

**MATHEMATICS GRADE 9**

**Administered Spring 2004**

**Test by Objectives**

# Mathematics Chart

## LENGTH

### Metric

1 kilometer = 1000 meters

1 meter = 100 centimeters

1 centimeter = 10 millimeters

### Customary

1 mile = 1760 yards

1 mile = 5280 feet

1 yard = 3 feet

1 foot = 12 inches

## CAPACITY AND VOLUME

### Metric

1 liter = 1000 milliliters

### Customary

1 gallon = 4 quarts

1 gallon = 128 ounces

1 quart = 2 pints

1 pint = 2 cups

1 cup = 8 ounces

## MASS AND WEIGHT

### Metric

1 kilogram = 1000 grams

1 gram = 1000 milligrams

### Customary

1 ton = 2000 pounds

1 pound = 16 ounces

## TIME

1 year = 365 days

1 year = 12 months

1 year = 52 weeks

1 week = 7 days

1 day = 24 hours

1 hour = 60 minutes

1 minute = 60 seconds

## Mathematics Chart

<b>Perimeter</b>	rectangle	$P = 2l + 2w$ or $P = 2(l + w)$
<b>Circumference</b>	circle	$C = 2\pi r$ or $C = \pi d$
<b>Area</b>	rectangle	$A = lw$ or $A = bh$
	triangle	$A = \frac{1}{2}bh$ or $A = \frac{bh}{2}$
	trapezoid	$A = \frac{1}{2}(b_1 + b_2)h$ or $A = \frac{(b_1 + b_2)h}{2}$
	circle	$A = \pi r^2$
<b>Surface Area</b>	cube	$S = 6s^2$
	cylinder (lateral)	$S = 2\pi rh$
	cylinder (total)	$S = 2\pi rh + 2\pi r^2$ or $S = 2\pi r(h + r)$
	cone (lateral)	$S = \pi rl$
	cone (total)	$S = \pi rl + \pi r^2$ or $S = \pi r(l + r)$
	sphere	$S = 4\pi r^2$
<b>Volume</b>	prism or cylinder	$V = Bh^*$
	pyramid or cone	$V = \frac{1}{3}Bh^*$
	sphere	$V = \frac{4}{3}\pi r^3$
<i>*B represents the area of the Base of a solid figure.</i>		
<b>PI</b>	$\pi$	$\pi \approx 3.14$ or $\pi \approx \frac{22}{7}$
<b>Pythagorean Theorem</b>		$a^2 + b^2 = c^2$
<b>Distance Formula</b>		$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
<b>Slope of a Line</b>		$m = \frac{y_2 - y_1}{x_2 - x_1}$
<b>Midpoint Formula</b>		$M = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$
<b>Quadratic Formula</b>		$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
<b>Slope-Intercept Form of an Equation</b>		$y = mx + b$
<b>Point-Slope Form of an Equation</b>		$y - y_1 = m(x - x_1)$
<b>Standard Form of an Equation</b>		$Ax + By = C$
<b>Simple Interest Formula</b>		$I = prt$

## Grade 9

**Objective 1: The student will describe functional relationships in a variety of ways.**

A(b)(1) **Foundations for functions.** The student understands that a function represents a dependence of one quantity on another and can be described in a variety of ways.

(D) The student represents relationships among quantities using [concrete] models, tables, graphs, diagrams, verbal descriptions, equations, and inequalities.

**24** Jerome received a gift card for \$20 worth of video rentals from a video store. If the cost of renting a video is \$2.50, which table best describes  $b$ , the balance remaining on the gift card after he rents  $n$  videos?

**F**

$n$	$b$
0	\$20.00
1	\$17.50
2	\$15.00
4	\$10.00
6	\$5.00

**H**

$n$	$b$
1	\$17.50
2	\$15.00
3	\$13.50
4	\$11.00
5	\$8.50

**G**

$n$	$b$
0	\$20.00
2	\$17.50
4	\$15.00
6	\$12.50
8	\$10.00

**J**

$n$	$b$
0	\$20.00
1	\$15.00
4	\$10.00
6	\$2.50
8	\$0.00

## Grade 9

**Objective 1: The student will describe functional relationships in a variety of ways.**

A(b)(1) **Foundations for functions.** The student understands that a function represents a dependence of one quantity on another and can be described in a variety of ways.

(C) The student describes functional relationships for given problem situations and writes equations or inequalities to answer questions arising from the situations.

**27** The temperature in degrees Celsius,  $C$ , is  $\frac{5}{9}$  of the difference between the temperature in degrees Fahrenheit,  $F$ , and the constant 32. Which equation best represents this relationship?

A  $C = \frac{5}{9} - (F + 32)$

B  $C = \frac{5}{9}(F + 32)$

C  $C = \frac{5}{9}(F - 32)$

D  $C = \frac{5}{9} - F + 32$

**Objective 1: The student will describe functional relationships in a variety of ways.**

A(b)(1) **Foundations for functions.** The student understands that a function represents a dependence of one quantity on another and can be described in a variety of ways.

(B) The student [gathers and records data, or] uses data sets, to determine functional (systematic) relationships between quantities.

**41** Which equation could be used to generate this table of values?

$x$	$y$
-1	2
0	1
1	2
2	5

A  $y = -2x$

B  $y = 2x + 1$

C  $y = x + 1$

D  $y = x^2 + 1$

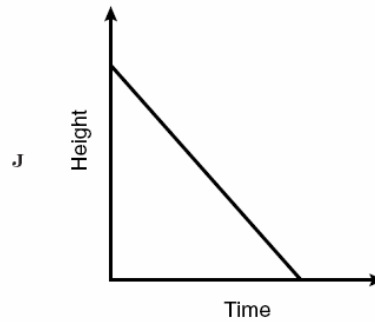
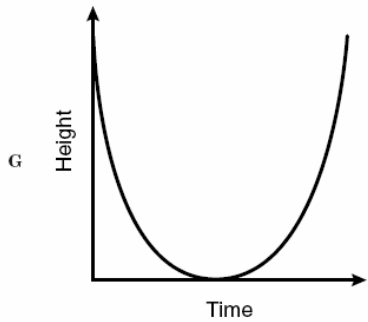
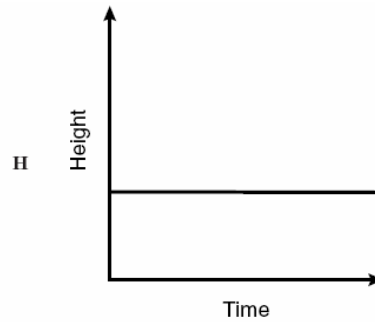
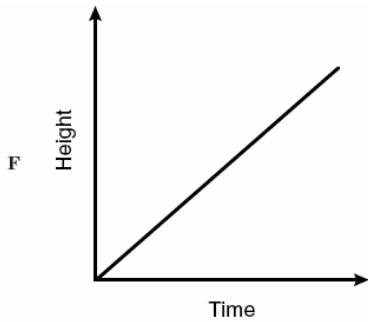
## Grade 9

**Objective 1: The student will describe functional relationships in a variety of ways.**

**A(b)(1) Foundations for functions.** The student understands that a function represents a dependence of one quantity on another and can be described in a variety of ways.

