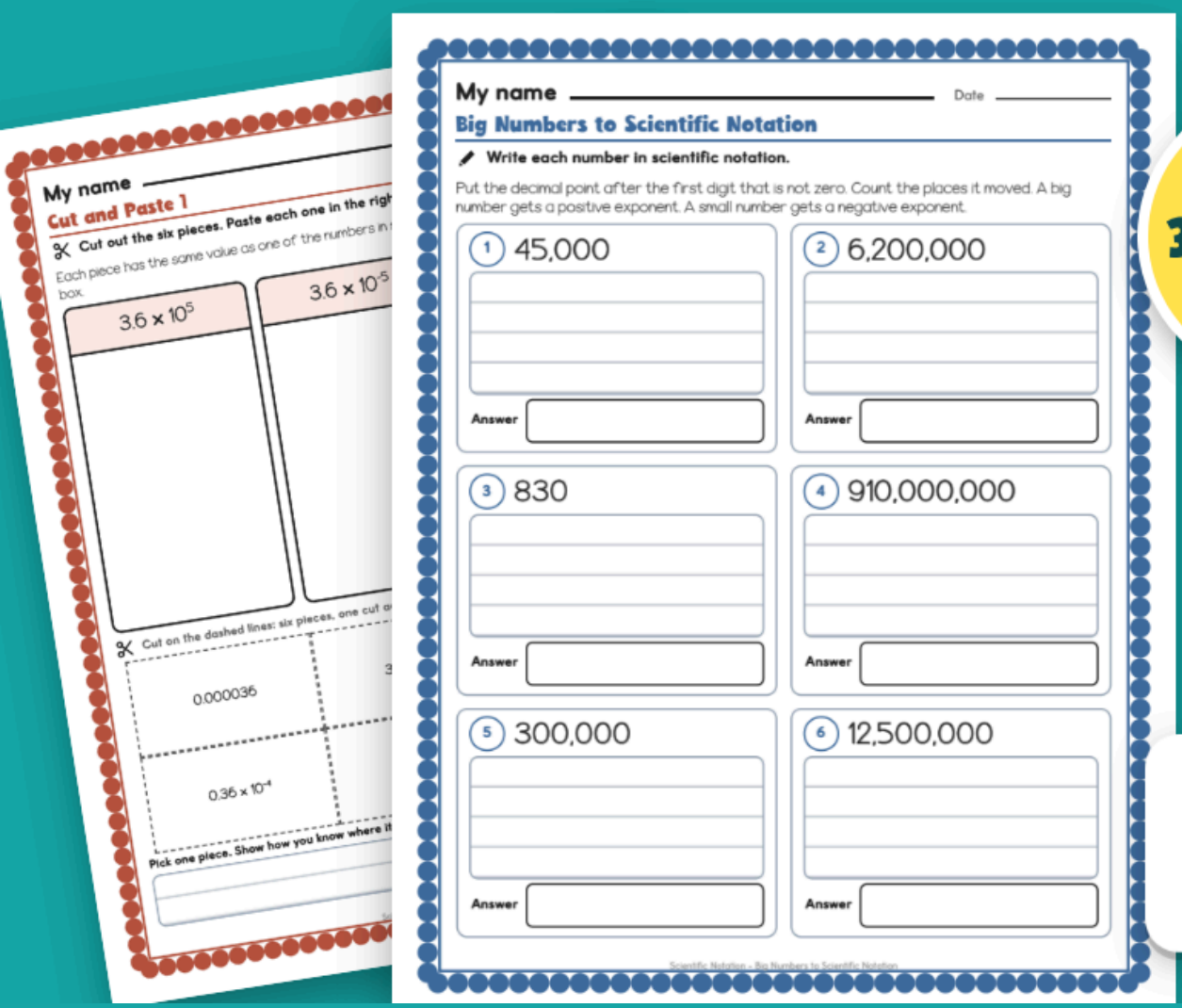
Bright Path Sped

SCIENTIFIC NOTATION

WORKSHEETS + CUT AND PASTE SORTS



39 PAGES

$4.5 \times 10^4 = 45{,}000$

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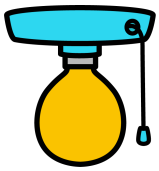
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PREVIEW

My name _____ Date _____



What Is Scientific Notation?

