Port Angeles School District

Mathematics Curriculum Committee 2008-09 Report

District-Wide Math Program Recommendations for 2009-10

July 13, 2009

EXECUTIVE SUMMARY

The Port Angeles School District Math Curriculum Committee was convened again in the winter of 2008. This group met throughout the 2008-09 school year. The committee understands that the intended, enacted and assessed curriculum must be aligned, and this report describes how it is working toward that end for the K-12 system.

The context for the work this group must accomplish is rapidly changing. The state and national expectations for math instruction and its requisite student achievement levels continue to increase. World-wide, United States students consistently under perform in comparison to their counterparts in many other countries. This is particular true in the higher grades. Indeed, this past year the state legislature has modified the math graduation requirements. These modifications inform high school math courses and professional development adjustments in math instruction.

The committee focused extensively on the high school curricular and assessment adjustments. With the advent of new state math standards and end of course assessments, the need to focus closely at this level is urgent. Given that these courses and the requisite success in them also are linked to the attainment of a high school diploma, support for these initiatives deserves significant attention. With the cancellation of the Collection of Evidence options, the end of course exams take on a high stakes persona for students and staff.

The district has sustained strong performance in reading and writing over the last several years. Math continues to be a challenging content area at every grade level in the district. A concomitant challenge is not to lose students' gains in core literacy areas while enhancing the focus on mathematics. As the district has shifted professional development and instructional resources, the result must maintain success within literacy instruction. This will empower teachers to build on their successes.

At the elementary level, the committee recommends the continued support of the *Bridges* curriculum materials published by the Math Learning Center in Salem, Oregon. The committee reviewed the alignment of the *Bridges* materials to the newly revised state grade level expectations. The alignment appears superior to the alignment of other curriculum materials. The resource support and professional development are superior to other possible curriculum choices. Developed with initial support from the National Science Foundation, *Bridges* offers a unique blend of problem solving and skill building in a clearly articulated program that moves through each grade level with common models, teaching strategies, and objectives. Even with the new math standards at the state level, the correlation of the curriculum materials is excellent. The Math Learning Center continues to dynamically adjust the materials to the new standards.

At the middle level, the McDougal Littell curriculum materials are also recommended with continued support. The committee reviewed the alignment of the McDougal Littell curriculum materials to the current state grade level expectations. Parent and technology support materials are

excellent. The McDougal Littell materials transition nicely from the *Bridges* materials at grades K-5 to the newly adopted Holt texts at the high school. There is a blend of application and computation in the approach and an appropriate emphasis on algorithms. Curriculum adoption specialists were able to schedule math professional development related to the assessment features of the instructional materials.

At the high school level, restructuring was undertaken once again to align with newly revised state expectations. At the state level, segmented mathematics has been eliminated. We will offer a statistics course in its place (see Appendix A). The end of course exams will replace the current WASL. The math committee wrote new benchmark tests to reflect end of the year exams (see Appendix B and C). We will offer algebra and geometry with units of the SIMMS integrated text supplementing within each course to prepare students for the new state exams. In January of 2009 courses were restructured at the high school to ability group freshmen and sophomores in math and *Algebra Basics* was a supplemental curriculum material support added to the core math curriculum to help struggling students. These students are now better positioned to be successful in the upcoming fall courses.

An unfortunate outcome of the recent legislative session is the elimination of the Collection of Evidence option for attaining a pass on the math WASL. As students in the high school here made great gains with this option, the focus must now shift to success in the discrete course taken. The committee recommended to the Instructional Materials Committee the selection of Holt as the publisher for the new high school texts. These are also the texts most highly recommended by the state in its recent recommendations for course matches in Algebra and Geometry.

As seniors at the high school level must yet continue to take and pass math courses, the course proposed to fit this bill for seniors will be Statistics. The committee reviewed this rationale and reviewed texts for use in this course. A text was selected and forwarded to the Instructional Materials Committee for the regular course. The text for the AP Statistics course will be selected and piloted following the summer AP conference.

It is of some assistance to consider the district math curriculum approach as ***balanced numeracy***. In other words, there is a balance between knowledge and understanding; computation and algorithms; and conceptual application of the computation and algorithms. Math fluency is still recognized as being critical to math success, as is math comprehension. The Math Curriculum Committee continues to clarify this balance and the many ways in which blending these components is believed to be the most powerful choice for students' success in math.

Appendices to this report are:

Appendix A, Curriculum Map for Grades 9-12
Appendix B, Algebra 1 Benchmark Test Proposal for 2009-2010
Appendix C, Geometry Benchmark Test Proposal for 2009-2010
Appendix D, New and Revised K-12 Standards Available
Appendix E, TIMSS Executive Summary

MATH COMMITTEE MEMERSHIP

The staff members listed below comprise the Math Curriculum Committee membership for the 2008-09 school year. These members represent every school in the district, including the kindergarten program and the special education department. Classroom teachers, support teachers, and administrators began this work last spring and continued collaborating regularly to produce this report.

1. Jody Adams
2. Donna Buck
3. Michelle Devlin
4. Loren Engel
5. Teresa Haller
6. Hester Hill
7. Carol Jackson
8. Anna Lee
9. Lisa Lisk
10. Nancy McCaleb
11. Theresa Schmid
12. Taylor Scott
13. Carol Sinton
14. Freda Tallmadge
15. Gunnar Thomason
16. Michelle Reid

BACKGROUND

As our nation and state have experienced higher accountability for student achievement outcomes, districts everywhere have been challenged to have clearer and more focused curriculum. The elementary math curriculum must mesh with the middle school curriculum and subsequently the high school curriculum. As districts struggle to develop and implement internal curricular targets that match external and internal accountability structures, there are pressure points which come to bear on the system. Limited time, fiscal resources, technology, information-sharing structures, availability of quality assessments, shared assessment understanding and expertise, and clear curricular targets all combine to impose significant pressure on systems already under stress.

The current math graduation requirements for the classes of 2010 through 2014 include the continuation of math coursework into the junior and senior years until demonstrated progress on the math WASL meets standard. This necessitates the need for junior and senior math courses aligned to the state grade level expectations. With high expectations must come high support.

Several high school math department members attended the AP Calculus course during the previous year. Pilot texts during the current year at the high school level included textbooks for AP Calculus, Honors Math Analysis (Pre-Calculus) and Honors Geometry. Next year, statistics courses will be added to meet the needs for junior and senior students. All of these proposals clearly underscore a need for more and varied math sections in the high school master schedule. The new state math end of course requirements will also have significant impact on the course offerings at the high school level.

PARAMETERS

The Math Curriculum Committee understands it is working within a time in which fiscal considerations constrain the district's capacity to purchase new materials. The committee is sensitive to these constraints. Given these constraints, and the current structure of the K-12 math curricu-

lum, the committee was charged with identifying an aligned curriculum and professional development support for the use of these materials. The following committee responsibilities include:

- Review the math curriculum currently in place.
- Review and recommend curriculum adjustments where grade levels conflict or are silent.
- Review best practice research with regard to math instruction.
- Review math materials and research alignment of these materials.
- Recommend new materials where necessary to meet the alignment needs of our students and teachers in the area of mathematics.
- Make recommendations for appropriate professional development that would support the effective implementation of these curriculum materials.
- Define our district beliefs about math instruction.
- Complete the district-wide instructional calendar for mathematics; examine how we block instructional time for math instruction.
- Establish expectations for systemic remediation programs in mathematics.
- Recognize time is of the essence, needing both a mid-year and end of year report next year.
- Determine most effective ways to garner teacher buy-in for new strategies and training.
- Determine strategies to manage all the manipulatives and materials with more investigative math instruction.
- Determine better time use after the WASL test in the spring.

The committee was charged to work on these responsibilities and make its recommendations during 2008-09. The committee will continue its work as new recommendations are implemented over the next several years in order to gain a high level of support for the new expectations outlined later in this report and other updates in the new academic year.

Finally, three major tenets frame our work at the district level. These are: 1) we live and work in a standards-based environment; 2) there must be equity across the system for students and staff; and 3) coherence is necessary throughout a student's experience in the Port Angeles School District.

PROCESS

The committee was convened again in the winter of the 2008-09 academic year. Our first order of business was to understand the current issues and concerns of school staffs with regard to the math curriculum and the new state math standards. Until two years ago, the math curriculum lacked a coherent focus, adequate resources and effective levels of professional development. The factors leading to the concerns were examined and addressed. Barriers to the program desired were identified and addressed. The committee generated a number of topics requiring resolution to successfully meet the district's math instructional challenges. These are consistently and relentlessly being worked on.

The Math Curriculum Committee met monthly during the 2008-09 academic year. As the new math curriculum materials are implemented, the committee continues to provide oversight to the implementation and professional development necessary for teachers to effectively incorporate

the new materials into their classroom practice. Curriculum adoption specialists continue to be instrumental in the professional development for the new math curriculum materials.

The Math Curriculum Committee continues to engage in a review of research and literature regarding math curriculum and instructional strategies. Further, this year, the committee spent a significant amount of time reviewing and integrating the new state standards into the enacted curriculum. A substantial next body of work for the committee is the remediation support and strategies for mathematics in the classroom and across the school and district. The current approach to this topic is fragmented at best and not as effective as it must be.

