A Significant Review -- KEY

Let's start off with scientific notation…

1a) 54,670,000,000 → 5.467×10^{10} (original value was greater than |1|, so positive exponent)
1b) -5526.7 → -5.5267×10^{3} (original value was greater than |1|, so positive exponent)
1c) 0.03289 → 3.289×10^{-2} (original value was less than |1|, so negative exponent)
1d) 100.00 → 1.0000×10^{2} (original value was greater than |1|, so positive exponent)
1e) -0.000093740 → -9.3740×10^{-5} (original value was less than |1|, so negative exponent)
1f) 9999.606 → 9.999606×10^{3} (original value was greater than |1|, so positive exponent)
1g) 2800 → 2.8×10^{3} (original value was greater than |1|, so positive exponent)
1h) -0.00000005883 → -5.883×10^{-8} (original value was less than |1|, so negative exponent)
1i) 0.00008 → 8×10^{-5} (original value was less than |1|, so negative exponent)
1j) 0.11250 → 1.1250×10^{-1} (original value was less than |1|, so negative exponent)

How many significant figures in a number:

2a) 6200 →**2**
2b) 1.032 →**4**
2c) 420. →**3**
2d) 3.750×10^{-6} →**4**
2e) 0.0006000 →**4**
2f) 1×10^{4} →**1**
2g) 35000000 →**2**
2h) 23.4400 →**6**
2i) 100.0003 →**7**
2J) 100. →**3**

Significant figures in calculations

3a) $160 \times 0.3490 \times 23.1 = 1289.904$ 160 = **2** s.f., 0.3490 = **4** s.f., 23.1 = **3** s.f., so answer can only have 2 s.f.→ **1300 or 1.3×10^{3}**

3b)
$$\begin{array}{r} 2.3806 \\ +0.01 \\ \hline 2.3906 \end{array}$$
→ **2.39**

3c) $\dfrac{0.2689}{0.000159} = 1691.19497$ 0.2689 = 4 s.f., 0.000159 = 3 s.f., answer has 3 s.f. → **1690** or **1.69×10^{3}**

3b)
$$\begin{array}{r} 11 \mid 3 \\ -2 \\ \hline 9 \mid 3 \end{array}$$
→ **9**

3e) $1500. \div 25 = 60$ 1500. = 4 s.f., 25 = 2 s.f., answer has 2 s.f. → **60.** or **6.0×10^{1}**

3f) $3.65 \times 10^{-3} \times 9.822 \times 10^{4} = 360.693$ 3.65×10^{-3} = 3 s.f., 9.822×10^{4} = 4 s.f., answer has 3 s.f. → **361**

3g) $\dfrac{2.21100 \times 10^{2}}{32.1 \times 0.002000} = 3443.92523$ 2.21100×10^{2} = 6 s.f., 32.1 = 3 s.f., 0.002000 = 4 s.f., answer = 3 s.f. → **3440**

OR **3.44×10^{3}**

3h)

$$\begin{array}{r} 0.34864 \\ +1 \\ \hline 1.34864 \end{array}$$ → **1** (this is the answer)

3i)

$$\begin{array}{r} 26.1 \\ -\ .00030000 \\ \hline 26.09970000 \end{array}$$ → **26.1** (you are subtracting a very small number from a large number; it doesn't make a difference here)

3j)

$$\begin{array}{r} 1200 \\ 49.49 \\ +\ \ 1.004 \\ \hline 1250.494 \end{array}$$ $12|50.494 = 1.2|50494 \times 10^3$ → **1.3×10^3** (again, put into scientific notation THEN round off)

3k) $33.3 \times 3.0 = 99.9$ 33.3 = 3 s.f., 3.0 = 2 s.f., answer = 2 s.f. 99.9 rounds to 100, but MUST have 2 s.f. → **1.0×10^2**

Significant figures in mixed operation calculations

4a) $106.905\ X + 108.9048 \bullet (1 - X) = 107.870$ (step 1)

$106.905\ X + 108.9048 - 108.9048\ X = 107.870$ (step 2)

$$\begin{array}{l} 106.905\ X + 108.9048 - 108.9048\ X = 107.870 \\ \qquad\qquad -108.9048 \qquad\qquad\quad -108.9048 \\ \hline 106.905\ X \qquad\quad -108.9048\ X = -1.0\overline{348} \end{array}$$ (step 3)

$$\begin{array}{l} 106.905\ X - 108.9048\ X = -1.0\overline{348} \\ \quad -1.999\overline{8}\ X \qquad\quad = -1.0\overline{348} \end{array}$$ (step 4)

$$\frac{-1.999\overline{8}\ X}{-1.999\overline{8}} = \frac{-1.0\overline{348}}{-1.999\overline{8}} \Rightarrow X = 0.517451745 \rightarrow \mathbf{0.5175}$$ (answer)

4b) $184.95297\ X + 186.956 \bullet (1 - X) = 186.2$ (step 1)

