

## *Locked Out* **STAR WARS**

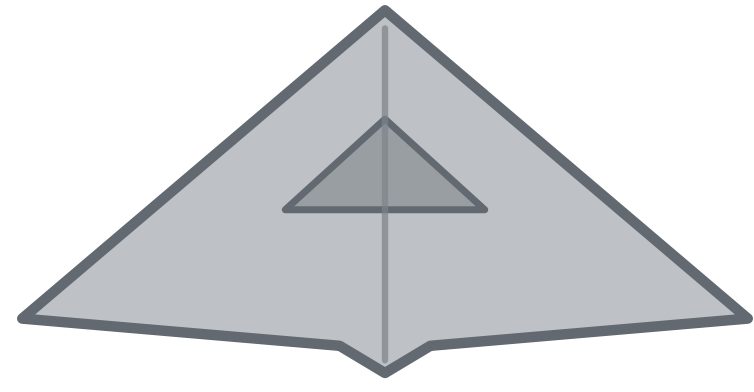
*Those rebel scum continue to scourge the galaxy. Locate their base so that we can wipe them out and bring peace and security to the empire.*

Complete each of the following tasks. If you fail — you will answer to Lord Vader. It is recommended to achieve these tasks *in order*, but feel free to divide tasks to conquer the galaxy.

1. **Coordinate the Fleet:** Place star destroyers to secure a sector of the galaxy.
2. **Probe Retrieval:** Lock on to probe droids transmitting information.
3. **Galactic Reconnaissance:** Pin point the 7 potential systems where the rebels are hiding.
4. **locate the rebel base:** Analyze probe data to determine which system is the most probable to have the rebel base.
5. **Attack Inference:** Ensure we defeat them with *probability* on our side.

$$\sum [\text{Coordinated Fleet}] + \sum [\text{Probes Retrieved}] + \sum [\text{Recon}] + S_{\text{rebel}} + R_{\#} + n_{\text{attempts}} = \boxed{\text{FINAL ANSWER}}$$

