1. To create a spanning tree, we can connect the top 3 vertices to the bottom $m$ either by connecting all 3 to one of the $m$ vertices, or connecting 2 to one of the $m$ vertices, and 2 to one of the remaining $m - 1$ vertices, as in the above diagram.

For the first case we then have 3 choices for each of the remaining $m - 1$ vertices, for a total of $3^{m-1}m$ spanning trees. For the other 3 cases we have 3 choices for each of the remaining $m - 2$ vertices for a total of $3^{m-2}m(m - 1)$ spanning trees, and hence in total

$$3^{m-1}m + 3^{m-2}m(m - 1) = 3^{m-1}m^2$$

spanning trees.

2. If the total weight on every cycle is even then in particular the total weight on every triangle is even.

Conversely, let us do an induction on the length of the cycle, $n$.

Base case: $n = 3$ is fine since the weight of every triangle is even.

Induction step: Assume true for $n = k$. For $n = k + 1$ make the cycle by removing an edge $e$ from a cycle of length $k$ and inserting the other 2 sides of the triangle $f, g$ (since we have a complete graph). If $w(e)$ was odd then $w(f) + w(g)$ is odd since $w(e) + w(f) + w(g)$ is even, and if $w(e)$ was even then $w(f) + w(g)$ is even since $w(e) + w(f) + w(g)$ is even. In both cases the weight of the cycle of length $k + 1$ is even and the result follows by induction.
4.

5.
6. At each stage of Kruskal’s algorithm there is a unique choice of edge, and hence a unique minimal spanning tree is produced.