ARITHMETIC (Q 1, PAPER 1)

2003

1 (a) A train leaves Cork at 09:05 and arrives in Dublin at 12:25.
The distance from Cork to Dublin is 250 km.
Find the average speed of the train in km/h.

(b) The present reading on the electricity meter in John's house is 63792 units. The previous reading was 62942 units.
(i) How many units of electricity were used since the previous reading?

(ii) What is the cost of the electricity used, if electricity costs 9.52 cent per unit?

(iii) A standing charge of €7.00 is added and VAT is then charged on the full amount. If John's total bill is €98.91, calculate the rate at which VAT is charged.

(c) (i) When using a calculator to add 1.7 and 2.2, a student strikes the multiplication key instead of the addition key.
Calculate the percentage error in the result, correct to one decimal place.

(ii) What sum of money invested at 6% per annum compound interest will amount to €5000 in 7 years?
Give your answer correct to the nearest euro.

SOLUTION

1 (a)

Hours	**Minutes**
12	25
9	05
3	20

$v = \frac{s}{t}$ 4

s = 250 km

t = 3 hr 20 min = $3\frac{1}{3}$ hr

$\therefore v = \frac{250 \text{ km}}{3\frac{1}{3} \text{ hr}} = 75$ km/hr [Using calculator]

1 (b)

(i)
Present reading	= 63792 units	
Previous reading	= 62942 units	
Units used	= 850 units	

(ii)
1 unit	costs	9.52 c
850 units	costs	$850 \times 9.52\text{c} = 8092\text{c} = €80.92$

(iii) Add on the standing charge: €80.92 + €7.00 = €87.92
VAT amount: €98.91 – €87.92 = €10.99

Rate of VAT $= \frac{10.99}{80.92} \times 100\% = 12.5\%$

1 (c) (i) FINDING THE PERCENTAGE ERROR

STEPS

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

$$\%\ \text{Error} = \frac{\text{Absolute Error}}{\text{True Value}} \times 100\% \quad \ldots\ldots \ (2)$$

1. True value = 1.7 + 2.2 = 3.9 Estimated value = $1.7 \times 2.2 = 3.74$

Absolute error $= |3.9 - 3.74| = 0.16$

2. Fractional error $= \dfrac{0.16}{3.9}$

3. % error $= \dfrac{0.16}{3.9} \times 100\% = 4.1\%$

1 (c) (ii)

$R = 6\%$
$A = €5{,}000$
$n = 7$
$P = ?$

$$A = P\left(1 + \frac{R}{100}\right)^n \quad \ldots\ldots \ (3)$$

$$5000 = P\left(1 + \frac{6}{100}\right)^7 \Rightarrow 5000 = P(1.06)^7$$

$$\therefore P = \frac{5000}{(1.06)^7} = €3{,}325$$