

WAVE ATLAS

FOR

ARABIAN SEA & BAY OF BENGAL



NATIONAL INSTITUTE OF OCEANOGRAPHY

(Council of Scientific & Industrial Research)

INDIA

WAVE (SWELL) ATLAS
for
ARABIAN SEA AND BAY OF BENGAL

NATIONAL INSTITUTE OF OCEANOGRAPHY
(COUNCIL OF SCIENTIFIC AND INDUSTRIAL RESEARCH)
DONA PAULA, GOA-403004
INDIA

JANUARY 1982

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FOREWORD

Knowledge of the characteristics of waves in the sea is necessary for planning coastal and offshore engineering works. These works are largely related to the development of harbours, shore protection, offshore oil exploitation, sea-bed mining, shipping etc.

Earlier studies on wave characteristics in the Arabian Sea and the Bay of Bengal have largely been confined to significant waves.

Collection of wave data, using either visual or recording methods, is a time-consuming process. However, historical data, when properly processed and analysed, can provide general information on wave climate for the use of engineers, oceanographers and mariners.

With a view to provide comprehensive information on swell characteristics, the National Institute of Oceanography undertook the task of preparing a swell atlas for the northern Indian Ocean with equator, Asiatic land mass, 60°E meridian, and 95°E meridian as the boundaries. This area was divided into twenty nine 5° lat.—long. squares and the swell characteristics pertaining to each square are presented monthwise in polar diagrams.

The data on swell characteristics for the period 1968-1973 published in the Indian Daily Weather Reports were utilised for the preparation of the atlas. It is hoped that the information presented here will be useful to oceanographers, engineers and others working in the ocean environment.

Compilation, analysis and the preparation of the wave rose diagrams have been carried out by the following Scientists of the Physical Oceanography Division of NIO :

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ACKNOWLEDGEMENTS

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DATA SOURCE

The swell data reported in the Indian Daily Weather Reports, published by the India Meteorological Department during 1968-73, have been used as the basic data for this atlas. Till 1968, ships used to report such information on waves as their direction, period and height, without differentiating between 'sea' and 'swell'. Since 1968, the direction, period and height of the swells are reported separately along with the period and height of the 'sea', thus clearly distinguishing the 'swell' and the sea characteristics.

COMPILATION AND PROCESSING

The specified region was divided into twenty nine 5° lat. - long. squares with approximations near coastal boundaries. For each of these squares, the swell data were first decoded and then grouped according to the direction of approach, period and height for each month. The pooled data was assumed to represent an average wave climate for the zone. Then, the percentage frequencies of different periods and heights for each direction of approach were calculated.

In all 23,879 observations were utilised in the present analysis. The grid-wise distribution of the data has been given in the tables (pages 383 - 385). As can be seen from the tables, observations in some of the squares are scanty and the utility of these diagrams is, therefore, limited.

PRESENTATION

Computed results are presented in the form of polar diagrams. The concentric circles (representing percentage frequency) are drawn in the increasing order of 5% extending from 0 to 45%. Percentage frequency of swell in each direction is marked by a straight line. On these lines, which show the direction of approach, graduations have been made for each group of periods and heights according to the respective percentages of their occurrence. For presenting the statistics, the following seven steps have been followed.

Procedure 1 : The percentage frequencies of periods and heights are marked along the line, representing the direction of approach according to their magnitudes with higher values closer to the centre subject to Procedure 2 being fulfilled. Whenever two or more period/height groups have the same percentage level, the larger periods and the greater heights are entered closer to the centre.

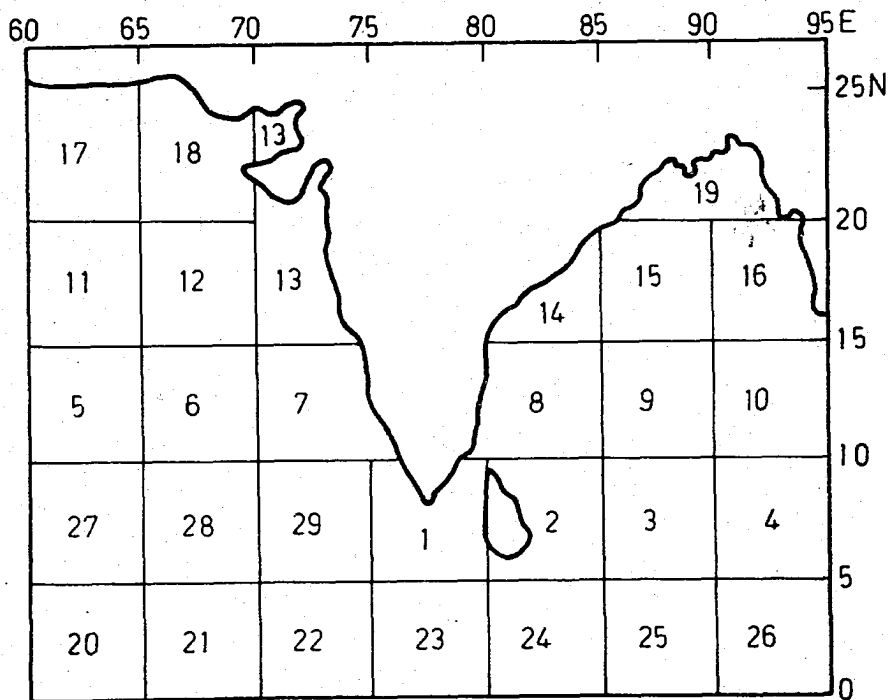
Procedure 2 : Whenever the percentage occurrence of swell in any direction is less than 5% of the total for a month, the period and height graduations are not shown.

Procedure 3 : For all directions, except those coming under the Procedure 2, the largest period and the maximum reported height have been presented, irrespective of the quantum of data available, to present the extreme values (see also Procedure 7).

- Procedure 4 :** Since the observed period and height distributions, in all probability, may not contain the complete spectrum that has actually prevailed, a portion of the percentage line at the end is left ungraduated to represent collectively the 'unobserved' and infrequent periods and heights subject to Procedure 5 being fulfilled.
- Procedure 5 :** When the group of 'maximum height observed' happens to have the least percentage and is representable, no provision is made for the 'unobserved' heights. When the complete spectrum of periods extending from 5 seconds or less (represented as 5) to 14 seconds or more (represented as 14) can be presented, all graduations have been shown.
- Procedure 6 :** When the percentage occurrence of the largest period group and the maximum height group is 1.5 or more, the graduations along the line are extended to present the maximum information by adopting Procedure 4.
- Procedure 7 :** When the percentage occurrence of the largest period group or the maximum height group is less than 1.5 of the total for the month, those values are entered at the end of the line in bold letters, adopting Procedure 3.

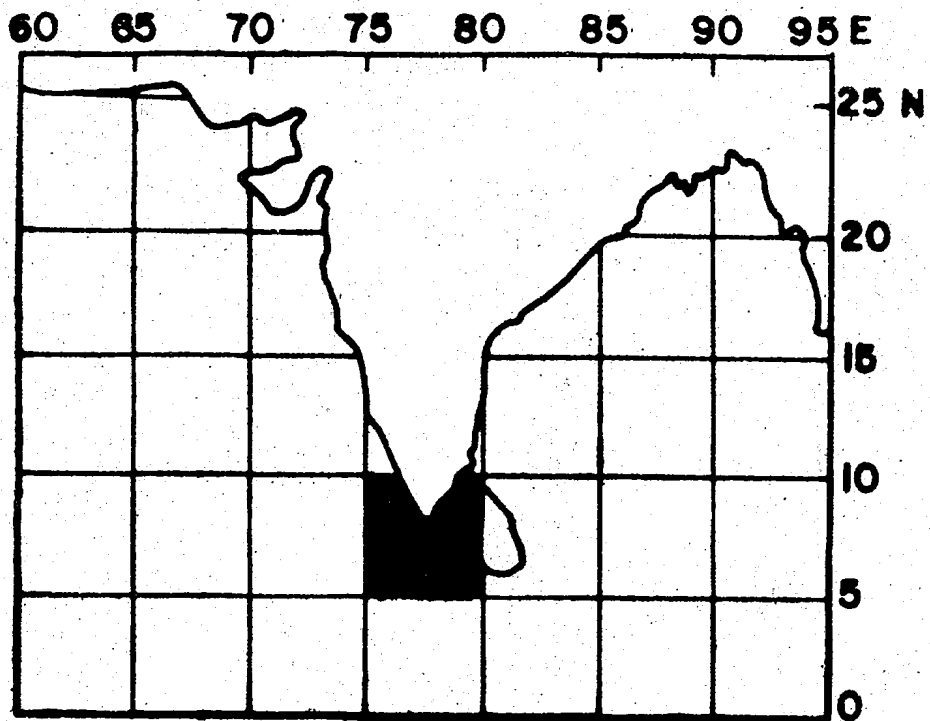
SAMPLE DIAGRAM WITH EXPLANATION

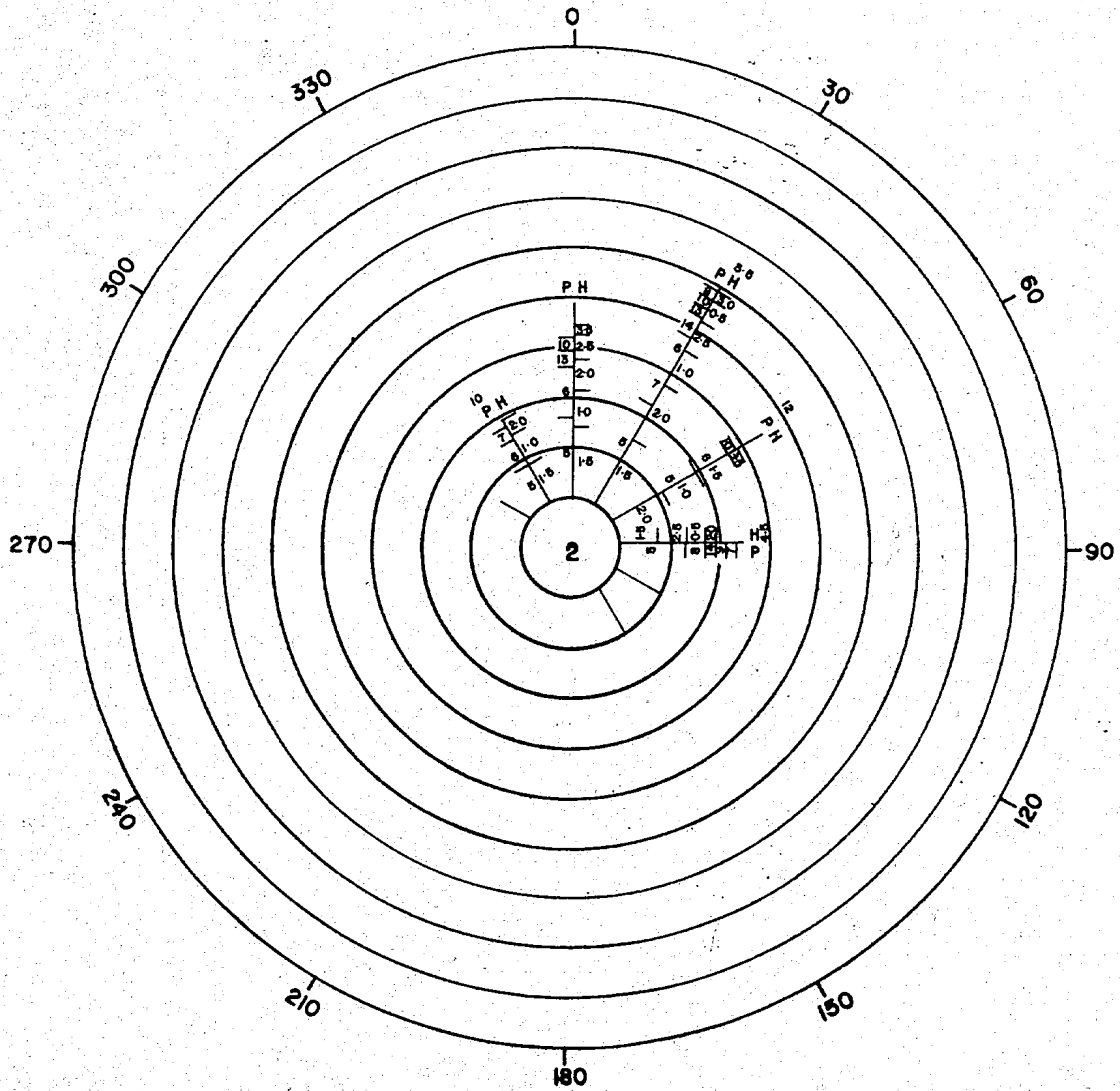
Referring to the figure for the month of April for the 5° square, 5° - 10°N and 75°-80°E (No. 1) the occurrence of swells for the directions 0°, 90°, 120° and 240° is less than 5% of the total for the month and the graduations for period and height groups are not shown (Procedure 2). Referring to the direction of approach, 180°, the swells prevailed for about 25.5% of the time during the month. The graduations on the period scale from the centre show the percentage occurrence of periods as follows : 7 secs (7.6%); 5 secs or less (4.2%); 6 secs (3.4%); 14, 13, 11, 10, 9 secs (1.7%). The graduations on the height scale are : 1.5 m (8.5%); 1.0 m (7.7%); 0.5 m (3.4%); 2.0 m (2.6%) and 3.0 m (1.7%). Heights of 2.5 and 4.0 m were also observed but because of their infrequent occurrence, the corresponding graduations have not been shown. However, the maximum height recorded 4.0 m, is shown at the end of the line (applying Procedures 3, 4 and 7). Referring to the direction of approach, 210°, in the same diagram, the maximum height (2.0 m) observed can be represented on the height scale and no space is left at the end of that scale (Procedure 5). On the period scale, the periods 6, 5, 7 and 14 seconds are represented leaving some percentage at the end of the scale for infrequent and unobserved periods (Procedures 4 and 6). In all the diagrams, the percentage occurrences of calms are noted at the centre.



