

Perspective Drawing

Subject Area: Geometry **Grade Level:** 9-12 **Date:** 8/4/14

Abstract Lesson Overview

- The concept of parallel lines and the angles created when a transversal cuts through them, as well as the concept of the proportionality of similar figures will be taught through perspective drawing. In an introduction, students will learn a little about the history of perspective drawing, what it is, and how it is used. They will then draw perspective lines on photographs, create their own perspective drawings, and discover properties of parallel lines and similar figures through their perspective photos and drawings.

Instructional Materials Needed

- Computer and projector (teacher)
- Tracing paper
- Ruler
- Photographs/Internet and printer access for students

Instructional Materials Provided

- Powerpoint
- Word Documents (3 assignments and an assessment)
- Photographs for activities

Expected Student Outcomes

- Students will be able to identify one and two-point perspective drawings.
- Students will be able to explain properties of parallel lines.
- Students will be able to explain proportionality.

Student Deliverables

- A photo with horizon line and perspective lines overlain
- Their own perspective drawing
- A photo they overlay with horizon and perspective lines and label angles and similar figures

Cost of Lesson: \$25 (tracing paper)

Duration of Lesson: 5 Days

❑ **Culminating Activity and/or Assessment**

- Students will be given a photograph and be responsible for drawing the horizon and perspective lines, and labeling:
 - A set of parallel lines
 - Alternate interior angles and their measures
 - Vertical angles and their measures
 - A linear pair and the measure of each angle in it
 - A set of similar figures, the lengths of their sides, and the constant of proportionality

❑ **Enrichment Suggestions**

- This will help me prepare my students for a later project, when they draw a floorplan and create a 3-D model of it. The concept of proportional thinking and the exposure to drafting and measurement will begin here to be built upon in future projects and lessons.

❑ **Additional Resources**

- <http://legacy.mos.org/leonardo/zone.html>
- <http://www.mathsisfun.com/geometry/parallel-lines.html>
- <http://www.math.com/school/subject3/lessons/S3U3L2GL.html#sm1>

❑ **CTE Pathway Standards**

- Communications 2.5: Communicate information and ideas effectively to multiple audiences using a variety of media and formats
- Problem Solving and Critical Thinking 5.4: Interpret information and draw conclusions, based on the best analysis, to make informed decisions.
- Responsibility and Flexibility 7.5: Apply high-quality techniques to product or presentation design and development.

❑ **CA Common Core Standards**

- Geometry G-SRT 2: Determine if two figures are similar and apply definition of similar figures.
- (Building to) Geometry G-CO 9: Prove theorems about parallel lines.
- Integrated Math 1: G-CO 1 and 2: Experiment with transformations.

❑ **Lesson Plan Relevance to Externship**

- I was placed with the UC Davis Solar Decathlon Team. I was able to watch people working on a variety of parts of the design of a zero net energy solar home. The competition is more than a year away, so they are still putting their design concepts on paper. While watching the design team discuss, I witnessed one team member who was sketching the home from a variety of perspectives, so I asked him more about it. I was unfamiliar with perspective drawing before this experience, and I thought it would be a great way to bring art and interesting images into my geometry classroom. I soon realized it would also give the opportunity to introduce parallel lines and similar figures in a more interesting way than in a vacuum (as is traditionally done with geometry textbooks.)

Description of Activities

(A ten-day lesson plan is not required)

❑ Activity Day One:

Powerpoint on one and two point perspective will be shown in class. On their own, students will either take pictures or find them online, one for each perspective. They will bring printed copies day two.

❑ Activity Day Two:

Students will overlay their photographs with tracing paper and draw lines to find the vanishing points on their photos. They will also identify parallel lines, vertical angles, and a linear pair in the photos. For homework, they will create/finish their own perspective drawing.

❑ Activity Day Three:

Students will be given a photograph and they will need to find the vanishing points, horizon lines, a set of parallel lines, and a transversal. They will measure angles surrounding the parallel lines to discover properties of different angle pairs when lines are parallel. (They will contrast the relationships with those of the same angle pairs when lines are not parallel.)

