

## Lesson Worksheet 8.1A(II)

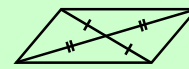
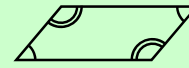
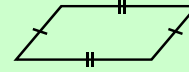
*Objective: To understand and use the properties of parallelograms.*

A parallelogram is a quadrilateral with two pairs of parallel opposite sides.

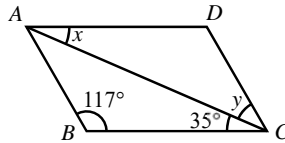
平行四邊形是一個有兩對平行線的四邊形。

The followings are the properties of a parallelogram: 以下是平行四邊形的性質：

- (1) The opposite sides are equal. 對邊相等。  
[Ref.: *opp. sides of // gram*] [簡記：平行四邊形對邊]
- (2) The opposite angles are equal. 對角相等。  
[Ref.: *opp. ∠s of // gram*] [簡記：平行四邊形對角]
- (3) The diagonals bisect each other. 對角線互相平分。  
[Ref.: *diags. of // gram*] [簡記：平行四邊形對角線]



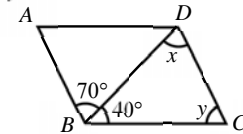
1. In the figure,  $ABCD$  is a parallelogram. Find the values of  $x$  and  $y$ .



$$\begin{aligned} \therefore AD \parallel BC & \quad (\text{definition of // gram}) \\ \angle DAC = \angle BCA & \quad (\text{alt. } \angle\text{s, } AD \parallel BC) \\ x = \underline{35^\circ} \\ \angle ADC = \angle ABC = \underline{117^\circ} & \quad (\text{opp. } \angle\text{s of // gram}) \\ \text{In } \triangle ACD, \\ \angle ADC + \angle DAC + \angle ACD = 180^\circ & \quad (\angle \text{sum of } \triangle) \\ 117^\circ + 35^\circ + y = 180^\circ \\ y = \underline{28^\circ} \end{aligned}$$

### Demonstration

In the figure,  $ABCD$  is a parallelogram. Find the values of  $x$  and  $y$ .

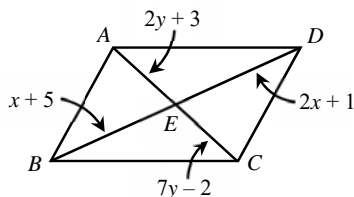


### Solution

$$\begin{aligned} AB \parallel DC & \quad (\text{definition of // gram}) \\ \angle CDB = \angle ABD & \quad (\text{alt. } \angle\text{s, } AB \parallel DC) \\ x = \underline{70^\circ} \\ \text{In } \triangle BCD, \\ \angle BDC + \angle BCD + \angle CBD = 180^\circ & \quad (\angle \text{sum of } \triangle) \\ 70^\circ + y + 40^\circ = 180^\circ \end{aligned}$$

2. In each of the following,  $ABCD$  is a parallelogram. Find the unknown(s).

(a)  $AEC$  and  $BED$  are straight lines.  $\therefore DE = \underline{BE}$  (diags. of // gram)



$$2x + 1 = x + 5$$

$$x = \underline{4}$$

$$\therefore CE = \underline{AE}$$
 (diags. of // gram)

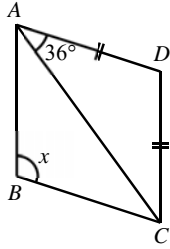
$$7y - 2 = 2y + 3$$

$$5y = 5$$

$$y = \underline{1}$$

parallelogram 平行四邊形      opposite side 對邊      opposite angle 對角  
diagonal 對角線      bisect 平分      equilateral triangle 等邊三角形

(b)



In  $\triangle ACD$ ,

$$\therefore AD = CD \quad (\text{given})$$

$$\therefore \angle DCA = \angle DAC = \underline{36^\circ} \quad (\text{base } \angle\text{s, isos. } \triangle)$$

$$\angle ADC + \angle DAC + \angle DCA = 180^\circ \quad (\angle \text{sum of } \triangle)$$

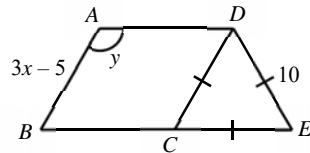
$$\angle ADC + 36^\circ + 36^\circ = 180^\circ$$

$$\angle ADC = 108^\circ$$

$$\therefore \angle ABC = \underline{\angle ADC} \quad (\text{opp. } \angle\text{s of } // \text{ gram})$$

$$x = \underline{108^\circ}$$

3. In the figure,  $ABCD$  is a parallelogram and  $\triangle CDE$  is an equilateral triangle.  $BCE$  is a straight line. Find the values of  $x$  and  $y$ .



$$\therefore AB = \underline{DC} \quad (\text{opp. sides of } // \text{ gram})$$

$$3x - 5 = 10$$

$$x = \underline{5}$$

$$\angle DCE = \underline{60^\circ} \quad (\text{property of equil. } \triangle)$$

$$\angle BCD + \underline{60^\circ} = \underline{180^\circ} \quad (\text{adj. } \angle\text{s on st. line})$$

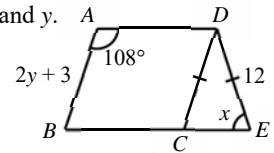
$$\angle BCD = 120^\circ$$

$$\therefore \angle BAD = \underline{\angle BCD} \quad (\text{opp. } \angle\text{s of } // \text{ gram})$$

$$y = \underline{120^\circ}$$

#### Demonstration

In the figure,  $ABCD$  is a parallelogram and  $\triangle CDE$  is an isosceles triangle.  $BCE$  is a straight line. Find the values of  $x$  and  $y$ .



#### Solution

$$\angle BCD = \angle BAD = 108^\circ \quad (\text{opp. } \angle\text{s of } // \text{ gram})$$

$$108^\circ + \angle DCE = 180^\circ \quad (\text{adj. } \angle\text{s on st. line})$$

$$\angle DCE = 72^\circ$$

In  $\triangle CDE$ ,

$$\therefore DC = DE \quad (\text{given})$$

$$\therefore \angle DEC = \angle DCE \quad (\text{base } \angle\text{s, isos. } \triangle)$$

$$x = 72^\circ$$

$$AB = DC \quad (\text{opp. sides of } // \text{ gram})$$

$$2y + 3 = 12$$

$$y = \underline{4.5}$$

parallelogram 平行四邊形      opposite side 對邊      opposite angle 對角  
 diagonal 對角線      bisect 平分      equilateral triangle 等邊三角形