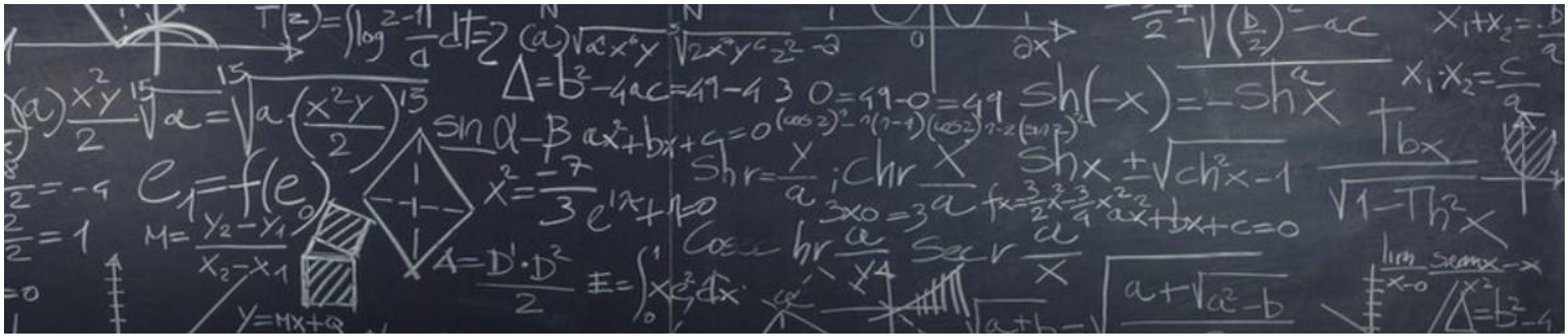
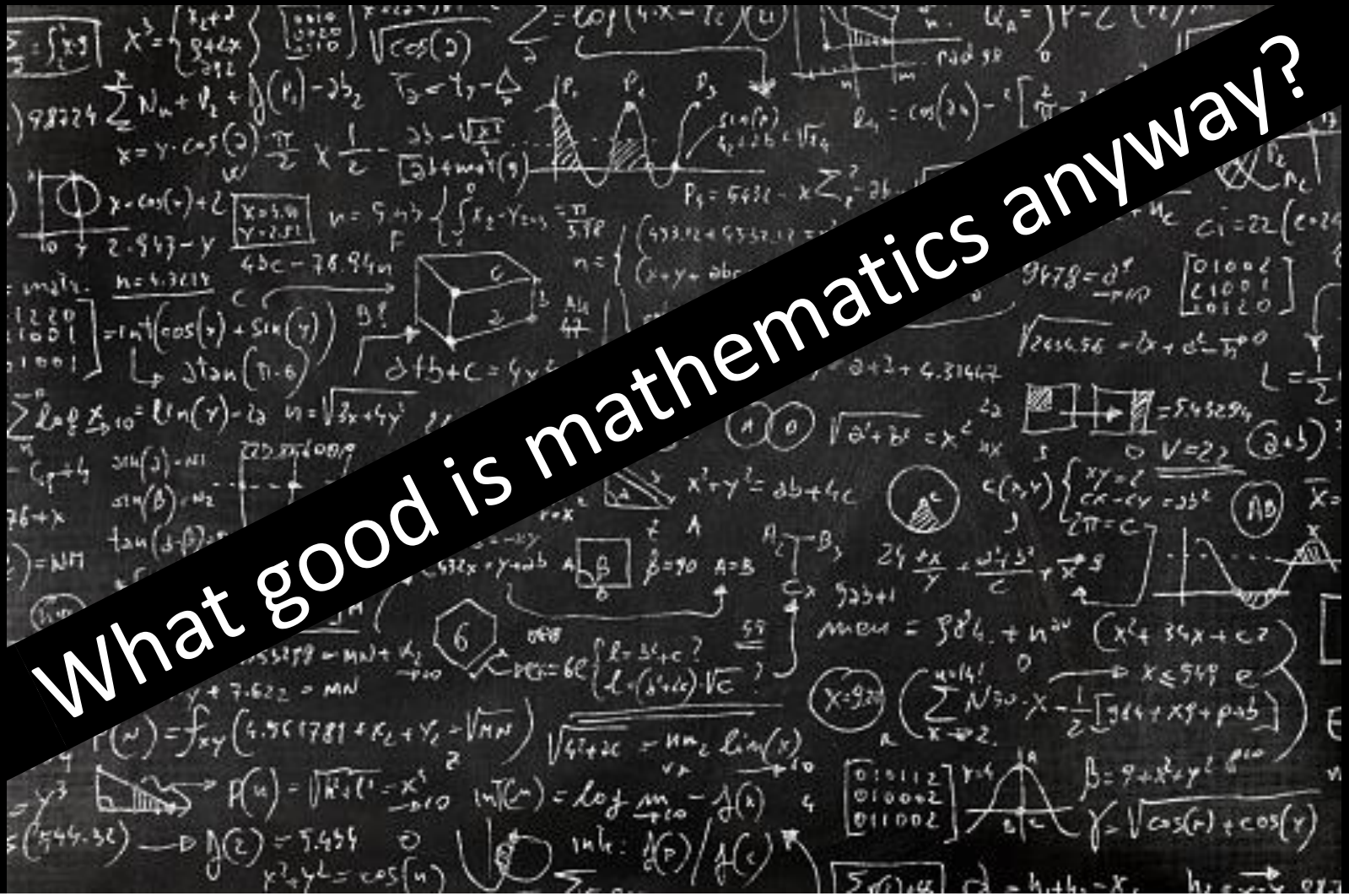


The Beauty of Mathematics – Part 1

Chuck Webber, teacher
Greenhouse Community

June 8, 2023

The Intimidating World of Mathematics



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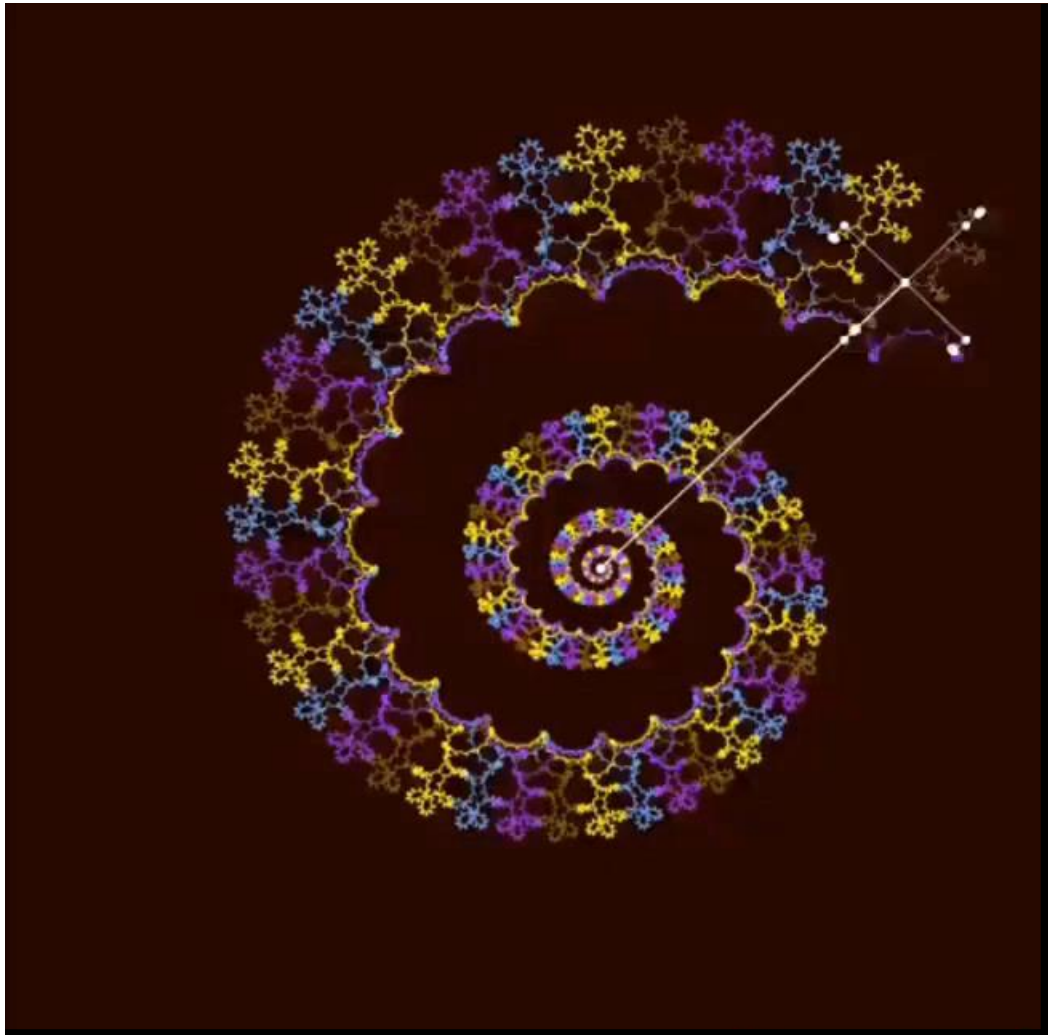
YOU COULD GO AT ANY TIME NOW.
HA! I DID IT! I LIVED MY WHOLE LIFE WITHOUT EVER ONCE USING ALGEBRA!!
Glenn McCoy

