



# Creative Thinking

Reading & Vocabulary Development  
for CS50x Iran Learners

Authored by Shabnam Shahlapour



# Table of Content

- **Study Guide**

1. **Reading 1**
2. Vocabulary & Self Assessment
3. Definitions
4. **Exercise 1**

1. **Reading 2**

2. Vocabulary & Self Assessment
3. Definitions
4. **Exercise 2**

1. **Reading 3**

2. Vocabulary & Self Assessment
3. Definitions
4. **Exercise 3**

1. [Reading 4](#)
2. Vocabulary & Self Assessment
3. Definitions
4. [Exercise 4](#)

1. [Reading 5](#)
2. Vocabulary & Self Assessment
3. Definitions
4. Delve Deeper into It
5. [Exercise 5](#)

1. [Reading 6](#)
2. Vocabulary & Self Assessment
3. Definitions
4. [Exercise 6](#)

- **Answer Keys**
- **Sources**

## □ چطور مطالعه کنم؟

### ▪ قدم اول:

در بخش اول (Reading)، یک بار متن مقاله رو بخون. سعی نکن از همون اول همه کلمات رو بفهمی؛ فقط با کلیت متن آشنا شو.

### ▪ قدم دوم:

در بخش بعدی نگاهی به لیست لغات و اصطلاحات متن بنداز. بین کدوم ها برای آشنا هستن و کدوم ها نه. بعضی از کلمات نآشنا رو میتوانی با توجه به جمله و کلمات اطرافش حدس بزنی. از طرفی، بعضی کلمات ممکنه برای آشنا باشن، اما معنیشون توی این متن فرق کنه.

### ▪ قدم سوم:

در بخش های بعد، توضیح و مثال هایی برای اون کلمات آورده شده. بعضی از لغت ها ممکنه مستقیماً توی متن نباشن، اما چون به موضوع مرتبط بودن، فرصت خوبی بوده تا باهاشون آشنا شی.

این روند تا پایان مقاله ادامه داره. میتوانی بسته به نیاز و وقتی که داری، با فاصله های زمانی دلخواه مطالعه کنی. هر وقت خسته شدی، به خودت استراحت بده.

## □ درباره لغات مقاله

کلمات مقاله ها بر اساس سطح زبان دسته بندی نشده، اما به طور کلی در سه گروه قرار می‌گیرن:

1. کلمات پر تکرار و رایج که در اثر مجاورت زیاد، تکرار و به مرور زمان در ذهن جا می‌افتن.
2. کلمات تخصصی حوضه IT و کامپیوتر که با دیدن در متن های مرتبط کم کم یاد می‌گیریشون.
3. کلماتی که کمتر رایج هستن که شاید فقط چند بار در متن های خاص ببینی.

### ❖ نکته مهم

دوست من هیچ نیازی نیست این کلمات و اصطلاحات رو حفظ کنی. هدف فقط اینه که مسیر یادگیریات رو هموار تر کنیم. هر چیزی که با تکرار و توجه وارد ذهن بشه، موندگار تر میشه.

### لینک مقاله کامل

<https://medium.com/@adamjorlen/five-types-of-creative-thinking-3f734a427f7c>

# Medium



Search



Write



## Five Types of Creative Thinking

Adam Jorlen · [Follow](#)

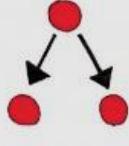
7 min read · Jun 17, 2020

225

3



This is an outtake of my [Master's thesis](#) on what role creative thinking plays when we think about the future. Part of this research was to go through a vast amount of literature on creative thinking, which I categorised into five main types of creative thinking:

				
DIVERGENT THINKING (Exaggeration)	LATERAL THINKING (Out-of-the-box)	AESTHETIC THINKING (Beauty and taste)	SYSTEMS THINKING (Synthesis towards a whole)	INSPIRATIONAL THINKING (Emergent, radical insight)

Much of the management research and general literature combines these five types into one type, simply called 'creative thinking'. This is based on old bi-polar concepts such as right vs. left-brain thinking or rational vs. intuitive thinking. So that's why we often hear that a person is either a right-brain or a left-brain thinker, or have either a creative or a logical personality. That can certainly be useful sometimes. But much of the research around creativity paints a more nuanced picture.