(E) The student interprets and makes inferences from functional relationships.

**46** Which graph best represents the relationship between the height of a burning candle and the amount of time that passes as the candle burns?



## Grade 9

**Objective 1: The student will describe functional relationships in a variety of ways.**

A(b)(1) **Foundations for functions.** The student understands that a function represents a dependence of one quantity on another and can be described in a variety of ways.

(B) The student [gathers and records data, or] uses data sets, to determine functional (systematic) relationships between quantities.

**50** Which equation best describes the relationship between the corresponding values of  $x$  and  $y$  shown in the table?

$x$	$y$
-2	-12
0	-6
1	-3
4	6

**F**  $y = x - 10$

**G**  $y = 2x - 8$

**H**  $y = 3x - 6$

**J**  $y = x^2 - 8$

## Grade 9

**Objective 2: The student will demonstrate an understanding of the properties and attributes of functions.**

A(b)(4) **Foundations for functions.** The student understands the importance of the skills required to manipulate symbols in order to solve problems and uses the necessary algebraic skills required to simplify algebraic expressions and solve equations and inequalities in problem situations.

(A) The student finds specific function values, simplifies polynomial expressions, transforms and solves equations, and factors as necessary in problem situations.

**16** The area of a rectangle is  $3x^2 + 14x + 8$ , and the width is  $x + 4$ . Which expression best describes the rectangle's length?

- F**  $3x + 2$
- G**  $2x + 4$
- H**  $2x + 2$
- J**  $3x - 2$

**Objective 2: The student will demonstrate an understanding of the properties and attributes of functions.**

A(b)(4) **Foundations for functions.** The student understands the importance of the skills required to manipulate symbols in order to solve problems and uses the necessary algebraic skills required to simplify algebraic expressions and solve equations and inequalities in problem situations.

(B) The student uses the commutative, associative, and distributive properties to simplify algebraic expressions.

**20** Simplify the algebraic expression

$$3(x + 3) - 2(x + 3).$$

- F**  $x + 3$
- G**  $x - 3$
- H**  $-6x^2 - 54$
- J**  $6x^2 + 3$

## Grade 9

**Objective 2: The student will demonstrate an understanding of the properties and attributes of functions.**

A(b)(3) **Foundations for functions.** The student understands how algebra can be used to express generalizations and recognizes and uses the power of symbols to represent situations.

(B) Given situations, the student looks for patterns and represents generalizations algebraically.

**43** Sue wants to write an expression that will always produce an even integer. Which of the following will always produce an even integer for any given integer,  $n$ ?

- A  $2n + 1$
- B  $2n - 1$
- C  $n + 2$
- D  $2n$

**Objective 2: The student will demonstrate an understanding of the properties and attributes of functions.**

A(b)(3) **Foundations for functions.** The student understands how algebra can be used to express generalizations and recognizes and uses the power of symbols to represent situations.

(A) The student uses symbols to represent unknowns and variables.

**45** A class consists of 8 freshmen and 22 sophomores. Freshmen had an average of  $x$  points on a test, while sophomores had an average of  $y$  points. Which expression gives the average test score per student for the entire class?

- A  $\frac{8x + 22y}{30}$
- B  $\frac{22x + 8y}{30}$
- C  $30\left(\frac{8}{x} + \frac{y}{22}\right)$
- D  $\frac{x + y}{2}$

## Grade 9

**Objective 2: The student will demonstrate an understanding of the properties and attributes of functions.**

A(b)(2) **Foundations for functions.** The student uses the properties and attributes of functions.

(C) The student interprets situations in terms of given graphs [or creates situations that fit given graphs].

47 Which statement is true for the graph below?



- A Ms. Goodlett will earn \$500 if she sells \$5000 worth of merchandise.
- B Mr. Murphy will not earn any money if he does not sell any merchandise.
- C Mr. Laster will earn \$1000 if he sells \$1000 worth of merchandise.
- D Ms. Cho will earn \$700 if she sells \$5000 worth of merchandise.

## Grade 9

### Objective 3: The student will demonstrate an understanding of linear functions.

A(c)(2) **Linear functions.** The student understands the meaning of the slope and intercepts of linear functions and interprets and describes the effects of changes in parameters of linear functions in real-world and mathematical situations.

(D) The student graphs and writes equations of lines given characteristics such as two points, a point and a slope, or a slope and -intercept.

10 Which equation describes a line that has a y-intercept of 5 and a slope of  $\frac{1}{2}$  ?

F  $y = 5 + \frac{1}{2}x$

G  $y = (5 + x)\frac{1}{2}$

H  $y = 5x + \frac{1}{2}$

J  $y = (5x + 1)\frac{1}{2}$

### Objective 3: The student will demonstrate an understanding of linear functions.

A(c)(1) **Linear functions.** The student understands that linear functions can be represented in different ways and translates among their various representations.

(C) The student translates among and uses algebraic, tabular, graphical, or verbal descriptions of linear functions.

13 Which function includes the data set  $\{(2, 4), (6, 6), (12, 9)\}$ ?

A  $y = 2x$

B  $y = \frac{x}{2}$

C  $y = 2x - 9$

D  $y = \frac{x}{2} + 3$

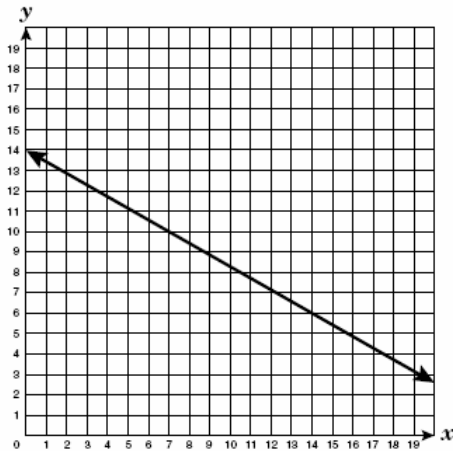
## Grade 9

**Objective 3: The student will demonstrate an understanding of linear functions.**

A(c)(2) **Linear functions.** The student understands the meaning of the slope and intercepts of linear functions and interprets and describes the effects of changes in parameters of linear functions in real-world and mathematical situations.

