# TreeDecisions User Guide

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## About Us

Marjorie Corman Aaron is Professor of Practice Emerita at the University of Cincinnati College of Law, where she taught negotiation, mediation, mediation advocacy, decision analysis, client counseling, and trial practice. Among her publications is the book *Risk & Rigor: A Lawyer's Guide to Assessing Cases and Advising Clients* (DRI Press 2019). She now practices as arbitrator, mediator and decision tree builder.[1]

Greg Dingle is a software engineer with experience in high-stakes mediation as a member of the Creditor Committee of the Blockfi Chapter 11 bankruptcy. He previously worked for Flux.ai and Facebook.

## Introduction

We created TreeDecisions to provide a simple and easy software for professionals seeking to make decision trees. It accomplishes the basics, enabling users to build a tree structure that reflects a decision and the possible but uncertain paths that might follow. A user can enter estimated probabilities, and estimated outcomes and estimated costs of achieving those outcomes. Based on the numerical values entered, the software will calculate an overall expected value, the expected value at each juncture along the way, and the overall probability of each possible outcome.

## A Bit of History and Current Context

Decision tree analysis has its historical roots in business and economics. [2] The earliest decision tree software we know of is TreeAge, which was developed in the 1980s by a Boston lawyer, Morris Raker, then a Boston Lawyer, and his neighbor David Hoffer, then a teenage "whiz kid."   One of the authors of this guide, Marjorie Aaaron, was an early user of

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[1] Professor Aaron's book is available via the link above for free chapter-by-chapter download and also on Amazon. Her website, RiskandRigor.com, includes several book chapters, tutorial videos for the book's practice exercises, videos of teaching sessions, and other resources related to the use of decision analysis or risk analysis in practice.

[2] A celebration of the "Golden Anniversary of Decision Analysis,"dated the field's origin to 1964 and attributed it to two professors, Howard Raiffa from Harvard, who made great advances in applying statistical decision theory to real world problems, and Ronald Howard from Stanford (then on Sabbatical from MIT), who created an engineering approach to decision problems and called it "Decision Analysis. www.smartorg.com/golden-anniversary-decision-analysis-raiffa-howard-award-organizational-decision-quality/ and Raiffa, Howard," Decision Analysis: A personal Account of how it Got Started and Evolved," *Operations Research* 50, no.1 (2002):10.

TreeAge. Though still used by some lawyers today, TreeAge is a paid product predominantly used for public health, pharmaceutical and medical research, as well as business decision-making. To serve those communities, the TreeAge[3] software has developed to become highly sophisticated but less accessible to the non-technical user. In recent years, others have developed decision analytic software and services primarily aimed at and priced for large corporate and law firm clients.[4]

The accumulated experience of 35+ years of building and teaching decision trees convinced Marjorie Aaaron of the need for a simple decision tree software with graphically clean and efficient interface and outputs.[5]  Meanwhile, Greg Dingle's experience in repeated high-stakes mediations convinced him that there was a need for collaborating on basic decision trees via an app.

From the beginning of our partnership, our goal has been to keep TreeDecisions minimal and unfussy. It's designed for users who are comfortable with the basic method, who are able to organize the needed information, questions, uncertainties, and professional assessments and estimates into a tree format. In other words, it's for users who understand how to draw trees on paper and do the arithmetic, but if possible, would prefer to make trees that are neater and do the math with a mouse click.

As you will see, most examples used in this Guide (and in the *Risk & Rigor* book) involve decision trees in litigation contexts, largely because our practice and teaching experience has been with legal cases. However, the TreeDecisions software application can be used for decision tree analysis in just about any context.

Note also that, while always called a "decision" tree, a tree may be used purely for risk analysis of contingent outcomes reached at the end of various uncertain paths. For example,

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[3] TreeAge moved to Williamstown, MA, and was later sold to a larger company.

[4] In particular, the software Eperoto was developed in Sweden by Olof Heggeman and his team; and the software SettleIndex was developed by Robert Hogarth and his team. An author of this Guide was among many people consulted by the creators of these software products and provided feedback and suggestions to them. In fact, earlier versions of TreeDecisions were in the works long before; that was fully disclosed. We do not denigrate the value of these software products. We see them as aimed at users less familiar with the basic method, less comfortable with building trees "from scratch," and useful in corporate settings that appreciate extensive graphs and charts. While not inexpensive, they may be exactly what some users require to use this method. We encourage folks to go to these sites to see if these software products would better meet their needs.

[5] SilverDecisions.pl is also a free and relatively simple decision tree software, with open source code. However, we have always found it a bit clunky and yearned for a cleaner and more efficient user interface, with less technical terminology. If TreeDecisions.app didn't exist, we would recommend SilverDecisions.pl.

a litigation case tree is generally pure risk analysis because, while the parties surely seek to influence decision makers, they don't hold decision-making power within the process.

## Just About the App

This User's Guide merely offers instructions for working with the TreeDecisions software application. As stated above, it assumes the user knows how to build a decision tree on paper – how to map sequential uncertainties, possibilities, probabilities, and possible outcomes along risky paths that might follow a decision.

For the uninitiated, detailed guidance on the theory and best practices for building decision trees is contained in Risk & Rigor: A Lawyer's Guide to Decision Tree Analysis for Assessing Cases and Advising Clients (DRI Press 2019). It was written by the TreeDecisions.app's co-creator and co-author of this User's Guide, Marjorie Aaron. It's offered as a resource here without shame or profit motive for, while the book is on Amazon, it's also available for free chapter-by-chapter download. The associated website, RiskandRigor.com, also contains resources and references for decision tree builders including shorter articles outlining the underlying theory and practice basics for decision trees.

## At the Creation

Upon arrival at TreeDecisions.App, click on the blue box labeled "Create" near the upper left of the page.
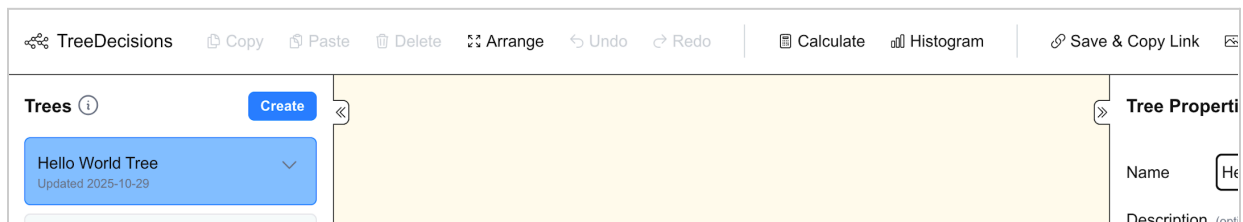


A dialog will pop up to "Create New Decision Tree." At that point, you can create an entirely new tree, import a pre-existing tree from a downloaded JSON file, or generate one with AI. If you are creating and seeking to build a new tree (whether yourself or with the "Generate with AI" Option, you will want to label the tree, and you may want to include an optional description for your later use or for others viewing the tree.

**Create New Decision Tree**

+ Create New          📁 Import from File          ✦ Generate with AI

Enter a name for your new decision tree

Enter tree name...

Enter an optional description for your new decision tree
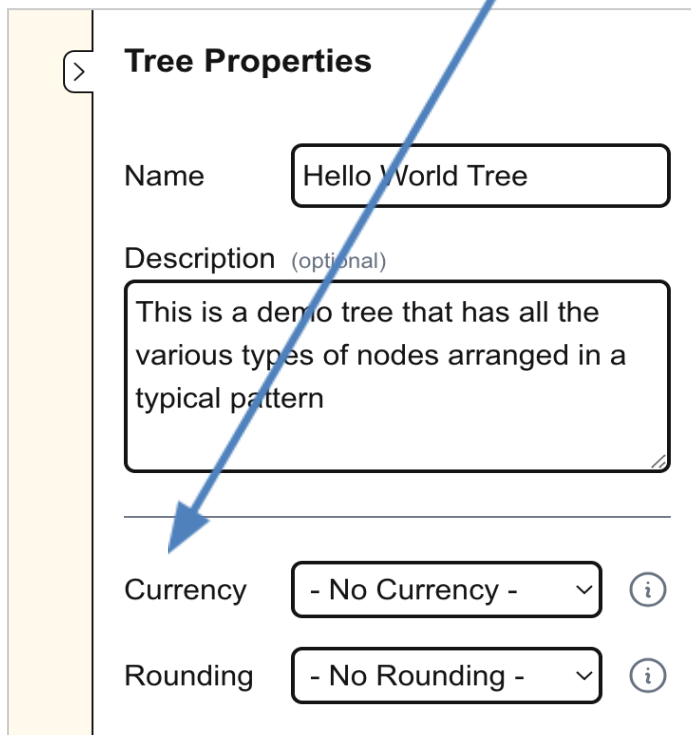
Enter tree description...

Cancel          Create

Once you've created and labeled your tree, the label name and its creation date will appear in a blue box on the lefthand sidebar. You can leave that sidebar showing or use the left facing chevron (<) at the top to hide it, leaving more screen space for your tree.

## Tree Properties

As soon as the tree label appears on the left sidebar, a column titled "Tree Properties" will appear in the right sidebar. Under the tree name and description, you'll see a series of prompts. These enable you to create settings that will apply to the entire tree. These include:
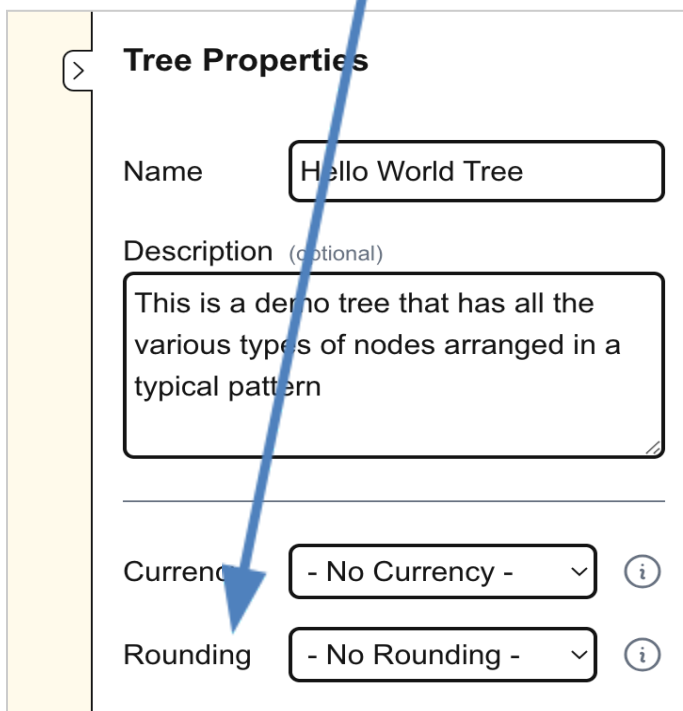
● An input box labeled "Currency"



As indicated you may choose the currency symbol that will appear next to all amounts on your tree––outcome values and expected values.
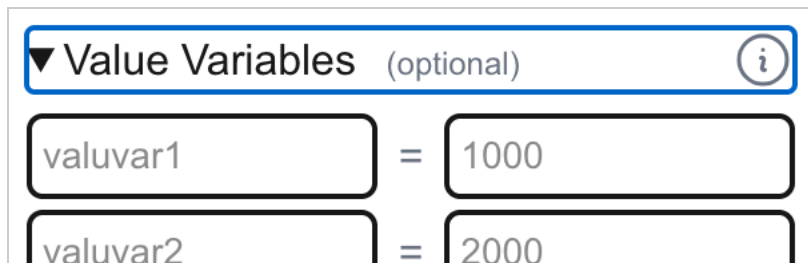
● An input box labeled "Rounding"

This enables you to have all amounts *appear* on the tree exactly as you enter them, or round them to something shorter. By default, if you enter the number $1,367,595.03, that is what will show on your tree. Or you may choose to show numbers with the abbreviation conventions of the USA or the UK. For example, $1,367,595.03 would appear at $1.37m by the UK convention. That will save space on your tree – helpful if the tree is complex. Whether you choose to round or not, the numerical values included in the tree calculations will be the exact numbers you entered into your tree.