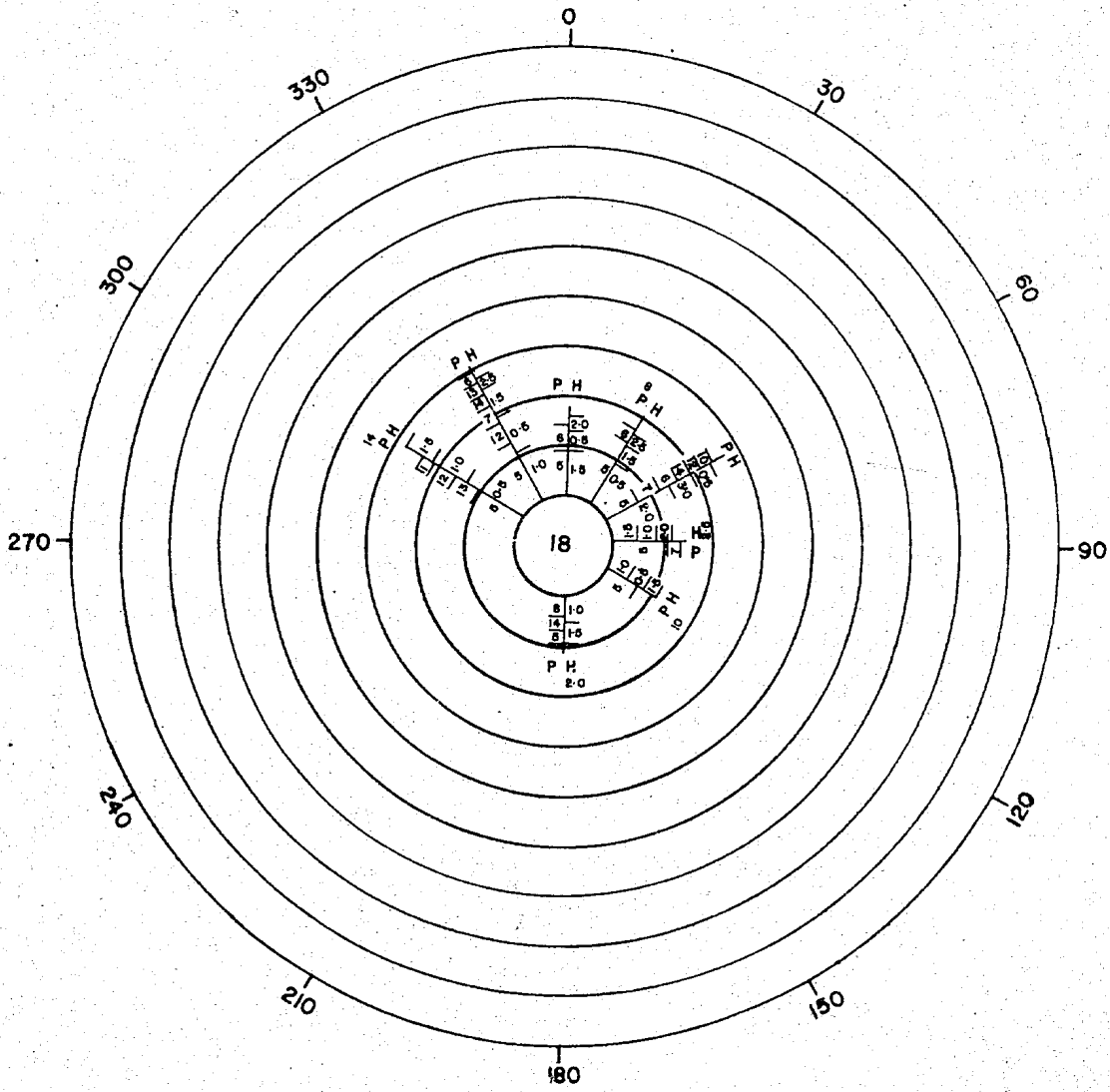
ZONE INDEX MAP

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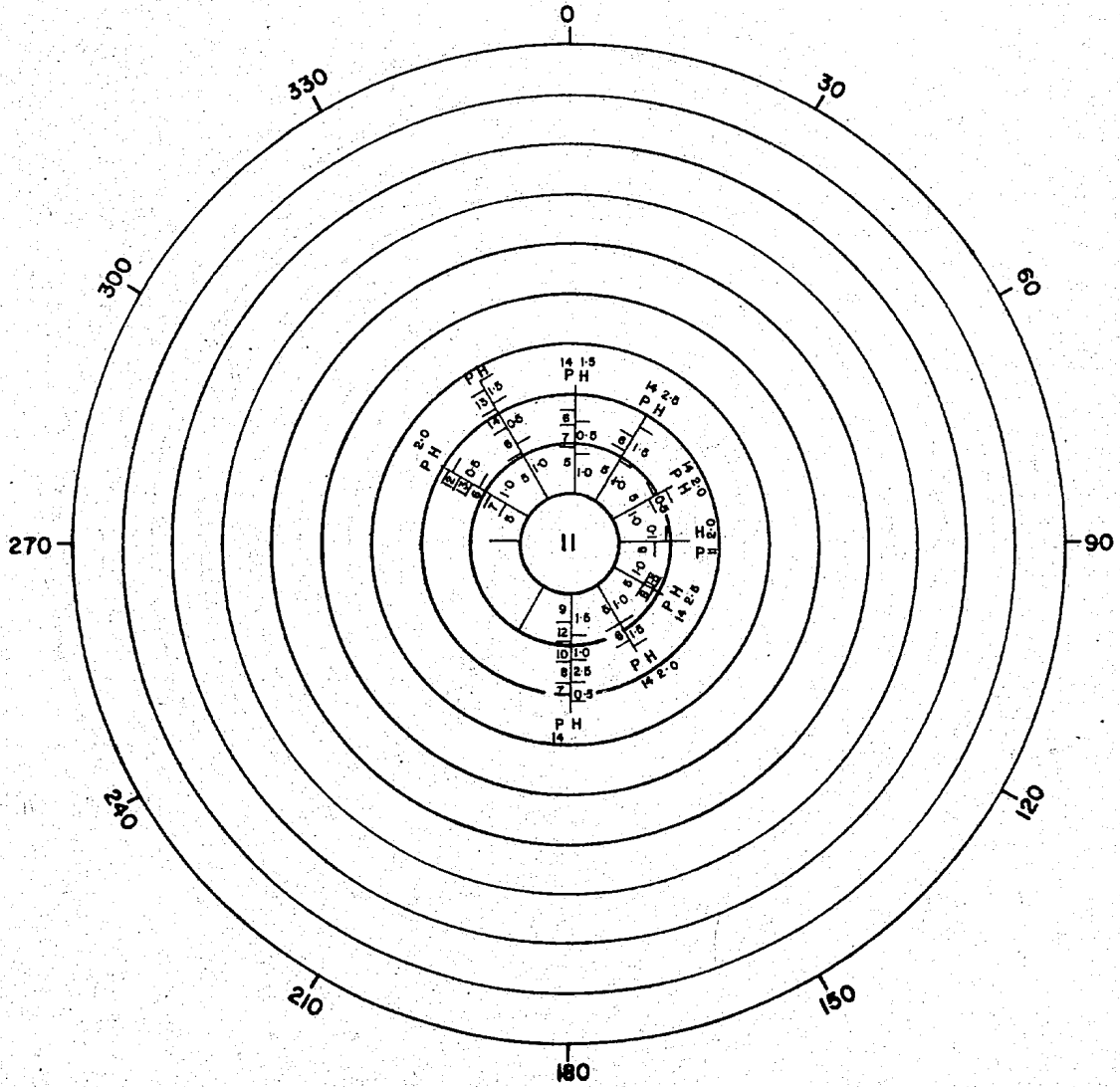