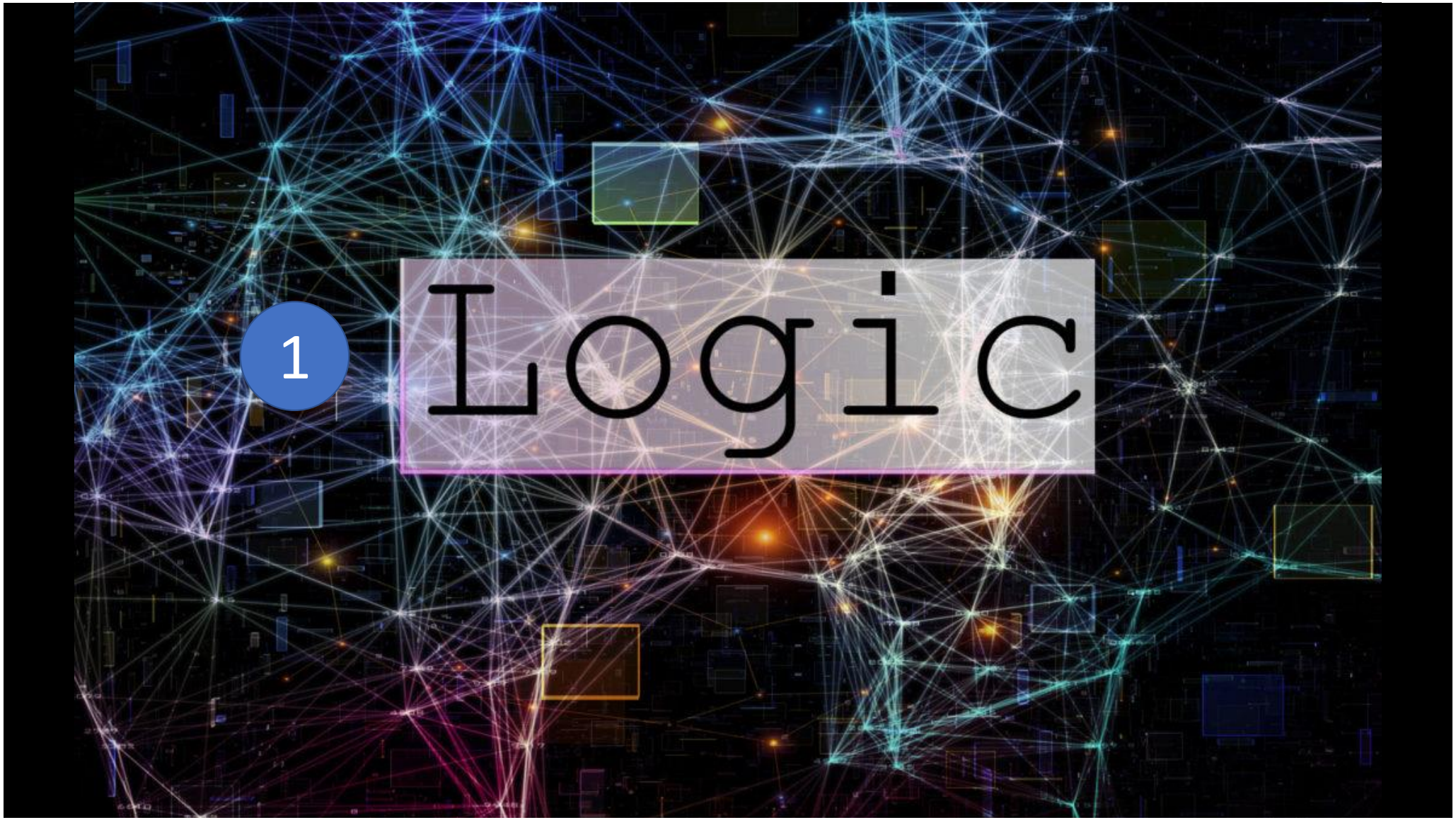


MATHEMATICS 1.01

1. LOGIC
2. TALLY COUNTS AND NUMBERS
3. ZERO VERSUS NOTHING
4. MEASUREMENTS AND CONSTANTS
5. PROBABILITY AND PREDICTION

MATHEMATICS 2.01

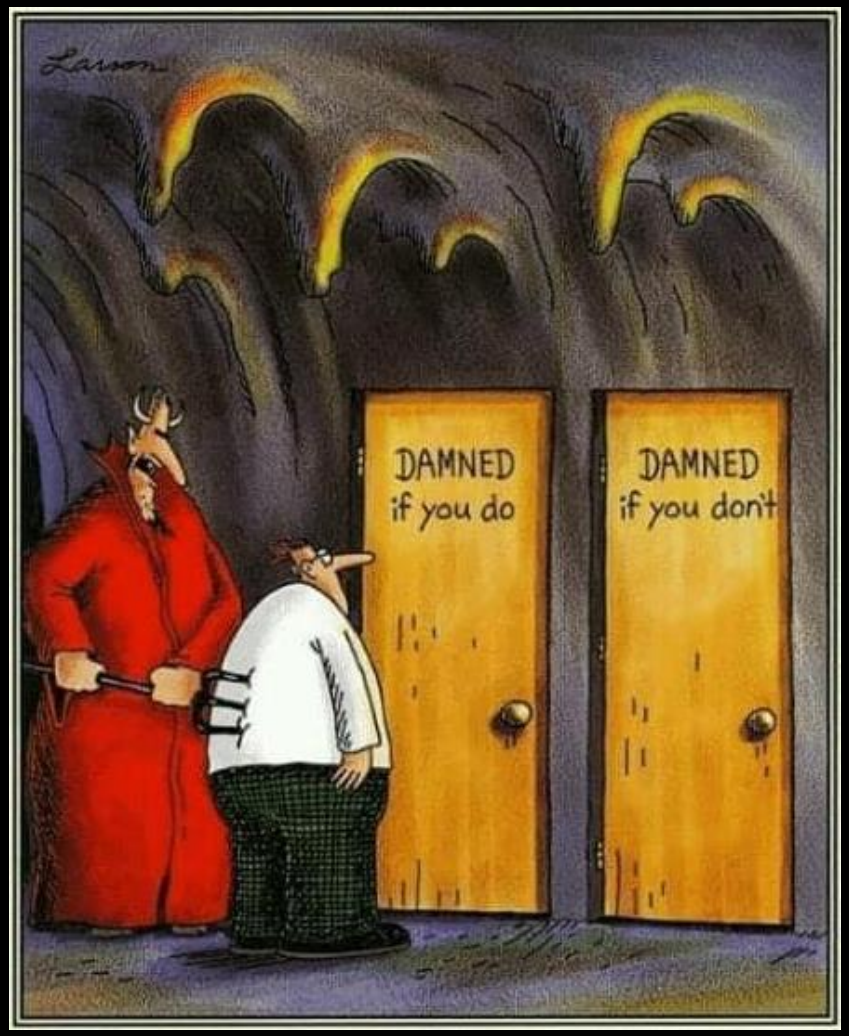
6. PERCEPTIONS, DIMENSIONS, AND SCALE
7. PATTERNS AND RECURRENCE
8. FRACTIONS AND FRACTALS
9. INFINITY AND ETERNITY


1
Logic

The Brilliant Logic of Jesus when Confronted by Religious Leaders

[1] One day, as Jesus was teaching the people in the temple and preaching the gospel, the chief priests and the scribes with the elders came up [2] and said to him, "Tell us by what authority you do these things, or who it is that gave you this authority." [3] He answered them, "I also will ask you a question. Now tell me, [4] was the baptism of John from heaven or from man?" [5] And they discussed it with one another, saying, "If we say, 'From heaven,' he will say, 'Why did you not believe him?' [6] But if we say, 'From man,' all the people will stone us to death, for they are convinced that John was a prophet." [7] So they answered that they did not know where it came from. [8] And Jesus said to them, "Neither will I tell you by what authority I do these things." (Luke 20:1-8)

- Jesus wisely and logically places the chief priests, scribes, and elders between a rock and a hard place.



