CS-2050-All-Sections CS 2050 Homework 6 (HOWARD, FAULKNER, ELLEN)

Vidit Dharmendra Pokharna

TOTAL POINTS

101.5 / 100

QUESTION 1

Question 1 6 pts

1.1 a **3 / 3**

✓ **- 0 pts** *$$2^4 \cdot 3^3 \cdot 5^3 \cdot 13^2 \cdot 23^2$$*

- 3 pts Incorrect / No Answer

1.2 b **3 / 3**

✓ **- 0 pts** *$$2^7 \cdot 3^2 \cdot 5 \cdot 7$$*

- 3 pts Incorrect / No Answer

QUESTION 2

2 Question 2 **4 / 4**

✓ **- 0 pts** *$$ \frac{8^3}{\ln(8^3)} \approx 82$$*

- 4 pts Incorrect / No Answer

QUESTION 3

3 Question 3 **4 / 4**

✓ **- 0 pts** *$$(101000001)_2$$*

- 1 pts No subscript indicating base 2

- 2 pts Minor error in work

- 3 pts Major error in work / no work shown

- 4 pts Incorrect / No Answer

QUESTION 4

4 Question 4 **4 / 4**

✓ **- 0 pts** *Octal: $$(246)_8$$*

Hex: $$(A6)_{16}$$

Decimal: $$(166)_{10}$$

Partly correct

- 1 pts Incorrect Octal

- 1 pts Incorrect Hex

- 1 pts Incorrect Decimal

- 1 pts Missed labelling a subscript

- 2 pts Minor error in work

- 3 pts Major error in work / No work shown

- 4 pts Incorrect / No Answer

QUESTION 5

5 Question 5 **4 / 4**

✓ **- 0 pts** *$$(1100 1001 1010 0110)_2$$*

- 1 pts No subscript indicating base 2

- 2 pts Minor error in work

- 3 pts Major error in work / No work shown

- 4 pts Incorrect / No Answer

QUESTION 6

6 Question 6 **3 / 4**

- 0 pts $${(135023)_8}$$

✓ **- 1 pts** *No subscript indicating base 8*

- 2 pts Minor error in work

- 3 pts Major error in work / No work shown

- **4 pts** Incorrect / No Answer

QUESTION 7

Question 7 16 pts

7.1 a **4 / 4**

✓ **- 0 pts** *5*

- **4 pts** Incorrect / No Answer

7.2 b **4 / 4**

✓ **- 0 pts** *9*

- **4 pts** Incorrect / No Answer

7.3 c **4 / 4**

✓ **- 0 pts** *0*

- **4 pts** Incorrect / No Answer

7.4 d **4 / 4**

✓ **- 0 pts** *3*

- **4 pts** Incorrect / No Answer

QUESTION 8

Question 8 9 pts

8.1 a **3 / 3**

✓ **- 0 pts** *$$c = 1$$*

- **3 pts** Incorrect / No Answer

8.2 b **3 / 3**

✓ **- 0 pts** *$$c = 10$$*

- **3 pts** Incorrect / No Answer

8.3 c **3 / 3**

✓ **- 0 pts** *$$c = 1$$*

- **3 pts** Incorrect / No Answer

QUESTION 9

9 Question 9 **8 / 8**

✓ **- 0 pts** *Correct*

- **1 pts** Missing/incorrect introduction (doesn't mention proof type and/or match assumptions made)
- **2 pts** Does not state assumption(s) in introduction or proof body
- **3 pts** Invalid assumption (e.g. assumes entire statement is true, assumes conclusion is true in a direct proof, etc.)

Common Errors

- **1 pts** Missing domain for 1 variable
- **2 pts** Missing domain for 2+ vairables
- **2 pts** Uses the same variable for different definitions of divisibility (e.g., saying $$b = ak$$ and $$c = bk$$)

Invalid Steps

- **2 pts** 1 Invalid Step
- **4 pts** 2 Invalid steps
- **6 pts** 3+ Invalid Steps

Skipped Steps

- **2 pts** 1 Skipped Step
- **4 pts** 2 Skipped Steps
- **6 pts** 3+ Skipped Steps

Miscited Steps

- **1 pts** 1 Miscited Steps
- **2 pts** 2 Miscited Steps
- **3 pts** 3 Miscited Steps
- **4 pts** 4+ Miscited Steps

- **2 pts** Missing or Incorrect Conclusion

Must say that if $$a | b$$ and $$b | a$$ then $$b = a$$ or $$b =-a$$

- 8 pts No Answer

QUESTION 10

10 Question 10 **10 / 10**

✓ **- 0 pts** *Correct*

- 3 pts Minor math error

- 6 pts Major Math Error

Missed / Incorrect / Invalid prime

- 2 pts 1 Missed / Incorrect / Invalid prime

- 4 pts 2 Missed / Incorrect / Invalid prime

- 6 pts 3 Missed / Incorrect / Invalid prime

- 8 pts 4+ Missed / Incorrect / Invalid prime

- 10 pts No Answer

QUESTION 11

Question 11 6 pts

11.1 a **3 / 3**

✓ **- 0 pts** *2*

- 3 pts Incorrect / No Answer

11.2 b **3 / 3**

✓ **- 0 pts** *$$2^3 \cdot 3^2 \cdot 7$$ or $$504$$*

- 3 pts Incorrect / No Answer

QUESTION 12

Question 12 4 pts

12.1 a **2 / 2**

✓ **- 0 pts** *$$2^4 \cdot 3 \cdot 7 \cdot 11$$ or $$3696$$*

- 2 pts Incorrect / No Answer

12.2 b **2 / 2**

✓ **- 0 pts** *$$2^4 \cdot 3^4 \cdot 5^6 \cdot 11^2 \cdot 13$$ or $$31853250000$$*

