

INSTRUCTIONAL MATERIALS for the Criterion Referenced Test



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MATHEMATICS GRADE 8



Which table shows a relationship between the values of *x* and *y* that represents a linear function?







1	r	-
	1	1
л	L	,

x	у	
-2	-8	
0	0	
3	27	

2

Mario draws 2 circles.

- The larger circle has a radius of 5 centimeters (cm).
- The smaller circle has a radius of 2 cm.

Which is **closest** to the difference between the circumferences of Mario's circles?

- A 18 cm
- **B** 19 cm
- **C** 24 cm
- **D** 25 cm
- **3** The graph below shows Anna's distance from her home during each hour of a bike ride.



During which hour was Anna traveling toward her home?

- A the first hour
- **B** the second hour
- **C** the fourth hour
- **D** the sixth hour



4 Students from grades 6, 7, and 8 were asked their opinion about lengthening the school day. The results are summarized in the table below.

	For	Against	No Opinion	Total
Grade 6	25	60	15	100
Grade 7	40	50	10	100
Grade 8	50	50	0	100
Total	115	160	25	300

School Day Lengthening

Based on the information shown in the table, which statement about the students' opinions is true?

- A Younger students are more likely to be for lengthening the school day than older students.
- **B** Older students are more likely to be for lengthening the school day than younger students.
- **C** Grade 7 students are more likely to be against lengthening the school day than students from any other grade.
- **D** Grade 8 students are more likely to be against lengthening the school day than students from any other grade.

5 Which equation has infinitely many solutions?

- A 3x 5 = 3(5 + x)
- **B** 3x 5 = 3(5 x)
- **C** 5(x+3) = 3(x+5)
- **D** 5(x-3) = -5(3-x)

A tutor is paid \$12.50 for each hour he works. Which function models the relationship between the number of hours the tutor works (x) and the total amount, in dollars, he is paid (y)?

$$\mathbf{A} \quad y = 12.50x$$

B
$$y = 12.50 + x$$

C
$$x = 12.50y$$

D x = 12.50 + y



Write your answer to Question 7 on a separate sheet of paper. Be sure to answer Parts A and B.

7

Peter compares the speeds of copier A and copier B. The total amount of time it takes to make copies using each copier includes some setup time plus time to actually make the copies.

- The table below shows the total amount of time it takes to make different numbers of copies using copier A .
- The equation below describes the relationship between the number of copies (*c*) and the total amount of time (*t*), in seconds, it takes to make copies using copier B.

Copier B

t = 1.6c + 20

Number of Copies	Total Amount of Time (seconds)
10	50
30	90
40	110
70	170
100	230

Copier A

- A After the copiers are set up, how much faster, in seconds, is copier B than copier A at making 1 copy? Show your work or explain your thinking.
- **B** Peter determines that the total amount of time to make 350 copies using copier B is 2.5 **minutes** less than the total amount of time to make 350 copies using copier A . Show **and** explain why Peter is correct.



An equation is shown below. 8

 $\frac{1}{6}(36x-12)-5x=10$

What value of *x* makes the equation true?

- Α -2
- 8 B
- С 12
- **D** 22

A function is	graphed	below.
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The *x*-axis represents time. Which situation is **most** likely represented by this function?

- **A** the total distance, in yards, that a student walked from her home to school and back to her home on Monday
- **B** the value, in dollars, of a stock that increased and decreased several times during a week
- **C** the speed, in miles per hour, of a wind that blew at a constant rate for a while. then became calm for a few hours, and then blew again at the same constant rate as it first blew, but in the opposite direction
- **D** the height above sea level, in feet, of an airplane that took off, reached a certain altitude, traveled at that altitude for a while, and then landed

10

The shortest distance between point A and point B on a coordinate plane is 5 units. The ordered pair (-1, 1) describes the location of point A. Which ordered pair could describe the location of point B?

