| | |
|---|---|
| **Started on** | Wednesday, 18 October 2023, 12:37 PM |
| **State** | Finished |
| **Completed on** | Wednesday, 25 October 2023, 12:57 AM |
| **Time taken** | 6 days 12 hours |
| **Marks** | 102.00/102.00 |
| **Grade** | **100.00** out of 100.00 |

**Information**

# COMP110 Worksheet 3: Boolean Logic and Binary Notation

This worksheet is an online quiz. Complete all the questions.

You may make **multiple** attempts -- your **highest** grade will be taken.

You are strongly encouraged to complete the questions by working on pen and paper and then transferring your answers into the quiz interface. Please resist the temptation to use online converters or calculators, except to check your answers.

Most of the questions have a correct answer and will be graded automatically when you complete your attempt. The written questions towards the end of the quiz will be graded manually and feedback will be given after the formative deadline.

For questions which ask you to enter an 8-bit binary number, please ensure you enter your answer **without spaces** and **with leading 0s**. For example:

- `01101110` ✅
- `1101110` ❌
- `0110 1110` ❌

**Question 1**

Correct

Mark 2.00 out of 2.00

Convert **126** from decimal to 8-bit binary.

Answer: 01111110 ✔

The correct answer is: 01111110

**Question 2**

Correct

Mark 2.00 out of 2.00

Convert **225** from decimal to 8-bit binary.

Answer: 11100001 ✔

The correct answer is: 11100001

**Question 3**

Correct

Mark 2.00 out of 2.00

Convert **226** from decimal to 8-bit binary.

Answer: 11100010 ✔

The correct answer is: 11100010

**Question 4**

Correct

Mark 2.00 out of 2.00

Convert **243** from decimal to 8-bit binary.

Answer: 11110011 ✔

The correct answer is: 11110011

**Question 5**

Correct

Mark 2.00 out of 2.00

Convert **60** from decimal to 8-bit binary.

Answer: 00111100 ✔

The correct answer is: 00111100

**Question 6**

Correct

Mark 2.00 out of 2.00

Convert **01010111** from 8-bit binary to decimal.

Answer: 87 ✔

The correct answer is: 87

**Question 7**

Correct

Mark 2.00 out of 2.00

Convert **01001101** from 8-bit binary to decimal.

Answer: 77 ✔

The correct answer is: 77

**Question 8**

Correct

Mark 2.00 out of 2.00

Convert **01011100** from 8-bit binary to decimal.

Answer: 92 ✔

The correct answer is: 92

**Question 9**

Correct

Mark 2.00 out of 2.00

Convert **10111011** from 8-bit binary to decimal.

Answer: 187 ✔

The correct answer is: 187

**Question 10**

Correct

Mark 2.00 out of 2.00

Convert **10000001** from 8-bit binary to decimal.

Answer: 129 ✔

The correct answer is: 129

**Question 11**

Correct

Mark 4.00 out of 4.00

**Calculating 67 + 105**

Convert 67 to 8-bit binary: 01000011 ✔

Convert 105 to 8-bit binary: 01101001 ✔

Add these two numbers together: 10101100 ✔

Convert your answer from binary to decimal: 172 ✔

**Question 12**

Correct

Mark 4.00 out of 4.00

**Calculating 90 + 24**

Convert 90 to 8-bit binary: 01011010 ✔

Convert 24 to 8-bit binary: 00011000 ✔

Add these two numbers together: 01110010 ✔

Convert your answer from binary to decimal: 114 ✔

**Question 13**

Correct

Mark 4.00 out of 4.00

**Calculating 98 + 91**

Convert 98 to 8-bit binary: 01100010 ✔

Convert 91 to 8-bit binary: 01011011 ✔

Add these two numbers together: 10111101 ✔

Convert your answer from binary to decimal: 189 ✔

**Question 14**

Correct

Mark 4.00 out of 4.00

**Calculating 49 + 14**

Convert 49 to 8-bit binary: 00110001 ✔

Convert 14 to 8-bit binary: 00001110 ✔

Add these two numbers together: 00111111 ✔

Convert your answer from binary to decimal: 63 ✔

**Question 15**

Correct

Mark 4.00 out of 4.00

**Calculating 21 + 7**

Convert 21 to 8-bit binary: 00010101 ✔

Convert 7 to 8-bit binary: 00000111 ✔

Add these two numbers together: 00011100 ✔

Convert your answer from binary to decimal: 28 ✔

**Question 16**

Correct

Mark 5.00 out of 5.00

Complete the following truth table:

| A | B | C | A and B and not C |
|---|---|---|---|
| False | False | False | False ✔ |
| False | False | True | False ✔ |
| False | True | False | False ✔ |
| False | True | True | False ✔ |
| True | False | False | False ✔ |
| True | False | True | False ✔ |
| True | True | False | True ✔ |
| True | True | True | False ✔ |

**Question 17**

Correct

Mark 5.00 out of 5.00

Complete the following truth table:

| A | B | C | A and not (B and not C) |
|---|---|---|---|
| False | False | False | False ✔ |
| False | False | True | False ✔ |
| False | True | False | False ✔ |
| False | True | True | False ✔ |
| True | False | False | True ✔ |
| True | False | True | True ✔ |
| True | True | False | False ✔ |
| True | True | True | True ✔ |

**Question 18**

Correct

Mark 5.00 out of 5.00

Complete the following truth table:

| A | B | C | (A or not B) and (A or C) |
|---|---|---|---|
| False | False | False | False ✔ |
| False | False | True | True ✔ |
| False | True | False | False ✔ |
| False | True | True | False ✔ |
| True | False | False | True ✔ |
| True | False | True | True ✔ |
| True | True | False | True ✔ |
| True | True | True | True ✔ |

**Question 19**

Correct

Mark 5.00 out of 5.00

Complete the following truth table:

| A | B | C | D | A and not (B or not C) and (not A and D) |
|---|---|---|---|---|
| False | False | False | False | False ✔ |
| False | False | False | True | False ✔ |
| False | False | True | False | False ✔ |
| False | False | True | True | False ✔ |
| False | True | False | False | False ✔ |
| False | True | False | True | False ✔ |
| False | True | True | False | False ✔ |
| False | True | True | True | False ✔ |
| True | False | False | False | False ✔ |
| True | False | False | True | False ✔ |
| True | False | True | False | False ✔ |
| True | False | True | True | False ✔ |
| True | True | False | False | False ✔ |
| True | True | False | True | False ✔ |
| True | True | True | False | False ✔ |
| True | True | True | True | False ✔ |

**Question 20**

Correct

Mark 10.00 out of 10.00

Show that **not (A and B) = not A or not B** by completing the following truth table:

| A | B | not (A and B) | not A or not B |
|---|---|---|---|
| False | False | True ✔ | True ✔ |
| False | True | True ✔ | True ✔ |
| True | False | True ✔ | True ✔ |
| True | True | False ✔ | False ✔ |

**Question 21**

Complete

Not graded

Hence explain why the following two code snippets are equivalent:

```
if not (file_exists("a.txt") and file_exists("b.txt")):
    print("A required file is missing")


if not file_exists("a.txt") or not file_exists("b.txt"):
    print("A required file is missing")
```

In the first code snippet the string will be printed as long as both "file_exists("a.txt")" and "file_exists("b.txt")" aren't true. This means that if only one of them is true the statement is still true , as the statement is only false when both are true.

In the second code the string will be printed if either of the two files are false but will not be printed if both are true, this is exactly the same as the first snippet with both code snippets if statements being true until both "file_exists("a.txt")" and "file_exists("b.txt")" are true.

**Question 22**

Correct

Mark 1.00 out of 1.00

Consider the following two code snippets:

```
if not (file_exists("a.txt") and file_exists("b.txt")):
    print("A required file is missing")


if not file_exists("a.txt") or not file_exists("b.txt"):
    print("A required file is missing")
```

Which of the following statements **are** correct?

a. These statements mean the same thing because the result of 'NOT( A AND B)' is the same as 'NOT A OR NOT B'. ✔

b. These statements mean the same thing because 'AND' is equivalent to 'OR NOT'

c. These statements do not mean the same thing because the second expression means 'NOT (A OR NOT B)'.

d. These statements do not mean the same thing because there is only one way to express each Boolean condition.

Your answer is correct.