- 2 pts Incorrect / No Answer

QUESTION 13

Question 13 4 pts

13.1 a **2 / 2**

✓ **- 0 pts** *No*

- 2 pts Incorrect / No Answer

13.2 b **2 / 2**

✓ **- 0 pts** *Yes*

- 2 pts Incorrect / No Answer

QUESTION 14

Question 14 8 pts

14.1 a **4 / 4**

✓ **- 0 pts** *$$\gcd(123, 456) = 3$$*

- 4 pts Incorrect / No Answer

14.2 b **4 / 4**

✓ **- 0 pts** *$$\gcd(423, 72) = 9$$*

- 4 pts Incorrect / No Answer

QUESTION 15

Question 15 9 pts

15.1 a **3 / 3**

✓ **- 0 pts** *10*

- 3 pts Incorrect / No Answer

15.2 b **3 / 3**

✓ **- 0 pts** *22*

- 3 pts Incorrect / No Answer

15.3 C **3 / 3**

✓ **- 0 pts** *8*

- 3 pts Incorrect / No Answer

QUESTION 16

16 Matching **0 / 0**

✓ **- 0 pts** *Correct*

- 5 pts Incorrect

QUESTION 17

17 On Time **2.5 / 0**

✓ **+ 2.5 pts** *On Time (Before Thursday)*

- 0 pts On Time (Friday)

- 10 pts 1 day late

- 25 pts 2 days late

Vidit Pokharna

CS 2050 HW 6

1.
   a. $46^2 26^2 15^3 = 2^2 23^2 2^2 13^2 3^3 5^3 = 2^4 3^3 5^3 13^2 23^2$
   b. $8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 = 2^3 7^1 2^1 3^1 5^1 2^2 3^1 2^1 = 2^7 3^2 5^1 7^1$

2. According to the Prime Number Theorem, the approximate number of primes is $\frac{512}{\ln(512)} \approx 82.07331$

3.
$$321 - 256 = 65$$
$$65 - 64 = 1$$
$$1 - 1 = 0$$
$$321 = 256 + 64 + 1$$
Binary: 101000001

4.
- Binary to Octal: $010|100|110 \rightarrow 0 \cdot 2^2 + 1 \cdot 2^1 + 0 \cdot 2^0 | 1 \cdot 2^2 + 0 \cdot 2^1 + 0 \cdot 2^0 | 1 \cdot 2^2 + 1 \cdot 2^1 + 0 \cdot 2^0 \rightarrow 246$
- Binary to Hexadecimal: $1010|0110 \rightarrow 1 \cdot 2^3 + 0 \cdot 2^2 + 1 \cdot 2^1 + 0 \cdot 2^0 | 0 \cdot 2^3 + 1 \cdot 2^2 + 1 \cdot 2^1 + 0 \cdot 2^0 \rightarrow A6$
- Binary to Decimal: $10100110 \rightarrow 1 \cdot 2^7 + 0 \cdot 2^6 + 1 \cdot 2^5 + 0 \cdot 2^4 + 0 \cdot 2^3 + 1 \cdot 2^2 + 1 \cdot 2^1 + 0 \cdot 2^0 \rightarrow 128 + 32 + 4 + 2 = 166$

5.
- Hexadecimal to Binary: $C|9|A|6 \rightarrow 12|9|10|6 \rightarrow 1100|1001|1010|0110 \rightarrow 1100100110100110$

6.
- Hexadecimal to Binary: $B|A|1|3 \rightarrow 11|10|1|3 \rightarrow 1011|1010|0001|0011 \rightarrow 1011101000010011$
- Binary to Octal: $001|011|101|000|010|011 \rightarrow 1|3|5|0|2|3 \rightarrow 135023$

1.1 a **3 / 3**

✓ **- 0 pts** *$$2^4 \cdot 3^3 \cdot 5^3 \cdot 13^2 \cdot 23^2$$*

- 3 pts Incorrect / No Answer

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1.2 b **3 / 3**

✓ **- 0 pts** *$$2^7 \cdot 3^2 \cdot 5 \cdot 7$$*

- 3 pts Incorrect / No Answer

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2 Question 2 4 / 4

✓ **- 0 pts** $$ \frac{8^3}{\ln(8^3)} \approx 82$$

- 4 pts Incorrect / No Answer

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3 Question 3 4 / 4

✓ **- 0 pts** *$$(101000001)_2$$*

- 1 pts No subscript indicating base 2

- 2 pts Minor error in work

- 3 pts Major error in work / no work shown

- 4 pts Incorrect / No Answer

Vidit Pokharna

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4 Question 4 4 / 4

✓ **- 0 pts** *Octal: $$(246)_8$$*

Hex: $$(A6)_{16}$$

Decimal: $$(166)_{10}$$

Partly correct

- 1 pts Incorrect Octal

- 1 pts Incorrect Hex

- 1 pts Incorrect Decimal

- 1 pts Missed labelling a subscript

- 2 pts Minor error in work

- 3 pts Major error in work / No work shown

- 4 pts Incorrect / No Answer

Vidit Pokharna

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5 Question 5 4 / 4

✓ **- 0 pts** *$$(1100 1001 1010 0110)_2$$*

- 1 pts No subscript indicating base 2

- 2 pts Minor error in work

- 3 pts Major error in work / No work shown

- 4 pts Incorrect / No Answer

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6 Question 6 3 / 4

- **0 pts** $${(135023)_8}$$

✓ **- 1 pts** *No subscript indicating base 8*

- **2 pts** Minor error in work
- **3 pts** Major error in work / No work shown
- **4 pts** Incorrect / No Answer

