

Chapter 13 Short-Answer Exercises

Java AP

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1. What is the 2's complement of the following binary numbers?

|  |  |
| --- | --- |
| **Binary Number** | **2's Complement** |
| **11010000** | 0011 0000 |
| **00000001** | 1111 1111 |
| **00000000** | 0000 0000 |

1. What is the signed binary 8 bits representation of the following decimal values? ***(Assume we are following the 2's complement representation).***

|  |  |
| --- | --- |
| **Decimal Value** | ***Signed Binary 8 bits Representation*** |
| **21** | 00010101 |
| **0** | 0000 |
| **-128** | 10000000 |

1. Convert the following signed binary values (Base 2) to signed decimal (Base 10).

|  |  |
| --- | --- |
| **Signed Binary Value** | ***Decimal Value*** |
| **00001000** | 8 |
| **11010110** | 214 |
| **11111111** | 255 |

1. What is the following operation's output?

|  |  |
| --- | --- |
| **Operation** | **Output** |
| **0 & 0** | 0 |
| **0 & 1** | 0 |
| **1 & 0** | 0 |
| **1 & 1** | 1 |

1. What is the following operation's output?

|  |  |  |  |
| --- | --- | --- | --- |
| **Operation** | **Output** | | |
| **0 | 0** | 0 | | |
| **0 | 1** | 1 | | |
| **1 | 0** | 1 | | |
| **1 | 1** | 1 | | |
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1. What is the following operation's output?

|  |  |
| --- | --- |
| **Operation** | **Output** |
| **0 ^ 0** | 0 |
| **0 ^ 1** | 1 |
| **1 ^ 0** | 1 |
| **1 ^ 1** | 0 |

1. What is the following operation's output?

|  |  |
| --- | --- |
| **Operation** | **Output** |
| **~0** | -1 |
| **~1** | -2 |

1. Assuming that N is an 8-bit integer, what is the value of N after the following operations?

|  |  |
| --- | --- |
| **Operation** | **N's Value** |
| **N = 10 << 1** | **100** |
| **N = 1 << 3** | **10** |
| **N = -80 << 1** | **160** |
| **N = 10 >> 1** | **5** |
| **N = 1 >> 3** | **0** |
| **N = -128 >> 10** | **-1** |
| **N = 10 >>> 1** | **5** |
| **N = -10 >>> 1** | **2147483643** |
| **N = -128 >>> 5** | **134217724** |
| **N = -128 >>> 5** | **4** |

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1. Assuming that N is an 8-bit integer, what is the value of N after the following operations?

|  |  |
| --- | --- |
| **Operation** | **N's Value** |
| **N = 0b0011\_1010 & 0b1111\_1111** | **58** |
| **N = 0b0011\_1010 & 0b0000\_0000** | **0** |
| **N = 0b0011\_1010 & 0b0010\_0010** | **34** |
| **N = 0b0011\_1010 | 0b0010\_0010** | **58** |
| **N = 0b0011\_1010 | 0b1111\_1111** | **255** |
| **N = 0b0011\_1010 | 0b0000\_0000** | **58** |
| **N = 0b0011\_1010 ^ 0b0010\_0010** | **24** |
| **N = 0b0011\_1010 ^ 0b1111\_1111** | **197** |
| **N = 0b0011\_1010 ^ 0b0000\_0000** | **58** |
| **N = ~0b0011\_1010** | **-59** |
| **N = ~0b1111\_1111** | **-256** |
| **N = ~0b0000\_0000** | **-1** |

1. Assuming that N is an 8-bit integer, what is the value of N after the following operations?

|  |  |
| --- | --- |
| **Operation** | **N's Value** |
| **N = -56 & 32** | **0** |
| **N = -1 & 17** | **17** |
| **N = -56 | 32** | **-24** |
| **N = -1 | 17** | **-1** |
| **N = -56 ^ 32** | **-24** |
| **N = -1 ^ 17** | **-18** |
| **N = ~(-56)** | **55** |
| **N = ~17** | **-18** |

|  |  |
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1. Assuming that N is an 8-bit integer, what is the value of N after the following operations?

|  |  |
| --- | --- |
| **Operation** | **N's Value** |
| **N = (5 % 2) << 2** | **4** |
| **N = (5 % 3) >> (10 % 3)** | **1** |
| **N = (3 >> 3) << 3** | **0** |
| **N = 7 & ~(1 << 2)** | **3** |
| **N = (1 | 12) & (7 | 12)** | **13** |

1. Write the following function:

|  |  |
| --- | --- |
| **Function** | **boolean** isOdd(**int** value) |
| **Description** | Using **bitwise operators**, this function determines if an integer value is **odd**.  The function returns **true** if the value is **odd** and **false** if the value is **even**. |
| **Code** | public static boolean isOdd(int value) {  return (value & 1) == 1;  } |

1. Write the following function:

|  |  |
| --- | --- |
| **Function** | **boolean** haveOppositeSigns(**int** n1, **int** n2) |
| **Description** | Using **bitwise operators**, this function determines if two given integers have opposite signs (in other words, one is positive and the other negative).  The function returns **true** if the two integers have opposite signs otherwise **false** is returned.    ***Hint: integers have a sign bit.*** |

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1. Write the following function:

|  |  |
| --- | --- |
| **Function** | **boolean** isBitSet(**int** number, **int** bitPosition) |
| **Description** | Using **bitwise operators**, this function determines if a number has a specific bit set to 1.  The function returns **true** if the specific bit is set to 1 otherwise **false** is returned.    ***Example:***  ***"isBitSet (3, 1);" returns true because 3 = 00000011 and of course its 1st bit is set to 1.***    ***"isBitSet (3, 5);" returns false because 3 = 00000011 and of course its 5th bit is not set to 1.*** |