- A (-6, 6)
- **B** (-4, 3) **C** (3, -2)
- **D** (11, -12)
- Tara surveys several companies to 11 determine how much they charge for renting different numbers of tables. She uses the survey information to develop a model that can be used to predict the total charge (y), in dollars, for renting x tables. Tara's model is represented by the equation y = 75.00 + 16.65x. Based on Tara's model, which statement about the total charge for renting tables is true?
 - A Renting each additional table increases the total charge by \$16.65.
 - **B** Renting each additional table increases the total charge by \$75.00.
 - **C** The total charge for renting 2 tables is twice the total charge for renting 1 table.
 - **D** The total charge for renting 1 table is less than half the total charge for renting 4 tables.



12 The graph below shows the relationship between the number of minutes (*x*) after a water container begins to empty and the number of gallons of water (*y*) remaining in the container.



Which equation could represent a water container that empties at a **faster** rate than the container represented in the graph?

A $y = \frac{1}{2}x + 1$ **B** $y = -\frac{2}{3}x + 1$ **C** $y = -\frac{5}{4}x + 4$ **D** $y = \frac{8}{5}x + 4$



The table below shows the age and height of each tree planted on a school's grounds.

Trees on School Grounds

Age (years)	Height (feet)
1	4
2	7
4	12
3	9
5	15
1	5
4	13
2	6
6	19

A scatter plot is correctly made from the data in the table. Which is shown on the scatter plot?

- A 1 outlier and 3 data clusters
- **B** 1 outlier and no data clusters
- C no outliers and 3 data clusters
- **D** no outliers and no data clusters



Write your answer to Question 14 on a separate sheet of paper. Be sure to answer Parts A and B.

- **14** A student is studying the currencies of other countries. He learns that in a certain country, U.S. dollars can be exchanged for pesos at a rate of 1 U.S. dollar for 4.5 pesos.
 - A Copy the coordinate grid below on a separate sheet of paper.



Create a graph on the coordinate grid that shows the relationship between the number of U.S. dollars and the number of pesos. Write an equation that describes the relationship between the number of U.S. dollars (x) and the number of pesos (y).

B The student wants to change the coordinate grid so that the axes are reversed. The number of pesos will be on the *x*-axis, and the number of U.S. dollars will be on the *y*-axis. Explain how the slope of the graph from **Part A** will change when the axes are reversed. Also, explain why the *y*-intercept of the graph will **not** change.



- **15** A cone has a circular base with a radius of 6 cm. The height of the cone is 12 cm. What is the volume of the cone?
 - A 24π cm³
 - **B** 36π cm³
 - C 144 π cm³
 - **D** 288π cm³
- A campground charges \$14 per night plus a one-time fee of \$20 to camp. Which function shows the relationship between the number of nights spent at the campground (x) and the total charge (y), in dollars, to camp?
 - $\mathbf{A} \quad x = 14y + 20$
 - $\mathbf{B} \quad y = 14x + 20$
 - **C** x = 20y + 14
 - **D** y = 20x + 14



Between which two labeled points is the function increasing?

- $\mathbf{A} \quad F \text{ and } G$
- **B** G and H
- **C** H and J
- **D** J and K



18 The scatter plot below shows the temperatures at different altitudes in an area.



Temperature by Altitude

Which line **best** models the data shown in the scatter plot?

- A the vertical line that intersects the *x*-axis at 3,000
- **B** the horizontal line that intersects the *y*-axis at 55
- C the line that passes through the origin and (4000, 50)
- **D** the line that passes through (0, 70) and (8000, 0)



19 A linear function passes through the points (-3, 14) and (2, -1). What is the rate of change of the function?

A -13

B
$$-\frac{17}{3}$$

C -3

D
$$-\frac{3}{17}$$

20

A square garden has an area of 36 square meters. The equation below can be used to determine the length (x), in meters, of each side of the garden.

 $x^2 = 36$

Which expression represents the length of each side of the garden?

- A $\sqrt{36}$ meters
- **B** $36 \div 2$ meters
- C 36•2 meters
- **D** 36^2 meters



Sara takes a train trip. She records the distance of the train from the train station over several hours, as represented in the graph below.



At what average speed, in miles per hour (mph), does the train travel away from the station?

- A 18 mph
- **B** 25 mph
- **C** 50 mph
- **D** 75 mph



Write your answer to Question 22 on a separate sheet of paper. Be sure to answer Parts A and B.

