The Peculiar Puzzles of Professor Fibbernacho

BLACKLINE MASTERS

Puzzle One: Game, Set, Math

SETS

Exercises:

1. Write which **set** these numbers belong to:

     a. 1, 2, 5, 6, 12, 100   The set of _____ .

     b. -2, 78, 12, 0   The set of _____ .

     c. 2/3, 2/9, 12, 5/4, 1 1/2   The set of _____ .

     d. 7.8, 97.567, 13.5, 0.9   The set of _____ .

     e. 1/2, 2/4, 4/15, 14/19   The set of _____ .

2. Can a number be in two sets at once? Look at the first two sets in the exercises you have just done. Is there a number common to both?

Advanced:

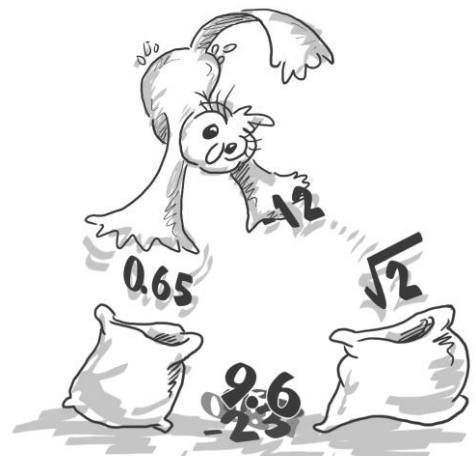1. Write which **set** these numbers belong to:

     a. -3, 0, 5, -12   The set of _____ .

     b. 1/3, 9.6, 21, 3/5   The set of _____ .

     c. 0.87, -65, 0, 3/7   The set of _____ .

     d. $\sqrt{2}$, π , 0   The set of _____ .

     e. $-\sqrt{2}$, $-\pi$, 100.001   The set of _____ .

Puzzle One: Game, Set, Math

a. aratNul   _____
b. rteengl   _____
c. oaatnRil   _____
d. aelR   _____

Still stuck? If you swap the letters of the key (remainuptot) around, you get the word "permutation". To decode the secret message, permute (which means swap) the letters in each word around.

hTree saw lnoy noe nam ni danElng woh doucl cepidher arMy, uneeQ fo cotS's doec,

dan hatt wsa uneeQ azthebEil's rsceetyar. fl eh dha eben elabnu ot kreab het coed,

yrMa dowul evah noge erfe.

Decode the secret message here:

_____

_____

_____

_____

Puzzle Two: Top That

TOPOLOGY

Exercises:

1. How many sides, corners and faces do these shapes have?

        a. a tetrahedron
   b. an octahedron
        c. a square based pyramid

A tetrahedron has _____ sides, _____ corners and _____ faces.
An octahedron has _____ sides, _____ corners and _____ faces.
A square based pyramid has _____ sides, _____ corners and _____ faces.

2. If you had a long, thin strip of paper and joined the two ends together with sticky tape, you would make a ring. You could cut down the centre line of the ring to make two thinner rings. Cut a strip of paper and try it.

- -
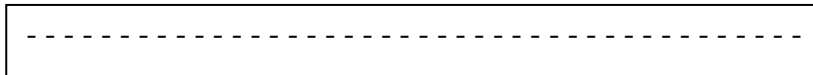
3. If you had another long, thin strip of paper and you put a single twist in it before joining the ends together, you would have a ring with a twist. If you cut down the centre line of this twisted ring, would you get two thinner rings with a twist? Try it and see.

Advanced:

1. The ring with a twist that you have made is called a Mobius strip. When you cut it down its centre line, you should have ended up with one long, narrow loop with some twists in it. How many twists do you have? What would happen if you took this loop and cut it down its centre line? Try it. What do you find?

2. When you make a ring with no twists, you can colour the outside using one colour, and the inside using another colour. This seems obvious enough. Now make another Mobuis strip. Colour one side of the Mobius strip. What do you find?

Puzzle Two: Top That

_ . _. // . . / . . . // _ /. . . . / . // _ . / . . _ / _ _ / _ . . . / . / . _ . //

_ _ _ / . . _ . // _ . _ . / _ _ _ / . _ . / _ . / . _ . / . . _ / . . . // . // . . / . . . //

_ / . . . . / . // _ . / . . _ / _ _ / _ . . . / . / . _ . // _ _ _ / . . _ . // . / _ . . /

_ _ . / . / . . . // . . _ . // . . / . . . // _ / . . . . / . // _ . / . . _ / _ _ / _ . . . /

. / . _ . // _ _ _ / . . _ . // . . _ . / . _ / _ . _ . / . / . . . //

Decode the secret message here:

_____
_____
_____
_____
_____
_____

Can you see what C + F - E = 2 means now?

