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Advanced Topics

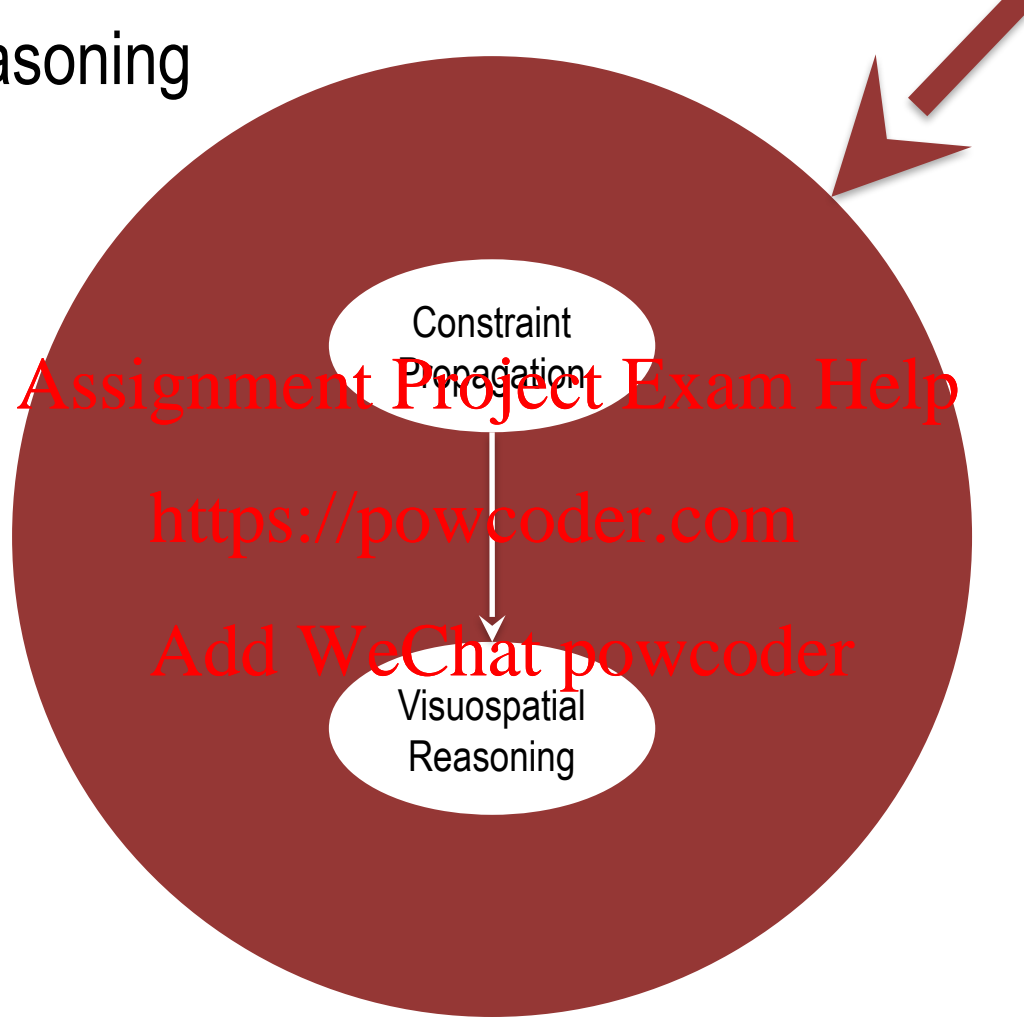
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Visuospatial  
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Reasoning

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# Visuospatial Reasoning



**Visuospatial Knowledge:** Knowledge wherein causality is, at most, implicit.

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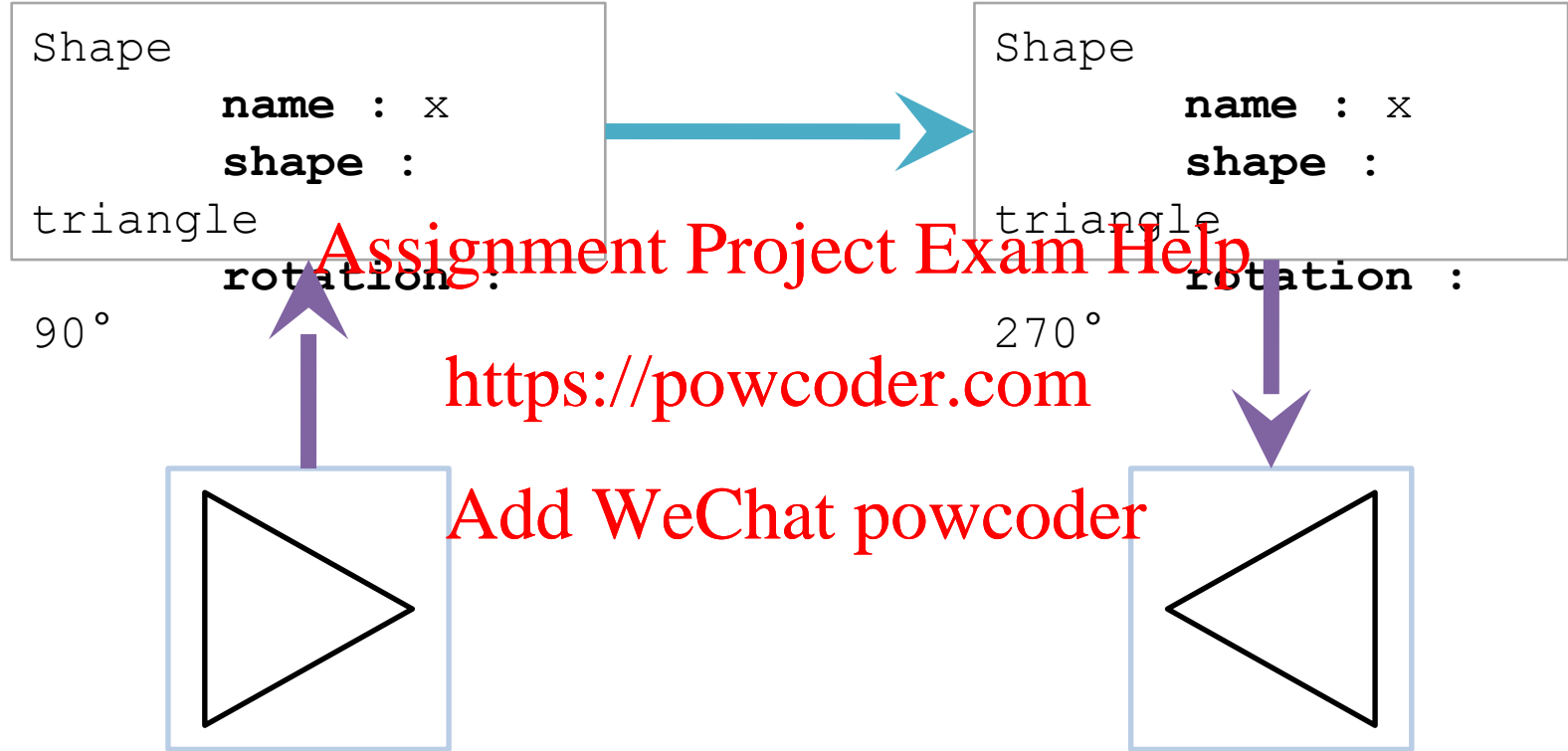
**Visuospatial Knowledge:** Knowledge wherein causality is, at most, implicit.

