Identify parallel line segments in these photos. How could you check they are parallel?

Explore

You may need a ruler, plastic triangle, tracing paper, protractor, and Mira.
Use any methods or tools. Draw a line segment on plain paper.
Draw a line segment parallel to the line segment.
Find as many ways to do this as you can using different tools.

Reflect & Share

Compare your methods with those of another pair of classmates.
How do you know the line segment you drew is parallel to the line segment?
Which method is most accurate? Explain your choice.

Connect

Parallel lines are lines on the same flat surface that never meet.
They are always the same distance apart.
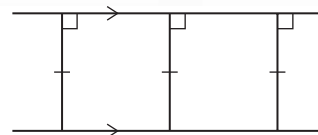
Here are 3 strategies to draw a line segment parallel
to a given line segment.

➤ Use a ruler.
   Place one edge of a ruler along the line segment.
   Draw a line segment along
   the other edge of the ruler.

➤ Use a ruler and protractor.
   Choose a point on the line segment.
   Place the centre of the protractor on the point.

Align the base line of the protractor with the line segment.
Mark a point at 90°.
Repeat this step once more.
Join the 2 points to draw a line segment parallel to the line segment.

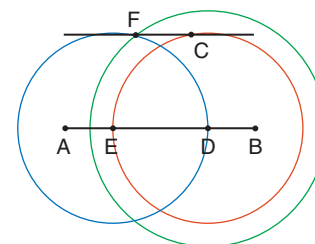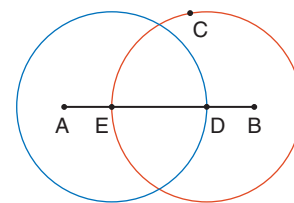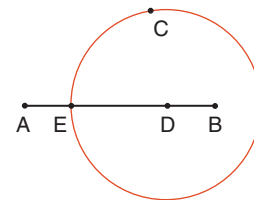➤ Use a ruler and compass as shown below.

Example

Use a ruler and compass to draw a line segment parallel to line segment AB that passes through point C.

A *line segment* is the part of a line between two points on the line.

A Solution

- Mark any point D on AB.

- Place the compass point on D.
  Set the compass so the pencil point is on C.
  Draw a circle.
  Label point E where the circle intersects AB.

- Do not change the distance between the compass and pencil points.
  Place the compass point on E.
  Draw a circle through D.

- Place the compass point on E.
  Set the compass so the pencil point is on C.

- Place the compass point on D.
  Draw a circle to intersect the circle through D.
  Label the point of intersection F.

- Draw a line through points C and F.
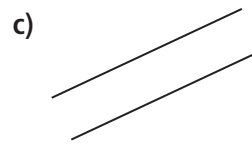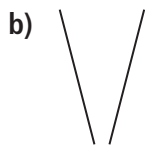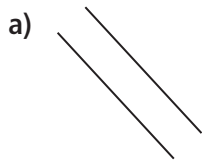 Line segment CF is parallel to AB.

The 2 line segments are parallel because they are always the same distance apart.

1. Which lines are parallel? How do you know?

a) **b)** **c)**

2. a) Draw line segment CD of length 5 cm.
   Use a ruler to draw a line segment parallel to CD.
   b) Choose 3 different points on CD.
   Measure the shortest distance from each point to the line segment you drew.
   What do you notice?

3. Draw line segment EF of length 8 cm.
   a) Use a ruler and protractor to draw a line segment parallel to EF.
   b) Use a ruler and compass to draw a line segment parallel to EF.

4. Suppose there are 2 line segments that look parallel.
   How could you tell if they are parallel?

5. Make a list of where you see parallel line segments
   in your community or around the house.
   Sketch diagrams to illustrate your list.

6. **Assessment Focus** Your teacher will give you
   a large copy of this diagram.
   Find as many pairs of parallel line segments as you can.
   How do you know they are parallel?

7. **Take It Further** Draw line segment CD.
   Use what you know about drawing parallel line segments
   to construct parallelogram CDEF.
   Explain how you can check you have drawn a parallelogram.
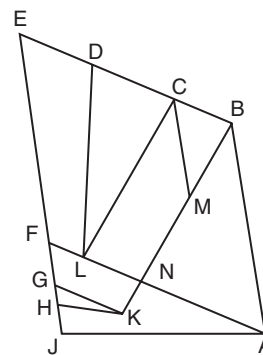
Reflect

Describe 3 different methods you can use to draw a line segment
parallel to a given line segment. Which method do you prefer?
Which method is most accurate? Explain your choice.

Focus Use different methods to construct and identify perpendicular line segments.

Identify perpendicular line segments in these photos. How could you check they are perpendicular?

Explore

You may need a ruler, plastic triangle, protractor, and Mira.
Use any methods or tools. Draw a line segment on plain paper.
Draw a line segment perpendicular to the line segment.
Find as many ways to do this as you can using different tools.

