Discrete Mathematical Structures
(CS330)

owledge of the concepts needed to test the

Course Outcomes

Course

Outcomes

logic of the program.

CO2 : Demonstrate the understanding of relations and

able to determine the properties.

CO3 : Perceive, construct and decode group codes

ties.

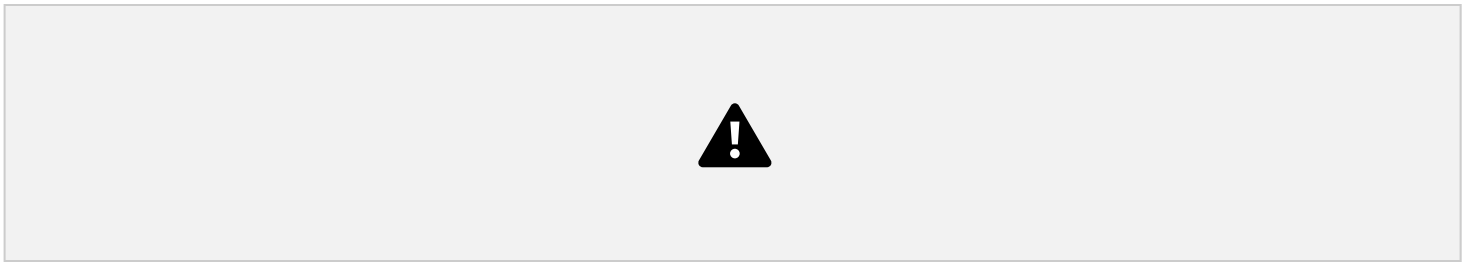
based on the various methods.

CO4 : Demonstrate different traversal methods for

Course Contents

	Fundamental of Logic: Basic Connectives and Truth Tables, Logical Equivalence: The Laws of Logic, Logical Implication: Rules of Inference, The Use of Quantifiers, Quantifiers, Definitions and the Proofs of Theorems.	08

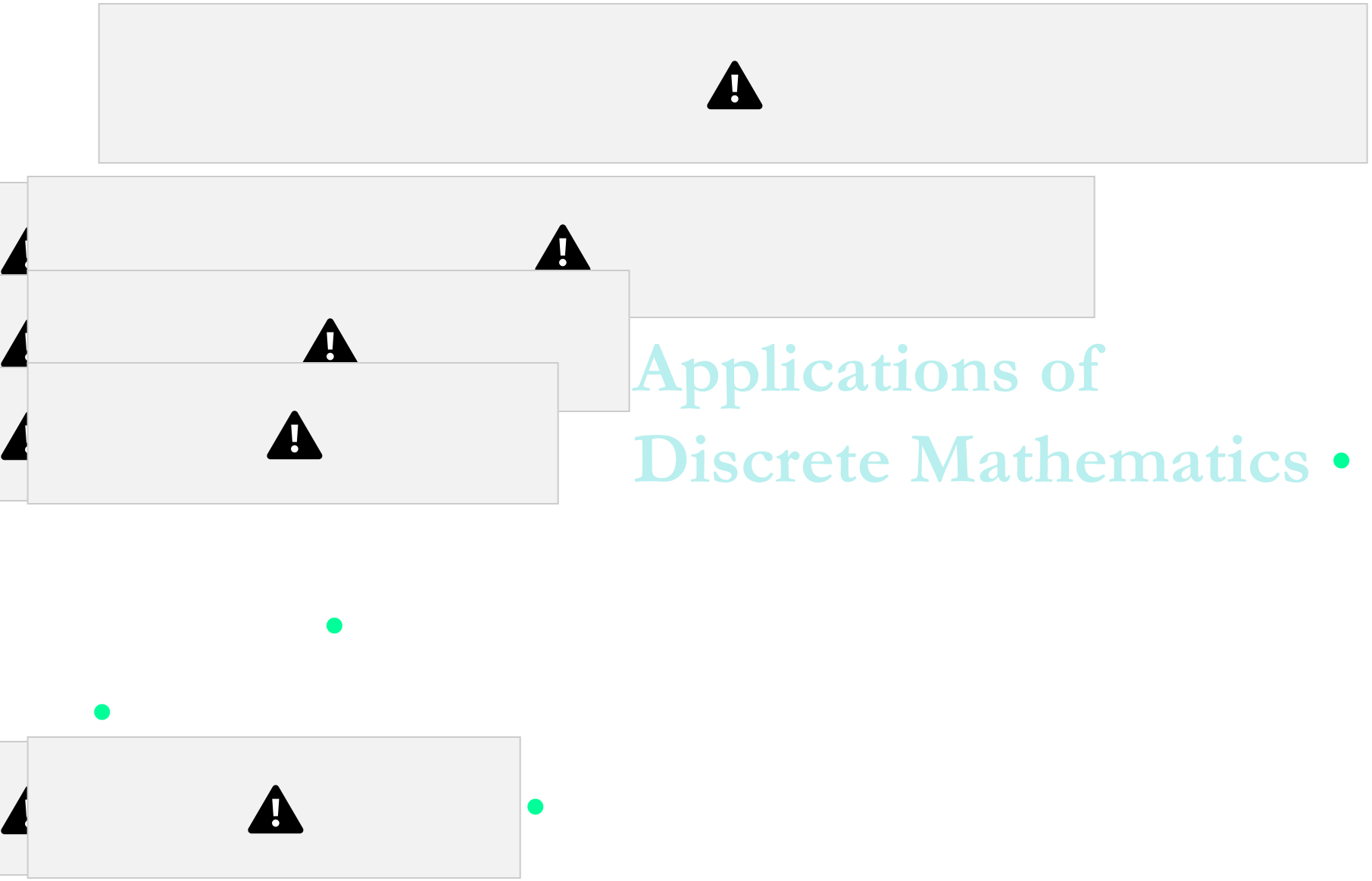
	Relations: Properties of relations, Computer Recognition: Zeros-One Matrices and Directed Graphs, Partial; orders: Hasse diagrams , Equivalence Relations and Partitions , Lattices.	08
	Elements of coding theory and Hamming Metric, generation of codes using Parity check and Generator matrices.	08
	Graph theory: Definitions and Examples, Subgraphs, Complements, and Graph Isomorphism, Vertex degree, Euler trail and circuits, Planar Graphs, Hamiltonian Paths and cycles.	08
	Trees: Definitions, Properties and Examples, Rooted trees, trees and sorting weighted trees and prefix Codes.	07



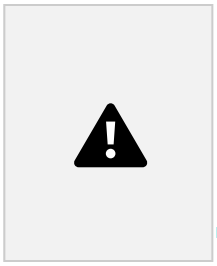
Text and Reference Books

1.

What is Discrete Mathematics?

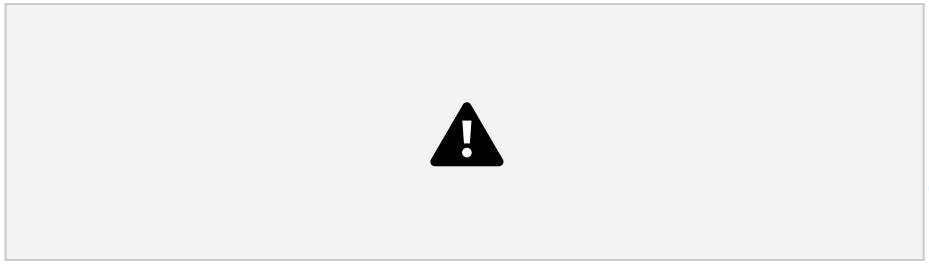


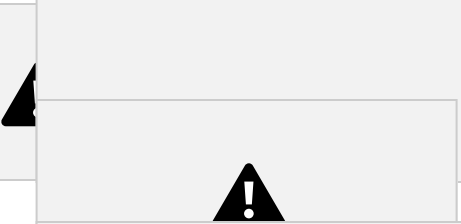
Applications of Discrete Mathematics

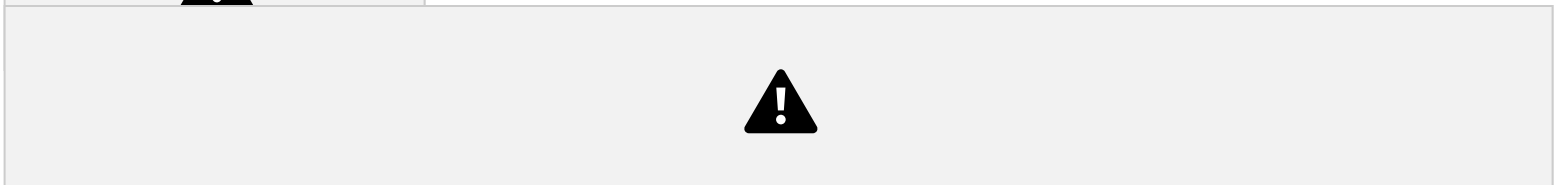
Unit  – 1

Fundamentals of Logic

What is Logic ?







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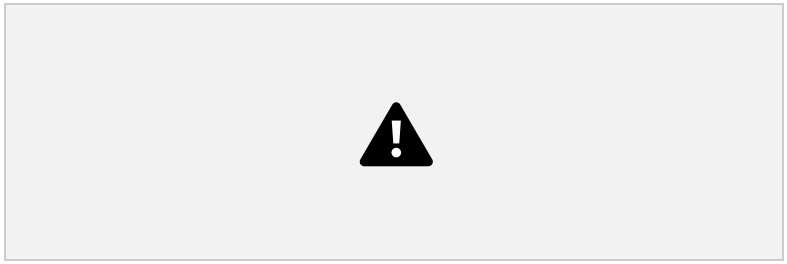
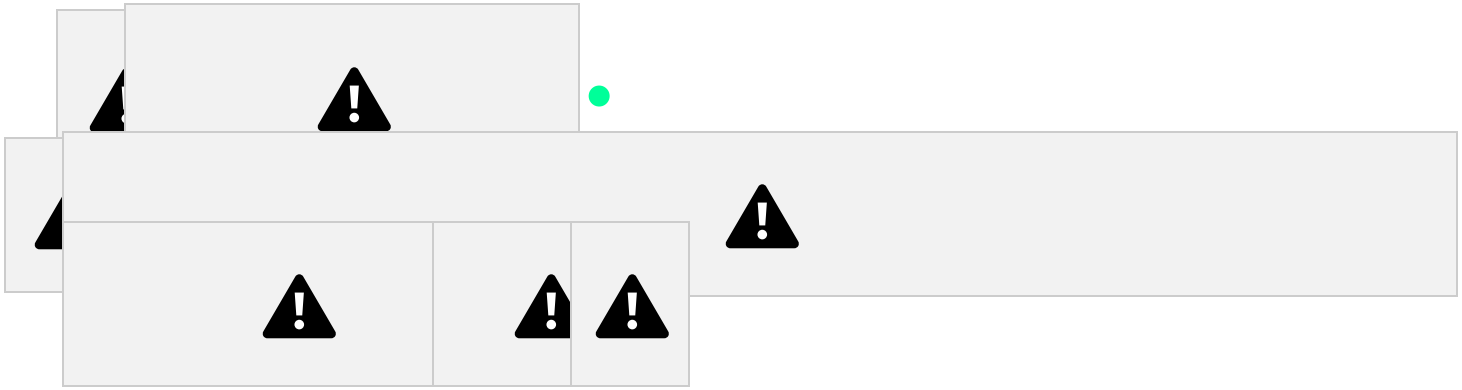
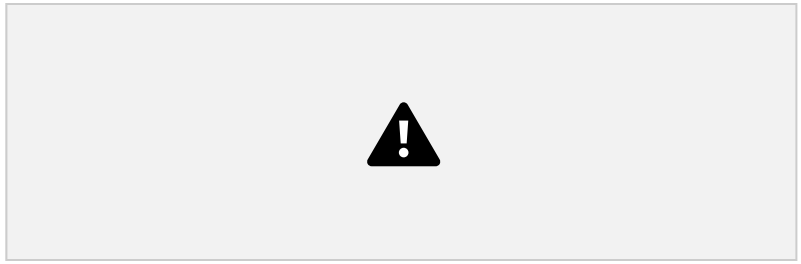