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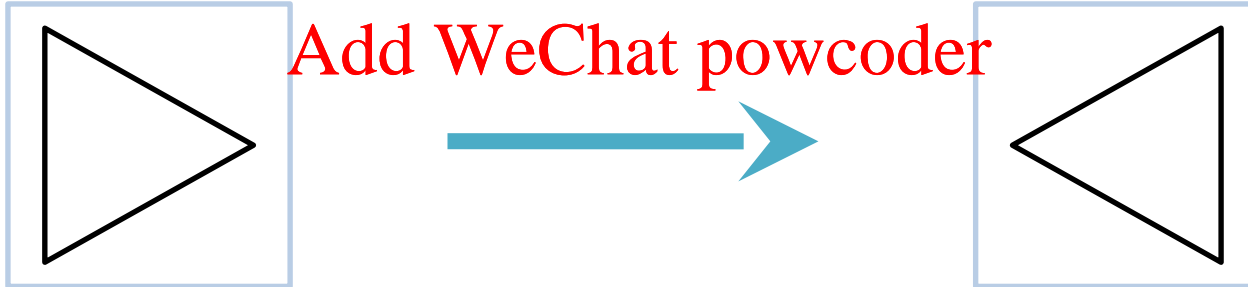
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Measure

**key** : G

**style** : pop

**tempo** : 90

Measure

**key** : B

**style** : pop

**tempo** : 90

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Visuospatial

Verbal

Content

Appearance:  
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Arbitrary:

What and Where

Driven by Inferential Needs

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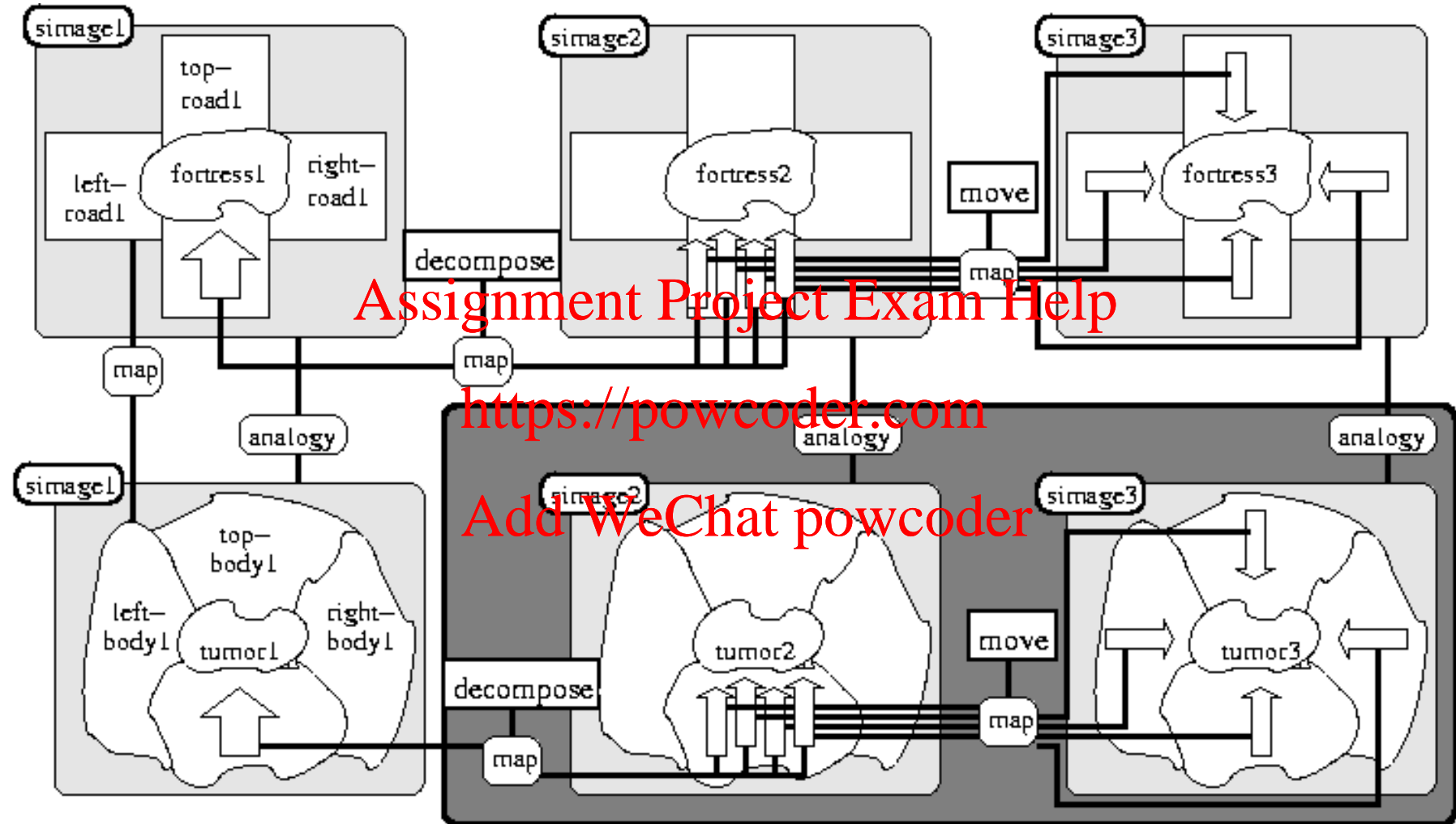
Encoding