Read the notes. Fill in the blanks.

4.5×10^4 Scientific notation writes a number as a coefficient times a power of 10.

The coefficient is ☐ **The power of 10 is** ☐ **The exponent is** ☐

The coefficient is at least ☐ **and less than** ☐ **.**

4.5×10^4 means 4.5 times 10 four times: 4.5 times 10,000 = 45,000.

A big number (10 or more) has a ☐ **positive** ☐ **negative exponent.**

A small number (between 0 and 1) has a ☐ **positive** ☐ **negative exponent.**

Powers of 10. Fill in each one.

$10^3 =$ ☐	$10^2 =$ ☐	$10^1 =$ ☐	$10^0 =$ ☐
$10^{-1} =$ ☐	$10^{-2} =$ ☐	$10^{-3} =$ ☐	$10^{-4} =$ ☐

A pattern I see in the powers of 10 is...

PREVIEW

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My name _____ Date _____

Worked Examples: Standard to Scientific

Read the example. Then fill in the blanks.

Example 1: a big number: 45,000

Step 1	4.5 Put the decimal point after the first digit that is not zero. 45,000 becomes 4.5.
Step 2	4 Count how many places the decimal point moved: 4. It moved left.
Step 3	4.5×10^{4} A big number (10 or more) has a positive exponent. The exponent is 4.

Example 2: a small number: 0.00056

Step 1	5.6 Put the decimal point after the first digit that is not zero. 0.00056 becomes 5.6.
Step 2	4 Count how many places the decimal point moved: 4. It moved right.
Step 3	5.6×10^{-4} A small number (between 0 and 1) has a negative exponent. The exponent is -4.

Now it is your turn.

Your turn 1: a big number: 73,000

Step 1	Put the decimal point after the first digit that is not zero. What number do you get?	
Step 2	How many places did the decimal point move?	
Step 3	Write the number in scientific notation.	

Your turn 2: a small number: 0.0083

Step 1	Put the decimal point after the first digit that is not zero. What number do you get?	
Step 2	How many places did the decimal point move?	
Step 3	Write the number in scientific notation.	

PREVIEW

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My name _____ Date _____

Worked Examples: Multiply and Divide

Read the example. Then fill in the blanks.

Example 1: multiply: $(6 \times 10^4)(5 \times 10^3)$

Step 1

30

Multiply the coefficients: 6 times 5 = 30.

Step 2

10^7

Add the exponents: 4 + 3 = 7.

Step 3

3×10^8

30 is not between 1 and 10. $30 = 3 \times 10^1$, so add 1 to the exponent: 7 + 1 = 8.

Example 2: divide: $\frac{4.5 \times 10^8}{9 \times 10^3}$

Step 1

0.5

Divide the coefficients: 4.5 divided by 9 = 0.5.

Step 2

10^5

Subtract the exponents: 8 - 3 = 5.

Step 3

5×10^4

0.5 is not between 1 and 10. $0.5 = 5 \times 10^{-1}$, so add -1 to the exponent: 5 + (-1) = 4.

Now it is your turn.

Your turn 1: multiply: $(7 \times 10^2)(4 \times 10^5)$

Step 1 Multiply the coefficients. What do you get? _____

Step 2 Add the exponents. What do you get? _____

Step 3 Is the coefficient between 1 and 10? Fix it, then write the answer. _____

Your turn 2: divide: $\frac{3.6 \times 10^{-2}}{4 \times 10^{-5}}$

Step 1 Divide the coefficients. What do you get? _____

Step 2 Subtract the exponents. What do you get? _____

Step 3 Is the coefficient between 1 and 10? Fix it, then write the answer. _____

PREVIEW

My name _____ Date _____

Big Numbers to Scientific Notation

Write each number in scientific notation.