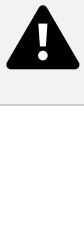


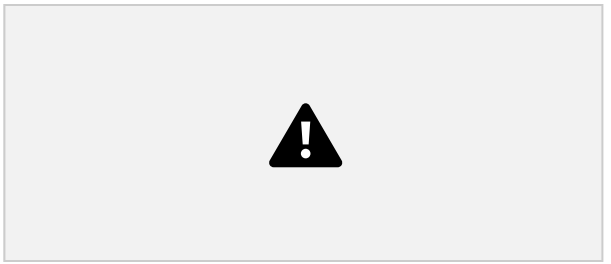
True

False

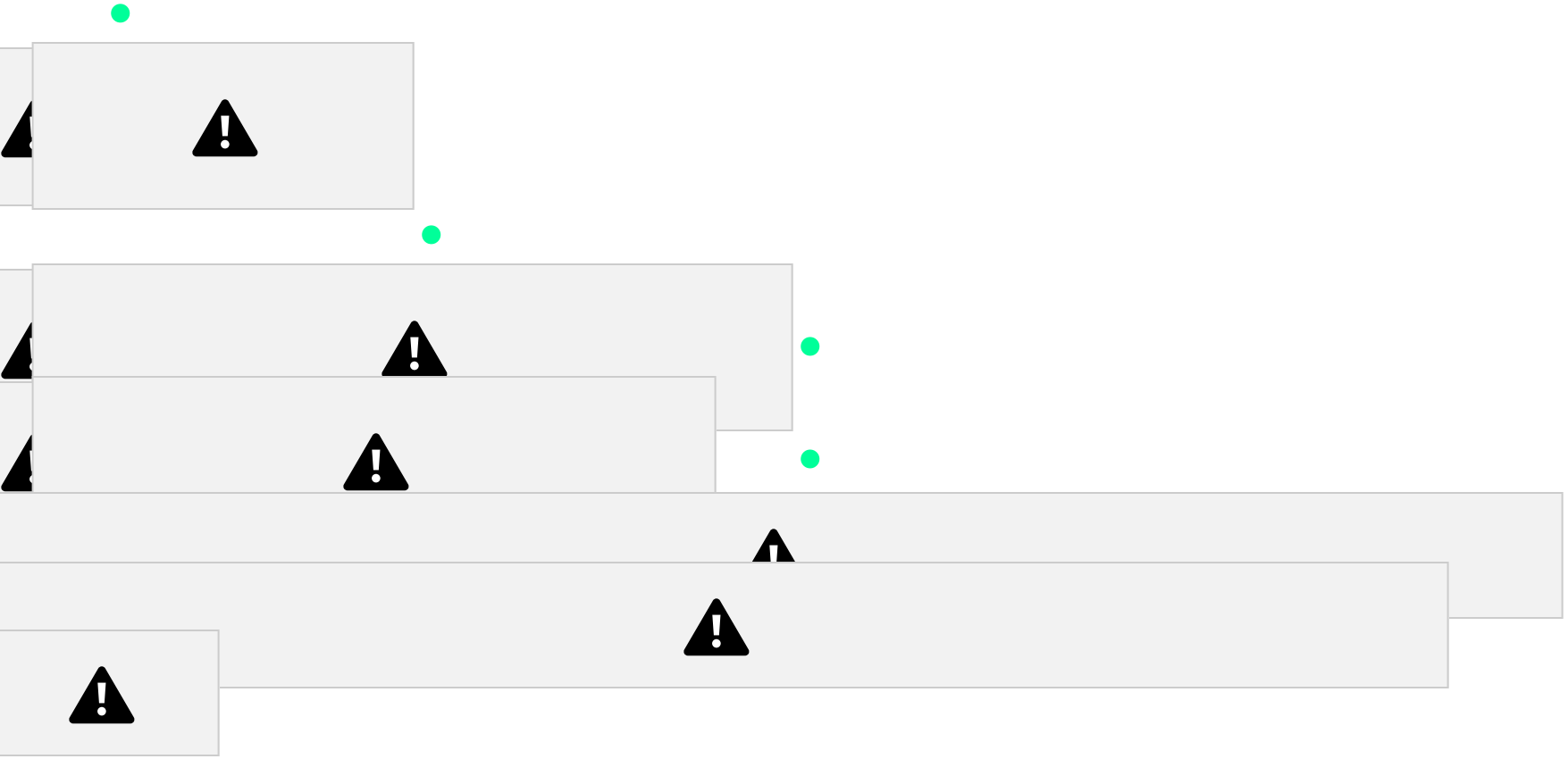
True or False

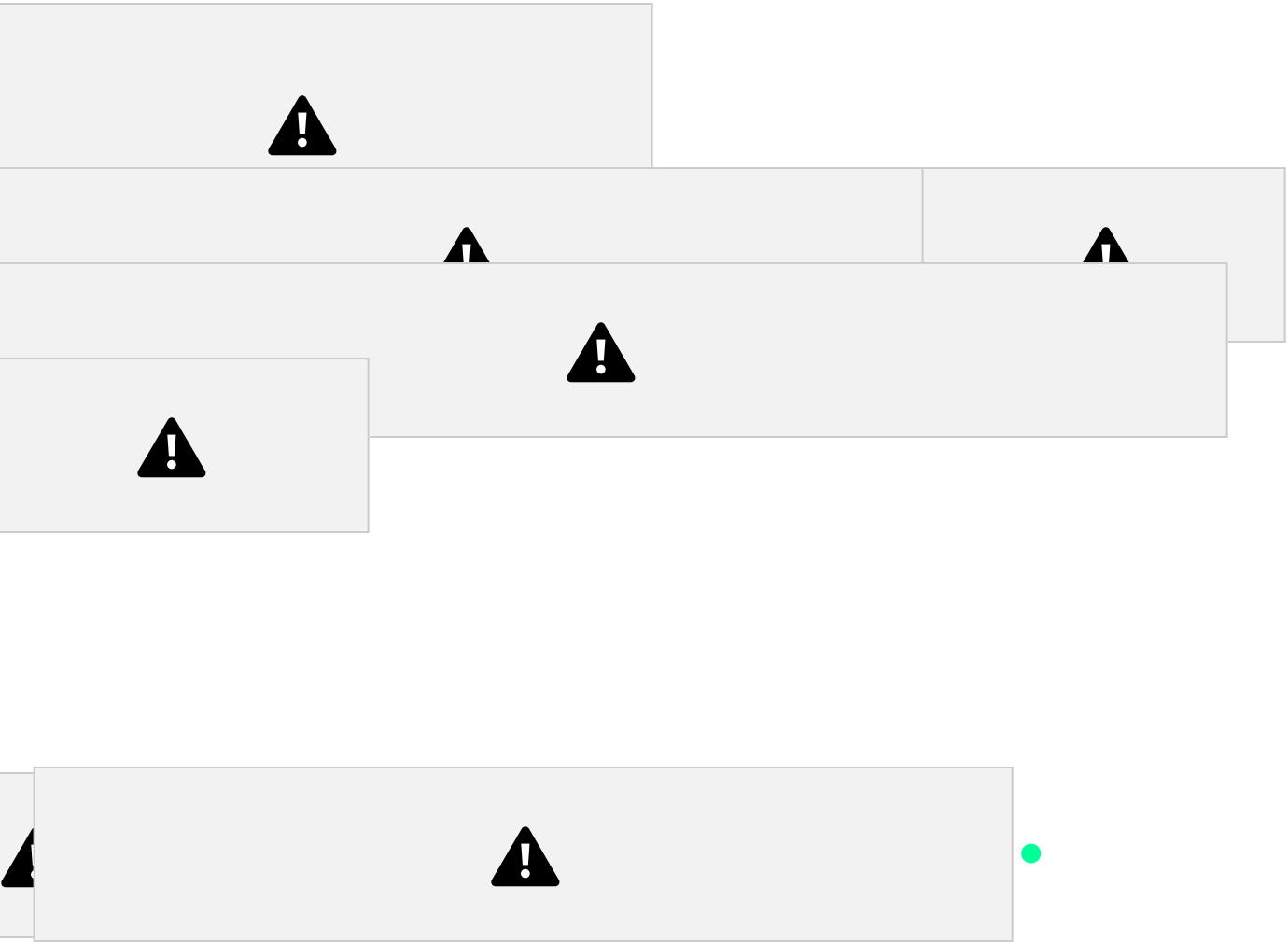






Example





Example

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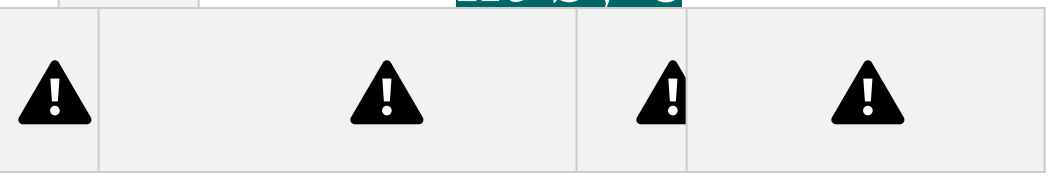
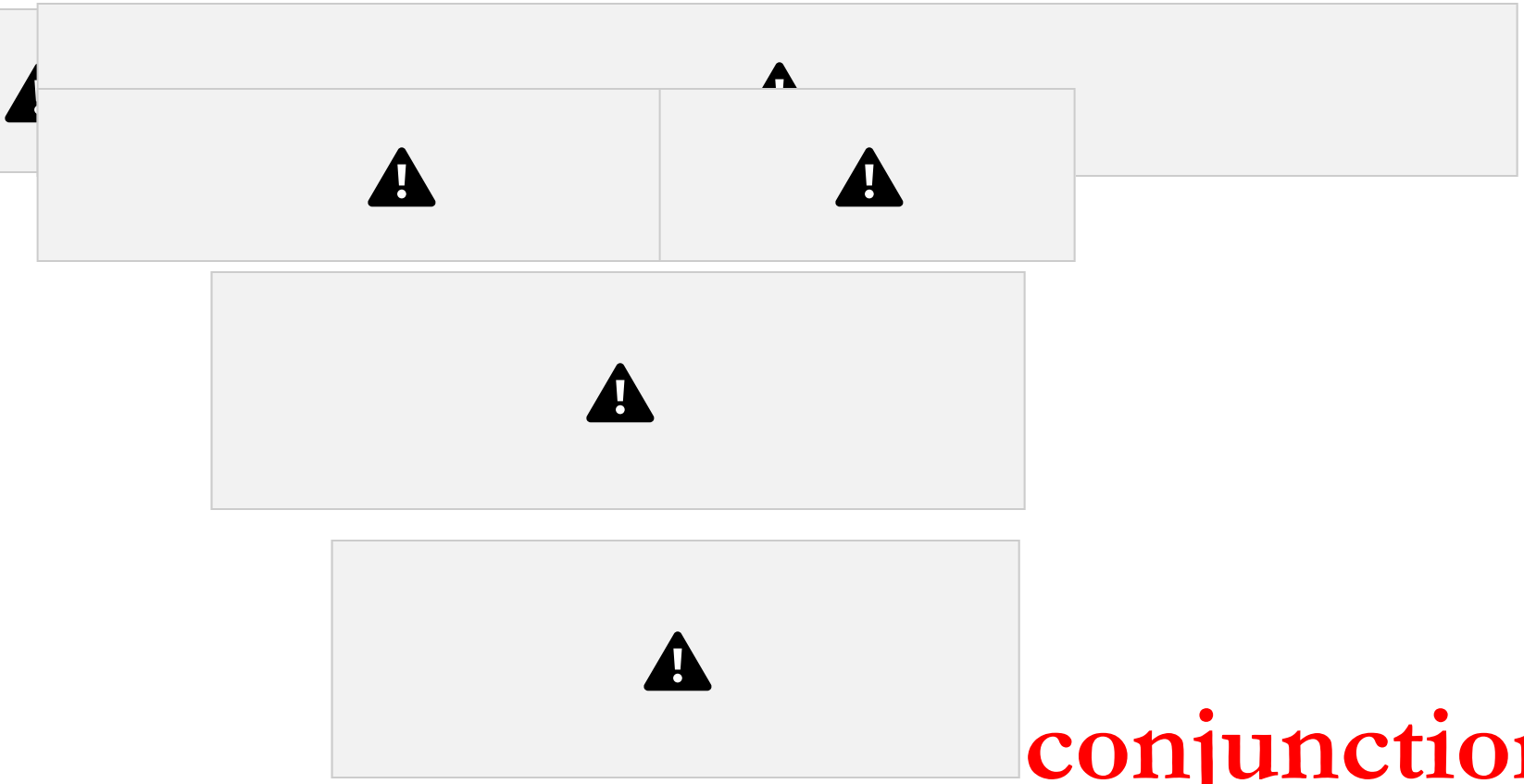
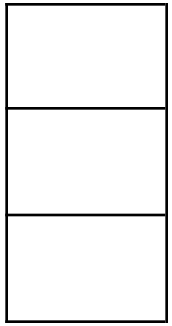




conjunction •



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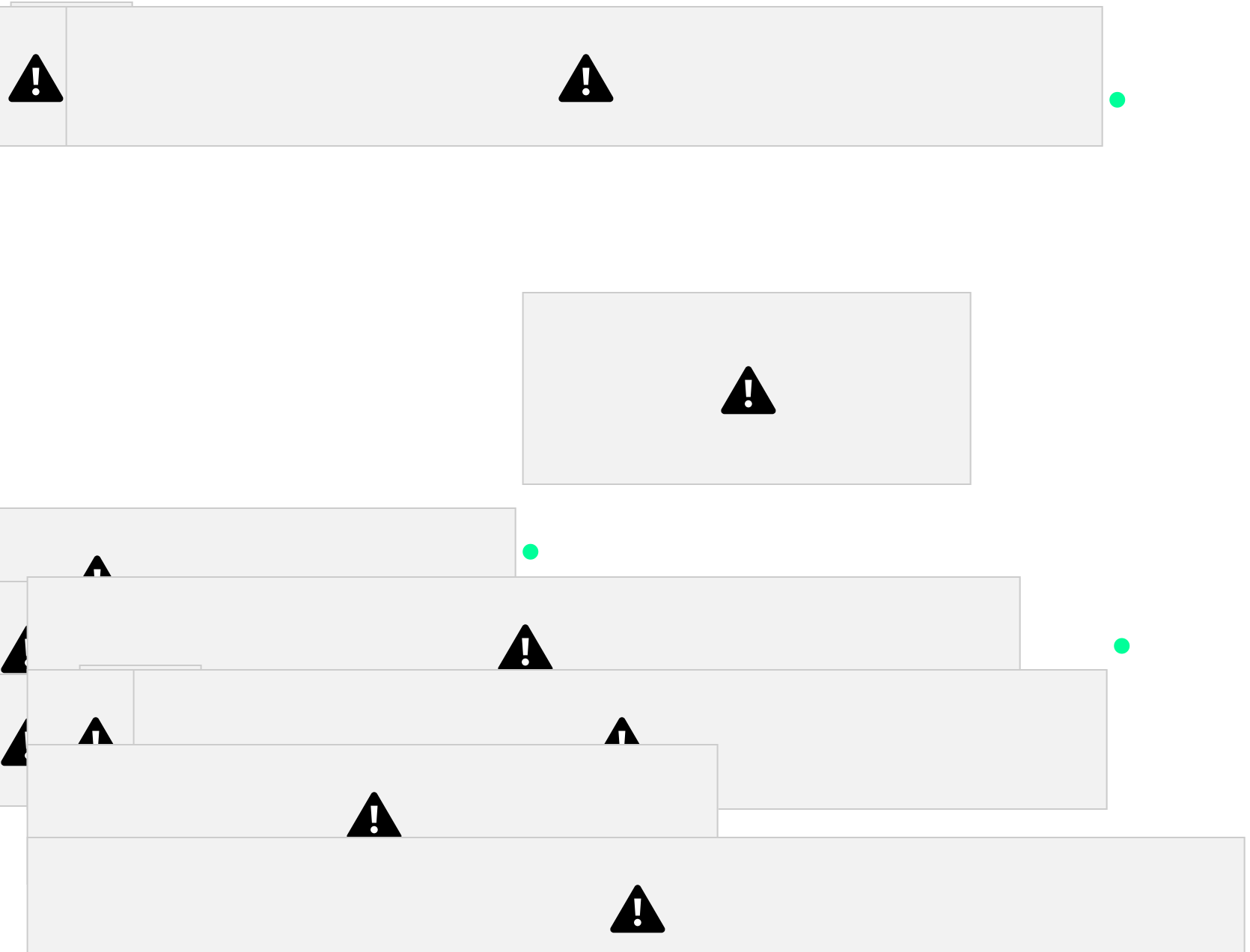

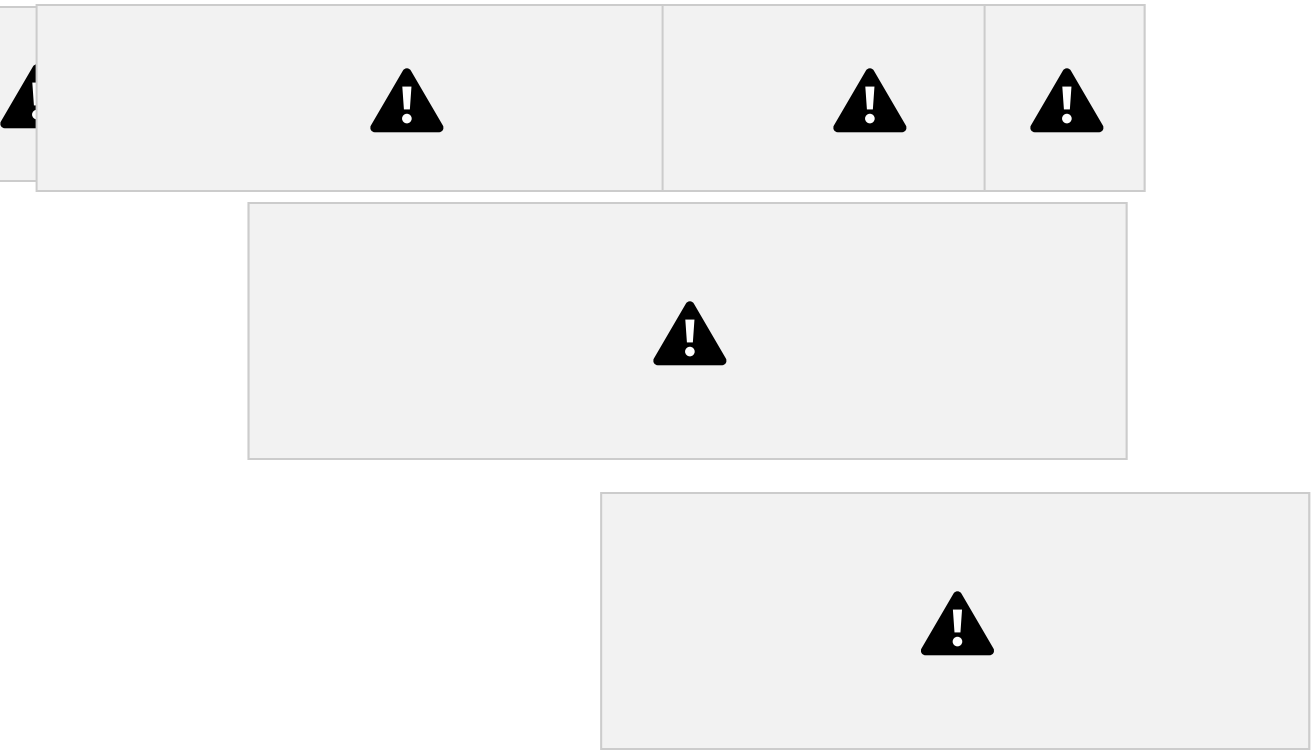

disjunction •

disjunction

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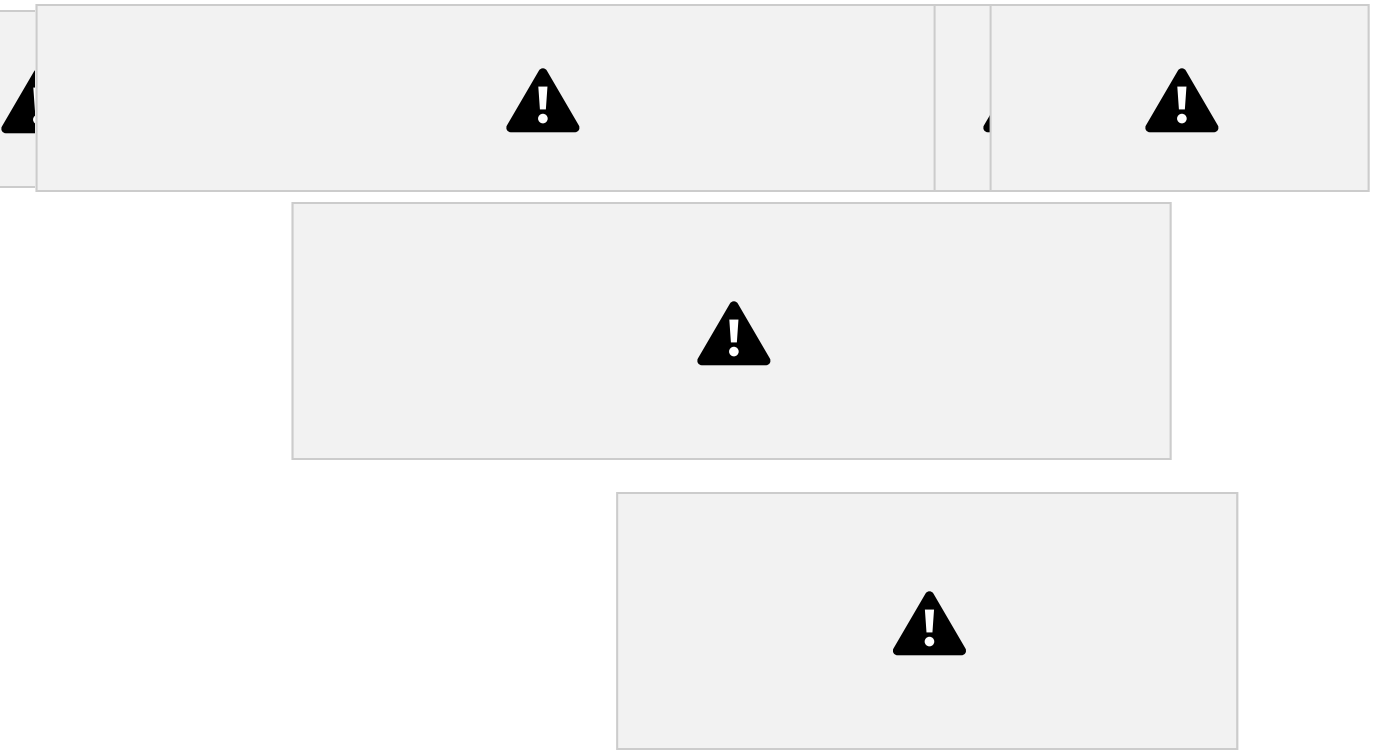

Negation

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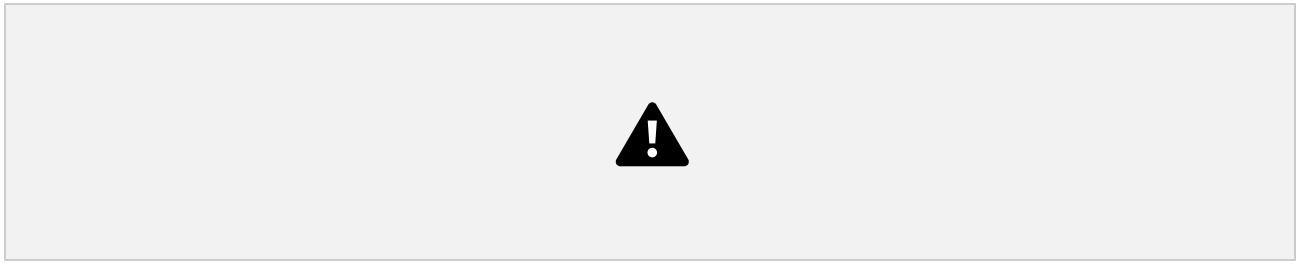
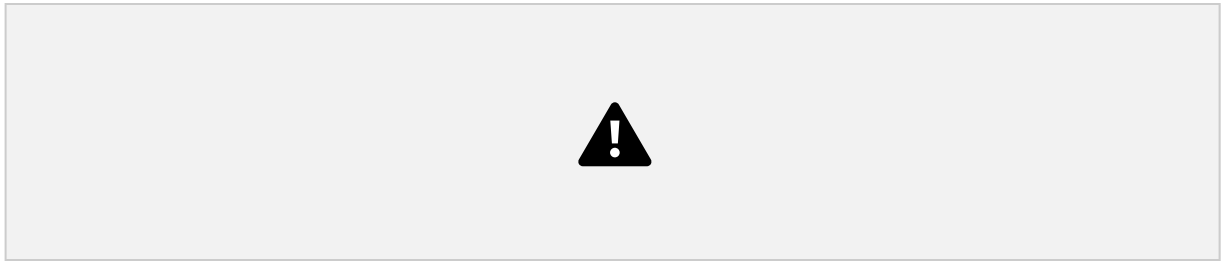