Still enthusiastic? Keep decoding!

_ / . _ . / . _ . _ // . . / _ // . _ _ / . . / _ / . . . . // _ / . . . . / . // . _ _ . / _ . _ _ /

. _ . / . _ / _ _ / . . / _ . . // _ . . / _ _ _ / . / . . . // . . / _ // . _ _ . / _ _ _ / . . . /

_ . _ // . . _ . / _ _ _ / . _ . // . _ // _ . _ . / . . / _ . . . / . //

Decode the secret message here:

_____

_____

_____

_____

_____

Want some more challenges? Keep going!

. _ _ / . . . . / . _ / _ // . _ / _ . . . / _ _ _ / . . _ / _ // . _ // _ . . / _ _ _ / _ . . /

. / _ . _ . / . _ / . . . . / . / _ . . / . _ . / _ _ _ / _ . // _ / . _ . / _ . _ _ //

. _ // _ . . . / . . _ / _ . _ . / _ . _ / _ _ / . . / _ . / . . . / _ / . / . _ /

. . _ . / . . _ / . _ . . / . _ . . / . / . _ . / . / _ . / . //

Decode the secret message here:

_____

_____

_____

_____

_____

A **polygon** is a **two** dimensional shape whose edges are made up of straight lines. Some examples are a square, a triangle and a hexagon. A circle is not a polygon. Does the formula C + F - E = 2 work for polygons?

A **polyhedron** is a **three** dimensional shape whose faces are made up of polygons. These can be all the same shape, or different shapes, as long as they are all polygons. A sphere is not a polyhedron. Does the formula C + F - E = 2 work for a sphere? Can you find any other three dimensional shapes where this formula will not work?

Puzzle Three: Fe Fi Fo Fum

SEQUENCES

Exercises:

Find the next three numbers in the sequences below. What is the pattern in each?

a. 2, 4, 8, 16, ___, ___, ___.   Pattern: _____

b. 1, ½, 1/3, ¼, ___, ___, ___.   Pattern: _____

c. 1, 3, 6, 10, ___, ___, ___.   Pattern: _____

d. 2, 3, 5, 9, ___, ___, ___.   Pattern: _____

Advanced:

1. Find the next three numbers in the sequences below. What is the pattern in each?

a. 2, 3, 5, 8, 12, 17, ___, ___, ___.   Pattern: _____

b. 1, 1, 2, 3, 5, 8, 13, ___, ___, ___.   Pattern: _____

c. 1, 4, 9, 16, 25, ___, ___, ___.   Pattern: _____

2. What is the pattern in this sequence of numbers?

0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, 1, 2, 3, …

Pattern: _____

Puzzle Three: Fe Fi Fo Fum

The **Fibonacci sequence** is 1, 1, 2, 3, 5, __, __, __, ...

The *sixth* Fibonacci number is: ___
The *fourth* Fibonacci number is: ___
That means the **key** is ___ - ___ = ___

Below is the alphabet. Use the **key** that you found from the Fibonacci numbers to find the first letter you will write under the A. Write the rest of the alphabet out underneath the one below.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Ymj Kngtsfhhn xjvzjshj lnajx dtz ymj szrgjw umn. Yfpj ybt

htsxjhzynaj szrgjwx ns ymj xjvzjshj fsi inanij ymj qfwljw gd ymj

xrfqqjw. Ymj qfwljw ymj szrgjwx dtz zxj, ymj hqtxjw dtz ljy

yt umn.

Decode the secret message here:

_____
_____
_____
_____
_____
_____

Try doing this with the numbers in the Fibonacci sequence. Do it with a larger pair of numbers each time. What do you find?

What about the rectangles? Decode to find out more!

Ymj wjhyfslqjx fwj hfqqji Itqijs wjhyfslqjx. Ymjd mfaj qjslym tsj, fsi bniym umn. Umn nx fs nwwfyntsfq szrgjw.

