Fully-worked Solutions

Practice 2

Formative Practice

1 26 834 ≈ 26 800 (three significant figures)
Answer: **A**

2 (a) 29.373 [5] (c) 80 003 [5]

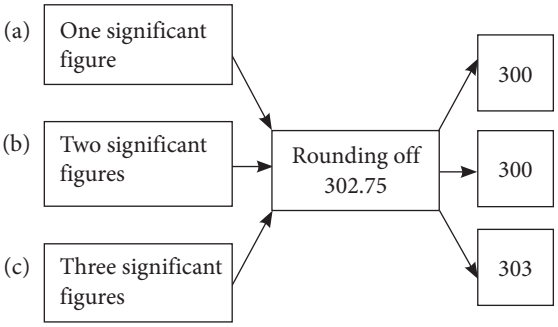
(b) 1.40 [3] (d) 0.0006420 [4]

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 figures) ✗

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 $\frac{12}{1.2 \times 10^1}$ as $\frac{400\,000}{4 \times 10^5}$ as $\frac{0.9}{9 \times 10^{-1}}$ 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) $2 \times 10^{5} + 7 \times 10^{5} = (2 + 7) \times 10^{5}$
$= 9 \times 10^{5}$ [✓]

(b) $5 \times 10^{-3} - 3 \times 10^{-4} = 5 \times 10^{-3} - 3 \times 10^{-1} \times 10^{-3}$
$= 5 \times 10^{-3} - 0.3 \times 10^{-3}$
$= (5 - 0.3) \times 10^{-3}$
$= 4.7 \times 10^{-3}$
$\neq 2 \times 10^{-3}$ [✗]

(c) $4 \times 10^{3} \times 9 \times 10^{5} = (4 \times 9) \times (10^{3} \times 10^{5})$
$= 36 \times 10^{8}$
$= 3.6 \times 10^{9}$ [✓]

(d) $(6 \times 10^{6}) \div (8 \times 10^{-2}) = \dfrac{6 \times 10^{6}}{8 \times 10^{-2}}$
$= \dfrac{6}{8} \times \dfrac{10^{6}}{10^{-2}}$
$= 0.75 \times 10^{6 - (-2)}$
$= 7.5 \times 10^{-1} \times 10^{8}$
$= 7.5 \times 10^{7}$ [✓]

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) $\dfrac{3 \times 10^{-6}}{4 \times 10^{-2}} = \dfrac{3}{4} \times \dfrac{10^{-6}}{10^{-2}}$
$= 0.75 \times 10^{-6 - (-2)}$
$= 7.5 \times 10^{-5}$

15 (a) Mass of one atom of oxygen
$= 16 \times 1.66 \times 10^{-24}$
$= 26.56 \times 10^{-24}$
$= 2.656 \times 10^{-23}$g

(b) Mass of one molecule of water
$= 2 \times 1.66 \times 10^{-24} + 2.656 \times 10^{-23}$
$= 0.332 \times 10^{-23} + 2.656 \times 10^{-23}$
$= 2.988 \times 10^{-23}$g

16 (a) Distance travelled
$= 3 \times 10^{5} \times 15$
$= (3 \times 15) \times 10^{5}$
$= 45 \times 10^{5}$
$= 4.5 \times 10^{6}$ km

(b) Time taken
$= \dfrac{5.4 \times 10^{10} \times 10^{-3}}{3 \times 10^{5}}$
$= \dfrac{5.4 \times 10^{7}}{3 \times 10^{5}}$
$= \dfrac{5.4}{3} \times \dfrac{10^{7}}{10^{5}}$
$= 1.8 \times 10^{2}$ 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 $\dfrac{215\,000}{0.0005} = \dfrac{2.15 \times 10^{5}}{5 \times 10^{-4}}$
$= \dfrac{2.15}{5} \times \dfrac{10^{5}}{10^{-4}}$
$= 0.43 \times 10^{5 - (-4)}$
$= 0.43 \times 10^{9}$
$= 4.3 \times 10^{-1} \times 10^{9}$
$= 4.3 \times 10^{8}$
Answer: **D**

