

# Truth table for logic gate 1

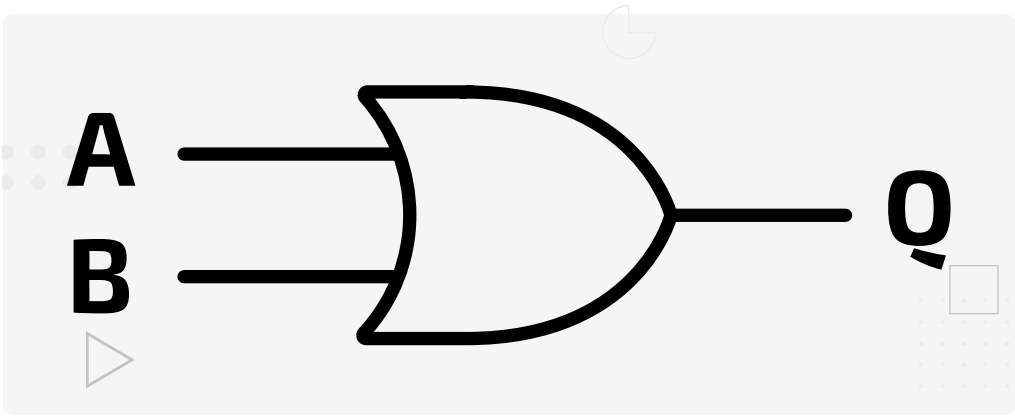


Figure 1: A logic gate

Select the correct truth table for the logic gate represented by the symbol in Figure 1.

☐

A	B	Q
0	0	0
0	1	0
1	0	0
1	1	1

☐

A	B	Q
0	0	0
0	1	1
1	0	1
1	1	1

☐

A	B	Q
0	0	0
0	1	1



1	0	1
1	1	0
A		Q
0		1
1		0

# Truth table for logic gate 8



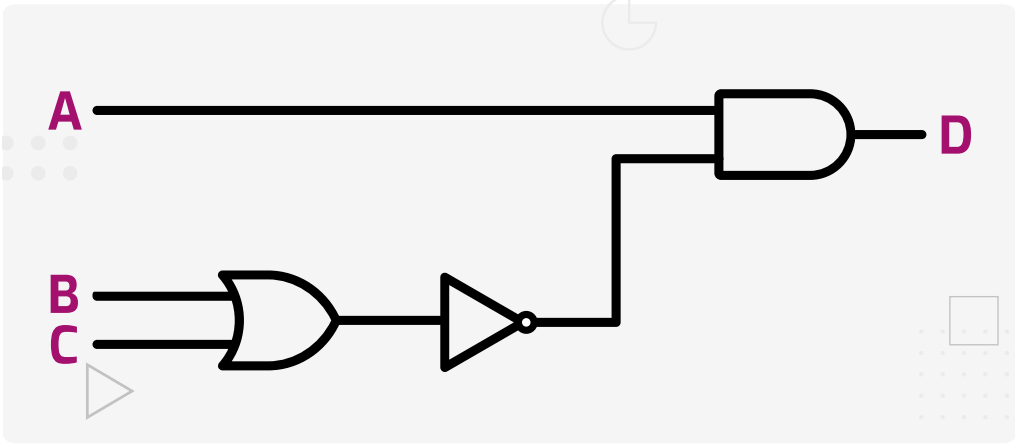
Which logic gate does the truth table below represent?

A	B	Q
0	0	0
0	1	1
1	0	1
1	1	0

- ☐ NAND
- ☐ XOR
- ☐ OR
- ☐ NOR

# Trace a logic circuit

Consider the logic circuit and its truth table shown below.



Circuit diagram

The truth table for the circuit is:

0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	0
1	1	1	0

If all inputs (A, B, C) are 1 (True), what will the output (D) of the circuit be?

☐ 1 (True)

☐ 0 (False)



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# Boolean operator precedence 2



Boolean operators have an order of precedence which is taken into account when an expression is evaluated. Some operators have equal precedence.

The groups below contain **sets of operators with equal precedence**. Drag the groups into order so that the group with the highest precedence is at the top, and the group with the lowest precedence is at the bottom.