"C'mon, c'mon – It's either one door or the other."

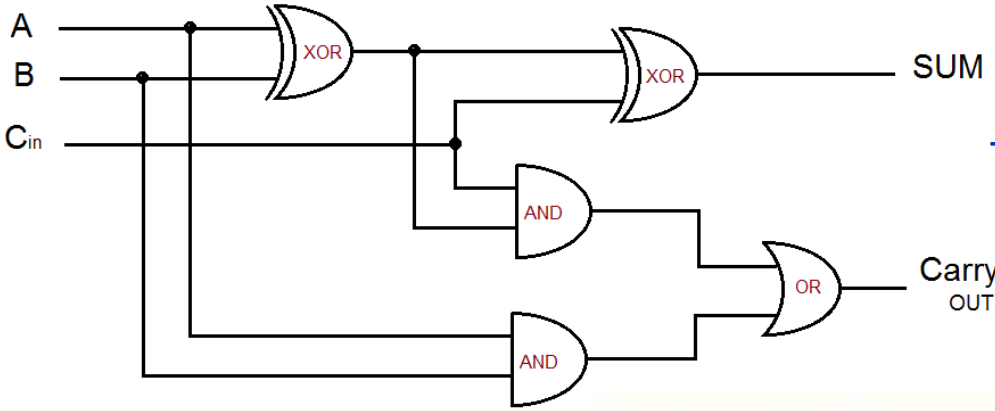
Logical Reasoning and Rational Argumentation

18 "Come now, let us reason together, says the Lord:
though your sins are like scarlet,
they shall be as white as snow;
though they are red like crimson,
they shall become like wool.
(Isa. 1:18)

25 "I, I am he
who blots out your transgressions for my own sake,
and I will not remember your sins.
26 Put me in remembrance; let us argue together;
set forth your case, that you may be proved right."
(Isa. 43:25-26)

Formalization of Logic: Programmable 4-bit Manual Computer

Computer Circuitry Designed Using Logical Rules (Truth Statements) of Boolean Algebra



The schematic logic

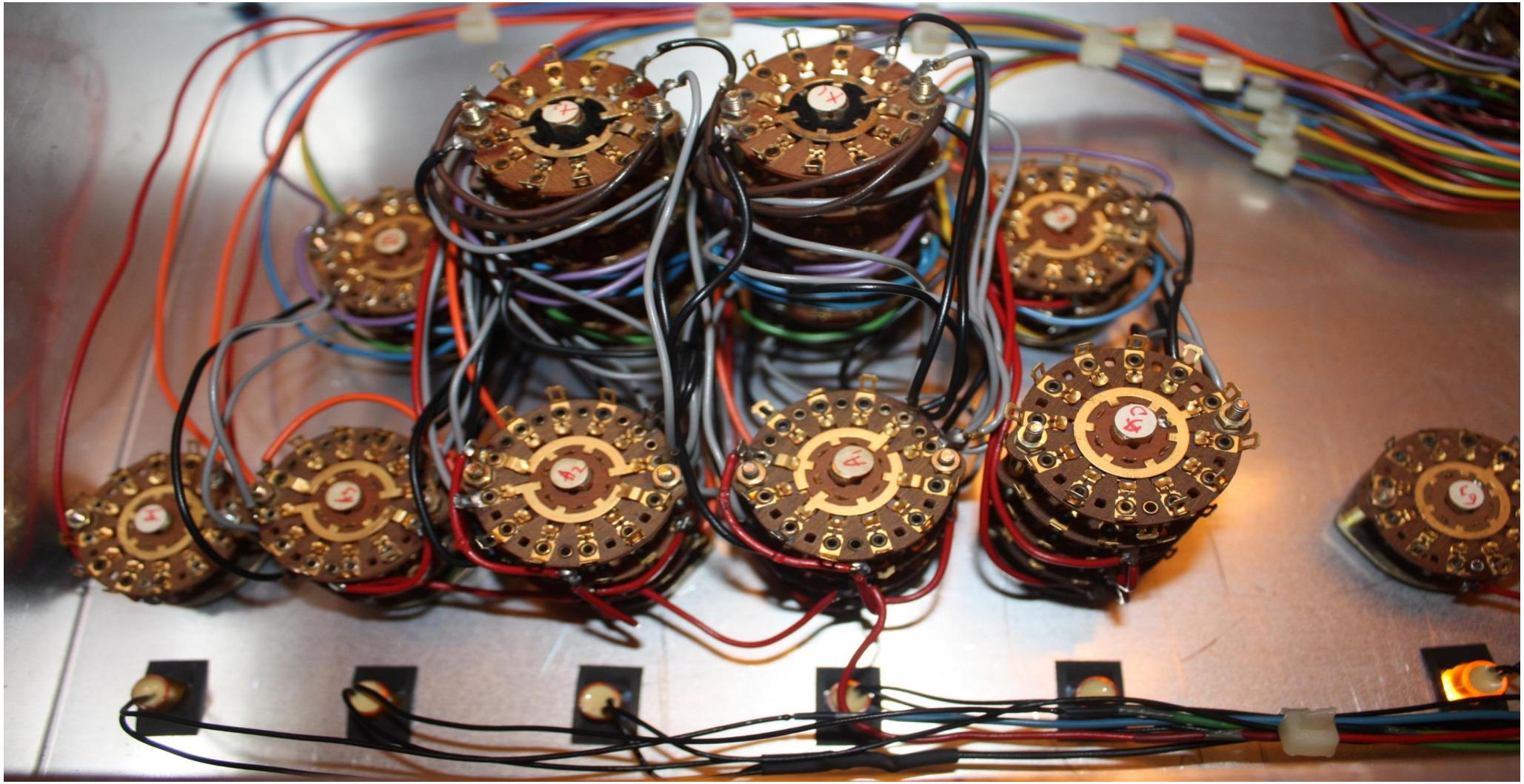
$$S = (\overline{A}_u \cdot \overline{A}_d \cdot C_{pc}) + (\overline{A}_u \cdot A_d \cdot \overline{C}_{pc}) + (A_u \cdot \overline{A}_d \cdot \overline{C}_{pc}) + (A_u \cdot A_d \cdot C_{pc})$$

$$C = (A_u \cdot A_d \cdot C_{pc}) + (\overline{A}_u \cdot A_d \cdot C_{pc}) + (A_u \cdot \overline{A}_d \cdot C_{pc}) + (A_u \cdot A_d \cdot \overline{C}_{pc})$$

