



# NEVADA INSTRUCTIONAL MATERIALS

FOR THE  
NEVADA ACADEMIC CONTENT STANDARDS FOR MATHEMATICS

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# Grade 8

TEACHER EDITION



# Scoring Support Materials

## Grade 8 Mathematics

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## **Introduction**

This document represents the Phase III release of Nevada Instructional Materials. These released materials were developed in collaboration with Nevada educators, the Nevada Department of Education, and WestEd (a nonprofit research development and service agency).

These materials are intended for use in various guided instructional activities to support deep understanding of the Nevada Academic Content Standards (NVACS) for English Language Arts and mathematics based on Common Core. The Nevada Instructional Materials provide educators opportunities to investigate and explore the standards and tasks that are aligned to the standards. The Nevada educators involved in the development of these materials also developed “Teacher Tips” to assist in using these materials as an instructional resource. The Nevada Instructional Materials also provide educators opportunities to investigate and explore the standards and tasks that are aligned to the standards.

While these materials can provide students with practice in responding to a variety of assessment items, it is more important that they are used to help students deepen their understanding of the expectations embedded in the standards. If these instructional materials are used solely as an assessment practice activity, we highly recommend that educators go over each item with their students and evaluate each answer choice so that students can better understand the knowledge required to successfully complete each task.

Through rich classroom discussion around each item and the various answer choices or potential responses, educators can actively engage students in critical thinking, reasoning, and application of knowledge and skills, helping to ensure all students are ready for success in the 21st century.



## Item Level Data

| Item Number | NVACS*   | DOK | Answers |
|-------------|----------|-----|---------|
| 1           | 8.NS.A1  | 1   | B, C, D |
| 2           | 8.NS.A2  | 2   | C       |
| 3           | 8.NS.A2  | 2   | -----   |
| 4           | 8.EE.A1  | 1   | C       |
| 5           | 8.EE.A2  | 1   | -----   |
| 6           | 8.EE.A3  | 2   | C, D    |
| 7           | 8.EE.A4  | 2   | -----   |
| 8           | 8.EE.A4  | 3   | -----   |
| 9           | 8.EE.B5  | 2   | B       |
| 10          | 8.EE.B5  | 2   | B, D    |
| 11          | 8.EE.B6  | 2   | -----   |
| 12          | 8.EE.C7a | 1   | -----   |
| 13          | 8.EE.C7b | 1   | -----   |
| 14          | 8.EE.C8b | 2   | D       |
| 15          | 8.EE.C8b | 2   | -----   |
| 16          | 8.EE.C8c | 2   | A, C, D |
| 17          | 8.EE.C8b | 3   | -----   |
| 18          | 8.F.A1   | 1   | D       |
| 19          | 8.F.A2   | 2   | A       |
| 20          | 8.F.A2   | 3   | -----   |
| 21          | 8.F.A3   | 2   | -----   |
| 22          | 8.F.A3   | 2   | -----   |
| 23          | 8.F.B4   | 2   | B, D    |

| Item Number | NVACS*  | DOK | Answers |
|-------------|---------|-----|---------|
| 24          | 8.F.B5  | 1   | A, D, E |
| 25          | 8.G.A2  | 2   | -----   |
| 26          | 8.G.A3  | 2   | C       |
| 27          | 8.G.A4  | 2   | -----   |
| 28          | 8.G.A5  | 2   | A, B, F |
| 29          | 8.G.B6  | 3   | -----   |
| 30          | 8.G.B7  | 2   | -----   |
| 31          | 8.G.B7  | 2   | B, D    |
| 32          | 8.G.B8  | 1   | D       |
| 33          | 8.G.B8  | 2   | -----   |
| 34          | 8.G.C9  | 3   | -----   |
| 35          | 8.G.C9  | 2   | -----   |
| 36          | 8.G.C9  | 3   | -----   |
| 37          | 8.SP.A1 | 2   | D       |
| 38          | 8.SP.A1 | 1   | -----   |
| 39          | 8.SP.A2 | 1   | -----   |
| 40          | 8.SP.A3 | 2   | C       |
| 41          | 8.SP.A3 | 2   | -----   |
| 42          | 8.SP.A3 | 2   | A, C    |
| 43          | 8.SP.A3 | 3   | -----   |
| 44          | 8.SP.A4 | 2   | -----   |
| 45          | 8.SP.A4 | 3   | -----   |

\*Nevada Academic Content Standards

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



**Scoring Guides  
and  
Student Response  
Examples by  
Score Point**

**Grade 8  
Mathematics**

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.NS.A1**

**1**

Which numbers are rational? Select **all** that apply.

A  $\sqrt{2}$

B  $\frac{3}{4}$

C 3.14

D  $4.\bar{5}$

E  $\frac{\sqrt{5}}{8}$

**Scoring Notes:**

**Correct Answers:** B, C, D

**Rationale A:** thinks square roots of rational numbers must be rational

**Rationale E:** thinks any fraction is rational

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.NS.A2**

**2**

A set of irrational numbers is shown below.

$$2\sqrt{3} \quad \frac{\sqrt{28}}{4} \quad \sqrt{\frac{54}{3}} \quad \frac{16\pi}{5}$$

Polly selects the two numbers with a value between 3 and 5 from the set. Which inequality correctly compares the two numbers Polly selects?

- A  $2\sqrt{3} < \frac{16\pi}{5}$
- B  $\frac{\sqrt{28}}{4} < \frac{16\pi}{5}$
- C  $2\sqrt{3} < \sqrt{\frac{54}{3}}$
- D  $\frac{\sqrt{28}}{4} < \sqrt{\frac{54}{3}}$

**Scoring Notes:**

**Rationale A:** reads  $\frac{16\pi}{5}$  as  $\frac{16}{5}$

**Rationale B:** correct comparison but neither has a value between 3 and 5

**Rationale C:** correct

**Rationale D:** finds  $\frac{\sqrt{28}}{4}$  as  $\frac{14}{4} = 3.5$

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.NS.A2**

**3** Two expressions are shown below.

$$10\sqrt{15} \qquad 15\sqrt{10}$$

Write an inequality that compares the two expressions. Explain why the inequality is correct. As part of the explanation, determine approximately how much greater one expression is than the other.

Write your response on the grid below.

**Scoring Notes:**

For this item, a full-credit response (2 points) includes

- correct inequality,  $10\sqrt{15} < 15\sqrt{10}$ , or equivalent  
**AND**
- explanation indicating why the inequality is correct  
**AND**
- identifying how much greater one expression is than the other

For example,

- $\sqrt{15}$  is a little less than  $\sqrt{16}$ . The value of  $\sqrt{16}$  is 4 so the value of  $\sqrt{15}$  can be estimated as 3.9. So the value of  $10\sqrt{15}$  is approximately 39.  $\sqrt{10}$  is a little more than  $\sqrt{9}$ . The value of  $\sqrt{9}$  is 3 so the value of  $\sqrt{10}$  can be estimated as 3.1. So the value of  $15\sqrt{10}$  is approximately 46.5. So,  $10\sqrt{15} < 15\sqrt{10}$ , and since  $46.5 - 39 = 7.5$ ,  $15\sqrt{10}$  is about 7.5 greater than  $10\sqrt{15}$ .

For this item, a partial-credit response (1 point) includes either

- correct inequality,  $10\sqrt{15} < 15\sqrt{10}$ , or equivalent  
**OR**
- explanation indicating why the inequality is correct  
**OR**
- identifying how much greater one expression is than the other

For this item, a no-credit response (0 points) includes none of the features of a full- or partial-credit response.

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.EE.A1**

**4**

Which expression is equivalent to

$$\left(\frac{3^7}{3^{-12}}\right)(3^{-4})?$$

A  $\frac{1}{3^9}$

B  $\frac{1}{3}$

C  $3^{15}$

D  $3^{16}$

**Scoring Notes:**

**Rationale A:** adds all exponents;  $7 + (-12) + (-4) = -9$

**Rationale B:** reverses when exponents should be added and subtracted; uses  $7 + (-12) - (-4)$

**Rationale C:** correct

**Rationale D:** multiplies exponents in numerator, gets -28, then uses  $-28 - (-12)$ , gets -16, and ignores the negative sign

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.EE.A2**

**5**

A list of numbers is shown below.

**2   3   4   5   6   7   8   9**

Write a number from the list in the blank in each equation to make the equation true. Some numbers from the list may not be used.

**A**  $\sqrt{49} = \underline{\hspace{2cm}}$

**B**  $\sqrt[3]{64} = \underline{\hspace{2cm}}$

**C**  $\sqrt{81} = \underline{\hspace{2cm}}$

**D**  $\sqrt[3]{8} = \underline{\hspace{2cm}}$

**E**  $\sqrt[3]{27} = \underline{\hspace{2cm}}$

**Scoring Notes:**

**A:**  $\sqrt{49} = 7$

**B:**  $\sqrt[3]{64} = 4$

**C:**  $\sqrt{81} = 9$

**D:**  $\sqrt[3]{8} = 2$

**E:**  $\sqrt[3]{27} = 3$

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.EE.A3**

**6**

A skin cell measures  $3 \times 10^{-5}$  meter in length. Which comparisons are true? Select **all** that apply.

- A** The length of a type of bacteria measuring  $5 \times 10^{-7}$  meter is more than 100 times as great as the length of the skin cell.
- B** The length of a red blood cell measuring  $8 \times 10^{-6}$  meter is  $\frac{1}{10}$  as great as the length of the skin cell.
- C** The width of a grain of rice measuring  $2.4 \times 10^{-3}$  meter is 80 times as great as the length of the skin cell.
- D** The length of a coffee bean measuring  $1.2 \times 10^{-2}$  meter is 400 times as great as the length of the skin cell.
- E** The thickness of a piece of paper measuring  $1 \times 10^{-4}$  meter is more than 30 times as great as the length of the skin cell.

**Scoring Notes:**

**Correct answers:** C, D

**Rationale A:** disregards negative signs in exponents

**Rationale B:** disregards whole numbers, only looks at exponents

**Rationale E:** greater, but exponent should be -3 to be more than 30 times greater

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.EE.A4**

**7** Some information about particles of dust is listed below.

- The average mass of a particle of dust is  $7.5 \times 10^{-10}$  kg.
- There are approximately 35,000,000 particles of dust in 1 cubic foot of city air.
- There are 1,728 cubic inches in a cubic foot.

City air fills a cube with sides 3 inches long. What is the approximate mass of the particles of dust in the cube? Using scientific notation, write the answer in the blank below.

\_\_\_\_\_ kg

**Scoring Notes:**

$$4.1 \times 10^{-4} \text{ (kg)}$$

Rationale:

$$\begin{aligned} & \left(\frac{3}{12}\right)^3 \cdot (3.5 \times 10^7) \cdot (7.5 \times 10^{-10}) \\ &= \frac{26.25 \times 10^{-3}}{64} \\ &\approx 0.41 \times 10^{-3} \\ &\approx 4.1 \times 10^{-4} \end{aligned}$$

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.EE.A4**

**8**

Two distances in the solar system are described by the values in the statements below.

- The distance from Earth to the moon is approximately  $2.4 \times 10^5$  miles.
- The distance from Earth to the sun is approximately  $9.3 \times 10^7$  miles.

Greg performs an operation with these values and gets a correct result of 387.5 .

**A** Identify the operation (addition, subtraction, multiplication, or division) that Greg performed with these values to get a result of 387.5 . Show your work to demonstrate that Greg performed the operation correctly.

Greg then states that the distance from Earth to the sun is approximately 387.5 miles greater than the distance from Earth to the moon, but Greg's statement is incorrect.

**B** Greg's statement is incorrect because the distance from Earth to the sun is **not** approximately 387.5 miles greater than the distance from Earth to the moon. Based on the operation Greg performed, what does the result of 387.5 represent? Explain your thinking.

**Write your response on the grid on the next page.**

**Scoring Notes:**

| <b>Score</b> | <b>Description</b>  |
|--------------|---|
| <b>3</b>     | Student scores 3 points.  |
| <b>2</b>     | Student scores 2–2.5 points.  |
| <b>1</b>     | Student scores 0.5–1.5 points.  |
| <b>0</b>     | Student’s response provides insufficient evidence of appropriate skills or knowledge to successfully accomplish the task. |
| <b>Blank</b> | No student response.  |

**Score Points:**

|                |                  |   |
|----------------|------------------|---|
| <b>Part A:</b> | score 1.5 points | correct answer with correct and complete work   |
|                | <b>OR</b>        |   |
|                | score 1.0 point  | correct answer with incomplete work or incorrect work due to calculation error (work must be shown) |
|                | <b>OR</b>        | no correct answer with correct and complete work  |
| <b>OR</b>      | score 0.5 point  | correct answer with no work   |
|                | <b>OR</b>        | some correct procedure  |
|                |                  |   |
| <b>Part B:</b> | score 1.5 points | correct and complete explanation  |
|                | <b>OR</b>        |   |
|                | score 1.0 point  | partially correct or incomplete explanation   |
| <b>OR</b>      | score 0.5 point  | vague explanation only  |
|                |                  |   |

**Correct Answers:**

**Part A:** Greg performed division.

$$\frac{9.3 \times 10^7}{2.4 \times 10^5} = \frac{9.3}{2.4} \times 10^{7-5} = 3.875 \times 10^2 = 387.5$$

**or equivalent work**

**Part B:** Accept all correct and complete explanations.

**Sample Explanation:**

Greg used division to arrive at 387.5 miles. This means that 387.5 represents how many **times** greater the distance from Earth to the sun is than the distance from Earth to the moon.

