Chapter 8. Polynomials

Ex. 8.3

Answer 1CU.

Writing of a number in scientific notation is as follows.

The scientific notation of a number N is the product of a factor and a power of 10, and the factor must be greater than or equal to 1 and is less than 10.

That is,

$N = a \times 10^n$, where $1 \le a < 10$, and n is an integer

For example:

$0.0001 = 1 \times 10^{-4}, 3000 = 3 \times 10^3$

So, if a number between 0 and 1 is written in scientific notation, then the exponent will be negative, and if the number is not between 01 and 1 then the exponent will be positive.

Answer 1PQ.

Consider the following expression.

$n^3(n^4)(n)$

Simplify this expression as follows.

$n^3(n^4)(n) = n^{3+4+1}$ Use product of powers: $a^m \times a^n = a^{m+n}$

$= n^8$ Simplify

Therefore, the simplified form of the given expression is $\boxed{n^8}$

Answer 2CU.

Consider the following number.

65.2×10^3

To decide whether this number is in scientific notation, observe the below pattern of scientific notation of a number.

The scientific notation of a number N is the product of a factor and a power of 10, and the factor must be greater than or equal to 1 and is less than 10.

That is,

$N = a \times 10^n$, where $1 \le a < 10$, and n is an integer

In the number 65.2×10^3, $a = 65.2 \not< 10$.

Therefore, this number is not in scientific notation.

Answer 2PQ.

Consider the following expression.

$$4ad\left(3a^3d\right)$$

Simplify this expression as follows.

$4ad\left(3a^3d\right)=(4\times3)\left(a\times a^3\right)\left(d\times d\right)$ Group powers that have the same base

$=(12)\left(a^4\right)\left(d^2\right)$ Use product of powers: $a^m\times a^n=a^{m+n}$

$=12a^4d^2$ Simplify

Therefore, the simplified form of the given expression is $\boxed{12a^4d^2}$

Answer 3CU.

Consider the following decimal number.

$$3.7\text{ trillion}$$

Since $1\text{ trillion}=10^{12}$, this number can be written as,

$$3.7\text{ trillion}=3.7\times10^{12}$$

Use the following steps to express a number of the form $a\times10^n$ in standard notation.

1. Determine whether $n>0$ or $n<0$.

2. If $n>0$, move the decimal point in a to the right n places.

If $n<0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, the standard notation of 3.7 trillion is,

$$\begin{aligned}3.7\text{ trillion}&=3.7\times10^{12}\\&=\boxed{3,700,000,000,000}\end{aligned}$$

The scientific notation of a number N is the product of a factor and a power of 10, and the factor must be greater than or equal to 1 and is less than 10.

That is,

$N=a\times10^n$, where $1\le a<10$, and n is an integer

Therefore, the scientific notation of the number 3.7 trillion is

$$3.7\text{ trillion}=\boxed{3.7\times10^{12}}$$

Answer 3PQ.

Consider the following expression.

$$\left(-2w^3z^4\right)^3\left(-4wz^3\right)^2$$

Simplify this expression as follows.

$$\left(-2w^3z^4\right)^3\left(-4wz^3\right)^2=(-2)^3\left(w^3\right)^3\left(z^4\right)^3(-4)^2\left(w^2\right)\left(z^3\right)^2$$ Use $(ab)^n=a^nb^n$

$$=-8w^9z^{12}(16)w^2z^6$$ Use $\left(a^m\right)^n=a^{mn}$

$$=-128w^{9+2}z^{12+6}$$ Use product of powers: $a^m\times a^n=a^{m+n}$

$$=-128w^{11}z^{18}$$

Therefore, the simplified form of the given expression is $\boxed{-128w^{11}z^{18}}$

Answer 4CU.

Consider the following number.

$$2\times10^{-8}$$

Express this number in standard notation:

Use the following steps to express a number of the form $a\times10^n$ in standard notation.

1. Determine whether $n>0$ or $n<0$.

2. If $n>0$, move the decimal point in a to the right n places.

If $n<0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$$2\times10^{-8}=0.00000002$$ Here $n=-8$; move decimal point 8 places to the left

Therefore, the standard notation of 2×10^{-8} is,

$$2\times10^{-8}=\boxed{0.00000002}$$

Answer 4PQ.

Consider the following expression.

$$\frac{25p^{10}}{15p^{3}}$$

Simplify this expression as follows.

$$\frac{25p^{10}}{15p^{3}}=\left(\frac{25}{15}\right)\left(\frac{p^{10}}{p^{3}}\right)$$ Group powers that have the same base

$$=(1.666)\left(p^{10-3}\right)$$ Use quotient of powers: $\frac{a^m}{a^n}=a^{m-n}$

$$=1.666\times p^{7}$$

Therefore, the simplified form of the given expression is $\boxed{1.666\times p^{7}}$

Answer 5CU.

Consider the following number.

$$4.59\times10^{3}$$

Express this number in standard notation:

Use the following steps to express a number of the form $a\times10^{n}$ in standard notation.

1. Determine whether $n>0$ or $n<0$.

2. If $n>0$, move the decimal point in a to the right n places.

If $n<0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$4.59\times10^{3}=4590$ Here $n=3$; move decimal point 3 places to the right

Therefore, the standard notation of 4.59×10^{3} is,

$$4.59\times10^{3}=\boxed{4590}$$

Answer 5PQ.

Consider the following expression.

$$\left(\frac{6k^3}{7np^4}\right)^2$$

Simplify this expression as follows.

$$\left(\frac{6k^3}{7np^4}\right)^2 = \frac{(6k^3)^2}{(7np^4)^2} \quad \text{Use } \left(\frac{a}{b}\right)^2 = \frac{a^2}{b^2}$$

$$= \frac{6^2(k^3)^2}{7^2n^2(p^4)^2} \quad \text{Use } (ab)^2 = a^2b^2$$

$$= \frac{36k^6}{49n^2p^8} \quad \text{Use power of power } (a^m)^n = a^{mn}$$

Therefore, the simplified form of the given expression is $\boxed{\frac{36k^6}{49n^2p^8}}$

Answer 6CU.

Consider the following number.

$$7.183\times10^{14}$$

Express this number in standard notation:

Use the following steps to express a number of the form $a\times10^n$ in standard notation.

1. Determine whether $n>0$ or $n<0$.

2. If $n>0$, move the decimal point in a to the right n places.

If $n<0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$$7.183\times10^{14} = 718300000000000$$

Here $n=14$; move decimal point 14 places to the right

Therefore, the standard notation of 7.183×10^{14} is,

$$7.183\times10^{14} = \boxed{718,300,000,000,000}$$

Answer 6PQ.

Consider the following expression.

$$\frac{4x^0y^2}{\left(3y^{-3}z^5\right)^{-2}}$$

Simplify this expression as follows.

$$\frac{4x^0y^2}{\left(3y^{-3}z^5\right)^{-2}} = \frac{4(1)y^2}{3^2\left(y^{-3}\right)^{-2}\left(z^5\right)^{-2}} \text{ Use } (ab)^n = a^nb^n$$

$$= \frac{4y^2}{9\left(y^6\right)\left(z^{-10}\right)} \text{ Use power of power } \left(a^m\right)^n = a^{mn}$$

$$= \frac{4}{9y^4z^{-10}}$$

$$= \frac{4z^{10}}{9y^4}$$

Therefore, the simplified form of the given expression is $\boxed{\frac{4z^{10}}{9y^4}}$

Answer 7CU.

Consider the following number.

$$3.6\times10^{-5}$$

Express this number in standard notation:

Use the following steps to express a number of the form $a\times10^n$ in standard notation.

1. Determine whether $n>0$ or $n<0$.

2. If $n>0$, move the decimal point in a to the right n places.

If $n<0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$$3.6\times10^{-5} = 0.000036$$

Here $n=-5$; move decimal point 5 places to the left

Therefore, the standard notation of 3.6×10^{-5} is,

$$3.6\times10^{-5} = \boxed{0.000036}$$

Answer 7PQ.

Consider the following expression.

$$\left(6.4\times10^{3}\right)\left(7\times10^{2}\right)$$

Write this number in scientific and standard notations as follows.

$\left(6.4\times10^{3}\right)\left(7\times10^{2}\right)=\left(6.4\times7\right)\left(10^{3}\times10^{2}\right)$ Group powers that have the same base

$=\left(44.8\right)\left(10^{5}\right)$ Use product of powers, $a^{m}\times a^{n}=a^{m+n}$

$=\left(4.48\times10^{1}\right)\left(10^{5}\right)$ Write $44.8=4.48\times10^{1}$

$=\left(4.48\right)\left(10^{1}\times10^{5}\right)$ Group powers that have the same base

$=4.48\times10^{6}$ (Or) $4,480,000$

Therefore, the scientific notation of the given number is $\boxed{4.48\times10^{6}}$

And, the standard notation of the given number is $\boxed{4,480,000}$

Answer 8CU.