MATH COMMITTEE RECOMMENDATIONS

Elementary Level

Bridges is an element of a coherent K-12 program. It aligns not only with state standards, but also prepares students for what they will experience in middle and high school. *Bridges* has a good balance of concepts and understanding. It also contains a very strong computation strand and reinforces algorithms when developmentally appropriate.

The number corner component of the curriculum is demonstrating strong mathematical thinking at all grade levels. It is also the paramount core curriculum component for inclusion for students with a pull out math support plan in place. The Response to Intervention program at the elementary level will be studied in the content area of math in the upcoming year.

Math remained a significant focus of grade level team meeting time. The curriculum adoption specialists also provided strong support in the content area of math. Supplemental and replacement units were provided by the Math Learning Center and were integrated into the instructional calendar. Assessments have been collaboratively written to align with report card reporting timelines.

Middle School Level

At the middle level, the committee reviewed the McDougal Littell text and materials and their alignment to the newly revised state math standards. The materials continue to be a nice match for the current standards. When these materials were selected, they were matched to the NCTM math standards which are more represented in the new state math standards.

The publisher provided supplemental professional development and new assessment technology support during the past year. This has resulted in more flexible use of the core curriculum and enhanced differentiation of the core math curriculum.

Mid-year assessments, benchmark assessments, will continue to be refined in the upcoming year. At this time, no changes to these are being proposed.

Placement math assessments were developed for the incoming seventh graders to ensure students are accurately placed in the math class they need to be in when the academic year begins. These were administered to sixth grade students in the spring.

High School Level

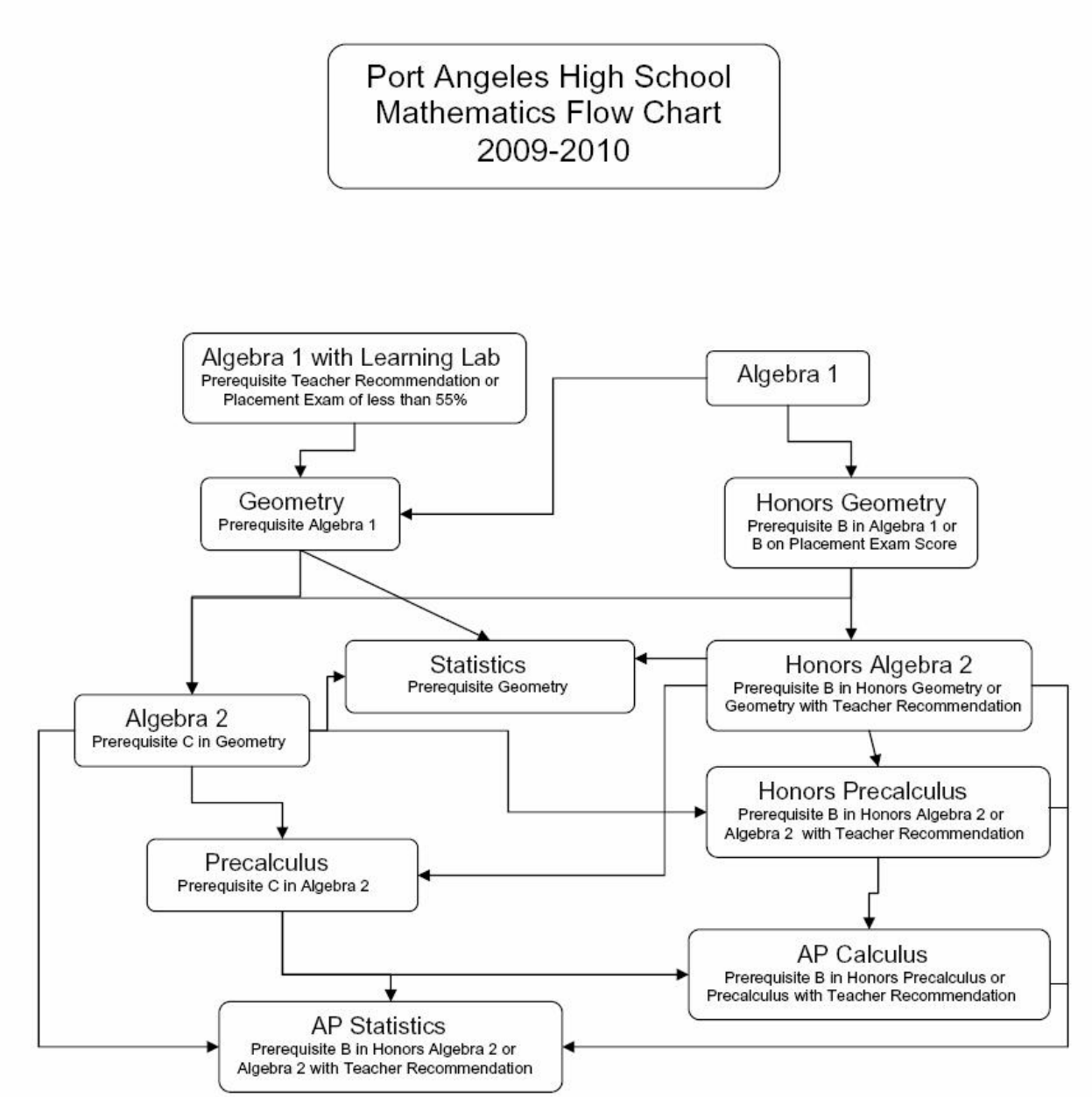
The high school piloted new texts for AP Calculus, Honors Math Analysis and Honors Geometry. These texts were subsequently reviewed both by the high school math department and by the committee as was their impact on student learning. The AP Calculus and Honors Math Analysis texts were recommended for approval while the Honors Geometry text was replaced in favor of the Holt published text.

The high school math department also put forth recommendations to respond to the newly revised state math standards. These were reviewed by the district committee for articulation fidelity with the feeder school math curricula. The resultant recommendation of the committee was to recommend the Holt published Algebra 1, Geometry and Algebra II texts for use in the upcoming year. The Pre-Calculus text will be a publisher match to the current AP Calculus text.

Courses were restructured in January to add *Algebra Basics* as a supplemental curriculum material support to the core curriculum to help struggling students. New benchmark tests were constructed for the 2009-2010 school year (see Appendix B and C). Placement exams were developed and administered to incoming freshmen from Stevens Middle School and Queen of Angels schools to help with proper placement. A course curriculum map was developed for course selection clarification (see Appendix A).

Clearly, as our ability to compete in the ever flattening global economy continues to be challenging, math knowledge and understanding consistently is a requisite skill set. The international assessment report, the TIMMS report, made several clear observations regarding the strengths of math instruction and student math achievement in countries around the world (see Appendix E).

Appendix A Curriculum Map for Grades 9-12



Appendix B Algebra 1 Benchmark Test Proposal for 2009-2010

Number Properties and Operations

Solve each problem. Choose the best answer for each question and record your answer on the Student Answer Sheet.

1. The Berry Company has $43,500,000 in total sales for the year. What is this number in scientific notation?
   - **A** 43×10^6
   - **B** 435×10^6
   - **C** 4.35×10^5
   - **D** 4.35×10^7
   - **E** 4.35×10^6

2. Which equation represents the statement "the length ℓ of the rectangle is five times the width w"?
   - **A** $w = 5 + \ell$
   - **B** $w = 5\ell$
   - **C** $\ell = 5w$
   - **D** $\ell = 5 + w$
   - **E** $\ell = w - 5$

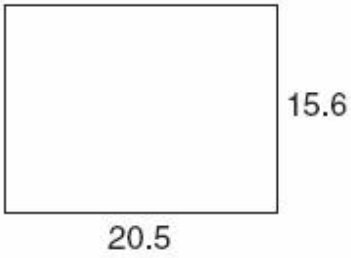
3. Which statement is false?
   - **A** $-6 > -8$
   - **B** $3^3 > 4^2$
   - **C** $|-6^2| = |7^2 - 13|$
   - **D** $-121 < -141$
   - **E** $5 \times 3^2 < 6 \times 2^3$

4. Which number has the greatest value?
   - **A** 0.137
   - **B** 0.46
   - **C** 0.3
   - **D** 0.2138
   - **E** 0.152

5. Evaluate the expression $6 \cdot (4^2 + 6)$.
   - **A** 30
   - **B** 54
   - **C** 84
   - **D** 102
   - **E** 132

6. Estimate the product 7.38×19.716 by rounding to the nearest one.
   - **A** 114
   - **B** 120
   - **C** 140
   - **D** 146
   - **E** 160

7. Find the area of this figure, round your final answer to the nearest whole number of square units.



   - **A** 72
   - **B** 280
   - **C** 319
   - **D** 320
   - **E** 336

8. Martin washed his vehicle exactly once every week for 2 years in a row. How many times did he wash his vehicle during this time period?
   - **A** 24 times
   - **B** 100 times
   - **C** 104 times
   - **D** 124 times
   - **E** 144 times

Appendix B, cont. **Algebra 1 Benchmark Test Proposal for 2009-2010**

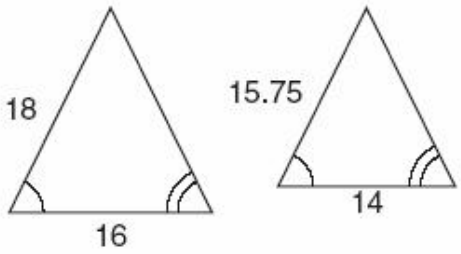
9. A gym class had 42 students and 7 volleyballs. What was the ratio of volleyballs to students?