There are similarities and correlations between the five clusters, and instead of five, I could have picked ten. Another challenge in my study was that much of the literature on creativity is based on personal stories, which makes any classification difficult as it can never be proven whether different accounts of creativity and creative thinking are referring to the same experiences for different people.

## □ Phrases & Vocabulary

an outtake of  
vast amount of literature  
bi-polar concepts  
a more nuanced picture  
different accounts of  
make classification difficult  
on/about

## outtake

- a piece of film or a song that is not in the final version of a program, movie, or record.
- content that is excluded from a final version of written works

## literature

- writing that has lasting value as art
- all the information relating to a subject, especially information written by specialists
- printed material published by a company, etc. to encourage people to buy its products or services

classical/modern literature

sales/promotional literature

literature on/about sth

## bi- [prefix]

two

bilingual (= speaking two languages)

bimonthly (= happening twice in a month or once every two months)

## BI

Business Intelligence (BI) consists of strategies, methodologies, and technologies used by enterprises for data analysis and management of business information.

## polar

- relating to the North or South Pole.
- directly opposite in character or tendency.

**concept [noun]**

- a principle or idea
- [marketing] an idea for a new product or a way to sell a product

**not have any concept/have no concept of something**  
to not understand about something

**nuanced [adj.]**

characterized by subtle shades of meaning or expression

**account**

- a report or description of an event or experience.

Synonyms:

story, narration, narrative

- an agreement with a store or business that allows you to buy things and pay for them later
- a customer who does business with a company

**be of no/little account [formal]**

to not be important

## □ Exercise 1

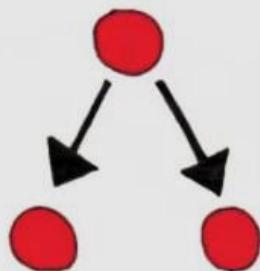
Fill in the blanks with the words below. Some word forms may need to be changed.

literature(x2) concept(x2) nuanced  
account(x2) dent shift

1. She's just a child - she has no \_\_\_\_\_ of how much things cost.
2. It's important to keep up-to-date with the \_\_\_\_\_ in your field.
3. Her singing had a \_\_\_\_\_ quality, with subtle \_\_\_\_\_ in tone and emotion.
4. Product differentiation is an important \_\_\_\_\_ in marketing.
5. He kept a detailed \_\_\_\_\_ of the suspect's movements.
6. They handed out \_\_\_\_\_ at the meeting about their new software.
7. If the advertising agency loses this \_\_\_\_\_, it will make a big \_\_\_\_\_ in their profits.

[Answer Key](#)

## 1. Divergent thinking



*“The work of art is the exaggeration of the idea”.*

– André Gide

The American psychologist J.P. Guilford was the first who proposed that an element of divergence is involved in the creative process. He made a distinction between convergent and divergent production, which he also called convergent and divergent thinking.

Divergent thinking is the process of thought where a person uses **flexibility**, **fluency** and **originality** to explore as many solutions or options to a problem or issue as possible. It is the opposite of convergent thinking, which has the characteristic to focus on only one idea or single solution.

Brainstorming is a typical example of divergent thinking, where “downloading” or emptying the brain of a certain topic takes place. This technique is however limited in that it builds on releasing the ideas that are already stored in a person’s brain, and not to generate any new ideas.

Other tools for divergent thinking are for instance to assume that something known for certain is false, or to explore ideas that cause discomfort.

## □ Phrases & Vocabulary

**divergent**

**divergence**

**convergent**

**propose**

**make a distinction between**

**brainstorming**

**it builds on (sth)**

**take place:** occur, happen

**exaggeration:** overstatement,  
overemphasis

**divergent [adj.]**

tending to be different or develop in different directions

divergent paths

divergent interpretations

Synonyms:

differing, different, varying

Antonym:

convergent

**divergence [noun]**

the situation in which two things become different

divergence between/from

a divergence of opinion

a considerable/significant/sharp divergence

Synonyms:

difference, separation, division

Antonym:

convergence

**convergent [adj.]**

the situation in which two things become different

divergence between/from

a divergence of opinion

a considerable/significant/sharp divergence

## propose

- to suggest or state (a possible plan or action) for consideration

propose reform

propose to do sth

propose doing sth

propose that

- If you propose to someone, you ask that person to marry you
- to intend to do something [formal]
- to suggest someone for a position or as a member of an organization