● A "Value Variables" line

If you click on the left hand triangle, boxes to input outcome Value variable names and estimates will appear below.
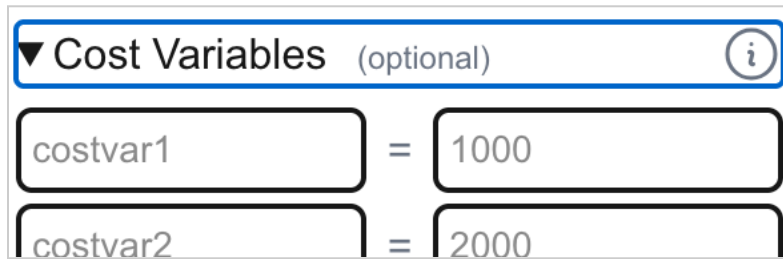


Sometimes, on a complex tree, it can be helpful to work with labeled variables for probabilities, costs, or outcomes if you anticipate these may need to be revised later. For example, in a litigation related tree, let's say that you've included a chance node for the possibility that a certain damages theory will be accepted by a judge or jury. That theory inevitably leads to a much higher (or lower) damages prediction. You have read your expert's report and you've interviewed them, but you haven't seen the other side's expert report and you haven't deposed them. At the moment, you estimate the final damages (under that theory) will be $3 million. What if, a week from now, you receive the other side's expert report in discovery, and it causes you to adjust your value estimates?  Instead of going back to every place that $3 million appears on the tree, you can use a variable in its place, and just change the value within the "Value Variables" box and it will change over the entire tree.

● A "Cost Variables" line

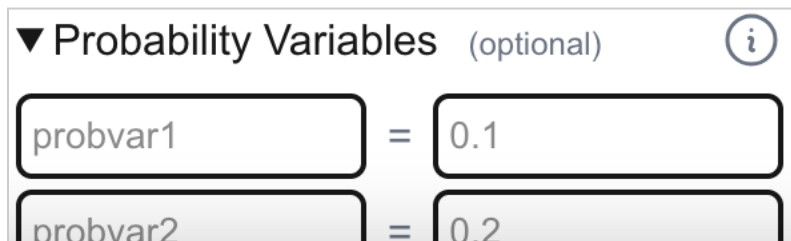If you click on the left hand triangle, boxes to input Cost variable names and estimates will appear below.

▼ **Cost Variables** (optional)    ⓘ

| costvar1 | = | 1000 |
| costvar2 | = | 2000 |

The Cost Variables work the same way as the "Value Variables". Assume you will estimate the cost of attorneys' fees or expert fees at many terminal nodes. That cost will be subtracted from the outcome values to yield the overall value to be recovered or paid (depending on whether you represent the plaintiff or defendant in litigation). What if the expert costs more, or the fee estimate rises?  (Or less likely, what if they turn out to be lower?). If you entered these as $25,000 and $75,000, and the new budget estimates are $40,000 and $120,000, all you have to do is change these values in the variable settings. The new values will be used at all places on the tree where you used the appropriate variables.

- A "Probability Values" line

  If you click on the left hand triangle, boxes to input Probability variable names and estimates will appear below.

  ▼ **Probability Variables** (optional)    ⓘ

  | probvar1 | = | 0.1 |
  | probvar2 | = | 0.2 |

  Unsurprisingly, using variables for one or more probabilities enables you to change them everywhere they appear on the tree as your probability assessments change. Thus, if you currently estimate a 75% likelihood of a certain expert damages theory carrying the day but later wish to change that % estimate (based on their expert's deposition), you can just change the variable value. There's no need to change the % at each location it appears on the tree.

  Once your "Tree Properties" are set, you can put your cursor on the blank screen, at the spot where you'd like the tree to start and right-click (or control-click if you don't have a right-click button). Click on the chevron (>) at the top left of that righthand sidebar and it will disappear. That will free up screen space for your tree.

If you'd like to revisit them, just click on left chevron (<) at the upper righthand edge of the screen to bring back Tree Properties.

## Building the Tree

If you move your cursor on the blank screen, it will look like a little gloved hand. Begin to build the tree by placing a node in one of two ways: by right-clicking your mouse, or by hitting and holding the control key and left clicking (useful if you don't have a two-button mouse, or you are using a trackpad). The tree will begin in the spot where you clicked the little gloved hand cursor.

By the way, left-clicking and holding will allow you to drag the whole canvas around to put your tree into a better view. Similarly, using the scroll wheel on your mouse (if you have one) will zoom in and out.

After control+click or right-clicking, a little menu will appear that gives you the option to "Add Chance Node," "Add Terminal Node", or "Add Decision Node". (At the bottom it also gives you the option to add a Note. That will be discussed later.)
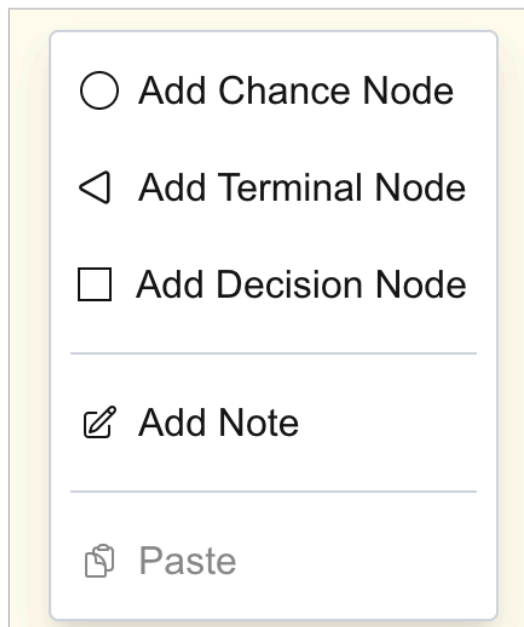


Left click on your choice of node.

If you choose Decision Node, it will appear as a blue square. When you hover the cursor over the box, two little white circles will pop up – one on the left and one on the right of the decision node. The white circles are for branch placement.
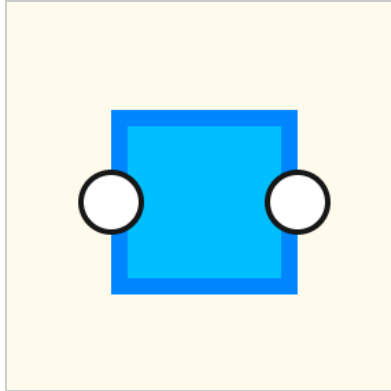
If you choose a Chance node, it will appear as a red circle. When you hover over the Chance node, two little white circles pop up, one on the left and one on the right. As stated above, the white circles are for branch placement.
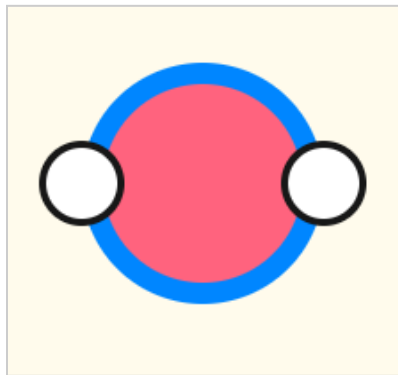
Notice that when you click on a chance node, a right sidebar pops-up titled "Chance Node Properties." This is intended to allow for an explanation of the uncertainty marked by the Chance node, in more words than you would put onto the branches. It also allows you to enter costs that would be incurred from the start of the tree to that Chance Node. You may choose to enter this descriptive information and-or costs, or not. To remove this image away from your screen, simply click on its top left arrows.

**Chance Node Properties**

Cost
(optional)

[Enter cost]   (i)

*Note: Ignore costs that occur before the start of the tree. Those are sunk costs.*
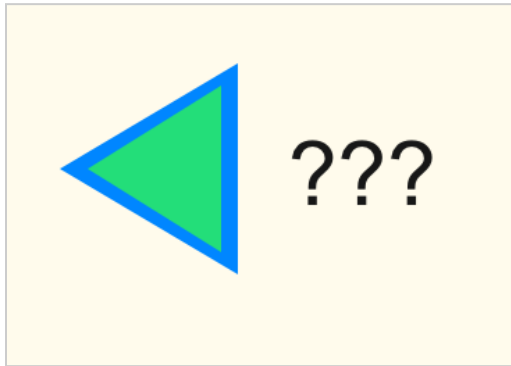
Description (optional)

[Enter description]

Imagine we know the defense will file a motion to dismiss, the branches after that might be labeled: Motion to Dismiss Granted, and Motion to Dismiss Denied, or just Dismissal Granted, Dismissal Denied – too many words on branch labels will clutter up the tree. You could opt to write more in the Chance Node Description for example:

Description (optional)

Motion to Dismiss based on argument that an earlier release signed covers this incident.

Or:

Description (optional)

Motion to Dismiss based on statute of limitations grounds; defense argues plaintiff knew or should have known of the injury at an earlier date, making this claim beyond the statutory time limits. Plaintiff argues she was unaware and could not have known until a later date.

If you enter a Terminal Node, it will appear as a green triangle.



To the right of the Terminal Node, you'll see "???". This invites you to add outcome values. When you get to that point on a tree, we advise you to click on the chevron (>) to see the righthand sidebar labeled "Terminal Node Properties." Terminal Node Properties will be discussed in more detail later in this Users' Guide.

## A Note on Colors

As you may have guessed, a node is outlined blue when you are working on it – setting it up or clicking on it to add branches or convert it to a different node type. When it is outlined in blue, it is "active".

This is also true for the branches. They generally appear on the tree as gray lines, but the lines turn blue when "active" – when you are actively working on them.

