Group A Vinny L. Anthony A. John K. Emily D. Claudette Foley } who did what?

Part A) See attached paper

Part B)

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> restart;
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> with(LinearAlgebra):
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```
> T:=Matrix(10,10, [seq([seq(3*x+5*y, x=0..9)], y=0..9)]);
```

$$T := \begin{bmatrix} 0 & 3 & 6 & 9 & 12 & 15 & 18 & 21 & 24 & 27 \\ 5 & 8 & 11 & 14 & 17 & 20 & 23 & 26 & 29 & 32 \\ 10 & 13 & 16 & 19 & 22 & 25 & 28 & 31 & 34 & 37 \\ 15 & 18 & 21 & 24 & 27 & 30 & 33 & 36 & 39 & 42 \\ 20 & 23 & 26 & 29 & 32 & 35 & 38 & 41 & 44 & 47 \\ 25 & 28 & 31 & 34 & 37 & 40 & 43 & 46 & 49 & 52 \\ 30 & 33 & 36 & 39 & 42 & 45 & 48 & 51 & 54 & 57 \\ 35 & 38 & 41 & 44 & 47 & 50 & 53 & 56 & 59 & 62 \\ 40 & 43 & 46 & 49 & 52 & 55 & 58 & 61 & 64 & 67 \\ 45 & 48 & 51 & 54 & 57 & 60 & 63 & 66 & 69 & 72 \end{bmatrix}$$

```
> sort([seq(seq(3*x+5*y, x=0...10), y=0...10)]);
```

[0, 3, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 15, 16, 17, 18, 18, 19, 20, 20, 21, 21, 22, 23, 23, 24, 24, 25, 25, 26, 26, 27, 27, 28, 28, 29, 29, 30, 30, 30, 31, 31, 32, 32, 33, 33, 34, 34, 35, 35, 35, 36, 36, 37, 37, 38, 38, 39, 39, 40, 40, 40, 41, 41, 42, 42, 43, 43, 44, 44, 45, 45, 45, 46, 46, 47, 47, 48, 48, 49, 49, 50, 50, 50, 51, 51, 52, 52, 53, 53, 54, 54, 55, 55, 56, 56, 57, 57, 58, 59, 59, 60, 60, 61, 62, 62, 63, 64, 65, 65, 66, 67, 68, 69, 70, 71, 72, 74, 75, 77, 80]

Our conjecture: The numbers that are not of the form 3x + 5y with x and y greater than or equal to zero are numbers that are less than the value of the largest coefficient not including multiples of either coefficient.

Part C)

```
> sort([seq(seq(3*x+7*y, x=0...10), y=0...10)]);
```

[0, 3, 6, 7, 9, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 21, 22, 23, 24, 24, 25, 26, 27, 27, 28, 28, 29, 30, 30, 31, 31, 32, 33, 34, 34, 35, 35, 36, 37, 37, 38, 38, 39, 40, 41, 41, 42, 42, 43, 44, 44, 45, 45, 46, 47, 48, 48, 49, 49, 50, 51, 51, 52, 52, 53, 54, 55, 55, 56, 56, 57, 58, 58, 59, 59, 60, 61, 62, 62, 63, 63, 64, 65, 65, 66, 66, 67, 68, 69, 69, 70, 70, 71, 72, 72, 73, 73, 74, 75, 76, 76, 77, 78, 79, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 90, 91, 93, 94, 97, 100]

The largest number that is not of the form ax + by with x and y greater than or equal to 0, is 11.

```
> sort([seq(seq(5*x+7*y, x=0...10), y=0...10)]);
```

[0, 5, 7, 10, 12, 14, 15, 17, 19, 20, 21, 22, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 35, 36, 37, 38, 39, 40, 40, 41, 42, 42, 43, 44, 45, 45, 46, 47, 47, 48, 49, 49, 50, 50, 51, 52, 52, 53, 54, 54, 55, 56, 56, 57, 57, 58, 59, 59, 60, 61, 61, 62, 63, 63, 64, 64, 65, 66, 66, 67, 68, 68, 69, 70, 70, 71, 71, 72, 73, 73, 74, 75, 75, 76,

Group A

77, 78, 78, 79, 80, 80, 81, 82, 83, 84, 85, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 98, 99, 100, 101, 103, 105, 106, 108, 110, 113, 115, 120]

The largest number that is not of the form ax + by with x and y greater than or equal to 0, is 23.

