

Fully-Worked Solutions

PRACTICE 2

Formative Practice

1 $26\ 834 \approx 26\ 800$ (three significant figures)

Answer: A

2 (a) 29.373

5

(c) 80 003

5

(b) 1.40

3

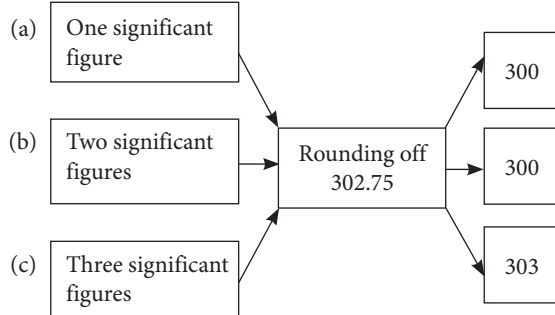
(d) 0.0006420

4

3

Number		
(a) One significant figure	(b) Two significant figures	(c) Three significant figures
0.04	5.0	1.02
90	0.032	43.9
3	0.00063	0.00701
20 000	88	0.230

4



5 (a) $4\ 537 = 4\ 540$
(3 significant figures)

✓

(b) $70\ 062 = 70\ 060$
(4 significant figures)

✓

(c) $0.05128 = 0.05$
(2 significant figures)

✗

(d) $0.00066 = 0.00070$
(1 significant figure)

✗

6

Number	One significant figure	Three significant figures
(a) 6.148	6	6.15
(b) 250.56	300	251
(c) 0.81974	0.8	0.820
(d) 0.004203	0.004	0.00420

7 A

$n = \frac{1}{2}$ is not an integer

$\therefore 3 \times 10^{\frac{1}{2}}$ is not in standard form.

B

$A = 40.2 > 10$

$\therefore 40.2 \times 10^5$ is not in standard form.

C

$\frac{1}{2} < 1$

$\therefore \frac{1}{2} \times 10^{-2}$ is not in standard form.

D

$A = 9.6 > 10$ and $n = -8$ is an integer

$\therefore 9.6 \times 10^{-8}$ is in standard form.

Answer: D

8 (a) $800 = 8 \times 10^2$

(b) $0.0063 = 6.3 \times 10^{-3}$

(c) $1\ 724 = 1.724 \times 10^3$

(d) $0.00000591 = 5.91 \times 10^{-6}$

9 (a) $26 \times 10^2 = 2.6 \times 10^3$

(b) $154.8 \times 10^{-6} = 1.548 \times 10^{-4}$

(c) $0.032 \times 10^7 = 3.2 \times 10^5$

(d) $0.00045 \times 10^{-3} = 4.5 \times 10^{-7}$

10

$$\frac{12}{1.2 \times 10^1} \text{ as } \frac{400\ 000}{4 \times 10^5} \text{ as } \frac{0.9}{9 \times 10^{-1}} \text{ as } \frac{0.00064}{6.4 \times 10^{-4}}$$

11

(a) $13\ 600 = 14\ 000$

$= 1.4 \times 10^4$

(b) $705\ 800 = 700\ 000$

$= 7 \times 10^5$

$$(c) 0.04296 = 0.0430$$

$$= 4.30 \times 10^{-2}$$

$$(d) 0.00000287 = 0.0000029$$

$$= 2.9 \times 10^{-6}$$

$$12 (a) 584 + 6\,103 = 6\,687$$

$$= 6.687 \times 10^3$$

$$(b) 0.46 - 0.0007 = 0.4593$$

$$= 4.593 \times 10^{-1}$$

$$(c) 320 \times 80 = 25\,600$$

$$= 2.56 \times 10^4$$

$$(d) 0.12 \div 2\,400 = 0.00005$$

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

$$13 (a) 2 \times 10^5 + 7 \times 10^5 = (2 + 7) \times 10^5$$

$$= 9 \times 10^5 \quad [\checkmark]$$

$$(b) 5 \times 10^{-3} - 3 \times 10^{-4} = 5 \times 10^{-3} - 3 \times 10^{-1} \times 10^{-3}$$

$$= 5 \times 10^{-3} - 0.3 \times 10^{-3}$$

$$= (5 - 0.3) \times 10^{-3}$$

$$= 4.7 \times 10^{-3}$$

$$\neq 2 \times 10^{-3} \quad [X]$$

$$(c) 4 \times 10^3 \times 9 \times 10^5 = (4 \times 9) \times (10^3 \times 10^5)$$

$$= 36 \times 10^8$$

$$= 3.6 \times 10^9 \quad [\checkmark]$$

$$(d) (6 \times 10^6) \div (8 \times 10^{-2}) = \frac{6 \times 10^6}{8 \times 10^{-2}}$$

