Nov. 11 - Mth171 Agenda

- Return / discuss portfolios
- Volume formulas (etc.) for pyramids & prisms
- Platonic solids
    - Definition
    - How many are there?
    - Nets, models
    - Duals
- If time, meet & work on group presentations

HW 7.2 #9, 10, 12, 13, 14, 17-22.

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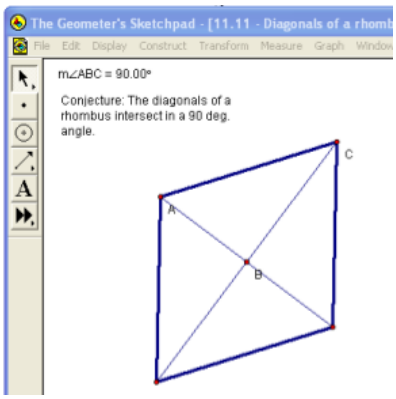
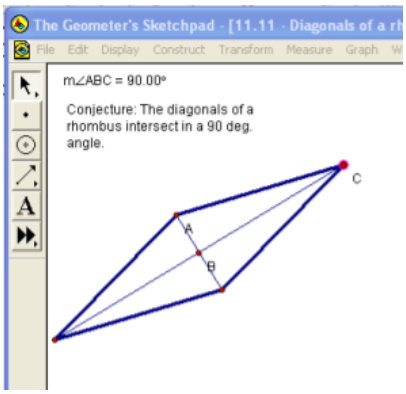
Portfolio Comments:

1. What is a "conjecture"?

    (A conjecture is a proposition; it may be supported by examples or disproved with a single counter-example)

    To satisfy the "explore and illustrate conjectures" clause, you might explore why the construction gives the desired result.

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Portfolio Comments:

2. Formatting Math in Word
   - Equation editor
   - Making diagrams
   - Including GSP sketches

3. Organization Tips
   - Try to make it "skim-able" (at a glance) without skimping on depth.
   - Include a T.O.C. and a lead-in to each artifact.
   - It helps to include a title on each page.
   - Use annotations throughout to guide your reader and explain what this shows.

4. Be reflective - What have you learned? Why is this important to you? How does this fit into K-12? Etc.

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**Course Objectives:** Recall the course objectives, as outlined on your syllabus:

1. Formulate and test conjectures about geometric principles and relationships.

2. Provide formal and informal arguments about geometric principles.

3. Use ruler and compass constructions and Geometer's Sketchpad to illustrate and explore geometric conjectures.

4. Describe and analyze the properties of pyramids, prisms, and other three dimensional figures, including the Platonic and Archimedean solids.

5. Apply transformations to 2D and 3D objects and describe and analyze the effects of those transformations.

6. Describe and analyze the similarities and differences between Euclidean geometry and other non-Euclidean geometries, including the taxicab geometry and spherical geometry.

7. Reason about topological properties such as connectedness, orientability, and dimension.

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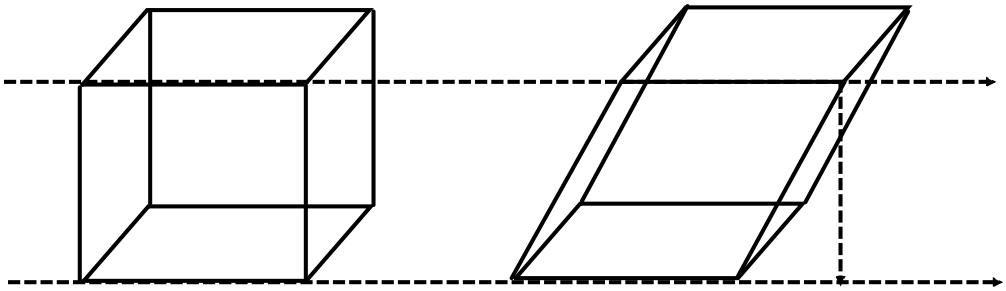
## Volume Formulae: Prisms

It is a (perhaps suprising) fact that the volume of any prism is

$V = (A_{base})(h)$.

This is true if the base is regular or not, and whether the prism is skew or right.



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## Volume Formulae: Pyramid

It is a (perhaps even more suprising) fact that the volume of any pyramid is

$V = (1/3)(A_{base})(h)$

That is, the volume of a pyramid is 1/3 the volume of the corresponding prism with the same base and height.

http://www.math-videos-online.com/examples-of-finding-the-volume-of-pyramids.html


$V = \frac{1}{3}A \cdot h$

$= \frac{1}{3}(Ah)$

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Platonic Solids (Regular Polyhedra)

**Definition:** Regular polyhedra have faces that are congruent regular polygons and all vertex configurations must be the same.