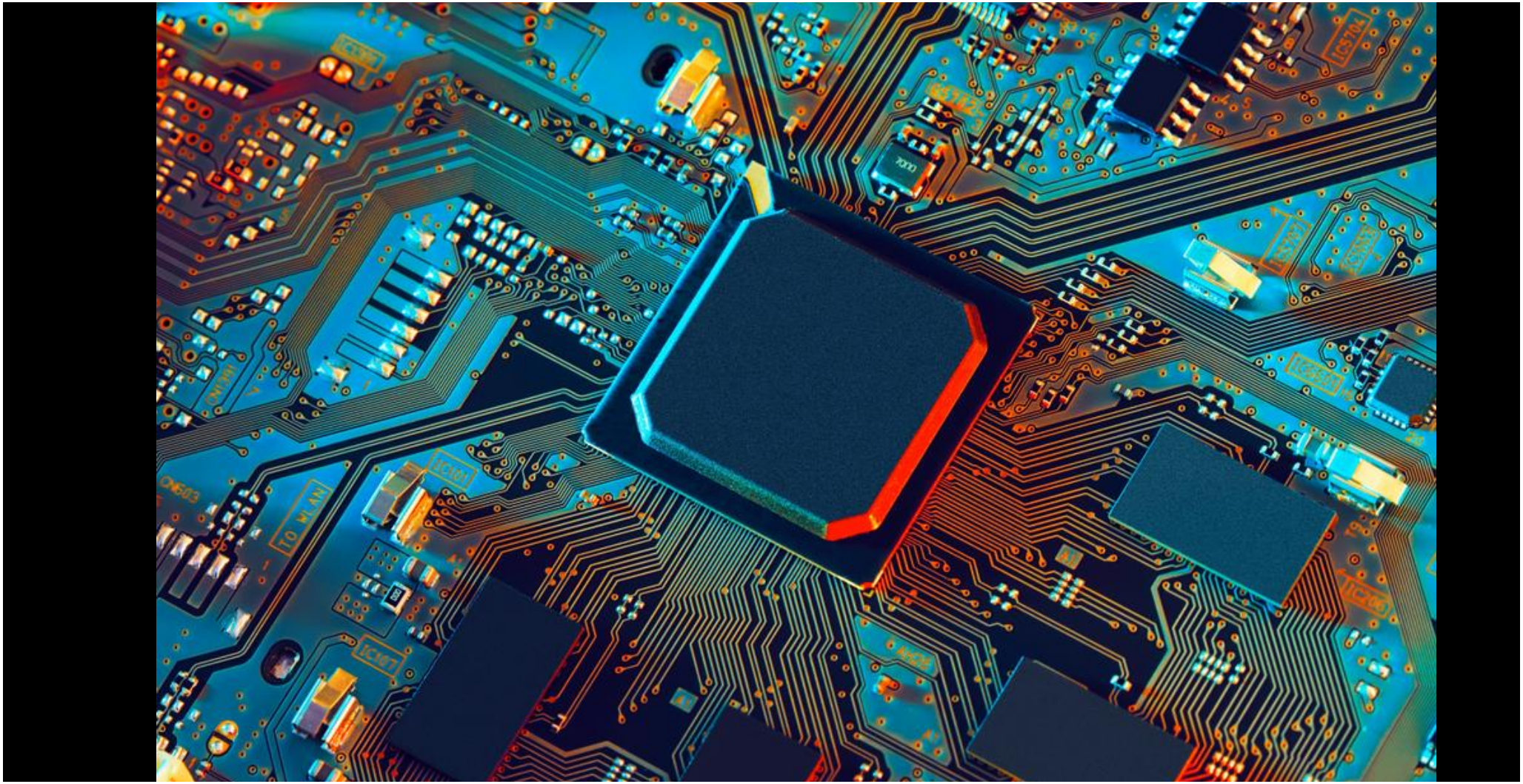
where: $S = \text{Sum}$
$A_u = \text{Augend}$
$A_d = \text{Addend}$
$C_{pc} = \text{Carry (previous column)}$
$C = \text{Carry}$

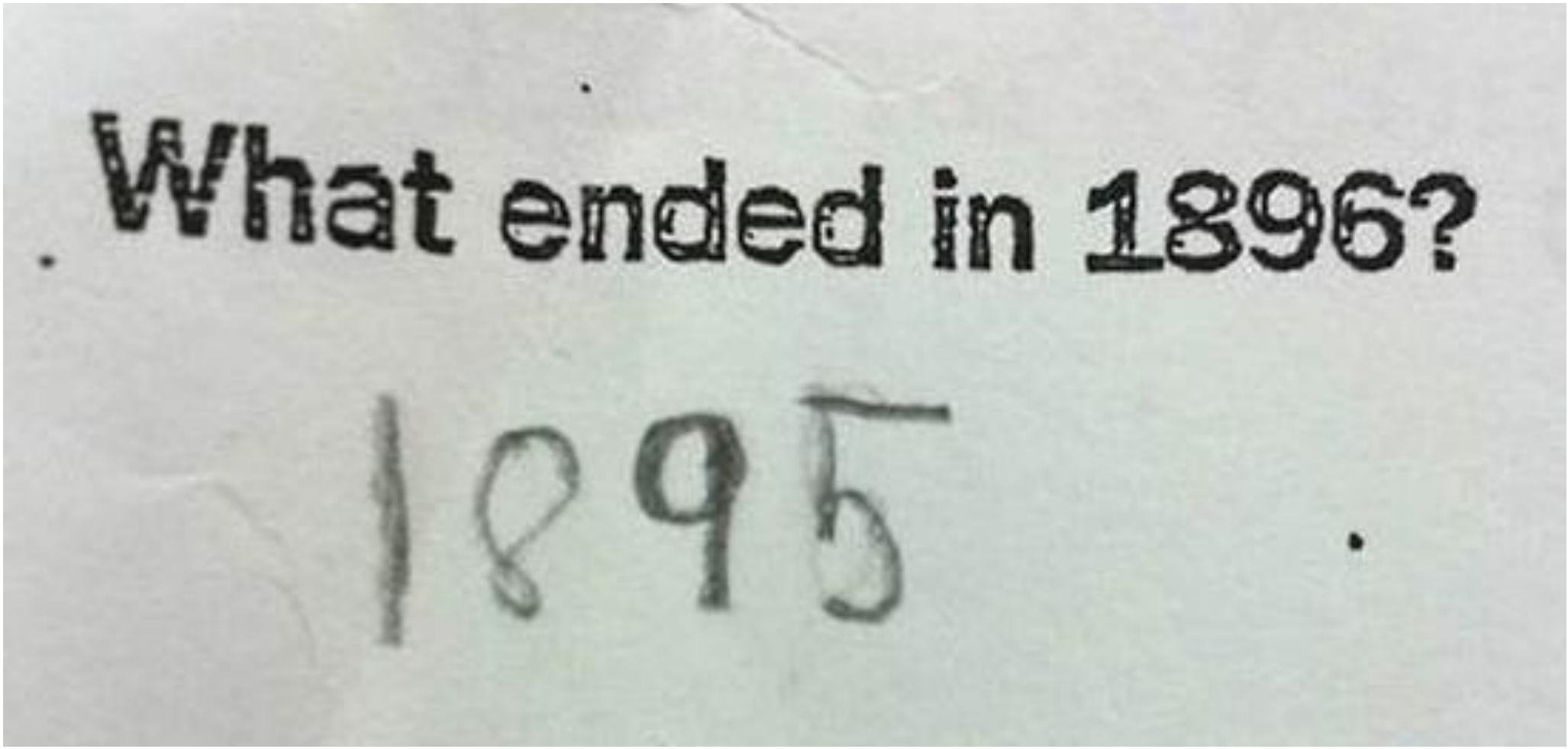
The mathematical logic

Boolean Computer Circuits Implemented by Wafer Switches



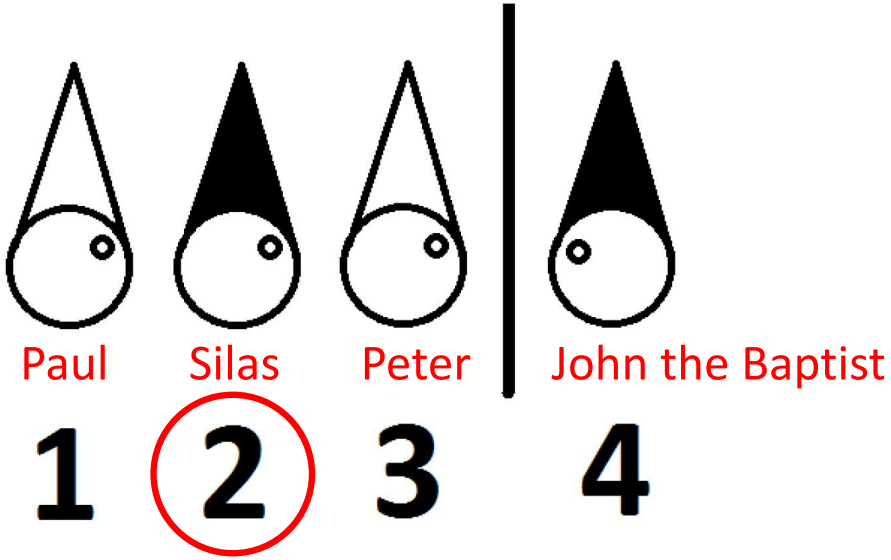
Ultra-Large-Scale Integration – Superhighways of Information Flow





Other correct answers: 1895.9 or 1895.999999, but not 1895.999999 . . .