$184.95297\ X + 186.956 - 186.956\ X = 186.2$ (step 2)

$$\begin{array}{l} 184.95297\ X + 186.956 - 186.956\ X = 186.2 \\ \qquad\qquad -186.956 \qquad\qquad -186.956 \\ \hline 184.95297\ X \qquad -186.956\ X = -0.\overline{756} \end{array}$$ (step 3)

$$\begin{array}{l} 184.95297\ X - 186.956\ X = -0.\overline{756} \\ \quad -2.00\overline{303}\ X \qquad\quad = -0.\overline{756} \end{array}$$ (step 4)

$$\frac{-2.00\overline{303}\ X}{-2.00\overline{303}} = \frac{-0.\overline{756}}{-2.00\overline{303}} \Rightarrow X = 0.377428196 \rightarrow \mathbf{0.4}$$ (answer)

4c) $120.903824\,X + 122.904222 \bullet (1 - X) = 121.75$ (step 1)

$120.903824\,X + 122.904222 - 122.904222\,X = 121.75$ (step 2)

$$\begin{array}{r} 120.903824\,X + 122.904222 - 122.904222\,X = 121.75 \\ -122.904222 \qquad\qquad -122.904222 \\ \hline 120.903824\,X \qquad\qquad -122.904222\,X = -1.1\overline{54222} \end{array}$$ (step 3)

$$\begin{array}{l} 120.903824\,X - 122.904222\,X = -1.1\overline{54222} \\ -2.000398\overline{}\,X \qquad\quad = -1.1\overline{54222} \end{array}$$ (step 4)

$$\frac{-2.000398\overline{}\,X}{-2.000398\overline{}} = \frac{-1.1\overline{54222}}{-2.000398\overline{}} \Rightarrow\; X = 0.576996177 \rightarrow \mathbf{0.577}$$ (answer)

4d) $0.0521 \times \left(112.40 + \left(3.02391 + 24.0224 + 31.9988\right) \times 3.0000000\right) \Rightarrow 0.0521 \times \left(112.40 + 59.0443\overline{1} \times 3.0000000\right)$ (step 1)

$0.0521 \times \left(112.40 + 59.0443\overline{1} \times 3.0000000\right) \Rightarrow 0.0521 \times \left(112.40 + 177.13\overline{293}\right)$ (step 2)

$0.0521 \times \left(112.40 + 177.132\overline{93}\right) \Rightarrow 0.0521 \times 289.5\overline{3293}$ (step 3)

$0.0521 \times 289.5\overline{3293} = 15.\overline{08466565} \rightarrow \mathbf{15.1}$ (answer)

4e) $5.6629 \times \left(47.90 + 2.0000000 \times \left(1.00797 + 15.9994\right)\right) \Rightarrow 5.6629 \times \left(47.90 + 2.0000000 \times 17.0073\overline{7}\right)$ (step 1)

$5.6629 \times \left(47.90 + 2.0000000 \times 17.0073\overline{7}\right) \Rightarrow 5.6629 \times \left(47.90 + 34.0147\overline{4}\right)$ (step 2)

$5.6629 \times \left(47.90 + 34.0147\overline{4}\right) \Rightarrow 5.6629 \times 81.9\overline{1474}$ (step 3)

$5.6629 \times 81.9\overline{1474} = 463.\overline{874981} \rightarrow \mathbf{463.9}$ (answer)

4f) $\dfrac{28.641}{\left(-2.3154 + 2.1\right)} \Rightarrow \dfrac{28.641}{-0.\overline{2154}}$

$\dfrac{28.641}{-0.\overline{2154}} = -\overline{132.96657} \rightarrow \mathbf{100\ or\ -1x10^{2}}$

4g) $\dfrac{\left(-0.4680 + 135.79\right) \times 16.0}{\left(128.42 - 129.226\right)} \Rightarrow \dfrac{135.3\overline{22} \times 16.0}{-0.\overline{806}}$

$\dfrac{135.3\overline{22} \times 16.0}{-0.\overline{806}} = -\overline{2686.292804} = -2.\overline{686292804} \times 10^{3} \rightarrow \mathbf{-2.7x10^{3}}$

4h) $\dfrac{\left(0.8000 - 0.7943\right)}{0.8000} \Rightarrow \dfrac{0.00\overline{57}}{0.8000}$ $\qquad \dfrac{0.00\overline{57}}{0.8000} = 7.\overline{125} \times 10^{-3} \rightarrow \mathbf{7.1x10^{-3}}$

4i) $\left(0.00748214 \times 5.6237 \times 10^{2}\right) + \left(1161 \div 20\right) \Rightarrow 4.207\overline{7}31072 + \overline{8}0.55$

$4.207\overline{7}31072 + \overline{8}0.55 \Rightarrow \overline{8}4.75773107$ → **80 or 8x10^{1}**

4j) $\left(28.621 + 81.993\right) \times 100.000 \Rightarrow 110.61\overline{4} \times 100.000$

$110.61\overline{4} \times 100.000 = 110614$ → **110614**

4k) $8640. \times 85.4861 + 17.0 \times 317.65 \Rightarrow 738\overline{5}99.904 + 54\overline{0}0.05$

$738\overline{5}99.904 + 54\overline{0}0.05 = 74\overline{3}999.954 \Rightarrow 7.4\overline{3}999954 \times 10^{5}$ → **7.440x10^{5}**