(A) The student develops the concept of slope as rate of change and determines slopes from graphs, tables, and algebraic representations.

**19** What is the slope of the linear function shown in the graph?



- A  $-\frac{7}{4}$
- B  $-\frac{4}{7}$
- C  $\frac{4}{7}$
- D  $\frac{7}{4}$

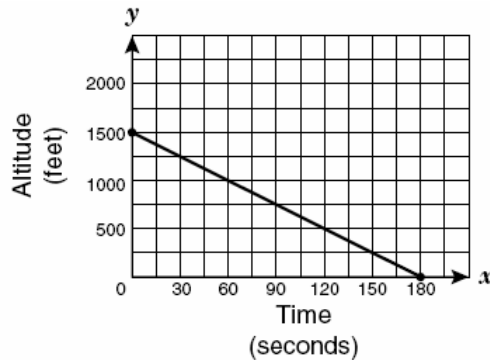
## Grade 9

**Objective 3: The student will demonstrate an understanding of linear functions.**

A(c)(2) **Linear functions.** The student understands the meaning of the slope and intercepts of linear functions and interprets and describes the effects of changes in parameters of linear functions in real-world and mathematical situations.

(B) The student interprets the meaning of slope and intercepts in situations using data, symbolic representations, or graphs.

**34** The line segment on the graph shows the altitude of a landing airplane from the time its wheels are lowered to the time it touches the ground. Which of the following best describes the slope of the line segment?



- F** The plane descends about 1 foot per 8 seconds.
- G** The plane descends about 8 feet per second.
- H** The plane descends about 1 foot per 2 seconds.
- J** The plane descends about 2 feet per second.

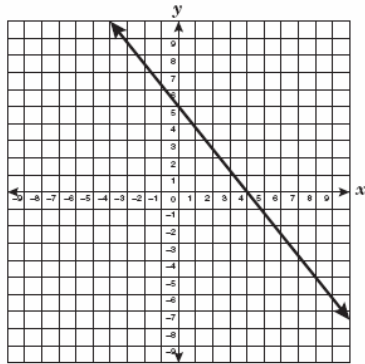
## Grade 9

**Objective 3: The student will demonstrate an understanding of linear functions.**

A(c)(2) **Linear functions.** The student understands the meaning of the slope and intercepts of linear functions and interprets and describes the effects of changes in parameters of linear functions in real-world and mathematical situations.

(E) The student determines the intercepts of linear functions from graphs, tables, and algebraic representations.

42 What are the  $x$ - and  $y$ -intercepts of the function graphed below?



- F** (4, 0) and (5, 0)
- G** (4, 0) and (0, 5)
- H** (0, 4) and (5, 0)
- J** (0, 4) and (0, 5)

## Grade 9

### Objective 4: The student will formulate and use linear equations and inequalities.

A(c)(3) **Linear functions.** The student formulates equations and inequalities based on linear functions, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation.

(C) For given contexts, the student interprets and determines the reasonableness of solutions to linear equations and inequalities.

5 A recycling center pays \$0.35 per pound of glass that it receives. If students at Falcon High School want to raise \$500 in a glass-recycling project, what is a reasonable number of pounds of glass they must collect?

- A 750 lb
- B 175 lb
- C 500 lb
- D 1500 lb

### Objective 4: The student will formulate and use linear equations and inequalities.

A(c)(3) **Linear functions.** The student formulates equations and inequalities based on linear functions, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation.

(A) The student analyzes situations involving linear functions and formulates linear equations or inequalities to solve problems.

7 A weather balloon is launched from a height of 475 feet above sea level. If the balloon rises at a constant rate of 85 feet per minute, which equation could be used to determine  $t$ , the time in minutes it will take the balloon to reach a height of 9245 feet above sea level?

- A  $9245 = 85 + 475t$
- B  $9245 = 85(t + 475)$
- C  $9245 = 475 + 85t$
- D  $9245 = (475 + 85)t$

## Grade 9

**Objective 4: The student will formulate and use linear equations and inequalities.**

A(c)(3) **Linear functions.** The student formulates equations and inequalities based on linear functions, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation.

(A) The student analyzes situations involving linear functions and formulates linear equations or inequalities to solve problems.

17 If  $(x, -4)$  is a solution to the equation  $4x - 5y = 8$ , what is the value of  $x$ ?

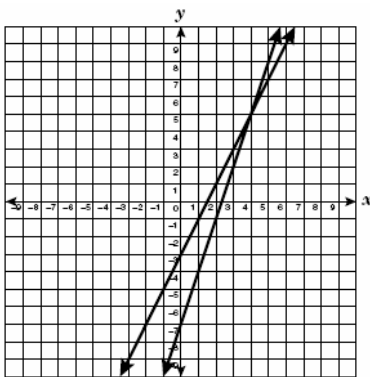
- A -4.8
- B -3
- C 1.6
- D 7

**Objective 4: The student will formulate and use linear equations and inequalities.**

A(c)(3) **Linear functions.** The student formulates equations and inequalities based on linear functions, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation.

(B) The student investigates methods for solving linear equations and inequalities using [concrete] models, graphs, and the properties of equality, selects a method, and solves the equations and inequalities.

36 The graphs of the linear equations  $y = 2x - 3$  and  $y = 3x - 7$  are shown below.



If  $2x - 3 = 3x - 7$ , what is the value of  $x$ ?

- F 4
- G 5
- H 9
- J 10

## Grade 9

**Objective 4: The student will formulate and use linear equations and inequalities.**

A(c)(4) **Linear functions.** The student formulates systems of linear equations from problem situations, uses a variety of methods to solve them, and analyzes the solutions in terms of the situation.

(A) The student analyzes situations and formulates systems of linear equations to solve problems.

**39** The Frosty Ice-Cream Shop sells sundaes for \$2 and banana splits for \$3. On a hot summer day, the shop sold 8 more sundaes than banana splits and made \$156. Which system of equations could be used to find the number of sundaes,  $s$ , and banana splits,  $b$ , that the shop sold that day?