Consider the following number.

$$56,700,000$$

Express this number in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a\times10^{n}$.

If the decimal point moved to the right, write as $a\times10^{-n}$.

Then, we have

$56,700,000\rightarrow5.6700000\times10^{n}$ Move decimal point 7 places to the left.

$56,700,000=5.67\times10^{7}$ $a=5.67$, and $n=7$

Therefore, the scientific notation of $56,700,000$ is,

$$56,700,000=\boxed{5.67\times10^{7}}$$

Answer 8PQ.

Consider the following expression.

$$\left(4\times10^{2}\right)\left(15\times10^{-6}\right)$$

Write this number in scientific and standard notations as follows.

$$\left(4\times10^{2}\right)\left(15\times10^{-6}\right)=\left(4\times15\right)\left(10^{2}\times10^{-6}\right)$$ Group powers that have the same base

$$=\left(60\right)\left(10^{-4}\right)$$ Use product of powers, $a^{m}\times a^{n}=a^{m+n}$

$$=\left(6.0\times10^{1}\right)\left(10^{-4}\right)$$ $\text{Write } 60=6.0\times10^{1}$

$$=\left(6\right)\left(10^{1}\times10^{-4}\right)$$ Group powers that have the same base

$$=6\times10^{-3}$$ (Or) 0.006

Therefore, the scientific notation of the given number is $\boxed{6\times10^{-3}}$

And, the standard notation of the given number is $\boxed{0.006}$

Answer 9CU.

Consider the following number.

$$0.00567$$

Express this number in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a\times10^{n}$.

If the decimal point moved to the right, write as $a\times10^{-n}$.

Then, we have

$$0.00567\rightarrow0005.67\times10^{n}$$ Move decimal point 3 places to the right.

$$0.00567=5.67\times10^{-3}$$ $a=5.67$, and $n=-3$

Therefore, the scientific notation of 0.00567 is,

$$0.00567=\boxed{5.67\times10^{-3}}$$

Answer 9PQ.

Consider the following expression.

$$\frac{9.2\times10^3}{2.3\times10^5}$$

Write this number in scientific and standard notations as follows.

$$\frac{9.2\times10^3}{2.3\times10^5}=\left(\frac{9.2}{2.3}\right)\left(\frac{10^3}{10^5}\right)$$ Group powers that have the same base

$=(4)\left(10^{3-5}\right)$ Use quotient of powers, $\frac{a^m}{a^n}=a^{m-n}$

$=4\times10^{-2}$ (or) 0.04

Therefore, the scientific notation of the given number is $\boxed{4\times10^{-2}}$

And, the standard notation of the given number is $\boxed{0.04}$

Answer 10CU.

Consider the following number.

0.00000000004

Express this number in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a\times10^n$.

If the decimal point moved to the right, write as $a\times10^{-n}$.

Then, we have

$0.00000000004\to000000000004.0\times10^n$ Move decimal point 11 places to the right.

$0.00000000004=4.0\times10^{-11}$ $a=4.0$, and $n=-11$

Therefore, the scientific notation of 0.00000000004 is,

$0.00000000004=\boxed{4\times10^{-11}}$

Answer 10PQ.

Consider the following expression.

$$\frac{3.6\times10^{7}}{1.2\times10^{-2}}$$

Write this number in scientific and standard notations as follows.

$$\frac{3.6\times10^{7}}{1.2\times10^{-2}}=\left(\frac{3.6}{1.2}\right)\left(\frac{10^{7}}{10^{-2}}\right)$$ Group powers that have the same base

$$=(3)\left(10^{7-(-2)}\right)$$ Use quotient of powers, $\frac{a^m}{a^n}=a^{m-n}$

$$=3\times10^{9}\ (\text{or})\ 3,000,000,000$$

Therefore, the scientific notation of the given number is $\boxed{3\times10^{9}}$

And, the standard notation of the given number is $\boxed{3,000,000,000}$

Answer 11CU.

Consider the following number.

$$3,002,000,000,000,000$$

Express this number in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a\times10^{n}$.

If the decimal point moved to the right, write as $a\times10^{-n}$.

Then, we have

$$3,002,000,000,000,000\rightarrow3.002000000000000\times10^{n}$$

Move decimal point 15 places to the left.

$$3,002,000,000,000,000=3.002\times10^{15}$$ Here $a=3.002$, and $n=15$

Therefore, the scientific notation of $3,002,000,000,000,000$ is,

$$3,002,000,000,000,000=\boxed{3.002\times10^{15}}$$

Answer 12CU.

Consider the following product.

$$\left(5.3\times10^{2}\right)\left(4.1\times10^{5}\right)$$

Simplify this product as follows.

$\left(5.3\times10^{2}\right)\left(4.1\times10^{5}\right)=(5.3\times4.1)\left(10^{2}\times10^{5}\right)$ Group powers that have the same base

$=(21.73)\left(10^{2+5}\right)$ Use product of powers, $a^{m}\times a^{n}=a^{m+n}$

$=21.73\times10^{7}$ Simplify

Express this number in standard notation:

Use the following steps to express a number of the form $a\times10^{n}$ in standard notation.

1. Determine whether $n>0$ or $n<0$.

2. If $n>0$, move the decimal point in a to the right n places.

If $n<0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$$21.73\times10^{7}=217300000$$

Here $n=7$; move decimal point 7 places to the right.

Therefore, the standard notation of $\left(5.3\times10^{2}\right)\left(4.1\times10^{5}\right)$ is,

$$\left(5.3\times10^{2}\right)\left(4.1\times10^{5}\right)=\boxed{217,300,000}$$

Express the number 21.73×10^{7} in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a\times10^{n}$.

If the decimal point moved to the right, write as $a\times10^{-n}$.

Then, we have

$$\begin{aligned}21.73\times10^{7}&\rightarrow2.173\times10^{1}\times10^{7}\\&\rightarrow2.173\times10^{8}\end{aligned}$$

Therefore, the scientific notation of $\left(5.3\times10^{2}\right)\left(4.1\times10^{5}\right)$ is,

$$\left(5.3\times10^{2}\right)\left(4.1\times10^{5}\right)=\boxed{2.173\times10^{8}}$$

Answer 13CU.

Consider the following product.

$$\left(2\times10^{-5}\right)\left(9.4\times10^{-3}\right)$$

Simplify this product as follows.

$\left(2\times10^{-5}\right)\left(9.4\times10^{-3}\right)=(2\times9.4)\left(10^{-5}\times10^{-3}\right)$ Group powers that have the same base

$=(18.8)\left(10^{-5-3}\right)$ Use product of powers, $a^m\times a^n=a^{m+n}$

$=18.8\times10^{-8}$ Simplify

Express this number in standard notation:

Use the following steps to express a number of the form $a\times10^n$ in standard notation.

1. Determine whether $n>0$ or $n<0$.

2. If $n>0$, move the decimal point in a to the right n places.

If $n<0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$$18.8\times10^{-8}=0.000000188$$

Here $n=8$; move decimal point 8 places to the right.

Therefore, the standard notation of $\left(2\times10^{-5}\right)\left(9.4\times10^{-3}\right)$ is,

$$\left(2\times10^{-5}\right)\left(9.4\times10^{-3}\right)=\boxed{0.000000188}$$

Express the number 18.8×10^{-8} in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a\times10^n$.

If the decimal point moved to the right, write as $a\times10^{-n}$.

Then, we have

$$\begin{aligned}18.8\times10^{-8}&\to1.88\times10^{1}\times10^{-8}\\&\to1.88\times10^{-7}\end{aligned}$$

Therefore, the scientific notation of $\left(2\times10^{-5}\right)\left(9.4\times10^{-3}\right)$ is,

$$\left(2\times10^{-5}\right)\left(9.4\times10^{-3}\right)=\boxed{1.88\times10^{-7}}$$

Answer 14CU.

Consider the following fraction.

$$\frac{1.5\times10^{2}}{2.5\times10^{12}}$$

Simplify this product as follows.

$$\frac{1.5\times10^{2}}{2.5\times10^{12}}=\left(\frac{1.5}{2.5}\right)\left(\frac{10^{2}}{10^{12}}\right)$$ Group powers that have the same base

$=(0.6)\left(10^{2-12}\right)$ Use quotient of powers, $\frac{a^{m}}{a^{n}}=a^{m-n}$

$=0.6\times10^{-10}$ Simplify

Express this number in standard notation:

Use the following steps to express a number of the form $a\times10^{n}$ in standard notation.