A group of 50 students is surveyed. The students are asked whether or not they own a bicycle and whether or not they play sports. The two-way table below shows some of the results of the survey.

Survey	Results

	Owns a Bicycle	Does Not Own a Bicycle
Plays Sports	?	5
Does Not Play Sports	3	18

- A Without calculating any percents, explain why the percent of all the students who play sports but do not own a bicycle is less than the percent of all the students who do not own a bicycle but play sports, even though the number of these students is the same.
- **B** Using relative frequencies, explain why there appears to be a positive association between owning a bicycle and playing sports.



23 The point (3, -4) lies on a line that intercepts the *y*-axis at -6. What is the equation of the line?

A
$$y = -\frac{4}{3}x - 6$$

B $y = -\frac{4}{9}x - 6$
C $y = \frac{2}{3}x - 6$
D $y = \frac{10}{3}x - 6$

24

A flagpole is 20 feet (ft) tall. A 50 ft wire is stretched from the top of the flagpole to a point on the ground, as pictured below.



Which is **closest** to the distance from the base of the flagpole to the point where the wire touches the ground?

- **A** 8 ft
- **B** 30 ft
- **C** 46 ft
- **D** 54 ft



The scatter plot below shows the distance some garden snails traveled and the amount of time each snail spent traveling.



A linear model of the data is shown on the scatter plot. What does the slope of the linear model represent?

- A the total amount of time each snail traveled
- **B** the total distance each snail traveled
- **C** the amount of time, in hours, it would take a snail to travel one mile
- **D** the average speed, in miles per hour, of the snails



26

Which set of ordered pairs does **not** represent a function?

27

An animal cell has a diameter of 1×10^{-5} meter. A bacterium has a diameter of 2×10^{-7} meter. How many times as great is the diameter of the animal cell as the diameter of the bacterium?

- A 5×10^1 times
- **B** 1×10^2 times
- C 2×10^2 times
- **D** 5×10^3 times

28

Marianne has a mound of snow in her driveway. The mound is in the shape of a cone with a diameter of 4 feet and a height of h feet. Marianne makes spherical snowballs with a radius of r feet from the snow. Which expression could be used to determine the maximum number of snowballs Marianne can make from the snow in the mound?

$$\mathbf{A} \quad \frac{h}{r^2}$$
$$\mathbf{B} \quad \frac{h}{r^3}$$
$$\mathbf{C} \quad \frac{2h}{r^3}$$
$$\mathbf{D} \quad \frac{4h}{r^3}$$



A group of 400 people is surveyed. The people are asked whether their hair is short or long, and whether they would select a comb or a brush as a gift. The two-way table below shows the results of the survey.

Gift Selections

	Comb	Brush
Short Hair (≤ 6 inches)	120	30
Long Hair (> 6 inches)	120	130

Which two-way table shows the relative frequency of people with short hair who selected each gift and the relative frequency of people with long hair who selected each gift?

	Comb	Brush
Short Hair (≤ 6 inches)	0.8	0.1875
Long Hair (> 6 inches)	0.2	0.8125

C Gift Selections

	Comb	Brush
Short Hair (≤ 6 inches)	0.5	0.1875
Long Hair (> 6 inches)	0.5	0.8125

B

Gift Selections

	Comb	Brush
Short Hair (≤ 6 inches)	0.3	0.075
Long Hair (> 6 inches)	0.3	0.325

D

Gift Selections

	Comb	Brush
Short Hair (≤ 6 inches)	0.8	0.2
Long Hair (> 6 inches)	0.48	0.52



Write your answer to Question 30 on a separate sheet of paper. Be sure to answer Parts A and B.

30 The graph below shows the number of gallons of fuel remaining (y) in a fuel tank as a function of the number of hours (x) the tank has been draining during the first 5 hours the tank drains.



Draining Fuel Tank

- A Write an equation that describes the function. Show your work or explain your thinking.
- **B** After the first 5 hours, the rate at which the fuel tank drains increases by 5 gallons per hour. The tank continues draining at this rate until empty. Determine the **total** number of hours it takes for the tank to be completely emptied. Show your work **and** explain your thinking.





