9-4 Tessellations

Master

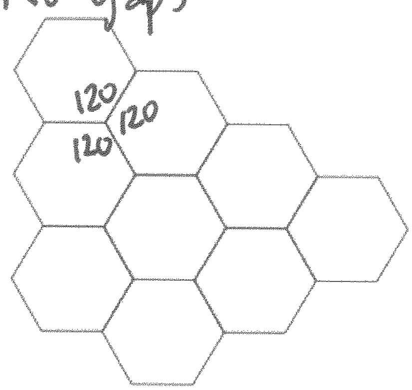
- A tessellation is a pattern of one or more figures that covers a plane so that there are no over- lapping or empty spaces.
- The sum of the measures of the angles of the polygons surrounding a vertex is 360 °.
- A regular tessellation is formed by only one type of regular polygon.
- A semi-regular tessellation is formed by 2 or more regular polygons.
- A regular polygon will tessellate if it has an interior angle measure that is a factor of 360°

DETERMINE IF A REGULAR POLYGON WILL TESSELATE THE PLANE

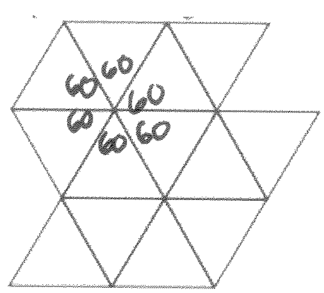
n =	Measure of the interior angle	Does the polygon tessellate the plane?
3	60	Yes $360 \div 60 = 6$
4	90	Yes $360 \div 90 = 4$
5	108	No $360 \div 108 = 3.3$
6	120	Yes $360 \div 120 = 3$
7	128.6	No $360 \div 128.6 = 2.8$
8	135	No $360 \div 135 = 2.7$
9	140	No $360 \div 140 = 2.6$
10	144	No $360 \div 144 = 2.5$

1-3: Why do the following polygons create a tessellation?

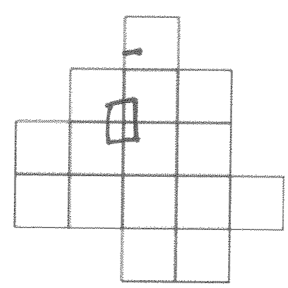
1. $360 \div 120 = 3$
No gaps



2. $360 \div 60 = 6$



3. $360 \div 90 = 4$



9-6 Dilations

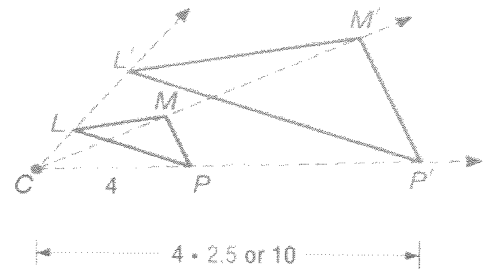
Master ξ

A dilation is a Similarity transformaton that enlarges or reduces a figure proportionally with respect to a center point and a scale factor.

Understanding a Dilation:

A dilation with center C and positive scale factor k, $k \neq 1$, maps a point P in a figure to its image such that

- if point P and C coincide, then the image and preimage are the same point, or
- if point P is not the center of dilation, then P' lies on $\overrightarrow{CP}$ and $CP' = k(CP)$.



$\triangle L'M'P'$ is the image of $\triangle LMP$ under a dilation with center C and scale factor of 2.5.

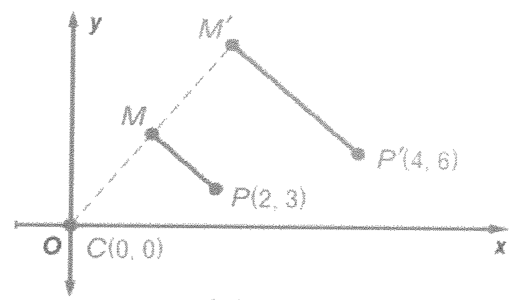
Understanding Dilations in the Coordinate Plane:

Words To find the coordinates of an image after a dilation centered at the origin, multiply the x- and y-coordinates of each point on the preimage by the scale factor of the dilation, k.

Symbols $(x, y) \rightarrow (kx, ky)$

The scale factor (k) $= \dfrac{\text{image side length}}{\text{preimage side length}} = \dfrac{M'P'}{MP}$

Example



scale factor = 2

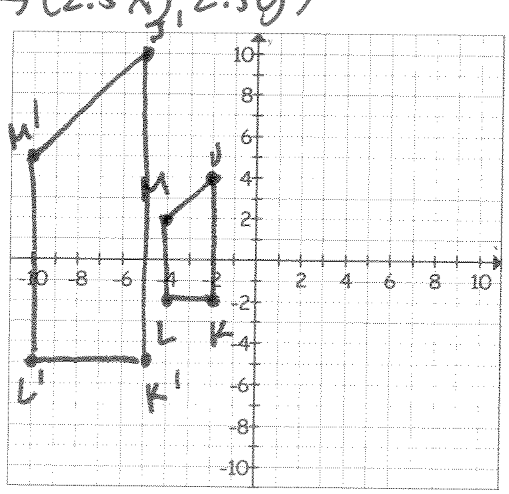
1-2: Quadrilateral JKLM has vertices J(-2,4), K(-2,-2), L(-4,-2), & M(-4,2). Graph the image of JKLM after a dilation centered at the origin with the given scale factor.

Hint: Multiply the coordinates of each vertex by the scale factor k: $(x,y) \rightarrow (kx, ky)$

$(x,y) \rightarrow (2.5x, 2.5y)$

1. $k = 2.5$

J'(−5, 10)
K'(−5, −5)
L'(−10, −5)
M'(−10, 5)



$(x,y) \rightarrow (\frac{3}{4}x, \frac{3}{4}y)$

2. $k = \dfrac{3}{4}$

J'(−1.5, 3)
K'(−1.5, −1.5)
L'(−3, −1.5)
M'(−3, 1.5)