

**N.Q.1\*****SELECTED RESPONSE**

Select the correct answer.

1. A certain cooking oil has a density of 0.91 grams per milliliter. Which of the following series of calculations correctly determines the mass, in kilograms, of 15 liters of this oil?

(A)  $15\text{L} \cdot \frac{1\text{L}}{1000\text{mL}} \cdot \frac{0.91\text{g}}{1\text{mL}} \cdot \frac{1\text{kg}}{1000\text{g}}$

(B)  $15\text{L} \cdot \frac{1000\text{mL}}{1\text{L}} \cdot \frac{0.91\text{g}}{1\text{mL}} \cdot \frac{1000\text{g}}{1\text{kg}}$

(C)  $15\text{L} \cdot \frac{1000\text{mL}}{1\text{L}} \cdot \frac{1\text{mL}}{0.91\text{g}} \cdot \frac{1000\text{g}}{1\text{kg}}$

(D)  $15\text{L} \cdot \frac{1000\text{mL}}{1\text{L}} \cdot \frac{0.91\text{g}}{1\text{mL}} \cdot \frac{1\text{kg}}{1000\text{g}}$

2. Ordering  $n$  books from an online bookstore at \$19.99 per book comes with a 6.25% sales tax and a shipping charge of \$3.50 for each book after the first. If  $n$  is the whole number of books ordered, what are the units for the quantity represented by the expression  $19.99n + 0.0625(19.99n) + 3.50(n - 1)$ ?

(A) dollars

(B) books

(C) dollars per book

(D) percent of total cost

3. Shawn jogs  $n$  blocks, each of which are  $d$  meters long, in  $t$  minutes. What are the units for the expression  $\frac{nd}{t}$ , Shawn's average speed for his jog?

(A) blocks

(B) meters

(C) minutes

(D) meters per minute

**Each activity will be graphed, with time on the horizontal axis. Match the activities with appropriate scales for the horizontal axis.**

- \_\_\_\_\_ 4. Graphing the remaining amount of a sandwich against the time taken to eat it

- \_\_\_\_\_ 5. Graphing the distance traveled against the time taken to drive to work 30 miles away during rush hour

- \_\_\_\_\_ 6. Graphing the distance traveled against the time taken to fly from the east coast of the United States to the west coast

- \_\_\_\_\_ 7. Graphing the amount of weight lost against the time spent on a new diet and exercise regimen

- \_\_\_\_\_ 8. Graphing the length of a signature against the time spent writing it

A 0 days to 60 days

B 0 seconds to 2 seconds

C 0 minutes to 10 minutes

D 0 hours to 24 hours

E 0 hours to 10 hours

F 0 minutes to 60 minutes

G 0 seconds to 30 seconds

H 0 days to 3 days

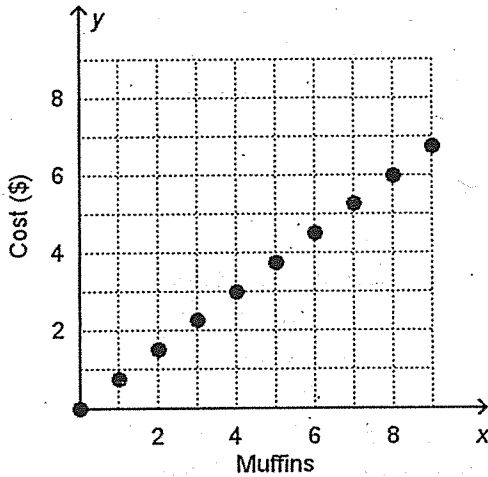
**Select the correct answer for each lettered part.**

9. A newton is a unit of force, and it's measured in units of kilogram-meters per second squared, or  $\frac{\text{kg} \cdot \text{m}}{\text{s}^2}$ . Which of the following represent a quantity measured in newtons?

- a.  $150 \text{ g} \cdot \frac{1 \text{ kg}}{1000 \text{ g}} \cdot \frac{3 \text{ m}}{\text{s}^2}$   Yes  No
- b.  $\frac{7}{350 \text{ kg}} \cdot \frac{2 \text{ m}}{\text{s}^2}$   Yes  No
- c.  $1.8 \text{ kg} \cdot \frac{25 \text{ cm}}{100 \text{ cm}} \cdot \frac{1 \text{ m}}{\text{s}^2}$   Yes  No
- d.  $37 \text{ g} \cdot \frac{107 \text{ mm}}{\text{s}^2} \cdot \frac{\text{kg}}{1000 \text{ g}} \cdot \frac{1 \text{ m}}{1000 \text{ mm}}$   Yes  No

**CONSTRUCTED RESPONSE**

10. A local store sells muffins for \$0.75 each. The graph below shows a customer's total bill  $C$  as a function of  $m$  muffins purchased, which can be represented by the function  $C = 0.75m$ .