## brainstorming

an activity or business method in which people meet in a group to suggest a lot of new ideas to choose from for possible development  
brainstorming sessions

## build on sth

to use a success or achievement as a base from which to achieve more success

## build in/into sth

to include something as part of a plan, system, or agreement

## □ Exercise 2

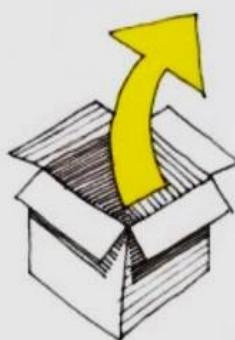
Fill in the blanks with the words below. Some word forms may need to be changed.

divergence(x2) convergence(x2) propose(x2)  
on in/into affordable approach

1. After years of conflict, the two countries' leaders \_\_\_\_\_ on a peace agreement.
2. She \_\_\_\_\_ a tax reform designed to make basic insurance more \_\_\_\_\_.
3. A design team might \_\_\_\_\_ by brainstorming many different product features, then \_\_\_\_\_ by selecting a few key features to include in the final product.
4. There are widely divergent \_\_\_\_\_ to the problem
5. The two politicians presented sharply \_\_\_\_\_ views on the proposed tax cuts.
6. How do you \_\_\_\_\_ tackling this problem?
7. We need to build \_\_\_\_\_ our reputation to expand the business.
8. New safety regulations are being built \_\_\_\_\_ the proposal.

[Answer Key](#)

## 2. Lateral thinking



*“Creativity involves breaking out of established patterns in order to look at things in a different way.”*

- Edward De Bono

Creativity researcher Edward De Bono came up with the term **lateral thinking** in 1967 to “distinguish between artistic creativity and idea creativity”. The term was invented as an alternative to step-by-step thinking, so-called vertical thinking, which is justified with sequential steps based on logic.

Lateral thinking can be used for generation of new ideas and problem solving as it by definition leaves the already-used behind and looks for completely new options. This type of thinking is based on avoiding the intrinsic limitations in the brain, which rapidly sees patterns and handles information in a distinctive way, where long thought sequences are not broken up once formed. Instead, lateral thinking tools and techniques can be used to restructure and escape such “clichéd” patterns and think “outside the box”.

Lateral thinking is related to divergent thinking, as discussed above. Both have the purpose to break out of habitual ways of thinking. Both falls “outside the box”, but divergent thinking is still sequential in that it follows on an earlier thought, while lateral thinking has no direct connection to an earlier thought.

If rational or vertical thinking is described as following the most likely path; divergent thinking is following an extreme path, while lateral thinking is following the least likely path.

## □ Phrases & Vocabulary

**come up with sth**

**lateral thinking (horizontal thinking)**

**distinguish between sth**

**so-called vertical thinking**

**be justified with**

**sequential**

**leave sth behind**

**intrinsic limitations in the brain**

**restructure**

**clichéd**

**break out of habitual ways of thinking**

**an extreme path**

**come up with sth**

- to suggest or think of an idea or plan

come up with a plan/idea/solution

come up with a name/title/advert

Synonyms:

think up, invent, create

- to manage to find or produce something that is needed, usually money

**lateral**

related to the side of an object or to sideways movement

**distinguish between sth**

to show or understand a difference between two similar things

**so-called**

- commonly named
- falsely or improperly so named

**sequential**

following a particular order; performed or used in sequence

**an intrinsic limitation**

you can use it to refer to natural, inherent restrictions such as the constraints of time, space or resources

a constraint or deficiency that is inherent to something, meaning it stems from its basic nature or constitution and is not an external factor

## **justified**

- having or shown to have a just, right, or reasonable basis
- (typography) aligned evenly at the margin

## **clichéd**

something is overused, unoriginal, and therefore boring or predictable, often used to describe phrases, ideas, or situations.

The term "cliché" often has a negative connotation, suggesting a lack of originality or creativity.

## **extreme**

- extreme opinions, ideas, etc., are beyond the usual range of variety and would seem unreasonable to most people.
- the largest possible amount or degree of something

## **break out**

- to escape from a place or a situation
- "**break out** from habitual ways of thinking" to escape or free oneself from the ingrained and often unconscious patterns of thought that one typically relies on.
- to begin, or to begin using or doing something

## □ Exercise 3

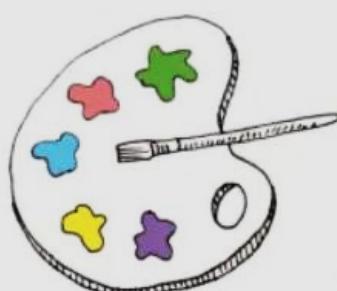
Fill in the blanks with the words below. Some word forms may need to be changed.

