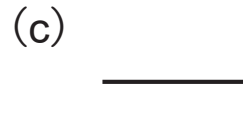
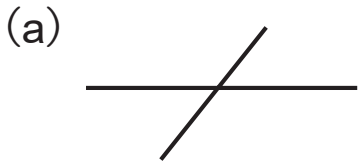


# 7 - 1

## Perpendicular / Parallel Lines and Quadrilaterals

### Intersecting Lines

**Example** Which of the following intersections have a right angle?

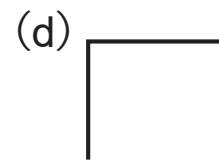
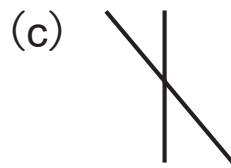
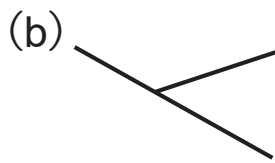
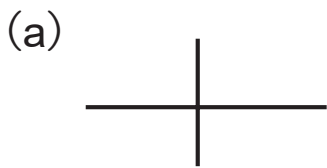


Intersection  have a right angle.

By matching a set square or a corner of folded paper, you can find it.



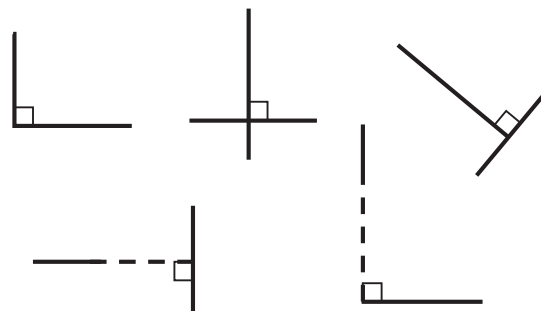
**1** Which of the following intersections have a right angle?



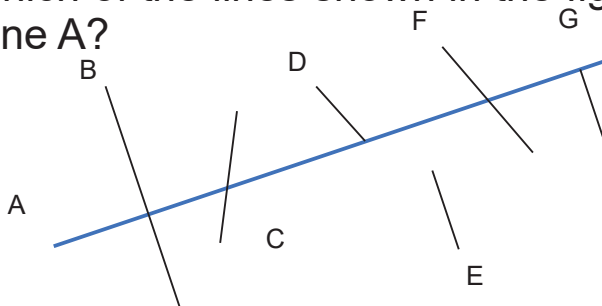
Intersection  have a right angle.

**Instruction** Perpendicular lines.

- When two lines intersect at a right angle, they are called “**perpendicular**.”
- Even when two lines are not intersecting if we can find a right angle by extending the lines, we can still call these lines are perpendicular.



**2** Which of the lines shown in the figure below are perpendicular to Line A?



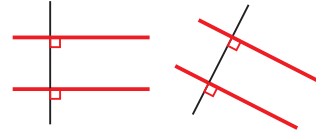
# 7 - 2

## Perpendicular / Parallel Lines and Quadrilaterals

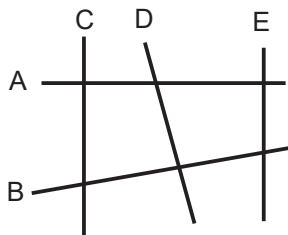
### Arrangements of Lines

**Instruction** Parallel lines.

- When two lines are perpendicular to another line, these two lines are called “parallel.”

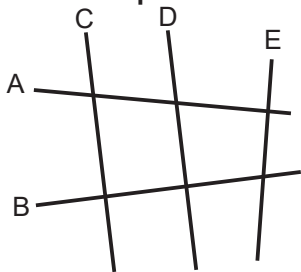


**Example 1** Which pair of lines are parallel to each other?



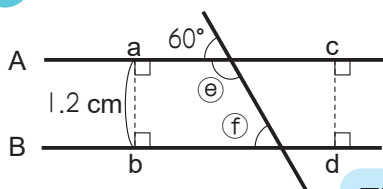
C and E

**1** Which pair of lines are parallel to each other?




**Example 2** Line A and B are parallel.

- Find the length of line c d.
- Find the size of the angles.



Length of line c d

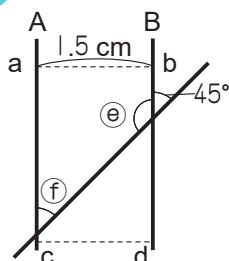
Angle e

Angle f

The length between two parallel lines is the same everywhere, which means parallel lines never intersect.