Analogical:  
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Propositional:

Structural Correspondence

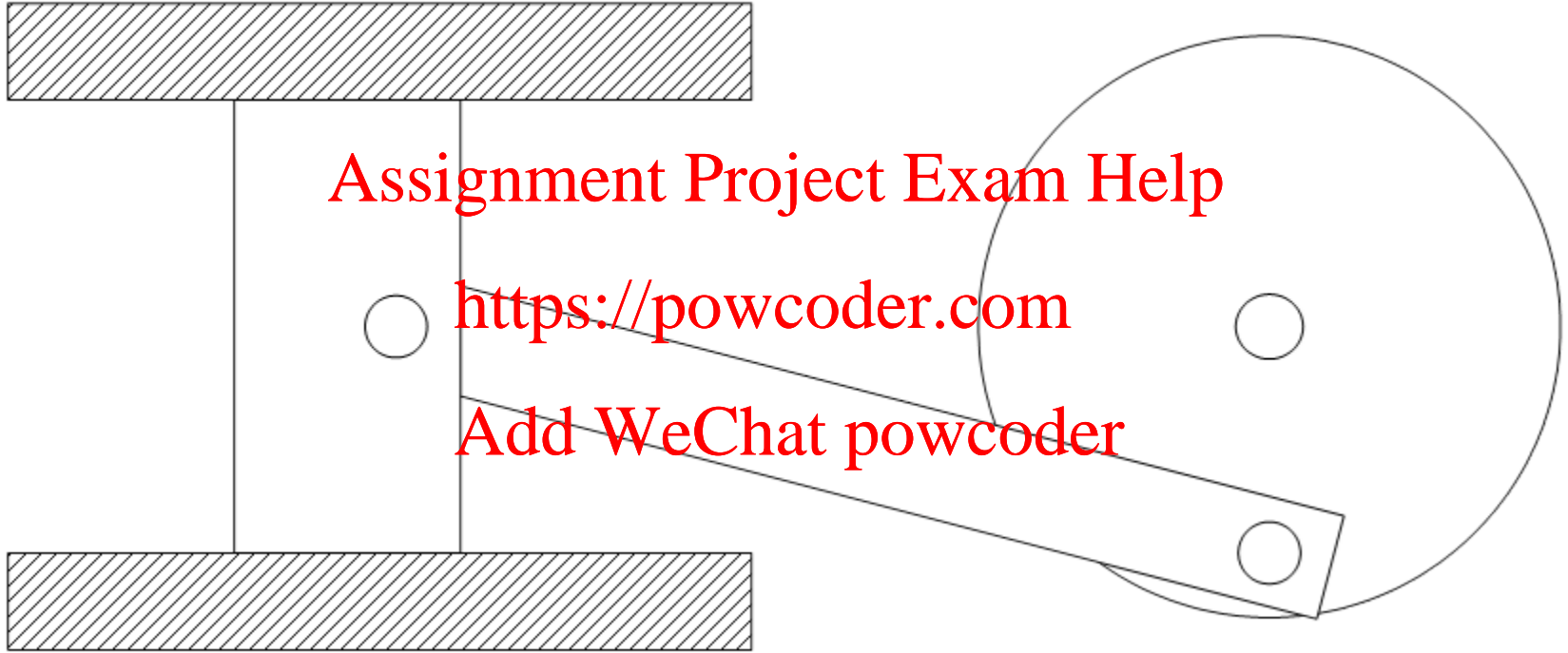
No Correspondence

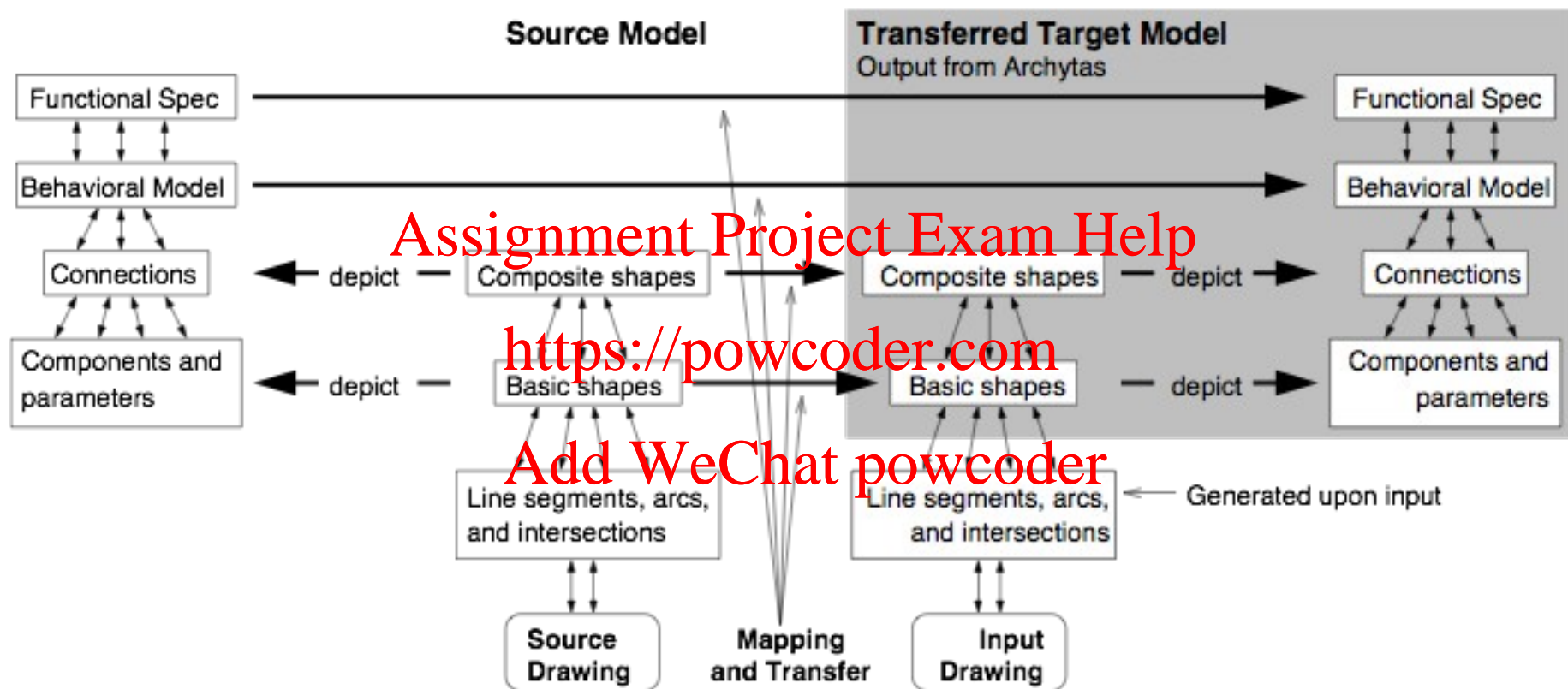


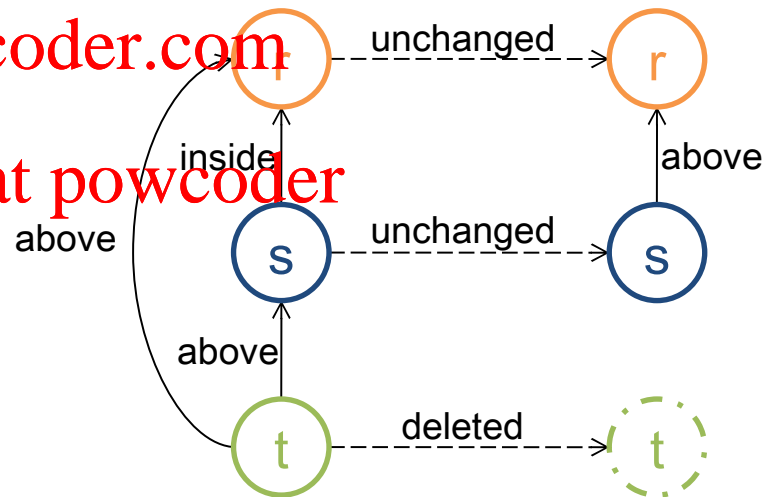
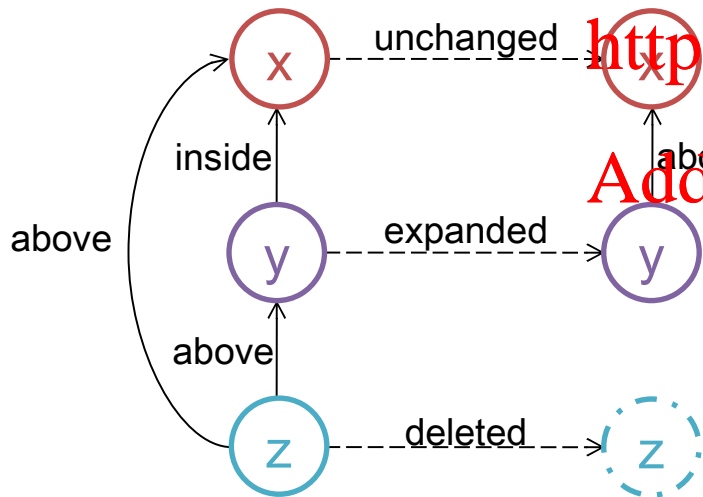
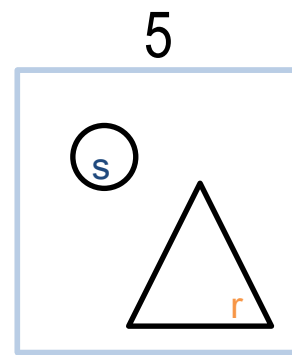