Instructional Materials Question 8

**A**

Handwritten mathematical work on grid paper. It includes several arithmetic problems:

- Subtraction:  $10 - 10 = 0$ ,  $100 - 100 = 0$ ,  $1000 - 1000 = 0$ ,  $10000 - 10000 = 0$ ,  $100000 - 100000 = 0$ ,  $1000000 - 1000000 = 0$ ,  $10000000 - 10000000 = 0$ ,  $100000000 - 100000000 = 0$ ,  $1000000000 - 1000000000 = 0$ .
- Multiplication:  $24 \times 10 = 240$ ,  $24 \times 100 = 2400$ ,  $24 \times 1000 = 24000$ ,  $24 \times 10000 = 240000$ ,  $24 \times 100000 = 2400000$ ,  $24 \times 1000000 = 24000000$ ,  $24 \times 10000000 = 240000000$ ,  $24 \times 100000000 = 2400000000$ .
- Long Division:  $93000000 \div 24 = 3875000$ . The student shows the steps:  $24 \overline{) 93000000}$ ,  $38$ ,  $72$ ,  $210$ ,  $192$ ,  $168$ ,  $144$ ,  $120$ ,  $96$ ,  $72$ ,  $48$ ,  $24$ ,  $0$ .
- Another Long Division:  $93760000 \div 24 = 3906666.666...$ . The student shows the steps:  $24 \overline{) 93760000}$ ,  $39$ ,  $72$ ,  $190$ ,  $168$ ,  $120$ ,  $96$ ,  $72$ ,  $48$ ,  $24$ ,  $0$ .

**B**

Because Greg used division  $387.5$  represents how many times greater the distance from the Earth to the Sun is compared to the distance from the Earth to the Moon. This is because Greg used division and the opposite of division is multiplication. So the distance from the Earth to the Sun is  $387.5$  times greater than the distance from the Earth to the Moon.

Score Point: 3

The response to Part A includes the correct answer with correct and complete work (1.5). The response to Part B includes a correct and complete explanation (1.5).

### Instructional Materials Question 8

**A**  $2.4 \times 10^5 = 240,000$   $\begin{array}{r} \times 100,000 \\ 2.4 \\ \hline 240,000 \end{array}$

$9.3 \times 10^7 = 93,000,000$

$10 \times 10$   
 $100 \times 10$   
 $1,000 \times 10$   
 $10,000 \times 10$   
 $100,000 \times 10$   
 $1,000,000 \times 10$   
 $\times 10,000,000$   
 $\quad 9.3$   
 $\hline 30,000,000$   
 $90,000,000$   
 $\hline 93,000,000$

$240,000 \overline{) 93,000,000} \quad 387.5$   $\begin{array}{r} \times 240,000 \\ 387.5 \\ \hline 120,000 \end{array}$

The operation that Greg used was division.

**B** The number 387.5 miles represents how many times greater it is to go to the sun rather than the moon.

**Score Point: 3**

The response to Part A includes the correct answer with correct and complete work (1.5). The response to Part B includes a correct and complete explanation (1.5).

Instructional Materials Question 8

**A**

moon-earth  
 $1/6 \text{ } 000 \text{ } 00 \times 2,400,000$

sun-earth  
 $9.3 \times 100,000,000$       $93,000,000,000$

Greg  
 Pelomed  
 division

$93,000,000$

**B**

It represents how many times farther the sun is from Earth compared to the moon. It takes 287.3 times' more distance from the earth to the moon to get to the sun.

Score Point: 2  
 The response to Part A includes the correct answer with incomplete work (1.0). The response to Part B includes a correct and complete explanation (1.5).

### Instructional Materials Question 8

**A**  $9.3 \times 10^7 \div 2.4 \times 10^5$

$100,000,000$

$93,000,000 \div 240,000$

$$\begin{array}{r}
 387.5 \\
 240000 \overline{) 93000000} \\
 \underline{720000} \phantom{00} \\
 2100000 \phantom{00} \\
 \underline{1680000} \phantom{00} \\
 4200000 \phantom{00} \\
 \underline{3360000} \phantom{00} \\
 8400000 \phantom{00} \\
 \underline{8400000} \phantom{00} \\
 0 \phantom{00}
 \end{array}$$

Greg performed division with the two equations

**B** The result 387.5 is the amount of trips from the earth to the moon it takes to get from the earth to the sun. This is because the distance from the sun was divided by the distance from the moon.

Score Point: 2

The response to Part A includes the correct answer with correct and complete work (1.5). The response to Part B includes an incomplete explanation (1.0).

### Instructional Materials Question 8

|          |  |  |   |
|----------|--|--|---|
| <b>A</b> | $\begin{array}{r} 9,300,000 \\ \underline{2,400,000} \end{array}$  | $\begin{array}{r} 93,000,000 \\ 240,000 \end{array}$                           | $\begin{array}{r} 387.5 \\ \hline 240,000 \overline{) 93,000,000} \\ \underline{12} \phantom{000} \\ 120 \phantom{00} \\ \underline{192} \phantom{00} \\ 180 \phantom{00} \\ \underline{168} \phantom{00} \\ 120 \phantom{00} \\ \underline{120} \phantom{00} \\ 0 \end{array}$ |
|          | <p>I believe Greg used division to get a result of 387.5 because if you divide 240,000 into 93,000,000 it will give you exactly that answer.</p> |  |   |
| <b>B</b> | <p>I believe 387.5 miles represents the correct difference in distances then, you divide by 240,000.</p>   |  |   |
|          | $\begin{array}{r} 387.5 \\ \hline 240 \overline{) 92,760,000} \\ \underline{117} \phantom{000} \end{array}$                                      | $\begin{array}{r} 93,000,000 \\ \underline{240,000} \\ 92,760,000 \end{array}$ |   |

**Score Point: 1**

The response to Part A includes the correct answer with correct and complete work (1.5). The response to Part B is incorrect (0).

Instructional Materials Question 8

**A**

$2.4 \times 10^5$   
 $240,000$   
 $9.3 \times 10^7$   
 $93,000,000$

$7-5=2$   
 $9.3000$   
 $93,000$

$387.5$   
 $2.4 \overline{) 93000}$   
 $720$   
 $210$

$3 \overline{) 312}$   
 $387.5$   
 $\times 2.4$   
 $15500$   
 $77500$   
 $93000$

Division

**B**

The distance of 387.5 miles is how far it is from the moon to the sun.

Score Point: 1

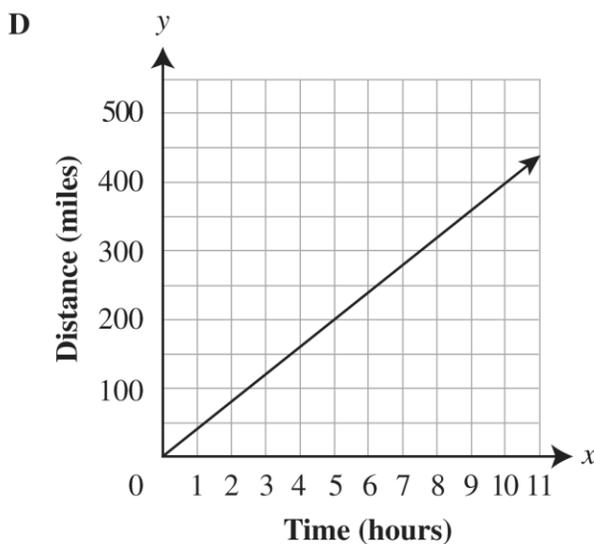
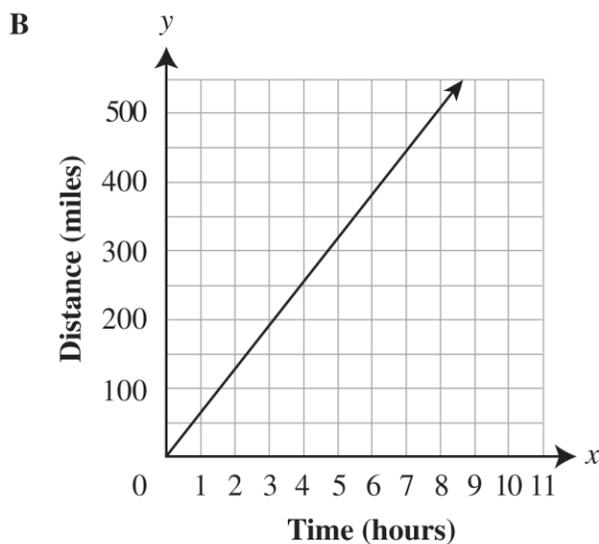
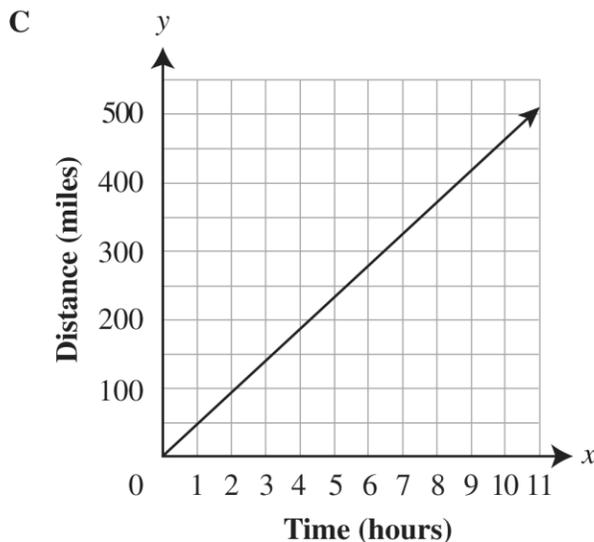
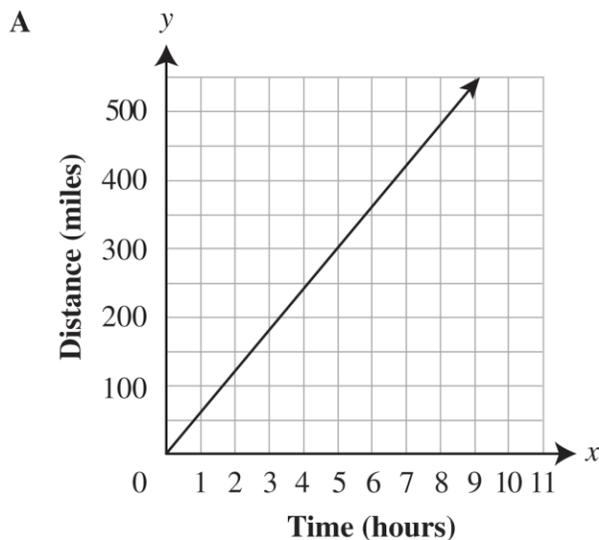
The response to Part A includes some correct procedure (0.5). The response to Part B is incorrect (0).

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.EE.B5**

- 9** The speed of a moving object can be described by the equation below, in which time ( $x$ ), in hours, is related to distance ( $y$ ), in miles.

$$y = 60x$$

Which graph represents an object moving at a **greater** speed than that of the object described by the equation?



**Scoring Notes:**

**Rationale A:** the rates are the same

**Rationale B:** correct

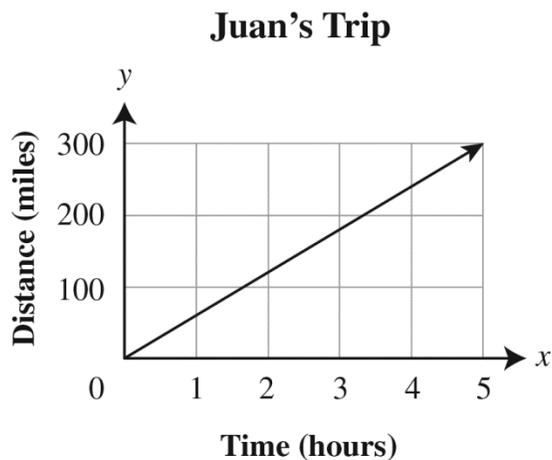
**Rationale C:** the graph has a lesser rate

**Rationale D:** the graph has a lesser rate

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.EE.B5**

**10**

On a trip, Juan drove at a constant rate. The graph below shows the relationship between the time he drove and the distance he traveled.



In which situations is the rate **greater** than the rate at which Juan traveled on his trip? Select **all** that apply.

- A** Monica drove at a constant rate for 5 hours and traveled 200 miles.
- B**  $y = 65x$ , where  $x =$  time in hours and  $y =$  distance in miles
- C**  $320 = 80s$ , where  $s =$  speed in miles per hour
- D** Cindy drove 35 miles in 30 minutes.

**Scoring Notes:**

**Correct Answers:** B, D

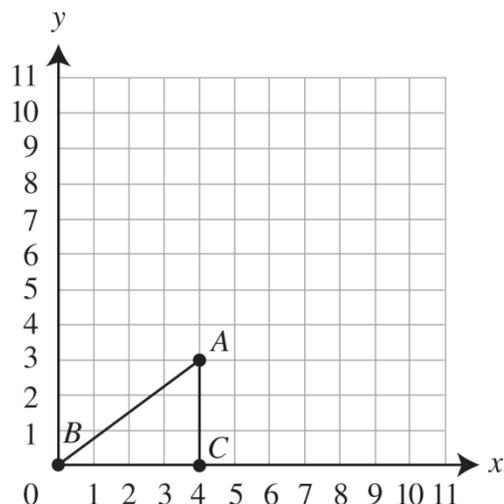
**Rationale A:** thinks rate is greater if slope is less steep

**Rationale C:** uses 80 as  $s$  instead of dividing to determine 4

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.EE.B6**

**11**

The coordinate grid below shows the location of triangle  $ABC$ .



What is the equation of the line that has the same slope as the hypotenuse of triangle  $ABC$  and has a  $y$ -intercept of 2? Explain your thinking.

Write your response on the grid below.

**Scoring Notes:**

For this item, a full-credit response (2 points) includes

- the equation,  $y = \frac{3}{4}x + 2$ , or equivalent equation

**AND**

- complete explanation identifying how the equation was determined

For example,

- The slope of the hypotenuse is  $\frac{3}{4}$  because the rise is 3 and the run is 4. So,  $m = \frac{3}{4}$  and  $b = 2$ .

For this item, a partial-credit response (1 point) includes either

- the equation,  $y = \frac{3}{4}x + 2$ , or equivalent equation

**OR**

- some explanation identifying how the equation was determined

For this item, a no-credit response (0 points) includes none of the features of a full- or partial-credit response.