### Available items

BRACKETS

NOT

OR, NOR, XOR

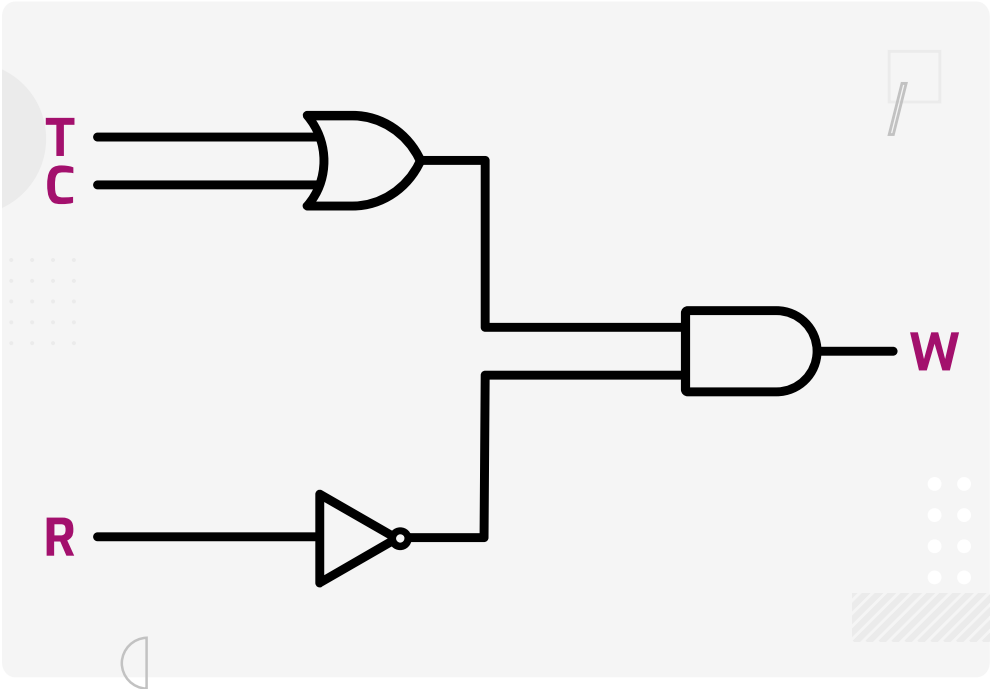
AND, NAND

# Logic circuit for problem

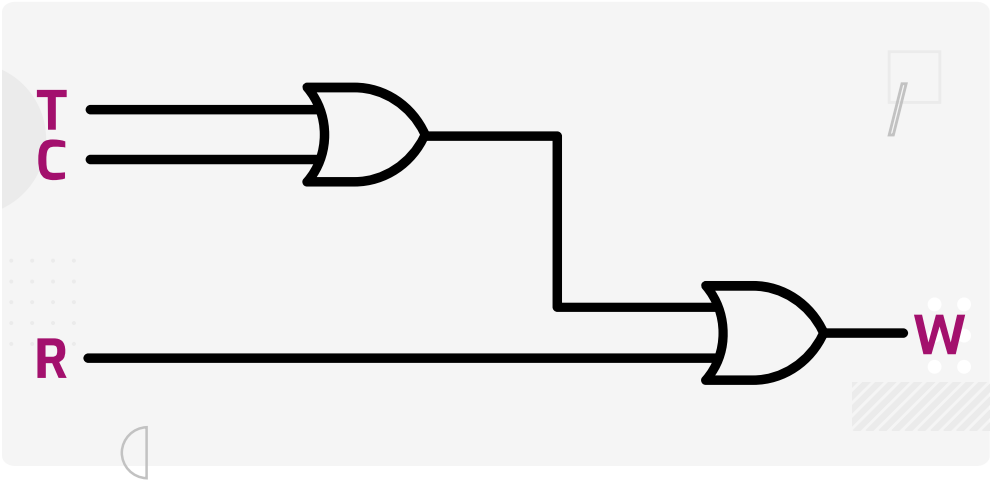


A watering sprinkler (W) is on when the timer (T) is set, the temperature (C) exceeds 26° Celsius, and the rain sensor (R) does not detect rainfall.