Decode the secret message here:

_____
_____
_____
_____
_____

In case you want more information:

Ymj rfymjrfynhnfs Kngtsfhhn bfx fqnaj ns ymj ymnwyjjsym hjsyzwd, gzy ymj szrgjw umn mfx gjjs fwtzsi xnshj ymj knkym hjsyzwd GH, bmjs ny bfx zxji gd ymj fshnjsy Lwjjpx ns ymjnw ijxnls tk ymj Ufwymjsts ns Fymjsx

Decode the secret message here:

_____
_____
_____
_____
_____
_____

Puzzle Four: Primate Helpers

PRIME NUMBERS

Exercises:

1. Use the **Sieve of Eratosthenes** to find the prime numbers between one and one hundred.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
22 23 24 25 26 27 28 29 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

Remember, first cross off all the numbers divisible by 2 (except for 2) then cross off all the numbers divisible by 3 (except for 3) then cross off all the numbers divisible by 5 (except for 5) then cross off all the numbers divisible by 7 (except for 7). You can use a calculator if you need to. Do you need to cross off the numbers divisible by 11? Try it and see.

2. Write the prime numbers between 1 and 100 here.

_____

_____

_____

3. How many prime numbers did you find? You should have found 25 prime numbers.

Advanced:

To find the prime numbers from 1 to 50 we only had to check if the numbers were divisible by 2, 3, 5 or 7. So the highest number to divide by is 7. To find the prime numbers from 1 to 100, what is the highest number we had to divide by?

Can you find the next prime number after 97?

Puzzle Four: Primate Helpers

The *ninth* prime number is: ___
The *sixth* prime number is: ___

That means the **key** is: ___

Write out the alphabet underneath this one, starting with the letter that corresponds to the key that you have just worked out.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Dro Scrkxqy lyxo gkc pyexn sx Kpbsmk. Sd sc yfob dgoxdi

psfo dryeckxn iokbc yvn.

Write the secret message here:

_____
_____
_____
_____

Here is some extra information, for all you super sleuth fast finishers!

Cywo zoyzvo cki sd sc dro yvnocd dklvo yp zbswo xewlobc.

Ydrobc cki sd sc k mkvoxnob. Grkd ny iye drsxu?

Write the secret message here:

_____
_____
_____
_____

This bone is the second oldest mathematical object that has been found. Can you find out what the oldest is? On the bone, there are three columns of numbers. Two of the columns both add to sixty. What do you think the importance of the number sixty is?

Puzzle Five: Shaking Hands

PRIME FACTORIZATION

Exercises:

1. Find the **prime factorization** of the following numbers:

a. 24 _____

b. 33 _____

c. 15 _____

d. 16 _____

Advanced:

1. Find the **prime factorization** of the following numbers:

a. 32 _____

b. 57 _____

c. 48 _____

d. 64 _____

Puzzle Five: Shaking Hands

A =   F =   K =   P =   U =   Z =
B =   G =   L =   Q =   V =
C =   H =   M =   R =   W =
D =   I =   N =   S =   X =
E =   J =   O =   T =   Y =

Next to each letter of the alphabet, write the **double digit number** which corresponds to each letter. It will look like this: **A = 00, B = 01, …, Y = 24, Z = 25**.

141304 / 150417181413 / 180700100418 / 131414130418 / 07001303. /

192214 / 150414151104 / 12001004 / 141304 / 070013031807001004. /

1907170404 / 150414151104 / 12001004 / 1907170404 /

070013031807001004.418.

Decode the secret message here:

_____

_____

_____

Try this with one, two and three people.

Keep decoding to help you work out the pattern!

05142017 / 150414151104 / 12001004 / 180823 / 070013031807001004.418. /

05082104 / 150414151104 / 12001004 / 190413 / 070013031807001004.418. /

180823 / 150414151104 / 12001004 / 05080519040413 /

070013031807001004.418.

Decode the secret message here:

_____

_____

_____

_____

Try this with four, five and six people.

Can you see the pattern? Keep decoding if you can't.

190704 / 132012010417 / 1405 / 07001303180700100418 / 0818 /

25041714, / 141304, / 1907170404, / 180823, / 190413, /

05080519040413, / 001303 / 1814 / 1413. / 0813 / 19070818 /

1804162004130204 / 241420 / 001704 / 000303081306 / 141304, /

19070413 / 192214, / 1907170404, / 05142017, / 05082104 001303 /

1814 / 1413.

Decode the secret message here:

_____

_____

_____

_____

_____

_____

The numbers that you have found are known as Triangular numbers. Do you know why?

Can you work out how many handshakes seven people would have?

