# **Section 4 - Integers (114 points)**

To receive credit, you must show your work on the worksheet.

**114/144**

1. (15 points) Express a in terms of b using the division algorithm:

a = bq + r ***(remainder must be positive)***

To receive credit, you must show your work.

* 1. (5 pts) a = 916, b = 7

q=a/b r=a%b

q=916/7 r=916%7

q=130 r=6

916 = (7)(130) + 6

* 1. (5 pts) a = -201, b = 13

q=-201/13 r=-201%13

q=-15 r= 7

-201 = (13)(-16) + 7

* 1. (5 pts) a = 1335, b = 5

q=1335/5 r=1335&5

q=267 r=0

1335 = (5)(267) + 0

1. (20 points) Compute using modular arithmetic (positive remainders only)

To receive credit, you must show your work.

* 1. (6 pts) 2035 mod 9

344730881243 mod 9

2

* 1. (6 pts) (593 + 13013) mod 27

(205379 + 2202073901) mod 9

2202279280 mod 9

7

* 1. (8 pts) (451 + 301 \* (−70) - 2154) mod 43

(451 – 21070 – 2154) mod 43

-22773 mod 43

17

1. (19 points) What is the prime factorization of the following?

To receive credit, you must show your work.

* 1. (4 pts) 714

714/2 = 357

357/7=51

51/3=17

2\*3\*7\*17

* 1. (4 pts) 620

620/2=310

310/2=155

155/5=31

2\*2\*5\*31

2^2\*5\*31



* 1. (5 pts) 993 \* 580

575940/2=287970

287970/2=143985

143985/5=28797

28797/3=9599

9599/29=331

2\*2\*5\*3\*29\*331

2^2\*5\*3\*29\*331

* 1. (6 pts) 252 \* 123

1080000/2=540000

540000/2=270000

270000/2=135000

135000/2=67500

67500/2=33750

33750/2=16875

16875/5=3375

3375/5=675

3375/5=135

135/5=27

27/3=9

9/3=3

2\*2\*2\*2\*2\*2\*5\*5\*5\*5\*3\*3\*3

2^6\*5^4\*3^3

1. (20 points) Find the following

To receive credit, you must show your work.

* 1. (5 pts) LCM(21, 612)

21=3\*7

612=2\*2\*3\*3\*17

2\*2\*3\*3\*7\*17

=4284

* 1. (5 pts) LCM(1012, 150)

1012=2\*2\*11\*23

150=2\*3\*5\*5

2\*2\*11\*23\*3\*5\*5

=75900

* 1. (5 pts) GCD(190, 670)

190=2\*5\*19

670=2\*5\*67

2\*5

=10

* 1. (5 pts) GCD(1215, 7875)

1215=3\*3\*3\*3\*3\*5

7875=3\*3\*5\*5\*5\*7

3\*3\*5

=45

1. (20) For the following pair of numbers, find the GCD and then use Euclid’s algorithm to express the GCD as a linear combination of the two numbers.

To receive credit, you must show your work.

* 1. (20 pts) 190 and 100

190 mod 100 = 90

100 mod 90 = 10

90 mod 10 = 0

10 = 100 mod 90

10 = 100 (-100/90) 90

10 = 100 – (1)90

90 = 190 mod 100

90 = 190 (-190/100) \* 100

90 = 190 - (1)100

10 = 100 – (1)(190 – (1)100)

10 = 100 – (1)190 + (1)100

10 = 2(100) – (1)190

10 = s(190) + t(100)

s = -1, t = 2

1. (20 points) Convert the following numbers

To receive credit, you must show your work.

* 1. (6 pts) 21932510 to base 21

219325 mod 21 = 1

10444 mod 21 = 7

497 mod 21 = 14 = E

23 mod 21 = 2

21 mod 21 = 1

0 mod 21 = 0

12E71 base 21

* 1. (6 pts) 1121023 to base 10

3^0 = 1 \* 2 = 2

3^1 = 3 \* 0 = 0

3^2 = 9 \* 1 = 9

3^3 = 27 \* 2 = 54

3^4 = 81 \* 1 = 81

3^5 = 243 \* 1 = 243

243+81+54+9+0+2 = 389 base 10

* 1. (8 pts) (11110112 + 10100002) to base 4

1111011

+1010000

=11001011

2^0 = 1 \* 1 = 1

2^1 = 2 \* 1 = 2

2^2 = 4 \* 0 = 0

2^3 = 8 \* 1 = 8

2^4 = 16 \* 0 = 0

2^5 = 32 \* 0 = 0

2^6 = 64 \* 1 = 64

2^7 = 128 \* 1 = 128

128+64+8+2+1 = 203 base 10

203 mod 4 = 3

50 mod 4 = 2

12 mod 4 = 0

3 mod 4 = 3

0 mod 4 = 0

3023 base 4