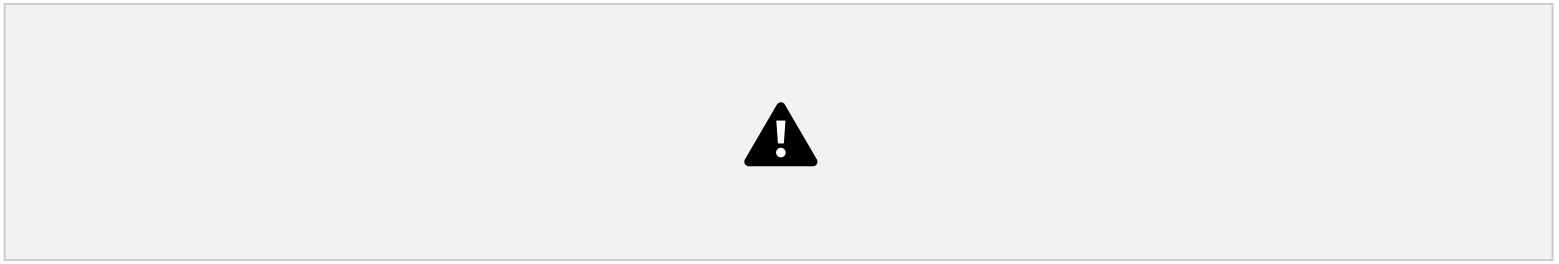
Negation Continued…

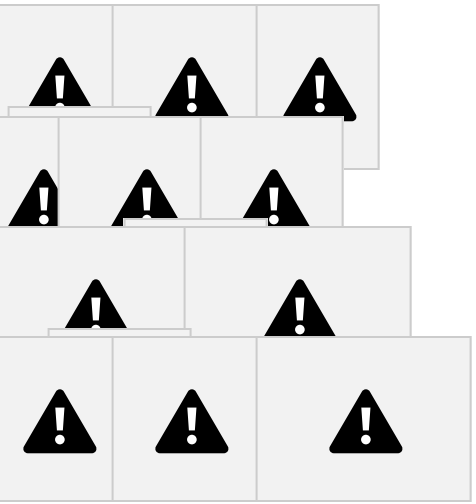


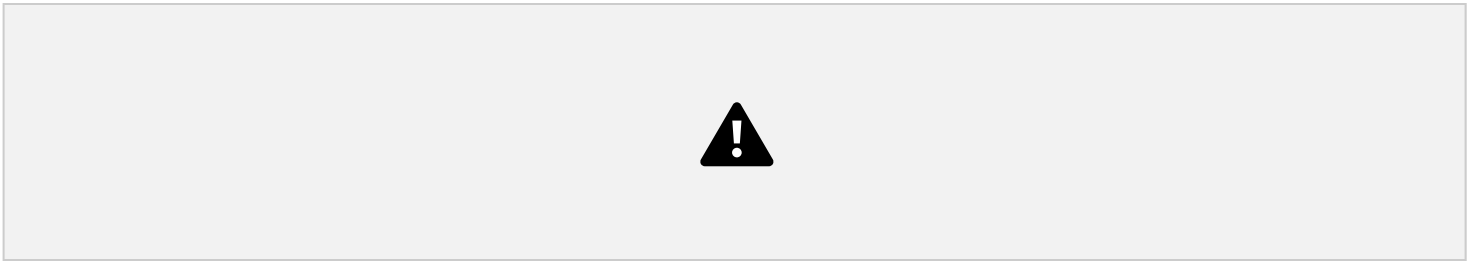
- Either P or Q” (but not both),

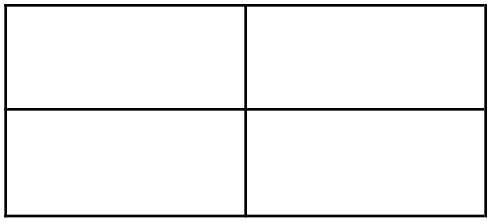
T

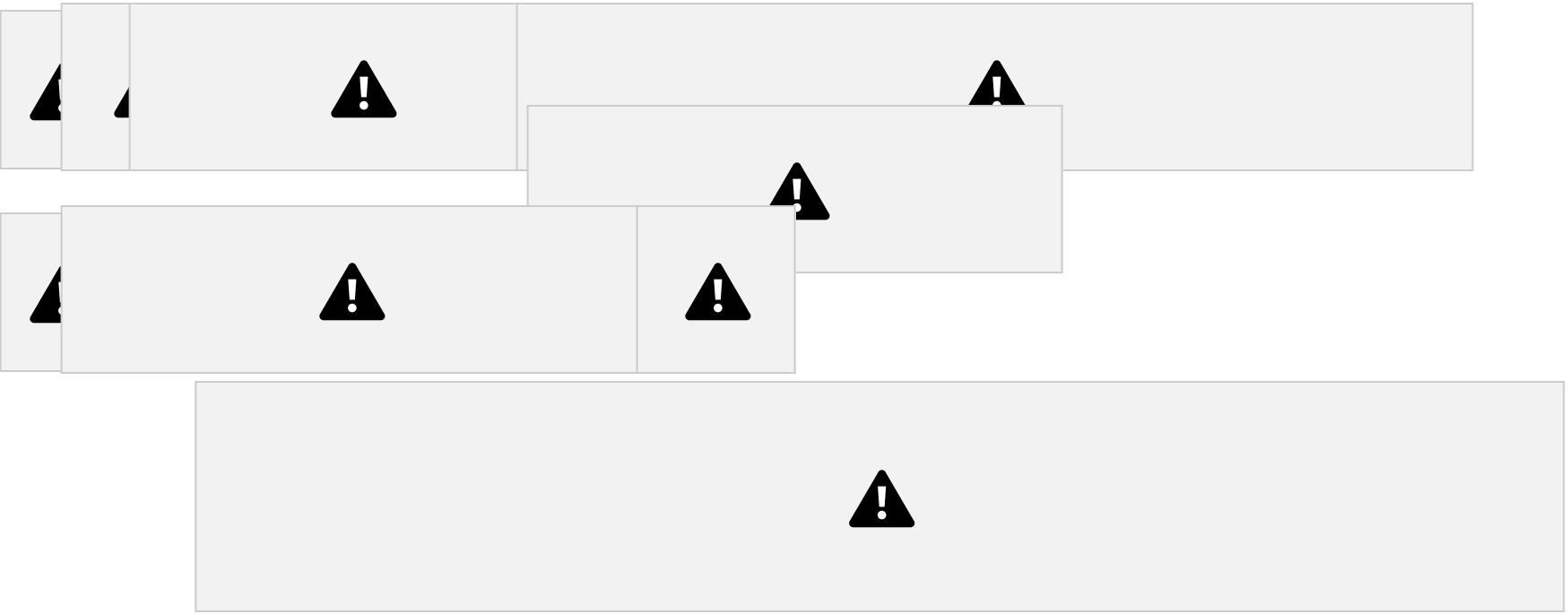
T

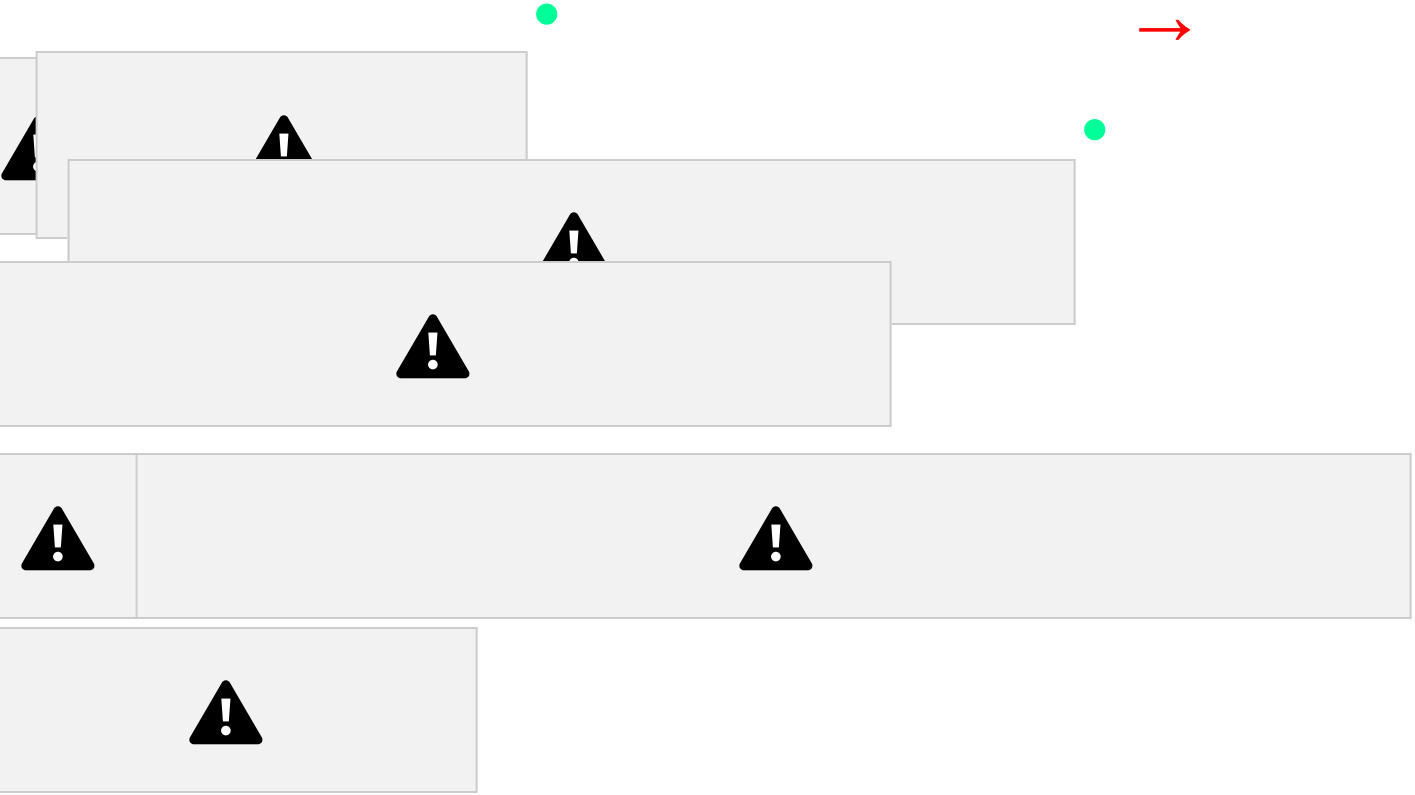


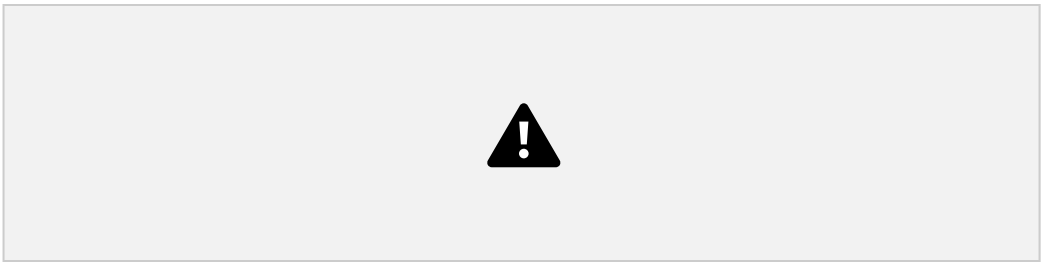


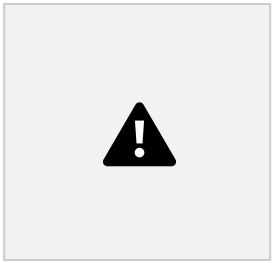


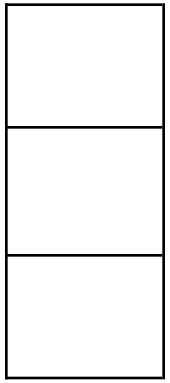












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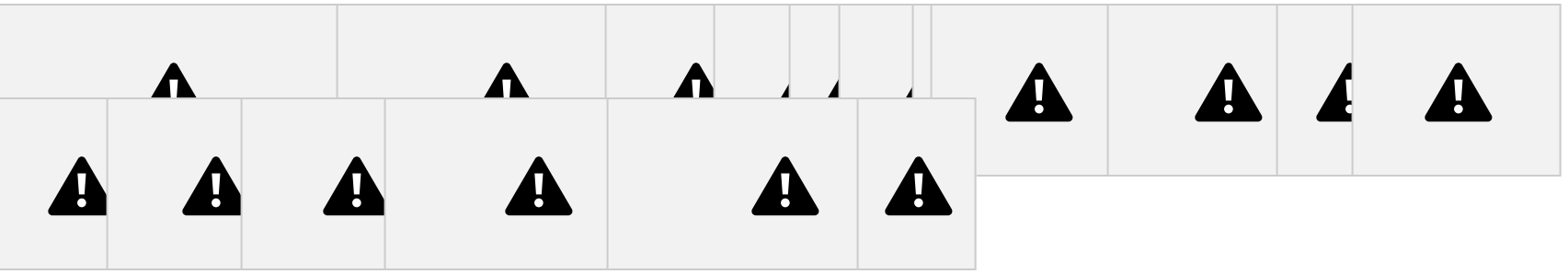
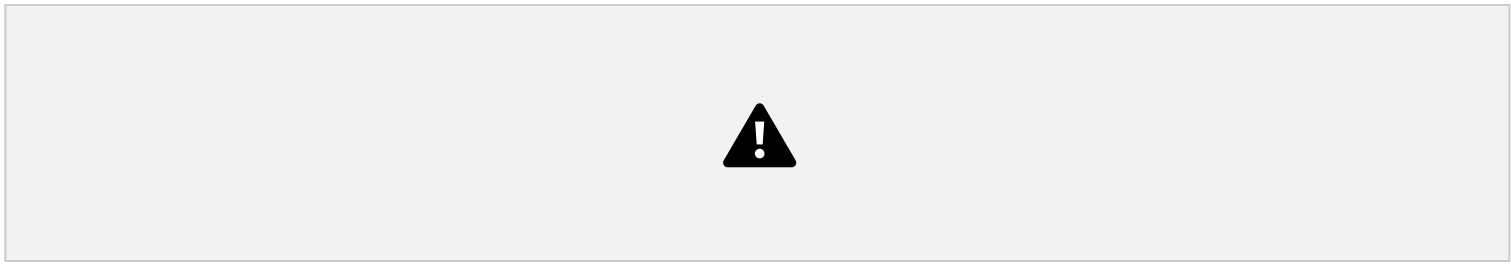
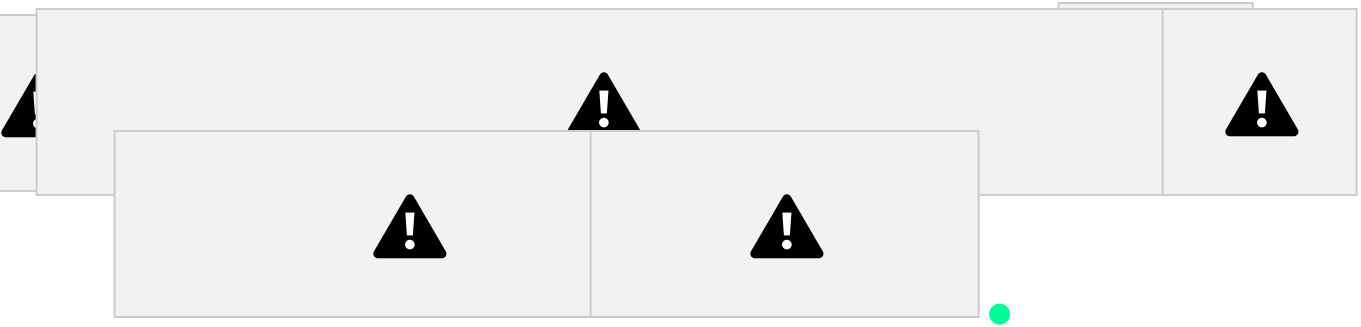
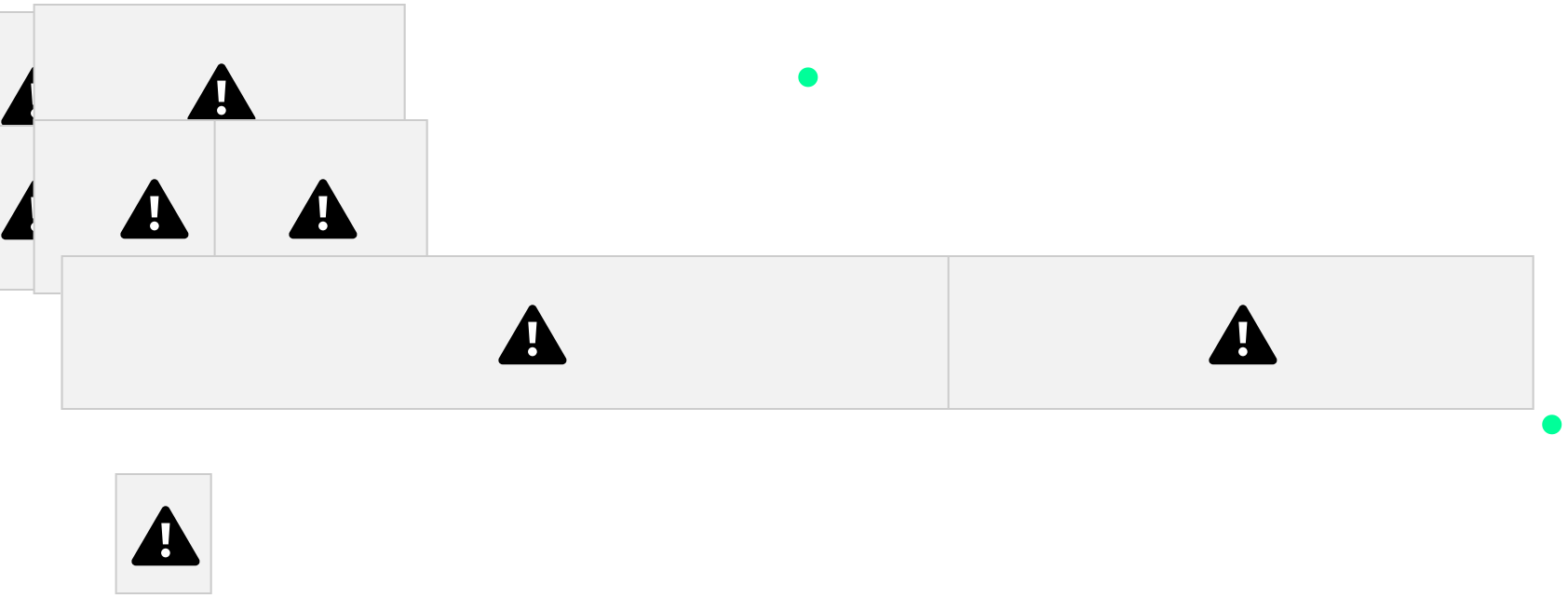
Example







Example



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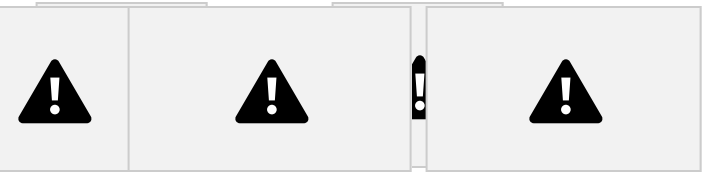

