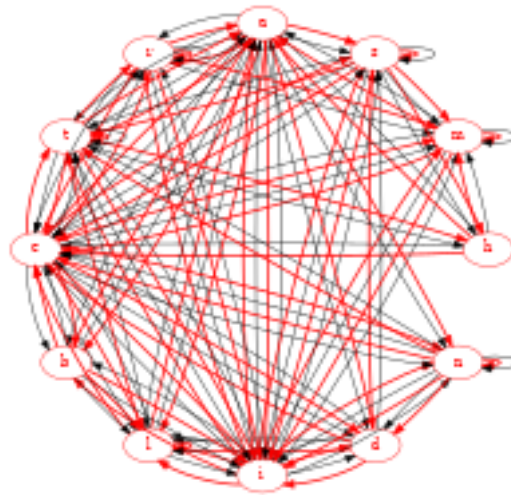


WordWalkTM

25 Hard Puzzles

Root Words with 9 letters and 5 subwords



WordWalk™
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Michael L. Carroll

May 2022

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Chapter 1

Introduction

A WordWalk puzzle represents several words embedded in a directed graph. A directed graph is a diagram that consists of nodes and arrows.¹ In WordWalk puzzles, nodes are represented as ellipses.

WordWalk puzzles are generated from several words, one of which is unknown— called the root word — while the other words are subwords of the root word and are known to the player. A word is considered a subword of another word if each letter of the first word is also used somewhere in the second word.

To solve the puzzle, one must fill in all the blank nodes with the correct letters and correctly guess the root word from which the WordWalk puzzle was generated.

There is no need to guess the subwords because

¹In mathematics, nodes and arrows are also known as vertices and edges.

they are known. But they need to be found in the puzzle.²

WordWalk puzzle graphs are formed from words as follows: Each letter in the word is assigned to a unique node in the graph. If a certain letter in the word is followed by another letter, then an arrow is drawn from the node of the first letter to the node of the second letter. If a letter is immediately repeated in a word – as the letter 'o' is in the word 'book' – then the arrow is drawn as a loop pointing right back at the same originating node.

Given a graph generated in this way from a hidden word called the root word, additional subwords of that root word are chosen and also contribute new arrows to the graph. A subword is a word whose letters also occur in the root word. For example, the word 'test' is a subword of the root word 'street'.

Even very short root words can have many subwords. E.g. the word 'would' has at least the following subwords: 'do', 'old', 'low', 'wood', 'odd', 'loud', 'wow', 'doll'. However, only a few words are generally chosen (sometimes as random) to be included in the WordWalk graph.

By contributing arrows, the subword graphs become embedded in the root word's graph as sub-

²The puzzle player must verify that he/she has found each subword. In future online/interactive versions of WordWalk, the app itself will verify that each subword has been found.

graphs and the root word graph becomes more complicated. The subgraphs offer multiple ways to walk through the graph and trace out the subwords.

As said above, each node in a WordWalk puzzle represents one letter of the root word. But only the first letter of the root word is given in the graph. For simpler versions of this puzzle designed for kids, more than one letter of the root word can also be given.

The arrows from node to node show which letters follow which. Letters that repeat in a word represent repeated crossings of the associated node(s).

At the lowest level of difficulty, all the subwords from which the graph was made are given to you. At higher levels, the number of letters in the root word is generally larger, and the number of possible subwords is therefore also greater; yet not all of the subwords contained in the graph are shown to the player. Think of the given subwords as clues. The more clues you get, the easier it is to solve the puzzle. However, there is also a downside to having more clues: the number of arrows and hence the number possible letter assignments does increase as well. At even higher levels of difficulty WordWalk puzzles may be generated by more than one root word and their chosen subwords.

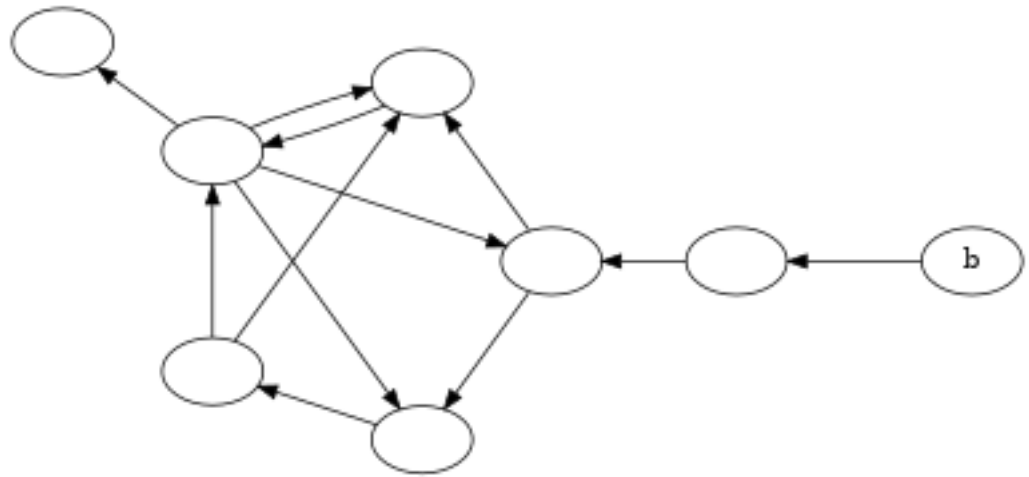
Chapter 2

Examples

In this chapter we present examples that illustrate how puzzles are built and solved.

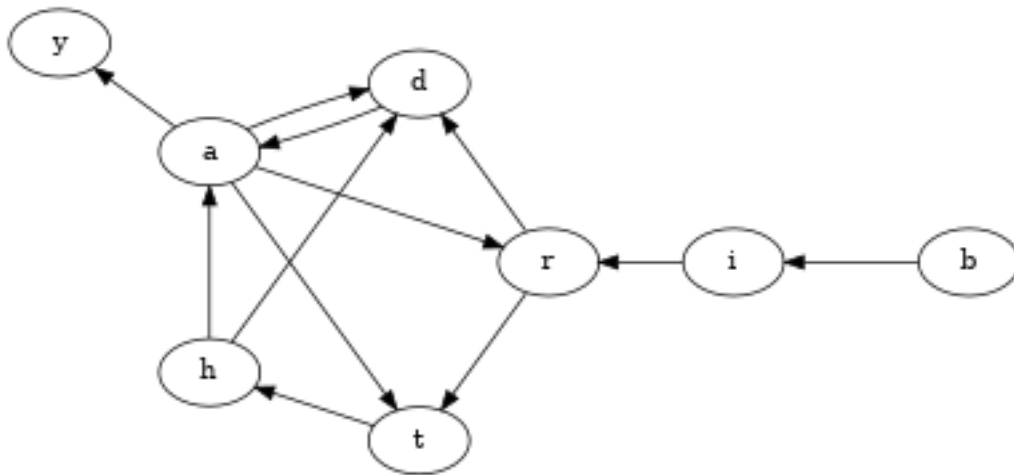
As an example, consider the unsolved WordWalk puzzle in Figure 2.1. This puzzle was built from the root word 'birthday' with the subwords 'day', 'had', 'hard', and 'hat'. The solution is provided in Figure 2.2.

Figure 2.1: Unsolved WordWalk Puzzle for root word 'birthday' and subwords 'day', 'had', 'hard', 'hat'



WordWalk Puzzle

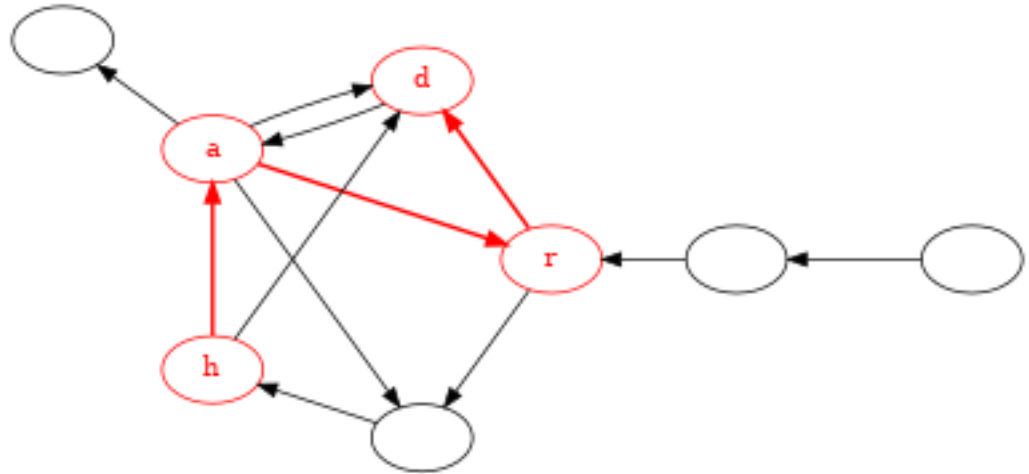
Figure 2.2: Solved WordWalk Puzzle for root word 'birthday' and subwords 'day', 'had', 'hard', 'hat'



WordWalk Puzzle

To see how the subword 'hard' is embedded in the graph, consider Figure 2.3.

Figure 2.3: WordWalk Puzzle for root word 'birthday' showing only the hidden subword 'hard'.

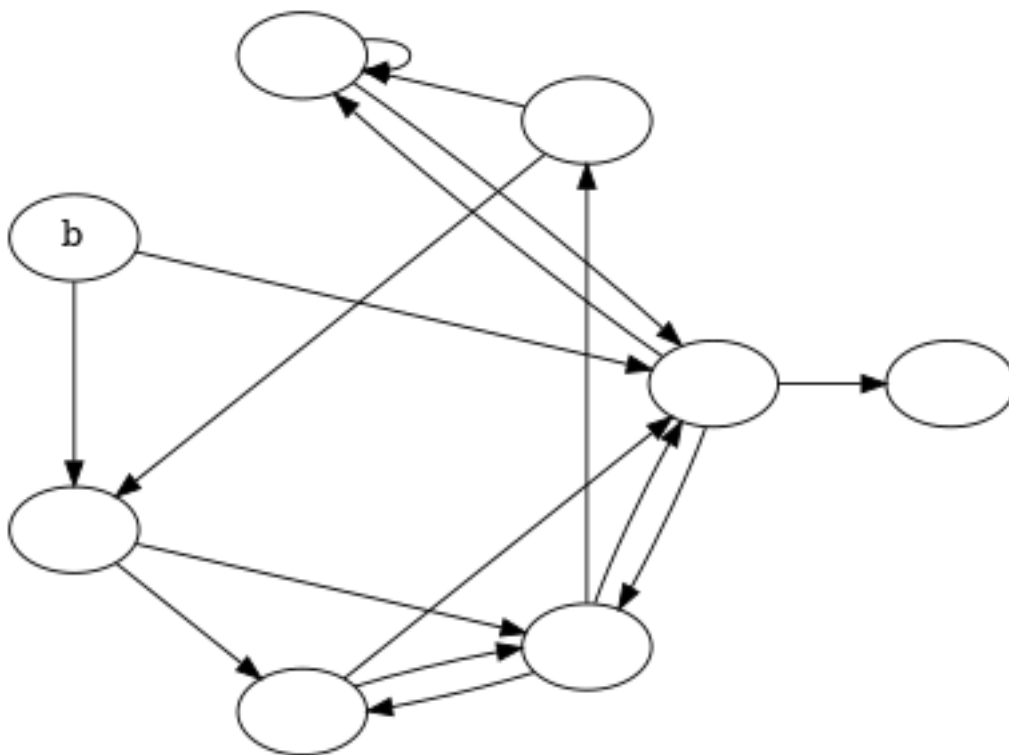


WordWalk Puzzle

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The WordWalk graph in Figure 2.4 shows how different a graph can be for the same word ('birthday') yet involving different subwords and, as in this case, a different *number* of subwords.

Figure 2.4: Unsolved WordWalk Puzzle for root word 'birthday' and subwords 'add', 'hit', 'data', 'bay', 'tray'

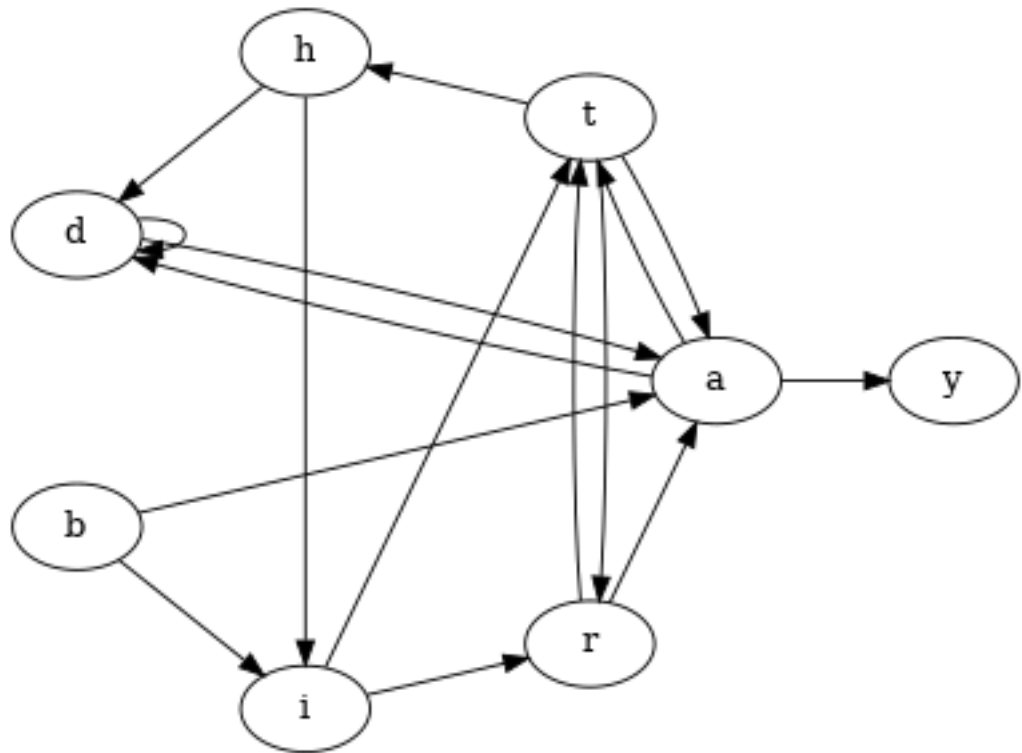


WordWalk Puzzle

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The solution for the word 'birthday' is shown in Figure 2.5.

Figure 2.5: Unsolved WordWalk Puzzle for root word 'birthday' and subwords 'add', 'hit', 'data', 'bay', 'tray'



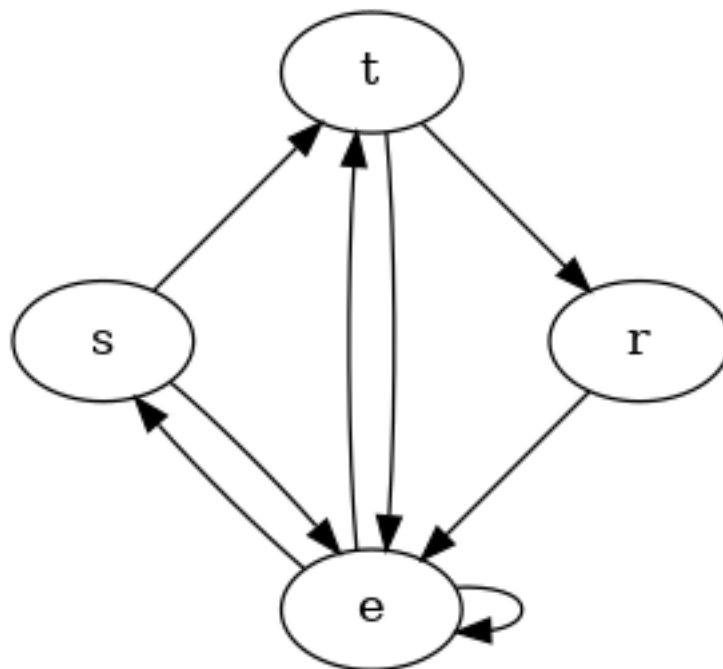
WordWalk Puzzle

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The original WordWalk puzzle for 'birthday' in Figure 2.1 did not exhibit any loops. That's because neither the root word nor the subwords contained consecutive double letters. Indeed, none of these words that make up the WordWalk graph require that any of the letter nodes be re-visited at all. However, the second graph for 'birthday' given in Figure 2.5 did in fact exhibit a loop due to the double 'dd' in the subword 'add'.

The solved puzzle below for the root word 'street' presented in Figure 2.6 also exhibits a loop.

Figure 2.6: Solved WordWalk Puzzle for root word 'street' and subwords 'see', 'set', 'test' and 'rest'.



WordWalk Puzzle

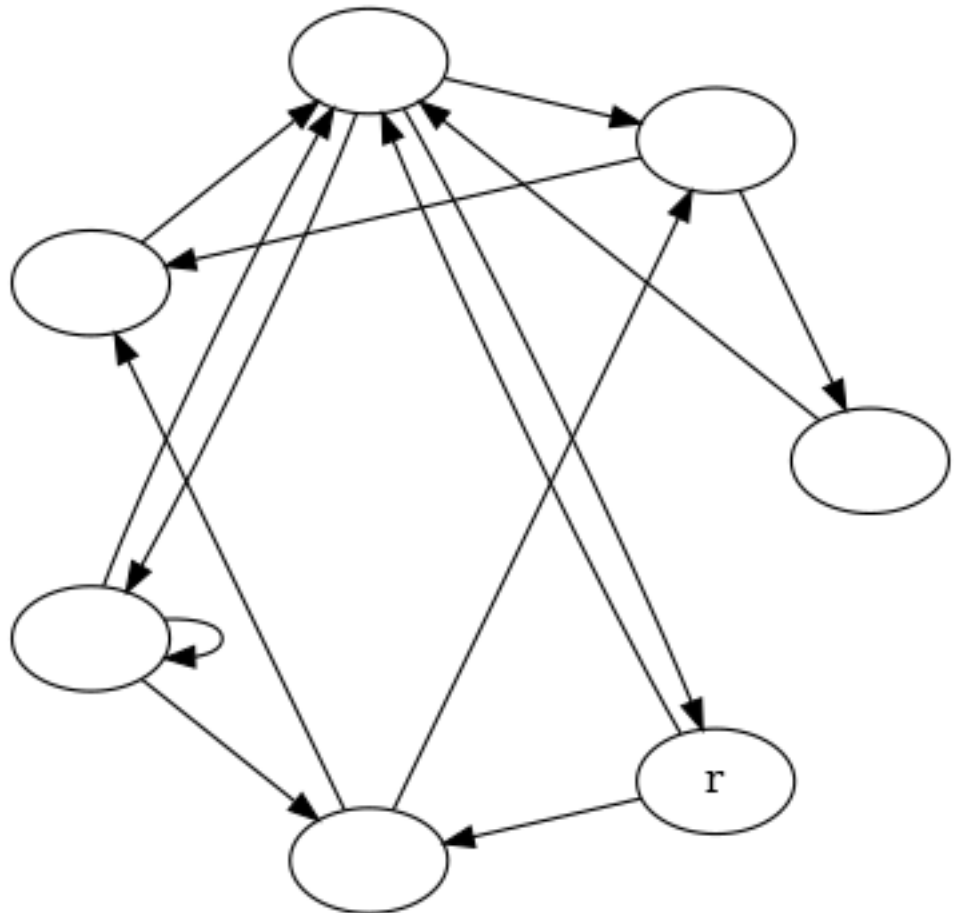
Copyright 2022 by Michael L. Carroll

Chapter 3

Puzzles

Figure 3.1: Longest root word has 9 letters.

Link to Solution: [4.1](#).