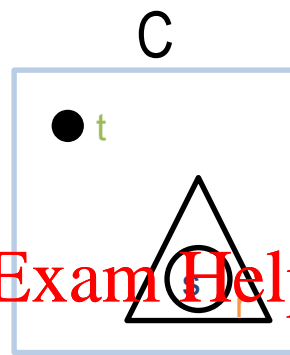
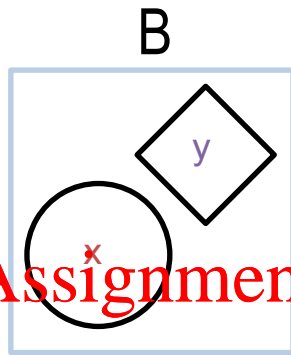
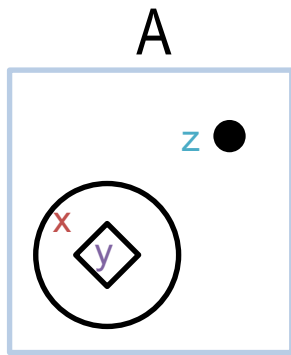
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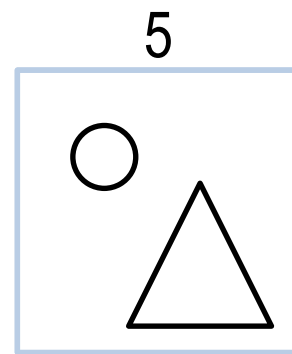
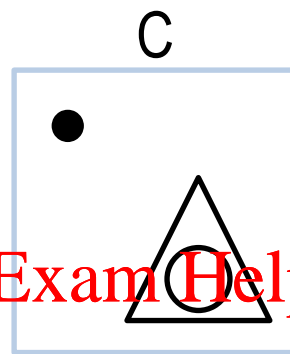
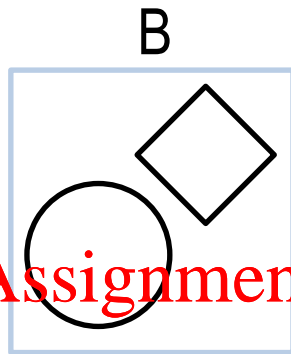
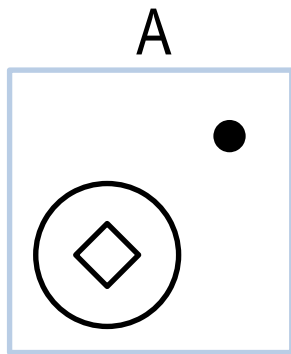




