Treasures of Bharatiya Maths

Three BIG Ideas

Jonathan J. Crabtree

Virat Hindustan Sangam Karnataka VHS

13 August 2021

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The First BIG Idea?

Rebuild Maths from Zero

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The First BIG Idea?

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An example of the detailed research that went into the development of Podometic™ Bharatiya Maths

Examples of some languages reviewed by elementary mathematics historian

Jonathan J. Crabtree, Founder of www.podometic.in (Post Vedic Maths)

888	Greek	ἀριθμὸς ἀριθμὸν πολυπλασιάζειν λέγεται. ὅτ’αν ὅσαι εἰσιν ἐν αὐτῶι μονάδες τοσαυτάκις συντεθῆι ὁ πολλαπλασιαζόμενος καὶ γένηταί τις
950	Arabic	يوجد أحد العددين بعدد آحاد العدد الآخر فيكون حصة الواحد من آحاد المضروب هي المضروب فيه بعينه والمجموع هو العدد الحاصل من ضرب العدد
1482	Latin	Numerous per alium multiplicari dicitur, qui totiens sibi coacervatur, quotiens in multiplicante est unitas.
1543	Italian	Quel numero se dice esser multiplicato per un'altro, il quale si e assunato tante volte, quante unita e in lo multiplicante.
1555	German	Ain zal multiplicirt oder meret ain andere / wann die ander / als offt die erst zal ains in jr beschleüßt / genommen vnd zuesamen bracht wirdt. multiplicirt oder meret die zal 7. wann die zal 7. vier mal / in ansehen das ains in 4. viermal begriffen ist / genommen vnd zuesamen bracht wir
1565	French	Un nombre, se dict multiplier un autre nombre, quand autant d'unitez, qu'il y a en luy, autant de fois se compose le multiplie, & en naist un aut
1570	English	A number is sayd to multiply a number, when the number multiplyed, is so oftentimes added to itselfe, as there are in the number multiplying and an other number is produced.
1665	Spanish	Un número se dice multiplicar á otro quando tantas veces estuviere compuesto el que se multiplica, quantas fueren las unidades del multiplica producto fuere algun número.
1695	Dutch	Een getal segt men een getal te vermeenigvuldigen, als dat soo meenigmaal een saamgeset getal is, dat vermeenigvuldigt word, als ‘er eenhede vermeenigvuldigende sijn, en dat ‘er eenig getal voortkomt.
1719	Sanskrit	गुण्याङ्कगुण्काङ्कयोर्घातो गुणनफलं क्षेत्रफलं भवति
1855	Swedish	Ett tal säges multiplicera ett tal, när det sednare talet tages så många gånger, som enheter finnas i det förra, och ett annat tal (produkten) derat uppkommer
1857	Chinese	乘數者，數有若干倍，即若干為乘數。面數者，兩數相乘所得，原兩數為其邊。
1865	Hungarian	Szám számot szorozni mondatik, midon a hány egység van benne, annyiszor rakatik a szorzandó, és igy származik szám.
1907	Czech	Pravíme, že číslo číslem se násobí, když násobené (násobenec) tolikrát se složí, kolik v druhém jest jednotek, a nějaké vznikne.
1912	Hebrew	כוי במספר אחר הוא המספר הנכפל פעמים אשר מנינם כמנין האחדים אשר במספר השני אשר הוא נמנה בו, כמו שתי פעמים שלש או שתי פעמים עשרה מספר שטוח וזו צ ו ר ת ו : : : והמספר הנקבע מהכפל הזה יקרא מספר שטוח
1912	Danish	Et Tal siges at multiplicere et Tal, naar det, som multipliceres, lægges sammen ligesaa mange Gange, som der er Enheder i det første, og et eller frembringes.
1949	Russian	Говорят, что число умножает число, когда сколько в нем единиц, столько раз составляется умножаемое и что-то возникает.

Sanskrit text and commentary from Ch.18 Verses 30-35 from Brahmagupta's Brāhmasphutasiddhānta

P.1

अथ धनर्णशून्यानां सङ्कलनम् ।

धनयोर्धनमृणमृणयो-
र्धनर्णयोरन्तरं समैक्यं खम् ।
ऋणमैक्यं च धनमृणध-
नशून्ययोः शून्ययोः शून्यम् ॥ ३० ॥ (३१)

धनयोरैक्यं धनमृणयोरैक्यमृणं भवति । धनर्णयोरन्तरमेवैक्यं भवति । समयोर्धनर्णयोरैक्यं खं शून्यं भवति । ऋणशून्ययोरैक्यमृणं धनशून्ययोरैक्यं धनं शून्ययोरैक्यं च शून्यं भवति ।

अत्रोपपत्त्यर्थं मन्मुद्रिता भास्करबीजटिप्पणी द्रष्टव्या ॥ ३० ॥

इदानीं व्यवकलनमाह ।

ऊनमधिकाद्विशोध्यं धनं धनादृणमृणादधिकमूनात् ।
व्यस्तं तदन्तरं स्यादृणं धनं धनमृणं भवति ॥ ३१ ॥ (३२)
शून्यविहीनमृणमृणं धनं धनं भवति शून्यमाकाशम् ।
शोध्यं यदा धनमृणादृणं धनाद्वा तदा क्षेप्यम् ॥ ३२ ॥ (३३)

अधिकाद्ध्नादूनं धनं विशोध्यं शेषं धनं भवति । अधिकादृणाद्धनमृणं विशोध्यं शेषमृणं भवति । ऊनाद्धनादधिकं धनं वोनादृणादधिकमृणं विशोध्यं तदा तदन्तरं व्यस्तं विपरीतं स्यात् । अर्थादधिकं धनं विशोध्यं तदा शेषमृणं भवति । अधिकमृणं विशोध्यं तदा शेषं धनं भवति । कथं विपरीतं भवतीत्याह । ऋणं धनं भवति धनं चर्णं भवतीति । चेदृणं शून्यविहीनं शून्येन विहीनं तदा ऋणं धनं च शून्यविहीनं धनं शून्यं च शून्यविहीनमाकाशं शून्यं भवति । यदि ऋणाद्ध्नं शोध्यं वा धनादृणं शोध्यं तदा क्षेप्यमर्थात् तदा तयोर्योग एवान्तरं भवतीति ।

अत्रोपपत्त्यर्थं मन्मुद्रिता भास्करबीजटिप्पणी विलोक्या ॥ ३१–३२ ॥

P.2

इदानीं गुणने करणसूत्रम् ।

ऋणमृणधनयोर्घातो धनमृणयोर्धनवधो धनं भवति ।
शून्यर्णयोः स्वधनयोः स्वशून्ययोर्वा वधः शून्यम् ॥ ३३ ॥ (३४)

ऋणधनयोर्घात ऋणं भवति । ऋणयोर्वधो धनवधो धनयोर्वधश्च धनं भवति । शून्यर्णयोः स्वधनयोः शून्यधनयोर्वा स्वशून्ययोश्च वधः शून्यं भवति ॥ ३३ ॥

इदानीं भागहारे करणसूत्रं वृत्तद्वयम् ।

धनभक्तं धनमृणहृतमृणं धनं भवति खं स्वभक्तं खम् ।
भक्तमृणेन धनमृणं धनेन हृतमृणमृणं भवति ॥ ३४ ॥ (३५)
खोद्धृतमृणं धनं वा तच्छेदं खमृणधनविभक्तं वा ।
ऋणधनयोर्वर्गः स्वं स्वं स्वस्य पदं कृतिर्यत् तत् ॥ ३५ ॥ (३६)

धनं धनभक्तं वा ऋणं ऋणभक्तं फलं धनं भवति । स्वभक्तं खं फलं खं भवति । ऋणेन धनं भक्तं फलमृणं स्यात् । धनेन ऋणं हृतं फलमृणं भवति । ऋणं वा धनं खेनोद्धृतं तच्छेदं तस्य शून्यस्य छेदो यस्मिन् ऋणे वा धने तच्छेदं भवति । एवं खं शून्यमृणधनविभक्तं (शून्यं) वा तच्छेदं भवति । फलं शून्यं भवति वा शून्यं तद्धरं स्यादित्यर्थः । ऋणधनयोर्वर्गः स्वं भवति । स्वस्य वर्गः खं भवति । तदेव वर्गस्य पदं भवति यत्कृतिः स एव वर्गो भवेदिति । भास्करबीजेऽप्येतदेव सर्वम् । अत्र स्वभक्तं स्वमर्थात् $\frac{0}{0}$ इदं सर्वदा शून्यसमं नेत्येतदर्थे चलनकलनं विलोक्यम् ॥ ३४–३५ ॥

इदानीं सङ्क्रमणविषमकर्माह ।

योगोऽन्तरयुतहीनो द्विहृतः सङ्क्रमणमन्तरविभक्तं वा ।
वर्गान्तरमन्तरयुतहीनं द्विहृतं विषमकर्म ॥ ३६ ॥ (३७)

योगो राश्योर्योगोऽन्तरेण राश्यन्तरेण युतो हीनश्च द्विहृतो दलितो राशी स्तः । इदं सङ्क्रमणं नाम गणितम् । वा राश्योर्वर्गान्तरं राश्यन्तरेण विभक्तं फलमन्तरेण युतं हीनं द्विहृतं च राशी स्तः । इदं विष-

that explain addition, subtraction, multiplication & division on Zero, Negatives and Positives, 628 C.E..

Brahmagupta's 18 Sūtras of Symmetry
598 - 668 CE

Ch. 18
Brāhmasphuṭasiddhānta 628 CE

Crabtree's Brahmagupta by AFX Animation Kolkata, India.

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Brahmagupta's 5 Addition Sutras

धनयोर्धनम्ऋणमृणयोः धनर्णयोरन्तरं समैक्यं खम् ऋणमैक्यं च धनमृणधनशून्ययोः शून्ययोः शून्यम्

AS1 positive plus positive is positive

AS2 negative plus negative is negative

AS3 positive plus negative is the difference between the positive and negative

AS4 when positive and negative are equal the sum is zero

AS5
positive plus zero is positive
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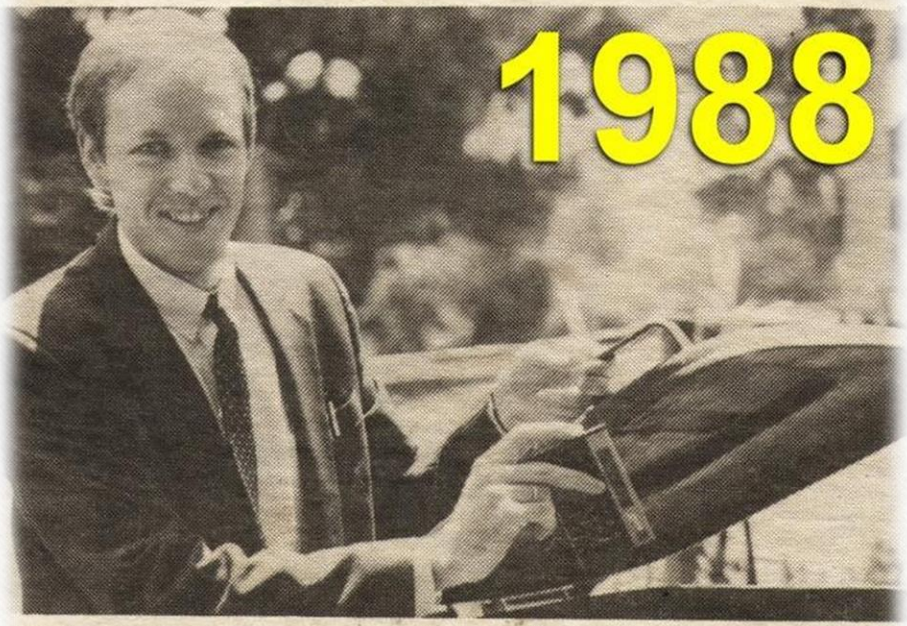
Maths? It's all in the mind, says Jonathan



JONATHAN throws away his calculator and uses brain powers to solve even the hardest of equations.

IF you were asked what day it was on July 24, 1706, what would you say?

It's all in the mind, he says.

After a four second calculation he came up with the correct day.

"I hope to change the way the Western world teaches maths," Jonathon said.

Jonathon will be holding two classes at the Park Orchards Community Centre.

"I hope to change the way the Western world teaches maths," Jonathon said

Brain power burgeoning

HELEN ELLIOT discovers a hidden potential in the deeper regions of her brain after meeting the memory man

TRUE LIFE

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Think bigger

Local Legends

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2011

Mastering maths

An Aussie maths teacher has developed a fun new way to tackle age-old numerical concepts

BY
USHA RAMANUJAM ARVIND

The terms "*Podometic*" and "*Australian Hindu Arabic*" (AHA) numeral system may sound blasphemous to purists, but these could well be the hottest additions to the maths lexicon, when Geelong-based Jonathan Crabtree unveils his dream project - *The legend of Podo* and the Secret Numbers.

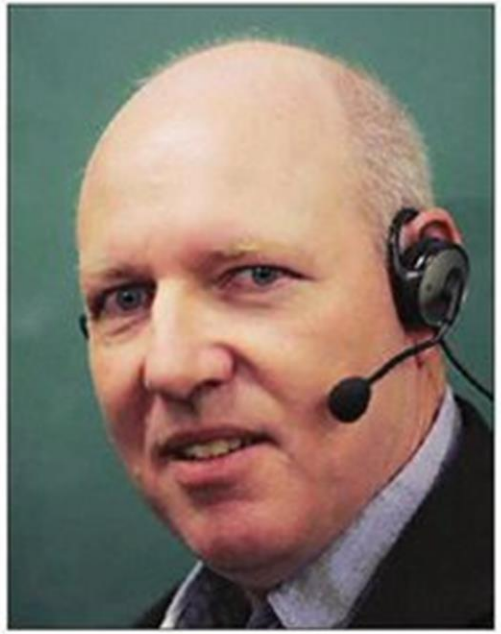
Maths made easy

Three decades in the making, the picture web book *Legend of Podo* is a novel concept in maths teaching. Aimed at young children and their parents, particularly those with learning difficulties, Crabtree believes it will demystify the subject and make learning "fun, fast and easy".

"AHA not just a new number system, it's a new visual way of learning numbers that matches the way children's brains function through geometric concepts," he claims.

According to Crabtree, because of the left-brain biased education system, students and in due course, masters them to become Super Puppy. Podo eventually replaces his mentor Arith, as the ruler of Metic Land.

Using creative visual aids like Bumps, Holes, Power Ups, Circle, Lettumbers, Dig Its, Pig Its, he comes up with the secret number code to unscramble the hot-wired for geometry before we learn to speak. The use of this type of instruction taught at the same time we learn digits, he adds is, however, the wrong way to teach mathematics. According to Crabtree, the written words and symbols should be taught after the visual maths processing is



Arithmophobia or fear of numerical concepts is a common phenomenon among students, which if

Crabtree's counting on a new number system

Jonathan Crabtree and Podo.

JONATHAN Crabtree would like to see the way children learn maths changed. long man the whole changed.

"We m Roman nu Hindu-Ara and now i new systen said. "The reason is t been hated centuries.

"My new

simple improvement in a product overdue by over a thousand years."

"What I am doing is summarising all the maths number theory up until

a vertical axis because it reflects the world in which children live.

NEWS

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Seaholme man's dogged determination

Printer Friendly

Text size A⁻ A⁺

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Search

LYING on his back in hospital with a smashed spine and facing the prospect of never walking again, Jonathan Crabtree made an unusual promise to a God he didn't believe in at the time.

"Let me walk and have children, and I will change the way the world does maths," Mr Crabtree said.

Twenty-five years later the Seaholme resident is walking, has children and is on his way to keeping his promise with the help of Podo the Super Puppy.

Mr Crabtree was badly hurt in a motorcycle accident at 21 and spent months in hospital, which gave him time

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*Guided Object Action Learning Stories

