

## the

## औोहtorical

In 205 B.C., the Greek astronomer Eratosthenes, at the time Director of the Great Library of Alexandria in Egypt, proposed a purely geometrical method to measure the length of the Earth's meridian (circle passing through the poles).

He started by using the observation of shadows made at two different places, Alexandria and Syene (now Aswan) distanced approximately 800 km apart (distance estimated in relation to the time taken by a caravan of camels to connect the two towns!) at the time of the Summer solstice and at noon local solar time.

On that date and at that precise time in the northern hemisphere, the Sun reaches its highest position in the year above the horizon. However, Eratosthenes noticed differences from one place to another.

In Syene (approximately situated on the tropic of Cancer) the Sun is at the vertical, so much so that its rays reach the bottom of a well: and the shadows of vertical objects are perfectly centred round them.

Syene


Alexandria

In Alexandria, on the other hand, the Sun is no longer at the vertical, and these same objects have a very shallow offset shadow. Eratosthenes set about measuring the shadow of an obelisk whose height he knew, and used this information to deduce the angle of the sun's rays from the vertical: he found $7.2^{\circ}$

On the basis of these observations, two hypotheses lay before him:

The Earth is flat, but in this case the Sun would be sufficiently close for there to be a significant divergence in its rays reaching distant objects: since objects of identical length have shadows of different length and no shadow at all when vertically underneath the Sun (zero angle).


The Earth is not flat, but has a curved, and perhaps even a round surface. Only, the same results can be obtained with sun rays which are all parallel: this implies that the Sun is sufficiently far away, very, very far away...

Eratosthenes opted for the second hypothesis. Indeed, the Ancients had already suspected that the Earth was not flat, on the basis of various observations seemingly providing evidence that its surface was somewhat curved: navigators perched on the top of their main mast are the first to perceive the distant coastline; observers on top of a cliff have a longer view of ships moving towards the horizon than observers on the beach; the pole star is not at the same height above the horizon in Greece as in Egypt; finally during eclipses of the Moon, the shadow of the Earth projected onto the Moon shows a circular section.

Convinced that the Earth is round, our genius Eratosthenes set about tracing his famous "amazingly simple" geometrical figure, which he used to calculate with ease the length of the Earth's meridian! Look for yourselves:


If the Earth is round, by extending the vertical in Alexandria (the obelisk) and the vertical in Syene (the well), these two verticals should by definition meet at the centre of the Earth. Also, Eratosthenes knew that the town of Syene being situated directly South in relation to Alexandria, the two cities were situated on approximately the same meridian. Since the sun's rays are indeed parallel, the angle formed by the two verticals at the centre of the Earth must therefore be identical to the angle he measured with the shadow of the obelisk $\left(7.2^{\circ}\right)$.

The proportion of this angle in relation to the $360^{\circ}$ of a circle is the same as the proportion of the distance separating the two cities (approximately 800 km ) relative to the circumference of a circle (in this case the Earth's meridian). The rest you can guess: $360^{\circ}$ divided by $7.2^{\circ}$ gives 50 , and 800 km multiplied by 50 indeed gives 40000 km (a length which was found again later but using other methods).

| Angle $\left(^{\circ}\right)$ | Distance (km) |
| :---: | :---: |
| 7.2 | 800 |
| 208 | circumference |

Circumference $=360 \times 800 / 7.2=40000$

On July $27^{\text {th }}$ ，the conditions were the same in Mumbai as in Syene 205 BC：
The Sun is at the vertical at noon．The experiment took place in Marwari Vidyalaya High School，conducted by Vishal Sawant．

For this date a special measuring spot was built in Baghpat，Shri Vinayak College Of Education，during the science fair organized by Yogesh Kumar，co－ordinator VIPNET club：Science Innovation \＆Humanist Sansthan．

In Allahabad， 2 schools participated to this event：Vashisth Vatsalya Public School， and St Marys Convent School Ghoorpur，under guidance of science communicators Swapnil Kumar Sharma，Ritanshu Gupta，and Rishi Pandey Rishabh from iCREATORZ．

Yamunanagar measure was planned by Darshan Baweja co－ordinator VIPNET club： C．V．Raman Science Club．