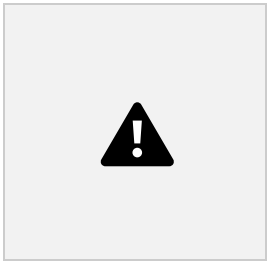

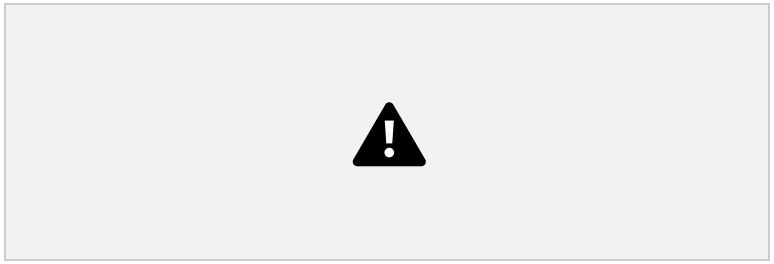

Exercise Problems

(p → q)
∧

$$[(q \wedge \neg r) \rightarrow (p \vee r)]$$

p	q	r	p → q (a)	q ∧ ¬ r	⚠	[(q ∧ ¬ r) → (p ∨ r)] (b)	a ∧ ⚠ b
0	0	0	1	0	p ∨ r 0	1	1
0	0	1	1	0	1	1	1
0	1	0	1	1	0	0	0
0	1	1	1	0	1	1	1
1	0	0	0	0	1	1	0
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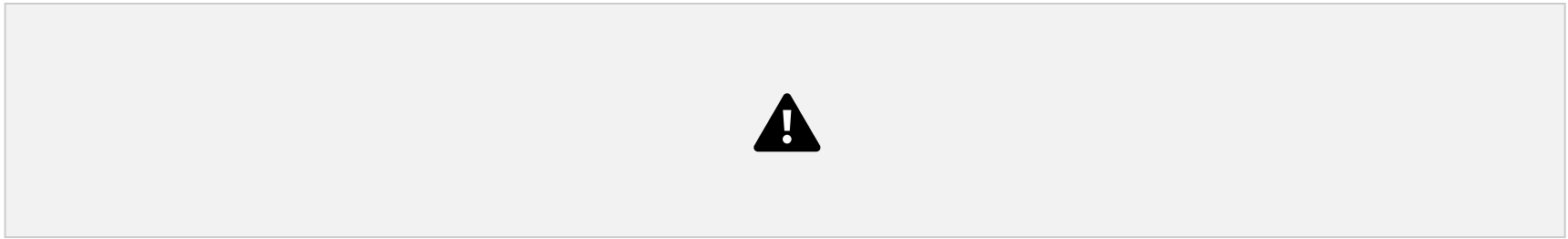
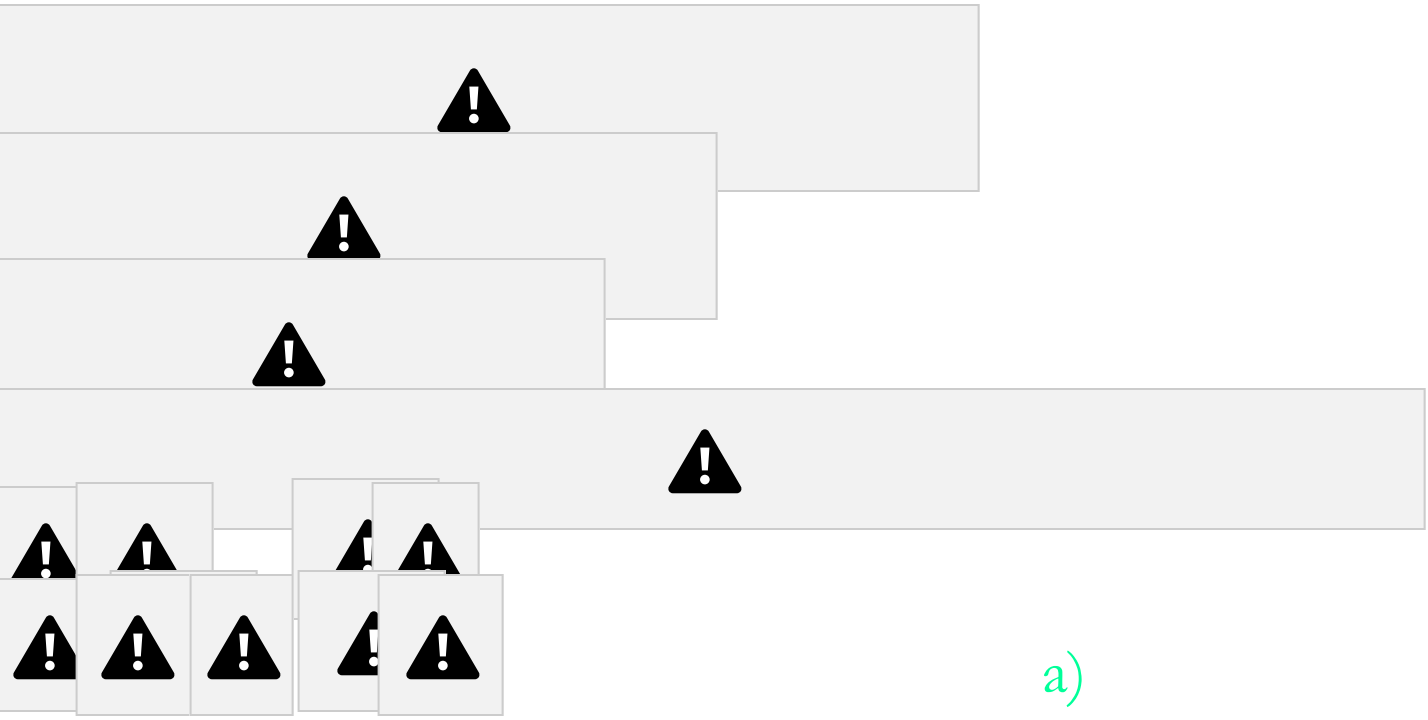
1	1	0	1	1	1	1	1
1	1	1	1	0	1	1	1



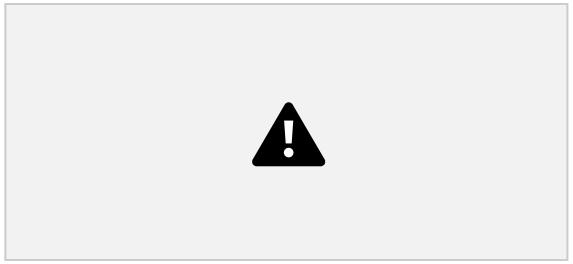
Exercise Problems continues…



a)

b)

c)

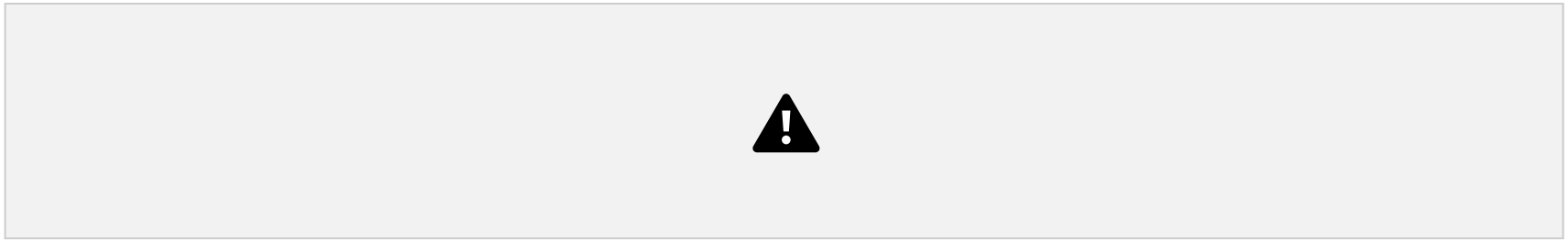


Solution

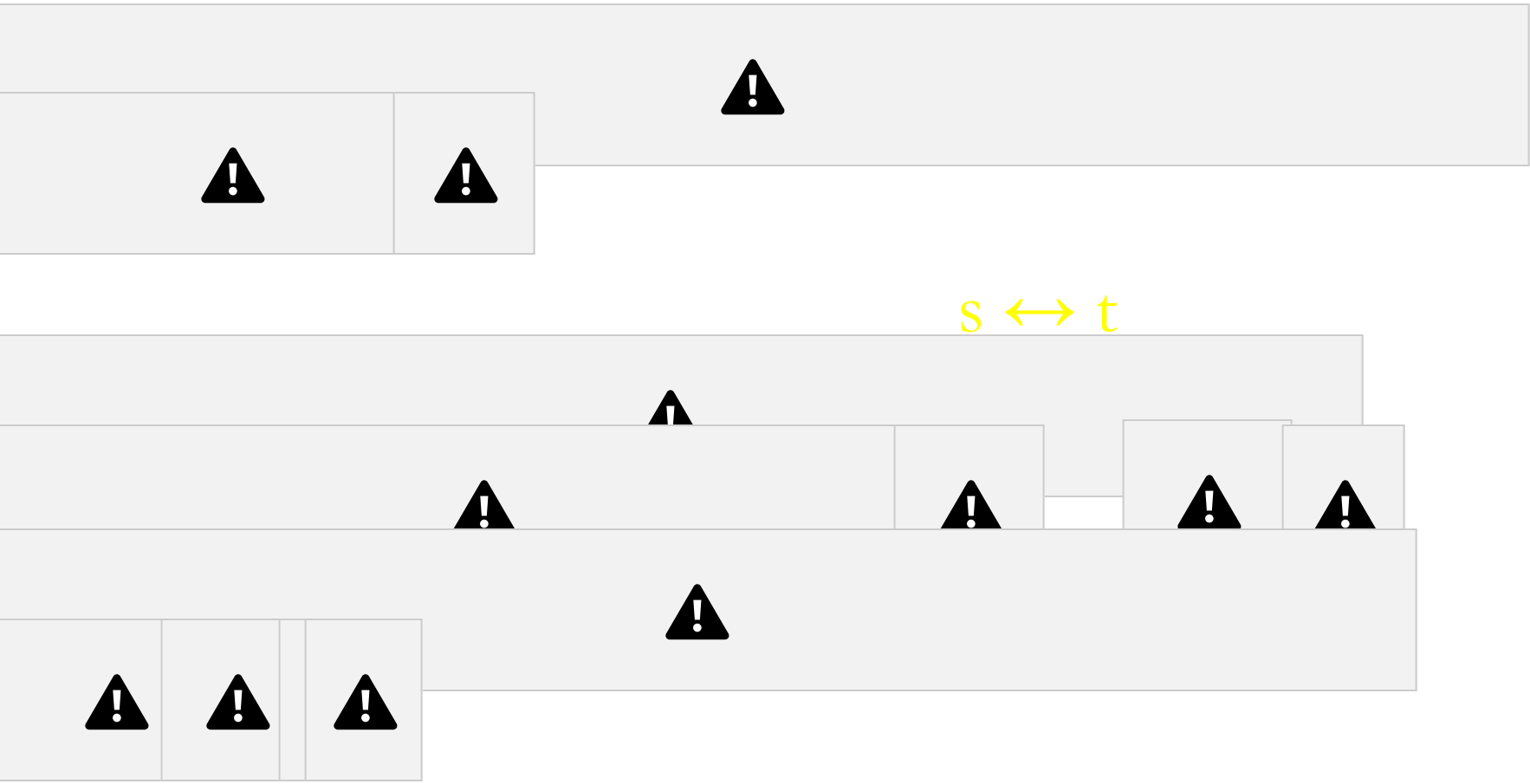
a)

b)

c)



Exercise problems continues…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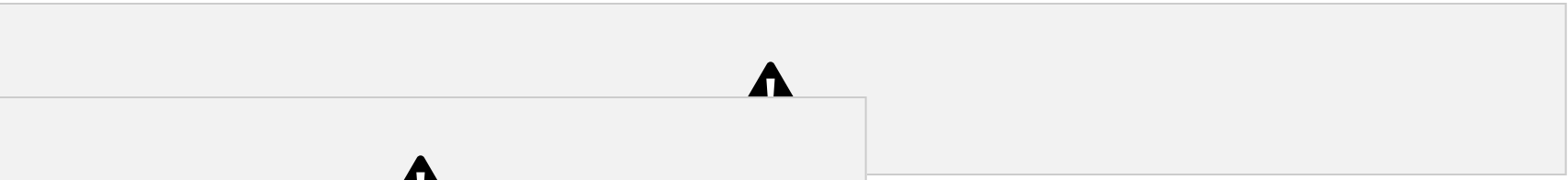
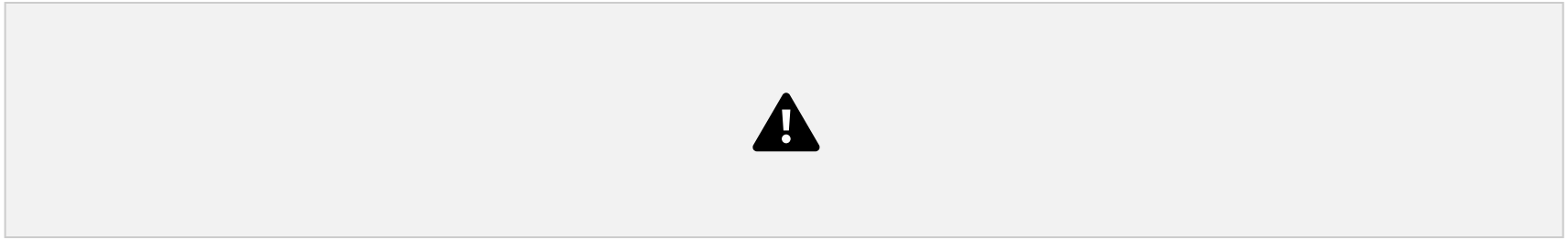
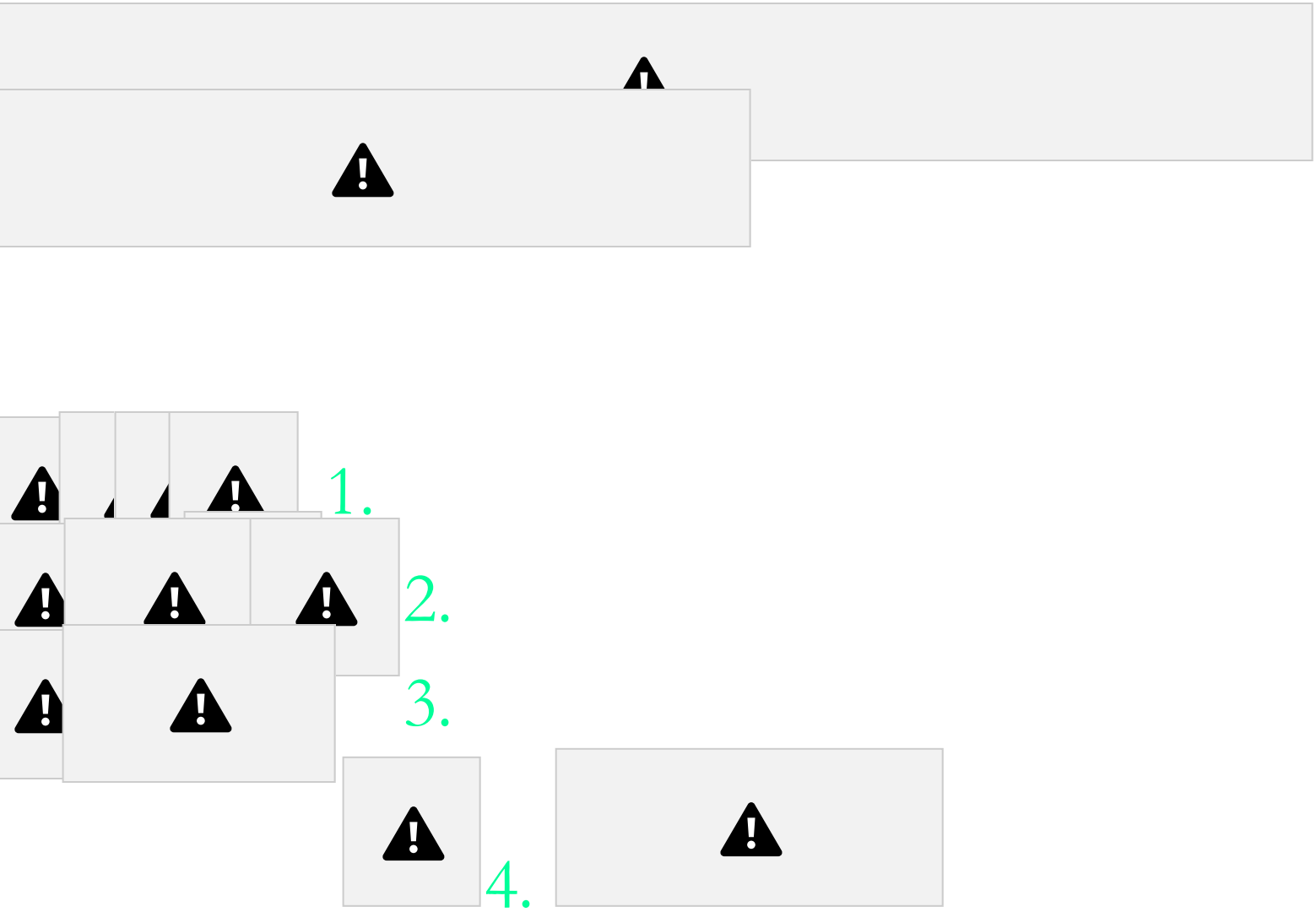
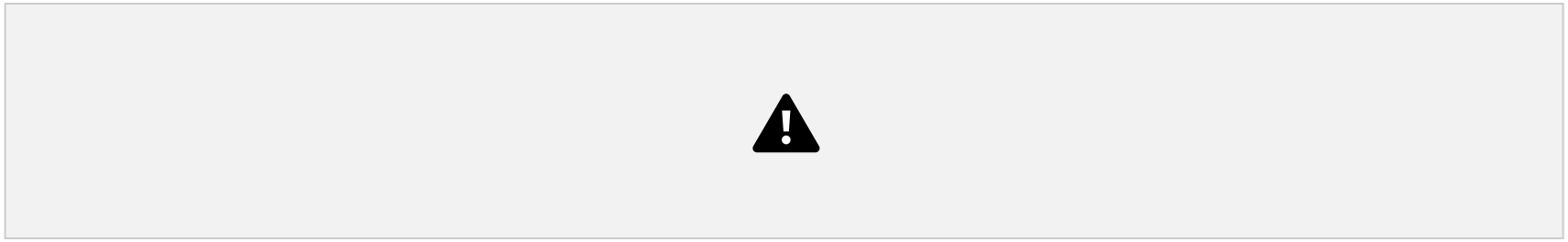
u ∧ s





Exercise problems continues…


1.
2.
3.
4.