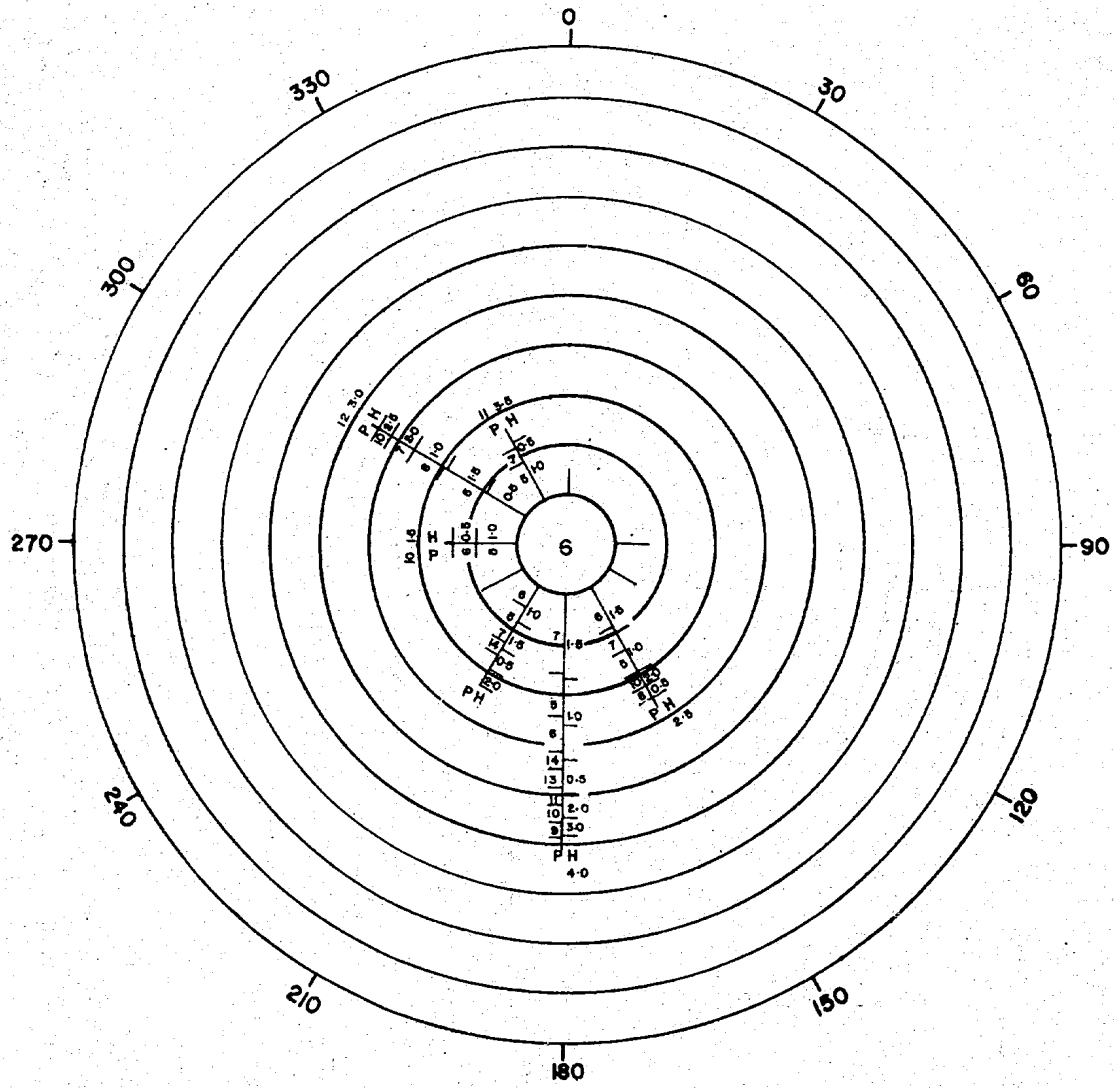
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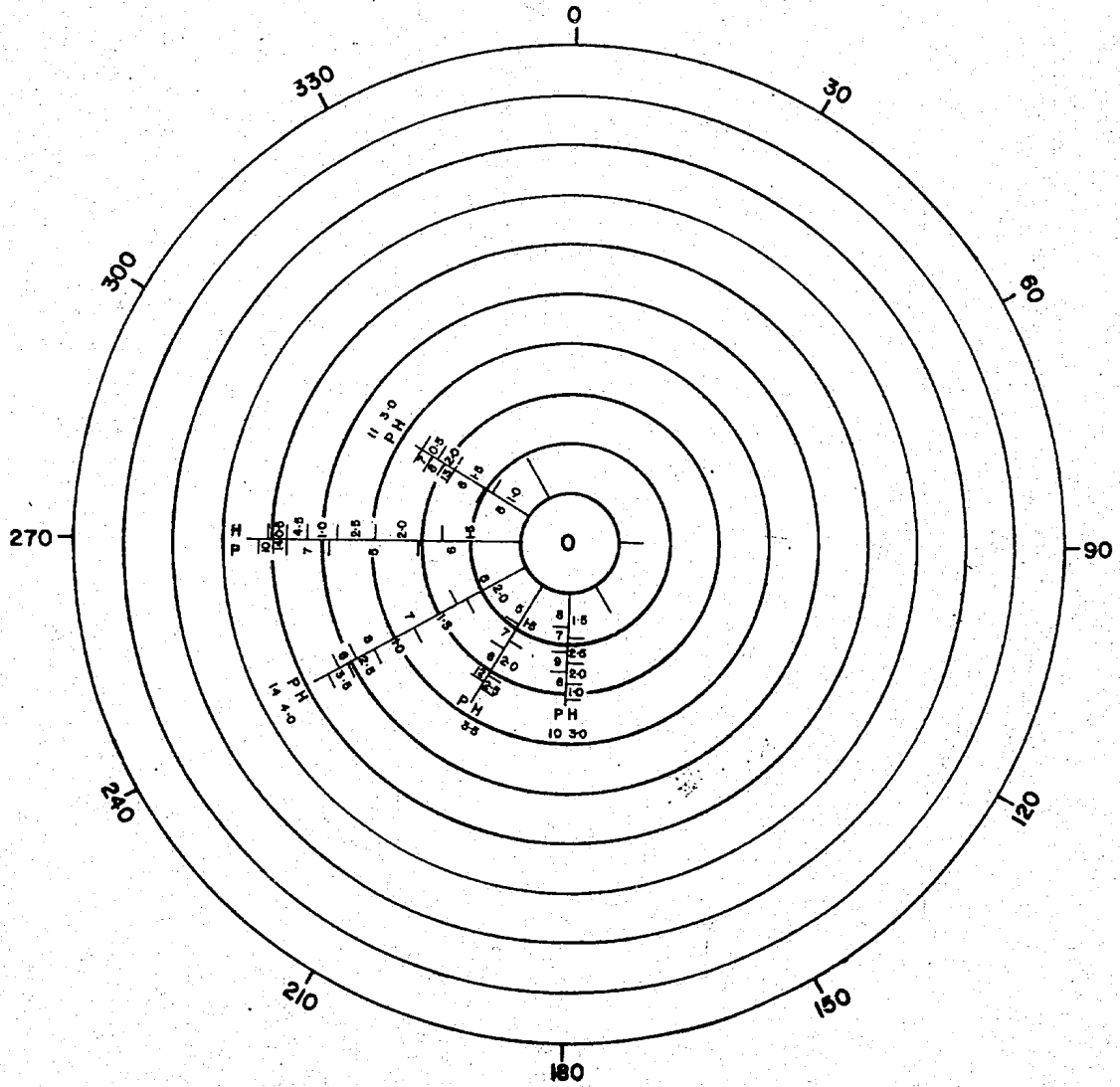
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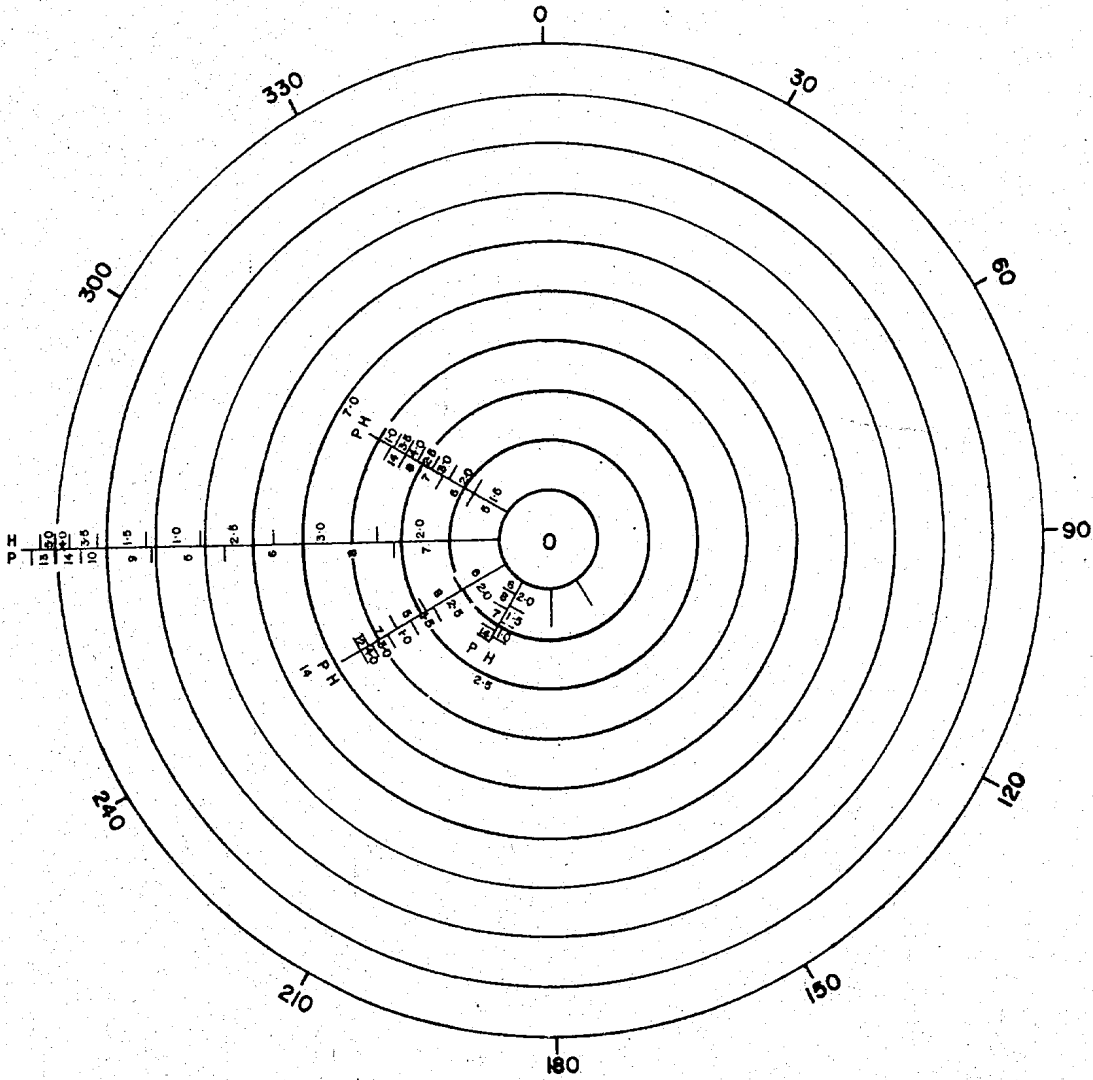
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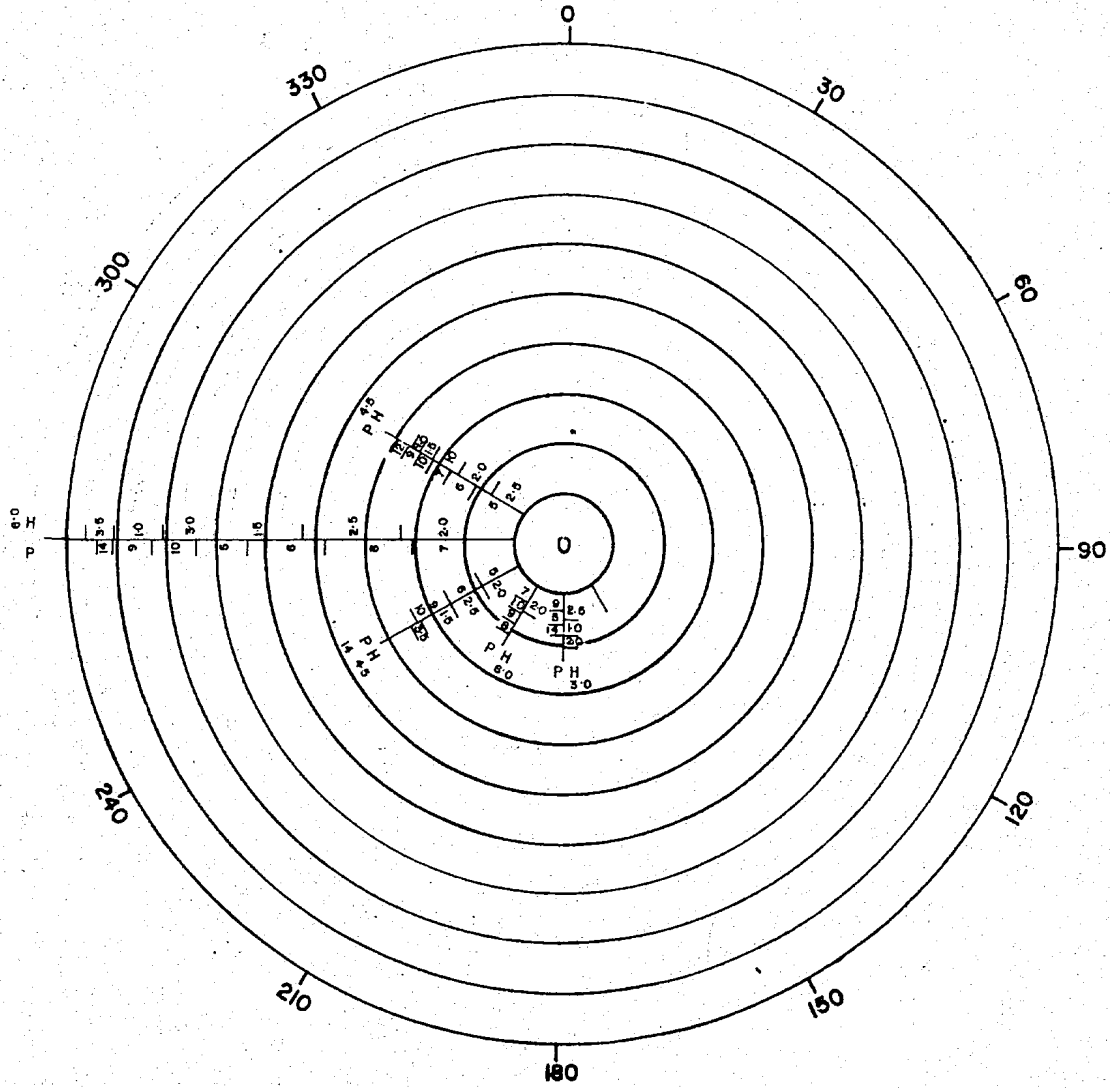
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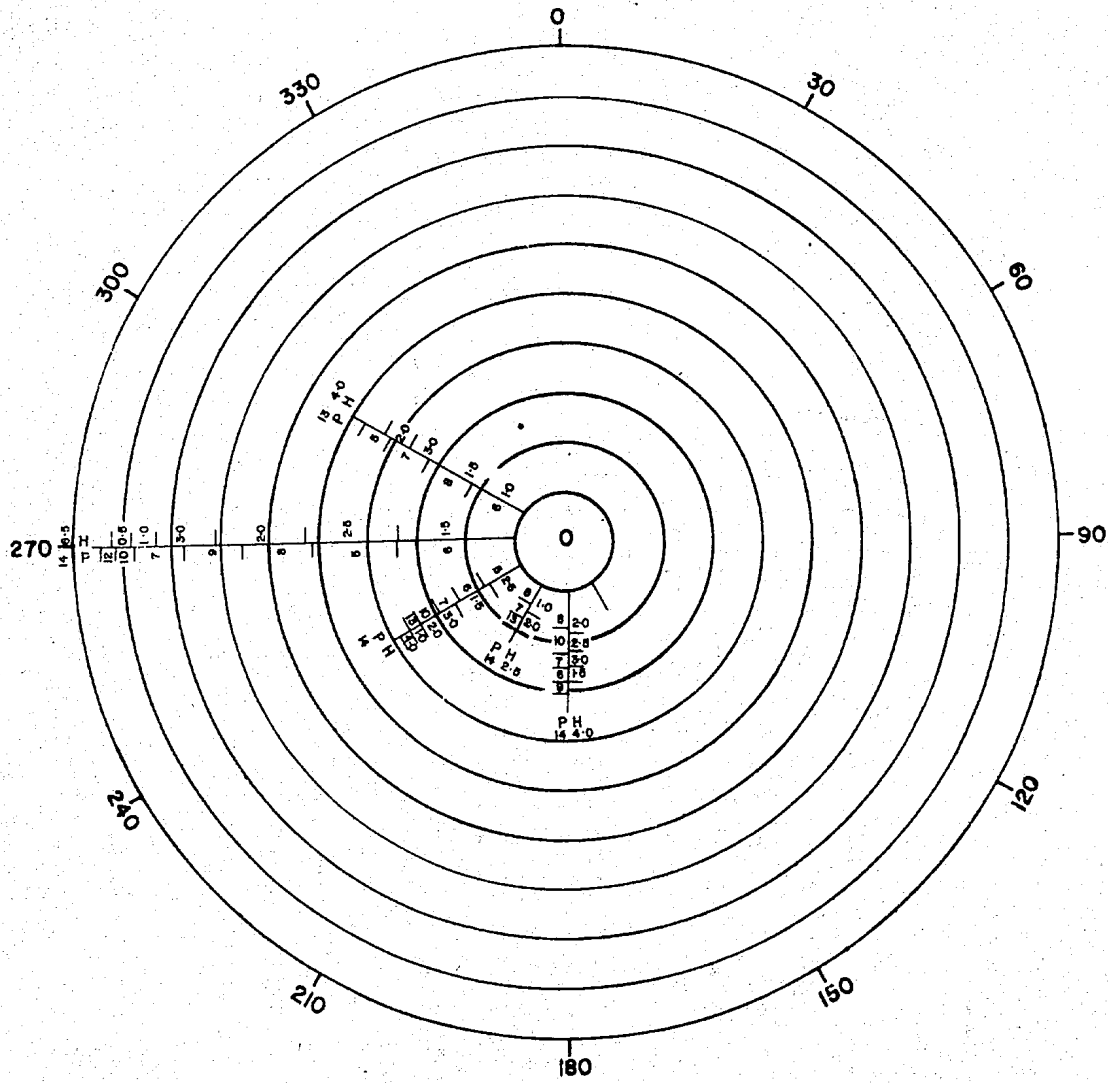
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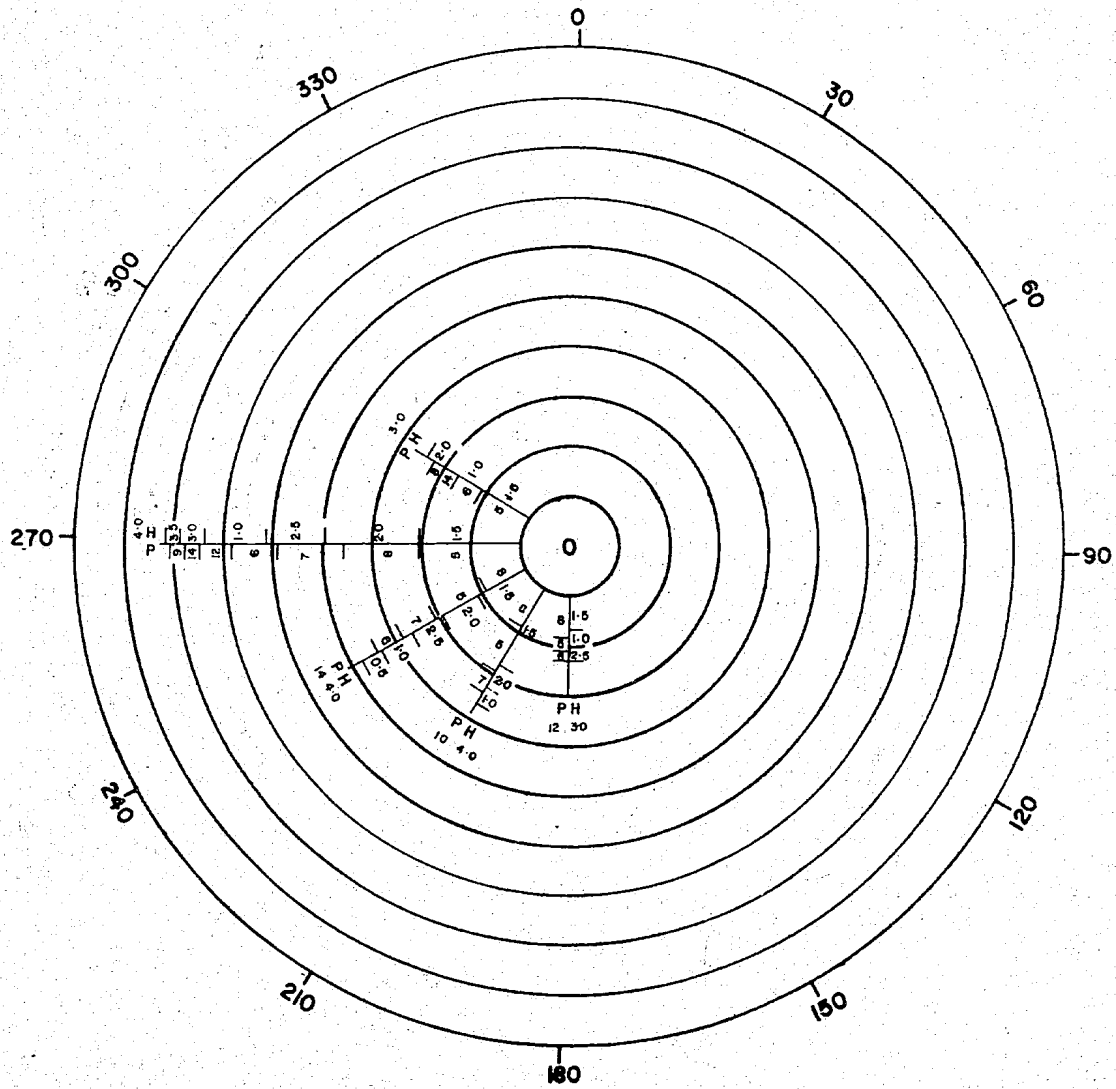
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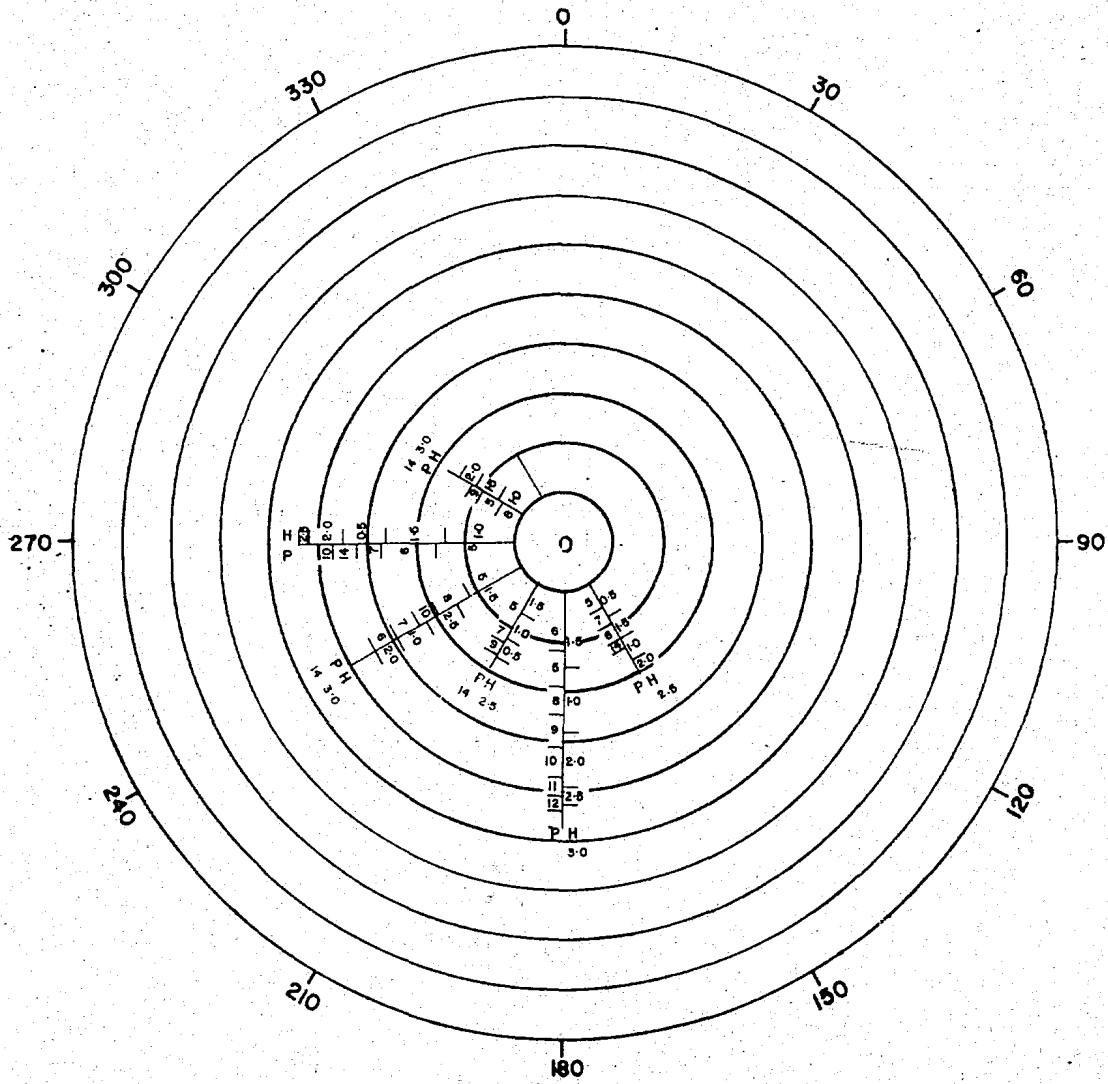
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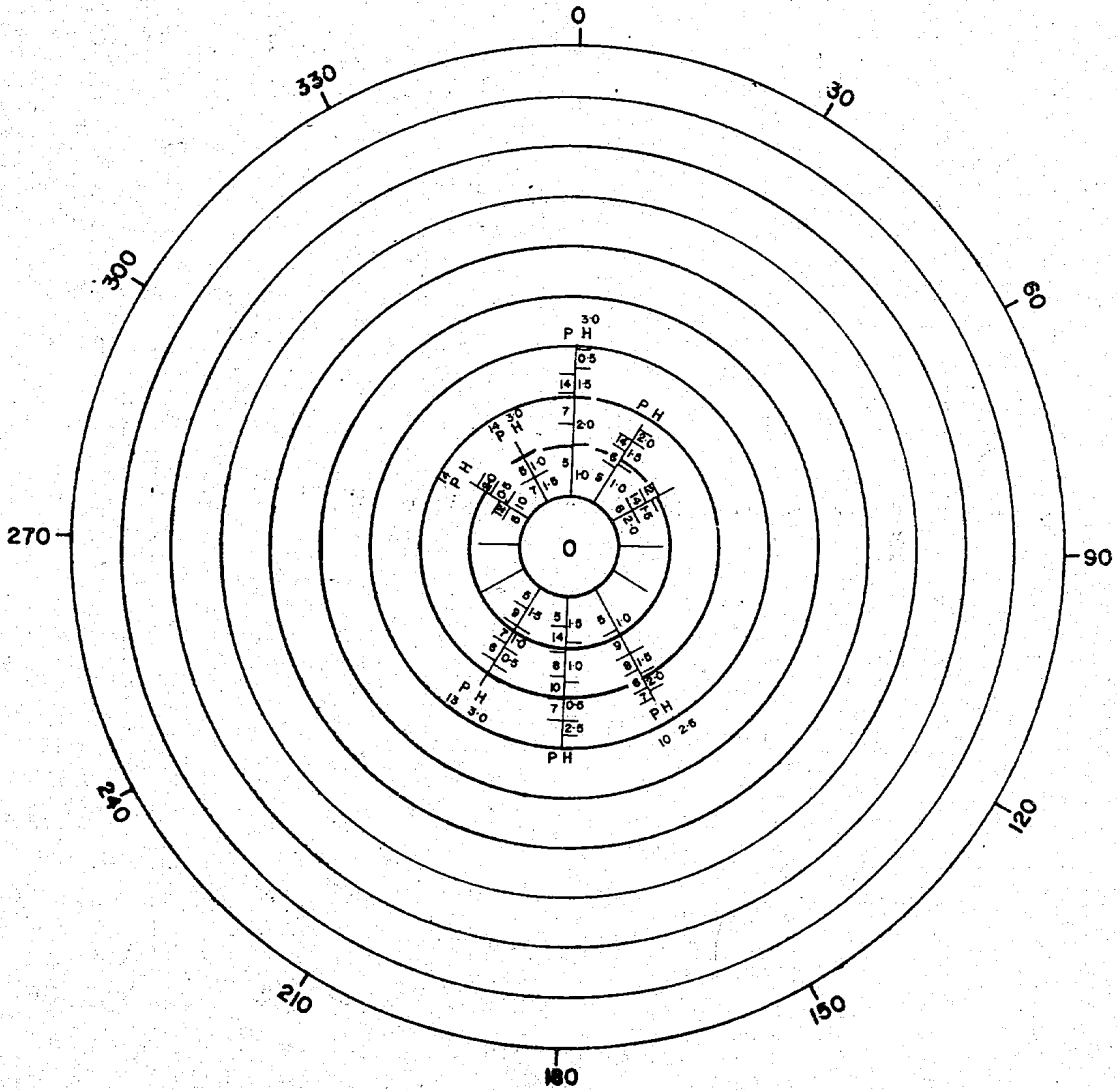
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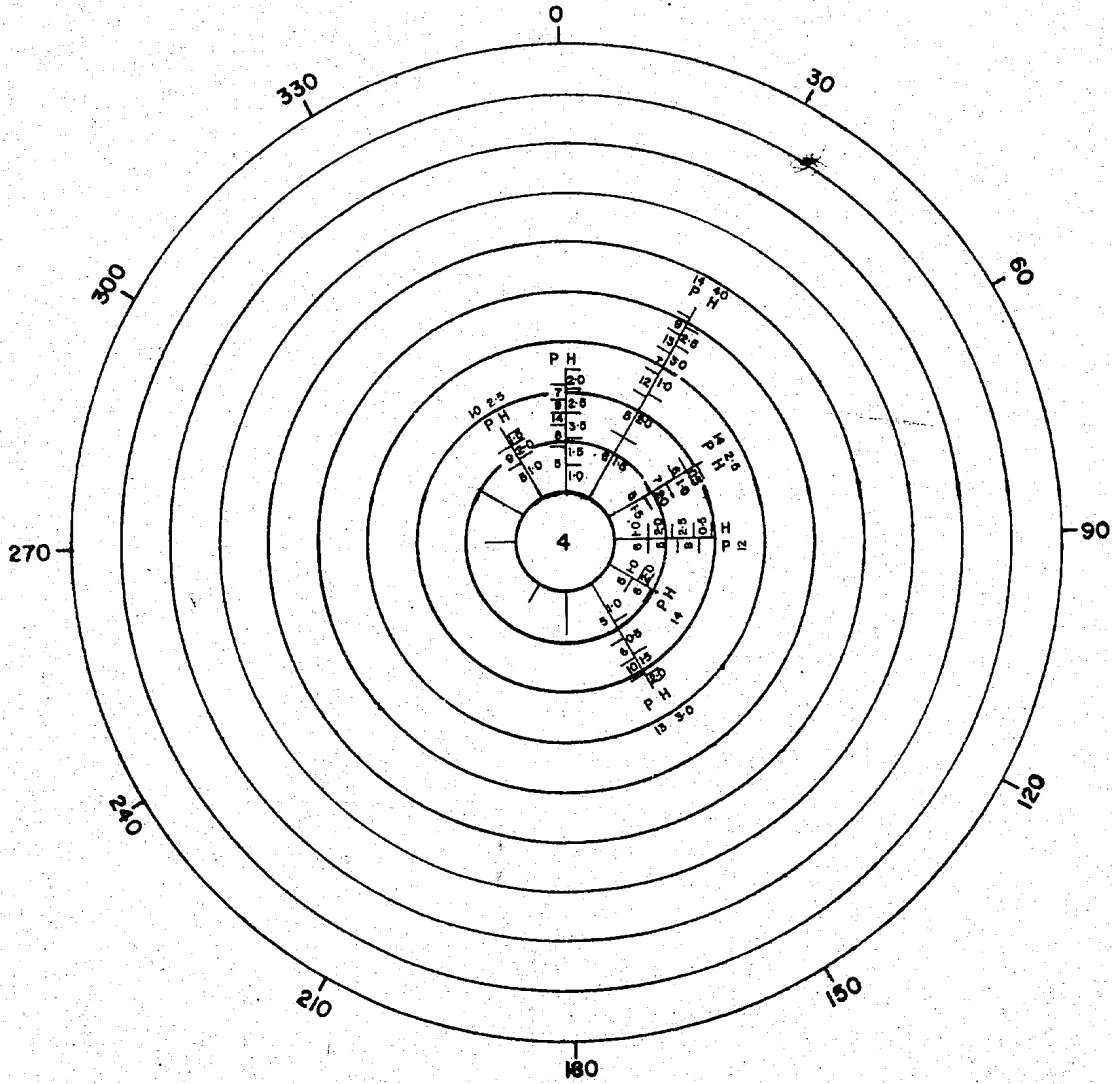
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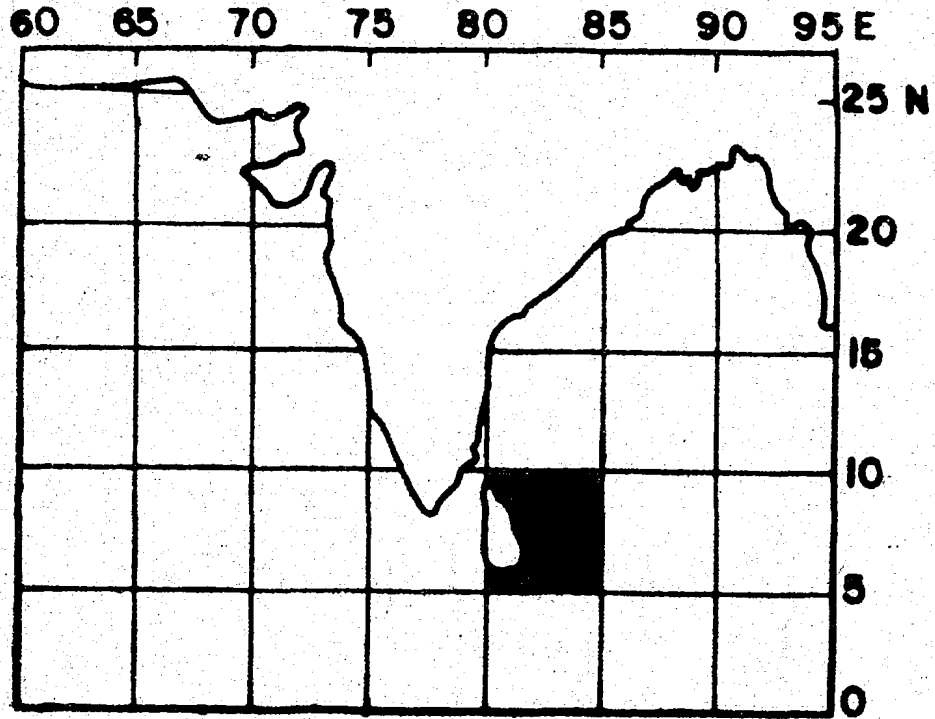
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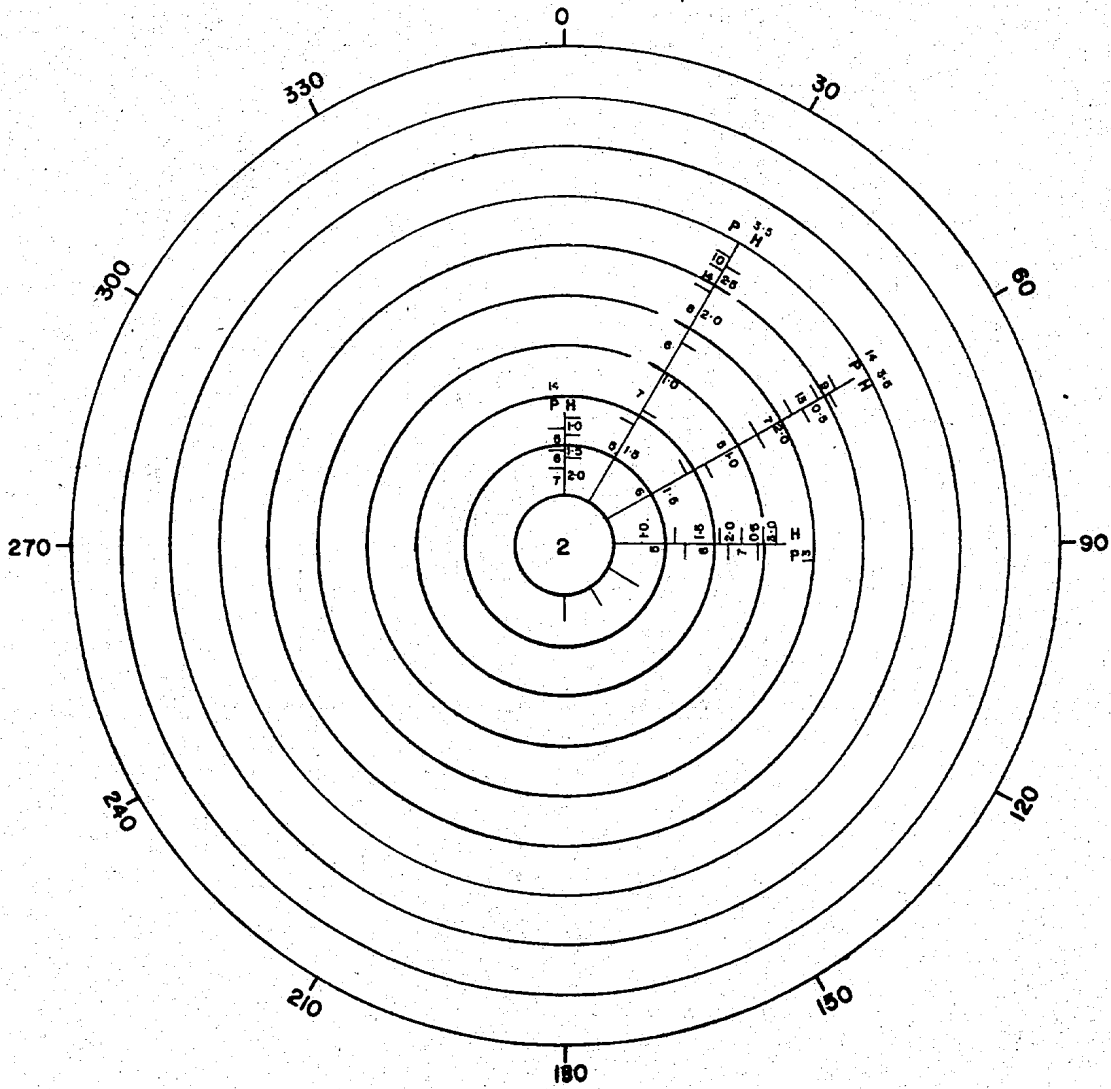


