

The sum of the digits of this integer is  $1 + 2 + 1$  which equals 4.

To determine this integer without using a calculator, we can let  $x = 10^3$ .

Then

$$\begin{aligned}(10^3 + 1)^2 &= (x + 1)^2 \\&= x^2 + 2x + 1 \\&= (10^3)^2 + 2(10^3) + 1 \\&= 1\,002\,001\end{aligned}$$

$$2 \cdot \$1.50 + \$2.00 = \$5.00.$$

10% of \$1.50 is  $0.1 \cdot \$1.50 = \$0.15$ . After the price increase, 1 small cookie costs  $\$1.50 + \$0.15 = \$1.65$ .

5% of \$2.00 is  $0.05 \cdot \$2.00 = \$0.10$ . After the price increase, 1 large cookie costs  $\$2.00 + \$0.10 = \$2.10$ .

After the price increase, the total cost of 2 small cookies and 1 large cookie is  $2 \cdot \$1.65 + \$2.10 = \$5.40$ .

The percentage increase in the total cost is  $\frac{\$5.40 - \$5.00}{\$5.00} \times 100\% = \frac{40}{500} \times 100\% = 8\%$ .

(c) Suppose that Rayna's age is  $x$  years.

Since Qing is twice as old as Rayna, Qing's age is  $2x$  years.

Since Qing is 4 years younger than Paolo, Paolo's age is  $2x + 4$  years.

Since the average of their ages is 13 years, we obtain

$$\frac{x + (2x) + (2x + 4)}{3} = 13$$

This gives  $5x + 4 = 39$  and so  $5x = 35$  or  $x = 7$ .

Therefore, Rayna is 7 years old, Qing is 14 years old, and Paolo is 18 years old.

(Checking, the average of 7, 14 and 18 is  $\frac{7 + 14 + 18}{3} = \frac{39}{3} = 13$ .)

3. (a) The length of  $PQ$  is equal to  $\sqrt{(0 - 5)^2 + (12 - 0)^2} = \sqrt{(-5)^2 + 12^2} = 13$ .

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