A 1 to 6
B 6 to 1
C 1 to 7
D 7 to 1
E 1 to 42

10. At the baseball stadium, 3 hotdogs cost $8.25. At this price, how much will 7 hotdogs cost? Which proportion could be used to solve the problem?

A $\frac{\$8.25}{3} = \frac{7}{x}$
B $\frac{\$8.25}{3} = \frac{x}{7}$
C $\frac{\$8.25}{x} = \frac{7}{3}$
D $\frac{\$8.25}{3} = \frac{x}{10}$
E $\frac{\$8.25}{10} = \frac{x}{7}$

11. What is the scale factor for the two similar figures shown below, in simplest form?



A 16 to 14
B 9 to 7
C 15.75 to 16
D 8 to 7
E 9 to 8

12. A ball player makes 538 field goals out of 934 attempts. What percent of his field goals did he make?

A 28.2%
B 34.6%
C 52.2%
D 57.6%
E 173.6%

13. What is 32% of 125?

A 20
B 32
C 40
D 42
E 44

14. The number 8 is a factor of which of the following numbers?

A 21
B 57
C 81
D 92
E 104

15. What is the greatest common factor of 36 and 42?

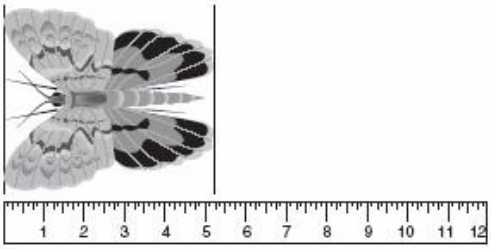
A 3
B 4
C 6
D 9
E 252

16. How much tax is charged to purchase 5 lamps at $65 each, if the sales tax rate is 8%?

A $1.04
B $5.20
C $10.40
D $26.00
E $52.00

Measurement

17. What is the length of the figure shown?

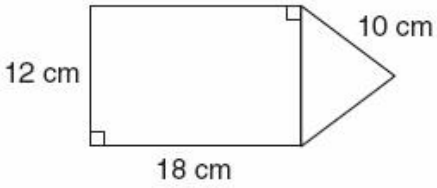


A 5 inches
B 5.125 inches
C $5\frac{1}{4}$ inches
D 5.375 inches
E $5\frac{1}{2}$ inches

18. What is the circumference of a circle with radius 8 inches? (Use 3.14 for π.)

A 12.56 inches
B 25.12 inches
C 50.24 inches
D 100.48 inches
E 200.96 inches

19. What is the perimeter of the figure?

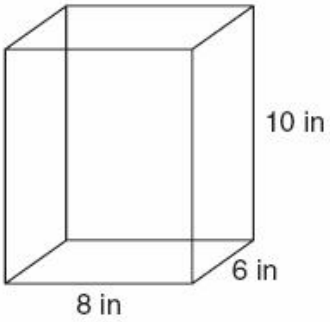


A 68 cm
B 74 cm
C 78 cm
D 80 cm
E 112 cm

20. What is the volume, in cubic inches, of a cylinder with a radius of 4 inches and a height of 12 inches? (Use 3.14 for π.)

A 150.72
B 301.44
C 602.88
D 1205.76
E 1808.64

21. What is the surface area of the prism?



A 168 square inches
B 216 square inches
C 240 square inches
D 376 square inches
E 480 square inches

22. Mr. and Mrs. Kingston are installing fence around a rectangular piece of property. The length of the property is 780 yards and the width is 520 yards. How many yards of fencing are needed?

A 1300 yards
B 1560 yards
C 2600 yards
D 2860 yards
E 405,600 yards

23. Joel canoes 6.2 miles in 85 minutes. What is his rate in miles per hour?

A 13.4 mph
B 6.2 mph
C 4.3 mph
D 1.4 mph
E 0.7 mph

Geometry

24. What is the transformation from figure 1 to figure 2?

Figure 1

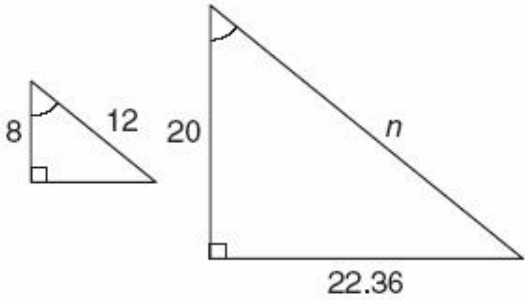
Figure 2

A slide, turn
B flip, turn
C turn
D slide, slide, turn
E slide, flip

25. Which type of transformation is shown below?

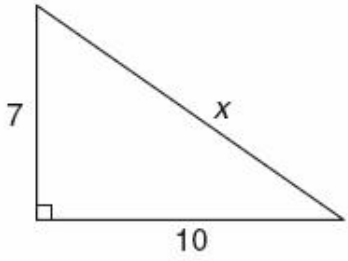
A translation
B rotation
C reflection
D glide reflection
E dilation

26. The figures shown are similar. What is the value of *n*?



A 4.8
B 30
C 32
D 48
E 56

27. What is the value of *x*?

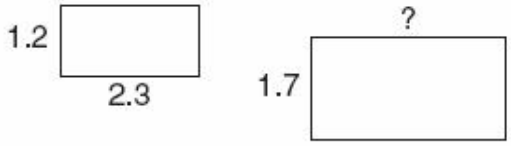


A 3
B $\sqrt{149}$
C $\sqrt{170}$
D 17
E 34

28. Which lengths below would form a right triangle?

A 1, 3, 5
B 1.2, 2.4, 6.1
C 6, 9, 10
D $2\sqrt{5}$, 4, 6
E $3\sqrt{2}$, $\sqrt{2}$, $\sqrt{2}$

29. The two rectangles are similar. What is the measure of the unknown side? Round your answer to the nearest hundredth.



A 0.89
B 1.62
C 2.80
D 3.26
E 5.94

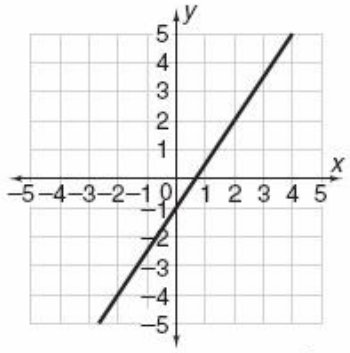
30. A right triangle has one leg that is 5 inches longer than the other leg. The hypotenuse is 25 inches long. Find the length of the longer leg.

A 10 in.
B 13 in.
C 15 in.
D 17 in.
E 20 in.

31. A parallelogram has an area of 180 square inches and the height is 12 inches. What is the length of the base?

A 6 inches
B 15 inches
C 18 inches
D 90 inches
E 2160 inches

32. What is the slope of the line?



A -1
B 1
C $\frac{2}{3}$
D $\frac{3}{2}$
E 2

33. What is the midpoint of $(-8, -4)$ and $(14, 8)$?

A $(-3, -2)$
B $(3, 2)$
C $(-11, -6)$
D $(11, 6)$
E $(6, 4)$

34. What is the slope of a line parallel to $4x - 3y = 12$?

A -4
B $-\frac{3}{4}$
C $\frac{1}{4}$
D $\frac{3}{4}$
E $\frac{4}{3}$

Data Analysis, Statistics, and Probability

Use the data in the table for Questions 35 to 38.

The data shows the top five ranked men's tennis players, their total earned points, and number of tournaments played.

Player	Points Earned	Number of Tournaments Played
Roddick	3085	20
Federer	6225	18
Hewitt	2490	17
Agassi	2275	17
Nadal	4765	24

35. Who has earned the greatest number of points?

A Roddick
B Federer
C Hewitt
D Agassi
E Nadal

36. What is the average number of points Agassi has scored in a tournament?

A 133.8 points
B 198.5 points
C 146.5 points
D 154.3 points
E 345.8 points

37. If using the data in the table to construct a bar graph based on the number of tournaments played, the height of which two players would be the same?

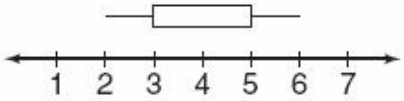
A Federer and Hewitt
B Nadal and Hewitt
C Agassi and Roddick
D Roddick and Nadal
E Hewitt and Agassi

38. What is the median of the points earned by the top five players?

A 3085
B 6225
C 2490
D 2275
E 4765

Use the box and whisker plot for Questions 39 and 40.

The Humane Society is tracking the number of puppies born in a litter in a given year.