7.

a. $(43^2 \ mod \ 36) \ mod \ 8$
$= (((43 \ mod \ 36)^2 \ mod \ 36) \ mod \ 8)$
$= (7^2 \ mod \ 36) \ mod \ 8$
$= (49 \ mod \ 36) \ mod \ 8$
$= 13 \ mod \ 8$
$= 5$

b. $(9^3 \ mod \ 11)^2 \ mod \ 18$
$= \left(\left((9^2 \ mod \ 11)(9 \ mod \ 11)\right) mod \ 11\right)^2 \ mod \ 18$
$= \left((4)(9) \ mod \ 11\right)^2 \ mod \ 18$
$= (36 \ mod \ 11)^2 \ mod \ 18$
$= 3^2 \ mod \ 18$
$= 9$

c. $(24^2 \ mod \ 6) \ mod \ 7003$
$= (((24 \ mod \ 6)^2 \ mod \ 6) \ mod \ 7003)$
$= (((0)^2 \ mod \ 6) \ mod \ 7003)$
$= (0 \ mod \ 6) \ mod \ 7003$
$= 0 \ mod \ 7003$
$= 0$

d. $((-7)^3 \ mod \ 10)^3 \ mod \ 5$
$= ((-7 \ mod \ 10)^3 \ mod \ 10)^3 \ mod \ 5$
$= (3^3 \ mod \ 10)^3 \ mod \ 5$
$= (27 \ mod \ 10)^3 \ mod \ 5$
$= 7^3 \ mod \ 5$
$= (7 \ mod \ 5)^3 \ mod \ 5$
$= 2^3 \ mod \ 5$
$= 8 \ mod \ 5$
$= 3$

7.1 a **4 / 4**

✓ **- 0 pts** *5*

- 4 pts Incorrect / No Answer

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a. $(43^2 \ mod \ 36) \ mod \ 8$
$= (((43 \ mod \ 36)^2 \ mod \ 36) \ mod \ 8)$
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7.2 b **4 / 4**

✓ **- 0 pts** *9*

- 4 pts Incorrect / No Answer

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$= (((43 \ mod \ 36)^2 \ mod \ 36) \ mod \ 8)$
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$= (7 \ mod \ 5)^3 \ mod \ 5$
$= 2^3 \ mod \ 5$
$= 8 \ mod \ 5$
$= 3$

7.3 C **4 / 4**

✓ **- 0 pts** *0*

- 4 pts Incorrect / No Answer

7.

a. $(43^2 \ mod \ 36) \ mod \ 8$
$= (((43 \ mod \ 36)^2 \ mod \ 36) \ mod \ 8)$
$= (7^2 \ mod \ 36) \ mod \ 8$
$= (49 \ mod \ 36) \ mod \ 8$
$= 13 \ mod \ 8$
$= 5$

b. $(9^3 \ mod \ 11)^2 \ mod \ 18$
$= \left(\left((9^2 \ mod \ 11)(9 \ mod \ 11)\right) mod \ 11\right)^2 \ mod \ 18$
$= \left((4)(9) \ mod \ 11\right)^2 \ mod \ 18$
$= (36 \ mod \ 11)^2 \ mod \ 18$
$= 3^2 \ mod \ 18$
$= 9$

c. $(24^2 \ mod \ 6) \ mod \ 7003$
$= (((24 \ mod \ 6)^2 \ mod \ 6) \ mod \ 7003)$
$= (((0)^2 \ mod \ 6) \ mod \ 7003)$
$= (0 \ mod \ 6) \ mod \ 7003$
$= 0 \ mod \ 7003$
$= 0$

d. $((-7)^3 \ mod \ 10)^3 \ mod \ 5$
$= ((-7 \ mod \ 10)^3 \ mod \ 10)^3 \ mod \ 5$
$= (3^3 \ mod \ 10)^3 \ mod \ 5$
$= (27 \ mod \ 10)^3 \ mod \ 5$
$= 7^3 \ mod \ 5$
$= (7 \ mod \ 5)^3 \ mod \ 5$
$= 2^3 \ mod \ 5$
$= 8 \ mod \ 5$
$= 3$

7.4 d **4 / 4**

✓ **- 0 pts** *3*

- 4 pts Incorrect / No Answer

8.

$$a = 2 + 15x, x \in \mathbb{Z}$$
$$b = 11 + 15y, y \in \mathbb{Z}$$

... refers to any term containing a multiple of 15, which would not matter when determining the value in modulo 15 as it is congruent to 0 in modulo 15, therefore, replaced with ...

a. $c \bmod 15$
$= 11(11 + \cdots) \bmod 15$
$= (121 \bmod 15)$
$= 1$
$\rightarrow c \bmod 15 = 1$
$\rightarrow c = 1$

b. $c \bmod 15$
$= ((2 + 15x)^3 + 2(11 + 15y)^2) \bmod 15$
$= \big((8 + \cdots) + 2(121 + \cdots)\big) \bmod 15$
$= \big((8 \bmod 15) + (2(121 \bmod 15) \bmod 15)\big) \bmod 15$
$= \big(8 + (2 \bmod 15)\big) \bmod 15$
$= (8 + 2) \bmod 15$
$= 10 \bmod 15$
$= 10$
$\rightarrow c \bmod 15 = 10$
$\rightarrow c = 10$

c. $c \bmod 15$
$= \big(8(2 + \cdots)\big)^{2000} \bmod 15$
$= 16^{2000} \bmod 15$
$= (16 \bmod 15)^{2000} \bmod 15$
$= 1^{2000} \bmod 15$
$= 1 \bmod 15$
$= 1$
$\rightarrow c \bmod 15 = 1$
$\rightarrow c = 1$