The measure in Dholpur was conducted by A．K．Srivastava．

13 European teachers were involved in this experiment（from their holiday place）：
Stavroula Lada，Primary School DDMN，Greece（Chania）
Olga Keramida，1st Kindergarten of Pylos，Greece（Pylos）
Katerina Atmatzidoys，Lykeio Sximatariou，Greece（Chalkida）
Maria Kontoula，Junior High School of Krokos，Greece（Kozani）
Petros Efstathiou，3rd Junior High School of Ilion，Greece（Selianitika）
Aspasia Dilalou，1st Junior High School of Aigio，Greece（Cephalonia）
Eleni Chartzavalou，Experimental College of Ioannina，Greece（loannina）
Bill Kostopoulos，Experimental College Agion Anargyron，Greece（Athens）
Fotini Petridou，Lardos Elementary school，Greece（Lardos beach \＆Serres）
Athanasia Zafeiropoulou，4th Junior High School of Petroupolis，Greece（Methoni）
Daniela Ruzic Mrak，OŠ kneza Branimira，Croatia，Donji Muc
José María Díaz Fuentes，Colegio Salesiano Santo Domingo Savio，Spain，Ubeda Costantino Soudaz，Istituzione Scolastica Monte Rosa A，Italy Pont Saint Martin

Cindea Hung coordinated measures in Taiwan at Chia Hwa Senior High School， Chiayi City and 鳳西國中FXM，Kaohsiung，and in China Shenzhen with Jia Huang

Jeane de Fatima，Centro Educacional Nosso Mundo，Brazil，Rio de Janeiro and， Dr Jose Luis Cabrera，Fundación Caminos de Anisacate，Argentina were our 2 south American partners

The circumference of the Earth has been calculated after experiments of 25 spots of measurements from 9 countries

Argentina Brazil
China
Croatia
India
Italy
Greece
Spain
Taiwan

For the videoconference，all the calculations of the circumference were made with the measure in Mumbai as reference

| City | Country | School | $\left.\begin{array}{\|c\|} \hline \text { Latitude } \\ (+\mathrm{N} /-\mathrm{S}) \\ \text { decimal( } \left.{ }^{\circ}\right) \end{array} \right\rvert\,$ | Longitude | Date | Gnomon height ［cm ］ | Shadow length ［cm］ | Angle （ ${ }^{\circ}$ ） |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Pont St Martin | Italy | Istituzione Scolastica Monte RosaA | 45.601 | 7.795 | 2707／2015 | 100.0 | 48.5 | 25.9 |
| Donji Muć | Croatia | Oš kneza Branimira | 43.694 | 16.462 | 2707／2015 | 100.0 | 43.5 | 23.5 |
| Serres | Greece | Teacher | 41.089 | 23.553 | 2707／2015 | 100.0 | 39.4 | 21.5 |
| Kozani | Greece | Teacher | 40.290 | 21.815 | 3007／2015 | 130.0 | 48.2 | 20.3 |
| loannina | Greece | Teacher | 39.683 | 20.825 | 2707／2015 | 100.0 | 36.4 | 20.0 |
| Chalkida | Greece | Teacher | 38.465 | 23.592 | 27，07／2015 | 60.0 | 21.0 | 19.3 |
| Selianitika | Greece | Teacher | 38.282 | 22.028 | 2707／2015 | 143.0 | 47.7 | 18.4 |
| Athens | Greece | Teacher | 38.130 | 23.849 | 27，07／2015 | 40.0 | 13.3 | 18.4 |
| Cephalonia | Greece | Teacher | 38.102 | 20.575 | 2707／2015 | 40.5 | 13.8 | 18.8 |
| Ubeba | Spain | Colegio Salesiano Santo Domingo Savio | 38.017 | －3．367 | 2707／2015 | 109.4 | 37.3 | 18.8 |
| Methoni Castle | Greece | Teacher | 36.812 | 21.705 | 2707／2015 | 100.0 | 30.0 | 16.7 |
| Pylos | Greece | Teacher | 36.544 | 21.413 | 2707／2015 | 58.0 | 19.2 | 18.3 |
| Lardos | Greece | Teacher | 36.042 | 28.004 | 27，07／2015 | 163.0 | 49.8 | 17.0 |
| Chania | Greece | Teacher | 35.514 | 24.015 | 2607／2015 | 121.0 | 35.0 | 16.1 |
| Yamuna nagar | India | Mukand Lal PS Sarojini Colory | 30.133 | 77.283 | 27，07／2015 | 20.0 | 3.6 | 10.2 |
| Baghpat | India | Shri Vinayak College Of Education | 28.881 | 77.249 | 2707／2015 | 114.6 | 19.0 | 9.4 |
| Tagiwali Dholpur | India | GSSS Tagamali | 26.708 | 77.908 | 3／8／2015 | 159.0 | 24.0 | 8.6 |
| Allahabad WPS | India | Vashisth Vatsalya Public School | 25.452 | 81.841 | 2707／2015 | 100.0 | 12.5 | 7.1 |
| Allahabad Ghoorn | India | St May s Convent School Ghoorpur | 25.327 | 81.823 | 2707／2015 | 100.0 | 12.5 | 7.1 |
| Chiayi City | Taiwan | Chia Hwa Senior High School | 23.483 | 120.477 | 3007／2015 | 50.0 | 3.2 | 3.7 |
| Kaohsiung | Taiwan | 風西國中 FXM | 22.621 | 120.354 | 27，07／2015 | 50.0 | 2.9 | 3.3 |
| Shenzen | China | Futian | 22.524 | 114.061 | 27，07／2015 | 50.0 | 5.5 | 6.3 |
| Mumbai | India | Marwari Vidyalay a High School | 18.957 | 72.818 | 2707／2015 | 81.0 | 0.0 | 0.0 |
| Rio de Janeiro | Brazil | Centro Educacional Nosso Mundo | －22．890 | －43．317 | 27，07／2015 | 30.0 | －29．0 | －44．0 |
| Anisacate | Argentina | Fundación Caminos de Anisacate | －31．717 | －64．400 | 27，07／2015 | 96.0 | －117．0 | －50．6 |