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.EE.C7a**

**12** Indicate whether **each** equation shown in the table below has exactly one solution, an infinite number of solutions, or no solution by placing a check mark in the correct column of the table.

| Equation                   | Exactly One Solution | Infinite Number of Solutions | No Solution |
|----------------------------|----------------------|------------------------------|-------------|
| $x + 3 = 3x + 3$           |                      |                              |             |
| $2x - 3 = 2x + 5 - 1$      |                      |                              |             |
| $3x - 2x + 4 = x + 3 + 1$  |                      |                              |             |
| $6 - 4x = 9 - 3x + 3 - 5x$ |                      |                              |             |

**Scoring Notes:**

| Equation                   | Exactly One Solution | Infinite Number of Solutions | No Solution |
|----------------------------|----------------------|------------------------------|-------------|
| $x + 3 = 3x + 3$           | ✓                    |                              |             |
| $2x - 3 = 2x + 5 - 1$      |                      |                              | ✓           |
| $3x - 2x + 4 = x + 3 + 1$  |                      | ✓                            |             |
| $6 - 4x = 9 - 3x + 3 - 5x$ | ✓                    |                              |             |

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.EE.C7b**

**13**

Solve for  $x$ :

$$-\frac{1}{2}(x - 6) = -4$$

Write the answer in the blank below.

$x =$  \_\_\_\_\_

**Scoring Notes:**

14

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.EE.C8b**

**14**

A system of linear equations is shown below.

$$\begin{cases} 2x + 5y = 7 \\ 5x + 3y = -11 \end{cases}$$

Which of these shows an equivalent system of linear equations and the values of  $x$  and  $y$  that make both systems of equations true?

**A**  $\begin{cases} 6x + 15y = 21 \\ 25x + 15y = -55 \end{cases}$   
 $x = 4$  and  $y = -3$

**B**  $\begin{cases} 6x + 15y = 7 \\ -25x - 15y = -11 \end{cases}$   
 $x = 4$  and  $y = -3$

**C**  $\begin{cases} 10x + 25y = 7 \\ -10x - 6y = -11 \end{cases}$   
 $x = -4$  and  $y = 3$

**D**  $\begin{cases} 10x + 25y = 35 \\ 10x + 6y = -22 \end{cases}$   
 $x = -4$  and  $y = 3$

**Scoring Notes:**

**Rationale A:** equations are correct, solutions are not

**Rationale B:** equations and solutions are both incorrect

**Rationale C:** correct solutions, but does not multiply constants by 5 and -2

**Rationale D:** correct

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.EE.C8b**

**15**

Indicate whether each system of linear equations has no solution, exactly one solution, or infinitely many solutions.

**A**  $\begin{cases} 2x + y = 7 \\ 2x + y = 6 \end{cases}$      no solution     exactly one solution     infinitely many solutions

**B**  $\begin{cases} 2x - 4y = 8 \\ \frac{2}{3}x - \frac{4}{3}y = \frac{8}{3} \end{cases}$      no solution     exactly one solution     infinitely many solutions

**C**  $\begin{cases} x + y = 3 \\ 2x + 6y = 10 \end{cases}$      no solution     exactly one solution     infinitely many solutions

**D**  $\begin{cases} x = -5 \\ x + y = -5 \end{cases}$      no solution     exactly one solution     infinitely many solutions

**Scoring Notes:**

**A:** no solution

**B:** infinitely many solutions

**C:** exactly one solution

**D:** exactly one solution

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.EE.C8c**

**16**

The line described by the equation below is graphed on a coordinate plane.

$$x + y = 8$$

Additional lines are graphed on the same coordinate plane. Which of these lines intersect the line described by the equation? Select **all** that apply.

- A** the line passing through the points (0, 8) and (-1, 2)
- B** the line passing through the points (-8, 3) and (-3, -2)
- C** the line passing through the points (0, 4) and (6, 0)
- D** the line passing through the points (-9, 8) and (-6, 14)

**Scoring Notes:**

**Correct Answers:** A, C, D

**Rationale B:** only considers slope, not  $y$ -intercept (lines are parallel)

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.EE.C8b**

**17**

A system of equations is shown below.

$$\begin{cases} 2x - 3y = 6 \\ ax + 9y = -6 \end{cases}$$

For what value of  $a$  does the system of equations have no solution? Explain your answer.

Write your response on the grid below.

**Scoring Notes:**

For this item, a full-credit response (2 points) includes

- correct value of  $a$ , -6
- AND**
- explanation identifying why the system of equations has no solution

For example,

- A system of equations has no solution when the lines represented by the equations in the system are parallel, meaning they have the same slope.

$$2x - 3y = 6 \quad (\times -3) \rightarrow -6x + 9y = -18$$

$$ax + 9y = -6 \qquad ax + 9y = -6$$

For the lines to have the same slope, the ratios of the coefficients of  $x$  to the coefficients of  $y$  must be equal or equivalent. When the first equation is multiplied by  $-3$  to get coefficients of  $y$  that are equal, the value that would make the coefficients of  $x$  equal is  $-6$ .

For this item, a partial-credit response (1 point) includes either

- correct value of  $a$ , -6
- OR**
- identifying why the system of equations has no solution

For this item, a no-credit response (0 points) includes none of the features of a full- or partial-credit response.

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.F.A1**

**18** Which description of input and output values does **not** represent a function?

- A** input: a state in the United States  
output: the number of states that border the state
- B** input: an integer  
output: the integer multiplied by 3
- C** input: a fraction between 0 and -1  
output: the fraction divided by  $-\frac{1}{2}$
- D** input: the age of a person in a room  
output: the name of the person

**Scoring Notes:**

**Rationale A:** reverses input and output and thinks more than one state can have the same number of bordering states

**Rationale B:** confuses “is a function” with “is not a function”

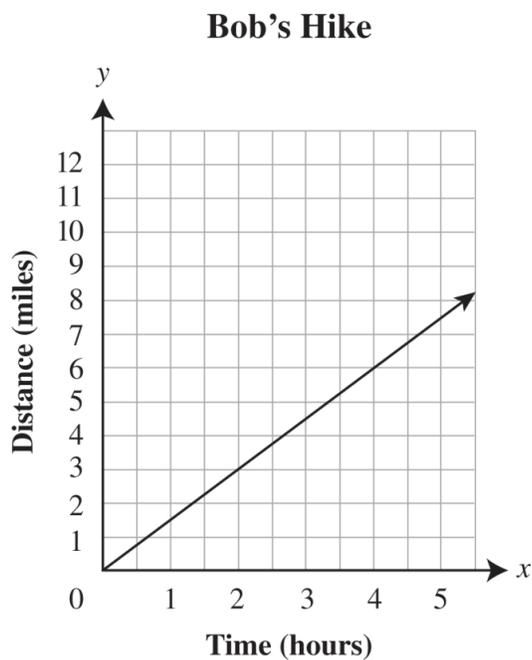
**Rationale C:** result will be positive, so confuses with closure property and thinks it is not a function

**Rationale D:** correct

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.F.A2**

**19**

Bob and Cathy follow the same path along a trail. The graph below represents the relationship between the amount of time Bob has been hiking along the trail and the distance he has hiked.



One hour after Bob begins hiking the trail, Cathy begins jogging along the trail at an average rate of  $3\frac{1}{3}$  miles per hour. After Bob has been hiking for 4 hours, what is the distance along the trail between Bob and Cathy?

- A 4 miles
- B 6 miles
- C 10 miles
- D 16 miles

**Scoring Notes:**

**Rationale A:** correct

**Rationale B:** distance Bob has traveled

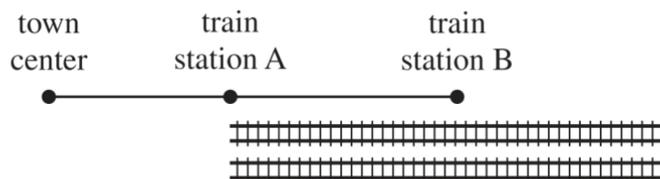
**Rationale C:** distance Cathy has traveled

**Rationale D:** sum of distances

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.F.A2; 8.EE.C8b**

**20**

The diagram below shows the locations of train station A and train station B in relation to a town's center.



One train departs from each station at the same time and travels the same direction along the side-by-side rails. The distance ( $d$ ), in miles, that each train has traveled away from the town center is a function of time ( $t$ ), in hours, that each train has been traveling. Information about each train is listed below.

- The rate at which the train departing station A travels can be described by the equation  $d = 50t + 20$ .
- The rate at which the train departing station B travels can be represented by the ordered pairs (1, 85), (2, 125), and (3, 165).

- A** Explain how the functions could be used to determine the distance, in miles, between station A and station B. As part of your explanation, determine the distance between station A and station B.
- B** How many hours after departing the stations will the trains be side by side, **and** how many miles away from the town's center will each train have traveled? Show your work or explain your thinking.

**Write your response on the grid on the next page.**

## Scoring Notes:

| Score | Description   |
|-------|---|
| 3     | Student scores 3 points.  |
| 2     | Student scores 2–2.5 points.  |
| 1     | Student scores 0.5–1.5 points.  |
| 0     | Student’s response provides insufficient evidence of appropriate skills or knowledge to successfully accomplish the task. |
| Blank | No student response.  |

## Score Points

|                |                  |   |
|----------------|------------------|---|
| <b>Part A:</b> | score 1.5 points | correct answer with correct and complete explanation  |
|                | <b>OR</b>        |   |
|                | score 1.0 point  | correct answer with partially correct or incomplete explanation   |
|                | <b>OR</b>        | incorrect answer due to calculation error (work must be shown) with complete explanation                    |
| <b>OR</b>      |                  |   |
|                | score 0.5 point  | correct answer with no explanation  |
|                | <b>OR</b>        | some correct procedure  |
|                | <b>OR</b>        | vague explanation only  |
| <b>Part B:</b> | score 1.5 points | correct answers (based on answer from <b>Part A</b> ) with correct and complete work or explanation         |
|                | <b>OR</b>        | correct answers with correct and complete work or explanation   |
|                | <b>OR</b>        |   |
|                | score 1.0 point  | correct answers (based on answer from <b>Part A</b> ) with partially correct work or incomplete explanation |
| <b>OR</b>      |                  | incorrect answer(s) due to calculation error (work must be shown)   |
|                | <b>OR</b>        |   |
|                | score 0.5 point  | correct answers (based on answer from <b>Part A</b> ) with no work or explanation                           |
|                | <b>OR</b>        | some correct procedure  |
| <b>OR</b>      |                  | vague explanation only  |

## Correct Answers

**Part A:** 25 (miles)

$$r = \frac{125 - 85}{2 - 1} = \frac{40}{1} = 40$$

$$d = 40t + b$$

$$85 = 40(1) + b$$

$$45 = b$$

$$45 - 20 = 25$$

**or equivalent work**

**AND**

### Sample Explanation:

The constant, 20, in the equation given for the train departing station A represents the number of miles that train is from the town's center when it departs. Calculate  $\frac{125 - 85}{2 - 1} = \frac{40}{1} = 40$  to determine that the train departing station B is traveling at a rate of 40 miles per hour. Then calculate  $d = 40t + b$ ,  $85 = 40(1) + b$ ,  $45 = b$ , to determine the constant in the equation describing the travel of the train departing station B:  $d = 40t + 45$ . The difference between these constants is 25, so station A and station B must be 25 miles apart.

**Part B:** 2.5 (hours) **AND** 145 (miles)

$$\begin{cases} d = 50t + 20 \\ d = 40t + 45 \end{cases}$$

$$50t + 20 = 40t + 45$$

$$10t = 25$$

$$t = 2.5$$

$$d = 50(2.5) + 20$$

$$d = 125 + 20$$

$$d = 145$$

**or equivalent work**

**OR**

### Sample Explanation:

Use a system of equations to determine the point at which the number of hours traveled and the distance from the town's center are the same for both trains.

$$\begin{cases} d = 50t + 20 \\ d = 40t + 45 \end{cases}$$

$$50t + 20 = 40t + 45$$

$$10t = 25$$

$$t = 2.5$$

$$d = 50(2.5) + 20$$

$$d = 125 + 20$$

$$d = 145$$

So the trains will be side by side after traveling for 2.5 hours, and they will both be 145 miles away from the town's center.

Instructional Materials Question 20

A The equation for station A and B are given. Show the distance between the stations by subtracting A's y-intercept (b in  $y=mx+b$ ) from B's y-intercept (also b in  $y=mx+b$ ) to find the distance between the two stations.

Station B:  $d = 40t +$

$$\frac{125 - 85}{2 - 1} = \frac{40 - 40}{1} \quad 45$$

$$\frac{-20}{25}$$

$$85 = 40(1) + B$$

$$40 - 40$$

$$45 = B$$

The distance between stations A and B is 25 miles.

note - Include writing space for written math questions please.

B

$$d = 40t + 45$$

$$d = 50t + 20$$

$$\left( \frac{25}{10}, 145 \right)$$

$$50t + 20 = 40t + 45$$

$$-40t \quad -20 \quad -40t \quad -20$$

$$10t = 25$$

$$\frac{10}{10}$$

$$t = \frac{25}{10}$$

$$d = 40 \left( \frac{25}{10} \right) + 45$$

$$d = 100 + 45$$

$$d = 145$$

Score Point: 3

The response to Part A includes the correct answer with correct and complete explanation (1.5).

The response to Part B includes the correct answers with correct and complete work (1.5).

Instructional Materials Question 20

**A** We know that train station A is 20 miles from the town center because of the +20 in the equation. We also know that train station B is 45 miles from the town center because the trend of the y-coordinates increases by 40, so  $95 - 40 = 45$  miles. So if you subtract the two distances, (20 and 45) you get 25 miles in between the two stations.