39. What is the first quartile in the distribution of data?

A 2
B 3
C 4
D 5
E 6

40. What is the difference between the median and the third quartile?

A 1
B 2
C 3
D 4
E 5

41. The caterer for Joan and Matt's wedding has given them a choice of 3 different kinds of meat, 3 kinds of potatoes, 4 vegetables, and 2 soups. How many complete dinners are available to choose from?

A 12
B 18
C 24
D 36
E 72

42. Regita collected data on the kind of sandwiches her customers order at her deli shop. The table shows her findings.

Sandwich	Number of Customers
Ham	26
Turkey	25
Chicken	15
Roast Beef	22
Corned Beef	12

Based on this data, what is the probability that the next customer will order a ham sandwich?

A $\frac{1}{100}$
B $\frac{21}{100}$
C $\frac{13}{50}$
D $\frac{1}{2}$
E $\frac{67}{100}$

43. Which of the following is a possible sample space for this experiment?

A {1, 2, 3, 4, 5}
B {Roy, Becky, George}
C {head, tails}
D {Roy, Yolanda, Paul, George, Becky, Walt}
E {1, 4, heads, tails}

44. What is the probability of spinning a 1 then a 2 on the next spin?

A $\frac{1}{4}$

B $\frac{1}{64}$

C $\frac{1}{16}$

D $\frac{1}{2}$

E $\frac{1}{8}$

45. Several numbers and letters are put on cards. Jamil hangs them on a wall as shown in the picture and randomly throws a dart at one of the cards.

5	A	3	S
B	Z	8	M
N	7	2	U
E	Q	P	12

What is the probability of landing on a vowel or an odd number?

A $\frac{1}{5}$

B $\frac{5}{16}$

C $\frac{3}{8}$

D $\frac{7}{16}$

E $\frac{9}{14}$

Algebra and Functions

46. What is the common ratio for the given sequence?
4, −6, 9, −13.5, 20.25

A −1.5

B 1.5

C 2

D −2

E 3

47. What is the missing number in the table?

x	*y*
−2	3
0	7
2	11
4	15
6	?

A 12

B 17

C 19

D 21

E 28

48. Miguel made a display of DVD's at a movie rental store. One DVD was in the first row, and the other rows each had two more DVD's than the row before it. How many DVD's does Miguel have if he has nine rows?

A 19

B 27

C 36

D 81

E 121

49. Solve for *x*.
$6x + 13 = 49$

A −6

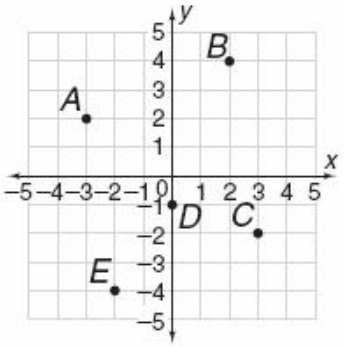
B 5

C 6

D $10\frac{1}{3}$

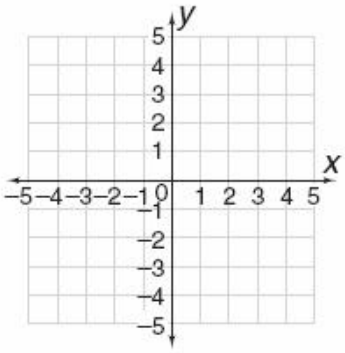
E 12

50. What are the coordinates of point *C*?



A (−3, 2)
B (0, −1)
C (2, 4)
D (3, −2)
E (−2, −4)

51. Plot and connect the given points in order, and determine the perimeter of the figure.
(−4, 2), (−2, 2), (−2, 4), (1, 4), (1, 3), (3, 3), (3, −4), (−4, −4)

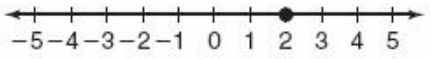


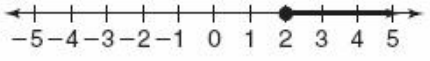
A 24
B 26
C 30
D 32
E 36

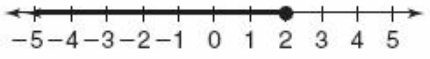
52. Which of the following is the equation of $y = -4x - 3$ shifted 4 units down?

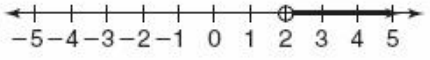
A $y = -4x + 1$
B $y = -4x - 7$
C $y = 4x - 7$
D $y = 4x + 1$
E $y = -4x - 8$

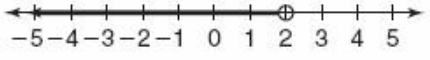
53. Which graph represents the solution of $2x + 12 > 16$?

A


B


C


D


E


54. Simplify: $\frac{4x^2\sqrt{6^2 + 8^2}}{8x}$

A $5x$
B $10x$
C $0.5x$
D $30x$
E $20x$

55. Which expression is equivalent to $-3(b^2 - 4b)$?

A $3b^2 + 4b$
B $-3b^2 - 12b$
C $9b^2 + 12b$
D $-3b^2 + 4b$
E $12b - 3b^2$

56. Which expression is the completely factored form of $x^3 - x^2 - 26x + 30$?

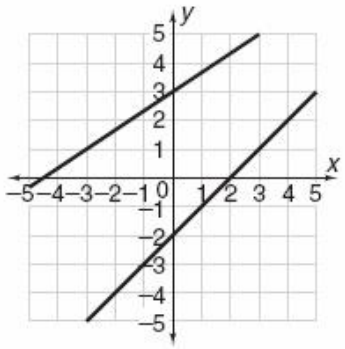
A $(x + 5)(x^2 - 4x + 6)$
B $(x - 5)(x^2 + 4x - 6)$
C $(x + 5)(x^2 + 4x - 6)$
D $(x - 5)(x^2 - 4x + 6)$
E $(x + 5)(x^2 - 4x - 6)$

57. Which graph is the solution to the system of equations?

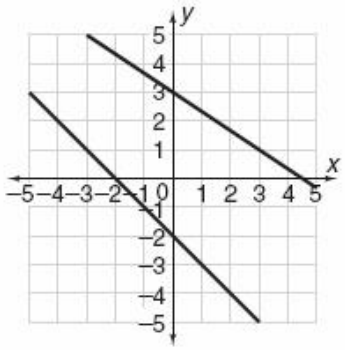
$y = x - 2$

$2x - 3y = -9$

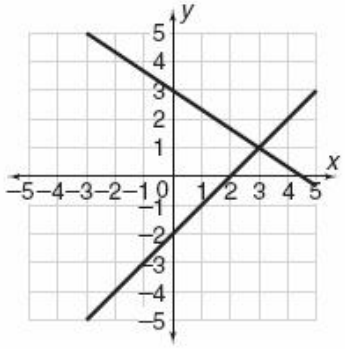
A



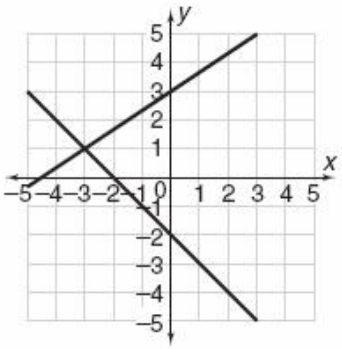
B



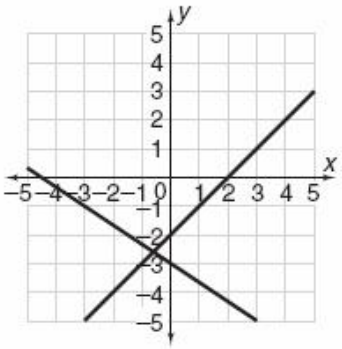
C



D



E



58. What is the x-value in the following system?

$3x - 2y = 1$

$x + 2y = 11$

A 0 **D** 3

B 1 **E** 4

C 2

59. What is the value of m in the matrix?

$$\begin{bmatrix} 6 & -2 \\ m & 0 \end{bmatrix} = \begin{bmatrix} n & -2 \\ -4 & 0 \end{bmatrix}$$

A $m = -4$ **D** $m = 4$

B $m = -2$ **E** $m = 6$

C $m = 0$

60. What is the value of y in the matrix below?

$$\begin{bmatrix} -12 & 10 & -11 \\ 10 & 11 & 12 \end{bmatrix} + \begin{bmatrix} 8 & 6 & -5 \\ -8 & 6 & 5 \end{bmatrix} = \begin{bmatrix} 4 & 16 & -16 \\ 2 & y & 17 \end{bmatrix}$$

A −16 **D** 16

B −6 **E** 17

C 4

Appendix C Geometry Benchmark Test Proposal for 2009-2010

Number Properties and Operations

Select the best answer.

