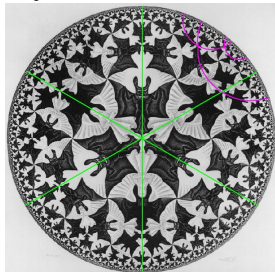Euclidean proof of I-32.

Discuss what goes wrong with the proof of I-32 on the sphere.

Escher's representation of hyperbolic geometry

http://www.malinc.se/noneuclidean/images/triangleSum.svg

What are various ideas that relate to parallel?

Write down as many definitions, ideas and concepts that relate to the meaning or visualization of parallel.
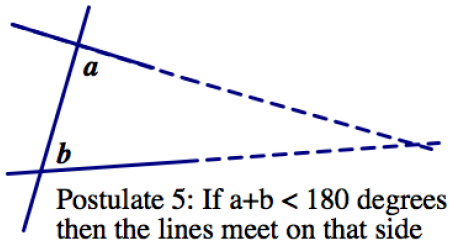
Parallel lines have so much in common

it's a shame they'll never meet

ASAP SCIENCE

Euclid's Elements 5th Postulate

If a straight line falling on two straight lines make the interior angles on the same side less than two right angles, if produced indefinitely, meet on that side...

a

b

Postulate 5: If a+b < 180 degrees then the lines meet on that side

Guess the punchline!

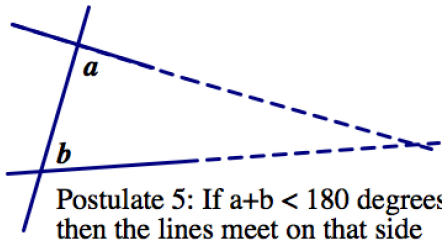# *Negation of Euclid's Elements 5th Postulate?*

If a straight line falling on two straight lines make the interior angles on the same side less than two right angles, if produced indefinitely, meet on that side...

Postulate 5: If a+b < 180 degrees then the lines meet on that side

Guess the punchline!

Consistency ⇏ Uniqueness

Wile E. Coyote

1		1

Axiom 1) Each square is a number or a mine.

Axiom 2) A numbered square represents the number of neighboring mines in the blocks immediately above, below, left, right, or diagonally touching (or a subset of those if a block is on a boundary)

How many consistent games can you find that satisfy the initial board plus the axioms?
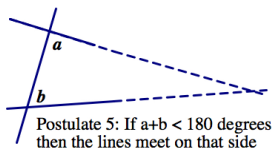
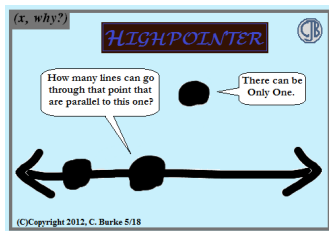# Euclid's Elements Postulates on Plane and Sphere

Euclid's 5th:
If a straight line falling on two straight lines make the interior angles on the same side less than two right angles, if produced indefinitely, meet on that side...

Playfair's:
Given a line and a point off that line there is exactly 1 parallel to the line through the point.

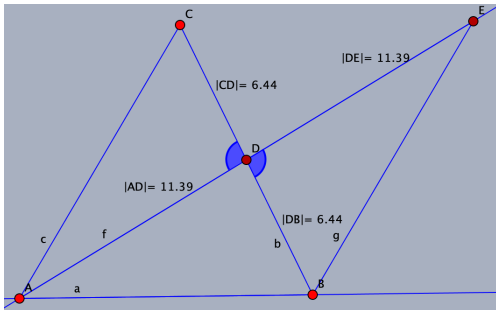Postulate 5: If a+b < 180 degrees then the lines meet on that side

Guess the punchline!

Existence Portion of Playfair's Postulate

- Create a parallel—what Euclidean propositions are we using?

Existence Portion of Playfair's Postulate

- Create a parallel—what Euclidean propositions are we using?
- Why is the perpendicular to the perpendicular parallel in Euclidean geometry but not in spherical geometry?

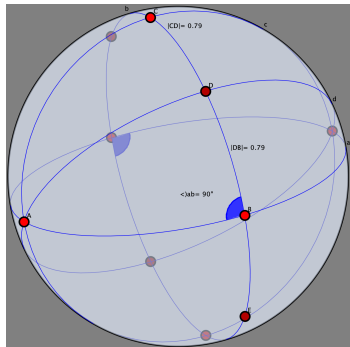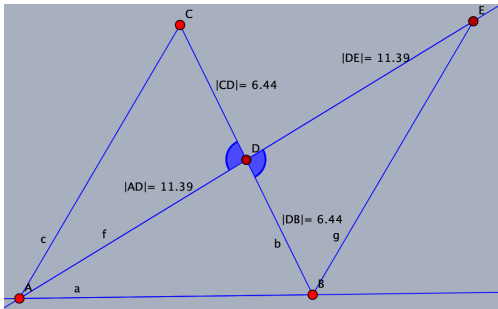# Existence Portion of Playfair's Postulate

- Create a parallel—what Euclidean propositions are we using?
- Why is the perpendicular to the perpendicular parallel in Euclidean geometry but not in spherical geometry?

Existence Portion of Playfair's Postulate

- Create a parallel—what Euclidean propositions are we using?
- Why is the perpendicular to the perpendicular parallel in Euclidean geometry but not in spherical geometry?
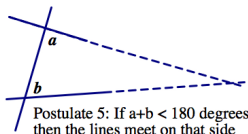- Euclid's 5th Postulate is vacuously true on the sphere so unlike what is listed on the web and in some books, the statements are different. We will prove: Euclid's 5th Postulate plus Euclid's other axioms before I-31 prove Playfair's (underlying assumptions like for SAS!)
- We will also investigate parallels in hyperbolic geometry.

Postulate 5: If a+b < 180 degrees then the lines meet on that side

Guess the punchline!

(x, why?)

HIGHPOINTER

How many lines can go through that point that are parallel to this one?

There can be Only One.

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Dr. Sarah