**A**       $2s + 3b = 156$   
           $s = b + 8$

**B**       $2b + 3s = 156$   
           $s + b = 8$

**C**       $2s + 3b = 8$   
           $s = b + 156$

**D**       $2s + 3b = 156$   
           $b - s = 8$

## Grade 9

**Objective 5: The student will demonstrate an understanding of quadratic and other nonlinear functions.**

A(d)(1) **Quadratic and other nonlinear functions.** The student understands that the graphs of quadratic functions are affected by the parameters of the function and can interpret and describe the effects of changes in the parameters of quadratic functions.

(C) The student investigates, describes, and predicts the effects of changes in  $c$  on the graph of  $y = x^2 + c$ .

2 How would the graph of the function  $y = x^2 + 4$  be affected if the function were changed to  $y = x^2 + 1$ ?

- F The graph would shift 3 units up.
- G The graph would shift 3 units down.
- H The graph would shift 3 units to the right.
- J The graph would shift 3 units to the left.

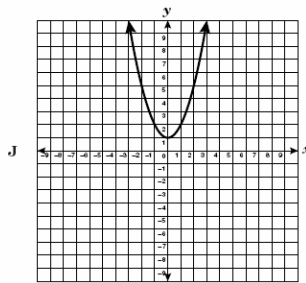
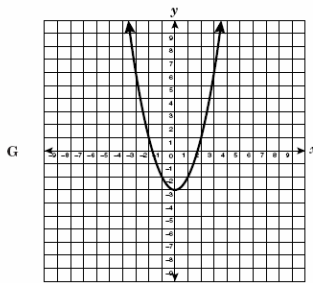
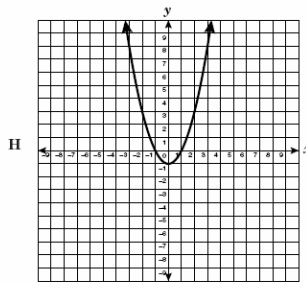
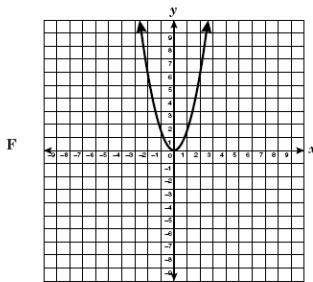
## Grade 9

**Objective 5: The student will demonstrate an understanding of quadratic and other nonlinear functions.**

A(d)(1) **Quadratic and other nonlinear functions.** The student understands that the graphs of quadratic functions are affected by the parameters of the function and can interpret and describe the effects of changes in the parameters of quadratic functions.

(C) The student investigates, describes, and predicts the effects of changes in  $c$  on the graph of  $y = x^2 + c$ .

8 Which graph shows a function  $y = x^2 + c$  when  $c < -1$ ?



**Objective 5: The student will demonstrate an understanding of quadratic and other nonlinear functions.**

A(d)(3) **Quadratic and other nonlinear functions.** The student understands there are situations modeled by functions that are neither linear nor quadratic and models the situations.

(A) The student uses [patterns to generate] the laws of exponents and applies them in problemsolving situations.

9 Which expression is equivalent to  $\frac{(8x^3)(2x^5)}{4x^6}$ ?

- A  $4x^9$
- B  $4x^2$
- C  $2x^8$
- D  $2x^4$

## Grade 9

**Objective 5: The student will demonstrate an understanding of quadratic and other nonlinear functions.**

A(d)(3) **Quadratic and other nonlinear functions.** The student understands there are situations modeled by functions that are neither linear nor quadratic and models the situations.

(A) The student uses [patterns to generate] the laws of exponents and applies them in problemsolving situations.

**44** If  $y = x^3$ , what is equivalent to  $x^{12}$ ?

- F**  $y^{36}$
- G**  $y^{15}$
- H**  $y^9$
- J**  $y^4$

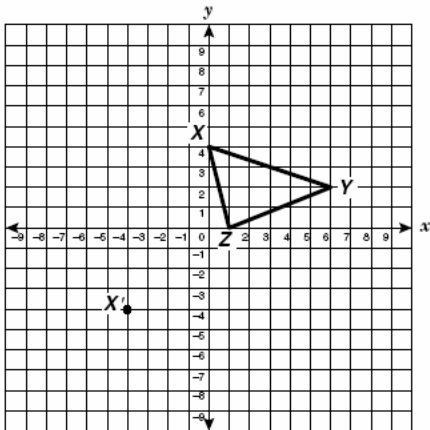
## Grade 9

**Objective 6:** The student will demonstrate an understanding of geometric relationships and spatial reasoning.

(8.6) **Geometry and spatial reasoning.** The student uses transformational geometry to develop spatial sense. The student is expected to

(B) graph dilations, reflections, and translations on a coordinate plane.

6 Triangle  $XYZ$  is translated so that  $X$  is mapped to  $X'$ .



Which coordinate pair best represents  $Y'$  ?

- F**  $(-3, -8)$
- G**  $(2, -7)$
- H**  $(2, -6)$
- J**  $(2, -2)$

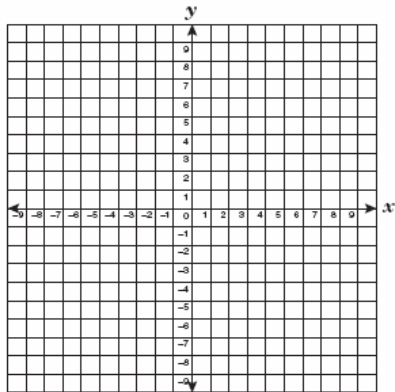
## Grade 9

**Objective 6:** The student will demonstrate an understanding of geometric relationships and spatial reasoning.

(8.6) **Geometry and spatial reasoning.** The student uses transformational geometry to develop spatial sense. The student is expected to

(A) generate similar shapes using dilations including enlargements and reductions;

**18**  $\triangle DFG$  has vertices  $D(2, 4)$ ,  $F(4, 8)$ , and  $G(6, 4)$ .



$\triangle DFG$  is dilated by a scale factor of  $\frac{1}{4}$  and has the origin as the center of dilation. What are the coordinates of  $F'$ ?

