

**GRADE 9** MATHEMATICS SAMPLE QUESTIONS

Blank grids are provided on page 273.

1. The side length of a certain square microchip, expressed in scientific notation, is  $1.2 \times 10^{-3}$  meter. If the area of this microchip is expressed in scientific notation as  $b \times 10^a$  square meter, what is the value of  $a$ ?

2. A company surveyed 800 people about their use of Soap L and Soap M. The table shows the results.

SOAP SURVEY

	Use Soap M	Do Not Use Soap M
Use Soap L	148	252
Do Not Use Soap L	264	136

Based on the results, of those who do **not** use Soap L,  $x\%$  use Soap M. What is the value of  $x$ , expressed as a whole number?

3. The values in the table represent a function. What value of  $R$  makes the function linear?

$x$	$y$
-4	2
-1	-1
3	$R$

4. What is the distance, in units, between the points  $(3, 20)$  and  $(11, 5)$ ?

- E. 8  
F. 15  
G. 17  
H. 23

5.  $3(x - 4) + 4x = 4 - x + 8(6 + x)$

What is the solution to the equation shown above?

- A.  $x = 8$   
B.  $x = 65$   
C. no solution  
D. infinite number of solutions

6. Which expression represents a rational number?

- E.  $\frac{3}{8}$   
F.  $\pi$   
G.  $\sqrt{3}$   
H.  $\sqrt{83}$

7. Which expression is equivalent to  $\frac{6^{-10}}{6^2}$ ?

- A.  $-6^8$
- B.  $\frac{1}{6^{12}}$
- C.  $6^{-5}$
- D.  $6^{12}$

8. Which table best represents a linear function?

E.

$x$	$y$
-3	5
-1	3
0	1

F.

$x$	$y$
-2	7
-1	4
0	3

G.

$x$	$y$
-4	-17
-3	-12
1	8

H.

$x$	$y$
-1	3
0	3
2	5

9. The diameter of Biological Cell A is  $6 \times 10^{-7}$  meter. The diameter of Biological Cell B is  $3 \times 10^{-8}$  meter. Which statement correctly compares the diameters of these two cells?

- A. The diameter of Cell A is 2 times the diameter of Cell B.
- B. The diameter of Cell B is 2 times the diameter of Cell A.
- C. The diameter of Cell A is 20 times the diameter of Cell B.
- D. The diameter of Cell B is 20 times the diameter of Cell A.

10.

#### SOCCER DATA

Player	Seasons Played	Goals Scored
Isabella	3	5
Porter	6	10
Jazmine	4	6
Colin	1	3

The data in the table show the number of seasons some players on a soccer team played versus the number of goals they scored. Which conclusion is supported by the data?

- E. There are multiple outliers in the data set.
- F. There is a positive association between seasons played and goals scored.
- G. There is a negative association between seasons played and goals scored.
- H. There is no association between seasons played and goals scored.

**11.** What is the value of  $y$  when  $0.25(y + 8) = 15$  ?

- A.** 1.75
- B.** 3.25
- C.** 28
- D.** 52

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**12.** What is the volume, in cubic inches, of a beach ball with a diameter of 24 inches?

- E.**  $48\pi$
- F.**  $256\pi$
- G.**  $576\pi$
- H.**  $2,304\pi$

**13.** How many integers,  $n$ , satisfy the condition  $5 < \sqrt{n} < 6$  ?

- A.** 0
- B.** 5.5
- C.** 10
- D.** 11

1. (-6) Since the microchip is a square, the area of the microchip is  $(1.2 \times 10^{-3})^2$  square meter.

$$\begin{aligned} (1.2 \times 10^{-3})^2 &= (1.2)^2 \times (10^{-3})^2 \\ &= 1.44 \times 10^{-6} \end{aligned}$$

So the value of  $a$ , the exponent, is  $-6$ .

2. (66) First, determine the number of people who do not use Soap L.

$$264 + 136 = 400$$

Then determine what percentage of those people use Soap M.

$$\frac{264}{400} = 0.66 = 66\%$$

Since 66% of the people who do not use Soap L use Soap M, the value of  $x$  is 66.

3. (-5) A linear function consists of ordered pairs that make a linear equation true, with a consistent slope,  $m$ , and a  $y$ -intercept,  $b$ . Use the slope formula and the two given ordered pairs to determine the slope.

$$m = \frac{2 - (-1)}{-4 - (-1)} = \frac{3}{-3} = -1$$

Then use the slope and one of the given ordered pairs to determine the  $y$ -intercept. The equation is in slope-intercept form.

$$y = (-1)x + b$$

$$2 = (-1)(-4) + b$$

$$2 = 4 + b$$

$$-2 = b$$

Use the slope and the  $y$ -intercept to determine the value of  $R$ . The equation is in slope-intercept form.

$$y = (-1)x + -2$$

$$R = (-1)(3) + -2$$

$$R = -3 + -2$$

$$R = -5$$

4. (G) Use the Pythagorean theorem,  $A^2 + B^2 = C^2$ , to find the distance between the two given points. A right triangle can be drawn in the coordinate system using the two given points as vertices.

To determine the lengths of the legs of the right triangle, find the absolute values of the difference between the  $x$ -coordinates and the difference between the  $y$ -coordinates.

$$|3 - 11| = 8$$

$$|20 - 5| = 15$$

Use the lengths of the legs, 8 units and 15 units, to determine the length of the hypotenuse,  $h$ , which is the distance, in units, between the two given points.

$$8^2 + 15^2 = h^2$$

$$64 + 225 = h^2$$

$$289 = h^2$$

$$\sqrt{289} = h$$

$$17 = h$$

The length of the hypotenuse is 17 units.

