Sarah Catovic Homework 2 9/19/2021

Chapter II, Sections 4-5 Summary: Mesopotamian mathematics was more advanced than Egyptian mathematics. Some old texts dating back to the Sumerian era include use of sexagesimal (base 60) decimal system and changing from the regular to that. Egyptians used differing symbols to show different units, but Mesopotamians used placement to determine units, not differing symbols. ($563 = 5\times60^2 + 6\times60 + 3 = 18363$). There were two main issues with this system: 1) you couldn't tell the power so (5, 6, 3) might be $5\times60^1 + 6\times60^0 + 3\times60^{-1} = 306\frac{1}{20}$ 2) There was no real concept of 0 till the persian era so (11, 5) could be $11\times60^2 + 5 = 39605$. The use of sexagesimal dates back to the Sumerians (60 mins/hour, 360° circles, etc). This may be because 60 has many factors or it could be done for unity purposes. The place value system was also of quite importance since it is still in use today, and it seems like different groups such as the Indians and Greeks wanted to claim invention of it. The next time period in Mesopotamia was the Babylonians, with Hammurabi as ruler. The Egyptians could only do linear equations, but tablets from this time period indicate that the Babylonians knew how to solve quadratic and cubic equations. An example from the text has to do with knowing the area of two squares summed together, with a relationship defined between the two side lengths. A quadratic equation is then formed and must be solved, and they know it must be the positive value. Babylonian geometry included knowing the area of rectangle like shapes and volumes of some as well. Pythagoras' theorem was known and applied. Geometry was mainly seen through an algebraic lense. During the New Babylonian, Persian and Selucid eras, math focused on astronomy. Selucid era computations which include 17 sexagesimal places. They used multiplication tables and lists of reciprocals, cubic and square roots. (Example: table of n^3+n^2 probably to solve equations of the form $x^3+x^2=a$). Good approximations for $\sqrt{2}$ and $1/\sqrt{2}$ which seem to be found by $\sqrt{A} = \sqrt{a^2+h} = a + \frac{h}{2a} = \frac{1}{2}(a + \frac{A}{a})$

They assumed the Biblical $\pi = 3$ because the area of the circle was seen as $1/12$ of the circumference. There are texts which have problems with compound interest How long it would take a certain sum to double at 20% compounded interest

Equation: $(1\frac{1}{5})^x = 2$ Firstly $3 < x < 4$ which can be written as $4 - x = (1.2)^4 - 2$

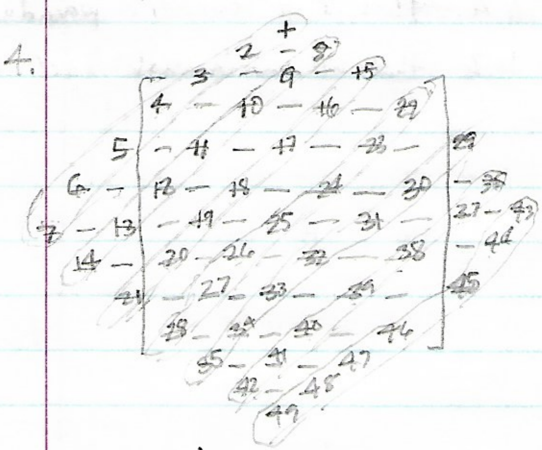
$(1.2)^4 - (1.2)^3$

$x = 4$ years $- (2, 33, 20)$ months

1. $(1+2+\cdots+n^2)/n$ Since there are n rows, n columns, and n elements on the main diagonal and each of these must add up to the same amount, then the total amount of values added up must be split evenly across these three domains. So therefore, it must be the total summed from 1 to n^2 divided by n in each row/column/main diagonal.

2. $\begin{array}{ccc} & 1 & \\ 3 & \begin{bmatrix} 2 & - & 4 \\ - & 5 & - \\ 6 & - & 8 \end{bmatrix} & 7 \\ & 9 & \end{array}$ $\begin{bmatrix} 2 & 9 & 4 \\ 7 & 5 & 3 \\ 6 & 1 & 8 \end{bmatrix}$

3. $\begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \\ 13 & 14 & 15 & 16 \end{bmatrix}$ $\begin{bmatrix} 1 & 15 & 14 & 4 \\ 12 & 6 & 7 & 9 \\ 8 & 10 & 11 & 5 \\ 13 & 3 & 2 & 16 \end{bmatrix}$

4. 

$\begin{bmatrix} 4 & 35 & 10 & 41 & 16 & 47 & 22 \\ 29 & 11 & 42 & 17 & 48 & 23 & 5 \\ 12 & 36 & 18 & 49 & 24 & 6 & 30 \\ 37 & 19 & 43 & 25 & 7 & 31 & 13 \\ 20 & 44 & 26 & 1 & 32 & 14 & 38 \\ 45 & 27 & 2 & 33 & 8 & 39 & 21 \\ 28 & 3 & 34 & 9 & 40 & 15 & 46 \end{bmatrix}$

$1+49=50$	$8+42=50$	$14+36=50$	$21+29=50$
$2+48=50$	$9+41=50$	$15+35=50$	$22+28=50$
$3+47=50$	$10+40=50$	$16+34=50$	$23+27=50$
$4+46=50$	$11+39=50$	$17+33=50$	$24+26=50$
$5+45=50$	$12+38=50$	$18+32=50$	$+25$
$6+44=50$	$13+37=50$	$19+31=50$	$=1225/7$
$7+43=50$		$20+30=50$	

175 per row/column/main diagonal

5. $A = \{1, 3, 5, 7\}$ $B = \{2, 4, 6\}$

B \ A	1	3	5	7
2	B	A	A	A
4	B	B	A	A
6	B	B	B	A

Out of the 12 outcomes both A and B each have half a chance of winning. So when a card is drawn, no single one will be more likely to win since they each have ½ chance of winning.

6. $\begin{bmatrix} 2 & 9 & 4 \\ 7 & 5 & 3 \\ 6 & 1 & 8 \end{bmatrix}$ Let $A = \{2, 7, 6\}$, $B = \{9, 5, 1\}$ and $C = \{4, 3, 8\}$

A vs B

B \ A	2	7	6
9	B	B	B
5	B	A	A
1	A	A	A

A wins

B vs C

C \ B	9	5	1
4	B	B	C
3	B	B	C
8	B	C	C

B wins

A vs C

C \ A	2	7	6
4	C	A	A
3	C	A	A
8	C	C	C

C wins

Deck A is greater than Deck B, Deck B is greater than Deck C, and Deck C is greater than Deck A. This is a sucker's paradox because there is no clearly superior deck that will win against each of the other 2 decks.