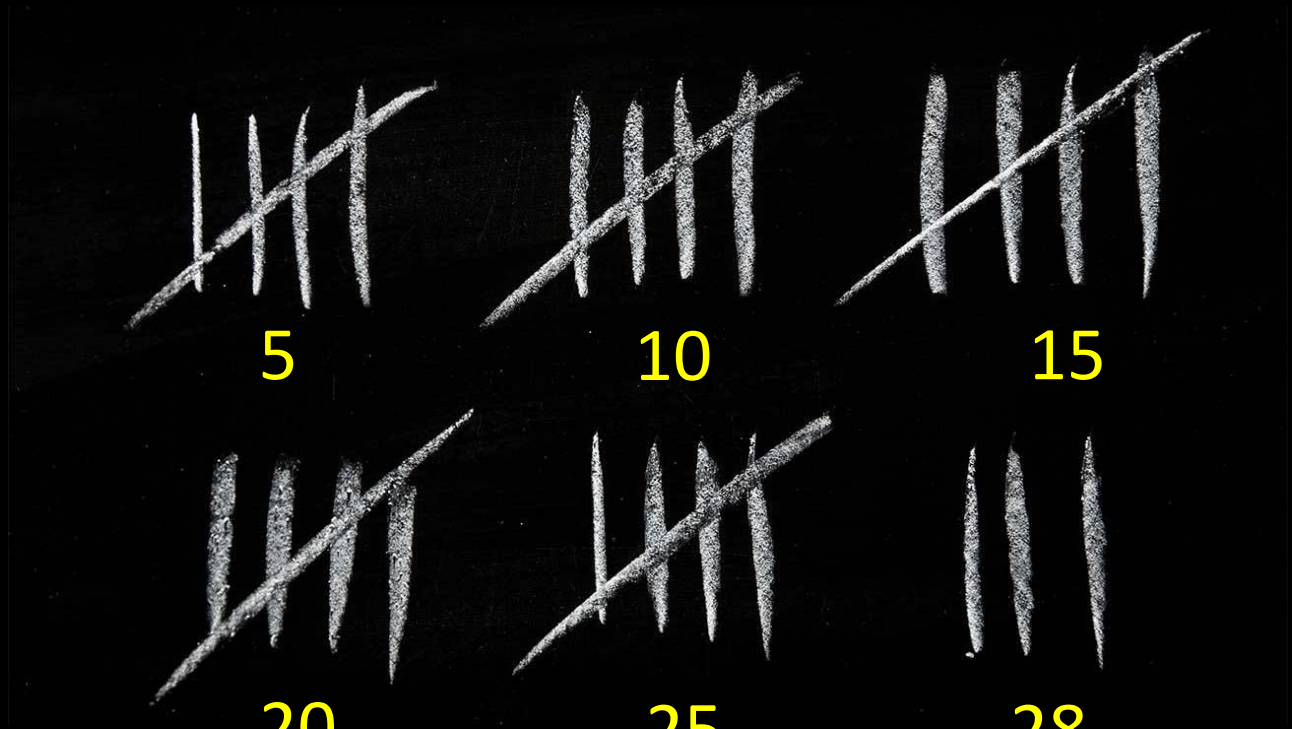
THE PRISONERS' DILEMMA



1. Four prisoners are jailed in two separate cells
2. Two prisoners wear white hats, and two prisoners wear black hats
3. For all to be set free, only one prisoner must identify the color of his hat
4. No verbal cues are allowed, and no prisoner may turn around
5. Logically, which prisoner can correctly give the color of his hat?

2

Tally Counts and Numbers



Was the Biblical Job a "Mathematician?"

1 "Behold, my eye has seen all this,
my ear has heard and understood it.
2 What you know, I also know;
I am not inferior to you.
3 But I would speak to the Almighty,
and I desire to argue my case with God.

(Job 13:1-3)

Yes, in the sense that Job applied human logic to his dealings with God (albeit with false assumptions)

1 There was a man in the land of Uz whose name was Job, and that man was blameless and upright, one who feared God and turned away from evil. 2 There were born to him seven sons and three daughters. 3 He possessed 7,000 sheep, 3,000 camels, 500 yoke of oxen, and 500 female donkeys, and very many servants, so that this man was the greatest of all the people of the east.

(Job 1:1-3)

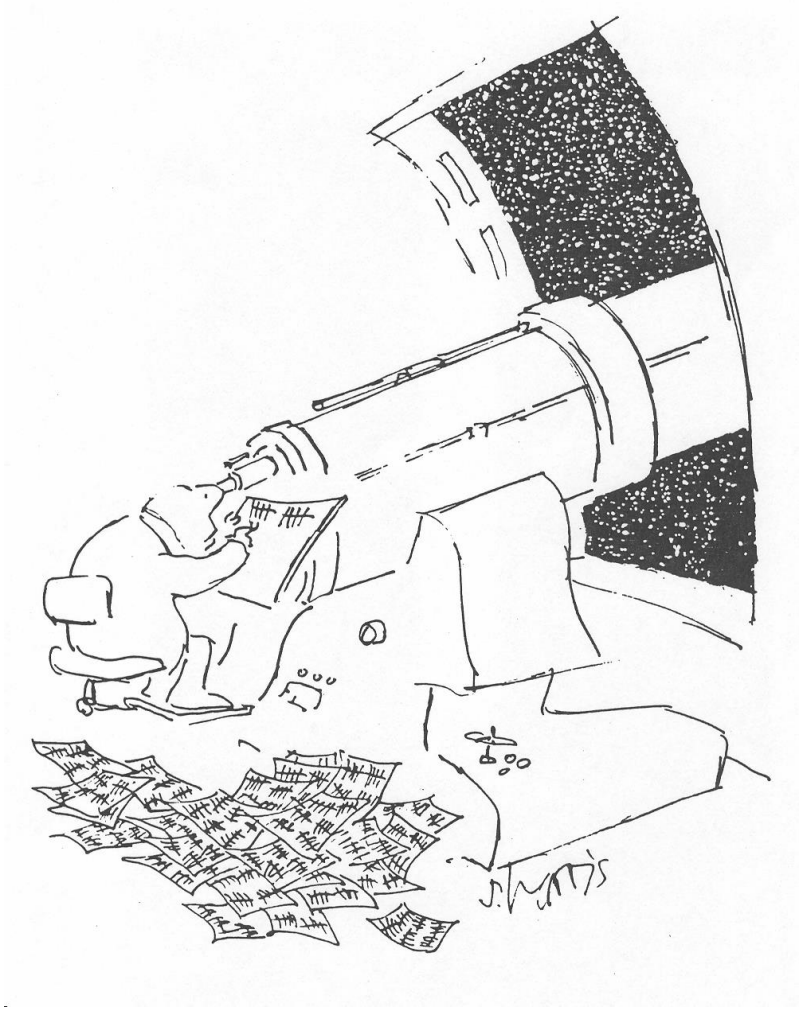
Yes, because Job could accurately count his children and estimate his livestock

Counting Sheep and Stars

3 So he told them this parable: 4 “What man of you, having a hundred sheep, if he has lost one of them, does not leave the ninety-nine in the open country, and go after the one that is lost, until he finds it? 5 And when he has found it, he lays it on his shoulders, rejoicing. (Luke 15:3-5)

5 And he brought him outside and said, “Look toward heaven, and number the stars, if you are able to number them.” Then he said to him, “So shall your offspring be.” 6 And he believed the Lord, and he counted it to him as righteousness. (Gen. 15:5-6)

How many stars are there estimated to be in the Universe?