## Finally, a Note on Notes

At the bottom of the little pop-up box, you'll see the words "Add Note," enabling you to create a textbox note wherever you've placed your cursor.
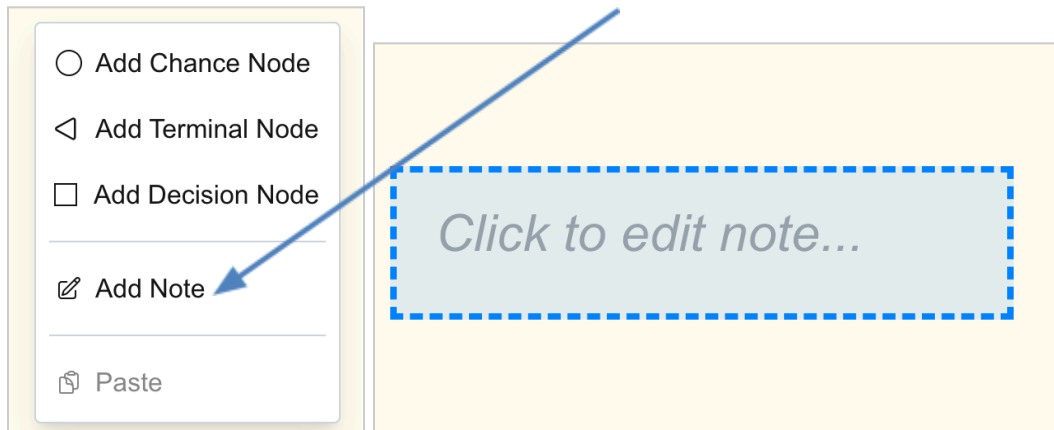


This can be helpful for explaining – in more words than you would want to put in a branch label – what a particular area of the tree represents, why it matters, etc., what the legal issue is. You can either enter the explanation directly into the text box, or into the "Note Properties" righthand sidebar, in the box labeled Description.
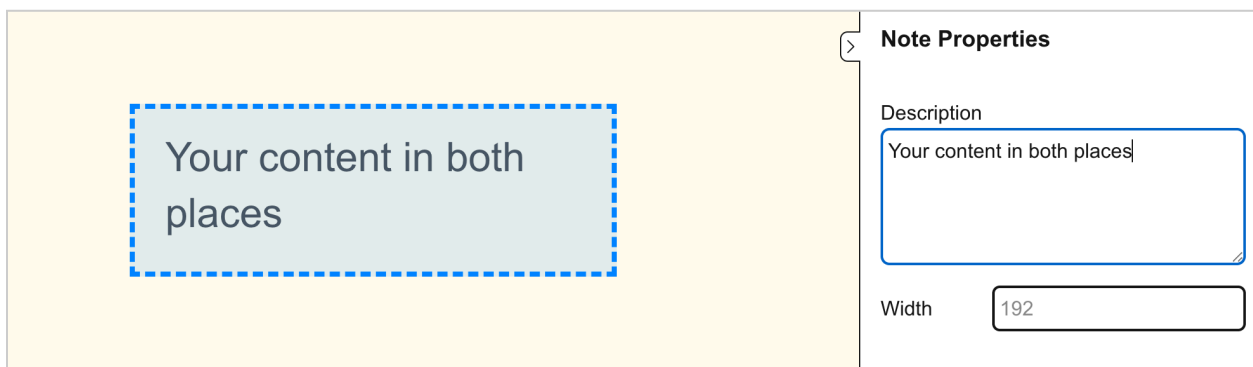


Any text entered into the Description box will automatically go into the text box and vice versa.

If you hover over the text box, little white circles will appear at each side. From there, you can draw an arrow to the place on the tree directly related to the note text.

Your content in both places
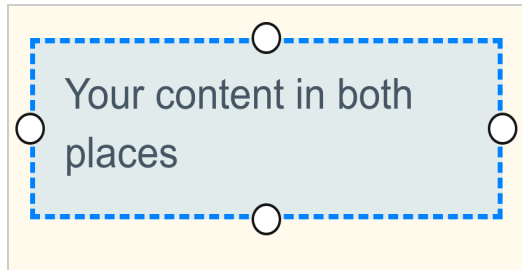
## Once upon a Node, Time for Branches or Conversion

To add branches from a node, you may right click or hold the control key and click on the node itself. Either way, you'll be presented with a box that gives you the options.
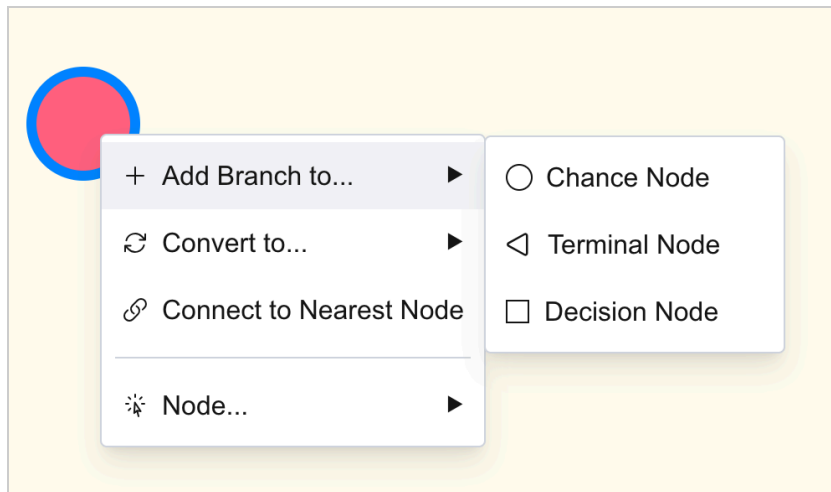
### *Branches first*
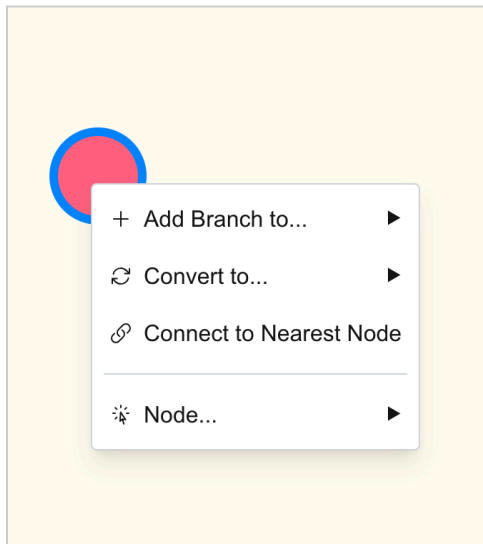


And at the bottom "Node", which refers to actions you can do to the node itself (Select, copy or delete).

If you seek to add a branch (presumably more than one), click on the +Add Branch.

Up will pop another box, to the right, giving you the choice between a branch to a Chance Node, Terminal Node, or Decision Node.

Choose the type of Node you wish this branch to lead to, and it will be added to the tree, starting at the little white circle.
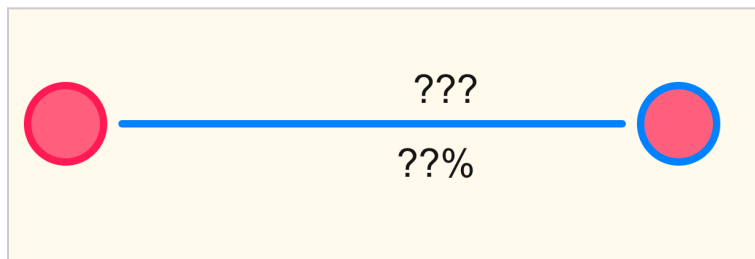


Of course, you will usually be creating more than one branch from any Decision Node or Chance Node. To add a second branch (or as many as you like), go back to the Node where that branch would start and just click on "Add Branch to" again. The software will add a branch and automatically adjust the spacing so the distance between the branches is consistent.
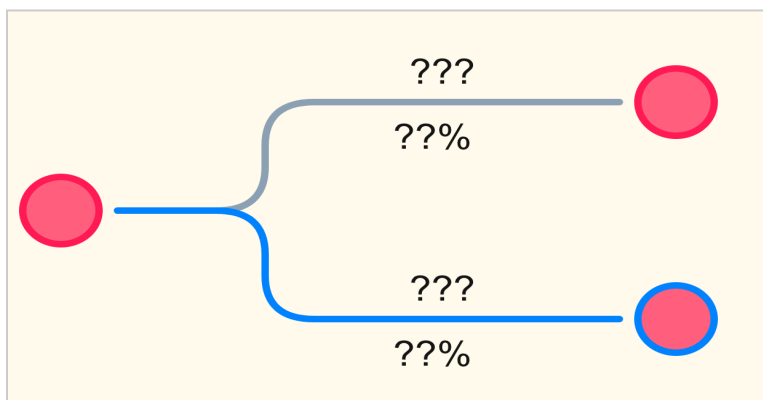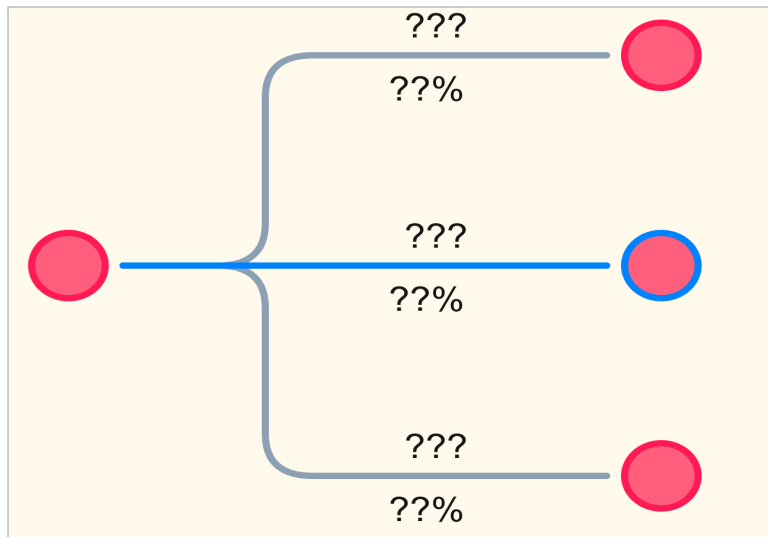
You may continue to add branches to further nodes, anywhere on the tree.
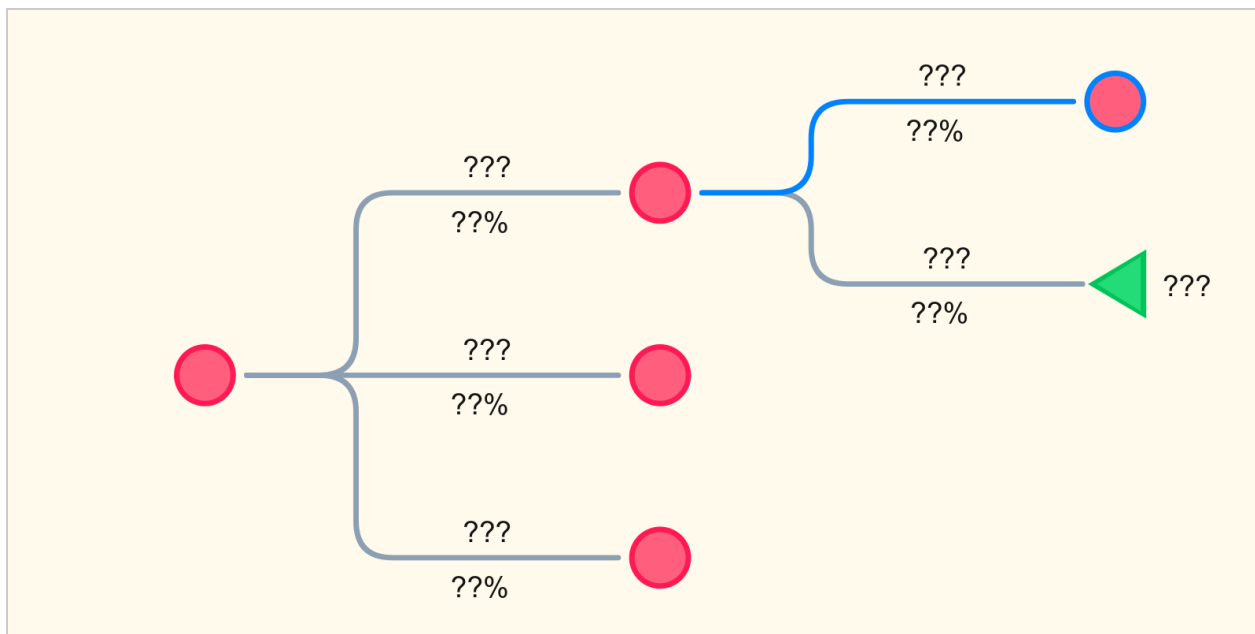