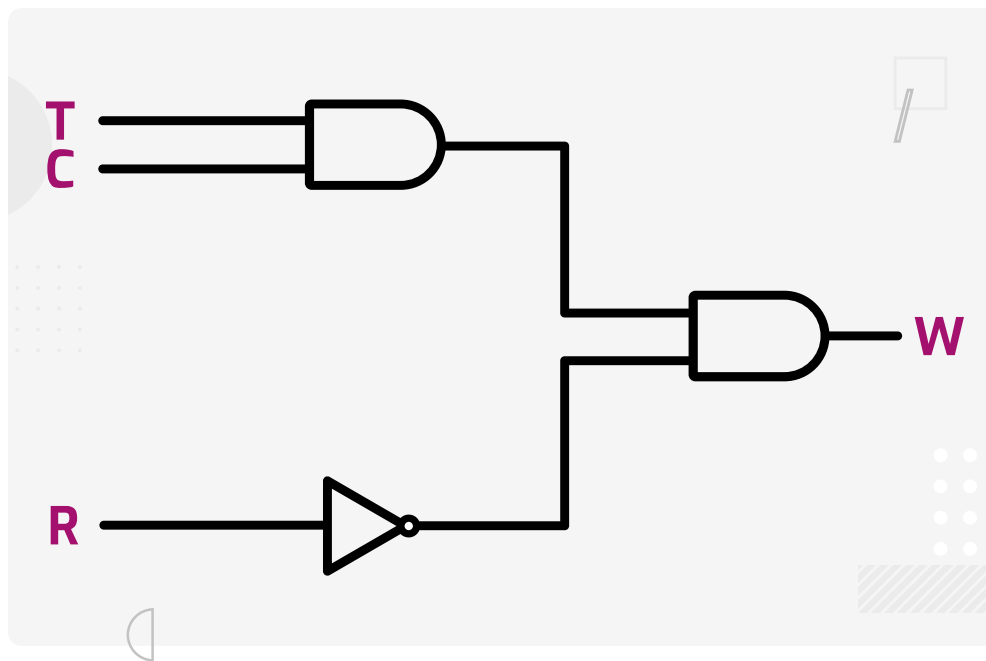
Select the logic circuit diagram that corresponds to the circuit for the sprinkler.



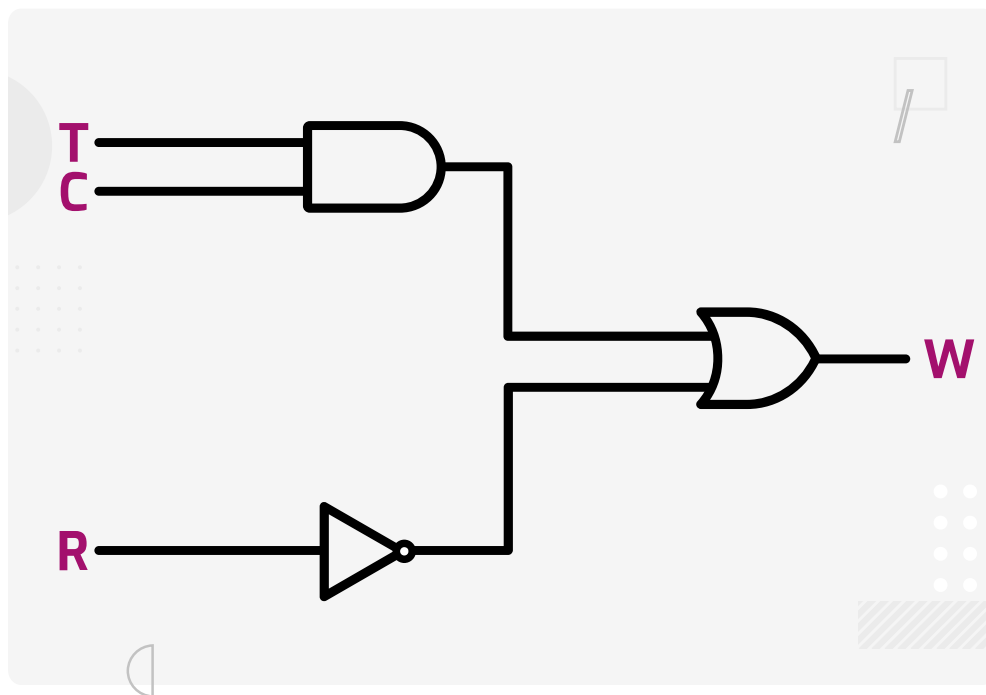
Option A circuit diagram



Option B circuit diagram



Option C circuit diagram



Option D circuit diagram

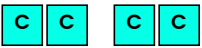
Select the correct logic diagram for the sprinkler.