**B**

|   |              |  |          |          |   |              |
|---|--------------|--|----------|----------|---|--------------|
| $d = 50(1) + 20$ $d = 50 + 20$ $d = 70$     | $(1, 95)$    |  |          |          |   |              |
| $d = 50(2) + 20$ $d = 100 + 20$ $d = 120$   | $(2, 125)$   |  |          |          |   |              |
| $d = 50(3) + 20$ $d = 150 + 20$ $d = 170$   | $(3, 165)$   | $\rightarrow$  |          |          |   |              |
| $d = 50(4) + 20$ $d = 200 + 20$ $d = 220$   | $(4, 205)$   | <table border="0"> <tr> <td style="text-align: center; padding-right: 10px;"><b>A</b></td> <td style="text-align: center; padding-right: 10px;"><b>B</b></td> </tr> <tr> <td style="vertical-align: top;"> <math display="block">d = 50(2.5) + 20</math> <math display="block">d = 125 + 20</math> <math display="block">d = 145</math> </td> <td style="vertical-align: top;"> <math display="block">(2.5, 145)</math> </td> </tr> </table> <p>At exactly 2.5 hours, the trains will be side by side. Train A will have traveled 165 miles from the town center, &amp; Train B will have traveled 140 miles from the town center.</p> | <b>A</b> | <b>B</b> | $d = 50(2.5) + 20$ $d = 125 + 20$ $d = 145$ | $(2.5, 145)$ |
| <b>A</b>                                    | <b>B</b>     |  |          |          |   |              |
| $d = 50(2.5) + 20$ $d = 125 + 20$ $d = 145$ | $(2.5, 145)$ |  |          |          |   |              |

Score Point: 2

The response to Part A includes the correct answer with correct and complete explanation (1.5).

The response to Part B includes the correct answers with partially correct explanation (1.0).

Instructional Materials Question 20

A The functions could be used to determine the distance in miles, between station A and station B by first finding the slope of station B by using the formula  $m = \frac{y_2 - y_1}{x_2 - x_1}$ , and then find the y-int.

Next, you will solve for d (distance in miles) by using the sub. method. Now, you plug in t (hours) in to both equations to find their distance. The distance would be 145 miles apart.

Work:

A:  $d = 50t + 20$   
 $40t + 145 = 50t + 20$   
 $-40t - 20 - 40t - 20$   
 $-25 = 10t$   
 $\frac{-25}{10} = \frac{10t}{10}$   
 $t = -\frac{2.5}{1} = -2.5$

B:  $(1, 85), (2, 125)$  and  $(3, 165)$   
 $m = \frac{125 - 85}{2 - 1} = \frac{40}{1} = 40$   
 $85 = 40(1) + b$   
 $85 = 40 + b$   
 $-40 - 40$   
 $b = 45$   
 $d = 40t + 45$   
 $85 = 40(2.5) + 45$   
 $d = 100 + 45$   
 $d = 145$

Vertical calculations on the right side of the work area:  
 $50$   
 $2.5$   
 $\times 50$   
 $250$   
 $1000$   
 $1250$   
 $200$   
 $40$   
 $2.5$   
 $\times 40$   
 $1000$   
 $800$   
 $1000$

B The trains will be side by side in 2 hours and 30 min.

Score Point: 2  
 The response to Part A includes some correct procedure (0.5). The response to Part B includes the correct answers with correct and complete work (1.5).

Instructional Materials Question 20

**A**

The functions could be used to find the distance by taking the points  $(1, 85)$ ,  $(2, 125)$  and  $(3, 165)$  and say Train B is moving 40 miles/hour and is 45 miles away

Station A is 20 miles from town center, this means the stations are 20 miles apart.

**B**

| Train A | 50t | Train B | 40t + 25 |
|---------|-----|---------|----------|
| 1 hr.   | 50  | 1 hr.   | 40       |
| 2 hr.   | 100 | 2 hr.   | 80       |
| 3 hr.   | 150 | 3 hr.   | 120      |
| 4 hr.   | 200 | 4 hr.   | 160      |
| 5 hr.   | 250 | 5 hr.   | 200      |
| 6 hr.   | 300 |         |          |

At hour 4

Score Point: 1

The response to Part A includes the correct answer with correct and complete explanation (1.5).

The response to Part B is incorrect (0).

### Instructional Materials Question 20

**A** It could show or be used to help calculate distance, in miles by showing an exact rate. For example, station A is  $d = 50t + 20$ . This means that for every hour it will increase.  $d = 50(1) + 20$ . In station B for every hour it will increase by 40.  $d = 50 + 20 = 70$ . The beginning is 85 for station B while the beginning for station A is 75. So the difference would be 10.

**B**

|                  |                    |   |                  |
|------------------|--------------------|---|------------------|
| $d = 50t + 20$   | $d = 50(2.5) + 20$ | $2.5$   | $d = 50(2) + 20$ |
| $d = 50(3) + 20$ | $d = 125 + 20$     | $2.25 \times 50$  | $d = 100 + 20$   |
| $d = 150 + 20$   | $d = 145$          | $\begin{array}{r} 50 \\ \times 2.25 \\ \hline 112.5 \\ 1000 \\ \hline 1125.0 \end{array}$ |                  |
| $d = 170$        |                    |   |                  |

2 and a half hours away from both stations the trains will be side by side. Station A will be at 145 as shown above. Station B increases by 20 per half-hour so at the second hour station B will be 125 distances away. With a half-hour it will be 145 distances away.

**Score Point: 1**

The response to Part A is incorrect (0). The response to Part B includes the correct answers with correct and complete explanation (1.5).

Instructional Materials Question 20

**A** Train station A is 25 miles from Train Station B. By finding the slope of the coordinates of Station B, you can put it into slope intercept form, then find the difference in each y intercept.

$$d = 40 + 45$$

**B**

Score Point: 1

The response to Part A includes the correct answer with incomplete explanation (1.0). The response to Part B is missing (0).

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.F.A3**

**21**

Determine whether each equation defines  $y$  as a linear function of  $x$  or a nonlinear function of  $x$  by selecting the correct box next to each equation.

A  $(4x)(7y) = 28$        Linear       Nonlinear

B  $x(y+1) + y(x+1) = x - 7$        Linear       Nonlinear

C  $x + 5 = y + 5x$        Linear       Nonlinear

D  $3(y - 4) = 2x(x - 6)$        Linear       Nonlinear

E  $\frac{2}{7}x - \frac{3}{14}y + \frac{3}{7} = \frac{5}{14}x + \frac{4}{7}y$        Linear       Nonlinear

**Scoring Notes:**

**Linear:** C, E

**Nonlinear:** A, B, D

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.F.A3**

**22** Which equation defines  $y$  as a nonlinear function of  $x$  ?

- A  $y = 3x + 2$
- B  $y = x(x + 2)$
- C  $3x + 4y = 14$
- D  $4x + 5y = 4x + 15$

Explain why the function you selected is nonlinear.

Write your response on the grid below.

**Scoring Notes:**

For this item, a full-credit response (2 points) includes

- selecting equation B,  $y = x(x + 2)$
- AND**
- complete explanation indicating why the selected function is nonlinear

For example,

- The equation  $y = x(x + 2)$  is nonlinear because it is equivalent to  $y = x^2 + 2x$ , and the exponent of 2 implies that the function is not linear.

For this item, a partial-credit response (1 point) includes either

- selecting equation B,  $y = x(x + 2)$
- OR**
- some explanation indicating why the selected function is nonlinear

For this item, a no-credit response (0 points) includes none of the features of a full- or partial-credit response.

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.F.B4**

**23**

During a heavy rainstorm, 0.05 inch of rain fell in 5 minutes. The storm continued, and after 40 minutes, a total of 0.4 inch of rain had fallen. Select the **two** descriptions of functions that model the relationship between the amount of time it rained and the total amount of rain that fell during this storm.

- A** The function  $y = 0.01x$ , with  $x$  representing the number of inches of rain that fell and  $y$  representing the number of minutes it rained, models the relationship.
- B** The function  $y = 0.6x$ , with  $x$  representing the number of hours it rained and  $y$  representing the number of inches of rain that fell, models the relationship.
- C** The function  $y = 0.05x$ , with  $x$  representing the number of minutes it rained and  $y$  representing the number of inches of rain that fell, models the relationship.
- D** The function  $y = 0.01x$ , with  $x$  representing the number of minutes it rained and  $y$  representing the number of inches of rain that fell, models the relationship.
- E** The function  $y = 0.4x$ , with  $x$  representing the number of inches of rain that fell and  $y$  representing the number of minutes it rained, models the relationship.
- F** The function  $y = 0.6x$ , with  $x$  representing the number of inches of rain that fell and  $y$  representing the number of hours it rained, models the relationship.

**Scoring Notes:**

**Correct Answers:** B, D

**Rationale A:** reverses variables

**Rationale C:** variables are correct, but uses incorrect rate

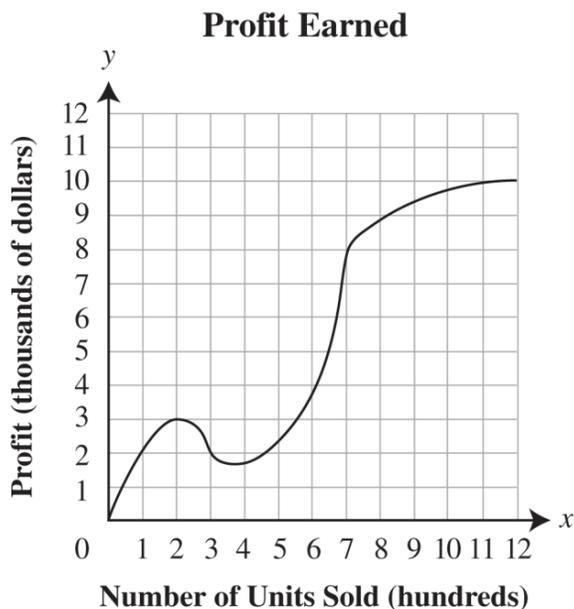
**Rationale E:** reverses variables and uses incorrect rate

**Rationale F:** reverses variables

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.F.B5**

**24**

The graph below shows the relationship between the number of units of a product that are manufactured and sold and the profit earned from the manufacture and sale of the product.



Over which intervals of the numbers of units sold is the profit increasing? Select **all** that apply.

- A** between 0 and 200
- B** between 200 and 300
- C** between 300 and 400
- D** between 400 and 700
- E** between 700 and 1,200

**Scoring Notes:**

**Correct Answers:** A, D, E

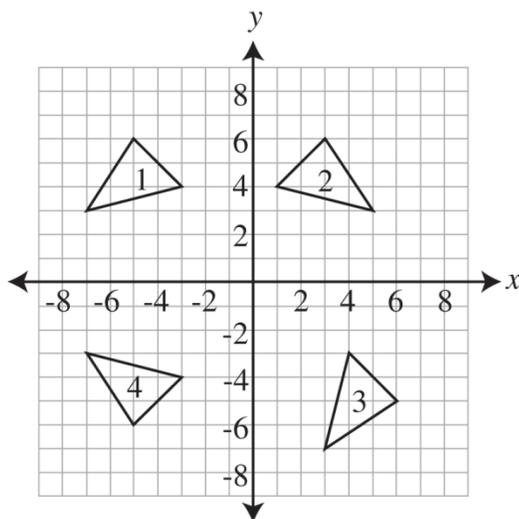
**Rationale B:** does not increase

**Rationale C:** does not increase

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.G.A.2**

**25**

Triangles 1, 2, 3, and 4 are congruent to each other. The triangles are graphed on the coordinate plane shown below.



Draw lines from column A to column B to match **each** pair of triangles to the transformation that describes how the second triangle in the pair can be obtained from the first triangle in the pair, thereby showing that the triangles are congruent. Some transformations in column B might not be used, and some might be used more than once.

**Column A**

- triangle 1 to triangle 2
- triangle 1 to triangle 3
- triangle 3 to triangle 4
- triangle 4 to triangle 1

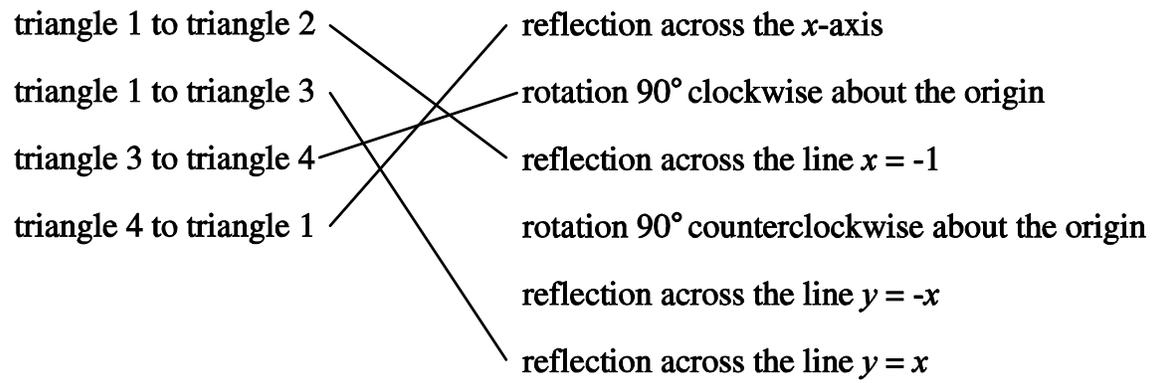
**Column B**

- reflection across the  $x$ -axis
- rotation  $90^\circ$  clockwise about the origin
- reflection across the line  $x = -1$
- rotation  $90^\circ$  counterclockwise about the origin
- reflection across the line  $y = -x$
- reflection across the line  $y = x$

Scoring Notes:

**Column A**

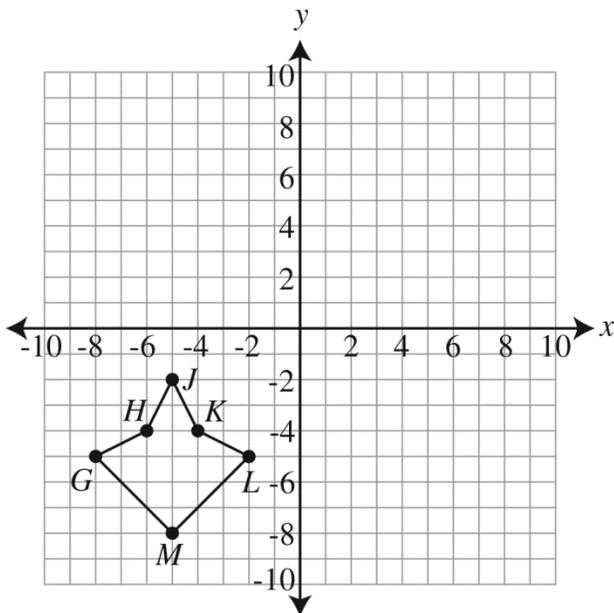
**Column B**



**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.G.A3**

**26**

Polygon  $GHIJKL$  is graphed on the coordinate plane shown below.