Exercise problems continues…

Exercise problems

continues…

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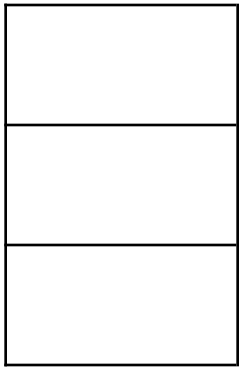
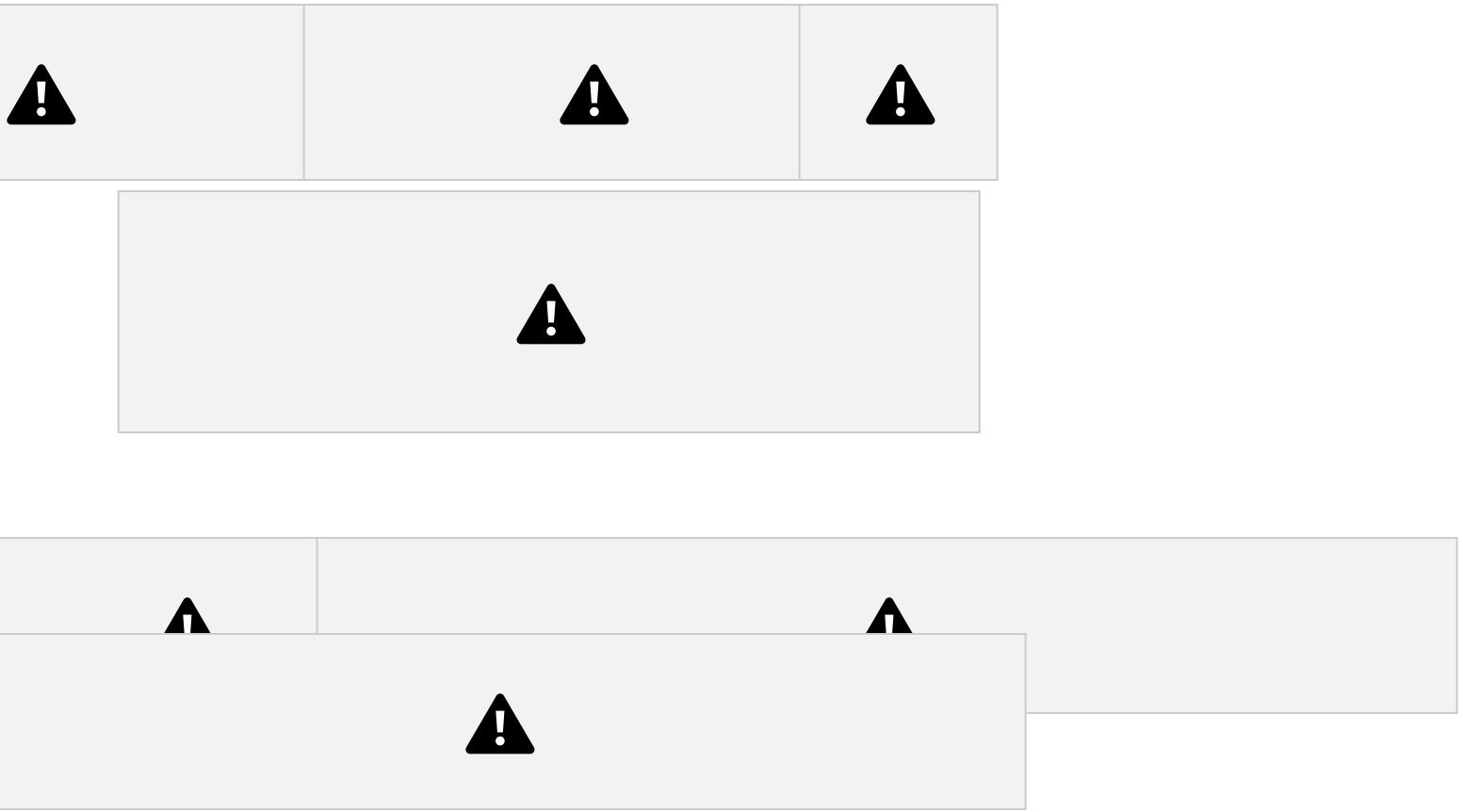
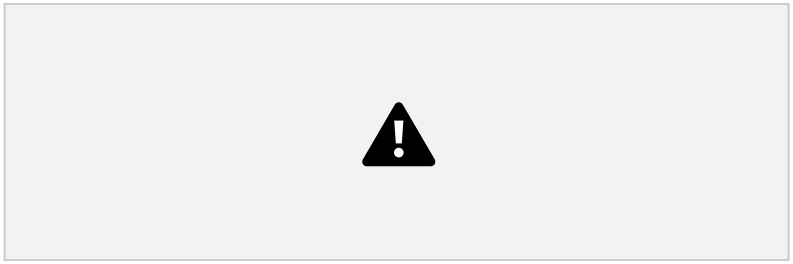
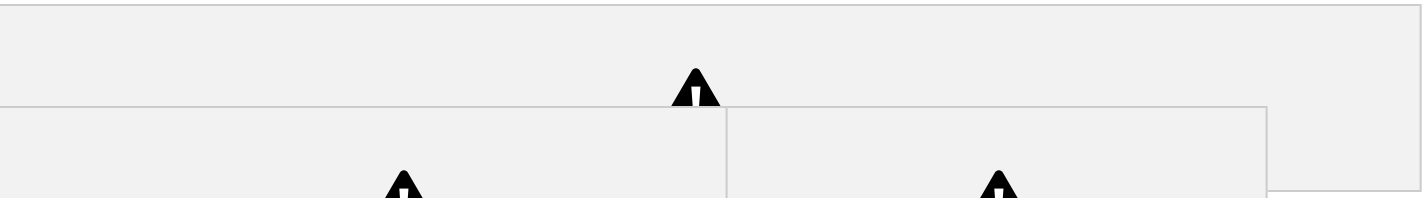


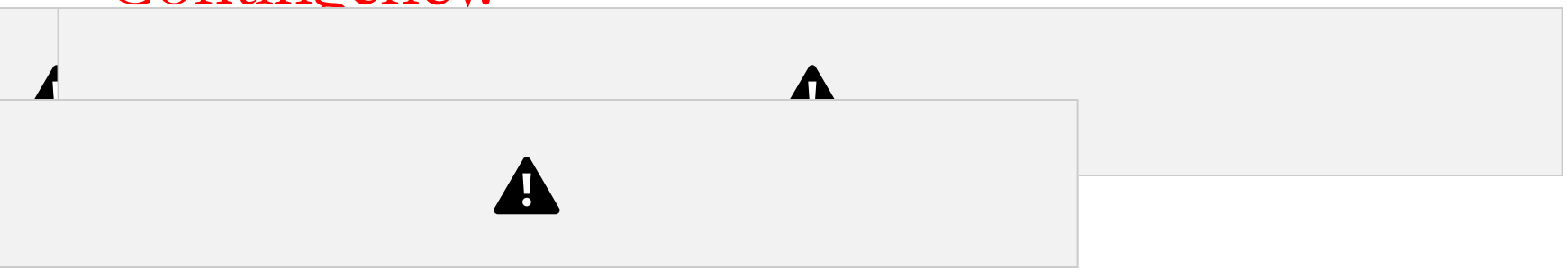


Contradiction *absurdity*

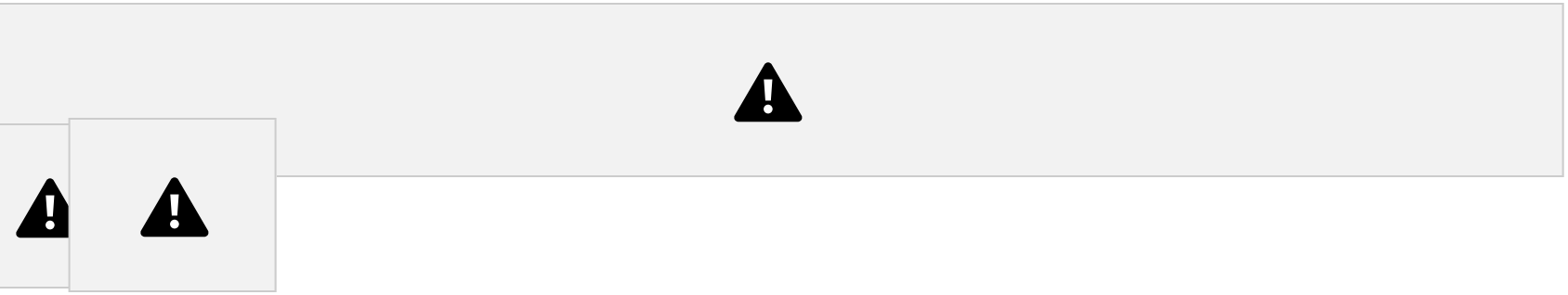




Contingency.

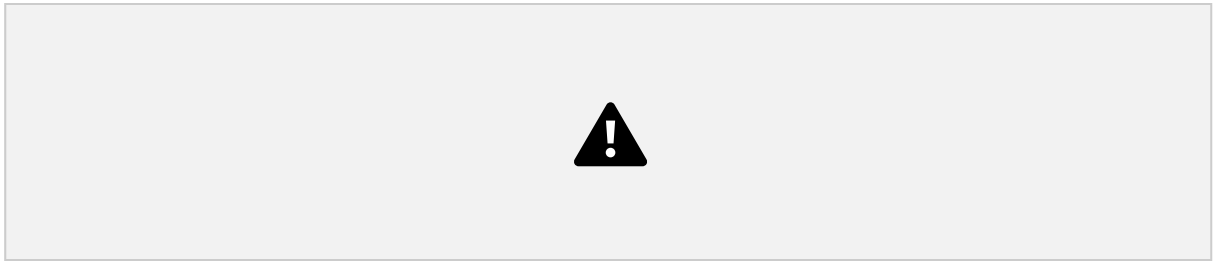


Exercise problems :

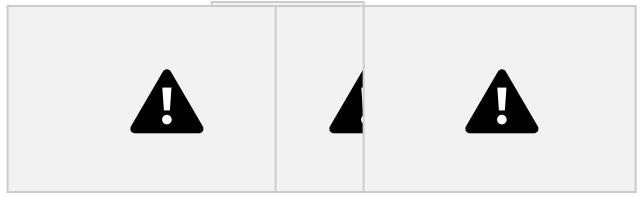


a)

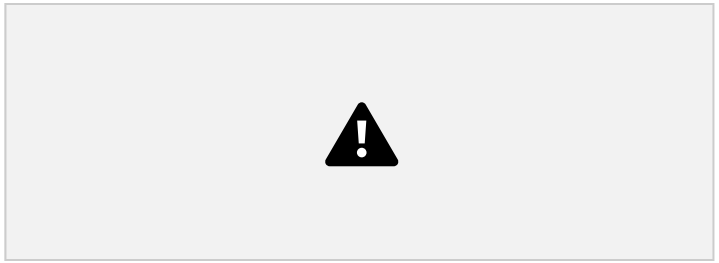
b)



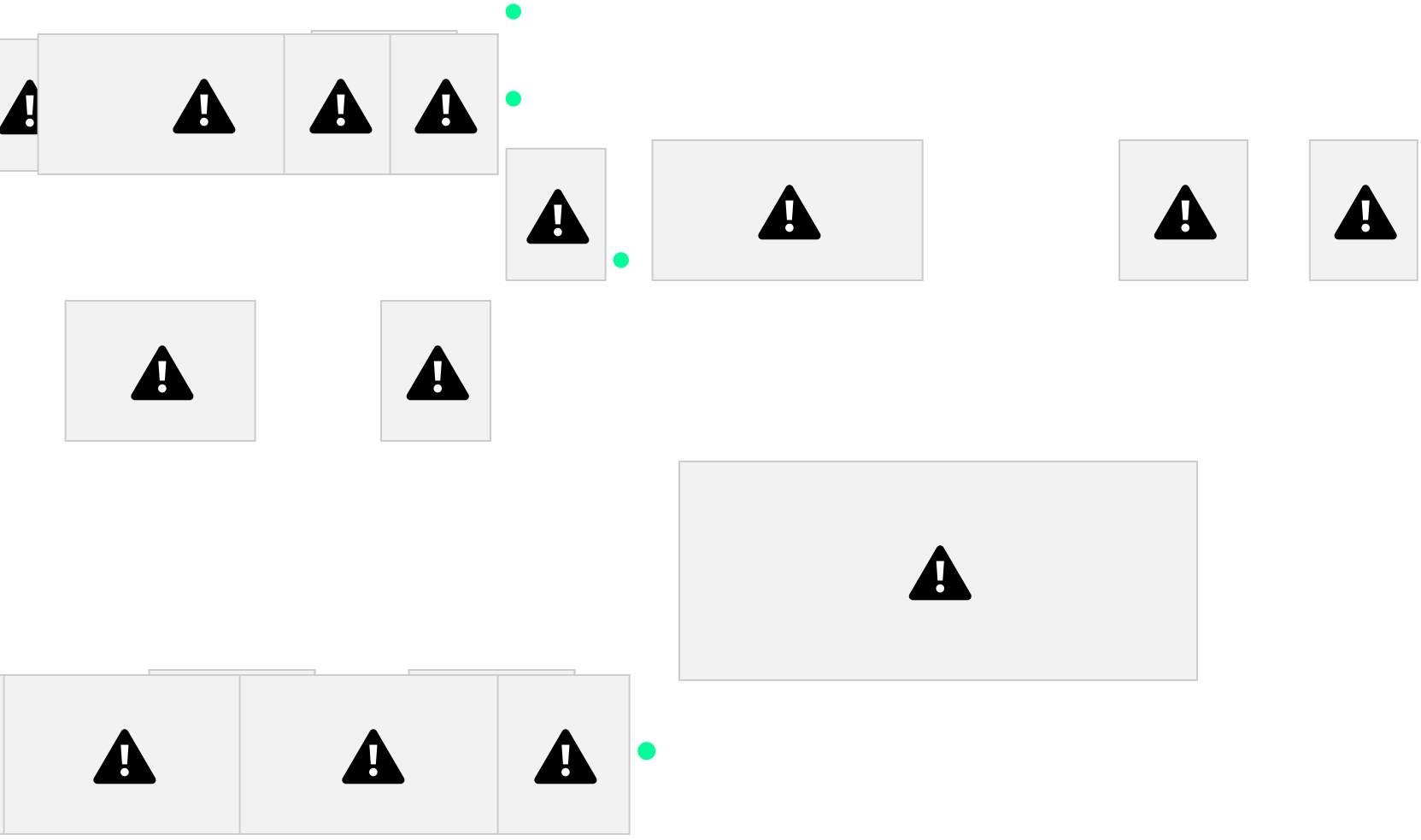
Problems:

1. 

2.

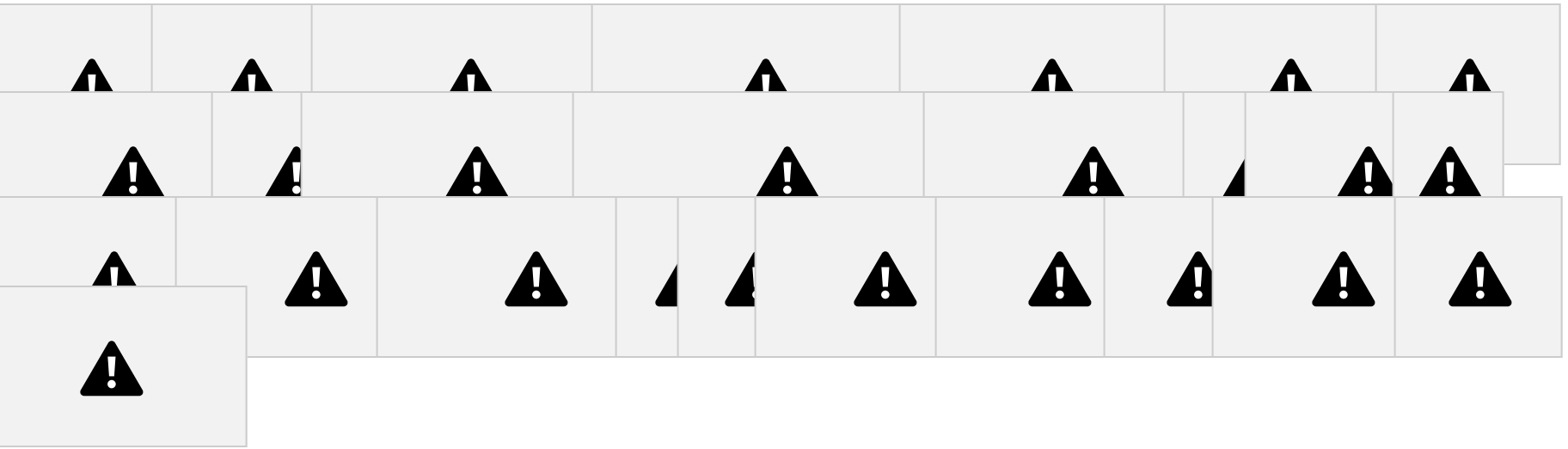


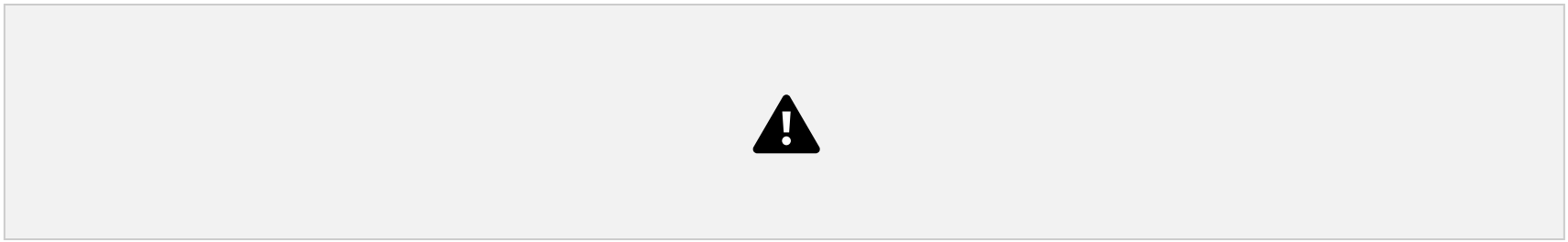
Definitions

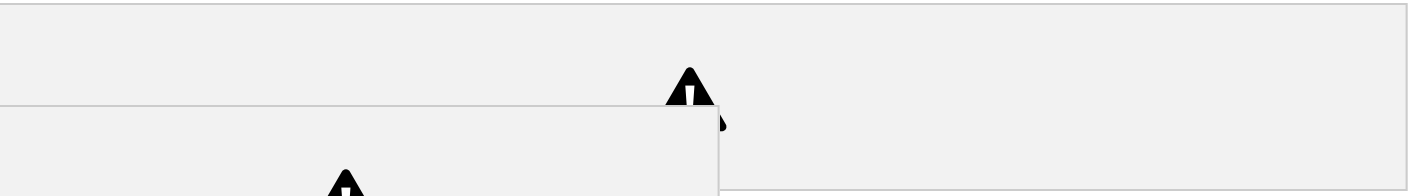


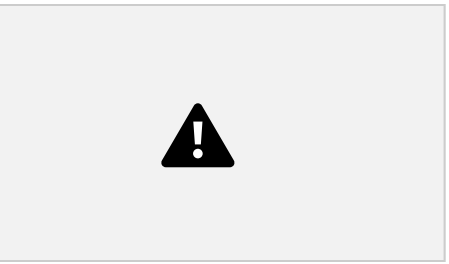
→ ~p

The Laws of Logic



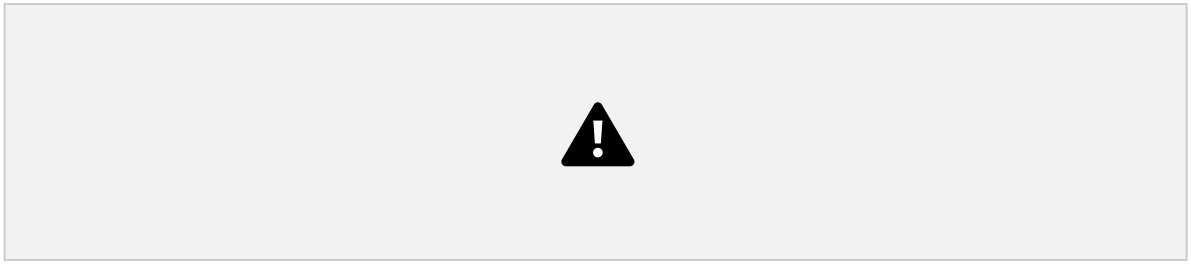






Proof :

