Practice Worksheet #2: Sections 10.5–10.7

Reading, Writing, and Operating with Scientific Notation

Directions: Show all work. For Section D, write each final answer in **scientific notation**.

A. Tell whether the number is written in scientific notation. Explain. (Section 10.5)

1. 4.2×10^9

Yes!

2. 0.58×10^3 No!

$= 0.58 \cdot (10^1 \cdot 10^2)$

$= 5.8 \cdot 10^2$

Or...

$0.58 \times 10^3 = 580 = 5.8 \cdot 10^2$

3. 9.87×10^{-2}

Yes!

4. 15.6×10^4 No! Move decimal back 1 unit ($\cdot 10^{-1}$)

$15.6 \times 10^4 = 156000 = 1.56 \times 10^5$

5 4 3 2 1

B. Write the number in standard form. (Section 10.5)

5. 7.25×10^6 =

6. 4.01×10^{-3}

7. 2.9×10^{1}

You got these

8. 6.84×10^{-5}

C. Write the number in scientific notation. (Section 10.6)

9. 0.00000672

10. 81,400,000

11. 0.0935

12. 6,020,000

D. Evaluate the expression. Write your answer in scientific notation. (Section 10.7)

13. $(4.8 \times 10^4) + (3.6 \times 10^4)$

same base!

$= (4.8 + 3.6)(10^4)$

$= (8.4)(10^4)$

or $\boxed{8.4 \times 10^4}$

$4.8 + 3.6 = 8.4$

Note: bases only matter if adding or subtracting!

14. $(6.2 \times 10^{-5}) - (1.9 \times 10^{-6})$

Different bases! Let's write in terms of 10^{-5}: $1.9 \times 10^{-6} = 0.00000 1 9 = 0.19 \times 10^{-5}$

$= (6.2 \times 10^{-5}) - (0.19 \times 10^{-5})$

$= (6.2 - 0.19)(10^{-5})$

$= (6.01)(10^{-5})$

or $\boxed{6.01 \times 10^{-5}}$

$6.20 - 0.19 = 6.01$

15. $(7.5 \times 10^2) \times (4.0 \times 10^{-3})$

multiplication is commutative!

$= 7.5 \times 10^2 \times 4.0 \times 10^{-3}$ → let's group them!

$= (7.5 \times 4.0) \times (10^2 \times 10^{-3})$

$7.5 \times 4.0 = 30$ (add a place holder 0)

$10^{2 + (-3)} = 10^{-1}$

$= (30) \times (10^{-1}) = 3.0 \times 10^1 \times 10^{-1} = \boxed{3.0 \times 10^0}$

Exponent Rules

- $a^n \cdot a^m = a^{n+m}$
- $(a^n)^m = a^{n \cdot m}$
- $a^{-n} = \frac{1}{a^n}$
- $\frac{a^n}{a^m} = a^{n-m}$

16. $(9.6 \times 10^{-6}) \div (1.2 \times 10^{-9})$

express as a fraction to use $\frac{a^n}{a^m} = a^{n-m}$

$= \frac{(9.6 \times 10^{-6})}{(1.2 \times 10^{-9})}$

since multiplication and all is being multiplied, group them to your convenience!

$= \left(\frac{9.6}{1.2}\right) \times \left(\frac{10^{-6}}{10^{-9}}\right)$

now use $\frac{a^n}{a^m} = a^{n-m}$ & long decimal division

$1.2 \overline{)9.6}$: -96, 0 → 8

$= 10^{-6-(-9)} = 10^{-6+9} = 10^3$

$= (8) \times (10^3)$ or $\boxed{8.0 \times 10^3}$

17. $(3.4 \times 10^8) + (6.5 \times 10^7)$

$= (3.4 \times 10^1 \times 10^7)$

$= 34 \times 10^7$

$= (34 \times 10^7) + (6.5 \times 10^7)$ (factor out 10^7)

$= (34 + 6.5)(10^7)$

$= (40.5) \times (10^7)$

$= \boxed{4.05 \times 10^8}$

$34.0 + 6.5 = 40.5$

18. $(8.1 \times 10^{-2}) - (2.7 \times 10^{-3})$

$= (.27 \times 10^{-2})$

$= (8.1 \times 10^{-2}) - (0.27 \times 10^{-2})$ factor out 10^{-2}

$= (8.1 - 0.27)(10^{-2})$

$= (7.83) \times (10^{-2})$

or 7.83×10^{-2}

$8.1 = 8.10$
-0.27
7.83

E. Applications (Sections 10.5–10.7)

1. PLANETS. The table shows approximate equatorial radii of several planets.

Planet		Equatorial Radius (km)
Mercury	6	2.44×10^3
Venus	4	6.05×10^3
Earth	3	6.38×10^3
Mars	5	3.40×10^3
Jupiter	1	7.15×10^4
Saturn	2	6.03×10^4

1 → largest
6 → smallest

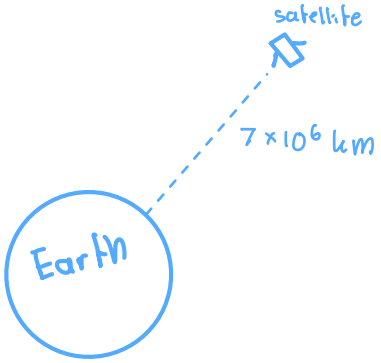
a. Which planet has the **smallest** equatorial radius? Explain.

Mercury as the group of planets with a radius of the magnitude 10^3, $2.44 < 3.40 < 6.05 < 6.38$

b. Which planet has the **largest** equatorial radius? Explain.

Jupiter because there only 2 planets with radius of 10^4 and between the two: $7.15 > 6.03$

2. DISTANCE. A satellite is 7×10^6 kilometers from Earth. If 1 kilometer $= 10^3$ meters, how far is the satellite from Earth in meters? Write your answer in scientific notation.



Goal: Find distance between Earth and satellite in km:

7×10^6 km $= ?$ m

(1 km $= 10^3$ m)

=> we multiply!

Solution:

$(7 \times 10^6) \times (1 \times 10^3) = (7 \times 1) \times (10^6 \times 10^3)$

(1 km in m)

$= 7 \times 10^9$ meters (m)

=> The satellite is 7.0×10^9 meters from earth.

3. BIOLOGY. A cell membrane is 0.00000091 meters thick. Write this number in scientific notation.

$= 9.1 \times 10^{-7}$

4. ORBITS. The Sun takes about 2.4×10^8 years to orbit the Milky Way. A planet takes 1.5×10^1 years to orbit its star. How many times does the planet orbit while the Sun completes one orbit? Write your answer in standard form.

(# of years it takes the Sun to orbit the Milky way) × (# of years it takes it takes a planet to orbit its star)

$\Rightarrow (2.4 \times 10^8) \times (1.5 \times 10^1)$

$= (2.4 \times 1.5) \times 10^8 \times 10^1$

$= (3.6) \times 10^{(8+1)}$

$= 3.6 \times 10^9$

$$\begin{array}{r} {\scriptstyle 2} \\ 2.4 \\ \times 1.5 \\ \hline 120 \\ +240 \\ \hline 3.60 \end{array}$$