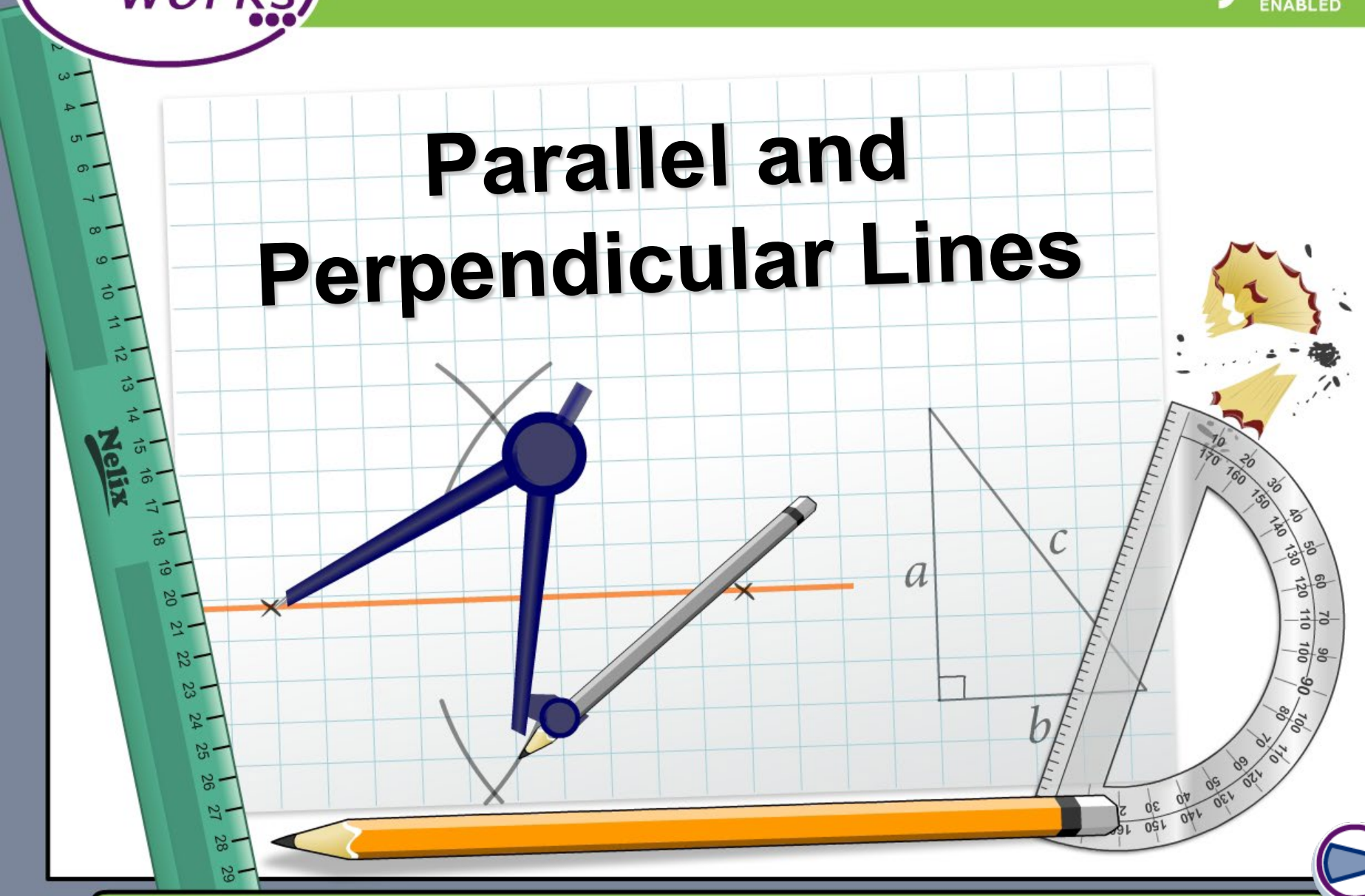
Parallel and Perpendicular Lines



Information

Common core icons

This icon indicates a slide where the Standards for Mathematical Practice are being developed. Details of these are given in the Notes field.