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Systems  
Thinking



## **Systems Thinking:**

Reasoning about systems with numerous components and processes at multiple, potentially invisible, levels of abstraction.

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Today, an extremely serious earthquake of magnitude 8.5 hit Lower Slabovia, killing 25 people and causing \$500 million in damage.

The President of Lower Slabovia said that the hard-hit area near the Sadie Hawkins fault has been a danger zone for years.

Today, the **President of Lower Slabovia** killed **25** proposals totaling **\$500 million** for research in **earthquake** prediction. Our Lower Slabovian correspondent calculates that **8.5** research proposals are rejected for every one approved.

There are rumors that the President's science advisor, **Sadie Hawkins**, is at **fault**.

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# Restaurant Script

Script

**script** : restaurant

**track** : formal dining

**props** : tables, menu, check,  
money, F = food, P = place

**roles** : S = customer, W = waiter,  
C = cook, M = cashier,  
O = owner

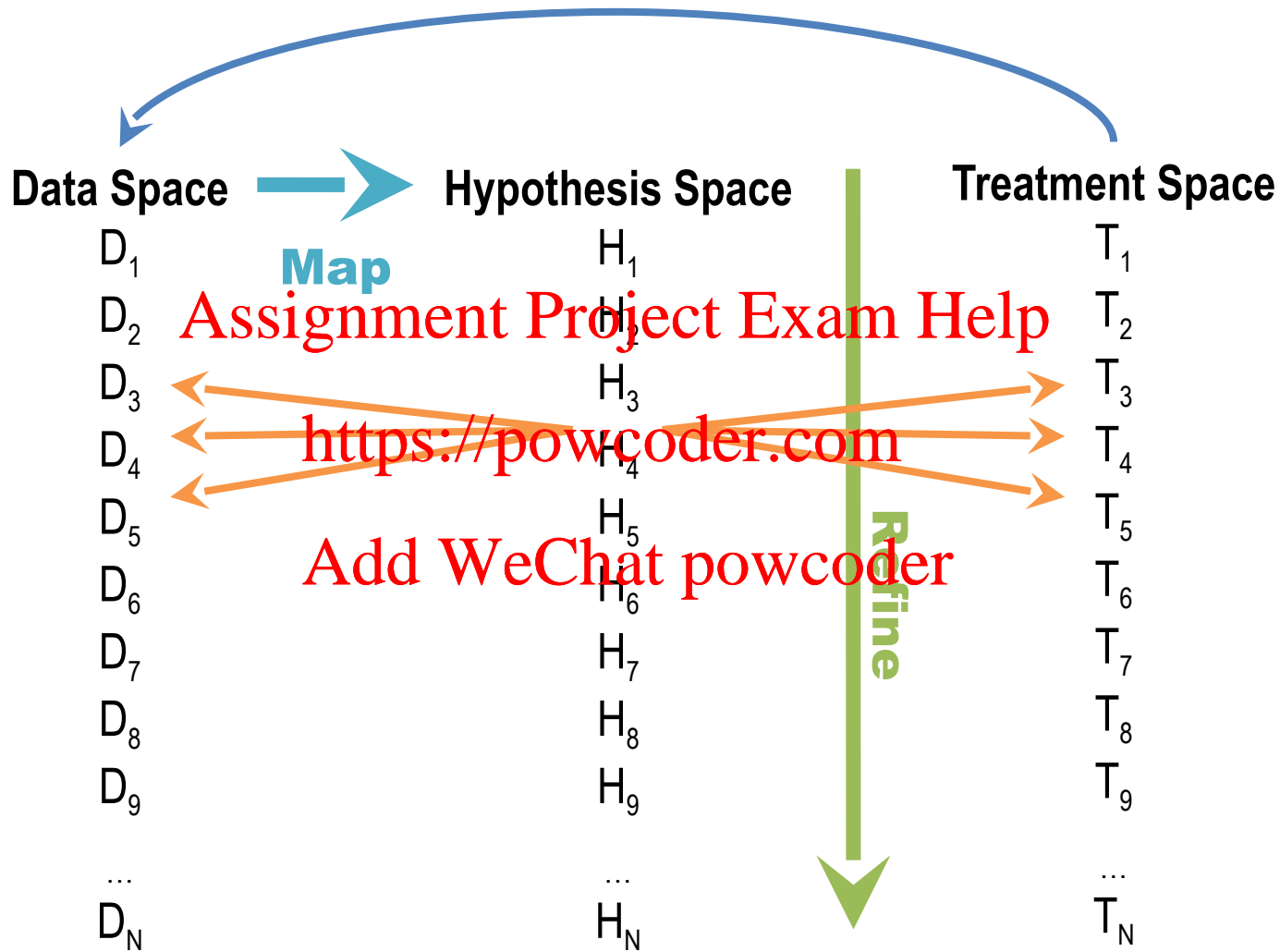
**entry** : S is hungry, S has money

**result** : S has less money,  
O has more money,  
S is not hungry,  
S is pleased

**scenes** :

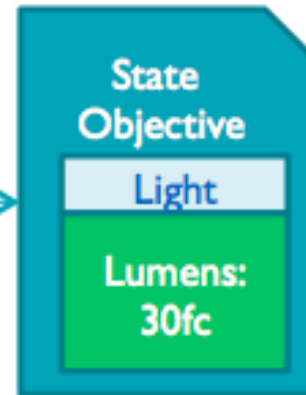
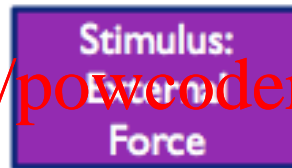