Two transformations are performed on polygon  $GHIJKL$ .

- First, the polygon is reflected across the line  $y = 1$ .
- Then, the resulting polygon is translated right 3 units.

The result of both transformations is polygon  $G'H'J'K'L'M'$ . What ordered pair describes the location of vertex  $L'$ ?

- A  $(-2, 7)$
- B  $(1, 5)$
- C  $(1, 7)$
- D  $(7, -5)$

**Scoring Notes:**

**Rationale A:** reflects correctly, but does not translate

**Rationale B:** reflects across  $x$ -axis instead of  $y = 1$ , translates correctly

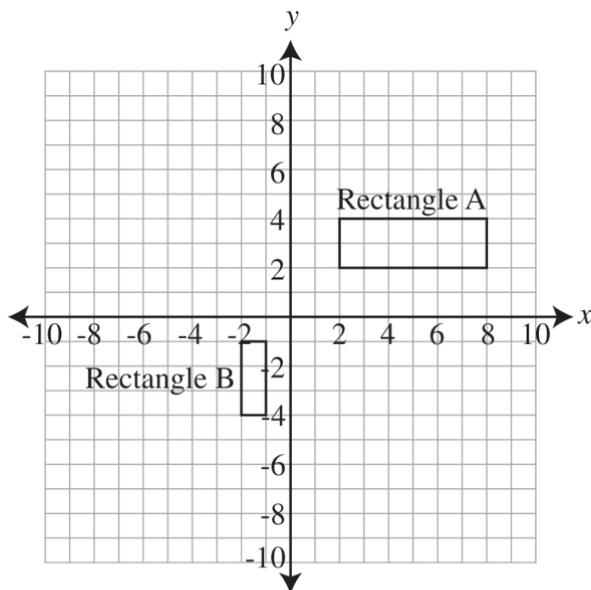
**Rationale C:** correct

**Rationale D:** reflects across  $x = 1$  instead of  $y = 1$ , translates correctly

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.G.A4**

**27**

On the coordinate plane below, rectangle A has been transformed to create similar rectangle B .



A list of transformations is shown below.

- A** a dilation with a scale factor of 0.5 and center of dilation at the origin
- B** a dilation with a scale factor of 2 and center of dilation at (1, 2)
- C** a rotation of  $90^\circ$  clockwise about the origin
- D** a rotation of  $180^\circ$  about the origin
- E** a reflection across the  $y$ -axis
- F** a reflection across the  $x$ -axis
- G** a translation 2 units left
- H** a translation 2 units left and 3 units down

Determine a series of 3 transformations that could describe how rectangle A was transformed to create similar rectangle B . Write the answers in the blanks below.

transformation 1: \_\_\_\_\_

transformation 2: \_\_\_\_\_

transformation 3: \_\_\_\_\_

**Scoring Notes:**

**transformation 1: A**  
**transformation 2: C**  
**transformation 3: E**

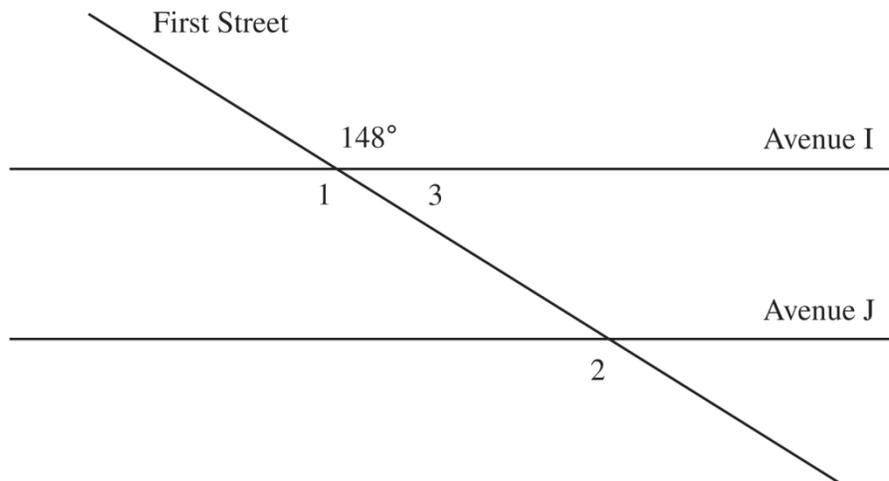
OR

**transformation 1: A**  
**transformation 2: F**  
**transformation 3: C**

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.G.A5**

**28**

The map below shows three streets in a city.



Avenue I and Avenue J are parallel. First Street intersects Avenue I at an angle of  $148^\circ$ .

Based on the map, which equations are true? Select **all** that apply.

- A**  $m\angle 1 = 148^\circ$
- B**  $m\angle 2 + m\angle 3 = 180^\circ$
- C**  $m\angle 2 = m\angle 3$
- D**  $m\angle 3 = 148^\circ$
- E**  $m\angle 1 + m\angle 2 = 180^\circ$
- F**  $m\angle 1 + m\angle 3 = 180^\circ$

**Scoring Notes:**

**Correct Answers:** A, B, F

**Rationale C:** confuses supplementary and congruent

**Rationale D:** confuses adjacent and congruent

**Rationale E:** confuses corresponding and supplementary

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.G.B6**

**29**

Jillian has three fruit trees in her backyard: a peach tree, an orange tree, and an apple tree. The locations of the trees form a right triangle.

- The peach tree is 30 feet from the orange tree.
- The peach tree is 40 feet from the apple tree.

Jillian believes that the triangle formed by the three trees is a right triangle with a hypotenuse of 50 feet because both  $50-40$  and  $40-30$  equal 10, but she has made an error in her reasoning.

- A** Explain the error that Jillian has made in her reasoning.
- B** Explain why the distance from the orange tree to the apple tree could be 50 feet or could be less than 50 feet.

**Write your response on the grid on the next page.**

**Scoring Notes:**

| <b>Score</b> | <b>Description</b>  |
|--------------|---|
| <b>3</b>     | Student scores 3 points.  |
| <b>2</b>     | Student scores 2–2.5 points.  |
| <b>1</b>     | Student scores 0.5–1.5 points.  |
| <b>0</b>     | Student’s response provides insufficient evidence of appropriate skills or knowledge to successfully accomplish the task. |
| <b>Blank</b> | No student response.  |

**Score Points**

- Part A:**      score 1.5 points      correct and complete explanation  
**OR**  
                  score 1.0 point      partially correct or incomplete explanation  
**OR**  
                  score 0.5 point      vague explanation only
- Part B:**      score 1.5 points      correct and complete explanation  
**OR**  
                  score 1.0 point      partially correct or incomplete explanation  
**OR**  
                  score 0.5 point      vague explanation only

## Correct Answers

**Part A:** Accept all correct and complete explanations.

**Sample Explanation:**

Jillian's procedure will not work for every right triangle. For a triangle to be a right triangle, the square of the two legs must equal the square of the hypotenuse.

**Part B:** Accept all correct and complete explanations.

**Sample Explanation:**

The distance could be 50 feet because 30 feet and 40 feet could be the legs of the triangle and, using the Pythagorean theorem, the hypotenuse would be 50 feet.

$$30^2 + 40^2 \rightarrow 900 + 1600 = 2500$$

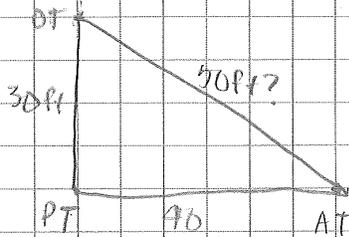
$$50^2 = 2500$$

The distance could also be less than 50 feet because 40 feet could be the hypotenuse, which would mean it is the longest side. If the distance from the orange tree to the apple tree is less than 40 feet it is also less than 50 feet.

# **No 3-point responses**

### Instructional Materials Question 29

**A** Jillian made a mistake when she did not use the Pythagorean theorem to discover the length of the hypotenuse which involves more complex math than simply deciding that since a number she discovered and the remaining numbers subtracted from one another equal the same number that that is the answer she needed to square the two known numbers, add them together and find the square root of that to determine answer.



$$a^2 + b^2 = c^2$$

$$30^2 + 40^2 \quad \sqrt{2500}$$

$$900 + 1600$$

**B** It could be 50 ft as the hypotenuse because the numbers 30 and 40 squared and added together equal 2500 and the square root of that is 50, meaning that the hypotenuse, the unknown length between the orange tree and the apple tree could be 50 ft. It could be less than 50 ft if in fact it

**Score Point: 2**

The response to Part A includes a correct and complete explanation (1.5). The response to Part B includes an incomplete explanation (1.0).

### Instructional Materials Question 29

**A** Jillian is wrong because you'd have to use the equation  $a^2 + b^2 = c^2$ . Then, you'd find the square root of  $c^2$ .  $50^2 - 40^2$  and  $40^2 - 30^2$  may have the same difference, but that's not how you'd find the hypotenuse of a triangle.

**B** The distance from the orange tree to the apple tree is 50ft because  $30^2 + 40^2 = 2500$ , and the square root of 2500 is 50ft.

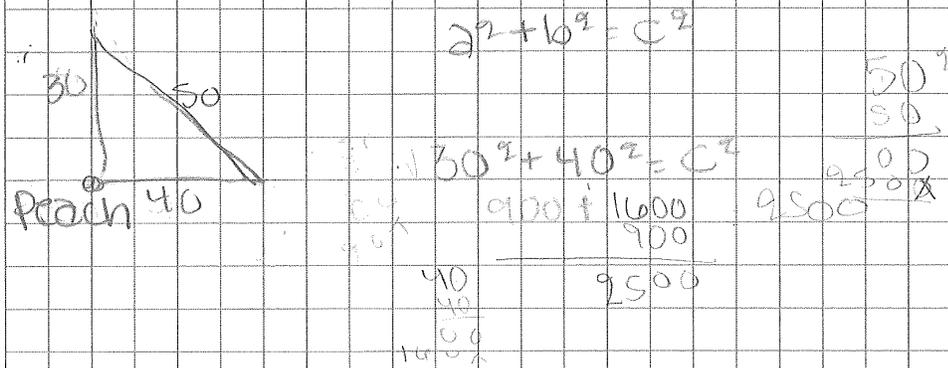
Score Point: 2

The response to Part A includes a correct and complete explanation (1.5). The response to Part B includes an incomplete explanation (1.0).

Instructional Materials Question 29

A Jillian error was that she believed there wasn't a difference between 50-40 and 40-30 just because they both equalled 10. There is a difference because 50 ft is 10 more feet than 40 ft. Plus, she had to use the information she had to get the real answer. Jillian can't just use numbers because they're the same.

B The distance from the orange and apple tree is 50.  $a^2 + b^2 = c^2$  so  $30^2 + 40^2 = c^2 \rightarrow 900 + 1600 = 2500$  and  $50^2$  is 2500. So the distance is 50 feet.



Score Point: 1

The response to Part A is incorrect (0). The response to Part B includes an incomplete explanation (1.0).

### Instructional Materials Question 29

A The error that Jillian had made in her reasoning is the way she thought it's a right triangle. Although it is true that both equations equal 10, the true way to determine if it is a right triangle is by using the formula  $a^2 + b^2 = c^2$ . In this case, it would be  $900 + 1600 = 2500$ , which is true.

|   |   |   |
|---|---|---|
| 30  | 40  | 50  |
| 30  | 40  | 50  |
| <hr style="width: 100%; border: 0.5px solid black;"/> | <hr style="width: 100%; border: 0.5px solid black;"/> | <hr style="width: 100%; border: 0.5px solid black;"/> |
| 900   | 1600  | 2500  |

B The distance from the orange tree to the apple tree must be 50 feet or less because the hypotenuse must be greater than the two other sides. It must be 50 feet because that is the only case where the two other sides will add up to the formula  $a^2 + b^2 = c^2$ .

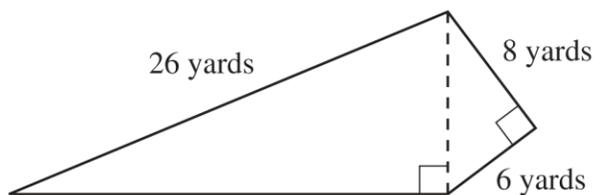
Score Point: 1

The response to Part A includes a correct and complete explanation (1.5). The response to Part B is incorrect (0).

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.G.B7**

**30**

A dog park is in the shape of a quadrilateral. The shape of the dog park and some of its dimensions are shown in the diagram below.



What is the perimeter, in yards, of the dog park? Show your work or explain your thinking.

Write your response on the grid below.

**Scoring Notes:**

For this item, a full-credit response (2 points) includes

- perimeter of the quadrilateral, 64 (yards)
- AND**
- correct work or explanation indicating how the perimeter was determined

For example,

- $6^2 + 8^2 = c^2$   
 $36 + 64 = c^2$   
 $100 = c^2$   
 $10 = c$

$$10^2 + b^2 = 26^2$$

$$100 + b^2 = 676$$

$$b^2 = 576$$

$$b = 24$$

$$P = 6 + 8 + 24 + 26$$

$$P = 64$$

**OR**

- To determine the perimeter of the dog park, the length of the 4th side of the park needs to be determined. The dog park is made up of two right triangles. The sides of the dog park that are 6 yards and 8 yards are the legs of the small right triangle. They can be used to determine the hypotenuse of the small triangle by applying the Pythagorean theorem:  $a^2 + b^2 = c^2$ . The hypotenuse of the small triangle is 10 yards. The hypotenuse of the small triangle is a leg of the larger right triangle. Applying the Pythagorean theorem to the larger triangle will result in the missing length of the dog park. The missing length is 24 yards. Then the lengths of all the sides of the dog park can be summed to determine the perimeter:  $6 + 8 + 24 + 26 = 64$ . The perimeter of the dog park is 64 yards.