❑ Activity Day Four:

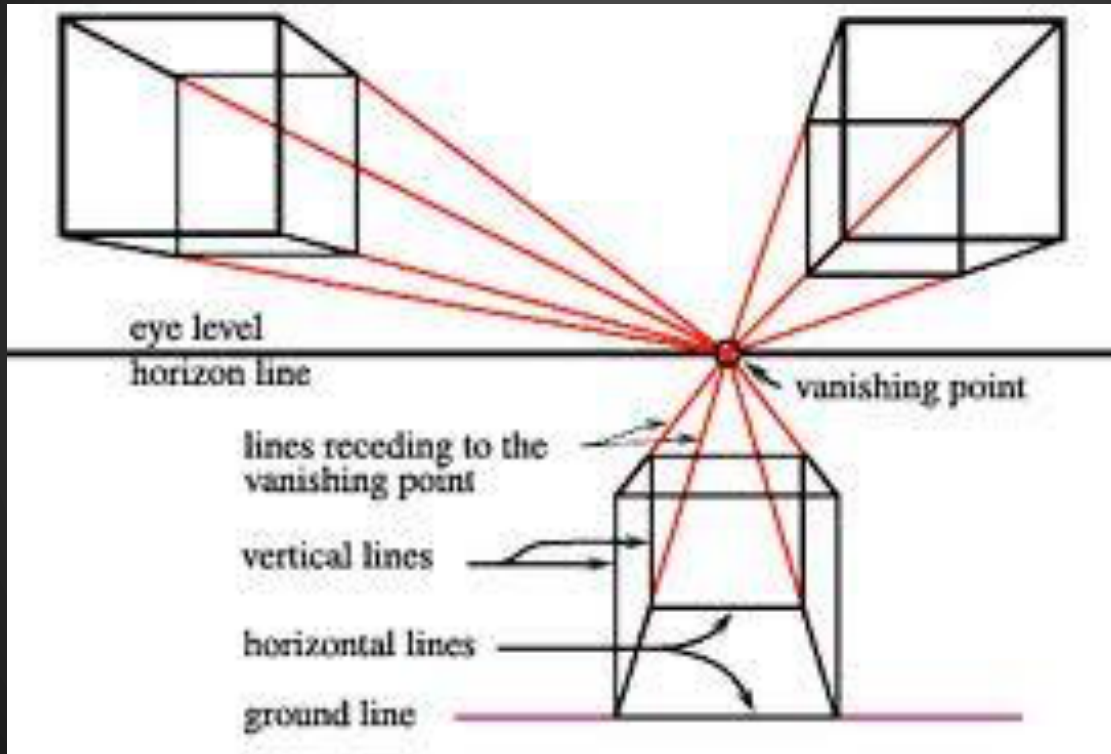
Students will be given a photograph with similar figures (identical objects, repeated in perspective) in it. They will measure the lengths of the sides of each object and label them. They will also measure the interior angle measures. Then they will explain what they found about the interior angles (they should match) and find the constant of proportionality between the two objects.

❑ Activity Day Five:

Students will be given a photograph and tracing paper, and they will be asked to synthesize their learning and show:

The horizon line, the vanishing point, a set of vertical angles and their measures, a set of parallel lines, a transversal, a set of alternate interior angles and their measures, a set of corresponding angles and their measures, a set of alternate exterior angles and their measures, a set of consecutive interior angles and their measures. They will also need to show a set of similar figures, the measures of their sides and interior angles, and the constant of proportionality between them.