## The average circumference is： 40027 km

# Marwari Vidyalaya High School Mumbai, India (18.957N - 72.818E) 



## Shri Vinayak College Of Education Baghpat, India (28.881N - 77.249E)



27 July 2015 (Baghpat-INDIA) Latitude: 28.88 ${ }^{\circ}$
27 July 2015 (Mumbai-INDIA) Latitude: $18.96^{\circ}$


$$
\text { circumference }=\frac{360^{\circ} \times 1103 \mathrm{~km}}{9.4^{\circ}+0^{\circ}}=42243 \mathrm{~km}
$$



## C V Raman Science Club Sarojini Colony Yamunanagar India (30.133N-77.283E)



27 July 2015 (Yamuna Nagar-INDIA) Latitude: 30.13 ${ }^{\circ}$
27 July 2015 (Mumbai-INDIA) Latitude: $18.96^{\circ}$


$$
\text { circumference }=\frac{360^{\circ} \times 1242 \mathrm{~km}}{10.2^{\circ}+0^{\circ}}=43835 \mathrm{~km}
$$



## GSSS Tagawali

## Tagawali Dholpur, India (26.708N - 77.908E)



3 August (Tagawali Dholpur-INDIA) Latitude: $26.71^{\circ}$ 27 July 2015 (Mumbai-INDIA) Latitude: 18.96


## St Marys Convent School Ghoorpur Allahabad Ghoorpur, India (25.327N - 81.823S)



27 July 2015 (Allahabad Ghoorpur-INDIA) Latitude: $25.33^{\circ}$ 27 July 2015 (Mumbai-INDIA) Latitude: 18.96º


$$
\text { circumference }=\frac{360^{\circ} \times 708 \mathrm{~km}}{7.1^{\circ}+0^{\circ}}=35899 \mathrm{~km}
$$



# Vashisth Vatsalya Public School Allahabad, India (25.452N- 81.841S) 



27 July 2015 (Allahabad-INDIA) Latitude: $25.45^{\circ}$
27 July 2015 (Mumbai-INDIA) Latitude: $18.96^{\circ}$


$$
\text { circumference }=\frac{360^{\circ} \times 722 \mathrm{~km}}{7.1^{\circ}+0^{\circ}}=36608 \mathrm{~km}
$$



