Solutions

Scientific Notation & Approximating Square Roots

express numbers in scientific notation, including negative exponents, in appropriate problem situations

Numbers written in scientific notation have two factors. The first factor is a number between 1 and 10. The second factor is a power of 10.

CHANGE FROM STANDARD FORM TO SCIENTIFIC NOTATION

Step 1: Move the decimal point so there is one non-zero digit to the left of the decimal point (*a number **greater** than **1** and **less** than **10**).*

Example: Given: 4,750,000 use: 4.75

Step 2: Count the number of decimal places the decimal has "moved" from the original number. This will be the exponent of the 10.

Example: 4,750,000 to 4.75 *(moved **6** decimal places)*

answer: **4.75×10^{6}**

The original number was greater than 1 so the exponent is positive.

If the original number was ***less than 1, the exponent is ***negative.***

Example: Given: 0.000789 use: 7.89

0.000789 to 7.89 (moved 4 decimal places)

answer: **7.89×10^{-4}**

The original number was less than 1 so the exponent is negative.

STAAR Practice

In science class, Misty was learning about the solar system. She wanted to write a report about the distance of each planet from the Sun. She found a table that displays this information.

Planet	Average distance from the sun (km)
Earth	150 million
Jupiter	779 million
Mars	228 million
Mercury	57 million
Neptune	4500 million
Saturn	1430 million
Uranus	2880 million
Venus	108 million

Write the distance of the planet furthest from the Sun in scientific notation.

4.5×10^{9} Km

4500 million is 4500,000,000 ↑ 9 digits

4.5×10^{9}

CHANGE FROM SCIENTIFIC NOTATION TO STANDARD FORM

Move the decimal point to the ***right*** for a ***positive*** exponent of **10**.

Example: Given: 5.024×10^3

answer: 5,024 (**3** places to the **right**)

Positive exponent - move the decimal to the **right**.

***HINT: A POSITIVE EXPONENT TELLS YOU THE STANDARD FORM WILL BE GREATER THAN 1.

Move decimal point to ***left*** for ***negative*** exponent of **10**.

Example: Given: 1.015×10^{-8}

answer:

0.00000001015 (**8** places to the **left**)

Negative exponent - move the decimal to the **left**.

***HINT: A NEGATIVE EXPONENT TELLS YOU THE STANDARD FORM WILL BE LESS THAN 1.

STAAR Practice

The unit price of 1 ounce of Biff creamy peanut butter is \$0.094. How would this value be written in scientific notation?

0.094 small # so negative exponent

9.4×10^{-2}

A. 0.94×10^{-1}
B. 9.4×10^{2}
C. 9.4×10^{1}
D. 9.4×10^{-2}

The equatorial diameter or the Earth is 7,926.6 miles. How would this distance be represented in scientific notation?

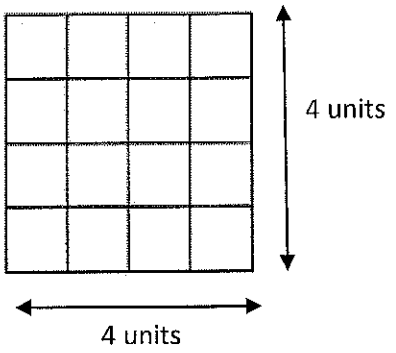
7926.6 large # so positive exponent

7.9266×10^{3}

A. 7.9×10^{3}
B. 7.9266×10^{3}
C. $7.999999266 \times 10^{-3}$
D. 7.9266×10^{-3}

Approximating Square Roots

Sixteen tiles make a square with four tiles on a side.



- The square of 4 is 16.

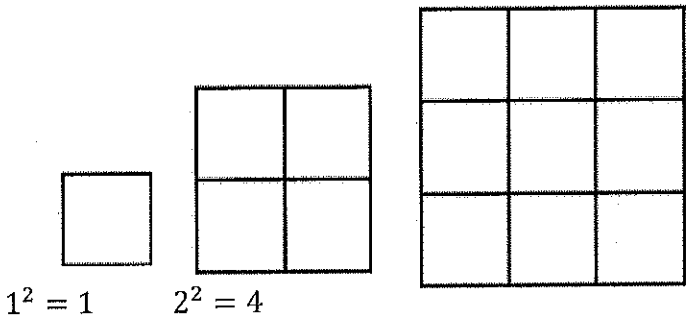
$$4 \times 4 = 16$$

- The square root of 16 is 4 because $4^2 = 16$.

$$\sqrt{16} = 4$$

Numbers that can form squares are perfect squares.