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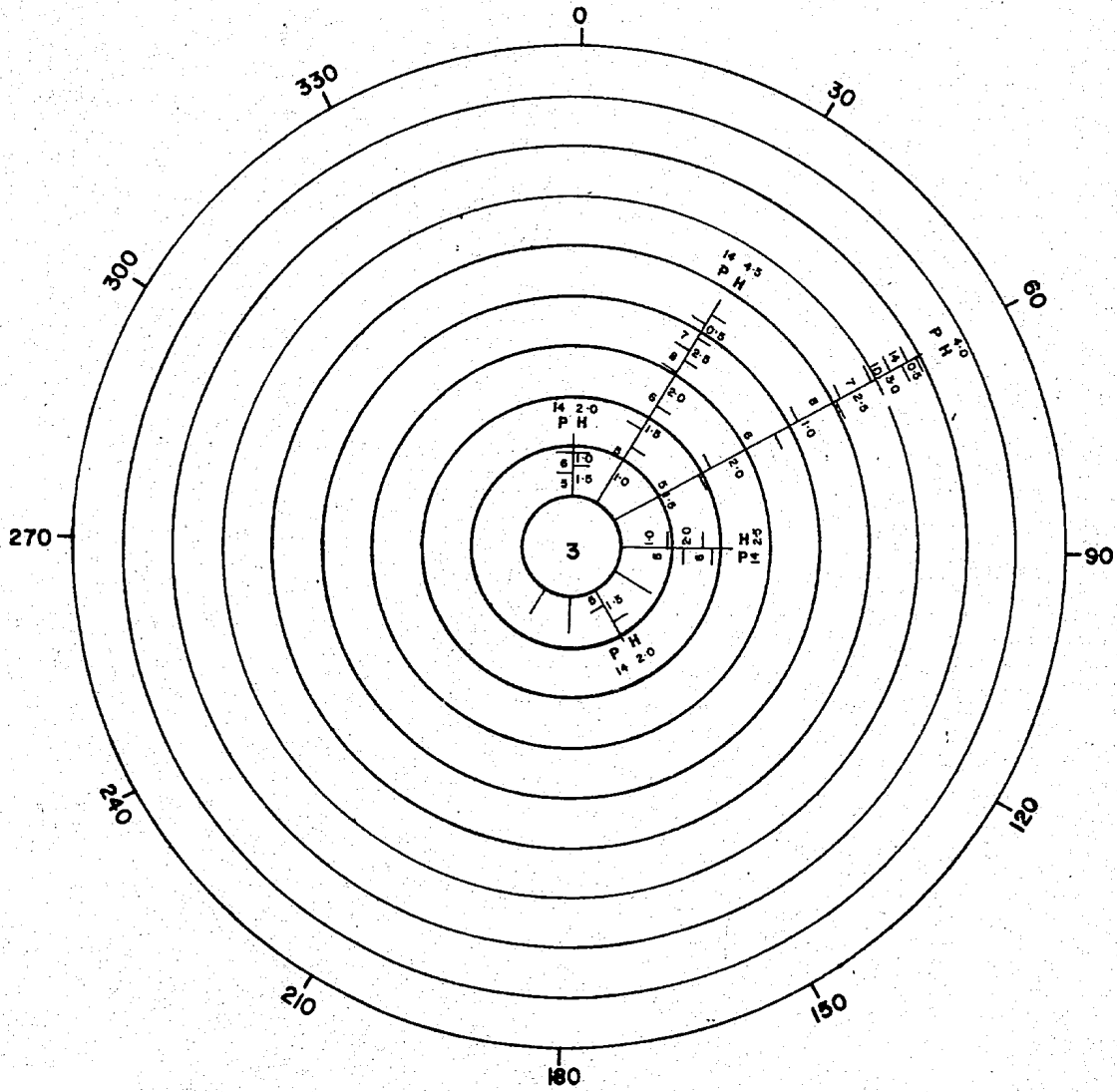


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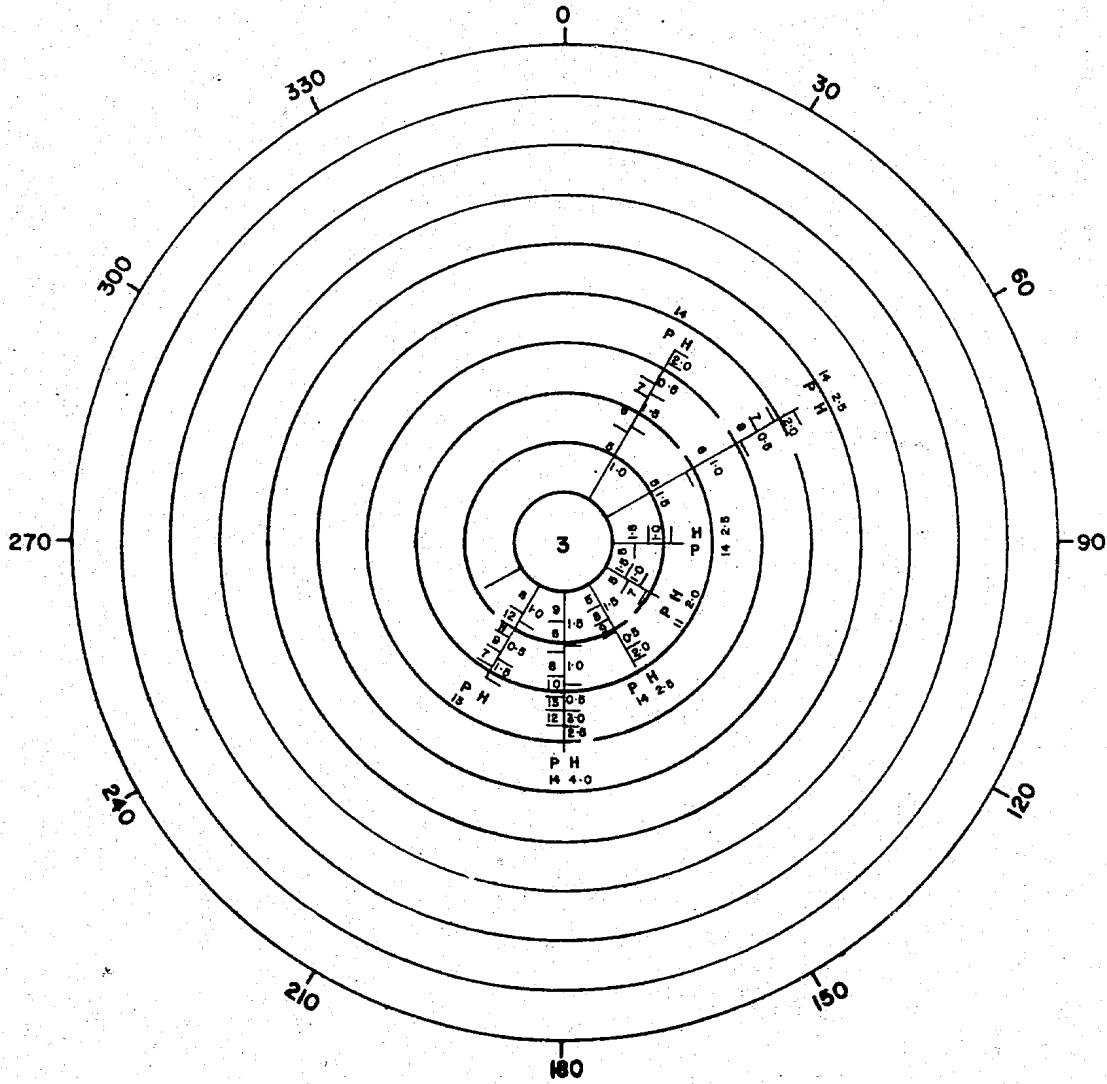




