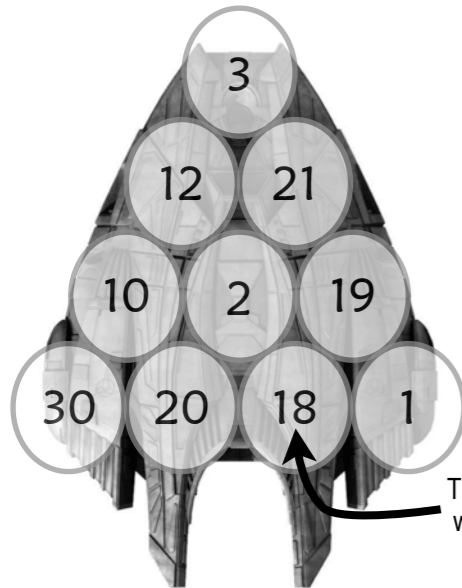


Earth Attack

with a new and improved ion cannon



Everyone is competing to find the most efficient way of shooting down enemy starships. To shoot one down, all its disk deflectors must be destroyed. You destroy these by hitting them with your ion cannon.

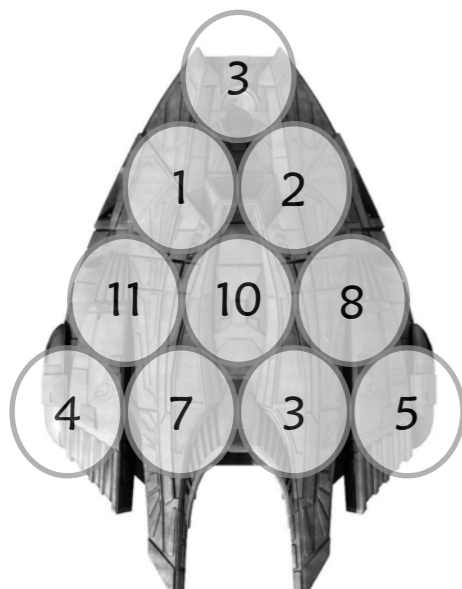
This disk deflector was destroyed at time 18.

Disk deflectors on the bottom row are chosen first. Other disk deflectors must be either the sum of the two disk deflectors underneath or must be a factor of the two numbers underneath.

For example, the disk deflectors 10 and 2 add to 12.

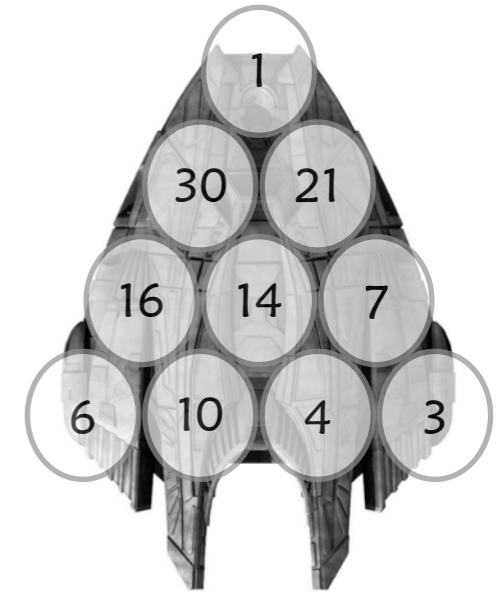
For example, the disk deflectors 12 and 21 share a common factor of 3.

The starship above was destroyed by targeting its disk deflectors at times 1, 2, 3, 10, 12, 18, 19, 20, 21, and 30. Since 30 is the largest, this starship was destroyed in time 30. You should try to reduce this number.



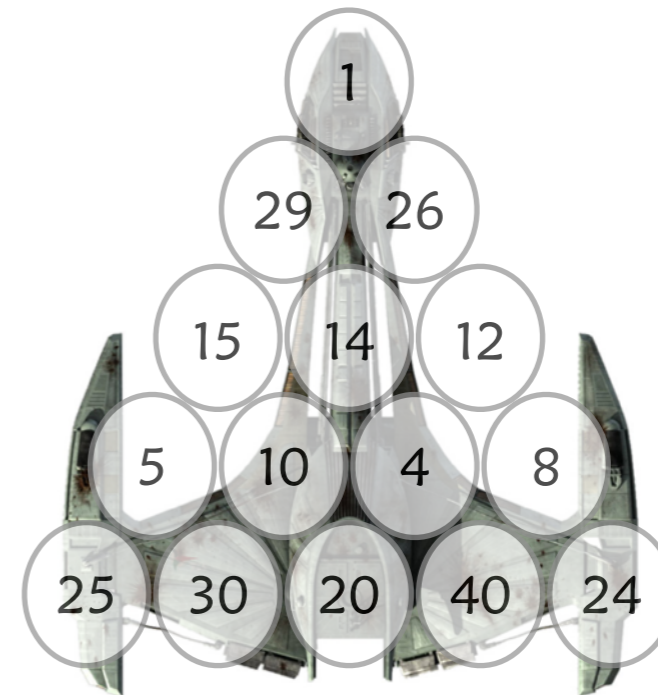
That looks easy, but our ion cannon can only aim at one disk deflector at a time, so we have to make sure that no numbers are repeated... The starship on the left was targeted incorrectly because 3 has been duplicated. Drats - the earth is destroyed.

This looks great. We have successfully destroyed a dangerous dreadnought in time 30. Asia and North America were obliterated, but the rest of the world survived. Congratulations! (Next time try to choose your biggest number so it is as small as possible. Taking time 30 is too slow.)



Unfortunately, these dastardly aliens are now attacking earth with a terrifying new dreadnought (pictured below).

Your task is to devise the fastest possible strategy to shoot it down. Perhaps the time 40 solution with the expected loss of the whole Northern hemisphere is as good as we can do, but perhaps you can do better!



Another scary development: some aliens are attacking in groups. Remember: try to reduce the time needed to destroy all the disk deflectors.