## Futian

Shenzhen, China (22.524N-114.061E)


27 July 2015 (Shenzhen-CHINA) Latitude: $\mathbf{2 2 . 5 2}{ }^{\circ}$ 27 July 2015 (Mumbai-INDIA) Latitude: $18.96^{\circ}$


$$
\text { circumference }=\frac{360^{\circ} \times 396 \mathrm{~km}}{6.3^{\circ}-0^{\circ}}=\mathbf{2 2 6 2 9} \mathrm{km}
$$



## 鳳西國 中 FXM

Kaohsiung，Taiwan（22．621N－120．354E）


27 July 2015 （Kaohsiung－TAIWAN）Latitude： $\mathbf{2 2 . 6 2}{ }^{\circ}$ 27 July 2015 （Mumbai－INDIA）Latitude： $18.96^{\circ}$


## Chia Hwa Senior High School

 Chiayi City, Taiwan (23.483N-120.477E)

30 July 2015 (Chiayi City -TAIWAN 23.48)
27 July 2015 (Mumbai-INDIA 18.96)

circumference $=\frac{360^{\circ} \times 503 \mathrm{~km}}{3.7^{\circ}-0^{\circ}}=48941 \mathrm{~km}$

## Serres, Greece (41.089N - 23.553E)



27 July 2015 (Serres-GREECE) Latitude: $41.09^{\circ}$ 27 July 2015 (Mumbai-INDIA) Latitude: $18.96^{\circ}$


## Chalkida, Greece (38.465N - 23.592E)



30 July 2015 (Kozani-GREECE) Latitude: $40.29^{\circ}$
27 July 2015 (Mumbai-INDIA) Latitude: $18.96^{\circ}$


$$
\text { circumference }=\frac{360^{\circ} \times 2370 \mathrm{~km}}{20.3^{\circ}+0^{\circ}}=42030 \mathrm{~km}
$$



## Kozani, Greece (40.290N - 21.815E)

30 July 2015 (Kozani-GREECE) Latitude: $40.29^{\circ}$ 27 July 2015 (Mumbai-INDIA) Latitude: 18.96º


$$
\text { circumference }=\frac{360^{\circ} \times 2370 \mathrm{~km}}{20.3^{\circ}+0^{\circ}}=42030 \mathrm{~km}
$$



## Ioannina, Greece (39.683N-20.825E)



27 July 2015 (loannina-GREECE) Latitude: $39.68^{\circ}$ 27 July 2015 (Mumbai-INDIA) Latitude: $18.96^{\circ}$


## Selianitika,Greece (38.282N - 22.028E)



27 July 2015 (Selianitika-GREECE) Latitude: $38.28^{\circ}$
27 July 2015 (Mumbai-INDIA) Latitude: $18.96^{\circ}$


Athens, Greece (38.130N - 23.849E)


27 July 2015 (Athens-GREECE) Latitude: $38.13^{\circ}$ 27 July 2015 (Mumbai-INDIA) Latitude: 18.96º


## Cephalonia, Greece (38.102N - 20.575E)




$$
\text { circumference }=\frac{360^{\circ} \times 2127 \mathrm{~km}}{18.8^{\circ}+0^{\circ}}=40730 \mathrm{~km}
$$

## Methoni Castle, Greece (36.812N - 21.705E)



July 2015 (Methoni Castle-GREECE) Latitude: $36.81^{\circ}$ 27 July 2015 (Mumbai-INDIA) Latitude: 18.96º