P	q	P ∨ q	~(p ∨q)	~p	~q	~(p) ∧~(q)
0	0	0	1	1	1	1
0	1	1	0	1	0	0
1	0	1	0	0	1	0
1	1	1	0	0	0	0

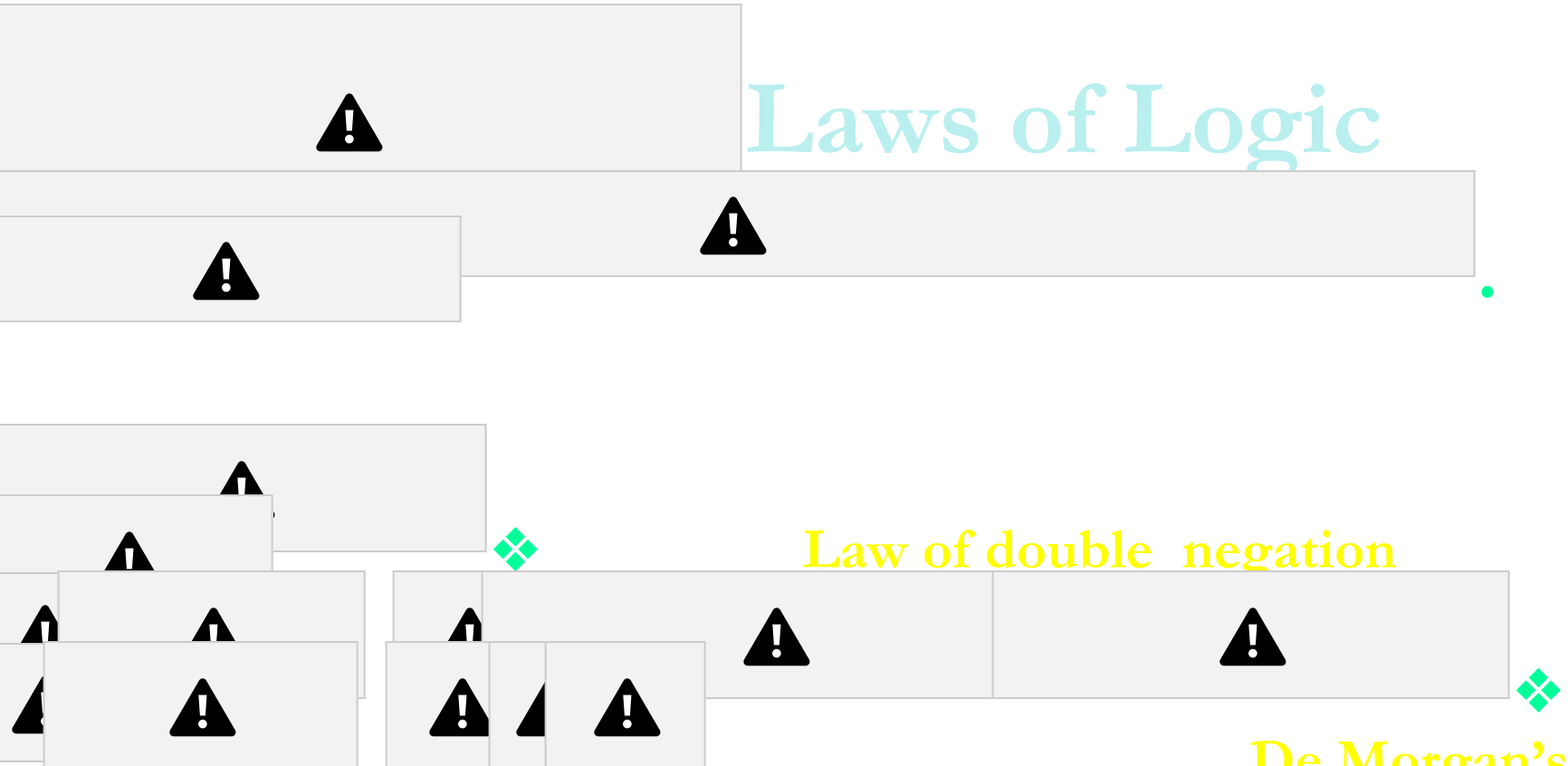


2.

Distributive Law

Laws of Logic

- Law of double negation
- De Morgan's



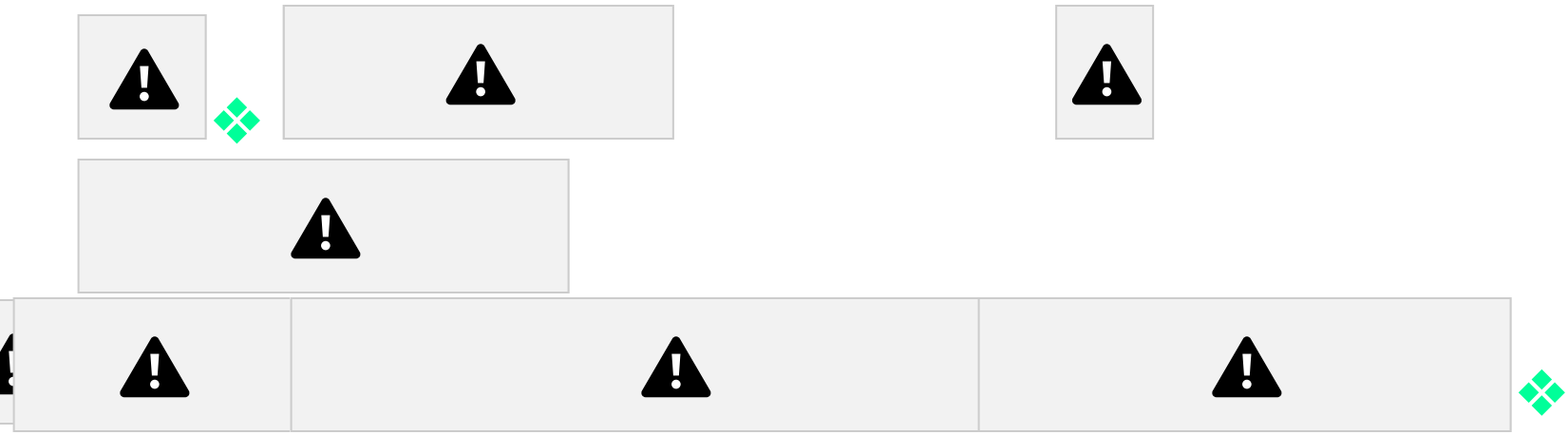
laws

Commutative Laws

Associative Laws

Laws of Logic….

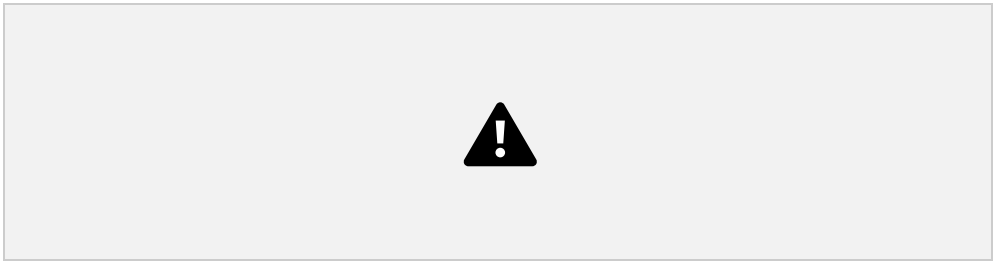
Distributive Laws



Idempotent Laws

Identity Laws

❖ Inverse Laws ❖

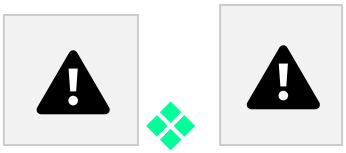


Laws of Logic…

❖

Domination Laws ❖

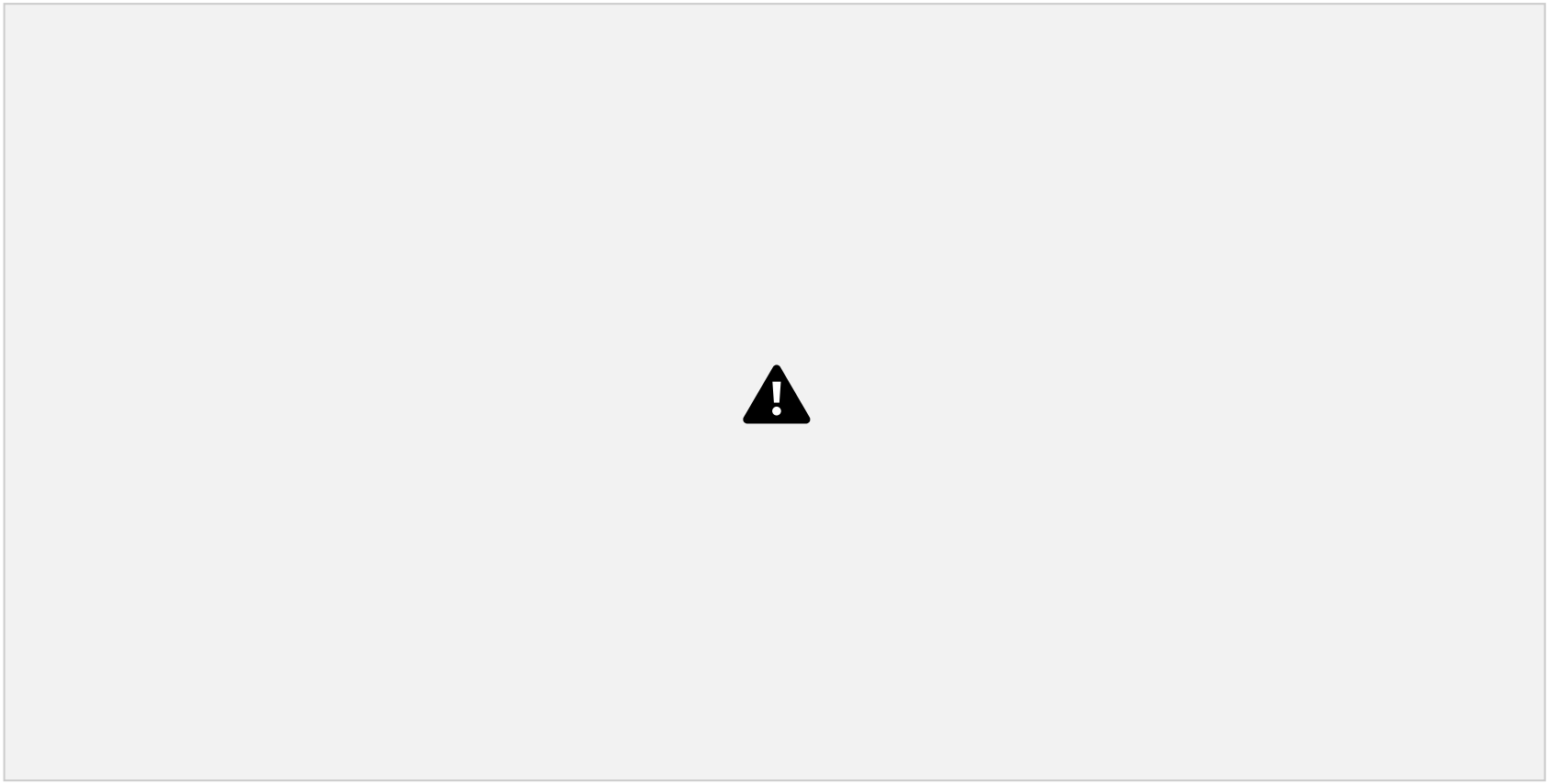
Absorption Laws



Implication Law

Exercise Problems

1.



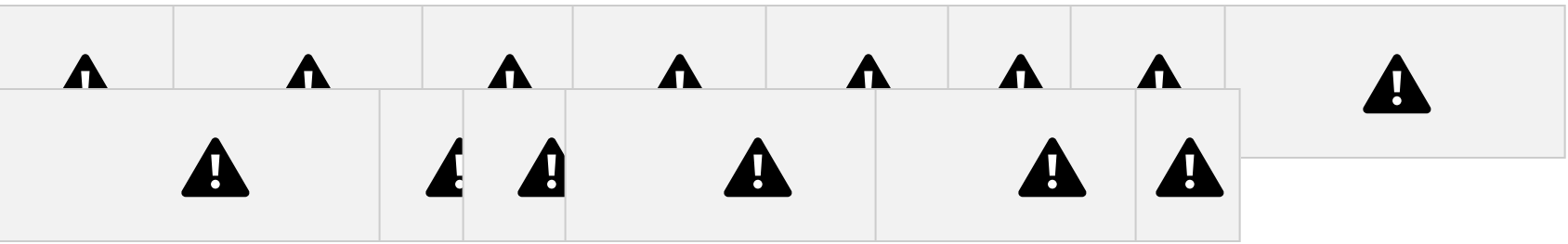
Exercise Problems

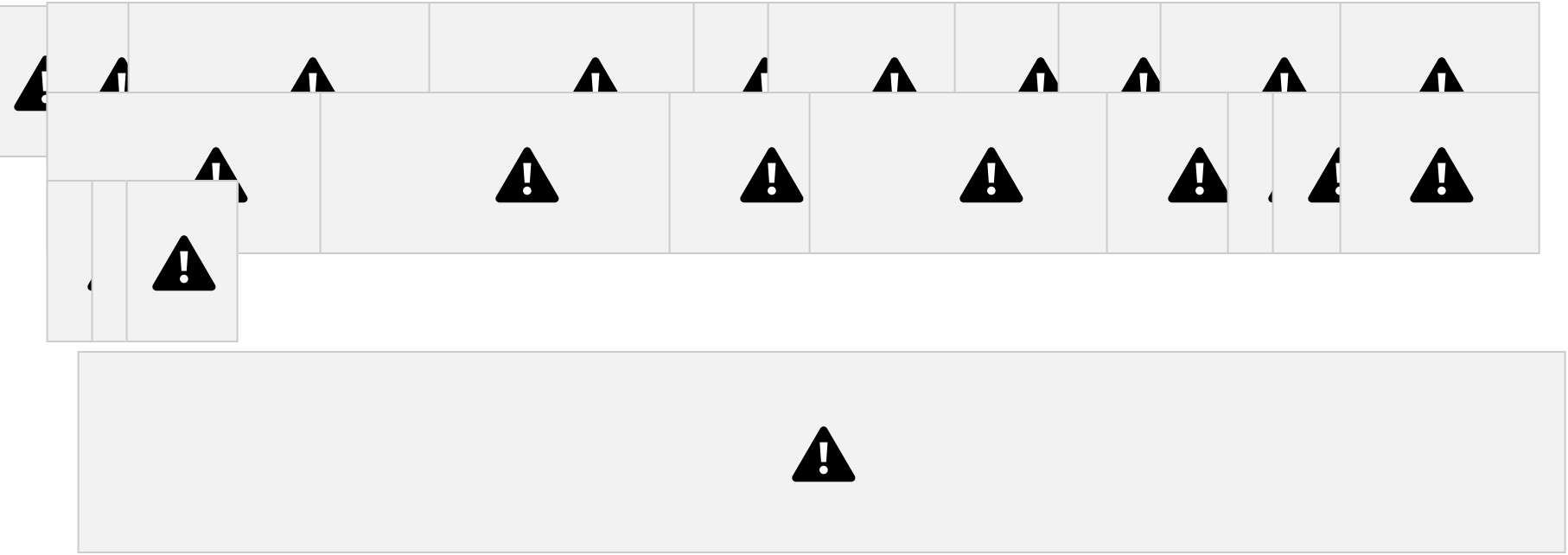
Exercise Problems

Exercise Problems

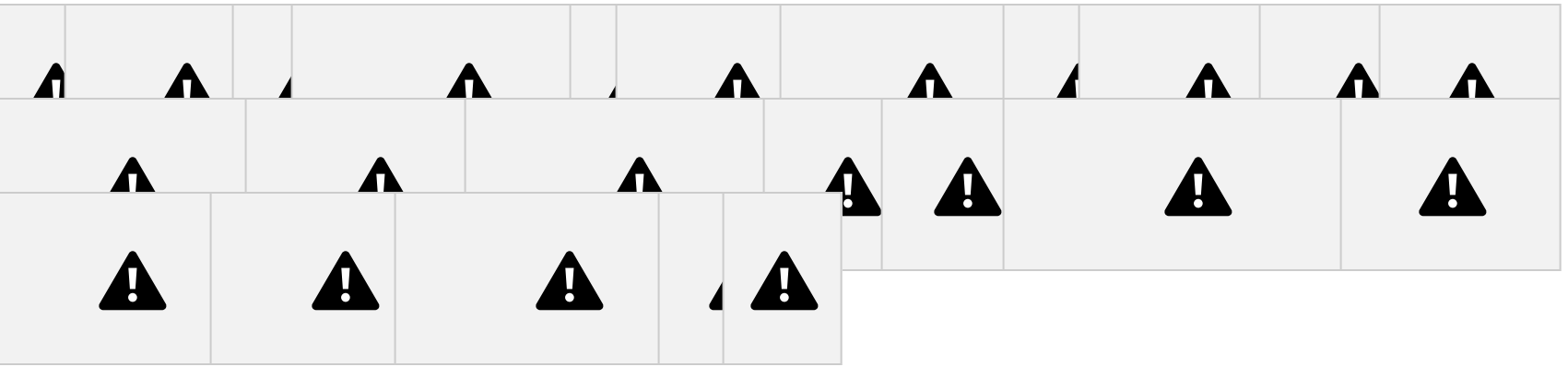
Exercise Problems

Exercise Problem :