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



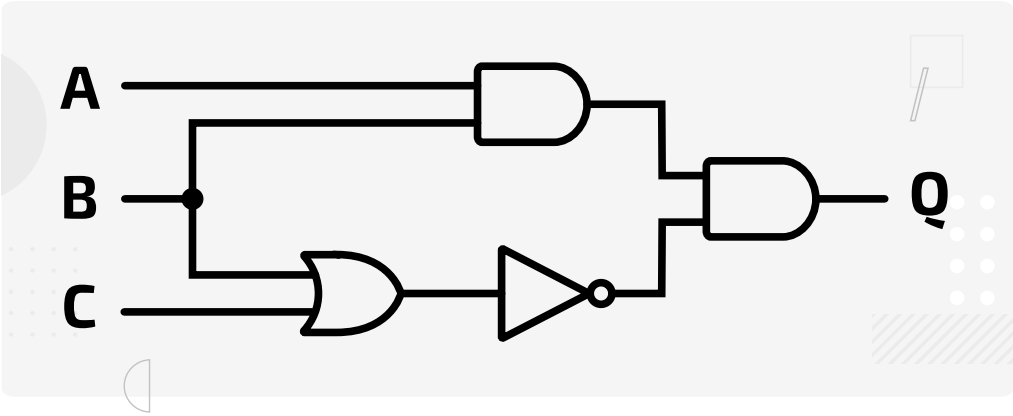


# Logic circuit for expression

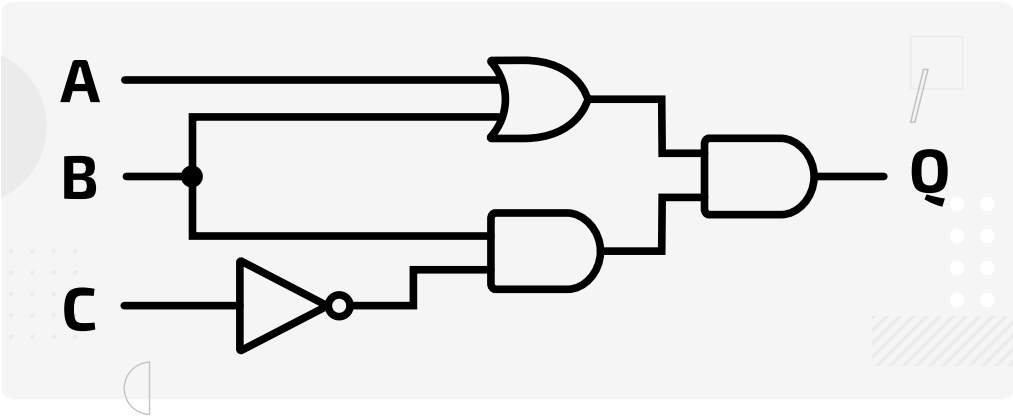


Which of the circuits below represents the following Boolean expression?

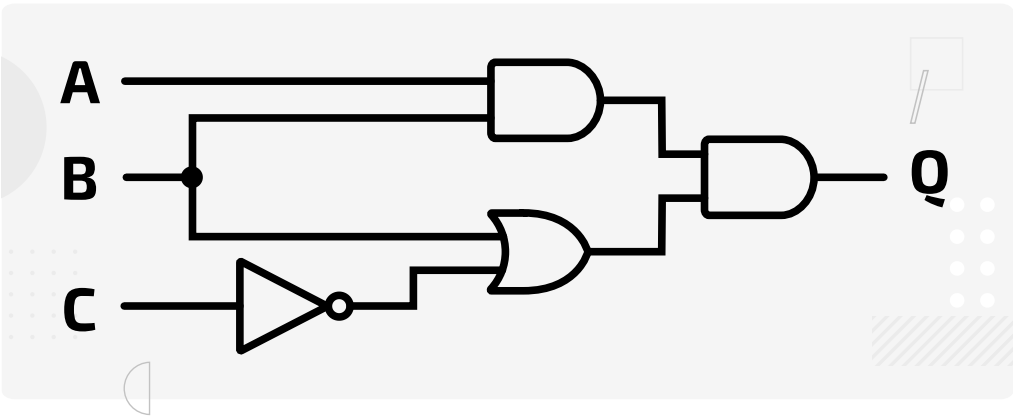
$$= (A \wedge B) \wedge (\neg C \vee B)$$