**2** When Line A and B are parallel, **1** find the length of cd and **2** find the size of angles e, f.



Length cd

Angle e

Angle f

# 7 - 3

## Perpendicular / Parallel Lines and Quadrilaterals

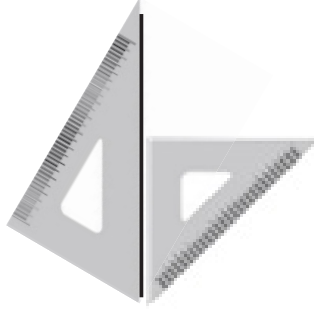
### How to Draw Perpendicular / Parallel Lines

**Instruction** How to draw perpendicular line.

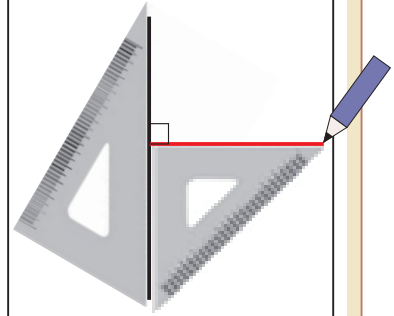
1. Match a side of a set square to the given line.



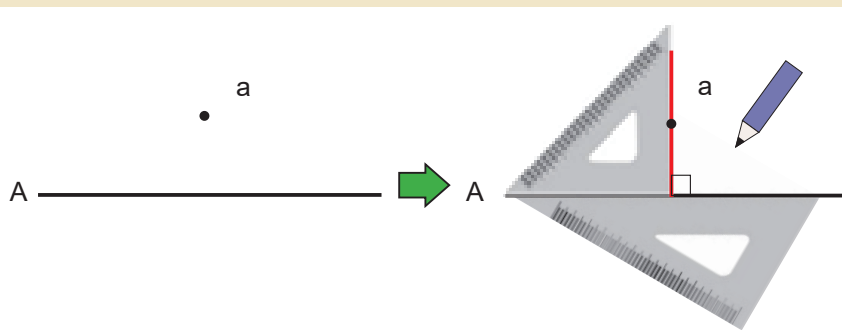
2. While holding the set square on the left, place the other set square so that the sides of the right angle matches the line.



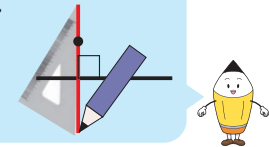
3. Hold the set squares down and draw a line.



**Example 1** Draw a perpendicular line to line A through the given point a.



If you want to draw intersected line, place the set square as shown to extend the line.



**1** Draw a perpendicular line to each the following lines through the given point.

1



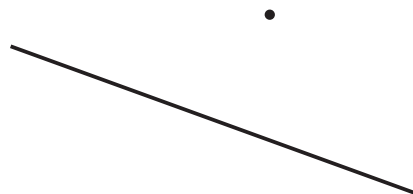
2



3



4

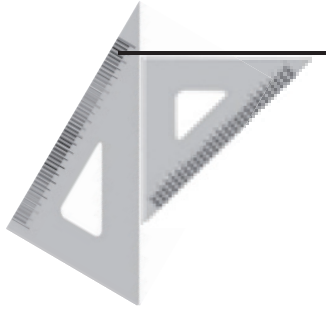


**Instruction** How to draw parallel lines.

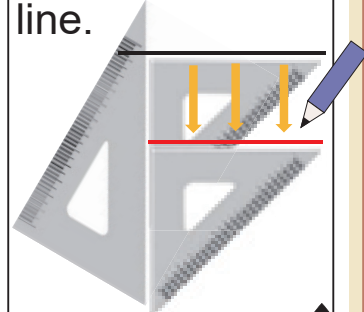
1. Line up one of the right angle sides of a set square on the line.



2. As you hold the set square on the right steady, put another set square along the other side of the right angle.



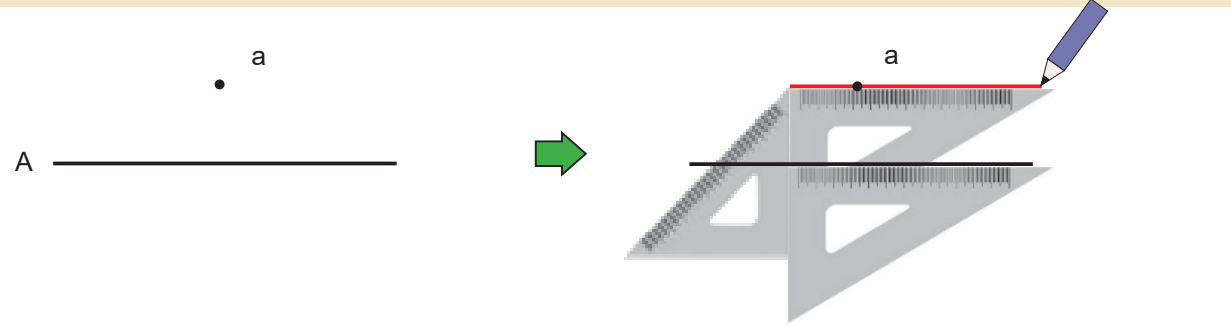
3. Slide the set square down on the right and draw another line.



Check if the two lines intersect each other or not.



**Example 2** Draw a line parallel to the given line that passes through point a.

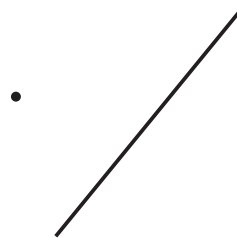


**2** Draw a line parallel to the given line that passes through the following points.

**1**



**2**



**3**

Draw lines parallel to line A. The length between all the lines should be 1 cm.