1. Determine whether $n>0$ or $n<0$.

2. If $n>0$, move the decimal point in a to the right n places.

If $n<0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$$0.6\times10^{-10}=0.000000000006$$

Here $n=10$; move decimal point 10 places to the left.

Therefore, the standard notation of $\frac{1.5\times10^{2}}{2.5\times10^{12}}$ is,

$$\frac{1.5\times10^{2}}{2.5\times10^{12}}=\boxed{0.000000000006}$$

Express the number 0.6×10^{-10} in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a\times10^{n}$.

If the decimal point moved to the right, write as $a\times10^{-n}$.

Then, we have

$$\begin{aligned}0.6\times10^{-10} &\to 6.0\times10^{-1}\times10^{-10}\\ &\to 6\times10^{-11}\end{aligned}$$

Therefore, the scientific notation of $\frac{1.5\times10^{2}}{2.5\times10^{12}}$ is,

$$\frac{1.5\times10^{2}}{2.5\times10^{12}}=\boxed{6\times10^{-11}}$$

Answer 15CU.

Consider the following fraction.

$$\frac{1.25\times10^{4}}{2.5\times10^{-6}}$$

Simplify this product as follows.

$$\frac{1.25\times10^{4}}{2.5\times10^{-6}}=\left(\frac{1.25}{2.5}\right)\left(\frac{10^{4}}{10^{-6}}\right)$$ Group powers that have the same base

$$=(0.5)\left(10^{4-(-6)}\right)$$ Use quotient of powers, $\frac{a^{m}}{a^{n}}=a^{m-n}$

$$=0.5\times10^{10}$$ Simplify

Express this number in standard notation:

Use the following steps to express a number of the form $a\times10^{n}$ in standard notation.

1. Determine whether $n>0$ or $n<0$.

2. If $n>0$, move the decimal point in a to the right n places.

If $n<0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$$0.5\times10^{10}=5{,}000{,}000{,}000$$

Here $n=10$; move decimal point 10 places to the right.

Therefore, the standard notation of $\frac{1.25\times10^{4}}{2.5\times10^{-6}}$ is,

$$\frac{1.25\times10^{4}}{2.5\times10^{-6}}=\boxed{5{,}000{,}000{,}000}$$

Express the number 0.5×10^{10} in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a\times10^{n}$.

If the decimal point moved to the right, write as $a\times10^{-n}$.

Then, we have

$$\begin{aligned}0.5\times10^{10} &\rightarrow 5.0\times10^{-1}\times10^{10}\\ &\rightarrow 5\times10^{9}\end{aligned}$$

Therefore, the scientific notation of $\frac{1.25\times10^{4}}{2.5\times10^{-6}}$ is,

$$\frac{1.25\times10^{4}}{2.5\times10^{-6}}=\boxed{5\times10^{9}}$$

Answer 16CU.

The number of credit cards were used during the year 2000 in U.S. is,

$$1.65\text{ billion}$$

This number can be written as,

$$1.65\text{ billion}=1.65\times10^{9}$$

Use the following steps to express a number of the form $a\times10^{n}$ in standard notation.

1. Determine whether $n>0$ or $n<0$.

2. If $n>0$, move the decimal point in a to the right n places.

If $n<0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$$1.65\times10^{9}=1,650,000,000$$

Here $n=9$; move decimal point 9 places to the right.

Therefore, the standard notation of 1.65×10^{9} is,

$$1.65\times10^{9}=\boxed{1,650,000,000}$$

Express the number 1.65×10^9 in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a\times10^n$.

If the decimal point moved to the right, write as $a\times10^{-n}$.

From this definition, the scientific notation of this number is itself.

That is, $\boxed{1.65\times10^9}$

During the year 2000, the total amount charged to these cards is,

$$\$1.54\text{ trillion}=\$1.54\times10^{12}$$

Now we can write,

$$1.54\times10^{12}=1,540,000,000,000$$

Here $n=12$; move decimal point 12 places to the right.

Therefore, the standard notation of 1.54×10^{12} is,

$$1.54\times10^{12}=\boxed{1,540,000,000,000}$$

From the definition of scientific notation of a number, the scientific notation of the number 1.54×10^{12} is itself.

That is, $\boxed{1.54\times10^{12}}$

Answer 17CU.

The average amount charged per credit card is,

$$\frac{1.54\,\text{trillion}}{1.65\,\text{billion}}=\frac{1.54\times10^{12}}{1.65\times10^{9}}$$

This number can be written as,

$$\frac{1.54\times10^{12}}{1.65\times10^{9}}=\left(\frac{1.54}{1.65}\right)\times\frac{10^{12}}{10^{9}}$$ Group powers that have the same base

$$=\left(\frac{1.54}{1.65}\right)\times10^{12-9}$$ Use quotient of powers, $\frac{a^m}{a^n}=a^{m-n}$

$$=0.93333\times10^{3}$$

Use the following steps to express a number of the form $a\times10^n$ in standard notation.

1. Determine whether $n>0$ or $n<0$.

2. If $n>0$, move the decimal point in a to the right n places.

If $n<0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$$0.93333\times10^{3}=933.33$$

Here $n=3$; move decimal point 3 places to the right.

Therefore, the standard notation of 0.93333×10^{3} is,

$$0.93333\times10^{3}=\boxed{\$933.33}$$

Answer 18PA.

Consider the following number.

$$5\times10^{-6}$$

Use the following steps to express a number of the form $a\times10^n$ in standard notation.

1. Determine whether $n>0$ or $n<0$.

2. If $n>0$, move the decimal point in a to the right n places.

If $n<0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$$5\times10^{-6}=0.000005$$

Here $n=6$; move decimal point 6 places to the left.

Therefore, the standard notation of 5×10^{-6} is,

$$5\times10^{-6}=\boxed{0.000005}$$

Answer 19PA.

Consider the following number.

6.1×10^{-9}

Use the following steps to express a number of the form $a \times 10^n$ in standard notation.

1. Determine whether $n > 0$ or $n < 0$.

2. If $n > 0$, move the decimal point in a to the right n places.

If $n < 0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$6.1 \times 10^{-9} = 0.0000000061$

Here $n = 9$; move decimal point 9 places to the left.

Therefore, the standard notation of 6.1×10^{-9} is,

$6.1 \times 10^{-9} = \boxed{0.0000000061}$

Answer 20PA.

Consider the following number.

7.9×10^{4}

Use the following steps to express a number of the form $a \times 10^n$ in standard notation.

1. Determine whether $n > 0$ or $n < 0$.

2. If $n > 0$, move the decimal point in a to the right n places.

If $n < 0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$7.9 \times 10^{4} = 79000$

Here $n = 4$; move decimal point 4 places to the right.

Therefore, the standard notation of 7.9×10^{4} is,

$7.9 \times 10^{4} = \boxed{79,000}$

Answer 21PA.

Consider the following number.

$$8 \times 10^7$$

Use the following steps to express a number of the form $a \times 10^n$ in standard notation.

1. Determine whether $n > 0$ or $n < 0$.

2. If $n > 0$, move the decimal point in a to the right n places.

If $n < 0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$$8 \times 10^7 = 80,000,000$$

Here $n = 7$; move decimal point 7 places to the right.

Therefore, the standard notation of 8×10^7 is,

$$8 \times 10^7 = \boxed{80,000,000}$$

Answer 22PA.

Consider the following number.

$$1.243 \times 10^{-7}$$

Use the following steps to express a number of the form $a \times 10^n$ in standard notation.

1. Determine whether $n > 0$ or $n < 0$.

2. If $n > 0$, move the decimal point in a to the right n places.

If $n < 0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$$1.243 \times 10^{-7} = 0.0000001243$$

Here $n = 7$; move decimal point 7 places to the right.

Therefore, the standard notation of 1.243×10^{-7} is,

$$1.243 \times 10^{-7} = \boxed{0.0000001243}$$

Answer 23PA.

Consider the following number.

2.99×10^{-1}

Use the following steps to express a number of the form $a\times10^{n}$ in standard notation.

1. Determine whether $n>0$ or $n<0$.

2. If $n>0$, move the decimal point in a to the right n places.

If $n<0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$2.99\times10^{-1}=0.299$

Here $n=1$; move decimal point 1 place to the left.