The correct answer is: These statements mean the same thing because the result of 'NOT( A AND B)' is the same as 'NOT A OR NOT B'.

**Question 23**

Correct

Mark 10.00 out of 10.00

Show that **not (A or B) = not A and not B** by completing the following truth table:

| A | B | not (A or B) | not A and not B |
|---|---|---|---|
| False | False | True ✔ | True ✔ |
| False | True | False ✔ | False ✔ |
| True | False | False ✔ | False ✔ |
| True | True | False ✔ | False ✔ |

**Question 24**

Complete

Not graded

Hence explain why the following two code snippets are equivalent:

```
if x == 0 and y == 0:
    do_something()
else:
    print("Do nothing")
```

```
if x != 0 or y != 0:
    print("Do nothing")
else:
    do_something()
```

It is easier to imagine the code snippets being equivalent when you imagine "do_something()" and "print("Do nothing")" are true and false respectively.

In both code snippets when x and y == 0 "do_something()" (true) is run, when both x and y != 0 "print(Do nothing")  (false) is run.  This makes it clear that these two code snippets are equivalent as when fed the same values for x and y we receive the exact same outputs.

**Question 25**

Correct

Mark 1.00 out of 1.00

Consider the following two code snippets:

```
if x == 0 and y == 0:
    do_something()
else:
    print("Do nothing")
```

```
if x != 0 or y != 0:
    print("Do nothing")
else:
    do_something()
```

When are these two code snippets the **same**?

- a. Both code snippets are never the same
- b. Only when both 'x' and 'y' are 0
- c. These code snippets are always the same ✔
- d. If only 'x' or 'y' are 0 not both

Your answer is correct.

The correct answer is:
These code snippets are always the same

**Question 26**

Correct

Mark 10.00 out of 10.00

Show that **(A and B) or (A and C) = A and (B or C)** by completing the following truth table:

| A | B | C | (A and B) or (A and C) | A and (B or C) |
|---|---|---|---|---|
| False | False | False | False ✔ | False ✔ |
| False | False | True | False ✔ | False ✔ |
| False | True | False | False ✔ | False ✔ |
| False | True | True | False ✔ | False ✔ |
| True | False | False | False ✔ | False ✔ |
| True | False | True | True ✔ | True ✔ |
| True | True | False | True ✔ | True ✔ |
| True | True | True | True ✔ | True ✔ |

**Question 27**

Complete

Not graded

Hence explain why the following two code snippets are equivalent:

```
if (type(x) == int and x > 7) or (type(x) == float and x > 7):
    print("Hello")
```

```
if (type(x) == int or type(x) == float) and x > 7:
    print("Hello")
```

In the first code snippet in order for the condition to be true x > 7, in the second code snippet this is also true.

In the first code snippet the variable x must be type int or float, in the second code snippet this is also true.

Both of them are the same but in the second code snippet the "x > 7" is taken out of the or statements because it is common in both of them.

**Question 28**

Correct

Mark 10.00 out of 10.00

Show that **(A or B) and (A or C) = A or (B and C)** by completing the following truth table:

| A | B | C | (A or B) and (A or C) | A or (B and C) |
|---|---|---|---|---|
| False | False | False | False ✔ | False ✔ |
| False | False | True | False ✔ | False ✔ |
| False | True | False | False ✔ | False ✔ |
| False | True | True | True ✔ | True ✔ |
| True | False | False | True ✔ | True ✔ |
| True | False | True | True ✔ | True ✔ |
| True | True | False | True ✔ | True ✔ |
| True | True | True | True ✔ | True ✔ |

**Question 29**

Complete

Not graded

Hence explain why the following two code snippets are equivalent:

```
if x > 10 or (x > 0 and y > 0):
    do_something()
```

```
if x > 0 and (x > 10 or y > 0):
    do_something()
```

In both code snippets if (x > 10) or (x > 0 and y > 0) then the statement is true
In both code snippets if 10 > x > 0 then y must be greater than 0 also. In the first code snippet this can be seen as the statement is only it is true if either x > 10 or both x and y are greater than 0.  In the second code snippet this can also be seen as the statement is only true if x > 0 and either x >10 or y > 0, this is the same as the first code snippet

◄ Worksheet 2 Brief

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