One Point Perspective





Vanishing Point

Horizon Line







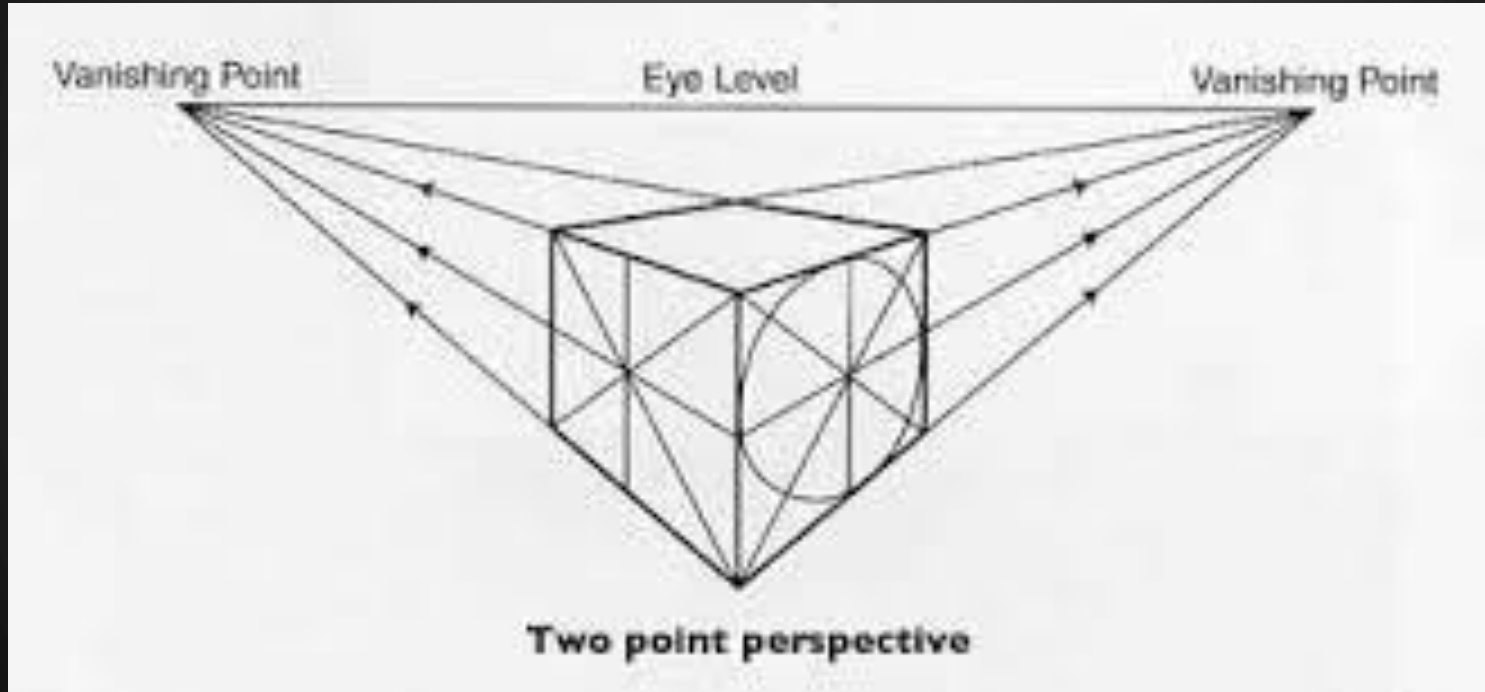


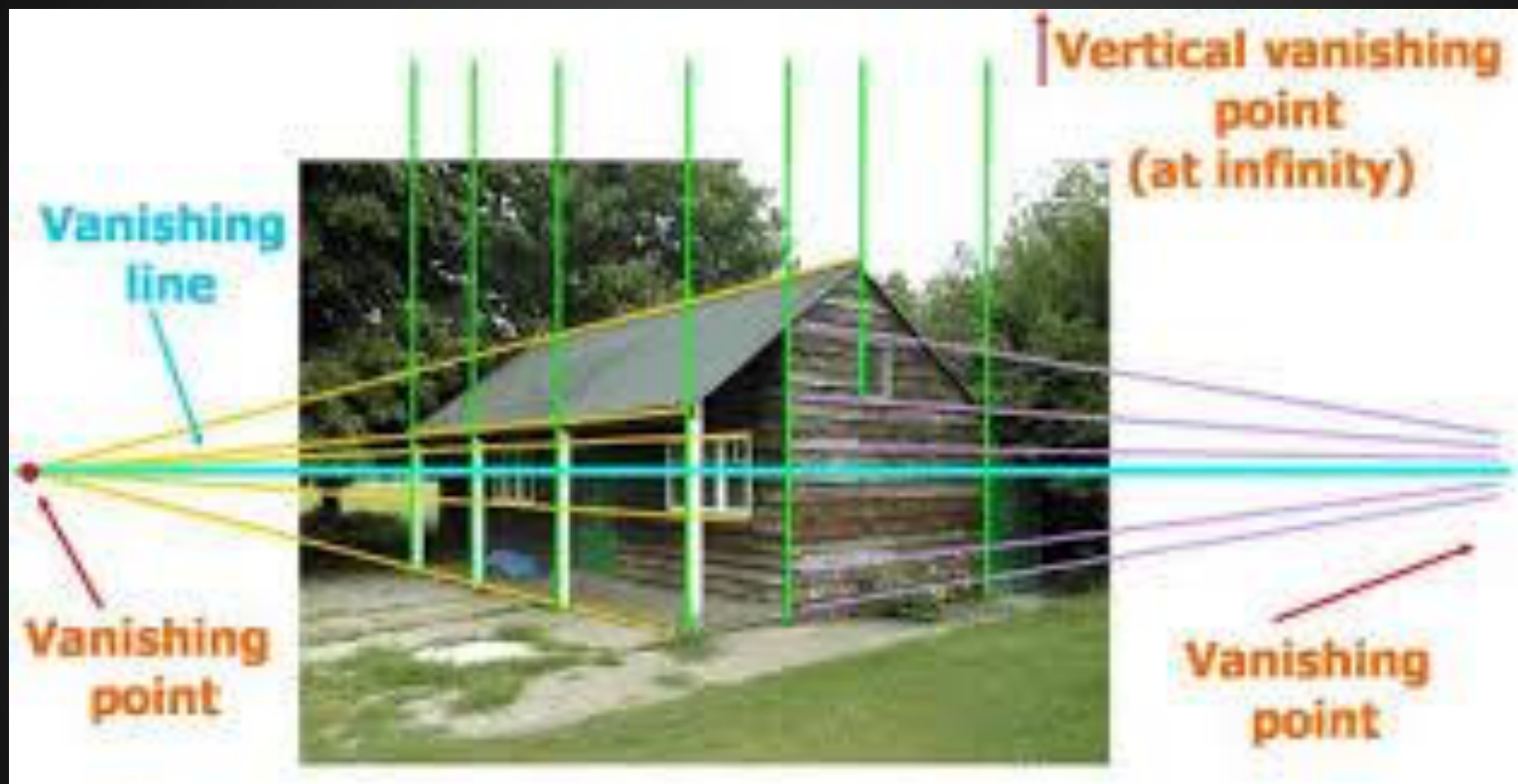


Mattias Reblisch ©



