

# Notes, Assignments and Study Guides

## Notes

- Numbers: Rationals, Reals, Complex<sup>1</sup>
- Basic proof techniques: Direct<sup>2</sup>
- Square root of 2 is irrational<sup>3</sup>
- Quantifiers<sup>4</sup>
- Principle of Mathematical Induction<sup>5</sup>
- Strong induction and Well-Ordering Principle<sup>6</sup>
- Fibonacci Numbers<sup>7</sup>
- Divisibility<sup>8</sup>
- Prime and Composite Numbers<sup>9</sup>
- Patterns in the Primes<sup>10</sup>
- Common Divisors<sup>11</sup>
- The Division Theorem<sup>12</sup>
- A weird number system<sup>13</sup>
- The Division Theorem (cont)<sup>14</sup>
- The Euclidean Algorithm<sup>15</sup>
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- Euclidean Division and Diophantine Equations<sup>17</sup>
- Finding all Solutions<sup>18</sup>
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- Fundamental Theorem of Arithmetic<sup>20</sup>
- Consequences of Fundamental Theorem<sup>21</sup>
- Modular Arithmetic and Congruences<sup>22</sup>

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<sup>2</sup>[notes/proofs\\_basic.html](#)

<sup>3</sup>[notes/irrationality\\_of\\_sqrt2.html](#)

<sup>4</sup>[notes/proofs\\_quantifiers.html](#)

<sup>5</sup>[notes/proofs\\_induction.html](#)

<sup>6</sup>[notes/proofs\\_induction\\_other.html](#)

<sup>7</sup>[notes/numbers\\_fibonacci.html](#)

<sup>8</sup>[notes/numbers\\_divisibility.html](#)

<sup>9</sup>[notes/primes\\_intro.html](#)

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<sup>11</sup>[notes/numbers\\_gcd.html](#)

<sup>12</sup>[notes/numbers\\_division\\_theorem.html](#)

<sup>13</sup>[notes/weird\\_number\\_system.html](#)

<sup>14</sup>[notes/numbers\\_division\\_theorem.html](#)

<sup>15</sup>[notes/numbers\\_euclidean\\_algorithm.html](#)

<sup>16</sup>[notes/equations\\_diophantine\\_intro.html](#)

<sup>17</sup>[notes/equations\\_diophantine\\_and\\_euclidean.html](#)

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<sup>19</sup>[notes/equations\\_diophantine\\_all\\_solutions.html](#)

<sup>20</sup>[notes/numbers\\_fundamental\\_theorem.html](#)

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- Arithmetic with Congruences<sup>23</sup>
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- Encryption via Multiplication<sup>28</sup>
- Fermat's Little Theorem<sup>29</sup>
- Reduced Residues and  $\phi$ <sup>30</sup>
- Euler's Theorem<sup>31</sup>
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- Public Key Cryptography and RSA<sup>33</sup>
- Order of Elements in  $\mathbb{Z}_n$ <sup>34</sup>
- Polynomials over  $\mathbb{Z}_n$ <sup>35</sup>
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## Assignments

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## Study Guides

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