Via Āryabhaṭa Bhāskara & Brahmagupta

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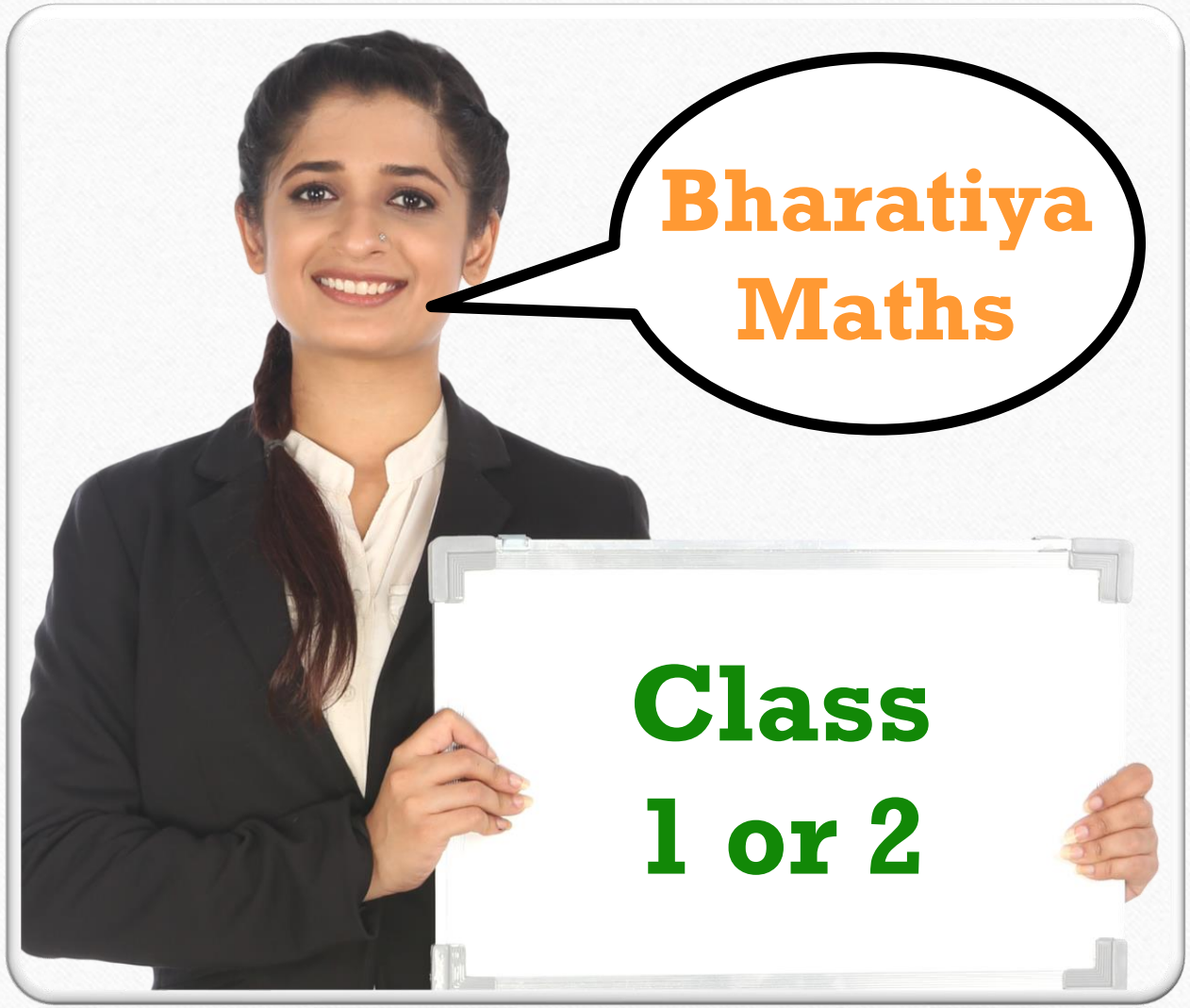
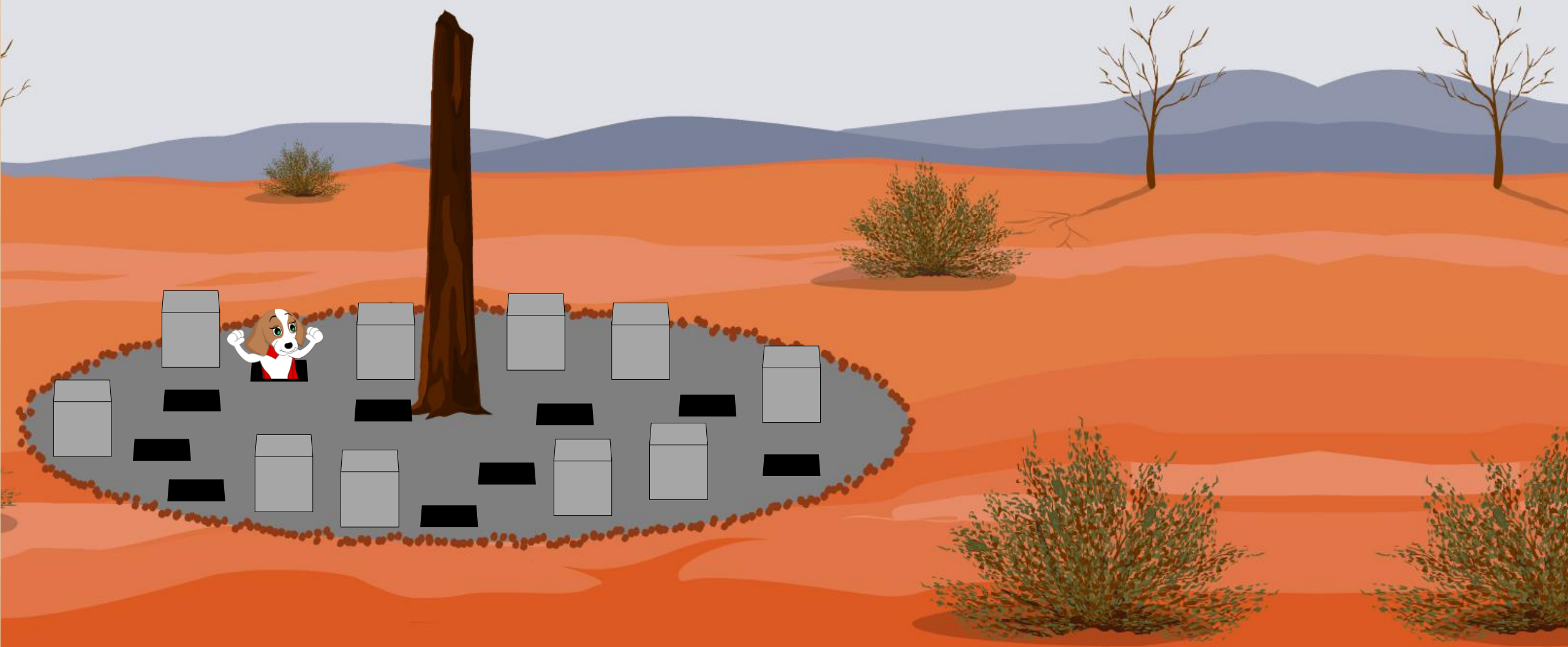
~~Class 7~~

Neg. + Pos.

–3 + +7



Class 1 and 2 Children Play the Happy Harappan Positive + Brick and Negative – Hole Game!



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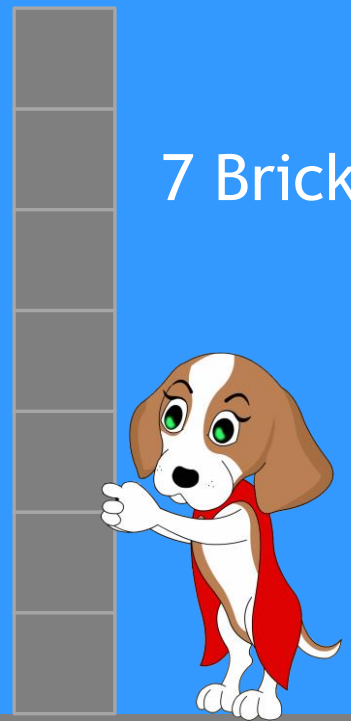
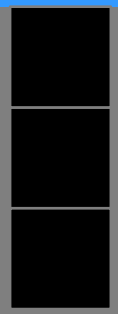


7 Bricks

$-3 + {}^{+}7 = ?$

Podo the Puppy
by AFX Animation
Kolkata, India.

3 Holes



$-3 + {}^{+}7 = ?$

7 Positives

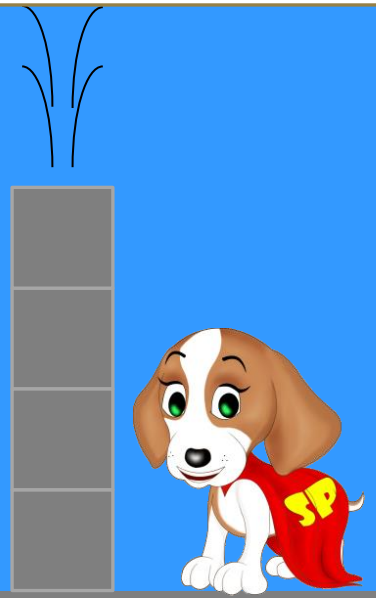
3 Negatives

$-3 + {}^{+}7 = ?$

7 Positives

3 Negatives

3 Holes $^{-}3$ and 7 Bricks $^{+}7$ = 4 Bricks $^{+}4$



$$^{-}3 + {}^{+}7 = {}^{+}4$$

Brahmagupta's

Addition Sutra #3

Brahmagupta's 5 Addition Sutras

धनयोर्धनम्ऋणमृणयोः धनर्णयोरन्तरं समैक्यं खम् ऋणमैक्यं च धनमृणधनशून्ययोः शून्ययोः शून्यम्

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Brahmagupta's 5 Addition Sutras

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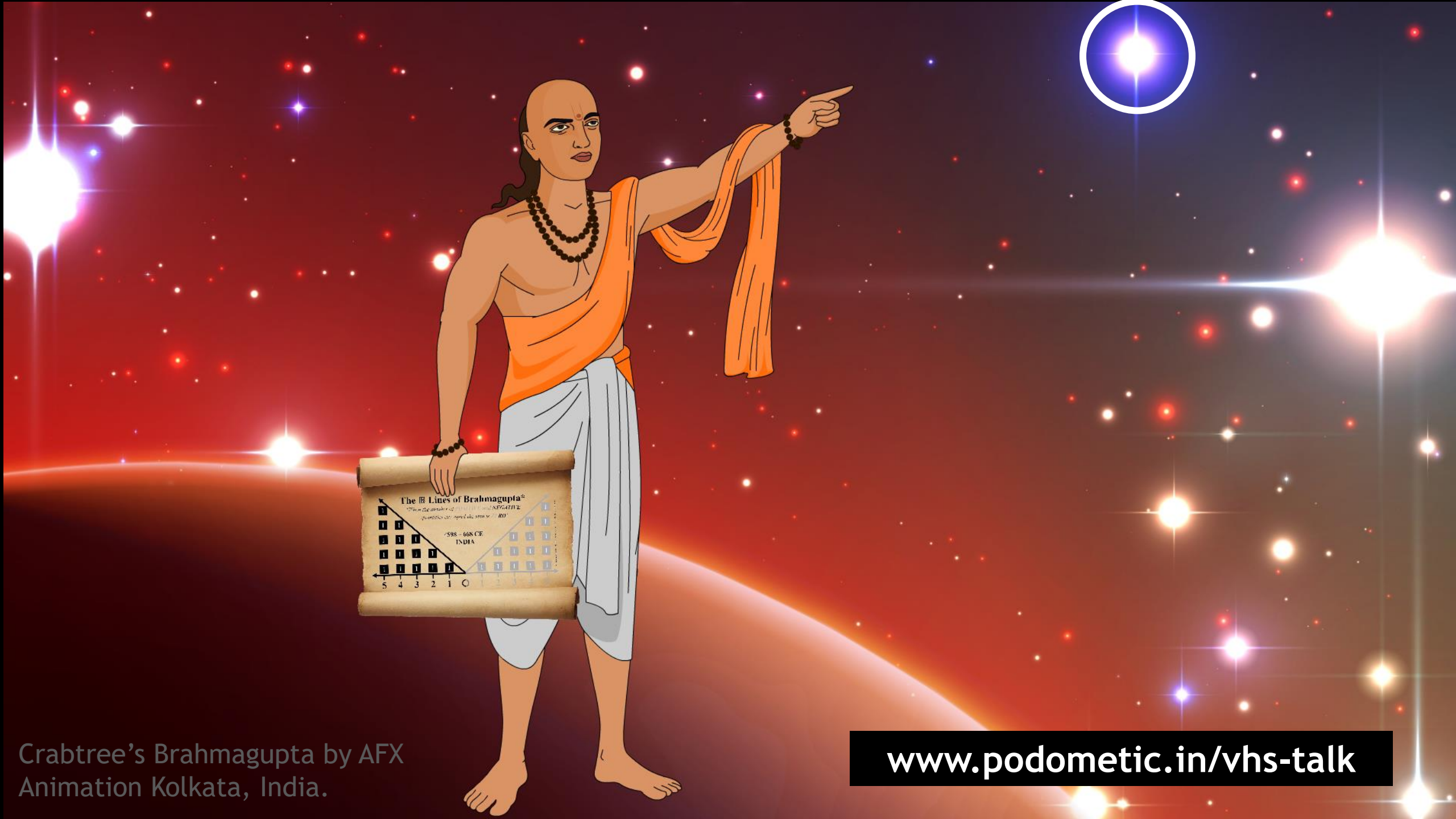
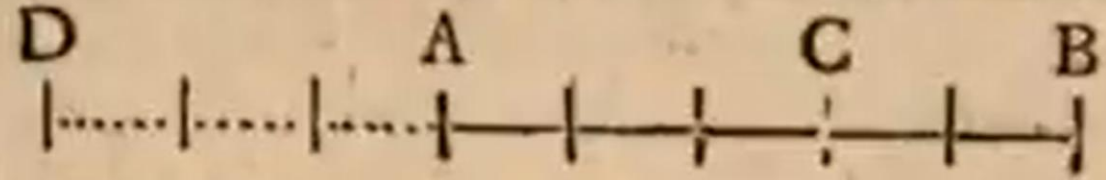


Crabtree's Brahmagupta by AFX Animation Kolkata, India.

As for instance: Supposing a man to have advanced or moved forward, (from A to B,) 5 Yards; and then to retreat (from B to C) 2 Yards: If it be asked, how much he had Advanced (upon the whole march) when at C? or how many Yards he is now Forwarder than when he was at A? I find (by Subducting 2 from 5,) that he is Advanced 3 Yards. (Because $+5-2=+3$.)

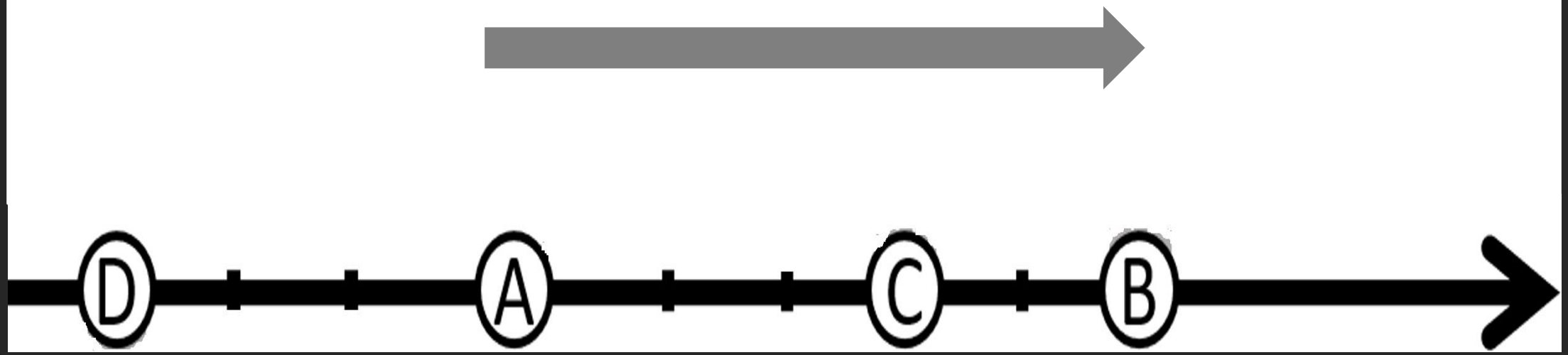


But if, having Advanced 5 Yards to B, he thence Retreat 8 Yards to D; and it be then asked, How much he is Advanced when at D, or how much Forwarder than when he was at A: I say -3 Yards. (Because $+5-8=-3$.) That is to say, he is advanced 3 Yards less than nothing.

John Wallis, p.265, A Treatise of Algebra 1685.

"But if, having Advanced 5 Yards to B, he thence retreated 8 yards to D; and it be then asked How much he is Advanced when at D,

*... **he is advanced 3 Yards less than nothing.**"*



"But if, having Advanced 5 Yards to B, he thence retreated 8 yards to D; and it be then asked How much he is Advanced when at D,

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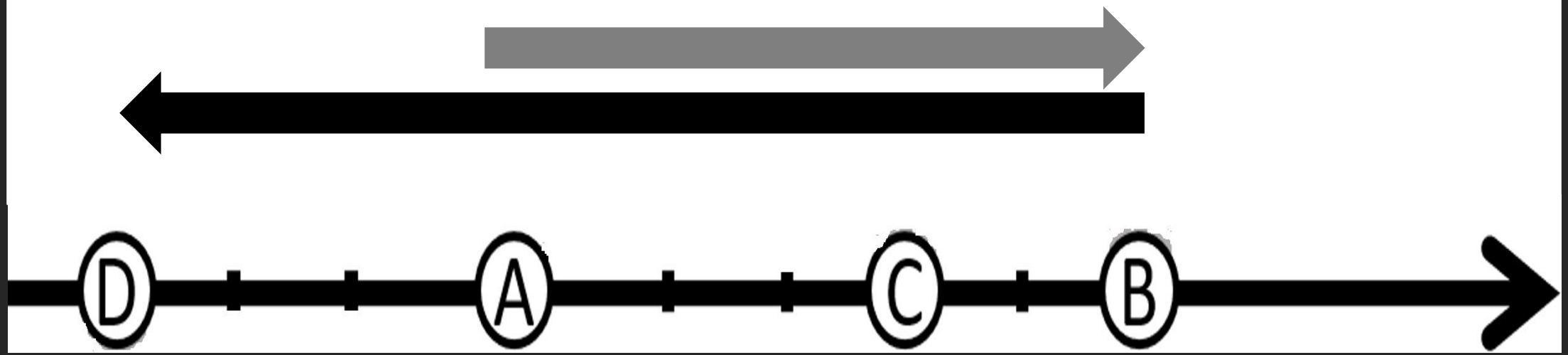
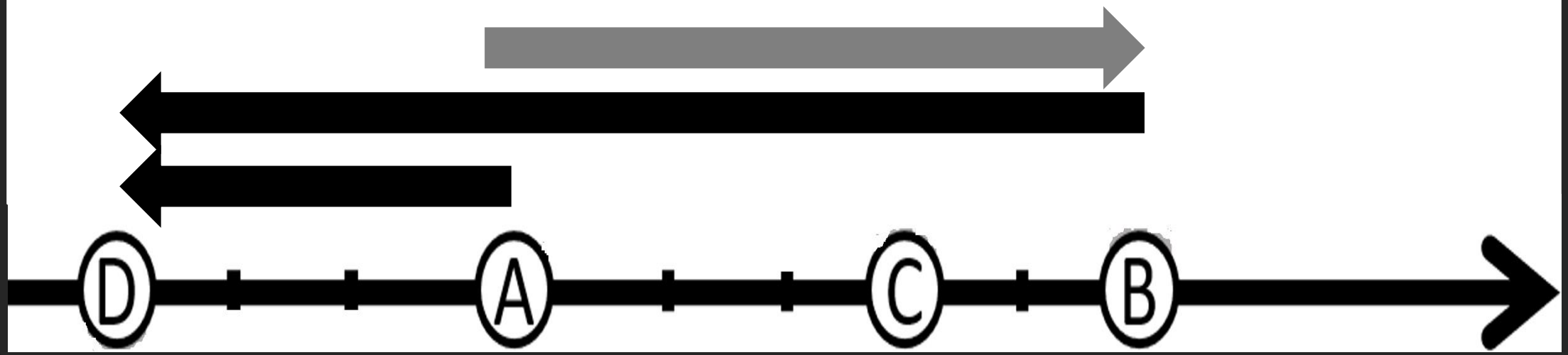


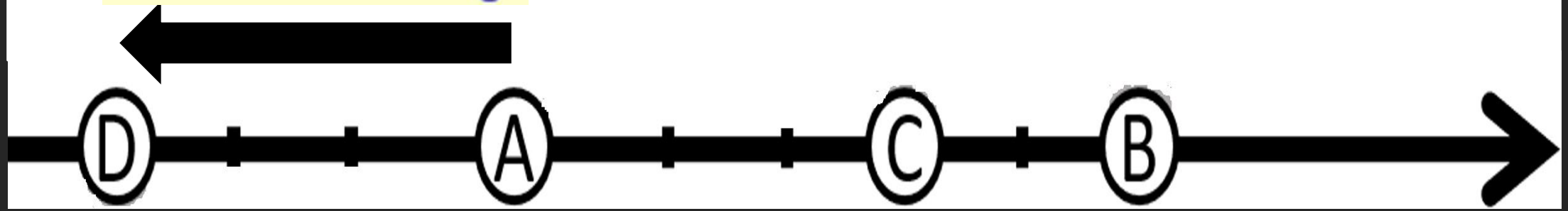
"But if, having Advanced 5 Yards to B, he thence retreated 8 yards to D; and it be then asked How much he is Advanced when at D,

... he is advanced 3 Yards less than nothing."