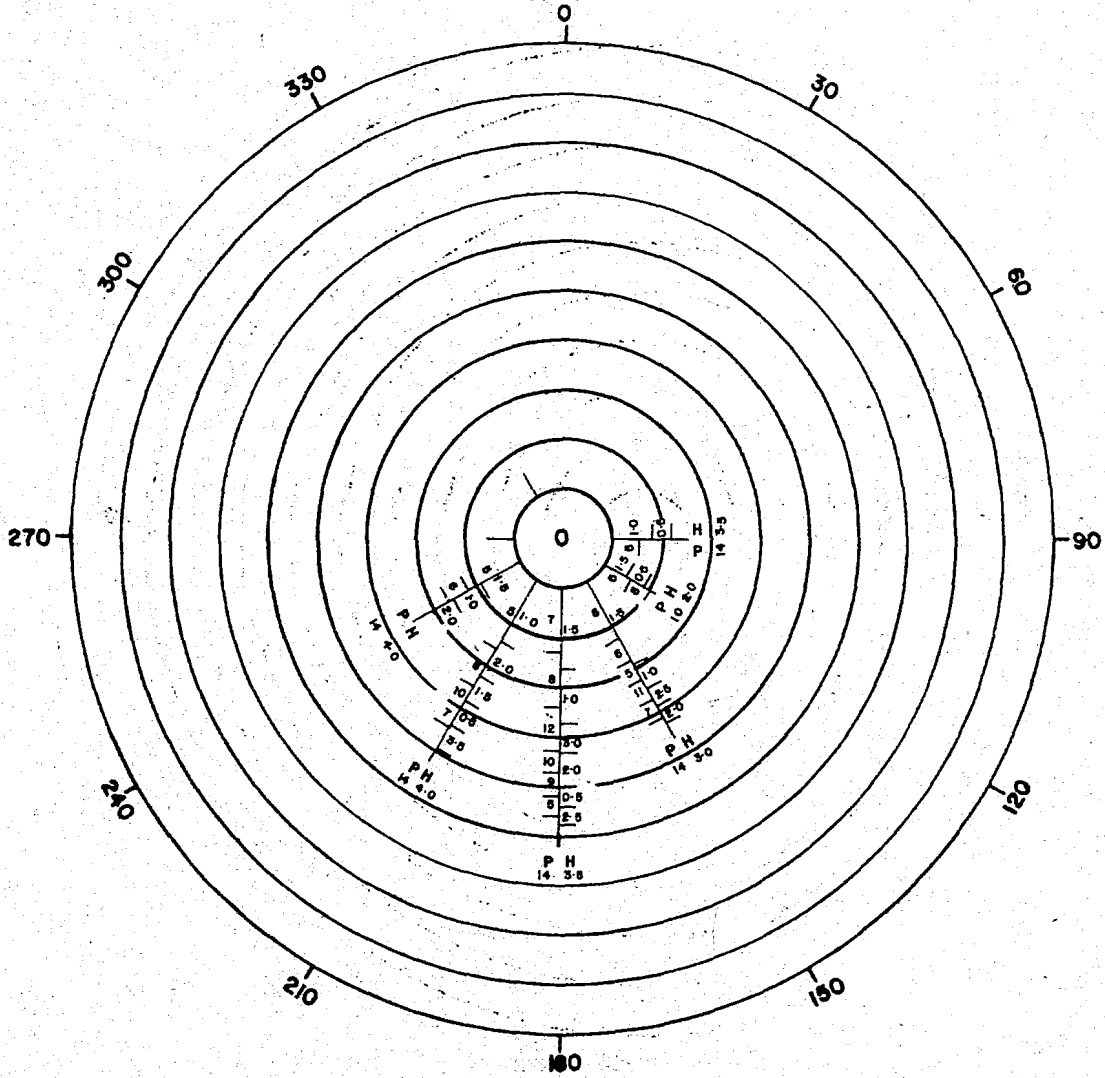
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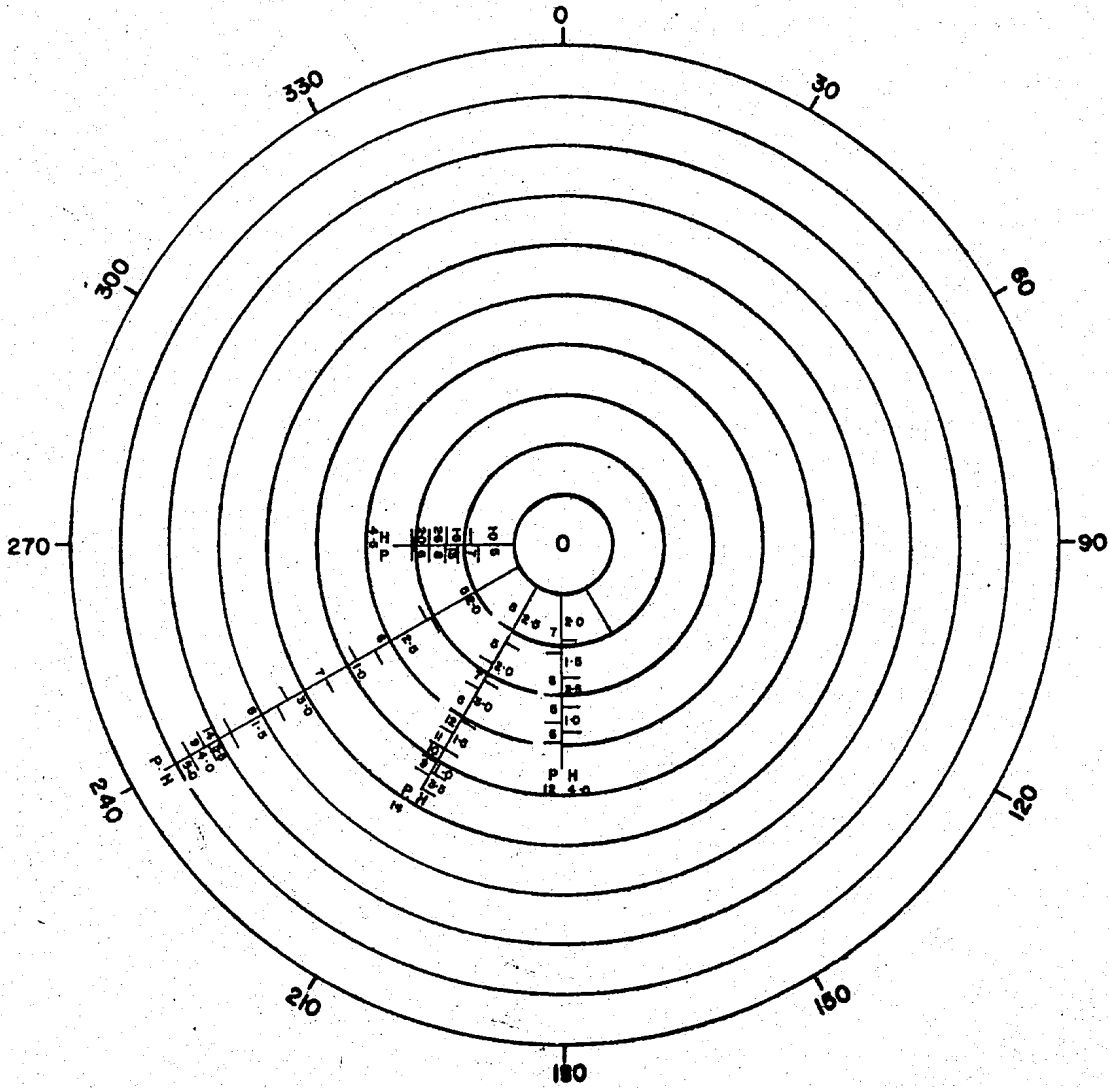
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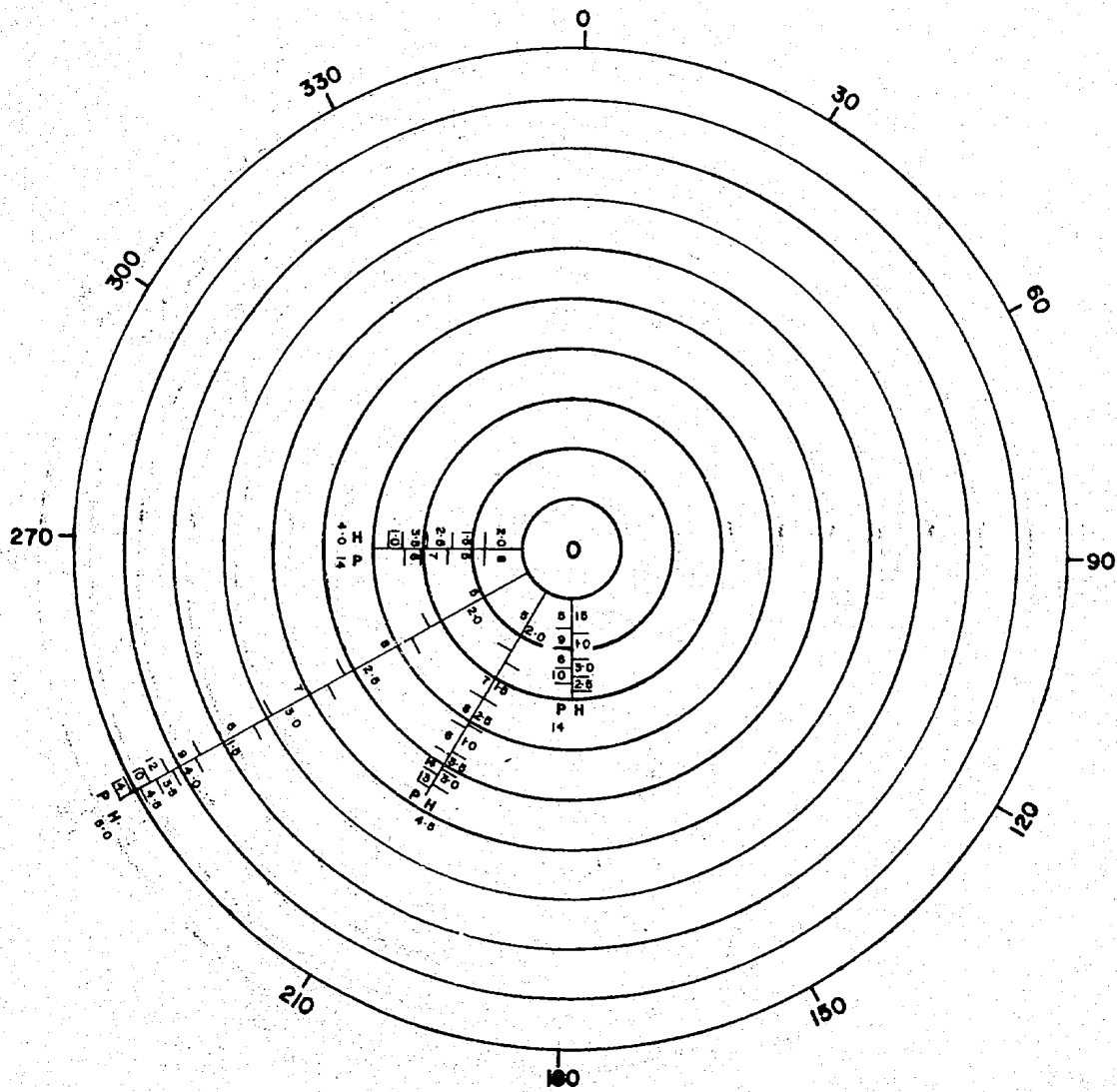
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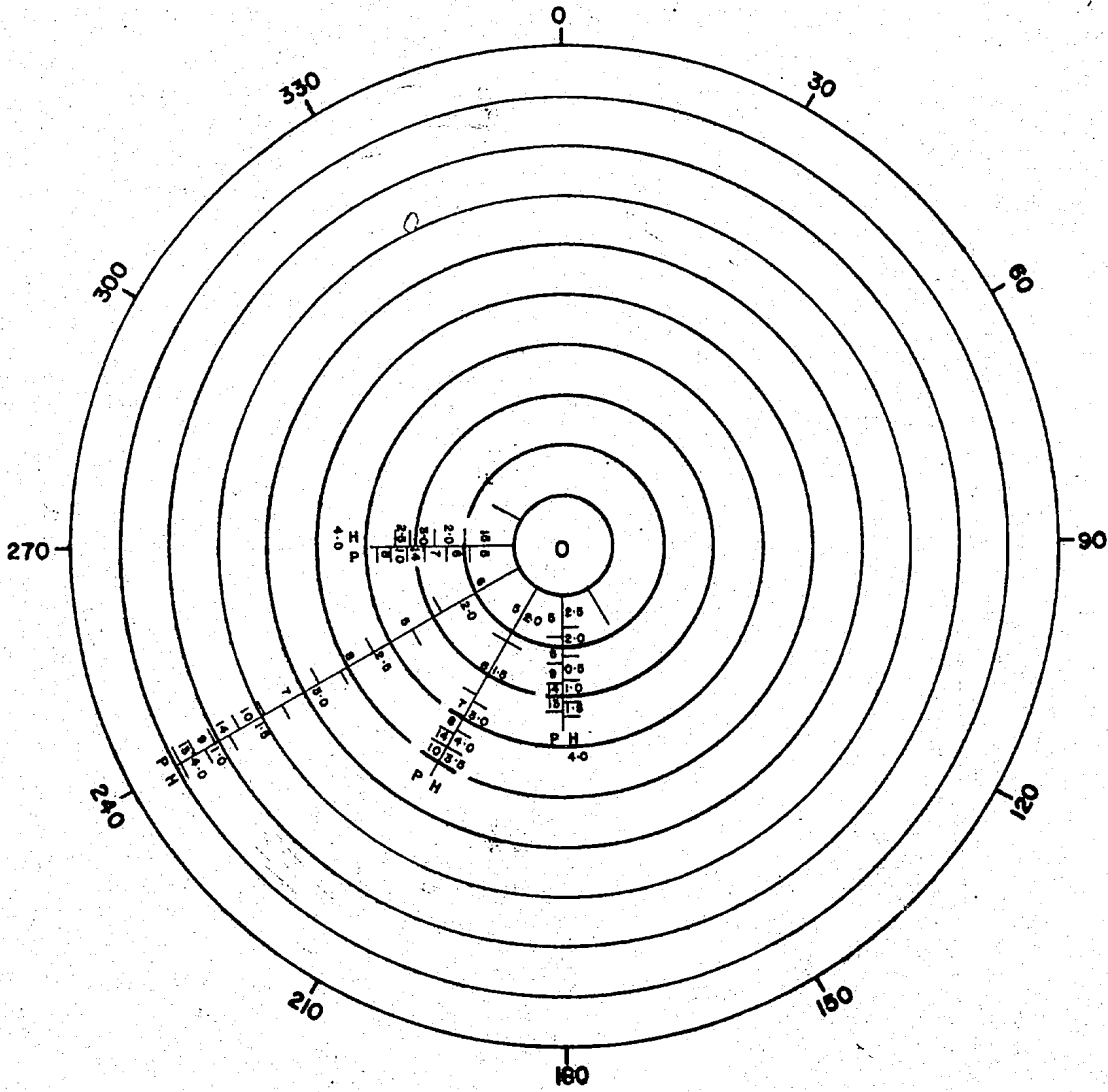
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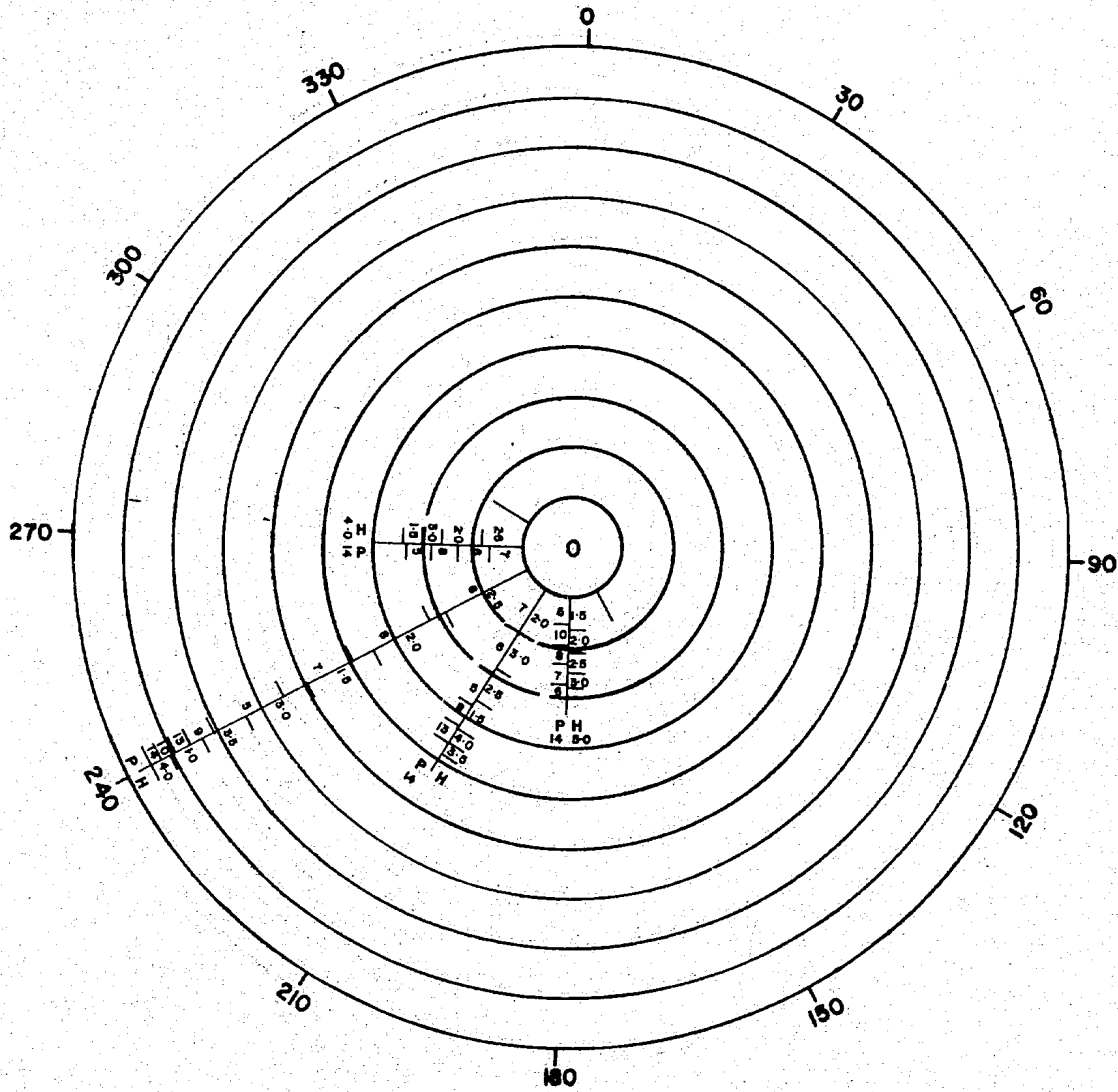
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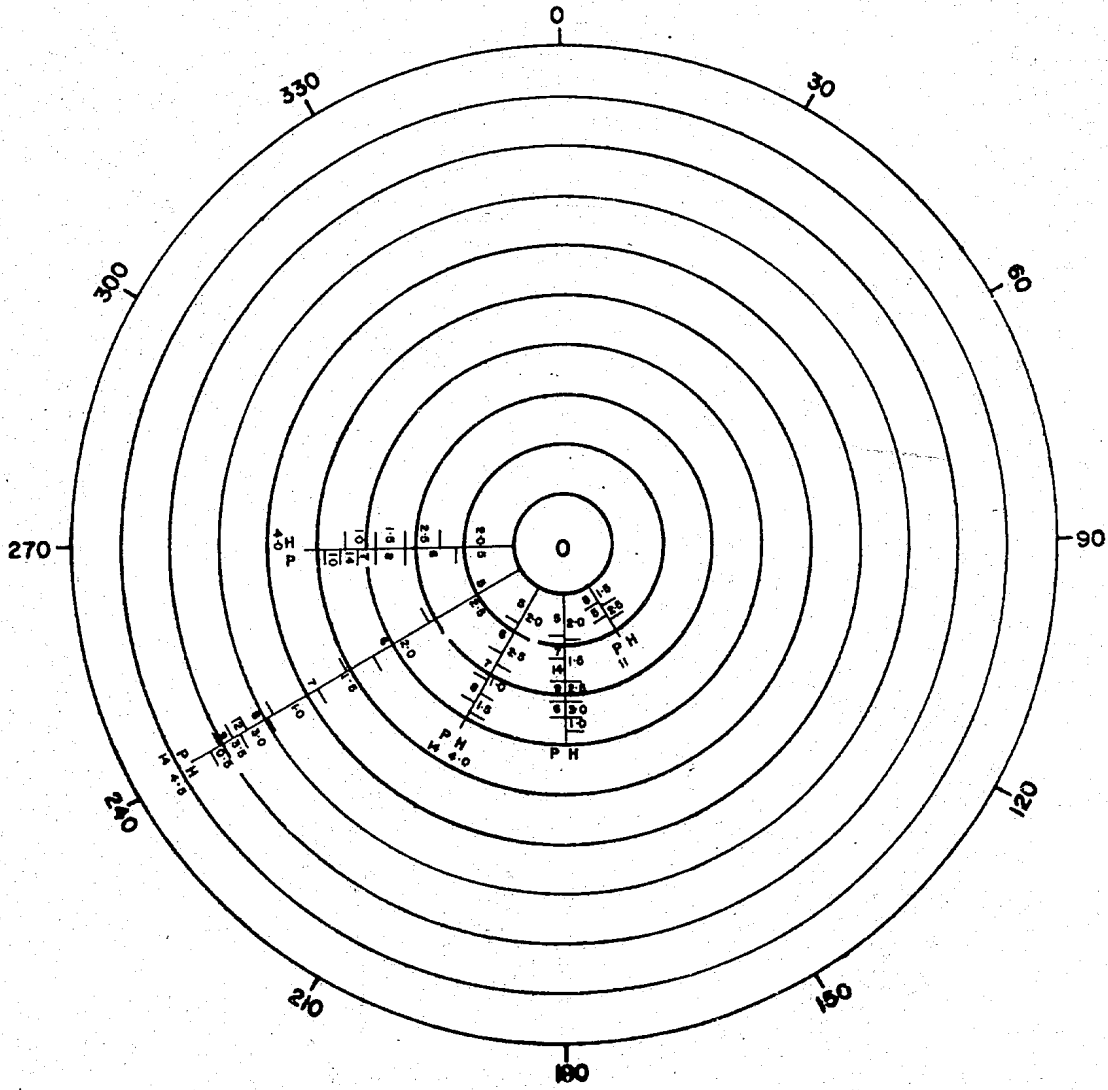
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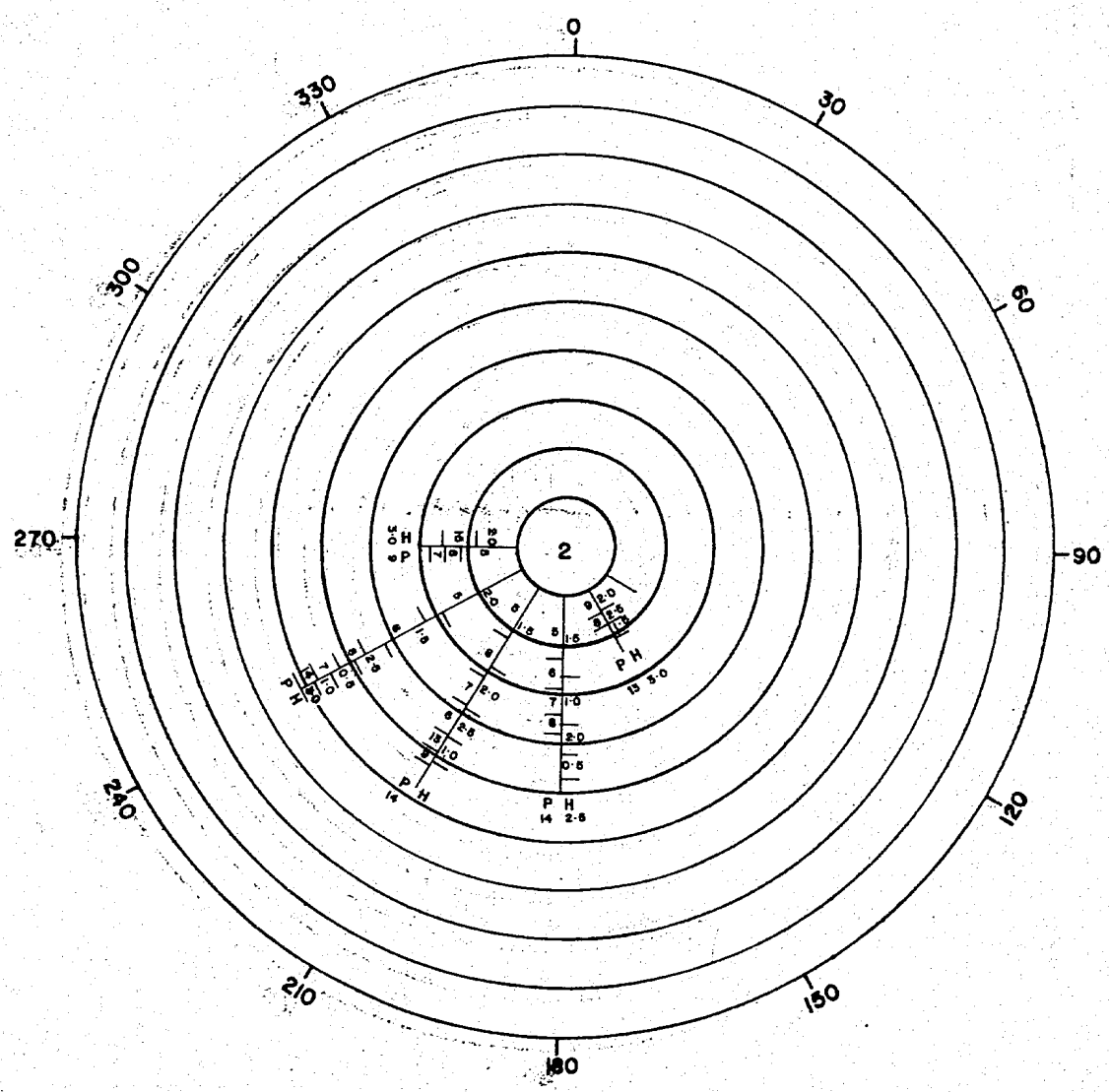
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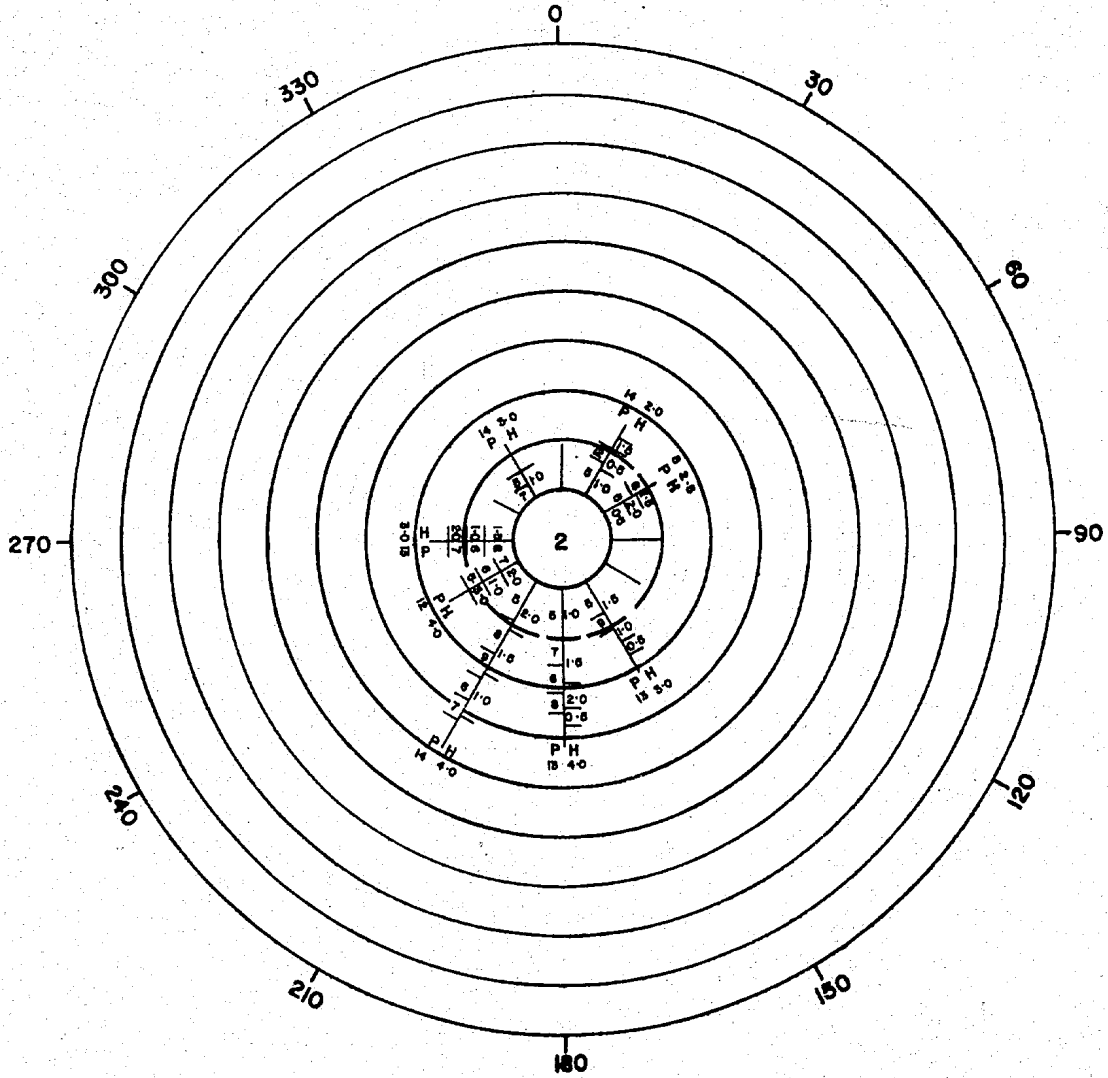
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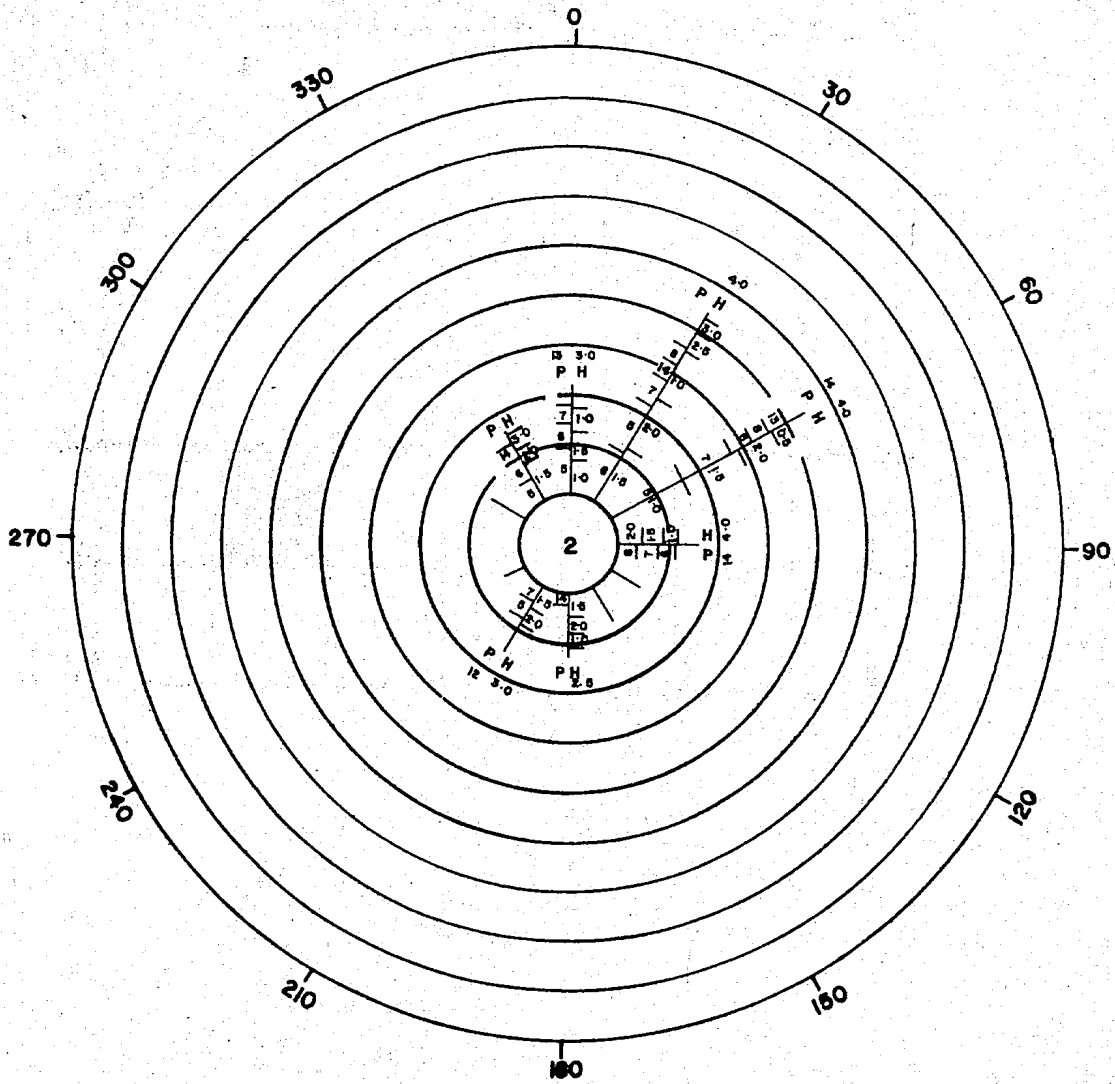
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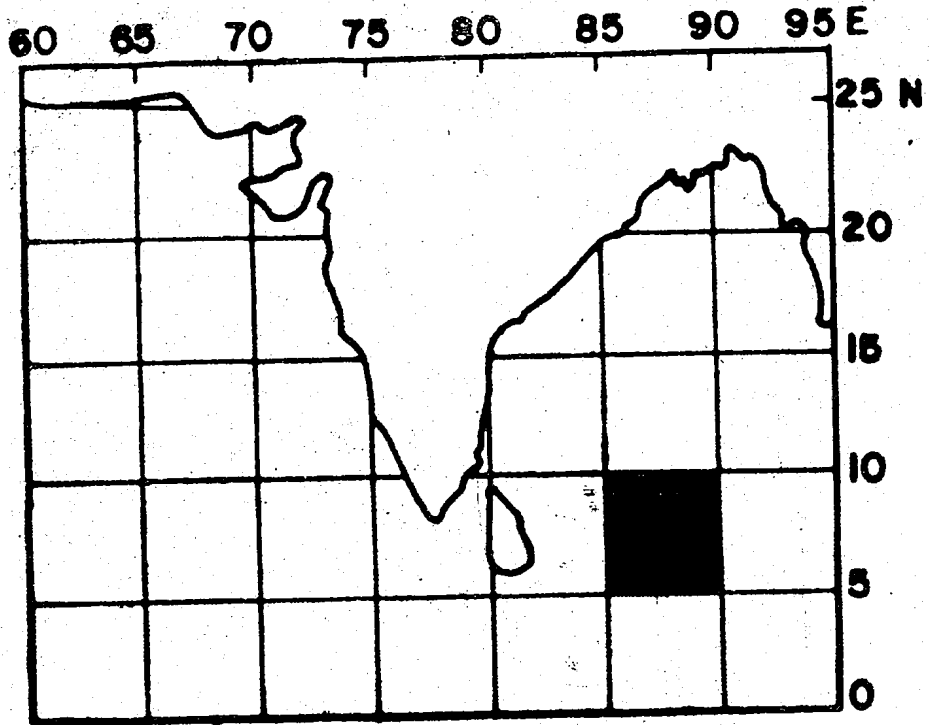
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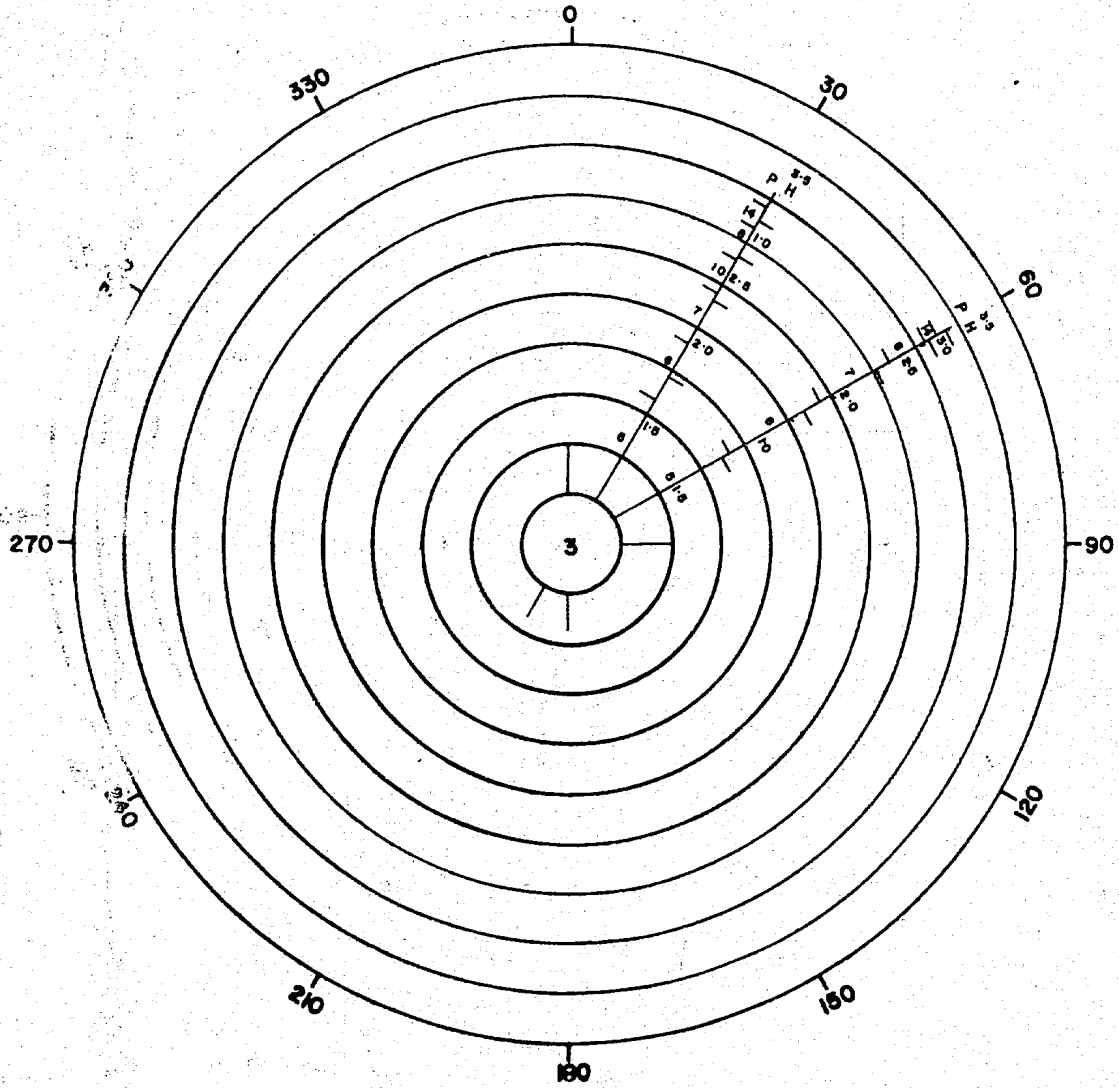