Therefore, the standard notation of 2.99×10^{-1} is,

$2.99\times10^{-1}=\boxed{0.299}$

Answer 24PA.

Consider the following number.

4.782×10^{13}

Use the following steps to express a number of the form $a\times10^{n}$ in standard notation.

1. Determine whether $n>0$ or $n<0$.

2. If $n>0$, move the decimal point in a to the right n places.

If $n<0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$4.782\times10^{13}=47,820,000,000,000$

Here $n=13$; move decimal point 13 places to the right.

Therefore, the standard notation of 4.782×10^{13} is,

$4.782\times10^{13}=\boxed{47,820,000,000,000}$

Answer 25PA.

Consider the following number.

6.89×10^0

Use the following steps to express a number of the form $a\times10^n$ in standard notation.

1. Determine whether $n>0$ or $n<0$.

2. If $n>0$, move the decimal point in a to the right n places.

If $n<0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$$\begin{aligned}6.89\times10^0 &= 6.89\times(1)\\ &= 6.89\end{aligned}$$

Therefore, the standard notation of 6.89×10^0 is,

$$6.89\times10^0=\boxed{6.89}$$

Answer 26PA.

The number of stars in the Andromeda Galaxy is,

2×10^{11}

Use the following steps to express a number of the form $a\times10^n$ in standard notation.

1. Determine whether $n>0$ or $n<0$.

2. If $n>0$, move the decimal point in a to the right n places.

If $n<0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$$2\times10^{11}=200,000,000,000$$

Here $n=11$; move decimal point 11 places to the right.

Therefore, the standard notation of 2×10^{11} is,

$$2\times10^{11}=\boxed{200,000,000,000}$$

Answer 27PA.

The number of miles that the center of the moon away from the center of Earth is,

$$2.389 \times 10^5$$

Use the following steps to express a number of the form $a \times 10^n$ in standard notation.

1. Determine whether $n > 0$ or $n < 0$.

2. If $n > 0$, move the decimal point in a to the right n places.

If $n < 0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$$2.389 \times 10^5 = 238{,}900$$

Here $n = 5$; move decimal point 5 places to the right.

Therefore, the standard notation of 2.389×10^5 is,

$$2.389 \times 10^5 = \boxed{238{,}900}$$

Answer 28PA.

The mass of a proton is,

$$1.67265 \times 10^{-27}\,\text{kg.}$$

Use the following steps to express a number of the form $a \times 10^n$ in standard notation.

1. Determine whether $n > 0$ or $n < 0$.

2. If $n > 0$, move the decimal point in a to the right n places.

If $n < 0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$$1.67265 \times 10^{-27} = 0.000000000000000000000000167265$$

Here $n = 27$; move decimal point 27 places to the left.

Therefore, the standard notation of 1.67265×10^{-27} is,

$$1.67265 \times 10^{-27} = \boxed{0.000000000000000000000000167265}$$

Answer 29PA.

The mass of an electron is,

$$9.1095\times10^{-31}\,\text{kg.}$$

Use the following steps to express a number of the form $a\times10^{n}$ in standard notation.

1. Determine whether $n>0$ or $n<0$.

2. If $n>0$, move the decimal point in a to the right n places.

If $n<0$, move the decimal point in a to the left n places.

3. Add zeros, decimal point, and/or commas as needed to indicate place value.

Then, we have

$$9.1095\times10^{-31}=0.0000000000000000000000000000091095$$

Here $n=31$; move decimal point 31 places to the left.

Therefore, the standard notation of 9.1095×10^{-31} is,

$$9.1095\times10^{-31}\,\text{kg.}=\boxed{0.0000000000000000000000000000091095}$$

Answer 30PA.

Consider the following number.

$$50,400,000,000$$

Express the number $50,400,000,000$ in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a\times10^{n}$.

If the decimal point moved to the right, write as $a\times10^{-n}$.

Then, we have

$$50,400,000,000\rightarrow5.0400000000\times10^{n}$$ Move decimal point 10 places to the left

$$50,400,000,000=5.04\times10^{10}$$ Here $a=5.04$, and $n=10$

Therefore, the scientific notation of $50,400,000,000$ is,

$$50,400,000,000=\boxed{5.04\times10^{10}}$$

Answer 31PA.

Consider the following number.

$34,402,000$

Express the number $34,402,000$ in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a \times 10^n$.

If the decimal point moved to the right, write as $a \times 10^{-n}$.

Then, we have

$34,402,000 \rightarrow 3.4402000 \times 10^n$ Move decimal point 7 places to the left

$34,402,000 = 3.4402 \times 10^7$ Here $a = 3.4402$, and $n = 7$

Therefore, the scientific notation of $34,402,000$ is,

$34,402,000 = \boxed{3.4402 \times 10^7}$

Answer 32PA.

Consider the following number.

0.000002

Express the number 0.000002 in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a \times 10^n$.

If the decimal point moved to the right, write as $a \times 10^{-n}$.

Then, we have

$0.000002 \rightarrow 2.0 \times 10^{-n}$ Move decimal point 6 places to the right

$0.000002 = 2 \times 10^{-6}$ Here $a = 2$, and $n = 6$

Therefore, the scientific notation of 0.000002 is,

$0.000002 = \boxed{2 \times 10^{-6}}$

Answer 33PA.

Consider the following number.

0.00090465

Express the number 0.00090465 in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a \times 10^n$.

If the decimal point moved to the right, write as $a \times 10^{-n}$.

Then, we have

$0.00090465 \to 9.0465 \times 10^{-n}$ Move decimal point 4 places to the right

$0.00090465 = 9.0465 \times 10^{-4}$ Here $a = 9.0465$, and $n = 4$

Therefore, the scientific notation of 0.00090465 is,

$0.00090465 = \boxed{9.0465 \times 10^{-4}}$

Answer 34PA.

Consider the following number.

25.8

Express the number 25.8 in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a \times 10^n$.

If the decimal point moved to the right, write as $a \times 10^{-n}$.

Then, we have

$25.8 \to 2.58 \times 10^n$ Move decimal point 1 place to the left

$25.8 = 2.58 \times 10^1$ Here $a = 2.58$, and $n = 1$

Therefore, the scientific notation of 25.8 is,

$25.8 = \boxed{2.58 \times 10^1}$

Answer 35PA.

Consider the following number.

$$380.7$$

Express the number 380.7 in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a \times 10^n$.

If the decimal point moved to the right, write as $a \times 10^{-n}$.

Then, we have

$380.7 \to 3.807 \times 10^n$ Move decimal point 2 places to the left

$380.7 = 3.807 \times 10^2$ Here $a = 3.807$, and $n = 2$

Therefore, the scientific notation of 380.7 is,

$$380.7 = \boxed{3.807 \times 10^2}$$

Answer 36PA.

Consider the following number.

$$622 \times 10^6$$

Express the number 622×10^6 in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a \times 10^n$.

If the decimal point moved to the right, write as $a \times 10^{-n}$.

Then, the scientific notation of 622×10^6 is,

$$\begin{aligned} 622 \times 10^6 &= 622000000 \\ &= 6.22000000 \times 10^8 \\ &= \boxed{6.22 \times 10^8} \end{aligned}$$

Answer 37PA.

Consider the following number.

87.3×10^{11}

Express the number 87.3×10^{11} in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a\times10^{n}$.

If the decimal point moved to the right, write as $a\times10^{-n}$.

Then, the scientific notation of 87.3×10^{11} is,

$$\begin{aligned}87.3\times10^{11} &= 8730000000000\\ &= 8.730000000000\times10^{12}\\ &= \boxed{8.73\times10^{12}}\end{aligned}$$

Answer 38PA.

Consider the following number.

0.5×10^{-4}

Express the number 0.5×10^{-4} in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a\times10^{n}$.

If the decimal point moved to the right, write as $a\times10^{-n}$.

Then, the scientific notation of 0.5×10^{-4} is,

$$\begin{aligned}0.5\times10^{-4} &= 0.00005\\ &= 5.0\times10^{-5}\\ &= \boxed{5\times10^{-5}}\end{aligned}$$

Answer 39PA.

Consider the following number.

$$0.0081 \times 10^{-3}$$

Express the number 0.0081×10^{-3} in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a \times 10^{n}$.

If the decimal point moved to the right, write as $a \times 10^{-n}$.

Then, the scientific notation of 0.0081×10^{-3} is,

$$\begin{aligned} 0.0081 \times 10^{-3} &= 0.0000081 \\ &= \boxed{8.1 \times 10^{-6}} \end{aligned}$$

Answer 40PA.