"But if, having Advanced 5 Yards to B, he thence retreated 8 yards to D; and it be then asked How much he is Advanced when at D, ... he is advanced 3 Yards less than nothing."

less than nothing.



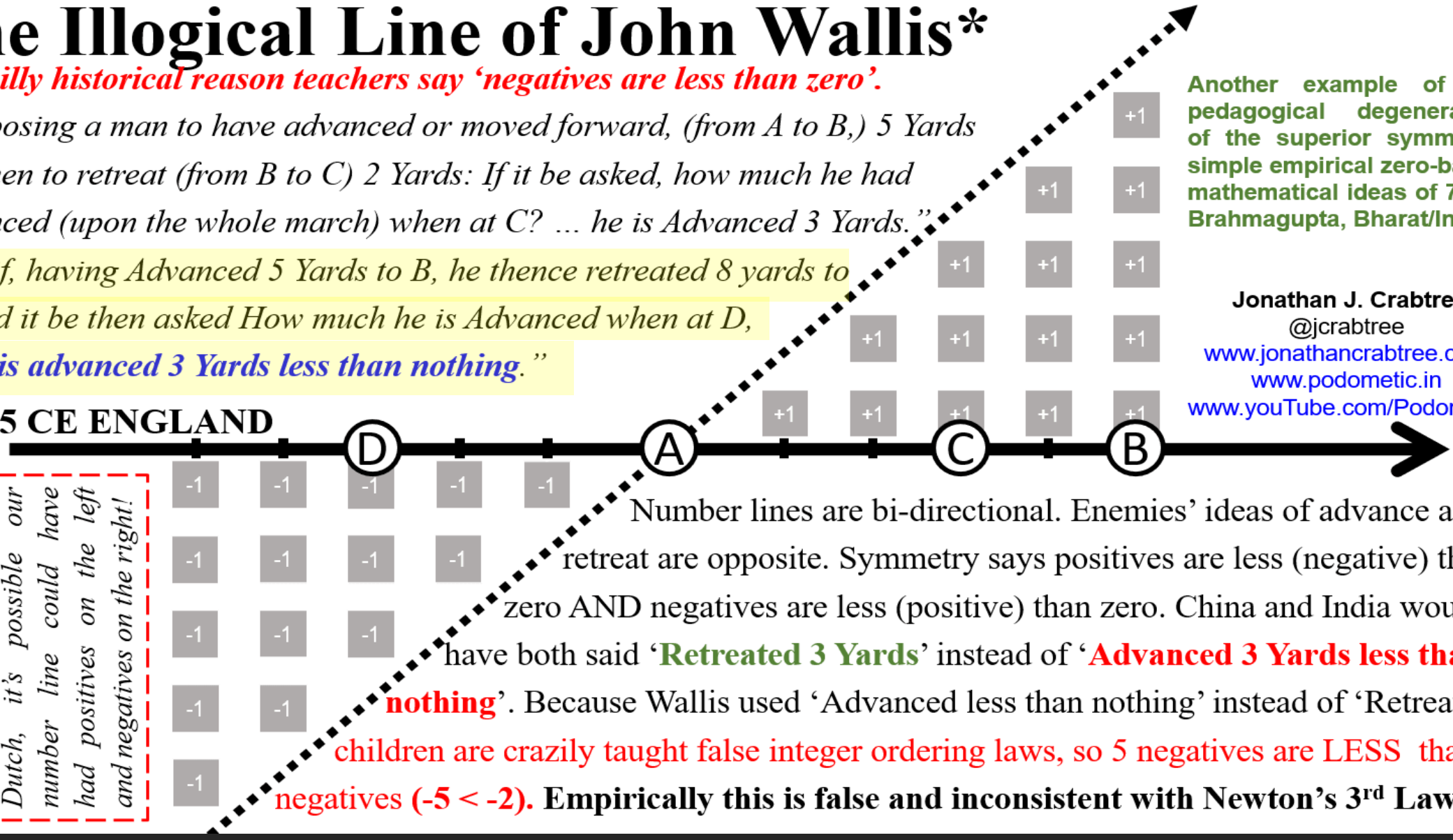
The Illogical Line of John Wallis*

The silly historical reason teachers say 'negatives are less than zero'.

"Supposing a man to have advanced or moved forward, (from A to B,) 5 Yards and then to retreat (from B to C) 2 Yards: If it be asked, how much he had Advanced (upon the whole march) when at C? … he is Advanced 3 Yards."

*"But if, having Advanced 5 Yards to B, he thence retreated 8 yards to D; and it be then asked How much he is Advanced when at D, … **he is advanced 3 Yards less than nothing**."*

***1685 CE ENGLAND**



If England had been at war with the Irish instead of the Dutch, it's possible our number line could have had positives on the left and negatives on the right!

Another example of the pedagogical degeneration of the superior symmetric simple empirical zero-based mathematical ideas of 7th C. Brahmagupta, Bharat/India.

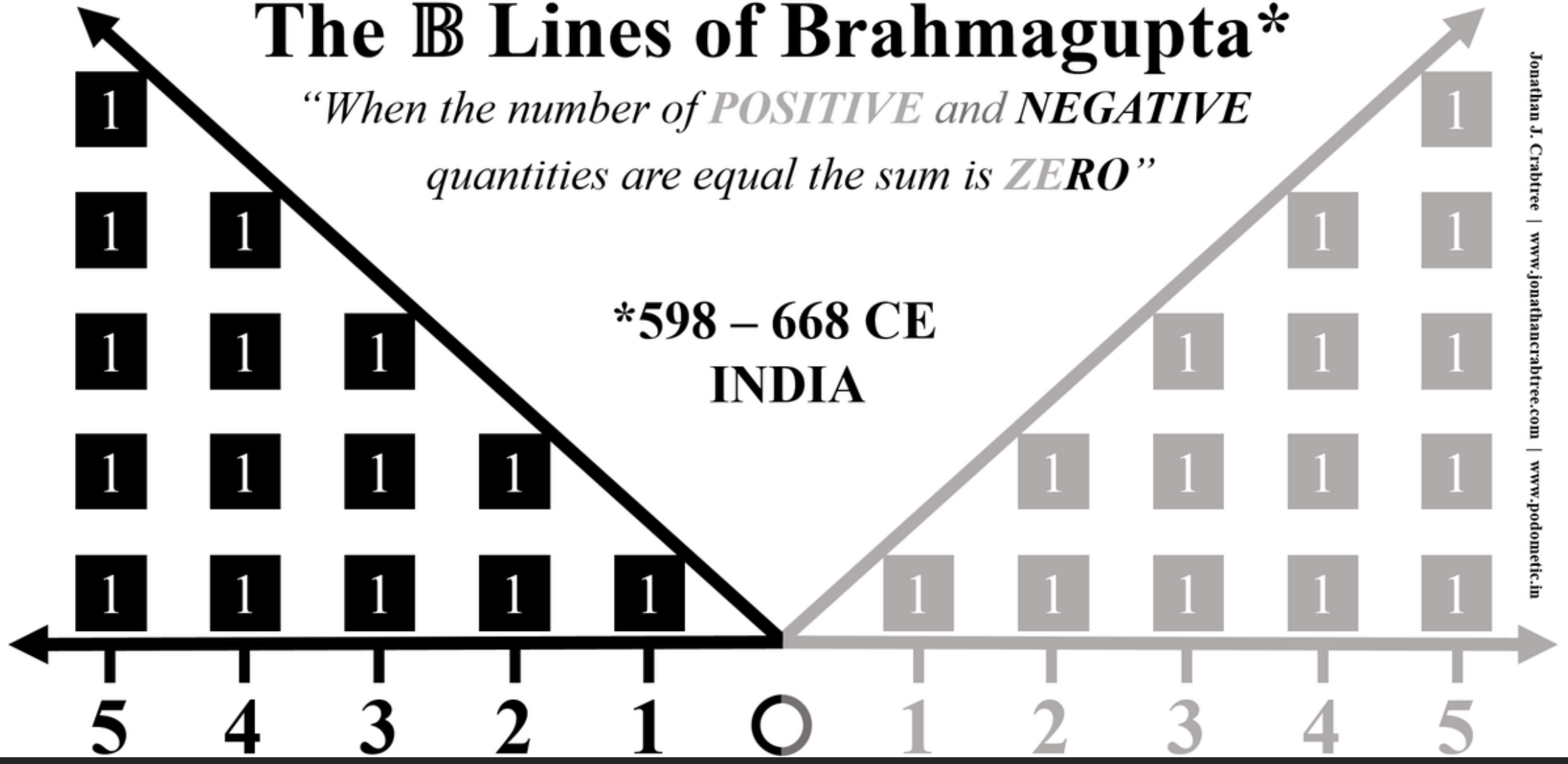
Jonathan J. Crabtree
@jcrabtree
www.jonathancrabtree.com
www.podometic.in
www.youTube.com/Podometic

Number lines are bi-directional. Enemies' ideas of advance and retreat are opposite. Symmetry says positives are less (negative) than zero AND negatives are less (positive) than zero. China and India would have both said '**Retreated 3 Yards**' instead of '**Advanced 3 Yards less than nothing**'. Because Wallis used 'Advanced less than nothing' instead of 'Retreated', children are crazily taught false integer ordering laws, so 5 negatives are LESS than 2 negatives **(-5 < -2). Empirically this is false and inconsistent with Newton's 3rd Law.**

The 𝔹 Lines of Brahmagupta*

"When the number of POSITIVE and NEGATIVE quantities are equal the sum is ZERO"

***598 – 668 CE**
INDIA



Jonathan J. Crabtree | www.jonathancrabtree.com | www.podometic.in

www.podometic.in/vhs-talk

Brahmagupta's 5 Subtraction Sutras

ऊनमधिकाद्विशोध्यं धनं धनाद्ऋणमृणाद्अधिकमूनात् व्यस्तं तदन्तरं स्यादृणं धनं धनमृणं भवति
शून्यविहीनमृणमृणं धनं धनं भवति शून्यमाकाशम् शोध्यं यदा धनमृणाद्ऋणं धनाद्वा तदा क्षेप्यम

SS1 A smaller **positive** subtracted from a larger **positive** is **positive**.

SS2 A smaller **negative** subtracted from a larger **negative** is **negative**.

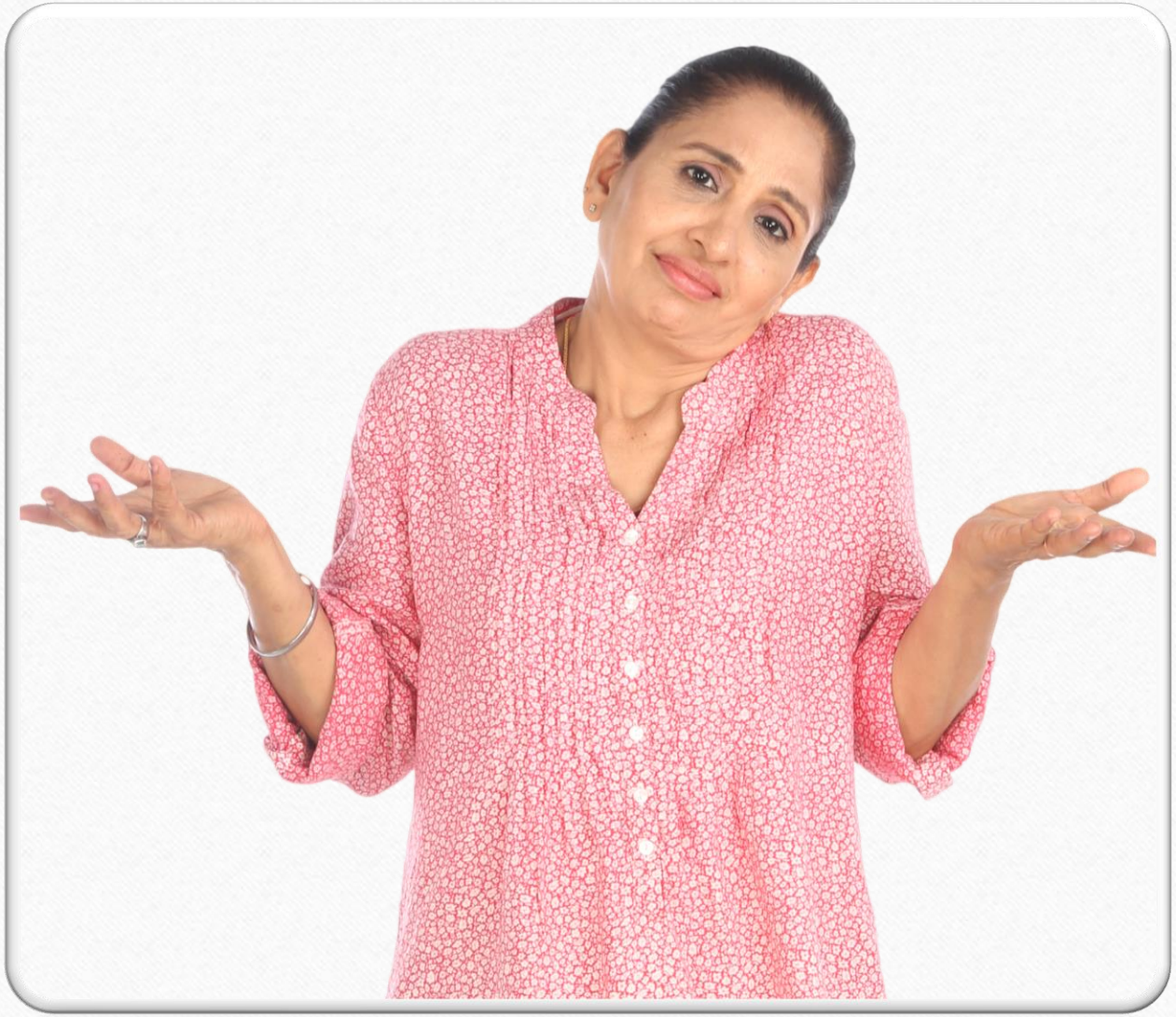
SS3 If a larger **negative** or **positive** is to be subtracted from a smaller **negative** or **positive**, the sign of their difference is reversed – **negative** becomes **positive** and **positive** **negative**.

SS4 A **negative** minus **zero** is **negative**,
a **positive** minus **zero** is **positive**,
zero minus **zero** is **zero**.

SS5 When a **positive** is to be subtracted from a **negative** or a **negative** from a **positive**, then it is to be added.

Rebuild Maths from Zero

What does negative seven minus negative four equal?



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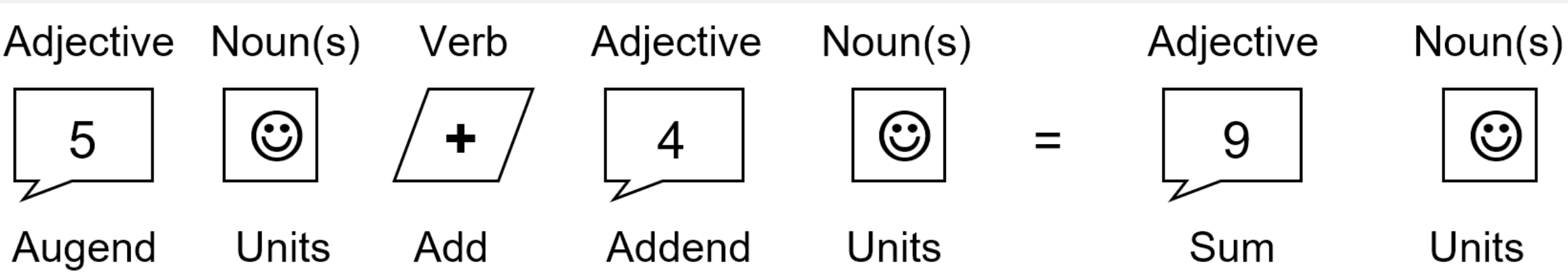
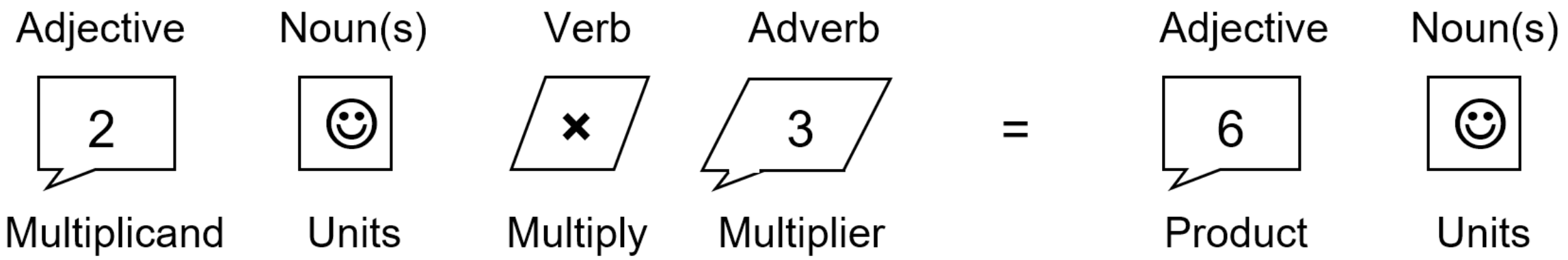


The Grammar of Podometic Aligns with Logic



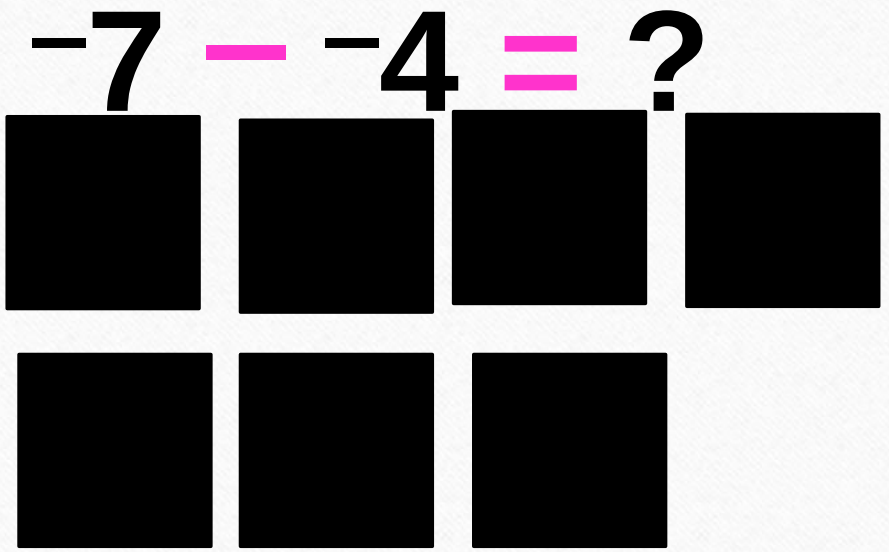
www.podometic.in/vhs-talk

Rebuild Maths from Zero

What does seven negatives minus four negatives equal?