```
> sort([seq(seq(4*x+11*y, x=0...10), y=0...10)]);
```

[0, 4, 8, 11, 12, 15, 16, 19, 20, 22, 23, 24, 26, 27, 28, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 122, 123, 124, 126, 127, 128, 130, 131, 134, 135, 138, 139, 142, 146, 150]

The largest number that is not of the form ax + by with x and y greater than or equal to 0, is 29.

Part D)

To find the largest number that is not of the form ax + by with x and y greater than or equal to 0, you can use the formula: (ab) - (a + b) = Largest possible value that does not occur.

```
> sort([seq(seq(4*x+7*y, x=0...10), y=0...10)]);
```

[0, 4, 7, 8, 11, 12, 14, 15, 16, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 28, 29, 30, 31, 32, 32, 33, 34, 35, 35, 36, 36, 37, 38, 39, 39, 40, 40, 41, 42, 42, 43, 43, 44, 45, 46, 46, 47, 47, 48, 49, 49, 50, 50, 51, 52, 53, 53, 54, 54, 55, 56, 56, 57, 57, 58, 59, 60, 60, 61, 61, 62, 63, 63, 64, 64, 65, 66, 67, 67, 68, 68, 69, 70, 70, 71, 71, 72, 73, 74, 74, 75, 75, 76, 77, 78, 78, 79, 80, 81, 82, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 94, 95, 96, 98, 99, 102, 103, 106, 110]

```
> 4*7-(4+7);
```

17

17 is the largest number not present in the sequence.

```
> sort([seq(seq(11*x+13*y, x=0...15), y=0...15)]);
```

[0, 11, 13, 22, 24, 26, 33, 35, 37, 39, 44, 46, 48, 50, 52, 55, 57, 59, 61, 63, 65, 66, 68, 70, 72, 74, 76, 77, 78, 79, 81, 83, 85, 87, 88, 89, 90, 91, 92, 94, 96, 98, 99, 100, 101, 102, 103, 104, 105, 107, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 154, 155, 156, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 165, 166, 167, 167, 168, 169, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 178, 179, 180, 180, 181, 182, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 191, 192, 193, 193, 194, 195, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 204, 205, 206, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 253, 255, 256, 257, 258, 259, 260, 261, 262, 264, 266, 268, 269, 270, 271, 272, 273, 275, 277, 279, 281, 282, 283, 284, 286, 288, 290, 292, 294, 295, 297, 299, 301, 303, 305, 308, 310, 312, 314, 316, 321, 323, 325, 327, 334, 336, 338, 347, 349, 360]

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> 11*13-(13+11);
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119

119 is the largest number not present in the sequence.

Part E)

[redacted] They are Primes

Part F)

Group A

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> sort([seq(seq(seq(6*x+10*y+15*z, x=0...8), y=0...8), z=0...8)]);
```