$$= \frac{6}{8} \times \frac{10^6}{10^{-2}}$$

$$= 0.75 \times 10^{6 - (-2)}$$

$$= 7.5 \times 10^{-1} \times 10^8$$

$$= 7.5 \times 10^7 \quad [\checkmark]$$

$$14 (a) 3.7 \times 10^6 - 5 \times 10^5 = 3.7 \times 10^6 - 0.5 \times 10^6$$

$$= (3.7 - 0.5) \times 10^6$$

$$= 3.2 \times 10^6$$

$$(b) 8 \times 10^{-3} - 4 \times 10^{-5} = 8 \times 10^{-3} - 0.04 \times 10^{-3}$$

$$= (8 - 0.04) \times 10^{-3}$$

$$= 7.69 \times 10^{-3}$$

$$(c) 6 \times 10^4 \times 7 \times 10^3 = (6 \times 7) \times (10^4 \times 10^3)$$

$$= 42 \times 10^{4+3}$$

$$= 4.2 \times 10^8$$

$$(d) \frac{3 \times 10^{-6}}{4 \times 10^{-2}} = \frac{3}{4} \times \frac{10^{-6}}{10^{-2}}$$

$$= 0.75 \times 10^{-6 - (-2)}$$

$$= 7.5 \times 10^{-5}$$

$$15 (a) \text{ Mass of one atom of oxygen}$$

$$= 16 \times 1.66 \times 10^{-24}$$

$$= 26.56 \times 10^{-24}$$

$$= 2.656 \times 10^{-23} \text{ g}$$

$$(b) \text{ Mass of one molecule of water}$$

$$= 2 \times 1.66 \times 10^{-24} + 2.656 \times 10^{-23}$$

$$= 0.332 \times 10^{-23} + 2.656 \times 10^{-23}$$

$$= 2.988 \times 10^{-23} \text{ g}$$

$$16 (a) \text{ Distance travelled}$$

$$= 3 \times 10^5 \times 15$$

$$= (3 \times 15) \times 10^5$$

$$= 45 \times 10^5$$

$$= 4.5 \times 10^6 \text{ km}$$

$$(b) \text{ Time taken}$$

$$= \frac{5.4 \times 10^{10} \times 10^{-3}}{3 \times 10^5}$$

$$= \frac{5.4 \times 10^7}{3 \times 10^5}$$

$$= \frac{5.4}{3} \times \frac{10^7}{10^5}$$

$$= 1.8 \times 10^2 \text{ s}$$

Summative Practice

1 A Correct

B Correct

C Wrong

D Correct

Answer: C

2 $0.02698 \approx 0.0270$ (three significant figures)

Answer: D

3 507 000

$$= 5.07 \times 10^5$$

$\approx 5.1 \times 10^5$ (two significant figures)

Answer: B

$$4 \frac{215\,000}{0.0005} = \frac{2.15 \times 10^5}{5 \times 10^{-4}}$$

$$= \frac{2.15}{5} \times \frac{10^5}{10^{-4}}$$

$$= 0.43 \times 10^{5 - (-4)}$$

$$= 0.43 \times 10^9$$

$$= 4.3 \times 10^{-1} \times 10^9$$

$$= 4.3 \times 10^8$$

Answer: D

$$5 \quad 8 \times 10^7 - 6 \times 10^5 = 8 \times 10^7 - 6 \times 10^{-2} \times 10^7$$

$$= 8 \times 10^7 - 0.06 \times 10^7$$

$$= (8 - 0.06) \times 10^7$$

$$= 7.94 \times 10^7$$

Answer: D

6

Number	Number of significant figures	One significant figure
5 431	4	5 000
170 000	2	200 000
0.000926	3	0.0009
20.080	5	20

- 7 (a) Number of significant figures of 342 000 (in the nearest hundred) is 4.

$$(b) \frac{0.0516}{0.03} = 1.72 \\ \approx 1.7 \text{ (two significant figures)}$$

$$8 (a) \frac{3}{4} \times 10^6 = 0.75 \times 10^6 \\ = 7.5 \times 10^{-1} \times 10^6 \\ = 7.5 \times 10^5$$

$$\therefore A = 7.5, n = 5$$

$$(b) 10.496 \times 10^{-13} = 1.0496 \times 10^1 \times 10^{-13} \\ = 1.0496 \times 10^{-12}$$

$$(i) 1.0 \times 10^{-12} \text{ (two significant figures)}$$

$$(ii) 1.050 \times 10^{-12} \text{ (four significant figures)}$$

$$9 (a) 4\,800 \times 0.03 = 4.8 \times 10^3 \times 3 \times 10^{-2} \\ = (4.8 \times 3) \times (10^3 \times 10^{-2}) \\ = 14.4 \times 10^{3-2} \\ = 1.44 \times 10^1 \times 10^1 \\ = 1.44 \times 10^2$$

