IP addresses: 1

Practice 1

Select the **two** statements about IP addresses which are correct.

- [ ] Mobile phones do not have IP addresses
- [ ] IP addresses are assigned to a device by the manufacturer and can't easily be changed
- [ ] An example of an IP address is `192.168.4.23`
- [ ] Every device connected to the internet has an IP address

Application layer protocols

Practice 2

A protocol is a set of rules that determines how two devices will communicate. Most network communications rely on sets of protocols that are organised in layers.

Name one network protocol that resides on the application layer of the TCP/IP model and briefly describe what it is used for.

[2 marks]

Quiz:
STEM SMART Computer Science Week 15

Von Neumann architecture 3

Practice 1

John von Neumann proposed a general purpose computer that is sometimes referred to as the "three box model". Which of the following statements provides a correct definition of a von Neumann machine?

- A processor, main memory, and secondary storage linked by a system bus
- A processor, clock, and main memory linked by a system bus
- A processor, main memory, and I/O controllers linked by a system bus
- A processor, cache, and main memory linked by a system bus

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Special purpose registers

Practice 2

Which sentence below best describes dedicated (special-purpose) registers?

- Registers that hold memory addresses.
- Registers that are used to store the results of intermediate calculations.
- Registers that have a specific role in the fetch-execute cycle.
- Registers that is defined in software and can be customised by the user.

Quiz:
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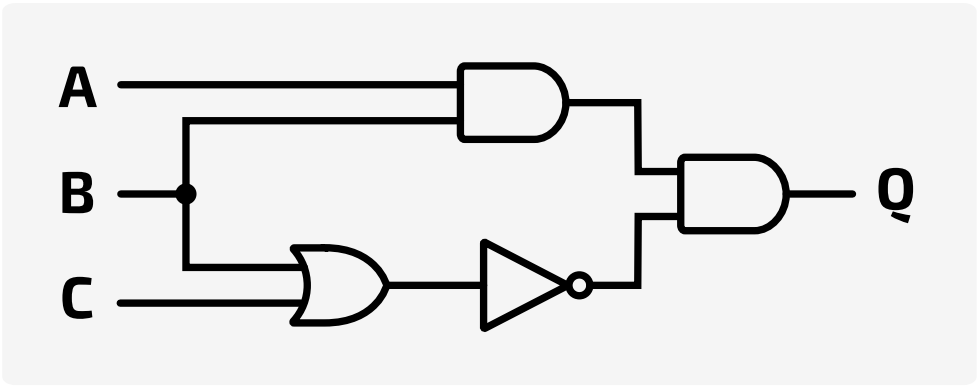
Logic circuit for expression

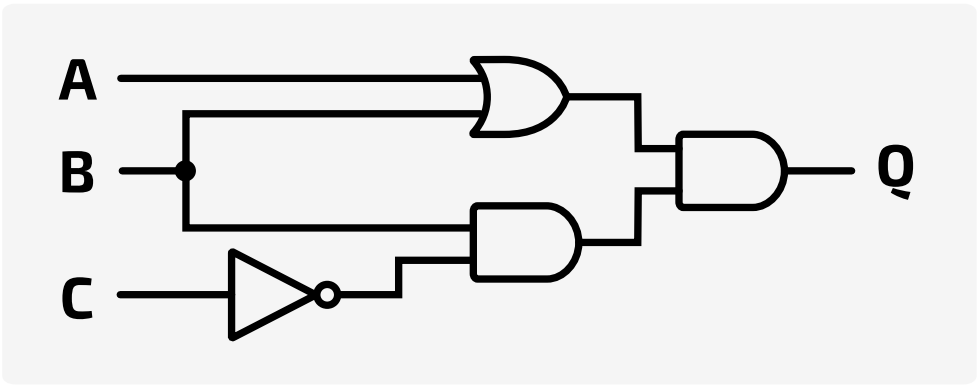
Challenge 2

Which of the circuits below represents the following Boolean expression?

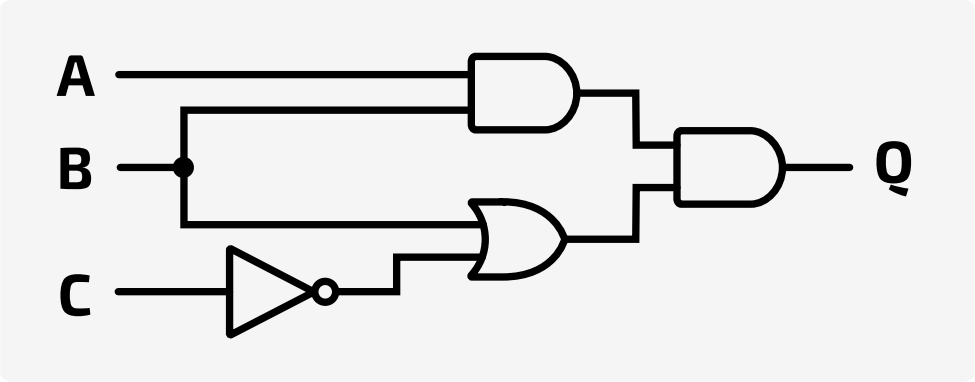
$Q = (A \wedge B) \wedge (\neg C \vee B)$



