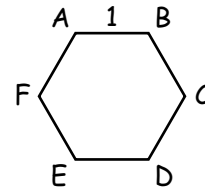


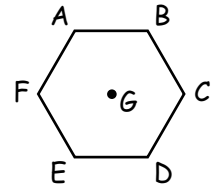
Hexagons/Circles Stretch

Hexagons appear in beehives, tile patterns, quilts, games and elsewhere. They have many unique properties, some of which are explored here. For the problems in this stretch we will be using regular hexagon $ABCDEF$, shown in problem #1, the sides of which are each one unit long.

1. _____ diags How many diagonals does hexagon $ABCDEF$ have?



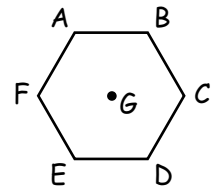
2. _____ units The three main diagonals of hexagon $ABCDEF$ meet at point G , the center of the hexagon. What is the length of segment GB ?



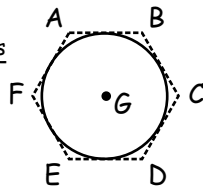
3. _____ degrees What is the measure of each interior angle of hexagon $ABCDEF$?

4. _____ lines Segment BE is a line of symmetry for hexagon $ABCDEF$. How many additional lines of symmetry does the hexagon have?

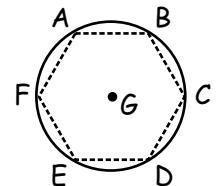
5. _____ sq units What is the area of hexagon $ABCDEF$? Express your answer as a common fraction in simplest radical form.



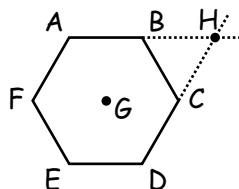
6. _____ units A circle with center G is inscribed in hexagon $ABCDEF$. What is the circumference of this circle? Express your answer in simplest radical form in terms of π .



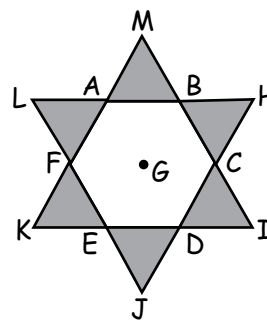
7. _____ sq units A circle with center G is circumscribed about hexagon $ABCDEF$. What is the area of this circle? Express your answer in terms of π .



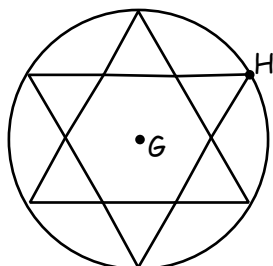
8. _____ Sides AB and DC are extended to meet at point H . What is the ratio of the area of triangle BCG to the area of triangle BCH ? Express your answer in simplest form.



9. _____ sq units The extension of other pairs of sides, in the manner used in the previous problem, results in a six-point star, as shown. What is the total area of the shaded regions? Express your answer as a common fraction in simplest radical form.



10. _____ units



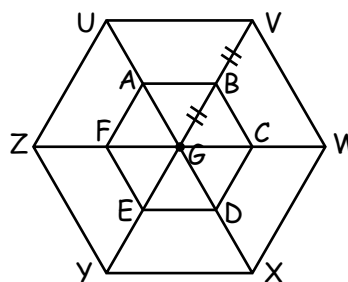
- A circle with radius GH is drawn to circumscribe the six-point star. How long is the radius of this new circle? Express your answer in simplest radical form.

11. _____ sq units

- What is the difference between the area of the circle circumscribed about the six-point star and the area of the circle inscribed in the original hexagon? Express your answer as a common fraction in terms of π .

12. _____ sq units

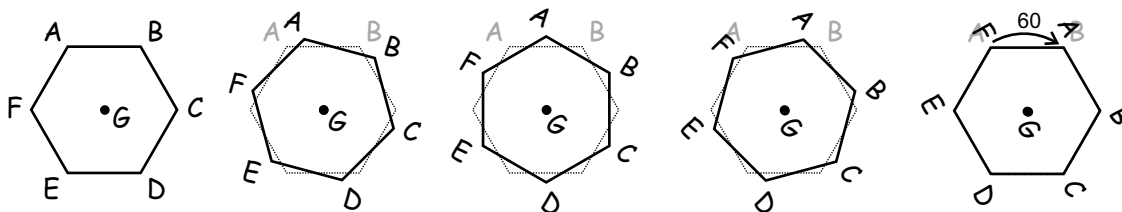
- Segment GB is extended to point V such that $GB = BV$. Likewise, GC , GD , GE , etc. are extended such that $GC = CW$; $GD = DX$; $GE = EY$, etc. What is the area of trapezoid $BCWV$? Express your answer as a common fraction in simplest radical form.



13. _____ What is the ratio of the length of a side of hexagon $ABCDEF$ to the length of a side of hexagon $UVWXYZ$? Express your answer as a common fraction.

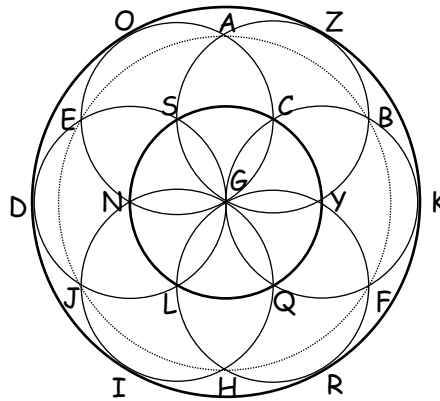
14. _____ What is the ratio of the area of hexagon $ABCDEF$ to the area of hexagon $UVWXYZ$? Express your answer as a common fraction.

15. _____ deg If point G is held fixed and hexagon $ABCDEF$ is rotated 60 degrees clockwise (shown below in four steps) such that point A moves to the previous location of point B , the resulting hexagon has the exact same orientation. What is the maximum number of degrees less than 500 degrees that this figure can be rotated clockwise and maintain its exact same orientation?



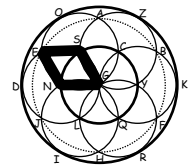
Fellowship of 9 Rings Stretch

In the figure below, a circle with center G goes through points S, C, Y, Q, L and N (which are equally spaced around circle G) and has a radius of 1 unit. These six points also are centers of circles of radius 1 unit. Express all answers as a decimal to the nearest tenth unless otherwise instructed.



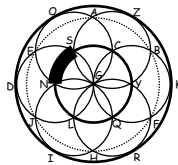
1. _____ units What is the circumference of the circle with center G that goes through S and C ?

2. _____ units What is the perimeter of quadrilateral $SGNE$? Express your answer as a whole number.



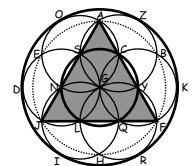
3. _____ What is the ratio of the area of circle G through N and S to the area of circle G through E and A ? Express your answer as a common fraction.

4. _____ units What is the length of the minor arc with endpoints S and N ?

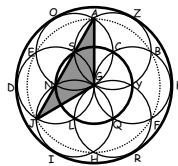


5. _____ sq units What is the area of the circle with center G that goes through points O, Z and K ?

6. _____ sq units What is the area of the triangle with vertices at A, F and J ?



7. _____ sq units What is the area of the triangle with vertices at J, A and G ?



8. _____ units What is the perimeter of the triangle with vertices at O, K and I ?

9. _____ units What is the circumference of the circle with center G that goes through points E, A and B ?

10. _____ sq units What is the area of the quadrilateral with vertices at A, B, H and J ?