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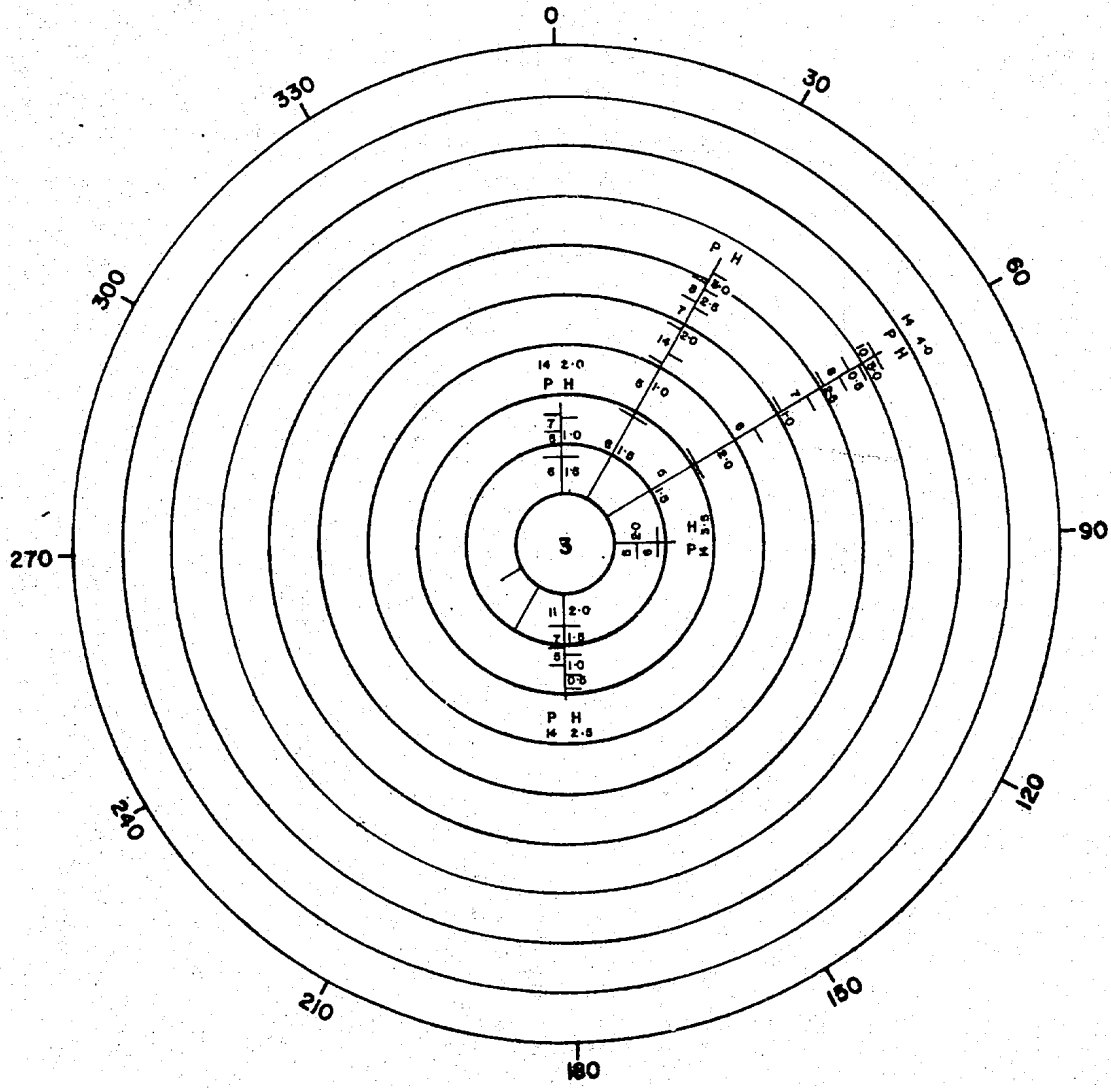


