

**NPTEL**

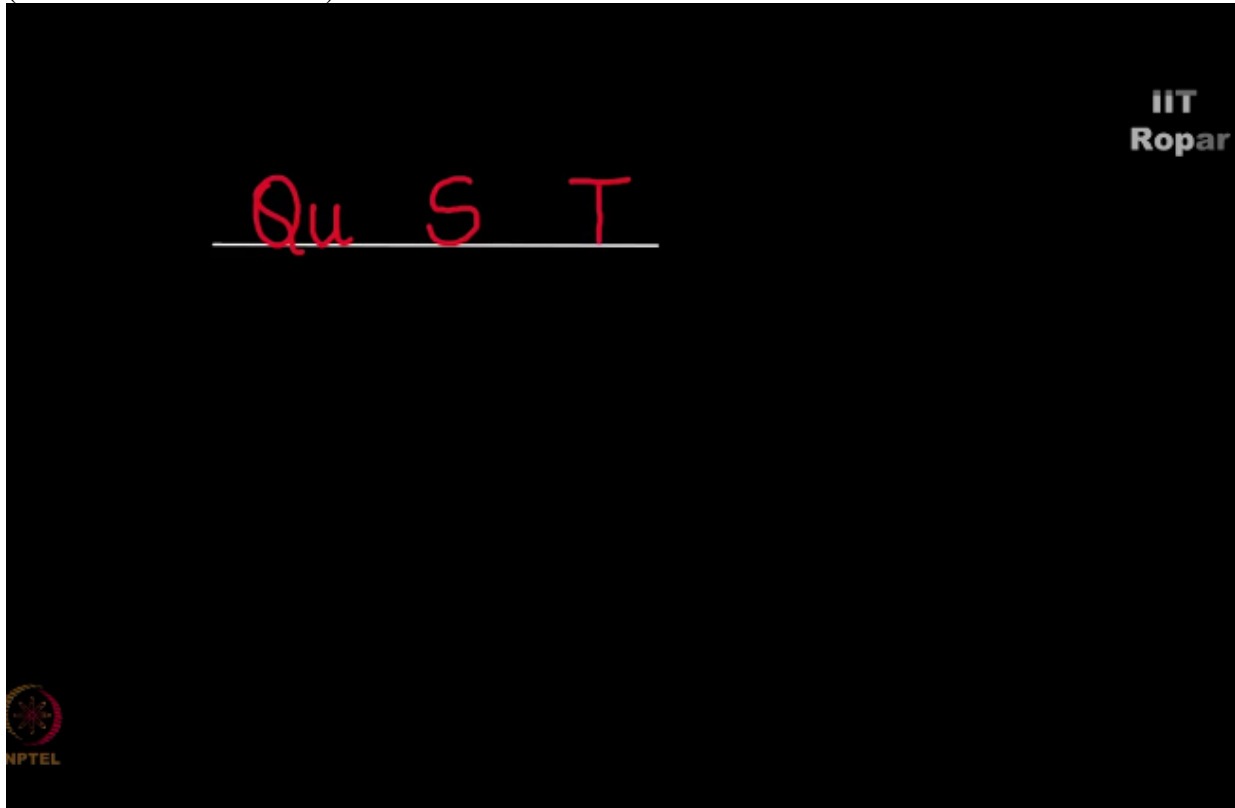
**NPTEL ONLINE CERTIFICATION COURSE**

**Discrete Mathematics  
Graph Theory – 3 &  
Generating Functions**

**Example 1 – Fun with words**

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We don't like talking terminologies and definitions and abstraction in the beginning of the chapter, as in always let us start with a very motivating example rather a puzzle, look at this first line happens to be QUS and T,  
(Refer Slide Time: 00:21)



second line here is A and I,  
(Refer Slide Time: 00:25)

Qu S T  
a i



the third line is D, CK,  
(Refer Slide Time: 00:27)

Qu S T  
a i  
d ck



now what you should do is pick one entity per line and create a word, for example you can pick a S here, A here, D here and make a sad,  
(Refer Slide Time: 00:39)

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Qu S T

a i

d ck

Sad

Pick one entity per line  
and create a word.

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or pick a QU here, A here and D here and make a quad so on and so forth.  
(Refer Slide Time: 00:46)

Qu S T  
a i  
d ck

Quad

Pick one entity per line  
and create a word.