Consider the following number.

$$94 \times 10^{-7}$$

Express the number 94×10^{-7} in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a \times 10^{n}$.

If the decimal point moved to the right, write as $a \times 10^{-n}$.

Then, the scientific notation of 94×10^{-7} is,

$$\begin{aligned} 94 \times 10^{-7} &= 9.4 \times 10^{1} \times 10^{-7} \\ &= 9.4 \times 10^{1-7} \qquad \text{Use product of powers } a^m \times a^n = a^{m+n} \\ &= \boxed{9.4 \times 10^{-6}} \end{aligned}$$

Answer 41PA.

Consider the following number.

$$0.001\times10^{12}$$

Express the number 0.001×10^{12} in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a\times10^{n}$.

If the decimal point moved to the right, write as $a\times10^{-n}$.

Then, the scientific notation of 0.001×10^{12} is,

$$\begin{aligned}0.001\times10^{12} &= 1.0\times10^{-3}\times10^{12}\\ &= 1\times10^{-3+12} \quad \text{Use product of powers } a^{m}\times a^{n}=a^{m+n}\\ &= \boxed{1\times10^{9}}\end{aligned}$$

Answer 42PA.

The density of neutron stars per teaspoonful is given as,

$$10\text{billion tons} = 10\times10^{9}\text{ tons}$$

Express the number 10×10^{9} in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a\times10^{n}$.

If the decimal point moved to the right, write as $a\times10^{-n}$.

Then, the scientific notation of 10×10^{9} is,

$$\begin{aligned}10\times10^{9} &= 1.0\times10^{1}\times10^{9}\\ &= 1\times10^{1+9} \quad \text{Use product of powers } a^{m}\times a^{n}=a^{m+n}\\ &= \boxed{1\times10^{10}}\end{aligned}$$

Answer 43PA.

The number of molecules in a mole of substance is,

$602,214,299,000,000,000,000,000.$

Express the number $602,214,299,000,000,000,000,000.$ in scientific notation:

1. Move the decimal point so that it is to the right of the first non-zero digit.

The result is a decimal number *a*.

2. Observe the number places *n* and the direction in which you moved the decimal point.

3. If the decimal point moved to the left, write as $a \times 10^{n}$.

If the decimal point moved to the right, write as $a \times 10^{-n}$.

Then, the scientific notation of $602,214,299,000,000,000,000,000$ is,

$$602,214,299,000,000,000,000,000$$
$$= \boxed{6.02214299000000000000000 \times 10^{23}}$$

Answer 44PA.

Consider the following number.

$$(8.9 \times 10^{4})(4 \times 10^{3})$$

Write this number in scientific and standard notations as follows.

$(8.9 \times 10^{4})(4 \times 10^{3}) = (8.9 \times 4)(10^{4} \times 10^{3})$ Group powers that have the same base

$= (35.6)(10^{4+3})$ Use product of powers, $a^{m} \times a^{n} = a^{m+n}$

$= 35.6 \times 10^{7}$

$= (3.56 \times 10^{1}) \times 10^{7}$ Write $35.6 = 3.56 \times 10^{1}$

$= 3.56 \times (10^{1} \times 10^{7})$ Group powers that have the same base

$= 3.56 \times 10^{1+7}$ Use product of powers, $a^{m} \times a^{n} = a^{m+n}$

$= 3.56 \times 10^{8}$ (Or) $356,000,000$

Therefore, the scientific notation of the given number is $\boxed{3.56 \times 10^{8}}$

And, the standard notation of the given number is $\boxed{356,000,000}$

Answer 45PA.

Consider the following number.

$\left(3\times10^{6}\right)\left(5.7\times10^{2}\right)$

Write this number in scientific and standard notations as follows.

$\left(3\times10^{6}\right)\left(5.7\times10^{2}\right)=\left(3\times5.7\right)\left(10^{6}\times10^{2}\right)$ Group powers that have the same base

$=\left(17.1\right)\left(10^{6+2}\right)$ Use product of powers, $a^{m}\times a^{n}=a^{m+n}$

$=17.1\times10^{8}$

$=\left(1.71\times10^{1}\right)\times10^{8}$ Write $17.1=1.71\times10^{1}$

$=1.71\times\left(10^{1}\times10^{8}\right)$ Group powers that have the same base

$=1.71\times\left(10^{1+8}\right)$ Use product of powers, $a^{m}\times a^{n}=a^{m+n}$

$=1.71\times10^{9}$ (Or) $1,710,000,000$

Therefore, the scientific notation of the given number is $\boxed{1.71\times10^{9}}$

And, the standard notation of the given number is $\boxed{1,710,000,000}$

Answer 46PA.

Consider the following number.

$\left(5\times10^{-2}\right)\left(8.6\times10^{-3}\right)$

Write this number in scientific and standard notations as follows.

$\left(5\times10^{-2}\right)\left(8.6\times10^{-3}\right)=\left(5\times8.6\right)\left(10^{-2}\times10^{-3}\right)$ Group powers that have the same base

$=\left(5\times8.6\right)\left(10^{-2-3}\right)$ Use product of powers, $a^{m}\times a^{n}=a^{m+n}$

$=43\times10^{-5}$

$=\left(4.3\times10^{1}\right)\times10^{-5}$ Write $43=4.3\times10^{1}$

$=4.3\times\left(10^{1}\times10^{-5}\right)$ Group powers that have the same base

$=4.3\times\left(10^{1-5}\right)$ Use product of powers, $a^{m}\times a^{n}=a^{m+n}$

$=4.3\times10^{-4}$ (Or) 0.00043

Therefore, the scientific notation of the given number is $\boxed{4.3\times10^{-4}}$

And, the standard notation of the given number is $\boxed{0.00043}$

Answer 47PA.

Consider the following number.

$$\left(1.2\times10^{-5}\right)\left(1.2\times10^{-3}\right)$$

Write this number in scientific and standard notations as follows.

$\left(1.2\times10^{-5}\right)\left(1.2\times10^{-3}\right)=\left(1.2\times1.2\right)\left(10^{-5}\times10^{-3}\right)$ Group powers that have the same base

$=\left(1.44\right)\left(10^{-5-3}\right)$ Use product of powers, $a^m\times a^n=a^{m+n}$

$=\left(1.44\right)\left(10^{-8}\right)$ (Or) 0.0000000144

Therefore, the scientific notation of the given number is $\boxed{1.44\times10^{-8}}$

And, the standard notation of the given number is $\boxed{0.0000000144}$

Answer 48PA.

Consider the following number.

$$\left(3.5\times10^{7}\right)\left(6.1\times10^{-8}\right)$$

Write this number in scientific and standard notations as follows.

$\left(3.5\times10^{7}\right)\left(6.1\times10^{-8}\right)=\left(3.5\times6.1\right)\left(10^{7}\times10^{-8}\right)$ Group powers that have the same base

$=\left(21.35\right)\left(10^{-1}\right)$ Use product of powers, $a^m\times a^n=a^{m+n}$

$=\left(2.135\times10^{1}\right)\left(10^{-1}\right)$ Write $21.35=2.135\times10^{1}$

$=\left(2.135\right)\left(10^{1}\times10^{-1}\right)$ Group powers that have the same base

$=2.135$

Therefore, the scientific notation of the given number is $\boxed{2.135}$

And, the standard notation of the given number is $\boxed{2.135}$

Answer 49PA.

Consider the following number.

$$\left(2.8\times10^{-2}\right)\left(9.1\times10^{6}\right)$$

Write this number in scientific and standard notations as follows.

$\left(2.8\times10^{-2}\right)\left(9.1\times10^{6}\right)=\left(2.8\times9.1\right)\left(10^{-2}\times10^{6}\right)$ Group powers that have the same base

$=\left(25.48\right)\left(10^{4}\right)$ Use product of powers, $a^m\times a^n=a^{m+n}$

$=\left(2.548\times10^{1}\right)\left(10^{4}\right)$ Write $25.48=2.548\times10^{1}$

$=\left(2.548\right)\left(10^{1}\times10^{4}\right)$ Group powers that have the same base

$=2.548\times10^{5}$ (Or) $254{,}800$

Therefore, the scientific notation of the given number is $\boxed{2.548\times10^{5}}$

And, the standard notation of the given number is $\boxed{254{,}800}$

Answer 50PA.

Consider the following number.

$$\frac{7.2\times10^{9}}{4.8\times10^{4}}$$

Write this number in scientific and standard notations as follows.

