

## Lesson Worksheet 8.2A(II)

*Objective: To learn and use the properties of rhombuses.*

A rhombus is a quadrilateral with four equal sides. It is a kind of parallelogram.

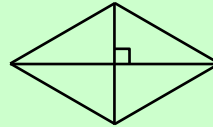
菱形是一個四邊相等的四邊形。它是平行四邊形的其中一種。

The followings are the properties of rhombuses: 以下是菱形的性質：

(1) All properties of a parallelogram. 平行四邊形的所有性質。

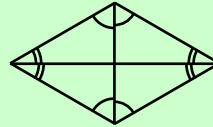
(2) The diagonals are perpendicular to each other.

對角線互相垂直。



(3) The diagonals bisect each interior angle.

對角線平分每一個內角。



[Ref.: *property of rhombus*] [簡記：菱形性質]

1. In the figure,  $ABCD$  is a rhombus.  $AC$  and  $BD$  intersect at  $E$ .  $\angle CBE = 26^\circ$ . Find the values of  $x$  and  $y$ .

$$x = \underline{90^\circ} \quad (\text{property of rhombus})$$

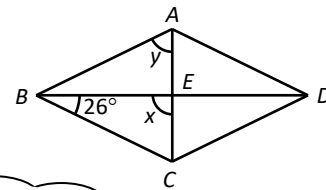
$$\angle ABE = \angle CBE = \underline{26^\circ} \quad (\text{property of rhombus})$$

In  $\triangle ABE$ ,

$$y + \angle ABE = x \quad (\text{ext. } \angle \text{ of } \triangle)$$

$$y + 26^\circ = 90^\circ$$

$$y = \underline{64^\circ}$$



What is the size of  $\angle ABE$ ?

2. In the figure,  $ABCD$  is a rhombus.  $AC$  and  $BD$  intersect at  $E$ . Find the values of  $x$  and  $y$ .

$$\therefore DE = BE \quad (\text{property of rhombus})$$

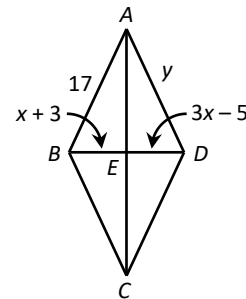
$$3x - 5 = x + 3$$

$$2x = 8$$

$$x = \underline{4}$$

$$\therefore AD = AB \quad (\text{definition of rhombus})$$

$$y = \underline{17}$$



rhombus(菱形)

parallelogram(平行四邊形)

intersect(相交)

3. In the figure,  $ABCD$  is a rhombus.  $AC$  and  $BD$  intersect at  $E$ .  $\angle ABE = 70^\circ$ . Find the values of  $x$ ,  $y$  and  $z$ .

$$x = \underline{70^\circ} \quad (\text{property of rhombus})$$

$$y = \angle CBD = \underline{70^\circ} \quad (\text{alt. } \angle\text{s, } AD \parallel BC)$$

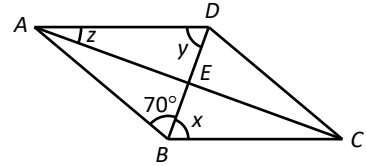
$$\angle DEC = \underline{90^\circ} \quad (\text{property of rhombus})$$

In  $\triangle ADE$ ,

$$z + y = \angle DEC \quad (\text{ext. } \angle \text{ of } \triangle)$$

$$z + 70^\circ = 90^\circ$$

$$z = \underline{20^\circ}$$



What is the size of  $\angle DEC$ ?

4. In the figure,  $PQRS$  is a rhombus.  $PR$  and  $QS$  intersect at  $T$ .  $PR = 30$  cm and  $QS = 16$  cm.

(a) Find  $RT$  and  $ST$ .

(b) Find  $RS$ .

(a)  $PT = RT$  (property of rhombus)

$$\therefore RT = 30 \div 2 \text{ cm} = \underline{15 \text{ cm}}$$

$$QT = ST \quad (\text{property of rhombus})$$

$$\therefore ST = 16 \div 2 \text{ cm} = \underline{8 \text{ cm}}$$

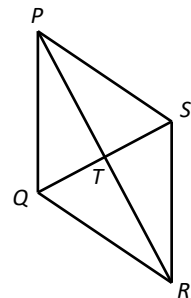
(b)  $\angle RTS = \underline{90^\circ}$  (property of rhombus)

In  $\triangle RTS$ ,

$$RS^2 = RT^2 + ST^2 \quad (\text{Pyth. theorem})$$

$$RS^2 = (15)^2 + (8)^2$$

$$RS = \sqrt{289} = \underline{17 \text{ (cm)}}$$



Challenging Question(Optional)

5. In the figure,  $PQRS$  is a rhombus.  $PR$  and  $QS$  intersect at  $T$ .  $PR = 28$  cm and  $QS = 45$  cm.

(a) Find  $PS$ .

(b) Find the perimeter of  $PQRS$ .

(a)  $PT = RT$  (property of rhombus)

$$\therefore PT = \frac{28}{2} \text{ cm} = 14 \text{ cm}$$

$$QT = ST \quad (\text{property of rhombus})$$

$$\therefore ST = \frac{45}{2} \text{ cm} = 22.5 \text{ cm}$$

$$\angle PTS = 90^\circ \quad (\text{property of rhombus})$$

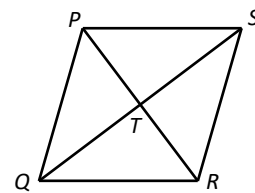
In  $\triangle PTS$ ,

$$PS^2 = PT^2 + ST^2 \quad (\text{Pyth. theorem})$$

$$= (14 \text{ cm})^2 + (22.5 \text{ cm})^2$$

$$PS = \sqrt{702.25} \text{ cm}$$

$$= \underline{26.5 \text{ cm}}$$



(b)  $PS = 26.5 \text{ cm}$  (by (a))

$$PQ = QR = RS = PS \quad (\text{definition of rhombus})$$

$$\text{Perimeter of } PQRS = 4 \times 26.5 \text{ cm}$$

$$= \underline{106 \text{ cm}}$$

rhombus(菱形)      parallelogram(平行四邊形)      intersect(相交)