It turns out there are only five of these "Platonic" solids.

1. Tetrahedron
2. Hexahedron (Cube)
3. Octahedron
4. Dodecahedron
5. Icosahedron

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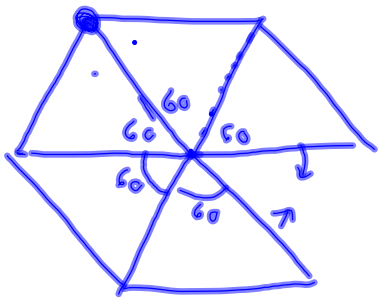
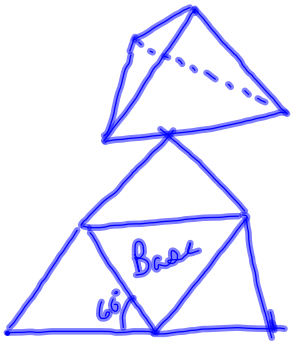
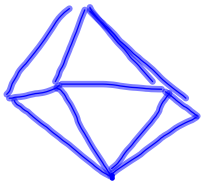
Platonic Solids (Regular Polyhedra)

Let's start with equilateral triangles.

1. Can we form a solid if 3 meet at each vertex? yes
2. Can we get 4 to meet at each vertex? yes
3. Can we get 5 to meet at each vertex? yes
4. Can we get 6 to meet at each vertex? no



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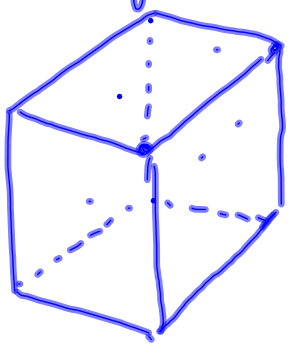
## Platonic Solids (Regular Polyhedra)

Let's start with squares.

1. Can we form a solid if 3 meet at each vertex? yes
2. Can we get 4 to meet at each vertex? no
3. Can we get 5 to meet at each vertex? no
4. Can we get 6 to meet at each vertex? no

3 squares



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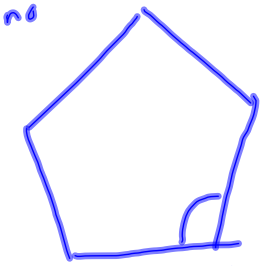
## Platonic Solids (Regular Polyhedra)

How about regular pentagons?

1. Can we form a solid if 3 meet at each vertex? plausible
2. Can we get 4 to meet at each vertex? no
3. Can we get 5 to meet at each vertex? no
4. Can we get 6 to meet at each vertex? no



$\frac{(5-2)(180)}{5} = 108°$

$\times 3$

$324°$

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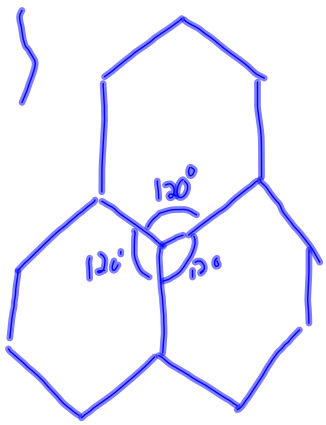
## Platonic Solids (Regular Polyhedra)

How about regular hexagons?

1. Can we form a solid if 3 meet at each vertex?
2. Can we get 4 to meet at each vertex?
3. Can we get 5 to meet at each vertex?
4. Can we get 6 to meet at each vertex?

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Complete the table below:

| Polyhedron | Face Type | Schläfli Symbol | v | e | f | |
|---|---|---|---|---|---|---|
| Tetrahedron | Equilateral Triangles | 3.3.3 | 4 | 6 | 4 | 0 |
| Cube | Squares | 4.4.4 | 8 | 12 | 6 | 0 |
| Octahedron | eq. triangles | 3.3.3.3 | 6 | 12 | 8 | 0 |
| Dodecahedron | | 5.5.5 | | | | 6 |
| Icosahedron | | 3.3.3.3.3 | | | | 0 |

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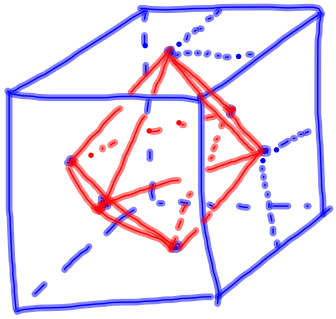
Duals (if time)



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