Two Point Perspective









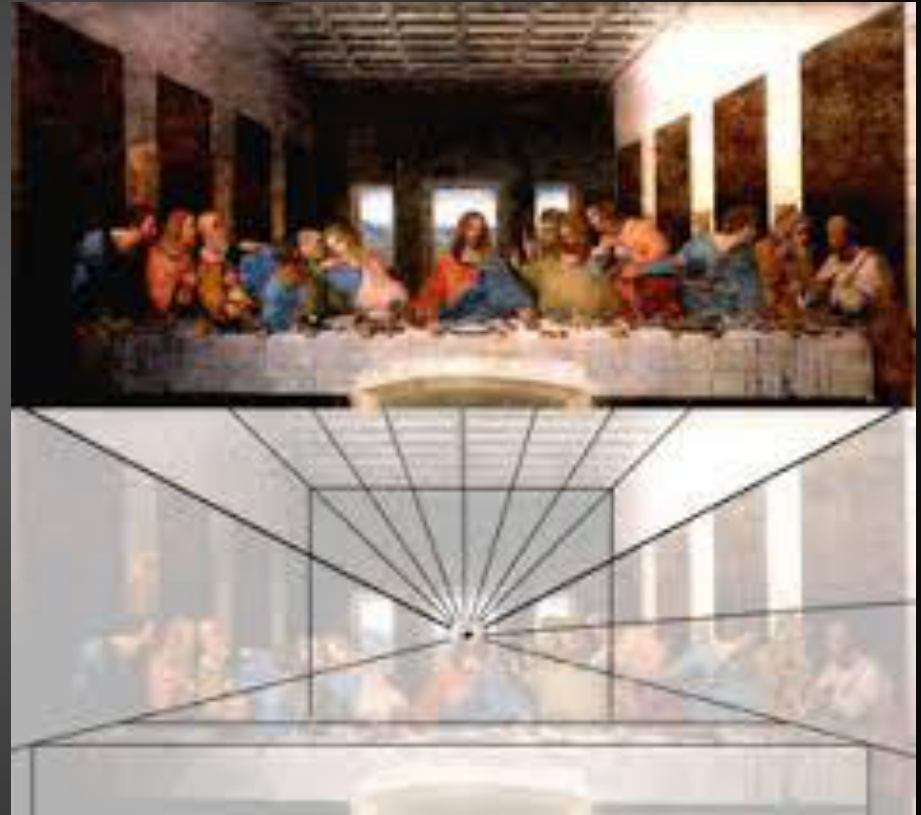


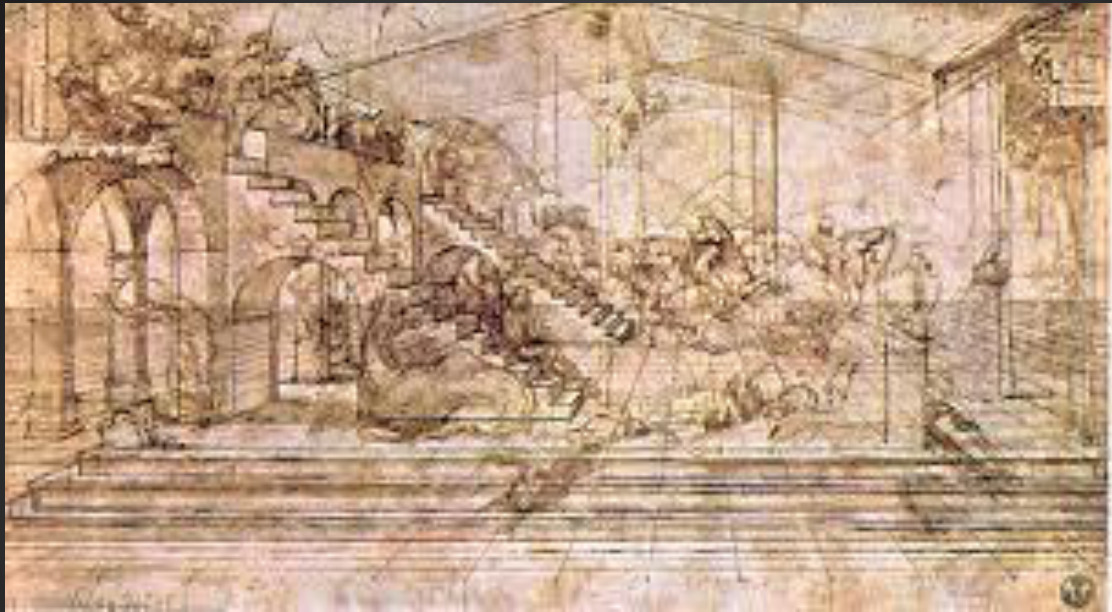
Task #1

Bring two printed photographs (can be from school printer) to class: one in one-point perspective, one in two-point perspective. You must be able to locate the vanishing points and horizon on each photo. You may take the photos yourself or find them online.