Puzzle Six: Tower Of Hanoi

NUMBER PATTERNS

Exercises:

Look at the two sequences of numbers below.

1, 3, 6, 10, 15, 21, 28, ….

1, 4, 9, 16, 25, 36, …

The first sequence comprises **triangular** numbers and the second sequence comprises **square** numbers. You can make **triangular** numbers from counting the number of dots in a triangle, and **square** numbers from counting the number of dots in a square.

The two columns below show the square and triangular numbers using dots. Fill in the rest of the columns using the number of dots written in the column. Does this help you see the square and triangular numbers?

Squares:

1 .

4 . .
   . .

9

16

25

Triangles:

1 .

3 .
   . .

6

10

15

Now add two consecutive (in a row) triangular numbers together. Do you get a square number? Do you think this always happens? See if you can draw a picture to show this.

Advanced:

What do you think **pentagonal numbers** are? Draw some pictures to help you.

Puzzle Six: Tower Of Hanoi

A =	F =	K =	P =	U =	Z =
B =	G =	L =	Q =	V =	
C =	H =	M =	R =	W =	
D =	I =	N =	S =	X =	
E =	J =	O =	T =	Y =	

Next to each letter of the alphabet, write the **double digit number** which corresponds to each letter. It will look like this: **A = 00, B = 01, …, Y = 24, Z = 25**.

1413040714 1415170416 2008170418 1413041214 2104192214

0714141518 1704162008 1704190717 0404121421 0418

Decode the secret message here:

_____

_____

_____

_____

_____

Have you found the pattern? If not, keep decoding.

1907170404 0714141518 1704162008 1704180421 0413121421

0418051420 1707141415 1817041620 0817040508 0519040413

1214210418

Decode the secret message here:

_____

_____

_____

_____

_____

Can you see the pattern in the number of moves yet? If not, keep decoding!

1413041907 1704041804 2104130508 0519040413 1907081818

0416200413 0204081812 0003040124 0314200111 0813061907

0415170421 0814201813 2012010417 0013030003 0308130614

1304

Decode the secret message here:

_____

_____

_____

_____

_____

How many moves would five hoops need?

Puzzle Seven: Hotel California

INFINITY

Exercises:

1. For each of the even numbers below, find two **odd prime numbers** that add together to give these numbers.

a. 10 = ___ + ___

b. 12 = ___ + ___

c. 14 = ___ + ___

d. 16 = ___ + ___

e. 18 = ___ + ___

f. 20 = ___ + ___

2. Goldbach believed that this pattern continued forever. This would mean that if we counted all the way up to infinity, all the even numbers could be written as the sum of two odd prime numbers. Do you think that he was correct? How would you find out?

Advanced:

Look at the pairs of prime numbers below:

3 and **5**
5 and **7**
11 and **13**
1,000,037 and **1,000,039**

These are known as **twin primes**. Can you see why? Let us have a look.

5 – 3 = 2
7 – 5 = 2
13 – 11 = 2
1,000,039 – 1,000,037 = 2

Twin primes are prime numbers that differ by **two.**

1. Look back through the list of prime numbers that you found using the sieve of Eratosthenes. Write down some more twin primes.

2. Mathematicians do not know if there are an infinite number of these twin prime numbers. They know there are lots of them, but do these pairs continue occurring forever? They have been working on this problem for many hundreds of years. What do you think?

Puzzle Seven: Hotel California

What is the first pair of *twin primes*? ___ and ___.

What is the *difference* between these two numbers? ___.

This is your **key**! This means that A = 00 + *key* = ___.

Fill in the double digits that correspond to the alphabet below.

A =	F =	K =	P =	U =	Z =
B =	G =	L =	Q =	V =	
C =	H =	M =	R =	W =	
D =	I =	N =	S =	X =	
E =	J =	O =	T =	Y =	

14162306 / 0623061900161506 / 2217 / 161506 / 19161614 /

21090615 / 19161614 / 161506 / 1020 / 2017021906.

Decode the secret message here:

_____

_____

_____

_____

Fill in the details below to show what happens to the movement of the guests in the first few rooms when you do what is suggested in the code. This gives you the pattern, which you can then use to see what happens to all of the guests in the hotel:

1 → ___
2 → ___
3 → ___
4 → ___

Using this pattern, which guest gets room 100?

Which guest gets room 10000?

Which guest gets room infinity?

Want an extra challenge? Read on.