1. The total value of outstanding stock in the stock market is 5.87 trillion dollars. What is this value in scientific notation?
   - **A** 587×10^9
   - **B** 587×10^9
   - **C** 58.7×10^9
   - **D** 5.87×10^{11}
   - **E** 5.87×10^{12}

2. Which number sentence could be used to determine the number of minutes, m in d days?
   - **A** $m = d(24 \cdot 60)$
   - **B** $m = d(24 \cdot 60 \cdot 60)$
   - **C** $m = d(24 + 60 + 60)w$
   - **D** $m = d(24 \cdot 52)$
   - **E** $m = d(12 \cdot 24 \cdot 60 \cdot 60)$

3. Which statement is *false*?
   - **A** $-16.566 > -18.378$
   - **B** $13^3 > 24^2$
   - **C** $|-26^2| = |27^2 - 53|$
   - **D** $-1\frac{3}{5} > -1\frac{3}{4}$
   - **E** $5 \times 4^2 < 9 \times 2^3$

4. Which value is the largest?
   - **A** 0.197
   - **B** 0.5
   - **C** 0.489
   - **D** 0.2348
   - **E** 0.178

5. Evaluate the expression:

   $4^2 \div (10 - 9 + 1)^3 \cdot 3 - 5$
   - **A** -16
   - **B** 1
   - **C** 15
   - **D** 19
   - **E** 26

6. Estimate the product 27.468×39.569 by rounding to the nearest one.
   - **A** 1070
   - **B** 1080
   - **C** 1082
   - **D** 1087
   - **E** 1090

7. Find the area of this figure to the nearest whole number.

   - **A** 33 m^2
   - **B** 64 m^2
   - **C** 252 m^2
   - **D** 260 m^2
   - **E** 306 m^2

8. Reginald went to the gym to work out exactly 13 times a month for 4 years in a row. How many times did he go to the gym during this time period?
   - **A** 24 times
   - **B** 52 times
   - **C** 312 times
   - **D** 624 times
   - **E** 780 times

9. The ball bin had 14 soccer balls, 18 baseballs, 22 basketballs and 20 playground balls. What was the ratio of soccer balls to total number of balls in the bin?
   - **A** 14 to 52
   - **B** 14:79
   - **C** 7:27
   - **D** 7 to 37
   - **E** 7:39

10. At the soccer stadium, 4 megaphones costs $38.25. Which proportion could be used to find the cost of 9 megaphones?

A $\frac{\$38.25}{4} = \frac{9}{x}$

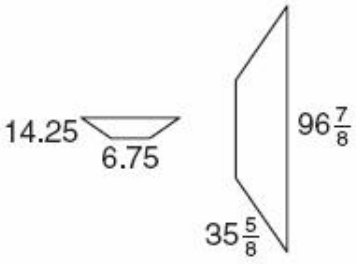
B $\frac{\$38.25}{4} = \frac{x}{9}$

C $\frac{\$38.25}{x} = \frac{9}{4}$

D $\frac{\$38.25}{4} = \frac{x}{13}$

E $\frac{\$38.25}{13} = \frac{x}{9}$

11. What is the scale factor, in simplest form, for the two similar isosceles trapezoids shown below?



A 14.25 to $35\frac{5}{8}$

B 2 to 5

C 6.75 to 14.25

D 8 to 7

E 9 to 8

12. An engine is rated at 160 horsepower, but only delivers 110 horsepower. What is the percent of efficiency?

A 14.6%

B 34.6%

C 68.8%

D 77.6%

E 145.5%

13. What is 67.5% of 610?

A 188.54

B 198.28

C 205.88

D 411.75

E 422.50

14. The number 17 is a factor of all of these numbers *except:*

A 85

B 119

C 221

D 272

E 359

15. What is the least common multiple of 27, 90, and 84?

A 3

B 9

C 1260

D 1890

E 3780

16. Sara purchases 6 kitchen faucets for $164 each. If the sales tax rate is 7.25%, what is the total amount Sara is charged?

A $876.21

B $984.00

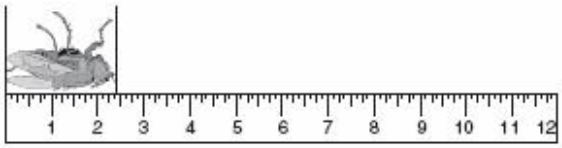
C $1055.34

D $1476.07

E $1502.36

Measurement

17. What is the length of three horseflies if one horsefly measures what is shown below?



A $2\frac{3}{8}$ inches

B 6.375 inches

C 6.875 inches

D $7\frac{1}{8}$ inches

E $7\frac{1}{2}$ inches

18. What is the approximate area of a circle with a diameter of 8 inches?

A 12.56 square inches

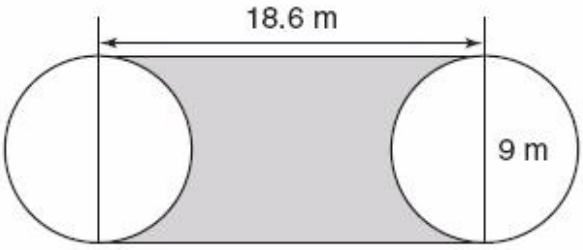
B 25.12 square inches

C 50.24 square inches

D 100.48 square inches

E 200.96 square inches

Use the figure below to answer Questions 19 and 20.



19. What is the perimeter of the shaded area?

A 27.6 m

B 55.2 m

C 63.12 m

D 65.46 m

E 167.4 m

20. What is the area of the shaded region? (Use 3.14 for π.)

A 103.815 m^2

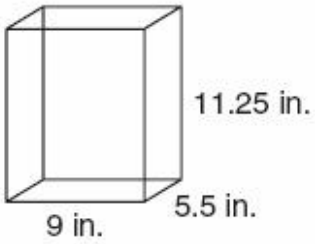
B 325.9791 m^2

C 525.636 m^2

D 669.625 m^2

E 705.345 m^2

21. What is the surface area of the prism?



A 111.4 square inches

B 154.5 square inches

C 222.8 square inches

D 324.0 square inches

E 425.25 square inches

22. The length of a rectangular air filter is 4 feet more than twice the width. Find the length of the air filter if the area is 240 square feet.

A 12 feet

B 16 feet

C 20 feet

D 24 feet

E 25 feet

23. Babe bikes 6.2 miles in 42 minutes. What is her rate in miles per hour?

A 8.86 mph

B 6.77 mph

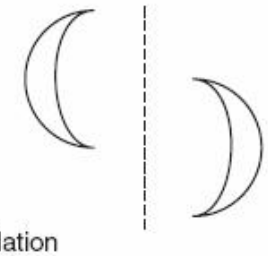
C 6.20 mph

D 0.15 mph

E 0.11 mph

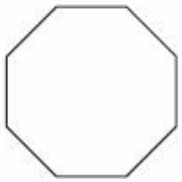
Geometry

24. Which type of transformation is shown below?



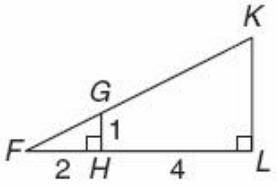
A translation
B rotation
C reflection
D glide reflection
E dilation

25. How many lines of symmetry does a regular octagon have?



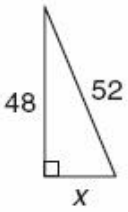
A 2
B 4
C 6
D 8
E 10

26. The figures are similar. What is the approximate length of $\overline{FK}$?



A 3
B 5.2
C 6.7
D 7.9
E 8.3

27. What is the value of x?

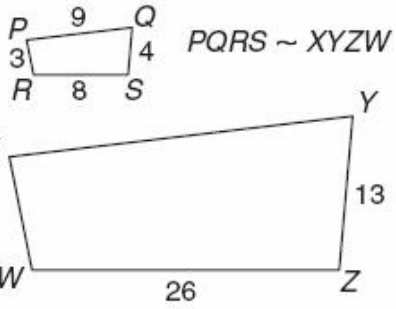


A 20
B 26
C 32
D 34
E 38

28. Which lengths below would NOT form a right triangle?

A 6, 8, 10
B $\sqrt{2}$, $\sqrt{7}$, 3
C 1, 7, $5\sqrt{2}$
D $\sqrt{7}$, 4, 5
E 1, 5, $2\sqrt{6}$

29. The two quadrilaterals are similar. Find the perimeter of the larger figure to the nearest hundredth.



A 24 units
B 54 units
C 78 units
D 86 units
E 92 units

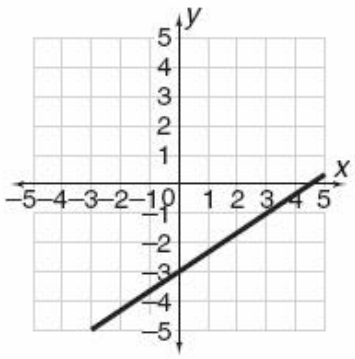
30. A garden is in the shape of a right triangle. If one leg is 16 feet long and the hypotenuse is 20 feet long, how many feet of fencing is required to enclose the garden?

A 28 ft **D** 72 ft
B 36 ft **E** 96 ft
C 48 ft

31. If a triangle has an area of 180 square inches and the height is 12 inches, what is the length of the base?

A 7.5 inches **D** 30 inches
B 15 inches **E** 60 inches
C 18 inches

32. What is the slope of the line?



A -1 **D** $\frac{3}{2}$
B 1 **E** 2
C $\frac{2}{3}$

33. What is the distance between the points $(-8, -4)$ and $(14, 8)$?

A $2\sqrt{17}$ **D** $4\sqrt{34}$
B $2\sqrt{157}$ **E** $10\sqrt{5}$
C $6\sqrt{5}$

34. What is the slope of a line perpendicular to $4x - 3y = 12$?

A $-\frac{3}{4}$ **D** -4
B $\frac{3}{4}$ **E** $\frac{4}{3}$
C $\frac{1}{4}$

Data Analysis, Statistics, and Probability

Use the data in the table for Questions 35–38.