Larry creates two linear functions of x. Function 1 is represented by the table below.

Function 1

x	1	4	7	9	10
у	4	10	16	20	22

Function 2 is described by the equation below.

Function 2: y = 3x - 1

Which statement about the functions is true?

- **A** The *y*-intercept of function 1 is greater than the *y*-intercept of function 2.
- **B** The value of function 1 is less than the value of function 2 for every value of x.
- **C** The rate of change of function 1 is greater than the rate of change of function 2.
- **D** The rate of change of function 1 varies, while the rate of change of function 2 remains constant.



The scatter plot below shows the different amounts of gasoline people purchased at different prices per gallon.



Based on the scatter plot, which statement is true?

- A The data set does not contain any outliers.
- **B** There is a positive association between the number of gallons purchased and the price per gallon.
- **C** There is a negative association between the number of gallons purchased and the price per gallon.
- **D** A data cluster is shown when the number of gallons purchased is highest and the price per gallon is lowest.



A group of 66 students was asked about the number of hours of sleep they got the night before a test and their grade on the test. The number of hours of sleep was rounded to the nearest whole number. The two-way frequency table below shows the results of the survey.

Amount of	Test Grade					
Sleep (hours)	Less than B	B or Better	Total			
4 to 6	17	8	25			
7 to 9	17	24	41			
Total	34	32	66			

Sleep and Test Grades

Which conclusion about students who got 7 to 9 hours of sleep can be drawn from this data?

- A They are more likely to have a test grade of B or better than students who got 4 to 6 hours of sleep because the total number of students increases as the number of hours of sleep increases.
- **B** They are equally likely to have a test grade of less than B than a test grade of B or better because the relative frequency of all students who have a test grade of less than B is the same for all numbers of hours of sleep.
- **C** They are more likely to have a test grade of B or better than students who got 4 to 6 hours of sleep because the relative frequency of all students who have a test grade of B or better increases as the number of hours of sleep increases.
- **D** They are equally likely to have a test grade of less than B than a test grade of B or better because the total number of students who have a test grade of less than B is almost equal to the total number of students who have a test grade of B or better.



- **34** A line segment is drawn on a coordinate plane. The endpoints of the line segment are (-3, 6) and (3, -4). What is the length of the line segment?
 - A $2\sqrt{10}$ units
 - **B** 8 units
 - C $2\sqrt{34}$ units
 - **D** 16 units
- **35** Which number line shows a point graphed closest to $2\sqrt{2}$?



36 Which expression is equivalent to -64 ?

- **A** -3^4 **B** -4^3
- **D** -4**C** 8^{-2}
- $D 64^{\circ}$



The table below shows the data collected by a student observing a species of plant.

Plant Observations

Height (inches)	Number of Leaves
5	15
10	30
13	39

Based on the information shown in the table, which of these **best** describes the relationship between the change in the height of a plant from this species and the change in the number of leaves it has?

- A For every 1 inch in height the plant grows, it adds 3 leaves.
- **B** For every 3 inches in height the plant grows, it adds 1 leaf.
- **C** For every 1 leaf the plant grows, it gains 1 inch in height.
- **D** For every 3 leaves the plant grows, it gains 5 inches in height.



Write your answer to Question 38 on a separate sheet of paper. Be sure to answer Parts A and B.

38 Frank is training for a bicycle race. The graph on the coordinate grid below shows the relationship between the number of hours Frank rides and the number of miles he travels during a training ride.



Frank's Training Ride

- A Explain why the slope of the graph represents the speed at which Frank rides his bicycle during the training ride. As part of the explanation, determine the speed, in miles per hour, at which Frank rides.
- **B** During the race, Frank rides his bicycle at a constant speed.
 - The graph representing Frank's ride during the race is steeper than the graph representing Frank's training ride.
 - The vertical distance between the graphs at 5 hours is 15 units.

Determine the difference between the numbers of miles Frank travels after riding for 6 hours at his training speed and after riding for 6 hours at his racing speed. Explain your thinking.



