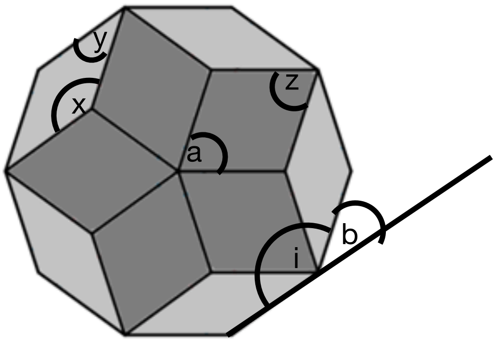


Rishika Saxena

Sum of interior angles in a polygon = (n-2)*180, where n is the number of sides.

Decagon = 10 sides

(10-2)*180= 1440°

Each angle is therefore 1440/10 = 144° (angle i)

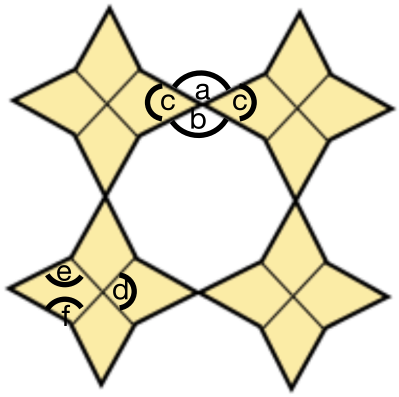
Angle x = 144° as opposite angles in a rhombus are equal.

Angles in a quadrilateral (4 sided shapes, including rhombuses) add to 360°. Therefore, angle y and the angle vertically opposite (which is equal), must be:
y = (360- 144-144)/2 (since there are two equal angles) = 72/2=36°

We can work out angle z because we know that z + 2y = i
z + 2*36 = 144
z + 72 = 144
z = 72°

This is can be verified because angle a (which is equal), is also 72°. 5*angle a fit around a point: 5*72 = 360°, which is the sum of a polygon's exterior angles.

The exterior angles are:
360/number of sides
360/10 = 36° = angle b.
This can also be verified as i + b= 180° (angles on a straight line are supplementary and add to 180°).



Sum of interior angles in a polygon = (n-2)*180, where n is the number of sides.

Octagon = 8 sides

(8-2)*180= 1080°

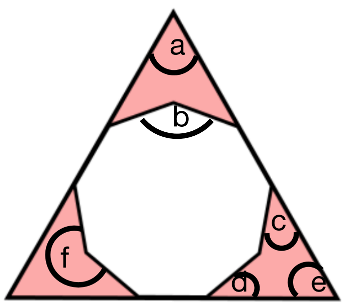
Each angle is therefore 1080/8 = 135° (angle a)

As vertically opposite angles are equal, angle b is also 135°.

We can work out angle c because we know that angles around a point add to 360°.
Therefore, angle c is (360 - 135 -135)/2 (there are two angles that are equal).
c = 390/2 = 45°

We can work out angle d as 4 fit around a point. Therefore, 4d = 360 and d = 90°.

Angles e and f (as one pair of diagonally opposite angles is equal in a kite):
(360 - 45 - 90)/2 = 112.5°
As angles in a quadrilateral add to 360°.



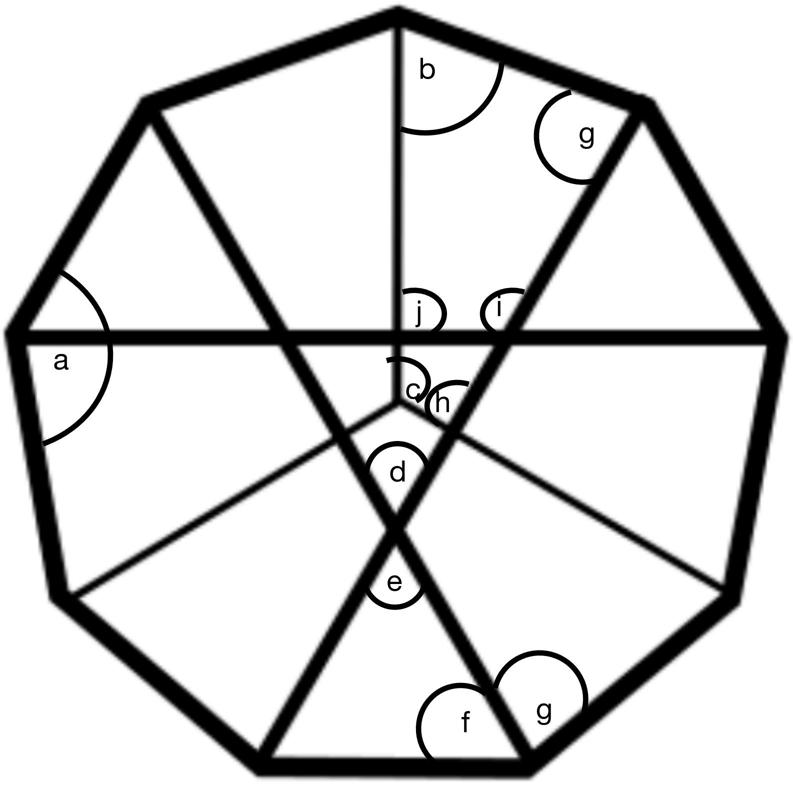
As it is an equilateral triangle, angles are equal. Angles in a triangle add to 180°, and therefore, angle a is 180/3 = 60°.