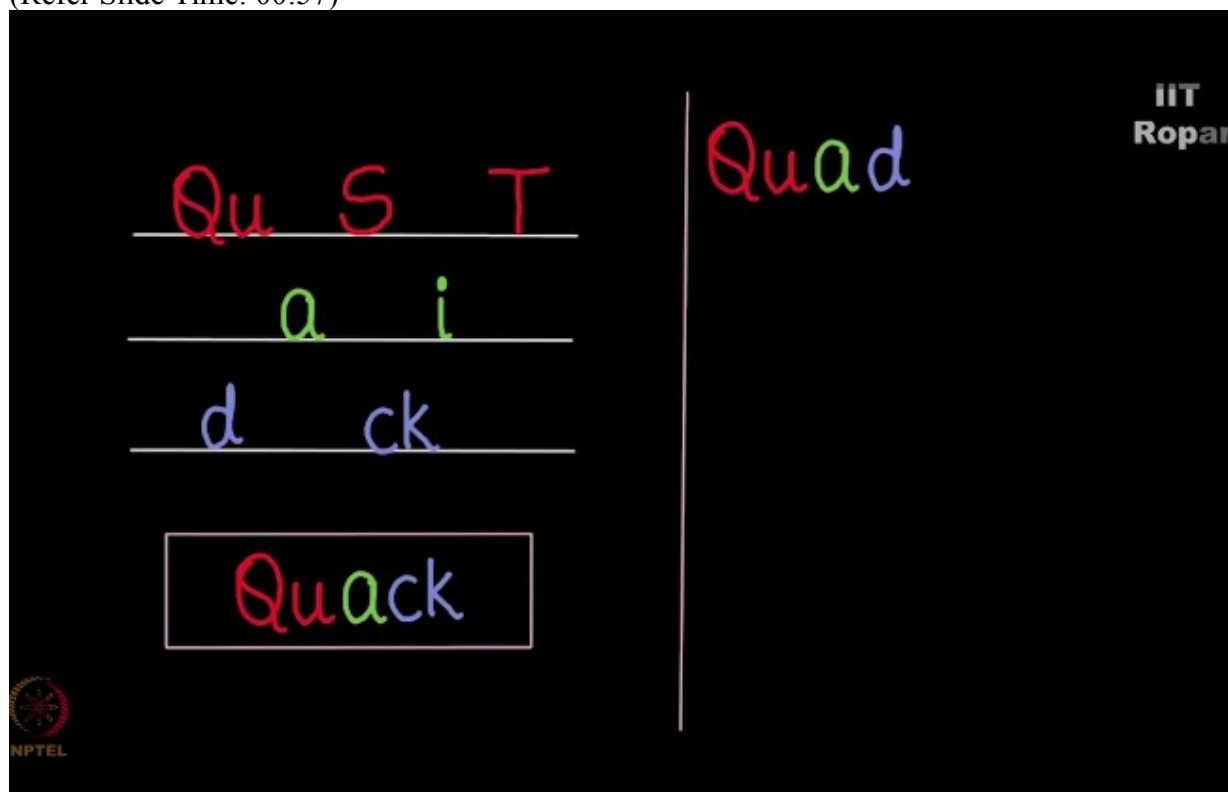
Let us try all possibilities, so let us start from QUAD which makes it quad,  
(Refer Slide Time: 00:53)

Qu S T  
a i  
d ck

Quad



QUACK, which makes it quack  
(Refer Slide Time: 00:57)



QUID makes it quid,  
(Refer Slide Time: 01:01)

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Qu S T

a i

d ck

Quid

Quad  
Quack  
Quid



please note you can use only one entity per line, okay and then you have quick, sad, sack, sid, sick, tad, tid, tack, and tick  
(Refer Slide Time: 01:14)

IIT  
Ropar

Qu S T


a i

d ck

Tick

Quad  
Quack  
Quid  
Quick  
Sad  
Sack

Sid  
Sick  
Tad  
Tid  
Tack  
Tick



aparts from the words make sense, but in needing necessarily make sense, the question is in how many ways can you create words? Not necessarily valid dictionary ones, but all possible words as you can count here you have created 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 words, right, (Refer Slide Time: 01:36)

The slide displays a word puzzle on a black background. On the left, the letters Q, u, S, T, a, i, d, c, k are arranged in three rows on horizontal lines. Below them, the word 'Tick' is enclosed in a white rectangular box. On the right, two vertical columns of words are listed, each with a checkmark to its left. The words are: Quad, Quack, Quid, Quick, Sad, Sack, Sid, Sick, Tad, Tid, Tack, and Tick. The letters in the words are color-coded: Q is red, u is green, S is blue, T is red, a is green, i is blue, d is red, c is green, and k is blue. In the top right corner, the text 'IIT Ropar' is visible. In the bottom left corner, the NPTEL logo is present.

now look at the 3 little words here, how many of them are there? Sad, sid, tad, tid, four of them, look at all the four-letter words, quad, quid, sack, sick, tack, and tick, look at all the 5-letter words quack and quick only two in number.

Now can you tell me a nice way in which we can actually count all possible related words, all possible four-lettered words, all possible five-lettered words, given lines such as these, (Refer Slide Time: 02:16)

The image shows a handwritten word search grid on a black background. The grid consists of three rows of letters: Row 1: Qu S T; Row 2: a i; Row 3: d ck. Below the grid, the text reads "Count all possible 3, 4 and 5-lettered words". To the right, two vertical columns of words are listed, each with a checkmark to its left. The first column contains: Quad, Quack, Quid, Quick, Sad, Sack. The second column contains: Sid, Sick, Tad, Tid, Tack, Tick. The letters in the words are color-coded: Q (red), u (green), a (green), d (blue), S (red), i (green), c (blue), k (blue), T (red), d (green), i (green), c (blue), S (red), a (green), d (blue), T (red), a (green), c (blue), k (blue), Q (red), u (green), a (green), c (blue), k (blue), S (red), a (green), d (blue), T (red), i (green), c (blue), k (blue). In the top right corner, the text "IIT Ropar" is visible. In the bottom left corner, the NPTEL logo is present.

and the constraints like it is in the current problem, think about it, how did four came about? How did 1, 2, 3, 4, 5, 6 ways 4 lettered words came about? And how come there are only two ways of generating a 5 lettered word, what is the math that's going on behind it? Think about it and we'll explain in the forthcoming videos.

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