8.1 a **3 / 3**

✓ **- 0 pts** *$$c = 1$$*

- 3 pts Incorrect / No Answer

8.

$$a = 2 + 15x, x \in \mathbb{Z}$$
$$b = 11 + 15y, y \in \mathbb{Z}$$

... refers to any term containing a multiple of 15, which would not matter when determining the value in modulo 15 as it is congruent to 0 in modulo 15, therefore, replaced with ...

a. $c \bmod 15$
$= 11(11 + \cdots) \bmod 15$
$= (121 \bmod 15)$
$= 1$
$\rightarrow c \bmod 15 = 1$
$\rightarrow c = 1$

b. $c \bmod 15$
$= ((2 + 15x)^3 + 2(11 + 15y)^2) \bmod 15$
$= \big((8 + \cdots) + 2(121 + \cdots)\big) \bmod 15$
$= \big((8 \bmod 15) + (2(121 \bmod 15) \bmod 15)\big) \bmod 15$
$= \big(8 + (2 \bmod 15)\big) \bmod 15$
$= (8 + 2) \bmod 15$
$= 10 \bmod 15$
$= 10$
$\rightarrow c \bmod 15 = 10$
$\rightarrow c = 10$

c. $c \bmod 15$
$= \big(8(2 + \cdots)\big)^{2000} \bmod 15$
$= 16^{2000} \bmod 15$
$= (16 \bmod 15)^{2000} \bmod 15$
$= 1^{2000} \bmod 15$
$= 1 \bmod 15$
$= 1$
$\rightarrow c \bmod 15 = 1$
$\rightarrow c = 1$

8.2 b **3 / 3**

✓ **- 0 pts** *$$c = 10$$*

- 3 pts Incorrect / No Answer

8.

$$a = 2 + 15x, x \in \mathbb{Z}$$
$$b = 11 + 15y, y \in \mathbb{Z}$$

... refers to any term containing a multiple of 15, which would not matter when determining the value in modulo 15 as it is congruent to 0 in modulo 15, therefore, replaced with ...

a. $c \bmod 15$
$= 11(11 + \cdots) \bmod 15$
$= (121 \bmod 15)$
$= 1$
$\rightarrow c \bmod 15 = 1$
$\rightarrow c = 1$

b. $c \bmod 15$
$= ((2 + 15x)^3 + 2(11 + 15y)^2) \bmod 15$
$= \big((8 + \cdots) + 2(121 + \cdots)\big) \bmod 15$
$= \big((8 \bmod 15) + (2(121 \bmod 15) \bmod 15)\big) \bmod 15$
$= \big(8 + (2 \bmod 15)\big) \bmod 15$
$= (8 + 2) \bmod 15$
$= 10 \bmod 15$
$= 10$
$\rightarrow c \bmod 15 = 10$
$\rightarrow c = 10$

c. $c \bmod 15$
$= \big(8(2 + \cdots)\big)^{2000} \bmod 15$
$= 16^{2000} \bmod 15$
$= (16 \bmod 15)^{2000} \bmod 15$
$= 1^{2000} \bmod 15$
$= 1 \bmod 15$
$= 1$
$\rightarrow c \bmod 15 = 1$
$\rightarrow c = 1$

8.3 C **3 / 3**

✓ **- 0 pts** *$$c = 1$$*

- 3 pts Incorrect / No Answer

9. I will use direct proof to show that if $a|b$ and $b|a$, then $b = a$ or $b = -a$

Line	Statement	Reason
1	$a\|b$	Given
2	$b\|a$	Given
3	$b = ac, c \in \mathbb{Z}$	Definition of a divides b (1)
4	$a = bd, d \in \mathbb{Z}$	Definition of b divides a (2)
5	$a = (ac)d$	Substitute (3) into (4)
6	$a = a(cd)$	Associativity
7	$1 = cd$	Simplify (6) by dividing a from both side
8	$c = d = \pm 1$	Given c and d are both integers, both must be either 1 or -1 as there are no other pairs of (c, d) that would make (7) true
9	$b = a(\pm 1)$	Plug (8) into (3)
10	$b = \pm a$	Simplify (9)
11	$b = a$ or $b = -a$	Definition of $\pm$

$\therefore$ Using direct proof, $a|b$ and $b|a$, then $b = a$ or $b = -a$. I proved this by instantiating two integer variables to explain the concept of "divides" and later used logic to show that the conditional statement was true.

9 Question 9 8 / 8

✓ **- 0 pts** *Correct*

- 1 pts Missing/incorrect introduction (doesn't mention proof type and/or match assumptions made)

- 2 pts Does not state assumption(s) in introduction or proof body

- 3 pts Invalid assumption (e.g. assumes entire statement is true, assumes conclusion is true in a direct proof, etc.)

