

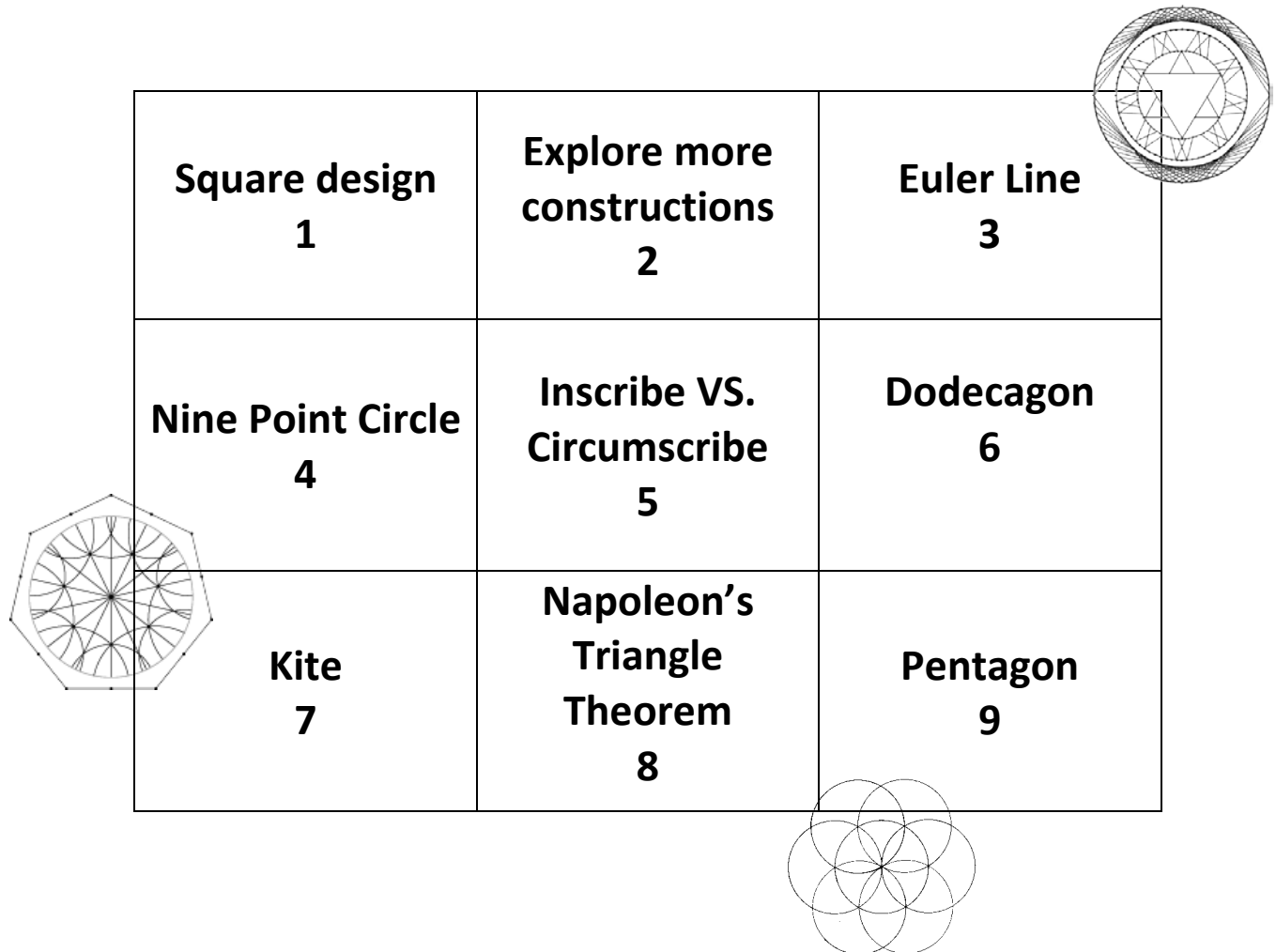
Geometry Construction Project

- You must complete 3 activities in a row (horizontally, vertically or diagonally)!
- You must complete each activity on a **separate sheet of paper, labeled with the number and title of the activity.**
- **Follow directions carefully** for your chosen activities!
- Remember to **show all your construction markings!**

Details:

- **Page 1:** cover page including your name, teacher's name, date, and class period and a unique circle design you created with your compass and straight edge!
***Color the design!**
- **Page 2:** this page with the boxes of the 3-in-a-row you have chosen **marked!**
- **The rest:** separate sheets for each construction. Attached in numeric order!