The data shows five male golfers, the country they are from, and the total points they have earned.

Player	Country	Points Earned
Goosen	South Africa	8.53
Mickelson	USA	9.15
Singh	Fiji	10.77
Els	South Africa	8.31
Woods	USA	18.07

35. Who is the top ranked player?

A Goosen
B Mickelson
C Singh
D Els
E Woods

36. What is the average number of points earned by all players?

A 5.69 points
B 7.35 points
C 9.15 points
D 10.97 points
E 54.83 points

37. If you use the data in the table to construct a bar graph based on the number of points earned, which bar would be about twice as tall as Mickelson's?

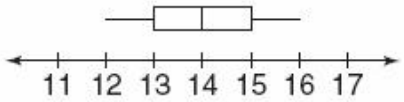
A Goosen
B Woods
C Singh
D Els
E None of them

38. What is the median of the points earned by the top five players?

A 18.07
B 9.15
C 8.53
D 8.31
E 10.77

Use the box and whisker plot for Questions 39 and 40.

Maria is keeping track of the number of trains that go through a particular intersection for one week.



39. What is the first quartile in the distribution of data?

A 12
B 13
C 14
D 15
E 16

40. What is the difference between the median and third quartile?

A 1
B 2
C 3
D 4
E 5

41. A buffet table has a choice of 4 different kinds of meat, 3 kinds of potatoes, 4 vegetables and 2 soups. How many different dinners (meat, potato, vegetable and soup) can be created?

A 13
B 24
C 48
D 72
E 96

42. Annabell collected data on the breed of chicks that customers at J & B Feed ordered. The table shows her findings.

Breed	Number of Customers
White Rock	26
Golden Comet	25
Rhode Island Red	15
Chinese Crested	22
Barred Rock	12

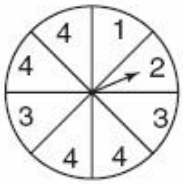
What is the probability that the next customer will order White Rock chicks?

A $\frac{1}{100}$
B $\frac{21}{100}$
C $\frac{13}{50}$
D $\frac{1}{2}$
E $\frac{67}{100}$

43. A coin is tossed and a number cube is rolled. What is the sample space for this experiment?

A {H, T}
B {1, 2, 3, 4, 5, 6}
C {HT, 12, 34, 56}
D {H1, H2, H3, H4, H5, H6, T1, T2, T3, T4, T5, T6}
E {H1, T1, H2, T2, H3, T4}

44. What is the probability of spinning a 4 then a 2 on the next spin?



A $\frac{1}{64}$

B $\frac{1}{16}$

C $\frac{1}{8}$

D $\frac{1}{4}$

E $\frac{1}{2}$

45. Several numbers and letters are put on cards. Jenny hangs them on a wall as shown in the picture and randomly throws a dart at one of the cards.

5	A	3	S
B	Z	8	M
N	7	2	U
E	Q	P	12

What is the probability of a dart that lands on the cards landing on a vowel or a number?

A $\frac{1}{5}$

B $\frac{5}{16}$

C $\frac{3}{8}$

D $\frac{9}{16}$

E $\frac{9}{14}$

Algebra and Functions

46. What is the common ratio for the given sequence?

4, −10, 25, −62.5, 156.25

A −1.5

B 1.5

C 2

D −2.5

E 3

47. What is the missing number in the table?

x	y
−3	7
−2	2
−1	−1
0	−2
1	−1
3	??
4	14

A −2

B 2

C 5

D 7

E 12

48. Mitchell made a display of boxes of cereal. One box of cereal was in the first row, and the other rows each had three more boxes than the row before it. How many boxes of cereal does Mitchell use if the display has seven rows?

A 21 boxes

B 49 boxes

C 64 boxes

D 70 boxes

E 81 boxes

49. Solve for x.

$-12x + 26 = 98$

A −6

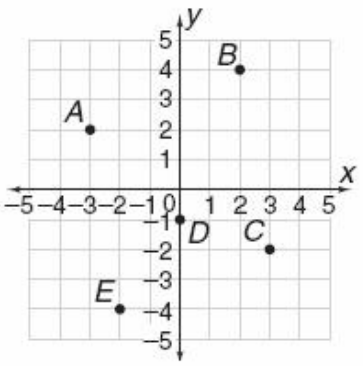
B 5

C 6

D $10\frac{1}{3}$

E 12

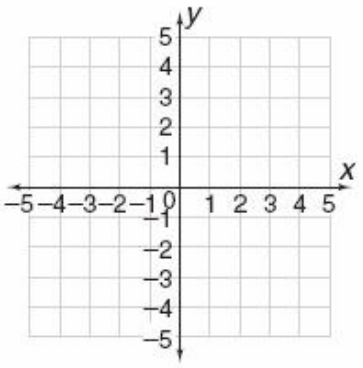
50. What are the coordinates of point *E*?



A (−3, 2)
B (0, −1)
C (2, 4)
D (3, −2)
E (−2, −4)

51. Plot and connect the given points in order and determine the area of the resulting figure.

(−4, 2), (−2, 2), (−2, 4), (1, 4), (1, 3), (3, 3), (3, −4), (−4, −4).

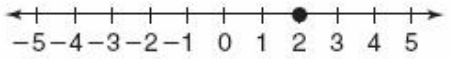


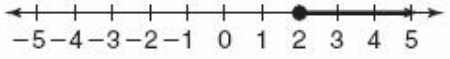
A 25
B 30
C 50
D 62
E 100

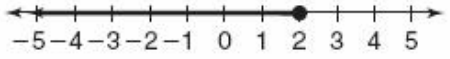
52. Which of the following is the equation of $y = -4x^2 - 3$ shifted 2 units down?

A $y = -4x^2 + 1$
B $y = -4x^2 - 5$
C $y = 4x^2 - 5$
D $y = 4x^2 + 6$
E $y = -4x^2 - 8$

53. Which graph represents the solution of $4x - 9 \leq -1$?

A


B


C


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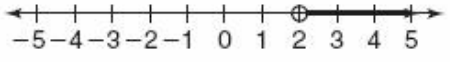

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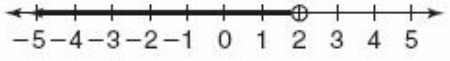


54. Simplify: $\dfrac{8\sqrt{(3+3)^2 + 2^3 \cdot 8}}{2}$.

A 4
B 10
C 24
D 40
E 80

55. What is the value of $\dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ if $a = 5$, $b = 2$ and $c = -3$?

A $\left\{\frac{3}{5}, -1\right\}$
B $\left\{-\frac{3}{5}, 1\right\}$
C $\{-5, 2\}$
D $\dfrac{5 \pm 2\sqrt{6}}{4}$
E $\left\{\frac{4}{5}, -1\right\}$

56. The function $y = 125{,}000(0.96^x)$ models the population of a bacteria after x minutes. What is the most accurate prediction for the population of the bacteria after 8 minutes?

A 89,128

B 90,174

C 96,000

D 120,000

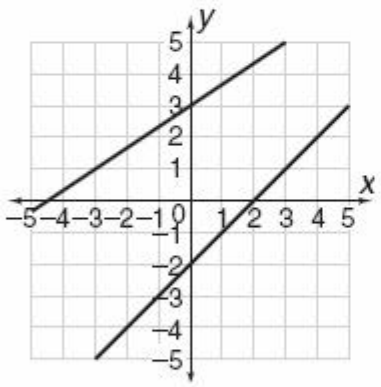
E 1,120,000

57. Which graph is the solution to the system of equations?

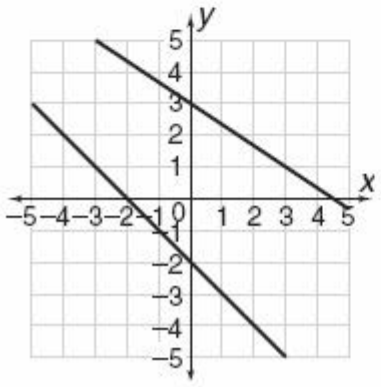
$x + y = -2$

$3y = -2x + 9$

A



B



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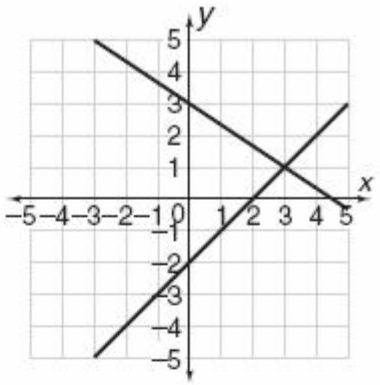