Rebuild Maths from Zero

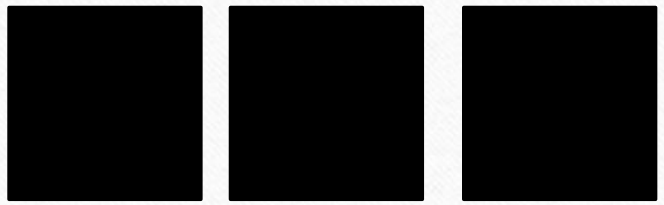
What does seven negatives minus four negatives equal?



Rebuild Maths from Zero

What does seven negatives minus four negatives equal?

$$-7 - -4 = -3$$



Rebuild Maths from Zero

So, what is $-7 - {}^{+}4$?

Brahmagupta's 5 Subtraction Sutras

ऊनमधिकाद्विशोध्यं धनं धनाद्ऋणमृणाद्अधिकमूनात् व्यस्तं तदन्तरं स्यादृणं धनं धनमृणं भवति
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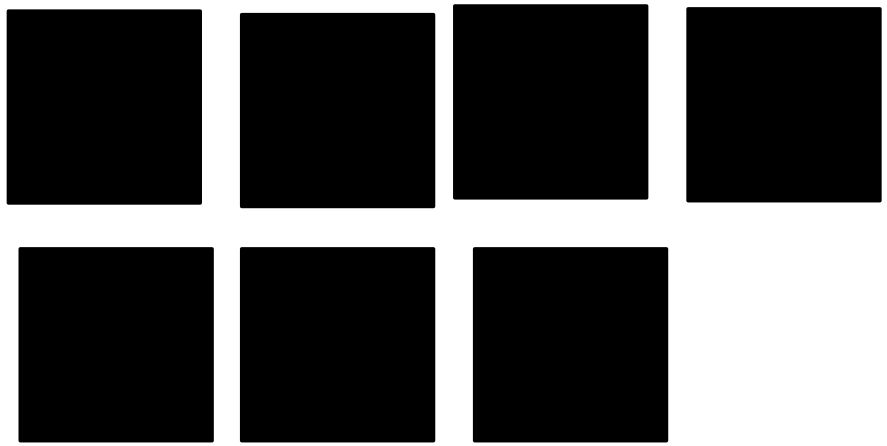
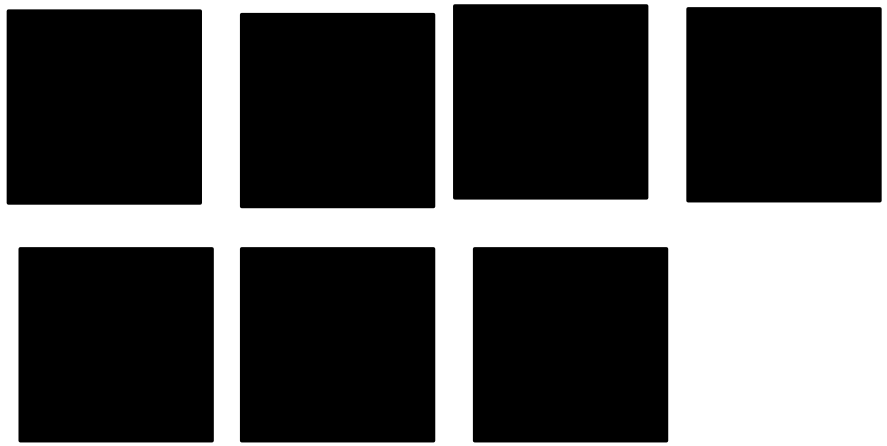
SS5

What does **seven negatives (holes)** minus four positives (bricks) equal?



SS5

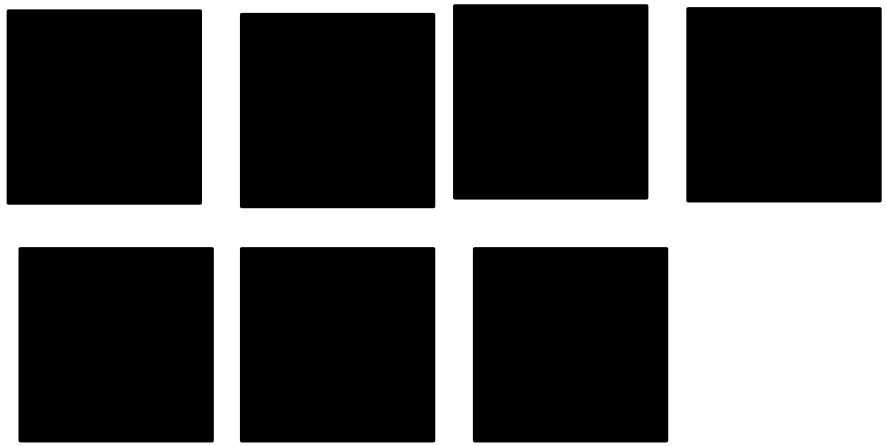
What does **seven negatives (holes)** minus four positives (bricks) equal?



Wait! We can't take away four positives (bricks) because we don't have any!

SS5

So, we dig **four negative holes** to make **four positive bricks.**



Brahmagupta's 5 Addition Sutras

धनयोर्धनम्ऋणमृणयोः धनर्णयोरन्तरं समैक्यं खम् ऋणमैक्यं च धनमृणधनशून्ययोः शून्ययोः शून्यम्

AS1 positive plus positive is positive

AS2 negative plus negative is negative

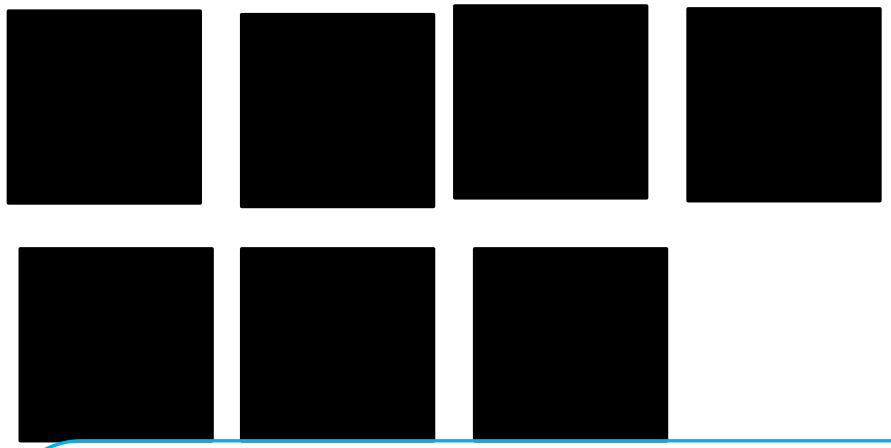
AS3 positive plus negative is the difference between the positive and negative

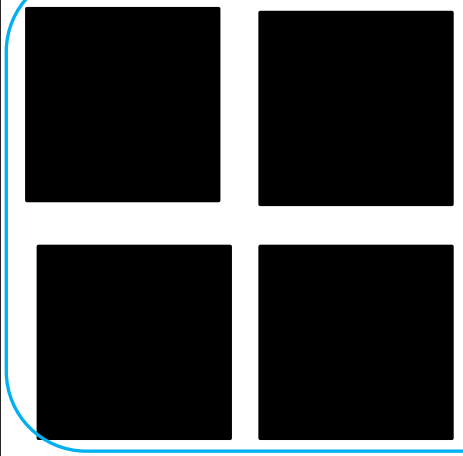
AS4 when positive and negative are equal the sum is zero

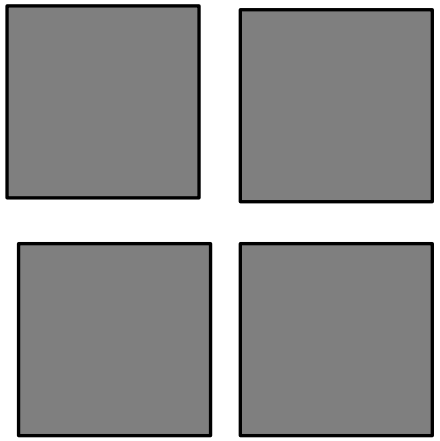
AS5
positive plus zero is positive
negative plus zero is negative
zero plus zero is zero

SS5

So, we dig **four negative holes** to make four positive bricks.







AS5

Brahmagupta's 5 Addition Sutras

धनयोर्धनम्ऋणमृणयोः धनर्णयोरन्तरं समैक्यं खम् ऋणमैक्यं च धनमृणधनशून्ययोः शून्ययोः शून्यम्

AS1 positive plus positive is positive

AS2 negative plus negative is negative

AS3 positive plus negative is the difference between the positive and negative

AS4 when positive and negative are equal the sum is zero

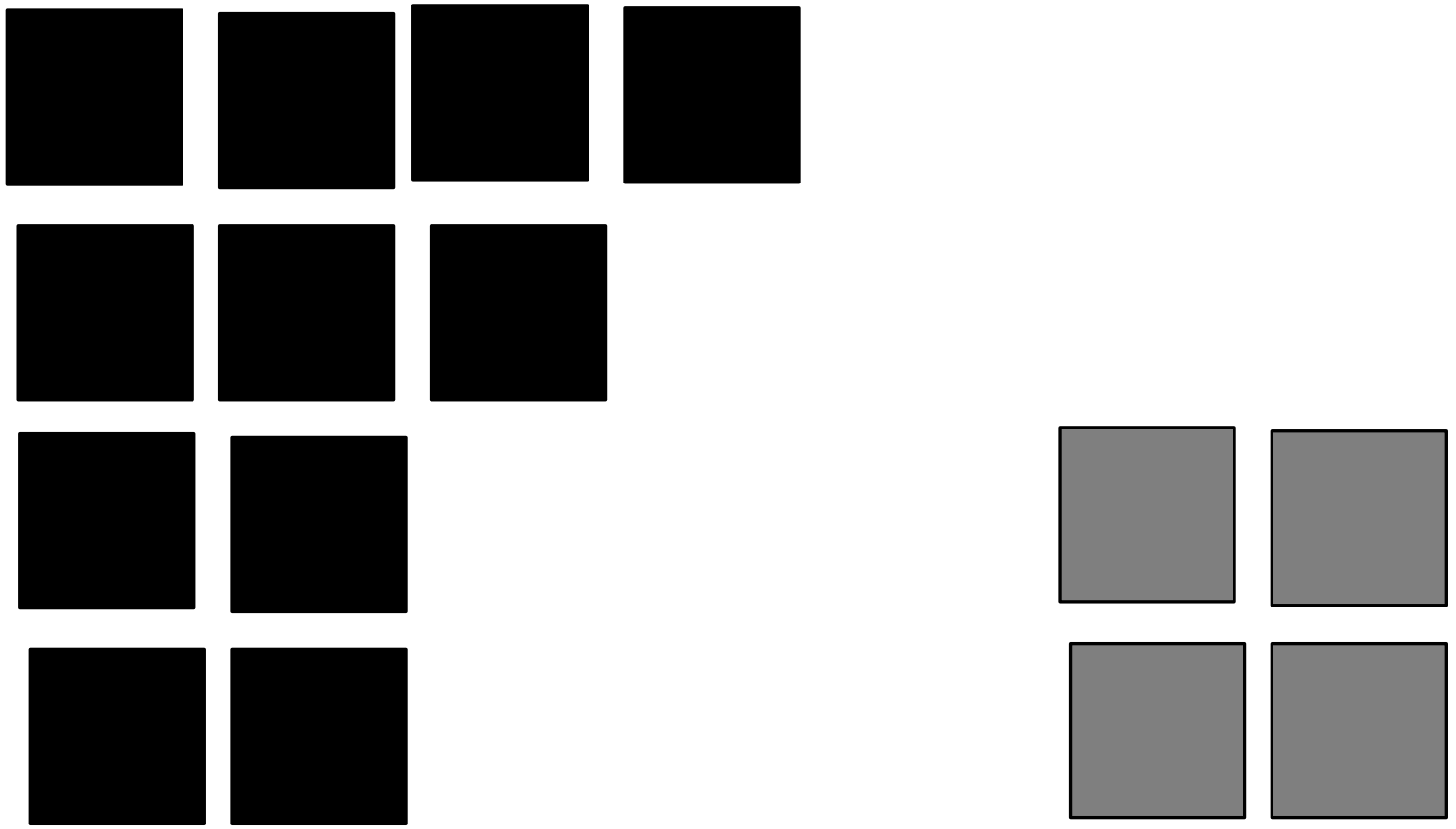
positive plus zero is positive

AS5 negative plus zero is negative

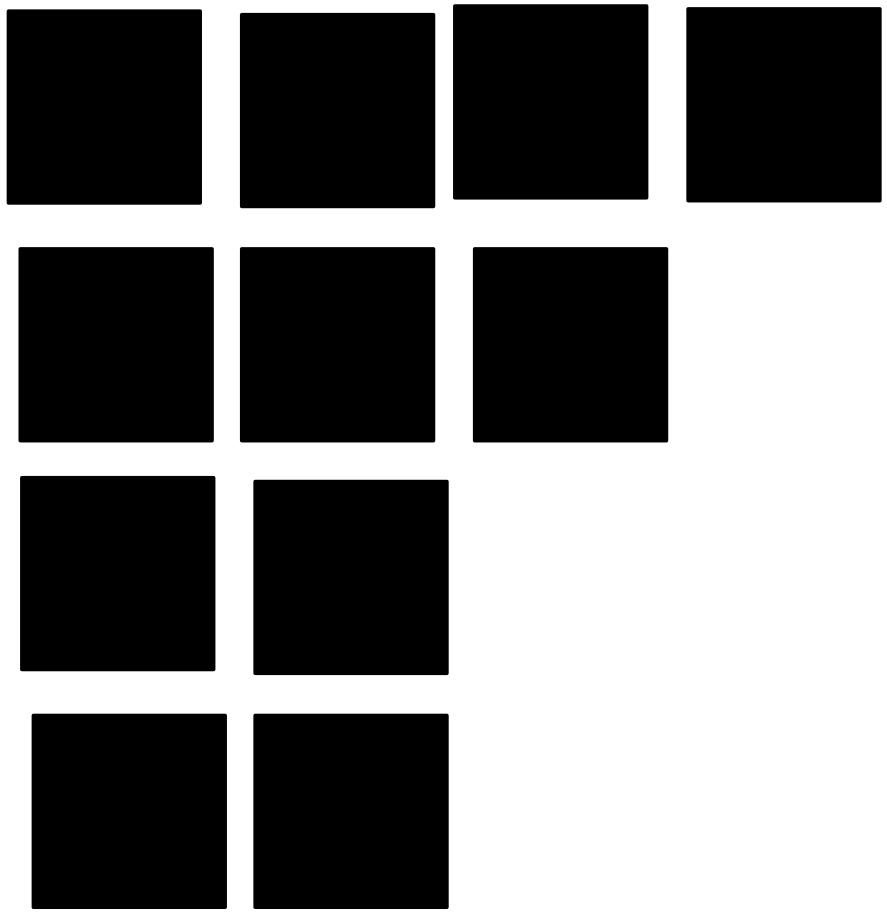
zero plus zero is zero

SS5

What does **seven negatives (holes)** minus four positives (bricks) equal?



Negative seven minus positive four equals negative eleven



Brahmagupta's 4 Multiplication Sutras

ऋणमृणधनयोर्घातो धनमृणयोः धनवधो धनं भवति
शून्यर्णयोः खधनयोः खशून्ययोर्वा वधः शून्यम्

MS1 The product of a **negative** and a **positive** is **negative**.

MS2 The product of two **negatives** is **positive**.

MS3 The product of two **positives** is **positive**.

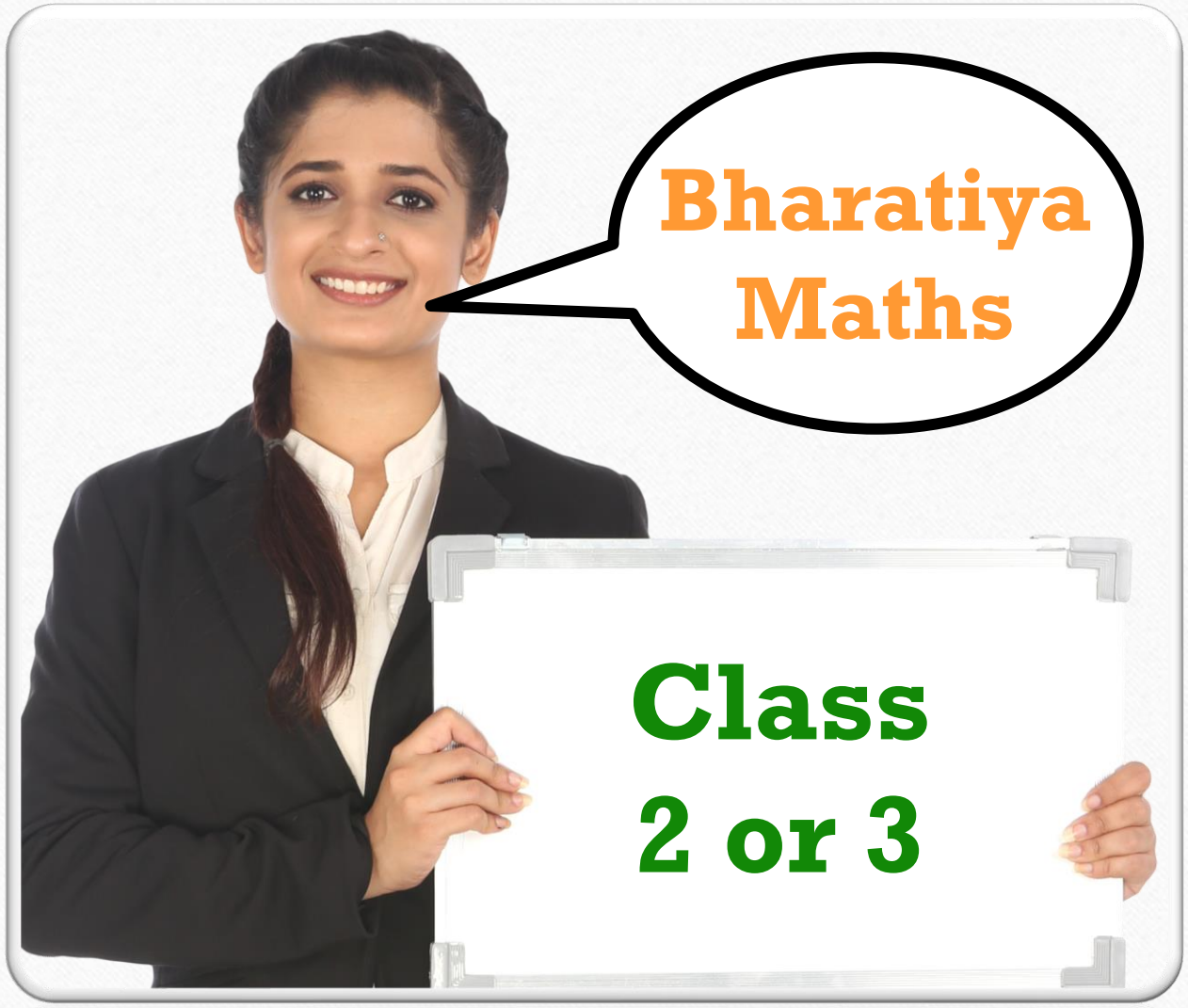
MS4 The product of **zero** and a **negative**,
of **zero** and a **positive**, or
of two **zeros** is **zero**.

