

Topic 3: Approximation and estimation, exact value, significant figures, decimal places and std form

1a. 2501×0.01019

$\sqrt{24.83}$

$\approx 2500 \times 0.01$

$\sqrt{25}$

$= 500 \times 0.01$

$= 5 \text{ (1 s.f.)}$

4

$389.95 \div \sqrt{0.0198 \times 2.054}$

$\approx 400 \div \sqrt{0.02 \times 2}$

$= 400 \div 0.2$

$= 2000 \text{ (1 s.f.)}$

1a

(i) $5678 = 5.678 \times 10^3$

(ii) $115.8 = 1.158 \times 10^2$

(iii) $0.0513 = 5.13 \times 10^{-2}$

(iv) $0.00072 = 7.2 \times 10^{-4}$

b. $p = 3.4 \times 10^4$

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

$\therefore p + \frac{1}{q}$

$= 3.4 \times 10^4 + \frac{1}{2 \times 10^{-6}}$

$= 3.4 \times 10^4 + 0.5 \times 10^6$

$= 3.4 \times 10^4 + 50 \times 10^4$

$= 53.4 \times 10^4$

$= 5.34 \times 10^5$

5a $4.11, \sqrt[3]{15.6}$

11.62

$\approx 4 \times \sqrt[3]{16}$

12

$= \frac{4 \times 6}{12}$

$= 2 \text{ (1 s.f.)}$

b

(i) $3.57 \times 10^3 = 3570$

(ii) $1.84 \times 10^{-4} = 0.000184$

(iii) $9.03 \times 10^0 = 9.03$

(iv) $\frac{5.99 \times 10^{-3}}{10^{-6}} = 5.99 \times 10^3$

$= 5990$

8a

$(3.5 \times 10^{-2}) + (4.4 \times 10^{-1})$

$= (3.5 \times 10^{-2}) + (44 \times 10^{-2})$

$= (3.5 + 44) \times 10^{-2}$

$= 47.5 \times 10^{-2}$

$= 4.75 \times 10^{-1}$

2a 0.0020549

$= 2.0549 \times 10^{-3}$

$= 2.05 \times 10^{-3} \text{ (to 3 sig. fig.)}$

6a

$p = 2.55 \times 10^{-6}$

$q = 8.7 \times 10^{-7}$

$p + q = 2.55 \times 10^{-6} + 8.7 \times 10^{-7}$

$= (2.55 + 0.87) \times 10^{-6}$

$= 3.42 \times 10^{-6}$

b

$(5.96 \times 10^2) \div (2 \times 10^{-2})$

$= \frac{5.96 \times 10^2}{2 \times 10^{-2}}$

$= 2.98 \times 10^4$

b. $0.04576 \div 0.9$

$= 0.04576 \div 9$

$= 0.0509 \dots$

$= 0.051 \text{ (3 d.p.)}$

c

$9.1 \times 10^7 - 4.5 \times 10^6$

$= 9.1 \times 10^7 - 0.45 \times 10^7$

$= 8.65 \times 10^7$

3a

$\sqrt[3]{0.00194}$

$\approx \sqrt[3]{0.008}$

$= 0.2 \text{ (1 s.f.)}$

b. 2529×0.0397

$\sqrt{25.06}$

$\approx 2500 \times 0.04$

$\sqrt{25}$

$= 500 \times 0.04$

$= 20 \text{ (1 s.f.)}$

d

$\frac{3(8.6 \times 10^{-5})}{10^{-9}}$

$= 25.8 \times 10^{-1}$

$= 2.58 \times 10^0$

b

$3.95 \times \frac{15.06}{\sqrt{0.0908}}$

$\approx 4 \times \frac{15}{\sqrt{0.09}}$

$= 4 \times 50$

$= 200 \text{ (1 s.f.)}$

9a

$0.03456 = 0.03 \text{ (2 d.p.)}$

b

$0.03456 = 0.0346 \text{ (to 3 s.f.)}$

c

$0.03456 = 3.456 \times 10^{-2}$

10a $4.0347 = 4.0$ (2 s.f.)

$4b \div a$

b $4.0347 = 4.03$ (2 d.p.)

$$= \frac{4b}{a}$$

$$= \frac{4}{2 \times 10^2}$$

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

11a $a = 7.8 \times 10^5$

$b = 3.9 \times 10^3$

$2a - b = 2 \times 7.8 \times 10^5 - 3.9 \times 10^3$

$= 15.6 \times 10^5 - 3.9 \times 10^3$

$= 15.6 \times 10^3 - 3.9 \times 10^3$

$= 11.7 \times 10^3$

$= 1.17 \times 10^4$

b. $3a + 12b$

$= 3(a + 4b)$

$= 3(7.8 \times 10^5 + 4 \times 3.9 \times 10^3)$

$= 3(7.8 \times 10^5 + 15.6 \times 10^3)$

$= 3(7.8 + 0.156) \times 10^5$

$= 3 \times 7.956 \times 10^5$

$= 23.868 \times 10^5$

$= 2.3868 \times 10^6$

c. $a \div b$

$= \frac{7.8 \times 10^5}{3.9 \times 10^3}$

$= 2 \times 10^2$

d. $4ab$

$= 4 \times 7.8 \times 10^5 \times 3.9 \times 10^3$

$= 121.68 \times 10^8$

$= 1.2168 \times 10^{10}$

e. $4ab^2$

$= 1.2168 \times 10^{10} \times 3.9 \times 10^3$

$= 4.74552 \times 10^{13}$