Slides containing examples of mathematical modeling are marked with this stamp.

This icon indicates an opportunity for discussion or group work.

The **Standards for Mathematical Practice** outlined in the Common Core State Standards for Mathematics describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

These are:

1) Make sense of problems and persevere in solving them.

2) Reason abstractly and quantitatively.

3) Construct viable arguments and critique the reasoning of others.

4) Model with mathematics.

5) Use appropriate tools strategically.

6) Attend to precision.

7) Look for and make use of structure.

8) Look for and express regularity in repeated reasoning.

This icon indicates that the slide contains activities created in Flash. These activities are not editable.

This icon indicates teacher's notes in the Notes field.

Conditional statements

A **conditional statement** has the form "if *x*, then *y*."

- *x* is called the **hypothesis**.
- *y* is called the **conclusion**.

Name a conditional statement from geometry.

The ***corresponding angles postulate***:

If... ...two parallel lines are cut by a transversal... then... ...pairs of corresponding angles are congruent.

hypothesis **conclusion**

The converse of a statement

The **converse** of a statement is given by exchanging the hypothesis and conclusion.

Find the *converse of the corresponding angles postulate*.

The ***corresponding angles postulate***:

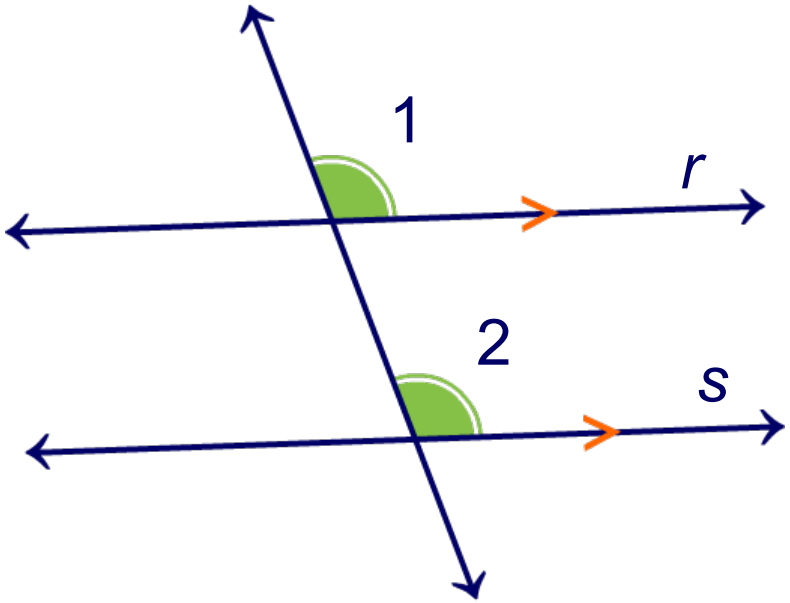
If... ...two parallel lines are cut by a transversal... then... ...pairs of corresponding angles are congruent.

The ***converse of the corresponding angles postulate***:

If... ...pairs of corresponding angles are congruent... then... ...two parallel lines are cut by a transversal.

Converse of the CAP

Converse of the corresponding angles postulate:
If two lines are cut by a transversal such that corresponding angles are congruent, then the two lines are parallel.