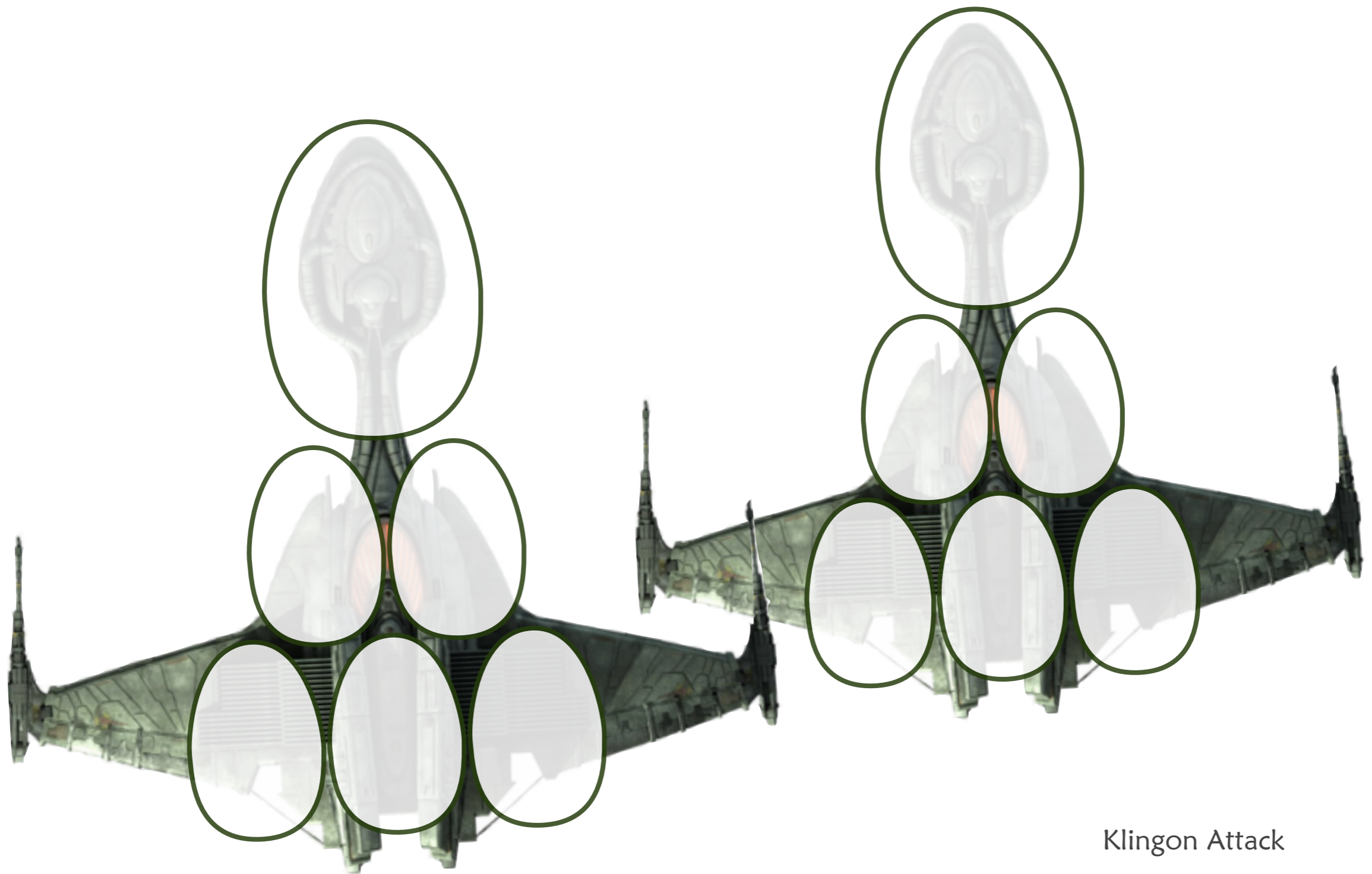








Two Klingon Bird of Prey Attack



Klingon Attack

Very scary - Enemies are attacking earth. Put integers ≥ 0 into each of the twelve deflectors. Each number must equal the sum or be a factor of the two numbers underneath. All numbers in the two space ships must be different. Try to make your largest number as small as possible.



Klingon Attack

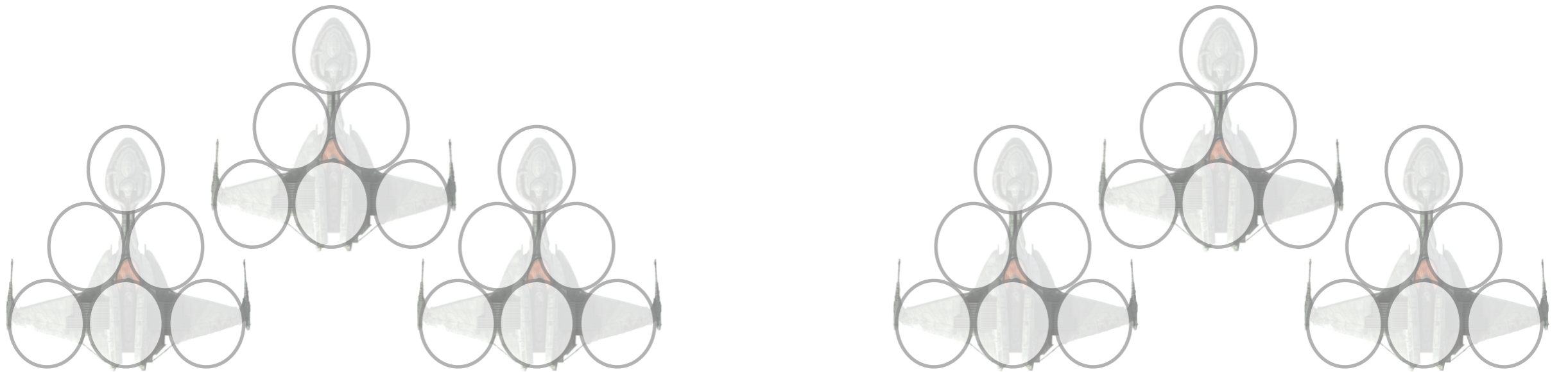
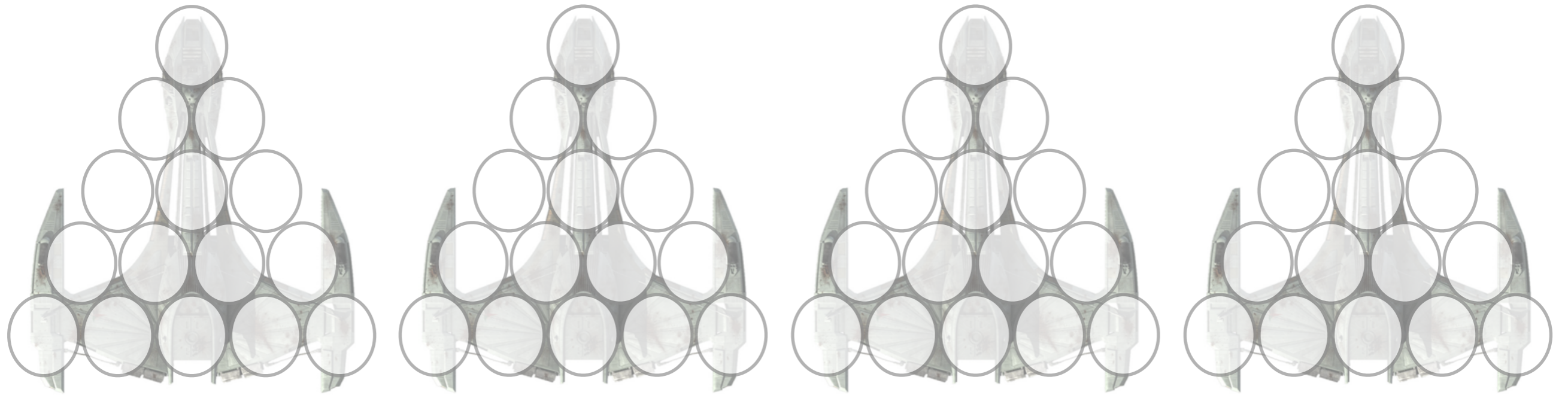
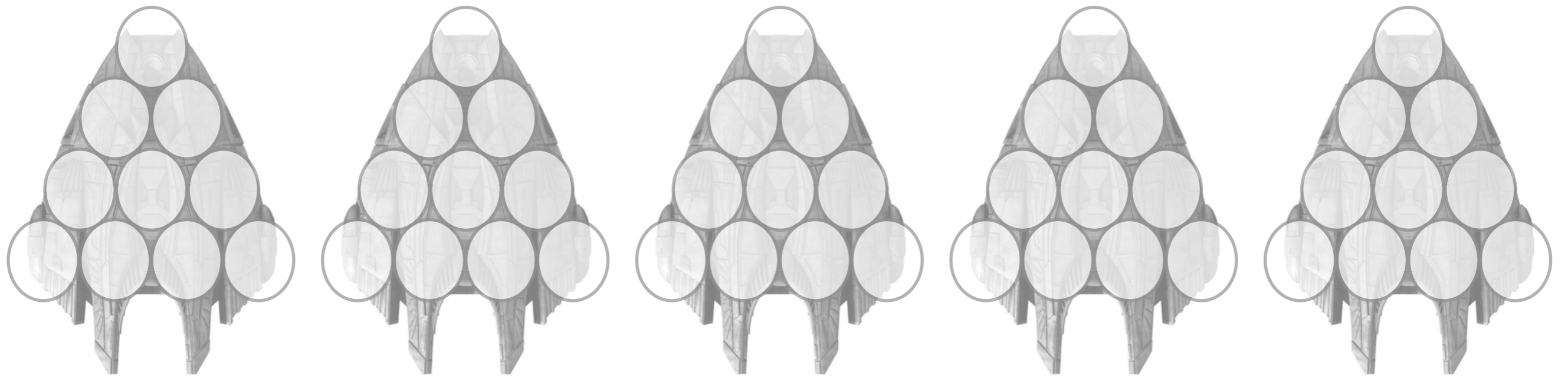
Very scary - Enemies are attacking earth. Put integers ≥ 0 into each of the 30 deflectors. Each number must equal the sum or be a factor of the two numbers underneath. All numbers in the two space ships must be different. Try to make your largest number as small as possible.

