Shift or Stay?

Sort the results, explain two choices, and make your own.

PA.N.1.3 "Multiply and divide numbers expressed in scientific notation and express the answer in scientific notation."

NAME _____ DATE _____

ALREADY IN FORM

Multiply coefficients and add exponents, or divide coefficients and subtract exponents. If the result's coefficient is at least 1 and less than 10, the result is already in scientific notation.

$(6 \times 10^7) \div (4 \times 10^2) = 1.5 \times 10^5$

NEEDS A SHIFT

If the result's coefficient is less than 1 or at least 10, move the decimal to make it at least 1 and less than 10. Adjust the exponent so the value stays the same.

$(9 \times 10^8)(3 \times 10^4) = 27 \times 10^{12} = 2.7 \times 10^{13}$

1 SORT

8 items

Multiply or divide each pair, circle READY or SHIFT based on your first result, then choose two items and explain how you knew where each belonged.

1. $(3 \times 10^5)(2 \times 10^2)$ READY SHIFT

2. $(4 \times 10^3)(3 \times 10^2)$ READY SHIFT

3. $(2 \times 10^7) \div (4 \times 10^2)$ READY SHIFT

4. $(8 \times 10^6) \div (2 \times 10^3)$ READY SHIFT

5. $(5 \times 10^{-3})(6 \times 10^5)$ READY SHIFT

6. $(5 \times 10^{-2})(1 \times 10^4)$ READY SHIFT

7. $(9 \times 10^3) \div (3 \times 10^5)$ READY SHIFT

8. $(3 \times 10^4) \div (6 \times 10^6)$ READY SHIFT

2 PROVE IT

Explain your thinking

Pick two items from Part 1. For each one, tell how you knew where it belonged.

ITEM # _____ **HOW I KNEW** _____

ITEM # _____ **HOW I KNEW** _____

3 MAKE YOUR OWN

One of each

Write one new multiplication or division example that is READY and one that is SHIFT, showing the first result and any rewrite needed.

READY _____

SHIFT _____

CHALLENGE

Write a division problem whose first result has a coefficient below 1 and a negative exponent, then rewrite the result in scientific notation.

PART 1 · SORT

#	ITEM	CATEGORY	WHY
1	$(3 \times 10^5)(2 \times 10^2)$	**READY**	The result is 6×10^7; 6 is already a valid coefficient.
2	$(4 \times 10^3)(3 \times 10^2)$	**SHIFT**	The first result is 12×10^5; rewrite it as 1.2×10^6.
3	$(2 \times 10^7) \div (4 \times 10^2)$	**SHIFT**	The first result is 0.5×10^5; rewrite it as 5×10^4.
4	$(8 \times 10^6) \div (2 \times 10^3)$	**READY**	The result is 4×10^3; 4 is already a valid coefficient.
5	$(5 \times 10^{-3})(6 \times 10^5)$	**SHIFT**	The first result is 30×10^2; rewrite it as 3×10^3.
6	$(5 \times 10^{-2})(1 \times 10^4)$	**READY**	The result is 5×10^2; 5 is already a valid coefficient.
7	$(9 \times 10^3) \div (3 \times 10^5)$	**READY**	The result is 3×10^{-2}; 3 is already a valid coefficient.
8	$(3 \times 10^4) \div (6 \times 10^6)$	**SHIFT**	The first result is 0.5×10^{-2}; rewrite it as 5×10^{-3}.

PART 2 · PROVE IT

Accept any explanation that names the deciding feature from the rule box for the chosen item.

PART 3 · MAKE YOUR OWN (SAMPLE ANSWERS)

- **READY**: $(4 \times 10^{-1}) \div (2 \times 10^2) = 2 \times 10^{-3}$, READY.
- **SHIFT**: $(6 \times 10^3)(2 \times 10^{-5}) = 12 \times 10^{-2} = 1.2 \times 10^{-1}$, SHIFT.

Challenge: $(3 \times 10^{-4}) \div (6 \times 10^2) = 0.5 \times 10^{-6} = 5 \times 10^{-7}$.

Accept any two explanations that correctly compute the first result and check whether its coefficient is at least 1 and less than 10. For student-made examples, verify both the operation and any exponent change during rewriting.