Put the decimal point after the first digit that is not zero. Count the places it moved. A big number gets a positive exponent. A small number gets a negative exponent.

1. 45,000

Answer

2. 6,200,000

Answer

3. 830

Answer

4. 910,000,000

Answer

5. 300,000

Answer

6. 12,500,000

Answer

PREVIEW

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My name _____ Date _____

Scientific Notation to Standard: Big

Write each number in standard form.

A positive exponent moves the decimal point right. A negative exponent moves it left. Fill the empty places with zeros.

1. 3.2×10^3

Answer

2. 7.5×10^5

Answer

3. 1.4×10^6

Answer

4. 9×10^4

Answer

5. 2.05×10^3

Answer

6. 6.3×10^7

Answer

PREVIEW

My name _____ Date _____

Go Both Ways

Read each one. Then change it the other way.

Some are standard form and some are scientific notation. Read the words under each one.

1 780,000

Write it in scientific notation.

Answer

2 5.9×10^{-3}

Write it in standard form.

Answer

3 0.00064

Write it in scientific notation.

Answer

4 1.2×10^{8}

Write it in standard form.

Answer

5 2,300,000,000

Write it in scientific notation.

Answer

6 7×10^{-5}

Write it in standard form.

Answer

PREVIEW

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My name _____ Date _____

Order Scientific Notation

Write the letters from least to greatest.

Turn each number into a plain number in your head, or compare the exponents first. Write the letters in order.

1 **Set 1**

A. 3.1×10^4

B. 2.9×10^5

C. 8.7×10^3

D. 1.5×10^4

Show how you know.

Least ☐ ☐ ☐ ☐ **Greatest**

2 **Set 2**

A. 4×10^{-3}

B. 7×10^{-5}

C. 2.5×10^{-3}

D. 9×10^{-4}

Show how you know.

Least ☐ ☐ ☐ ☐ **Greatest**

3 **Set 3**

A. 6.2×10^2

B. 5.4×10^{-1}

C. 1.8×10^3

D. 9.9×10^{-2}

Show how you know.

Least ☐ ☐ ☐ ☐ **Greatest**

PREVIEW

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My name _____ Date _____

Multiply: Move the Decimal Point

Multiply. Write the answer in scientific notation.

Multiply the coefficients. Add the exponents. If the coefficient is 10 or more, fix it.

1. $(5 \times 10^{3})(4 \times 10^{4})$

Answer

2. $(8 \times 10^{5})(7 \times 10^{2})$

Answer

3. $(6 \times 10^{-3})(5 \times 10^{-4})$

Answer

4. $(2.5 \times 10^{6})(6 \times 10^{-2})$

Answer

5. $(9 \times 10^{4})(9 \times 10^{3})$

Answer

6. $(4.5 \times 10^{-5})(8 \times 10^{2})$

Answer

PREVIEW

Preview - Bright Ezee Shop

My name _____ Date _____

Divide: Move the Decimal Point

Divide. Write the answer in scientific notation.

Divide the coefficients. Subtract the exponents. If the coefficient is less than 1, fix it.

1. $\frac{1.5 \times 10^{6}}{5 \times 10^{2}}$

Answer

2. $\frac{2 \times 10^{8}}{4 \times 10^{3}}$

Answer

3. $\frac{1.2 \times 10^{-2}}{4 \times 10^{-5}}$

Answer

4. $\frac{1.8 \times 10^{4}}{6 \times 10^{-3}}$

Answer

5. $\frac{4.2 \times 10^{3}}{7 \times 10^{-4}}$

Answer

6. $\frac{2.4 \times 10^{-5}}{8 \times 10^{2}}$

Answer

PREVIEW

My name _____ Date _____

Word Problems 2

Read each problem. Show your work. Write the answer.

