Decision Table

Back to basics

Decision Tables

- Precise way of modelling logic
- Considers every possible combination of conditions and what action is required

Decision Tables

Example

Students in a particular college take an end-of-year test. Any student with 90 marks or more gets a distinction. Students with fewer than 20 marks fail. All other students get a pass.

We set up a decision table by allowing one row for each condition and one row for each possible action. We need one column for every possible combination of conditions. Two conditions require four columns; three conditions require eight columns. Table 24.01 shows the decision table for awarding grades.

Conditions	>= 90 marks	Y	Y	N	N
	< 20 marks	Y	N	Y	N
Actions	Distinction	–	X		
	Pass	–			X
	Fail	–		X	

The real power of decision tables becomes apparent when the conditions and resulting actions are more complex. Inspection of the action entries sometimes shows redundancies and the decision table can be simplified. This means the program code to be written will also be simplified.

Decision Tables- How to create one

WORKED EXAMPLE 24.01

Creating a decision table

Consider an online order company that charges $5 for delivery of packages. If the order value is over $50, the package is small and the customer has a promotion code, the delivery is free. If the order value is over $50 and the package is small, the delivery charge is $1. If the order value is over $50 and the customer has a promotion code, the delivery charge is $1.

We complete the conditions in a decision table for the order form in the systematic manner shown. Table 24.02 shows the delivery charge conditions.

Conditions								
	order value over $50	Y	Y	Y	Y	N	N	N	N
	small package	Y	Y	N	N	Y	Y	N	N
	promotion code	Y	N	Y	N	Y	N	Y	N

Table 24.02 Delivery charge conditions

Decision Tables- How to create one

Next, we look at each combination of conditions in turn and decide which action needs to be taken and mark those with X (see Table 24.03).

Conditions	order value over $50	Y	Y	Y	Y	N	N	N	N
	small package	Y	Y	N	N	Y	Y	N	N
	promotion code	Y	N	Y	N	Y	N	Y	N
Actions	free delivery								
	$1 charge								
	$5 charge								

Decision Tables- How to create one

To find redundancies, we look at each action and then check whether the conditions are required:

Conditions	order value over $50	Y	Y	Y	Y	N	N	N	N
	small package	Y	Y	N	N	Y	Y	N	N
	promotion code	Y	N	Y	N	Y	N	Y	N
Actions	free delivery	X							
	$1 charge		X	X					
	$5 charge				X	X	X	X	X

Free delivery only applies if all 3 conditions are true. There are no redundancies here.

The $1 charge applies if condition 1 is true and either condition 2 or condition 3 is true. There are no redundancies here either.

The $5 charge applies in all cases where condition 1 is false. The redundant conditions are shown by the shaded cells. We can therefore simplify the table (see Table 24.04) We

Decision Tables- How to create one

Conditions	order value over $50	Y	Y	Y	Y	N	N	N	N
	small package	Y	Y	N	N	Y	Y	N	N
	promotion code	Y	N	Y	N	Y	N	Y	N
Actions	free delivery	X							
	$1 charge		X	X					
	$5 charge				X	X	X	X	X

put a dash in the cells where the condition can be true or false – the action will be the same. The dash is sometimes referred to as the 'don't care' symbol.

Conditions	order value over $50	Y	Y	Y	Y	N
	small package	Y	Y	N	N	–
	promotion code	Y	N	Y	N	–
Actions	free delivery	X				
	$1 charge		X	X		
	$5 charge			–	X	X

Decision Tables – Uses

- Algorithm design
- Testing
- Requirements management

https://reqtest.com/requirements-blog/a-guide-to-using-decision-tables/

Exercise

1 A toll road is a road on which motor vehicle drivers have to pay to drive. The payment is calculated as follows: Motor vehicles pay a standard charge. If passenger vehicles (cars and buses) use the road during off-peak times (not within 06:00 hrs to 19:00 hrs), the charge is reduced. Passenger vehicles with more than three occupants do not get charged.

a Complete the decision table. [6]

Conditions	passenger vehicle								
	between 06:00 and 19:00								
	more than 3 occupants								
Actions	standard charge								
	reduced charge								
	Free								

b Simplify your solution by removing redundancies. [3]

A level 2013 P2Q5

5 Bank customers are allowed to withdraw money from their accounts at an ATM. They cannot withdraw more than the current balance in their account. There is a daily limit on the amount that can be withdrawn. In some circumstances a charge is made for the transaction. The rules are:

- the transaction is rejected if the withdrawal amount requested is greater than the current balance
- the transaction is rejected if the withdrawal amount exceeds the daily limit
- if the current balance before the transaction is carried out is less than 50 dollars then any successful transaction incurs a fixed charge

(a) Create a decision table showing all the possible conditions and actions. [4]

(b) Simplify your decision table by removing redundancies. [4]

(c) Using your answer in **(b)** write a function using pseudocode. The function returns:

- -1 to indicate a rejection;
- 0 for a charge-free successful transaction;
- the charge for a chargeable successful transaction. [5]

(d) State **two** ways in which your answer in **(c)** demonstrates clarity of code. [2]