hypothesis: $\angle 1 \cong \angle 2$

conclusion: $r \parallel s$

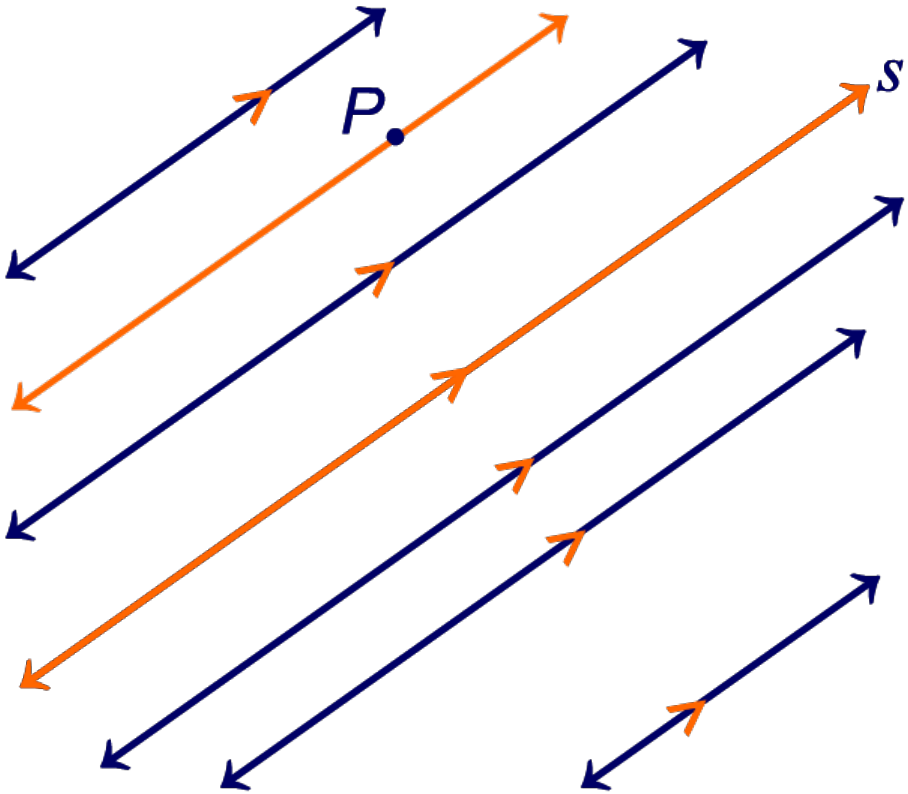
The parallel postulate

How many lines can be drawn that are parallel to s?

There is no limit.

How many lines can be drawn that are parallel to s and go through point P?

There is only one.



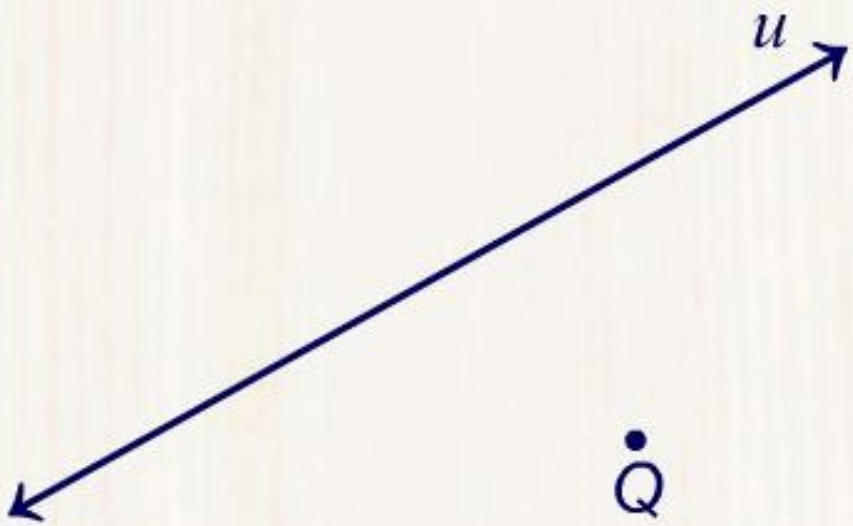
Parallel postulate: Through a point P not on line s, there is exactly one line parallel to s.

Constructing parallel lines (1)