Every number on this page is made up for practice. None of it is real data.

1. A made-up factory makes 5×10^4 bolts each day. How many bolts does it make in 8×10^2 days? Use scientific notation.

Show your work.

Answer _____ **bolts**

2. A made-up library holds 3.6×10^6 pages in 9×10^3 books. Every book has the same number of pages. How many pages are in one book? Use scientific notation.

Show your work.

Answer _____ **pages**

3. A made-up beam of light moves 3×10^8 meters each second. How far does it move in 6×10^1 seconds? Use scientific notation.

Show your work.

Answer _____ **meters**

4. A made-up coin is 1.2×10^{-3} meter thick. How tall is a stack of 5×10^2 of those coins? Use scientific notation.

Show your work.

Answer _____ **meter**

PREVIEW

My name _____ Date _____

Find the Mistake 2

Find the mistake. Then fix it.

Sam is made up for practice. Each problem has one mistake.

1 Multiply: $(2 \times 10^3)(3 \times 10^4)$

Sam wrote:

1 2 times 3 = 6
2 3 times 4 = 12
3 6×10^{12}

The mistake is on line

☐ 1 ☐ 2 ☐ 3

Fix it. Write the right answer.

2 Multiply: $(3 \times 10^2)(2 \times 10^3)$

Sam wrote:

1 3 + 2 = 5
2 2 + 3 = 5
3 5×10^5

The mistake is on line

☐ 1 ☐ 2 ☐ 3

Fix it. Write the right answer.

3 Divide: $\frac{8 \times 10^6}{2 \times 10^2}$

Sam wrote:

1 8 divided by 2 = 4
2 6 + 2 = 8
3 4×10^8

The mistake is on line

☐ 1 ☐ 2 ☐ 3

Fix it. Write the right answer.

4 Multiply: $(4.5 \times 10^{-5})(8 \times 10^2)$

Sam wrote:

1 4.5 times 8 = 36
2 -5 + 2 = -3
3 3.6×10^{-4}

The mistake is on line

☐ 1 ☐ 2 ☐ 3

Fix it. Write the right answer.

PREVIEW

My name _____ Date _____

Make Your Own

Make up your own scientific notation problems.

Tip: start with the answer. Then build a problem that gives that answer.

1. Write a big number. Write it in standard form and in scientific notation.

My big number and my work

Standard form: ☐ **Scientific notation:** ☐

2. Write a small number. Write it in standard form and in scientific notation.

My small number and my work

Standard form: ☐ **Scientific notation:** ☐

3. Write two numbers in scientific notation and multiply them. Make the coefficient need fixing.

My two numbers and my work

Product: ☐ **Is the coefficient between 1 and 10?** ☐ **yes** ☐ **no**

PREVIEW

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My name _____ Date _____

Cut and Paste 2

Cut out the six pieces. Paste each one in the right box.

Work out each piece. Paste it under the answer it makes.

6×10^{7}	2.4×10^{5}	5×10^{-3}

Cut on the dashed lines: six pieces, one cut across and two cuts down.

$\frac{4.8 \times 10^{8}}{2 \times 10^{3}}$	$(2.5 \times 10^{-5})(2 \times 10^{2})$	$(2 \times 10^{3})(3 \times 10^{4})$
$\frac{1.5 \times 10^{-1}}{3 \times 10^{1}}$	$(8 \times 10^{2})(3 \times 10^{2})$	$\frac{1.2 \times 10^{9}}{2 \times 10^{1}}$

Pick one piece. Show your steps.

PREVIEW

Answer Key: Notes, Worked Examples, Is It?

Every answer is computed from the same numbers as the page it keys, then checked by going back to standard form. The guided copies show steps 1 and 2, then the answer.