- The naked eye can see about 5,000 stars from Earth (assuming no light pollution)
- There are an estimated one sextillion (10^{21}) stars to one septillion (10^{24}) stars in the observable Universe

Big Number Estimates

hairs on head: 100×10^3 = 100 thousand hairs

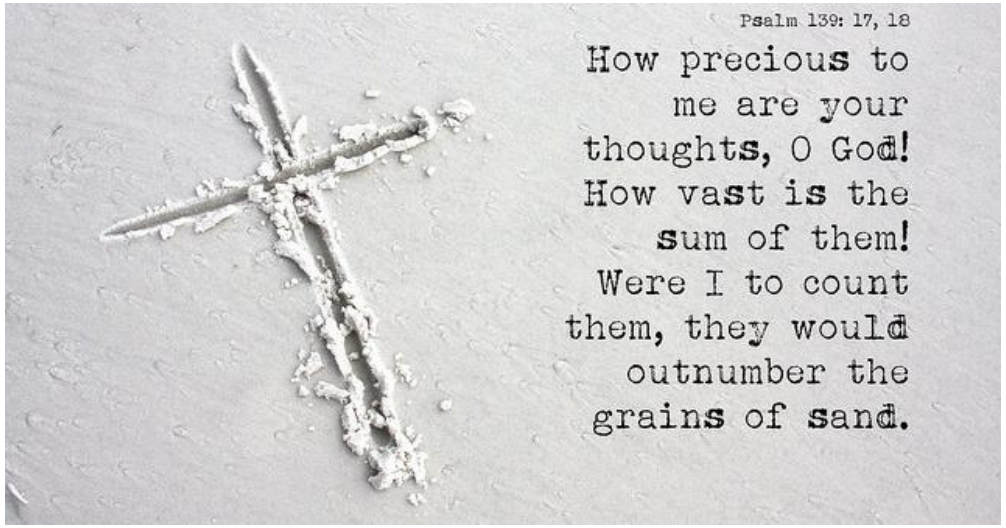
grains of sand on Earth: 7.5×10^{18} = 7.5 quintillion grains of sand

stars in Universe: 1.0×10^{21} to 1.0×10^{24} = 1.0 sextillion to 1.0 septillion stars

particles in Universe: 1.0×10^{81} = 100 sextillionth of googol (not Google)

Googol = 10^{100}

Googolplex = 10^{googol}
= 10^10^100



Counting Fish

[11] So Simon Peter went aboard and hauled the net ashore, full of large fish, 153 of them. And although there were so many, the net was not torn.

(John 21:11)

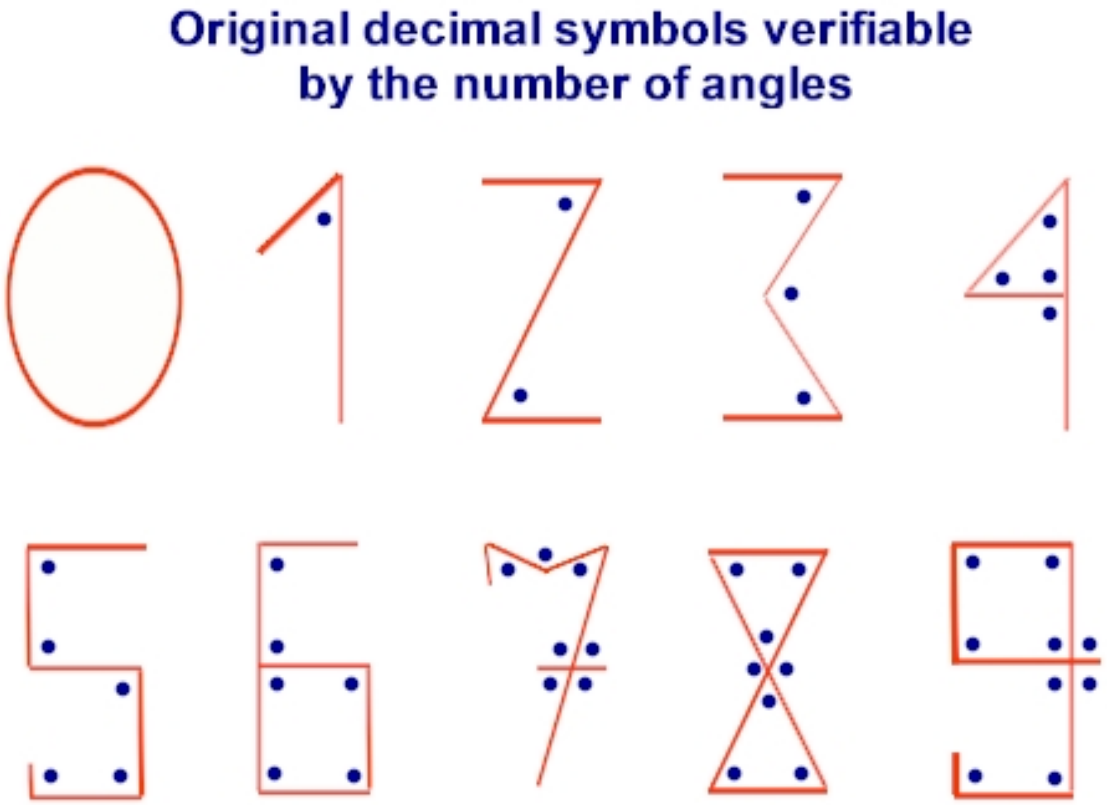
Inquiry to Open A.I. ChatGPT (Chatbox Generative Pre-trained Transformer)

Write a limerick poem about the number 153 with correct meter.

There was a number, one-five-three
Cubes of one, three, and five, you'll see
When these numbers combine
A special sum will shine
Mathematical magic, it will be!

$1^3 + 5^3 + 3^3 = 1 + 125 + 27 = 153$ fish

Arabic Numerals: Convenience and Convention Surpass the Tally Count



Ant Odometer – Evidence that Ants Count Their Steps to Home

Go to the ant, O sluggard; consider her ways, and be wise. (Prov. 6:6)

Does not he see my ways and number all my steps? (Job 31:4)

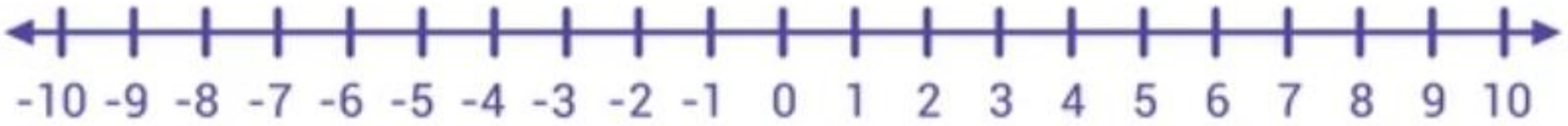
5 ANTS RENTED
AN APARTMENT
WITH 5 OT
NOW TH
TENANTS
1
2
3
4
5
6
7
8
9
10

3

Zero versus Nothing

Number Scale and Kitchen Scale

NEGATIVE NUMBERS ← ZERO → POSITIVE NUMBERS



Pain Management is OUR Goal:

¡ El Control Del Dolor Es Nuestra Meta!

WHY WAS 6 AFRAID OF 7?

- BECAUSE 7 8 9!

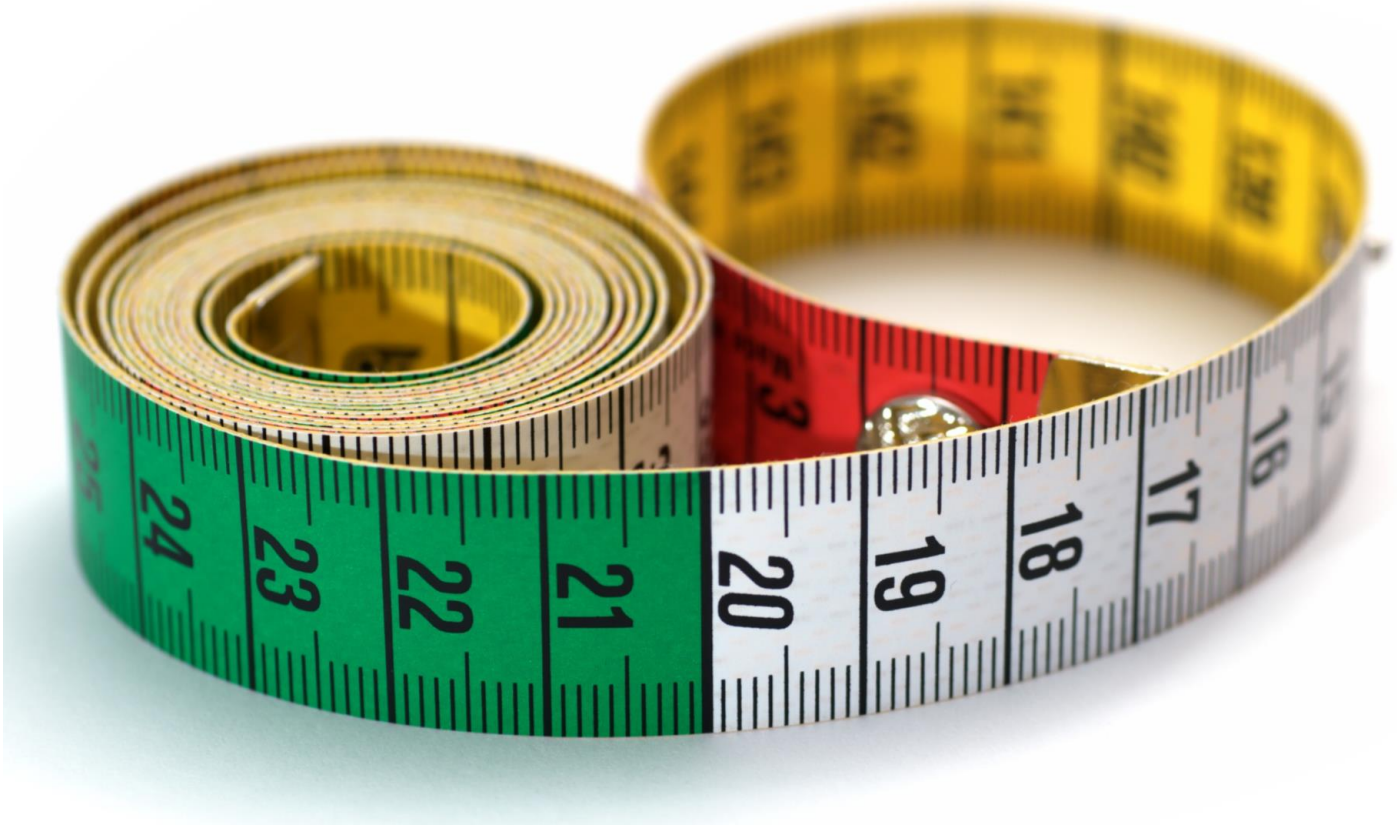
WHY WAS 6 AFRAID OF 7?