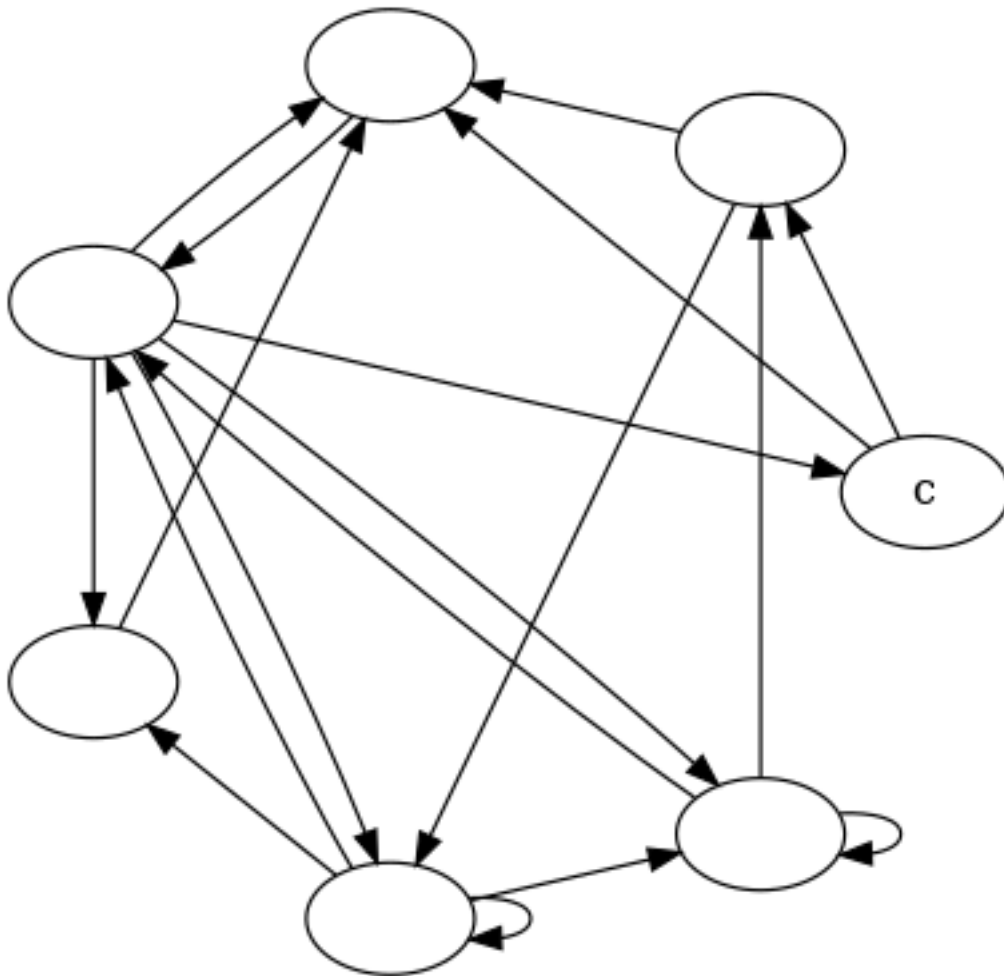
Subwords: since render essence send rider

WordWalk Puzzle

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Figure 3.2: Longest root word has 9 letters.

Link to Solution: [4.2](#).



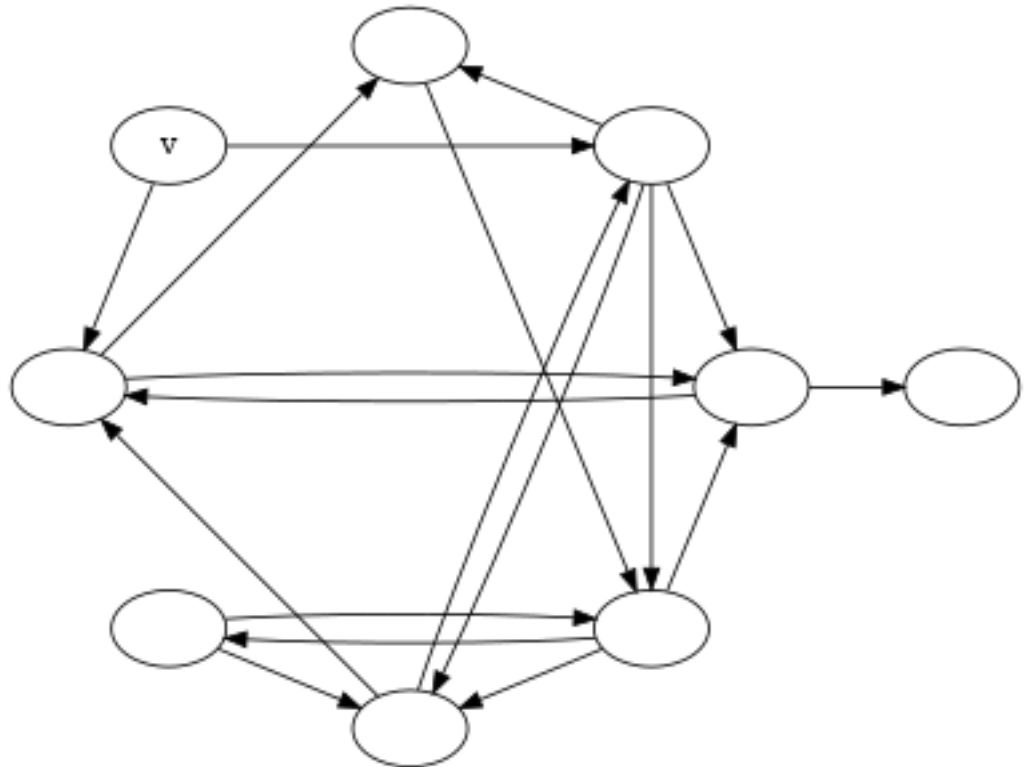
Subwords: pepper pet eat pot correct

WordWalk Puzzle

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Figure 3.3: Longest root word has 9 letters.

Link to Solution: [4.3](#).



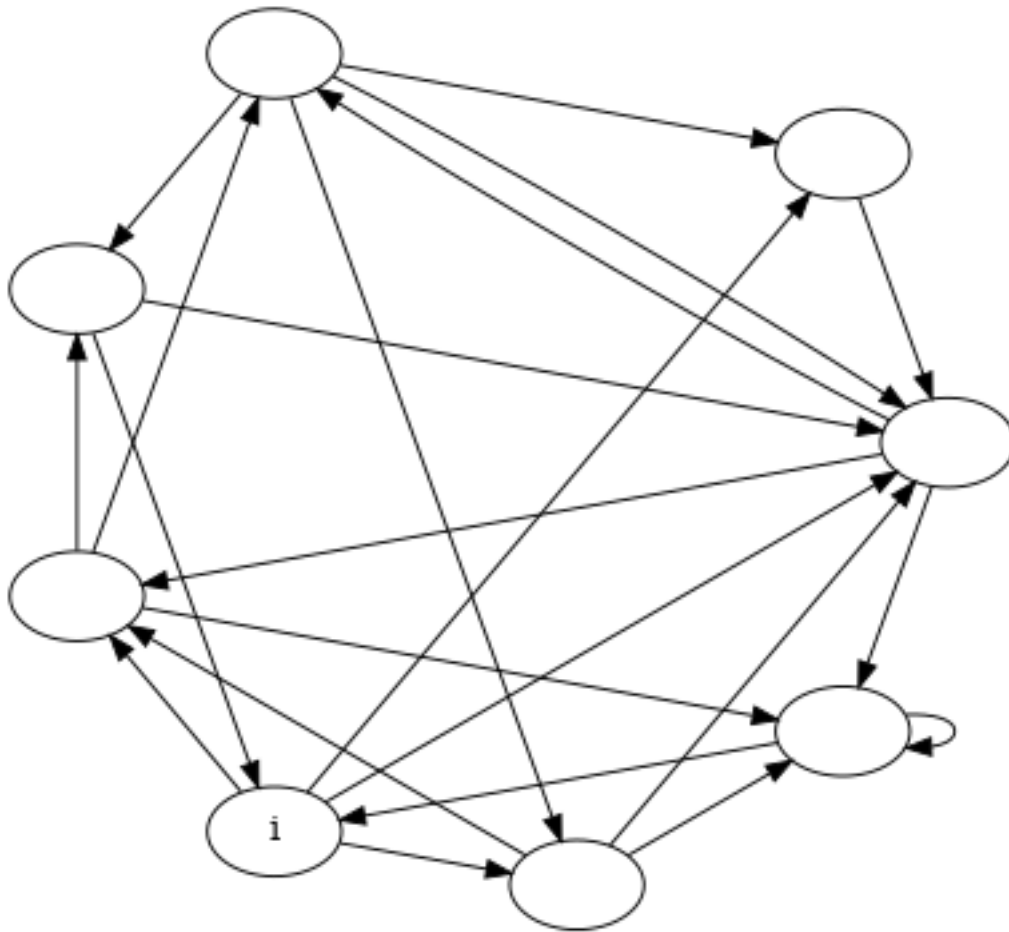
Subwords: nut total tour vary oral

WordWalk Puzzle

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Figure 3.4: Longest root word has 9 letters.

Link to Solution: [4.4](#).



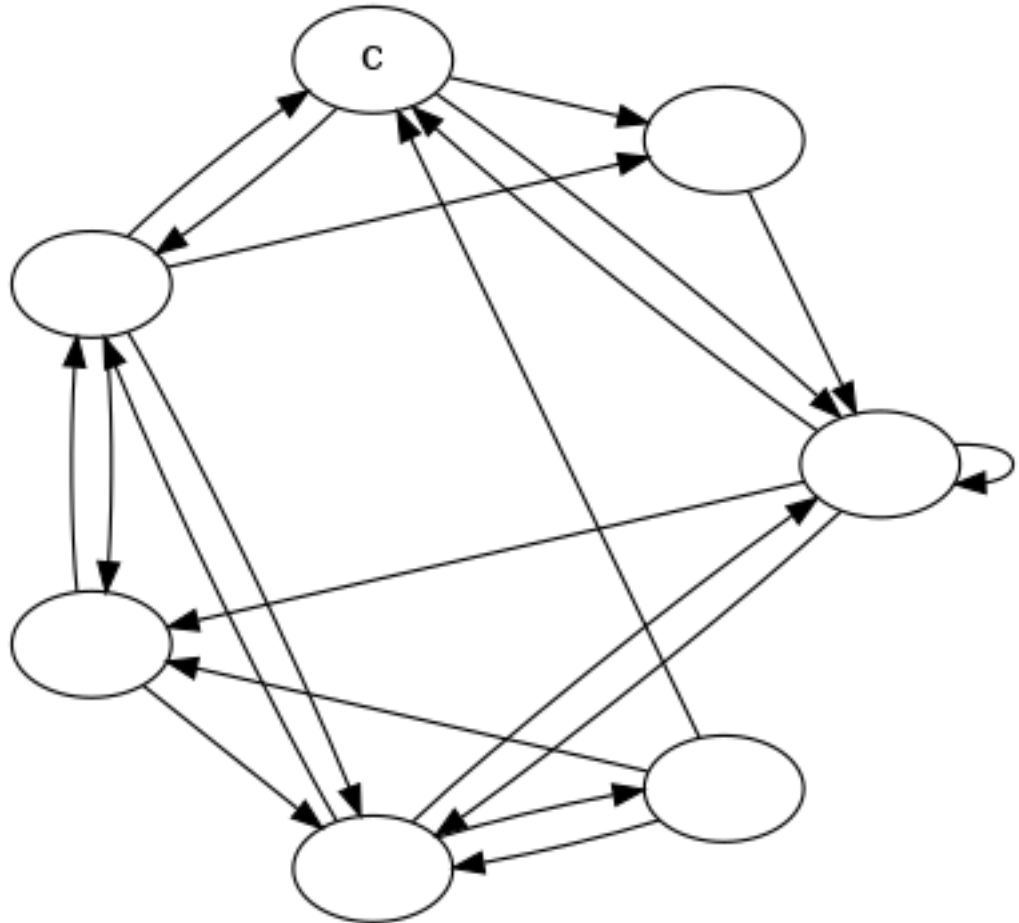
Subwords: tell client neat alliance and

WordWalk Puzzle

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Figure 3.5: Longest root word has 9 letters.

Link to Solution: 4.5.



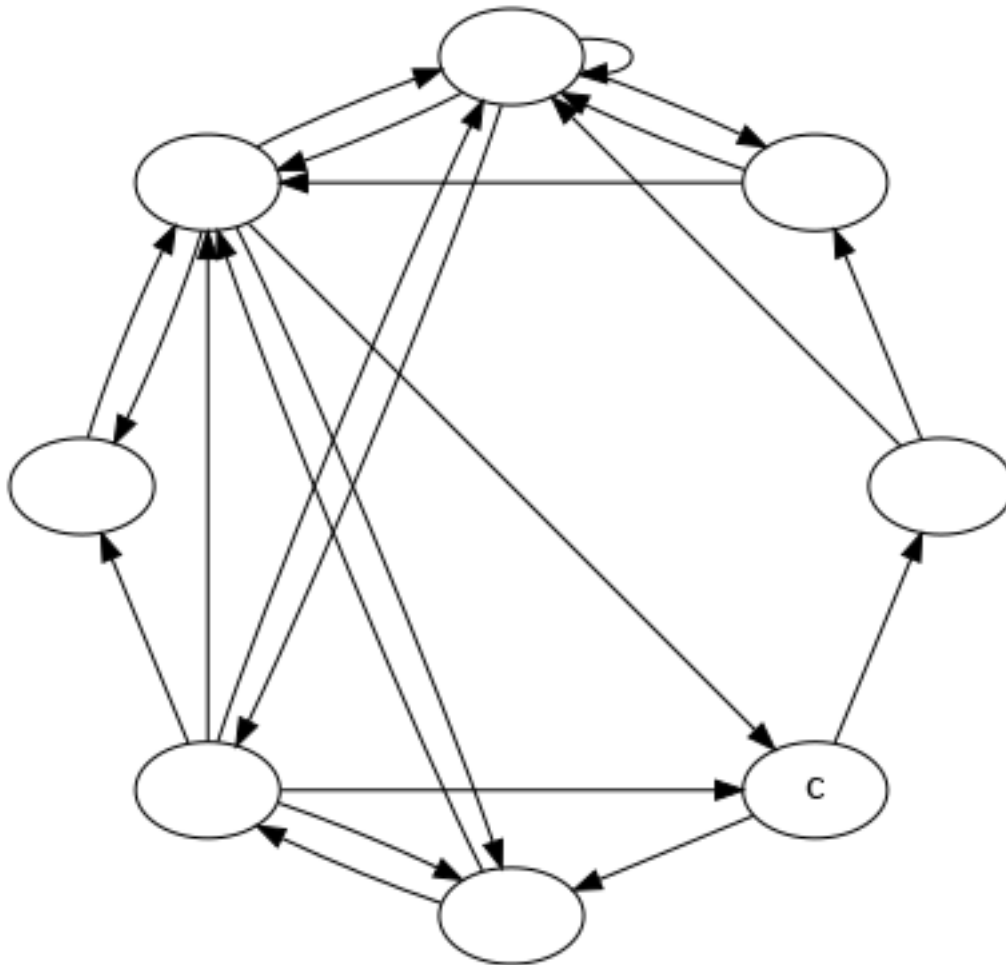
Subwords: act ice indeed enact decade

WordWalk Puzzle

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Figure 3.6: Longest root word has 9 letters.

Link to Solution: [4.6](#).



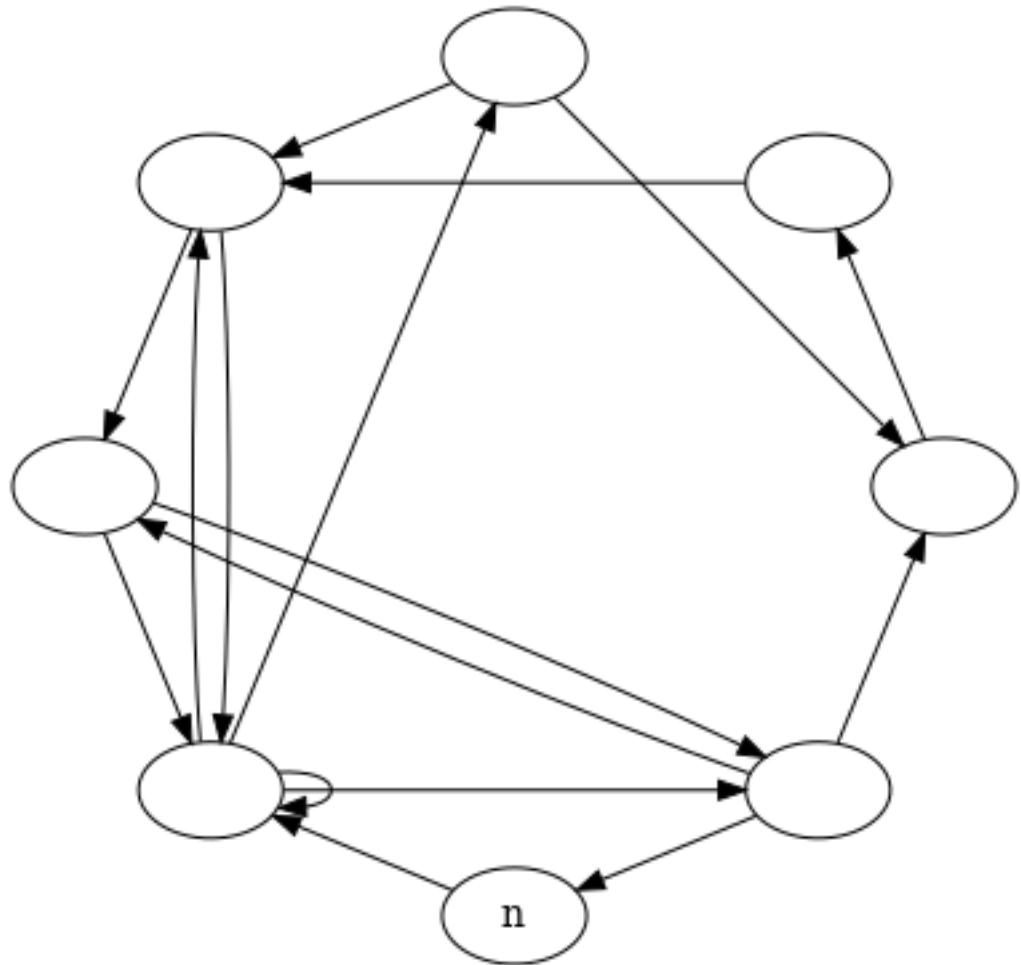
Subwords: ten connect tie genetic evening

WordWalk Puzzle

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Figure 3.7: Longest root word has 9 letters.

Link to Solution: [4.7](#).



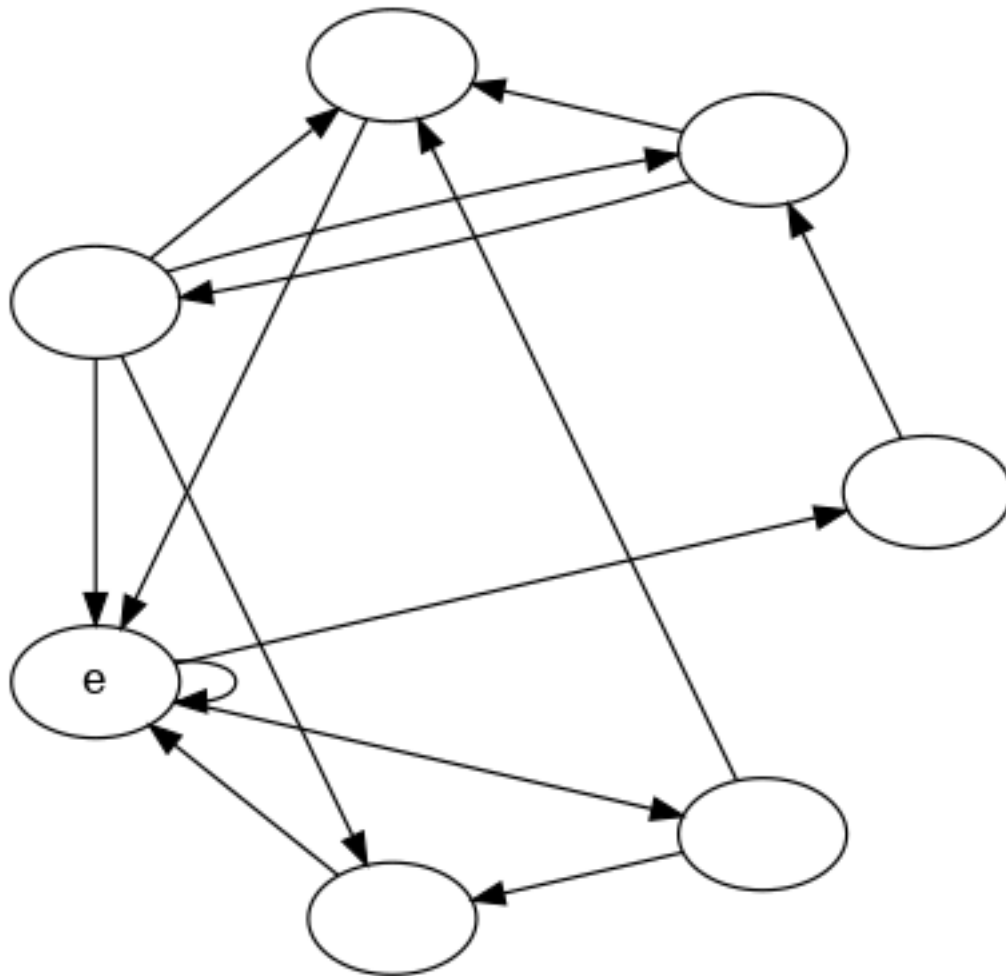
Subwords: tooth town store who too

WordWalk Puzzle

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Figure 3.8: Longest root word has 9 letters.

