# Challenges (Answers) ­– 2.4 Computational Logic

**Contents**

[Specification Content: 2](#_Toc445974144)

[Easy challenges! 3](#_Toc445974145)

[Question 1: 3](#_Toc445974146)

[Question 2: 3](#_Toc445974147)

[Question 3: 3](#_Toc445974148)

[Question 4: 3](#_Toc445974149)

[Question 5: 3](#_Toc445974150)

[Medium challenges! 4](#_Toc445974151)

[Question 6: 4](#_Toc445974152)

[Question 7: 4](#_Toc445974153)

[Question 8: 4](#_Toc445974154)

[Question 9: 4](#_Toc445974155)

[Stretch / Extension Challenges! 5](#_Toc445974156)

[Challenge 1: 5](#_Toc445974157)

[Challenge 2: 5](#_Toc445974158)

[Challenge 3: 5](#_Toc445974159)

## Specification Content:

**2.4 Computational logic Learners should have studied the following:**

* Why data is represented in computer systems in binary form
* Simple logic diagrams using the operations AND, OR and NOT
* Truth tables
* Combining Boolean operators using AND, OR and NOT to two levels.

## Easy challenges!

### Question 1:

What is the name of the component that allows us to use electrical pulses in a computer?***(1 mark)***

|  |
| --- |
|  |

### Question 2:

Which of these is not a logic gate? *(Tick the correct box)* ***(1 mark)***

| **Logic Gate** |  | **** |
| --- | --- | --- |
| NOD |  | **** |
| AND |  |  |
| OR |  |  |

### Question 3:

Complete the following truth table for a NOT gate: ***(2 marks)***

| **Input** | **Output** |
| --- | --- |
| 0 | 1 |
| 0 | 0 |

### Question 4:

What does the following notation mean: **A B *(1 mark)***

| **Answer** |  | **** |
| --- | --- | --- |
| NOT A OR B |  |  |
| A OR B |  | **** |
| A AND B |  |  |

### Question 5:

How many rows should an AND gate have in the truth table? ***(1 mark)***

| **Answer** |  | **** |
| --- | --- | --- |
| 1 |  |  |
| 3 |  |  |
| 2 |  | **** |

**TOTAL: \_\_\_\_ / 6**

## Medium challenges!

### Question 6:

How many gates would you expect to draw in a logic circuit for the following statement?***(1 mark)***

**( A B ) C**

| **Answer** |  | **** |
| --- | --- | --- |
| 1 |  |  |
| 2 |  | **** |
| 3 |  |  |

### Question 7:

Draw the logic circuit for the following logic statement:***(6 marks)***

**( A B )**

|  |
| --- |
| Llogic circuit for logic statement ¬ ( A ⋀ B ) |

### Question 8:

Draw the truth table for the following logic statement: ***(5 marks)***

**( A B )**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | A | B | **A B** | **( A B )** | | --- | --- | --- | --- | | 0 | 0 | 0 | 1 | | 0 | 1 | 0 | 1 | | 1 | 0 | 0 | 1 | | 1 | 1 | 1 | 0 | |

### Question 9:

A truth table has 8 inputs and 5 logic gates.  
How many rows will you need for your truth table?   
Show your working. ***(3 marks)***

|  |
| --- |
| Rows = 2number of inputs  Rows = 28  Rows = 256 |

**TOTAL: \_\_\_\_ / 15**

## Stretch / Extension Challenges!

### Challenge 1:

Create a guide on completing truth tables. Show this to 2 other members of your group and see if they like it. Get some peer assessment on it and then redevelop it as needed.

### Challenge 2:

1. Create a logic circuit and truth table for the following logic statement:

**(( A B ) C)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Logic circuit for logic statement ¬ (( A ⋀ B ) ⋀ C)   | **A** | **B** | **C** | **A B** | **( A B ) C)** | **(( A B ) C)** | | --- | --- | --- | --- | --- | --- | | 0 | 0 | 0 | 0 | 0 | 1 | | 0 | 0 | 1 | 0 | 0 | 1 | | 0 | 1 | 0 | 0 | 0 | 1 | | 0 | 1 | 1 | 0 | 0 | 1 | | 1 | 0 | 0 | 0 | 0 | 1 | | 1 | 0 | 1 | 0 | 0 | 1 | | 1 | 1 | 0 | 1 | 0 | 1 | | 1 | 1 | 1 | 1 | 1 | 0 | |

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