$\frac{7.2\times10^{9}}{4.8\times10^{4}}=\left(\frac{7.2}{4.8}\right)\left(\frac{10^{9}}{10^{4}}\right)$ Group powers that have the same base

$=\left(7.2\times4.8\right)\left(10^{9-4}\right)$ Use quotient of powers, $\frac{a^m}{a^n}=a^{m-n}$

$=\left(34.56\right)\left(10^{5}\right)$

$=\left(3.456\times10^{1}\right)\left(10^{4}\right)$ Write $34.56=3.456\times10^{1}$

$=\left(3.456\right)\left(10^{1}\times10^{4}\right)$ Group powers that have the same base

$=3.456\times10^{5}$ (Or) $254{,}800$

Therefore, the scientific notation of the given number is $\boxed{2.548\times10^{5}}$

And, the standard notation of the given number is $\boxed{254{,}800}$

Answer 51PA.

Consider the following number.

$$\frac{7.2\times10^3}{1.8\times10^7}$$

Write this number in scientific and standard notations as follows.

$$\frac{7.2\times10^3}{1.8\times10^7}=\left(\frac{7.2}{1.8}\right)\left(\frac{10^3}{10^7}\right)$$ Group powers that have the same base

$$=(7.2\times1.8)\left(10^{3-7}\right)$$ Use quotient of powers, $\frac{a^m}{a^n}=a^{m-n}$

$$=4\times10^{-4}$$ (Or) 0.0004

Therefore, the scientific notation of the given number is $\boxed{4\times10^{-4}}$

And, the standard notation of the given number is $\boxed{0.0004}$

Answer 52PA.

Consider the following number.

$$\frac{3.162\times10^{-4}}{5.1\times10^2}$$

Write this number in scientific and standard notations as follows.

$$\frac{3.162\times10^{-4}}{5.1\times10^2}=\left(\frac{3.162}{5.1}\right)\left(\frac{10^{-4}}{10^2}\right)$$ Group powers that have the same base

$$=(0.62)\left(10^{-4-2}\right)$$ Use quotient of powers, $\frac{a^m}{a^n}=a^{m-n}$

$$=0.62\times10^{-6}$$

$$=\left(6.2\times10^{-1}\right)\times10^{-6}$$ Write $0.62=6.2\times10^{-1}$

$$=(6.2)\left(10^{-1}\times10^{-6}\right)$$ Group powers that have the same base

$$=(6.2)\left(10^{-1-6}\right)$$ Use product of powers, $a^m\times a^n=a^{m+n}$

$$=6.2\times10^{-7}$$ (Or) 0.00000062

Therefore, the scientific notation of the given number is $\boxed{6.2\times10^{-7}}$

And, the standard notation of the given number is $\boxed{0.00000062}$

Answer 53PA.

Consider the following number.

$$\frac{1.035\times10^{-2}}{4.5\times10^{3}}$$

Write this number in scientific and standard notations as follows.

$$\frac{1.035\times10^{-2}}{4.5\times10^{3}}=\left(\frac{1.035}{4.5}\right)\left(\frac{10^{-2}}{10^{3}}\right)$$ Group powers that have the same base

$=(0.23)(10^{-2-3})$ Use quotient of powers, $\frac{a^m}{a^n}=a^{m-n}$

$=(0.23)(10^{-5})$

$=(2.3\times10^{-1})\times10^{-5}$ Write $0.23=2.3\times10^{-1}$

$=(2.3)(10^{-1}\times10^{-5})$ Group powers that have the same base

$=(2.3)(10^{-1-5})$ Use product of powers, $a^m\times a^n=a^{m+n}$

$=6.2\times10^{-7}$ (Or) 0.00000062

Therefore, the scientific notation of the given number is $\boxed{6.2\times10^{-7}}$

And, the standard notation of the given number is $\boxed{0.00000062}$

Answer 54PA.

Consider the following number.

$$\frac{2.795\times10^{-8}}{4.3\times10^{-4}}$$

Write this number in scientific and standard notations as follows.

$$\frac{2.795\times10^{-8}}{4.3\times10^{-4}}=\left(\frac{2.795}{4.3}\right)\left(\frac{10^{-8}}{10^{-4}}\right)$$ Group powers that have the same base

$=(0.65)(10^{-8-(-4)})$ Use quotient of powers, $\frac{a^m}{a^n}=a^{m-n}$

$=(0.65)(10^{-4})$

$=(6.5\times10^{-1})\times10^{-4}$ Write $0.65=6.5\times10^{-1}$

$=(6.5)(10^{-1}\times10^{-4})$ Group powers that have the same base

$=6.5\times10^{-5}$ (Or) 0.000065

Therefore, the scientific notation of the given number is $\boxed{6.5\times10^{-5}}$

And, the standard notation of the given number is $\boxed{0.000065}$

Answer 55PA.

Consider the following number.

$$\frac{4.65\times10^{-1}}{5\times10^{5}}$$

Write this number in scientific and standard notations as follows.

$$\frac{4.65\times10^{-1}}{5\times10^{5}}=\left(\frac{4.65}{5}\right)\left(\frac{10^{-1}}{10^{5}}\right)$$ Group powers that have the same base

$=(0.93)\left(10^{-1-5}\right)$ Use quotient of powers, $\frac{a^m}{a^n}=a^{m-n}$

$=(0.93)\left(10^{-6}\right)$

$=\left(9.3\times10^{-1}\right)\times10^{-6}$ Write $0.93=9.3\times10^{-1}$

$=(9.3)\left(10^{-1}\times10^{-6}\right)$ Group powers that have the same base

$=9.3\times10^{-7}$ (Or) 0.00000093

Therefore, the scientific notation of the given number is $\boxed{9.3\times10^{-7}}$

And, the standard notation of the given number is $\boxed{0.00000093}$

Answer 56PA.

The growth rate of human hair is given as,

3.3×10^{-4} Meter per day

So, the growth of hair in a year is,

$3.3\times10^{-4}\times365\,\text{meter}$

Therefore, the growth of the hair in 10 years is,

$3.3\times10^{-4}\times365\times10\,\text{meter}=(3.3\times365)\left(10^{-4}\times10^{1}\right)$ Group powers that have the same base

$=(1204.5)\left(10^{-4+1}\right)$ Use product of powers, $a^m\times a^n=a^{m+n}$

$=1204.5\times10^{-3}$

$=\left(1.2045\times10^{3}\right)\times10^{-3}$ Write $1204.5=1.2045\times10^{3}$

$=1.2045\times\left(10^{3}\times10^{-3}\right)$ Group powers that have the same base

$=1.2045\times\left(10^{0}\right)$ Use product of powers, $a^m\times a^n=a^{m+n}$

$=1.2045$

Therefore, the length of the hair for 10 years is $\boxed{1.2045\,\text{meters}}$

Answer 57PA.

A national debt in April 2001 was given as,

\$5.745 trillion

And, the estimated population in this nation was 283.9 million.

Therefore, the share of each citizen of the national debt at that time

$$= \frac{\$5.745 \text{ trillion}}{283.9 \text{ million}}$$

$$= \frac{\$5.745 \times 10^{12}}{283.9 \times 10^{6}}$$ 1 trillion= 10^{12}, 1 million= 10^{6}

$$= \left(\frac{5.745}{283.9}\right)\left(\frac{10^{12}}{10^{6}}\right)$$ Group powers that have the same base

$$= (0.020236)\left(10^{12-6}\right)$$ Use quotient of powers, $\frac{a^m}{a^n} = a^{m-n}$

$$= 0.020236 \times 10^{6}$$

$$= \boxed{\$20,236}$$

Answer 58PA.

The yearly salary of Alex Rodriguez in 2000 is given as,

\$25.2million

The yearly salary of George Foster in 1982is given as,

\$2.04million

Let the yearly salary of Alex Rodriguez in 2000 be *x* times the yearly salary of George Foster in 1982.

Then, we have

$$\$25.2\text{million} = x(\$2.04\text{million})$$

$$x = \frac{\$25.2\text{million}}{\$2.04\text{million}}$$

$$= \frac{25.2}{2.04}$$

$$\approx \boxed{12.4}$$

Answer 59PA.

The Sun burns about 4.4×10^{6} tons of hydrogen per second.