Explain what the point at the origin represents.

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11. Paige owns a car with a 12-gallon gas tank. Her car gets a highway gas mileage of 32 miles per gallon.

a. Write two ratios to represent the gas mileage of Paige's car. Make sure to include the units for the quantities.

b. Paige wants to drive to her sister's house, which is 162.4 highway miles away from where she lives. Use one of the ratios you wrote in part a to calculate how many gallons of gas Paige needs to make the trip.

c. Gas costs \$3.50 per gallon. Write two ratios to represent the cost of a gallon of gas. Make sure to include units for the quantities.

d. Use one of your ratios from part c to calculate how much Paige's trip costs. Round up to the nearest cent.

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**N.Q.2\*****SELECTED RESPONSE**

Select the correct answer.

1. The math club is having a fundraiser, selling mugs for \$5 each and T-shirts for \$10 each. The club raised \$1000. Which model describes the relationship between sales and money raised?
- (A)  $\$5(\text{the number of mugs sold}) + \$10(\text{the number of T-shirts sold}) = \$15$
- (B)  $\$10(\text{the number of mugs sold}) + \$5(\text{the number of T-shirts sold}) = \$1000$
- (C)  $\$5(\text{the number of mugs sold}) + \$10(\text{the number of T-shirts sold}) = \$1000$
- (D)  $\$5(\text{the number of mugs sold}) - \$10(\text{the number of T-shirts sold}) = \$1000$
2. Zach earns \$10 for every lawn he rakes and \$15 for every lawn he mows. He deposits \$500 into his college fund at the end of the summer. Which model describes the relationship between work and money earned?
- (A)  $\$15(\text{lawns raked}) + \$10(\text{lawns mowed}) = \$500$
- (B)  $\$10(\text{lawns raked}) + \$15(\text{lawns mowed}) = \$500$
- (C)  $(\text{lawns raked}) + (\text{lawns mowed}) = \$500$
- (D)  $\$10(\text{lawns raked}) + \$15(\text{lawns mowed}) = \$25$
3. Susie's Clothing Store sells sweatshirts for \$30 and sweatpants for \$25. The Drama Club buys a total of 100 sweatshirts and sweatpants and spends \$2825. Which model describes this situation?
- (A) 
$$\begin{cases} \$30(\text{the number of sweatshirts}) + \$25(\text{the number of sweatpants}) = \$2825 \\ \text{the number of sweatshirts} + \text{the number of sweatpants} = 100 \end{cases}$$
- (B) 
$$\begin{cases} \$30(\text{the number of sweatshirts}) + \$25(\text{the number of sweatpants}) = \$2825 \\ \text{the number of sweatshirts} - \text{the number of sweatpants} = 100 \end{cases}$$
- (C) 
$$\begin{cases} \$25(\text{the number of sweatshirts}) + \$30(\text{the number of sweatpants}) = \$2825 \\ \text{the number of sweatshirts} + \text{the number of sweatpants} = 100 \end{cases}$$
- (D) 
$$\begin{cases} \$30(\text{the number of sweatshirts}) + \$30(\text{the number of sweatpants}) = \$2825 \\ \$25(\text{the number of sweatshirts}) + \$25(\text{the number of sweatpants}) = \$2825 \end{cases}$$

**Match each situation with the correct expression.**

Match each description of the growth of a culture of bacteria cells to an appropriate model.

Assume the culture begins with a single cell.

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|--|---------------|
| _____ 4. The cell count doubles every hour.                | A $t + 2$     |
| _____ 5. The culture produces three more cells every hour. | B $3^t$       |
| _____ 6. The cell count triples every hour.                | C $(t + 1)^2$ |
|  | D $2^t$       |
|  | E $t + 3$     |
|  | F $3t + 1$    |

**CONSTRUCTED RESPONSE**

7. A factory produces widgets and sprockets. The factory sells widgets for \$2 each, and sprockets for \$3 each. The total amount of money earned from selling widgets and sprockets last month was \$3000.

a. Choose appropriate variables to represent the number of widgets sold and the number of sprockets sold. Write an equation representing the total amount of money earned from selling widgets and sprockets.