**Abstract**



## Function Models: Three Types

Light bulb  
circuit

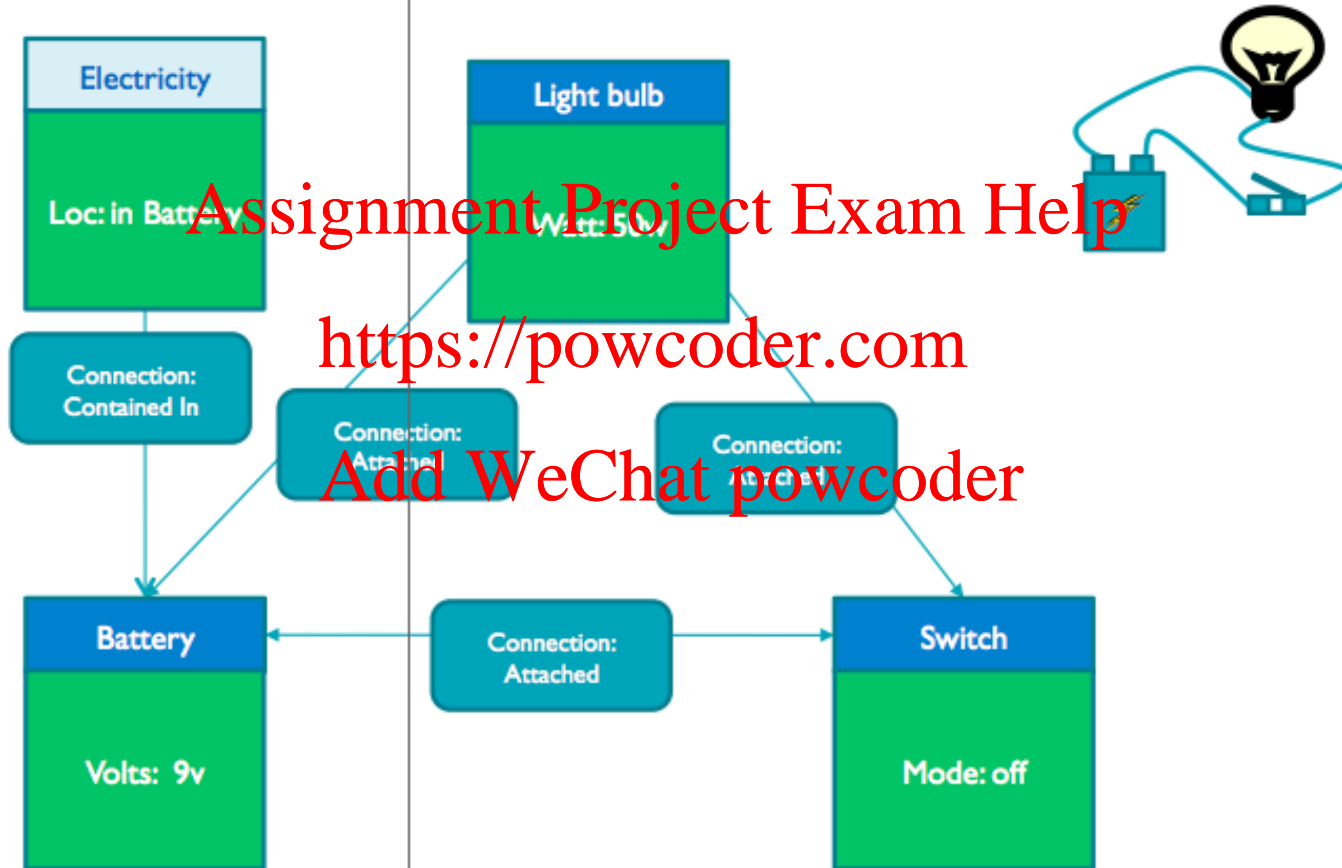


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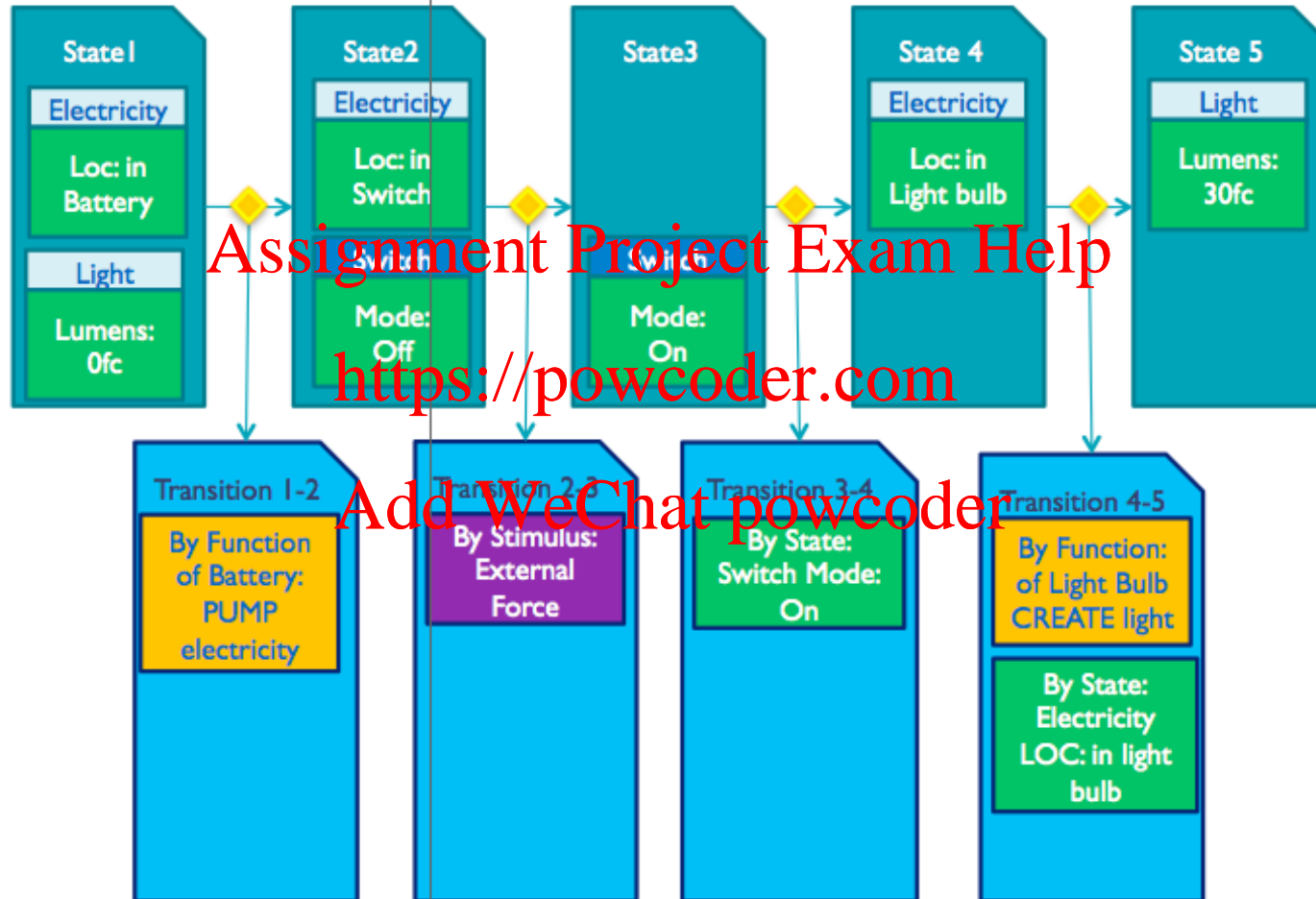
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## Structure Model: Light Circuit



## Behavior: Create Light



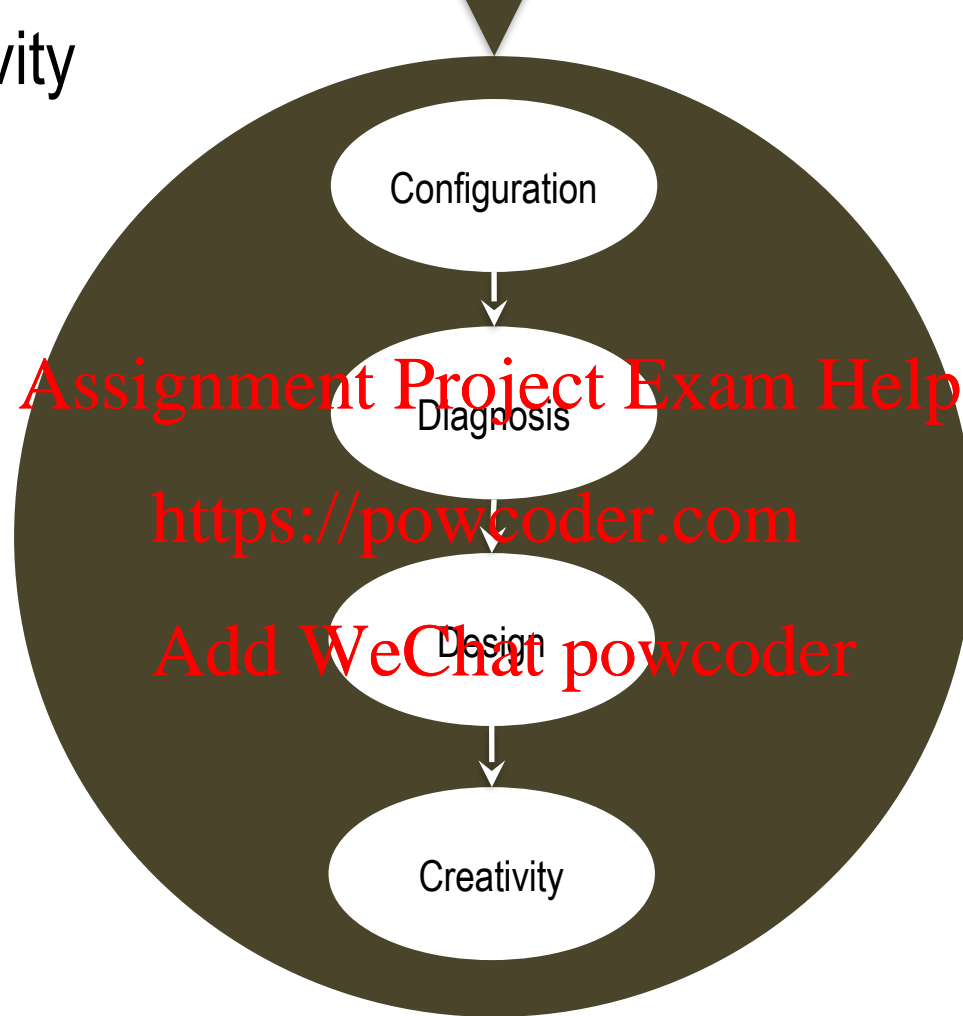
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# Design & Creativity



## **Design Thinking:**

Reasoning about ill-defined, unconstrained, open problems that are situated in the world.

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## Order:

A chair that weighs over 200g, costs at most \$20 to make, and has 4 legs.