Sum of interior angles in a nonagon is:
(n-2)*180 = (9-2)*180 = 1260°

Therefore, angle b is 1260/9 = 140°.

Angle c and d, which are equal, are 180° (straight line) - angle b = 180-140 = 40°

As angles in a quadrilateral add to 360°, angle e = 360° - c-d-a = 360 - 40-40-60 = 220°.
This is verified as e+b should equal 360° as it is around a point (140+220 = 360, so it is correct).



Angle a is established to be 140° (see above).

Angle b is 1/2 of angle a = 0.5*140 = 70°

Angle c is 360/3 (as 3 fit around a point) = 120°

Angle d is an angle in an equilateral triangle, and so must be 60° as all angles are equal and angles in a triangle add to 180°.

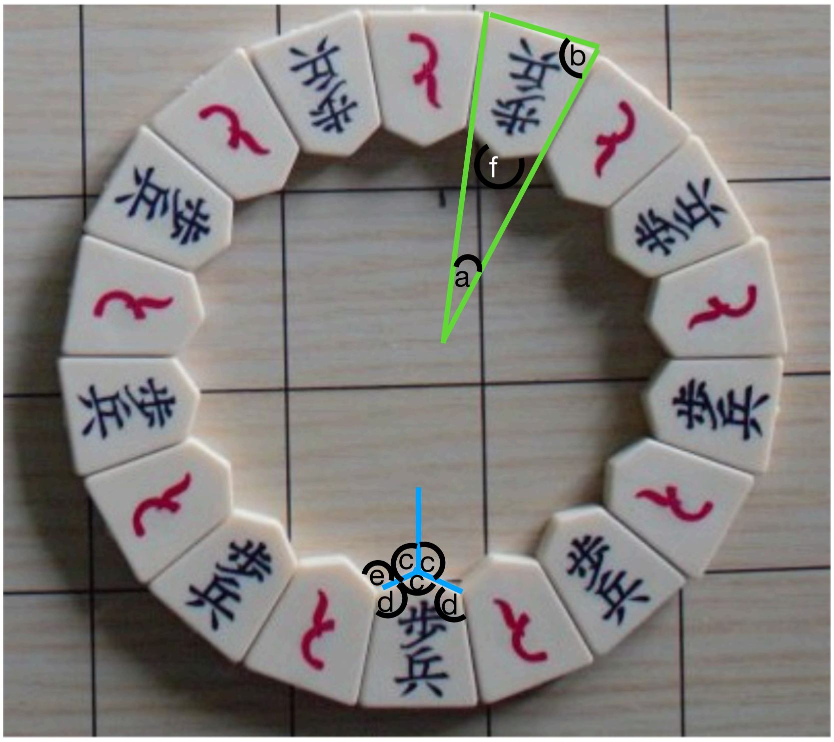
Angle e is equal as it is vertically opposite, and therefore is 60° as well.
Angle f is apart of an equilateral triangle = 60°.

Angle g = a - f as
g = 140 - 60 = 80°

Angle h must be 360 - c - b - g as angles in a quadrilateral add to 360°.
360 -70-120 -80 = 90°

Also, angles g , d and a can be verified as they form a kite and must add to 360°. 80+80+140+60 = 360° and therefore, they are correct.

Angle i must be (360 - 60-60)/2 as angles around a point add to 360°.
Angle i = 120°.
Angle j must be 360° - 70 - 80 - 120 = 90°



Is there a quick way to count the number of tiles in the picture?
The tiles are in pairs - there are 9 pairs. 2*9 = 18 tiles.

What shape are the tiles?
The tiles are congruent, irregular pentagons.

Which angles can be calculated?
The shape inside is 36-sided (each tile provides 2 sides), so the sum of the interior angles is:
(n-2)*180 = (36-2)*180 = 6120°

However, we have to remember that this includes 18 interior equal angles and 18 exterior equal angles.

We can work out angle a because the shogi pieces are arranged to make a circle - 360°.
There are 18 tiles, so 18a=360°
a = 20°

As the triangle formed is isosceles, with the base angles being equal, we can work out angle b as angles in a triangle add to 180°.
b= (180 -20)/2 (there are two angles) = 80°

3* angle c fits around a point, and therefore it must be 120°.

Both Angle d are:
sum of interior angles of pentagon ((n-2)*180) - 80 -80 - 120
540 - 280 = 260°
260/2 (as there are 2 angle d) = 130
d= 130°

Angle e (the acute interior angle) = 360 (around a point) - 2d
e= 360 - 130 - 130 = 100°
Sum of acute interior angles = 18*100 = 1800
Sum of obtuse interior angles = 6120 -1800 = 4320. Each angle (angle f) = 4320/18 = 240°.