

# **Math Challenge I-B: Number Theory**

**Answer Key**

**Areteem Institute**

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## Chapter 1. Number Sense and Place Values

### Quick Reponse Questions:

**1.11:** 1209

**1.16:** 180

**1.12:** 3065

**1.17:** 473

**1.13:** 890

**1.18:** 693

**1.14:** 89999

**1.19:** 9025

**1.15:** 588

**1.20:** 621

### Practice Questions:

**1.21:** 112, 212, 312, 412, 512, 612, 712, 812 and 912

**1.26(b):** 130

**1.22:** 9000; 8

**1.27(a):** 8173

**1.23:** No

**1.27(b):** 35651

**1.24:** 1249

**1.28(a):** 93025

**1.25(a):** 5329

**1.28(b):** 664225

**1.25(b):** 400

**1.29(a):** 4221

**1.26(a):** 550

**1.29(b):** 616221

**1.30:** \$52.94

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## Chapter 2. Primes and Factors

### Quick Reponse Questions:

**2.11:** 2

**2.16:** 5

**2.12:** 53

**2.17:** 31

**2.13:** 97

**2.18:** 31

**2.14:** 6

**2.19:** 30

**2.15:** 6

**2.20:** 6

### Practice Questions:

**2.21:** Yes

**2.26:**  $1776 = 2^4 \cdot 3 \cdot 37$ ,  $2001 = 3 \cdot 23 \cdot 29$

**2.22:** Omitted

**2.23:** 233, 239, 293

**2.27:**  $1492 = 2^2 \cdot 373$ ,  $2525 = 5^2 \cdot 101$

**2.24:** No

**2.28:** 7676767

**2.25:** 11, 101, 131, 151, 181, 191

**2.29:** 19

**2.30:**  $3 \cdot 7 \cdot 11 \cdot 13 \cdot 17 \cdot 19$

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## Chapter 3. Primes and Factors Continued

### Quick Reponse Questions:

**3.11:** 7

**3.16:** 6

**3.12:** 49

**3.17:** 6

**3.13:** 91

**3.18:** 15

**3.14:** 10

**3.19:** 64

**3.15:** 81

**3.20:** 33

### Practice Questions:

**3.21:** Omitted

**3.26:**  $2^4 \cdot 3^4 \cdot 7^5$

**3.22:** 13

**3.27:** 30

**3.23:** 56

**3.28:** 8

**3.24:** 504

**3.29:** 496

**3.25:** 4, 8, 16, 32

**3.30:** 14

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## Chapter 4. Divisibility

### Quick Reponse Questions:

**4.11:** 171

**4.16:** No

**4.12:** 24

**4.17:** 444

**4.13:** 18

**4.18:** 5

**4.14:** No

**4.19:** 2

**4.15:** Yes

**4.20:** 1980

### Practice Questions:

**4.21(a):** Look at the last (units) digit. If the last digit is 0, then the number is divisible by 10.

**4.24:** No, multiple examples exist, such as 2323233 or 2323222

**4.21(b):** Omitted

**4.25:** 35222, 35828

**4.22:** Yes

**4.26:** 7848

**4.23(a):** If the number is divisible by 3 and by 4, then it is divisible by 12.

**4.27:** 7

**4.23(b):** Look at the last three digits. If the last three digits form a number divisible by 8, then the number is divisible by 8.

**4.28:** 24

**4.29:** 82

**4.30:** 60, 90, 150

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## Chapter 5. Divisibility Continued

### Quick Reponse Questions:

**5.11:** 5

**5.16:** No

**5.12:** 24

**5.17:** Yes

**5.13:** No

**5.18:** No

**5.14:** 5

**5.19:** 223

**5.15:** Yes

**5.20:** 389

### Practice Questions:

**5.21(a):**  $x = 0, 9$

**5.26:** 100110, 101010, 101100,  
110010, 110100, 111000

**5.21(b):**  $x = 7$

**5.27:** 75

**5.22:** 3555

**5.28:** (4, 9), (6, 5), (10, 7)

**5.23:** 18, 81, 1188, 1818, 1881, 8118,  
8181, 8811

**5.29:** 10008

**5.24:** 2052, 2952, 2556

**5.30:** 10

**5.25:** 13

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## Chapter 6. GCD's and LCM's

### Quick Reponse Questions:

**6.11:** 24

**6.16:** 1155

**6.12:** 50

**6.17:** 35

**6.13:** Yes

**6.18:** 6930

**6.14:** 35

**6.19:** 10

**6.15:** 35

**6.20:** 60

### Practice Questions:

**6.21:** GCD: 2; LCM: 2400

**6.26:**  $m = 247, n = 323$

**6.22:** 60060

**6.27:** 5: They are  
1050, 1260, 1470, 1680, 1890

**6.23:**  $\frac{1}{9}, \frac{2}{9}, \frac{4}{9}, \frac{5}{9}, \frac{7}{9}, \frac{8}{9}$ .

**6.28:** 18, 36, 54, 90, 108, 180, 270, 540

**6.24:** 52

**6.25(a):**  $m \cdot n$ .

**6.29:** 13

**6.25(b):** GCD:  $m$ , LCM:  $n$ .

**6.30:**  $N = 306$

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## Chapter 7. GCD's and LCM's Continued

### Quick Reponse Questions:

**7.11:** 11

**7.16:** 30030

**7.12:** 823

**7.17:** 60

**7.13:** 36

**7.18:** 1400

**7.14:** 24

**7.19:** 8400

**7.15:** 1

**7.20:** 5

### Practice Questions:

**7.21:** 21, 15015

**7.26:** 13 or 91

**7.22:** No

**7.27:** \$15

**7.23:** 1, 4, 9, 36.

**7.28:** 85

**7.24:** 12

**7.29:** \$7

**7.25:** 956

**7.30:**  $A = 441$  and  $B = 35$



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## Chapter 8. Remainders

### Quick Reponse Questions:

**8.11:** 3

**8.16:** 4

**8.12:** 92

**8.17:** 25

**8.13:** 87

**8.18:** 6

**8.14:** Yes

**8.19:** 2

**8.15:** 2

**8.20:** 101

### Practice Questions:

**8.21:** 73

**8.26:** 2

**8.22:**  $11w + 6d + 8h$

**8.27:** 9 is possible

**8.23:** Monday

**8.28:** 17

**8.24:** 7

**8.29:** 1

**8.25:** 4

**8.30:**  $D = 29, R = 20$

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## Chapter 9. Modular Arithmetic

### Quick Reponse Questions:

**9.11:** 10

**9.16:** 6

**9.12:** 300

**9.17:** 68

**9.13:** 10

**9.18:** No

**9.14:** 3

**9.19:** Yes

**9.15:** 1

**9.20:** Yes

### Practice Questions:

**9.21:** 4

**9.26:** 1

**9.22:** 8

**9.27:** 48, 49, 50, 51

**9.23:** 13

**9.28:** No

**9.24:** 81

**9.29:** 2, 3, 6, 7, 11, 14, 21, 22, 33, 42, 66, 77, 154, 231, 462

**9.25:** 4

**9.30:** 3