~~Class 8~~

Neg. × Neg..

PROVE WHY

$-1 \times -1 = +1$



MS2

The product of two negatives is positive

$$^{-}1 \times {}^{-}1 = {}^{+}1$$

A demonstration goes like this...

$1 + (-1) = 0$	Definition of -1.

MS2

The product of two negatives is positive

$$^{-}1 \times {}^{-}1 = {}^{+}1$$

A demonstration goes like this...

$1 + (-1) = 0$	Definition of -1.
$-1 \times [1 + (-1)] = -1 \times 0$	Both sides multiplied by -1.

MS2

The product of two negatives is positive

$$^{-}1 \times {}^{-}1 = {}^{+}1$$

A demonstration goes like this...

$1 + (-1) = 0$	Definition of -1.
$-1 \times [1 + (-1)] = -1 \times 0$	Both sides multiplied by -1.
$(-1) \times 1 + (-1) \times (-1) = 0$	Distributive law

MS2

The product of two negatives is positive

$$^{-}1 \times {}^{-}1 = {}^{+}1$$

A demonstration goes like this...

$1 + (-1) = 0$	Definition of -1.
$-1 \times [1 + (-1)] = -1 \times 0$	Both sides multiplied by -1.
$(-1) \times 1 + (-1) \times (-1) = 0$	Distributive law
$(-1) + (-1) \times (-1) = 0$	Multiplicative identity

MS2

The product of two negatives is positive

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A demonstration goes like this...

$1 + (-1) = 0$	Definition of -1.
$-1 \times [1 + (-1)] = -1 \times 0$	Both sides multiplied by -1.
$(-1) \times 1 + (-1) \times (-1) = 0$	Distributive law
$(-1) + (-1) \times (-1) = 0$	Multiplicative identity
$1 + [(-1) + (-1) \times (-1)] = 1 + 0$	Add 1 to both sides

MS2

The product of two negatives is positive

$$^{-}1 \times {}^{-}1 = {}^{+}1$$

A demonstration goes like this...

$1 + (-1) = 0$	Definition of -1.
$-1 \times [1 + (-1)] = -1 \times 0$	Both sides multiplied by -1.
$(-1) \times 1 + (-1) \times (-1) = 0$	Distributive law
$(-1) + (-1) \times (-1) = 0$	Multiplicative identity
$1 + [(-1) + (-1) \times (-1)] = 1 + 0$	Add 1 to both sides
$[1 + (-1)] + (-1) \times (-1) = 1 + 0$	Associative law

MS2

The product of two negatives is positive

$$^{-}1 \times {}^{-}1 = {}^{+}1$$

A demonstration goes like this...

$1 + (-1) = 0$	Definition of -1.
$-1 \times [1 + (-1)] = -1 \times 0$	Both sides multiplied by -1.
$(-1) \times 1 + (-1) \times (-1) = 0$	Distributive law
$(-1) + (-1) \times (-1) = 0$	Multiplicative identity
$1 + [(-1) + (-1) \times (-1)] = 1 + 0$	Add 1 to both sides
$[1 + (-1)] + (-1) \times (-1) = 1 + 0$	Associative law
$0 + (-1) \times (-1) = 1 + 0$	Additive identity

MS2

The product of two negatives is positive

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A demonstration goes like this...

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$0 + (-1) \times (-1) = 1 + 0$	Additive identity
$(-1) \times (-1) = 1$	Desired Outcome

MS2

The product of two negatives is positive

$$^{-}1 \times {}^{-}1 = {}^{+}1$$

A demonstration goes like this...

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Crabtree, Jonathan J. *A new reason negative multiplied by negative is positive* Vinculum, Vol. 52, No. 3, Jul 2015

MS2

Negative *Multiplicand* Multiplied by Negative *Multiplier*

$$^{-}a \times {-}b$$

^{-}a subtracted from zero b times

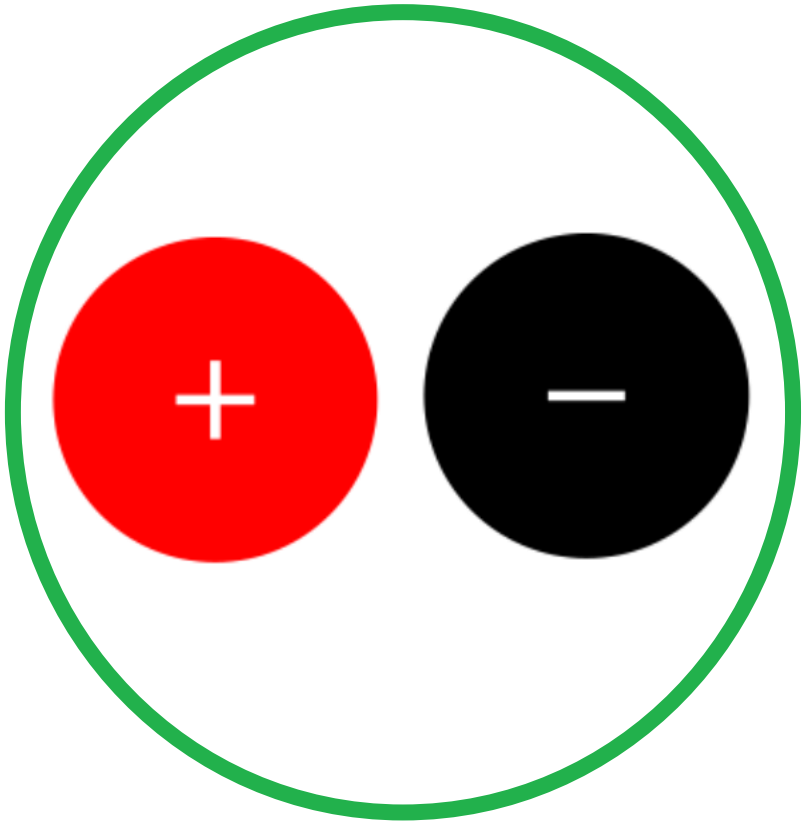
$$^{-}1 \times {-}1$$

$^{-}1$ subtracted from zero 1 times

Brahmagupta Defined ZERO in Law AS4

when positive and negative are equal the sum is ZERO

$^{+}1 + {}^{-}1$



$^{-}1 \times -1$

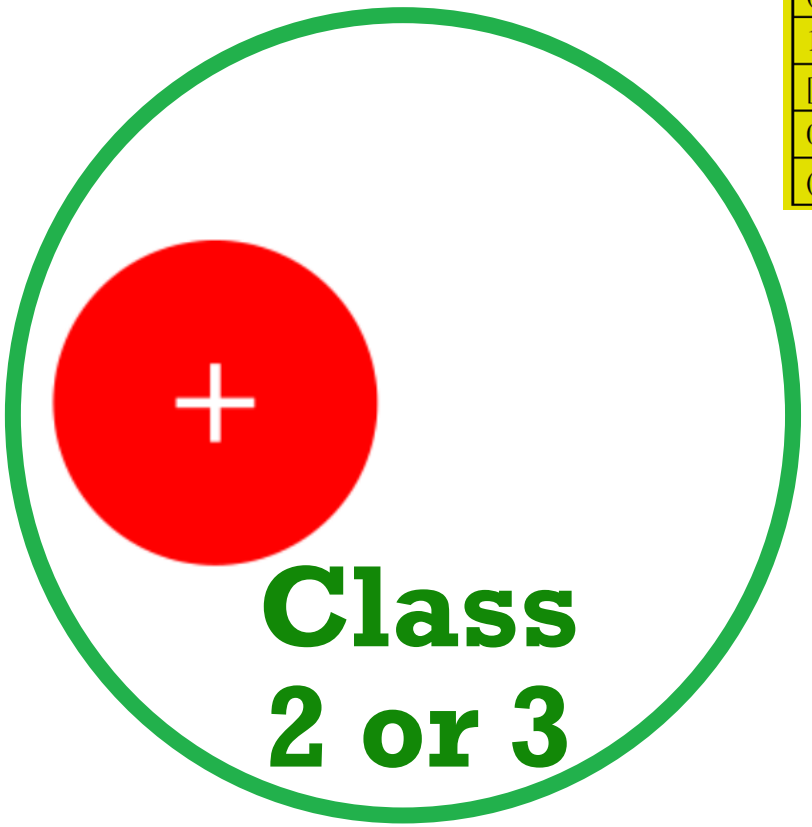
$^{-}1$ *subtracted*

from zero 1 *times*

Class 8

$1 + (-1) = 0$	Definition of -1.
$-1 \times [1 + (-1)] = -1 \times 0$	Both sides multiplied by -1.
$(-1) \times 1 + (-1) \times (-1) = 0$	Distributive law
$(-1) + (-1) \times (-1) = 0$	Multiplicative identity
$1 + [(-1) + (-1) \times (-1)] = 1 + 0$	Add both sides to 1.
$[1 + (-1)] + (-1) \times (-1) = 1 + 0$	Associative law
$0 + (-1) \times (-1) = 1 + 0$	Definition of -1
$(-1) \times (-1) = 1$	Additive identity

$^{+}1$



$^{-}1 \times {-1}$

$^{-}1$ *subtracted*

from ***zero*** ***1*** *times*

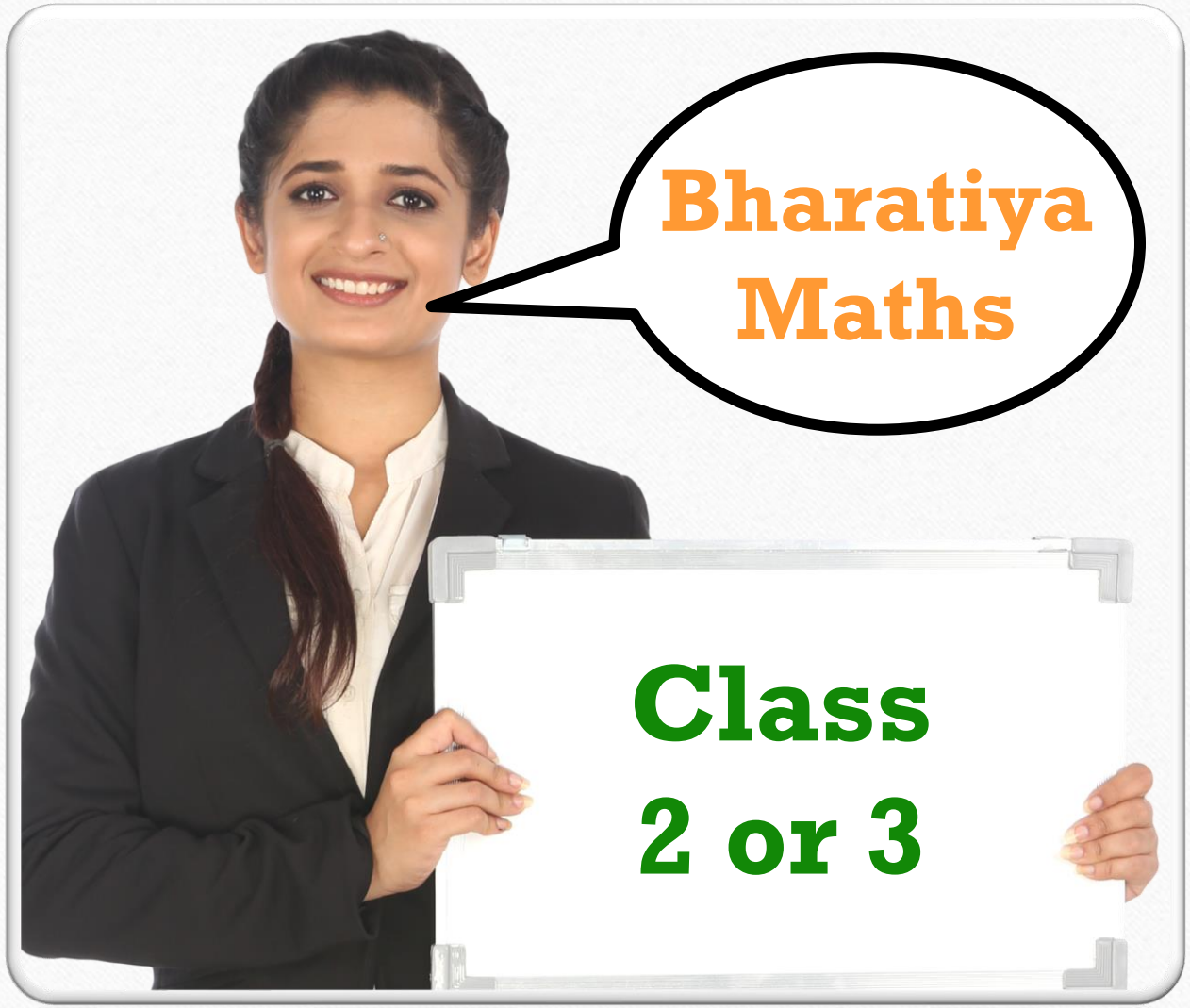
$\therefore \; {}^{-}1 \times {-1} = {}^{+}1$

~~Class 8~~

Neg. × Neg..

PROVE WHY

$-1 \times -1 = +1$



A Bonus BIG Idea?

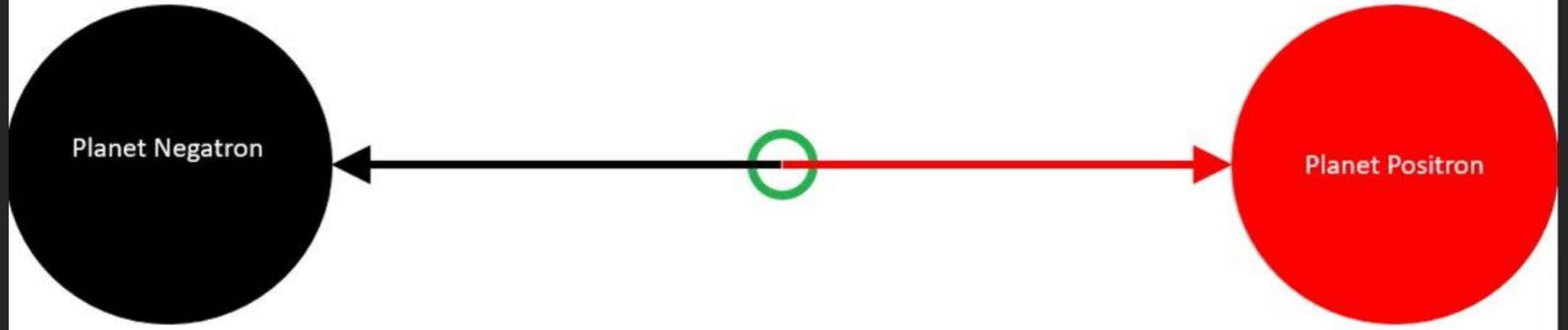
Rebuild Maths from Physics

'Void White' by Irma den Hertog

www.podometic.in/vhs-talk

It has been said...

"God created the universe from nothing, from Shunya, from Zero"



Wherever opposing quantities or forces are equal you will find zero.

... as per Brahmagupta

BIG BANG!

It's as if ŚŪNYA was decompressed,
creating infinite magnitudes
and multitudes from ZERO

ZERO SUM UNIVERSE | CONSERVATION OF MATTER AND ENERGY | NEWTON'S THIRD LAW

BRAHMAGUPTA | BHĀSKARA | SYMMETRY | PODOMETIC

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The Second BIG Idea?

Teach Better Bharatiya Maths!

DID YOU KNOW?

Arithmetic 300 BCE (British Maths)

Updated wrongly since the Renaissance

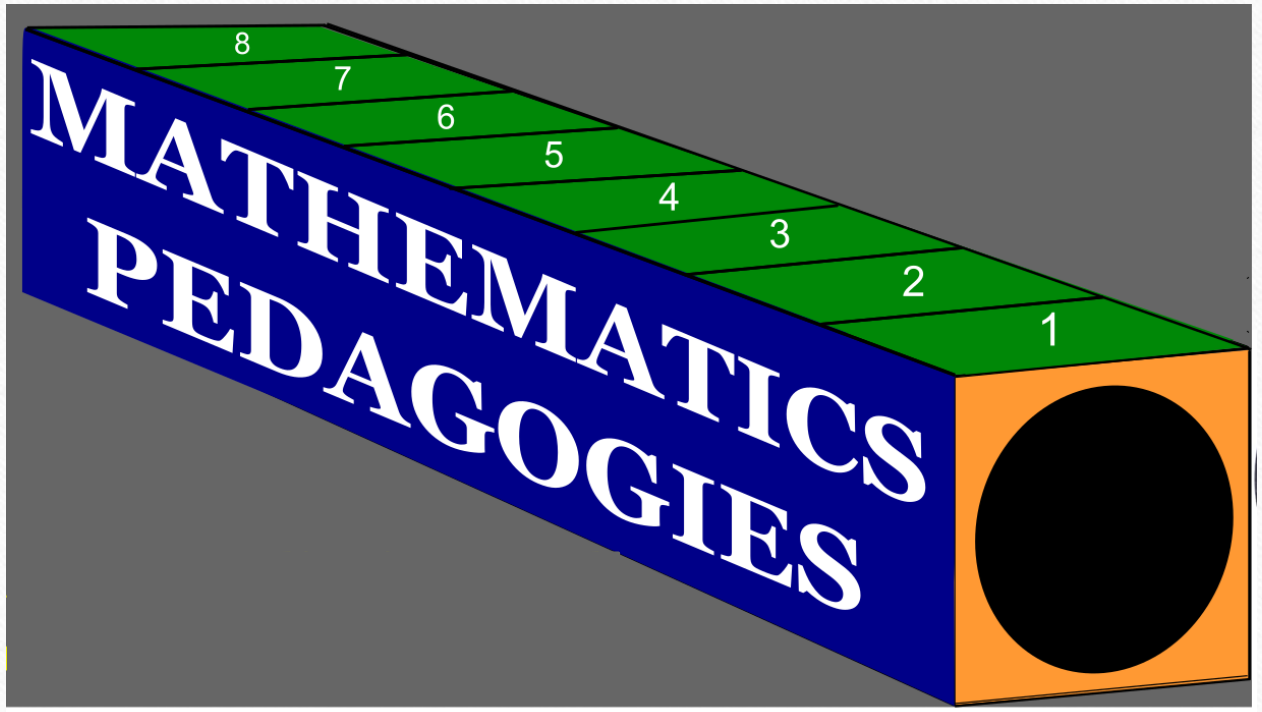
Podometic 700 CE (Bharatiya Maths)

Updated correctly since 18th March 1983

www.podometic.in/vhs-talk

The Second BIG Idea?