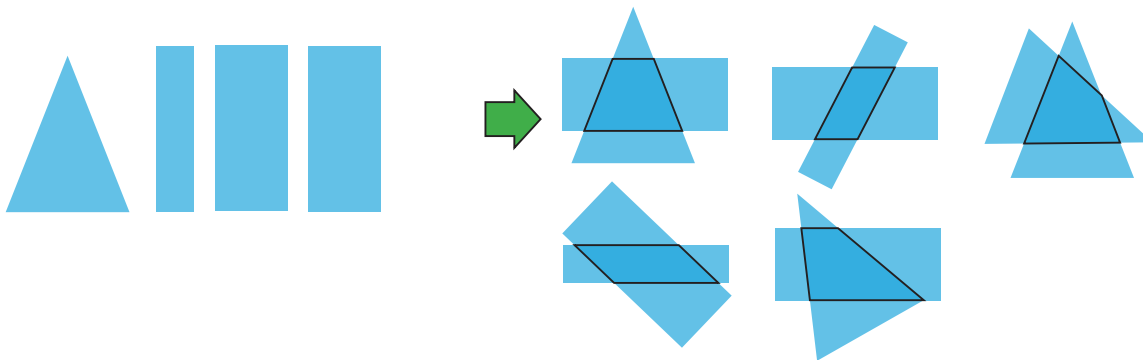


# 7 - 4

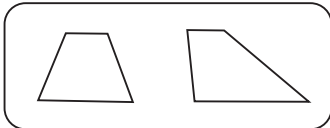
## Perpendicular / Parallel Lines and Quadrilaterals

### Various Quadrilaterals (1)

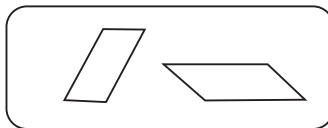
**Instruction** Make various quadrilaterals by overlapping the following figures as follows.



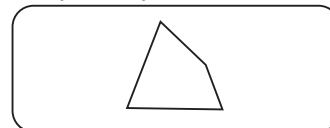
Quadrilaterals with one pair of parallel sides



Quadrilaterals with two pair of parallel sides



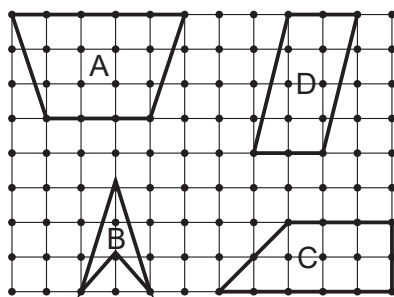
Quadrilaterals with no pair of parallel sides



● A quadrilateral with one pair of parallel lines is called a **trapezoid**.

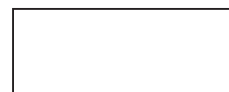
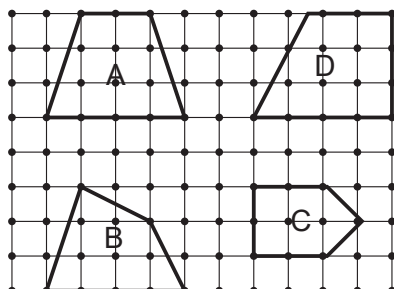


**Example 1** Find the trapezoids amongst the following quadrilaterals.

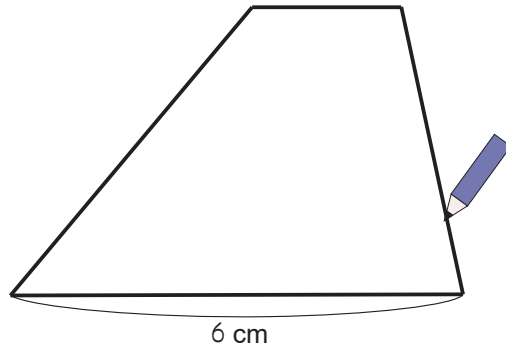
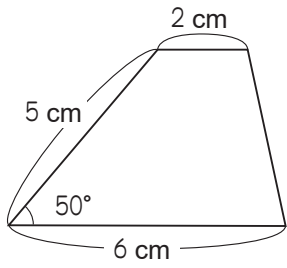


A and C

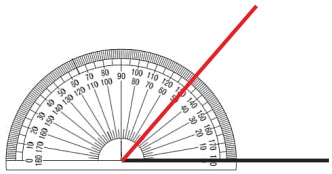
**1** Find trapezoids amongst the following quadrilaterals.



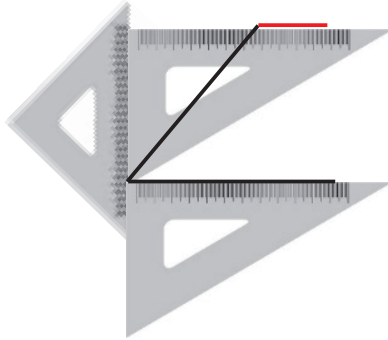
**Example 2** Draw the following trapezoid.



