

## Lesson Worksheet 7.2B(II)

*Objective: To solve problems involving constant decay rates.*

If a quantity decreases at a **constant rate** of  $r\%$  per **period**, then  
 若一個量在每個時期以固定的率  $r\%$  減少，則

$$\text{new value after } n \text{ periods} = \text{original value} \times (1 - r\%)^n$$

$$n \text{ 期後的新值} = \text{原值} \times (1 - r\%)^n$$

- $r\%$  is called the decay rate.  $r\%$  稱為衰減率。
- $(1 - r\%)$  is called the decay factor.  $(1 - r\%)$  稱為衰減因子。

1. The value of a set of tea wares decreases at a constant rate of 9% per year. If the present value of the set of tea wares is \$1997, find its value five years ago.

(Give the answer correct to the nearest dollar.)

Let  $x$  be the value of the set of tea wares five years ago.

$$x(1 - 9\%)^{(5)} = 1997$$

$$0.91^5 x = 1997$$

$$x = 3200, \text{ corr. to the nearest integer}$$

∴ The value of the set of tea wares was \$3200 five years ago.

2. The donation received by a charity organization decreases at a constant rate of 4.4% each year. If the charity organization receives donation of \$350 000 this year, find the donation received two years ago.

(Give the answer correct to the nearest thousand dollars.)

Let  $x$  be the donation received by the charity organization two years ago.

$$x(1 - 4.4\%)^{(2)} = 350\,000$$

$$0.956^2 x = 350\,000$$

$$x = 383\,000, \text{ corr. to the nearest thousand}$$

∴ The donation received by the charity organization was \$383 000 two years ago.

### Demonstration

The value of a gold coin decreases at a constant rate of 2.8% per year. If the present value of the gold coin is \$2173, find its value two years ago.

(Give the answer correct to the nearest dollar.)

### Solution

Let  $x$  be the value of the gold coin two years ago.

$$x(1 - 2.8\%)^2 = 2173$$

$$0.972^2 x = 2173$$

$$x = 2300, \text{ cor. to the nearest integer}$$

∴ The value of the gold coin was \$2300 two

Set up an equation to find the required value(s).

3. The number of secondary students in a city has decreased by 2% each year. In 2013, there were 96 040 secondary students in the city. Find the number of secondary students in 2011.

Let  $x$  be the number of secondary students in 2011.

$$x(1 - \underline{2\%})^{(\underline{2013} - \underline{2011})} = \underline{96040}$$

$$0.98^2x = 96\ 040$$

$$x = 100\ 000$$

∴ The number of secondary students in 2011 is 100000.

- \*4. At the end of 2014, an airline company carried a total of 4 000 000 passengers. If the total number of passengers carried has decreased by 2.5% every half year, find the total number of passengers carried at the end of 2010. (Give the answer correct to the nearest hundred.)

Let  $x$  be the total number of passengers carried at the end of 2010.

$$x(1 - \underline{2.5\%})^{(\underline{2014} - \underline{2010}) \times 2} = \underline{4\ 000\ 000}$$

$$0.975^8x = 4\ 000\ 000$$

$$x = \underline{4\ 898\ 000}, \text{ corr. to the nearest hundred}$$

∴ The total number of passengers carried at the end of 2010 is 4 898 000.

Challenging Question(Optional)

- \*5. Frankie bought a car six years ago. The value of the car has decreased by 4% every half year and the present value of the car is \$88 800. Find the amount Frankie paid for the car.

(Give the answer correct to the nearest hundred dollars.)

Let  $\$x$  be the amount Frankie paid for the car.

$$x(1 - \underline{4\%})^{(\underline{6}) \times 2} = \underline{88\ 800}$$

$$0.96^{12}x = 88\ 800$$

$$x = \underline{144\ 900}, \text{ corr. to the nearest hundred}$$

∴ The amount Frankie paid for the car was \$ 144 900.