## On those branches

When you create branches, you'll see "???" above them and "??%" below them. The ??? above the branches are prompts to enter a label – what uncertain event does this represent?  The ??% below the branches are prompts to enter probabilities. You can enter the label directly onto the branch in the box that appears when you click on the ???. And you can enter your estimate of its probability directly in the box that appears when you click on the ??%.
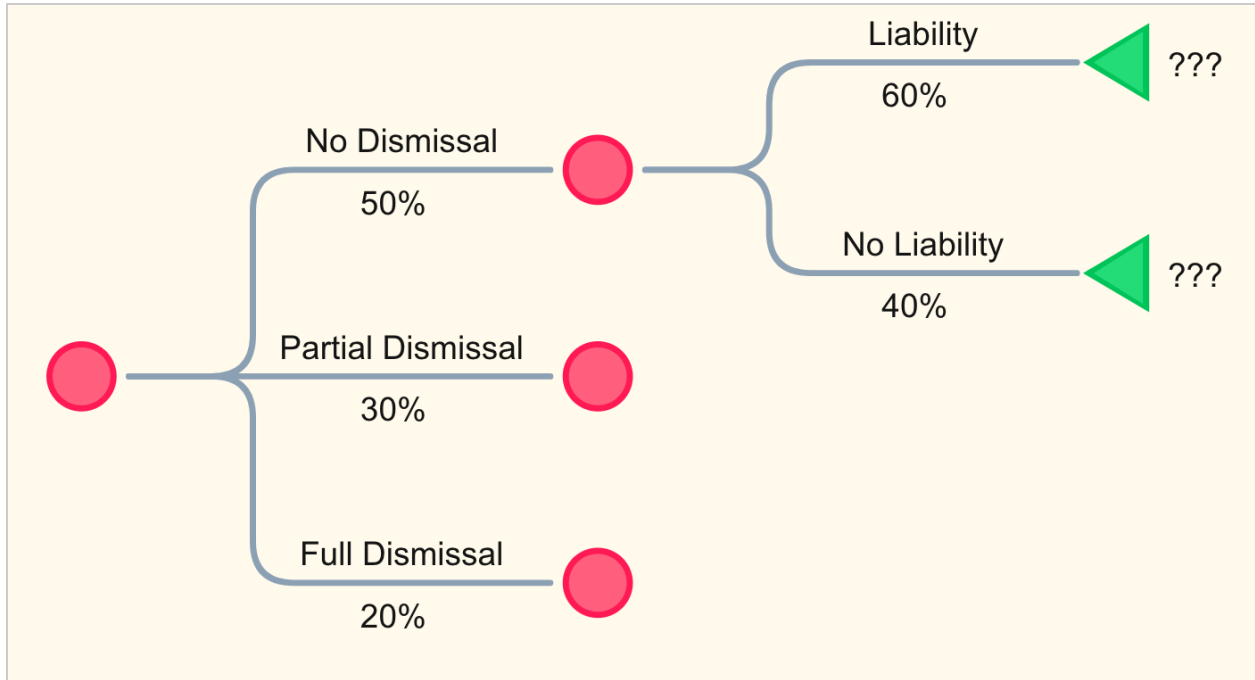
If the Branch Properties sidebar is open, you'll see a box for the branch label and the probabilities.
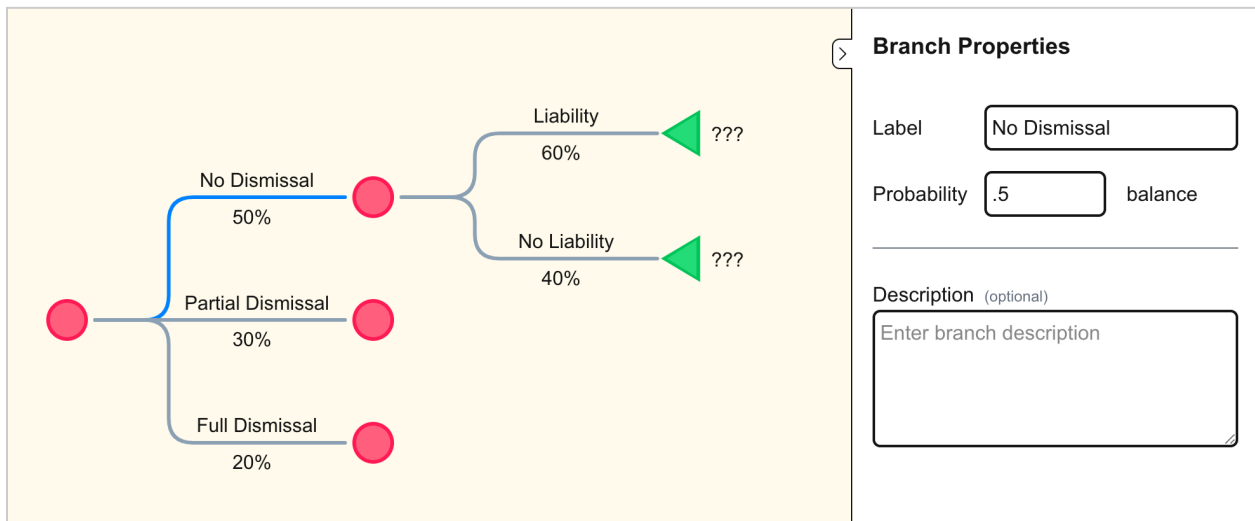


Either way you enter the values, they will appear in both places. You can enter them directly on the tree and later see them in the sidebar or enter them into the sidebar and they will appear on the tree itself.

## Node Conversion

A godsend for those of us who rethink as we go!

This veteran tree builder hereby confesses that when I right-click on any node, and the little menu appears, I click on "Convert to…" almost as often as "Add Branch to…". The "Convert to" option enables you to change your mind and hence the node type that will follow. It's not uncommon to start building a tree, realize there are three ways a motion or other procedural hurdle could pan out, and then just add three branches to Chance nodes – do the same mechanical thing three times.

However, after moving from mechanical to analytical, you realize that one of the paths leads directly to the end. One of those chance nodes should be converted to a terminal node instead. Or you may realize that a certain ruling or evidentiary gap gives rise to a decision opportunity: to retain an expert on a certain issue or not; to make a motion to join another party given the ruling, or not. If so, you would click on "Convert to." You'll then see a pop-up box to the right to select your changed Node type.
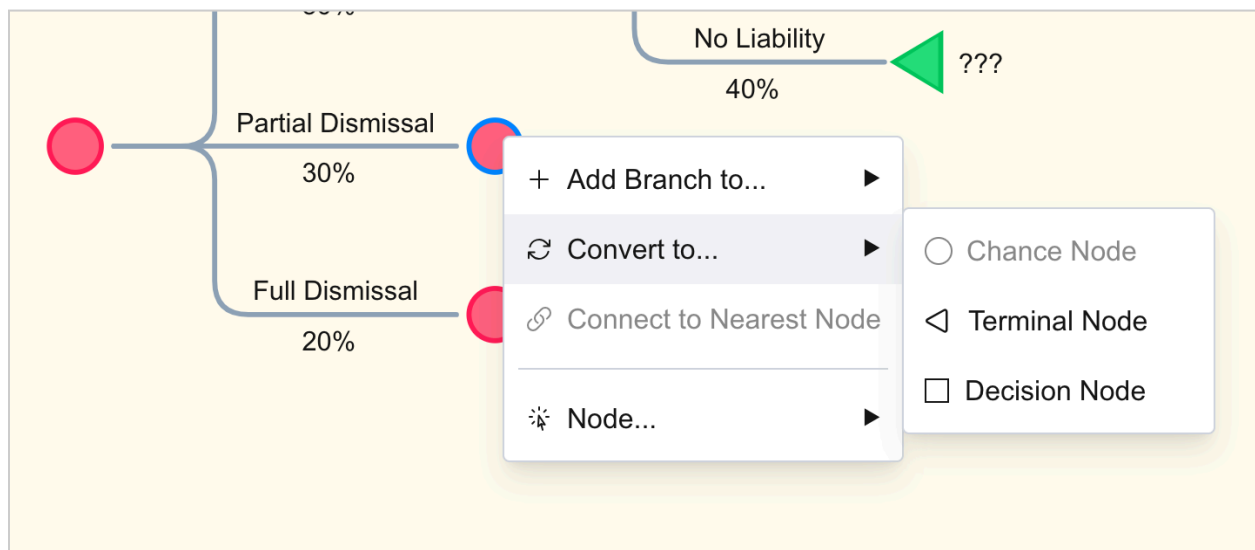


## Undoing, Deleting, copying and pasting subtrees

When you build a complex tree, it's often true that some parts of the tree are repetitive, and the builder would rather skip the mechanics of building each branch at each node when they are identical to the structure of another area of the tree.

For that reason, we've included a Select/Copy/Delete subtree option. This can be reached by right-clicking on the node that begins the subtree you'd like to select and then copy or

delete, as indicated below.
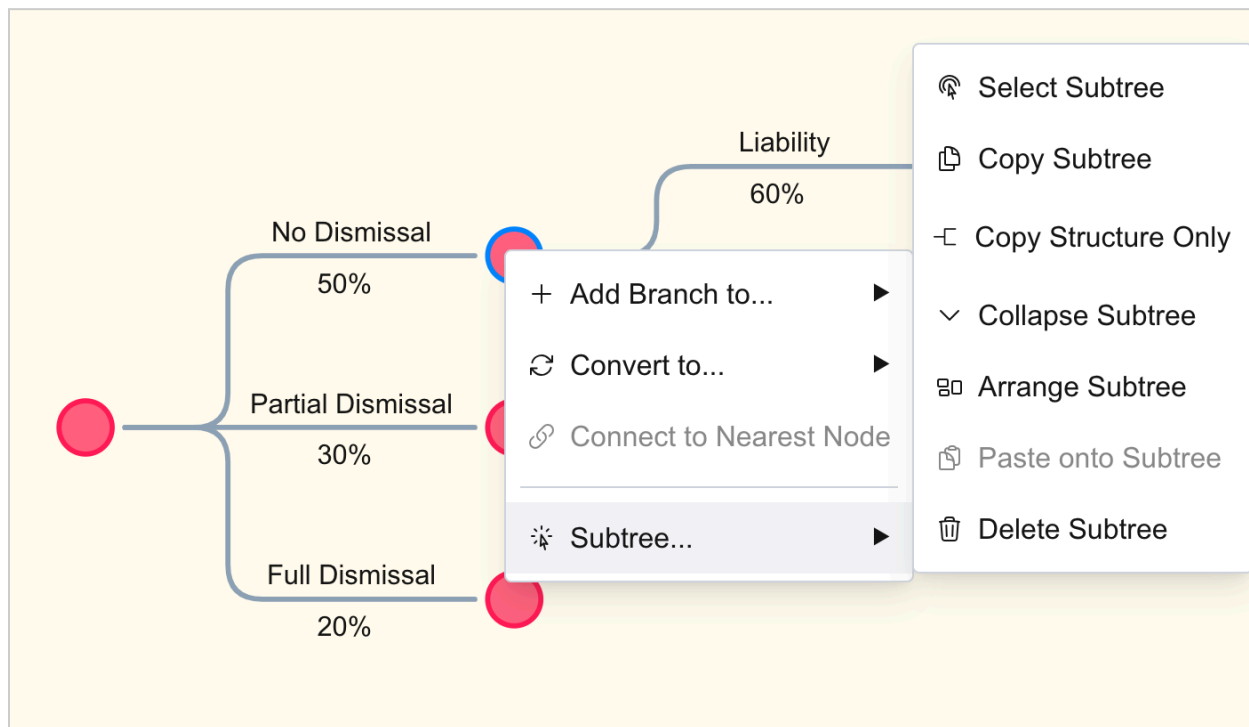


Sometimes, the tree builder just wishes to copy the structure – for example, the node and branch clusters representing the factual statutory framework for damages in a litigated employment case. There might be chance nodes for level of wage loss (if disputed based the testimony), from each of those, chance nodes for back pay only, back pay plus front pay, maybe separate branches for length of front pay, from there chance nodes for punitive damages or not, maybe separate branches for level of multiplier, and so forth.