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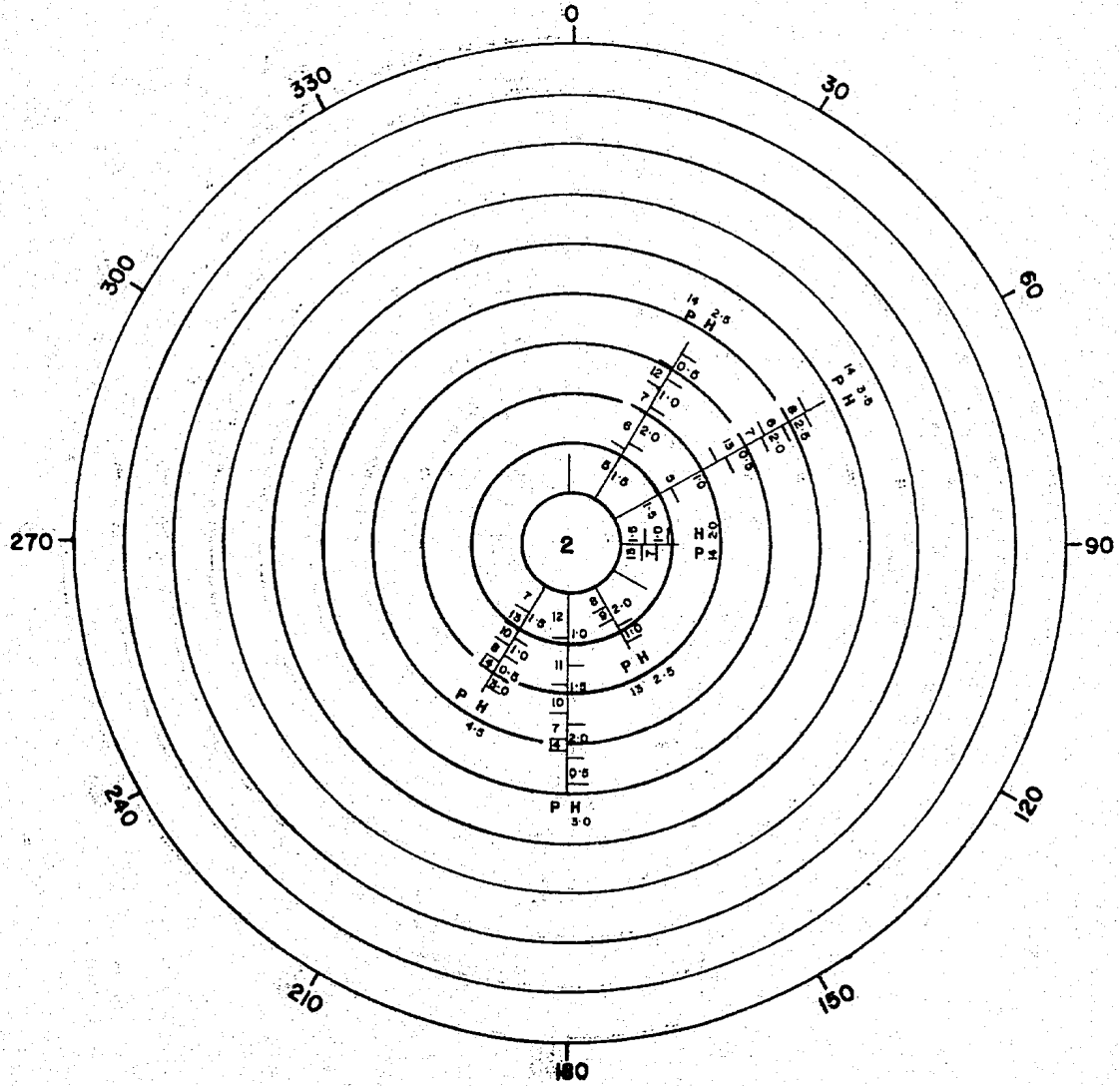




