# G8 Unit 1 Number Sense

# Grade 8 Mathematics Reference Sheet

## *CONVERSIONS*

1 inch = 2.54 centimeters
1 meter = 39.37 inches
1 mile = 5,280 feet
1 mile = 1,760 yards
1 mile = 1.609 kilometers

1 kilometer = 0.62 mile
1 pound = 16 ounces
1 pound = 0.454 kilogram
1 kilogram = 2.2 pounds
1 ton = 2,000 pounds

1 cup = 8 fluid ounces
1 pint = 2 cups
1 quart = 2 pints
1 gallon = 4 quarts
1 gallon = 3.785 liters
1 liter = 0.264 gallon
1 liter = 1,000 cubic centimeters

## *FORMULAS*

| | |
|---|---|
| **Triangle** | $A = \frac{1}{2}bh$ |
| **Parallelogram** | $A = bh$ |
| **Circle** | $A = \pi r^2$ |
| **Circle** | $C = \pi d$ or $C = 2\pi r$ |
| **General Prisms** | $V = Bh$ |
| **Cylinder** | $V = \pi r^2 h$ |
| **Sphere** | $V = \frac{4}{3}\pi r^3$ |
| **Cone** | $V = \frac{1}{3}\pi r^2 h$ |
| **Pythagorean Theorem** | $a^2 + b^2 = c^2$ |

## Question 1.

A supplier makes rulers that are supposed to be at least $0.\overline{78}$ inch wide. However, the machine that makes the rulers has been having problem. The table shows a sample of eight rulers and their widths. A supervisor states that if at least half of the samples are smaller than the desired width, he will call someone to fix the machine.

**Ruler Widths**

| | | | |
|---|---|---|---|
| $\frac{39}{50}$ inch | $\frac{26}{33}$ inch | $\frac{76}{99}$ inch | $\frac{2}{3}$ inch |
| $\frac{4}{5}$ inch | $\frac{1}{2}$ inch | $\frac{9}{10}$ inch | $\frac{7}{9}$ inch |

Drag the values into the appropriate bins below

| SMALLER THAN THE DESIRED WIDTH | NOT SMALLER THAN THE DESIRED WIDTH |
|---|---|
| | |

## Question 2.

If $t^3 = \frac{64}{27}$, what is the value of t ?

A. $t = \frac{16}{9}$

B. $t = \frac{8}{3}$

C. $t = \frac{4}{3}$

D. $t = \frac{22}{9}$

Question 3.

A company makes square poster frames whose sides are integer lengths. Select all of the areas that would satisfy this requirement.

A. $16\ ft^2$

B. $24\ ft^2$

C. $2.5\ ft^2$

D. $4\ ft^2$

E. $1\ ft^2$

F. $36\ ft^2$

G. $48\ ft^2$

**Question 4.**

A cargo ship has a stack of shipping containers. The stack is $x$ containers wide, $x$ containers long, and $x$ containers tall. Select all of the equations that could represent the total number of containers on the ship.

A. $x^3 = 64$

B. $x^3 = 9$

C. $0.343 = x^3$

D. $x^3 = 16$

E. $27 = x^3$

F. $x^3 = 8$

G. $100 = x^3$

H. $x^3 = 0.125$

I. $216 = x^3$

**Question 5.**

Imani is analyzing numbers.

Select whether the numbers in each situation is rational or irrational.

| | Rational | Irrational |
|---|---|---|
| A circumference of a circular picture frame is 5π, or 15.7079632..., inches. | ☐ | ☐ |
| A bottle contains $0.\overline{6}$ kiloliters of water. | ☐ | ☐ |
| The sales tax on a purchase was 6.25%. | ☐ | ☐ |
| The net change in Patrick's stock was −$11. | ☐ | ☐ |

**Question 6.**

Enrique says that the value of $\sqrt{\frac{1}{x}}$ is a rational number for any positive, nonzero integer value of $x$. Select all of the values of $x$ that could be used as counter examples to show that Enrique's conjecture is false.

A. $x = 1$

B. $x = 2$

C. $x = 4$

D. $x = 5$

E. $x = 8$

F. $x = 9$

Question 7.

The tables shows the approximate populations of four capital cities in the United States. Choose the correct city from the drop down menus to make each statement true.

| City | Augusta, Maine | Cheyenne, Wyoming | Jackson, Mississippi | Montpelier, Vermont |
|---|---|---|---|---|
| Population (approx.) | $3^9$ | $3^{10}$ | $3^{11}$ | $3^8$ |

The population of

A. Augusta

B. Cheyenne

C. Jackson

D. Montpelier

is about $\frac{1}{3}$ the population of Jackson.

The population of

A. Augusta

B. Cheyenne

C. Jackson

D. Montpelier

is about 3 the population of Montpelier.

