1 Number and algebra

Activity: Large numbers (Student version)

Questions

**1** Fill in the following chart showing the meaning of each SI prefix for length. It may be easier to start from the base and work your way up and down.

|  |  |  |  |
| --- | --- | --- | --- |
| **SI prefix name** | **Symbol** | **Fractional/numerical value** | **Value written in scientific notation** |
| tera |  | 1 000 000 000 000 = 1 trillion |  |
| giga |  |  |  |
|  | M |  |  |
|  |  | 1000 = 1 thousand |  |
| BASE | Just the base unit (e.g. metres) | One |  |
| milli |  |  |  |
|  |  | 1 millionth |  |
|  | n |  |  |
|  |  | 1 trillionth |  |
|  | f |  |  |

**2** Which two important prefixes are missing from the above table? How would you write these in scientific notation?

**3** Express each of these numbers in scientific notation.

**a** 42 000

**b** 0.000 87

**c** 150.64

**d** 56 789

**e** 0.009 47

**f** 5.2 Mg (in grams)

**g** 312 mm (in metres)

**h** 5.6 Gb (in bytes)

**i** 0.4 TW (in watts)

**j** 73 nm (in metres)

**4** Express each of these numbers in standard numerical form.

**a**

**b**

**c**

**d**

**e**

**f** 5.3 Mg (in grams)

**g** 312 mm (in metres)

**h** 5.6 Gb in (in bytes)

**i** 0.4 TW (in watts)

**j** 73 nm (in metres)

**5** Perform the indicated operations and express each answer in proper scientific notation WITHOUT using a calculator.

**a**

**b**

**c**

**d**

**e**

**f**

**g**

**h**

**i**

**6** Evaluate the following WITHOUT using a calculator.

**7** Estimate the following WITHOUT using a calculator.

**a**

**b**

**8** Check your answers to Question 7, **using scientific notation** on your calculator, and round your final answers to 3 significant figures. What is the percentage error of each of your estimates?

**9** Ride around the Sun!

A picture containing object

Description automatically generated

You decide to ride a spaceship around the Sun, following the same path as the Earth. Given that the distance from the Earth to the Sun is approximately km and your spaceship travels as fast as a bicycle (approximately km h−1), how many hours will it take you to ride around the Sun? How many times faster is the Earth than you are?

**10** Speed of light

A close up of a logo

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Given that light travels at approximately m s−1 and the Earth has an approximate radius of metres, how many times would light travel around the Earth in 1 second? How long would it take you to ride your bicycle around the Earth, assuming you ride at km h−1?

**11** Viruses and bacteria

A close up of a logo

Description automatically generated

How much larger are bacteria than viruses?

**12** Measure and then calculate the thickness of a piece of paper. State your final answer in millimetres, metres and micrometres.

**13** Research a really large or small number to present to the class. See if the class can guess what it represents.

**14** Approximately 90% of the cells in your body are bacteria. Use the diagram to estimate how many kilograms of bacteria cells there are in your body.

**15** According to Newton’s law of gravitation, the gravitational force between two objects is directly proportional to the masses of the objects and inversely proportional to the distance between their centres of mass.

**a** Explain what this means.

The equation for the gravitational force of attraction is , where is the gravitational force of attraction (in newtons), and are the masses of the two objects (in kg), is the distance between the two objects’ centres of masses (in metres) and is the universal gravitational constant ().

**b** What is the gravitational force of attraction between you and your friend?

**c** Given that the radius of the Earth is 6370 km, use your mass (in kg) and   
 weight (in newtons) to calculate the mass of the Earth.