Common Errors

- 1 pts Missing domain for 1 variable

- 2 pts Missing domain for 2+ vairables

- 2 pts Uses the same variable for different definitions of divisibility (e.g., saying $$b = ak$$ and $$c = bk$$)

Invalid Steps

- 2 pts 1 Invalid Step

- 4 pts 2 Invalid steps

- 6 pts 3+ Invalid Steps

Skipped Steps

- 2 pts 1 Skipped Step

- 4 pts 2 Skipped Steps

- 6 pts 3+ Skipped Steps

Miscited Steps

- 1 pts 1 Miscited Steps

- 2 pts 2 Miscited Steps

- 3 pts 3 Miscited Steps

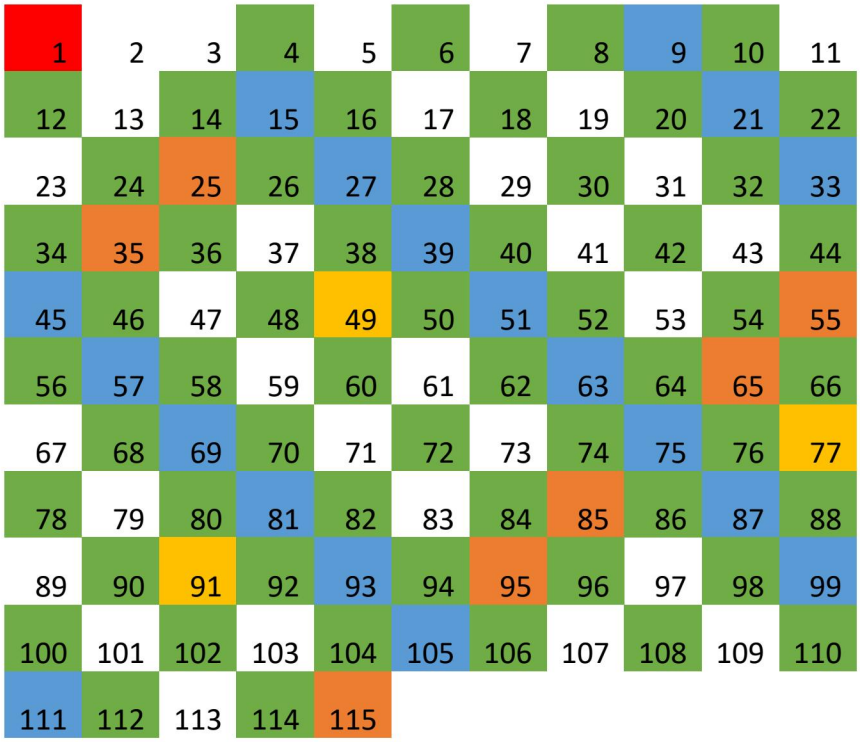
- 4 pts 4+ Miscited Steps

- 2 pts Missing or Incorrect Conclusion

Must say that if $$a | b$$ and $$b | a$$ then $$b = a$$ or $$b =-a$$

- 8 pts No Answer

10.



Crossed out multiples of:
2 3 5 7 11

Values that are left:
2 3 5 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113

This is a total of 30 primes

11.

a. $-294 = -(2^1 \cdot 3^1 \cdot 7^2)$
$274 = (2^1 \cdot 137^1)$
$gcd(-294, 274) = 2^1 = 2$

b. $a = (2^6 \cdot 3^2 \cdot 5^4 \cdot 7^2)$
$b = (2^3 \cdot 3^4 \cdot 7^1)$
$gcd(a, b) = 2^3 \cdot 3^2 \cdot 7^1 = 504$

12.

a. $77 = (7^1 \cdot 11^1)$
$336 = (2^4 \cdot 3^1 \cdot 7^1)$
$lcm(77, 336) = 2^4 \cdot 3^1 \cdot 7^1 \cdot 11^1 = 3696$

b. $a = (3^4 \cdot 5^6 \cdot 11^2)$
$b = (2^4 \cdot 5^3 \cdot 13)$
$lcm(a, b) = 2^4 \cdot 3^4 \cdot 5^6 \cdot 11^2 \cdot 13 = 31853250000$

10 Question 10 **10 / 10**

✓ **- 0 pts** *Correct*

- 3 pts Minor math error

- 6 pts Major Math Error

Missed / Incorrect / Invalid prime

- 2 pts 1 Missed / Incorrect / Invalid prime

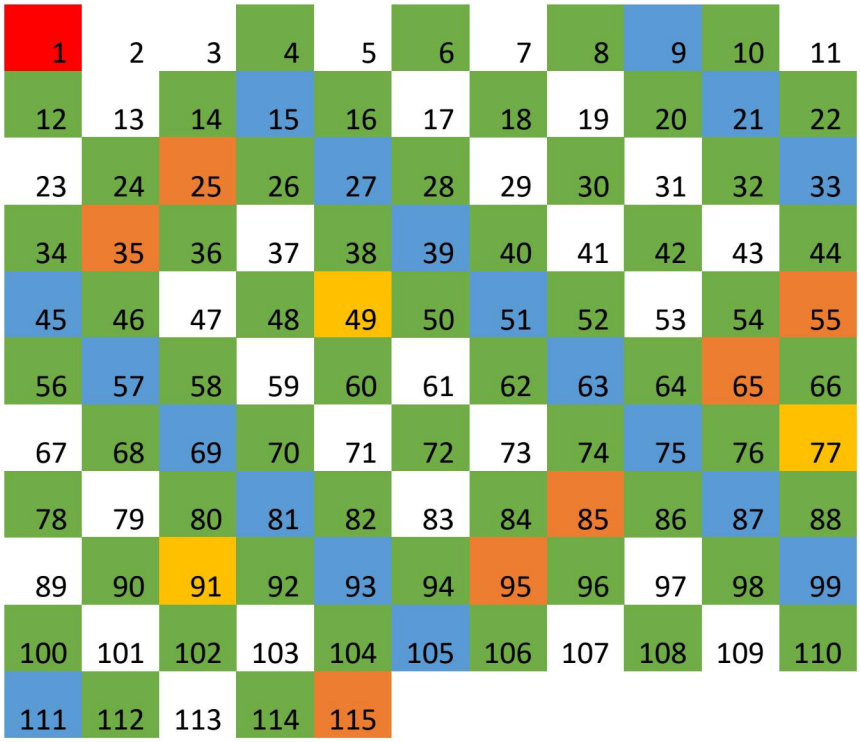
- 4 pts 2 Missed / Incorrect / Invalid prime

- 6 pts 3 Missed / Incorrect / Invalid prime

- 8 pts 4+ Missed / Incorrect / Invalid prime

- 10 pts No Answer

10.