Powers of 10 page 4

Power	Value
10^{3}	1,000
10^{2}	100
10^{1}	10
10^{0}	1
10^{-1}	0.1
10^{-2}	0.01
10^{-3}	0.001
10^{-4}	0.0001

Worked examples: your turn pages 5 to 7 (steps 1 and 2, then the answer)

Item	Problem	Steps	Answer
p5 #1	73,000	7.3; 4	7.3×10^{4}
p5 #2	0.0083	8.3; 3	8.3×10^{-3}
p6 #1	8.1×10^{4}	4 places right; 4	81,000
p6 #2	3.5×10^{-3}	3 places left; 3	0.0035
p7 #1	$(7 \times 10^{2})(4 \times 10^{5})$	28; 10^{7}	2.8×10^{8}
p7 #2	$\frac{3.6 \times 10^{-2}}{4 \times 10^{-5}}$	0.9; 10^{3}	9×10^{2}

Is It Scientific Notation? page 8

Item	Number	In sci. notation?	Rewrite
#1	4.7×10^{5}	yes	-
#2	47×10^{4}	no	4.7×10^{5}
#3	0.8×10^{3}	no	8×10^{2}
#4	9.99×10^{-2}	yes	-
#5	12.5×10^{-3}	no	1.25×10^{-2}
#6	0.06×10^{-1}	no	6×10^{-3}

Notes page (page 4): the blanks

- Coefficient 4.5, power of 10 is 10^{4}, exponent 4.
- The coefficient is at least 1 and less than 10.
- A big number has a positive exponent. A small number has a negative exponent.

Check by going back to standard form

Multiply the standard numbers and compare. $(2 \times 10^{3})(3 \times 10^{4})$ is 2,000 times 30,000 = 60,000,000, and 6×10^{7} is 60,000,000. The two match. Students can check any conversion the same way: go back the other direction and see if they land on the start.

PREVIEW

Answer Key: Compare, Multiply, Divide

Pages 14 to 19. Every answer is in scientific notation with the coefficient at least 1 and less than 10.

Item	Problem	Answer
p14 #1	3.2×10^5 ? 4.1×10^4	>
p14 #2	6×10^{-3} ? 2×10^{-2}	<
p14 #3	7.5×10^6 ? 7.5×10^8	<
p14 #4	9.1×10^{-5} ? 1.2×10^{-4}	<
p14 #5	5×10^3 ? 5,000	=
p14 #6	2.5×10^{-1} ? 0.025	>
p15 #1	Set 1	C, D, A, B: 8.7×10^3, 1.5×10^4, 3.1×10^4, 2.9×10^5
p15 #2	Set 2	B, D, C, A: 7×10^{-5}, 9×10^{-4}, 2.5×10^{-3}, 4×10^{-3}
p15 #3	Set 3	D, B, A, C: 9.9×10^{-2}, 5.4×10^{-1}, 6.2×10^2, 1.8×10^3
p16 #1	$(2 \times 10^3)(3 \times 10^4)$	6×10^7
p16 #2	$(1.5 \times 10^2)(2 \times 10^5)$	3×10^7
p16 #3	$(4 \times 10^{-3})(2 \times 10^{-2})$	8×10^{-5}
p16 #4	$(3 \times 10^6)(1.2 \times 10^{-2})$	3.6×10^4
p16 #5	$(2.5 \times 10^4)(2 \times 10^3)$	5×10^7
p16 #6	$(1.1 \times 10^5)(4 \times 10^{-8})$	4.4×10^{-3}
p17 #1	$(5 \times 10^3)(4 \times 10^4)$	2×10^8
p17 #2	$(8 \times 10^5)(7 \times 10^2)$	5.6×10^8

