Math 100:11 Assignment 1

1.1 56 1.2 36 1.3 10, 12, 16, 20, 24, 26, 34, 54

1.4 56

Choose any number - say 7.

a) x2 = 14
b) +6 = 20
c) ÷2 = 10
d) -7 = 3
e) answer is 3

now repeat but change b) to be +8

a) x2 = 14
b) +8 = 22
c) ÷2 = 11
d) -7 = (4)

now change b) to be +10

a) x2 = 14
b) +10 = 24
c) ÷2 = 12
d) -7 = (5)

f) goes up by one each time. If at b) was +14, would get number back

try with another number - say 11

a) x2 = 22 + 14 = 36 ÷2 = 18 -11 = 7 ✓

So would always get 7 no matter what you started with.

- Always end up with half the number you added in (b)

1.2 36

Divide first triangular number & record remainder

$T_1 = 1$ $\quad 1 = 0(3) + 1$ $\quad$ remainder = 1

$T_2 = 3$ $\quad 3 = 1(3) + 0$ $\quad$ remainder = 0

$T_3 = 6$ $\quad 6 = 2(3) + 0$ $\quad r = 0$

$T_4 = 10$ $\quad 10 = 3(3) + 1$ $\quad r = 1$

$T_5 = 15$ $\quad 15 = 5(3)$ $\quad r = 0$

$T_6 = 21$ $\quad 21 = 7(3)$ $\quad r = 0$

$T_7 = 28$ $\quad 28 = 9(3) + 1$ $\quad r = 1$

remainder is either 0 or 1 and pattern goes

1, 0, 0, 1, 0, 0, 1, 0, 0, 1, ...

1.3 10. How old? Pat & Chris have the same birthday. Pat is twice as old as Chris was when Pat was as old as Chris is now. If Pat is now 24, how old is Chris.

Now:	Pat is 24,	Chris is ?, = x
Then:	Pat is x (same as Chris now)	12 ↑ because Pat is now twice as old as Chris was then

Let Chris's age be x

Difference in years must be the same

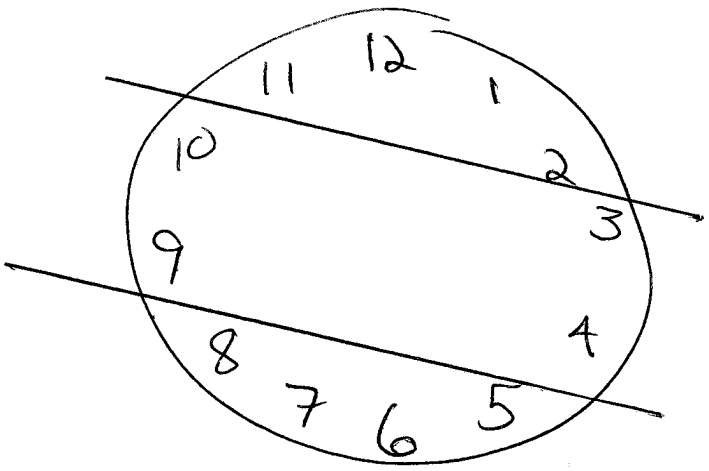
$24 - x = x - 12 \rightarrow 36 = 2x \rightarrow x = 18$

Chris is now 18

Check now: Pat is 24, Chris is 18
then: Pat is 18, Chris is 12 ✓

(could use trial + error)

12. Clock face draw 2 straight lines to divide clock face into regions such that numbers in regions have same total



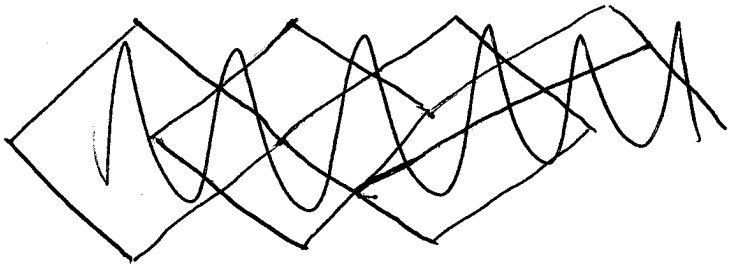
$1+2+..+12 = \frac{12(13)}{2} = 78$

$78 \div 3 = 26$

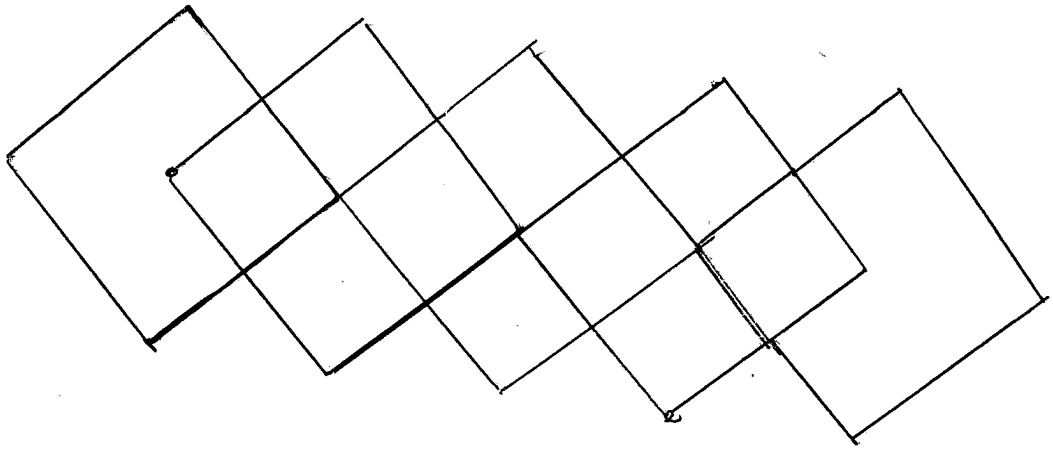
So numbers in each region must add up to 26

