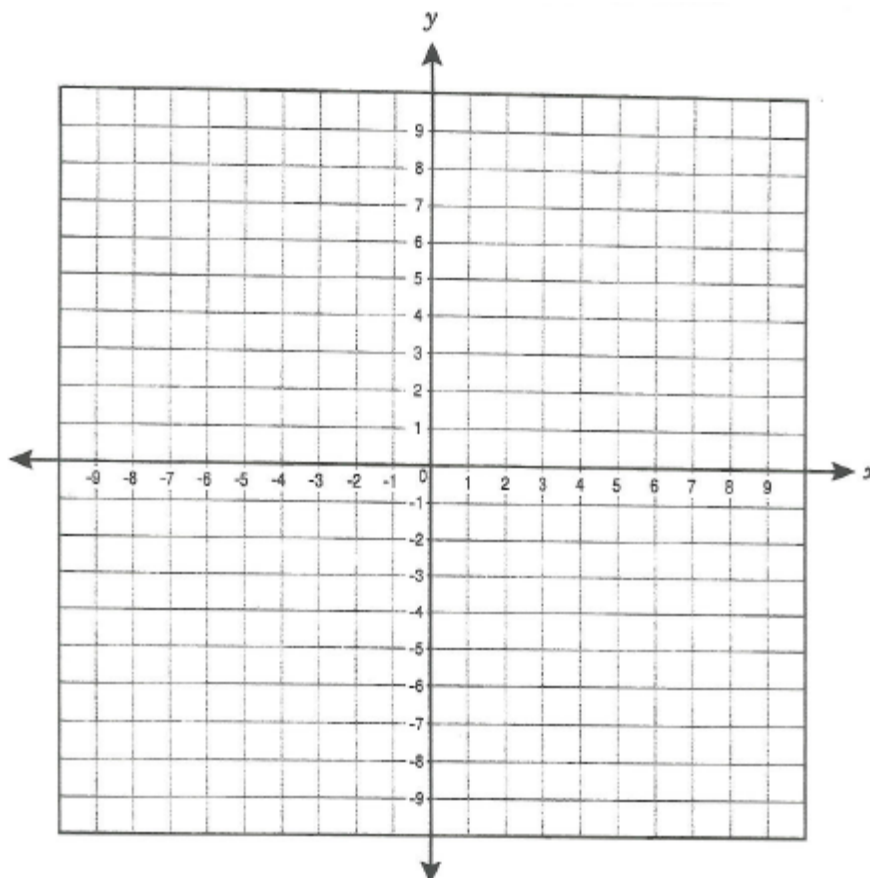
What is the value of  $m$ ? \_\_\_\_\_

## Geometry/Mathematics 2

### Completion Items

#### Sample item for performance expectation G.4.B/M2.3.L

Three vertices of a square have coordinates  $(3, 1)$ ,  $(4, -4)$  and  $(-1, -5)$ . The diagonals of the square intersect at point  $Q$ .



Determine the coordinates of point  $Q$ .

You may use the blank grid to help determine the solution.

Write your answer on the line.

**What are the coordinates of point  $Q$ ? ( \_\_\_\_\_ , \_\_\_\_\_ )**

Sample item for performance expectation G.6.F/M2.5.C

Martina has a calculator box that has a volume of 29 cubic inches.

**1 inch = 2.54 centimeters**

Determine the volume of the calculator box to the nearest cubic centimeter.

Write your answer on the line.

**What is the volume of the calculator box to the  
nearest cubic centimeter? \_\_\_\_\_**

## Resources/Contact Information

### Mathematics Assessment Webpage:

<http://www.k12.wa.us/mathematics/>

### Contact Information

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