- BECAUSE 7 8 9!

BUT WHY DID 7 EAT 9?

- TO GET 3^2 MEALS A DAY!

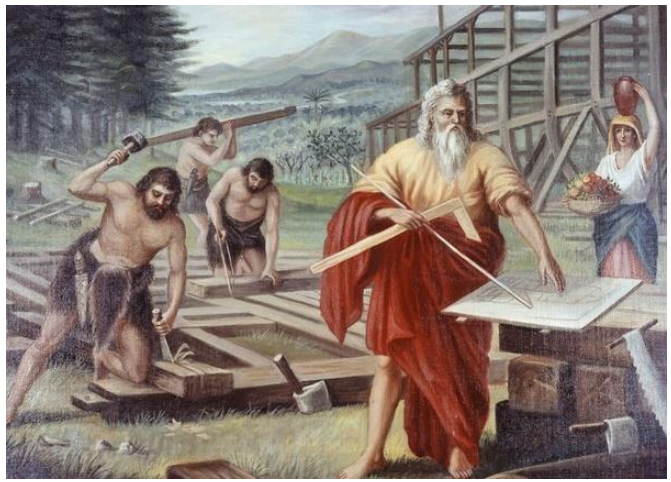
4 Measurements and Constants



Measurements by Man and by the Lord God

14 "Make yourself an ark of gopher wood. Make rooms in the ark, and cover it inside and out with pitch. 15 This is how you are to make it: the length of the ark 300 cubits, its breadth 50 cubits, and its height 30 cubits. (Gen. 6:14-15)

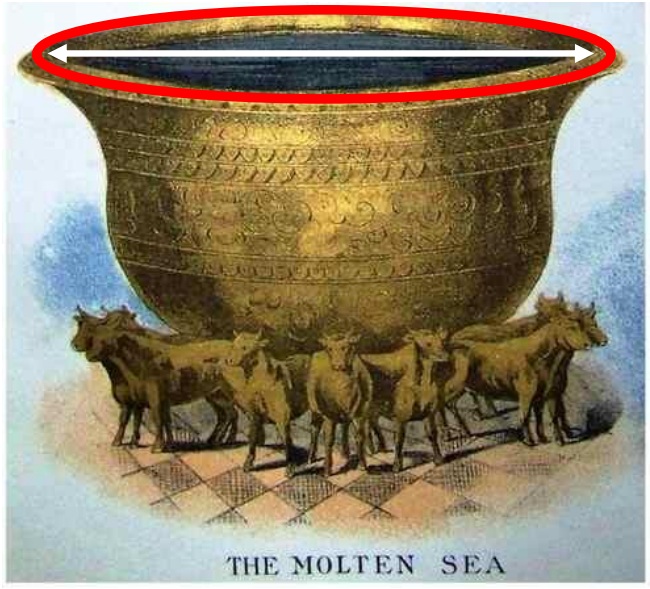
12 Who has measured the waters in the hollow of his hand
and marked off the heavens with a span,
enclosed the dust of the earth in a measure
and weighed the mountains in scales
and the hills in a balance?
(Isa. 40:12)



Just Balances and Accurate Measurements

[1] A false balance is an abomination to the Lord,
but a just weight is his delight. (Prov. 11:1)

[23] Then he made the sea of cast metal. It was round, ten cubits from brim to brim, and five cubits high, and a line of thirty cubits measured its circumference. (1 Kings 7:23; 2 Chron. 4:2)



Circumference = π × Diameter

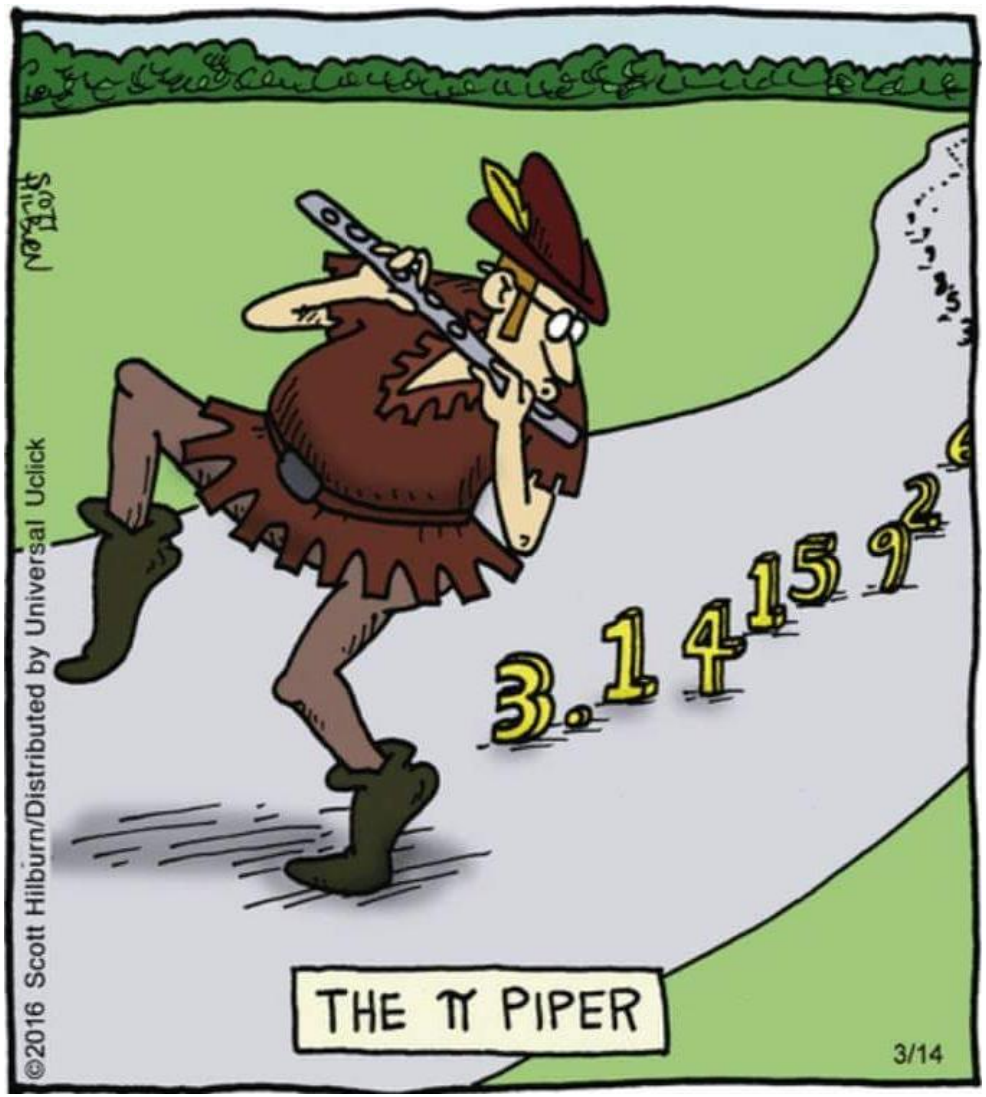
π = Circumference / Diameter

Circumference = 10 cubits

Diameter = 3 cubits

Pi or π = 10 / 3 = 3.3333 ?

