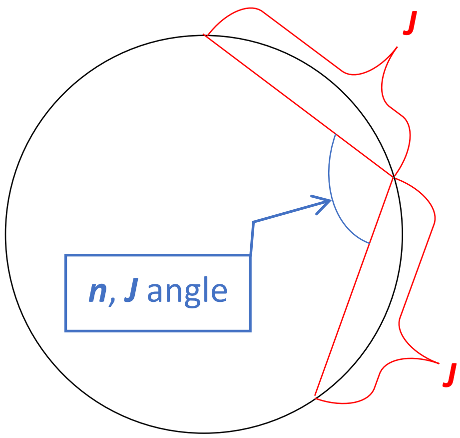
Angles from Regular Polygons and Stars



Continuously drawn stars are created from regular polygons having ***n*** vertices by jumping ***J*** vertices between each line. Such stars have ***n*** points if there is no common denominator between ***J*** and ***n***. All ***n*** > 4 except ***n*** = 6 has at least one ***J*** that produces an ***n***-point star. Call the angle created between successive lines, the ***n***, ***J*** angle.

Imagine a star is created from a regular ***n***-gon with ***J*** jumps. In order to focus on the general rule, specific values of ***n*** and ***J*** are not provided in the image to the left. In this instance, the formula for the ***n***, ***J*** angle, shown in blue to the left, is:

$$\boldsymbol{n}, \boldsymbol{J} \text{ angle} = \frac{(\boldsymbol{n} - 2 * \boldsymbol{J})}{\boldsymbol{n}} * 180° \text{ as long as } \boldsymbol{J} < \boldsymbol{n}/2.$$

If ***J*** = 1, the image is a polygon but the same equation for determining the ***n***, 1 angle holds. This formula is provided without proof, but it is based on a rule from geometry called the *Inscribed Angle Theorem*. The table below applies this formula and provides angle measures for polygons and stars for ***n*** ≤ 30.

Angle in degrees of Regular Polygons and Stars, 3 to 30

	Polygon	Star jump value ***J*** (***J*** and ***n*** have no common factors greater than 1, and **J** < **n**/2)												
n	(***J*** = 1)	2	3	4	5	6	7	8	9	10	11	12	13	14
3	60													
4	90													
5	108	36												
6	120													
7	128.57	77.14	25.71											
8	135		45											
9	140	100		20										
10	144		72											
11	147.27	114.5	81.82	49.09	16.36									
12	150				30									
13	152.31	124.6	96.92	69.23	41.54	13.85								
14	154.29		102.9		51.43									
15	156	132		84			12							
16	157.5		112.5		67.5		22.5							
17	158.82	137.6	116.5	95.29	74.12	52.94	31.76	10.59						
18	160				80		40							
19	161.05	142.1	123.2	104.2	85.26	66.32	47.37	28.42	9.474					
20	162		126				54		18					
21	162.86	145.7		111.4	94.29			42.86		8.571				
22	163.64		130.9		98.18		65.45		32.73					
23	164.35	148.7	133	117.4	101.7	86.09	70.43	54.78	39.13	23.48	7.826			
24	165				105		75				15			
25	165.6	151.2	136.8	122.4		93.6	79.2	64.8	50.4		21.6	7.2		
26	166.15		138.5		110.8		83.08		55.38		27.69			
27	166.67	153.3		126.7	113.3		86.67	73.33		46.67	33.33		6.667	
28	167.14		141.4		115.7				64.29		38.57		12.86	
29	167.59	155.2	142.8	130.3	117.9	105.5	93.1	80.69	68.28	55.86	43.45	31.03	18.62	6.207
30	168						96				48		24	