Teach Better Bharatiya Maths!



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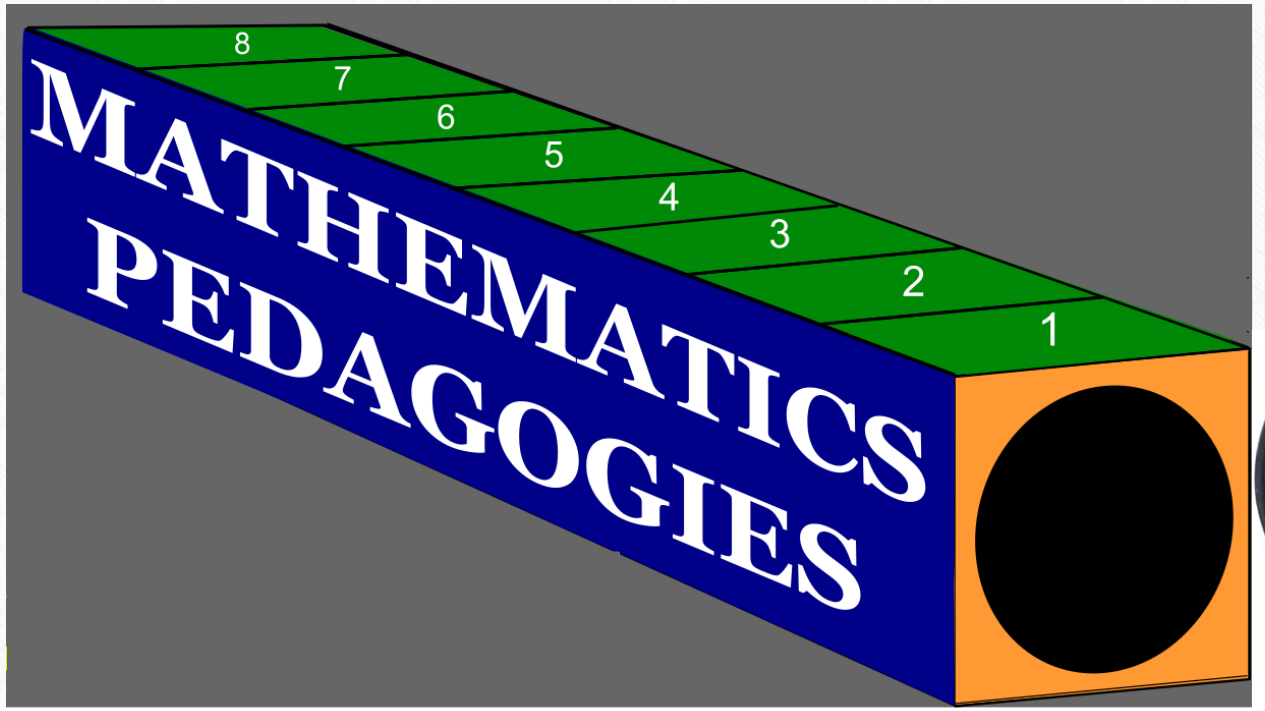

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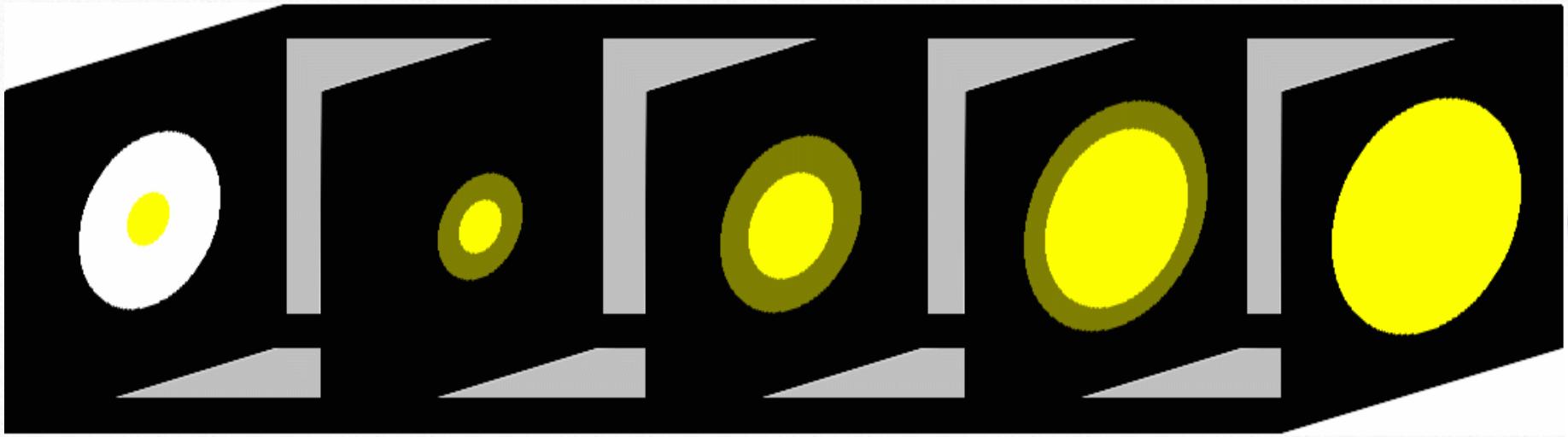
The Third BIG Idea?

Teach Better School Maths!



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THE CHILD'S OBSCURED MATHS MIND

Index Laws

Multiplication Makes More

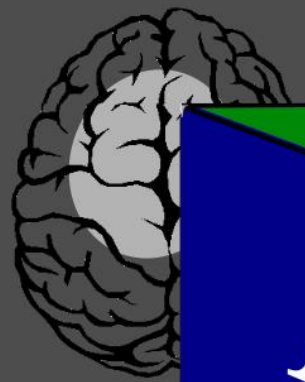
Negative Numbers

Rules not Reason

Integer Ordering

Number Words

Laws of Sign



5
4
3
2
1
Balavatika
Pre-School
Anganwadi

ARITHMETIC

NEP - WESTERN MATHS FEAR?

www.podometic.in/vhs-talk

ARITHMETIC (BRITISH MATHS)

Testing the teaching of + – × ÷ with ±12 and ±4

Do British origin school maths lessons pass the common-sense test? **NO**	$^{+}12$ & $^{+}4$ pos & pos	$^{+}12$ & $^{-}4$ pos & neg	$^{-}12$ & $^{+}4$ neg & pos	$^{-}12$ & $^{-}4$ neg & neg
Addition +	$^{+}12 + ^{+}4$	$^{+}12 + ^{-}4$	$^{-}12 + ^{+}4$	$^{-}12 + ^{-}4$
Subtraction –	$^{+}12 - ^{+}4$	$^{+}12 - ^{-}4$	$^{-}12 - ^{+}4$	$^{-}12 - ^{-}4$
Multiplication ×	$^{+}12 \times ^{+}4$	$^{+}12 \times ^{-}4$	$^{-}12 \times ^{+}4$	$^{-}12 \times ^{-}4$
Division ÷	$^{+}12 \div ^{+}4$	$^{+}12 \div ^{-}4$	$^{-}12 \div ^{+}4$	$^{-}12 \div ^{-}4$
Arithmetic fails as it wasn't built from zero		**PASS**	**FAIL**	**Absent**

PISA 2018 worldwide ranking

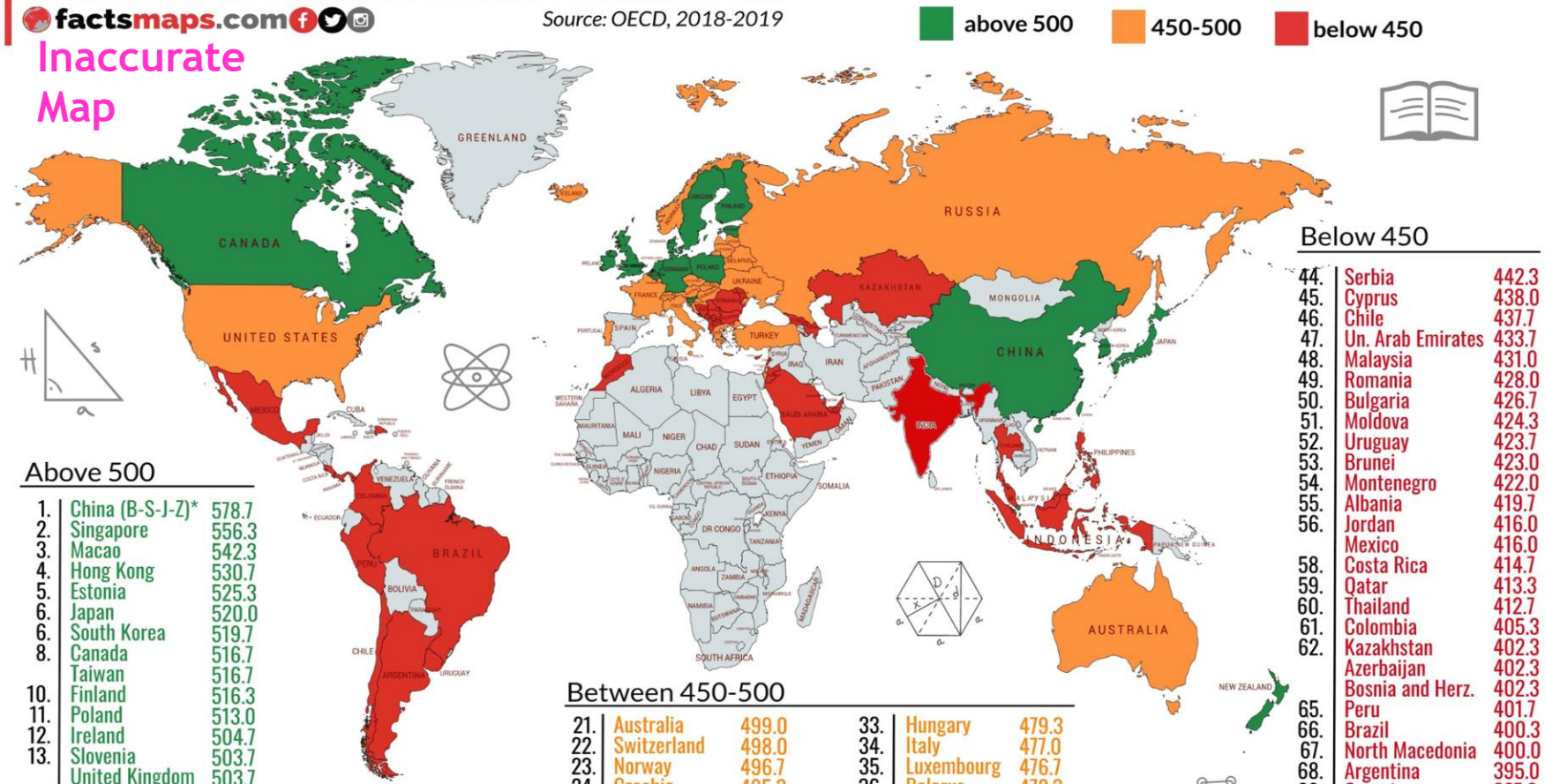
average score of math, science and reading

The Program for International Student Assessment (**PISA**) is a worldwide study by OECD in 78 nations of 15-year-old students' scholastic performance on mathematics, science and reading.

factsmaps.com

Source: OECD, 2018-2019

Inaccurate Map



Above 500

1.	China (B-S-J-Z)*	578.7
2.	Singapore	556.3
3.	Macao	542.3
4.	Hong Kong	530.7
5.	Estonia	525.3
6.	Japan	520.0
6.	South Korea	519.7
8.	Canada	516.7
	Taiwan	516.7
10.	Finland	516.3
11.	Poland	513.0
12.	Ireland	504.7
13.	Slovenia	503.7
	United Kingdom	503.7
15.	New Zealand	502.7
16.	Netherlands	502.3
17.	Sweden	501.0
18.	Denmark	500.3
	Germany	500.3
20.	Belgium	500.0

* *Beijing, Shanghai, Jiangsu, Zhejiang*

Between 450-500

21.	Australia	499.0
22.	Switzerland	498.0
23.	Norway	496.7
24.	Czechia	495.3
25.	United States	495.0
26.	France	493.7
27.	Portugal	492.0
28.	Austria	491.0
29.	Latvia	487.3
30.	Russia	487.1
31.	Iceland	481.3
32.	Lithuania	479.7
33.	Hungary	479.3
34.	Italy	477.0
35.	Luxembourg	476.7
36.	Belarus	472.3
37.	Croatia	471.7
38.	Slovakia	469.3
39.	Israel	465.0
40.	Turkey	462.7
	Ukraine	462.7
42.	Malta	459.0
43.	Greece	453.3

Below 450

44.	Serbia	442.3
45.	Cyprus	438.0
46.	Chile	437.7
47.	Un. Arab Emirates	433.7
48.	Malaysia	431.0
49.	Romania	428.0
50.	Bulgaria	426.7
51.	Moldova	424.3
52.	Uruguay	423.7
53.	Brunei	423.0
54.	Montenegro	422.0
55.	Albania	419.7
56.	Jordan	416.0
	Mexico	416.0
58.	Costa Rica	414.7
59.	Qatar	413.3
60.	Thailand	412.7
61.	Colombia	405.3
62.	Kazakhstan	402.3
	Azerbaijan	402.3
	Bosnia and Herz.	402.3
65.	Peru	401.7
66.	Brazil	400.3
67.	North Macedonia	400.0
68.	Argentina	395.0
69.	Georgia	387.0
70.	Saudi Arabia	386.0
71.	Indonesia	382.0
72.	Lebanon	376.7
73.	Morocco	368.0
74.	Panama	365.0
75.	Kosovo	361.3
76.	Philippines	350.0
77.	Dominican Rep.	334.3
	Tamil Nadu	**345**
	Himachal Pradesh	**327**
	2009 PISA RESULT	

Indian Maths Education?

www.bit.ly/mathsdata

Indian students rank 2nd last in global test

Hemali Chhapia | TNN | Jan 15, 2012, 02:24 IST

School students celebrate after checking their CBSE results. A global survey has found that the average 15-yea... Read More

MUMBAI: Across the world, India is seen as an education powerhouse — based largely on the reputation of a few islands of academic excellence such as the IITs. But scratch the glossy surface of our education system and the picture turns seriously bleak.

Fifteen-year-old Indians who were put, for the first time, on a global stage stood second to last, only beating Kyrgyzstan when tested on their reading,

www.podometic.in/vhs-talk

PISA Mathematics Survey?

(Programme for International Student Assessment)

In Tamil Nadu and Himachal Pradesh 15% and 12% of students are ready to use mathematics in ways that are considered fundamental for their future development.

