Boundary Value Analysis
What to test?

Software Test

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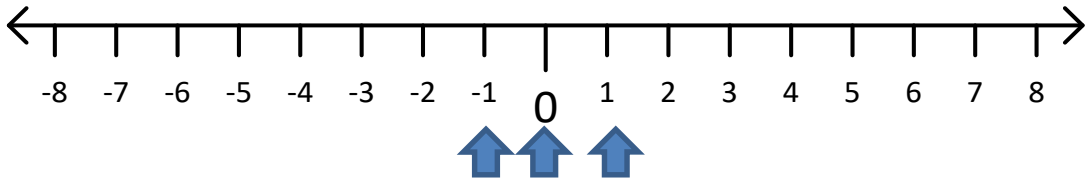
Boundary Value Analysis

- *Boundary Value Analysis (BVA)*
  - A test design technique to identify the **necessary** and **sufficient** set of test cases
  - Identify **input** values at which the **output(s)** change either in value or validity. These are ***boundary values***
  - Test **input** on and on either side of the boundary values

Boundary Value Analysis

- *Example*: `bool IsPositive(int number)`
  - What test cases would you define?

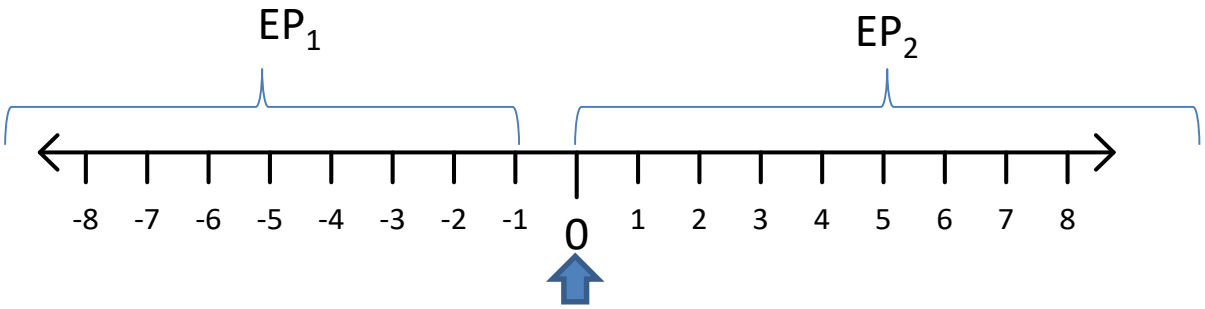


Equivalence partitions

- An **equivalence partition** (**EP**) is a part of all possible **inputs** that results in the same **output** – or at least the **same type of behavior**
- The parts of possible **inputs** that are **not a valid input** to the function are also **EPs**!
- Often **EPs** are defined by the **boundary values**, so it is important to do **BVA** first!
- **Test** with at least one input value from each **EP**!
  - This is necessary!
- **Don't test** with all values of an **EP**, but only one or a few
  - This is suffucient!

Equivalence partitions

- *Example*: `bool IsPositive(int number)`
  - What test cases would you define?



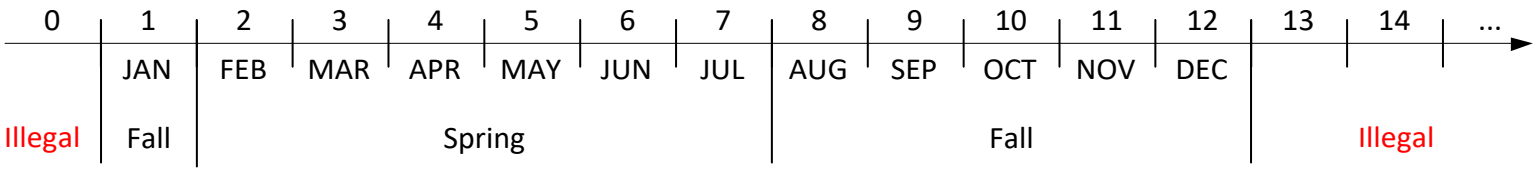
Equivalence Partitions and BVA

- When selecting the necessary and sufficient tests for an EP, use the BVA as guidance!
- Programming errors often occur at the boundaries!
  - If (x >100)
  - Should it be > or >=?
- So BVA and Eps are partners and should always be used together!