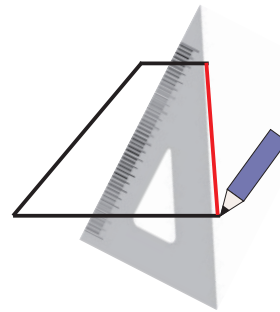
1. Draw the line with  $50^\circ$  and 5 cm length.



2. Draw the line with 2 cm parallel to the bottom line.

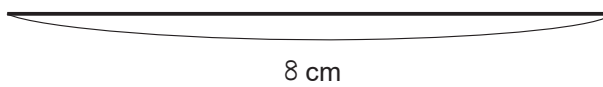
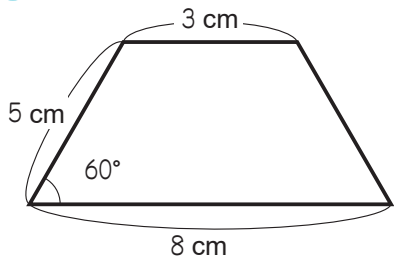


3. Draw the line to make the trapezoid.

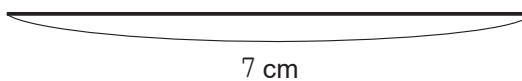
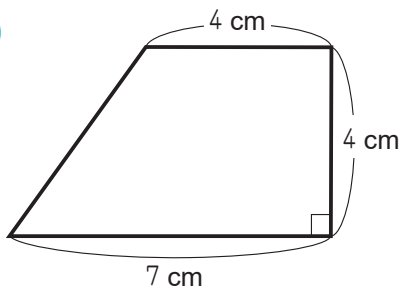


**2** Draw the following trapezoids.

1



2



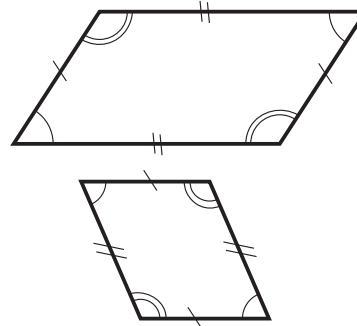
# 7 - 5

## Perpendicular / Parallel Lines and Quadrilaterals

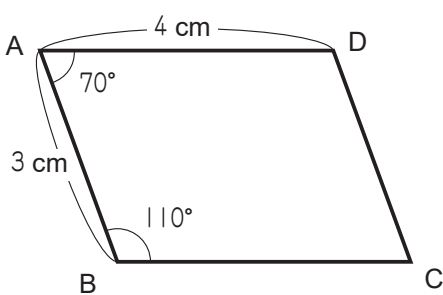
### Various Quadrilaterals (2)

#### Instruction Parallelograms.

- A quadrilateral with two pairs of parallel lines is called a **parallelogram**.
- The lengths of the opposite sides are equal.
- The sizes of the facing corners are equal.



#### Example 1 Find the following lengths and angles. Sides BC and CD, Angle C and D



Side BC

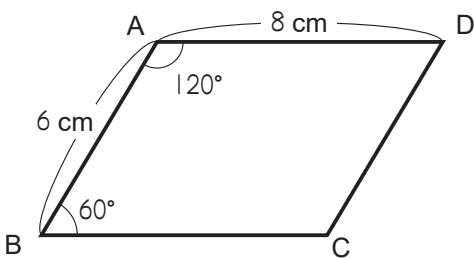
Side CD

Angle C

Angle D

#### 1 Find the following lengths and angles.

##### 1 Sides BC and CD, Angle C and D



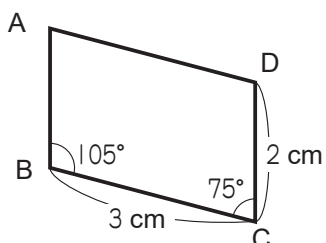
Side BC

Side CD

Angle C

Angle D

##### 2



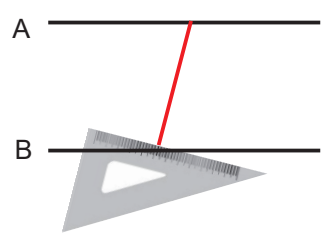
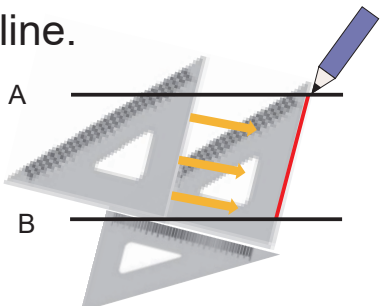
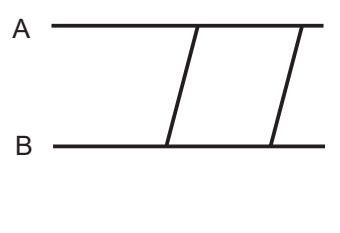
Side AB