For this item, a partial-credit response (1 point) includes either

- perimeter of the quadrilateral, 64 (yards)  
**OR**
- some work or explanation indicating how the perimeter was determined  
**OR**
- incorrect answer based on computation error (work must be shown)

For this item, a no-credit response (0 points) includes none of the features of a full- or partial-credit response.

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.G.B7**

**31**

Two runners begin running from the same spot. One runner runs north and the other runs west, so that their directions are perpendicular to each other. One runner runs at an average rate of 3 miles per hour (mph). The other runner runs at an average rate of 5 mph.

Which statements about the shortest distances between the two runners are true? Select **all** that apply.

- A** After 1 hour, the shortest distance between the runners is  $\sqrt{8}$  miles.
- B** After 1 hour, the shortest distance between the runners is  $\sqrt{34}$  miles.
- C** After 2 hours, the shortest distance between the runners is 2 times the shortest distance between the runners after 1 hour.
- D** After 2 hours, the shortest distance between the runners is 4 times the shortest distance between the runners after 1 hour.

**Scoring Notes:**

**Correct Answers:** B, D

**Rationale A:**  $\sqrt{(3+5)}$

**Rationale C:** thinks relationship is linear

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.G.B8**

**32** The locations of two points on a coordinate plane are described by the ordered pairs shown below.

$$(4, -1) \quad (-4, 3)$$

What is the shortest distance between the two points?

- A 2 units
- B  $\sqrt{10}$  units
- C  $\sqrt{74}$  units
- D  $\sqrt{80}$  units

**Scoring Notes:**

**Rationale A:** added corresponding  $x$ - and  $y$ -values instead of subtracting

**Rationale B:** adds  $x$ - and  $y$ -values from each pair

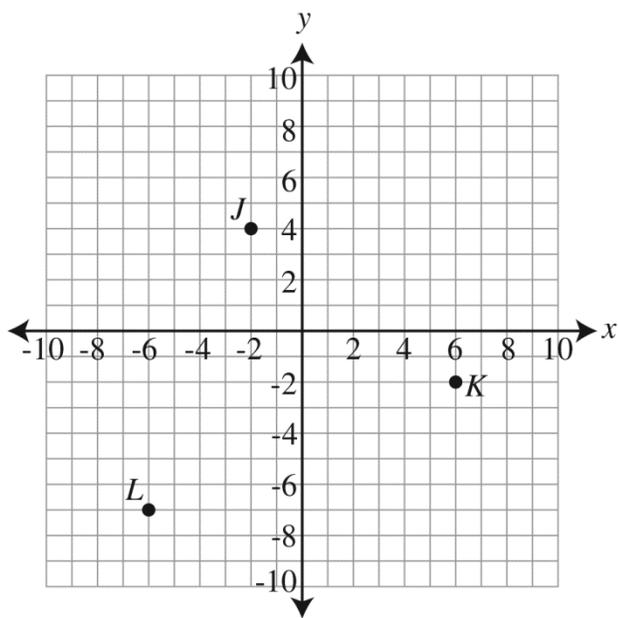
**Rationale C:** subtracts  $x$ - and  $y$ -values from each pair

**Rationale D:** correct

Nevada Instructional Materials Phase III  
Grade 8 Mathematics  
NVACS: M\_8.G.B8

33

Points  $J$ ,  $K$ , and  $L$  are graphed on the coordinate plane shown below.



How many units greater is the distance between points  $K$  and  $L$  than the distance between points  $J$  and  $K$ ? Write the answer in the blank below.

\_\_\_\_\_ units

**Scoring Notes:**

3 (units)

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.G.C9; 8.EE.A2**

**34**

The height of a cone is 3 times the diameter of its circular base. A cylinder has the same height and the same diameter as the cone. The cone is placed inside the cylinder. The volume of the cylinder that is not occupied by the cone is  $256\pi$  cubic inches. What are the diameter of the cylinder and the height of the cone? Write the answers in the blanks below.

diameter of the cylinder:

\_\_\_\_\_ inches

height of the cone:

\_\_\_\_\_ inches

**Scoring Notes:**

**diameter of cylinder:** 8 (inches)

**height of cone:** 24 (inches)

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.G.C9**

**35**

Two cylinders have the same volume.

- The radius of cylinder A is  $\frac{1}{3}$  the radius of cylinder B .
- The height of cylinder B is 18 centimeters (cm).

What is the height, in centimeters, of cylinder A ? Show your work or explain your thinking.

Write your response on the grid below.

**Scoring Notes:**

For this item, a full-credit response (2 points) includes

- height of cylinder A, 162 cm
- AND**
- work or explanation indicating how the height of cylinder A was determined

For example,

- $V = \pi r^2 h$

$$\pi r^2 h = \pi (3r)^2 (18)$$

$$h = 9 \cdot 18$$

$$h = 162$$

**OR**

- Since the radius of cylinder A is  $\frac{1}{3}$  the radius of cylinder B, then the radius of cylinder B is 3 times the radius,  $r$ , of cylinder A. Using the formula for the volume of a cylinder and substituting in what we know, the height of the cylinder is 162 cm.

$$\pi r^2 h = \pi (3r)^2 (18)$$

$$h = 162$$

For this item, a partial-credit response (1 point) includes either

- height of cylinder A, 162 cm
- OR**
- work or explanation indicating how the height of cylinder A was determined
- OR**
- incorrect answer based on a calculation error (work must be shown)

For this item, a no-credit response (0 points) includes none of the features of a full- or partial-credit response.

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.G.C9; 8.EE.A2**

**36**

A part for a machine is being custom-made for a customer. The part is originally a sphere-shaped object.

- The top half of the sphere is divided into 4 equal-sized sections.
- One of the sections is removed.
- The volume of the removed section is  $4.5\pi$  cubic inches.

**A** What is the diameter, in inches, of the original sphere? Show or explain all your work.

The sphere with the section removed will be shipped to the customer in a cylinder-shaped container. There needs to be 1 inch of room all around the sphere. The smallest possible cylinder-shaped container that the sphere fits in, including the extra space, will be used.

**B** What is the **greatest** volume, in cubic inches, of packing material that can be placed in the cylinder containing the sphere with the section removed? Show or explain all your work. Write your answer in terms of  $\pi$  .

**Write your response on the grid on the next page.**

## Scoring Notes:

| Score        | Description   |
|--------------|---|
| <b>3</b>     | Student scores 3 points.  |
| <b>2</b>     | Student scores 2–2.5 points.  |
| <b>1</b>     | Student scores 0.5–1.5 points.  |
| <b>0</b>     | Student’s response provides insufficient evidence of appropriate skills or knowledge to successfully accomplish the task. |
| <b>Blank</b> | No student response.  |

## Score Points

|                |                  |  |
|----------------|------------------|--|
| <b>Part A:</b> | score 1.5 points | correct answer with correct and complete work or explanation   |
|                | <b>OR</b>        |  |
|                | score 1.0 point  | correct answer with partially correct work or incomplete explanation                                       |
|                | <b>OR</b>        | incorrect answer due to calculation error (work must be shown)   |
| <b>OR</b>      |                  |  |
|                | score 0.5 point  | correct answer with no work or explanation   |
|                | <b>OR</b>        | some correct procedure   |
|                | <b>OR</b>        | vague explanation only   |
| <b>Part B:</b> | score 1.5 points | correct answer (based on answer from <b>Part A</b> ) with correct and complete work or explanation         |
|                | <b>OR</b>        |  |
|                | score 1.0 point  | correct answer (based on answer from <b>Part A</b> ) with partially correct work or incomplete explanation |
|                | <b>OR</b>        | incorrect answer due to calculation error (work must be shown)   |
| <b>OR</b>      |                  |  |
|                | score 0.5 point  | correct answer (based on answer from <b>Part A</b> ) with no work or explanation                           |
|                | <b>OR</b>        | some correct procedure   |
|                | <b>OR</b>        | vague explanation only   |

## Correct Answers

**Part A:** 6 (inches)

$$\frac{1}{8}\left(\frac{4}{3}\pi r^3\right) = 4.5\pi$$

$$\frac{1}{6}\pi r^3 = 4.5\pi$$

$$\frac{1}{6}r^3 = 4.5$$

$$r^3 = 27$$

$$r = 3$$

$$d = 2r = 6$$

**or equivalent work**

**OR**

**Sample Explanation:**

Since the top half of the sphere is divided into 4 sections, each section is  $\frac{1}{8}$  of the sphere.

So the volume of the removed section is  $\frac{1}{8}$  the volume of the whole sphere. This can be used to find the radius of the sphere, and then the diameter of the sphere.

$$\left(\frac{4}{3}\pi r^3\right) = (8)4.5\pi$$

$$\frac{1}{8}\left(\frac{4}{3}\pi r^3\right) = 4.5\pi$$

$$\frac{1}{6}\pi r^3 = 4.5\pi$$

$$r^3 = 27$$

$$r = 3$$

Since the radius of the sphere is 3 inches, the diameter is 6 inches.

**Part B:**  $96.5\pi$  (cubic inches)

$$V = \pi r^2 h$$

$$V = \pi(4)^2 8$$

$$V = 128\pi$$

$$\frac{8}{8} - \frac{1}{8} = \frac{7}{8}$$

$$7(4.5\pi) = 31.5\pi$$

$$128\pi - 31.5\pi = 96.5\pi$$

**or equivalent work**

**OR**

**Sample Explanation:**

The diameter of the sphere is 6 inches. So the cylinder must have a height of 8 inches, and the diameter of the circular base of the cylinder must also be 8 inches to allow for the extra inch of space needed all around the sphere. To determine the greatest possible volume of packing material, the volume of the sphere with the section removed will be subtracted from the volume of the cylinder.

Volume of cylinder:

$$V = \pi r^2 h$$

$$V = \pi(4^2)8$$

$$V = 128\pi$$

Since the volume of the removed section of the sphere is  $\frac{1}{8}$  the volume of the whole

sphere, the volume of the remaining  $\frac{7}{8}$  of the sphere is  $7(4.5\pi) = 31.5\pi$  cubic inches. So the greatest amount of packing material is  $128\pi - 31.5\pi = 96.5\pi$  cubic inches.

**No 3-point responses**  
**No 2-point responses**

Instructional Materials Question 36

**A**

$$V = \frac{4}{3} \pi r^3$$

$$V = 36\pi$$

$$\frac{108 \cdot 4}{3 \cdot 3}$$

$$\frac{36}{3} \div \frac{4}{3}$$

~~$$\frac{27 \cdot 5}{10}$$~~

~~$$\frac{145}{81}$$~~

~~$$\frac{27}{3}$$~~

$$\frac{108}{3} = 36$$

$$36 \div \frac{4}{3} = 27$$

$$4 \overline{)108}$$

$$\underline{8} \phantom{0}$$

$$28$$

$$\frac{136}{3} = 45 \text{ R } 1$$

$$44.5$$

$$\times 8$$

$$\hline 36.0$$

$$36\pi$$

$$D = 6 \text{ in}$$

the cylinder need to have a diameter of 7 in

**B**

Score Point: 1

The response to Part A includes the correct answer with correct and complete work (1.5). The response to Part B is incorrect (0).

### Instructional Materials Question 36

**A**

$$4.5 \pi \cdot 4 = 18\pi \quad 2 \cdot 3 \pi = 6\pi$$
$$18\pi + 6\pi = 24\pi$$
$$24\pi \cdot 4 = 96\pi$$
$$96\pi \cdot 3 = 288\pi$$
$$288\pi \cdot 4 = 1152\pi$$
$$1152\pi \cdot 3 = 3456\pi$$
$$3456\pi \cdot 4 = 13824\pi$$
$$13824\pi \cdot 3 = 41472\pi$$
$$41472\pi \cdot 4 = 165888\pi$$
$$165888\pi \cdot 3 = 497664\pi$$
$$497664\pi \cdot 4 = 1990656\pi$$
$$1990656\pi \cdot 3 = 5971968\pi$$
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$$16152266522110225790102974104484560961782865793598285820175053471122688\pi \cdot 3 = 48456799$$

Instructional Materials Question 36

**A**

$$4.5 \times 4 = 18.0 \cdot 2 = 36\pi$$

Diameter = 6 inches<sup>B</sup>

**B**

Score Point: 1

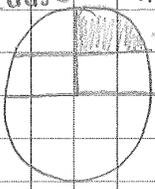
The response to Part A includes some correct procedure (correct answer but incorrect unit) (0.5).

The response to Part B is missing (0).

### Instructional Materials Question 36

**A**

The diameter of the original sphere is  $10^3$  inches. I figured this out by multiplying the one corners volume by four. I multiplied it by four because there was 2 four sections to the top half of the sphere.

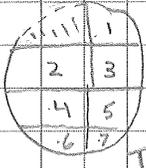


$$\begin{array}{r} 4.5 \\ \times 4 \\ \hline 18.0 \end{array}$$

4.5

**B**



You will need  $31.5^3$  inches of room to put the piece in the box.

I figured this out by multiplying the value of one piece by seven. The seven represents the seven equal pieces excluding the missing one.

$$\begin{array}{r} 4.5 \\ \times 7 \\ \hline 31.5 \end{array}$$

- multiply by 7

Score Point: 1

The response to Part A is incorrect (0). The response to Part B includes some correct procedure (correct volume of sphere with section removed, but incorrect unit) (0.5).