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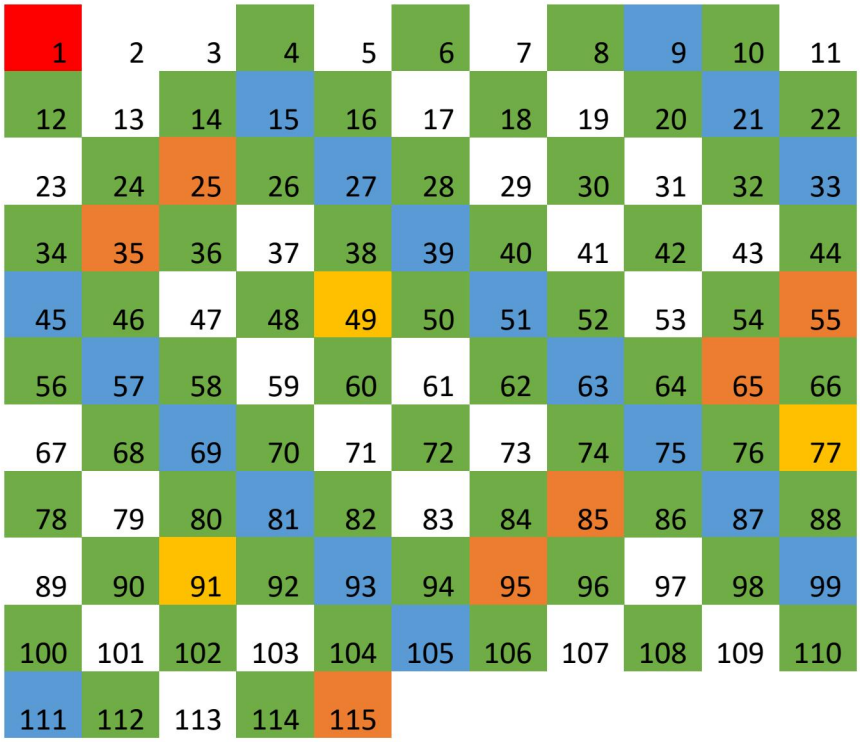
11.1 a **3 / 3**

✓ **- 0 pts** *2*

- 3 pts Incorrect / No Answer

10.



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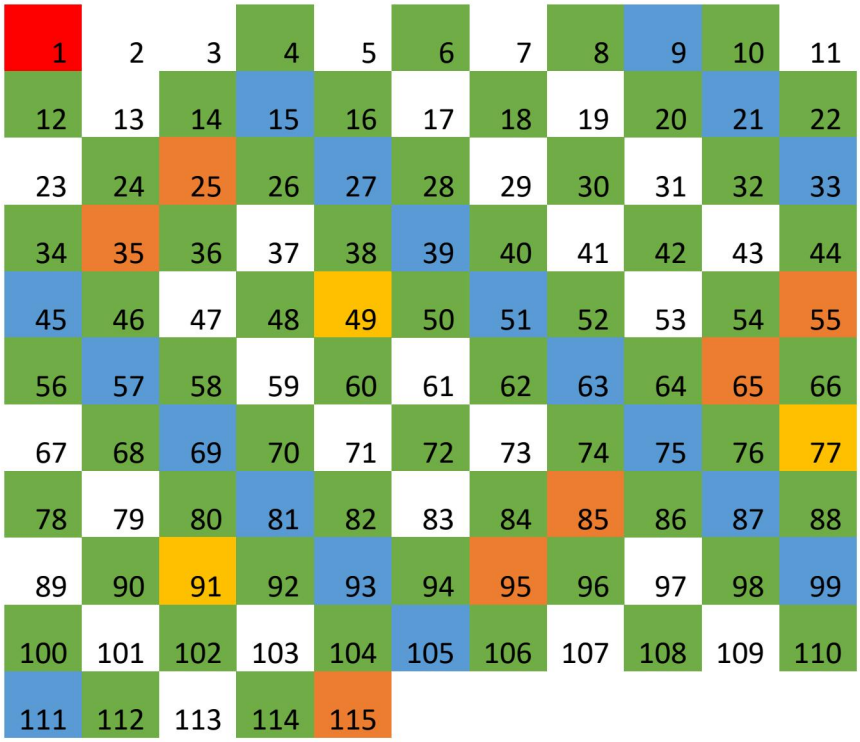
$lcm(a, b) = 2^4 \cdot 3^4 \cdot 5^6 \cdot 11^2 \cdot 13 = 31853250000$

11.2 b **3 / 3**

✓ **- 0 pts** *$$2^3 \cdot 3^2 \cdot 7$$ or $$504$$*

- 3 pts Incorrect / No Answer

10.



