Conditional Expectation (we branch to different loops based on our random variable):
$$ET(n) = \sum_{q=1}^n E(X \mid A) \operatorname{\mathbf{Prob}}(A) + ET(A) \operatorname{\mathbf{Prob}}(A) + ET(A) \operatorname{\mathbf{Prob}}(A)$$

probability is. may not be done but the After this point, the problem

our summations with. can then use to solve the rest of This will give us a value that we

Normal Expectation (one of the loops executes some random amount of times):
$$\mathbf{E}T(n) = \sum_{q=1}^n T(k=q) \cdot \mathbf{Prob}(k=q)$$

expectation. $n > \frac{1}{2} + (n) golo \frac{1}{2} =$ because of the linearity of $+E(T(n)\mid k>rac{n}{2})$ + $E(T(n)\mid k>0)$ the rest of our calculation value, we can us that result for $(rac{n}{2} \geq \lambda) \mathbf{dor} \mathbf{d} \ (rac{n}{2} \geq \lambda \mid (n)T) \mathbf{d} \sum_{\mathrm{I}=p}^{n} = (n)T \mathbf{d}$ Once we determine the expected

randomness. later on, we want to isolate the To make things easier for us

that fits best. random, we can find the formula Now that we know what parts are

expected value. selected, we can solve to find the Expectation code(1). With the appropriate formula From the Condtional







Aalue Find the Expected





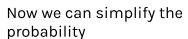
Breaking out of a loop early

When there's a random element that causes a loop to exit early, we use the Normal Expectation Formula and the following probability:

 $\sum \mathbf{Prob}(x \geq i)$

Where x is the number of times that we don't exit early.

Breaking out of a loop early (continued)



$$\mathbf{Prob}(x \geq 1) = \mathbf{Prob}(x \geq 1)$$

$$\mathbf{Prob}(x \ge 2) = \mathbf{Prob}(x \ge 1)^2$$

$$\mathbf{Prob}(x \ge 3) = \mathbf{Prob}(x \ge 1)^3$$

$$\mathbf{Prob}(x \geq q) = \mathbf{Prob}(x \geq 1)^q$$

After simplifying, we find that the sum is geometric.

$$\sum_{q=1}^n \mathbf{Prob}(x \leq q)^q$$

A Guide to Finding **Expected** Value

Tips and Tricks:

 Recursive probelms will follow the Conditional **Expectation Formula**