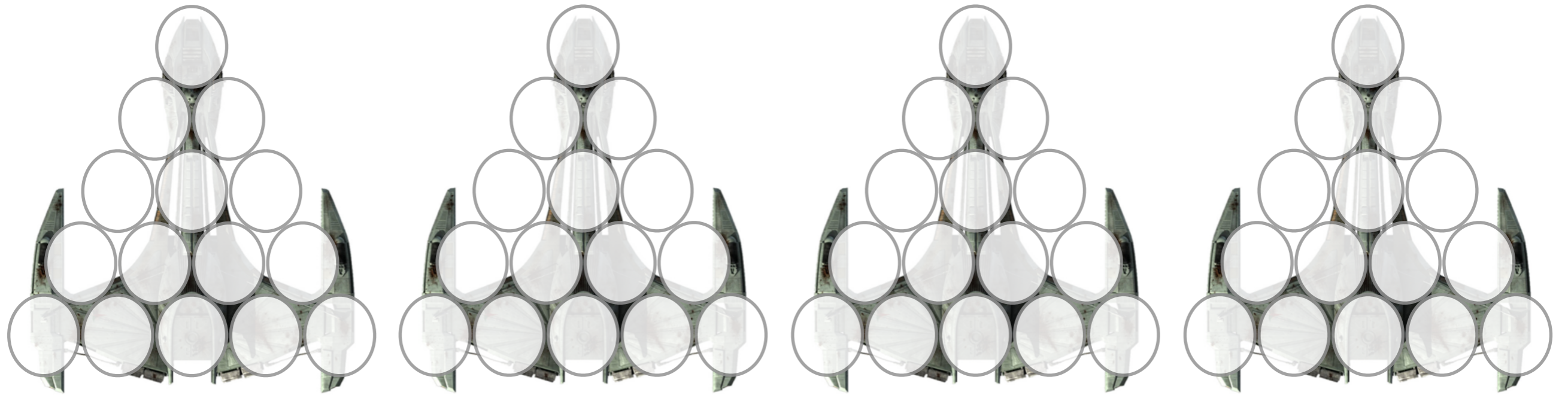
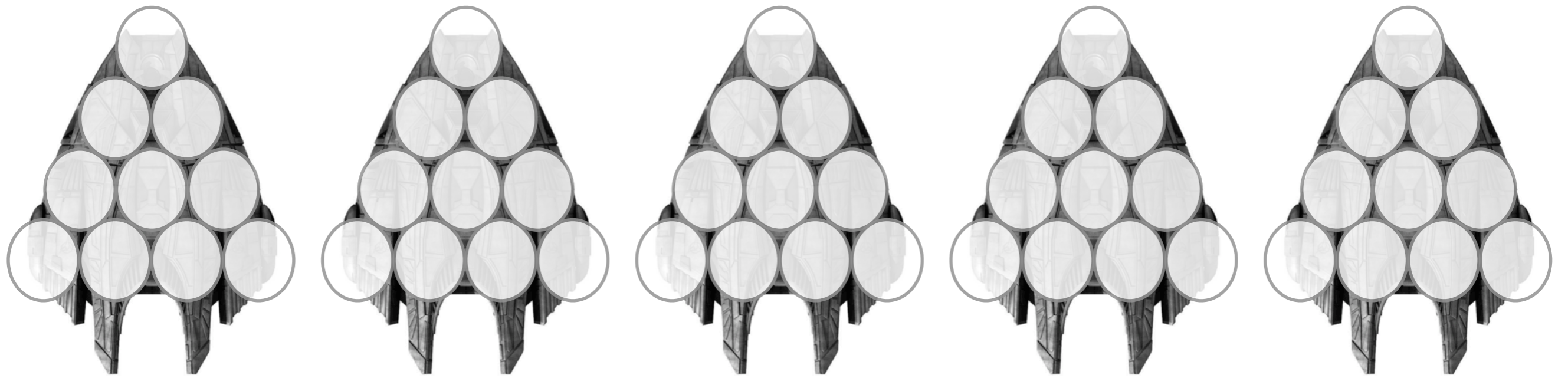