Side AD

Angle C

Angle D

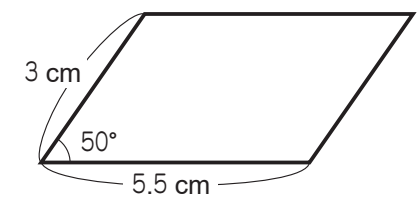
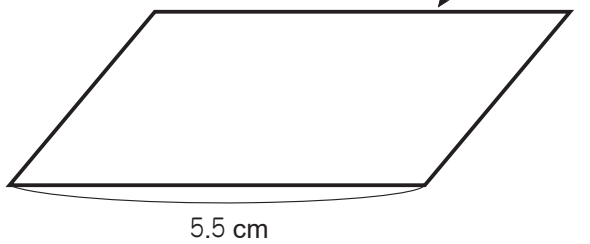
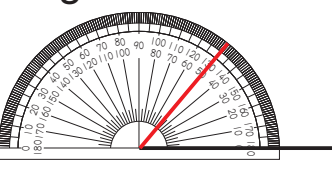
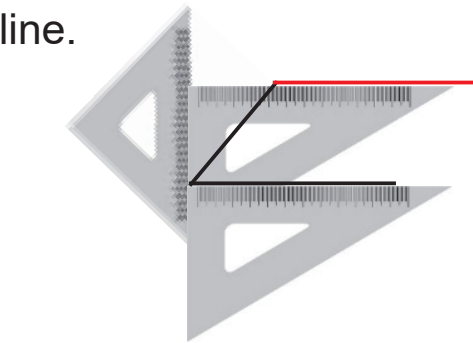
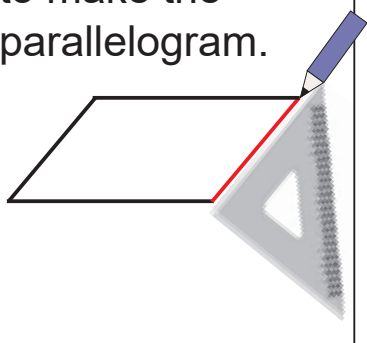
**Example 2** Lines A and B are parallel. Draw a parallelogram using these lines.

<p>1. Draw a straight line using a set square.</p> 	<p>2. Slide the set square up and down. Draw another line.</p> 	<p>3. This is your parallelogram.</p> 
--	---	---

**2** Lines A and B are parallel. Draw a parallelogram using these lines.



**Example 3** Draw the following parallelogram.

		
<p>1. Draw the line with <math>50^\circ</math> and 5 cm length.</p> 	<p>2. Draw the line with 5.5 cm parallel to the bottom line.</p> 	<p>3. Draw the line to make the parallelogram.</p> 

**3** Draw the following parallelogram.





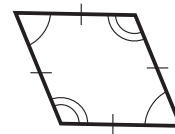
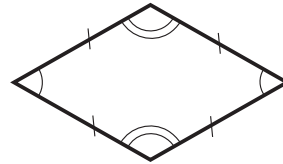
# 7 - 6

## Perpendicular / Parallel Lines and Quadrilaterals

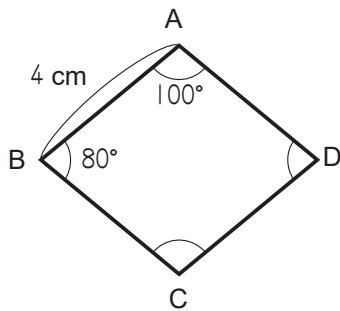
### Various Quadrilaterals (3)

**Instruction** What is a rhombus.

- A **rhombus** is a quadrilateral whose four sides are equal in length.
- The opposite sides of a rhombus are parallel.
- The opposite angles of a rhombus are equal.



**Example 1** Find the following lengths and angles.  
Sides BC, Angle C and D



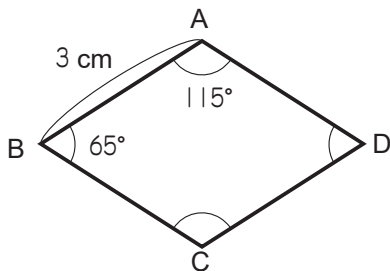
Side CD

Angle C

Angle D

**1** Find the following lengths and angles.

**1** Sides BC and CD, Angle C and D

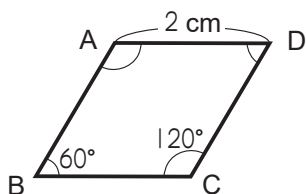


Side CD

Angle C

Angle D

**2**

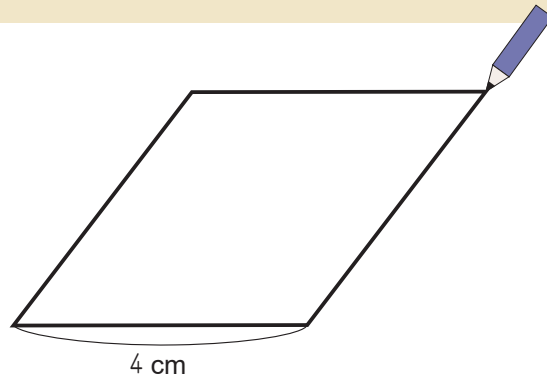
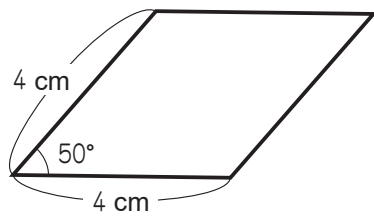