5. (D) Use properties of equations to successively transform the given equation into simpler forms, until an equivalent equation of the form  $x = a$ ,  $a = a$ , or  $a = b$  (where  $a$  and  $b$  are different numbers) results.

$$3(x - 4) + 4x = 4 - x + 8(6 + x)$$

$$3x - 12 + 4x = 4 - x + 48 + 8x$$

$$3x + 4x - 12 = 4 + 48 - x + 8x$$

$$7x - 12 = 52 + 7x$$

$$(7x - 7x) - 12 = 52 + (7x - 7x)$$

$$0 - 12 = 52 + 0$$

$$-12 = 52$$

The simplest form of the given equation is  $-12 = 52$ , which is not a true statement.

Therefore, there is no solution to the given equation.

6. (E) Since rational numbers have a decimal expansion that terminates or repeats, determine the decimal expansion of the number in each option. The option that represents a number with a decimal expansion that terminates or repeats is a rational number.

Option E:

$$\frac{3}{8} = 0.375$$

Option F

$$\pi = 3.14159\dots$$

Option G

$$\sqrt{3} = 1.73205\dots$$

Option H

$$\sqrt{83} = 9.11043\dots$$

Option E has a decimal expansion that terminates; therefore, it is a rational number. The decimal expansions for the other options do not terminate or repeat.

7. (B) Use the properties of integer exponents to generate a numerical expression that is equivalent to the given expression.

$$\frac{6^{-10}}{6^2} = \frac{1}{6^2 \times 6^{10}} = \frac{1}{6^{12}}$$

The given expression is equivalent to

$$\frac{1}{6^{12}}.$$

8. (G) Use the slope formula to determine the slope,  $m$ , between the ordered pairs in the table. If the slope between each pair of ordered pairs is the same, then the function is linear.

Option E:

Using the ordered pairs  $(-1, 3)$  and  $(-3, 5)$ :

$$m = \frac{3 - 5}{-1 - (-3)} = \frac{-2}{2} = -1$$

Using the ordered pairs  $(0, 1)$  and  $(-1, 3)$ :

$$m = \frac{1 - 3}{0 - (-1)} = \frac{-2}{1} = -2$$

Since the slopes do not match, this is not a linear function.

Option F:

Using the ordered pairs  $(-2, 7)$  and  $(-1, 4)$ :

$$m = \frac{7 - 4}{-2 - (-1)} = \frac{3}{-1} = -3$$

Using the ordered pairs  $(-1, 4)$  and  $(0, 3)$ :

$$m = \frac{4 - 3}{-1 - 0} = \frac{1}{-1} = -1$$

Since the slopes do not match, this is not a linear function.

Option G:

Using the ordered pairs  $(-4, -17)$  and  $(-3, -12)$ :

$$m = \frac{-17 - (-12)}{-4 - (-3)} = \frac{-5}{-1} = 5$$

Using the ordered pairs  $(-3, -12)$  and  $(1, 8)$ :

$$m = \frac{-12 - 8}{-3 - 1} = \frac{-20}{-4} = 5$$

The slopes match, so this is a linear function.

Option H:

Using the ordered pairs  $(-1, 3)$  and  $(0, 3)$ :

$$m = \frac{3 - 3}{-1 - 0} = \frac{0}{-1} = 0$$

**Response continued  
on next page**

Using the ordered pairs (0, 3) and (2, 5):

$$m = \frac{3 - 5}{0 - 2} = \frac{-2}{-2} = 1$$

Since the slopes do not match, this is not a linear function.

Option G is the only linear function and is the correct answer.

- 9.** (C) First, translate both cell diameters to standard form.

$$6 \times 10^{-7} = 0.0000006$$

$$3 \times 10^{-8} = 0.00000003$$

Then use division to compare the two numbers.

$$0.0000006 \div 0.00000003 = 20$$

The diameter of Biological Cell A is 20 times the diameter of Biological Cell B.



- 10.** (F) First, reorder the ordered pairs so that the numbers of seasons played,  $x$ , are increasing.

$(1, 3), (3, 5), (4, 6), (6, 10)$

Then examine the numbers of goals scored,  $y$ , to determine whether there is a pattern.

The pattern is that as  $x$  increases, so does  $y$ . This exemplifies a positive association between  $x$ , the number of seasons played, and  $y$ , the number of goals scored.

- 11.** (D) Use properties of equations to determine the value of  $y$  in the given equation.

$$0.25(y + 8) = 15$$

$$0.25y + 2 = 15$$

$$0.25y = 13$$

$$\frac{0.25y}{0.25} = \frac{13}{0.25}$$

$$y = 52$$

The value of  $y$  in the given equation is 52.

- 12. (H)** The formula for the volume of a sphere is  $V = \frac{4}{3}\pi r^3$ .

Since the diameter of the ball is 24 inches, the radius is half of that, or 12 inches.

$$V = \frac{4}{3}\pi(12)^3 = 2,304\pi$$

- 13. (C)** Since 5 is the square root of 25, and 6 is the square root of 36, the values of  $n$  that satisfy the given condition are all the integers greater than 25 and less than 36. That set of integers is  $\{26, 27, 28, 29, 30, 31, 32, 33, 34, 35\}$ . There are 10 numbers in the set, so Option C is the correct answer.

### Answer Key for Grade 9 Mathematics

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|-------|-------|-------|
| 1. -6 | 6. E  | 11. D |
| 2. 66 | 7. B  | 12. H |
| 3. -5 | 8. G  | 13. C |
| 4. G  | 9. C  |       |
| 5. D  | 10. F |       |