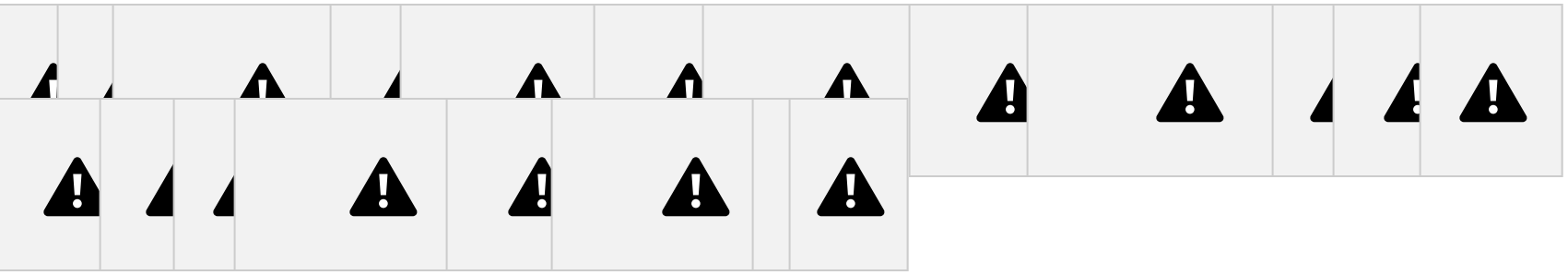




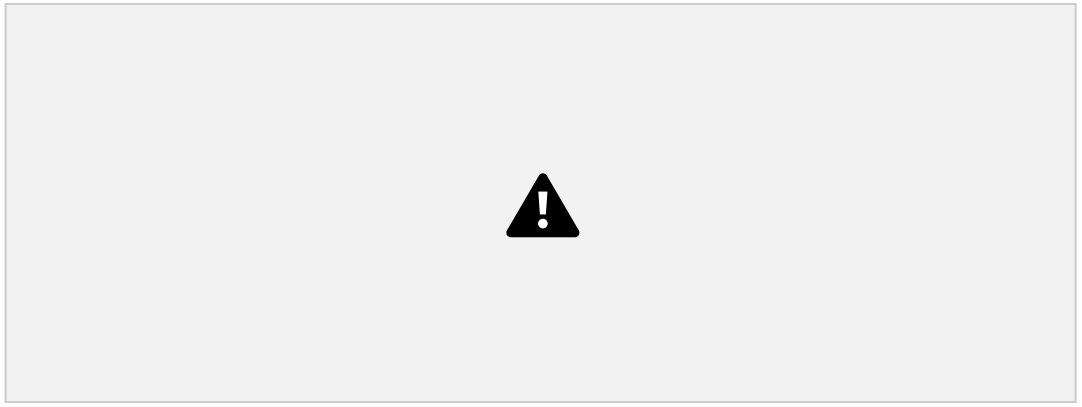
Application to Switching Networks

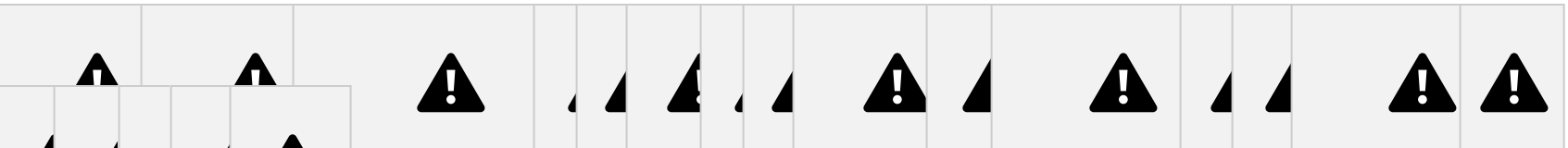


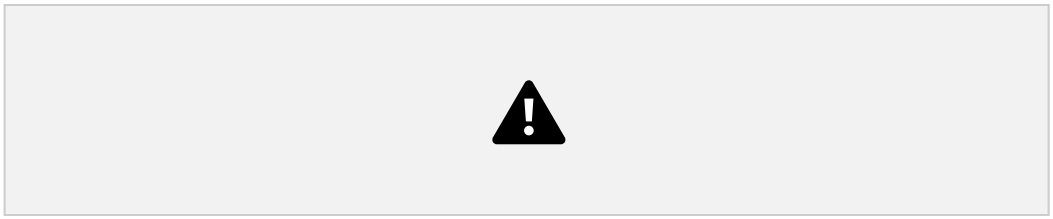
h is op



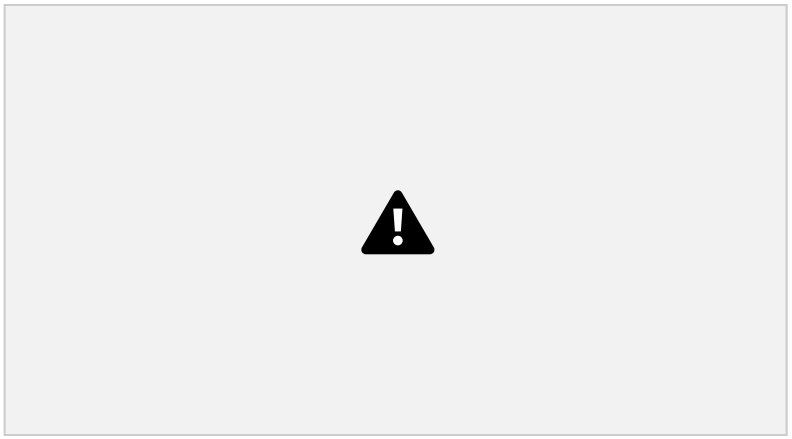
Switching Networks…

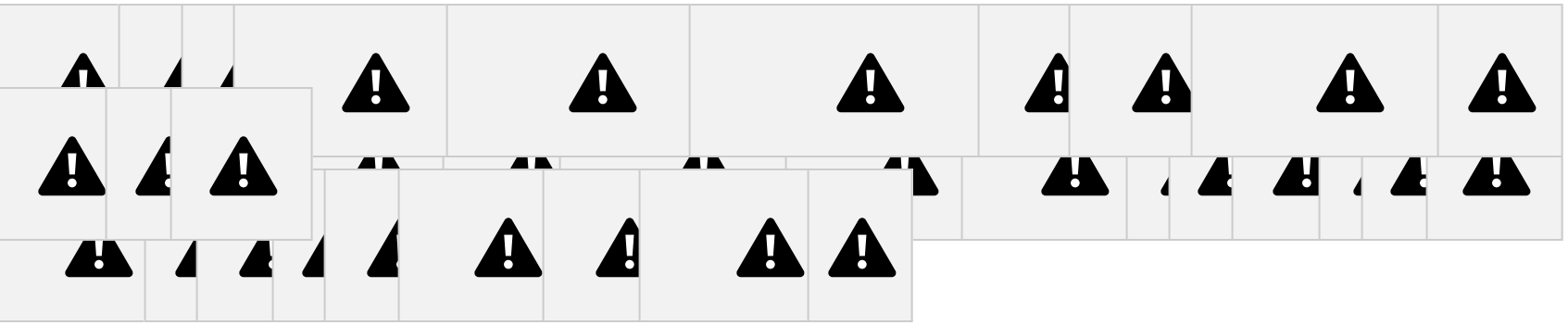






Switching Networks…

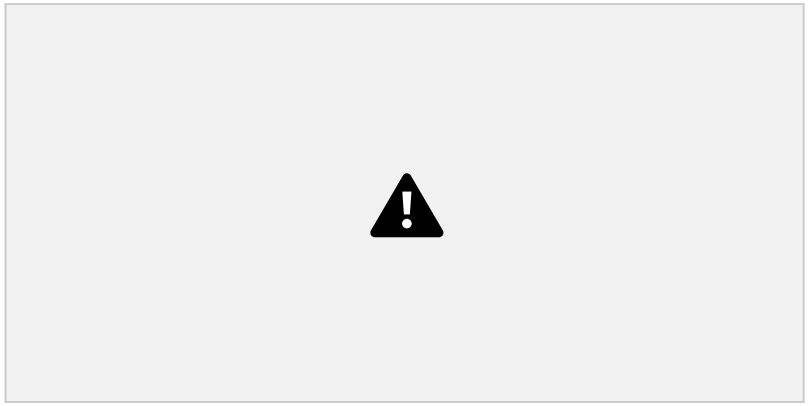




p

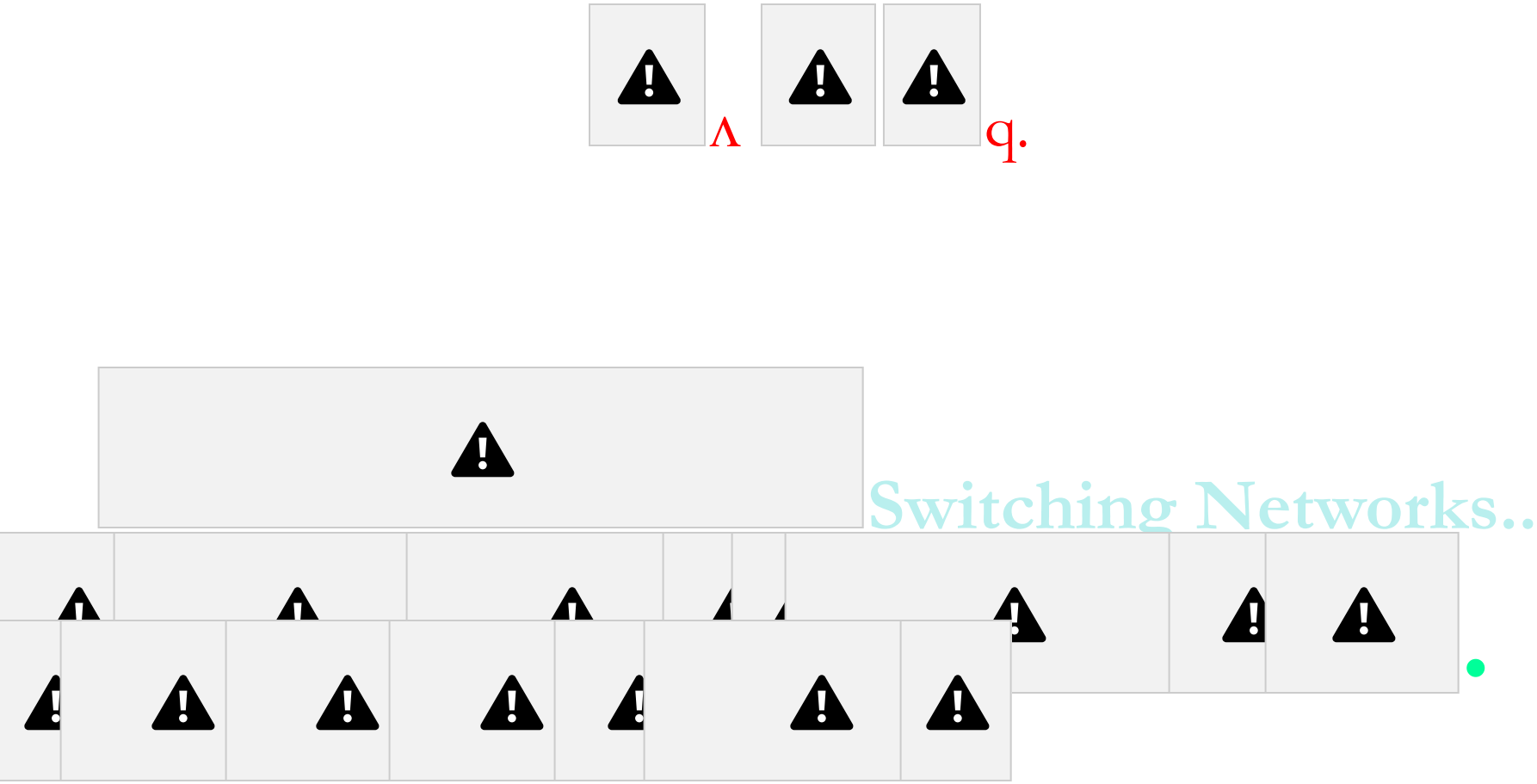
v q

Switching Networks…



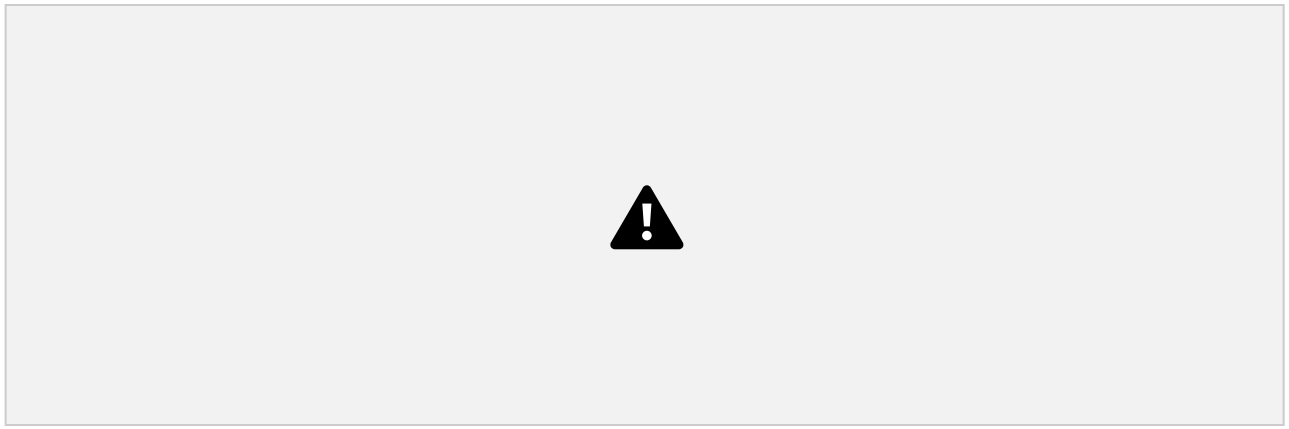
of two

p

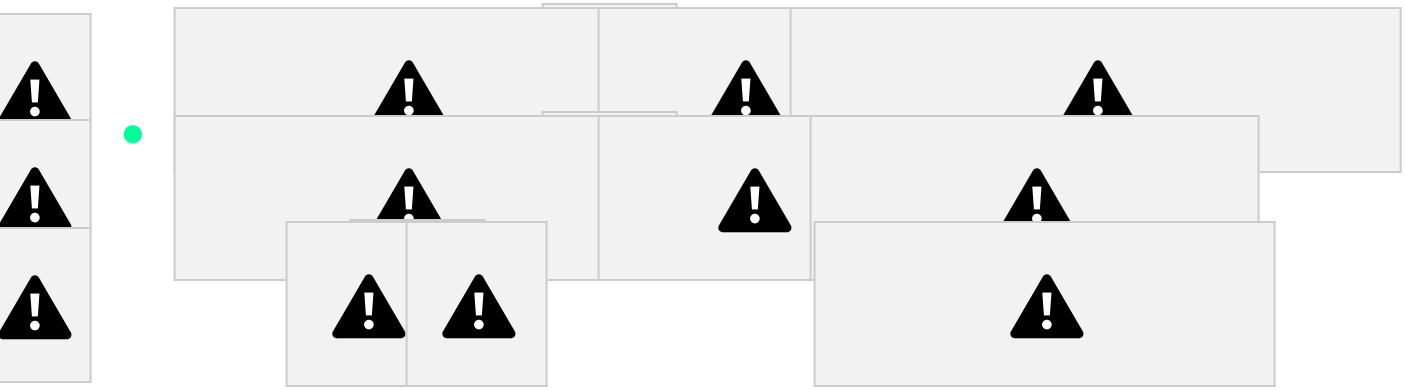

ʌ
q.
Switching Networks..

etwork

Examples:



Solution



commutative Law • Inverse Law

• Identity Law

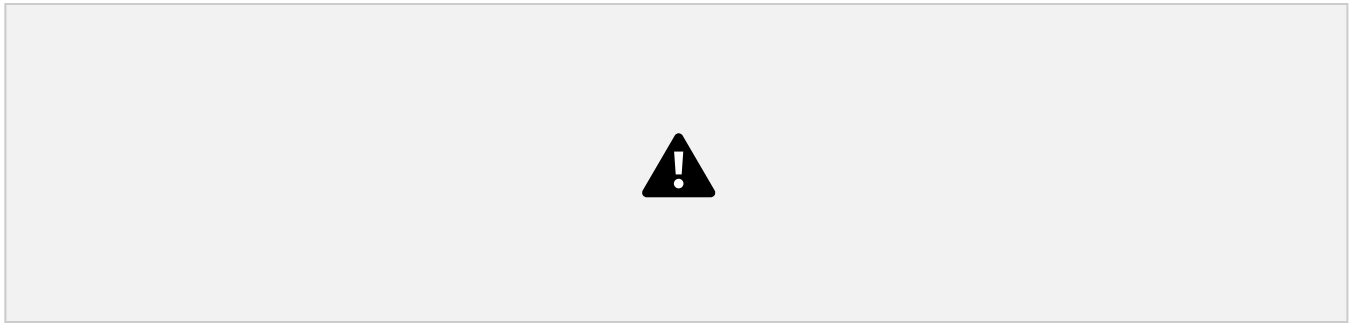
•

•

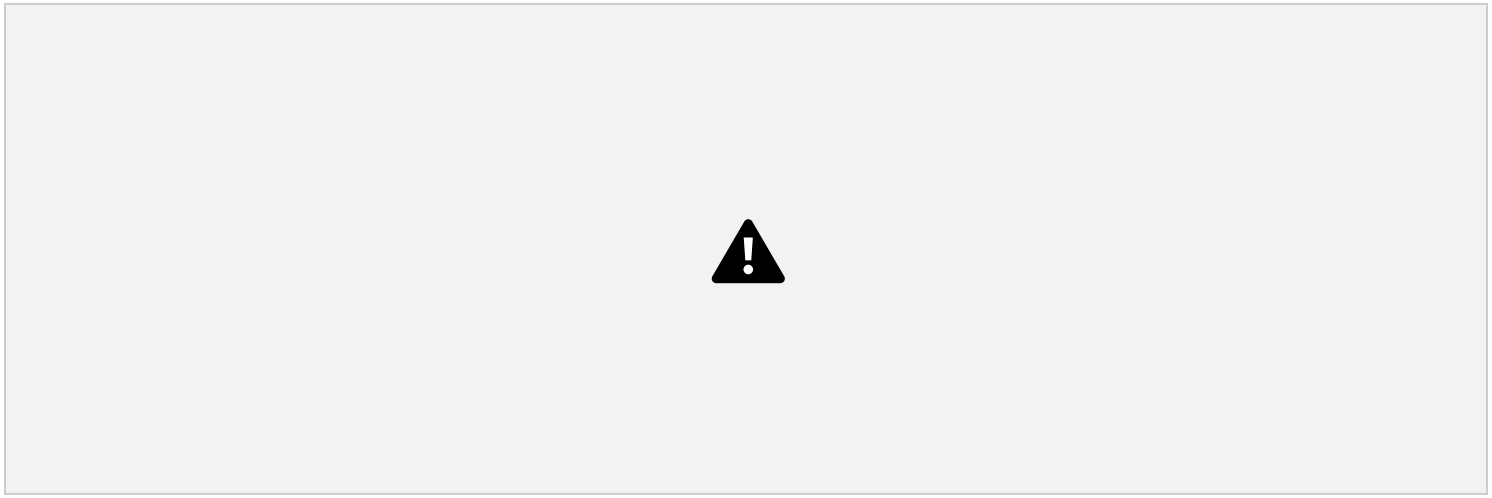
This shows that the given network with 4 switches is

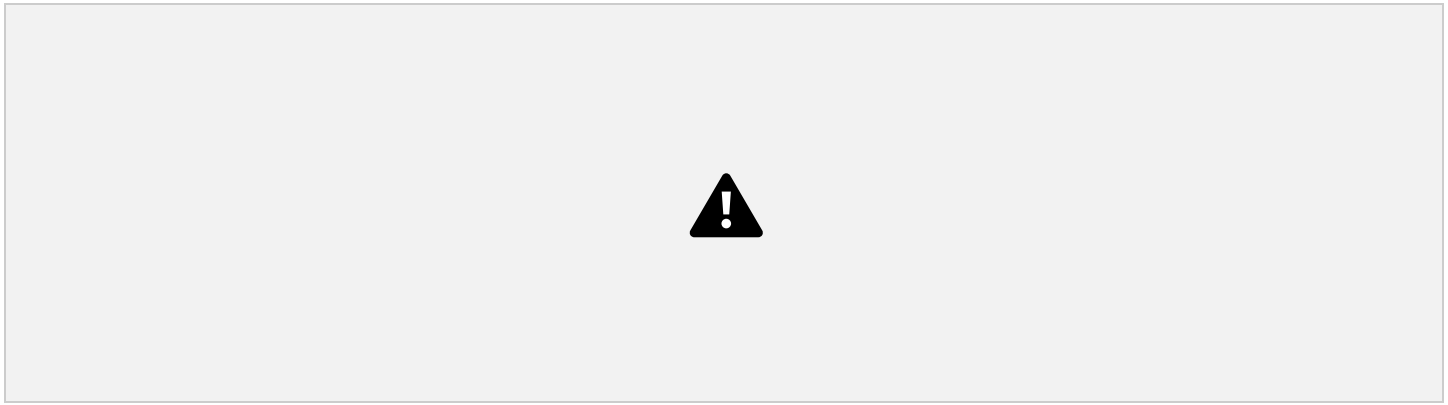
equivalent to a network that contains only one switch.

