DECEMBER 2021 BRAIN TEASER & SOLUTION

Big Exploration

Big Exploration: This company is very successful doing aggressive offshore oil exploration. They do some things similar to industry, but others their own way, for instance they have their own unique decision criteria. You are a new DA recent hire facing your first significant challenge answering to the VP of exploration and appraisal (E&A). You learn that this is a "test of fire" and predecessors that have failed this challenge have been relegated to minor roles. The stakes are high.

Each E&A program consists of one exploration and one appraisal well each costing PV $100 MM. The prospect's exploration well has 25% chance of success into appraisal; 75% chance of immediate exit. The potential appraisal well has 75% chance of success into development; 25% chance of immediate exit. The development case has a wide distribution of economic outcomes due to critical unresolved uncertainties like future prices and resources. The company has split the development case distribution into a downside case covering the lower 25% with some critical downside uncertainties. The forward NPV of this downside case is $0 MM - excluding incurred E&A. The other 75% of development case distribution is called the Economic Success Case where uncertainties play out favorably. The company uses a decision criteria of 2 times the PV cost of the full E&A program to justify the investment, for instance, if the full E&A program costs $200 MM, the company needs a minimum of $400 MM at the front of the rolled back decision tree. You are asked to lay out a simple decision tree and determine the forward breakeven NPV of the Economic Success Case (excluding incurred E&A) needed to achieve the mentioned target return for the E&A Program? The VP will use this info to decide whether to proceed with this exploration prospect.

Note: This structure could just as well apply to mining, pharma and tech development. All the PV cost and NPV numbers are consistent apples-to-apples to be used directly in the tree without any adjustment. This teaser is intended as a pencil and paper exercise, or simple Excel with Goal Seek.

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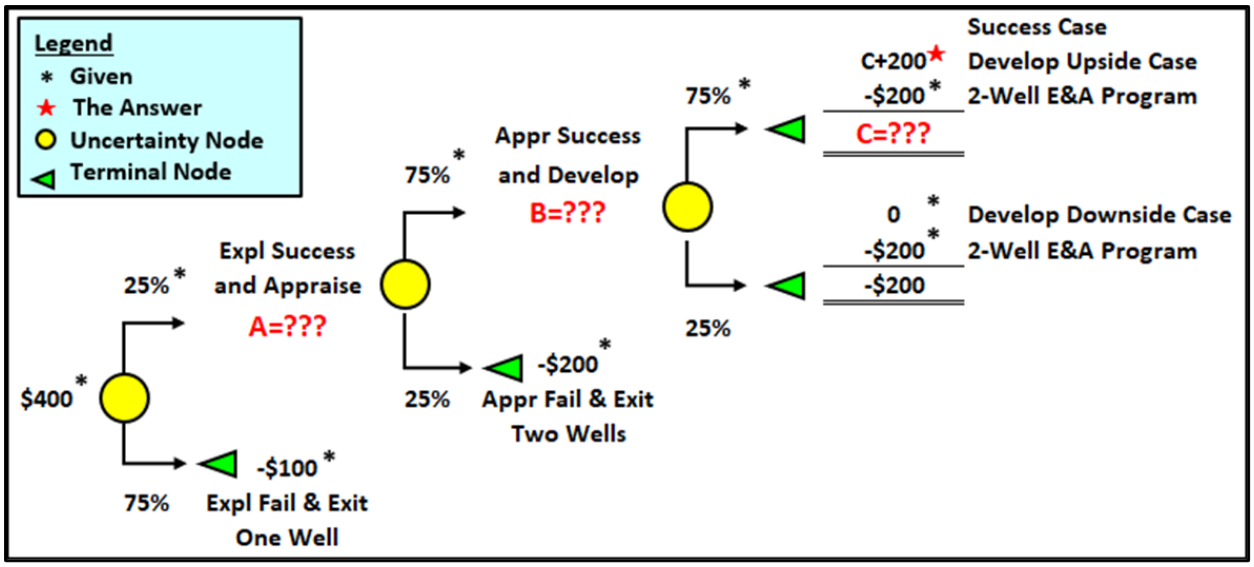
THE DECEMBER 2021 BRAIN TEASER SOLUTION

The answer to the "Big Exploration" December Brain Teaser

First step is to lay out the tree structure with the given (*) and missing (?) information.



From the root the tree can be "rolled forward" to determine A=(400-0.75*-100)/0.25=1,900. Similarly B=(1,900-0.25*-200)/0.75=2,600. Finally C=(2,600-0.25*-200)/0.75=3,533. The answer is 3,533+200=3,733 for the Success Case value excluding the sunk E&A spend. The VP determined that the assessment of the success case greatly exceeded this value and therefore proceeded with the exploration well.