Link to Solution: 4.8.



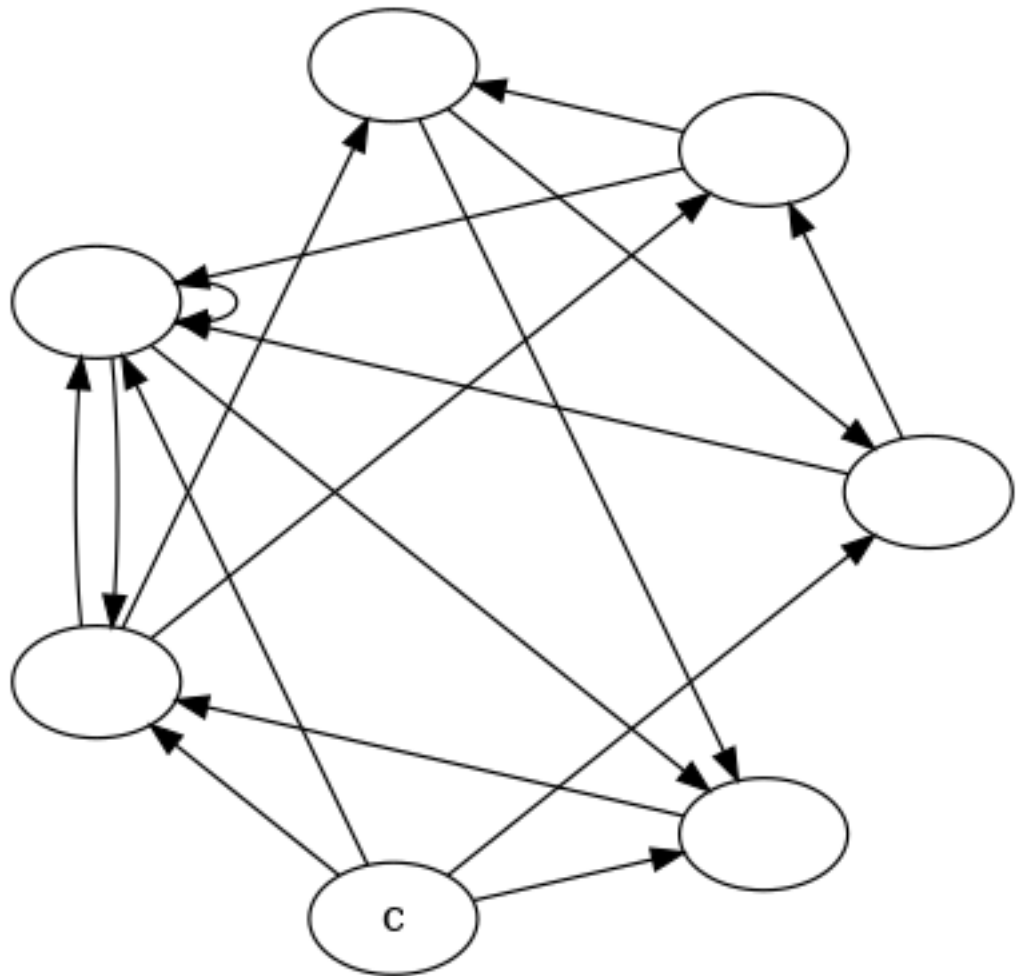
Subwords: ten exit see sit scent

WordWalk Puzzle

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Figure 3.9: Longest root word has 9 letters.

Link to Solution: [4.9](#).



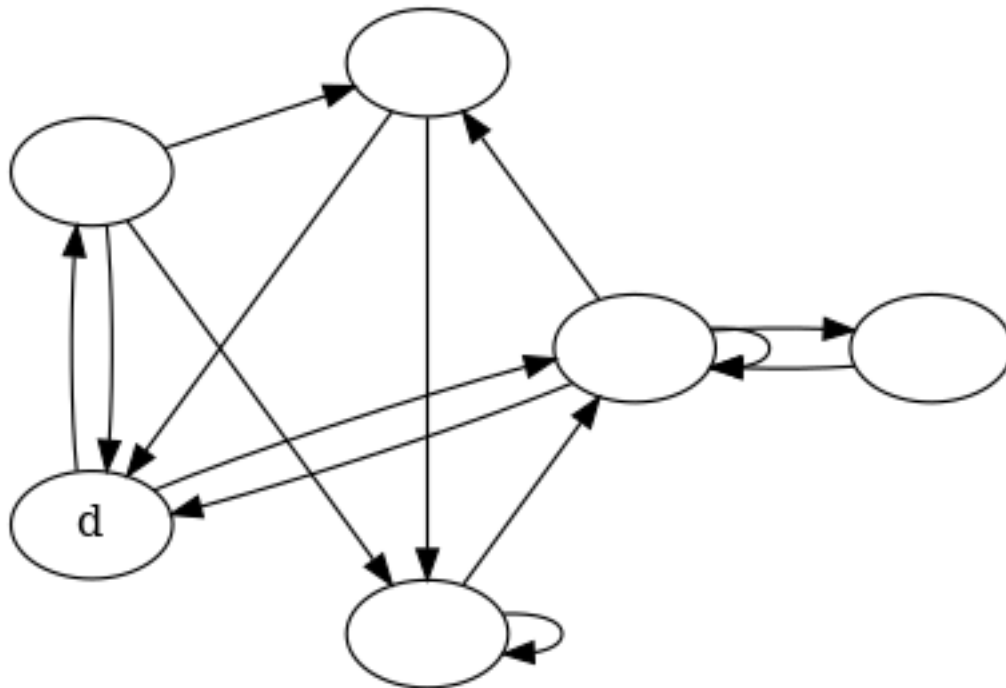
Subwords: leg cue clue cell goal

WordWalk Puzzle

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Figure 3.10: Longest root word has 9 letters.

Link to Solution: 4.10.



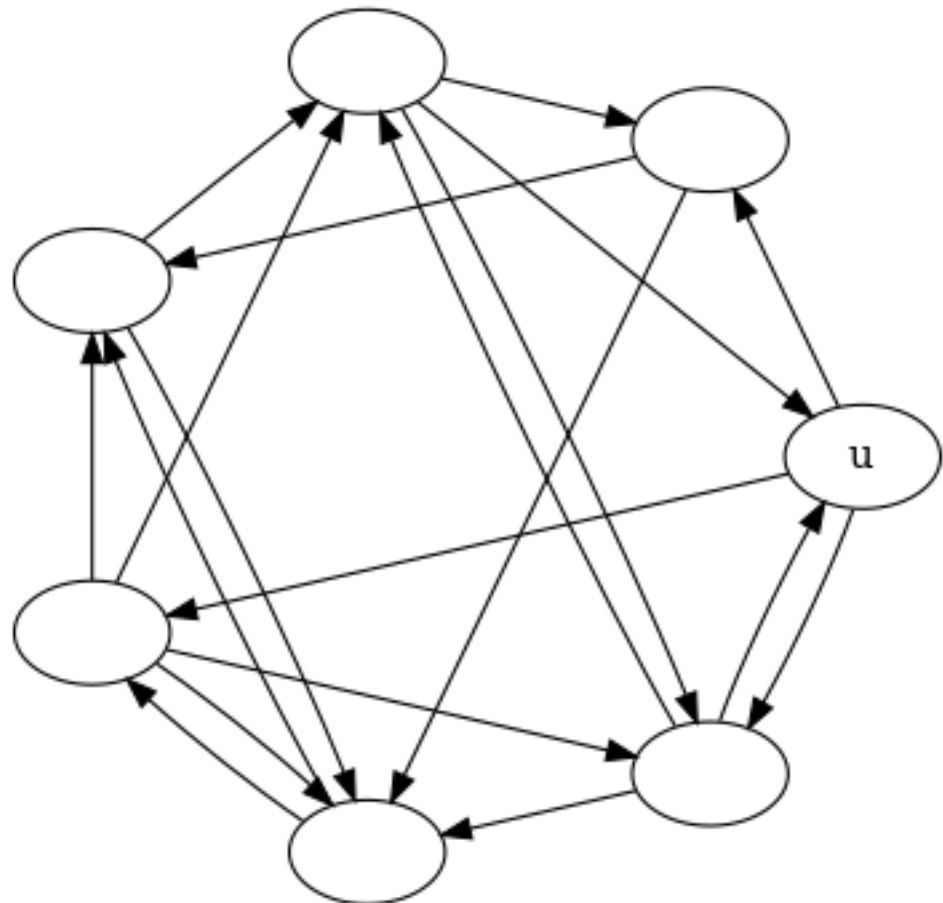
Subwords: tend attend dad defend feed

WordWalk Puzzle

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Figure 3.11: Longest root word has 9 letters.

Link to Solution: 4.11.



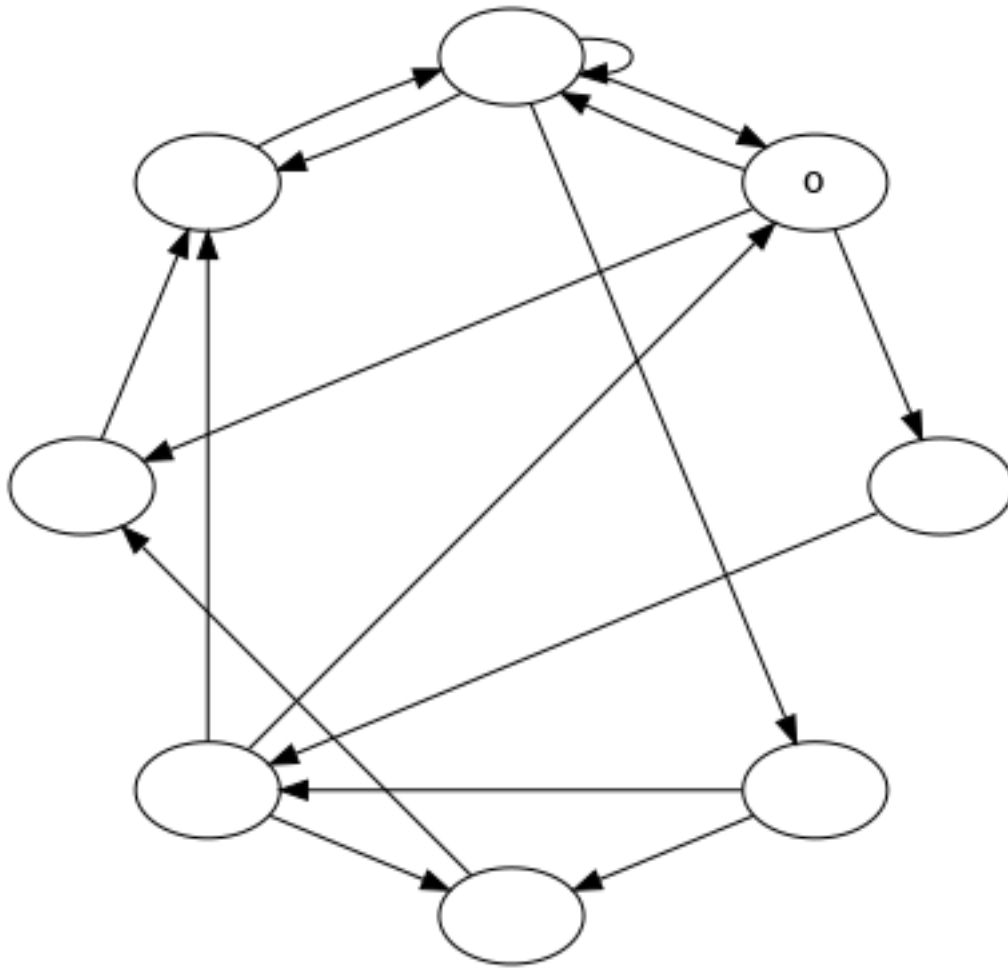
Subwords: mere murder under medium rim

WordWalk Puzzle

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Figure 3.12: Longest root word has 9 letters.

Link to Solution: 4.12.



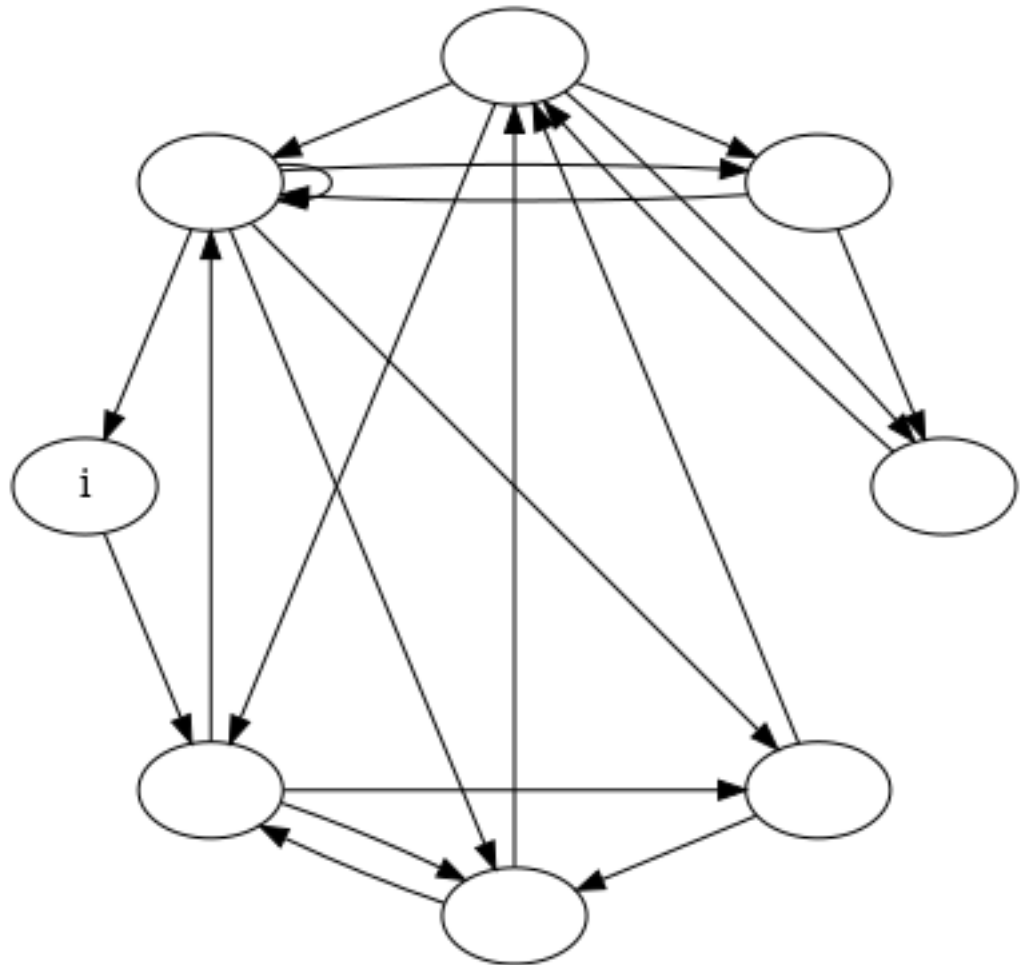
Subwords: where those error wise his

WordWalk Puzzle

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Figure 3.13: Longest root word has 9 letters.

Link to Solution: 4.13.



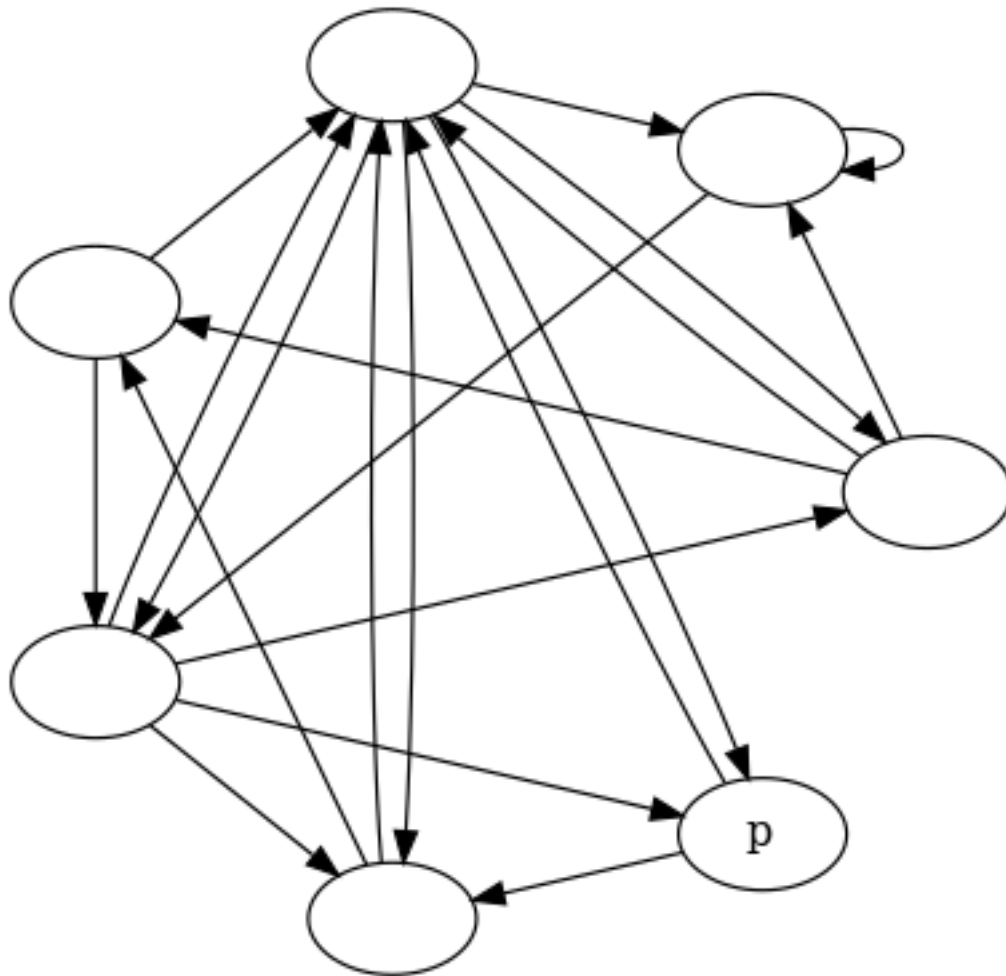
Subwords: scene ass sin cause ear

WordWalk Puzzle

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Figure 3.14: Longest root word has 9 letters.

Link to Solution: 4.14.