39

The number of calories Jane burns while swimming is proportional to the number of minutes she swims, as represented in the graph below.

Calories Jane Burns While Swimming



Lamar burns 12.5 calories each minute he swims. Which statement about the swimmers is true?

- **A** Jane burns more calories each minute than Lamar does.
- **B** Lamar burns more calories during the first minute than Jane does.
- **C** Jane's rate of burning calories increases over time, while Lamar's is constant.
- **D** Lamar's rate of burning calories is equal to Jane's.

40

A rover on Mars sends a signal to Earth at a speed of 299792 kilometers per second. The distance the signal travels is approximately 6×10^7 kilometers. Which is **closest** to the amount of time it takes the signal to travel from Mars to Earth?

- 20 seconds Α
- 50 seconds B
- C 200 seconds
- **D** 400 seconds
- The table below shows the balance in 41 Adyn's bank account for each of the past 4 months since she opened the account.

Adyn's Bank Account

Month (x)	Balance in Dollars (y)
1	500
2	800
3	1,100
4	1,400

Which function models the relationship between the number of months since Adyn opened the account and the balance, in dollars, in her account?

- A y = 200 + 300x
- **B** y = 300x
- **C** y = 500 + 300x
- **D** y = 500x



42 Tara is given a drawing of triangle *RST*. She is told that $r^2 + s^2 = t^2$. Tara has to show that triangle *RST* **must** be a right triangle. Tara draws **right** triangle *JKL* and makes the lengths of the legs of triangle *JKL* the same as the lengths of two of the sides of triangle *RST*. Triangle *RST* and triangle *JKL* are shown below.



Since triangle *JKL* is a right triangle, Tara knows that $r^2 + s^2 = n^2$ by using the Pythagorean theorem. Since $r^2 + s^2 = t^2$ and $r^2 + s^2 = n^2$, it must be that $t^2 = n^2$ and t = n. So Tara has shown that the lengths of the sides of triangle *RST* and right triangle *JKL* are the same. Which conclusion can Tara make to show that triangle *RST* is a right triangle?

- A Since the lengths of the sides of both triangles are the same, the areas of the triangles must be the same, so angle *T* must be a right angle and triangle *RST* must be a right triangle.
- **B** Since the lengths of the sides of both triangles are the same, the sum of the measures of the angles in both triangles must be the same, so angle T must be a right angle and triangle *RST* must be a right triangle.
- C Since the lengths of the sides of both triangles are the same, the measures of all the angles in both triangles must be the same. Since angle L is a right angle, all the angles in both triangles, including angle T, must be right angles, so triangle *RST* must be a right triangle.
- **D** Since the lengths of the sides of both triangles are the same, the measures of the corresponding angles of the triangles must be the same. Since angle L is a right angle, angle T must also be a right angle and triangle *RST* must be a right triangle.



43 The graph below shows a function that represents the relationship between the number of pounds of beans purchased and the cost per pound of the beans.



Which statement describes the function?

- A As the number of pounds of beans purchased increases, the cost per pound decreases linearly.
- **B** As the number of pounds of beans purchased increases, the cost per pound increases linearly.
- **C** As the number of pounds of beans purchased increases, the cost per pound decreases nonlinearly.
- **D** As the number of pounds of beans purchased increases, the cost per pound increases nonlinearly.

A scatter plot is shown below.



Which equation **best** models the data shown in the scatter plot?

A $y = -6x + \frac{1}{2}$ **B** $y = -\frac{1}{2}x + 6$

$$\mathbf{C} \quad y = \frac{1}{2}x + 6$$

D
$$y = 6x + 11$$



Write your answer to Question 45 on a separate sheet of paper. Be sure to answer Parts A and B.

45 The table below shows the age and average heart rate while exercising for each of 10 people.

Age (years)	19	55	43	28	60	24	33	31	49	52
Heart Rate (number of beats per minute)	127	104	112	130	105	125	120	113	110	110

Average Heart Rate While Exercising

A Copy the coordinate grid below on a separate sheet of paper. Make a scatter plot of the data set in the table on the coordinate grid.