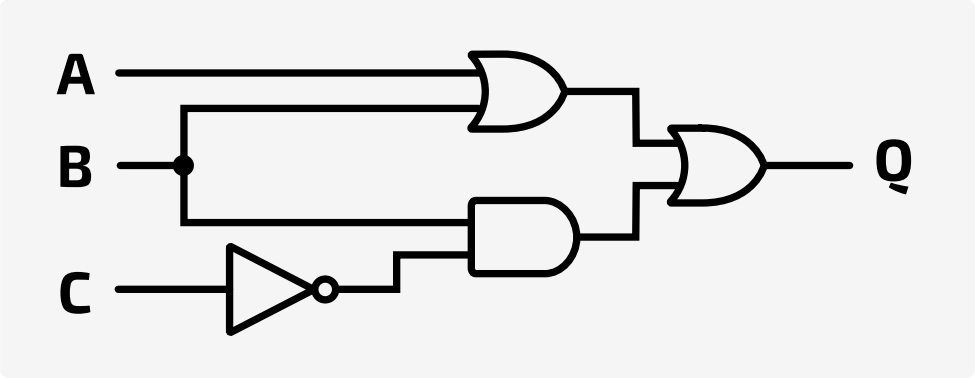
Option A



Option B



Option C



Option D

- Option A
- Option B
- Option C
- Option D

Quiz:
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Complete truth table for logic circuit 2

Practice 2

Study the logic circuit shown in **Figure 1** and the truth table below.

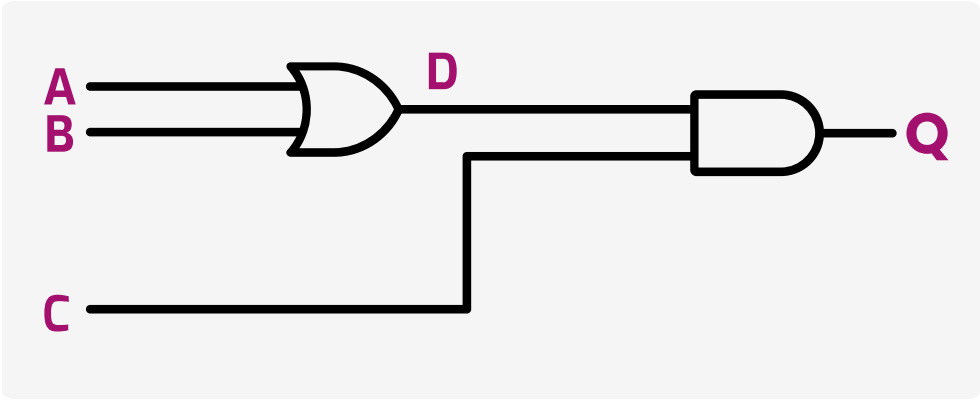

Figure 1: A circuit diagram

Complete the truth table for the logic circuit diagram in **Figure 1**. The column **D** represents the output of the logic gate with inputs A and B. The final output is in column **Q**.

A	B	C	D	Q
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

Quiz:
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Expression for problem 2

Challenge 1

A library system needs to indicate if a user is allowed to borrow a book. The decision is based on several criteria.

- No one can borrow a book if they have an unpaid fine on their account.
- The maximum number of books a user can borrow is six unless they are an A level student or they have been waiting for the book for more than four weeks.

The following inputs represent the listed conditions:

- F - True if there is an unpaid fine (F) on the account.
- L - True if the account has six or more books on loan (L).
- A - True if the account belongs to an A level (A) student.
- W - True if the book was requested more than 4 weeks (W) ago.

The output B will be True if the student is allowed to borrow the book (B).

Choose the correct Boolean expression to match the logic of the problem statement.

- $B = \neg F \vee (W \vee A \vee \neg L)$
- $B = \neg F \vee (W \wedge A \wedge \neg L)$
- $B = F \wedge (W \vee A \vee \neg L)$
- $B = F \wedge (W \vee A \vee L)$
- $B = \neg F \wedge (W \vee A \vee \neg L)$
- $B = \neg F \wedge (W \vee A \vee L)$

Quiz:
STEM SMART Computer Science Week 15

Two's complement: binary to denary 2

Practice 1

Convert the binary number 00101011 to denary. The binary value is encoded as an 8-bit **two's complement** number.

Type your answer as a **signed decimal number** (e.g. $+3.75$). Do not leave any spaces in your answer.

Quiz:
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Two's complement: smallest to largest

Practice 2

The integers shown below are represented using **two's complement**.

The smallest number is defined as the **negative number that is furthest away from 0** on the number line, and the largest number is defined as the **positive number that is furthest away from 0** on the number line.

A number line

Put the following two's complement numbers into order from **smallest** to **largest**. The smallest number should appear at the top of the list and the largest number at the bottom of the list.

Available items

- `11111111`
- `11001110`
- `01111111`
- `01001110`
- `10000000`

Quiz:
STEM SMART Computer Science Week 15

Two's complement: range 1

Practice 1

Signed integers can be stored in two's complement form. What is the range of values that can be stored using 8 bits in two's complement?

- +255 to -256
- +127 to -128
- +256 to -256
- +128 to -128