- F** (1, 2)
- G**  $(\frac{1}{2}, 1)$
- H** (16, 32)
- J**  $(\frac{3}{2}, 1)$

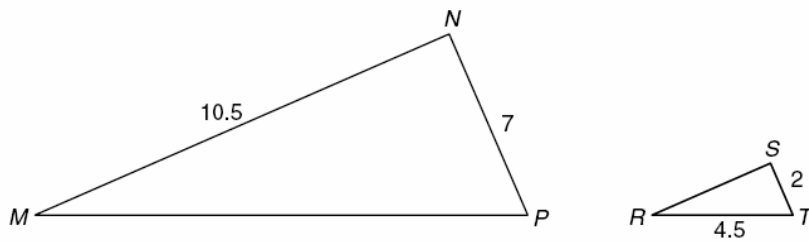
## Grade 9

**Objective 6:** The student will demonstrate an understanding of geometric relationships and spatial reasoning.

(8.6) **Geometry and spatial reasoning.** The student uses transformational geometry to develop spatial sense. The student is expected to

(A) generate similar shapes using dilations including enlargements and reductions;

31  $\triangle MNP \sim \triangle RST$  is shown below.



Which scale factor was used to transform  $\triangle MNP$  to  $\triangle RST$ ?

- A  $\frac{1}{3}$
- B  $\frac{1}{2}$
- C  $\frac{2}{7}$
- D 5

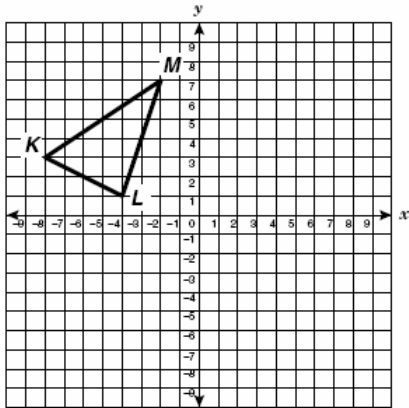
## Grade 9

**Objective 6: The student will demonstrate an understanding of geometric relationships and spatial reasoning.**

(8.7) **Geometry and spatial reasoning.** The student uses geometry to model and describe the physical world. The student is expected to

(D) locate and name points on a coordinate plane using ordered pairs of rational numbers.

52  $\triangle KLM$  has coordinates  $K(-8, 3)$ ,  $L(-4, 1)$ , and  $M(-2, 7)$ . What will be the new coordinates of point M if the triangle is translated 4 units to the right and 3 units down?



- F** (0, -2)
- G** (2, 4)
- H** (-4, 0)
- J** (-6, 4)

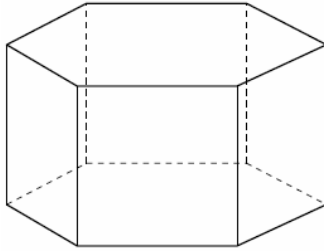
## Grade 9

**Objective 7: The student will demonstrate an understanding of two- and three-dimensional representations of geometric relationships and shapes.**

(8.7) **Geometry and spatial reasoning.** The student uses geometry to model and describe the physical world. The student is expected to

(A) draw solids from different perspectives;

4 The drawing shows a 3-dimensional solid.



Which best represents the shape of the solid when viewed from the top?

- F Pentagon
- G Hexagon
- H Heptagon
- J Octagon

**Objective 7: The student will demonstrate an understanding of two- and three-dimensional representations of geometric relationships and shapes.**

(8.7) **Geometry and spatial reasoning.** The student uses geometry to model and describe the physical world. The student is expected to

(B) use geometric concepts and properties to solve problems in fields such as art and architecture;

30 An artist made a drawing of a house with a tree next to it. The drawing is  $\frac{1}{18}$  the size of the actual house and tree. The tallest point of the house is 12 feet 8 inches, and the tree is 27 feet tall. How many inches tall is the tree in the drawing?

- F 8.4 in.
- G 18 in.
- H 23.4 in.
- J 486 in.

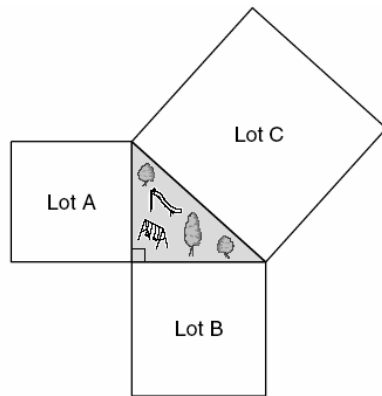
## Grade 9

**Objective 7: The student will demonstrate an understanding of two- and three-dimensional representations of geometric relationships and shapes.**

(8.7) **Geometry and spatial reasoning.** The student uses geometry to model and describe the physical world. The student is expected to

(C) use pictures or models to demonstrate the Pythagorean Theorem.

**33** The drawing below shows 3 square parking lots that enclose a grassy area shaped like a right triangle.



If Lot A's perimeter is 300 yards and Lot B's perimeter is 400 yards, what is the perimeter of Lot C?

- A 500 yd
- B 700 yd
- C 1400 yd
- D 2000 yd

**Objective 7: The student will demonstrate an understanding of two- and three-dimensional representations of geometric relationships and shapes.**

(8.7) **Geometry and spatial reasoning.** The student uses geometry to model and describe the physical world. The student is expected to

(B) use geometric concepts and properties to solve problems in fields such as art and architecture;

**49** Ms. Hill wants to carpet her rectangular living room, which measures 14 feet by 11 feet. If the carpet she wants to purchase costs \$1.50 per square foot, including tax, how much will it cost to carpet her living room?

- A \$50
- B \$75
- C \$154
- D \$231

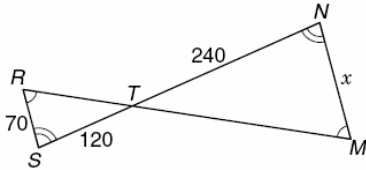
## Grade 9

**Objective 8: The student will demonstrate an understanding of the concepts and uses of measurement and similarity.**

(8.9) **Measurement.** The student uses indirect measurement to solve problems. The student is expected to

(B) use proportional relationships in similar shapes to find missing measurements.

1 If  $\triangle TSR$  is similar to  $\triangle TNM$ , what is the length of  $x$ ?



- A 240 units
- B 140 units
- C 120 units
- D 70 units

**Objective 8: The student will demonstrate an understanding of the concepts and uses of measurement and similarity.**

(8.8) **Measurement.** The student uses procedures to determine measures of solids. The student is expected to

(C) estimate answers and use formulas to solve application problems involving surface area and volume.

22 A cylindrical water tank has a radius of 2.8 feet and a height of 5.6 feet. The water tank is filled to the top. If water can be pumped out at a rate of 36 cubic feet per minute, about how long will it take to empty the water tank?