Constructing parallel lines

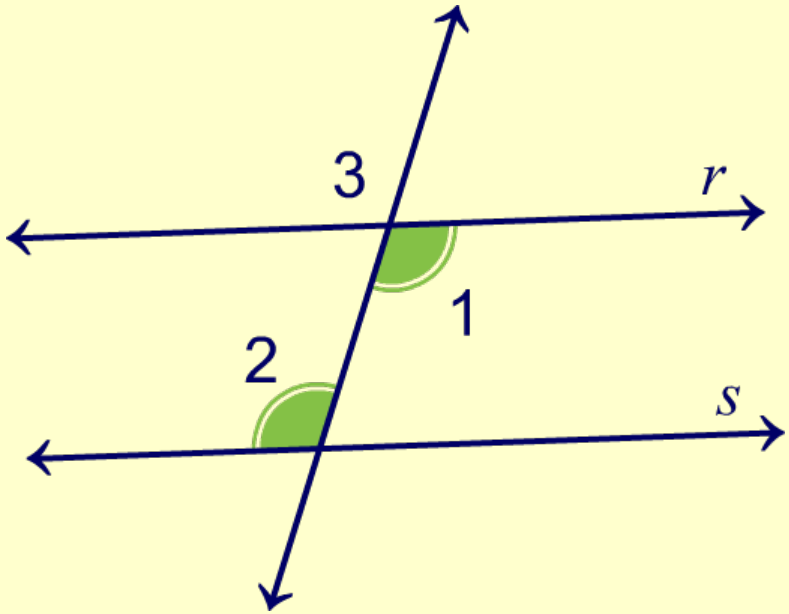
How can you make a line that goes through Q and is parallel to u using only a ruler and a compass?

Press **play** to learn more.



Proving lines parallel

What can you say about the relationship between lines r and s? Prove it.



given:	$\angle 1 \cong \angle 2$
hypothesis:	$r \parallel s$
vertical angle theorem:	$\angle 1 \cong \angle 3$
corresponding angles:	$\angle 2 \cong \angle 3$
converse of the corresponding angles theorem:	Since $\angle 2$ is congruent to $\angle 3$ $r \parallel s$ ✓

This is the ***converse of the alternate interior angle theorem***.

Converses of the angle theorems

Arrange the statements to form the converses

***Converse of the alternate interior angles theorem*:**

If...	two lines are parallel	...and...	a pair of alternate interior angles	...are congruent, then the...	two lines are cut by a transversal

***Converse of the alternate exterior angles theorem*:**

If...	two lines are parallel	...and...	a pair of alternate exterior angles	...are congruent, then the...	two lines are cut by a transversal

***Converse of the same-side interior angles theorem*:**

If...	same-side interior angles	...and...	two lines are parallel	...are supplementary, then the...	two lines are cut by a transversal

Constructing parallel lines by folding

How can you construct parallel lines by folding a piece of paper?

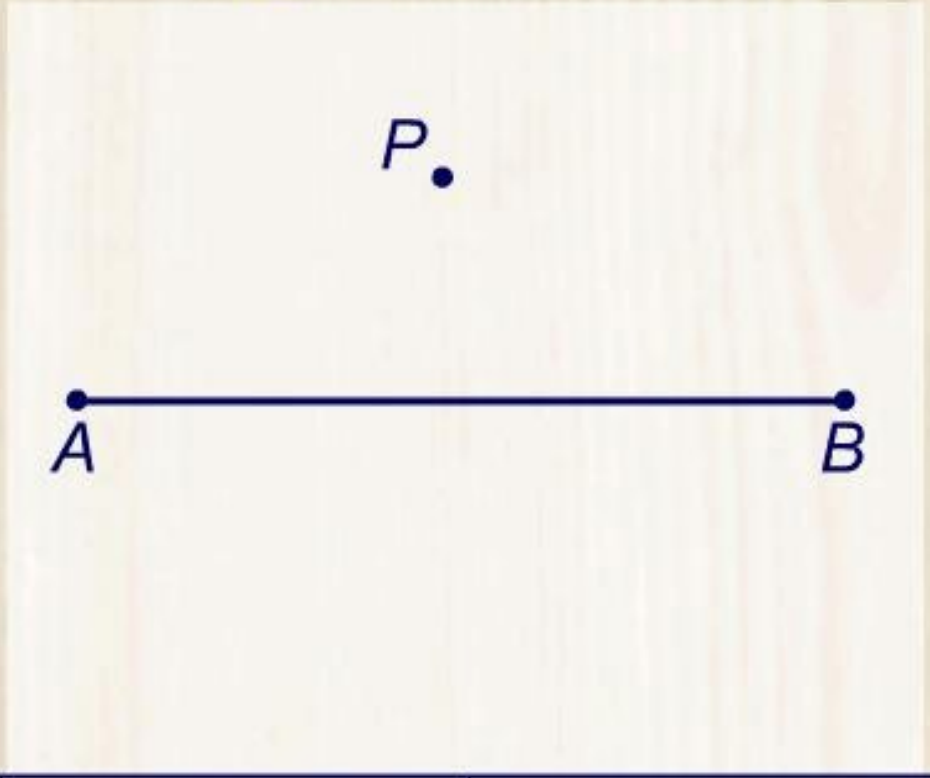
Press **play** to find out more.