## Pylos, Greece (36.544N - 21.413E)



27 July 2015 (Pylos castle-GREECE) Latitude: $36.54^{\circ}$ 27 July 2015 (Mumbai-INDIA) Latitude: $18.96^{\circ}$



## Chania, Greece (35.514N - 24.015E)

26 July 2015 (Chania-GREECE) Latitude: $35.51^{\circ}$ 27 July 2015 (Mumbai-INDIA) Latitude: $18.96^{\circ}$



## Istituzione Scolastica Monte Rosa A Pont St Martin, Italy (45.601N - 7.795E)



27 July 2015 (Pont Saint Martin-ITALY) Latitude: $45.6^{\circ}$ 27 July 2015 (Mumbai-INDIA) Latitude: 18.96º


# Oš kneza Branimira <br> Donji Muć, Croatia (43.694N - 16.462E) 



27 July 2015 (Donji Muc-CROATIA) Latitude: $43.69^{\circ}$ 27 July 2015 (Mumbai-INDIA) Latitude: 18.96


# Colegio Salesiano Santo Domingo Savio Ubeba, Spain (38.017N - 3.367W) 



27 July 2015 (Ubeda-SPAIN) Latitude: $38.02^{\circ}$
27 July 2015 (Mumbai-INDIA) Latitude: $18.96^{\circ}$


# Centro Educacional Nosso Mundo Rio de Janeiro, Brazil (22.890S - 43.317W) 



27 July 2015 (Rio de Janeiro-BRASIL) Latitude: -22.89º 27 July 2015 (Mumbai-INDIA) Latitude: $18.96^{\circ} \mathrm{N}$


$$
\text { circumference }=\frac{360^{\circ} \times 4649 \mathrm{~km}}{44^{\circ}-0^{\circ}}=38037 \mathrm{~km}
$$



# Fundación Caminos de Anisacate Anisacate, Argentina (31.717S-64.400W) 



27 July 2015 (Anisacate-ARGENTINA) Latitude: -31.72${ }^{\circ}$ S 27 July 2015 (Mumbai-INDIA) Latitude: $18.96^{\circ} \mathrm{N}$


$$
\text { circumference }=\frac{360^{\circ} \times 5630 \mathrm{~km}}{50.6^{\circ}-0^{\circ}}=40055 \mathrm{~km}
$$

The best parternship is calculated for all the measuring spots.

| Best Partnership |  | Table |
| :--- | :--- | :---: |
| Partner \#1 | Partner \#2 | Circumference (km) |
| Pont St Martin | loannina | 40088 |
| Donji Muć | Methoni Castle | 40500 |
| Rio de Janeiro | Donji Muć | 39451 |
| Baghpat | Serres | 40344 |
| Yamunanagar | Kozani | 40206 |
| Selianitika | Yamunanagar | 39732 |
| Chalkida | Anisacate | 40156 |
| Chiayi City | Athens | 39845 |
| Cephalonia | Kaohsiung | 39948 |
| Ubeba | Anisacate | 40186 |
| Pylos | Dholpur | 40565 |
| Pylos | Allahabad Ghoorpur | 40050 |
| Lardos | Anisacate | 40090 |
| Anisacate | Chania | 40312 |
| Allahabad VVPS | Anisacate | 39625 |
| Shenzhen | Anisacate | 38126 |
| Mumbai | Anisacate | 40055 |

The average circumference is:

