Name: _____ Date: _____

b) How many more radishes than carrots were produced by the farm last year?

Add and subtract very small numbers in scientific notation with the same power of 10.

Example

a) The diameter of a hydrogen atom is $2.4 \cdot 10^{-10}$ meter. The diameter of an oxygen atom is $2.8 \cdot 10^{-10}$ meter. How much greater in diameter is an oxygen atom compared to a hydrogen atom?

Difference in the diameter of the two atoms

$= \text{Diameter of oxygen atom} - \text{Diameter of hydrogen atom}$

$= 2.8 \cdot 10^{-10} - 2.4 \cdot 10^{-10}$ Substitute.

$= (2.8 - 2.4) \cdot 10^{-10}$ Use the distributive property.

$= 0.4 \cdot 10^{-10}$ Subtract within parentheses.

$= 4 \cdot 10^{-1} \cdot 10^{-10}$ Rewrite 0.4 in scientific notation.

$= 4 \cdot 10^{-1-10}$ Use the product of powers property.

$= 4 \cdot 10^{-11}$ m Write in scientific notation.

The diameter of an oxygen atom is $4 \cdot 10^{-11}$ meter greater than the diameter of hydrogen atom.

b) A copper coin is approximately $9 \cdot 10^{-4}$ meter thick. A thin coating on the coin is approximately $1.1 \cdot 10^{-4}$ meter thick. How thick is the coin with the coating added?

Approximate thickness of the coin and coating

$= \text{Thickness of coin} + \text{Thickness of coating}$

$= 9 \cdot 10^{-4} + 1.1 \cdot 10^{-4}$ Substitute.

$= (9 + 1.1) \cdot 10^{-4}$ Use the distributive property.

$= 10.1 \cdot 10^{-4}$ Add within parentheses.

$= 1.01 \cdot 10^{1} \cdot 10^{-4}$ Rewrite 10.1 in scientific notation.

$= 1.01 \cdot 10^{1-4}$ Use the product of powers property.

$= 1.01 \cdot 10^{-3}$ m Write in scientific notation.

So, the coin with the coating added is approximately $1.01 \cdot 10^{-3}$ meter thick.

Name: _____ Date: _____

Complete.

3. The length of a large *E. coli* bacterium is approximately $6 \cdot 10^{-6}$ meter. The length of a large *Salmonella* bacterium is approximately $4.5 \cdot 10^{-6}$ meter.

a) If a scientist studying both bacteria places them end to end in a petri dish, what is the total length of space that they occupy?

Total length of the two bacteria

= Length of *E. coli* + Length of *Salmonella*

$= 6 \cdot 10^{-6} + 4.5 \cdot 10^{-6}$ Substitute.

= (_____ + _____) · _____ Use the distributive property.

= _____ · _____ _____ within parentheses.

= _____ · _____ · _____ Rewrite _____ in scientific notation.

= _____ · _____ Use the product of powers property.

= _____ · _____ m Write in scientific notation.

So, the total length of the two bacteria is _____ meter.

b) What is the difference in the length of the two bacteria?

Difference in the length of the two bacteria

= Length of *E. coli* − Length of *Salmonella*

= _____ · _____ − _____ · _____ Substitute.

= (_____ − _____) · _____ Use the distributive property.

= _____ · _____ m _____ within parentheses.

The difference in the length of the two bacteria is _____ meter.

Solve. Write your answers in scientific notation. Round coefficients to the nearest tenth.

4. A plastic film with a sticky surface has a thickness of $4.9 \cdot 10^{-4}$ meter. The plastic film was placed over a piece of photo paper. The photo paper has a thickness of $5.3 \cdot 10^{-4}$ meter.

a) How thick is the photo paper with the plastic film added?

b) How much thicker is the photo paper than the plastic film?

Name: _____ Date: _____

Add and subtract very large numbers in scientific notation with different powers of 10.

Example

Town A is $3.8 \cdot 10^4$ kilometers from town B and town C is $9.2 \cdot 10^3$ kilometers from town B.

a) Find the distance between town C and town A.

Distance between town C and town A

= Distance between town A and town B + Distance between town C and town B

$= 3.8 \cdot 10^4 + 9.2 \cdot 10^3$ Substitute.

$= 38 \cdot 10^3 + 9.2 \cdot 10^3$ Rewrite $3.8 \cdot 10^4$ as $38 \cdot 10^3$.

$= (38 + 9.2) \cdot 10^3$ Use the distributive property.

$= 47.2 \cdot 10^3$ Add within parentheses.

$= 4.72 \cdot 10^1 \cdot 10^3$ Rewrite 47.2 in scientific notation.

$= 4.72 \cdot 10^{1+3}$ Use the product of powers property.

$= 4.72 \cdot 10^4$ km Write in scientific notation.

So, the distance between town C and town A is $4.72 \cdot 10^4$ kilometers.

b) How much further is town A from town B as compared to town C from town B?

Difference in distance between town A and town B and between town C and town B

= Distance between town A and town B − Distance between town C and town B

$= 3.8 \cdot 10^4 - 9.2 \cdot 10^3$ Substitute.

$= 38 \cdot 10^3 - 9.2 \cdot 10^3$ Rewrite $3.8 \cdot 10^4$ as $38 \cdot 10^3$.

$= (38 - 9.2) \cdot 10^3$ Use the distributive property.

$= 28.8 \cdot 10^3$ Subtract within parentheses.

$= 2.88 \cdot 10^1 \cdot 10^3$ Write 28.8 in scientific notation.

$= 2.88 \cdot 10^{1+3}$ Use the product of powers property.

$= 2.88 \cdot 10^4$ km Write in scientific notation.

So, town A is $2.88 \cdot 10^4$ kilometers further from town B as compared to town C from town B.

Name: _____ Date: _____

Complete.

5. A building has a cylindrical shape with a cone-shaped roof. The cylindrical portion of the building has a volume of $9.6 \cdot 10^3$ cubic meters and its cone-shaped roof has a volume of $4.7 \cdot 10^2$ cubic meters. What is the total volume of the building?

Total volume of building

= Volume of cylindrical portion + Volume of cone-shaped roof

= _____ · _____ + _____ · _____ Substitute.

= _____ · _____ + _____ · _____ Rewrite _____ · _____ as _____ · _____.

= (_____ + _____) · _____ Use the distributive property.

= _____ · _____ _____ within parentheses.

= _____ · _____ · _____ Rewrite _____ in scientific notation.

= _____ · _____ Use the product of powers property.

= _____ · _____ m^3 Write in scientific notation.

The total volume of the building is _____ cubic meters.

Solve. Write your answers in scientific notation. Round coefficients to the nearest tenth.

6. In the past two years, company A sold $7.9 \cdot 10^4$ cars and company B sold $9.3 \cdot 10^3$ cars.

a) How many total cars did the two companies sell in the past two years?

b) In the past two years, how many more cars did company A sell than company B?