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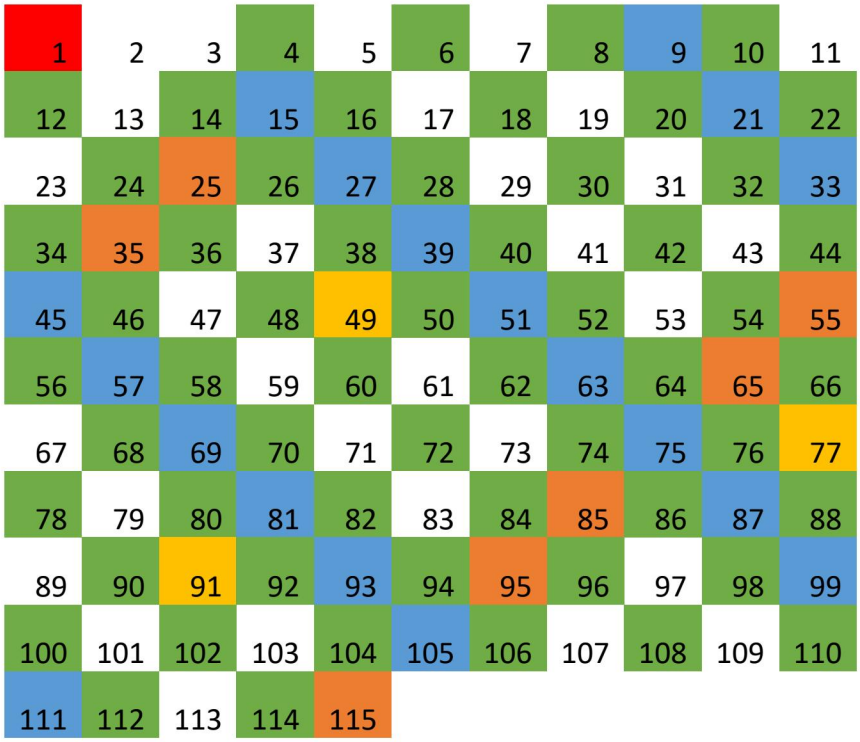
$lcm(a, b) = 2^4 \cdot 3^4 \cdot 5^6 \cdot 11^2 \cdot 13 = 31853250000$

12.1 a **2 / 2**

✓ **- 0 pts** *$$2^4 \cdot 3 \cdot 7 \cdot 11$$ or $$3696$$*

- 2 pts Incorrect / No Answer

10.



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$lcm(a, b) = 2^4 \cdot 3^4 \cdot 5^6 \cdot 11^2 \cdot 13 = 31853250000$

12.2 b **2 / 2**

✓ **- 0 pts** *$$2^4 \cdot 3^4 \cdot 5^6 \cdot 11^2 \cdot 13$$ or $$31853250000$$*

- 2 pts Incorrect / No Answer

13.

a. $15 = (3^1 \cdot 5^1)$
$175 = (3^1 \cdot 5^1 \cdot 7^1)$
$39 = (3^1 \cdot 13^1)$
$\gcd(15, 175) = (3^1 \cdot 5^1) = 15$
Therefore, the set is not pairwise relatively prime

b. $63 = (3^2 \cdot 7^1)$
$50 = (2^1 \cdot 5^2)$
$17 = (17^1)$
$\gcd(63, 50) = 1$
$\gcd(50, 17) = 1$
$\gcd(63, 17) = 1$
Therefore, the set is pairwise relatively prime

14.

a.

x	y	r
123	456	-
123	456	456 mod 123 = 87
87	123	123 mod 87 = 36
36	87	87 mod 36 = 15
15	36	36 mod 15 = 6
6	15	15 mod 6 = 3
3	6	6 mod 3 = 0

$\gcd(123, 456) = 3$

b.

x	y	r
423	72	-
72	423	423 mod 72 = 63
63	72	72 mod 63 = 9
9	63	63 mod 9 = 0

$\gcd(423, 72) = 9$

15.

a. $\varphi(22) = \varphi(2 \cdot 11) = 22\left(1 - \frac{1}{2}\right)\left(1 - \frac{1}{11}\right) = 22\left(\frac{1}{2}\right)\left(\frac{10}{11}\right) = 10$

b. $\varphi(23) = 23\left(1 - \frac{1}{23}\right) = 23\left(\frac{22}{23}\right) = 22$

c. $\varphi(24) = \varphi(2^3 \cdot 3) = 24\left(1 - \frac{1}{2}\right)\left(1 - \frac{1}{3}\right) = 24\left(\frac{1}{2}\right)\left(\frac{2}{3}\right) = 8$

13.1 a **2 / 2**

✓ **- 0 pts** *No*

- 2 pts Incorrect / No Answer

13.

a. $15 = (3^1 \cdot 5^1)$
$175 = (3^1 \cdot 5^1 \cdot 7^1)$
$39 = (3^1 \cdot 13^1)$
$\gcd(15, 175) = (3^1 \cdot 5^1) = 15$
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b. $63 = (3^2 \cdot 7^1)$
$50 = (2^1 \cdot 5^2)$
$17 = (17^1)$
$\gcd(63, 50) = 1$
$\gcd(50, 17) = 1$
$\gcd(63, 17) = 1$
Therefore, the set is pairwise relatively prime

14.

a.

x	y	r
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$\gcd(123, 456) = 3$

b.

x	y	r
423	72	-
72	423	423 mod 72 = 63
63	72	72 mod 63 = 9
9	63	63 mod 9 = 0

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c. $\varphi(24) = \varphi(2^3 \cdot 3) = 24\left(1 - \frac{1}{2}\right)\left(1 - \frac{1}{3}\right) = 24\left(\frac{1}{2}\right)\left(\frac{2}{3}\right) = 8$

13.2 b **2 / 2**

✓ **- 0 pts** *Yes*

- 2 pts Incorrect / No Answer

13.