The professor decided to hold a party at the hotel, and called the receptionist to ask her how many guests he could invite. She told him he could invite as many people as he wished to, as they had enough rooms for an infinite number of new guests, even though their hotel was full. How is this possible? On the back of an old envelope the professor had scribbled:

$$\infty + \infty = \ ?$$

How can we add infinity to infinity? And what might the answer be? Think about this before you decode the answer.

06020409 / 0822062021 / 1020 / 1416230605 / 10152116 / 02 / 19161614 /

21090221 / 1020 / 2124100406 / 210906 / 152214030619 / 1607 /

2109061019 / 1619100810150213 / 19161614. / 21091020 / 130602230620 /

021313 / 210906 / 160505 / 1916161420 / 07190606. / 2109061906 / 1020 /

0215 / 1015071015102106 / 152214030619 / 1607 / 160505 /

15221403061920.

Decode the secret message here:

_____

_____

_____

_____

Fill in the details below to show the movement of the guests in the first few rooms, using the information in the message you have just decoded.

1 → ___
2 → ___
3 → ___
4 → ___

Which guest gets room 10?

Which guest gets room 11?

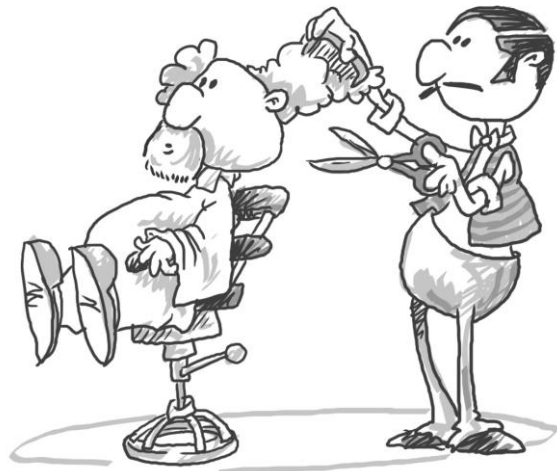Which guest gets room infinity?

Puzzle Eight: This Sentence Is False

BINARY NUMBERS

Exercises:

Work out the binary numbers from 1 to 10, and put them in the table below. Some have been done for you.

Sixteens 2^4=2x2x2x2	Eights 2^3=2x2x2	Fours 2^2=2x2	Twos 2^1=2	Units 2^0=1
0	0	0	0	1
0	0	0	1	0
0	0	0	1	1
0	0	1	0	0
0	1	0	1	0

1 = 00001
2 = 00010
3 = 00011
4 = 00100
5 =
6 =
7 =
8 =
9 =
10 = 01010

Can you see any patterns? Look down each column and see what you notice.

What do you notice about the numbers 3 and 7 in the binary system?

Advanced:

If the decimal system uses ten digits, and the binary system uses two digits (0 and 1) how many digits do you think the **ternary** system uses?

It uses **three** (0, 1, and 2). The columns in our table for the ternary system would be: units, threes, nines, twenty sevens and so on.

The first three numbers are in the table below, using the ternary system. Try to find the next few numbers in the ternary system.

Twenty-sevens $3^3=3\times3\times3$	Nines $3^2=3\times3$	Threes $3^1=3$	Units $3^0=1$
0	0	0	1
0	0	0	2
0	0	1	0

1 = 0001
2 = 0002
3 = 0010
4 =
5 =
6 =
7 =
8 =
9 =

What do you notice about the numbers 2 and 8 in the ternary system?

Puzzle Eight: This Sentence Is False

Decimal Number	Sixteens: $2^4 = 2{\times}2{\times}2{\times}2$	Eights: $2^3 = 2{\times}2{\times}2$	Fours: $2^2 = 2{\times}2$	Twos: $2^1 = 2$	Units: $2^0 = 1$
0	0	0	0	0	0
1	0	0	0	0	1
2	0	0	0	1	0
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25	1	1	0	0	1

We can now represent each letter of the alphabet with the binary numbers we have just worked out. Finish the list below and you will have the cipher that you need to decode the secret message!