(come up with) name sequential limitation  
extreme distinguish rely consider (break out)

1. Next you need to come up with a \_\_\_\_\_ for your product.
2. There are intrinsic \_\_\_\_\_ to human memory, which is why we \_\_\_\_\_ on external tools.
3. He has \_\_\_\_\_ opinions when it comes to politics, often expressing views that are \_\_\_\_\_ radical by most people.
4. The analyses involved three \_\_\_\_\_ steps.
5. Where am I supposed to \_\_\_\_\_ a thousand dollars?
6. He's color-blind and can't \_\_\_\_\_ between red and green easily.
7. She needed to \_\_\_\_\_ of her daily routine and travel somewhere new.

[Answer Key](#)

### 3. Aesthetic thinking



*"It took me four years to paint like Raphael, but a lifetime to paint like a child".*

– Pablo Picasso

The philosophy of aesthetics concerns the creation and appreciation of art and beauty. Taste is also a key concept here and the study of for instance form, colour and shape can augment a person's aesthetic thinking.

This type of thinking involves producing or discovering things, which are pleasant, harmonious and beautiful to our senses. It is an ancient form of thinking within us humans, and can be learned by anyone.

Some of the types of aesthetic thinking are visual and spatial, where knowledge of structure, composition, colour schemes and shapes can be used to make things aesthetically pleasing. Many architects, designers, painters and other aesthetic thinkers through the ages have been fascinated with mathematical characteristics of aesthetics, and how patterns, ratios and proportions found in nature can be represented by numbers and also in creative pursuits. Music, drama and other forms of culture can also be considered aesthetic thinking, where tempo, dramaturgy, rhythm, melody and other structural elements are applied to make output beautiful and harmonious.

Scientific formulas themselves can also be considered beautiful, and many chemists, physicists and mathematicians consider their work elegant and aesthetic. Many aspects of storytelling can also be included in this category, as this “art” is based on dramaturgic elements, pace, a well-crafted dialogue, etc.

It is however important to emphasize that this type of creative thinking might be enough to build a story, but in order to create a great work of art, other types of creative thinking are needed too. The same goes for all work, which is built on aesthetic thinking. A person will not become a great artist only by going to art school.

## □ Phrases & Vocabulary

concern

augment

spatial

creative pursuits

tempo

dramaturgy

elegant and aesthetic

the same goes for all work

**well-crafted: well-made, well-executed**

**concern**

- (worry) to cause worry to someone
- (involve) to be important to someone or to involve someone directly
- (business) a company

**augment**

to make something larger or fuller by adding something to it

augment income/the budget

augment the water supply

augment art collection

augment the storage space

Synonyms:

Increase, make larger/bigger/greater

**pursuit [noun]**

- the action of following or pursuing someone or something
- an activity of a specified kind, especially a recreational or athletic one

**spatial**

relating to the position, area, and size of things

spatial ability/awareness

spatial dimension/location

spatial interaction/perspective/pattern

**tempo**

- the speed at which an event happens
- the speed at which a piece of music is played

Synonyms:

pace, race, speed

**dramaturgy**

the theory and practice of dramatic composition

## □ Exercise 4

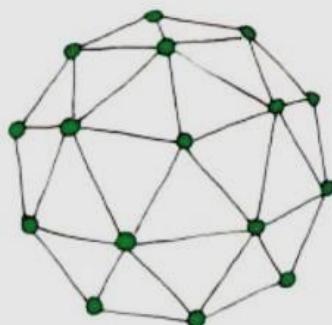
Fill in the blanks with the words below. Some word forms may need to be changed.

**concern(x2) augment(x2) pursuit(x2) space**

1. Matters of pollution and the environment  
\_\_\_\_\_ us all.
2. He \_\_\_\_\_ his income by taking a second job.
3. I enjoy outdoor \_\_\_\_\_, like hiking and riding.
4. The documentary concerns a woman who goes to China as a missionary.
5. It is not the case that a good life is one in which people must be constantly engaged in the active \_\_\_\_\_ of goals.
6. Games find their way onto every new platform, whether it's mobile, virtual reality, or \_\_\_\_\_ reality.
7. This task is designed to test children's \_\_\_\_\_ awareness (= their understanding of where things are in relation to other things).