Item	Problem	Answer
p17 #3	$(6 \times 10^{-3})(5 \times 10^{-4})$	3×10^{-6}
p17 #4	$(2.5 \times 10^6)(6 \times 10^{-2})$	1.5×10^5
p17 #5	$(9 \times 10^4)(9 \times 10^3)$	8.1×10^8
p17 #6	$(4.5 \times 10^{-5})(8 \times 10^2)$	3.6×10^{-2}
p18 #1	$\frac{8 \times 10^6}{2 \times 10^2}$	4×10^4
p18 #2	$\frac{6.9 \times 10^8}{3 \times 10^3}$	2.3×10^5
p18 #3	$\frac{8.4 \times 10^{-3}}{2 \times 10^{-5}}$	4.2×10^2
p18 #4	$\frac{9.6 \times 10^9}{3.2 \times 10^4}$	3×10^5
p18 #5	$\frac{5.5 \times 10^{-2}}{1.1 \times 10^{-6}}$	5×10^4
p18 #6	$\frac{6.4 \times 10^4}{1.6 \times 10^{-2}}$	4×10^6
p19 #1	$\frac{1.5 \times 10^6}{5 \times 10^2}$	3×10^3
p19 #2	$\frac{2 \times 10^8}{4 \times 10^3}$	5×10^4
p19 #3	$\frac{1.2 \times 10^{-2}}{4 \times 10^{-5}}$	3×10^2
p19 #4	$\frac{1.8 \times 10^4}{6 \times 10^{-3}}$	3×10^6
p19 #5	$\frac{4.2 \times 10^3}{7 \times 10^{-4}}$	6×10^6
p19 #6	$\frac{2.4 \times 10^{-5}}{8 \times 10^2}$	3×10^{-8}

Compare and order

- Compare the exponents first. The bigger exponent is the bigger number, as long as both coefficients are between 1 and 10.
- With negative exponents, -2 is greater than -5, so 3 times 10 to the -2 is greater.

Multiply and divide

- Page B problems need the coefficient fixed: a product of 10 or more, or a quotient less than 1.
- Every answer was checked by multiplying the answer back by the divisor, or by multiplying the standard numbers.

PREVIEW

Answer Key: Mistakes and Sorts

The student in each Find the Mistake problem is invented. Line numbers count the first thing Sam wrote as line 1. Sort pieces are named by their row and column in the cutting grid, left to right and top to bottom.

Item	Mistake	What went wrong	Right answer
p22 #1	Line 2	Sam counted 6 places. The decimal point moved 5 places, from the end of 380,000 to after the 3. The answer is 3.8 times 10 to the 5.	3.8×10^{5}
p22 #2	Line 2	Sam moved the decimal point to the right, but 0.0063 is a small number, so the exponent is negative: 6.3 times 10 to the -3.	6.3×10^{-3}
p22 #3	Line 2	Sam compared 5 and 2. With negative exponents, -2 is greater than -5, so 3 times 10 to the -2 is greater.	3×10^{-2} is greater
p22 #4	Line 3	56 is not between 1 and 10. Write 56 as 5.6 times 10 to the 1, so add 1 to the exponent: 5.6 times 10 to the 8.	5.6×10^{8}
p23 #1	Line 2	Sam multiplied the exponents. When you multiply, add the exponents: 3 + 4 = 7.	6×10^{7}
p23 #2	Line 1	Sam added the coefficients. When you multiply, multiply the coefficients: 3 times 2 = 6.	6×10^{5}
p23 #3	Line 2	Sam added the exponents. When you divide, subtract the exponents: 6 - 2 = 4.	4×10^{4}
p23 #4	Line 3	$36 = 3.6 \times 10^{1}$, so the exponent goes up by 1, from -3 to -2. Sam took 1 away. The answer is 3.6 times 10 to the -2.	3.6×10^{-2}

Cut and Paste 1 page 26

Piece	Expression	Box
r1 c1	0.000036	3.6×10^{-5}
r1 c2	36×10^{4}	3.6×10^{5}
r1 c3	360	3.6×10^{2}
r2 c1	0.36×10^{-4}	3.6×10^{-5}
r2 c2	360,000	3.6×10^{5}
r2 c3	0.036×10^{4}	3.6×10^{2}