Pi or π = 3.141592653589793 !


3.14159
THE π PIPER
3/14
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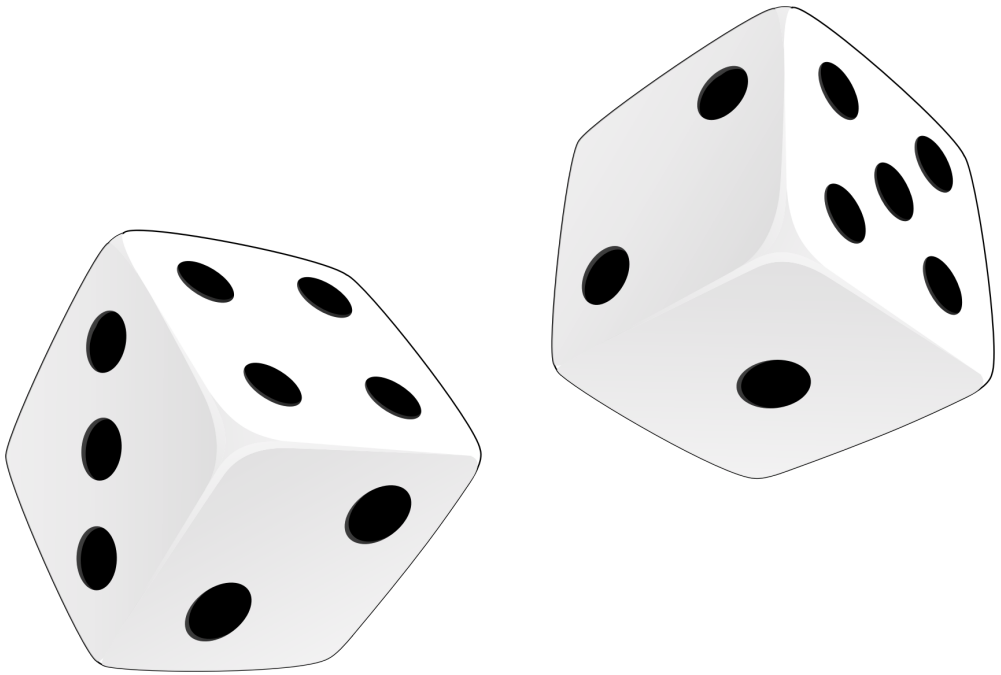
5 Probability and Prediction



Casting Lots versus Gambling

33 The lot is cast into the lap,
but its every decision is from the Lord. (Prov. 16:33)

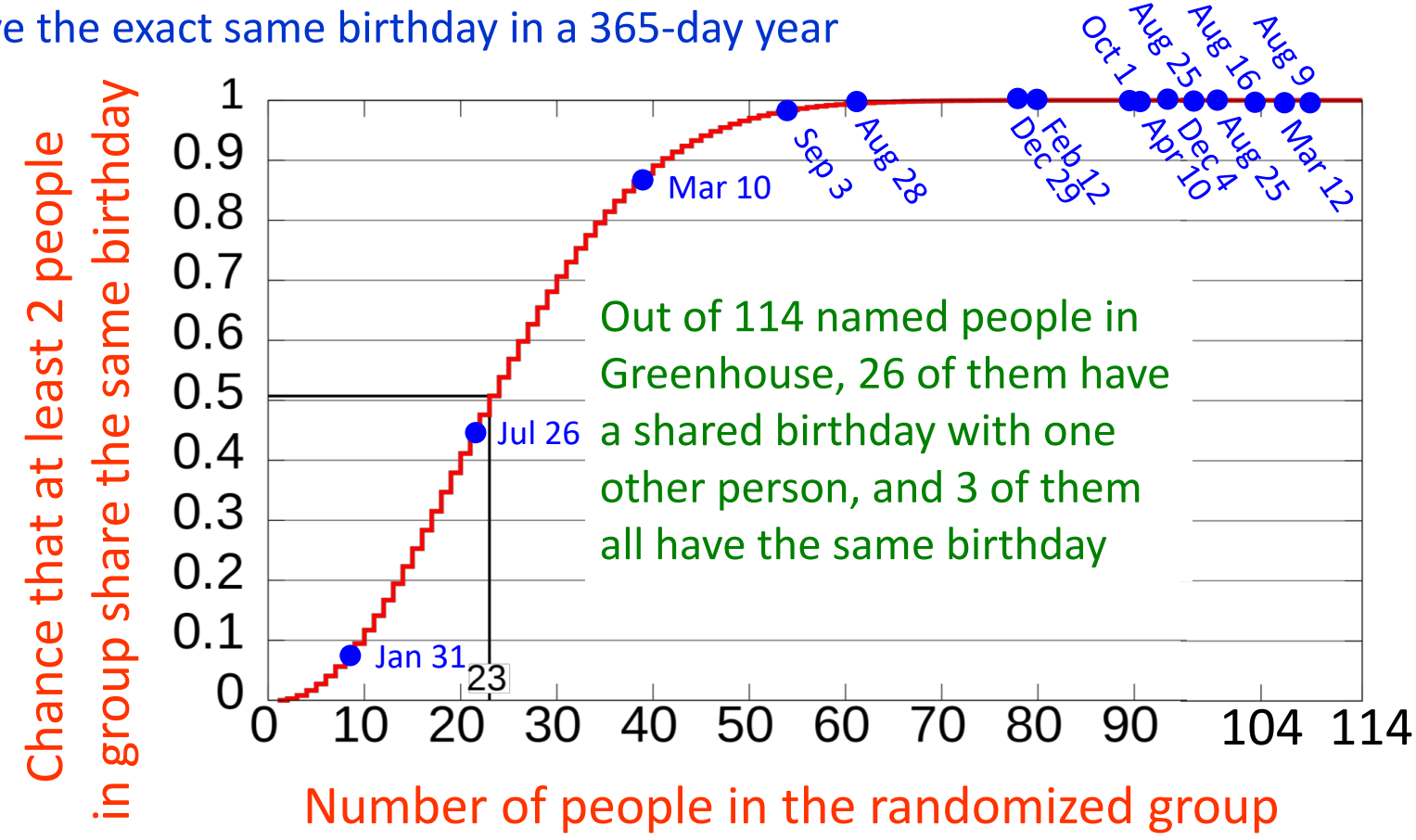
55 But the land shall be divided by lot. According to the names of the tribes of their fathers they shall inherit. 56 Their inheritance shall be divided according to lot between the larger and the smaller." (Num. 26:55-56)

35 And when they had crucified him, they divided his garments among them by casting lots. (Matt. 27:35)

26 And they cast lots for them, and the lot fell on Matthias, and he was numbered with the eleven apostles. (Acts 1:26)

The Birthday Paradox

In a random group of only 23 people, there is a 50% chance that two people will have the exact same birthday in a 365-day year



Predicting the Future

[28] For which of you, desiring to build a tower, does not first sit down and count the cost, whether he has enough to complete it? (Luke 14:28)

[18] This calls for wisdom: let the one who has understanding calculate the number of the beast, for it is the number of a man, and his number is 666. (Rev. 13:18)

666

The Mark of the Beast –
Satan's code for evil?

Universal Product Code

Quick Response Code

Sum of first 36 integers = 1 + 2 + 3 + 4 + . . . + 34 + 35 + 36 = 666

Sum of first 7 prime numbers squared = $2^2 + 3^2 + 5^2 + 7^2 + 11^2 + 13^2 + 17^2$ = 666

Sum of first 6 Roman numerals = I + V + X + L + C + D = 1 + 5 + 10 + 50 + 100 + 500 = 666

Sum of 14 Greek letters in Nero Caesar's name = Α ΚΑΙ ΔΟΜΕΤ ΣΕΒ ΓΕ =
1 + 20 + 1 + 10 + 4 + 70 + 40 + 5 + 300 + 200 + 5 + 2 + 3 + 5 = 666