EPs and BVA - example

- Write a method **`string Calendar.Month2Semester(uint month)`**:
  - Given a month 1-12, return either "**`Spring`**" or "**`Fall`**"
  - Spring semester starts in FEB and ends in JUL
  - Fall semester starts in AUG and ends in JAN

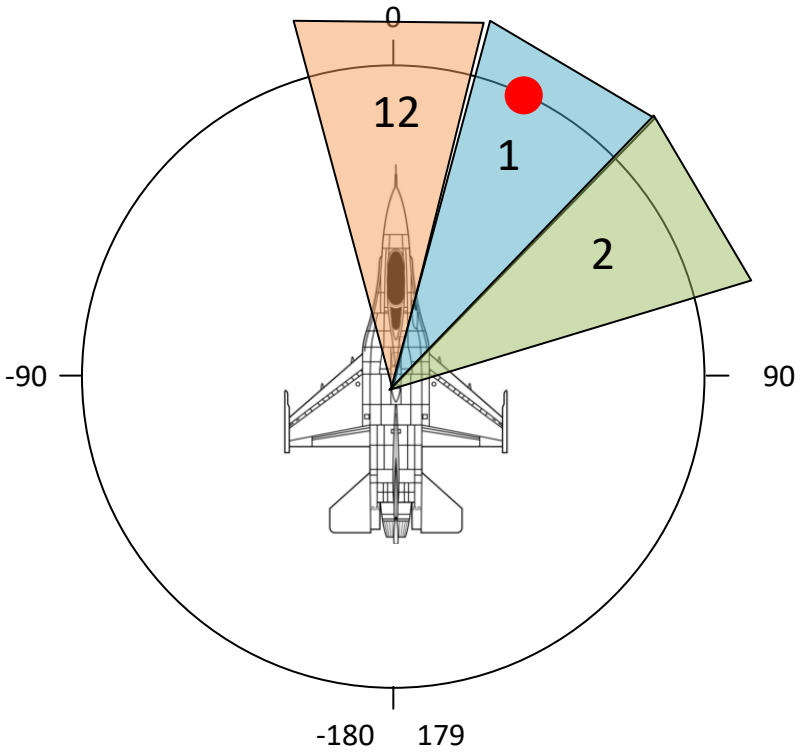
- What are the EPs? Boundary values? Test cases?



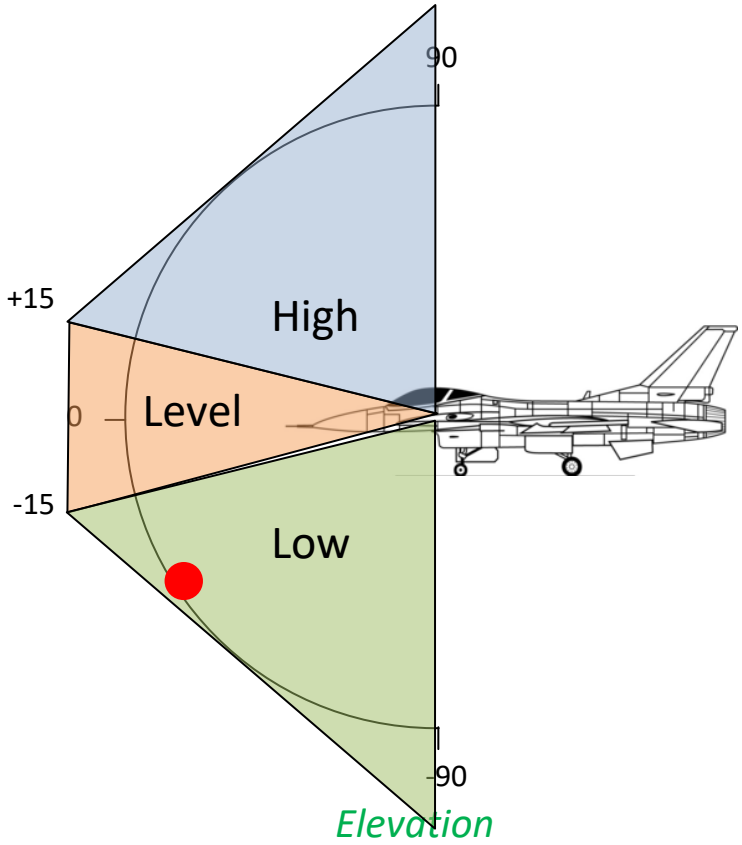
EPs and BVA

- BVA and EPs are black box test tools – we only consider input and expected output
- but uses general knowledge about how programs are built
- EPs reduce the amount of tests through analysis – not too many!
- BVA helps to select those tests in a way that makes it more probable that errors are found – not too few