Reflect & Share

Compare your methods with those of another pair of classmates. How do you know the line segment you drew is perpendicular to the line segment?
Which method is most accurate? Explain your choice.

> **Recall that 2 lines intersect if they meet or cross.**

Connect

Two line segments are **perpendicular** if they intersect at right angles.
Here are 5 strategies to draw a line segment perpendicular to a given line segment.

➤ Use a plastic right triangle.
Place the base of the triangle along the line segment.
Draw a line segment along the side
that is the height of the triangle.

➤ Use paper folding.
Fold the paper so that the line segment
coincides with itself. Open the paper.
The fold line is perpendicular to the line segment.

➤ Use a ruler and protractor.
  Choose a point on the line segment.
  Place the centre of the protractor on the point.
  Align the base line of the protractor with
  the line segment. Mark a point at 90°.
  Join the 2 points to draw a line segment
  perpendicular to the line segment.

➤ Use a Mira. Place the Mira so that the reflection
  of the line segment coincides with itself
  when you look in the Mira.
  Draw a line segment along the edge of the Mira.

➤ Use a ruler and compass as shown below.

Example

Use a ruler and compass to draw a line segment
perpendicular to line segment AB.

A Solution

- Mark a point C on AB.

- Set the compass so the distance between
  the compass and pencil points is
  greater than one-half the length of CB.
  Place the compass point on B.
  Draw a circle that intersects AB.

- Do not change the distance between
  the compass and pencil points.
  Place the compass point on C.
  Draw a circle to intersect the first circle
  you drew.
  Label the points D and E where the
  circles intersect.

- Draw a line through points D and E.
  DE is perpendicular to AB.

To check, measure the angles
to make sure each is 90°.
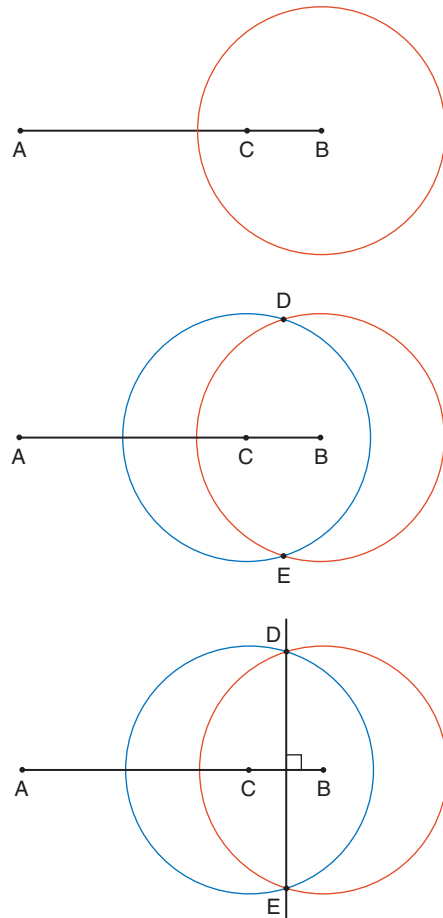
1. Which lines are perpendicular? How do you know?

a)

b)

c)
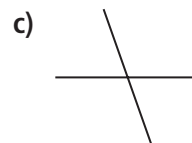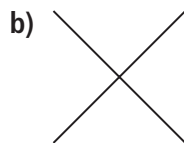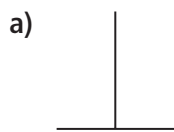
2. **a)** Draw line segment AB of length 6 cm.
Use a Mira to draw a line segment perpendicular to AB.
b) Draw line segment CD of length 8 cm. Mark a point on the segment.
Use paper folding to construct a line segment perpendicular to CD
that passes through the point.
How do you know that each line segment you drew is
perpendicular to the line segment?

3. Draw line segment EF of length 10 cm.
a) Use a ruler and protractor to draw a line segment perpendicular to EF.
b) Use a ruler and compass to draw a line segment perpendicular to EF.
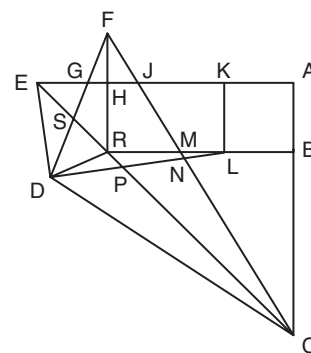**c)** Check that the line segments you drew are perpendicular to EF.

4. Make a list of where you see perpendicular line segments
in the world around you. Sketch diagrams to illustrate your list.

5. **Assessment Focus** Your teacher will give you
a large copy of this diagram.
Find as many pairs of perpendicular line segments as you can.
How do you know they are perpendicular?

6. **Take It Further** Draw line segment JK of length 10 cm.
Use what you know about drawing perpendicular and
parallel line segments to construct a rectangle JKMN, where KM is 4 cm.
Explain how you can check you have drawn a rectangle.

Reflect

Describe 4 different methods you can use to draw
a line perpendicular to a given line segment.
Which method do you prefer?
Which method is most accurate? Explain your choice.