$11+12+1+2 = 26$
$9+10+3+4 = 26$ ✓
$8+7+6+5 = 26$

16. ~~Counting Puzzle~~



Bad drawing!



how many rectangles

1x1 = 10

1x2 = 6 ▭ + 6 ◇ = 12

1x3 = 2+2=4

2x2 = 5

2x3 = 0 So 10+12+4+5 = 31

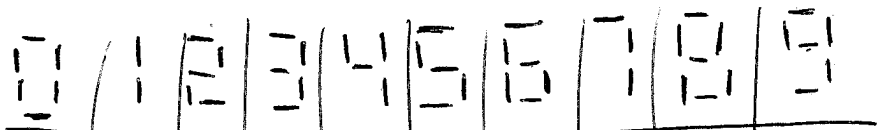
20. Digits place so that boxes that share common corners do not contain successive digits

1,2,3,4,5,6,7,8

	4	6	
7	1	8	2
	3	5	

used trial+error
(tried 1+8 in middle since they only have one successive number to worry about)

02. Brightness of clock display

possible numbers: 

#line:	6	2	5	5	4	5	6	3	7	6

Assume each line has same brightness

hour - can be 1, 2, 3, .. up to 12

highest # lines is with either 12 or 8 (7 lines)

lowest is with 1

minutes - can be 00, 01, 02, ... , 59, 60

highest # lines is 08 with 13

lowest # is 11 with 4

So brightest time is 10:08 or [illegible]

darkest time is 1:11

26 Units digit of a power of 3

$3^0 = 1$, $3^1 = 3$, $3^2 = 9$, $3^3 = 27$, $3^4 = 81$, $3^5 = 243$ ...

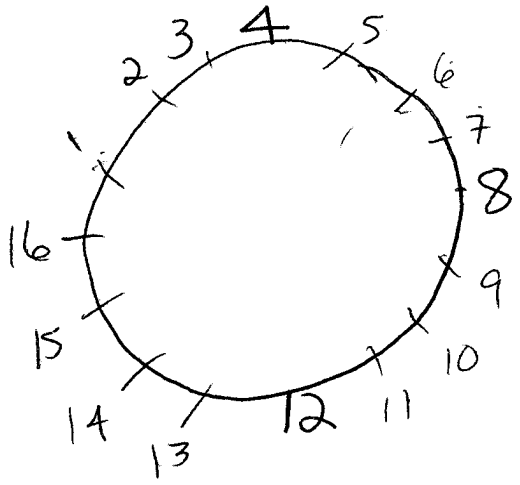
pattern is 1, 3, 9, 7 repeats every 4

$324 = (\text{multiple of } 4) + 0$ remainder is 0 so same as 3^0

Thus units digit of 3^{324} is 1

34. Children in a circle (6)

Some children are standing in a circular arrangement
Evenly spaced & marked in numerical order.
4th is opposite 12th. How many in total?



Halfway between is 8
so & since there are ~~7~~ between
4+12 on one side, needs to
be 7 between on other side
(not including 4+12)

Total = 16

54. Truth 3 Women: Ms Thompson, Ms Johnson & Ms Anderson are sitting side by side at a meeting.
Ms T always tells the truth.
Ms J sometimes tells the truth
Ms A never tells the truth.

① Woman on the left says "Ms T is in the middle." The
② woman in the middle says "I'm ms J" while woman
③ on the right says "Ms A is in the middle".
What are the correct positions?

Suppose Woman on left is telling the truth, so Ms T is in the middle. But Ms T always tells the truth & the woman in the middle says she is Ms J.
Thus this woman is lying.

$\Rightarrow$ Ms T is not in the middle

& Woman on the left is either Ms J or Ms A since she is lying.

IF the woman in the middle is telling the truth, then it would go

Ms A	Ms J	Ms T
left	middle	right

since left is Ms A or Ms J but then Ms T is lying and this isn't possible.

$\Rightarrow$ Middle is not Ms J

$\Rightarrow$ Middle is Ms A

$\Rightarrow$ Left is Ms J

$\Rightarrow$ right is Ms T

check:

Ms J	Ms A	Ms T
always lies	Sometimes truth	always truth
"Ms T is in Middle"	"I'm Miss J"	"Ms A in middle"
lie ✓	lie	truth ✓

(only one solution)