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b. Write an appropriate model for the situation in which this factory sold 1225 widgets and sprockets to earn \$3000.

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c. This factory also sells gizmos for \$5. Choose an appropriate variable to represent the number of gizmos sold and write an equation representing the situation in which the total amount of money earned from selling widgets, sprockets, and gizmos is \$5000.

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8. A model rocket's height after being launched is modeled by a quadratic function.

a. One quantity of interest is maximum height. What other quantity might be of interest?

b. The maximum height of the rocket's flight path is 192 meters after 8 seconds. Find and choose the dependent and independent variables that represent the quantities in this problem. Include units.

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c. Write a function that models the height of the rocket as it relates to the time since the rocket was launched, given that the rocket starts at a height of 0. Write the function in the form  $f(x) = a(x - h)^2 + k$ .

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d. This rocket is being fired off in a certain town. In the interest of safety, town regulations dictate that model rockets should land no more than 20 meters from where they are launched. This rocket's horizontal speed during flight is 1.5 meters per second. Does this rocket meet local regulations? Explain your reasoning.

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**N.Q.3\*****SELECTED RESPONSE**

Select the correct answer.

1. A triangle has side lengths 2.02 cm, 3.570 cm, and 4.1 cm. What is the perimeter of this triangle to the correct number of significant digits?
  - (A) 9.69
  - (B) 9.690
  - (C) 9.7
  - (D) 10
2. Which of these measurements is the most precise?
  - (A) 4 m
  - (B) 127 mm
  - (C) 1.3 km
  - (D) 5.14 cm

3. A rectangle has a length of 4.2 feet and a width of 7.36 feet. How many significant digits does the area of the rectangle have?
  - (A) 2
  - (B) 3
  - (C) 5
  - (D) 6

Select all correct answers.

4. Which of the following calculated values will have three significant digits?
  - (A) The perimeter of a square with side length 1.02 ft
  - (B) The area of a square with side length 0.024 m
  - (C) The perimeter of a triangle with side lengths 84.5 cm, 94 cm, and 117 cm
  - (D) The area of a triangle with base 4.50 in. and height 10.02 in.
  - (E) The circumference of a circle with radius 0.0910 m
  - (F) The area of a circle with radius 5000 ft

Select the correct answer for each lettered part.

5. Classify each measurement as having more significant digits than, fewer significant digits than, or the same number of significant digits as the volume of a cube with side length 14.20 ft.
  - a. The surface area of a sphere with radius 4.2 m
    - More
    - Fewer
    - Same
  - b. The sum of dimensions 2.049 ft and 10.67 ft
    - More
    - Fewer
    - Same
  - c. Half of the length 175.08 m
    - More
    - Fewer
    - Same
  - d. The sum of lengths 12.125 mm and 10 mm
    - More
    - Fewer
    - Same
  - e. The product of 120.7 cm, 44.50 cm, and 1.553 cm
    - More
    - Fewer
    - Same

**CONSTRUCTED RESPONSE**

6. Do 38,000 cm, 38 cm, 0.038 cm, and 0.00038 cm all have the same number of significant digits? Explain your reasoning, including the number of significant digits in each measurement.

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7. A company produces parts for an automobile manufacturer. One part consists of two rods connected end to end with a joint. The lengths for the rods are 31.4 cm and 82.25 cm.

a. What is the combined length of the two rods, using the correct number of significant digits? (Assume that the joint doesn't add any additional length.) Show your work.

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b. The automobile company says that the combined length of the two rods must be within 0.01 cm of 113.65 cm. The manager of the company says that this level of precision isn't possible given the precision of the lengths of the individual parts. Is the manager correct? Explain why or why not.

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8. Two physics classes at two different schools have a competition to build the best catapult. Each class will throw rubber balls with the same weight, and both will use a tape measure marked in eighths of an inch to measure the results.

At his school, Randal fires his catapult and measures the distance it throws the ball. The edge of the ball falls between the marks for 13 feet  $10\frac{1}{8}$  inches and

13 feet  $10\frac{1}{4}$  inches, so he rounds to the eighth of an inch closest to where his ball landed, which is 13 feet  $10\frac{1}{8}$  inches. At

her school, Lacey fires her catapult and measures the distance. Her distance falls between the same two marks, but she reports her distance as 13 feet

$10\frac{3}{16}$  inches and claims she's won.

a. What measurement error did Lacey make?

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b. The judges declare a tie, but is it possible that Randal would have won if they used a measuring tape with higher precision? Explain why or why not.

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