The number of seconds in a year is,

$$365\text{days}\times24\text{hours}\times60\text{ minutes}\times60\text{ seconds}=31,536,000\text{ seconds}$$

Therefore, the number of tons the Sun burns hydrogen in one year is,

$$31,536,000\times4.4\times10^{6}=\left(31,356\times10^{3}\right)\times\left(4.4\times10^{6}\right)$$

$=\left(31,356\times4.4\right)\left(10^{3}\times10^{6}\right)$ Group powers that have the same base

$=\left(137966.4\right)\left(10^{9}\right)$ Use product of powers, $a^{m}\times a^{n}=a^{m+n}$

$=137966.4\times10^{9}$

$=\left(1.379664\times10^{5}\right)\times10^{9}$ Write $1.379664=1.379664\times10^{5}$

$=\left(1.379664\right)\left(10^{5}\times10^{9}\right)$ Group powers that have the same base

$\approx\boxed{1.4\times10^{14}}$

Answer 60PA.

a)

According to the formula $(ab)^{n}=a^{n}b^{n}$, we have

$$\left(a\times10^{n}\right)^{p}=a^{p}\times\left(10^{n}\right)^{p}$$

$=a^{p}\times10^{np}$ Use the power of power $\left(a^{m}\right)^{n}=a^{mn}$

So, the result $\left(a\times10^{n}\right)^{p}=a^{p}\times10^{np}$, where $1\le a<10$, and n,p are integers, is true.

b)

The scientific notation of a number is $a\times10^{n}$, where $1\le a<10$, and n is an integer.

But, in part (a), the expression $a^{p}\times10^{np}$ is not in the form $a\times10^{n}$.

So, the expression $a^{p}\times10^{np}$ is not in the scientific notation.

Answer 61PA.

Astronomers often work with very large numbers like the masses of planets.

The mass of each planet in the solar system is given in the following table.

Planet	Mass(kg.)
Mercury	3.30×10^{23}
Venus	4.87×10^{24}
Earth	5.97×10^{24}
Mars	6.42×10^{23}
Jupiter	1.90×10^{27}
Saturn	5.69×10^{26}
Uranus	8.68×10^{25}
Neptune	1.02×10^{26}
Pluto	1.27×10^{22}

Observe that, these values are in scientific notation.

And, these are very large numbers when we observed in their standard notation.

Keeping track of place value can be difficult when we are dealing with very large and very small numbers.

Because of this reason, these numbers were expressed often in scientific notation.

Answer 62PA.

Consider the following number.

360×10^{-4}

This number can be written in scientific notation as follows.

$360\times10^{-4}=\left(3.60\times10^{2}\right)\times10^{-4}$ Write $360=3.60\times10^{2}$

$=(3.60)\left(10^{2}\times10^{-4}\right)$ Group powers that have the same base

$=(3.6)\left(10^{2-4}\right)$ Use product of powers, $a^{m}\times a^{n}=a^{m+n}$

$=3.6\times10^{-2}$

So, the correct option is $\boxed{(C)}$

Answer 63PA.

In a human body, there is an average of 25 billion red blood cells.

And, there are 270 million hemoglobin molecules in each red blood cell.

Therefore, the average number of hemoglobin molecules in the human body is,

$$25\text{ billion}\times 270\text{ million} = \left(25\times 10^{9}\right)\times\left(270\times 10^{6}\right)$$

$= (25\times 270)\left(10^{9}\times 10^{6}\right)$ Group powers that have the same base

$= (6750)\left(10^{9+6}\right)$ Use product of powers, $a^{m}\times a^{n} = a^{m+n}$

$= (6750)\left(10^{15}\right)$

$= \left(6.750\times 10^{3}\right)\times 10^{15}$ Write $6750 = 6.750\times 10^{3}$

$= (6.75)\left(10^{3}\times 10^{15}\right)$

$= \boxed{6.75\times 10^{18}}$

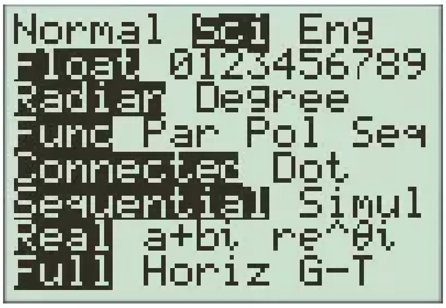
Answer 64PA.

Consider the following expression.

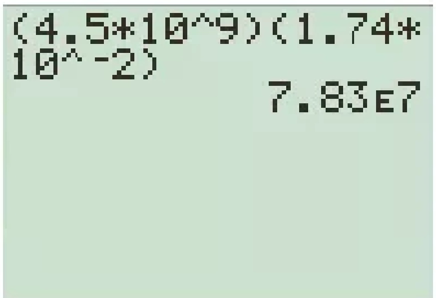
$$\left(4.5\times 10^{9}\right)\left(1.74\times 10^{-2}\right)$$

To simplify this, use graphing calculator as follows.

Keep calculator in scientific mode by pressing $\boxed{\text{MODE}}$, select Sci, then press $\boxed{\text{ENTER}}$.



Enter (4.5 × 10 ^ 9) (1.74 × 10 ^ (−) 2), and then press ENTER for the given expression.



From this screenshot, the value of the given expression can be written as,

$$\left(4.5\times10^{9}\right)\left(1.74\times10^{-2}\right)=\boxed{7.83\times10^{7}}$$

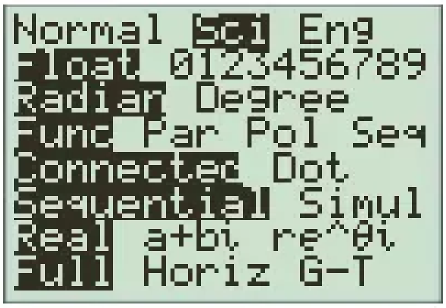
Answer 65PA.

Consider the following expression.

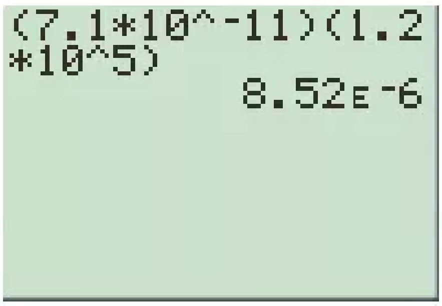
$$\left(7.1\times10^{-11}\right)\left(1.2\times10^{5}\right)$$

To simplify this, use graphing calculator as follows.

Keep calculator in scientific mode by pressing MODE, select Sci, then press ENTER.



Enter (7.1 × 10 ^ (−) 11) (1.2 × 10 ^ 5), and then press ENTER for the given expression.



From this screenshot, the value of the given expression can be written as,

$$\left(7.1\times10^{-11}\right)\left(1.2\times10^{5}\right)=\boxed{8.52\times10^{-6}}$$

Answer 66PA.

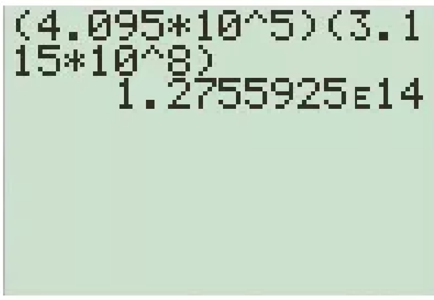
Consider the following expression.

$$\left(4.095\times10^{5}\right)\div\left(3.15\times10^{8}\right)$$

To simplify this, use graphing calculator as follows.

Keep calculator in scientific mode by pressing $\boxed{\text{MODE}}$, select Sci, then press $\boxed{\text{ENTER}}$.

Enter $\boxed{(}\,4.095\boxed{\times}10\boxed{\wedge}5\boxed{)}\boxed{\div}\boxed{(}\,3.15\boxed{\times}10\boxed{\wedge}8\boxed{)}$, and then press $\boxed{\text{ENTER}}$ for the given expression.



From this screenshot, the value of the given expression can be written as,

$$\left(4.095\times10^{5}\right)\div\left(3.15\times10^{8}\right)=\boxed{1.3\times10^{-3}}$$

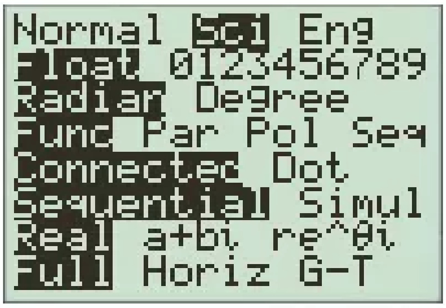
Answer 67PA.

Consider the following expression.

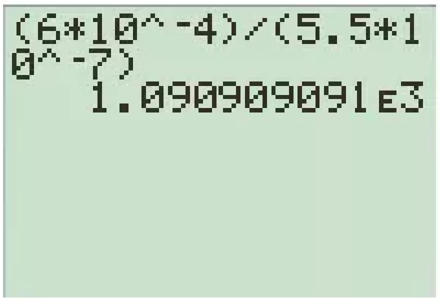
$$\left(6\times10^{-4}\right)\div\left(5.5\times10^{-7}\right)$$

To simplify this, use graphing calculator as follows.