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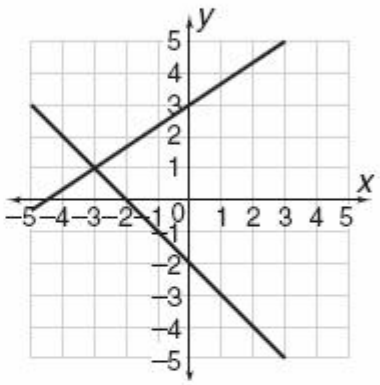
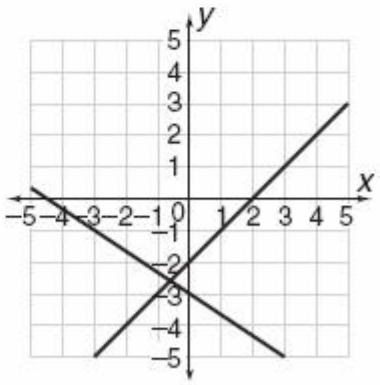


E



58. What is the x-value in the following system?

$$\begin{cases} 2y - 4 = 4x \\ y - 2 = x \end{cases}$$

A 0
B 1
C 2
D 4
E 8

59. What is the value of m in the matrix equation?

$$\begin{bmatrix} 6 & -2 \\ m & 0 \end{bmatrix} = \begin{bmatrix} n & -2 \\ -4 & 0 \end{bmatrix}$$

A $m = 4$
B $m = -4$
C $m = 0$
D $m = -2$
E $m = 6$

60. What is the value of x in the matrix equation?

$$\begin{bmatrix} -12 & 10 & -11 \\ 10 & 11 & 12 \end{bmatrix} + \begin{bmatrix} 8 & 6 & -5 \\ -8 & 6 & 5 \end{bmatrix} = \begin{bmatrix} x & 16 & -16 \\ 2 & y & 17 \end{bmatrix}$$

A -12
B -4
C -2
D 0
E 16

Appendix D New and Revised K-12 Standards Available

June 11, 2009 ( ) Action Requested
(X) Informational

MEMORANDUM NO. 030-09M TEACHING AND LEARNING

TO: Educational Service District Superintendents
School District Superintendents
School Building Principals
Curriculum, Instruction, and Assessment Administrators

FROM: Randy I. Dorn, State Superintendent of Public Instruction

RE: New and Revised K-12 Standards Available

CONTACT: Anne Banks, Program Manager, Learning and Technology
(360) 725-4966, anne.banks@k12.wa.us, TTY (360) 664-3631

INTRODUCTION

I am pleased to announce that K-12 standards for Social Studies, Educational Technology, Health and Fitness, and the revised Mathematics Standards were recently adopted by the Office of Superintendent of Public Instruction (OSPI). In addition, the revised state K-12 standards for Science will be adopted in June 2009.

In order to provide hands-on access to these standards, each school district, school building, and Educational Service District (ESD) will receive a "back-to-school" mailing in August 2009 that will include a CD that contains the standards documents for each content area, as well as additional information and resources.

Due to the current economic situation, OSPI will not be sending out hard copies of the standards, however, printed copies will soon be available for purchase through the Department of Printing at: https://fortress.wa.gov/prt/printwa/wsprt/default.asp. In addition, each set of standards and supporting documents will also be available on the OSPI website. By providing these important teaching and learning resources electronically on CDs and on the internet, educators will be able to access the materials and customize what they need more efficiently.

Please remember the following information related to these sets of standards:

- **Social Studies, Educational Technology, and Health & Fitness:** These standards were adopted in 2008 and are current.
- **Science:** The revised K-12 Science standards will be formally adopted by OSPI in June 2009.

Appendix D, cont. New and Revised K-12 Standards Available

- **Mathematics:** Starting in the spring of 2010, students will be assessed for their understanding of the 2008 revised standards for grades 3 through 8. High school tests will assess the 2008 revised standards in 2011.
- **Environment and Sustainability:** OSPI began the development of these standards in August 2008 and they are slated to be completed this summer. They will link closely with existing core content area standards.
- **The Arts:** These standards are scheduled for adoption in winter 2010.
- **Reading, Writing, and Communication:** These standards are still current.

ACCESSING STANDARDS ONLINE

All the standards documents can be accessed by visiting the following OSPI website: http://www.k12.wa.us/CurriculumInstruct/EALR_GLE.aspx.

Information regarding OSPI conducted instructional material reviews can be accessed online at: http://www.k12.wa.us/CurriculumInstruct/publishernotices.aspx.

As standards are adopted and updated, they will be added to OSPI's Grade Level Standards & Resources Website at http://standards.ospi.k12.wa.us. The site is user-friendly, easy to access, and provides these additional resources:

- Instructional support materials aligned to the standards
- Supports for English Language Learner (ELL) instruction
- Integration links to other content areas
- Links to assessment information
- Access to standards in different formats
- Links to glossaries
- A search feature to locate which standards contain specific skills

Additional information regarding each content area is available at: http://www.k12.wa.us/CurriculumInstruct/default.aspx.

BACKGROUND ON STANDARDS AND STUDENT ACHIEVEMENT

In 1993, Washington lawmakers passed a landmark school improvement initiative known as the Basic Education Act. They sought to create an education system that would "provide students with the opportunity to become responsible and respectful global citizens, to contribute to their economic well-being and that of their families and communities, to explore and understand different perspectives, and to enjoy productive and satisfying lives" (RCW 28A.150.210). The law established four common learning goals for all Washington students, designed to support high-quality academic standards and raise student achievement. The four learning goals provided the foundation for the development of content standards.

The state legislature has maintained an active interest in the development and revision of standards since 1993. During the 2007 legislative session, lawmakers enacted Second Substitute House Bill 1906 that initiated review and revision of the mathematics and science standards by

Appendix D, cont. **New and Revised K-12 Standards Available**

the State Board of Education and OSPI, as well as the development of educational technology standards.

It is important to note that the standards provide a baseline measure of academic achievement and can provide a springboard for more advanced and extended learning. Academic standards articulate state expectations by clarifying what students should know and be able to do. In this way, standards are essential to student achievement. In Washington, the alignment of curriculum, instruction, and assessment helps prepare every learner for post-secondary success.

If you have any questions regarding this memorandum or need further information, please contact Anne Banks, Program Manager, Learning and Technology at (360) 725-4966 or anne.banks@k12.wa.us, TTY (360) 664-3631.

K-12 EDUCATION

Alan Burke, Ed.D.
Deputy Superintendent

TEACHING AND LEARNING

Jessica Vavrus
Director of Teaching and Learning

Appendix E TIMSS Executive Summary

The Trends in International Mathematics and Science Study (TIMSS) 2003 is the third in a continuing cycle of international mathematics and science assessments conducted every four years. TIMSS assesses achievement in countries around the world and collects a rich array of information about the educational contexts for learning mathematics and science, with TIMSS 2003 involving more than 50 participants. This report contains the mathematics results for 46 countries and four benchmarking participants at the eighth grade and for 25 countries and three benchmarking participants at the fourth grade. Trend data are provided at the eighth and fourth grades for those countries that also participated in 1995 and 1999 (please see the Introduction for more information about TIMSS 2003.)

Students' Mathematics Achievement in 2003

- At both the eighth and fourth grades, Singapore was the top-performing country having significantly higher average achievement in mathematics than the rest of the participating countries.
- At the eighth grade, with the exception of Singapore, the Republic of Korea, Hong Kong SAR, and Chinese Taipei had significantly higher average achievement than all of the other participating countries.
- At the fourth grade, Hong Kong, SAR had significantly higher performance than all countries except Singapore, and, in turn, Japan and Chinese Taipei outperformed the rest of the countries except Singapore and Hong Kong, SAR.

Trends in Mathematics Achievement

- At the eighth grade, several countries showed significantly higher average achievement in 2003 compared to the previous assessments in 1995 and 1999. Korea, Hong Kong SAR, Latvia (LSS),1 Lithuania, and the United States, as well as the benchmarking Canadian province of Ontario, showed a pattern of improvement from assessment to assessment with significant change over the 8-year period from 1995 to 2003. Of the countries participating only in the 1999 and 2003 assessments, Israel and the Philippines showed significant improvement.
- At the eighth grade, countries showing a decrease in average achievement in 2003 compared to previous assessments (1995, 1999, or both) included Japan, Belgium (Flemish), the Russian Federation, the Slovak Republic, Sweden, Bulgaria, Norway, Cyprus, Macedonia, Iran, and Tunisia as well as the benchmarking Canadian province of Quebec.
- At the fourth grade, many countries showed significant gains in average achievement between 1995 and 2003, including Hong Kong SAR, Latvia (LSS), England, Cyprus, New Zealand, and Slovenia as well as the benchmarking province of Ontario. The only significant declines were found in the Netherlands, Norway, and Quebec province.