Side AB

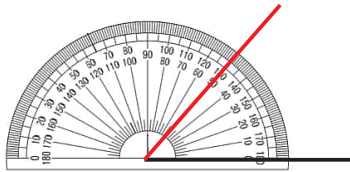
Angle A

Angle D

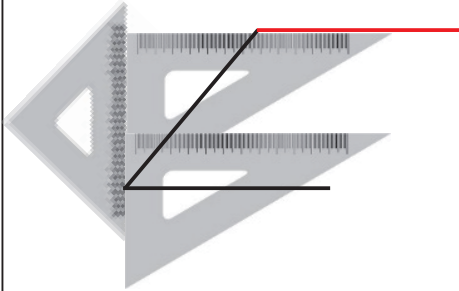
**Example 2** Draw the following rhombus.



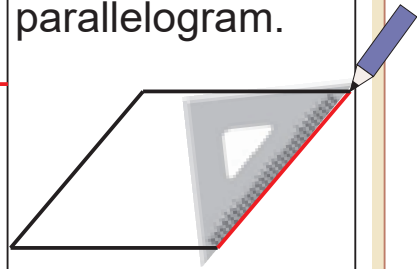
1. Draw the line with  $50^\circ$  and 5 cm length.



2. Draw the line with 5.5 cm parallel to the bottom line.

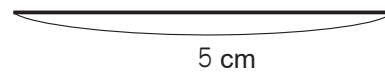
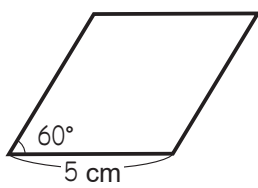


3. Draw the line to make the parallelogram.

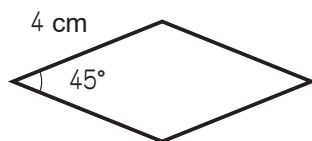


**2** Draw the following rhombuses.

1



2



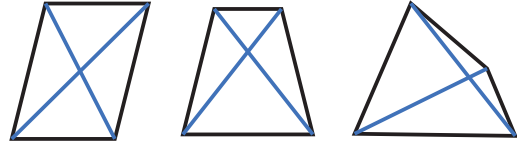
# 7 - 7

## Perpendicular / Parallel Lines and Quadrilaterals

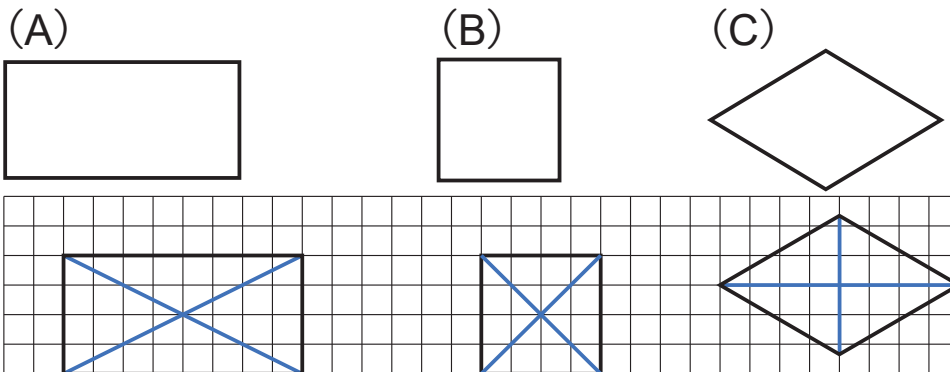
### Diagonal Lines and Quadrilaterals

**Instruction** Diagonals.

- The straight lines that connect opposite vertices are called **diagonals**.
- There are two diagonals inside a quadrilateral.



**Example 1** Examine the figures below using a compass or a set square.



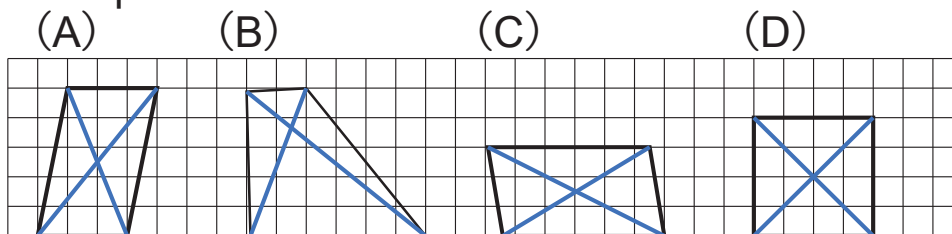
- 1 Which ones have the same diagonal length?
- 2 Which ones have diagonals that are perpendicular?
- 3 Which ones intersect at the middle of each diagonal?