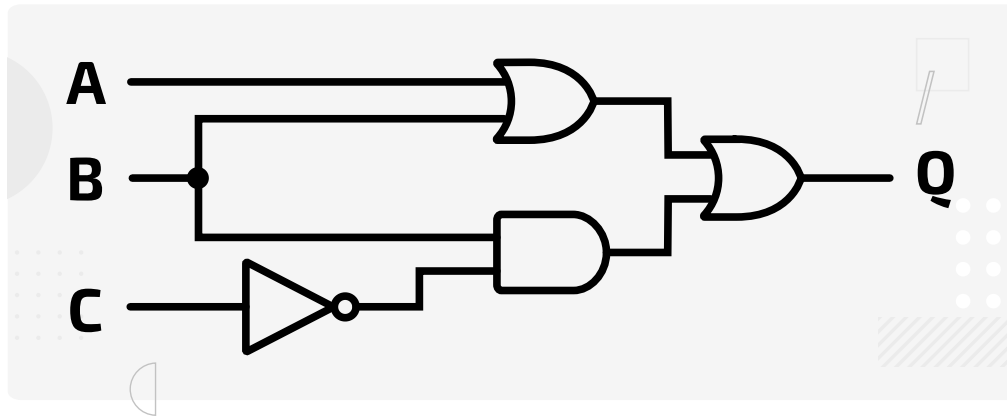
Option A



Option B



Option C



Option D

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

# Expression for truth table 3

Select the Boolean expression that corresponds to this truth table:

INPUTS		OUTPUT
A	B	Q
0	0	1
0	1	1
1	0	1
1	1	0

Select the correct Boolean expression for the given truth table.

- ☐ Q = A AND (NOT B)
- ☐ Q = NOT (A OR B)
- ☐ Q = (NOT A) OR B
- ☐ Q = NOT(A AND B)

Expression for problem 1

A Level

c

c

The offices at the Raspberry Pi Foundation have a security alarm that is set automatically each evening at 6.00pm. If the alarm is armed and a person is detected in the building, the alarm sounds (really loudly!).

Sensing that there could be a problem with the automatic alarm, the clever technicians at Raspberry Pi made it so that the alarm will not be armed at 6.00pm if someone is still in the building. Instead, there is a manual switch that can be used to set the alarm once the last person leaves.

- The evening time ( $E$ ) is set to True when it is 6.00pm.
- The person detector ( $P$ ) is set to True when someone is in the building.
- The manual switch ( $M$ ) is set to True when the alarm is turned on manually.

Complete the Boolean expression for the alarm ( $A$ ) to be set to True (and armed) when it is manually switched on, or if everyone has left the building at 6.00pm.



The following symbols may be useful:  $A$ ,  $E$ ,  $M$ ,  $P$

# Truth table to match problem 1

Lucia has made a circuit to control her garden lights. The circuit will have a switch, a light sensor, and a rain sensor. The lights will come on when the lights are switched on or the light sensor detects that it is sufficiently dark. They will not come on at all if it is raining.

- The switch ( $S$ ) returns 1 when the switch is set on
- The light sensor ( $L$ ) returns 1 when it is light outside
- The rain sensor ( $R$ ) returns 1 when it is raining

When the input to the garden lights ( $G$ ) is 1, the lights will turn on.

Which of the following options shows the truth table for the circuit?

☐

$S$	$L$	$R$	$G$
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1

☐

$S$	$L$	$R$	$G$
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1

○

<i>S</i>	<i>L</i>	<i>R</i>	<i>G</i>
1	0	1	0
1	1	0	1
1	1	1	0
<i>S</i>	<i>L</i>	<i>R</i>	<i>G</i>
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

○

<i>S</i>	<i>L</i>	<i>R</i>	<i>G</i>
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	0

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# Truth table for expression 1

A truth table can be used to check the logic of a Boolean expression. Consider the following expression:

$$Q = R \vee (S \wedge \neg T)$$

Create a truth table for the expression. There are three rows in the truth table which produce an output ( $Q$ ) of 0. What are the values of  $R$ ,  $S$ , and  $T$  for these three rows?

- ☐  $R = 1; S = 0; T = 1$   
 $R = 1; S = 1; T = 0$   
 $R = 1; S = 1; T = 1$
- ☐  $R = 0; S = 0; T = 0$   
 $R = 0; S = 0; T = 1$   
 $R = 0; S = 1; T = 1$
- ☐  $R = 1; S = 0; T = 1$   
 $R = 0; S = 0; T = 1$   
 $R = 0; S = 1; T = 0$
- ☐  $R = 0; S = 0; T = 0$   
 $R = 0; S = 0; T = 1$   
 $R = 0; S = 1; T = 0$