Depending on the case, you might want to copy the structure *without* also copying any of the data entered in the original subtree – dollar outcome or probabilities. You might anticipate that if a jury awards the highest level of wage loss claimed, that's an angry jury, and they are more likely to lean heavily into punitive damages. Or, if a certain economic damages expert was excluded or not earlier in the case path, that might affect your assessment of the likely damages to be awarded, and so forth.

Of course, you can always use the top tool bar buttons on any selected node or a branch to copy, paste, or delete – or to undo or redo your last action.

# Finally, at the Terminal

When you reach a terminal node, a right-hand sidebar should pop in with prompts to enter the predicted outcome and the costs, from which the software calculates the Net Value, and displays it to the right of the Terminal Node on the tree. Remember that, as a matter of sound practice, the tree calculations should be made with NET Value – the dollar value outcome less the costs of achieving it, with costs counted only from the time you build the tree. Past costs – including past attorneys and expert fees that will not be recoverable – should not be included. They are sunk costs. The only exception would be at terminal nodes at the end of case pathways in which all past costs would be awarded. Good examples are statutory claims or some fraud claims where the law provides for recovery of costs and fees.

The last chance node along each branch path should lead to one and often many possible outcomes, each represented by a terminal node.

For example, in a contract case with a liquidated damages clause, after jumping through hoops (chance nodes) of uncertainty – a motion to dismiss based on a release, a motion to exclude certain evidence, a fraud allegation – you reach the end of a pathway. Assume the case path might be: motion to dismiss denied, motion to exclude certain evidence denied, fraud theory rejected, liability found on the contract claim that invokes the (unchallenged) liquidated damages provision. The case outcome is clear: it's the amount of the liquidated damages stated in the contract.
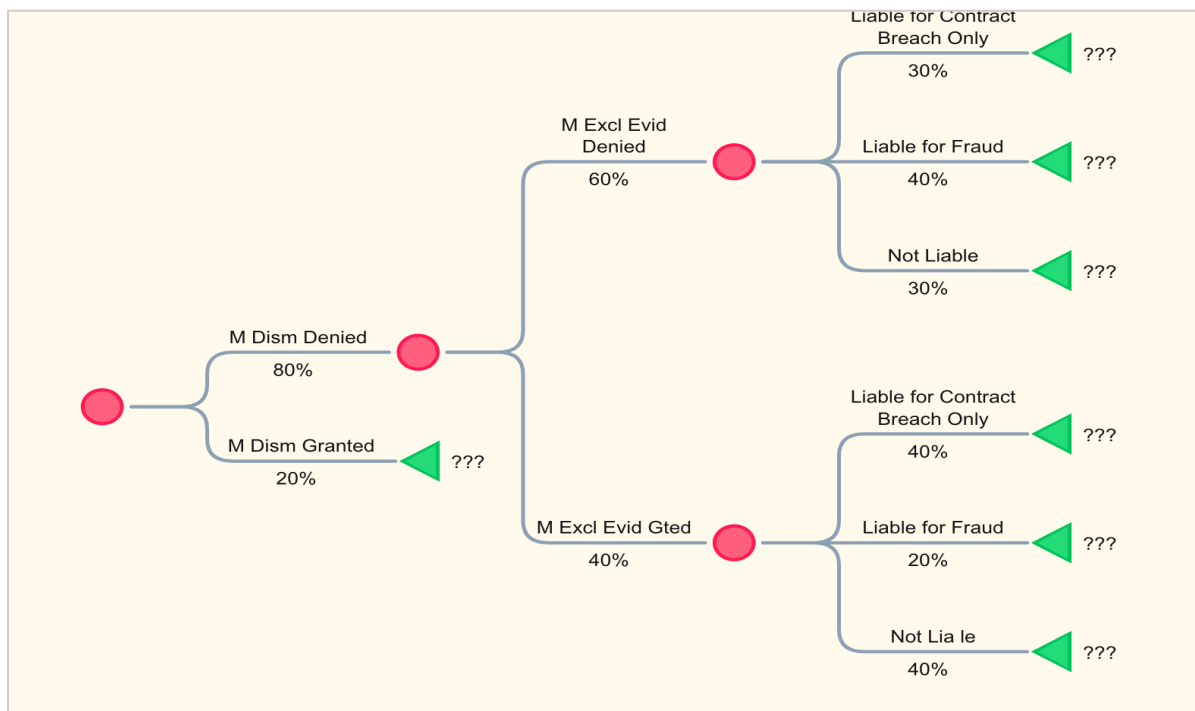
For the purposes of decision analysis, it's essential to subtract the costs of achieving that outcome (starting from the day you build the tree). So, if liquidated damages specified are $1 millon, and legal and expert fees are projected to be $200,000, the "Net Value" at the Terminal Node would be $800,000 at the end of that pathway.
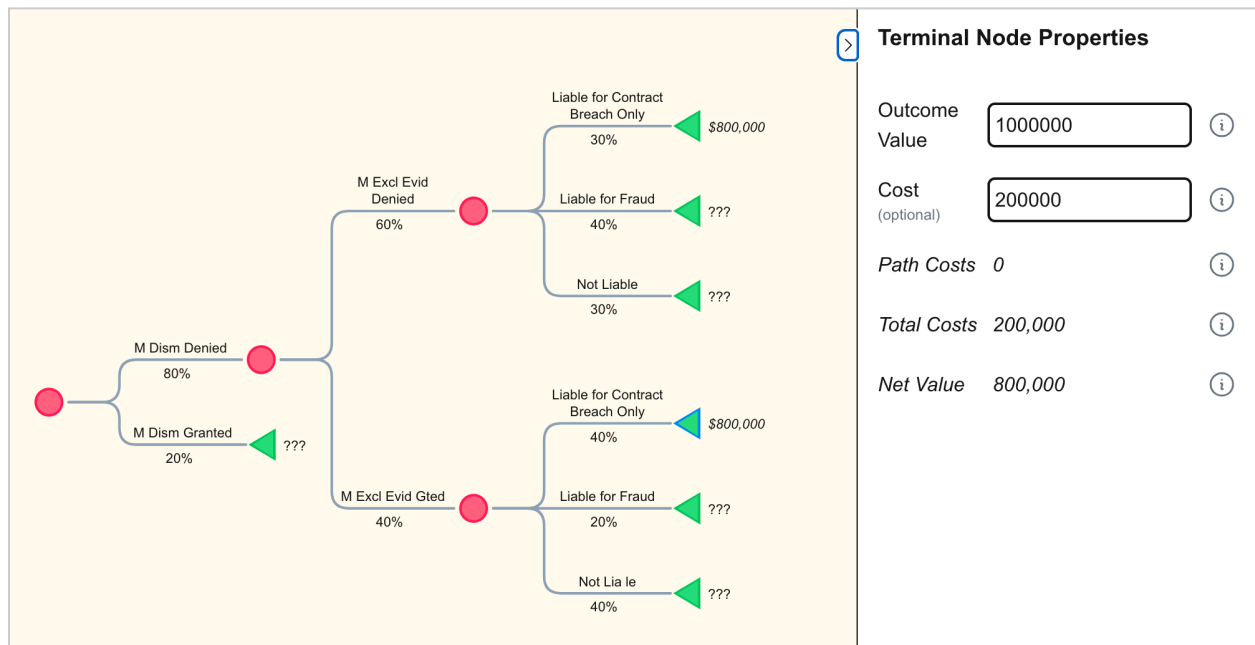


In many cases, there will be more than one branch to a terminal node. For example, in the case above, what if the contract did not include a liquidated damages provision?  Even if the fraud claim is rejected, there may be different theories as to what the actual damages were. Each theory might lead to a different predicted $ outcome. Or, without separate theories, there still may be a possible range of damages awards. Either way, you would create separate terminal nodes to reflect logically possible damages points, or to reflect a range. At each terminal node, you would include the predicted $ value of the case outcome, the costs, and the net value.

Here is where Variables (an option in Tree Properties) can be helpful. If you created and labeled a Variable for Costs – attorney's and expert's fees – you can enter your Variable name here. That can be handy if your estimated costs change over time. All you have to do is go back to the Cost Variables and change your dollar estimate.

If you created a variable called "Contract Breach High" outcome (and so forth), you could insert it into the Terminal Node box for Outcome Value. That way, if your projection changes, it will change at any Terminal Node involving "Contract Breach High." You can also create formulas with variables at the Terminal Nodes that include arithmetic operators like +, -, * or /.

# Moving, Sizing, and Arranging

## Moving

A terrific feature of TreeDecisions is that it allows you to move the entire tree anywhere on the screen by going to a blank area, click – see the little white-gloved hand - and drag.

You can also move any part of the tree by clicking on the target node and dragging to anywhere on the screen. The branches and nodes that follow to the right of the targeted node will move along with it.

To adjust the spacing between branches, or the length of a branch (to accommodate a long text label), simply click at the node on the end of the branch and drag to place it where you wish. To adjust the length of a branch, the operation is the same: go to the node at the end of the branch, then click, hold and drag to elongate or shorten. To move a branch up, down, or anywhere, click, hold and drag.

You can also move text boxes and arrows the same way- click, hold, and drag.

## Sizing

To make the tree larger or smaller, look to the lower righthand corner of the screen (inside the right sidebar, if it's showing), and click on + to make it larger, - to make it smaller  and on the little corner bracketed square to make it scale to the page.
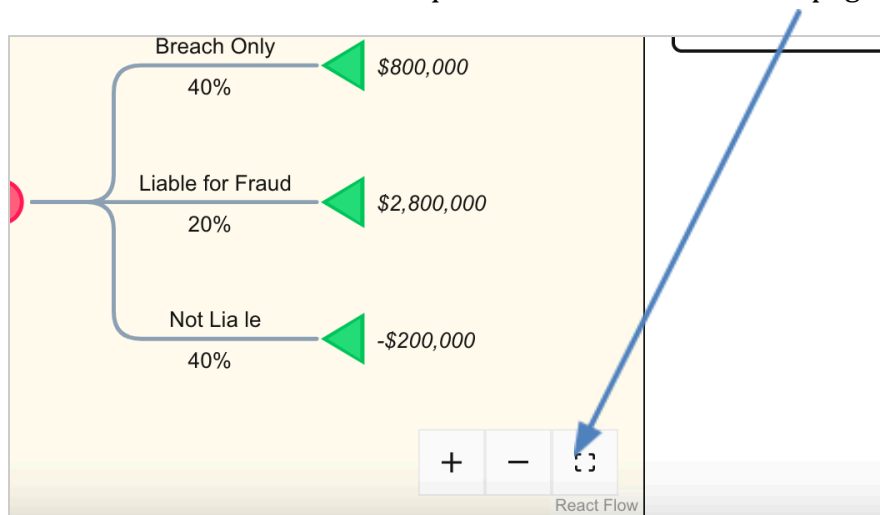


In practice, we often use the zoom out (-) function and then move the tree. When constructing a typical tree, you might begin with a few horizontal layers of nodes and branches that are quite large. However, as you build out a more complex tree, the additional nodes and branches don't fit on the screen page. At that point, the solution is to shrink the

tree size, and move it, usually up and to the left (depending on the position of the first node). That creates additional room for you to build out the tree.