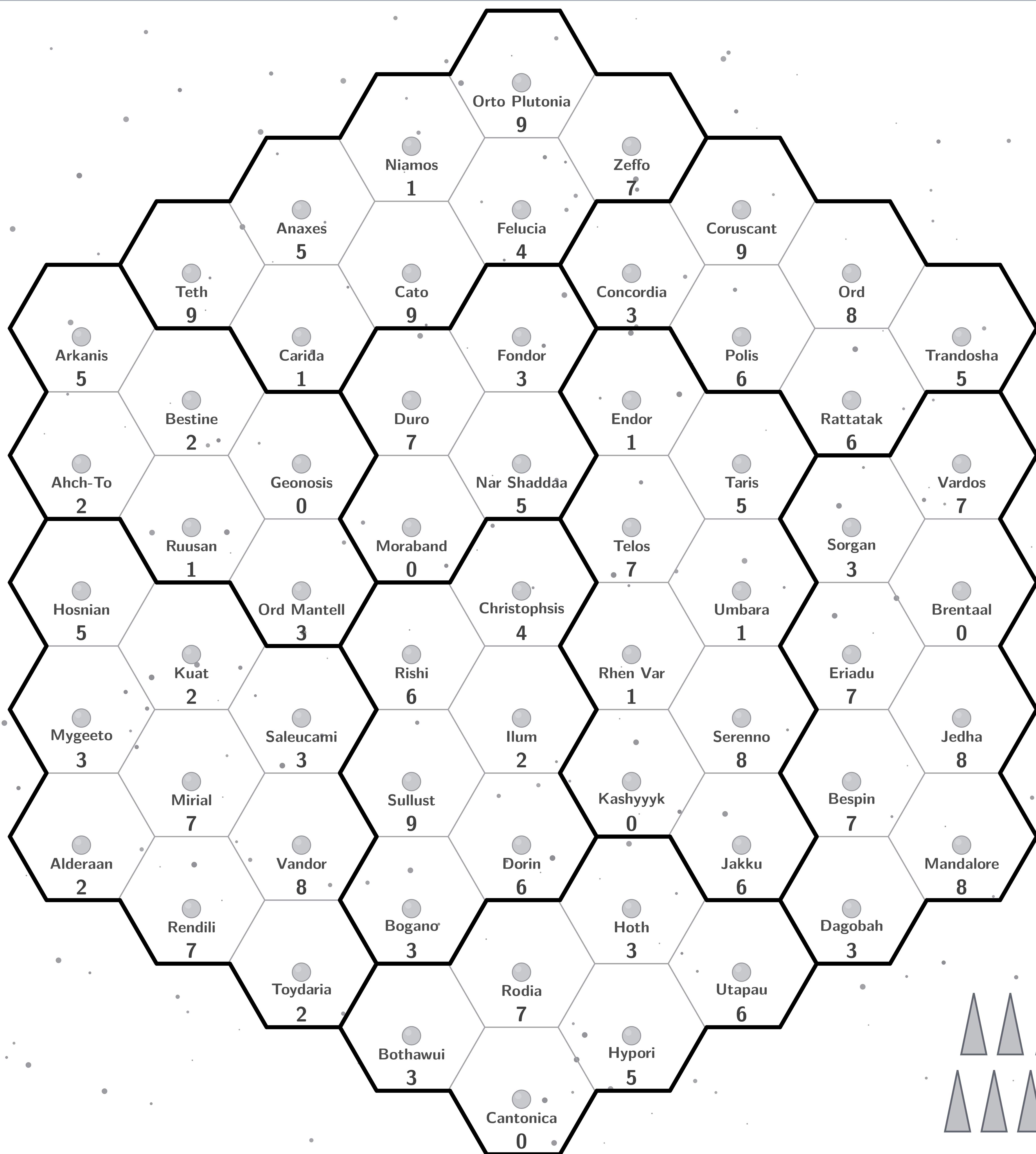




# COORDINATE THE FLEET

Deploy *Star Destroyers* to secure this contested sector of the galaxy and assert Imperial control.

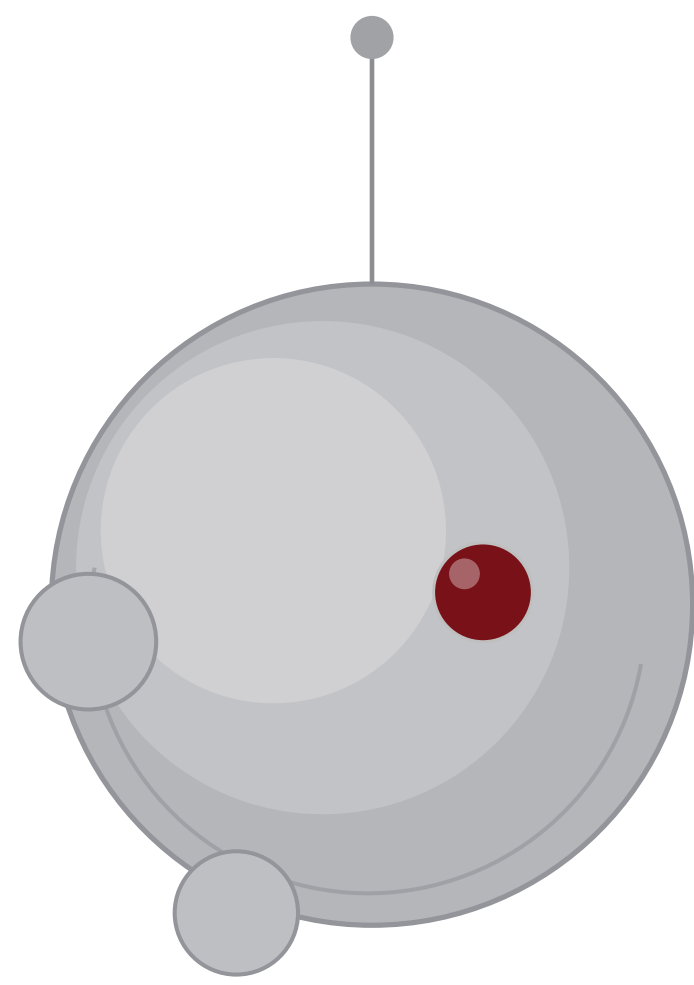
- Each column and two diagonal rows must contain exactly one Star Destroyer.
- Each command sector (outlined by thick borders) must contain exactly one Star Destroyer.
- Star Destroyers may not occupy adjacent systems.