- F 3 h
- G 2 h
- H 4 min
- J 1 min

## Grade 9

**Objective 8: The student will demonstrate an understanding of the concepts and uses of measurement and similarity.**

(8.9) **Measurement.** The student uses indirect measurement to solve problems. The student is expected to

(A) use the Pythagorean Theorem to solve real-life problems;

**26** A square park has a diagonal walkway from 1 corner to another. If the walkway is about 38 yards long, what is the approximate length of each side of the park?

- F** 6 yd
- G** 19 yd
- H** 27 yd
- J** 54 yd

**Objective 8: The student will demonstrate an understanding of the concepts and uses of measurement and similarity.**

(8.10) **Measurement.** The student describes how changes in dimensions affect linear, area, and volume measures. The student is expected to

(A) describe the resulting effects on perimeter and area when dimensions of a shape are changed proportionally;

**29** Tony and Edwin each built a rectangular garden. Tony's garden is twice as long and twice as wide as Edwin's garden. If the area of Edwin's garden is 600 square feet, what is the area of Tony's garden?

- A** 1200 ft<sup>2</sup>
- B** 2400 ft<sup>2</sup>
- C** 3600 ft<sup>2</sup>
- D** 4800 ft<sup>2</sup>

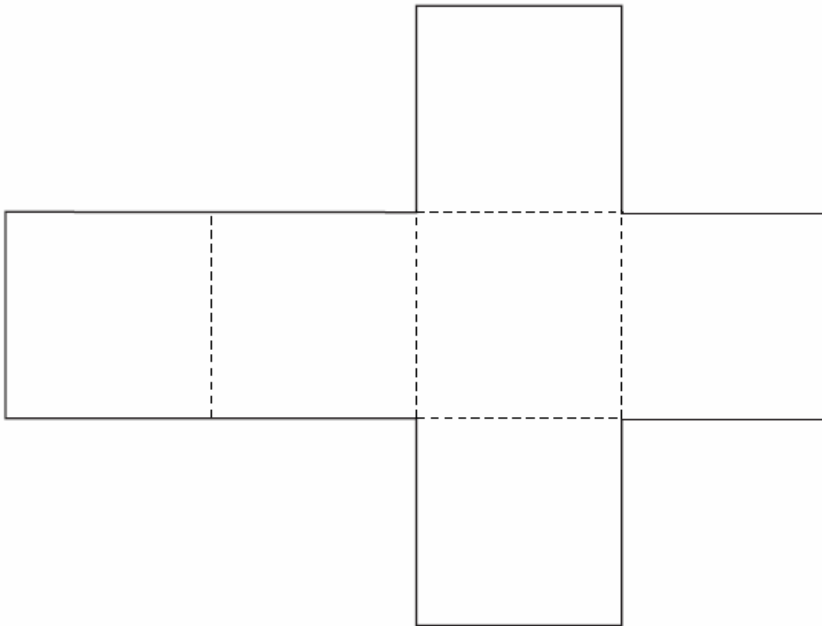
## Grade 9

**Objective 8: The student will demonstrate an understanding of the concepts and uses of measurement and similarity.**

(8.8) **Measurement.** The student uses procedures to determine measures of solids. The student is expected to

(A) find surface area of prisms and cylinders using [concrete] models and nets (two-dimensional models);

35 The net of a cube is shown below.



SCALE OF DIAGRAM ALTERED IN DUPLICATION

Use the ruler on the Mathematics Chart to measure the dimensions of the cube to the nearest  $\frac{1}{4}$  inch. Find the surface area of the cube to the nearest square inch.

- A      $2 \text{ in.}^2$
- B      $9 \text{ in.}^2$
- C      $14 \text{ in.}^2$
- D      $18 \text{ in.}^2$

## Grade 9

**Objective 8: The student will demonstrate an understanding of the concepts and uses of measurement and similarity.**

(8.10) **Measurement.** The student describes how changes in dimensions affect linear, area, and volume measures. The student is expected to

(A) describe the resulting effects on perimeter and area when dimensions of a shape are changed proportionally;

**37** The scale factor of two similar polygons is 2:3. The perimeter of the larger polygon is 150 centimeters. What is the perimeter of the smaller polygon?

- A** 100 cm
- B** 75 cm
- C** 50 cm
- D** 150 cm

## Grade 9

**Objective 9: The student will demonstrate an understanding of percents, proportional relationships, probability, and statistics in application problems.**

(8.13) **Probability and statistics.** The student evaluates predictions and conclusions based on statistical data. The student is expected to

(B) recognize misuses of graphical or numerical information and evaluate predictions and conclusions based on data analysis.

3 The table shows the results of a survey given to 450 graduating seniors about their educational plans after high school.

Educational Plans

Institution	Percent
University	44
Community college	26
Technical school	15
Undecided	15

Based on these data, which of the following statements is true?

- A Only 15 students have no future educational plans.
- B More students plan to attend a community college or technical school than plan to attend a university.
- C Fewer than half of the students plan to attend a university.
- D Fewer than one-fourth of the students plan to attend a community college.

**Objective 9: The student will demonstrate an understanding of percents, proportional relationships, probability, and statistics in application problems.**

(8.3) **Patterns, relationships, and algebraic thinking.** The student identifies proportional relationships in problem situations and solves problems. The student is expected to

(B) estimate and find solutions to application problems involving percents and proportional relationships such as similarity and rates.

11 Antonio works 40 hours per week at Electronics Warehouse. He earns \$6.50 per hour plus a 3% commission on the total dollar value of the service contracts he sells. If Antonio's hourly rate were increased by \$0.15 and his commission were raised to 5%, how much would he earn if he sold \$4000 worth of service contracts for the week?

- A \$126.50
- B \$206.65
- C \$466.00
- D \$580.00

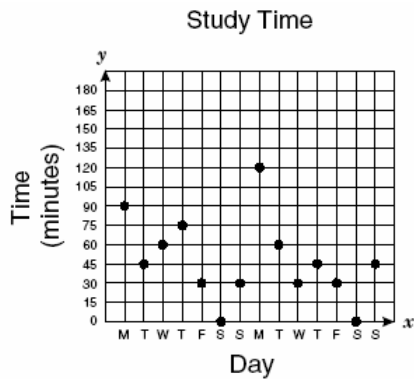
## Grade 9

**Objective 9: The student will demonstrate an understanding of percents, proportional relationships, probability, and statistics in application problems.**

(8.13) **Probability and statistics.** The student evaluates predictions and conclusions based on statistical data. The student is expected to

(B) recognize misuses of graphical or numerical information and evaluate predictions and conclusions based on data analysis.