[0, 6, 10, 12, 15, 16, 18, 20, 21, 22, 24, 25, 26, 27, 28, 30, 30, 30, 31, 32, 33, 34, 35, 36, 36, 36, 37, 38, 39, 40, 40, 40, 41, 42, 42, 42, 43, 44, 45, 45, 45, 46, 46, 46, 47, 48, 48, 48, 49, 50, 50, 50, 51, 51, 51, 52, 52, 52, 53, 54, 54, 55, 55, 55, 56, 56, 56, 57, 57, 57, 58, 58, 58, 59, 60, 60, 60, 60, 60, 61, 61, 61, 62, 62, 62, 63, 63, 63, 64, 64, 65, 65, 65, 66, 66, 66, 66, 66, 67, 67, 67, 68, 68, 68, 69, 69, 70, 70, 70, 70, 70, 71, 71, 71, 72, 72, 72, 72, 72, 73, 73, 73, 74, 74, 75, 75, 75, 75, 75, 76, 76, 76, 76, 76, 77, 77, 77, 78, 78, 78, 78, 78, 79, 79, 80, 80, 80, 80, 80, 81, 81, 81, 81, 81, 82, 82, 82, 82, 82, 83, 83, 83, 84, 84, 84, 85, 85, 85, 85, 85, 86, 86, 86, 86, 86, 87, 87, 87, 87, 87, 88, 88, 88, 88, 88, 89, 89, 90, 90, 90, 90, 90, 90, 91, 91, 91, 91, 91, 92, 92, 92, 92, 92, 93, 93, 93, 93, 93, 94, 94, 94, 95, 95, 95, 95, 95, 96, 96, 96, 96, 96, 96, 97, 97, 97, 97, 97, 98, 98, 98, 98, 98, 99, 99, 99, 100, 100, 100, 100, 100, 100, 101, 101, 101, 101, 101, 102, 102, 102, 102, 102, 102, 103, 103, 103, 103, 103, 104, 104, 104, 105, 105, 105, 105, 105, 105, 106, 106, 106, 106, 106, 106, 107, 107, 107, 107, 107, 108, 108, 108, 108, 108, 108, 109, 109, 109, 110, 110, 110, 110, 110, 110, 111, 111, 111, 111, 111, 111, 112, 112, 112, 112, 112, 112, 113, 113, 113, 113, 113, 114, 114, 114, 115, 115, 115, 115, 115, 115, 116, 116, 116, 116, 116, 116, 117, 117, 117, 117, 117, 117, 118, 118, 118, 118, 118, 118, 119, 119, 119, 120, 120, 120, 120, 120, 120, 121, 121, 121, 121, 121, 121, 122, 122, 122, 122, 122, 122, 123, 123, 123, 123, 123, 123, 124, 124, 124, 125, 125, 125, 125, 125, 125, 126, 126, 126, 126, 126, 126, 127, 127, 127, 127, 127, 127, 128, 128, 128, 128, 128, 128, 129, 129, 129, 130, 130, 130, 130, 130, 130, 131, 131, 131, 131, 131, 131, 132, 132, 132, 132, 132, 132, 133, 133, 133, 133, 133, 133, 134, 134, 134, 135, 135, 135, 135, 135, 136, 136, 136, 136, 136, 136, 137, 137, 137, 137, 137, 137, 138, 138, 138, 138, 138, 138, 139, 139, 139, 140, 140, 140, 140, 140, 140, 141, 141, 141, 141, 141, 142, 142, 142, 142, 142, 142, 143, 143, 143, 143, 143, 143, 144, 144, 144, 145, 145, 145, 145, 145, 146, 146, 146, 146, 146, 146, 147, 147, 147, 147, 147, 148, 148, 148, 148, 148, 148, 149, 149, 149, 150, 150, 150, 150, 150, 151, 151, 151, 151, 151, 152, 152, 152, 152, 152, 152, 153, 153, 153, 153, 153, 154, 154, 154, 155, 155, 155, 155, 155, 156, 156, 156, 156, 156, 157, 157, 157, 157, 157, 158, 158, 158, 158, 158, 158, 159, 159, 160, 160, 160, 160, 160, 161, 161, 161, 161, 161, 162, 162, 162, 162, 162, 163, 163, 163, 163, 163, 164, 164, 164, 165, 165, 165, 166, 166, 166, 166, 166, 167, 167, 167, 167, 167, 168, 168, 168, 168, 168, 169, 169, 170, 170, 170, 170, 170, 171, 171, 171, 172, 172, 172, 172, 172, 173, 173, 173, 173, 173, 174, 174, 175, 175, 175, 176, 176, 176, 176, 176, 177, 177, 177, 178, 178, 178, 178, 178, 179, 179, 180, 180, 180, 181, 181, 181, 182, 182, 182, 182, 182, 183, 183, 183, 184, 184, 185, 185, 185, 186, 186, 186, 187, 187, 187, 188, 188, 188, 188, 188, 189, 190, 190, 190, 191, 191, 191, 192, 192, 192, 193, 193, 193, 194, 194, 195, 196, 196, 196, 197, 197, 197, 198, 198, 198, 199, 200, 200, 200, 201, 202, 202, 202, 203, 203, 203, 204, 205, 206, 206, 206, 207, 208, 208, 208, 209, 210, 211, 212, 212, 212, 213, 214, 215, 216, 217, 218, 218, 218, 220, 221, 222, 223, 224, 226, 227, 228, 230, 232, 233, 236, 238, 242, 248]

The largest number not present in the sequence is 29.

In this example multiply the two smallest coefficients and subtract the sum of all three coefficients.

6.6

a.) $3x + 5y = 4$; no solutions when $x \geq 0$ and $y \geq 0$

when both x and y have to be greater than or equal to zero there is no such solution. This is so because the c value, 4 is not greater than both the a and b values, 3 and 5. Therefore, either x and y have to be negative