Materials Table

Material	Cost per gram
Plastic	\$0.01
Wood	\$0.05
Metal	\$0.10

Chair

mass :  
250g

cost :  
\$20

legs :  
4

seat :  
metal

arms :  
metal

back :  
metal

Chair Legs

count : 4  
size : 25g  
material :

cost : \$5.00

Chair Seat

size : 50g  
material :

cost : \$5.00

Chair Arms

size : 50g  
material :

cost : \$5.00

Chair Back

size : 50g  
material :

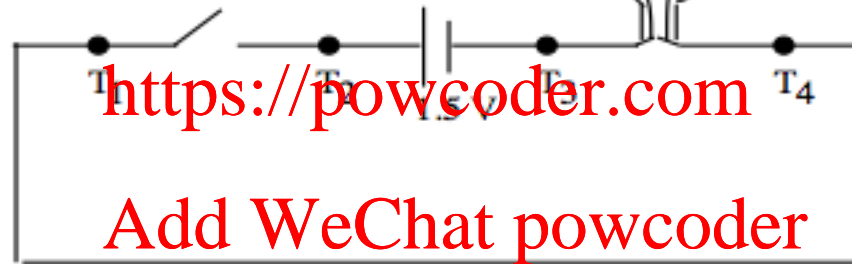
cost : \$5.00

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**DESIRED DESIGN:**

**GIVEN:**  $?SUB$   
 $?prop1: ?val12$

**MAKES:**  $?SUB$   
 $?prop1: ?val22$

**BY-BEHAVIOR:** Behavior B2

**CANDIDATE DESIGN:**

**GIVEN:**  $?SUB$   
 $?prop1: ?val11$

**MAKES:**  $?SUB$   
 $?prop1: ?val21$

**BY-BEHAVIOR:** Behavior B1

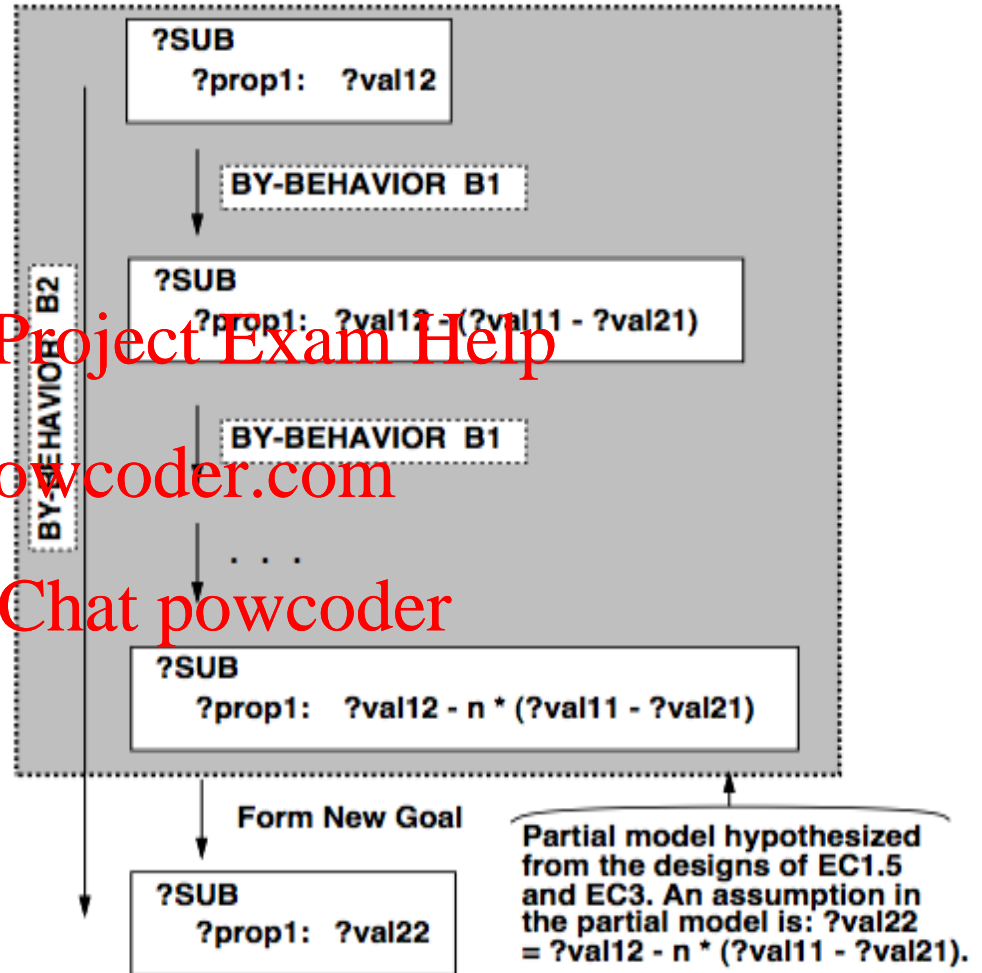
**CONDITION:**

$?val22 \sim ?val12 \gg ?val21 \sim ?val11$

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Creativity

# What is creativity?

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A non-obvious, desirable product.

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**Please also post your answer on the class forum.**

## **Something is creative if it is...**

- Novel
- Valuable
- Unexpected

## **Some other processes of creativity:**

- Emergence
- Re-representation
- Serendipity

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**For each of the following tasks, mark the box if successful completion of a task would mean that the agent is creative.**

- Performing well on Raven's Progressive Matrices
- Solving the stacked blocks problem
- Configuring a chair based on input parameters
- Diagnosing an illness in a patient
- Designing a route to a new destination
- Correctly classifying new types of animals
- Using a chair to prop open a door
- Deciding between multiple strategies for a problem
- Designing a new car based on a new fuel source

**Do you agree with David's assessment that none of these results are creative because we can trace through the underlying process that led to them?**

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- Yes, because in order for a result to be creative, it must be novel, and output of an algorithm cannot be novel.
- Yes, because given a set of input, the output will always be the same; therefore, the product can never be unexpected.
- No, because it defines creativity in terms of the output rather than the process.
- No, because under this definition, humans are only considered creative because we don't know how the brain works yet.

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# **Visuospatial Reasoning:**

Reasoning wherein causality is,  
at most, implicit.

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