A = 00000	N =
B = 00001	O =
C = 00010	P =
D = 00011	Q =
E = 00100	R =
F =	S =
G =	T =
H =	U =
I =	V =
J =	W =
K =	X =
L =	Y =
M =	Z = 11001

00000 / 01111 00000 10001 00000 00011 01110 10111 / 01000

10010 / 00000 / 10010 10011 00000 10011 00100 01100 00100

01101 10011 / 01110 10001 / 10010 10011 01110 10001 11000 /

10011 00111 00000 10011 / 00010 01110 01101 10011 10001

00000 00011 01000 00010 10011 10010 / 01000 10011 10010

00100 01011 00101. / 10011 00111 00100 / 10010 10011 01110

10001 11000 / 01110 00101 / 10011 00111 00100 / 00001 00000

10001 00001 00100 10001 / 01000 10010 / 00000/ 01111 00000

10001 00000 00011 01110 10111.

Decode the secret message here:

_____

_____

_____

_____

_____

_____

_____

_____

Want more information? Keep decoding!

10011 00111 00100 / 10010 10011 00000 10011 00100 01100

00100 01101 10011 "01000 / 00000 01011 10110 00000 11000

10010 / 01011 01000 00100" / 01000 10010 / 00000 01011 10010

01110 / 00000 / 01111 00000 10001 00000 00011 01110 10111, /

00001 00100 00010 00000 10100 10010 00100 / 01000 10011 /

00010 01110 01101 10011 10001 00000 00011 01000 00010 10011

10010 / 01000 10011 10010 00100 01011 00101. / 01000 00101 /

01000 10011 / 01000 10010 / 10011 10001 10100 00100 / 10011

00111 00100 01101 / 01000 10011 / 01100 10100 10010 10011 /

00001 00100 / 00101 00000 01011 10010 00100.

Decode the secret message here:

_____

_____

_____

_____

_____

_____

_____

Puzzle Nine: Three Triangles

HAILSTONE PROBLEM

Exercises:

Try the Hailstone problem starting with the number 24. Remember, if the number is even we halve it, and if it is odd we multiply it by three and add one. You can use a calculator if you need to.

24 is _____ so we get ___

___ is _____ so we get ___

___ is _____ so we get ___

___ is _____ so we get ___

___ is _____ so we get ___

___ is _____ so we get ___

___ is _____ so we get ___

___ is _____ so we get ___

___ is _____ so we get ___

___ is _____ so we get ___

Did you get 4, 2, 1, ..?

Advanced:

Try the Hailstone problem starting with the number 7.

Puzzle Nine: Three Triangles

0010010101 0010010001 1100001101 1010001100 0000100100

1000100010 0000001101   0000100100 1011010001 0100010011

1001100100 0110100000 1001010011 0011100100 1001010100

0110001110 0010101110 0110100100, 1001110110 0111001110

1000110011 0011110001 0010000100 1001110001 0100000000

0110100110 1010001011 0000010001 0110110100 0110000001

0010010001 10010.

Decode the secret message here:

_____
_____
_____
_____
_____
_____

Try it. Do you think this is true?

1 = 1

2 = 1 + 1

3 = 1 + 1 + 1 (or just 3, because it is a number in the sequence.)

4 = 3 + 1

5 = __ + __ + __

6 = 6 (because it is a number in the sequence.)

7 = __ + __   also 7 = 3 + 3 + 1

8 = __ + __ + __

Keep going. How far can you go?

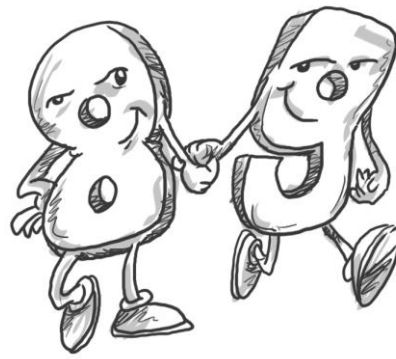Try these numbers as well:

19 = __ + __ + __

22 = __ + __ + __ = 21 + 1

26 = __ + __ + __

Are you finding any patterns?

For an extra challenge, decode the following information.

0011000000 1010010010 1001010110 0000010010 0000010101

0010010001 1100000010 0101100100 1010100100 1000101100

0000001101, 0000001101 0001100001 0010000010 0000001100

0010001010 0110101110 1011001101 0000010010 1001100111

0010001111 1000101000 0110100010 0010001110 0010101100

0000010011 0011100100 0110000000 1001101000 0001010010.