A, B

B, C






A, B, C

**1** Examine the following in the figures below using a compass or a set square.



- 1 Which ones have the same diagonal length?
- 2 Which ones have the diagonals perpendicular?
- 3 Which ones intersect at the middle of each diagonal?

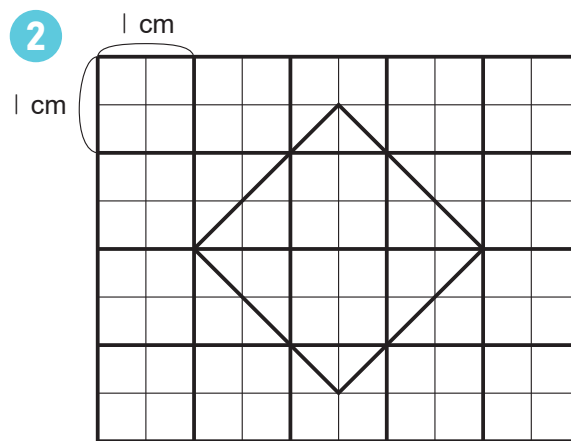
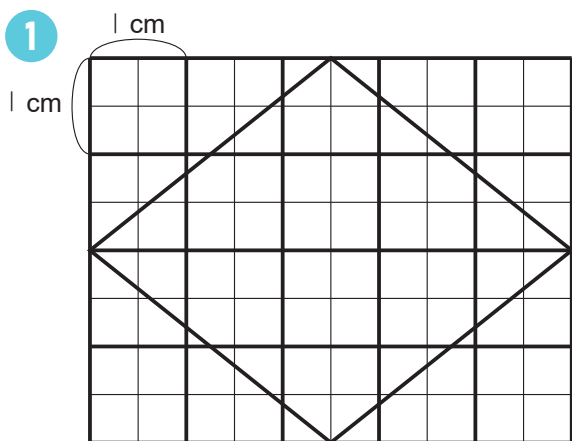

**2** Summarize the characteristics of diagonals of quadrilaterals in the table below. Write a ○ if the characteristics are true.

	Square 	Rectangle 	Rhombus 	Parallelogram 	Trapezoid 
The lengths of diagonals are the same					
The diagonals are perpendicular					
Each diagonal intersects at the middle of the line					

**Example 2** Draw the following figures.

1 A rhombus with 4 cm and 5 cm diagonals

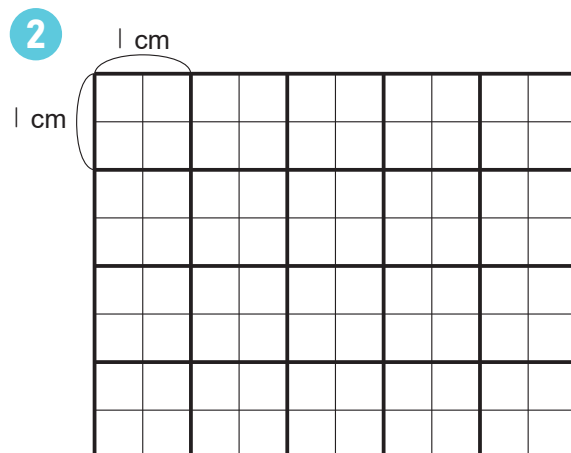
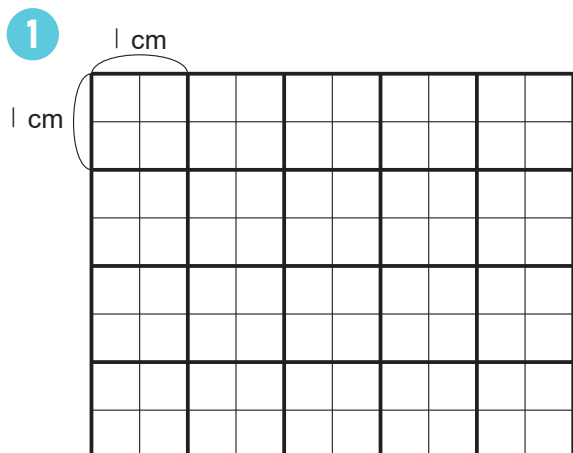
2 A square with 3 cm diagonals



**3** Draw the following figures.

1 A rhombus with 3 cm and 4 cm diagonals

2 A square with 4 cm diagonals

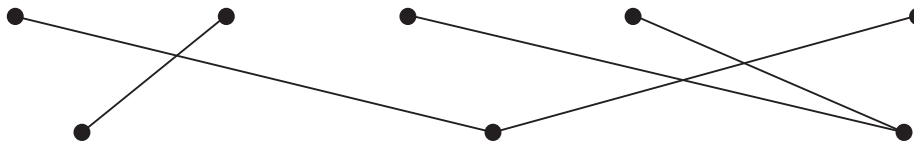
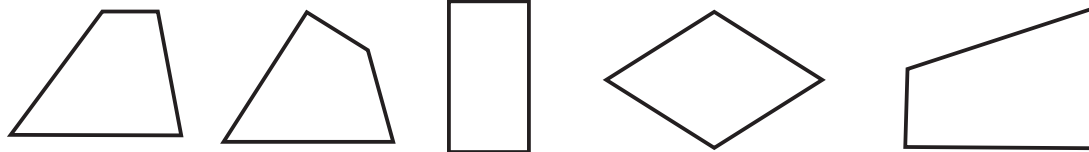


