

EXERCISE 1C.1

1 Write in standard form:

- a 325 b 62.4 c 327.62 d 92.47
e 5.264 f 123.5 g 37.968 h 4 230 000

2 Write in standard form:

- a 0.06 b 0.000 34 c 0.47 d 0.603
e 0.000 074 f 0.009 62 g 0.0865 h 0.000 000 000 462

Example 5

Write as an ordinary decimal number:

a 2.57×10^4 b 7.853×10^{-3}

a 2.57×10^4 b 7.853×10^{-3}
 $= 2.57 \times 10\,000$ $= 7.853 \div 10^3$
 $= \underline{\underline{25\,700}}$ $= \underline{\underline{0.007\,853}}$

Remember that

$$10^{-3} = \frac{1}{10^3}$$



3 Write as an ordinary decimal number:

- a 6.24×10^2 b 3.27×10^3 c 5.23×10^4
d 9.2×10^3 e 6.041×10^5 f 8.914×10^8

4 Write as an ordinary decimal number:

- a 3.6×10^{-2} b 4.8×10^{-5} c 6.32×10^{-1}
d 5.39×10^{-4} e 8.69×10^{-3} f 6.67×10^0

Example 6

Write 6374 in standard form accurate to 1 significant figure.

$$6374 = 6.374 \times 10^3$$
$$\doteq 6 \times 10^3 \quad \{\text{rounding } 6.374 \text{ to } 1 \text{ s.f.}\}$$

5 Write the following in standard form accurate to 1 significant figure:

- a 837 b 24.37 c 14 308 d 32 764 214
e 0.0638 f 0.492 68 g 0.000 429 7 h 0.000 000 392

6 Express the following quantities in standard form:

- a There are approximately 4 million red blood cells in a drop of blood.
b The thickness of a coin is about 0.0008 m.
c The earth's radius is about 6.38 million metres.
d A bacteria has a diameter of 0.000 000 4 cm.
e Seven months is around 18 144 000 seconds.
f A piece of plastic wrap is 0.000 007 m thick.



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7 Express the following quantities as ordinary decimal numbers:

- a The sun has diameter 1.392×10^6 km.
- b A piece of paper is about 1.8×10^{-2} cm thick.
- c A container holds 3.2×10^{11} bacteria.
- d A mushroom weighs 8.2×10^{-6} tonnes.
- e The number of minutes in an average person's life is around 3.7×10^7 .
- f A blood capillary is about 2.1×10^{-5} m in diameter.



Example 7

Simplify, giving your answer in standard form:

a $(3 \times 10^4) \times (8 \times 10^3)$

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

a $(3 \times 10^4) \times (8 \times 10^3)$
 $= 24 \times 10^{4+3}$
 $= 2.4 \times 10^1 \times 10^7$
 $= 2.4 \times 10^8$

b $(5 \times 10^{-4})^3$
 $= 5^3 \times (10^{-4})^3$
 $= 125 \times 10^{-4 \times 3}$
 $= 1.25 \times 10^2 \times 10^{-12}$
 $= 1.25 \times 10^{-10}$

8 Simplify the following products, giving your answers in standard form:

a $(3 \times 10^3) \times (4 \times 10^7)$

b $(4 \times 10^3) \times (7 \times 10^5)$

c $(8 \times 10^{-4}) \times (7 \times 10^{-5})$

d $(9 \times 10^{-5}) \times (6 \times 10^{-2})$

e $(3 \times 10^5)^2$

f $(4 \times 10^7)^2$

g $(2 \times 10^{-3})^4$

h $(8 \times 10^{-3})^3$

i $(6 \times 10^{-1}) \times (4 \times 10^3) \times (5 \times 10^{-4})$

j $(5 \times 10^{-3})^2 \times (8 \times 10^{11})$

Example 8

Simplify, giving your answer in standard form:

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

b $\frac{2 \times 10^{-3}}{5 \times 10^{-8}}$

a $\frac{8 \times 10^4}{2 \times 10^{-3}}$
 $= \frac{8}{2} \times 10^{4 - (-3)}$
 $= 4 \times 10^7$

b $\frac{2 \times 10^{-3}}{5 \times 10^{-8}}$
 $= \frac{20 \times 10^{-4}}{5 \times 10^{-8}}$
 $= 4 \times 10^{-4 - (-8)}$
 $= 4 \times 10^4$

9 Simplify the following divisions, giving your answers in standard form:

a $\frac{8 \times 10^6}{4 \times 10^3}$

b $\frac{9 \times 10^{-3}}{3 \times 10^{-1}}$

c $\frac{4 \times 10^6}{2 \times 10^{-2}}$

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$$d \quad \frac{6 \times 10^{-4}}{3 \times 10^{-6}}$$

$$e \quad \frac{6.3 \times 10^4}{7 \times 10^{-2}}$$

$$f \quad \frac{7.2 \times 10^{-3}}{9 \times 10^{-6}}$$

$$g \quad \frac{2.5 \times 10^{-4}}{(5 \times 10^7)^2}$$

$$h \quad \frac{(8 \times 10^{-2})^2}{2 \times 10^{-6}}$$

$$i \quad \frac{(5 \times 10^{-3})^{-2}}{(2 \times 10^4)^{-1}}$$

CALCULATOR USE

A scientific calculator with an **EXP** key can be used to simplify expressions which contain numbers given in standard form.

Example 9

Use your calculator to simplify, correct to 3 significant figures:

$$a \quad (3.2 \times 10^4) \times (8.6 \times 10^{-16}) \qquad b \quad \frac{2.8 \times 10^5}{6.4 \times 10^{-8}}$$

	Display	Answer
a Press: 3.2 EXP 4 × 8.6 EXP 16 +/- = or 3.2 EXP 4 × 8.6 EXP (-) 16 =	2.752 ⁻¹¹	2.75 × 10 ⁻¹¹
b Press: 2.8 EXP 5 ÷ 6.4 EXP 8 +/- = or 2.8 EXP 5 ÷ 6.4 EXP (-) 8 =	4.375 ¹²	4.38 × 10 ¹²

EXERCISE 1C.2

1 Use your calculator to simplify, correct to 3 significant figures:

- a** $(4.7 \times 10^5) \times (8.5 \times 10^7)$ **b** $(2.7 \times 10^{-3}) \times (9.6 \times 10^9)$
c $(3.4 \times 10^7) \div (4.8 \times 10^{15})$ **d** $(7.3 \times 10^{-7}) \div (1.5 \times 10^4)$
e $(2.83 \times 10^3)^2$ **f** $(5.96 \times 10^{-5})^2$



2 Use your calculator to answer the following:

- a** A rocket travels in space at 4×10^5 km/h. How far does it travel in:
i 30 days **ii** 20 years?
b A satellite travels 5×10^3 km in 2×10^{-5} hours. Find its average speed in kilometres per hour.
c A bullet travelling at an average speed of 2×10^3 km/h hits a target 500 m away. Find the time of flight of the bullet in seconds.

There are 365.25 days in a year.



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- d Planet A has volume $2.85 \times 10^{15} \text{ m}^3$ whereas planet B has volume $3.16 \times 10^7 \text{ m}^3$. How many times bigger is planet A than planet B?
 - e Microbe C has mass 2.63×10^{-5} grams, whereas microbe D has mass 8×10^{-7} grams. Which microbe is heavier? How many times is it heavier than the other one?