

ARITHMETIC (Q 1, PAPER 1)

1996

- 1 (a) Express 250 m as a fraction of 1 km.
- (b) A tanker delivered heating oil to a school. Before the delivery the meter reading showed 11,360 litres of oil in the tanker. After the delivery, the meter reading was 7160 litres.
Calculate the cost of the oil delivered if 1 litre of oil cost 20.5p.
When VAT was added to the cost of the oil delivered, the bill to the school amounted to IR£1041.81.
Calculate the rate of VAT added.
- (c) (i) Calculate the value of
- $$\frac{5.1 \times 10^8 + 19 \times 10^7}{1.4 \times 10^{12}}$$
- and write your answer as a decimal number.
- (ii) Calculate the percentage error if 5 is taken as an approximation for 4.95.
Give your answer correct to two places of decimals.

SOLUTION

1 (a)

1 kilometre (km) = 1000 m
100 centimetres (cm) = 1 m
1000 millimetres (mm) = 1m

Change each quantity to the same units, say metres.

1 km = 1000 m

$$\frac{250 \text{ m}}{1000 \text{ m}} = \frac{1}{4}$$

1 (b)

Number of litres: $11,360 - 7,160 = 4,200$ litres

Cost = $4,200 \times 20.5 \text{ p} = 86100 \text{ p} = \text{£}861.00$

Amount of VAT paid = $\text{£}1041.81 - \text{£}861.00 = \text{£}180.81$

$$\text{Rate of VAT} = \frac{\text{£}180.81}{\text{£}861.00} \times 100\% = 21\%$$

1 (c) (i) $\frac{5.1 \times 10^8 + 19 \times 10^7}{1.4 \times 10^{12}} = 5 \times 10^{-4} = 0.0005$ [Use calculator]

CALCULATOR: Calculate $\frac{5.1 \times 10^8 + 19 \times 10^7}{1.4 \times 10^{12}}$.

The calculator interface shows a grid of buttons: a clear button, digits 5, 1, 8, 1, 9, 7, 1, 4, 1, 2, and an equals button. There are also buttons for decimal point, multiplication, and powers of 10. A 'REPLAY' button is also present. To the right, a display window shows the expression $\frac{5.1 \times 10^8 + 19 \times 10^7}{1.4 \times 10^{12}}$ and the result 5×10^{-4} .

The answer given on the calculator is given as 5×10^{-4} . To change this number into a decimal number, move the decimal point 4 places to the left.

1 (c) (ii) FINDING THE PERCENTAGE ERROR

STEPS

1. Find the absolute error: Absolute error = |True value – Estimate|
2. Find the fractional error: Fractional error = $\frac{\text{Absolute Error}}{\text{True Value}}$
3. Find the percentage error: % Error = $\frac{\text{Absolute Error}}{\text{True Value}} \times 100\%$

$\% \text{ Error} = \frac{\text{Absolute Error}}{\text{True Value}} \times 100\%$ 2

1. True value = 4.95 Estimated value = 5

Absolute error = $|4.95 - 5| = 0.05$

2. Fractional error = $\frac{0.05}{4.95}$

3. % error = $\frac{0.05}{4.95} \times 100\% = 1.01\%$