The OECD average is 75%.

www.bit.ly/mathsdata

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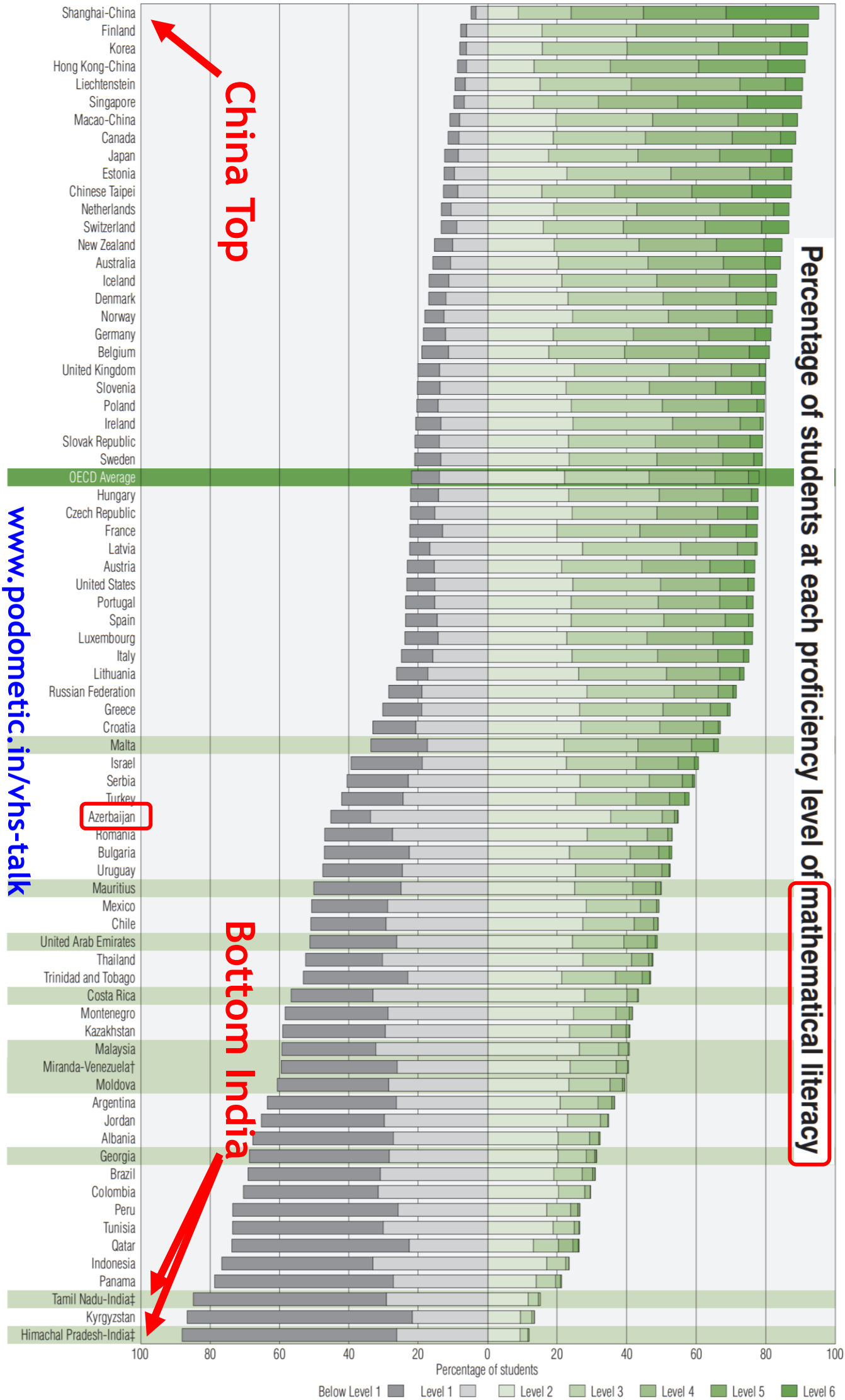
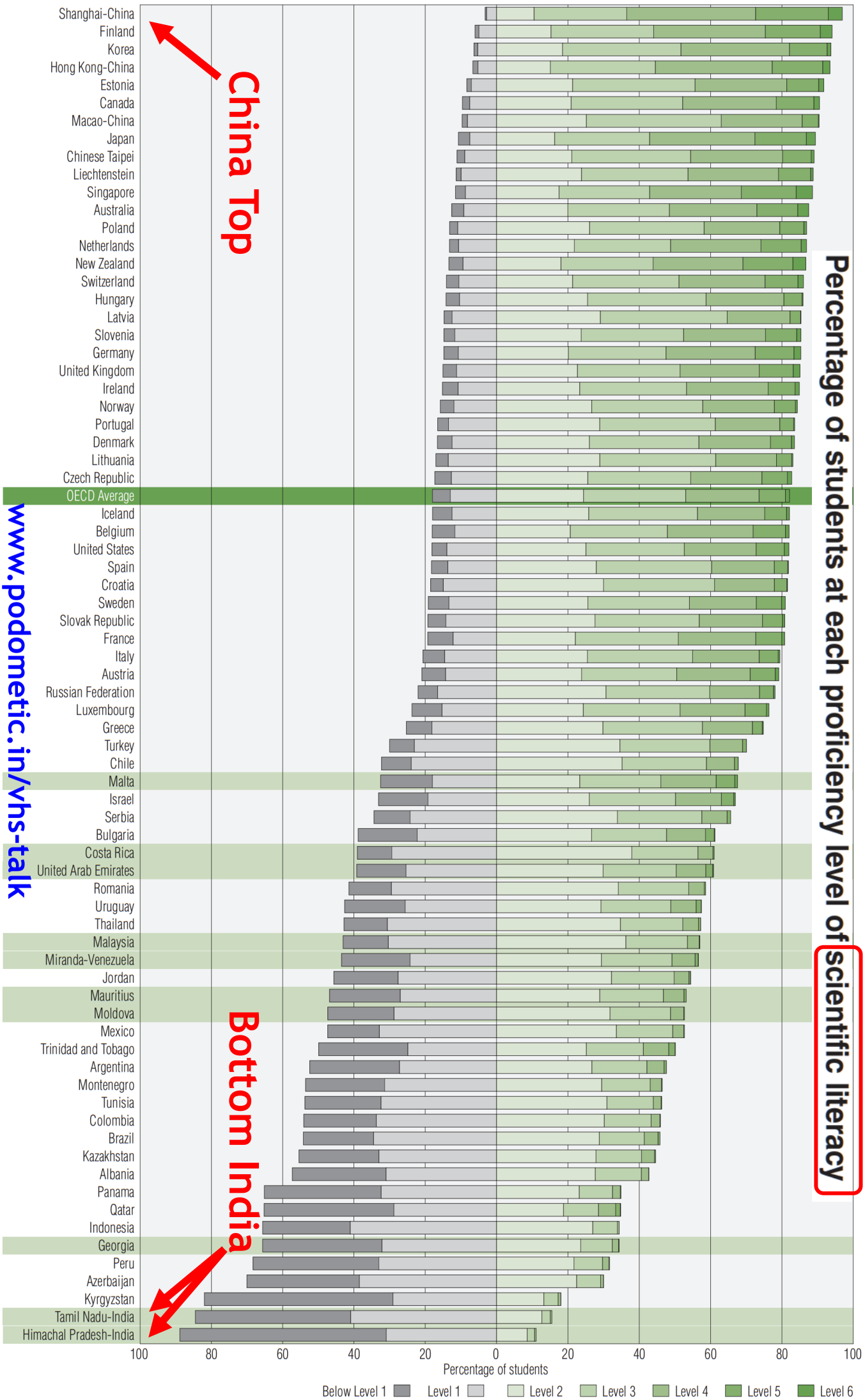
Figure 3.1: Percentage of students at each proficiency level of mathematical literacy



Note: figure ordered by proportion of students in Level 2 and above.
Source: Table B.3.2 Appendix B
† School response rate did not meet PISA standards. See Sampling outcomes, Appendix A.
‡ Student sampling did not meet PISA standards. See Sampling outcomes, Appendix A.

Figure 3.2: Percentage of students at each proficiency level of scientific literacy



Note: figure ordered by proportion of students in Level 2 and above.
Source: Table B.3.4 Appendix B
† School response rate did not meet PISA standards. See Sampling outcomes, Appendix A.
‡ Student sampling did not meet PISA standards. See Sampling outcomes, Appendix A.

THE CHILD'S ILLUMINATED MATHS MIND

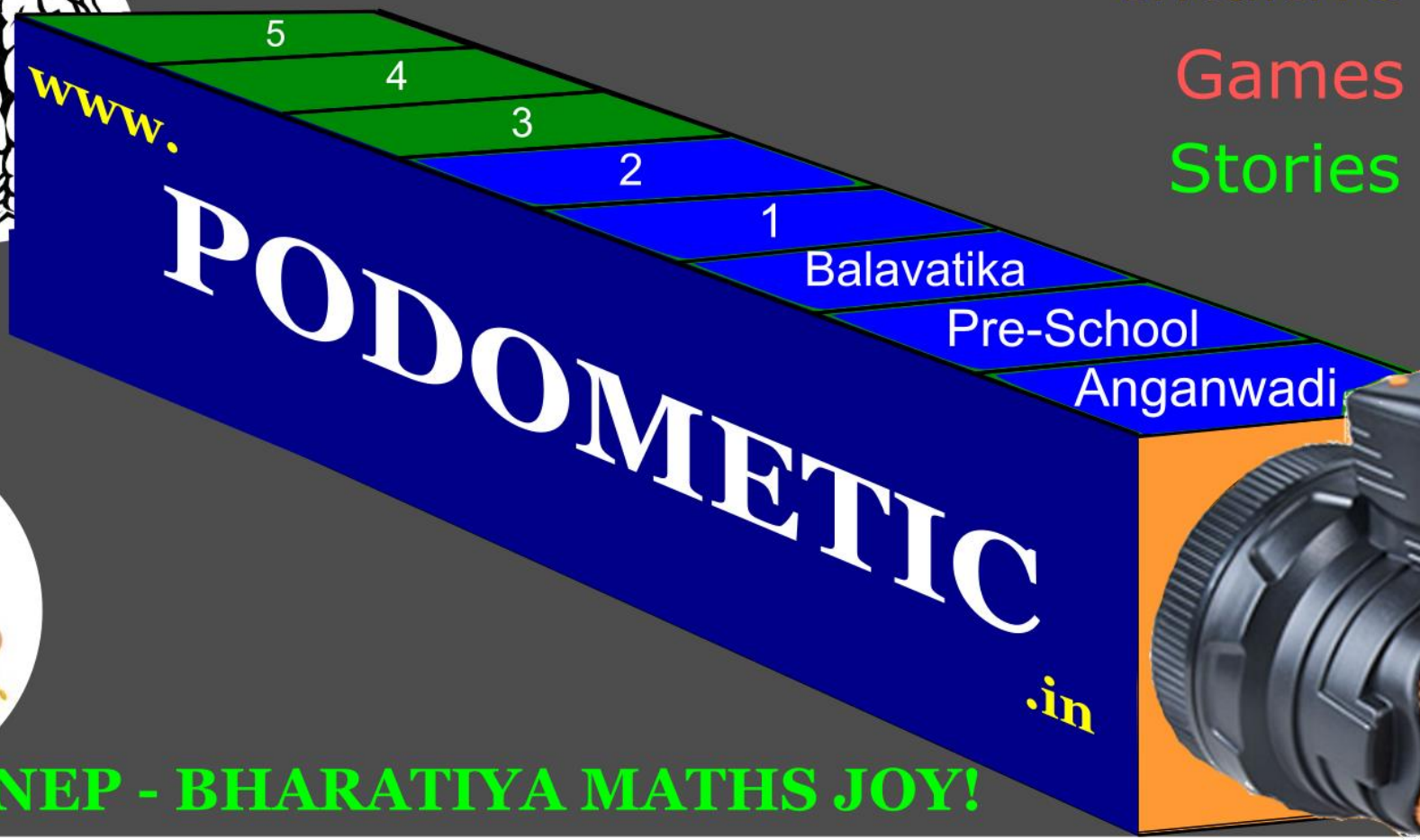
Common Sense

Multi-Sensory

Intuitive

Games

Stories



NEP - BHARATIYA MATHS JOY!

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PODOMETIC™ (BHARATIYA MATHS)

Testing the teaching of + – × ÷ with ±12 and ±4

Do Indian origin school maths lessons pass the common-sense test? **YES**	$^{+}12$ & $^{+}4$ pos & pos	$^{+}12$ & $^{-}4$ pos & neg	$^{-}12$ & $^{+}4$ neg & pos	$^{-}12$ & $^{-}4$ neg & neg
Addition +	$^{+}12 + ^{+}4$	$^{+}12 + ^{-}4$	$^{-}12 + ^{+}4$	$^{-}12 + ^{-}4$
Subtraction –	$^{+}12 - ^{+}4$	$^{+}12 - ^{-}4$	$^{-}12 - ^{+}4$	$^{-}12 - ^{-}4$
Multiplication ×	$^{+}12 \times ^{+}4$	$^{+}12 \times ^{-}4$	$^{-}12 \times ^{+}4$	$^{-}12 \times ^{-}4$
Division ÷	$^{+}12 \div ^{+}4$	$^{+}12 \div ^{-}4$	$^{-}12 \div ^{+}4$	$^{-}12 \div ^{-}4$
Podometic™ passes as was built from zero		**PASS**	**FAIL**	**Absent**

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Explanations of Zero Positive and Negative?

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Explanations of Zero Positive and Negative?

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S ave
Y our
S chools
T ime
E ffort &
M oney!

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The Third BIG Idea?

Become an Economic Superpower

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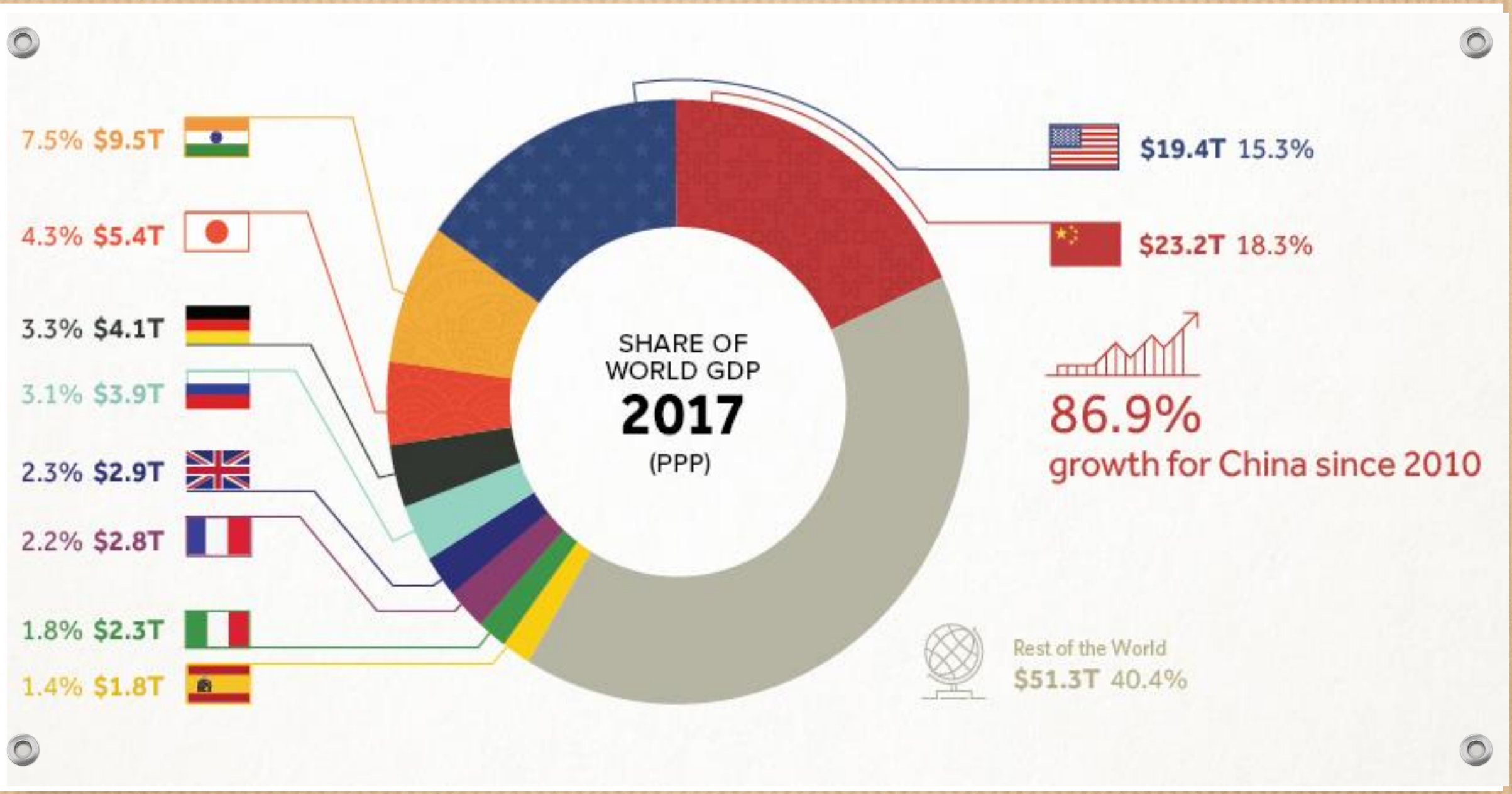
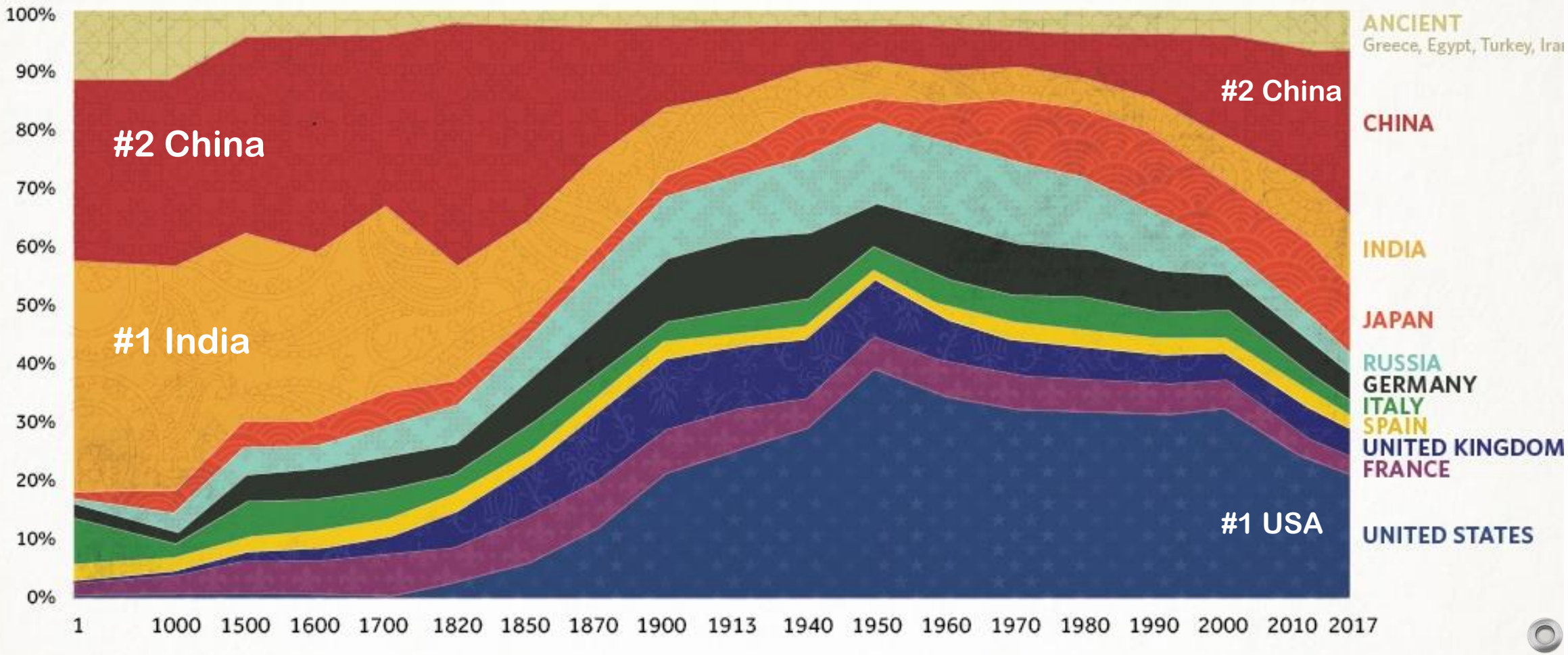