Leonardo Da Vinci

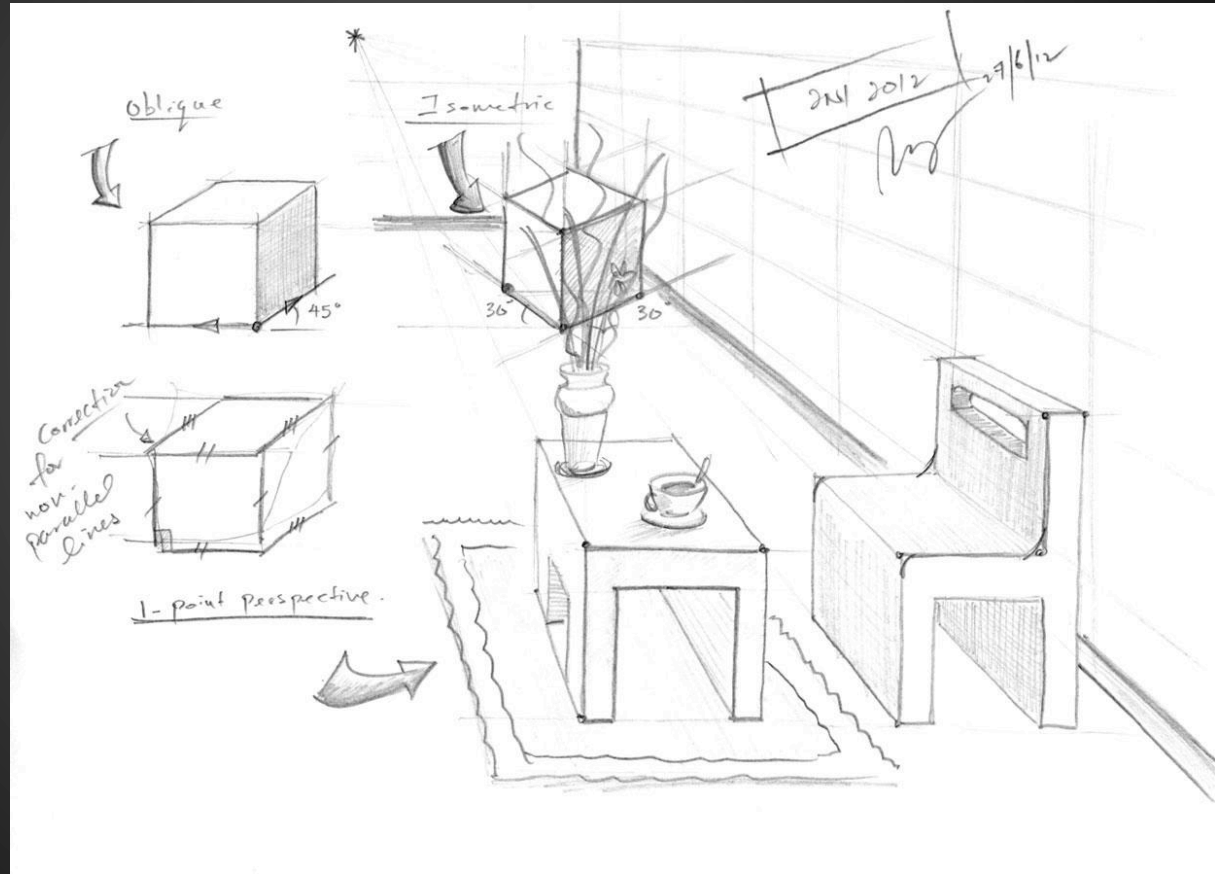
Incorporated
perspective into his
art--one example of
how he used
Geometry in his work.





Who uses this now?

Artists
Architects
Designers



Name: _____
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Perspective Drawing Project--Day Two

Overlay each of your photographs with tracing paper, or draw directly on the photo. You need to draw enough lines, from above and below the horizon (if possible) to find your vanishing points. Label the horizon (eye-level) line, vanishing points, and any vertical or horizontal lines in the picture.

To refresh, please define the following terms:

Vertical Angles:

Linear Pair:

Parallel Lines:

On your photographs, please locate, measure, and label:

- one pair of vertical angles
- one linear pair

Also locate and label:

- one pair of parallel lines

Homework: Draw your own one or two point perspective drawing with at least three objects!