The population of

A. Augusta

B. Cheyenne

C. Jackson

D. Montpelier

is about 27 times the population of

A. Augusta

B. Cheyenne

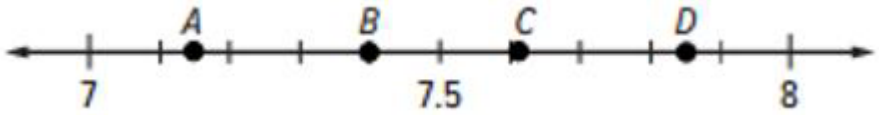
C. Jackson

D. Montpelier

.

**Question 8.**

The number line shows four points labeled $A$,$B$,$C$, and $D$. Select whether each statement is true or false.




| True | False | |
|---|---|---|
| ☐ | ☐ | The value of $\sqrt{50}$ is between point $A$ and point $B$. |
| ☐ | ☐ | The coordinate of point $C$ is less than $\sqrt{60}$. |
| ☐ | ☐ | The coordinate of point $D$ is greater than $\sqrt{63}$. |

**Question 9.**

The diagonal of a rectangular floor is $\sqrt{40}$ feet long.

***Part A*** : Select All of the sets of numbers to which $\sqrt{40}$ belongs.

A. real

B. integer

C. rational

D. irrational

E. whole

F. natural

***Part B*** : A student was asked to change one digit from $\sqrt{40}$ to a different digit so that the number belongs to a different set of numbers and to provide an explanation. Choose the best response.

A. $\sqrt{25}$ because 25 is equal to five squared

B. $\sqrt{48}$ because 48 is even

C. $\sqrt{49}$ because 49 is a perfect square

Question 10.

The population of five Asian capital cities are shown in the table. Drag and drop the names of the cities to order them from least to greatest.

| City | Population in 2012 |
|---|---|
| Bangkok, Thailand | $8.25 \times 10^6$ |
| Beijing, China | $2.02 \times 10^7$ |
| Manila, Philippines | $1.65 \times 10^6$ |
| Suva, Fiji | $8.44 \times 10^5$ |
| Tokyo, Japan | $1.32 \times 10^7$ |

Bangkok | Beijing | Manila | Suva | Tokyo

| | City |
|---|---|
| Least Population | *DEST_1* |
| | *DEST_2* |
| | *DEST_3* |
| | *DEST_4* |
| Greatest Population | *DEST_5* |

## Question 11.

The table shows the number of people living in the United States and in each region of the country according to the 2010 census. Write the correct number to make each statement true.

| U.S. Region | Population (approx.) |
|---|---|
| Northeast | $5.5 \times 10^7$ |
| Midwest | $6.7 \times 10^7$ |
| South | $1.1 \times 10^8$ |
| West | $7.2 \times 10^7$ |
| United States (All) | $3.1 \times 10^8$ |

2 3 4 5
20 30 40 50

The Population of the South is about DE times greater than the population of the Northeast.

The Population of the entire United States is about DE times greater than the population of the South alone.

The Population of the entire United States is about DE times greater than the population of the Midwest alone.

## Question 12.

An insect called a froghopper is $2^3$ millimeters long and jumps $2^9$ millimeters high. Choose the best answer from the drop down menu.

A froghopper can jump

A. 2 times

B. 8 times

C. 64 times

D. 4096 times

its body length.

Question 13.

The Caspian Sea has an area of 371,000 square kilometers. Lake Superior has an area of $8.24 \times 10^4$ square kilometers.

Complete each sentence to make a true statement.

The area of

A. Caspian sea

B. Lake Superior

C. 288,600

D. $8.32 \times 10^{10}$

E. 453,000

F. 4.5

is greater than the area of

A. Caspian Sea

B. Lake Superior

C. 288,600

D. $8.32 \times 10^{10}$

E. 453,000

F. 4.5

.

The difference in the areas of the two lakes is

A. Caspian Sea

B. Lake Superior

C. 288,600

D. $8.32 \times 10^{10}$

E. 453,000

F. 4.5

square kilometers.

Question 14.

Sort the expressions into the appropriate bins based on their values compared to 9.

$\frac{9^{10}}{9^{11}}$ $\frac{9^{11}}{9^{10}}$ $3^6 \cdot 3^{-3}$ $(3^2 \cdot 3)^0$ $(-3)^2$ $\frac{3^{-2}}{3^{-4}}$

| Less than 9 | Equal to 9 | Greater than 9 |
| --- | --- | --- |
| | | |

Question 15.

Oceanographers divide the oceans into layers, as shown in the table. Depths below sea level are represented as negative integers. Select whether each statement is true or false.

| Ocean Zones | |
|---|---|
| **Zone** | **Depth** |
| Sunlight Zone | 0 ft to –660 ft |
| Twilight Zone | –660 ft to –3,300 ft |
| Midnight Zone | –3,300 ft to –13,000 ft |
| Abyssal Zone | –13,000 ft and below |

| True | False | |
|---|---|---|
| ☐ | ☐ | A whale swimming at a depth of $-5.9 \times 10^2$ feet is in the sunlight zone. |
| ☐ | ☐ | A jellyfish swimming at a depth of $-3.4 \times 10^3$ feet is in the midnight zone. |
| ☐ | ☐ | A crab swimming at a depth of $-6.4 \times 10^2$ feet is in the twilight zone. |
| ☐ | ☐ | A squid swimming at a depth of $-1.8 \times 10^4$ feet is in the abyssal zone. |

## Question 16.

Lori found this information while doing research on stars. Select whether the answer to each question is yes or no.