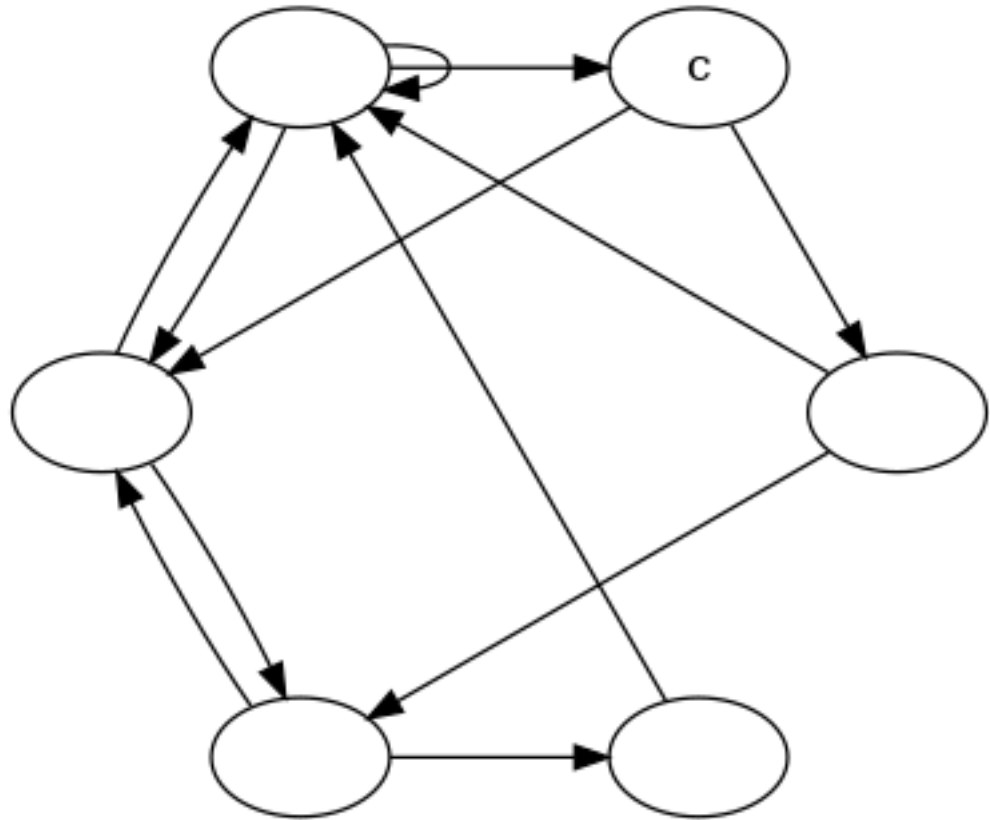
Subwords: partial tall clip air tap

WordWalk Puzzle

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Figure 3.15: Longest root word has 9 letters.

Link to Solution: 4.15.



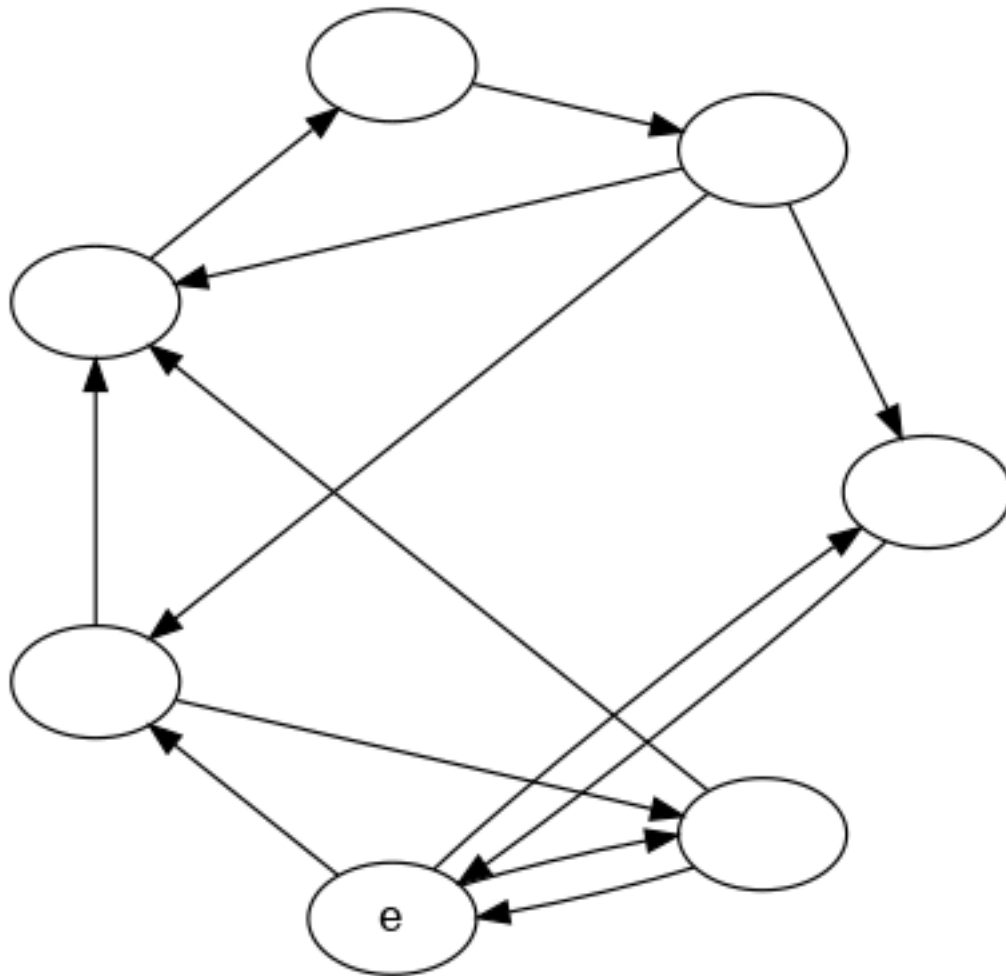
Subwords: tell cut call tall cat

WordWalk Puzzle

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Figure 3.16: Longest root word has 9 letters.

Link to Solution: [4.16](#).



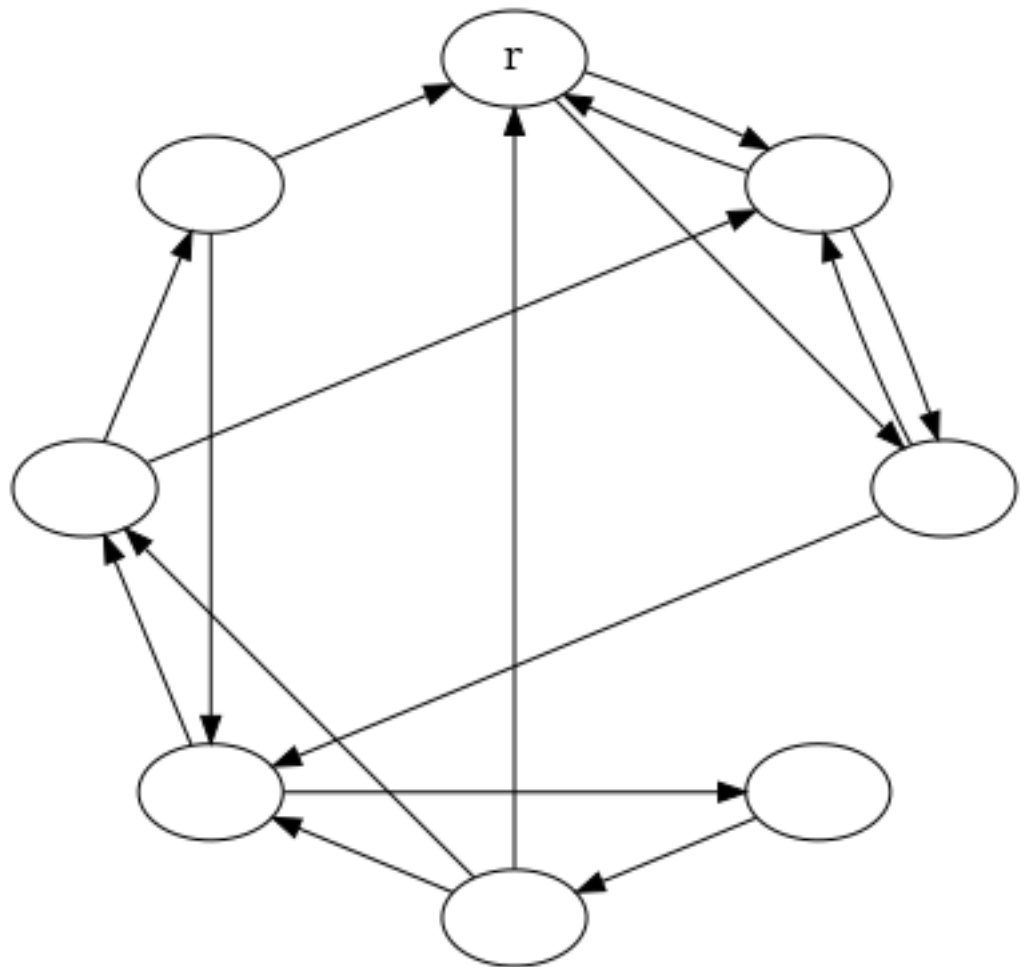
Subwords: boy very over dry red

WordWalk Puzzle

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Figure 3.17: Longest root word has 9 letters.

Link to Solution: 4.17.



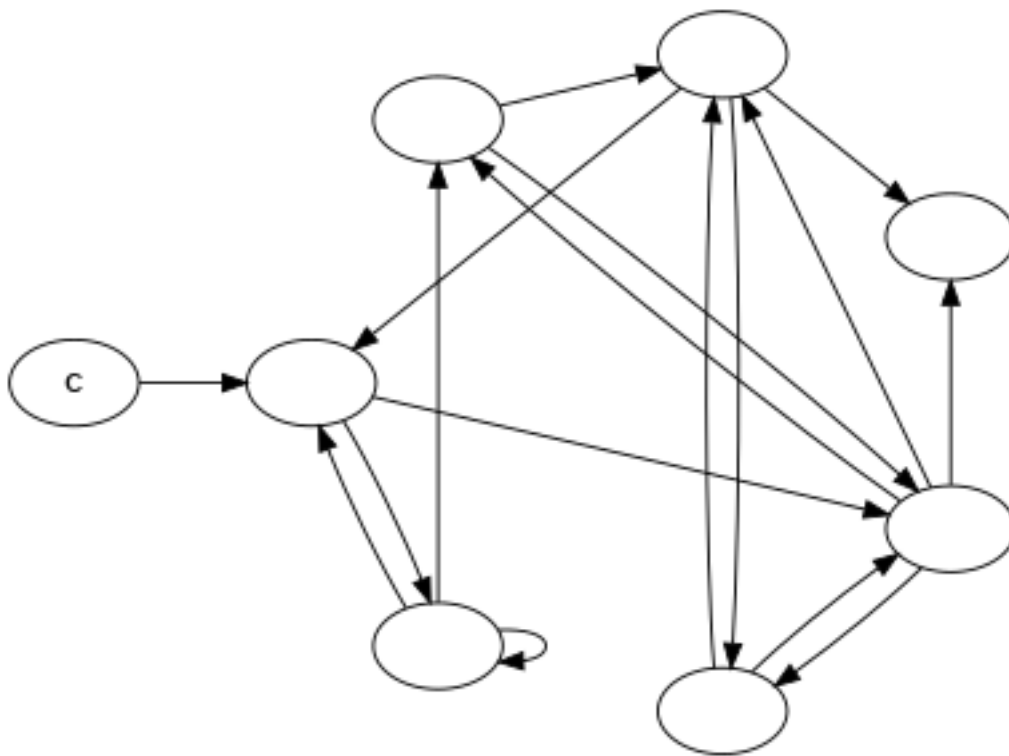
Subwords: auto outer late gut large

WordWalk Puzzle

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Figure 3.18: Longest root word has 9 letters.

Link to Solution: 4.18.



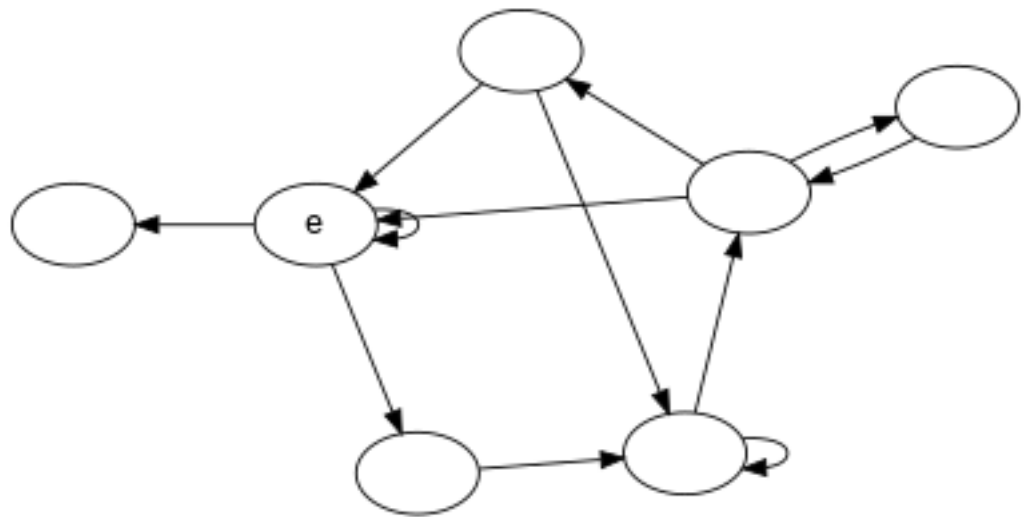
Subwords: onto tiny nut unity common

WordWalk Puzzle

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Figure 3.19: Longest root word has 9 letters.

Link to Solution: 4.19.



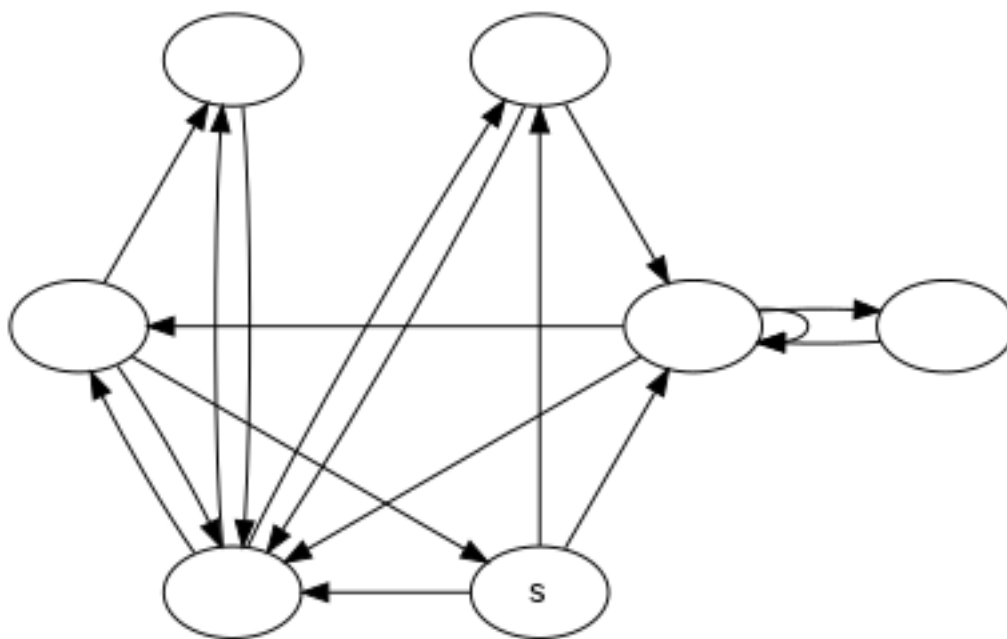
Subwords: stem too see system cost

WordWalk Puzzle

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Figure 3.20: Longest root word has 9 letters.

Link to Solution: 4.20.



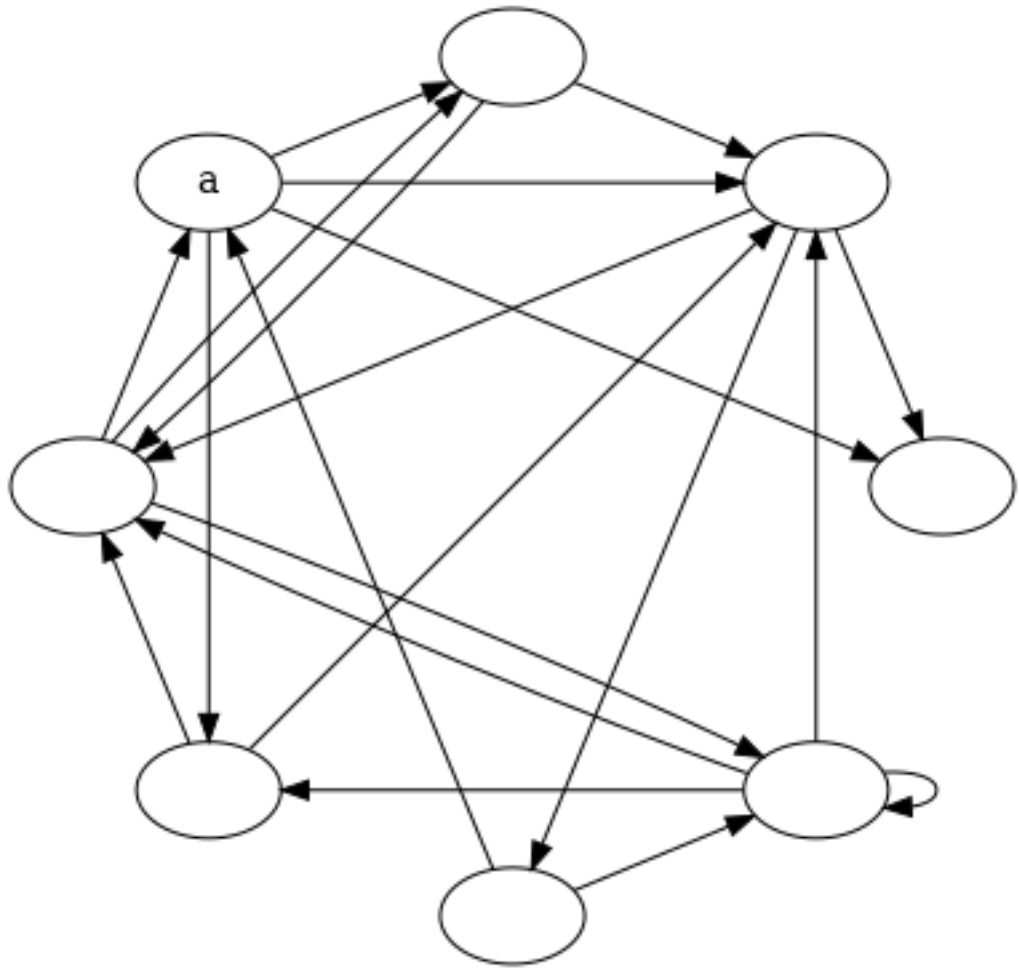
Subwords: sit soon status not out

WordWalk Puzzle

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Figure 3.21: Longest root word has 9 letters.

Link to Solution: 4.21.



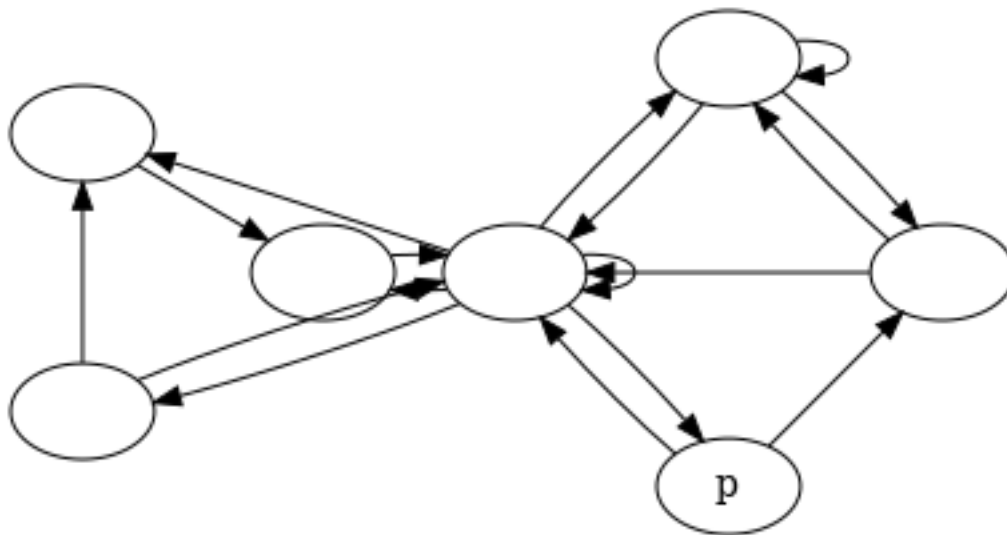
Subwords: our tray hat air root

WordWalk Puzzle

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Figure 3.22: Longest root word has 9 letters.

Link to Solution: [4.22](#).