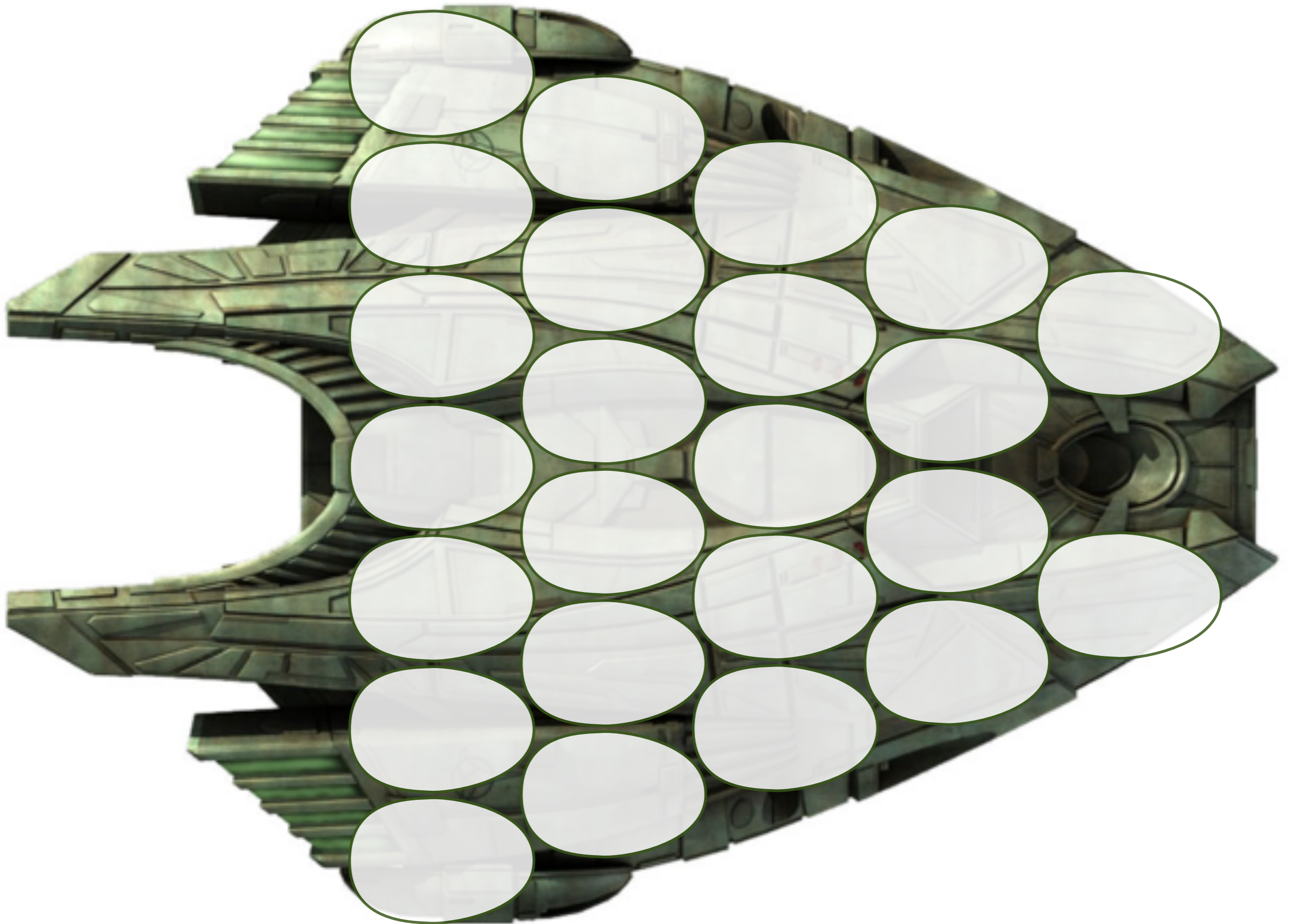


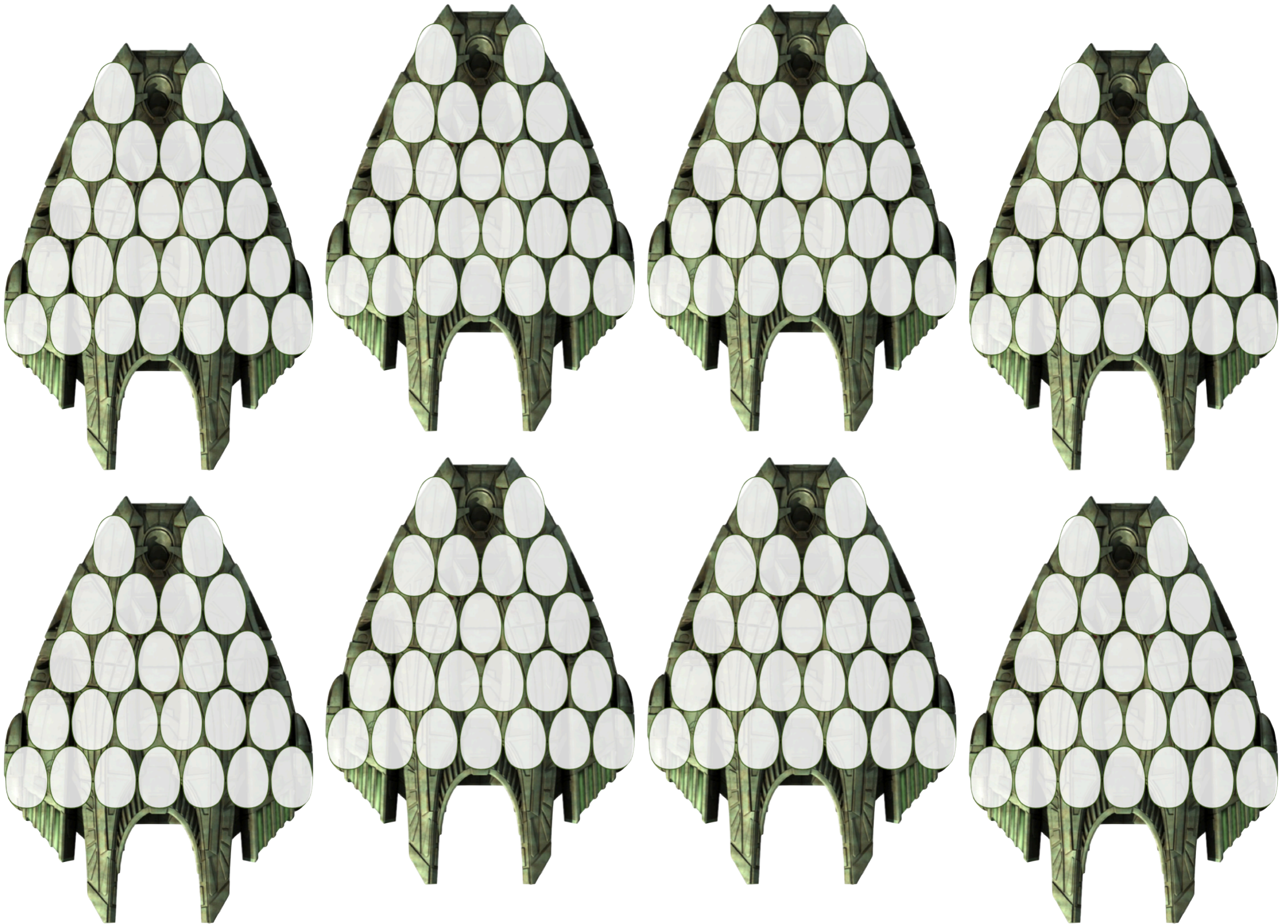












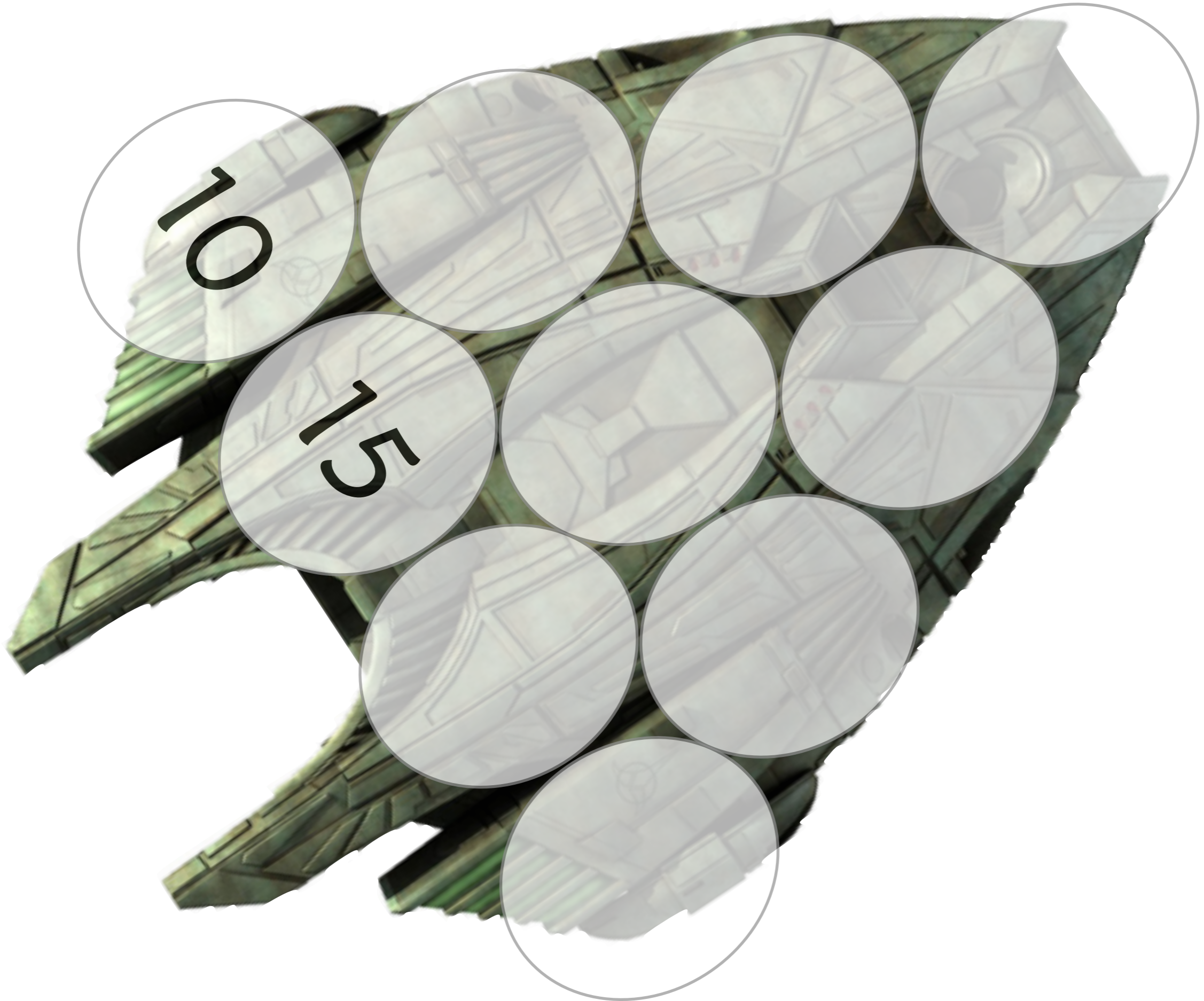






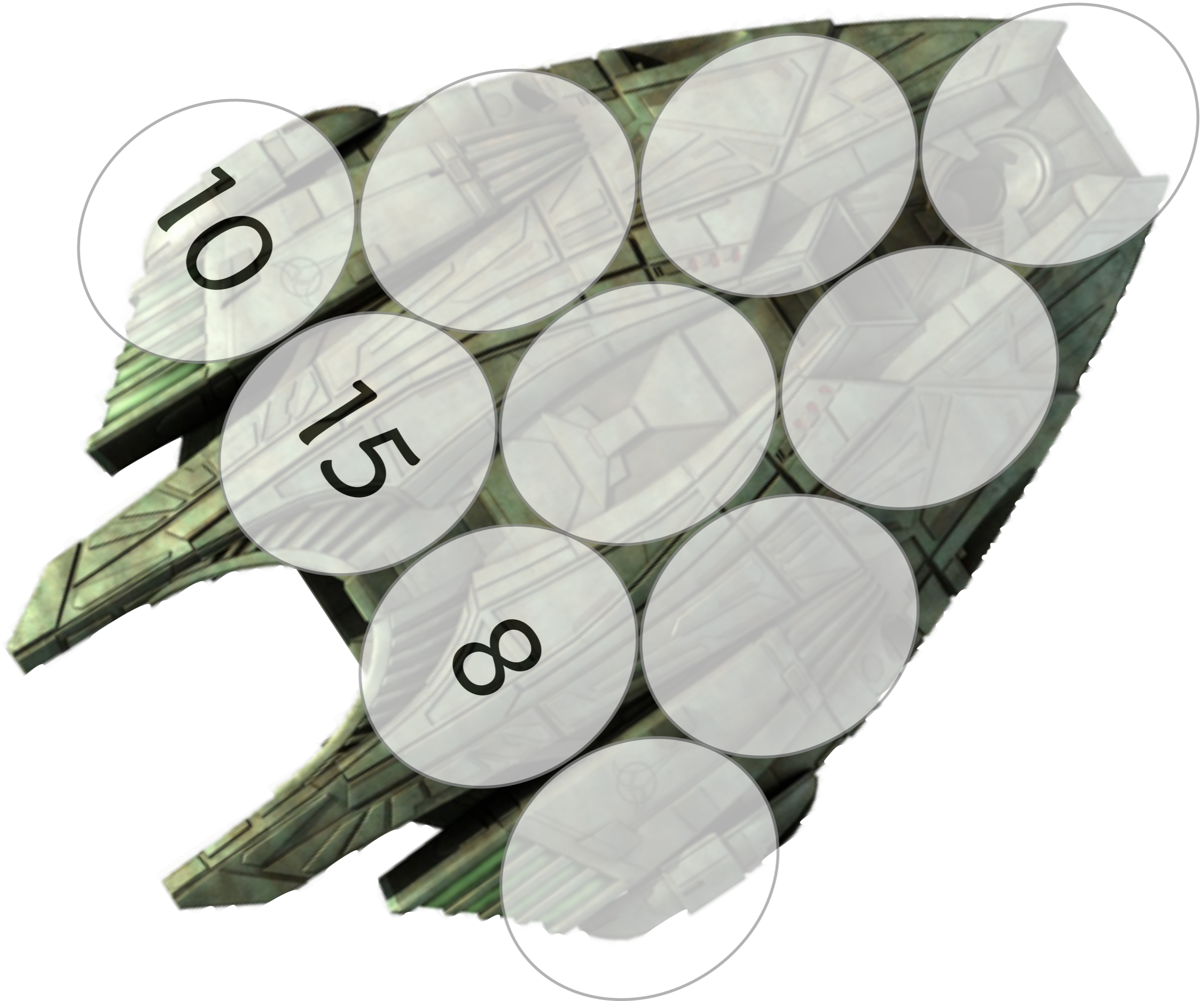