Square design 1	Explore more constructions 2	Euler Line 3
Nine Point Circle 4	Inscribe VS. Circumscribe 5	Dodecagon 6
Kite 7	Napoleon's Triangle Theorem 8	Pentagon 9

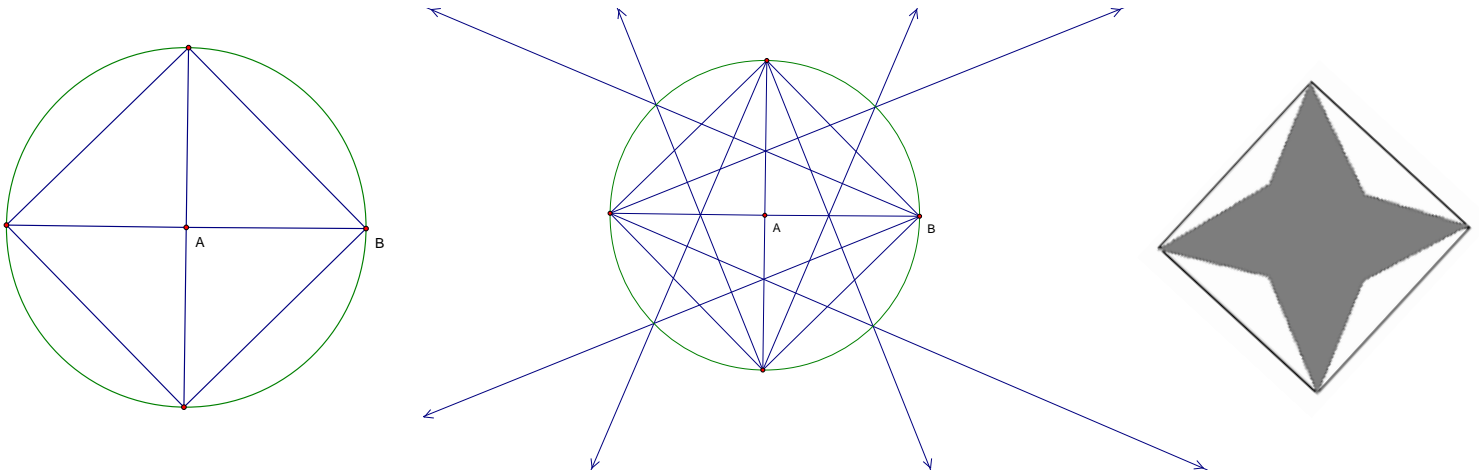


Adapted from:

http://www.newpaltz.k12.ny.us/cms/lib/NY01000611/Centricity/Domain/98/new_Construction%20Project_2012.doc

Square design (#1)

- 1) **Construct** a square with a **diagonal length of 8 cm** inside a circle
- 2) **Construct** the angle bisectors for the angles made by the diagonals and the sides of the square.
- 3) Find the “star like” region AND color in the “star-like region.”



Euler Line (#3)

- 1) Draw with a straightedge, an acute scalene triangle. (no sides should be less than 8cm long)
- 2) Construct the orthocenter. Mark this with a colored marker: **blue**
- 3) Construct the centroid. Mark this with a colored marker: **red**
- 4) Construct the circumcenter. Mark this with a colored marker: **green**
- 5) Show these points are collinear by drawing the line they contain.
- 6) **Label it “Euler Line”!**

Inscribe VS. Circumscribe (#5)

- 1) Construct an isosceles triangle where the legs are double the base length.
- 2) Inscribe a circle in that isosceles triangle.
- 3) Draw with a straightedge, a scalene triangle.
- 4) Circumscribe a circle about the scalene triangle.
- 5) **Explain** how these 2 constructions (Inscribe vs. Circumscribe) are different.

Kite (#7)

- 1) Research and write the definition of the quadrilateral called kite.
- 2) **Construct** a kite with compass and straightedge. (Show all arc marks!)
- 3) Draw in the diagonals. What is special about the diagonals?
- 4) Construct another kite.
- 5) Construct the midpoints of all sides, and then connect the midpoints.
- 6) What quadrilateral is formed?

Explore more constructions (#2)

Part 1: segments

- 1) Use a ruler to measure and draw a segment that is 4 inches long.
- 2) Research how to divide this segment into 7 equal parts by means of a construction using a compass and straight-edge...NOT a ruler!

Part 2: angles

- 1) Construct with a compass and straightedge, a 75° angle.
- 2) Explain how you did this construction.

Part 3: Circle

- 1) Research how to construct a circle through 3 points.
- 2) Perform the construction using a compass and straightedge.
- 3) Explain how this construction works! (the geometry concept)

Nine Point Circle (#4)

- 1) Draw with a straightedge a triangle of any size.
- 2) Construct the perpendicular bisectors of each side to find the midpoints. These three midpoints are the first three points of the circle.
- 3) Construct a perpendicular segment from each vertex to the opposite side. The intersection of the sides and the perpendicular segments are the next three points of the circle. The points are called the altitude bases.
- 4) Construct the orthocenter.
- 5) Construct the midpoints of the segments from the orthocenter to each vertex. These midpoints are the last three points of the circle.
- 6) Connect midpoints of original the triangle.
- 7) Find the circumcenter of the triangle made by the midpoints.
- 8) This is the center of the nine point circle!
- 9) Draw a circle centered there with radius out to any of the nine points.

Dodecagon (#6)

- 1) Write the definition of a dodecagon.
- 2) Construct a circle with any given radius ≥ 2 inches.
- 3) Now think of how you can inscribe a regular dodecagon in this circle.
- 4) Explain your construction process.