$$(b) 5.2 \times 10^{-6} + 9.76 \times 10^{-5} \\ = 5.2 \times 10^{-1} \times 10^{-5} + 9.76 \times 10^{-5} \\ = 0.52 \times 10^{-5} + 9.76 \times 10^{-5} \\ = (0.52 + 9.76) \times 10^{-5} \\ = 10.28 \times 10^{-5} \\ = 1.028 \times 10^1 \times 10^{-5} \\ = 1.028 \times 10^{-4}$$

$$10 (a) (2 \times 10^5)^3 \times (7 \times 10^{-6}) = 2^3 \times (10^5)^3 \times 7 \times 10^{-6} \\ = 8 \times 10^{15} \times 7 \times 10^{-6} \\ = (8 \times 7) \times (10^{15} \times 10^{-6}) \\ = 56 \times 10^9 \\ = 5.6 \times 10^1 \times 10^9 \\ = 5.6 \times 10^{10}$$

$$(b) \frac{(2 \times 10^5)^3 \times (7 \times 10^{-6})}{(0.08 \times 10^4)^2} = \frac{5.6 \times 10^{10}}{(0.08 \times 10^4)^2} \\ = \frac{5.6 \times 10^{10}}{0.08^2 \times (10^4)^2} \\ = \frac{5.6 \times 10^{10}}{(8 \times 10^{-2})^2 \times 10^8} \\ = \frac{5.6 \times 10^{10}}{64 \times 10^{-4} \times 10^8} \\ = \frac{5.6 \times 10^{10}}{64 \times 10^4} \\ = \frac{5.6}{64} \times \frac{10^{10}}{10^4} \\ = 0.0875 \times 10^6 \\ = 8.75 \times 10^{-2} \times 10^6 \\ = 8.75 \times 10^4$$

$$11 (a) \text{ Distance of satellite from the centre of the earth} \\ = 4.23 \times 10^4 - 6.4 \times 10^3 \\ = 4.23 \times 10^4 - 0.64 \times 10^4 \\ = (4.23 - 0.64) \times 10^4 \\ = 3.59 \times 10^4 \text{ km}$$

$$(b) \text{ Volume of the earth} \\ = \frac{4}{3} \pi \times 6\,400^3 \\ = \frac{4}{3} \pi \times (6.4 \times 10^3)^3 \\ = \frac{4}{3} \pi \times 6.4^3 \times (10^3)^3 \\ = 1\,098.5 \times 10^9 \\ = 1.0985 \times 10^3 \times 10^9 \\ = 1.0985 \times 10^{12} \\ \approx 1.1 \times 10^{12} \text{ km}^3 \text{ (two significant figures)}$$

$$12 (a) 25 \times 1.4 \times p = 1.75 \times 10^4 \\ 35 \times p = 1.75 \times 10^4 \\ p = 0.05 \times 10^4 \\ = 5 \times 10^{-2} \times 10^4 \\ = 5 \times 10^2$$

Length of the iron sheet is 5×10^2 cm.

$$(b) \text{ Mass of iron sheet} \\ = 1.75 \times 10^4 \times (10^{-2})^3 \times 7.87 \\ = (1.75 \times 7.87) \times 10^4 \times (10^{-2})^3 \\ = 13.8 \times (10^4 \times 10^{-6}) \\ = 1.38 \times 10^1 \times 10^{-2} \\ = 1.38 \times 10^{-1} \text{ kg}$$

$$13 (a) \text{ Area of the industrial region} \\ = (27.2 \times 10^3) \times (20 \times 10^3) \\ = (27.2 \times 20) \times (10^3 \times 10^3) \\ = 544 \times 10^6 \\ = 5.44 \times 10^2 \times 10^6 \\ = 5.44 \times 10^8 \text{ m}^2$$

$$(b) \text{ Area of the industrial region} \\ = 27 \times 20 \times 640 \div 2.59 \text{ acres} \\ = 134\,000 \text{ acres} \\ = 1.34 \times 10^5 \text{ acres}$$

Alternative method

$$\text{Area of the industrial region} \\ = 5.44 \times 10^8 \times (10^{-3})^2 \times 640 \div 2.59 \\ = (5.44 \times 640 \div 2.59) \times 10^8 \times (10^{-3})^2 \\ = 1\,340 \times 10^8 \times 10^{-6} \\ = 1.34 \times 10^3 \times 10^2 \\ = 1.34 \times 10^5 \text{ acres}$$