**14** The graph below shows the amount of time Dennis spent studying over a 2-week period in October.



Which of the following statements would be an invalid conclusion for these data?

- F** Dennis spent a total of 660 minutes studying.
- G** Dennis studied for an average of about 47 minutes per day.
- H** Dennis studied for an average of 330 minutes per week.
- J** Dennis earned good grades during this 2-week period.

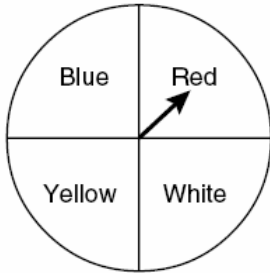
## Grade 9

**Objective 9: The student will demonstrate an understanding of percents, proportional relationships, probability, and statistics in application problems.**

(8.11) **Probability and statistics.** The student applies concepts of theoretical and experimental probability to make predictions. The student is expected to

(B) use theoretical probabilities and experimental results to make predictions and decisions.

32 A spinner was spun 20 times. The results are shown in the table below.



Spinner Results

Red	7
White	5
Blue	4
Yellow	4

Which color on the spinner has the same experimental probability as theoretical probability?

- F Red
- G White
- H Blue
- J Yellow

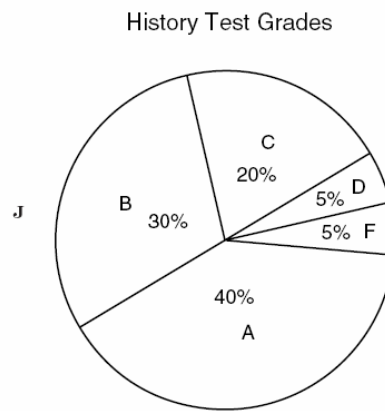
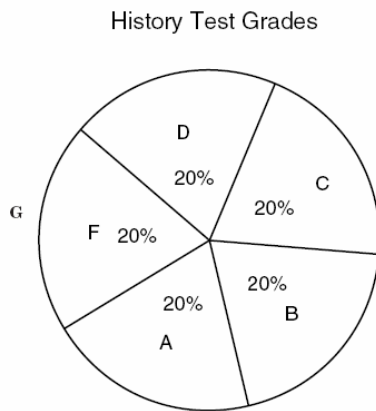
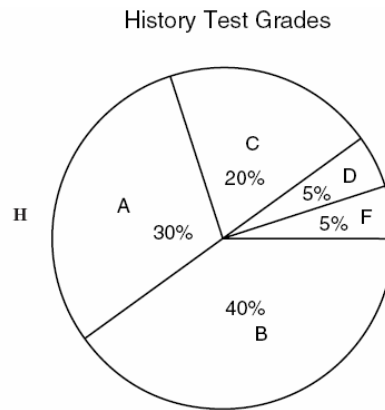
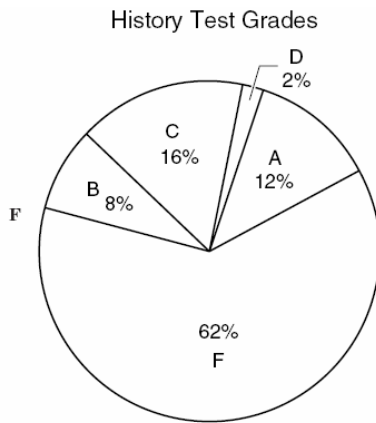
## Grade 9

**Objective 9: The student will demonstrate an understanding of percents, proportional relationships, probability, and statistics in application problems.**

(8.12) **Probability and statistics.** The student uses statistical procedures to describe data. The student is expected to

(C) construct circle graphs, bar graphs, and histograms, with and without technology.

**40** Students in two honors history classes took their first test. Of 40 students taking the test, 12 received an A, 16 received a B, 8 received a C, 2 received a D, and the remaining received an F. Which circle graph best represents these data?



## Grade 9

**Objective 10: The student will demonstrate an understanding of the mathematical processes and tools used in problem solving.**

(8.16) **Underlying processes and mathematical tools.** The student uses logical reasoning to make conjectures and verify conclusions. The student is expected to

(A) make conjectures from patterns or sets of examples and nonexamples;

**12** The figure below shows a partial view of Pascal's triangle.

### Pascal's Triangle

Row 1:				1					
Row 2:			1		1				
Row 3:			1		2		1		
Row 4:		1		3		3		1	
Row 5:	1		4		6		4		1

Which row of numbers best represents the seventh row in Pascal's triangle?

- F** 1 5 10 10 5 1
- G** 1 6 15 20 15 6 1
- H** 1 7 21 35 35 21 7 1
- J** 1 8 28 56 70 56 28 9 1

**Objective 10: The student will demonstrate an understanding of the mathematical processes and tools used in problem solving.**

(8.16) **Underlying processes and mathematical tools.** The student uses logical reasoning to make conjectures and verify conclusions. The student is expected to

(A) make conjectures from patterns or sets of examples and nonexamples;

**15** Mr. Collins invested some money that will double in value every 12 years. If he invested \$5,000 on the day of his daughter's birth, how much will the investment be worth on his daughter's 60th birthday?

- A** \$300,000
- B** \$160,000
- C** \$80,000
- D** \$320,000




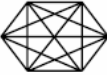
## Grade 9

**Objective 10: The student will demonstrate an understanding of the mathematical processes and tools used in problem solving.**

(8.16) **Underlying processes and mathematical tools.** The student uses logical reasoning to make conjectures and verify conclusions. The student is expected to

(A) make conjectures from patterns or sets of examples and nonexamples;

21 The table below shows the number of sides and diagonals in certain polygons.

Number of Sides	Diagram	Number of Diagonals
3		0
4		2
5		5
6		9

Based on the table, how many diagonals should a 9-sided convex polygon have?

Record your answer and fill in the bubbles on your answer document. Be sure to use the correct place value.

**Objective 10: The student will demonstrate an understanding of the mathematical processes and tools used in problem solving.**

(8.15) **Underlying processes and mathematical tools.** The student communicates about Grade 8 mathematics through informal and mathematical language, representations, and models. The student is expected to

(A) communicate mathematical ideas using language, efficient tools, appropriate units, and graphical, numerical, physical, or algebraic mathematical models.