7.5% $9.5T
4.3% $5.4T
3.3% $4.1T
3.1% $3.9T
2.3% $2.9T
2.2% $2.8T
1.8% $2.3T
1.4% $1.8T
SHARE OF
WORLD GDP
2017
(PPP)
$19.4T 15.3%
$23.2T 18.3%
86.9%
growth for China since 2010
Rest of the World
$51.3T 40.4%

www.visualcapitalist.com/2000-years-economic-history-one-chart

2,000 YEARS OF ECONOMIC HISTORY IN ONE CHART

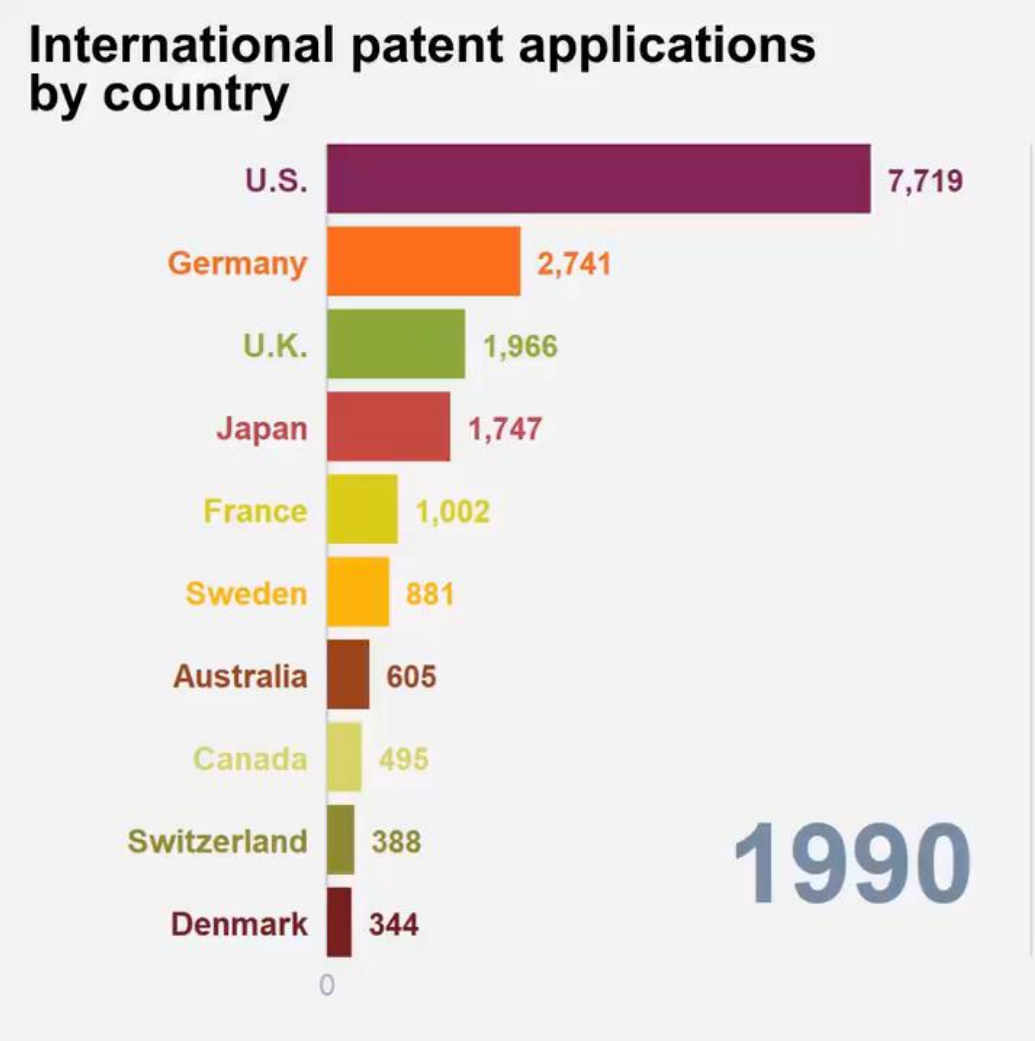
All major powers compared by GDP from the year 1 AD



The Patent Power Race

1990 to 2019

U.S. vs. China vs. India



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The Patent Power Race

1990 to 2019

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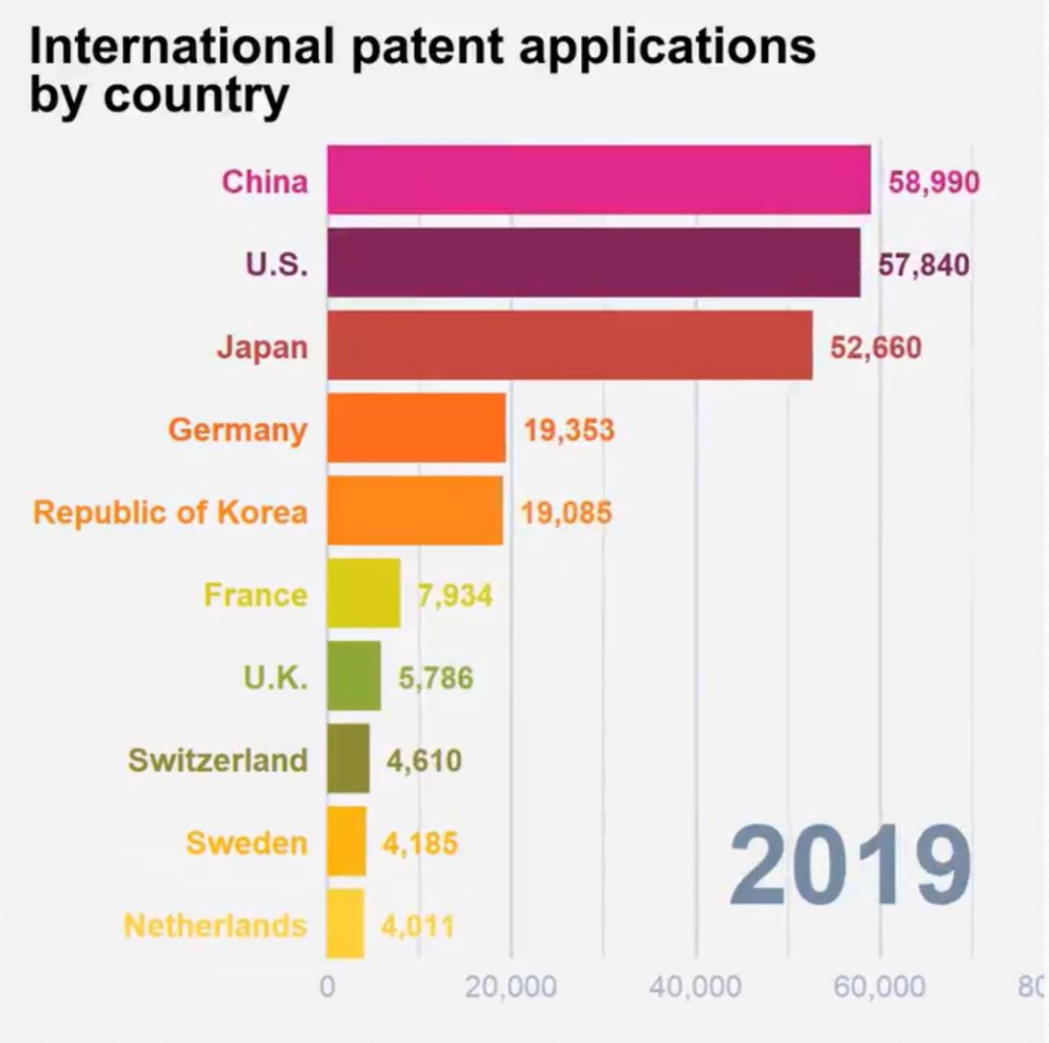

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There is a positive correlation between academic performance in STEM subjects (in particular math) and economic strength* Small improvements in the skills of a nation's labour force can have very large impacts on future well-being**

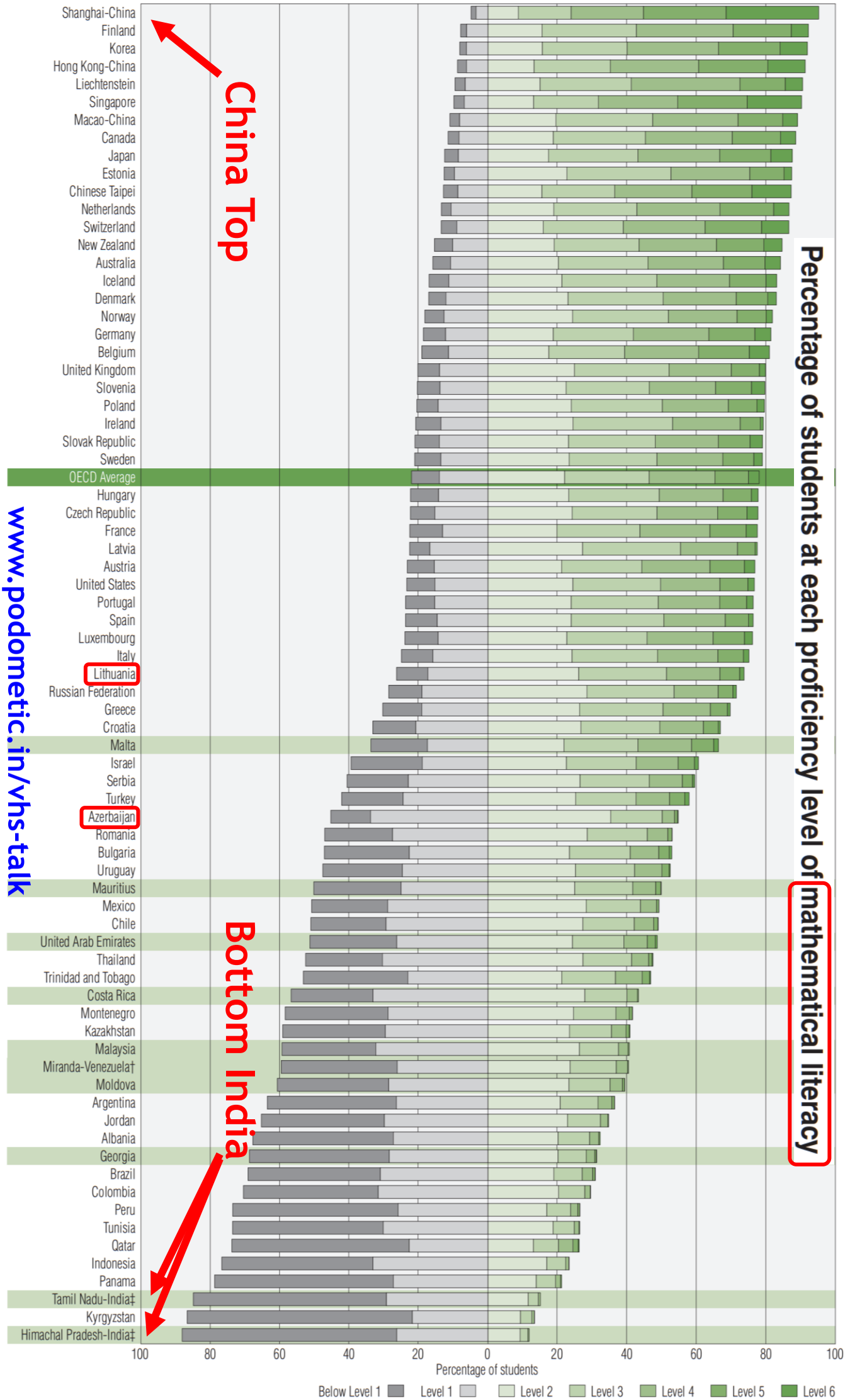
Moreover, the gains, put in terms of current GDP, far outstrip today's value of the short-run business-cycle management**

1% increase in PISA scores is estimated to lead to an increase in GDP growth of around 0.3% Maths scores were found to have the largest impact on economic growth… ***

SOURCES

* DiCorrado, Eric et al. "The Relationship Between Mathematical Performance and GDP per Capita." (2015) ** OECD, The high Cost of Low Educational performance. *** The Economic Impact of Improving Schooling Quality, Deloitte Access Economics for the Australian Government Department of Education 2016.

Figure 3.1: Percentage of students at each proficiency level of mathematical literacy



Note: figure ordered by proportion of students in Level 2 and above.
Source: Table B.3.2 Appendix B
† School response rate did not meet PISA standards. See Sampling outcomes, Appendix A.
‡ Student sampling did not meet PISA standards. See Sampling outcomes, Appendix A.

*"My goal is for India to become #1 in the world for mathematics education results. However, if by teaching Podometic™ instead of Arithmetic over the next decade it only catches up to Azerbaijan, **India's GDP** may have grown by an **EXTRA 7.5 PERCENT**.*

By gifting Podometic™ Bharatiya Maths to Prime Minister Narendra Modi, Jonathan J. Crabtree may have gifted the government of India a US$250 Billion increase in GDP.

*If by teaching Podometic™ instead of Arithmetic over the next decade it only catches up to Lithuania, **India's GDP** may have grown by an **EXTRA 11 PERCENT**."* Jonathan J. Crabtree | Founder Podometic™ Bharatiya Maths

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The L.A.S.T.

‘Missing’ Big Idea…

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Survival Beyond 2300

India's

L.A.S.T.

Chance

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CAN INDIA SURVIVE THE NEXT 500 YEARS?

"Beyond potential wars over diminishing resources, India may be on the cusp of mass starvation and natural disasters unless it can find scientific solutions to major threats to Mother Earth." JJC

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LAND

AIR

SEAS

THINKING

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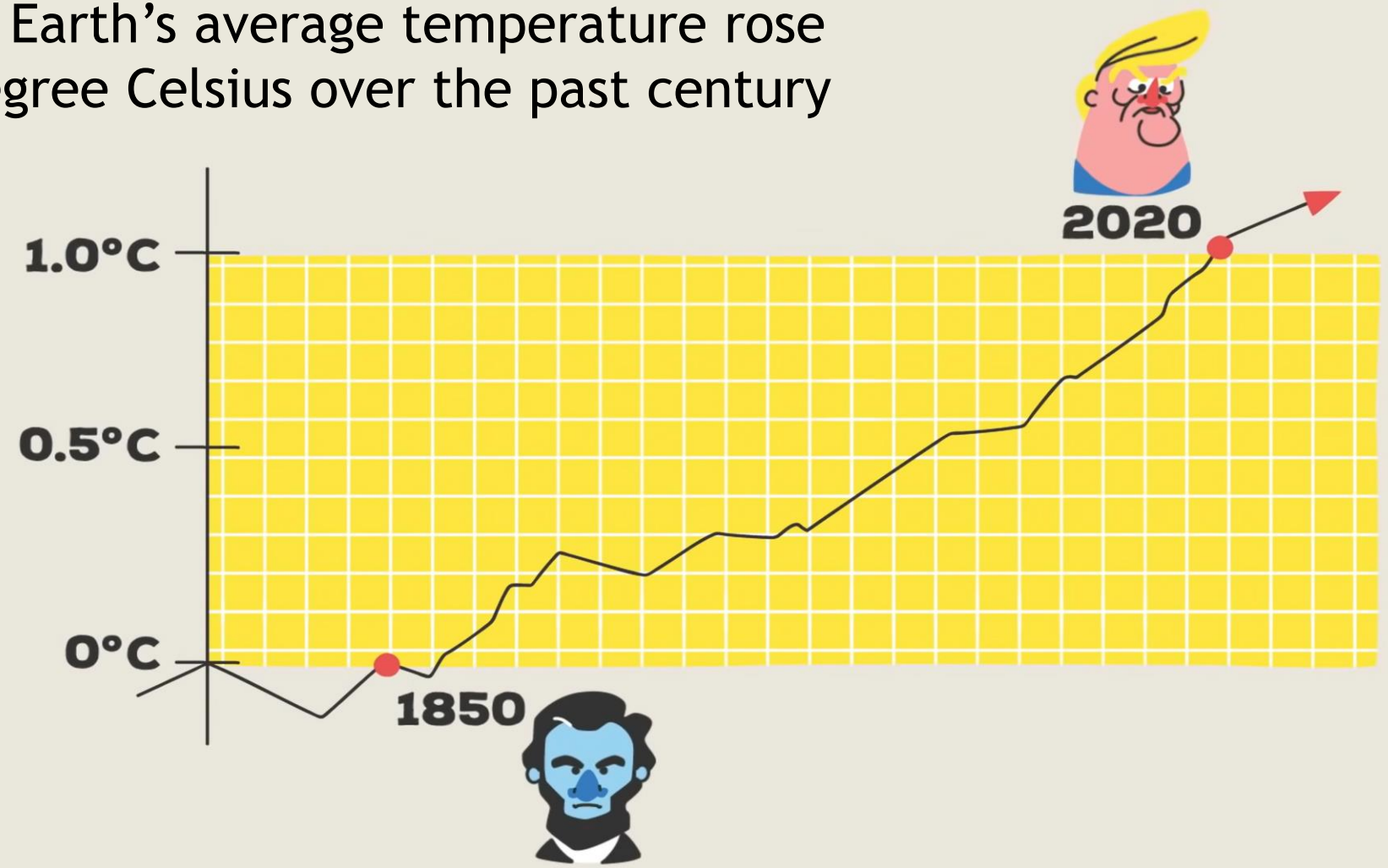
Mother Earth's average temperature rose by 1 degree Celsius over the past century



The next increase of average temperature by 1° degree means

ARCTIC

+10°

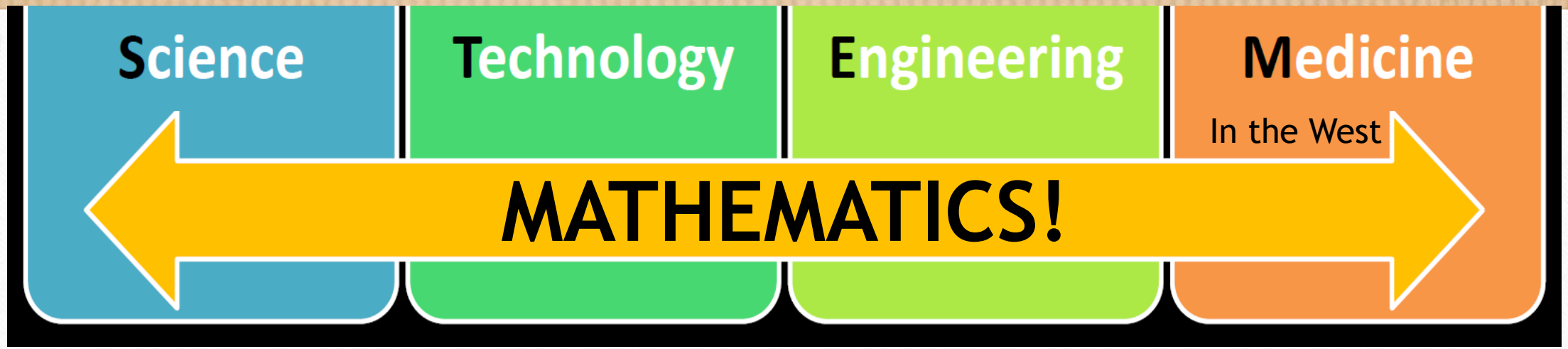
coldest nights

MUMBAI

+5°

warmest days

TED Ed



Science Saves Lives

Science Needs Maths

The World Needs Podometic™

Bharatiya Maths!

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