

Wordle

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Wordle puzzle

Five-letter word graphs

Variants

The WORDLE puzzle

WORDLE is a puzzle in which one tries to guess a five-letter word. A new word is chosen each day, and one has (up to) six guesses to determine the word.



Clues are given for correct letters: they are shown in **green** if they are in the right position, otherwise in **yellow**.

So let's start with a first guess:



Warning: one can only guess a valid word!

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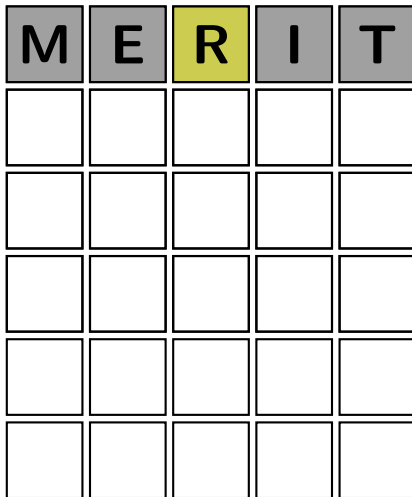
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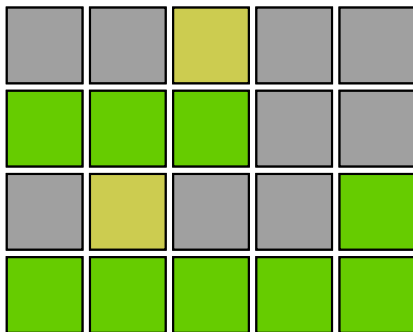


The WORDLE puzzle



The WORDLE puzzle

After solving the puzzle, one can share the an emoji color grid of your wordle solution.



This lets you share your game history without giving away the word of the day.

WORDLE

But where's the math?

Word graphs

Let V be the set of five-letter words. We define a word graph on the vertices V by adding an edge $e = \{w_1, w_2\}$ for each pair (w_1, w_2) of distinct words in $V \times V$, if the two words have disjoint sets of letters.

In order to test as many letters as possible, with as few guesses as possible, we look for adjacent pairs, triples, quadruples, and quintuplets in the graph.

Word graphs

Definition

A graph is complete on V if there is an edge $e = \{v_1, v_2\}$ for every pair (v_1, v_2) of distinct vertices in $V \times V$.

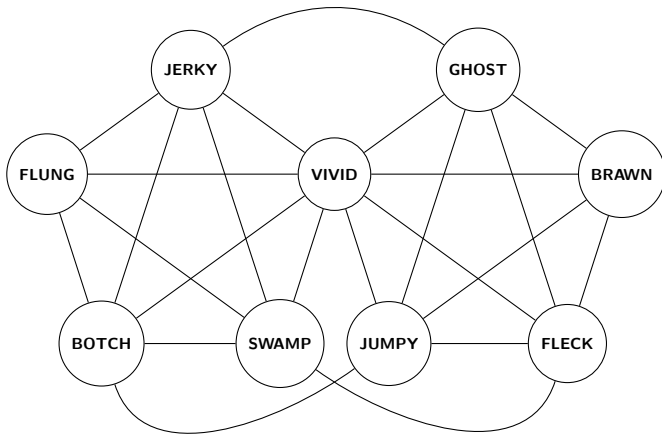
Proposition

A set of n words $W = \{w_1, \dots, w_n\}$ is pairwise disjoint if and only if the subgraph of the word graph on the vertex set W is complete.

Do there exist complete subgraphs of the five-letter word graph?

Word graphs

Yes!



This subgraph contains two complete subgraphs on five vertices.

WORDLE quintuplets

Examples. There exist numerous WORDLE quintuplets, even if we assume that four out of five words consist of five distinct letters.

BLITZ	FROND	JUMPY	WHACK	GEESE	$\neg \{Q, V\}$
BLITZ	FJORD	SHUCK	WAXEN	PYGMY	$\neg \{Q, V\}$
BLOCK	DWARF	JUMPS	ZINGY	TEETH	$\neg \{Q, V, X\}$
BOTCH	FLUNG	JERKY	SWAMP	VIVID	$\neg \{Q, X, Z\}$
BRAWN	FLECK	GHOST	JUMPY	VIVID	$\neg \{Q, X, Z\}$
CURVY	JAMBS	PHLOX	TWINK	EDGED	$\neg \{Q, Z\}$
DOWRY	FLUNG	JAMBS	THICK	PEEVE	$\neg \{Q, X, Z\}$
⋮					

Edge-colored graphs

In order to take into account known characters and their positions, we define the complete graph on V with *edge coloring*:

$$E \longrightarrow \mathbb{N}$$

taking an edge $\{w_1, w_2\}$ to the cardinality $|w_1 \cap w_2|$ of their common letters.

The previous graph is the subgraph on V of 5-colored edges.

How can we use the structure of this graph to solve WORDLE?

WORDLE variants

WORDLE only appeared online to the public in October 2021. As of November 1, it had 90 players, and by two months later had grown to 300,000 players. This spawned numerous spinoffs.

N.B. The word VIRAL is a five-letter word.

So, what about other languages ... like *marseillais* ?

motchus.fr

Questions?