Each *system* shows a 1-digit number. After placing all Star Destroyers, add the codes for systems that contain them:

$$\sum[\text{Coordinated Fleet}] = (\text{sum of the digits in the Star Destroyer hexes}).$$





# PROBE RETRIEVAL

Imperial probe droids are transmitting active signal counts from systems across this sector.

Each number represents the total number of active probe droids detected in that system – this is its *system value*. Together, these readings must form a complete sequence from 1 to 36. Some signal counts have already been confirmed. You'll want to review *Galactic Reconnaissance*.

Restore the missing readings so that consecutive numbers in the sequence are located in *touching* systems. Two systems are considered touching only if they share a common edge; diagonal contact does not qualify.



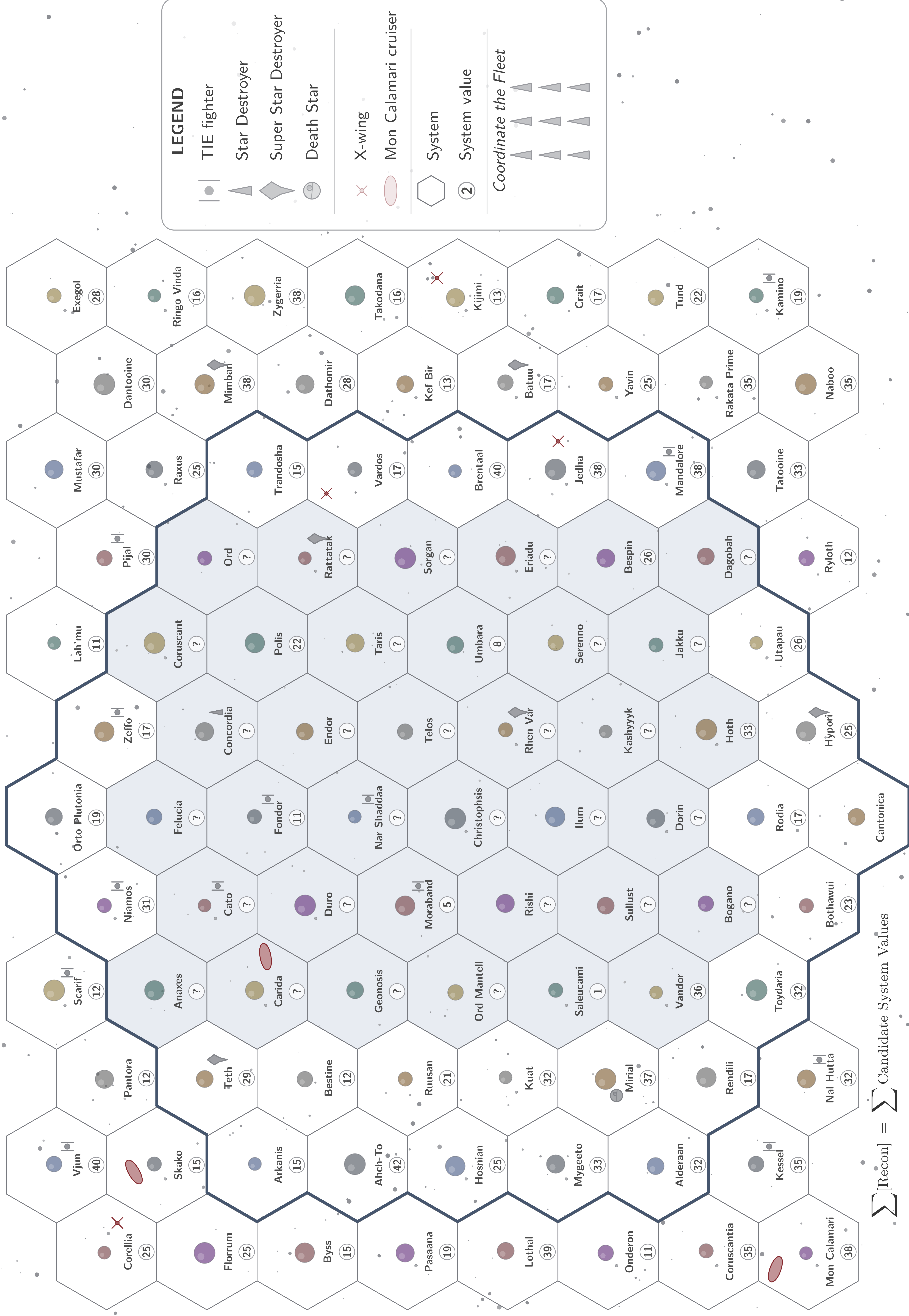
In the grid above, a system is considered *probed* if it contains a probe droid.