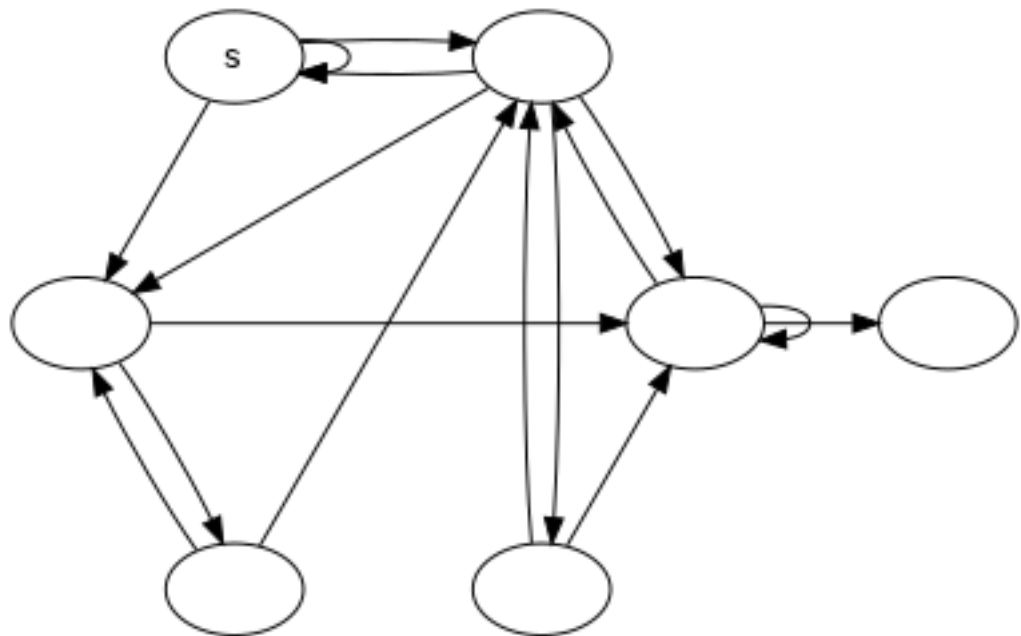
Subwords: root pill roof pop lot

WordWalk Puzzle

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Figure 3.23: Longest root word has 9 letters.

Link to Solution: 4.23.



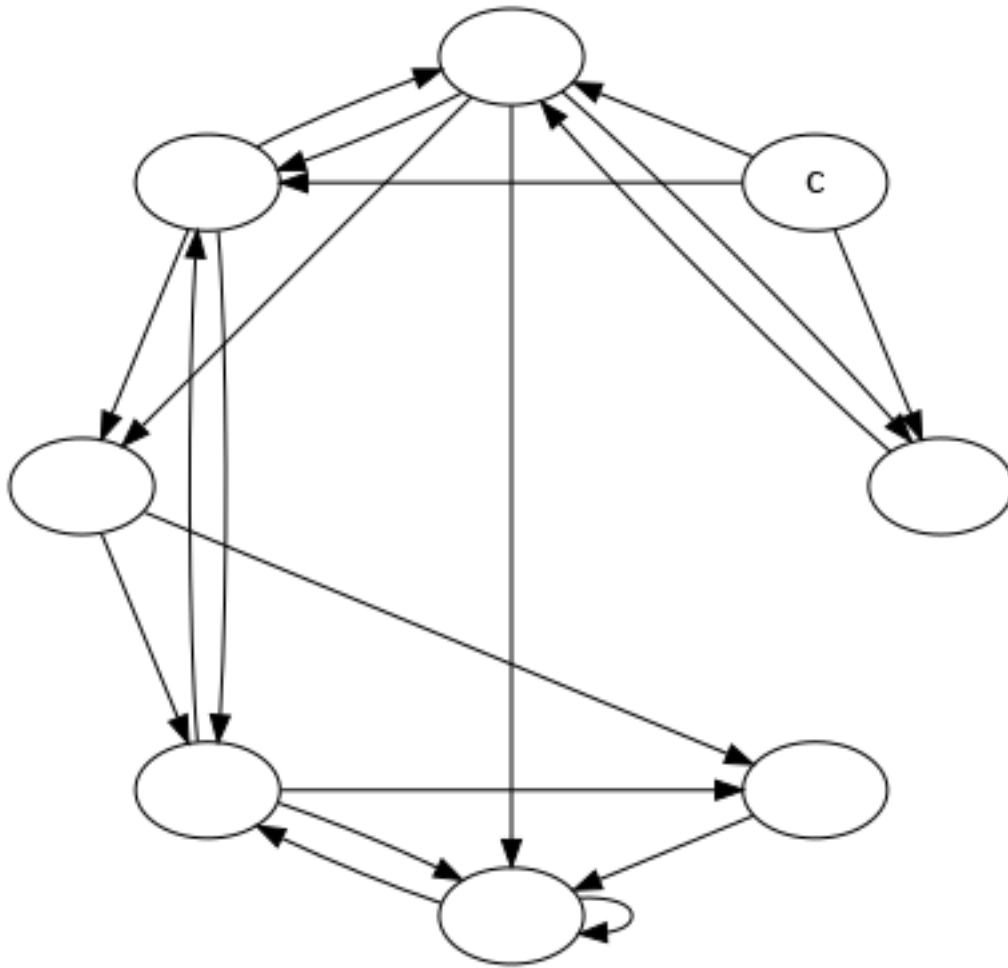
Subwords: similar sail ill rally mass

WordWalk Puzzle

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Figure 3.24: Longest root word has 9 letters.

Link to Solution: 4.24.



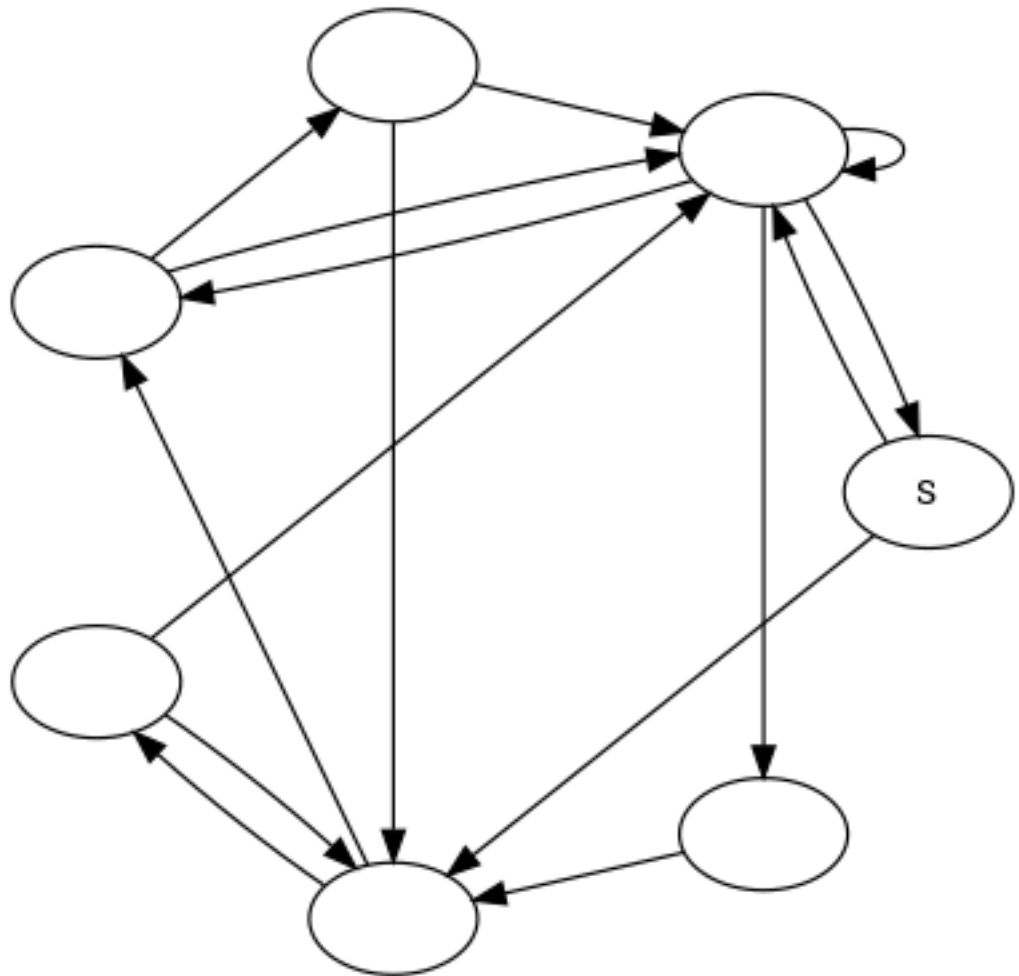
Subwords: less clue role cross lens

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Figure 3.25: Longest root word has 9 letters.

Link to Solution: 4.25.



Subwords: room rose wow whom home

WordWalk Puzzle

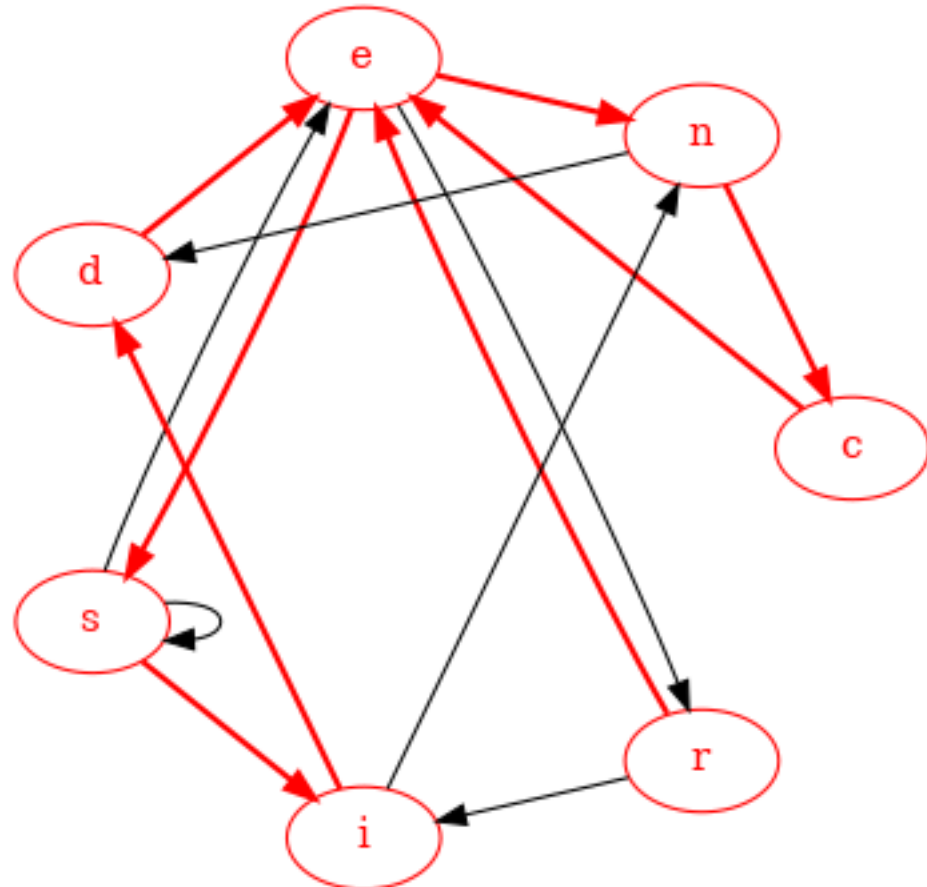
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Chapter 4

Solutions

Figure 4.1: Root Word: residence.

Link Back to Puzzle: 3.1



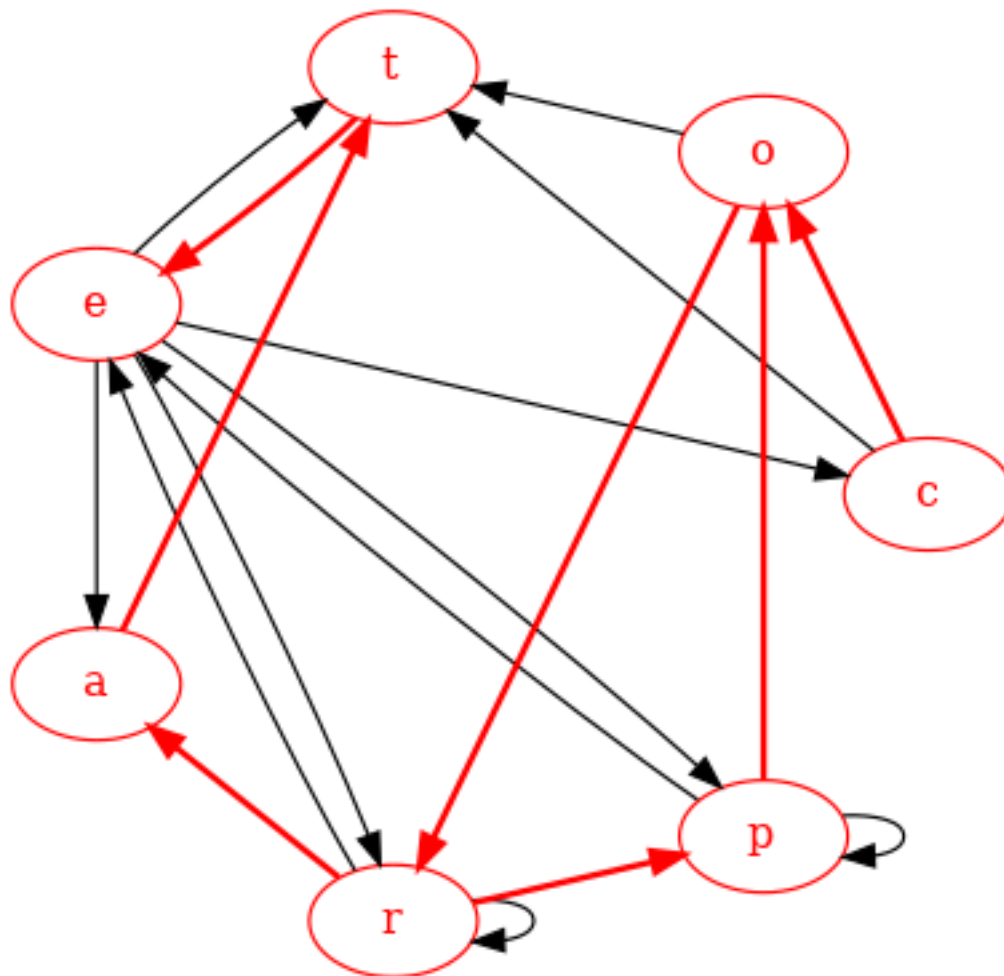
Root word(s): residence
 Subwords: since render essence send rider

WordWalk Puzzle

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Figure 4.2: Root Word: corporate.

Link Back to Puzzle: 3.2



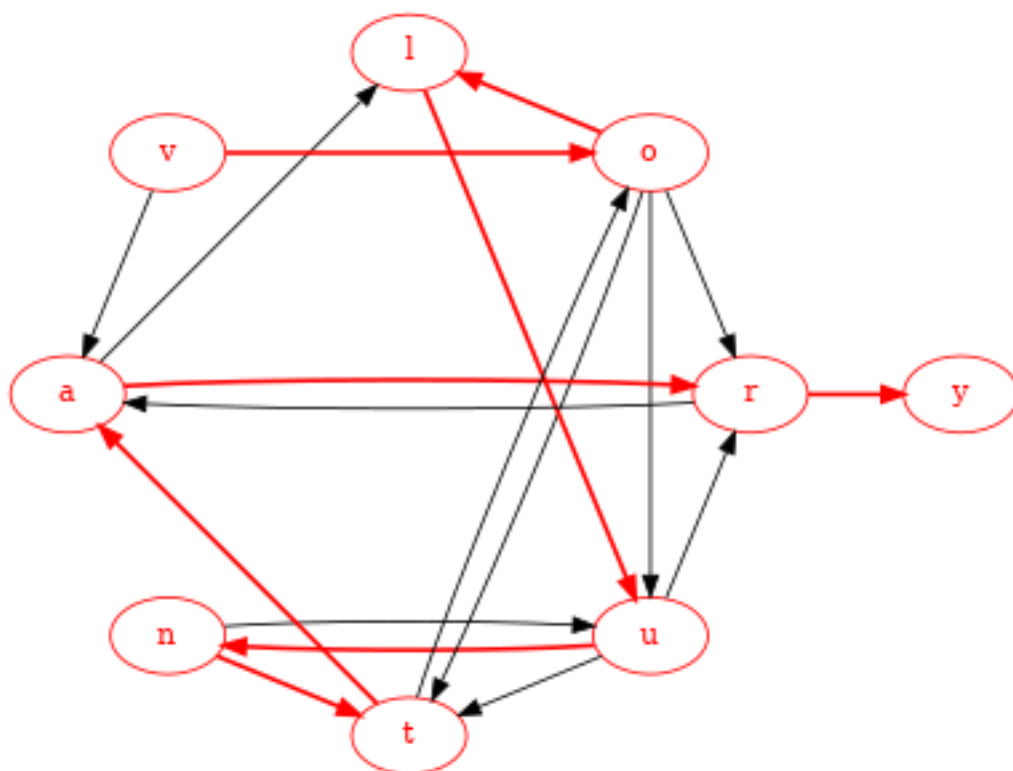
Root word(s): corporate
 Subwords: pepper pet eat pot correct

WordWalk Puzzle

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Figure 4.3: Root Word: voluntary.

Link Back to Puzzle: 3.3



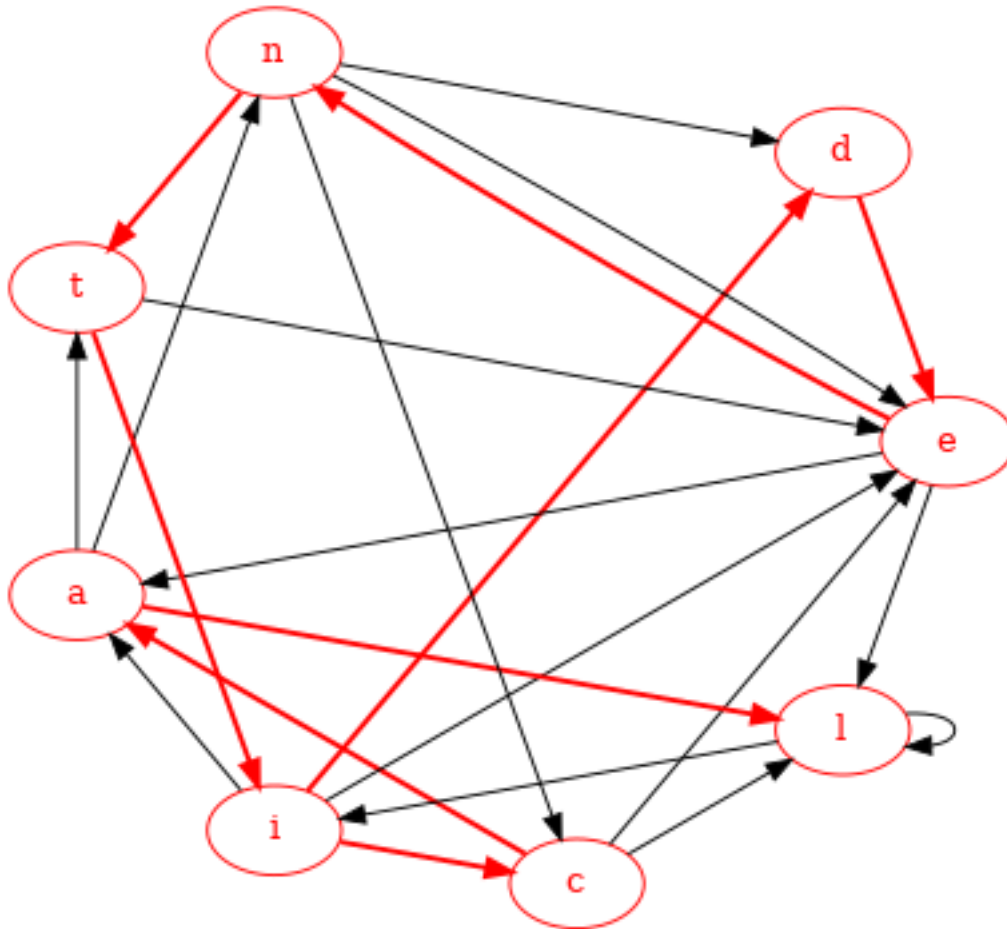
Root word(s): voluntary
 Subwords: nut total tour vary oral

WordWalk Puzzle

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Figure 4.4: Root Word: identical.

