Quiz before refresher course in Mathematics

INF539

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1 Euclidean division of integers and polynomials

Exercise 1. Compute the greatest common divisor and least common multiple of 180 and 126.

Exercise 2. Compute the quotient and the remainder of the euclidean division of 171 by 8.

Exercise 3. Choose the correct definition of the euclidean division of natural (non negative) integers.

1. For every couple of natural integers (a, b) , there exists a unique couple of integers (q, r) such that $a = b \times q + r$ and $0 \leqslant r < b$.
2. For every couple of natural integers (a, b) , with $b > 0$, there exists a unique couple of integers (q, r) such that $a = b \times q + r$.
3. For every couple of natural integers (a, b) , with $b > 0$, there exists a unique couple of integers (q, r) such that $a = b \times q + r$ and $r < b$.
4. For every couple of natural integers (a, b) , with $b > 0$, there exists a unique couple of integers (q, r) such that $a = b \times q + r$ and $0 \leqslant r < b$.
5. For every couple of natural integers (a, b) , with $b > 0$, there exists a unique couple of integers (q, r) such that $a = b \times q + r$ and $0 \leqslant r \leqslant b$.

Exercise 4. In the euclidean division of $X^3 + 2X^2 + 3X + 1$ by $X^2 + X + 2$, the quotient and the remainder are...

1. X and $X^2 + X$.
2. $X + 1$ and 2.
3. X and $X^2 + X - 3$.
4. $X + 1$ and -2.

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2 Boolean variables

Exercise 5. The boolean expression $A\,\mathbf{OR}(A\,\mathbf{AND}\,B)$ is equal to...

1. A.
2. B.
3. $A\,\mathbf{OR}\,B$.
4. $A\,\mathbf{AND}\,B$.

Exercise 6. The boolean expression $(A\,\mathbf{AND}\,B)\,\mathbf{OR}(\overline{A}\,\mathbf{AND}\,B)$ is equal to...

1. A.
2. B.
3. $\overline{A}$.
4. $\overline{B}$.

Exercise 7. Make the truth tables of $A \Rightarrow (B\,\mathbf{OR}\,C)$ and $(A \Leftarrow B)\,\mathbf{AND}\,C$.

3 Computational complexity

Exercise 8. The computational complexity of performing elementary operations involving an integer a depends on its size, which is equal to

1. $\lfloor \log_2(a) \rfloor$.
2. $\log_2(a)$.
3. $\lfloor \log_2(a) \rfloor + 1$.

Take two integers a and b of the same size n. The complexity of their addition is

1. $O(n)$.
2. $O(n^2)$.
3. $O(\log n)$.

Take two integers a and b of the same size n. The complexity of their addition is

1. $O(n^2)$.
2. $O(n^2 \log n)$.
3. $O((\log n)^2)$.

The best known complexity for the multiplication is

1. $O(n)$.
2. $O(n^2)$.
3. $O(n \log n)$.