Example 2…



Example 3 & 4

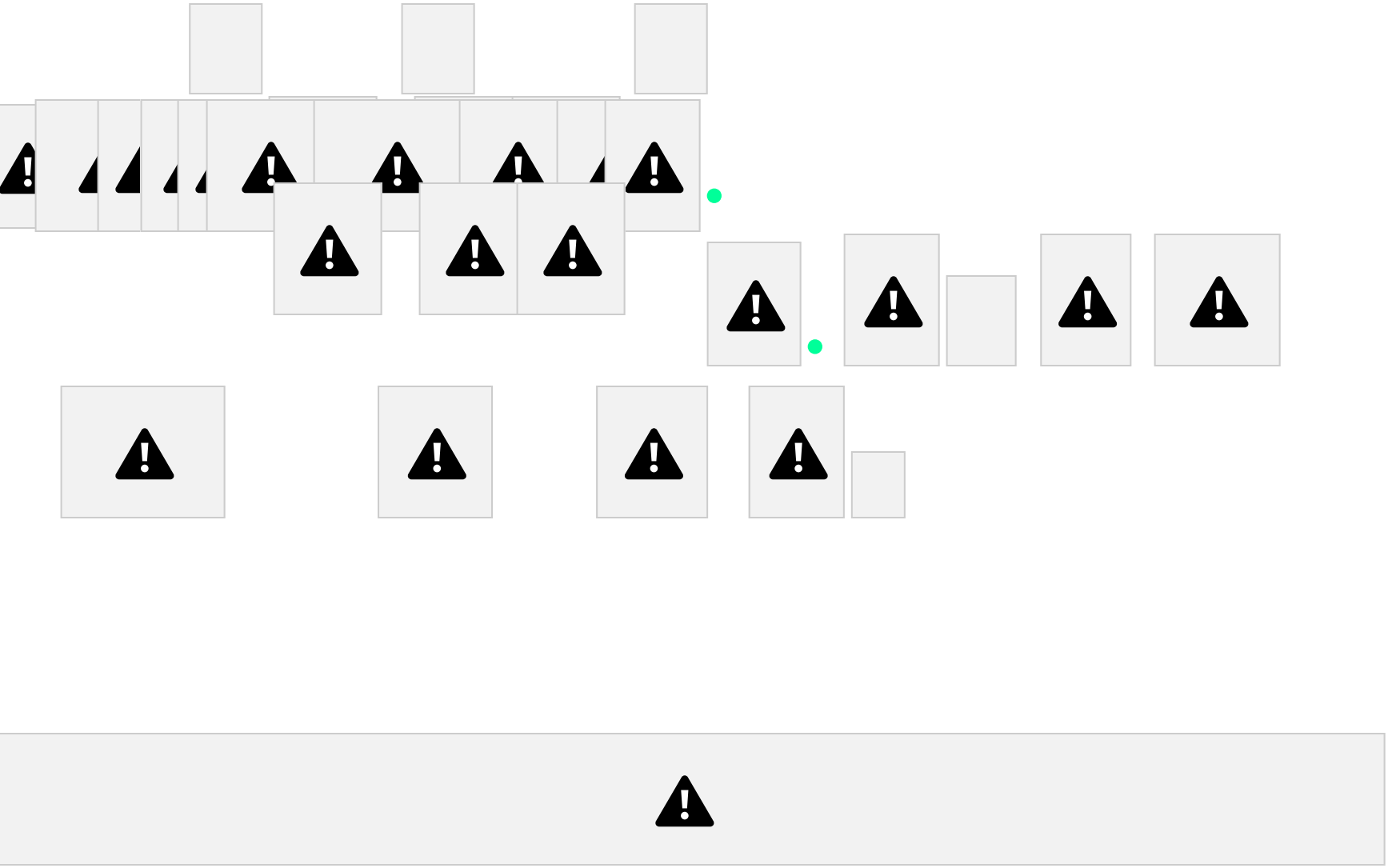




Solution 3

Try It Yourself

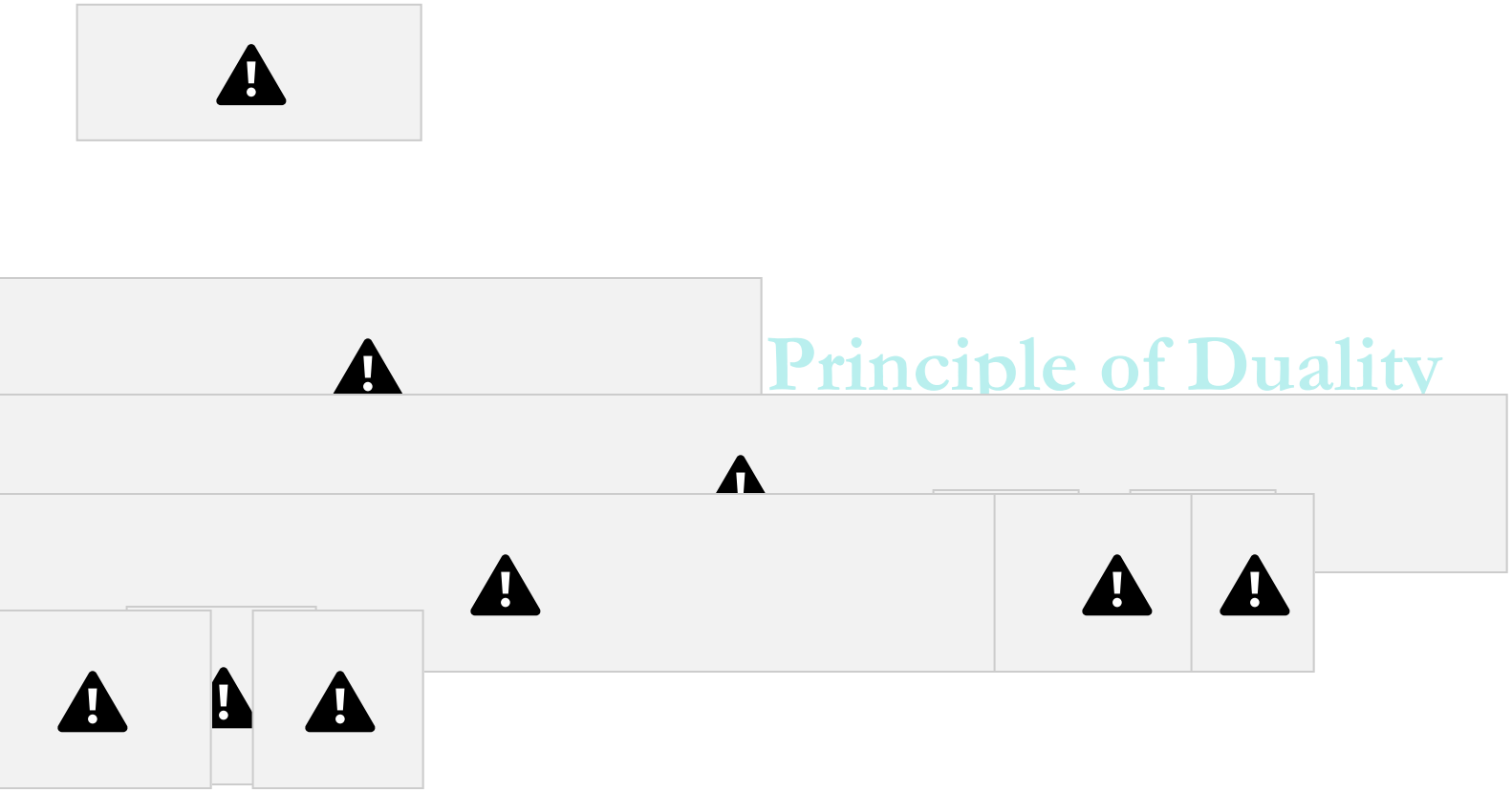
Duality



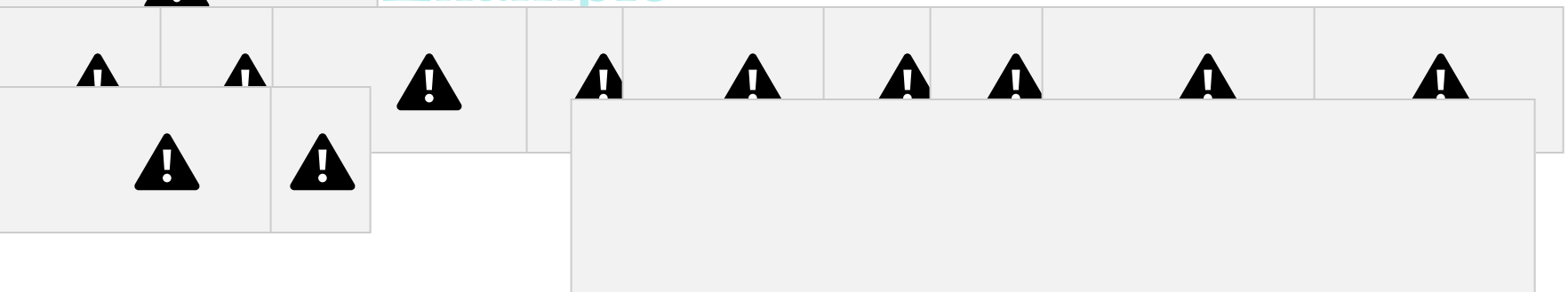
1.

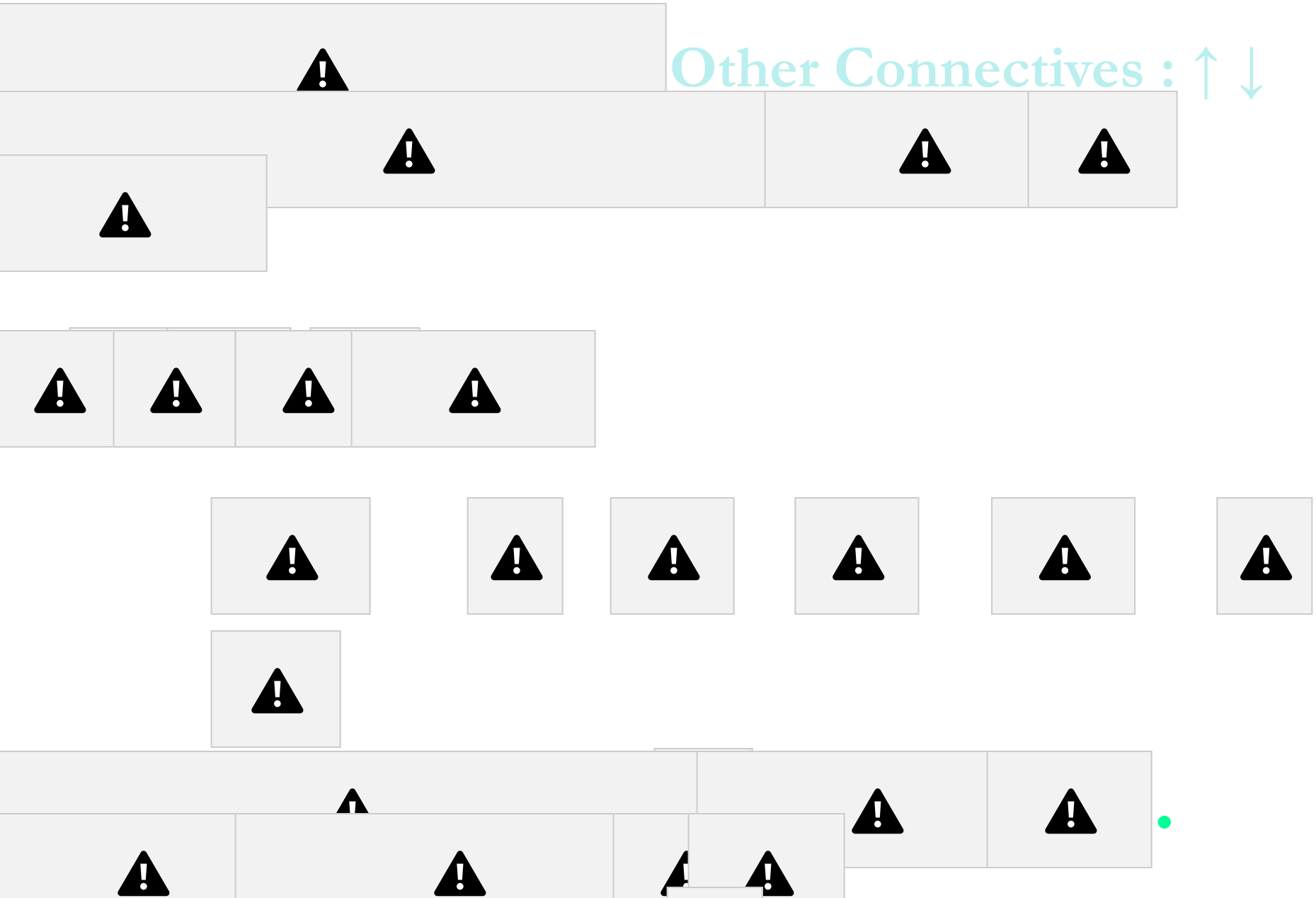
¬p ∧ q

p ∨ ¬q ∧ r


Principle of Duality

Example




Other Connectives : ↑ ↓

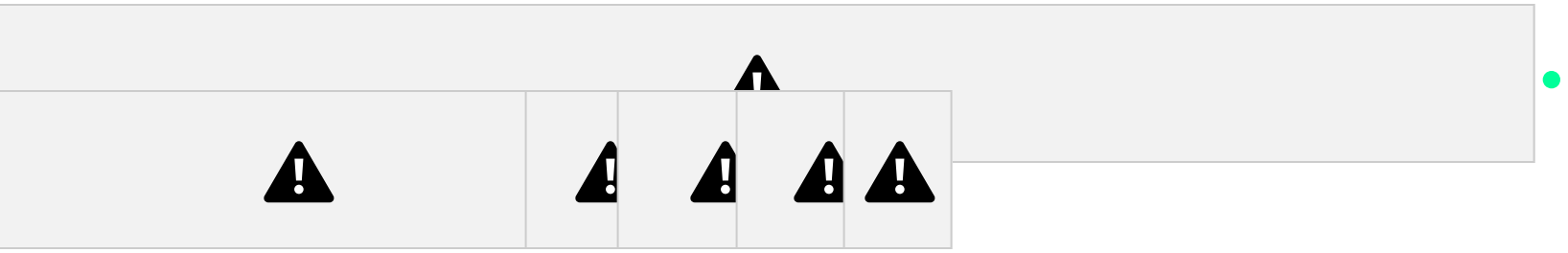
Not

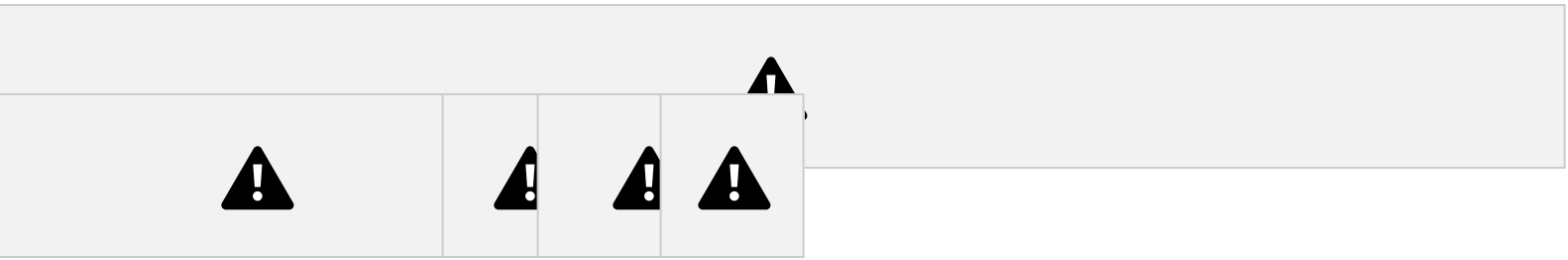
of p and q”

(p ↑ q)

“ Not of p or q”

(p ↓ q)





p	q	¬p	¬q	¬p∨¬q	¬(p ∧ q) ↑	
0	0	1	1	1	1	
0	1	1	0	1	1	
1	0	0	1	1	1	
1	1	0	0	0	0	

$(p \uparrow q)$

$(p \downarrow q)$

Exercise problems:

1.