| 27/07/2015 |  | Pont St Martin | Donji Muć | Serres | Kozani | loannina | Chalkida | Selianitik | A | Cephalonia | Ubeba | Methoni Castle | Pylos | Lardos | Chania | Yamuna nagar | Baghp | Tagiwali Dholpur | Allahabad WPS | Allahabad Ghoorpur | Chiayi City | Kaoh | Shenzhen | Mumb | Rio de Janeiro | Anisacate |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Angle> | 25.9 | 23.5 | 21.5 | 20.3 | 20.0 | 19.3 | 18.4 | 18.4 | 18.8 | 18.8 | 16.7 | 18.3 | 17.0 | 16.1 | 10.2 | 9.4 | 8.6 | 7.1 | 7.1 | 3.7 | 3.3 | 6.3 | 0.0 | -44.0 | -50.6 |  |
|  | Latitude V |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Pont St Martin | 45.601 |  | 31800 | 40991 | 37929 | 40088 | 43255 | 39024 | 39840 | 42237 | 42744 | 38191 | 47653 | 42957 | 41180 | 39394 | 40538 | 43679 | 42874 | 43123 | 39843 | 40667 | 47094 | 41143 | 39188 | 40424 | c |
| Donji Muć | 43.694 | 212 |  | 52020 | 42525 | 45874 | 49800 | 42424 | 43624 | 47566 | 48332 | 40500 | 54969 | 47077 | 44222 | 40791 | 42026 | 45592 | 44495 | 44802 | 40818 | 41721 | 49228 | 42097 | 39451 | 40703 |  |
| Serres | 41.089 | 501 | 289 |  | 26700 | 37440 | 47782 | 36232 | 38206 | 44267 | 45467 | 35625 | 56813 | 44880 | 41267 | 38772 | 40344 | 44595 | 43425 | 43775 | 39560 | 40589 | 48861 | 41174 | 39067 | 40389 | R |
| Kozani | 40.290 | 590 | 378 | 89 |  | 80400 | 73080 | 42253 | 45474 | 58320 | 60720 | 38600 | 74880 | 51491 | 45514 | 40206 | 41879 | 46431 | 44973 | 45327 | 40489 | 41569 | 50760 | 42030 | 39298 | 40621 | C |
| loannina | 39.683 | 657 | 446 | 156 | 67 |  | 69429 | 35100 | 38925 | 52800 | 55500 | 34800 | 73906 | 48600 | 42738 | 38976 | 40755 | 45537 | 44121 | 44512 | 39755 | 40872 | 50085 | 41454 | 39105 | 40452 | U |
| Chalkida | 38.465 | 793 | 581 | 292 | 203 | 135 |  | 8000 | 14800 | 28800 | 36000 | 25477 | 76680 | 42104 | 36900 | 36633 | 38727 | 43940 | 42669 | 43082 | 38423 | 39600 | 49043 | 40421 | 38770 | 40156 | M |
| Selianitika | 38.282 | 813 | 601 | 312 | 223 | 156 | 20 |  | \#DN/D! | -18000 | -26100 | 345186 | 694800 | 64029 | 48209 | 39732 | 41760 | 47241 | 45398 | 45844 | 40261 | 41483 | 52096 | 42007 | 39208 | 40576 | F |
| Athens | 38.130 | 830 | 618 | 329 | 240 | 173 | 37 | 17 |  | -2700 | -11700 | 309186 | 633600 | 59657 | 45548 | 38985 | 41120 | 46616 | 44888 | 45303 | 39845 | 41078 | 51590 | 41674 | 39110 | 40487 | E |
| Cephalonia | 38.102 | 833 | 621 | 332 | 243 | 176 | 40 | 20 | 3 |  | \#\#DIVI! | 24514 | 124560 | 45800 | 38400 | 37047 | 39217 | 44682 | 43231 | 43662 | 38718 | 39948 | 49853 | 40730 | 38843 | 40238 | R |
| Ubeba | 38.017 | 843 | 631 | 341 | 253 | 185 | 50 | 29 | 13 | 9 |  | 22971 | 118080 | 43800 | 37067 | 36670 | 38872 | 44329 | 42954 | 43385 | 38503 | 39716 | 49565 | 40557 | 38792 | 40186 | E |
| Methoni Castle | 36.812 | 976 | 765 | 475 | 386 | 319 | 184 | 163 | 146 | 143 | 134 |  | -6750 | -10320 | 86400 | 41095 | 43447 | 49911 | 47325 | 47850 | 41012 | 42367 | 54935 | 42769 | 39339 | 40729 | N |