Instructional Materials Question 36

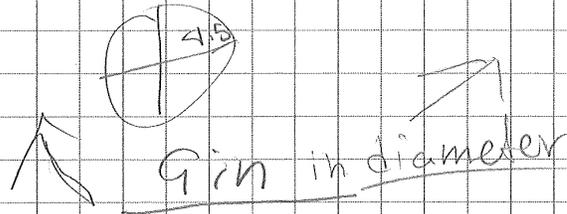
A

4.5

$$\pi \approx 3.14$$

$$4.5\pi$$

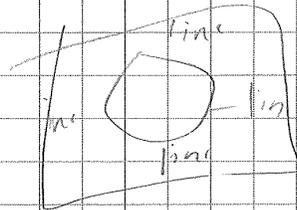
$$\frac{4.5}{2} = 9$$



B

$$9 + \frac{4}{\pi} = 13 \text{ in}$$

$$13\pi$$



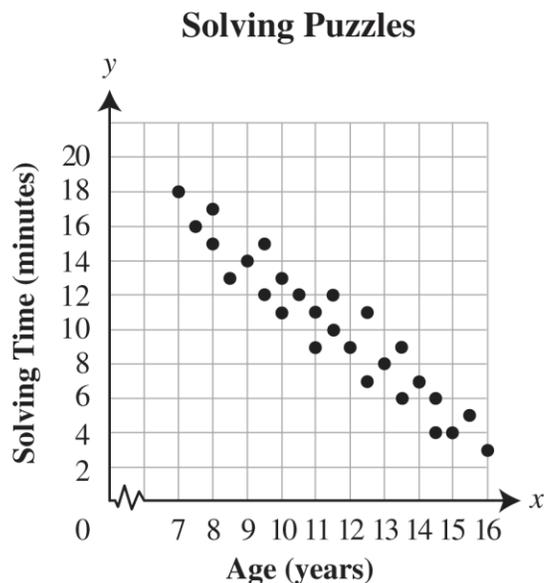
Score Point: 0

The response to Part A is incorrect, and represents a common error in student work (0). The response to Part B is incorrect (0).

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.SP.A1**

**37**

A researcher timed a group of students as they solved a puzzle. The scatter plot below shows the age of each student and the number of minutes it took that student to solve the puzzle.



The researcher decides to remove about  $\frac{1}{3}$  of the data points from the scatter plot because the background information on those students is incomplete. A new scatter plot is created with the remaining data points. Which statement about the new scatter plot **must** be true?

- A The new scatter plot will have an outlier.
- B The new scatter plot will have at least one cluster.
- C The new scatter plot will have a positive linear association.
- D The new scatter plot will have a negative linear association.

**Scoring Notes:**

**Rationale A:** could be true, but not necessarily true

**Rationale B:** could be true, but not necessarily true

**Rationale C:** strength of association will change, but new plot cannot have a positive association

**Rationale D:** correct

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.SP.A1**

**38**

Three sets of data are listed in the tables below. Each set of data is described by one of the types of association listed below.

|          |          |    |    |    |    |    |    |    |    |
|----------|----------|----|----|----|----|----|----|----|----|
| <b>A</b> | <i>x</i> | 1  | 3  | 7  | 4  | 8  | 5  | 2  | 9  |
|          | <i>y</i> | 60 | 55 | 35 | 40 | 20 | 35 | 50 | 15 |

positive association

|          |          |    |    |    |    |    |    |    |    |
|----------|----------|----|----|----|----|----|----|----|----|
| <b>B</b> | <i>x</i> | 1  | 3  | 7  | 4  | 8  | 5  | 2  | 9  |
|          | <i>y</i> | 50 | 55 | 45 | 70 | 40 | 65 | 35 | 60 |

negative association

|          |          |    |    |    |    |    |    |    |    |
|----------|----------|----|----|----|----|----|----|----|----|
| <b>C</b> | <i>x</i> | 1  | 3  | 7  | 4  | 8  | 5  | 2  | 9  |
|          | <i>y</i> | 15 | 25 | 70 | 40 | 75 | 45 | 20 | 80 |

no association

Match each set of data to the type of association that describes it by drawing a line from each table to the correct type of association.

**Scoring Notes:**

**A:** negative association

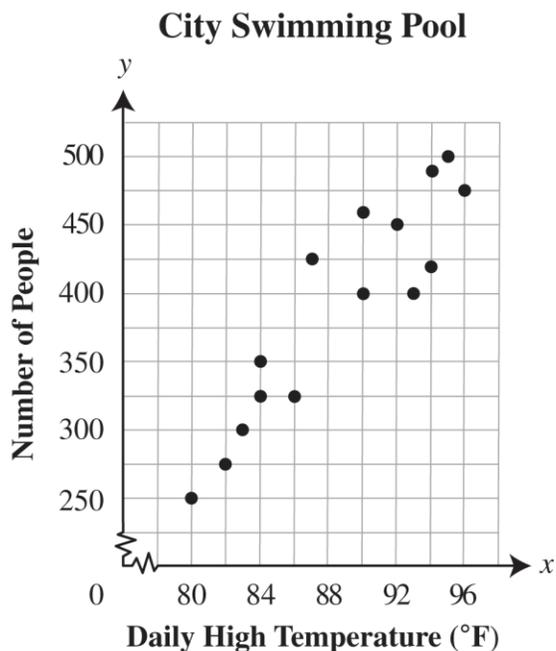
**B:** no association

**C:** positive association

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.SP.A2**

**39**

The scatter plot below shows the daily high temperatures and the number of people who visited a city swimming pool for each of 15 days.

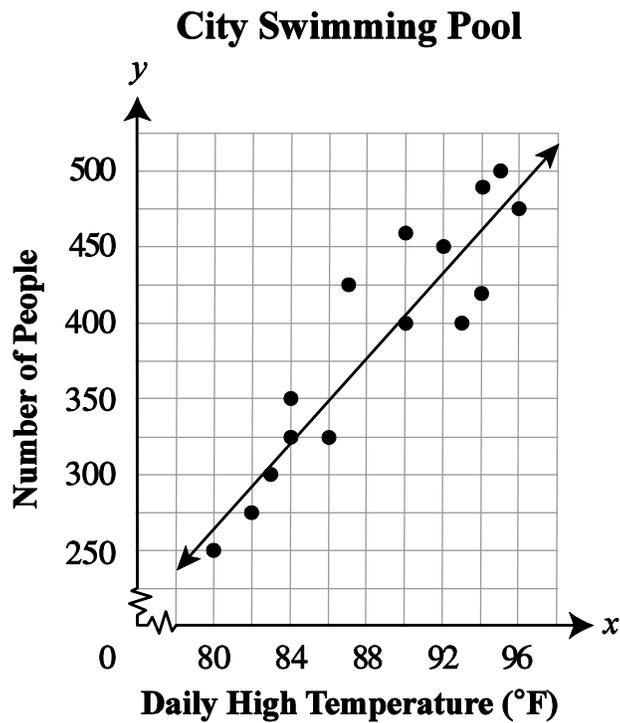


On the scatter plot, draw a line of best fit for the data.

**Scoring Notes:**

The line of best fit is  $y = 14.02x - 853.41$  approximated with  $y = 14x - 853$ . Some points the line passes through are (84, 323), (88, 379), (90, 407), and (95, 477).

(Lines may vary. A correct line should not be vertical, and should have about half of the data points above it and about half of the data points below it.)



**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.SP.A3**

**40**

Laura needs to rent a bike for  $x$  days. The store she rents the bike from charges a fee for cleaning the bike when it is returned. The total amount ( $y$ ), in dollars, that Laura will pay for renting the bike can be modeled using the linear equation shown below.

$$y = 3.50x + 1.25$$

Which statement **best** describes what the slope and the  $y$ -intercept of the linear equation represent in this situation?

- A** The slope represents an increase of \$1.25 each day Laura rents the bike, and the  $y$ -intercept represents a one-time cleaning fee of \$3.50 .
- B** The slope represents an increase of \$3.50 each day Laura rents the bike, and the  $y$ -intercept represents a cleaning fee of \$1.25 each day Laura rents the bike.
- C** The slope represents an increase of \$7.00 every 2 days Laura rents the bike, and the  $y$ -intercept represents a one-time cleaning fee of \$1.25 .
- D** The slope represents an increase of  $2x$  dollars every 2 days Laura rents the bike, and the  $y$ -intercept represents a one-time cleaning fee of \$1.25 .

**Scoring Notes:**

**Rationale A:** confuses slope and intercept

**Rationale B:** slope is correct,  $y$ -intercept is not

**Rationale C:** correct

**Rationale D:** confuses variable and coefficient for slope

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.SP.A3**

**41**

Jeff has a job mowing lawns. The linear equation shown below can be used to model the relationship between the number of hours ( $x$ ) Jeff spends mowing a lawn and the total amount ( $y$ ), in dollars, he charges a customer.

$$y = 20x + 5$$

Jeff mowed lawns for 3 customers last week.

- He spent 4.0 hours mowing the lawn for customer 1 .
- He spent 2.5 hours mowing the lawn for customer 2 .
- He spent 5.0 hours mowing the lawn for customer 3 .

Explain why the equation  $y = 20(11.5) + 5$  is **not** appropriate to use to determine the total amount Jeff charged his customers last week. As part of your explanation, state what both the slope and the  $y$ -intercept of the equation  $y = 20x + 5$  represent, and determine the total amount Jeff charged his customers last week.

Write your response on the grid below.

**Scoring Notes:**

For this item, a full-credit response (2 points) includes

- determining total amount charged, \$245.00
- AND**
- complete explanation indicating why the equation  $y = 20(11.5) + 5$  is not appropriate and identifying the slope as the hourly charge and the  $y$ -intercept as the initial charge

For example,

- The total number of hours Jeff worked is 11.5 hours. The slope of the equation, 20, represents the hourly charge for mowing the lawn. The  $y$ -intercept of the equation, 5, represents an initial charge to each customer. So, even though the total number of hours is 11.5, combining that amount in one equation does not take into account the initial charge to each customer. The total amount Jeff charged his customers is \$245.00 since:

The charge for customer 1 is \$85.00:

$$y = 20x + 5$$

$$y = 20(4) + 5$$

$$y = 85$$

The charge for customer 2 is \$55.00:

$$y = 20x + 5$$

$$y = 20(2.5) + 5$$

$$y = 55$$

The charge for customer 3 is \$105.00:

$$y = 20x + 5$$

$$y = 20(5) + 5$$

$$y = 105$$

Add the three amounts to find the total amount Jeff charged his customers:

$$85 + 55 + 105 = 245$$

For this item, a partial-credit response (1 point) includes either

- determining total amount charged, \$245.00

**OR**

- explanation indicating why the equation  $y = 20(11.5) + 5$  is not appropriate

**OR**

- identifying the slope as the hourly charge and the  $y$ -intercept as the initial charge

**OR**

- incorrect total amount charged based on a calculation error (work must be shown)

For this item, a no-credit response (0 points) includes none of the features of a full- or partial-credit response.

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.SP.A3**

**42**

The equation below represents the relationship between the number of games ( $g$ ) Matt plays at an arcade and the remaining amount of money ( $m$ ), in dollars, Matt has to spend.

$$16.75 - 0.50g = m$$

Using the equation, which statements are true? Select **all** that apply.

- A** Matt spends \$0.50 to play 1 game.
- B** Matt has a minimum of \$16.75 to spend at the arcade.
- C** Matt can play a maximum of 33 games.
- D** Matt will have \$6.75 remaining after playing 10 games.
- E** Matt spends \$8.00 to play 4 games.

**Scoring Notes:**

**Correct Answers:** A, C

**Rationale B:** confuses minimum and maximum

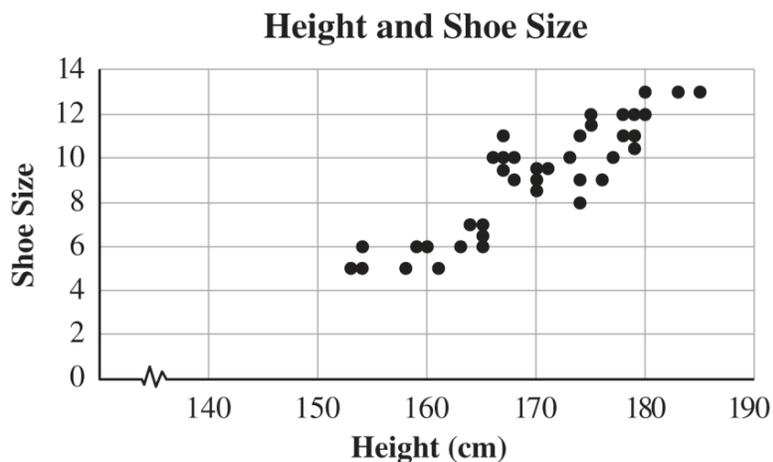
**Rationale D:** does not multiply by coefficient of  $g$

**Rationale E:** divides instead of multiplying

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.SP.A3; 8.SP.A1**

**43**

The scatter plot below shows a relationship between the heights and the shoe sizes of some high school students.



- A** What type of association **best** describes the data on the scatter plot? Explain your thinking. As part of your explanation, describe the relationship between height and shoe size as they change.
- B** Explain why the equation of a line of best fit for the data on the scatter plot might **not** be considered a good tool to predict the shoe size of any person that is any height.

**Write your response on the grid on the next page.**

### Scoring Notes:

| Score        | Description   |
|--------------|---|
| <b>3</b>     | Student scores 3 points.  |
| <b>2</b>     | Student scores 2–2.5 points.  |
| <b>1</b>     | Student scores 0.5–1.5 points.  |
| <b>0</b>     | Student’s response provides insufficient evidence of appropriate skills or knowledge to successfully accomplish the task. |
| <b>Blank</b> | No student response.  |

### Score Points

|                |                  |   |
|----------------|------------------|---|
| <b>Part A:</b> | score 1.5 points | correct answer with correct and complete explanation            |
|                | <b>OR</b>        |   |
|                | score 1.0 point  | correct answer with partially correct or incomplete explanation |
|                | <b>OR</b>        | correct and complete explanation with no answer                 |
| <b>OR</b>      |                  |   |
|                | score 0.5 point  | correct answer with no explanation                              |
|                | <b>OR</b>        | vague explanation only  |
| <b>Part B:</b> | score 1.5 points | correct and complete explanation                                |
|                | <b>OR</b>        |   |
|                | score 1.0 point  | partially correct or incomplete explanation                     |
|                | <b>OR</b>        |   |
|                | score 0.5 point  | vague explanation only  |

## Correct Answers

**Part A:** Accept all correct and complete explanations.

**Sample Explanation:**

The data display a positive linear association, since, as height increases, so does shoe size. Based on these data, for an increase of 20 cm there is an increase of about 6 shoe sizes.

