

the First Meridian. It is also divided, on the other side of the line, into 24 equal parts, to represent the hours of the day, with convenient subdivisions. 2. The First Meridian and the opposite meridian of 180° , forming a meridian circle, which is divided into degrees of latitude. 3. The Ecliptic, divided into signs and degrees, numbered eastward only, from the first point of Aries. [For convenience, the ecliptic is made to cut the equator at its intersection with the first meridian. Of course it has not properly any fixed position on the Earth]. 4. The Tropics. 5. The Polar Circles. 6. Parallels of Latitude, usually ten degrees apart. 7. Meridians, usually at a distance of 15° , answering to one hour.

On most globes there is also drawn a peculiar diagram called the Analemma, the object of which is to indicate the Sun's declination on any given day, and the "equation of time." (See any good almanac.)

With every globe there is furnished a pliable strip of brass, pivoted to a clamp, by which it may be attached to the brazen meridian. It is graduated in degrees of the earth's (or globe's) circumference, numbered from 0° to 90° in one direction, and to 18° in the opposite direction. When properly adjusted at the zenith or uppermost point of the universal meridian, it serves to measure distances above or below the horizon. It is called the **Quadrant of Altitude**.

PROBLEMS.

I. To find the latitude and longitude of any place.

Bring the given place to the graduated edge of the brazen meridian; the degree marked over it is the latitude; and the degree on the equator cut by the same edge of the brazen meridian, is the longitude.

Exercises. Find the lat. and long. of (1) London, (Eng.), (2) Ottawa, (3) St. John, (4) Quebec, (5) Halifax, (6) Rome, (7) Calcutta, (8) New York.

Ans. (1) $51^\circ 30' N.$; 0° . (2) $45^\circ 25' N.$; $75^\circ 45' W.$ (3) $45^\circ 14' N.$; $66^\circ 3' W.$ (4) $46^\circ 49' N.$; $71^\circ 13' W.$ (5) $44^\circ 38' N.$; $63^\circ 36' W.$ (6) $41^\circ 54' N.$; $12^\circ 59' E.$ (7) $22^\circ 36' N.$; $88^\circ 20' E.$ (8) $40^\circ 42' N.$; $74^\circ W.$

Find the lat. and long. of Jerusalem, Rio Janeiro, Peking, the North Pole, Melbourne.

II. The latitude and longitude of a place being given, to find that place.

Find the given longitude on the equator, and bring it to the universal meridian; then, under the given latitude on the meridian will be found the required place.

Exercises. Find the places situated as follows; (1) $48^\circ 50' N.$, $2^\circ 20' E.$; (2) $38^\circ 52' N.$, $77^\circ 3' W.$; (3) $59^\circ 58' N.$, $30^\circ 26' E.$; (4) $25^\circ S.$, $130^\circ W.$

Ans. (1) Paris, (2) Washington, (3) St. Petersburg, (4) Pitcairn Island.

What places are situated in lat. $0^\circ 13' S.$, and long. $78^\circ 23' W.$? in lat. $37^\circ 47' N.$, and $122^\circ 24' W.$? in lat. $20^\circ 10' S.$, and long. $57^\circ 35' E.$?

Note. The difference of latitude between two places on the same side of the equator, and the difference of longitude

between two places on the same side of the first meridian will evidently be found by subtraction. The difference of latitude or of longitude between two places on opposite sides of those lines respectively will be found by addition. **Ex.** The diff. of lat. between New York and Calcutta is $18^\circ 7'$, and the diff. of long. is $162^\circ 20'$.

III. To find the distance between any two places.

Lay the quadrant of altitude over the two places, and note the number of degrees between them; multiply by 69.1 for English miles, or by 60 for geographical miles.

Note. For distances greater than 100° , or in any case, a straight strip of paper may be used, marking the distance on the edge and then applying the strip to the Equator to ascertain the number of degrees.

Exercises. How many miles is it in a direct line (1) from Quebec to Rio Janeiro? (2) from Halifax to Montreal? (3) from London to the Cape of Good Hope? (4) from New York to Liverpool, thence to Barbadoes, and thence to St. John?

Ans. (1) 5115 miles. (2) 490 miles. (3) 6098 miles.

IV. To find the antipodes of a given place.

Set the poles of the globe in the horizon, in order to use the wooden horizon instead of the brass meridian; bring the given place to the eastern edge of the horizon, and find its latitude, which will be the number of degrees it is north or south of the East point of the horizon. The antipodes will be found the same number of degrees on the opposite side of the West point.

Note. Antipodes have the same latitude on opposite sides of the equator, and differ in longitude by 180° ; hence when it is a winter day at a given place it is a summer night at the antipodes, and *vice versa*.

Exercises. Find the antipodes of the following places:

(1) London, (2) Singapore, (3) Cape Horn, (4) Lisbon.

Ans. (1) Antipodes Island (nearly), (2) Mouth of the Amazon, (3) East of Lake Baikal.

V. To find the length of a degree of longitude in any given latitude.

With the quadrant of altitude or otherwise, find the number of degrees of the Earth's circumference between any two consecutive meridians, along the given parallel of latitude. This distance being equal to 15° of longitude, divide the number found by 15 , and multiply by 69.1 to reduce the result to English miles.

VI. The hour at any place being given, to find what hour it is then at any other place.

Bring the place at which the time is given to the universal meridian, set the hour circle or index to the given time; turn the globe until the other place comes to the meridian; the required time will then be found on the hour circle under the meridian or under the index.

Note. It should be remembered that, as a general rule, at places east of us (or of any given place) the hour is later in the day, and at places west of us the hour is earlier. But this is modified in many cases by the position with reference to the day line.