[Answer Key](#)

## 4. Systems thinking



*“Creativity is just connecting things. When you ask creative people how they did something, they feel a little guilty because they didn’t really do it, they just saw something. It seemed obvious to them after a while”.*

– Steve Jobs

**S**ystems thinking can be described as the ability to see how things are interrelated and form a larger “whole”. Some people seem to be able to perceive such links more easily than others, to “connect the dots” and understand that if one thing is changed, the whole system will change.

There are a number of different principles for a ‘systems thinking approach’; some of which are interdependence of objects, holism (emergent properties not possible to detect by analysis but possible to define by a holistic approach) and hierarchy (complex wholes are made up of smaller subsystems).

A foundational aspect of systems thinking is the synthesis of several elements into one, which transcends the significance of the sum of the two independent elements.

Systems thinking is closely related to aesthetic thinking, as mentioned above, in that synthesis and making things “whole” and perfect, somehow is related to elegance and beauty. It is also closely related to the next type of thinking — inspirational thinking.

## □ Phrases & Vocabulary

interrelated

interdependence of objects

ability to perceive such links

independence

closely related

feel a little guilty

it seemed obvious

transcend[formal]: go beyond, surpass,  
excel

**inter- [prefix]**

used to form words meaning between or among groups of people, things, or places

International

Inter-staff communication

**intra- [prefix]**

used to form adjectives meaning "within" (the stated place or group)

intra-EU trade

intra-family disputes

**perceive**

to see something or someone, or to notice something that is obvious

Synonyms:

Think of, recognize, become aware of

**guilty**

If you feel guilty, you feel that you have done something wrong

# easy to see, recognize, or understand

These are words for something you want to do or achieve.

Obvious is one of the most common words to describe things that are easy to see, recognize, or understand.

- It's obvious that she's upset.
- The answer is obvious.
- They're moving, so for obvious reasons they will need extra boxes.

Clear , apparent, and plain are common alternatives to obvious.

- It was clear that he was unhappy.
- Her joy was apparent to everyone.
- His disappointment was plain to see.

A more formal way of saying obvious is by using the words evident or manifest. Manifest is used in more formal contexts than evident.

- The company president was impressed by her evident ambition.
- His manifest lack of interest has provoked severe criticism.

An obvious change can be described as **marked**.

- There has been a marked improvement in his behavior.

If someone or something is very different from everything or everyone else and attracts attention or notice in a way that is not wanted, you can describe them as **conspicuous**.

- I felt very conspicuous in a suit when everyone else was in jeans.

When something is very obvious and bad, you can describe it as **blatant** or **glaring**.

- It was a blatant attempt to gain publicity.
- They made some glaring errors.

## □ Exercise 5

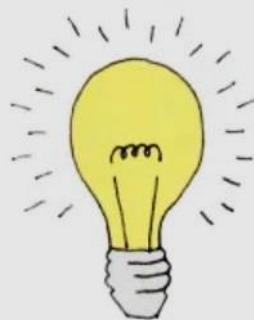
Fill in the blanks with the words below. Some word forms may need to be changed.

interrelated interdependent transcend  
perceive

1. In an \_\_\_\_\_ system, each part relies on others for survival, while in an \_\_\_\_\_ system, parts have connections but may not be mutually reliant for survival.
2. As humans, our five senses are basic ways through which we \_\_\_\_\_ the world.
3. The game, published by Electronic Arts, seems to \_\_\_\_\_ conventional genre classification.

[Answer Key](#)

## 5. Inspirational thinking



*"I was living in a little flat at the top of a house and I had a piano by my bed. I woke up one morning with a tune in my head and I thought, 'Hey, I don't know this tune — or do I?' It was like a jazz melody. My dad used to know a lot of old jazz tunes; I thought maybe I'd just remembered it from the past. I went to the piano and found the chords to it, made sure I remembered it and then hawked it round to all my friends, asking what it was: 'Do you know this? It's a good little tune, but I couldn't have written it because I dreamt it'.*

– Paul McCartney recounting how he wrote the song “Yesterday” in early 1964

**T**his type of creative thinking concerns the perception of receiving insights from somewhere or someone else. It often happens in dreams or other states, but sometimes in extremely powerful, rapid bursts of clarity and focus, known as light-bulb moments or peak experiences.