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Perspective Drawing Project--Day Three

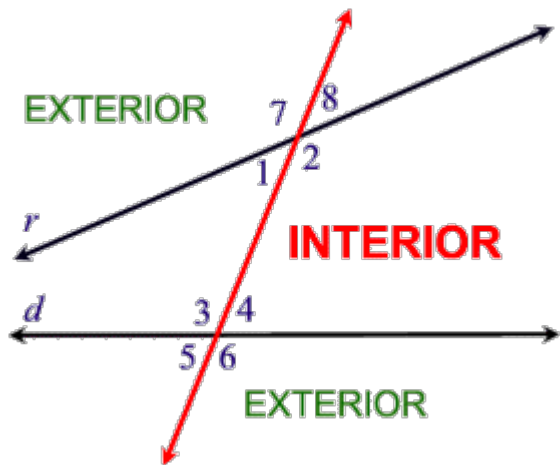
Define Transversal:

On the given photograph, find the vanishing point(s), horizon lines, a set of parallel lines, and a transversal. Using a protractor, measure all of the angles surrounding the parallel lines. What do you notice?

Now, on that same photograph or just on a piece of paper, trace/draw two lines that are not parallel and draw a transversal through them. Measure all the angles surrounding the lines and transversal. What do you notice?

Given the diagram on the back of this sheet, what conclusions can you draw about different angle relationships when lines are parallel? Write down as much as you have discovered as clearly as possible, using complete sentences.

Different angle pair relationships have specific names:



There are four sets of Corresponding angles:

- Angle 1 and Angle 5
- Angle 3 and Angle 7
- Angle 2 and Angle 6
- Angle 4 and Angle 8

Two sets of Alternate Interior Angles:

- Angle 1 and Angle 4
- Angle 3 and Angle 2

Two sets of Alternate Exterior Angles:

- Angle 6 and Angle 7
- Angle 5 and Angle 8

Two sets of Same Side Interior Angles:

- Angle 2 and Angle 4
- Angle 1 and Angle 3



yaman konuralp © photography



Name: _____
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Perspective Drawing Project--Day Four

On your given photograph, find two objects (windows, columns, posts, doors...) that are identical, but one closer to the vanishing point than the other. With a straightedge, trace the two objects very carefully.

Now, using a ruler, measure the lengths of the sides of each object and label them. You may use inches or centimeters, but be consistent. Using your protractor, measure the interior angles.

What do you notice about the interior angle measures of the two objects?

Look at the lengths of the sides. Do you notice anything about the relationship between the lengths of the sides of the smaller object and the corresponding sides of the bigger object? If you could not measure one or more of the sides, do you think there is a way to find their lengths anyway?

This is not a trick question: there is a way. Choose a side on the smaller figure, and call it "a." (Label these.) Make the corresponding side on the bigger figure "A." Now choose another side on the smaller figure and call it "b." Call the corresponding side on the larger figure "B." Now, using the measurements you found for a, b, A, and B, find the following:

$$\frac{a}{b} = \frac{A}{B}$$

$$\frac{a}{A} = \frac{b}{B}$$

Are your answers the same? They should be. This number, or constant, is the constant of proportionality. If you multiply any side length on the smaller figure by it, you should find the length of the side on the larger figure. If you divide any side length on the larger figure by it, you should find the length of the side on the smaller figure.

Now try this:

$$\frac{?}{?} = \underline{\quad}$$

$$\frac{?}{?} = \underline{\quad}$$

What do you find here? Can you explain what is happening? How could you use this information? Explain in complete sentences.





Name: _____
Workshop #: _____ Date: _____

Perspective Drawing Project--Day Five

Given your photograph, label the following:

The horizon line and the vanishing point. Explain here what you have learned about the history of perspective drawings and who uses them today. Write in complete sentences and also share what you liked about this unit, and what you thought could have improved it.

Now, find and label:

A set of vertical angles and their measures, a linear pair and their measures, a set of parallel lines, a transversal, a set of alternate interior angles and their measures, a set of corresponding angles and their measures, a set of alternate exterior angles and their measures, and a set of same side interior angles and their measures.

Explain what you have learned about angle relationships. Be specific and go into as much detail as possible. Write down everything that seems pertinent in complete sentences!

Next, trace the outline of a set of similar figures. Find and label the measures of their sides and interior angles.

Find the constant of proportionality between them. Show all your math here.

Explain what the constant of proportionality is. What else have you learned about similar figures through this unit? What do you know about their angles and the relationships between their sides? Be clear, concise, and use complete sentences.







j.ruivivar photography