Their square roots are whole numbers.



$1^2 = 1$ $2^2 = 4$

$3^2 = 9$

$\sqrt{1} = 1$ $\sqrt{4} = 2$ $\sqrt{9} = 3$

Whole numbers that are not perfect squares still have square roots. However, their square roots are not whole numbers; they are decimals or fractional parts of whole numbers. The non-terminating, non repeating decimals are called **irrational numbers.**

$\sqrt{21} \approx 4.58257...$

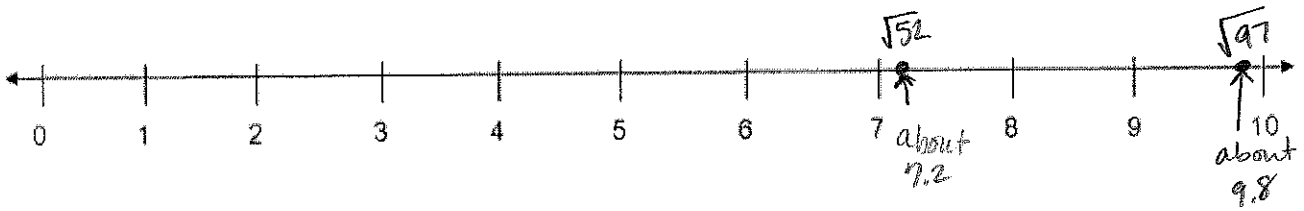
$\sqrt{10} \approx 3.16227...$

You can estimate square roots for numbers that are not perfect squares by using the calculator.

Estimate $\sqrt{52}$ ≈ 7.2111

Estimate $\sqrt{97}$ ≈ 9.84886

Graph these numbers on the number line.



STAAR Practice

1. The area of a square is 79.2 square inches. Which of these is closest to the side length of the square?

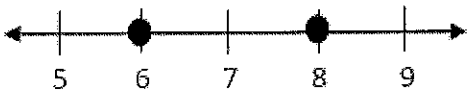
area of a square is (side length)^2 so do $\sqrt{\text{Area}}$ to solve.

$\sqrt{79.2} \approx 8.89944$

A	8.2
(B)	8.9
C	9.1
D	9.5

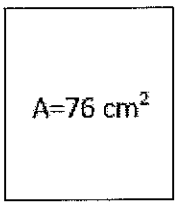
2. Which number is between Point X and Point Y on the number line?

Point X Point Y



F	$\sqrt{81} = 9$ too big
G	$\sqrt{64} = 8$ on the point, not between
(H)	$\sqrt{63} \approx 7.93725$
J	$\sqrt{30} \approx 5.47723$ too small

3. Which is the best estimate of the length of each side of this square?

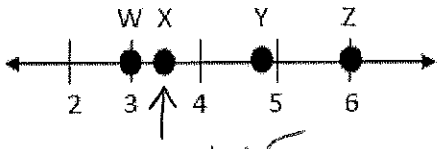


$\sqrt{76} \approx 8.7178$ rounds to 9.

(A)	9 cm
B	10 cm
C	19 cm
D	38 cm

4. Which point on this number line best represents $\sqrt{12}$?

$\sqrt{12} \approx 3.46$ close to 3.5



about 3.5

F	W
(G)	X
H	Y
J	Z

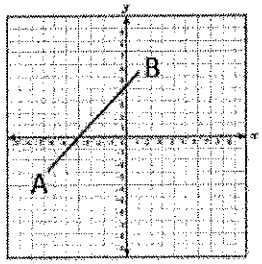
5. The area of a square is 144 square meters. Which best represents the perimeter of the square?

side = $\sqrt{144}$ = 12 meters

A	12 m
B	24 m
C	36 m
(D)	48 m

Perimeter = 12+12+12+12 = 48 meters

6. AB = $\sqrt{110}$, the length of AB is ___?



$\sqrt{110} \approx 10.4881$

F	Between 9 and 10
(G)	Between 10 and 11
H	Between 11 and 12
J	Between 12 and 13