Appendix G, cont. TIMSS Executive Summary

Gender Differences in Mathematics Achievement

- At the eighth grade, the gender difference in TIMSS 2003 was negligible in many countries. However, there were variations across countries with girls outperforming boys in the same number of countries that boys outperformed girls. The girls had significantly higher average achievement than boys in Serbia, Macedonia, Armenia, Moldova, Singapore, the Philippines, Cyprus, Jordan, and Bahrain. In contrast, boys had higher achievement in the United States, Italy, Hungary, Lebanon, Belgium (Flemish), Morocco, Chile, Ghana, and Tunisia as well as in two benchmarking participants – the US state of Indiana and Quebec province.
- The trend results at the eighth grade show a few more countries with improvement for girls than for boys. Girls had improved performance and boys did not in four countries, whereas there was no country in which boys improved and girls did not. Both girls and boys improved in five countries and Ontario province. Reflecting declines in achievement across assessments, both genders had lower achievement in TIMSS 2003 in seven countries and Quebec province as did the girls in Belgium (Flemish).
- At the fourth grade, the TIMSS 2003 results by gender paralleled those at the eighth grade. Girls had significantly higher average achievement in Singapore, Moldova, the Philippines, and Armenia. Boys had higher average achievement in the Netherlands, the United States, Italy, Cyprus, Scotland, and in the two Canadian provinces.
- The fourth-grade trend results for the genders mirror the overall results, showing more countries with improvements than declines and consistency between girls and boys. Both boys and girls improved in six countries and Ontario province, while both declined only in Norway and Quebec province.

Performance at the International Benchmarks in TIMSS 2003

TIMSS identified four benchmark levels to describe what students know and can do in mathematics and demonstrate the range of performance internationally – advanced, high, intermediate, and low. There were large differences across countries in the percentages of students reaching the various benchmarks. At the eighth grade, students reaching the **advanced benchmark** used algebraic, geometric, and measurement concepts in complex problem situations. At the other end of the performance continuum, those reaching the **low benchmark** demonstrated some basic mathematical knowledge.

- The highest performing countries – Singapore, Chinese Taipei, Korea and Hong Kong SAR – had about one-third of their students or more (from 31 to 44%) reaching the advanced benchmark followed by Japan with 24 percent. In contrast, all other countries had 11 percent or less of their students reaching the advanced benchmark, including 19 of the lowest-performing countries with 1 percent or less.
- The nine highest-performing countries and the two Canadian provinces had 95 percent or more of their students reaching the low benchmark whereas the eight lowest-performing countries had less than half their students reaching the low benchmark. At the fourth grade, students reaching the **advanced benchmark** used understanding of fractions and decimals, measurement concepts, and data interpretation in a wide variety of relatively complex situations. Those reaching the **low benchmark** demonstrated some mathematical knowledge.

Appendix G, cont. TIMSS Executive Summary

- With fewer and more homogenous countries at the fourth grade, Singapore had 38 percent of its students reaching the advanced benchmark followed by 21 to 22 percent of the students in Hong Kong SAR and Japan. Five of the lowest-performing countries had 1 percent or less of their students reaching the advanced benchmark.
- Eight countries as well as the US state of Indiana had 95 percent or more their students reaching the low benchmark and all except four countries had at least three-fourths of their students reaching this level. In the four lowest-performing countries (the Philippines, Iran, Tunisia, and Morocco), less than half the students reached the low benchmark.

Students' Home Context for Learning Mathematics

- At the eighth grade, students were asked about the level of their parents' schooling and their own expectations. Higher levels of parents' education were associated with higher student achievement in almost all countries. Also, students expecting to finish university had substantially greater average mathematics achievement than those without university expectations.
- At both the eighth and fourth grades, in general, students from homes where the language of the test was always or almost always spoken had higher average achievement than those who spoke it less frequently.
- At both the eighth and fourth grades, across countries on average, there was a clear-cut relationship between number of books in the home and mathematics achievement.
- Mathematics achievement was positively related to computer usage, particularly at eighth grade, with average achievement highest among students reporting using computers at home and at school. Next highest was achievement among students using computers at home but not school, followed by students using computers at school but not home, and then those using computers at other places or not using them at all. At both grades, the percentages of students reporting that they did not use a computer at all varied dramatically across countries – from one percent or less to as many as two-thirds at the eighth grade and three-fourths at the fourth grade.

The Mathematics Curriculum

- Most countries had mathematics curricula defined at the national level (except Australia and the United States) and often supported by ministry directives, instructional guides, school inspections, and recommended textbooks.
- At the eighth grade, all participants emphasized understanding mathematical concepts and principles followed by mastering basic skills. At the fourth grade, mastering basic skills was emphasized most, followed by understanding concepts and principles.
- In relation to the TIMSS assessment at the eighth grade, on average, participants reported that nearly all the number topics (96%) were included in their curricula, 78 percent of the measurement topics, 67 percent of the geometry topics, 63 percent of the algebra topics, and 39 percent of the data topics.

Appendix G, cont. TIMSS Executive Summary

- At the fourth grade, on average, 81 percent of the measurement topics assessed were included in the participants' curricula, 68 percent of the number topics, 62 percent of the data topics, 54 percent of the patterns and relationships topics, and 38 percent of the geometry topics.
- At the eighth grade, across countries on average, teachers reported that 95 percent of the students had been taught the number topics, 78 percent the measurement topics, 69 percent the geometry topics, 66 percent the algebra topics, and 46 percent the data topics.
- At the fourth grade, across countries on average, teachers reported that 86 percent of the students had been taught the measurement topics, 80 percent the data topics, 79 percent the patterns and relationships topics, 77 percent the number topics, and 55 percent the geometry topics.

Teachers of Mathematics

- Mathematics teachers reported considerable teaching experience. At both the eighth and fourth grades, on average, students were taught by teachers with 16 years of experience.
- On average, 76 percent of the eighth-grade students and 65 percent of the fourth-grade students were taught by teachers with at least a university degree.
- Seventy percent of the eighth-grade students, on average, had mathematics teachers with a mathematics major and more than half (54%) with a major in mathematics education or both. At the fourth grade, teachers typically studied primary or elementary education (80% of the students with such teachers, on average).
- At both grades, schools reported that their professional development programs emphasized improving content knowledge and teaching skills. More than 80 percent of students were taught mathematics by teachers having at least some professional development training in these areas.
- Across the five mathematics content areas assessed, teachers reported being ready to teach nearly all the major topics tested by TIMSS. Almost all of the eighth-grade students were taught by such teachers – 90 percent or more for 15 out of 18 topics (all but three data topics). Similarly, 90 percent or more of the fourth-grade students were taught by teachers reporting readiness for teaching 14 of the 16 topics (exceptions were two geometry topics).

Classroom Instruction

- At the eighth grade, on average, teachers reported that 27 percent of the instructional time was devoted to algebra, 26 percent to geometry, 21 percent to number, 10 percent to each of measurement and data, and 6 percent to other. At fourth grade, the profile was different, with number receiving 38 percent of the instructional time. Patterns and relationships, measurement, and geometry each were given 13 to 16 percent, data 9 percent, and other 6 percent.
- At the eighth grade, on average, teachers reported asking 62 percent of students to practice numerical operations and 43 percent to work on fractions and decimals in at least half their lessons. At the fourth grade, teachers reported an overwhelming emphasis on having students practice numerical operations (82% of students in half or more of the lessons).

Appendix G, cont. TIMSS Executive Summary

- At the eighth grade, on average, for 45 percent of students, teachers reported devoting some time in at least half their lessons to asking students to decide what procedures to use for solving complex problems.
- At both eighth and fourth grades, the textbook was often the foundation of mathematics instruction. On average, about two-thirds of students at both grades had teachers who reported using a textbook as the primary basis for their lessons, and another third as a supplementary resource.
- On average, the three most common instructional activities were teacher lecture, teacher-guided student practice, and students working on problems on their own (totaling 59% of the time at eighth grade and 61% at fourth grade).
- Policies about calculator usage varied dramatically from country to country. At the eighth grade, in 10 countries nearly all the students (98% or more) were permitted to use calculators. In contrast, less than half were permitted to use calculators in seven countries. At fourth grade, on average, more than half the students were not permitted to use calculators. Only five countries reported permitting widespread calculator usage (at least 90% of students).
- The percentages of eighth-grade students asked to use calculators in half their lessons averaged from 27 percent for checking answers to 14 percent for exploring number concepts. Relatively few fourth grade students were asked to engage in any calculator activities in as many as half their lessons.
- At the eighth grade, on average, 56 percent of students were taught by teachers who used only or mostly constructed-response tests. These students had higher average achievement than did students whose teachers used only multiple-choice tests or a combination.

School Contexts for Learning and Instruction

- At the eighth grade, average mathematics achievement was 57 points higher for students in schools with few students from economically disadvantaged homes than for students attending schools with more than half their students from disadvantaged homes. At fourth grade, the difference was 47 points.
- At both eighth and fourth grades, there was a strong positive relationship between the principals' perception of school climate (based on seven questions about behaviors of teachers, parents, and students) and average mathematics achievement. Asked the same seven questions, teachers had a somewhat more gloomy view of school climate than principals, but the relationship with achievement still was positive.
- Teachers were asked about the safety of their schools' neighborhoods, how safe they felt in their schools, and the sufficiency of security policies and practices. On average, 72 percent of eighth-grade students and 75 percent of fourth-grade students attended schools characterized as safe by their teachers. At both grades, there was a positive relationship between school safety and mathematics achievement.