Keep calculator in scientific mode by pressing $\boxed{\text{MODE}}$, select Sci, then press $\boxed{\text{ENTER}}$.



Enter $\boxed{(}\boxed{6}\boxed{\times}\boxed{10}\boxed{\wedge}\boxed{(-)}\boxed{54}\boxed{)}\boxed{\div}\boxed{(}\boxed{5.5}\boxed{\times}\boxed{10}\boxed{\wedge}\boxed{(-)}\boxed{7}\boxed{)}$, and then press $\boxed{\text{ENTER}}$ for the given expression.



From this screenshot, the value of the given expression can be written as,

$$\left(6\times10^{-4}\right)\div\left(5.5\times10^{-7}\right)=\boxed{1.09\times10^{3}}$$

Answer 68MYS.

Consider the following fraction.

$$\frac{49a^4b^7c^2}{7ab^4c^3}$$

Simplify this expression as follows.

$$\frac{49a^4b^7c^2}{7ab^4c^3} = \left(\frac{49}{7}\right)\left(\frac{a^4}{a}\right)\left(\frac{b^7}{b^4}\right)\left(\frac{c^2}{c^3}\right)$$ Group powers that have the same base

$$= 7a^{4-1}b^{7-4}c^{2-3}$$ Use quotient of powers, $\frac{a^m}{a^n} = a^{m-n}$

$$= 7a^3b^3c^{-1}$$ Simplify

$$= 7a^3b^3\left(\frac{1}{c}\right)$$ Use $a^{-1} = \frac{1}{a}$

$$= \frac{7a^3b^3}{c}$$

So, the simplified form of the given expression is, $\boxed{\frac{7a^3b^3}{c}}$

Answer 69MYS.

Consider the following fraction.

$$\frac{-4n^3p^{-5}}{n^{-2}}$$

Simplify this expression as follows.

$$\frac{-4n^3p^{-5}}{n^{-2}} = -4\left(\frac{n^3}{n^{-2}}\right)\left(p^{-5}\right)$$ Group powers that have the same base

$$= -4\left(n^{3-(-2)}\right)\left(p^{-5}\right)$$ Use quotient of powers, $\frac{a^m}{a^n} = a^{m-n}$

$$= -4n^5p^{-5}$$ Simplify

$$= -4n^5\left(\frac{1}{p^5}\right)$$ Use $a^{-n} = \frac{1}{a^n}$

$$= \frac{-4n^5}{p^5}$$

So, the simplified form of the given expression is, $\boxed{\frac{-4n^5}{p^5}}$

Answer 71MYS.

Consider the expression,

$$3a + 4b$$

To determine whether this expression is a monomial, use the following definition of a monomial.

A monomial is a number, a variable or a product of a number and one or more variables.

The given expression involves the addition, not the product of two variables.

So, the given expression is not a monomial.

Answer 72MYS.

Consider the expression,

$$\frac{6}{n}$$

To determine whether this expression is a monomial, use the following definition of a monomial.

A monomial is a number, a variable or a product of a number and one or more variables.

The given expression is not a product of a number and one variable.

So, the given expression is not a monomial.

Answer 73MYS.

Consider the expression,

$$\frac{v^2}{3}$$

To determine whether this expression is a monomial, use the following definition of a monomial.

A monomial is a number, a variable or a product of a number and one or more variables.

The given expression is a product of the number $\frac{1}{3}$ and one variable v^2.

So, the given expression is a monomial.

Answer 74MYS.

Consider the following inequality.

$m-3<-17$

Solve this inequality as follows.

$m-3<-17$ Original inequality

$m-3+3<-17+3$ Add 3 on both sides

$m<-14$ Simplify

So, the solution of the given inequality is $(-\infty,-14)$

To check the answer, put $m=-20$ in $m-3<-17$, we get

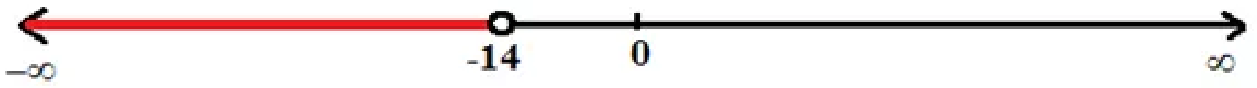
$-20-3<-17$

$-23<-17$

This is true.

Therefore, we conform that the solution of the given inequality is $\boxed{(-\infty,-14)}$

The graph of the solution $(-\infty,-14)$ on a number line is shown below:



Answer 75MYS.

Consider the following inequality.

$-9+d>9$

Solve this inequality as follows.

$-9+d>9$ Original inequality

$9-9+d>9+9$ Add 9 on both sides

$d>18$ Simplify

So, the solution of the given inequality is $(18,\infty)$

To check the answer, put $d = 20$ in $-9 + d > 9$, we get

$$-9 + 20 > 9$$
$$11 > 9$$

This is true.

Therefore, we conform that the solution of the given inequality is $\boxed{(18, \infty)}$

The graph of the solution $(18, \infty)$ on a number line is shown below:

Answer 76MYS.

Consider the following inequality.

$$-x - 11 \geq 23$$

Solve this inequality as follows.

$-x - 11 \geq 23$ Original inequality

$-x - 11 + 11 \geq 23 + 11$ Add 11 on both sides

$-x \geq 34$ Simplify

$x \leq -34$ Multiply both sides by -1

So, the solution of the given inequality is $(-\infty, -34]$

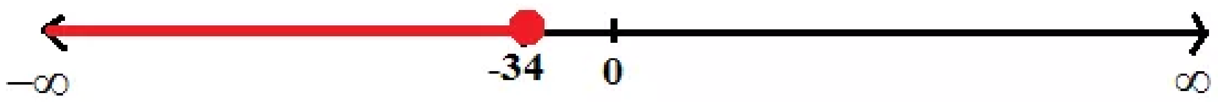
To check the answer, put $x = -40$ in $-x - 11 \geq 23$, we get

$$40 - 11 \geq 23$$
$$29 \geq 23$$

This is true.

Therefore, we conform that the solution of the given inequality is $\boxed{(-\infty, -34]}$

The graph of the solution $(-\infty, -34]$ on a number line is shown below:



Answer 77MYS.

Consider the following expression.

$5b^2$

Substitute $b=-2$ in this expression, we get

$5b^2=5(-2)^2$

$=5(4)$ Write $(-2)^2=(-2)(-2)=4$

$=20$ Simplify

Therefore the value of the expression $5b^2$ when $b=-2$ is $\boxed{20}$

Answer 78MYS.

Consider the following expression.

c^2-9

Substitute $c=3$ in this expression, we get

$c^2-9=3^2-9$

$=9-9$ Write $3^2=3\cdot3=9$

$=0$ Simplify

Therefore, the value of the expression c^2-9 when $c=3$ is $\boxed{0}$

Answer 79MYS.

Consider the following expression.

b^3+3ac

Substitute $a=5, b=-2, c=3$ in this expression, we get

$b^3+3ac=(-2)^3+3(5)(3)$

$=-8+45$ Simplify

$=37$ Simplify

Therefore, the value of the expression b^3+3ac when $a=5, b=-2, c=3$ is $\boxed{37}$

Answer 80MYS.

Consider the following expression.

$$a^2+2a-1$$

Substitute $a=5$ in this expression, we get

$$a^2+2a-1=5^2+2(5)-1$$

$=25+10-1$ Simplify

$=34$

Therefore, the value of the expression a^2+2a-1 when $a=5$ is $\boxed{34}$

Answer 81MYS.

Consider the following expression.

$$-2b^4-5b^3-b$$

Substitute $b=-2$ in this expression, we get

$$-2b^4-5b^3-b=-2(-2)^4-5(-2)^3-(-2)$$

$=-2(16)-5(-8)+2$ Simplify

$=10$

Therefore, the value of the expression $-2b^4-5b^3-b$ when $b=-2$ is $\boxed{10}$

Answer 82MYS.

Consider the following expression.

$$3.2c^3+0.5c^2-5.2c$$

Substitute $c=3$ in this expression, we get

$$3.2c^3+0.5c^2-5.2c=3.2(3)^3+0.5(3)^2-5.2(3)$$

$=3.2(27)+0.5(9)-15.6$ Simplify

$=75.3$

Therefore, the value of the expression $3.2c^3+0.5c^2-5.2c$ when $c=3$ is $\boxed{75.3}$