Of course, when working intently on one area of the tree, or discussing your analysis as reflected in particular sets of branches and nodes, you can place that portion center screen and make it larger.

### *Arranging*

At the top tool bar, you'll notice a prompt labeled "Arrange" with a little square icon containing four arrows.



Click on the V symbol next to "Arrange" and you'll see two dropdown options:
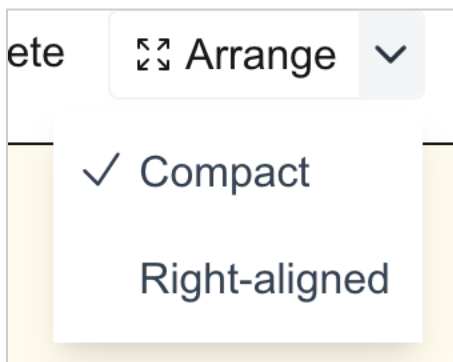


If you choose "Compact" and then click on Arrange, any asymmetries or irregular branch placements on your tree will be arranged so that spacing between branches will become uniform, and the branch layers following each node will line up vertically. Sometimes, this feature performs a welcome "neatening." However, on some trees, you may have deliberately adjusted certain branch placement, to save vertical or horizontal space, perhaps to create more space for issues of greater importance. To preserve these choices, don't click on Arrange. The good news is that Undo is immediately to the right of Arrange on that top bar, and Redo is next to that, in case you reconsider.

Here is a fairly complex tree, utilizing the "Compact" arrangement:
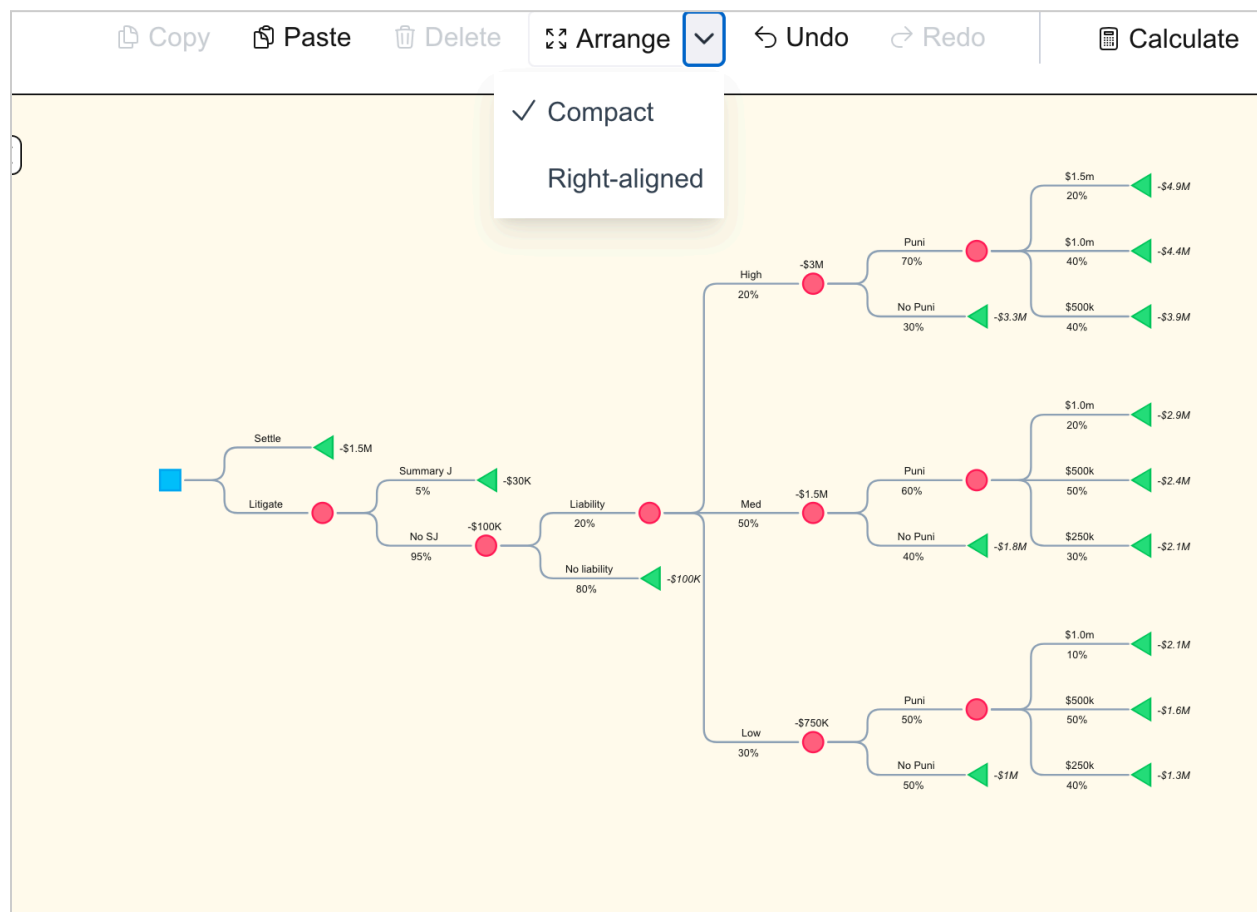


On the other hand, you may wish to see all possible outcomes aligned on the right-hand side – a stacked array for people to consider and discuss. After all, the way you arrive at the end of each road (branch pathway) may be interesting, but decision-makers may be far more interested in seeing clearly all the ways this could turn out.

For that purpose, you would go to the dropdown menu for "Arrange" and choose "Right-Aligned," to display all outcomes clearly on the right-hand side of the screen.
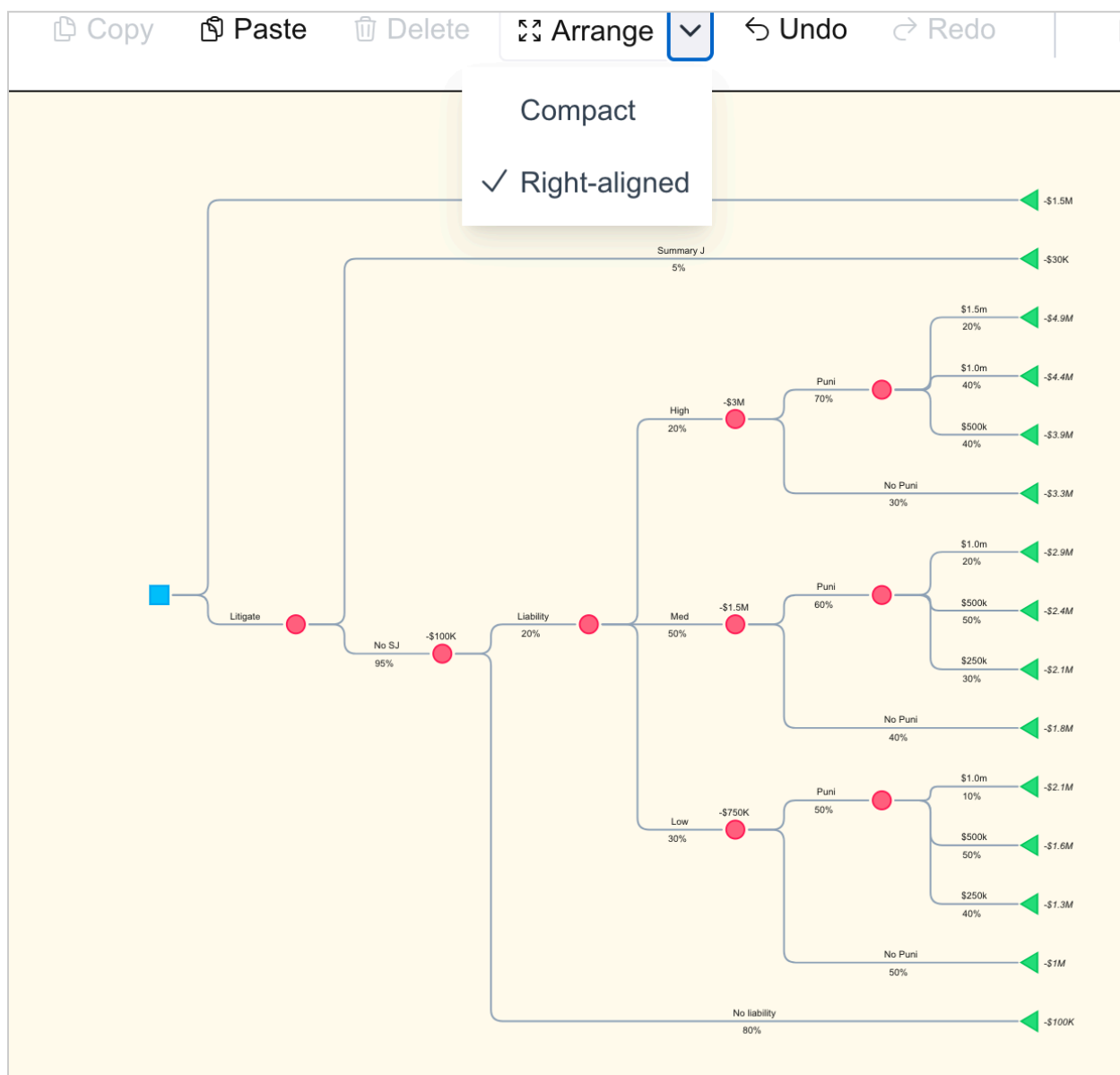
## Drumroll for Calculation

*Expected values – EVs* - Finally, the moment we all wait for: when we learn the "expected value" ("EV"), sometimes referred to as "estimated monetary value" ("EMV"), and we learn the probability distribution, the likelihood of each possible outcome.[6]

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[6]While the *Risk and Rigor book* uses the EMV acronym, we've opted for the even shorter EV in this Users' Guide and in TreeDecisions.app. Others may refer to it "RAV" or Risk Adjusted Value. Whatever the name or the acronym chosen, the concept is the same.

As all tree builders know, the EV is NOT a prediction of what will happen. Rather, it's the average of all possible outcomes, discounted by their probabilities. In other words, if a litigated case were tried a hundred times, and you totaled up all 100 outcomes, then divided by 100, that's your EV. Similarly, if your tree were constructed to map possible consequences of a decision to drill for oil, or to launch a business venture, its EV would represent the weighted average of all possible outcomes – each "weighted" or discounted by its likelihood.

