Math 161 – Assignment #~~4~~ 5 **Name:** Solution Set

Total = 40

1. Answer the following questions, showing your reasoning.

a) How many 3 digit numbers are divisible by 2? (2)

that's the sequence $\{100, 102, 104, \ldots 998\}$

$a_n = a_1 + (n-1)d$

$998 = 100 + (n-1)\cdot 2$

$898 = (n-1)\cdot 2$

$449 = n-1$

$\boxed{n = 450}$

or 3 digits

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1-9, 0-9, 0,2,4,6,8

so nine choices, so ten choices, so five choices

$\boxed{n = 9\cdot 10\cdot 5 = 450}$

b) How many 3-digit numbers are divisible by 5? (2)

that's the sequence $\{100, 105, 110, \ldots 995\}$

$a_n = a_1 + (n-1)d$

$995 = 100 + (n-1)\cdot 5$

$895 = (n-1)\cdot 5$

$179 = n-1$

$\boxed{n = 180}$

or 3 digits

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1-9, 0-9, 0,5

$\boxed{n = 9\cdot 10\cdot 2 = 180}$

c) How many 3-digit numbers are divisible by 2 and 5? (2)

that's the sequence $\{100, 110, 120, \ldots 990\}$

either calculate as before or notice this will be the same as the number of terms in the sequence $\{10, 11, 12, \ldots 99\}$

which is $n = \text{last} - \text{first} + 1$

$= 99 - 10 + 1 = 90$

or 3 digits

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1-9, 0-9, 0

$n = 9\cdot 10\cdot 1 = 90$

d) How many 3-digit numbers are divisible by 2 or 5? (3)

$n(\text{div by } 2 \text{ or } 5) = n(\text{div by } 2) + n(\text{div by } 5) - n(\text{div by } 2 \text{ and } 5)$

$= 450 + 180 - 90$

$\boxed{n = 540}$

or 3 digits

_ _ _

1-9, 0-9, 0,2,4,5,6,8

$n = 9\cdot 10\cdot 6$

$\boxed{= 540}$

3. Passwords on a particular computer system consist of Russian alphabet, which contains 31 letters (including the letter "π"). If no letters can be repeated, find the following:

a) the number of possible 3-letter codes

$$\underbrace{\underset{\text{any}}{\underline{31}}\ \underset{\text{any}}{\underline{30}}\ \underset{\text{any}}{\underline{29}}}_{\text{no repetition}} = 26970$$

(or P^{31}_3 if you wish)
↑
order matters

1

b) the number of possible 3-letter codes that begin with the letter "π"

$$\underset{\pi}{\underline{1}}\ \underset{\text{any but }\pi}{\underline{30}}\ \underset{\text{any}}{\underline{29}} = 870$$

($P^1_1 P^{30}_2$ if you wish)

2

c) the number of possible 3-letter codes that do not begin with the letter "π"

$$\#\text{ legal} = \text{total} - \text{illegal}$$
$$= 26970 - 870 = 26100$$

(or $P^{31}_3 - P^{30}_2$)

2

d) the number of possible 3-letter codes that contain the letter "π" somewhere

that do not contain π: $\underline{30}\ \underline{29}\ \underline{28} = 24360$

2

$$\#\text{legal} = \text{total} - \text{illegal}$$
$$= 26970 - 24360$$
$$= 2610$$

or

$$\text{total} = \#(\pi\_\_) + \#(\_\pi\_) + \#(\_\_\pi)$$
$$= 3 \times 870$$
$$= 2610$$