23 The amount of material needed to make a basketball best represents the ball's —

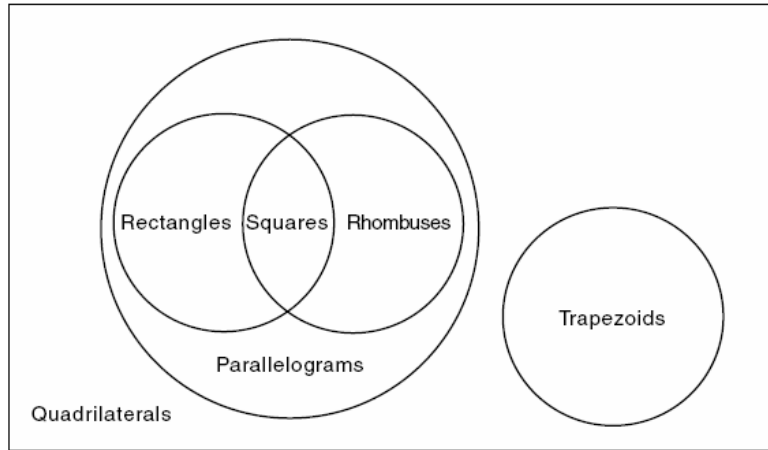
- A volume
- B surface area
- C circumference
- D perimeter

## Grade 9

**Objective 10: The student will demonstrate an understanding of the mathematical processes and tools used in problem solving.**

(8.16) **Underlying processes and mathematical tools.** The student uses logical reasoning to make conjectures and verify conclusions. The student is expected to

(A) make conjectures from patterns or sets of examples and nonexamples;



25 Which of the following is a valid conclusion based on the diagram shown above?

- A All rhombuses are squares.
- B All rhombuses are rectangles.
- C All quadrilaterals are parallelograms.
- D All rectangles are parallelograms.

## Grade 9

**Objective 10: The student will demonstrate an understanding of the mathematical processes and tools used in problem solving.**

(8.16) **Underlying processes and mathematical tools.** The student uses logical reasoning to make conjectures and verify conclusions. The student is expected to

(B) validate his/her conclusions using mathematical properties and relationships.

**28** Sean is an Algebra I student who believes that  $xy^2 = (xy)^2$ . Rudy informs Sean that this theory is not always true. Which pair of values for  $x$  and  $y$  could Rudy use to disprove Sean's theory?

**F**  $x = 0$  and  $y = 2$

**G**  $x = 1$  and  $y = 2$

**H**  $x = 2$  and  $y = 0$

**J**  $x = 2$  and  $y = 1$

**Objective 10: The student will demonstrate an understanding of the mathematical processes and tools used in problem solving.**

(8.14) **Underlying processes and mathematical tools.** The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. The student is expected to

(A) identify and apply mathematics to everyday experiences, to activities in and outside of school, with other disciplines, and with other mathematical topics;

**38** Adam's age is 4 years less than twice Blanca's age. If Adam is 16 years old, which equation can be used to determine Blanca's age?

**F**  $2(x - 4) = 16$

**G**  $2x - 4 = 16$

**H**  $4 - 2x = 16$

**J**  $2(4 - x) = 16$

## Grade 9

**Objective 10: The student will demonstrate an understanding of the mathematical processes and tools used in problem solving.**

(8.14) **Underlying processes and mathematical tools.** The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. The student is expected to

(C) select or develop an appropriate problem-solving strategy from a variety of different types, including drawing a picture, looking for a pattern, systematic guessing and checking, acting it out, making a table, working a simpler problem, or working backwards to solve a problem.

**48** Jake's square backyard covers an area of 104 square meters. How can Jake best determine the length of each side of his backyard?

- F** Divide the area by the number of sides
- G** Square the area
- H** Find the square root of the area
- J** Divide the area in half

**Objective 10: The student will demonstrate an understanding of the mathematical processes and tools used in problem solving.**

(8.15) **Underlying processes and mathematical tools.** The student communicates about Grade 8 mathematics through informal and mathematical language, representations, and models. The student is expected to

(A) communicate mathematical ideas using language, efficient tools, appropriate units, and graphical, numerical, physical, or algebraic mathematical models.

**51** A middle school band must be at the contest site by 8:00 A.M. to participate in a competition. It takes 45 minutes to load the bus with the band's equipment, and it takes 1 hour 45 minutes to travel to the contest site. What should be the first step in determining the band's departure time?

- A** Add the time it takes to travel to the contest site to 8:00 A.M.
- B** Add the time it takes to load the bus to 8:00 A.M.
- C** Add the travel time and loading time together
- D** Subtract the loading time from the travel time

**Grade: 09**  
**Subject: Mathematics**  
**Administration: April 2004**

Item Number	Correct Answer	Objective Measured	Student Expectations
01	B	08	8.9 (B)
02	G	05	A.D1 (C)
03	C	09	8.13 (B)
04	G	07	8.7 (A)
05	D	04	A.C3 (C)
06	H	06	8.6 (B)
07	C	04	A.C3 (A)
08	G	05	A.D1 (C)
09	B	05	A.D3 (A)
10	F	03	A.C2 (D)
11	C	09	8.3 (B)
12	G	10	8.16 (A)
13	D	03	A.C1 (C)
14	J	09	8.13 (B)
15	B	10	8.16 (A)
16	F	02	A.B4 (A)
17	B	04	A.C3 (B)
18	F	06	8.6 (A)
19	B	03	A.C2 (A)
20	F	02	A.B4 (B)
21	27	10	8.16 (A)
22	H	08	8.8 (C)
23	B	10	8.15 (A)
24	F	01	A.B1 (D)
25	D	10	8.16 (A)
26	H	08	8.9 (A)
27	C	01	A.B1 (C)
28	J	10	8.16 (B)
29	B	08	8.10 (A)
30	G	07	8.7 (B)
31	C	06	8.6 (A)
32	G	09	8.11 (B)
33	A	07	8.7 (C)
34	G	03	A.C2 (B)
35	B	08	8.8 (A)
36	F	04	A.C3 (B)
37	A	08	8.10 (A)
38	G	10	8.14 (A)
39	A	04	A.C4 (A)
40	H	09	8.12 (C)
41	D	01	A.B1 (B)
42	G	03	A.C2 (E)
43	D	02	A.B3 (B)
44	J	05	A.D3 (A)
45	A	02	A.B3 (A)
46	J	01	A.B1 (E)
47	D	02	A.B2 (C)
48	H	10	8.14 (C)
49	D	07	8.7 (B)
50	H	01	A.B1 (B)
51	C	10	8.15 (A)
52	G	06	8.7 (D)