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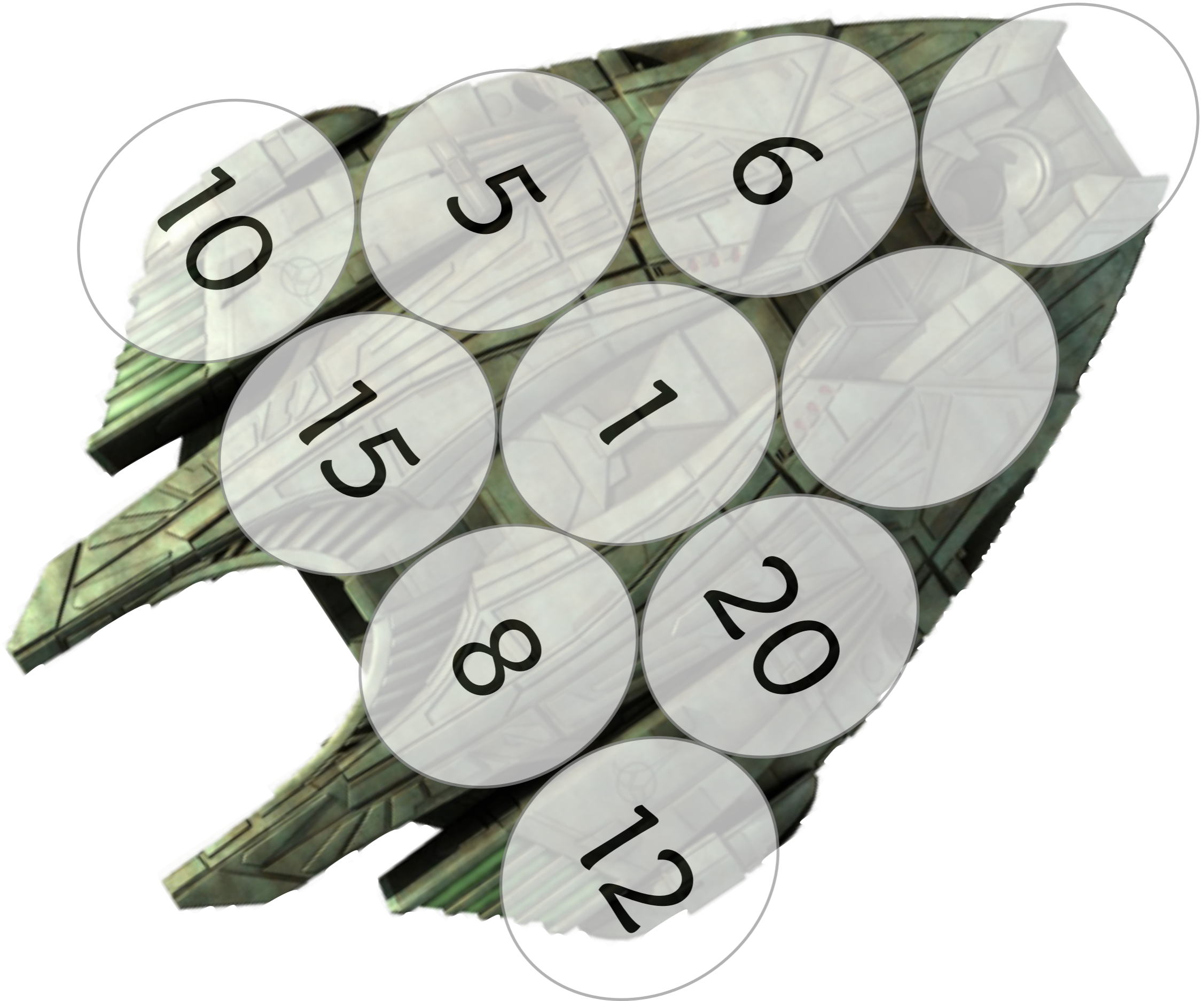
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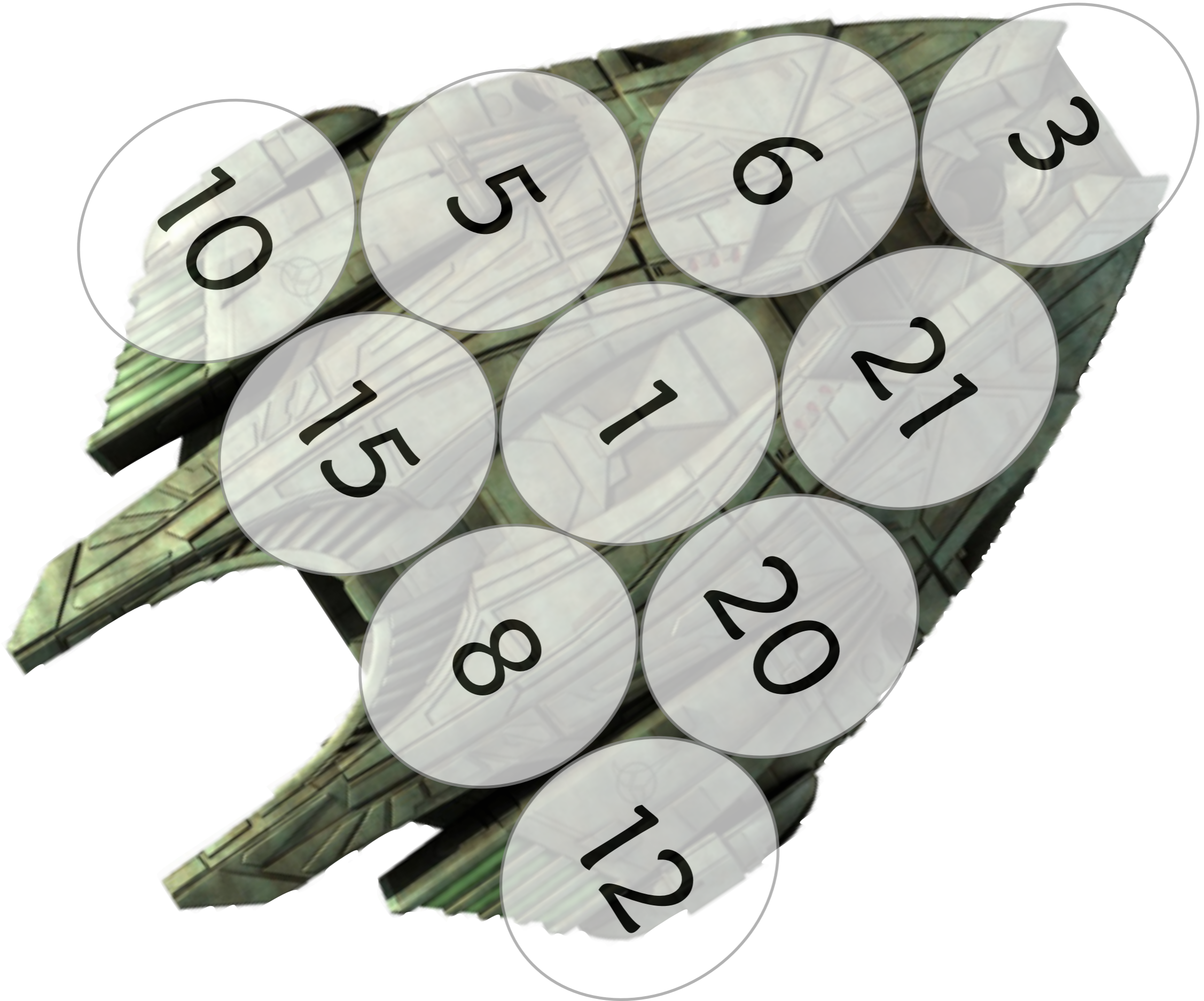