Decode the secret message here:

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Puzzle Ten: The Bridges Of Konigsberg

CLOCK ARITHMETIC

Exercises:

Using a 12 clock, find the answers to these calculations:

a. 5 + 9 =

b. 6 + 7 =

c. 9 + 14 =

d. 13 – 9 =

e. 14 + 11 + 8 =

Advanced:

Now do the same calculations but use a 6 clock. What do you notice? Can you see why this is?

a. 5 + 9 =

b. 6 + 7 =

c. 9 + 14 =

d. 13 – 9 =

e. 14 + 11 + 8 =

Chapter Ten: The Bridges Of Konigsberg

0100010011010001001001000001100011110111010010010010010000001

0101100100100110111000010100010111010010010000000101101011

0000110001010000001100110001001001001110011010001000100000000

0110100011011100110101111000011100110001000100.0001000000

0110111000011101010010010001000010010110011111000?

Decode the secret message here:

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For an extra challenge, you can work out how we know this is true. To help you, it is useful to represent the bridges using dots and lines, where the dots represent the land and the lines represent the bridges connecting the land. You will have four dots, for the four separate sections of land. How many lines will you have? Draw the four dots and label them A B C and D, as below.

A.

B.   C.   D.
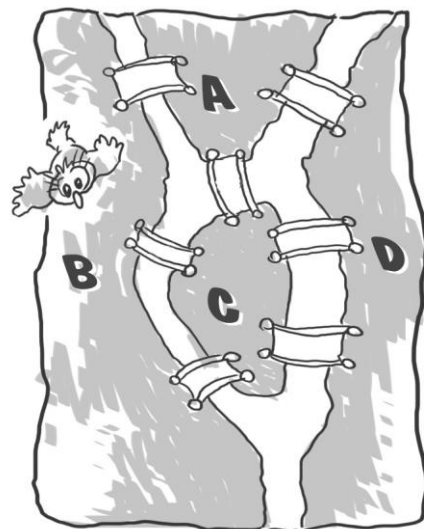
Now decode the following for more instructions.

000100111001101011011 00100000101001100011 0111010011"00000"10110

010001001100111000011 011101001110010"00001", "00010"000000110100011

"00011"101001001001000 01101001101001100111 10001001000010001011

0100001101001001001001. 000100111001101011011 0100000101001100011

0111010011110010"00001" 000000110100011"00010" 101001001001000011001

001101001110110011100 010110100001101001001 10010.0001001111001101

01101001000001010011 00011011101001110010 "00010"000000110100011

"00011"101001001001000 011010011010011110110 0111001011010000110011

0010010010.

Decode the secret message here:

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When you do this you should have seven lines on your diagram, one for each bridge.

Now count the number of lines coming off each dot.

A: _____
B: _____
C: _____
D: _____
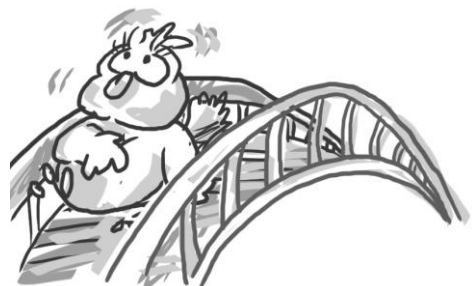
Now imagine each dot is like a door. You have to go in, then come out again. This means you need two lines coming from each dot. One is for in, the other is for out. You could also have four lines, or six lines, and so on. As long as there is an **even number** of lines coming from the dot, you can enter and exit the area. Do any of the dots above have an even number of lines?
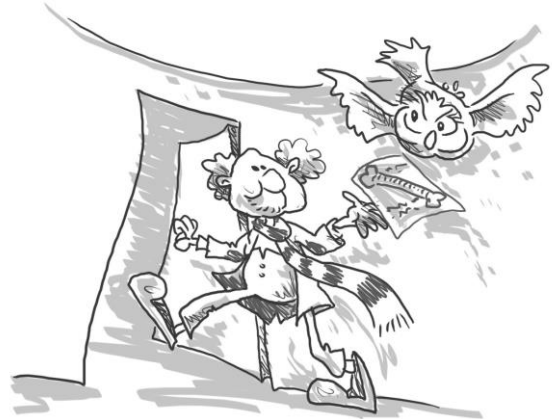
If you want to get back to the dot you started on, **all** the dots must have an even number of lines coming from them. If you start at a different dot from the one you finish on, then two of the dots can have an odd number of lines, one dot being the starting dot, the other dot being the end dot.

Is this the case with the Seven Bridges of Konigsberg?

Can you add or remove some bridges so that you can follow the path like the people of Konigsberg wanted to do?

A.

B.   C.   D.