# 7 - 8

## Perpendicular / Parallel Lines and Quadrilaterals

### Classification of Quadrilaterals

**Example** Match the following quadrilaterals and its properties



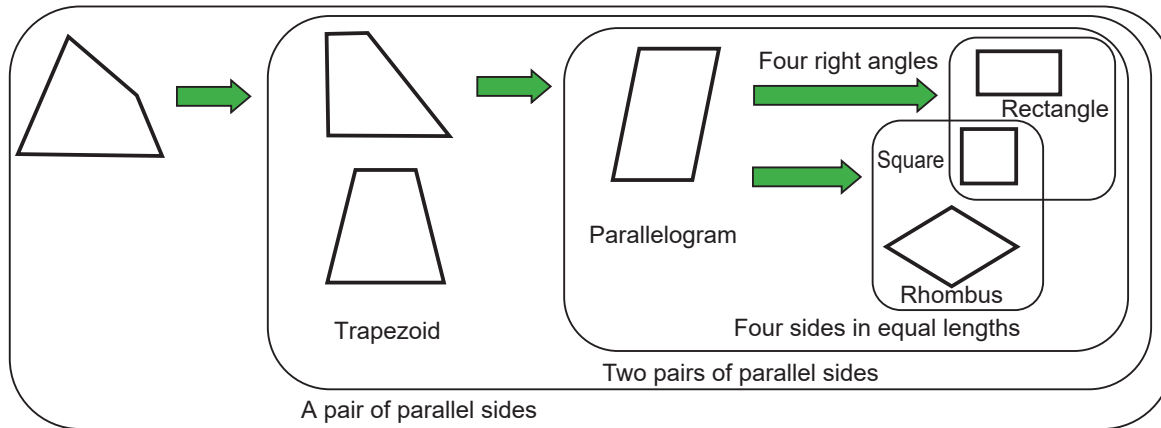
There is no pair of parallel sides.

There is a pair of parallel sides.

There are two pairs of parallel sides.

**Instruction** Classification of quadrilaterals.

Focusing on its sides or angles, quadrilaterals are classified as follows:



Four sided shapes

A pair of parallel sides

Parallelogram

Four right angles

Rectangle

Square

Rhombus

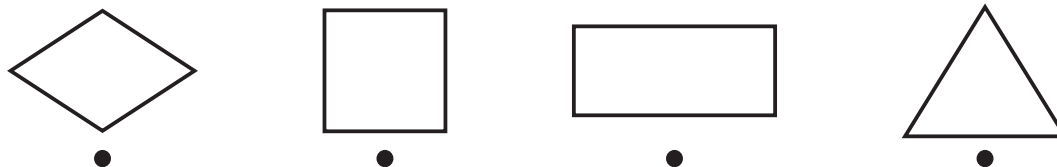
Four sides in equal lengths

Two pairs of parallel sides

Square is a kind of quadrilaterals which has many properties.



Match the following quadrilaterals and its properties



•

•

•

•

•

•

•

All the sides are in equal lengths.

There is a pair of parallel sides at least.

All the angles are the right angles.

# 7 - 9

## Perpendicular / Parallel Lines and Quadrilaterals

### Review

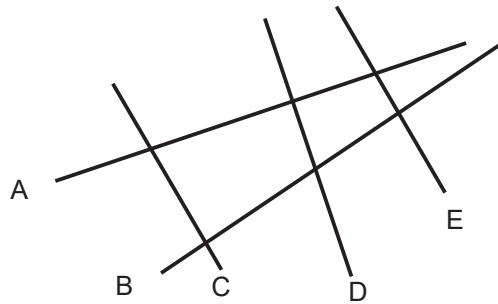
**1** Which of the following intersections have a right angle?



Intersection  have a right angle.

**2** Which of the lines shown in the figure below are the following?

- 1** Pair of perpendicular lines
- 2** Pair of parallel lines

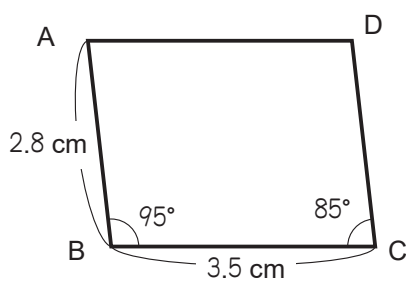


Perpendicular

Parallel

**3** Find the following lengths and angles.

**1** Parallelogram



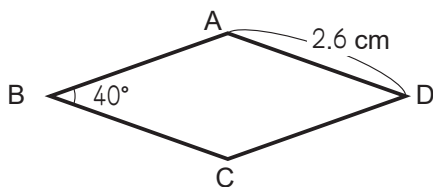
Side AD

Side CD

Angle A

Angle D

**2** Rhombus



Side CD

Angle D

Angle A