$$\sum[\text{Probes Retrieved}] = \sum(\text{Probed system values})$$

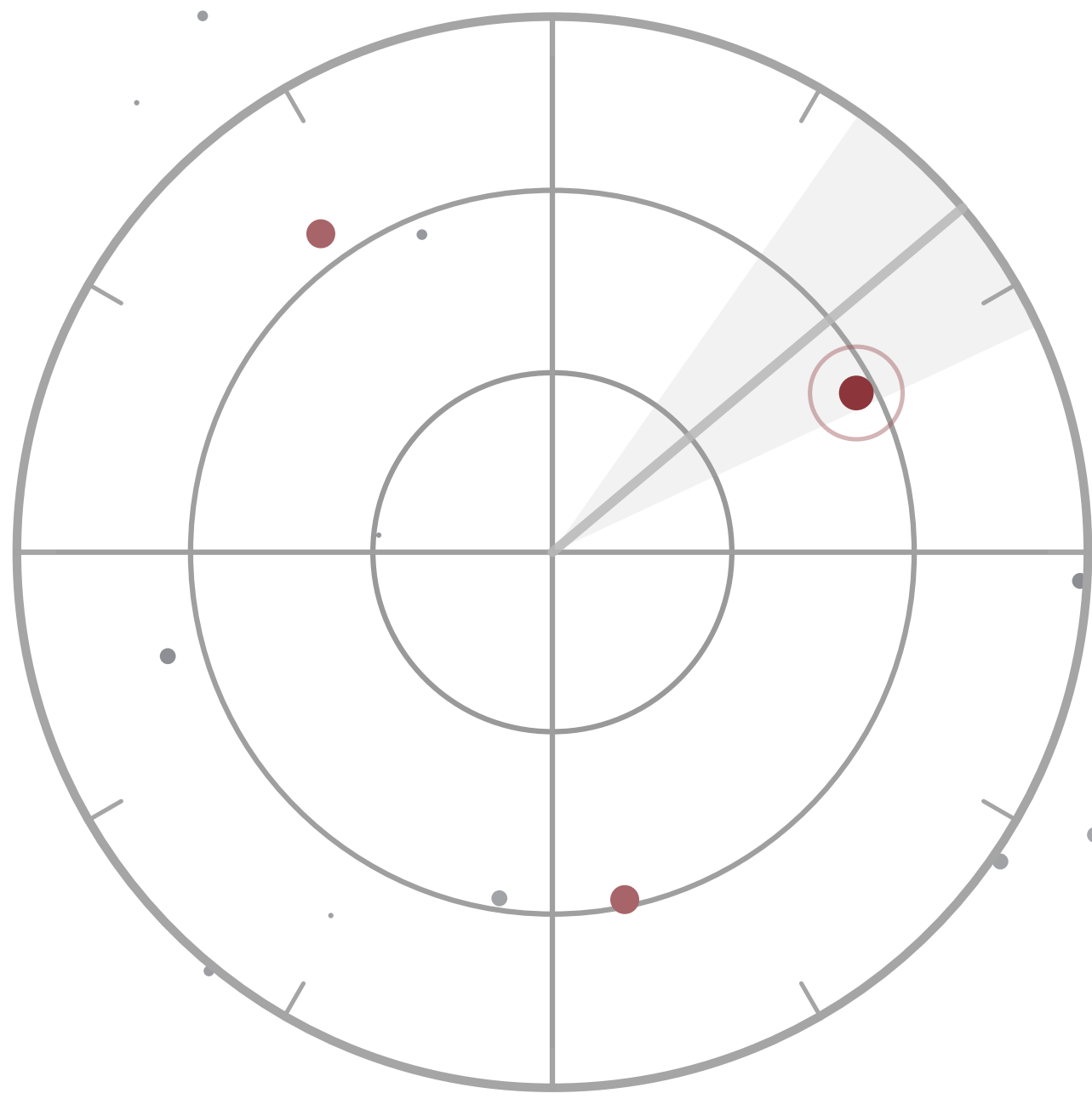


# GALACTIC RECOGNIZANCE

Identify the seven systems that are candidates for the Rebel base using *intel*. Do not forget to *coordinate the fleet* before finalizing your list.







# LOCATE THE REBEL BASE

Imperial probe droids are transmitting incident information readings from across the galaxy. *Your previous work* should have identified seven candidate systems where the rebel base could be hidden, along with corresponding system values.

In the table below, circle a set of numbers so that every row and every column matches its required total. Any number that is not circled is treated as excluded (treated as having no probe droids).

System names (A → G)	Transmitted Information type							System Value
	▲	■	◆	✱	●	▼	◀	
	9	6	7	5	4	7	4	<div></div>
	1	8	8	6	7	3	4	<div></div>
	5	8	2	3	2	2	2	<div></div>
	7	9	1	3	8	3	8	<div></div>
	2	7	3	5	2	4	1	<div></div>
	8	7	5	1	3	2	8	<div></div>
	1	2	3	6	5	4	8	<div></div>
Column totals	24	38	18	15	12	21	29	

Information Key

▲

 Dangerous lifeforms

■

 Rebel sabotage

◆

 Unstable planetary conditions

✱

 Smuggler traffic

●

 Patrol gaps

▼

 Encrypted bursts

◀

 Ion storm activity

For each system, define the rebellion probability by

$$p_{\text{rebellion}} = P(\text{Rebel sabotage} \mid \text{System})$$

The rebel base is located on the candidate system with the largest rebellion probability.