Some researchers call these breakthrough insights higher creativity. Compared to normal creative outputs, these seem to take a quantum leap beyond what can be achieved with other types of thinking. These extraordinary experiences, when everything seems to make sense in one instant moment, have been called poetic imagination, revelation and sometimes channelling. The last word indicates the belief that someone else is involved and the person with the breakthrough insight is simply a medium for the collective unconscious or a higher spirit.

Inspirational thoughts are something valuable, which needs to be noticed, recorded and put to use. This is clearly illustrated in the example of Paul McCartney above. He had a piano next to his bed, immediately found the chords, but also asked his friends for feedback. Countless personal experiences of this kind have been reported, but they are hard to measure with scientific rigour, as they are very difficult to generate at will.

• • •

## □ Phrases & Vocabulary

**hawk sth around to sb/sth**

**recounting**

**bursts of clarity**

**breakthrough insights**

**take a quantum leap**

**poetic imagination/revelation/channeling**

**scientific rigor**

**generate at will**

**perception: noun of perceive**

**light-bulb moment: a sudden realization, insight, or inspiration**

**peak experience: awe-inspiring moment**

**hawk**

- a type of large bird that catches small birds and animals for food
- to sell goods informally in public places
- someone who believes that the government should take strong action in controlling the national budget, inflation, etc.
- to try to interest a person or company in a product, idea, etc.

**hawk sth around to sb/sth**

to try to sell or promote something (like a product, idea, or news) to various people or companies, often by going from place to place and actively seeking out potential buyers or supporters.

**recount [formal, describe]**

- to describe how something happened, or to tell a story
- to count something again

**breakthrough**

a sudden advance especially in knowledge or technique

## leap

- to make a large jump or sudden movement, usually from one place to another
- to provide help, protection, etc. very quickly
- to achieve something suddenly, usually fame, power, or importance
- If your heart leaps, you have a sudden, strong feeling of pleasure or fear
- a big change, increase, or improvement  
a leap in costs/profits/sales  
a 20%/40%/75%, etc. leap

## quantum leap

a very large improvement or development in something  
a quantum leap in sth

## rigor

- [severity] the fact that people are made to follow rules in a very severe way
- [care] the quality of being detailed, careful, and complete
- high standards

## scientific rigor

the strict and thorough application of the scientific method to ensure unbiased, well-controlled, and transparent research, leading to robust and reproducible findings

## □ Exercise 6

Fill in the blanks with the words below. Some word forms may need to be changed.

hawk(x2) breakthrough recount

leap(x3) rigor

1. She was \_\_\_\_\_ flowers at the parking lot exit.
2. He \_\_\_\_\_ his adventures since he had left home.
3. The software designer should report a near 40% \_\_\_\_\_ in profits to around £124m.
4. He \_\_\_\_\_ to fame after his appearance in a Broadway play.
5. He has written a guide to finances which he plans to \_\_\_\_\_ around to all the major publishers.
6. The new drug is a quantum \_\_\_\_\_ in the fight against cancer.
7. A major \_\_\_\_\_ in negotiations has been achieved.
8. They conducted the experiments with scientific \_\_\_\_\_.

[Answer Key](#)

**1** [back to exercise](#)

1. concept
2. literature
3. nuanced-shifts
4. concept
5. account
6. literature
7. account-dent

**2** [back to exercise](#)

1. converged
2. proposed-affordable
3. diverge-converge
4. approaches
5. divergent
6. propose
7. on
8. in/into

**3** [back to exercise](#)

1. name
2. limitations-rely
3. extreme-considered
4. sequential
5. come up with
6. distinguish
7. break out

**4** [back to exercise](#)

1. concern
2. augmented
3. pursuits
4. concerns
5. pursuit
6. augmented
7. spatial

**5** [back to exercise](#)

1. interdependent-interrelated
2. perceive
3. transcend

**6** [back to exercise](#)

1. hawking
2. recounted
3. leap
4. leapt
5. hawk
6. leap
7. breakthrough
8. rigor

# Sources

Cambridge, Oxford, Merriam-Webster, Collins  
Dictionaries  
Ludwig.guru  
Thesaurus.com

# CS50x Iran

Harvard's Computer Science 50x Iran