Link Back to Puzzle: 3.4



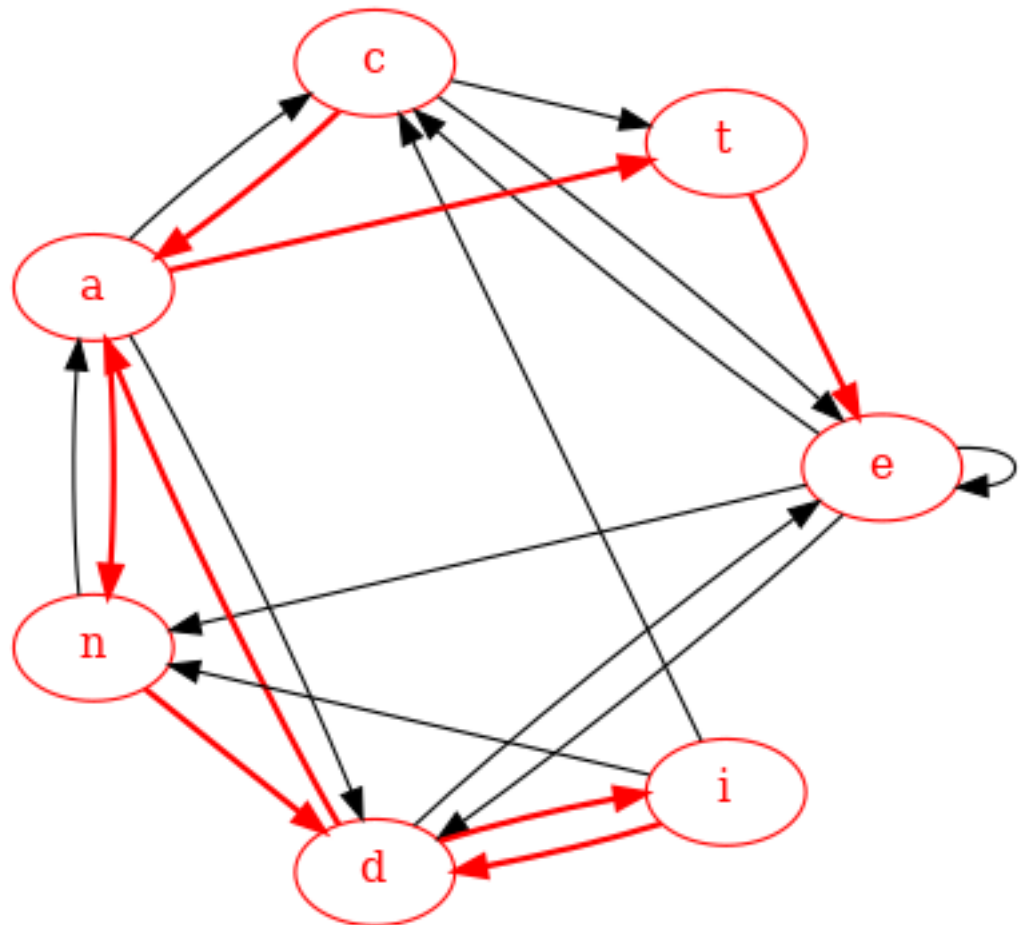
Root word(s): identical
 Subwords: tell client neat alliance and

WordWalk Puzzle

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Figure 4.5: Root Word: candidate.

Link Back to Puzzle: 3.5



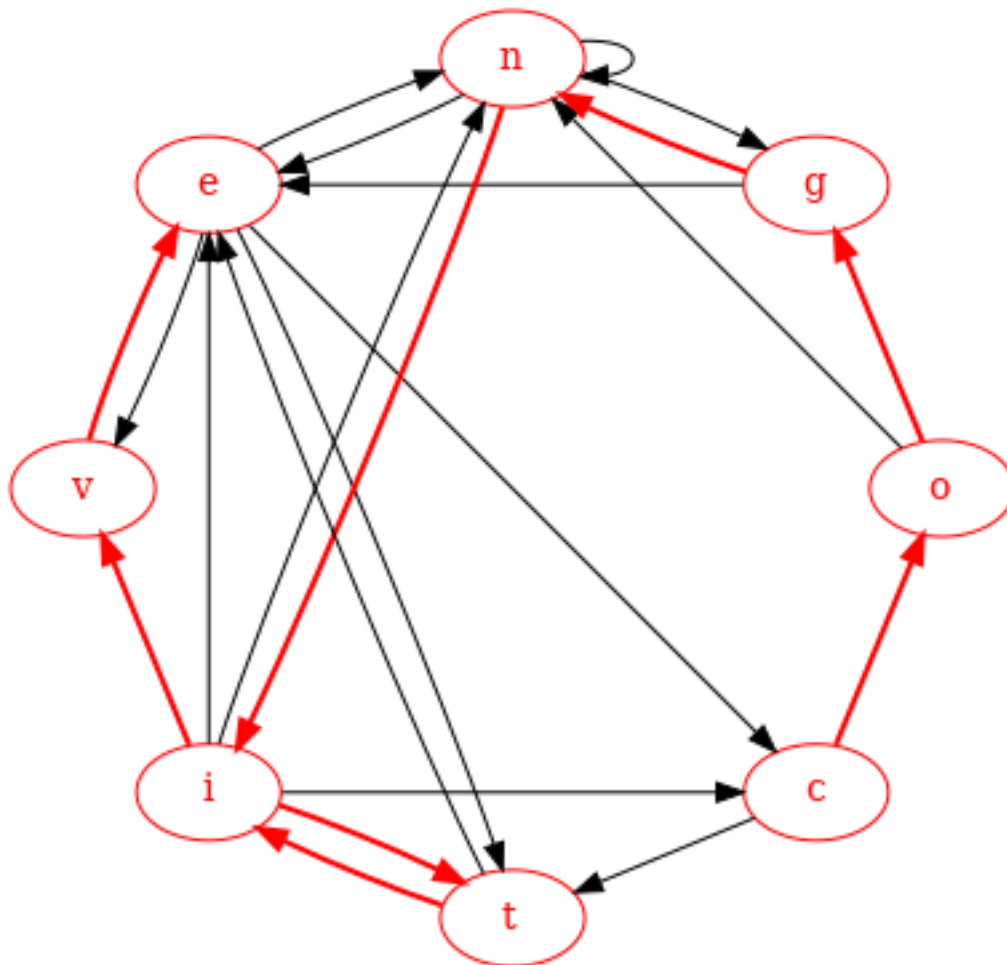
Root word(s): candidate
 Subwords: act ice indeed enact decade

WordWalk Puzzle

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Figure 4.6: Root Word: cognitive.

Link Back to Puzzle: 3.6



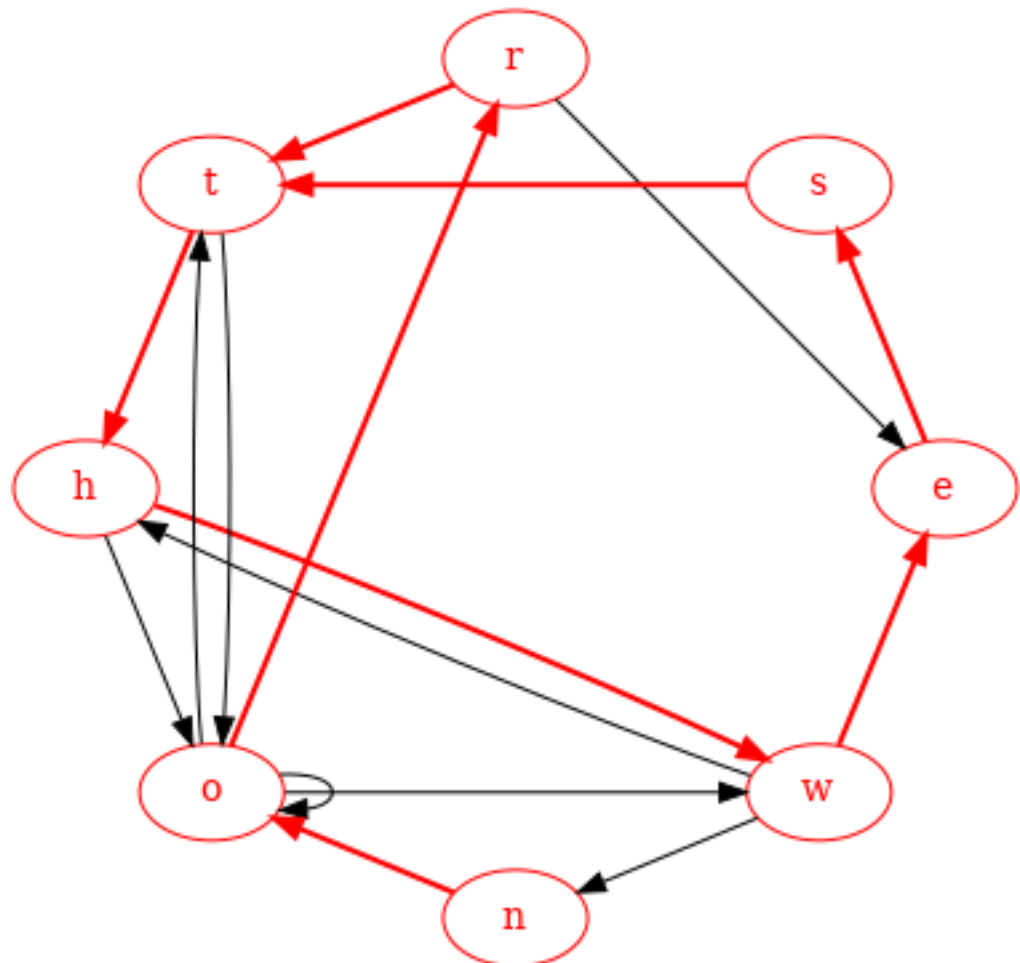
Root word(s): cognitive
 Subwords: ten connect tie genetic evening

WordWalk Puzzle

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Figure 4.7: Root Word: northwest.

Link Back to Puzzle: 3.7



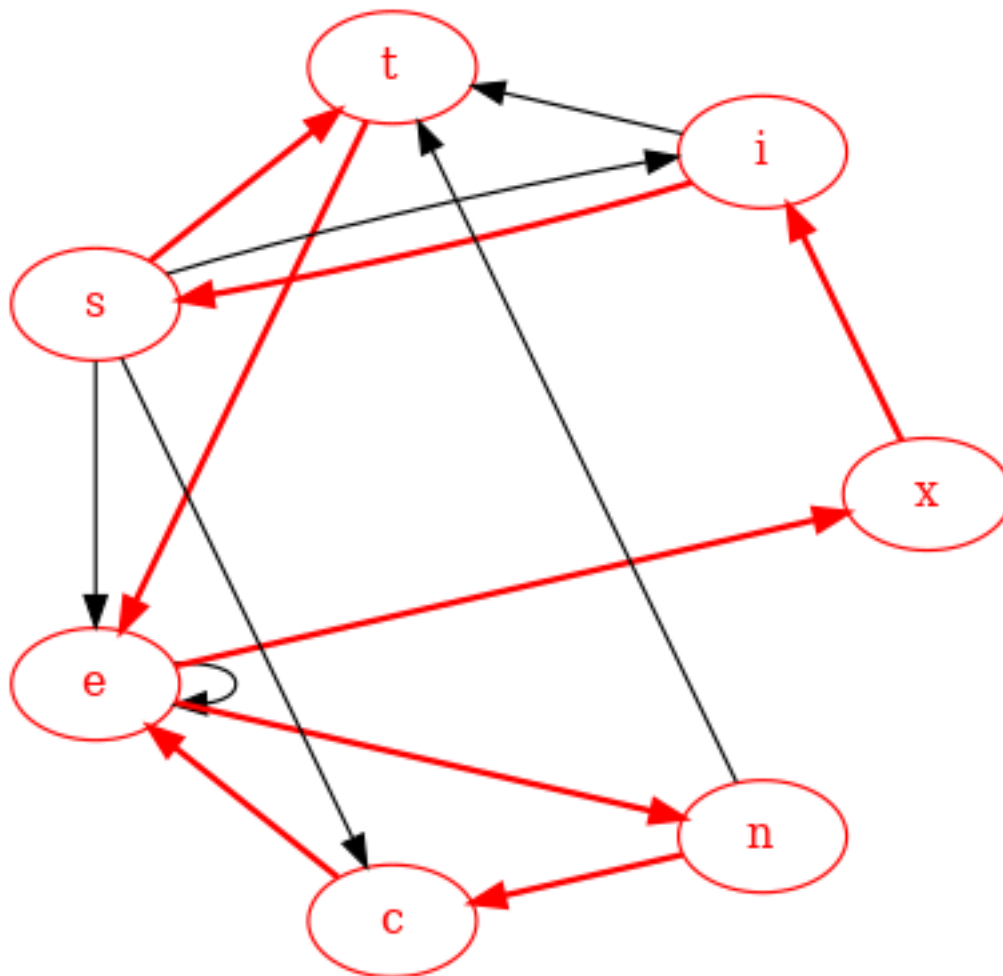
Root word(s): northwest
 Subwords: tooth town store who too

WordWalk Puzzle

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Figure 4.8: Root Word: existence.

Link Back to Puzzle: 3.8



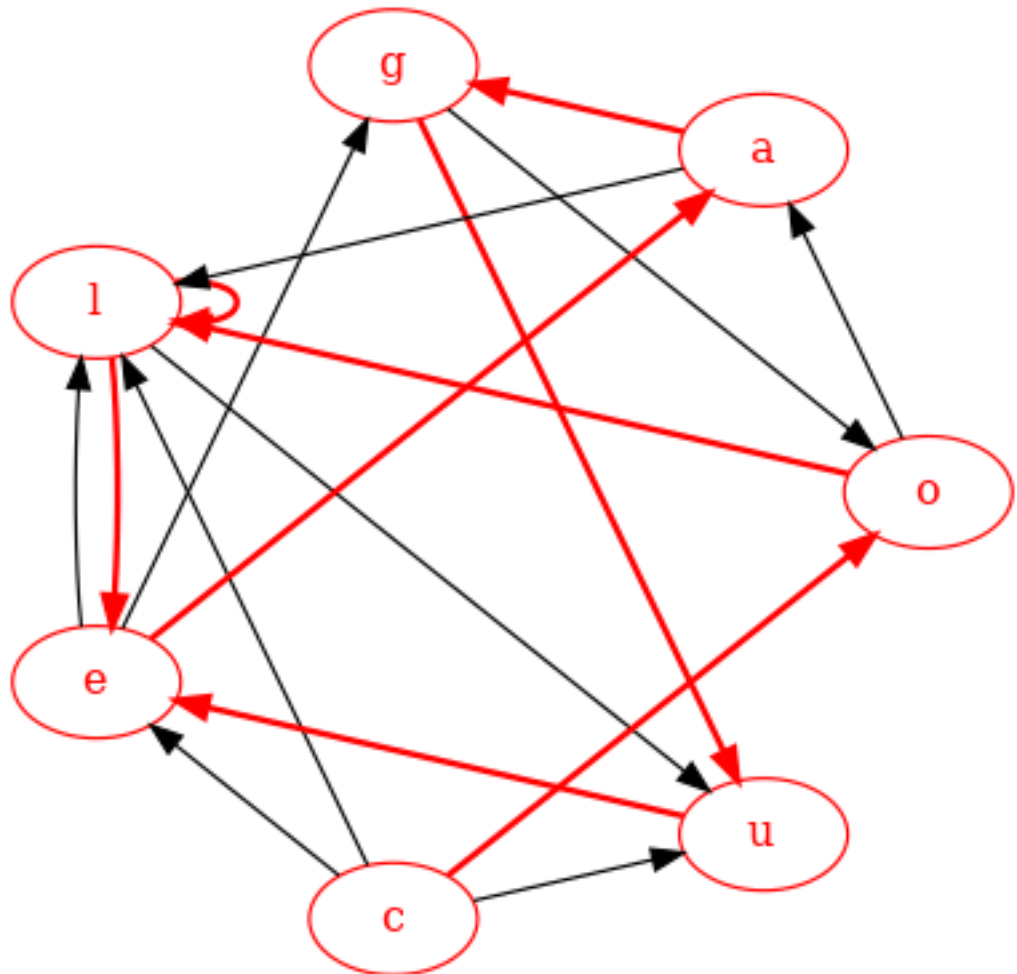
Root word(s): existence
 Subwords: ten exit see sit scent

WordWalk Puzzle

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Figure 4.9: Root Word: colleague.

Link Back to Puzzle: 3.9



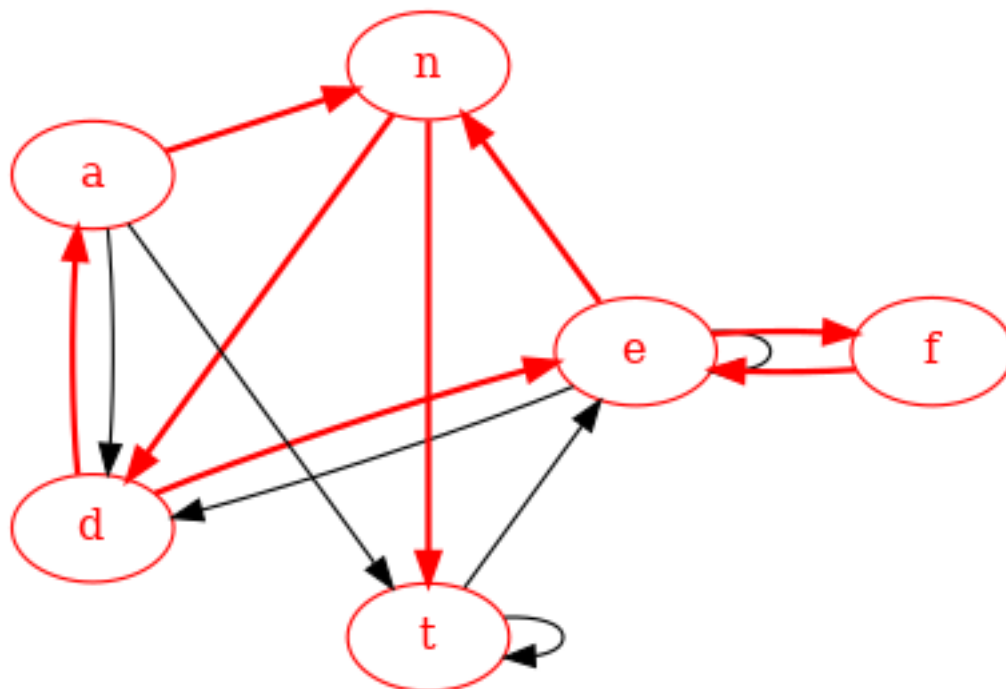
Root word(s): colleague
 Subwords: leg cue clue cell goal

WordWalk Puzzle

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Figure 4.10: Root Word: defendant.

Link Back to Puzzle: 3.10



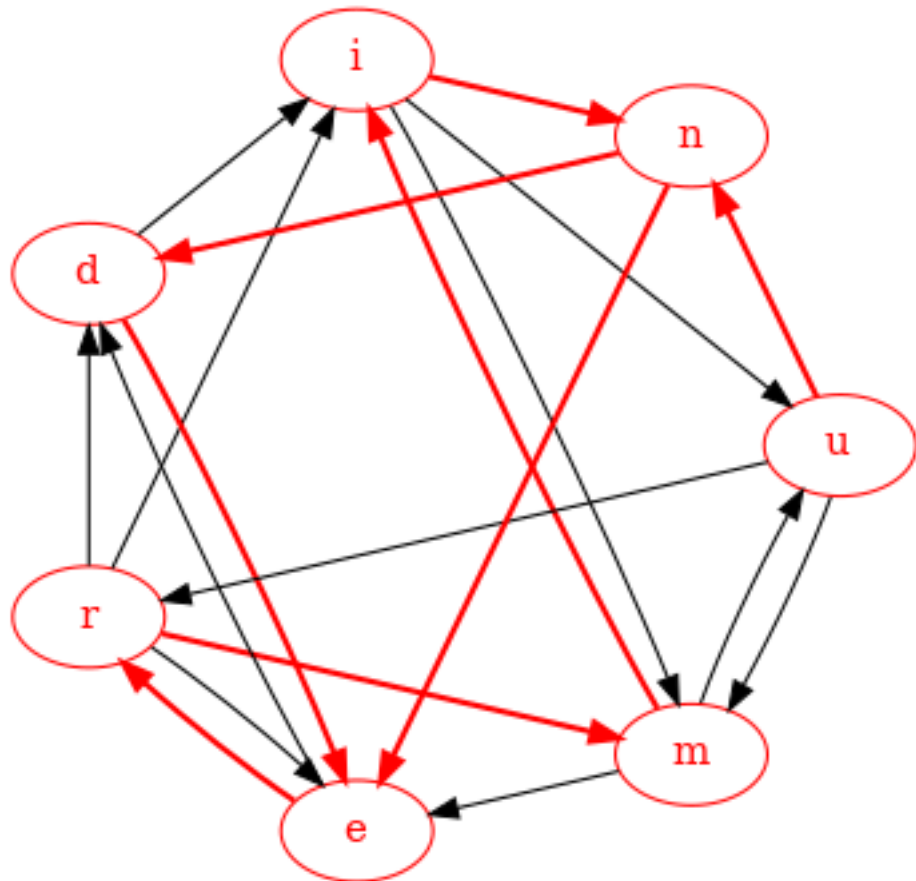
Root word(s): defendant
 Subwords: tend attend dad defend feed

WordWalk Puzzle

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Figure 4.11: Root Word: undermine.