| Pylos | 36.544 | 1006 | 794 | 505 | 416 | 349 | 213 | 193 | 176 | 173 | 164 | 30 |  | 15508 | 18655 | 31644 | 34422 | 40565 | 39600 | 40050 | 35778 | 37128 | 46740 | 38439 | 38155 | 39626 | C |
| Lardos | 36.042 | 1062 | 850 | 561 | 472 | 405 | 269 | 249 | 232 | 229 | 219 | 86 | 56 |  | 23600 | 34729 | 37705 | 44443 | 42800 | 43273 | 37759 | 39180 | 50535 | 40193 | 38638 | 40090 | E |
| Chania | 35.514 | 1121 | 909 | 619 | 531 | 463 | 328 | 308 | 291 | 288 | 278 | 144 | 114 | 59 |  | 36488 | 39600 | 46944 | 44720 | 45280 | 38816 | 40275 | 53008 | 41120 | 38869 | 40312 |  |
| Yamuna nagar | 30.133 | 1718 | 1507 | 1217 | 1128 | 1061 | 926 | 905 | 888 | 885 | 876 | 742 | 712 | 656 | 598 |  | 3108 | 85725 | 60387 | 62013 | 40929 | 43565 | 78000 | 43835 | 39128 | 40689 |  |
| Baghpat | 28.881 | 1858 | 1646 | 1356 | 1268 | 1200 | 1065 | 1044 | 1028 | 1024 | 1015 | 881 | 851 | 796 | 737 | 139 |  | 108450 | 59635 | 61826 | 37895 | 41016 | 81987 | 42243 | 38778 | 40392 |  |
| Tagiwali Dholpur | 26.708 | 2099 | 1887 | 1598 | 1509 | 1442 | 1306 | 1286 | 1269 | 1266 | 1256 | 1123 | 1093 | 1037 | 978 | 381 | 241 |  | 33600 | 23948 | 26302 | 30838 | 72783 | 36042 | 37711 | 39472 |  |
| Allahabad WPS | 25.452 | 2239 | 2027 | 1737 | 1649 | 1581 | 1446 | 1425 | 1409 | 1405 | 1396 | 1262 | 1232 | 1177 | 1118 | 520 | 381 | 140 |  | 2191 | 23188 | 29842 | 146250 | 36608 | 37839 | 39625 |  |
| Allahabad Ghoorpur | 25.327 | 2252 | 2041 | 1751 | 1662 | 1595 | 1460 | 1439 | 1422 | 1419 | 1410 | 1276 | 1246 | 1190 | 1132 | 534 | 395 | 153 | 14 |  | 21706 | 28516 | 139950 | 35899 | 37740 | 39544 |  |
| Chiayi City | 23.483 | 2457 | 2245 | 1956 | 1867 | 1800 | 1665 | 1644 | 1627 | 1624 | 1615 | 1481 | 1451 | 1395 | 1337 | 739 | 600 | 358 | 219 | 205 |  | 86400 | -14815 | 48941 | 38883 | 40661 |  |
| Kaohsiung | 22.621 | 2553 | 2341 | 2052 | 1963 | 1896 | 1760 | 1740 | 1723 | 1720 | 1710 | 1577 | 1547 | 1491 | 1432 | 835 | 695 | 454 | 315 | 301 | 96 |  | -1320 | 44400 | 38481 | 40321 |  |
| Shen zhen | 22.524 | 2564 | 2352 | 2063 | 1974 | 1906 | 1771 | 1751 | 1734 | 1731 | 1721 | 1587 | 1558 | 1502 | 1443 | 845 | 706 | 465 | 325 | 311 | 107 | 11 |  | 22629 | 36107 | 38126 |  |
| Mumbai | 18.957 | 2960 | 2748 | 2459 | 2370 | 2303 | 2167 | 2147 | 2130 | 2127 | 2118 | 1984 | 1954 | 1898 | 1839 | 1242 | 1103 | 861 | 722 | 708 | 503 | 407 | 396 |  | 38037 | 40055 |  |
| Rio de Janeiro | -22.890 | 7609 | 7397 | 7108 | 7019 | 6952 | 6817 | 6796 | 6779 | 6776 | 6767 | 6633 | 6603 | 6547 | 6489 | 5891 | 5752 | 5510 | 5371 | 5357 | 5152 | 5056 | 5045 | 4649 |  | 53509 |  |
| Anisacate | -31.717 | 8590 | 8378 | 8089 | 8000 | 7933 | 7797 | 7777 | 7760 | 7757 | 7747 | 7614 | 7584 | 7528 | 7469 | 6872 | 6732 | 6491 | 6351 | 6338 | 6133 | 6037 | 6026 | 5630 | 981 |  |  |
|  |  |  |  |  |  |  |  | DISTANC |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## Videoconference



## https://youtu.be/fZ-lifkTE8w





## वि P VIGYAN PRASAR V प्र विज्ञान प्रसार

## http://www.vigyanprasar.gov.in/

 http://www.fondation-lamap.org/eratos http://www.fondation-lamap.org/