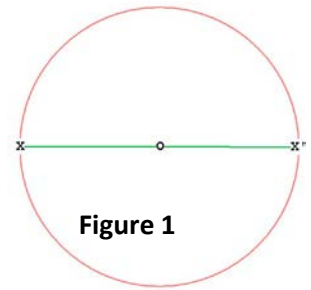
Napoleon's Triangle Theorem (#8)

When equilateral triangles are constructed on each side of any triangle, the centers of these equilateral triangles will form an equilateral triangle.

- 1) **Construct** a scalene triangle.
- 2) Now on each side of this triangle, **construct** equilateral triangles.
- 3) **Construct** the center of each of these 3 equilateral triangles.
- 4) Connect these center points and according to Napoleon you should have an equilateral triangle.

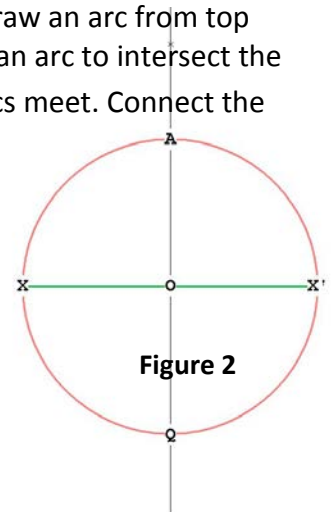
The Construction Of The Pentagon (#9)

First, begin with a circle. Pick a point anywhere on the circle, label it X . With the straightedge draw a line through X and O , the center of the circle, until it intersects the circle again at X' . **(Figure 1)**

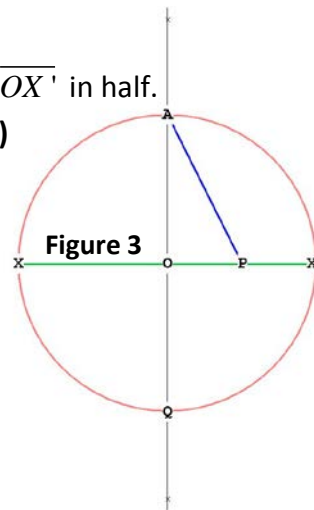


The radius of the circle is $OX = OX'$.

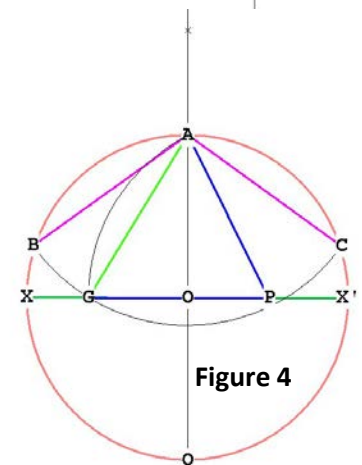
Next, bisect $\overline{XX'}$ with the compass. Pin compass at X , place the other leg at X' and draw an arc from top (above A) to bottom (below Q). Pin compass at X' , and place the other leg at X . Draw an arc to intersect the arcs you just drew. Two small x 's were placed on the diagram on \overline{AQ} where both arcs meet. Connect the x 's and you have \overline{AQ} . **(Figure 2)**



Next, bisect $\overline{OX'}$ at P . We have now divided $\overline{OX'}$ in half. With the straight-edge connect \overline{AP} . **(Figure 3)**



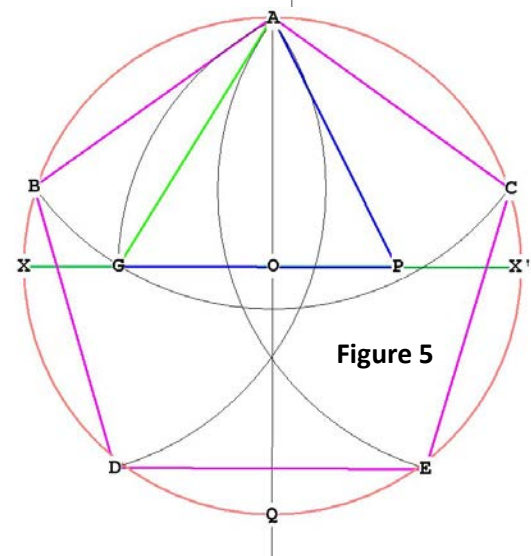
Now take the distance AP and transfer it to $\overline{XX'}$. Do this by pinning the compass at P , with length AP , and drawing an arc down to $\overline{XX'}$. Mark that point as G . Now $AP = PG$ and the distance AG is the side of the pentagon. (AG is $> AP$).



Now, pin the compass at A , with length AG . Draw an arc with the compass from \overline{AG} that intersects the circle at two points, label them B and C .

Now we have 3 of the 5 corners of the pentagon; A , B , and C . **(Figure 4)**

Now, find the last two points by either pinning the compass at B or C , with distance $AB = AC$, and finding D and E . Connect $ABDECA$ and you have the pentagon. **(Figure 5)**



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