Link Back to Puzzle: 3.11



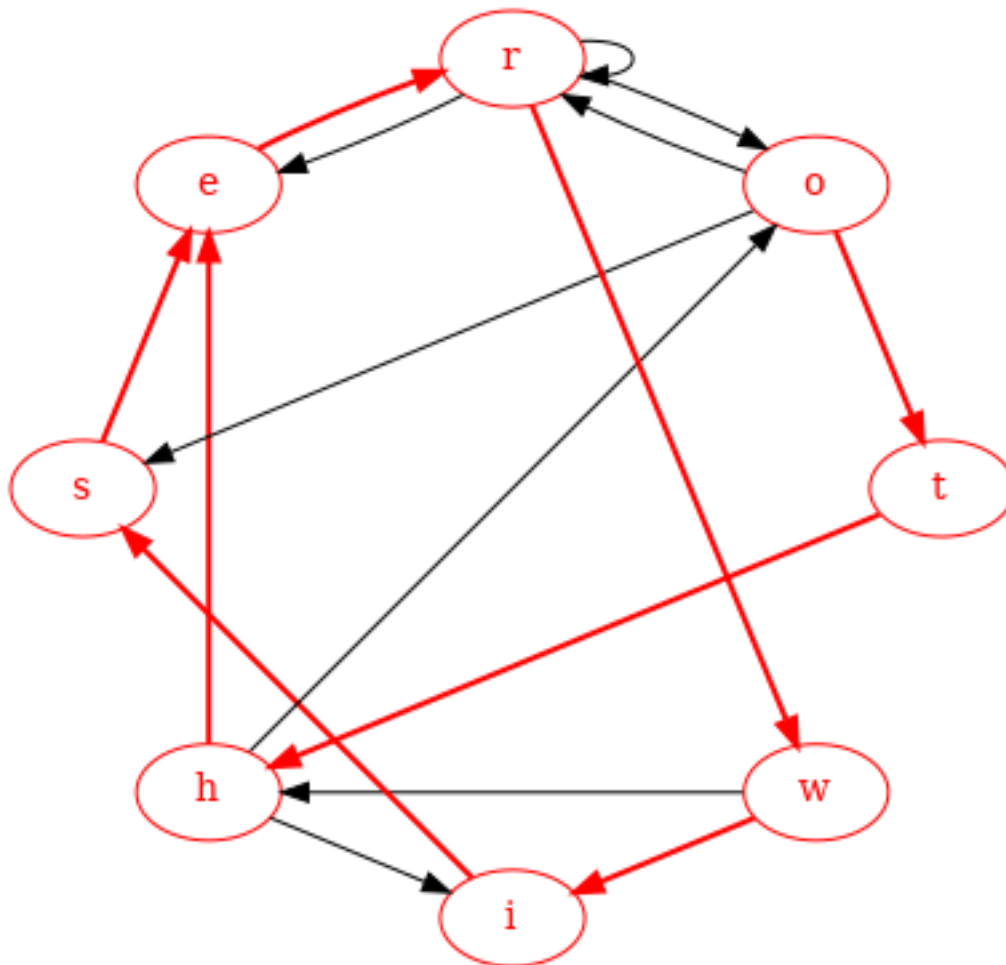
Root word(s): undermine
 Subwords: mere murder under medium rim

WordWalk Puzzle

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Figure 4.12: Root Word: otherwise.

Link Back to Puzzle: 3.12



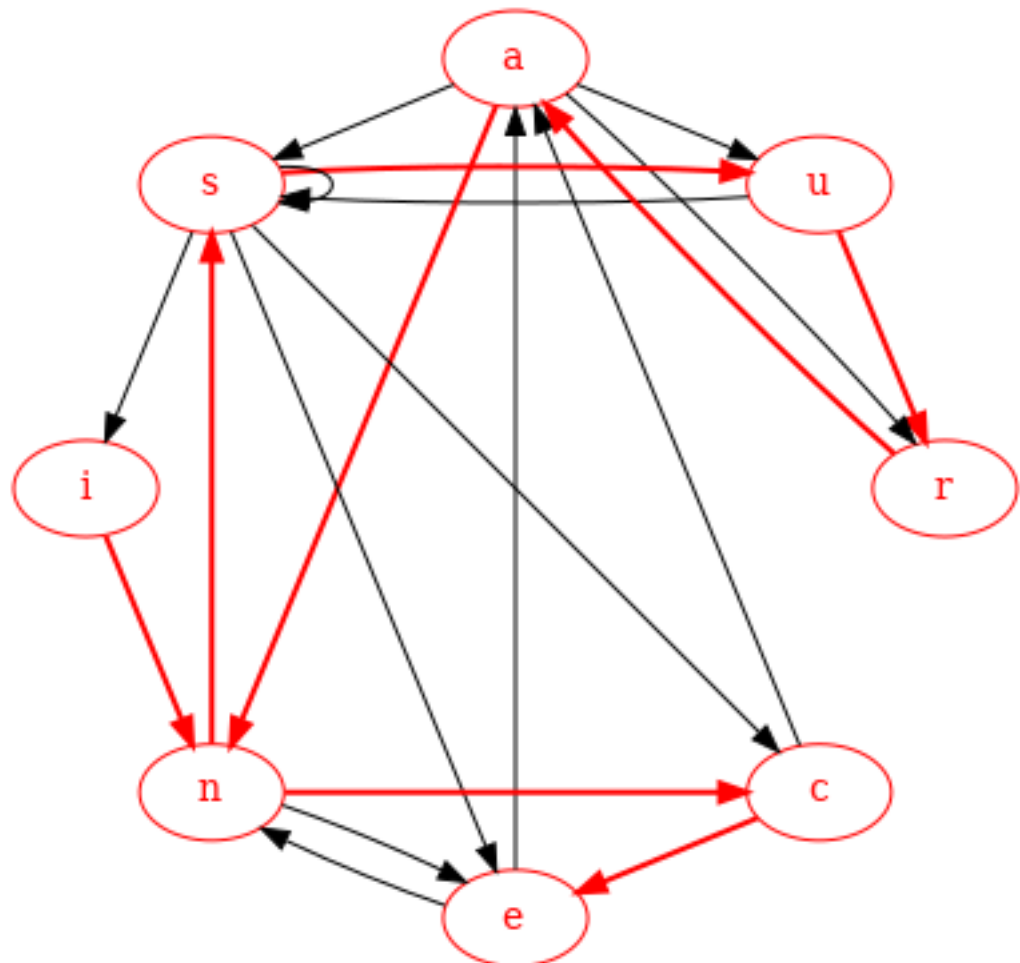
Root word(s): otherwise
Subwords: where those error wise his

WordWalk Puzzle

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Figure 4.13: Root Word: insurance.

Link Back to Puzzle: 3.13



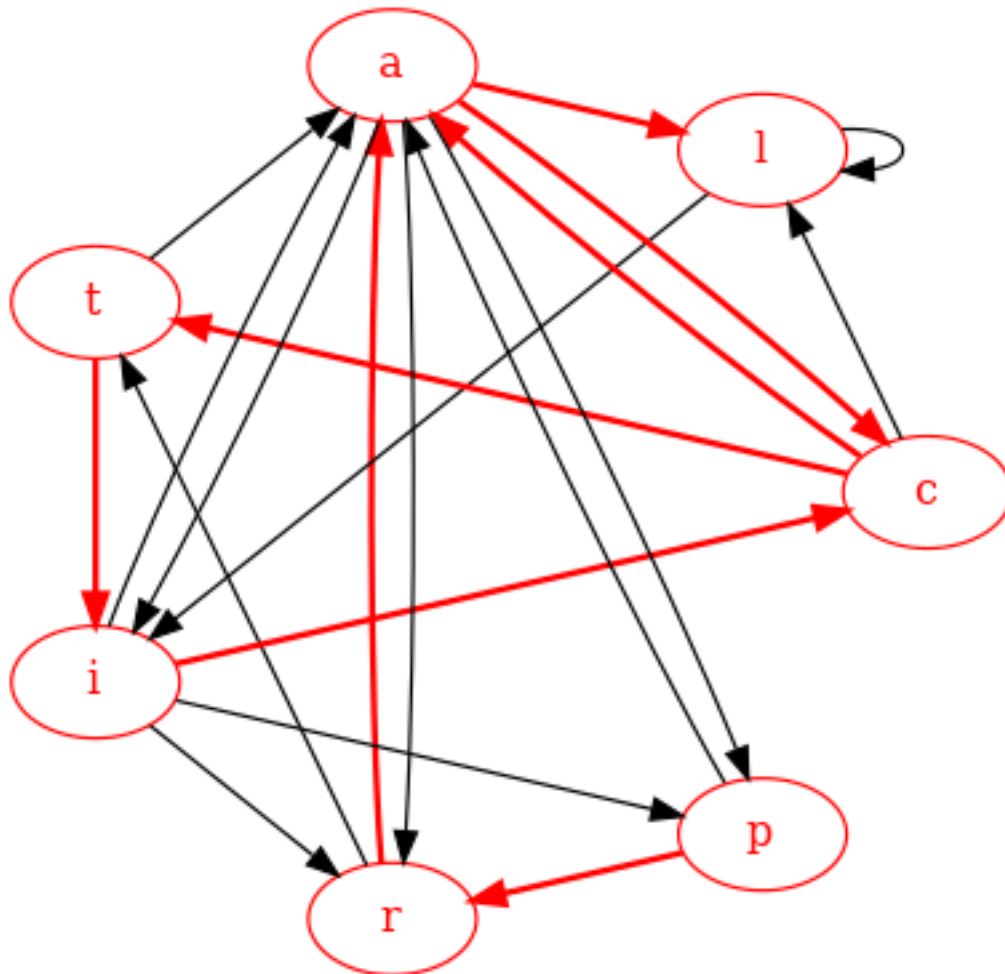
Root word(s): insurance
 Subwords: scene ass sin cause ear

WordWalk Puzzle

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Figure 4.14: Root Word: practical.

Link Back to Puzzle: 3.14



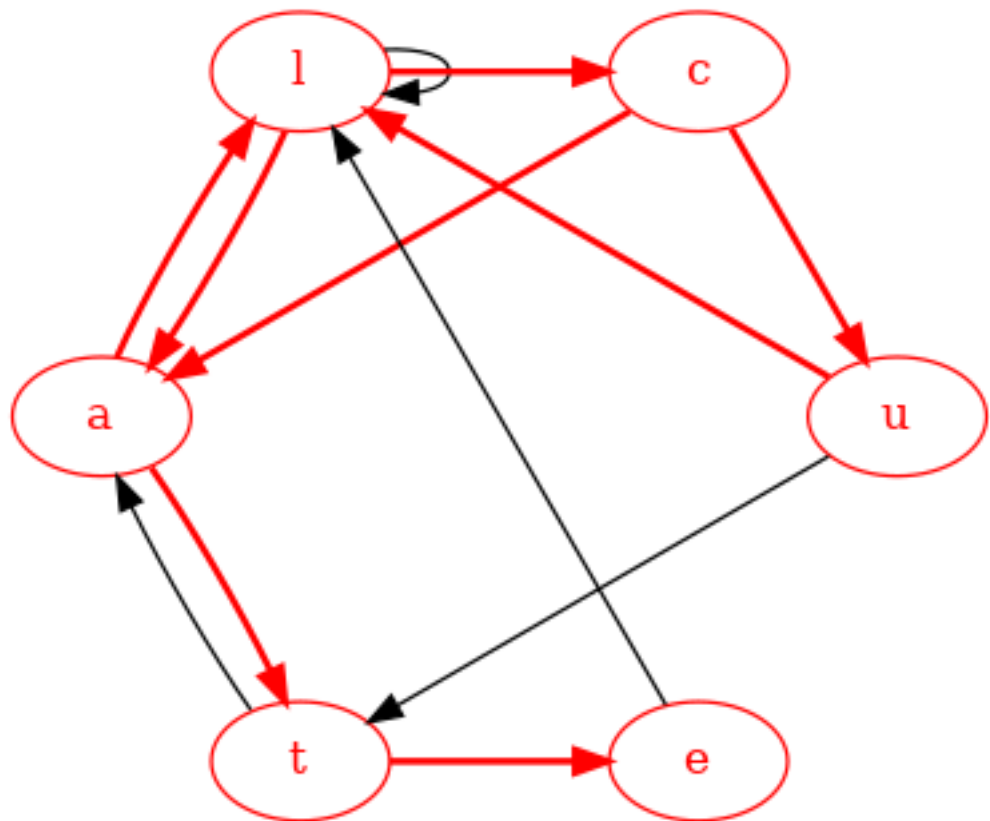
Root word(s): practical
 Subwords: partial tall clip air tap

WordWalk Puzzle

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Figure 4.15: Root Word: calculate.

Link Back to Puzzle: 3.15



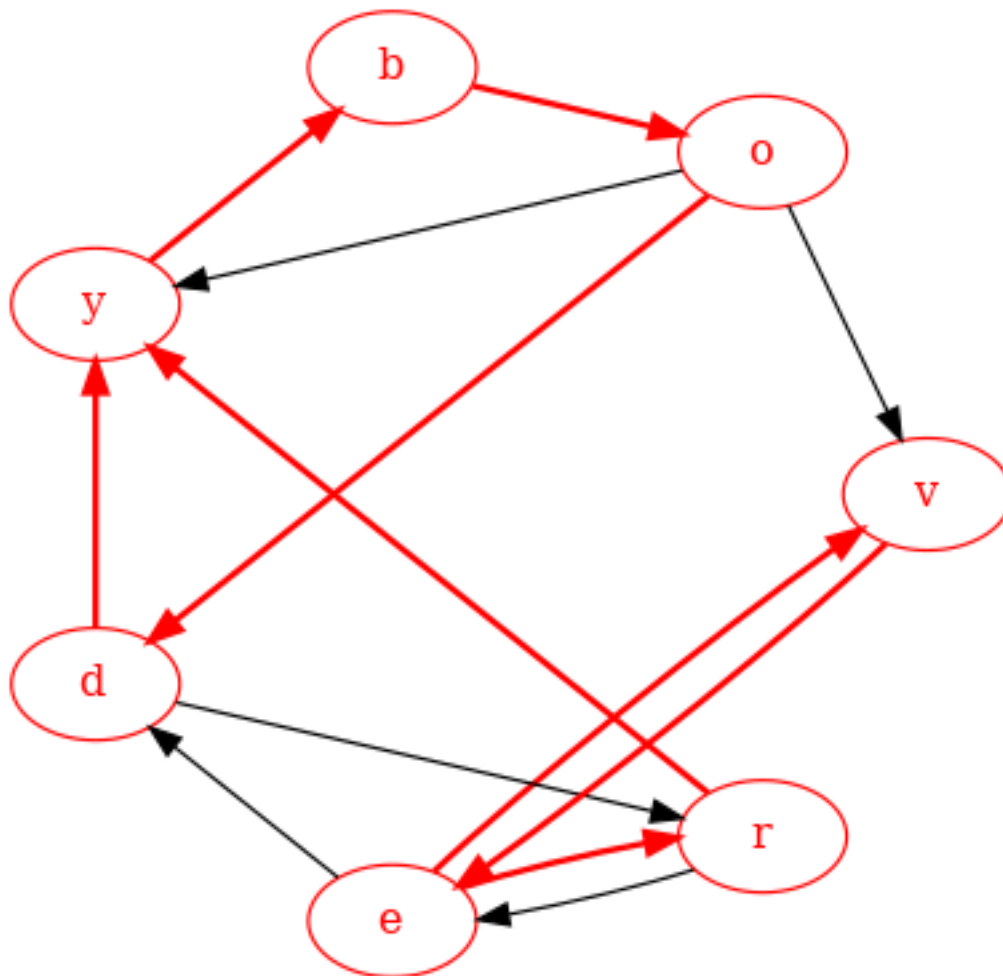
Root word(s): calculate
 Subwords: tell cut call tall cat

WordWalk Puzzle

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Figure 4.16: Root Word: everybody.

Link Back to Puzzle: 3.16



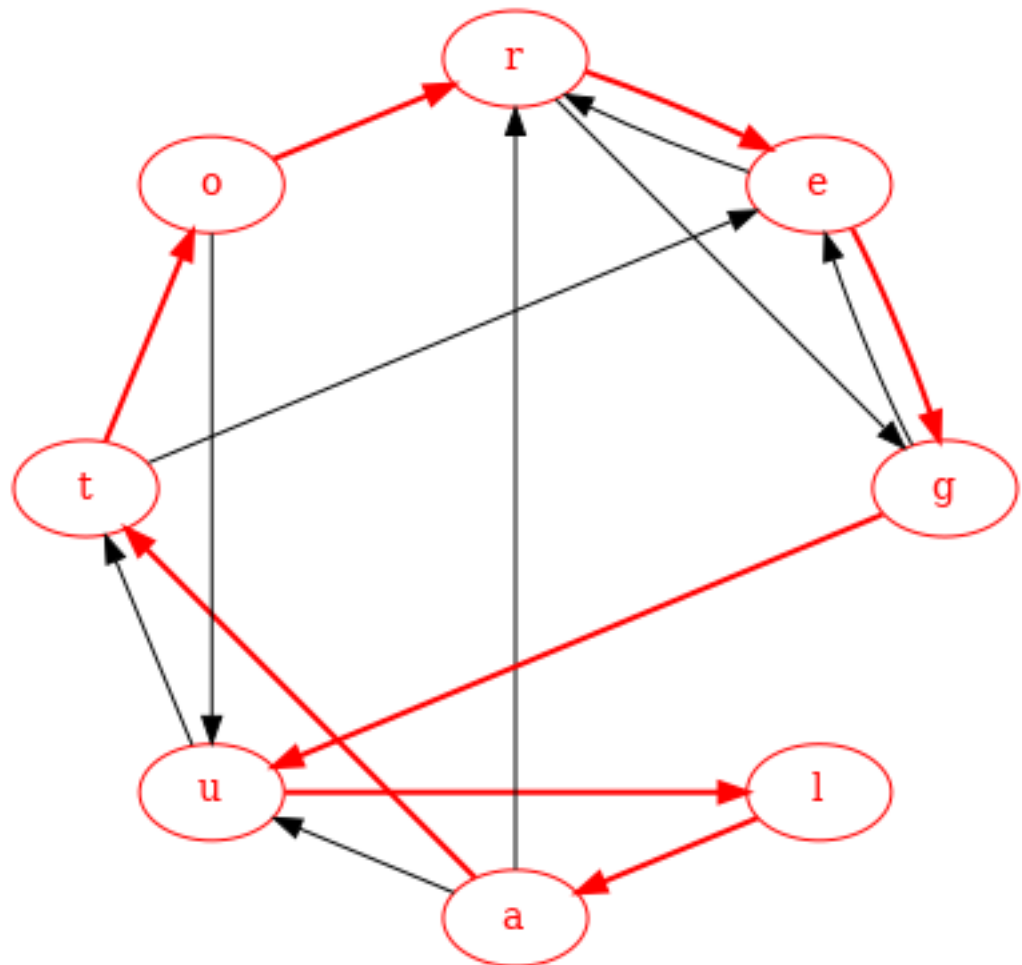
Root word(s): everybody
 Subwords: boy very over dry red

WordWalk Puzzle

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Figure 4.17: Root Word: regulator.

