Key

Math 118 - Dr. Miller - Quiz #9: Polygon Computations and Terms - **Due Wednesday, 03/12/14**

1. A nonagon has the following vertex angle measurements: 3 of the angles are x^o, 3 are 45^o larger than than twice that, and one angle is half as big as one of those large angles. The remaining angles are all right angles. Find the value of x, to the nearest hundredth. Show work.

nonagon: 9 sides, 7 Δs inside: $7 \cdot 180^\circ = 1260^\circ$ total

$$x + x + x + 3(45 + 2x) + \tfrac{1}{2}(45 + 2x) + 2 \times 90^\circ = 1260^\circ$$

$$3x + 135 + 6x + 22.5 + x + 180^\circ = 1260^\circ$$

$$10x = 922.5^\circ$$

$$\boxed{x = 92.25^\circ}$$

2. (a) A 600-gon has just 597 diagonals per vertex. Why must we subtract 3?

when you connect one vertex to make diagonals, you cannot connect to itself nor the 2 adjacent vertices. That rules out 3 vertices from the 600.

(b) How many diagonals would a 600-gon have altogether, and why is division required?

$600 \times 597 = 358200$

$\div 2 \longrightarrow \boxed{179100}$

Each diagonal got counted once from each endpoint, so they're all double-counted.

(c) How many triangles would be created if you drew all the diagonals from just one vertex, and what does that mean the total interior angle measurement is?

$597 + 1 = 598$ triangle

total interior angle measurement $= 598 \cdot 180^\circ$ $\boxed{= 107{,}640^\circ}$

3. Is it possible for a regular polygon to have interior angles that each measure 140^o? Justify your answer.

Guess + check:

5 sides → 3Δs inside → $3 \times 180^\circ = 540^\circ$ total = 108° each
too small

10 sides → 8 Δs inside → $8 \times 180^\circ = 1440^\circ$ total = 144° each
too big

9 sides → 7Δs inside → $7 \times 180^\circ = 1260^\circ$ total = 140° each.

yes. If the polygon has 9 sides + is regular, each interior angle will be 140° exactly.

4. What is the largest 3-digit number of diagonals a polygon could have? Justify your answer with an explanation or computation.

50 vertices → 47 diags each → $\frac{50 \cdot 47}{2} = 1175$ diags - too many

40 vertices → 37 diags each → $\frac{40 \cdot 37}{2} = 740$ diags - too few

45 vertices → 42 diags each → $\frac{45 \cdot 42}{2} = 945$ diags - maybe more?

46 vertices → 43 diags each → $\frac{46 \cdot 43}{2} = 989$ diags - stop

11 more will not happen, so

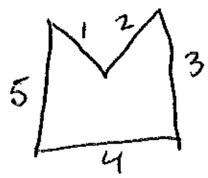
$\boxed{989}$ is the biggest.

5. Draw examples of the following, clearly and neatly marking ALL KEY ASPECTS.

(a) a closed curve that isn't simple

(b) an equilateral polygon that isn't equiangular

6. (a) Draw a nonconvex pentagon, clearly showing the correct number of sides. Explain in a sentence how you know that it is nonconvex.



It bows in, so it is not convex.

(b) If the pentagon were regular, how much would EACH of its interior angles measure?

5 sides $\rightarrow$ 3 Δs inside $\rightarrow$ $3 \cdot 180^\circ = 540^\circ$ total

shared equally: $\frac{540^\circ}{5} = \boxed{108^\circ \text{ each}}$

7. Is it possible for a polygon to have an interior angle total of 97840°? Justify your answer.

$$\frac{(n-2)\cdot \cancel{180^\circ}}{\cancel{180}} = \frac{97840^\circ}{180^\circ}$$

$$n-2 = 543.6$$

$$n = 545.6$$

not possible to have a decimal # of sides