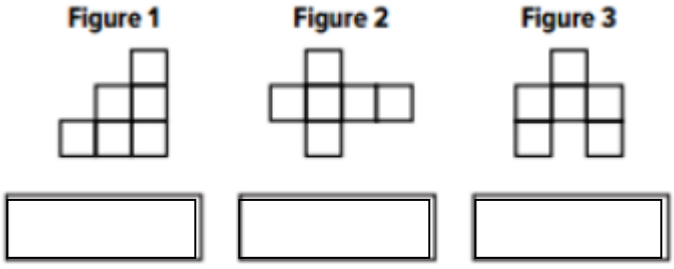
- The sun is approximately $1.4 \times 10^6$ kilometers across.
- A low-mass star can be approximately 700 thousands kilometers across.
- A red giant star can be approximately $1 \times 10^8$ kilometers across

| Yes | No | |
|---|---|---|
| ☐ | ☐ | Is a red giant star about 700 times larger than the sun? |
| ☐ | ☐ | Is the sun about 20 times larger then a low-mass star? |
| ☐ | ☐ | Is a red giant star about 143 times larger then a low-mass star? |
| ☐ | ☐ | Is a low-mass star about half the size of the sun? |

## Question 17.

The area of each small square in the figure is 64 square units.
Drag and drop the perimeter of each figure into the appropraite box below the figure.

| | |
|---|---|
| 84 units | 104 units |
| 88 units | 112 units |
| 96 units | 132 units |



**Question 18.**

Which equation has **both** 4 and −4 as possible values of $y$ ?

A. $y^2 = 8$

B. $y^3 = 8$

C. $y^2 = 16$

D. $y^3 = 64$

**Question 19.**

Which decimal is the equivalent of $\frac{6}{11}$?

A. $0.18\overline{3}$

B. $0.1\overline{83}$

C. $0.5\overline{4}$

D. $0.\overline{54}$

**Question 20.**

Peter determined the area, in square miles, of a piece of land using his calculator. The result of his calculation is displayed on his calculator in scientific notation as 7.4E − 4.

Which statement is true of the area of the piece of land?

A. It is between 0.07 and 0.7 square mile.

B. It is between 0.007 and 0.07 square mile.

C. It is between 0.0007 and 0.007 square mile.

D. It is between 0.00007 and 0.0007 square mile.

### Question 21.

Which expressions are equivalent to $\frac{3^{-8}}{3^{-4}}$?

Select **all** that apply.

A. $3^{-12}$

B. $3^{-4}$

C. $3^{2}$

D. $\frac{1}{3^{2}}$

E. $\frac{1}{3^{4}}$

F. $\frac{1}{3^{12}}$

### Question 22.

A carpenter bought 750 nails. Each nail has a mass of $5.2 \times 10^{-3}$ kilogram. The total mass of the nails purchased by the carpenter is

A. 0.0052 kilograms

B. 3.9 kilograms

C. 144.2 kilograms

D. 5200 kilograms

## Question 23.

An expression is shown. $j^2\left(\frac{k^6}{k^4k^3}\right)^{-3}$

Martha evaluates the expression using these steps

Step 1: $j^2\left(\frac{k^6}{k^7}\right)^{-3}$

Step 2: $j^2\left(k^{-1}\right)^{-3}$

Step 3: $j^2k^{-4}$

Martha made a mistake. In which step did Martha first make a mistake, and what is correct expression for that step?

A. Step 2; $j^2(k^1)^{-3}$

B. Step 2; $j^2(k^{13})^{-3}$

C. Step 3; $j^2k^{-2}$

D. Step 3; $j^2k^3$

## Question 24.

Which expression is equivalent to $(7^3)^5 \cdot 7^4$?
Select **each** correct answer.

A. $7^{3 \cdot 5 \cdot 4}$

B. $7^{3 \cdot 5+4}$

C. $7^{3+5+4}$

D. $7^{3(5+4)}$

E. $7^{3 \cdot 5} \cdot 7^4$

F. $7^{3+5} \cdot 7^4$

## Question 25.

Laurie entered the mass, in kilogram, of four substances into a spreadsheet. Her spreadsheet automatically converted the masses into scientific notation.

| | A | B |
|---|---|---|
| | **Substance** | **Mass (kilogram)** |
| **1** | Substance A | 2.45 E−4 |
| **2** | Substance B | 6.8 E−3 |
| **3** | Substance C | 7.125 E−5 |
| **4** | Substance D | 9.0 E−4 |

Which list shows the four substances in order from **least** mass to **greatest** mass?

A. Substance A, Substance B, Substance C, Substance D

B. Substance B, Substance A, Substance D, Substance C

C. Substance C, Substance A, Substance D, Substance B

D. Substance C, Substance D, Substance A, Substance B