Link Back to Puzzle: 3.17



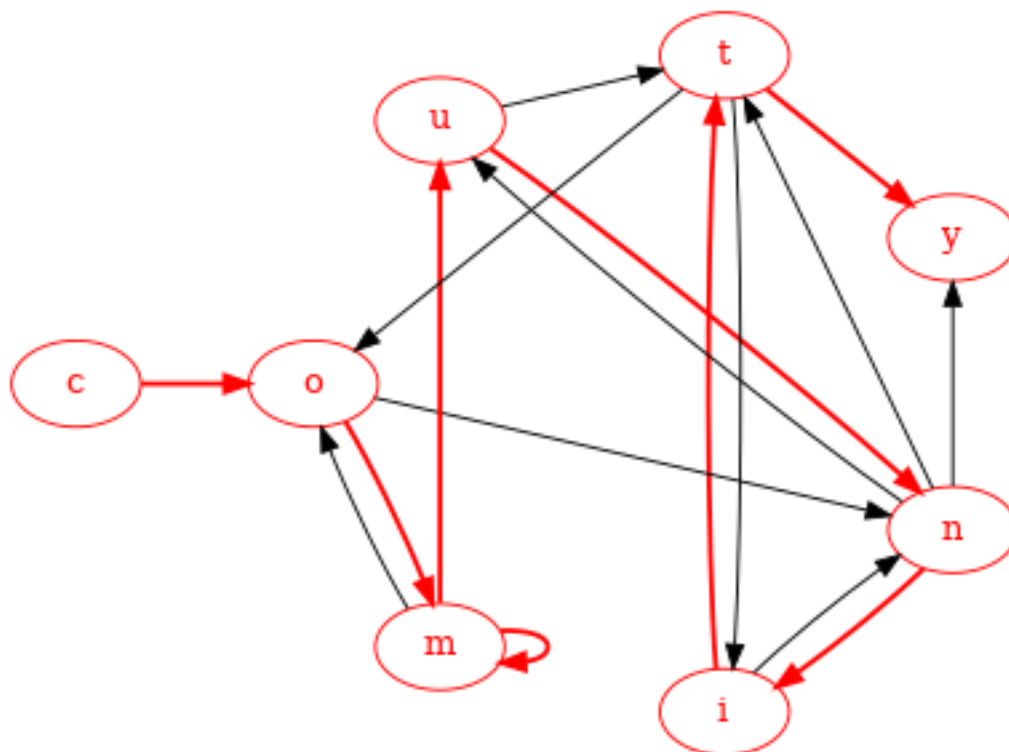
Root word(s): regulator
 Subwords: auto outer late gut large

WordWalk Puzzle

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Figure 4.18: Root Word: community.

Link Back to Puzzle: 3.18



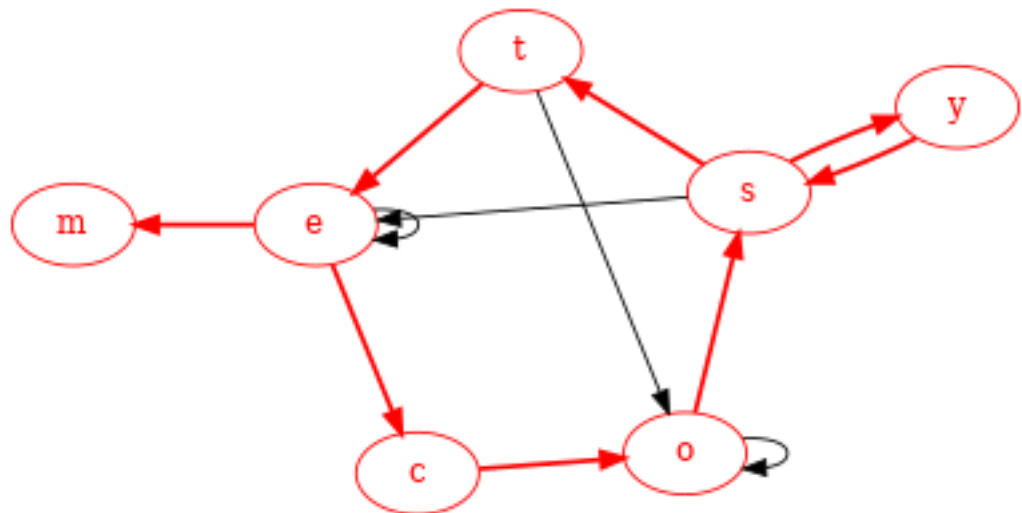
Root word(s): community
 Subwords: onto tiny nut unity common

WordWalk Puzzle

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Figure 4.19: Root Word: ecosystem.

Link Back to Puzzle: 3.19



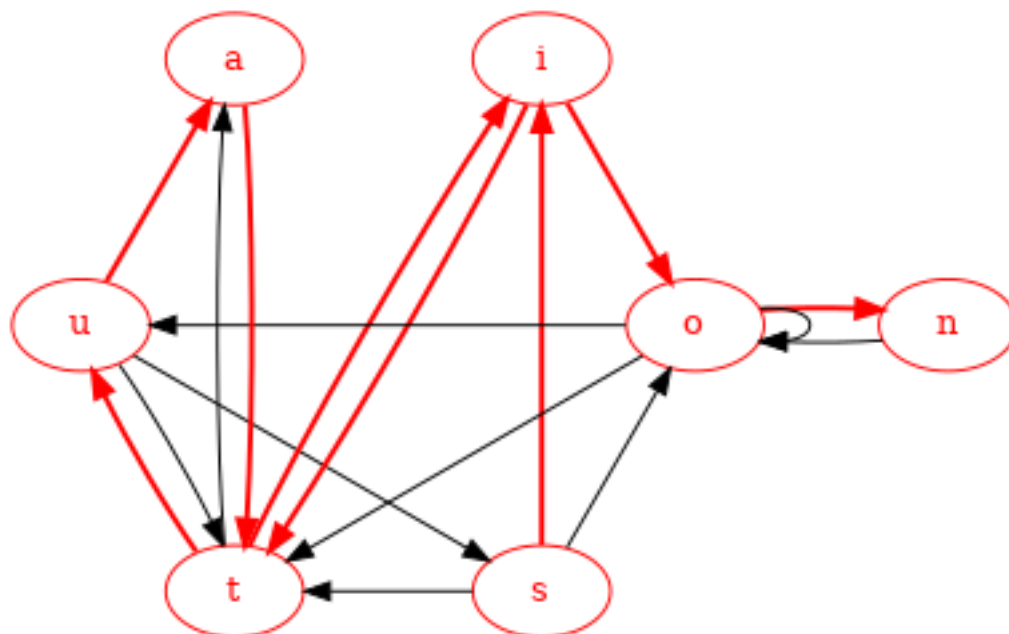
Root word(s): ecosystem
 Subwords: stem too see system cost

WordWalk Puzzle

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Figure 4.20: Root Word: situation.

Link Back to Puzzle: 3.20



Root word(s): situation

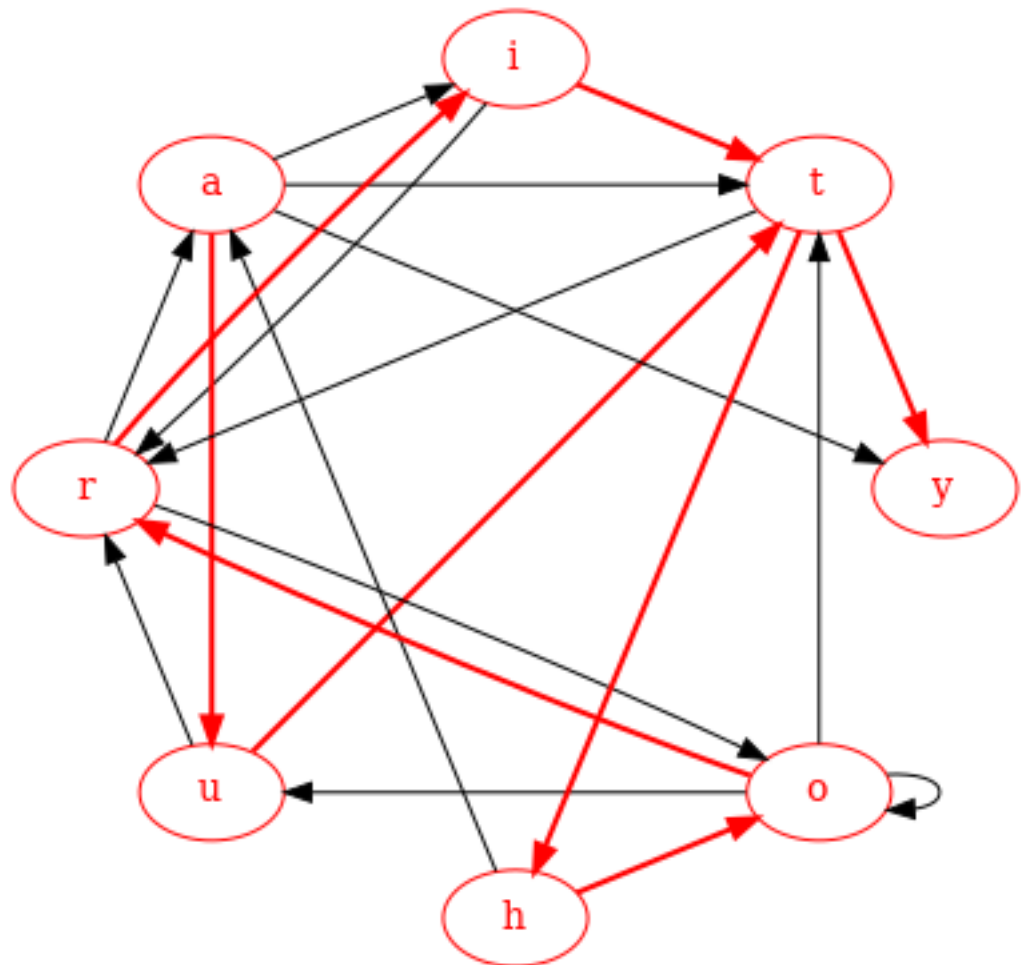
Subwords: sit soon status not out

WordWalk Puzzle

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Figure 4.21: Root Word: authority.

Link Back to Puzzle: 3.21



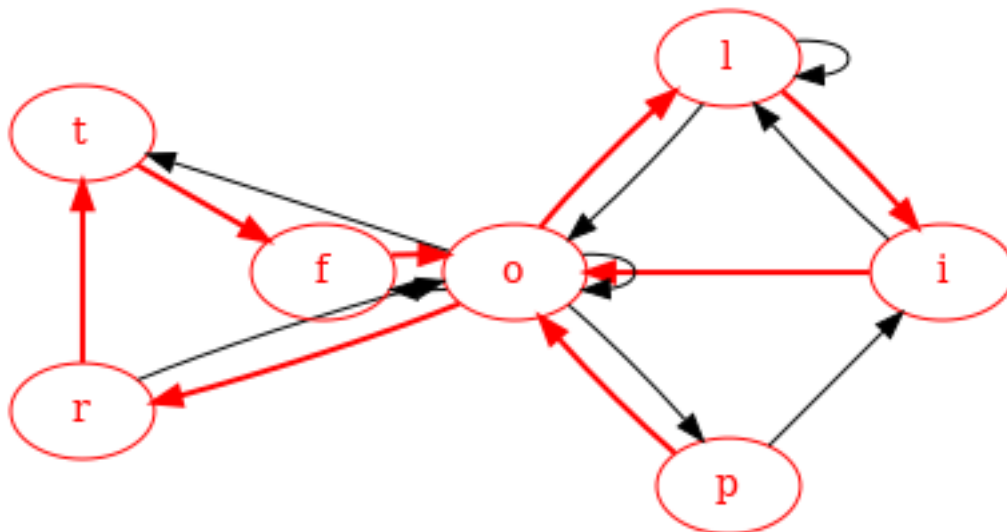
Root word(s): authority
 Subwords: our tray hat air root

WordWalk Puzzle

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Figure 4.22: Root Word: portfolio.

Link Back to Puzzle: 3.22



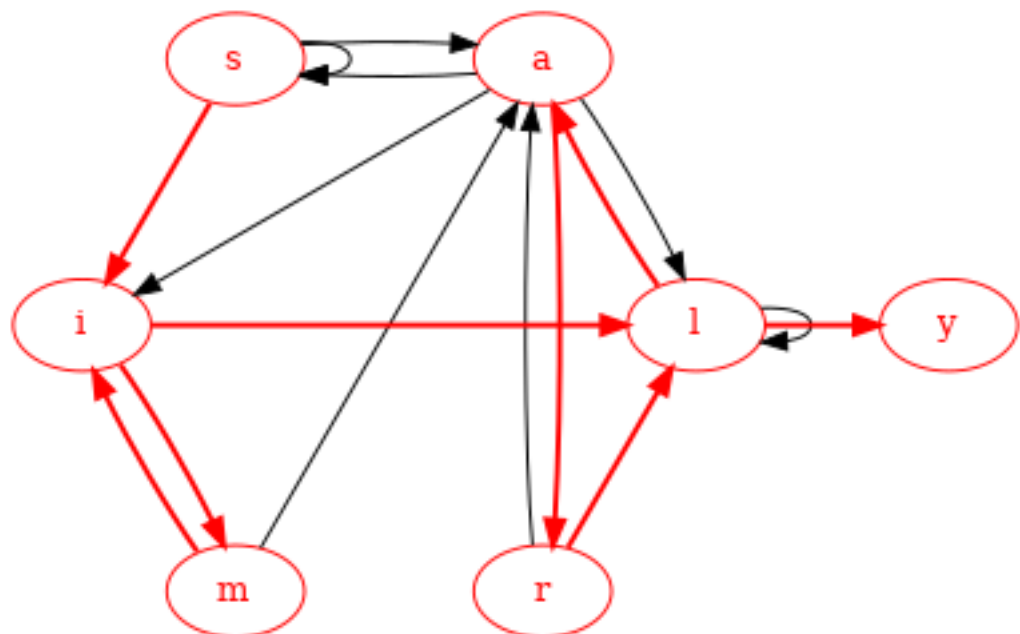
Root word(s): portfolio
Subwords: root pill roof pop lot

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Figure 4.23: Root Word: similarly.

Link Back to Puzzle: 3.23



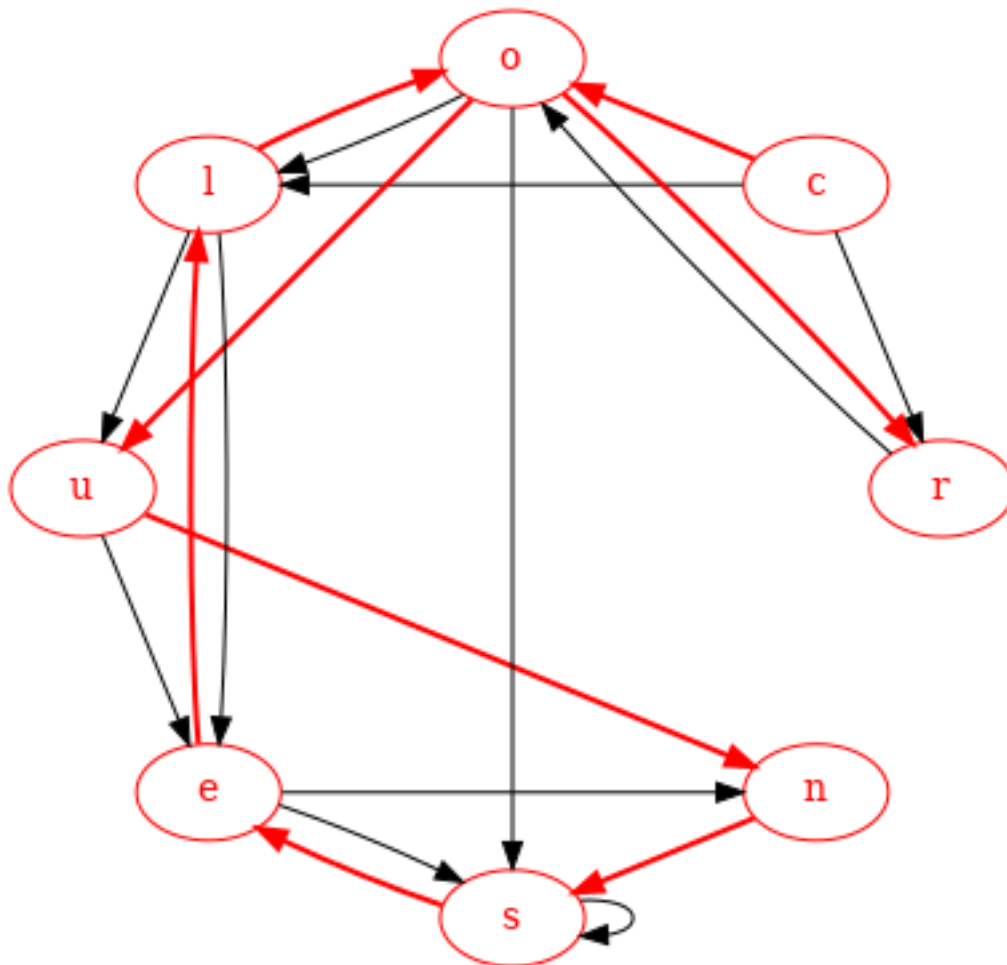
Root word(s): similarly
 Subwords: similar sail ill rally mass

WordWalk Puzzle

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Figure 4.24: Root Word: counselor.

Link Back to Puzzle: 3.24



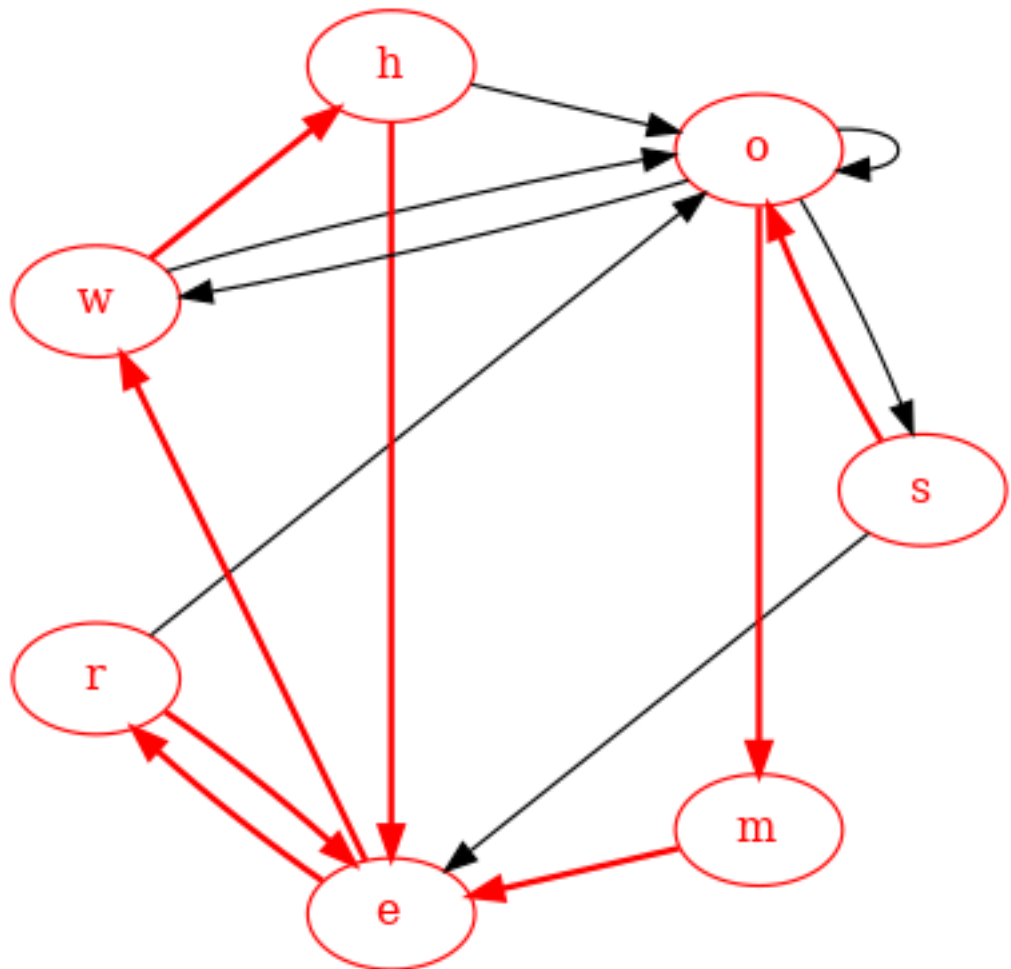
Root word(s): counselor
Subwords: less clue role cross lens

WordWalk Puzzle

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Figure 4.25: Root Word: somewhere.

Link Back to Puzzle: 3.25



Root word(s): somewhere

Subwords: room rose wow whom home

WordWalk Puzzle

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