This reading describes how the three logical *operators*—**AND**, **OR**, and **NOT**—work when one or both of their operands are **NULL**.

Many misunderstandings about **NULL**s in Boolean logic arise when you confuse **NULL**with **false**. So remember: **NULL**does *not*mean **false**; it means “unknown.”

The examples below use this sample table, which is not available to query in the VM:

| **name** | **age** | **siblings** |
| --- | --- | --- |
| An | 8 | 1 |
| Belinda | NULL | 3 |
| Chand | 3 | NULL |
| Delmar | NULL | NULL |
| Enise | 1 | 2 |

The **AND**Operator

For an **AND**expression to return **true**, the operands on both sides must be **true**. On the other hand, if either expression is **false**, then the expression returns **false**.

This means, if one operand is **NULL**and the other is **true**, then the **AND**expression returns **NULL**. If one operand is **NULL**and the other is **false**, then it returns **false**. If both operands are **NULL**, it returns **NULL**.

| **Expression** | **Value** |
| --- | --- |
| **true AND NULL** | **NULL** |
| **false AND NULL** | **false** |
| **NULL AND NULL** | **NULL** |

Look in the example table above for children that you know are under the age of two *and*have more than one sibling. Which can you say definitely *do*or *do not*match the criteria?

Here are the results:

| **name** | **age < 2** | **siblings > 1** | **age < 2 AND siblings > 1** |
| --- | --- | --- | --- |
| An | false | false | false |
| Belinda | NULL | true | NULL |
| Chand | false | NULL | false |
| Delmar | NULL | NULL | NULL |
| Enise | true | true | true |

The **OR**Operator

For an **OR**expression to return **true**, only one of the operands needs to be **true**. It is only **false**if both operands are **false**.

If one operand is **NULL**and the other is **true**, then the **OR**expression returns **true**. If one operand is **NULL**and the other is **false**, then it returns **NULL**. If both operands are **NULL**, it returns **NULL**.

| **Expression** | **Value** |
| --- | --- |
| **true OR NULL** | **true** |
| **false OR NULL** | **NULL** |
| **NULL OR NULL** | **NULL** |

For example, look in the table above for children who are under the age of two *or*have more than one sibling. Which can you say definitely *do*or *do not*match the criteria?

Here are the results:

| **name** | **age < 2** | **siblings > 1** | **age < 2 OR siblings > 1** |
| --- | --- | --- | --- |
| An | false | false | false |
| Belinda | NULL | true | true |
| Chand | false | NULL | NULL |
| Delmar | NULL | NULL | NULL |
| Enise | true | true | true |

The **NOT**Operator

When the unary operator **NOT**is applied to a **NULL**operand, the result remains **NULL**.

| **Expression** | **Value** |
| --- | --- |
| **NOT NULL** | **NULL** |

The expression **NOT NULL**in the table above does not represent the **IS NOT NULL**operator; it is simply the unary operator **NOT**applied to the literal Boolean value **NULL**.

Once again, look in the table, this time for children who are *not*under the age of two. Which can you say definitely *do*or *do not*match the criterion?

Here are the results:

| **name** | **age < 2** | **NOT age < 2** |
| --- | --- | --- |
| An | false | true |
| Belinda | NULL | NULL |
| Chand | false | true |
| Delmar | NULL | NULL |
| Enise | true | false |

Try It!

For this table of data, what would be the result of each expression, for each row in the table? [Click here for the answers.](https://www.coursera.org/learn/cloudera-big-data-analysis-sql-queries/resources/Lrtnf)

| **title** | **year** | **length** |
| --- | --- | --- |
| If | 1993 | 4:31 |
| Security | 1969 | NULL |
| Coming Around Again | NULL | 3:41 |
| Seasons of Love | 1996 | 2:52 |
| Love So Soft | 2017 | 2:52 |

1. year < 2000 AND length > 4:00

2. year < 2000 OR length > 4:00

3. NOT(year < 2000 OR length > 4:00)

# **Missing Values with Logical Operators (Ans)**

1​. year < 2000 AND length > 4:00

| **title** | **year** | **length** | **year < 2000** | **length > 3:00** | **year < 2000 AND length > 4:00** |
| --- | --- | --- | --- | --- | --- |
| If | 1993 | 4:31 | true | true | true |
| Security | 1969 | NULL | true | NULL | NULL |
| Coming Around Again | NULL | 3:41 | NULL | false | false |
| Seasons of Love | 1996 | 2:52 | true | false | false |
| Love So Soft | 2017 | 2:52 | false | false | false |

2. year < 2000 OR length > 4:00

| **title** | **year** | **length** | **year < 2000** | **length > 3:00** | **year < 2000 OR length > 4:00** |
| --- | --- | --- | --- | --- | --- |
| If | 1993 | 4:31 | true | true | true |
| Security | 1969 | NULL | true | NULL | true |
| Coming Around Again | NULL | 3:41 | NULL | false | NULL |
| Seasons of Love | 1996 | 2:52 | true | false | true |
| Love So Soft | 2017 | 2:52 | false | false | false |

3. NOT(year < 2000 OR length > 4:00)

| **title** | **year** | **length** | **year < 2000** | **length > 3:00** | **NOT(year < 2000 OR length > 4:00)** |
| --- | --- | --- | --- | --- | --- |
| If | 1993 | 4:31 | true | true | f​alse |
| Security | 1969 | NULL | true | NULL | false |
| Coming Around Again | NULL | 3:41 | NULL | false | NULL |
| Seasons of Love | 1996 | 2:52 | true | false | false |
| Love So Soft | 2017 | 2:52 | false | false | true |