**Part B:** Accept all correct and complete explanations.

**Sample Explanation:**

The equation of a line of best fit for this data is only accurate for a small section of the population (high school students) and should not be extrapolated to apply to people of all heights. The relationship shown in the scatter plot appears linear, but data like this will not always be linear. Not every 20-cm increase (or decrease) in height will result in an increase (or decrease) of 6 shoe sizes. For example, it is unlikely that a person with a height of 140 cm has a shoe size of 0, and that a person with a height of 120 cm has a shoe size that is a negative number.

# No 3-point responses

### Instructional Materials Question 43

A The association that best describes the scatter plot is, "The taller someone is, the greater chance they have of having a big shoe size." Someone who is 160 cm has size 6 shoes. Someone who is 165 cm also has size 6 shoes. Yet, someone who is 165 cm tall can have 6.5 sized shoes. Still, no one that is more than 165 cm has a size bigger than 8. This shows the correlation between height and shoe size.

B The equation of a line of best fit for the data on the scatter plot might not be considered a good tool to predict the shoe size of a person that is any height. The reason is that this is a very small survey conducted with almost 40 people. You need more people to have reliable data.

Score Point: 2

The response to Part A includes a correct and complete explanation with no answer (1.0). The response to Part B includes an incomplete explanation (1.0).

### Instructional Materials Question 43

**A** The association that best describes the data on the scatter plot is a positive increase. It's positive because it goes up diagonally, instead of down diagonally. The relationship between size and height is that for every 10 cm., shoe size increases by about one.

**B** The data on the scatter plot might not be considered a good tool because there is a line break on the X-axis. Another reason why the data on the scatter plot might not be considered a good tool is because they only used high-school students. To be more accurate, they need to use more variety, such as toddlers, middle school students, adults, elementary school students, etc.

Score Point: 2

The response to Part A includes the correct answer with partially correct explanation (1.0). The response to Part B includes an incomplete explanation (1.0).

### Instructional Materials Question 43

**A** Weak positive, at some places of the same height the shoe size can differ by 4. The correlation between shoe size to height is app. 3:10, because at 160 cm tall the student's shoe size is app. 6 and at 180 cm their shoe size is app. 12.

**B** The data already has some people of the same height differing more than 4 shoe sizes, so using a line of best fit would have a marginal error of around 2 shoe sizes.

Score Point: 1

The response to Part A includes the correct answer with partially correct explanation (1.0). The response to Part B is incorrect (0).

### Instructional Materials Question 43

A The height and shoe size vary more from 150 to 180

It seems to be that the taller the person the bigger shoe size he has and the shorter the person the smaller the shoe size.

ex, height: 155 cm  
shoe: 6

height: 180 cm  
shoe: 12

B The equation of a line of best fit for the data on the scatter plot might not be considered a good tool because you may have more data on a certain height but not have as much or even have data for another certain height. Also their height might not be on the graph.

Ex. There is no data for the height of 140 cm but then there is a lot of data given for the heights of 160 cm through 180 cm.

Score Point: 1

The response to Part A includes a correct and complete explanation with no answer (1.0). The response to Part B is incorrect (0).

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.SP.A4**

**44**

Sandy surveyed 40 students at her school about the classes they are taking. The data she collected from her survey are listed below.

- 23 students are taking music.
- 17 of the students taking music are taking biology.
- 32 students are taking biology.

Based on the data, complete the two-way table shown below.

|                    | Taking Music | Not Taking Music | Total |
|--------------------|--------------|------------------|-------|
| Taking Biology     |              |                  |       |
| Not Taking Biology |              |                  |       |
| Total              |              |                  |       |

**Scoring Notes:**

|                    | Taking Music | Not Taking Music | Total |
|--------------------|--------------|------------------|-------|
| Taking Biology     | 17           | 15               | 32    |
| Not Taking Biology | 6            | 2                | 8     |
| Total              | 23           | 17               | 40    |

**Nevada Instructional Materials Phase III**  
**Grade 8 Mathematics**  
**NVACS: M\_8.SP.A4**

**45**

A survey is given to a group of people to determine whether they exercise regularly and eat at least three servings of vegetables every day. The results are shown in the table below.

|   |     | Exercise Regularly |    |
|---|-----|--------------------|----|
|   |     | Yes                | No |
| Eat at Least Three Servings of Vegetables | Yes | 82                 | 95 |
|   | No  | 45                 | 78 |

- A** What percentage of the people in the group exercise regularly and do **not** eat at least three servings of vegetables every day? Show your work or explain your thinking.
- B** Explain why a randomly selected person from the group is 18% more likely to eat at least three servings of vegetables every day than not to, no matter whether he or she exercises regularly or not. Show your work.

**Write your response on the grid on the next page.**

## Scoring Notes:

| Score | Description   |
|-------|---|
| 3     | Student scores 3 points.  |
| 2     | Student scores 2–2.5 points.  |
| 1     | Student scores 0.5–1.5 points.  |
| 0     | Student’s response provides insufficient evidence of appropriate skills or knowledge to successfully accomplish the task. |
| Blank | No student response.  |

## Score Points

**Part A:** score 1.5 points correct answer with correct and complete work or explanation  
**OR**  
score 1.0 point correct answer with partially correct work or incomplete explanation  
**OR**  
incorrect answer due to calculation error (work must be shown)  
**OR**  
score 0.5 point correct answer with no work or explanation  
**OR**  
some correct procedure  
**OR**  
vague explanation only

**Part B:** score 1.5 points correct and complete explanation with correct and complete work  
**OR**  
score 1.0 point correct and complete explanation with partially correct or incomplete work  
**OR**  
partially correct or incomplete explanation with correct and complete work  
**OR**  
score 0.5 point correct and complete explanation with no work  
**OR**  
some correct procedure  
**OR**  
vague explanation only

## Correct Answers

**Part A:** 15%

$$82 + 95 + 45 + 78 = 300$$

$$45 \div 300 = 0.15$$

$$0.15 = 15\%$$

**or equivalent work**

**OR**

**Sample Explanation:**

There are 300 people in the group. There are 45 people who exercise regularly but do not eat 3 servings of vegetables every day. Divide 45 by the total number of people who exercise regularly to find the percentage.

$$\frac{45}{300} = 0.15, \text{ or } 15\%.$$

**Part B:** Accept all correct and complete explanations.

**Sample Explanation:**

A total of 177 people in the group  $(82 + 95)$  eat 3 servings of vegetables every day. A total of 123 people in the group  $(45 + 78)$  do not eat 3 servings of vegetables.  $\frac{177}{300}$  is a greater probability than  $\frac{123}{300}$ . And  $177 - 123 = 54$ , so 54 more people eat 3 servings of vegetables every day.

$$\frac{54}{300} = 0.18, \text{ or } 18\%.$$

Instructional Materials Question 45

**A**

$$\begin{array}{r} 2 \\ 82 \\ 95 \\ 45 \\ + 78 \\ \hline 300 \end{array}$$

300 people

$$\frac{45}{300} = \frac{x}{100}$$

$$\frac{300x}{300} = \frac{4500}{300}$$

$$x = 15\%$$

15% of the people who were surveyed exercise daily and do not eat at least three servings of vegetables every day. I know this because I added all the people of thing 300. then I checked the chart and 45 out of 300 people exercise but dont eat their vegetables daily. I then multiplied 45 x 100 % 300 getting 15%.

---

**B**

$$\begin{array}{r} 95 \\ 182 \\ \hline 177 \end{array}$$

$$\frac{177}{300} = \frac{x}{100}$$

$$\frac{300x}{300} = \frac{17700}{300}$$

$$x = 59\%$$

eat vegetables 00

$$\begin{array}{r} 59 \\ \sqrt{177} \\ -15 \\ \hline 27 \\ -24 \\ \hline 00 \end{array}$$

$$\begin{array}{r} 1 \\ 45 \\ + 78 \\ \hline 123 \end{array}$$

$$\frac{123}{300} = \frac{x}{100}$$

$$\frac{300x}{300} = \frac{12300}{300}$$

$$x = 41\%$$

not eat vegetables

$$\begin{array}{r} 59\% \\ - 41\% \\ \hline 18\% \end{array}$$

The percent of those who eat their vegetables daily to those who dont is greater by 18% so it is more likely to find a person who does then not.

Score Point: 3

The response to Part A includes the correct answer with correct and complete work (1.5). The response to Part B includes a correct and complete explanation with correct and complete work (1.5).

Instructional Materials Question 45

**A** 15% of people in the group exercise regularly and don't eat at least 3 servings of vegetables a day.

$$\begin{array}{r} 82 \\ + 45 \\ \hline 127 \end{array}$$

$$\begin{array}{r} 195 \\ + 78 \\ \hline 273 \end{array}$$

$$\begin{array}{r} 45 \div 3 = 15 \\ 300 \div 3 = 100 \end{array}$$

$$\begin{array}{r} 127 \\ + 173 \\ \hline 300 \end{array}$$

$$\begin{array}{r} 82 \\ + 95 \\ \hline 177 \end{array}$$

$$\begin{array}{r} 78 \\ + 45 \\ \hline 123 \end{array}$$

$$\begin{array}{r} 42.3 \\ 3 \overline{)127} \\ \underline{90} \\ 37 \\ \underline{30} \\ 7 \end{array}$$

**B** The randomly selected person has a 59% chance of eating vegetables than a 41% chance of not eating vegetables.  $59\% - 41\% = 18\%$ .

$$\begin{array}{r} 177 \div 3 = 59 \\ 300 \div 3 = 100 \end{array}$$

$$\begin{array}{r} 3 \overline{)177} \\ \underline{9} \\ 87 \\ \underline{84} \\ 37 \\ \underline{30} \\ 7 \end{array}$$

$$\begin{array}{r} 123 \div 3 = 41 \\ 300 \div 3 = 100 \end{array}$$

$$\begin{array}{r} 3 \overline{)123} \\ \underline{6} \\ 63 \\ \underline{63} \\ 0 \end{array}$$

$$\begin{array}{r} 59 \\ - 41 \\ \hline 18 \end{array}$$

Score Point: 3

The response to Part A includes the correct answer with correct and complete work (1.5). The response to Part B includes a correct and complete explanation with correct and complete work (1.5).

### Instructional Materials Question 45

|            |  |  |  |
|------------|--|--|--|
| A          |  | $\frac{45}{300} = \frac{15}{100} = 15\%$ |  |
| 82         |  |  |  |
| 95         |  |  |  |
| 45         |  |  | 15% of the group exercises daily but does not eat at least three servings        |
| 78         |  |  | of vegetables daily. 45 people out of 300 is 15%. This shows                     |
| <u>230</u> |  |  | 45 people or 15% exercise daily but does not get 3 servings of vegetables daily. |
| 300        |  |  |  |
|            |  |  |  |
| B          |  |  |  |
| 82         |  |  | It will be 1800 more likely because overall they are more                        |
| 95         |  |  | people that eat vegetables daily than people who exercise.                       |
| 177        |  |  | There is 177 people that eat vegetables daily.                                   |
| <u>300</u> |  |  | This is 59%. There is only 433 that don't eat vegetables                         |
| 100        |  |  | daily. This is 144%. This is a 180% difference.                                  |

**Score Point: 2**

The response to Part A includes the correct answer with correct and complete work (1.5). The response to Part B includes a correct and complete explanation with partially correct work (1.0).

### Instructional Materials Question 45

**A**

|     |    |     |     |   |     |                                      |      |
|-----|----|-----|-----|---|-----|--------------------------------------|------|
| 82  | 15 | x   | 45  | = | x   | 200x = 45,000                        | 0015 |
| +78 | of | 100 | 300 | = | 100 | $\frac{300}{300} = \frac{4500}{300}$ | 4500 |
| 145 |    |     |     |   |     | $\frac{4500}{300}$                   | 1500 |
| 145 |    |     |     |   |     | x = 15%                              | 1500 |
| 300 |    |     |     |   |     |                                      |      |

The percentage of people who exercise daily and do not eat 3 servings of vegetables is 15%.

**B**

|     |     |   |
|-----|-----|---|
| 82  | 1   | If someone from the group is randomly selected, they are 18% more likely to eat three servings of vegetables. This is because there are 54 more people who eat 3 servings of vegetables which means there is a greater possibility to pick someone that eats their veggies. |
| +78 | 78  |   |
| 145 | +45 |   |
| 177 | 123 |   |
| 177 | 54  |   |

**Score Point: 2**  
 The response to Part A includes the correct answer with correct and complete work (1.5). The response to Part B includes a correct and complete explanation with incomplete work (1.0).

Instructional Materials Question 45

A

$$\begin{array}{r} 82 \\ + 78 \\ \hline 160 \end{array}$$

$$\begin{array}{r} 95 \\ + 45 \\ \hline 140 \end{array}$$

$$\begin{array}{r} 140 \\ + 160 \\ \hline 300 \end{array}$$

15%

$$\begin{array}{r} 45 \\ \hline 300 \\ \hline 0.15 \\ 300 \overline{) 45.00} \\ \underline{300} \\ 1500 \\ \underline{1500} \\ 0 \end{array}$$

B

This is because 82 people eat vegetable but, only 45 people exercise daily.

Score Point: 1

The response to Part A includes the correct answer with correct and complete work (1.5). The response to Part B is incorrect (0).





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