EPs and BVA – your turn



Azimuth

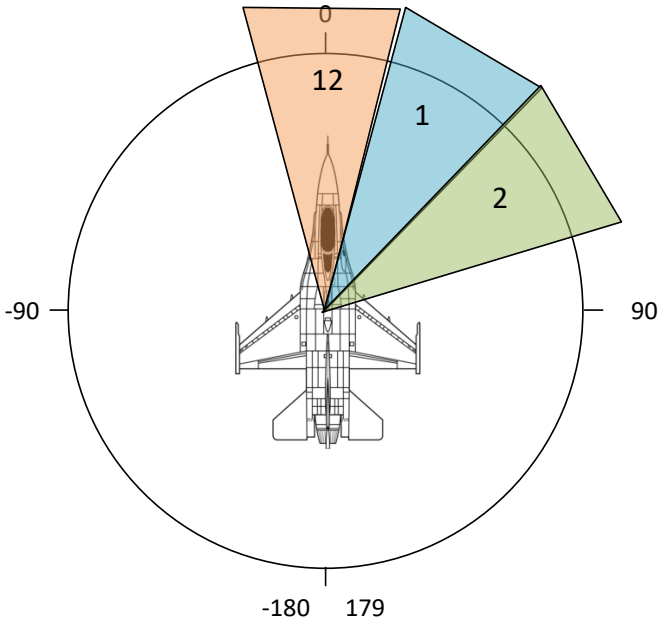


Elevation

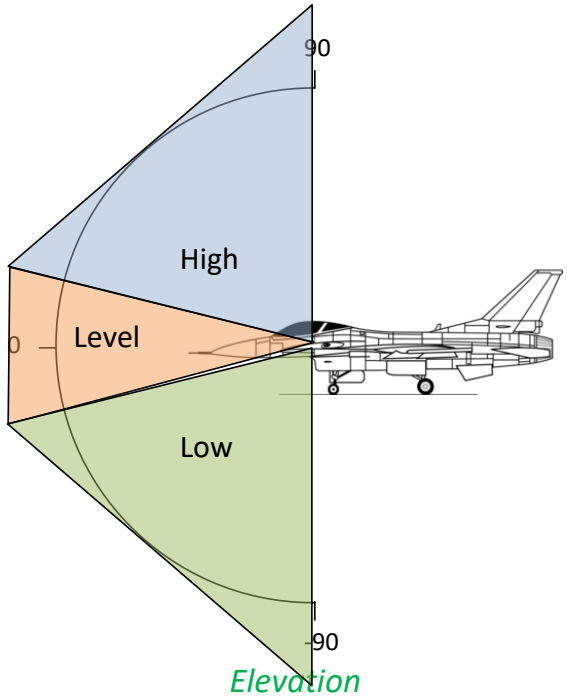
”Missile, 1 o’clock low”

EPs and BVA – your turn

- Perform BVA on the system and decide what test data you will use for azimuth and elevation
- Inputs are integers
- What would be different if inputs were floating point with high resolution?



Azimuth

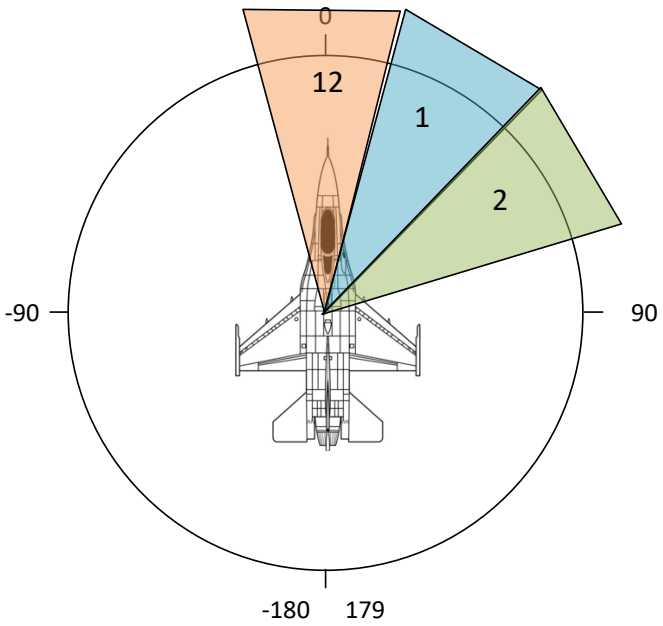


Elevation

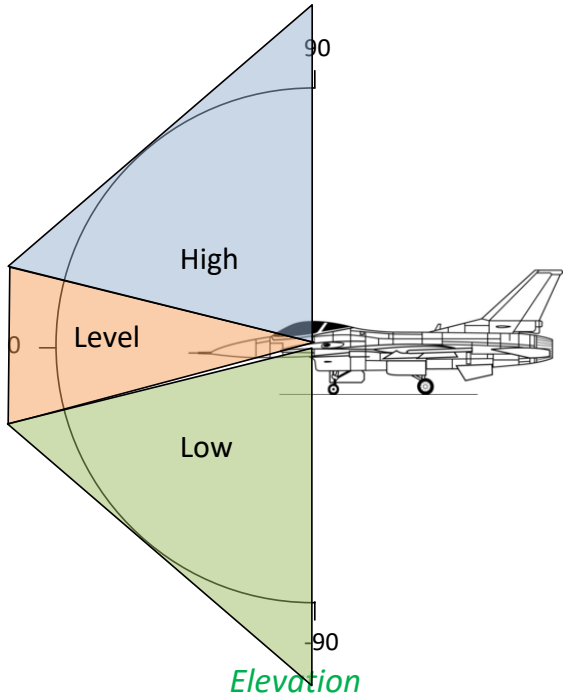
EPs and BVA – your turn

Azimuth -200 -180 -15 0 +15 +179 +200

Elevation -100 -90 -15 0 +15 +90 +100



Azimuth



Elevation

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Questions?