To perform these calculations, go to the "Calculate" toward the center of the top tool bar. You'll see that it gives you the option to Hide or Show Path EV's, or not.
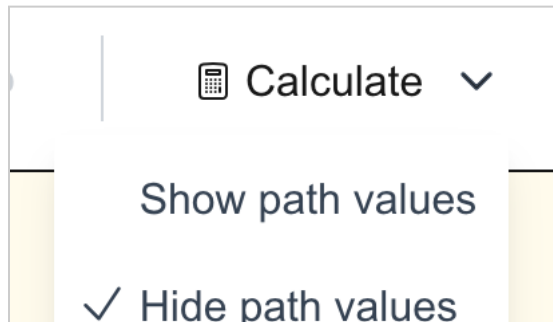
## Hide Path Values Option

If you choose to "Hide path values," you will not see what we think of as interim or path EVs in green boxes underneath each chance node along the path to the terminal node.
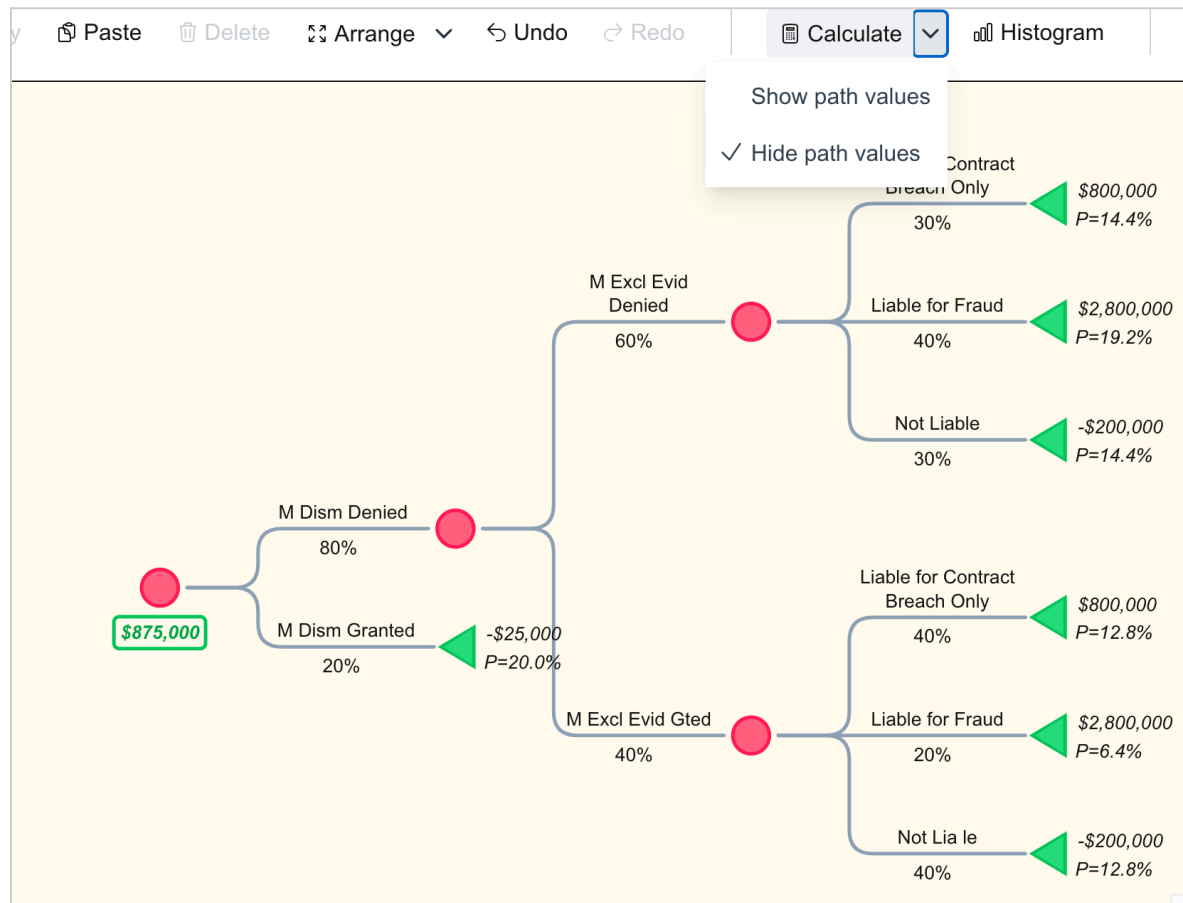


Note that, if you began the tree with a Decision Node, the software automatically assumes you would opt for the more profitable (or lower cost/liability) choice. Thus, it calculates a 100% chance that you will not make the other choice. This is true for decision nodes along a tree path. For example, if you decided to insert a decision node – mid litigation path - reflecting a choice between hiring a certain expert or foregoing the expert costs – the software will assume you chose whichever path yields the better result.

In litigation contexts, the decision tree is usually a pure a risk tree and can begin with a chance node. If your ultimate decision is "settle or not," the tree maps the possible risks and rewards or losses along the case's projected litigation paths. That picture – the EV and the chances of each outcome – can then be used to address the question of whether to take or propose a given or anticipated settlement offer.

## Show Path Values Option

If you choose to "Show path values," you will see what we think of as the interim or path EVs in green boxes underneath each chance node along the path to the terminal node.
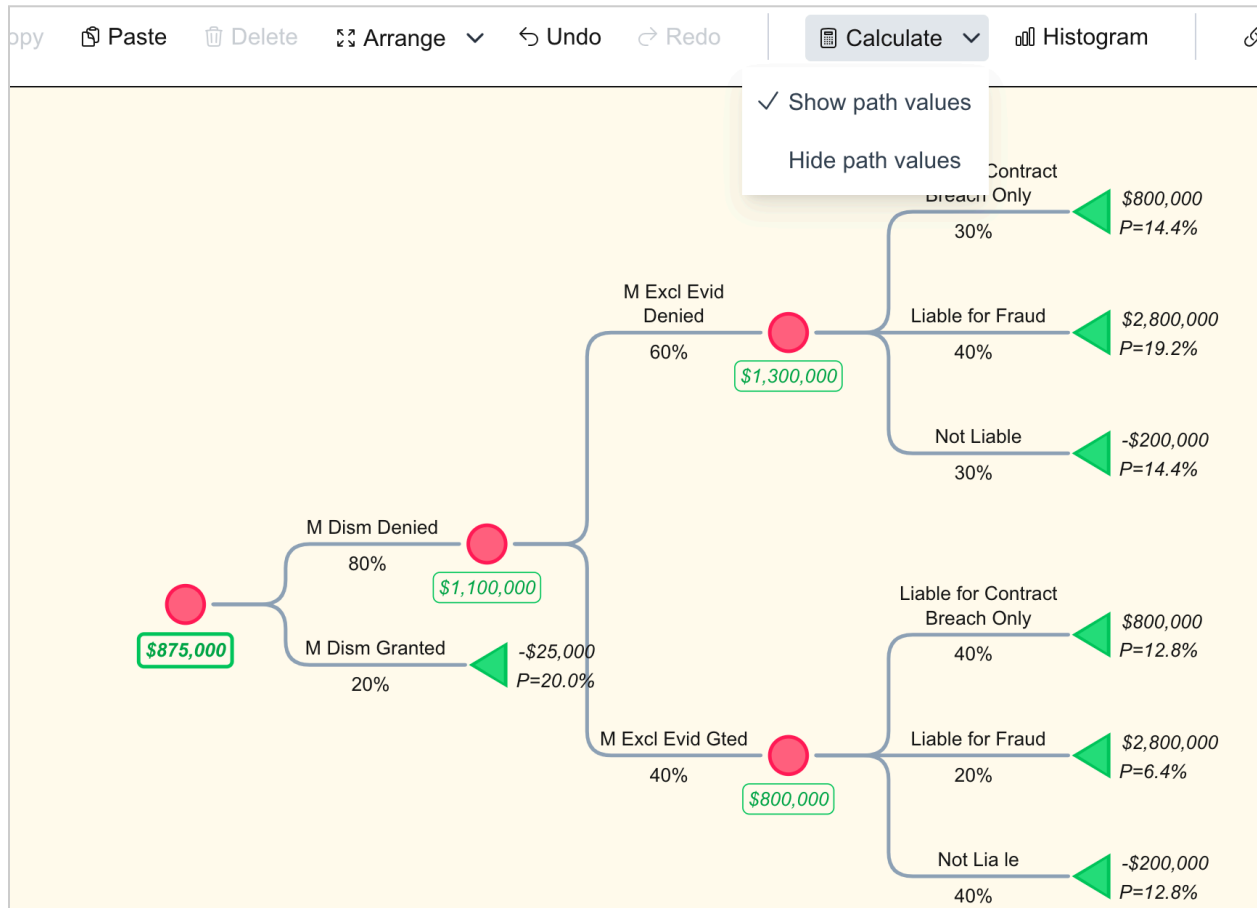


These Path Values reflect the changing EV along the way to the outcome. Translated to practical terms, they explain why settlement offers or demands may change as some earlier anticipated risks are eliminated.

Thus, in the simplified imaginary litigation case shown above, the overall EV – before a Motion to Dismiss is decided – is $875,000. The probability of that motion being granted is estimated at 20%. However, once it is denied, the EV increases to $1,100,000, because that risk has been eliminated. At that point, the Motion to Exclude [certain evidence] would not yet have been decided. But as is reflected on the tree, the EV at that point will go up to $1,300,000 or down to $800,000, depending on the outcome of that motion.

## Chances of Each Outcome

When the software calculates a tree's discounted values, it also calculates and shows the cumulative probability of each outcome identified at a terminal node. That appears as P=x%.
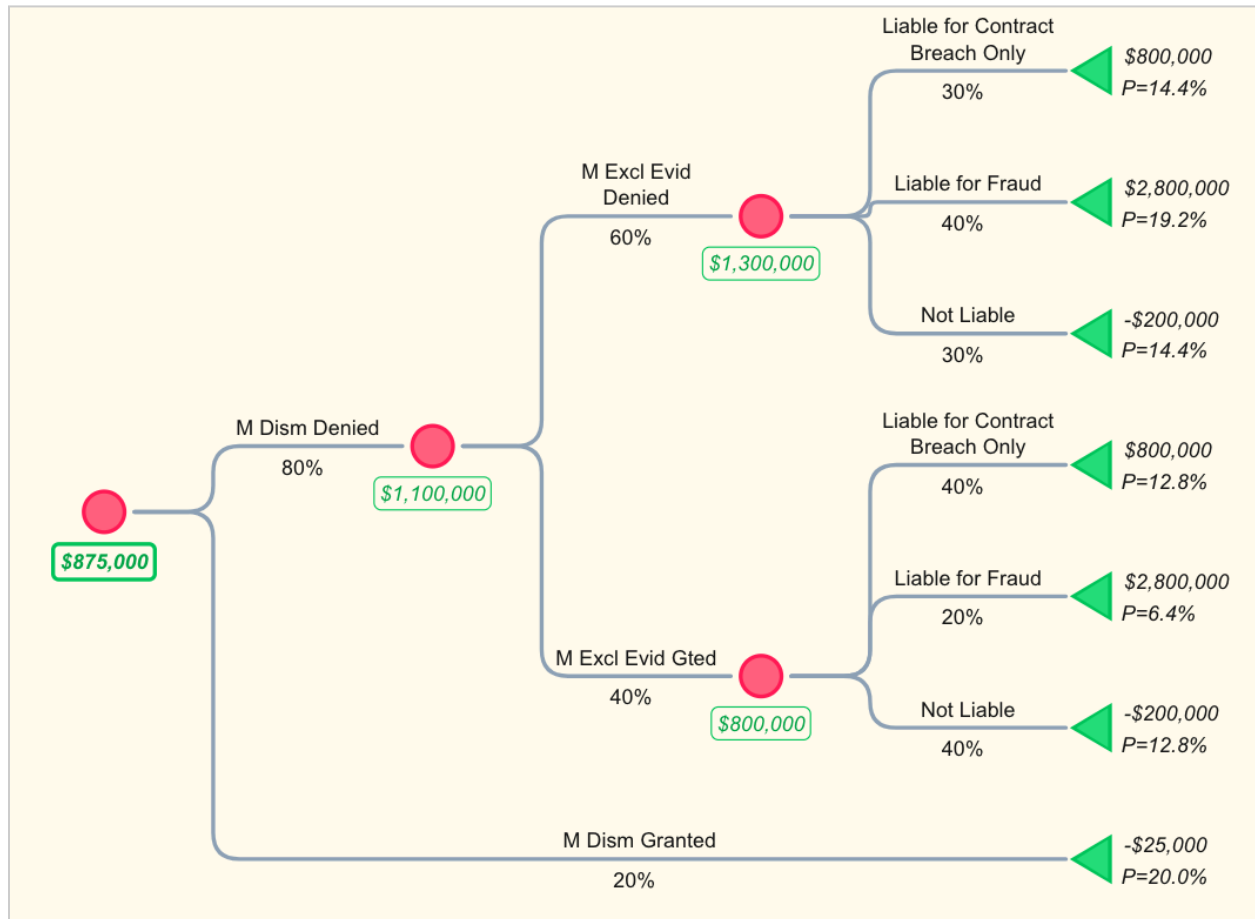


As stated, each % at each terminal node is the overall likelihood that this is the path the case will take – to this outcome, based on the probabilities entered along the way.