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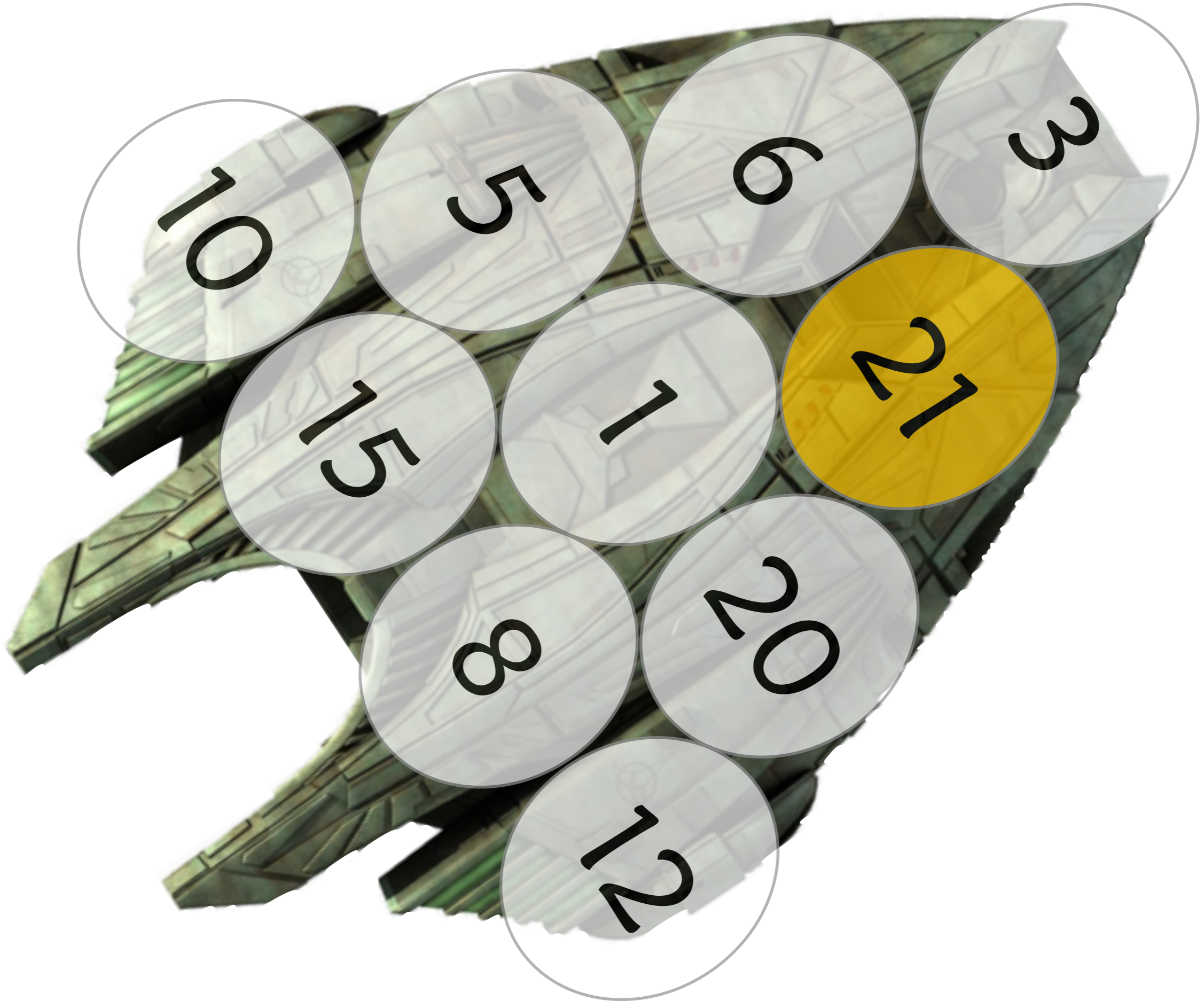
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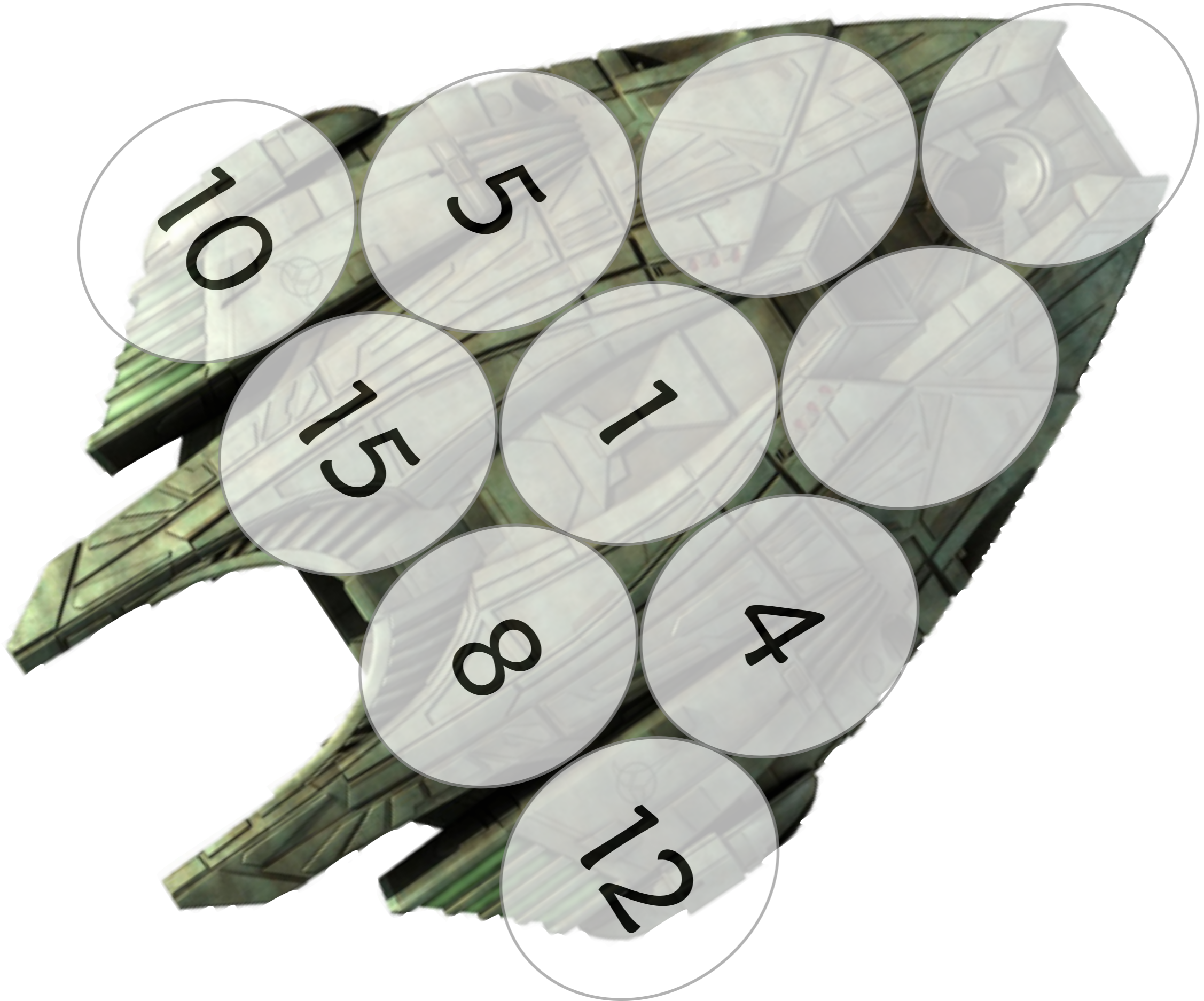
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