$$S_{\text{rebel}} = \text{system value for the rebel base}$$

Systems are considered *risky* if  $P(\text{System} \mid \text{◆}) > 0.2$ .

$$R_{\#} = \text{Number of } \textit{risky} \text{ systems}$$

# FINAL ASSAULT

## IMPERIAL HIGH COMMAND — OPERATIONAL DOSSIER

### DESCRIPTION

Commander, rebel scum have fortified their base and are wagering their lives on chance. You will show them what inevitability looks like.

Each starship on the map (*galactic recon*) represents a vessel with a battle competency value. For each ship type, competency has a particular probability distribution. Ships act independently; ships of the same type are i.i.d. You'll want to refer to *specification*.

### DEFINITIONS

- Let  $S_I$  be the total Imperial fleet competency (sum of competencies of all participating Imperial ships, Don't forget to include the 9 Star Destroyers assigned during *Coordinate the Fleet*).
- Let  $S_R$  be the total Rebel fleet competency (sum of competencies of all participating Rebel ships).
- An assault attempt succeeds if  $S_I > S_R$ .

$$p_{\text{win}} = \mathbb{P}(S_I > S_R).$$

- Let  $N$  be the number of assault attempts required for the Empire to defeat the rebels. Each attempt is independent with success probability  $p_{\text{win}}$ .

### ANSWER

Answer this puzzle using the expected number of assault attempts required to defeat the rebels (rounded to the nearest attempt)

$$n_{\text{attempts}} = \mathbb{E}[N].$$



[illegible]