Note, for example, on the tree above, if you or your client wanted to know, overall, what the chances of a $0 verdict are (after an expenditure for attorney's fees) you would have to add the % at both terminal nodes reflecting that outcome. In the tree above, the case could end up at $0 verdict in three ways:

● if a motion to dismiss were granted – 20%,
● if a motion to exclude certain evidence were denied – 14.4%
● if a motion to exclude certain evidence were granted – 12.8%

Thus, the total likelihood of a "No liability" outcome is 47.2%

As a practical matter, for a litigation client, the probabilities of each outcome are often more significant than the overall case EV. After all, the EV is an average of outcomes if the case were tried 100 times. But the case will NOT be tried 100 times, or even 10 times. The defense clients want to know, what are the chances this case will render my company bankrupt, or (for a larger company) be a reportable event to shareholders, or require us to delay a major planned investment?  The plaintiff clients want to know the chances of recovering fraud damages, or full compensation for needed medical care, or being left without necessary financial support. Carefully reviewing the chances of each outcome, desirable and undesirable, fundamentally respects the client's risk tolerance.

## Histograms and Overall Chances

With a large tree, displaying too many possible outcome values, a summary overview can be extremely helpful. Decisionmakers understandably and wisely want to know, at the end of the day: What are the chances that the outcome will be between $x and $y?  Lower than $x?  Higher than y? Worse than $z?  Once the EV calculation is done and you see the "P= x%" under each outcome, it's possible to figure that out.

Fortunately, the Histogram function makes this easier, as it groups the outcomes, and shows the overall chances of outcomes within specified ranges. (The software divides the full

numerical span of outcomes into ten equal smaller ranges.)
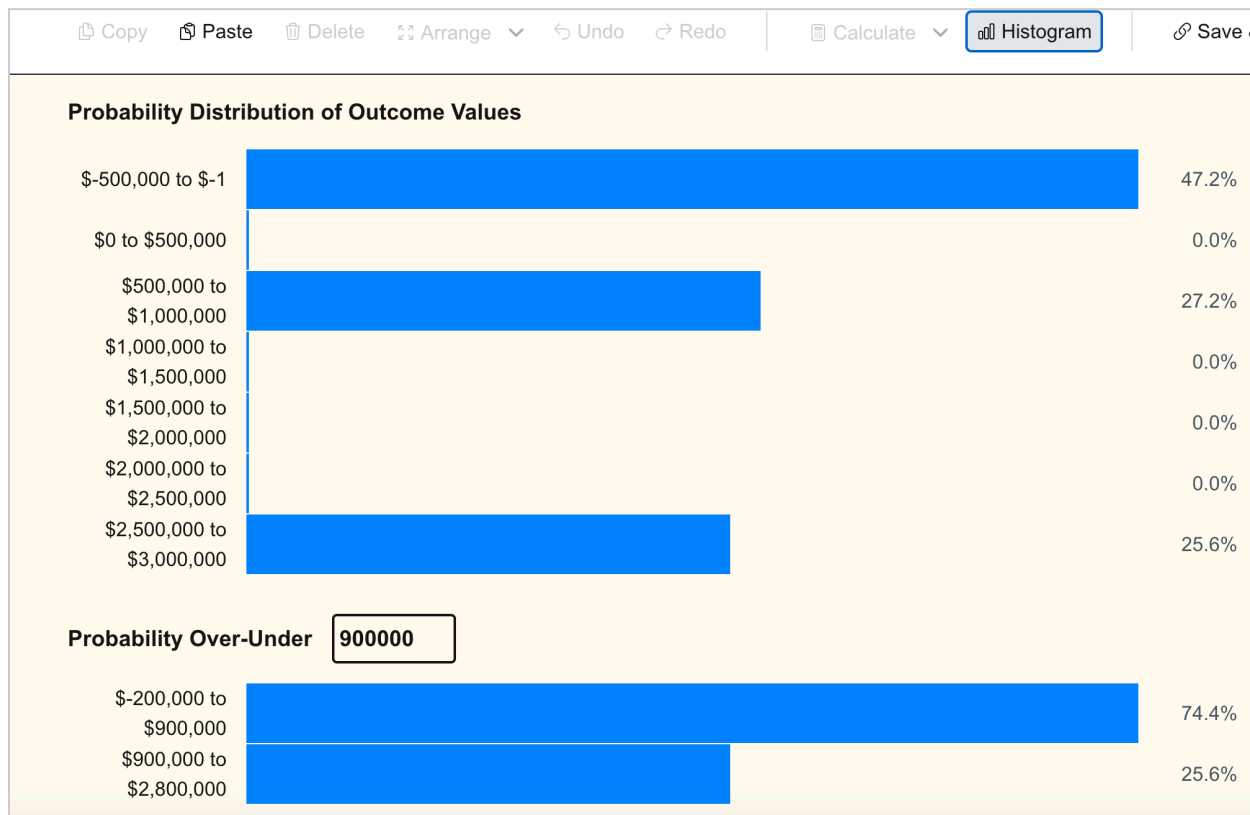


Below the classic histogram, you'll see an "over/under" option. Enter a number in the box that represents a significant point for the party or client in the case, and you'll see a bar graph that shows you the overall likelihood that the case outcome will be over or under that number.

We have found the "over/under" option to be quite helpful for people's decision making as it enables them to think through their level of comfort with different levels of risk.

## Preserving your tree

### *Save & Copy Link*

To store a permanent copy of your tree for future use, go to the upper right of the tool bar and click on Save and Export Link. Doing so will ensure that anytime you follow that link,

your tree will appear in TreeDecisions as it was when it was saved.



At the same time, you can share that link with others who wish to see and work with the tree. They will get their own copy of the tree when they follow that link.

When you click "Save & Copy Link", the app will encrypt your tree data locally and upload it to the TreeDecisions storage server *without* uploading the decryption key. The data is end-to-end encrypted, like WhatsApp. Only someone with your locally-generated link can read your tree data.

## *Export to File*

This feature is extremely handy! Click the button near the right side of the top toolbar that says "Export to File." You'll see this dropdown menu.
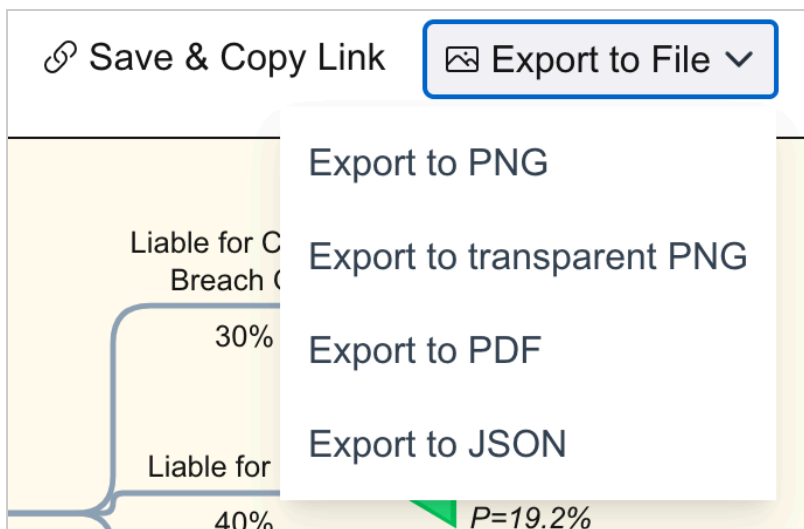


This dropdown is largely self-explanatory. You can print or save your tree to your computer directory as a PNG image or as a PDF, exactly as it appears on the screen. If you export it to "transparent PNG," you'll be able to paste it onto backgrounds of any color.

Lastly, if you save it to your directory as a JSON file, you can always open it again from TreeDecisions.app.  To do so, go back to the lefthand side bar, click on "Create", see the pop up box that offers the choice to "Create New" or "Import from File" and then choose and

import the JSON file from your directory.
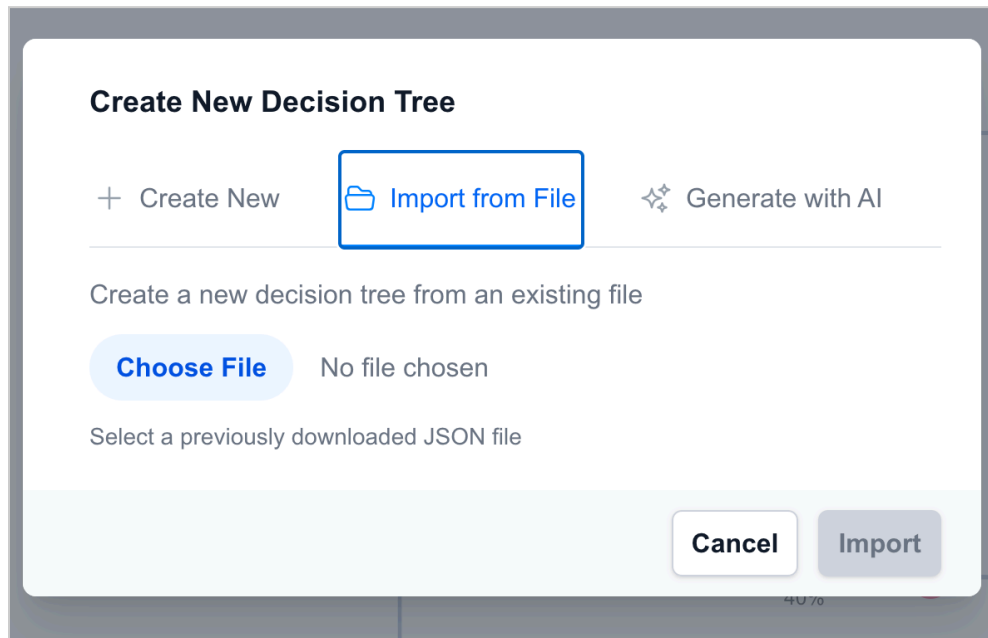


We recommend you export any important tree as a JSON file for a back up that you control. As described above, the "Save and Copy Link" function makes a copy on a remote server.