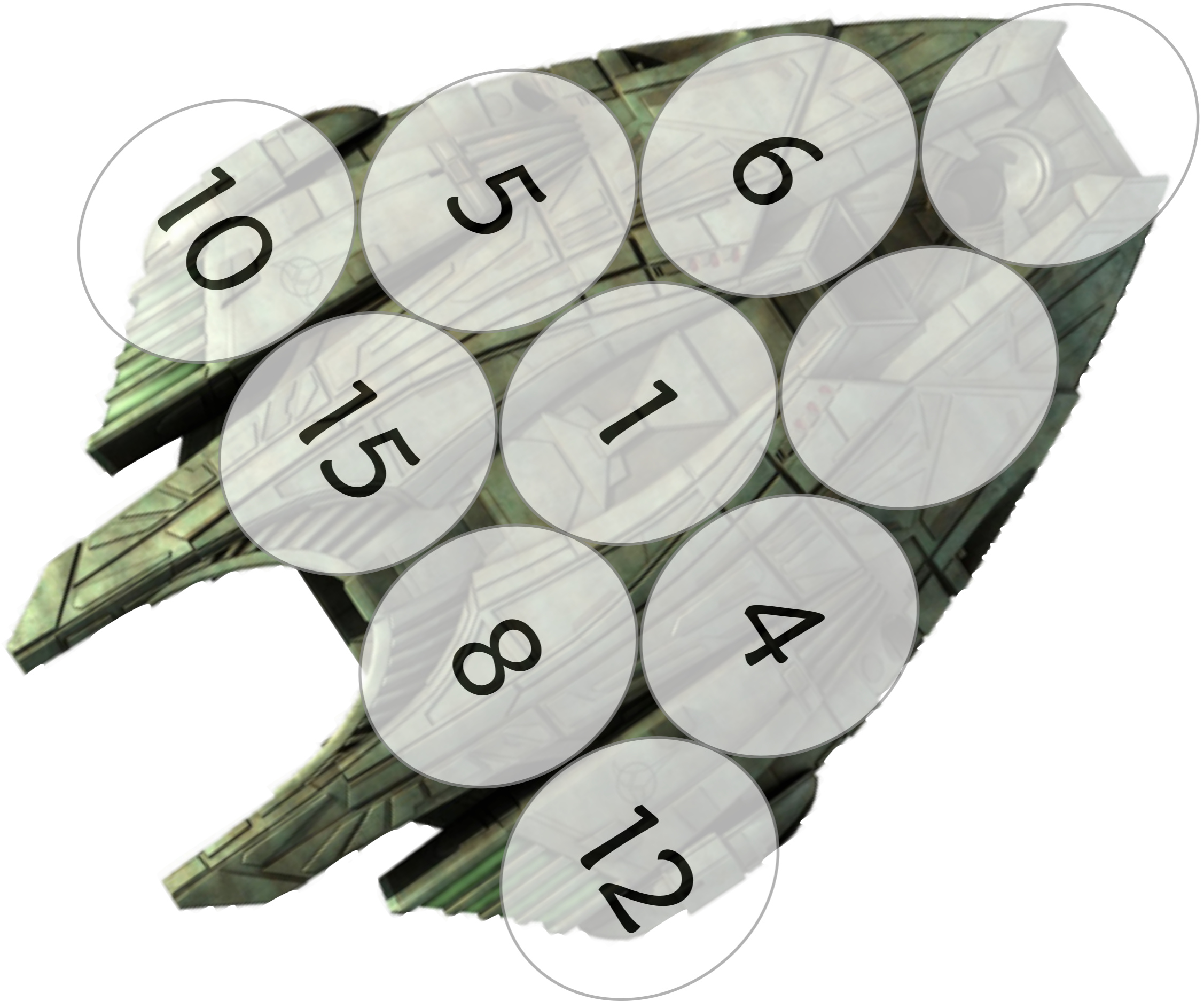
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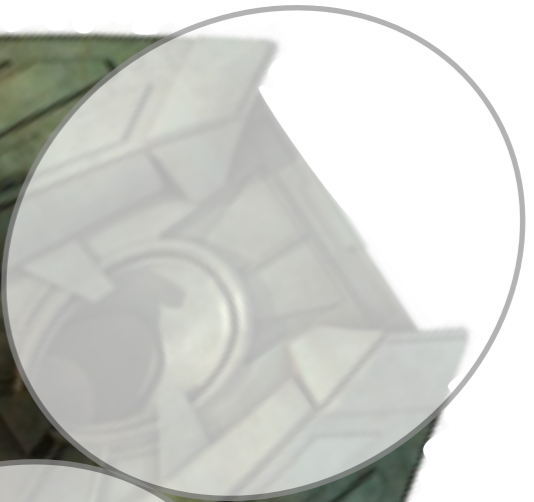
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