5 $8 \times 10^{7} - 6 \times 10^{5} = 8 \times 10^{7} - 6 \times 10^{-2} \times 10^{7}$
$= 8 \times 10^{7} - 0.06 \times 10^{7}$
$= (8 - 0.06) \times 10^{7}$
$= 7.94 \times 10^{7}$
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) $\dfrac{0.0516}{0.03} = 1.72$

≈ 1.7 (two significant figures)

8 (a) $\dfrac{3}{4} \times 10^6 = 0.75 \times 10^6$

$= 7.5 \times 10^{-1} \times 10^6$

$= 7.5 \times 10^5$

$\therefore A = 7.5, n = 5$

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

$= 1.0496 \times 10^{-12}$

(i) 1.0×10^{-12} (two significant figures)

(ii) 1.050×10^{-12} (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) $\dfrac{(2 \times 10^5)^3 \times (7 \times 10^{-6})}{(0.08 \times 10^4)^2} = \dfrac{5.6 \times 10^{10}}{(0.08 \times 10^4)^2}$

$= \dfrac{5.6 \times 10^{10}}{0.08^2 \times (10^4)^2}$

$= \dfrac{5.6 \times 10^{10}}{(8 \times 10^{-2})^2 \times 10^8}$

$= \dfrac{5.6 \times 10^{10}}{64 \times 10^{-4} \times 10^8}$

$= \dfrac{5.6 \times 10^{10}}{64 \times 10^4}$

$= \dfrac{5.6}{64} \times \dfrac{10^{10}}{10^4}$

$= 0.0875 \times 10^6$

$= 8.75 \times 10^{-2} \times 10^6$

$= 8.75 \times 10^4$

11 (a) Distance of satellite from the centre of the earth

$= 4.23 \times 10^4 - 6.4 \times 10^3$

$= 4.23 \times 10^4 - 0.64 \times 10^4$

$= (4.23 - 0.64) \times 10^4$

$= 3.59 \times 10^4$ km

(b) Volume of the earth

$= \dfrac{4}{3}\pi \times 6\,400^3$

$= \dfrac{4}{3}\pi \times (6.4 \times 10^3)^3$

$= \dfrac{4}{3}\pi \times 6.4^3 \times (10^3)^3$

$= 1\,098.5 \times 10^9$

$= 1.0985 \times 10^3 \times 10^9$

$= 1.0985 \times 10^{12}$

$\approx 1.10 \times 10^{12}$ km^3 (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) Mass of iron sheet

$= 1.75 \times 10^4 \times (10^{-2})^3 \times 7.87$

$= (1.75 \times 7.87) \times 10^4 \times (10^{-2})^3$

$= 13.8 \times (10^4 \times 10^{-6})$

$= 1.38 \times 10^1 \times 10^{-2}$

$= 1.38 \times 10^{-1}$ kg

13 (a) Area of the industrial region

$= (27.2 \times 10^3) \times (20 \times 10^3)$

$= (27.2 \times 20) \times (10^3 \times 10^3)$

$= 544 \times 10^6$

$= 5.44 \times 10^2 \times 10^6$

$= 5.44 \times 10^8$ m^2

(b) Area of the industrial region

$= 27 \times 20 \times 640 \div 2.59$ acres

$= 134\,000$ acres

$= 1.34 \times 10^5$ acres

Alternative method

Area of the industrial region

$= 5.44 \times 10^8 \times (10^{-3})^2 \times 640 \div 2.59$

$= (5.44 \times 640 \div 2.59) \times 10^8 \times (10^{-3})^2$

$= 1\,340 \times 10^8 \times 10^{-6}$

$= 1.34 \times 10^3 \times 10^2$

$= 1.34 \times 10^5$ ekar/*acres*