a. $15 = (3^1 \cdot 5^1)$
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$39 = (3^1 \cdot 13^1)$
$\gcd(15, 175) = (3^1 \cdot 5^1) = 15$
Therefore, the set is not pairwise relatively prime

b. $63 = (3^2 \cdot 7^1)$
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Therefore, the set is pairwise relatively prime

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$\gcd(123, 456) = 3$

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x	y	r
423	72	-
72	423	423 mod 72 = 63
63	72	72 mod 63 = 9
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$\gcd(423, 72) = 9$

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14.1 a **4 / 4**

✓ **- 0 pts** *$$\gcd(123, 456) = 3$$*

- 4 pts Incorrect / No Answer

13.

a. $15 = (3^1 \cdot 5^1)$
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$\gcd(123, 456) = 3$

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14.2 b **4 / 4**

✓ **- 0 pts** *$$\gcd(423, 72) = 9$$*

- 4 pts Incorrect / No Answer

13.

a. $15 = (3^1 \cdot 5^1)$
$175 = (3^1 \cdot 5^1 \cdot 7^1)$
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$\gcd(50, 17) = 1$
$\gcd(63, 17) = 1$
Therefore, the set is pairwise relatively prime

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87	123	123 mod 87 = 36
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15	36	36 mod 15 = 6
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$\gcd(123, 456) = 3$

b.

x	y	r
423	72	-
72	423	423 mod 72 = 63
63	72	72 mod 63 = 9
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$\gcd(423, 72) = 9$

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15.1 a **3 / 3**

✓ **- 0 pts** *10*

- 3 pts Incorrect / No Answer

13.

a. $15 = (3^1 \cdot 5^1)$
$175 = (3^1 \cdot 5^1 \cdot 7^1)$
$39 = (3^1 \cdot 13^1)$
$\gcd(15, 175) = (3^1 \cdot 5^1) = 15$
Therefore, the set is not pairwise relatively prime

b. $63 = (3^2 \cdot 7^1)$
$50 = (2^1 \cdot 5^2)$
$17 = (17^1)$
$\gcd(63, 50) = 1$
$\gcd(50, 17) = 1$
$\gcd(63, 17) = 1$
Therefore, the set is pairwise relatively prime

14.

a.

x	y	r
123	456	-
123	456	456 mod 123 = 87
87	123	123 mod 87 = 36
36	87	87 mod 36 = 15
15	36	36 mod 15 = 6
6	15	15 mod 6 = 3
3	6	6 mod 3 = 0

$\gcd(123, 456) = 3$

b.

x	y	r
423	72	-
72	423	423 mod 72 = 63
63	72	72 mod 63 = 9
9	63	63 mod 9 = 0

$\gcd(423, 72) = 9$

15.

a. $\varphi(22) = \varphi(2 \cdot 11) = 22\left(1 - \frac{1}{2}\right)\left(1 - \frac{1}{11}\right) = 22\left(\frac{1}{2}\right)\left(\frac{10}{11}\right) = 10$

b. $\varphi(23) = 23\left(1 - \frac{1}{23}\right) = 23\left(\frac{22}{23}\right) = 22$

c. $\varphi(24) = \varphi(2^3 \cdot 3) = 24\left(1 - \frac{1}{2}\right)\left(1 - \frac{1}{3}\right) = 24\left(\frac{1}{2}\right)\left(\frac{2}{3}\right) = 8$

15.2 b **3 / 3**

✓ **- 0 pts** *22*

- 3 pts Incorrect / No Answer

13.

a. $15 = (3^1 \cdot 5^1)$
$175 = (3^1 \cdot 5^1 \cdot 7^1)$
$39 = (3^1 \cdot 13^1)$
$\gcd(15, 175) = (3^1 \cdot 5^1) = 15$
Therefore, the set is not pairwise relatively prime

b. $63 = (3^2 \cdot 7^1)$
$50 = (2^1 \cdot 5^2)$
$17 = (17^1)$
$\gcd(63, 50) = 1$
$\gcd(50, 17) = 1$
$\gcd(63, 17) = 1$
Therefore, the set is pairwise relatively prime

14.

a.

x	y	r
123	456	-
123	456	456 mod 123 = 87
87	123	123 mod 87 = 36
36	87	87 mod 36 = 15
15	36	36 mod 15 = 6
6	15	15 mod 6 = 3
3	6	6 mod 3 = 0

$\gcd(123, 456) = 3$

b.

x	y	r
423	72	-
72	423	423 mod 72 = 63
63	72	72 mod 63 = 9
9	63	63 mod 9 = 0

$\gcd(423, 72) = 9$

15.

a. $\varphi(22) = \varphi(2 \cdot 11) = 22\left(1 - \frac{1}{2}\right)\left(1 - \frac{1}{11}\right) = 22\left(\frac{1}{2}\right)\left(\frac{10}{11}\right) = 10$

b. $\varphi(23) = 23\left(1 - \frac{1}{23}\right) = 23\left(\frac{22}{23}\right) = 22$

c. $\varphi(24) = \varphi(2^3 \cdot 3) = 24\left(1 - \frac{1}{2}\right)\left(1 - \frac{1}{3}\right) = 24\left(\frac{1}{2}\right)\left(\frac{2}{3}\right) = 8$

15.3 C **3 / 3**

✓ **- 0 pts** *8*

- 3 pts Incorrect / No Answer

16 Matching **0 / 0**

✓ **- 0 pts** *Correct*

- 5 pts Incorrect

17 On Time **2.5 / 0**

✓ **+ 2.5 pts** *On Time (Before Thursday)*

- 0 pts On Time (Friday)

- 10 pts 1 day late

- 25 pts 2 days late