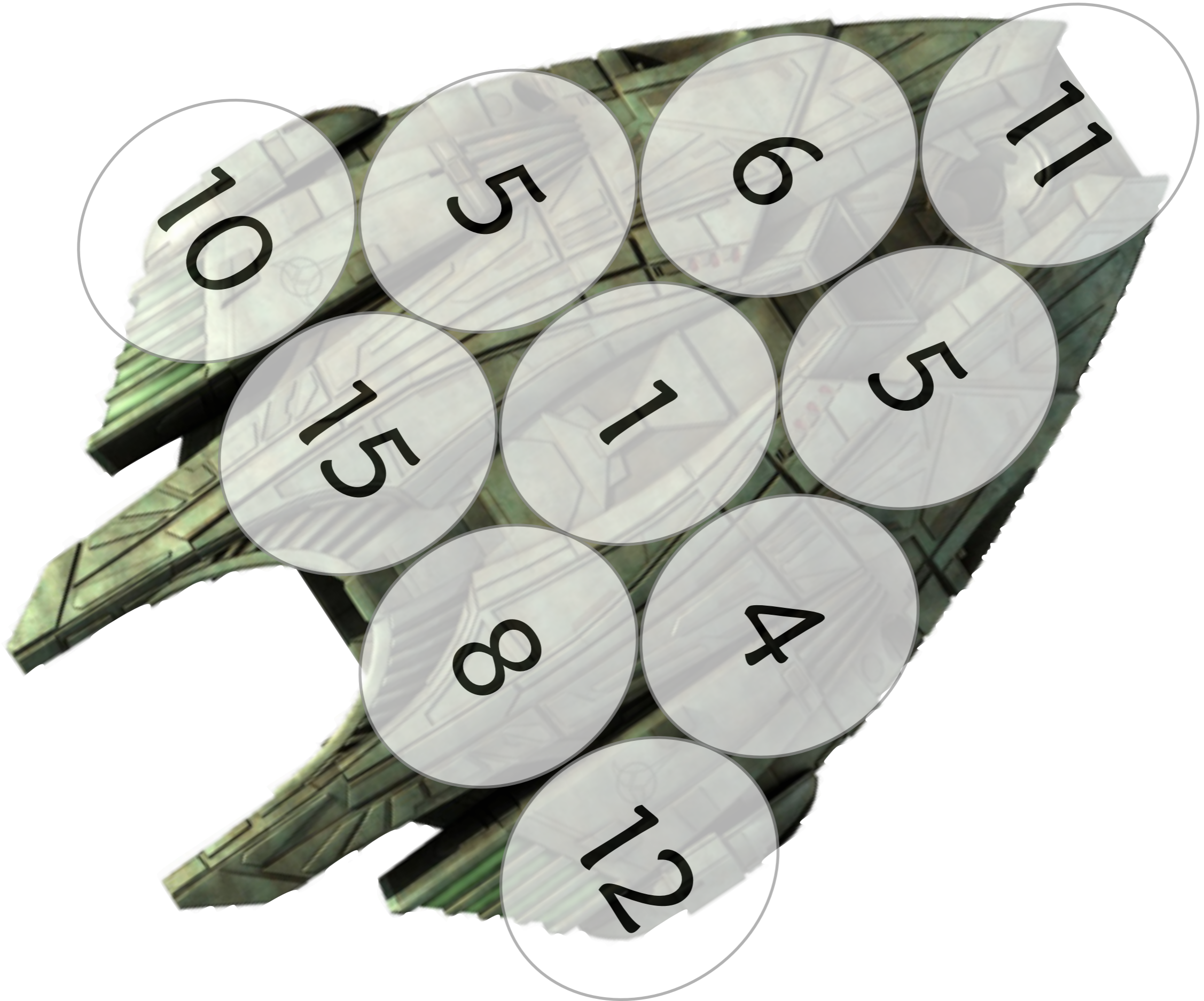
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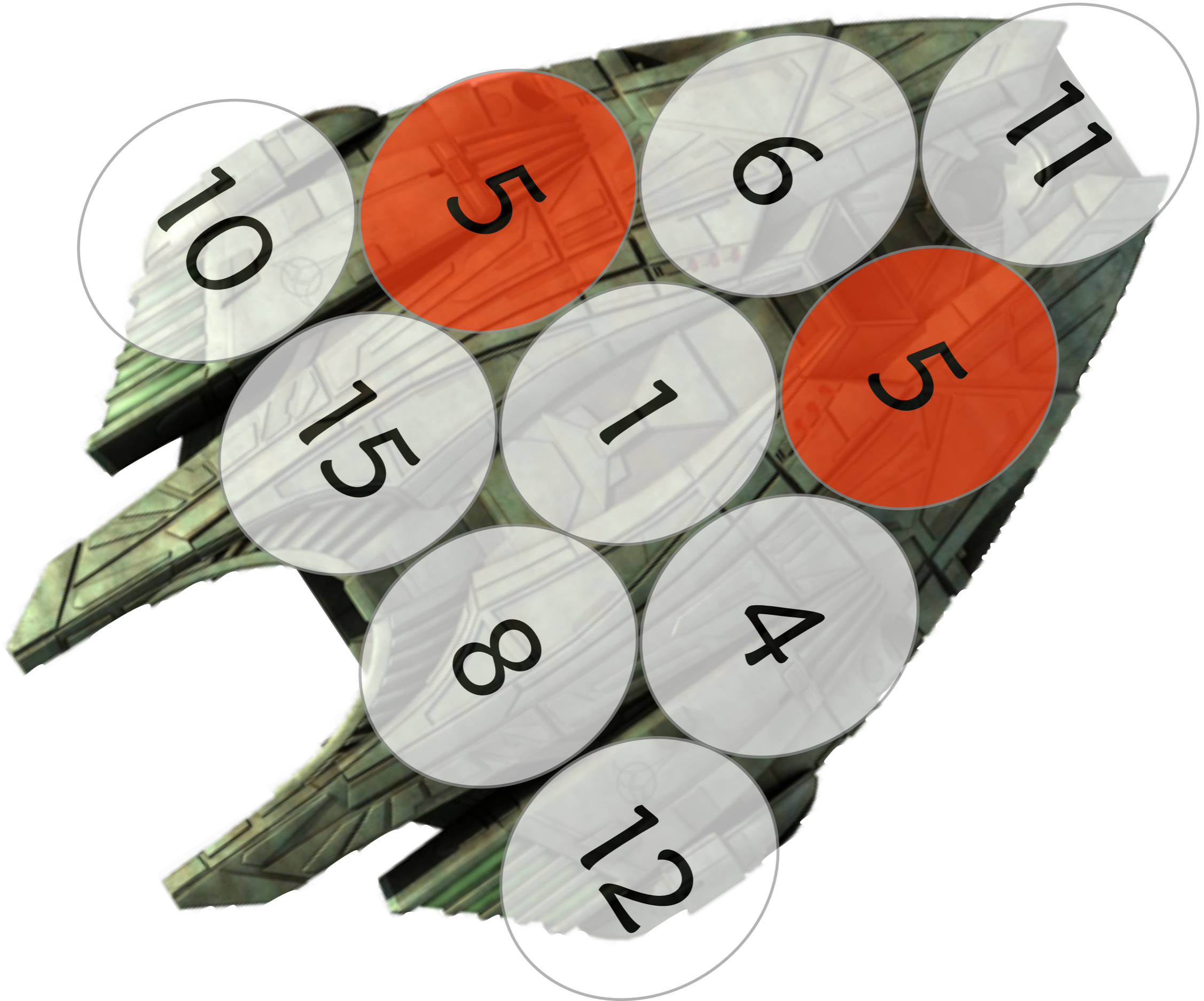
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