Exercise - 2.1

Complete Solution by Mubashar Siddique

Question 1: Expressing Numbers in Scientific Notation

Scientific notation expresses numbers as a product of a number between 1 and 10 (inclusive of 1, exclusive of 10) and a power of 10. The exponent of 10 indicates how many places the decimal point has been moved. Moving the decimal to the left results in a positive exponent, and moving it to the right results in a negative exponent.

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(i) 2000000

Step 1: Move the decimal point

The decimal is implicitly after the last zero. Moving it 6 places to the left gives 2.0.

Step 2: Determine the exponent

Since the decimal was moved 6 places to the left, the exponent of 10 is +6.

$$2000000 = 2.0 \times 10^6$$

Answer: $\mathbf{2 \times 10^6}$

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(ii) 48900

Step 1: Move the decimal point

Moving it 4 places to the left gives 4.89.

Step 2: Determine the exponent

Since the decimal was moved 4 places to the left, the exponent of 10 is +4.

$$48900 = 4.89 \times 10^4$$

Answer: $\mathbf{4.89 \times 10^4}$

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(iii) 0.0042

Step 1: Move the decimal point

Moving it 3 places to the right gives 4.2.

Step 2: Determine the exponent

Since the decimal was moved 3 places to the right, the exponent of 10 is −3.

$$0.0042 = 4.2 \times 10^{-3}$$

Answer: $\mathbf{4.2 \times 10^{-3}}$

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(iv) 0.0000009

Step 1: Move the decimal point

Moving it 7 places to the right gives 9.0.

Step 2: Determine the exponent

Since the decimal was moved 7 places to the right, the exponent of 10 is -7.

$$0.0000009 = 9.0 \times 10^{-7}$$

Answer: $\mathbf{9 \times 10^{-7}}$

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(v) 73×10^3

Step 1: Adjust the coefficient

The coefficient 73 is not between 1 and 10. Moving the decimal one place left gives 7.3.

Step 2: Adjust the exponent

Since the decimal was moved 1 place to the left, increase the exponent of 10 by 1:

$$10^3 \quad \rightarrow \quad 10^{3+1} = 10^4$$

$$73 \times 10^3 = 7.3 \times 10^4$$

Answer: $\mathbf{7.3 \times 10^4}$

Question 2: Express the following numbers in ordinary notation

Ordinary notation is the standard way of writing numbers without exponents of 10. To convert from scientific notation to ordinary notation, we move the decimal point: - A positive exponent means moving the decimal point to the **right**. - A negative exponent means moving the decimal point to the **left**.

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(i) 8.04×10^2

Step 1: Understand the exponent

The exponent is $+2$, so move the decimal point 2 places to the right.

Step 2: Write in ordinary form

$$8.04 \times 10^2 = 804$$

Answer: **804**

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(ii) 3×10^5

Step 1: Understand the exponent

The exponent is $+5$, so move the decimal point 5 places to the right.

Step 2: Write in ordinary form

$$3 \times 10^5 = 300000$$

Answer: 300000

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(iii) 1.5×10^{-2}

Step 1: Understand the exponent

The exponent is -2, so move the decimal point 2 places to the left.

Step 2: Write in ordinary form

$$1.5 \times 10^{-2} = 0.015$$

Answer: 0.015

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(iv) 1.77×10^7

Step 1: Understand the exponent

The exponent is $+7$, so move the decimal point 7 places to the right.

Step 2: Write in ordinary form

$$1.77 \times 10^7 = 17700000$$

Answer: 17700000

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(v) 5.5×10^{-6}

Step 1: Understand the exponent

The exponent is -6, so move the decimal point 6 places to the left.

Step 2: Write in ordinary form

$$5.5 \times 10^{-6} = 0.0000055$$

Answer: 0.0000055

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(vi) 4×10^{-5}

Step 1: Understand the exponent

The exponent is -5, so move the decimal point 5 places to the left.

Step 2: Write in ordinary form

$$4 \times 10^{-5} = 0.00004$$

Answer: $\mathbf{0.00004}$

Question 3: Express in standard form

The speed of light is approximately 3×10^8 metres per second. Express it in standard form.

Solution

Step 1: Expand the power of ten

$$3 \times 10^8 = 3 \times 100000000$$

Step 2: Multiply

$$3 \times 100000000 = 300000000$$

Answer: $\mathbf{300000000}$ metres per second

Question 4: Express in scientific notation

The circumference of the Earth at the equator is about 40075000 metres. Express this number in scientific notation.

Solution

Step 1: Place the decimal point
The given number is 40075000. Moving the decimal point 7 places to the left gives:

$$4.0075$$

Step 2: Determine the exponent
Since the decimal was moved 7 places to the left, the power of ten is 10^7.

Step 3: Write in scientific notation

$$40075000 = 4.0075 \times 10^7$$

Answer: $\mathbf{4.0075 \times 10^7}$ metres

Question 5: Express in standard form

The diameter of Mars is 6.779×10^3 km. Express this number in standard form.

Solution

Step 1: Expand the power of ten

$$6.779 \times 10^3 = 6.779 \times 1000$$

Step 2: Multiply

$$6.779 \times 1000 = 6779$$

Answer: **6779** km

Question 6: Express in standard form

The diameter of Earth is about 1.2756×10^4 km. Express this number in standard form.

Solution

Step 1: Expand the power of ten

$$1.2756 \times 10^4 = 1.2756 \times 10000$$

Step 2: Multiply

$$1.2756 \times 10000 = 12756$$

Answer: **12756** km