Exercise 1B: Solutions

1 a $47.8 = 4.78 \times 10^1 = 4.78 \times 10$

b $6728 = 6.728 \times 10^3$

c $79.23 = 7.923 \times 10^1 = 7.923 \times 10$

d $43\ 580 = 4.358 \times 10^4$

e $0.0023 = 2.3 \times 10^{-3}$

f $0.000\ 000\ 56 = 5.6 \times 10^{-7}$

g $\begin{aligned} 12.000\ 34 &= 1.2000\ 34 \times 10^1 \\ &= 1.2000\ 34 \times 10 \end{aligned}$

h $\begin{aligned} \text{Fifty million} &= 50\ 000\ 000 \\ &= 5.0 \times 10^7 \end{aligned}$

i $23\ 000\ 000\ 000 = 2.3 \times 10^{10}$

j $0.000\ 000\ 0013 = 1.3 \times 10^{-9}$

k $\begin{aligned} 165 \text{ thousand} &= 165\ 000 \\ &= 1.65 \times 10^5 \end{aligned}$

l $0.000\ 014\ 567 = 1.4567 \times 10^{-5}$

2 a 2.99×10^{-23}

b The decimal point moves 8 places to the right $= 1.0 \times 10^{-8}$

c 3.432×10^2

d 3.1536×10^7

e 6.09×10^9

f 3.057×10^{21}

3 a $1\ 390\ 000\ 000$

b $0.000\ 0075$

c $0.000\ 000\ 000\ 000\ 0056$

4 1 $456.89 \approx 4.569 \times 10^2$
(4 significant figures)

2 $34567.23 \approx 3.5 \times 10^4$
(2 significant figures)

3 $5679.087 \approx 5.6791 \times 10^3$
(5 significant figures)

4 $0.04536 \approx 4.5 \times 10^{-2}$
(2 significant figures)

5 $0.09045 \approx 9.0 \times 10^{-2}$
(2 significant figures)

6 $4568.234 \approx 4.5682 \times 10^3$
(5 significant figures)

5 a

$$\begin{aligned}\frac{324\,000 \times 0.000\,000\,7}{4000} &= \frac{3.24 \times 10^5 \times 7 \times 10^{-7}}{4 \times 10^3} \\ &= \frac{3.24 \times 7}{4} \times 10^{5+-7-3} \\ &= 5.67 \times 10^{-5} \\ &= 0.0000567\end{aligned}$$

b

$$\begin{aligned}\frac{5\,240\,000 \times 0.8}{42\,000\,000} &= \frac{5.24 \times 10^6 \times 8 \times 10^{-1}}{4.2 \times 10^7} \\ &= \frac{41.92 \times 10^5}{4.2 \times 10^7} \\ &= \frac{4192 \times 10^3}{42\,000 \times 10^3} \\ &= \frac{4192}{42\,000} = \frac{262}{2625}\end{aligned}$$

6 1

$$\begin{aligned}\frac{\sqrt[3]{a}}{b^4} &= \frac{\sqrt[3]{2 \times 10^9}}{3.215^4} \\ &= \frac{\sqrt[3]{2} \times \sqrt[3]{10^9}}{106.8375\ldots} \\ &= \frac{1.2599\ldots \times 10^3}{106.8375\ldots} \\ &= 0.011\,792\,\ldots \times 10^3 \approx 11.8\end{aligned}$$

2

$$\begin{aligned}\frac{\sqrt[4]{a}}{4b^4} &= \frac{\sqrt[4]{2 \times 10^{12}}}{4 \times 0.05^4} \\ &= \frac{\sqrt[4]{2} \times \sqrt[4]{10^{12}}}{4 \times 0.000\,006\,25} \\ &= \frac{1.189\,2\ldots \times 10^3}{4 \times 6.25 \times 10^{-6}} \\ &= 0.047\,568\ldots \times 10^9 \approx 4.76 \times 10^7\end{aligned}$$