Modular Arithmetic Quiz PDF

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Describe the Chinese Remainder Theorem and its significance in solving congruences.

How would you find the modular inverse of a number? Explain the process with an example.

What is the result of \((10 - 3) \mod 4 \)?

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4

Which field heavily utilizes modular arithmetic for encryption algorithms?

- ◯ Biology
- ◯ Chemistry
- ◯ Cryptography

◯ Astronomy

What does the expression \(a \equiv b \ (\text{mod} \ m) \) mean?

◯ \(a \) is equal to \(b \)
◯ \(a \) and \(b \) have the same remainder when divided by \(m \)
◯ \(a \) is a multiple of \(b \)
◯ \(a \) is less than \(b \)

What is the result of \((7 + 5) \mod 6 \)?

◯ 0
◯ 1
◯ 2
◯ 3

What is \(2^3 \mod 5 \)?

◯ 1
◯ 2
◯ 3
◯ 4

Discuss how modular arithmetic is applied in cryptographic algorithms, such as RSA.

How can Fermat's Little Theorem be used to simplify calculations in modular arithmetic? Provide an example.

Which methods can be used to simplify large powers in modular arithmetic?

- [ ] Repeated squaring
- [ ] Fermat's Little Theorem
- [ ] Chinese Remainder Theorem
- [ ] Euclidean Algorithm

According to Fermat's Little Theorem, if \(p \) is a prime, what is \(a^ p \equiv \) (mod \(p \))?

- ◯ 0
- ◯ 1
- ◯ a
- ◯ p

Which of the following are properties of modular arithmetic?

- [ ] Communtative
- [ ] Associative
- [ ] Distributative
- [ ] Transitive

Which of the following numbers are congruent to 2 modulo 5?

- [ ] 7
- [ ] 12
- [ ] 17
- [ ] 22

Modular arithmetic is used in which of the following areas?

- [ ] Cryptography
- [ ] Computer graphics
- [ ] Number theory

- [ ] Quantum mechanics

Explain in your own words what modular arithmetic is and provide a real-world example of its application.

Describe a technique for reducing large exponents in modular arithmetic and why it is useful.

Which numbers have a modular inverse under modulus 7?

- [ ] 1
- [ ] 2
- [ ] 3
- [ ] 7

Which of the following is a primary application of the Chinese Remainder Theorem?

- ◯ Solving linear equations
- ◯ Finding roots of polynomials
- ◯ Solving systems of congruences
- ◯ Calculating derivatives

Which of the following calculations are correct for \((a + b) \mod m \)?

- [ ] (5 + 3) \mod 4 = 0
- [ ] (6 + 7) \mod 5 = 3

- [ ] $(8 + 2) \mod 6 = 4$
- [ ] $(9 + 1) \mod 3 = 1$

What is the modular inverse of 3 under modulus 7?

- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5