Constructing a perpendicular segment from a point on a line segment

Press **play** to see how to construct a perpendicular segment from the point P on line segment $\overline{AB}$ using a ruler and a compass.

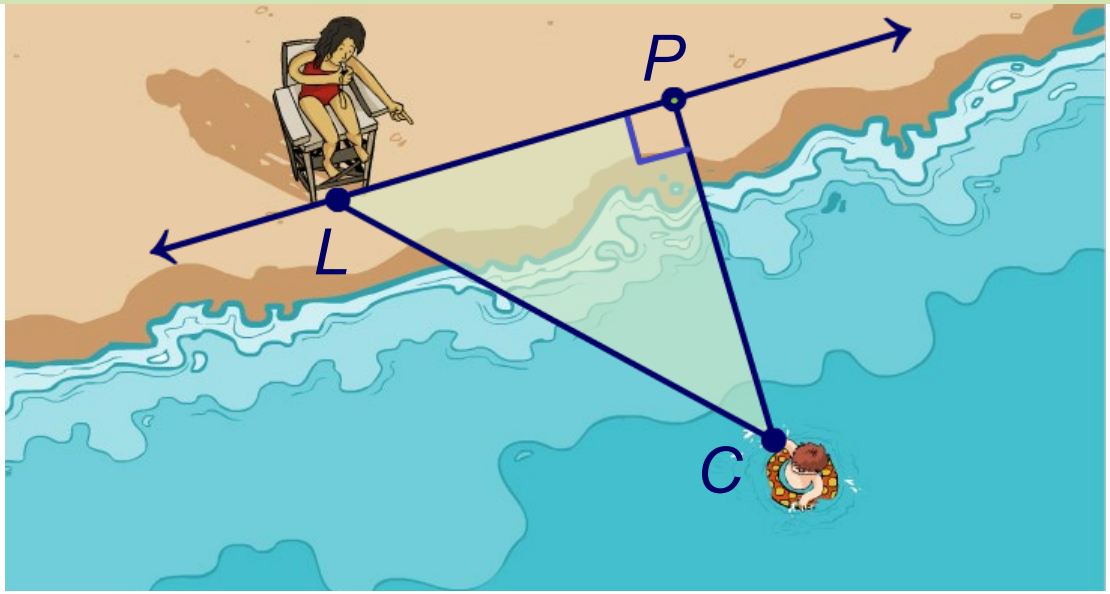
Constructing a perpendicular segment from a point to a line segment

Press **play** to see how to construct a line segment perpendicular to segment $\overline{AB}$ through point P not on the given segment using a ruler and a compass.



Shortest distance

A lifeguard on the beach sees a child in trouble. Swimming is much slower than running, so how should the lifeguard get to the child in order to minimize the distance she swims to rescue the child?



hint: draw a diagram.

Represent the beach as a line and the child and the lifeguard as points.

The shortest segment from a point to a line is always perpendicular to the line. She should run to point P, then swim to the child to minimize the distance swum.

Constructing perp. bisector (3)

Constructing a perpendicular bisector

The **perpendicular bisector** of a segment is the perpendicular line that intersects the segment at its **midpoint**.
Press **play** to see how to construct a perpendicular bisector.

Proving relationships in origami

Origami is the art of folding paper – a type of geometric construction.
See how parallel and perpendicular lines are made in the start of making an origami rose.
Press the **forward arrow** to begin.