Cut and Paste 2 page 27

Piece	Expression	Box
r1 c1	$\frac{4.8 \times 10^{8}}{2 \times 10^{3}}$	2.4×10^{5}
r1 c2	$(2.5 \times 10^{-5})(2 \times 10^{2})$	5×10^{-3}
r1 c3	$(2 \times 10^{3})(3 \times 10^{4})$	6×10^{7}
r2 c1	$\frac{1.5 \times 10^{-1}}{3 \times 10^{1}}$	5×10^{-3}
r2 c2	$(8 \times 10^{2})(3 \times 10^{2})$	2.4×10^{5}
r2 c3	$\frac{1.2 \times 10^{9}}{2 \times 10^{1}}$	6×10^{7}

Reteach by mistake

- Count the places: Find the Mistake 1, items 1 and 2. Go back to the worked page (page 5).
- Add, do not multiply, the exponents when multiplying; subtract when dividing. Use the worked page (page 7).

PREVIEW

Class Progress Grid

Every student on one grid: items right by page type.

Class or group _____ Month _____

Student	Notes and worked (of 14)	Is it and convert (of 36)	Compare and order (of 9)	Multiply (of 12)	Divide (of 12)	Word problems (of 8)	Mistakes (of 8)	Quiz (of 6)	Sorts (of 12)

PREVIEW

How to fill this in

For each column, add up how many items that student has right with no prompt (the tracker rows). One glance across a row shows which skill is easiest and which is next.

Grouping for small-group time

Students low in Is it and convert need the notes and worked pages (pages 4 to 6) first. Students low in Multiply and Divide need the worked page (page 7). Students near full marks can move to the word problems and mistakes (pages 20 to 23).

Maya's Tracker (Invented Student)

Maya R. is invented; nothing on this page describes a real student. The blank tracker is on page 34.

Student	Teacher	Month
Maya R. (an invented student)	Mr. Okafor (invented)	October

Page	Page type and set	Items	Right	Date	Notes
4	What Is Scientific Notation?	8	7	10/6	Mixed up 10 to the -1 and 10 to the -2
5	Worked Examples: Standard to Scientific	2	2	10/7	-
6	Worked Examples: Scientific to Standard	2	-	-	-
7	Worked Examples: Multiply and Divide	2	-	-	-
8	Is It Scientific Notation?	6	5	10/8	Missed 0.8 times 10 to the 3
9	Big Numbers to Scientific Notation	6	6	10/9	-
10	Small Numbers to Scientific Notation	6	4	10/10	Counted places wrong on two
11	Scientific Notation to Standard: Big	6	6	10/13	-
12	Scientific Notation to Standard: Small	6	5	10/14	Moved the decimal point the wrong way on one
13	Go Both Ways	6	-	-	-
14	Compare Scientific Notation	6	5	10/15	Compared coefficients first on one
15	Order Scientific Notation	3	-	-	-
16	Multiply: Coefficient Stays	6	6	10/17	-
17	Multiply: Move the Decimal Point	6	3	10/20	Left 56 as the coefficient on three
18	Divide: Coefficient Stays	6	-	-	-
19	Divide: Move the Decimal Point	6	-	-	-
20	Word Problems 1	4	-	-	-
21	Word Problems 2	4	-	-	-
22	Find the Mistake 1	4	3	10/22	One fix not finished
23	Find the Mistake 2	4	-	-	-
24	Quiz	6	-	-	-
26	Cut and Paste 1	6	-	-	-
27	Cut and Paste 2	6	-	-	-

PREVIEW

How to read it

Maya R. has done **11 of 23** scored pages and got **52 of 62** items right with no prompt. **4** pages were all right and **7** carry a note. Every number comes from the table.

What the table points to

The lowest page is Multiply: Move the Decimal Point (3 of 6). That is where the next practice goes. The 12 pages left blank are not tried yet, never wrong.