Average Heart Rate While Exercising

B The point (31, 113) is an outlier of the data set. Explain why the age represented by the point is **not** an outlier and the average heart rate represented by the point is **not** an outlier, but the point (31, 113) is an outlier of the data set.



Correct Answers for Multiple-Choice Items

Item Level Data

Item Number	NVACS*	DOK	P-value
1	8.F.3	2	0.32
2	8.NS.2	2	0.27
3	8.F.5	2	0.48
4	8.SP.4	2	0.65
5	8.EE.7a	1	0.35
6	8.F.4	1	0.59
7	8.F.2	3	N/A
8	8.EE.7b	1	0.36
9	8.F.5	2	0.48
10	8.G.8	2	0.19
11	8.SP.3	2	0.47
12	8.F.2	2	0.20
13	8.SP.1	2	0.18
14	8.EE.5	3	N/A
15	8.G.9	1	0.33
16	8.F.4	1	0.62
17	8.F.5	1	0.78
18	8.SP.2	2	0.39
19	8.F.4	1	0.31
20	8.EE.2	1	0.55
21	8.EE.5	2	0.63
22	8.SP.4	3	N/A
23	8.EE.6	2	0.24

Percentage of Students Selecting a Given Response

Α	В	С	D
41%	32% ✓	15%	12%
37 %	27% 🗸	19%	17%
22%	7%	48% ✓	22%
11%	65% ✓	11%	13%
14%	16%	35%	35% ✓
59% ✓	15%	16%	10%
25%	28%	36% ✓	10%
23%	12%	17%	48% ✓
58%	20%	19% 🗸	3%
47% ✓	21%	20%	12%
27%	39%	20% 🗸	13%
31%	21%	30%	18% 🗸
20%	37%	33% 🗸	11%
19%	62% ✓	10%	9%
4%	78% 🗸	12%	5%
16%	22%	22%	39% ✓
24%	23%	31% 🗸	21%
55% ✓	16%	11%	18%
9%	63% ✓	18%	10%
59%	10%	24% 🗸	7%

 \checkmark = Correct Answer

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the item correct

* Nevada Academic Content Standards

P-value is the proportion of students who got

Correct Answers for Multiple-Choice Items (continued)

Item Level Data

Item Number	NVACS*	DOK	P-value
24	8.G.7	1	0.41
25	8.SP.3	2	0.37
26	8.F.1	1	0.40
27	8.EE.3	1	0.10
28	8.G.9	3	0.18
29	8.SP.4	2	0.22
30	8.F.4	3	N/A
31	8.F.2	2	0.29
32	8.SP.1	1	0.27
33	8.SP.4	2	0.44
34	8.G.8	2	0.19
35	8.NS.2	1	0.18
36	8.EE.1	1	0.35
37	8.SP.3	2	0.61
38	8.EE.5	3	N/A
39	8.EE.5	2	0.29
40	8.EE.4	2	0.36
41	8.F.4	2	0.35
42	8.G.6	2	0.31
43	8.F.5	1	0.48
44	8.SP.2	2	0.32
45	8.SP.1	3	N/A

Percentage of Students Selecting a Given Response

А	В	С	D
8%	38%	41% 🗸	12%
12%	17%	34%	37% 🗸
18%	40% 🗸	20%	21%
10% 🗸	42%	39%	8%
24%	18% 🗸	18%	39%
12%	39%	27%	22% 🗸
29% 🗸	23%	23%	24%
14%	15%	27% 🗸	45%
31%	13%	44% 🗸	11%
19%	30%	19% 🗸	31%
19%	34%	28%	18% 🗸
4%	35% ✓	39%	21%
61% 🗸	10%	9%	19%
29% 🗸	15%	35%	21%
25%	22%	36% ✓	16%
35% ✓	29%	27%	8%
22%	23%	23%	31% 🗸
48% 🗸	31%	14%	7%
20%	32% ✓	33%	14%

* Nevada Academic Content Standards

P-value is the proportion of students who got the item correct

 \checkmark = Correct Answer

Detailed objectives for Content Standards and Depth of Knowledge (DOK) descriptions can be found on the Nevada Department of Education web site.