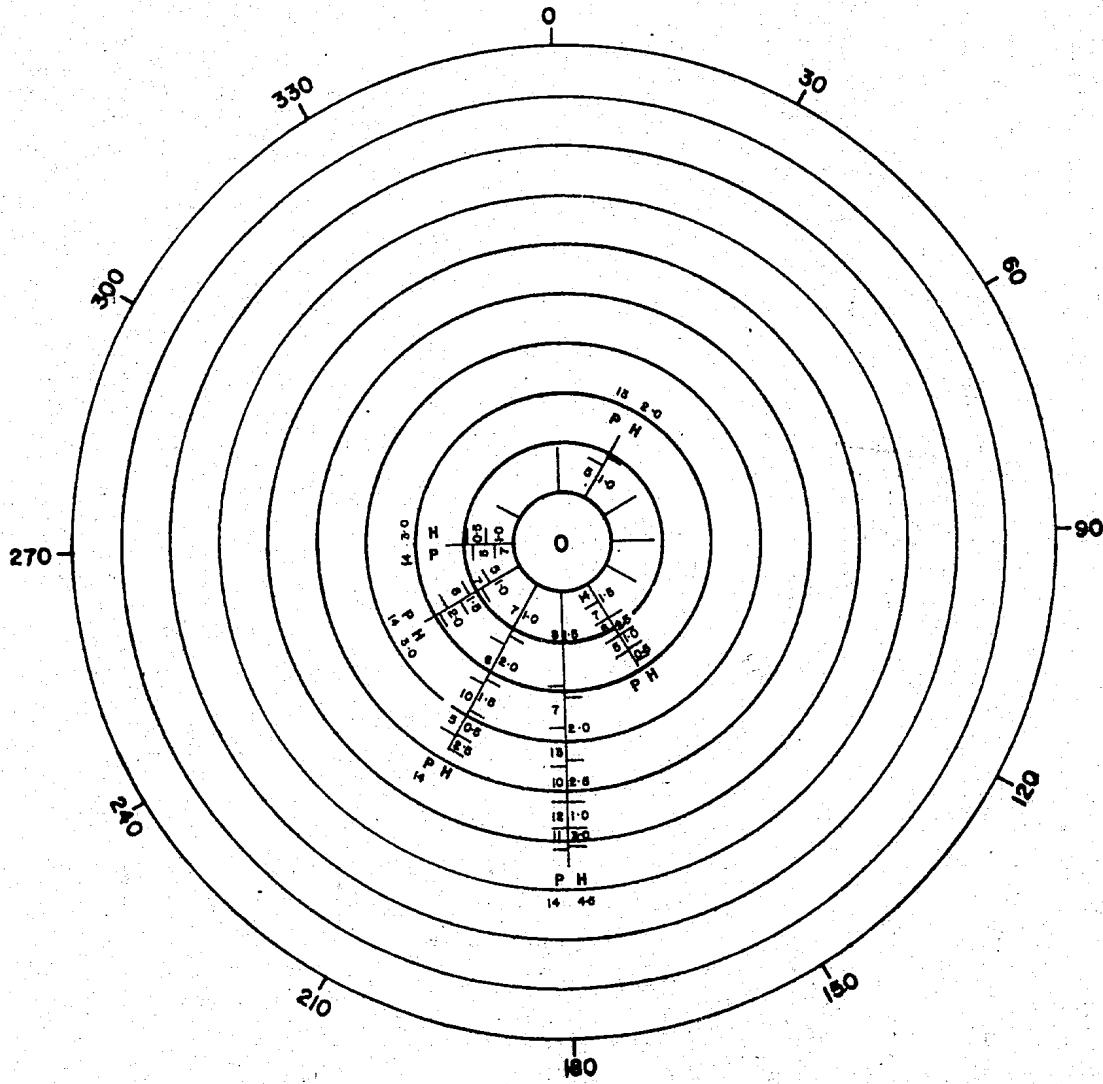
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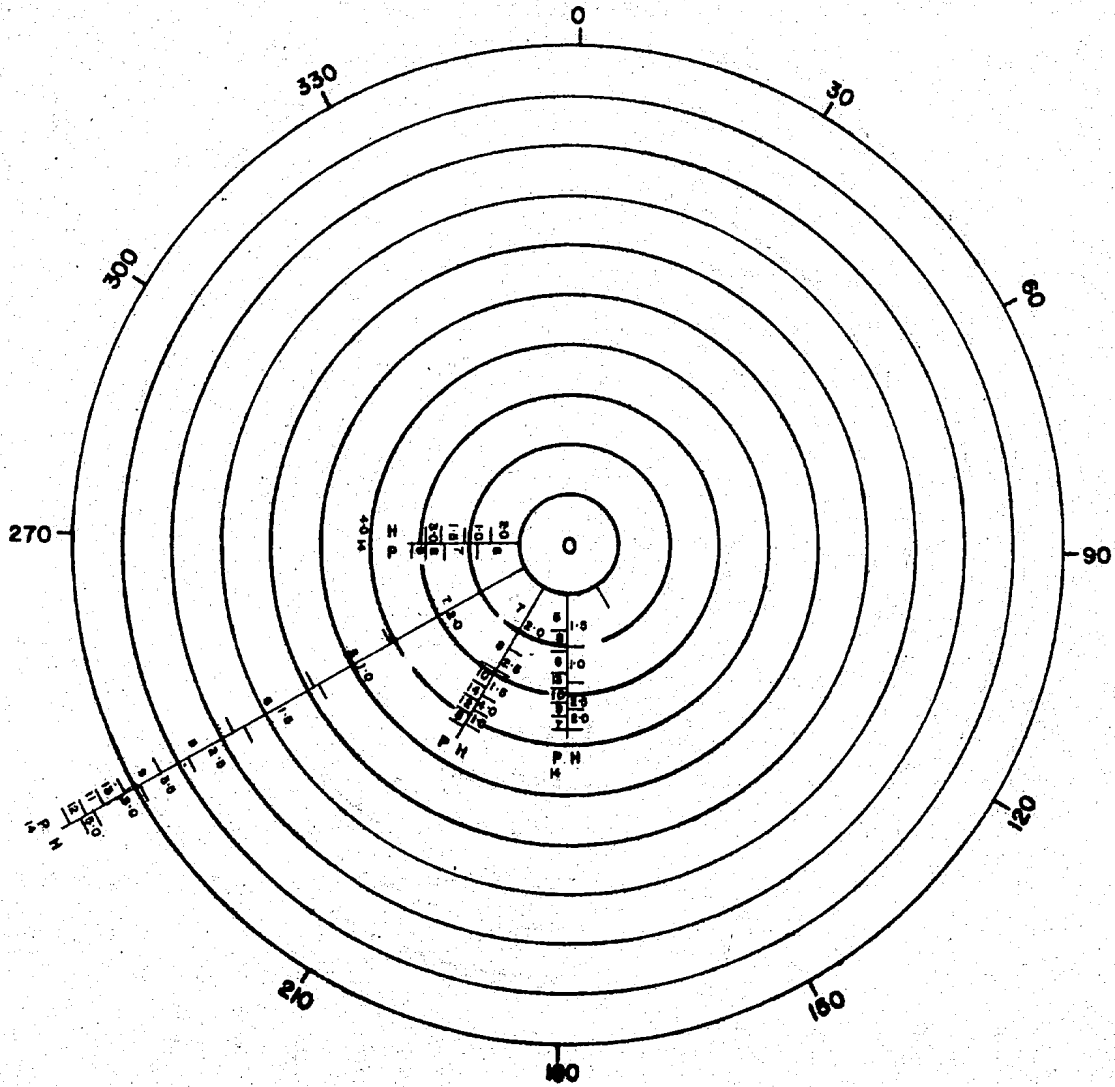
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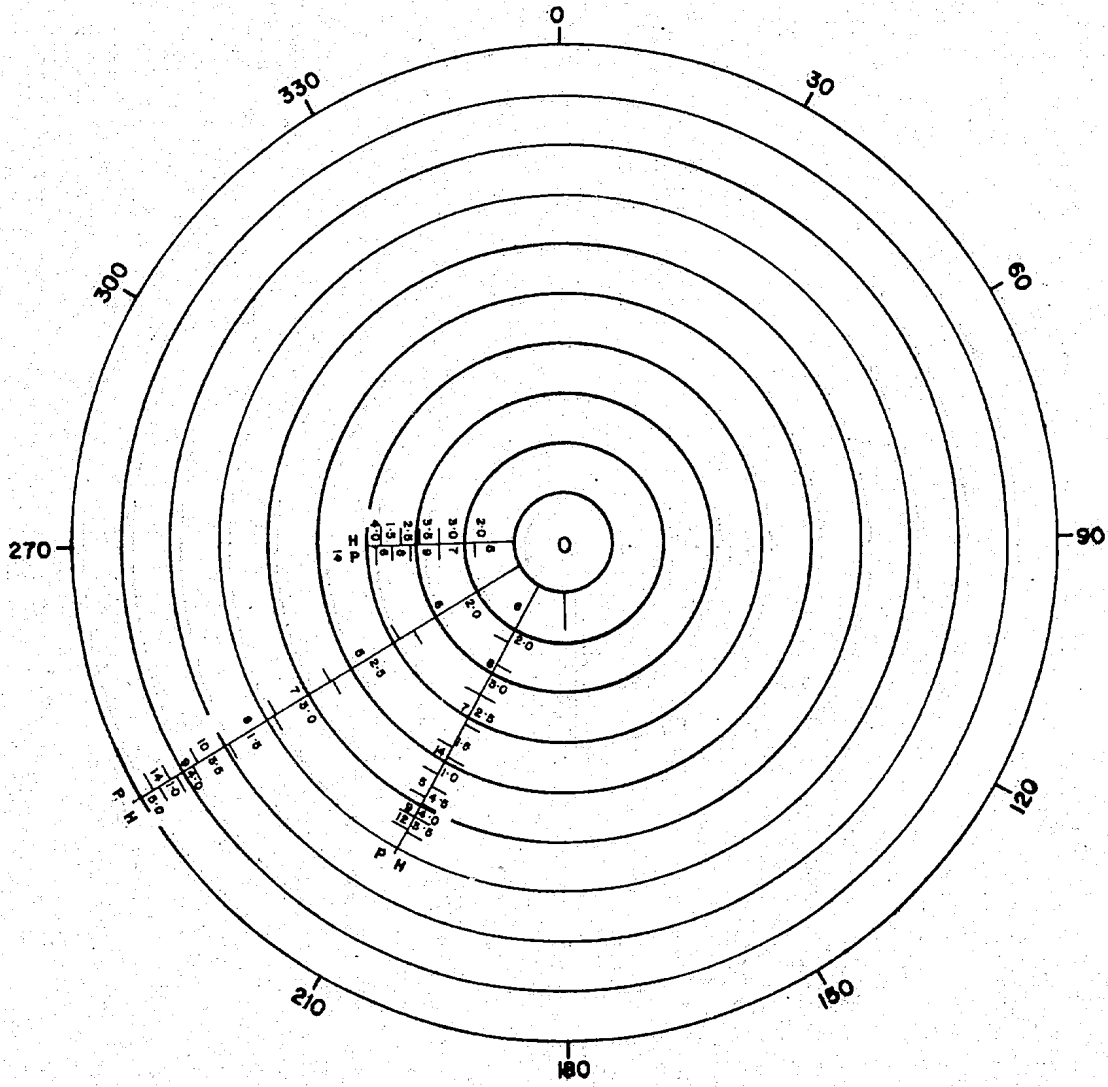
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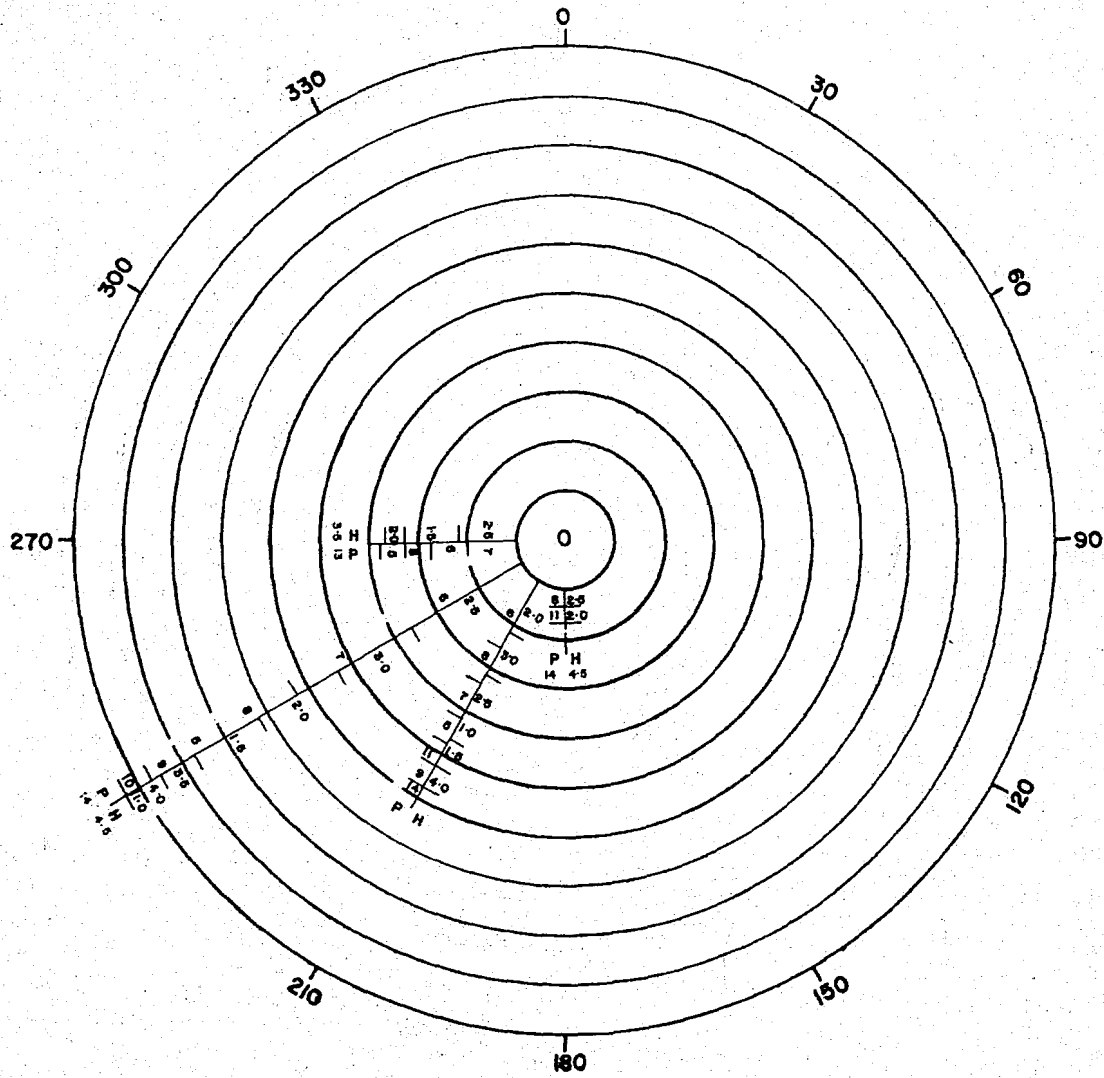
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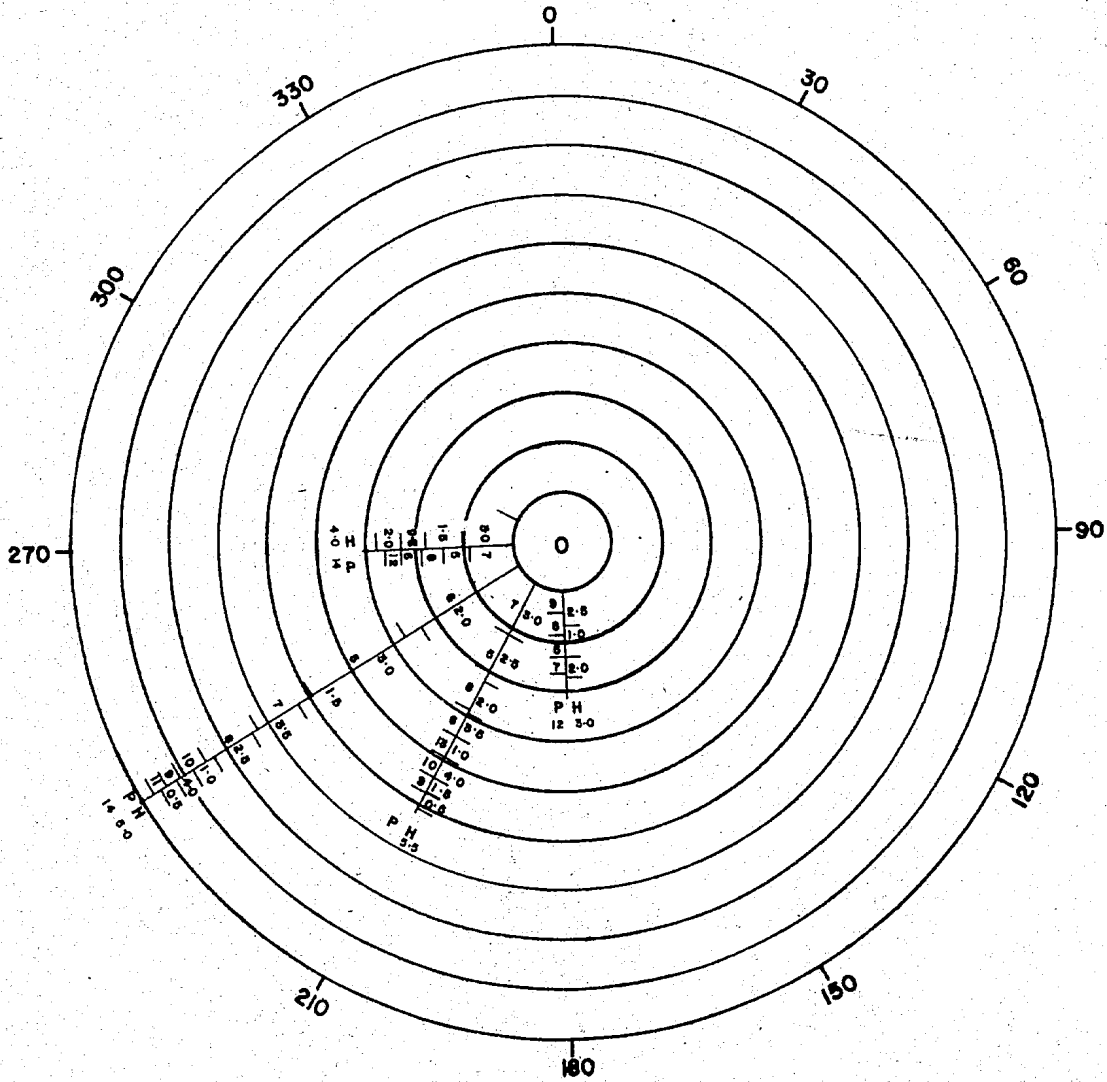
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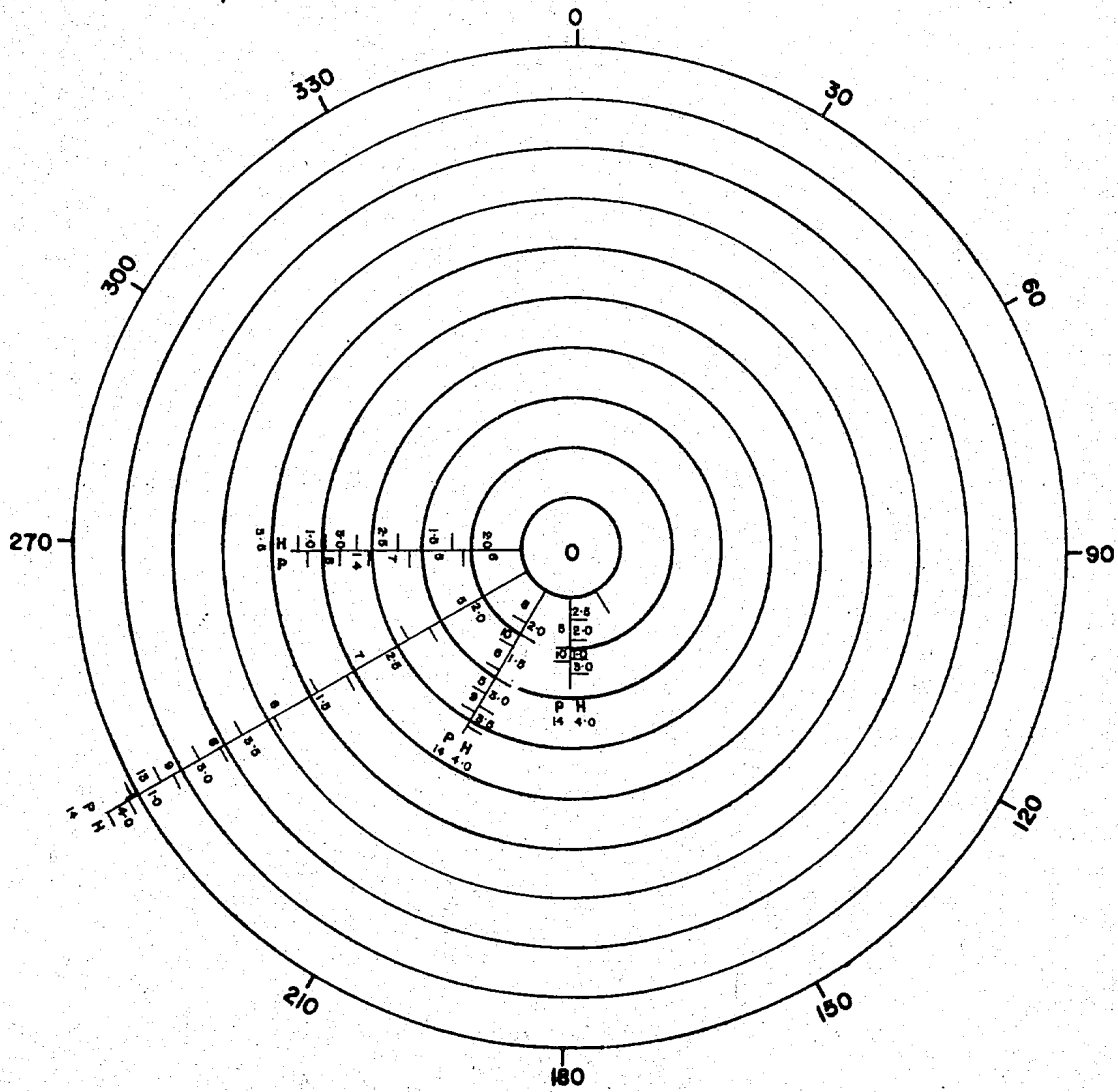
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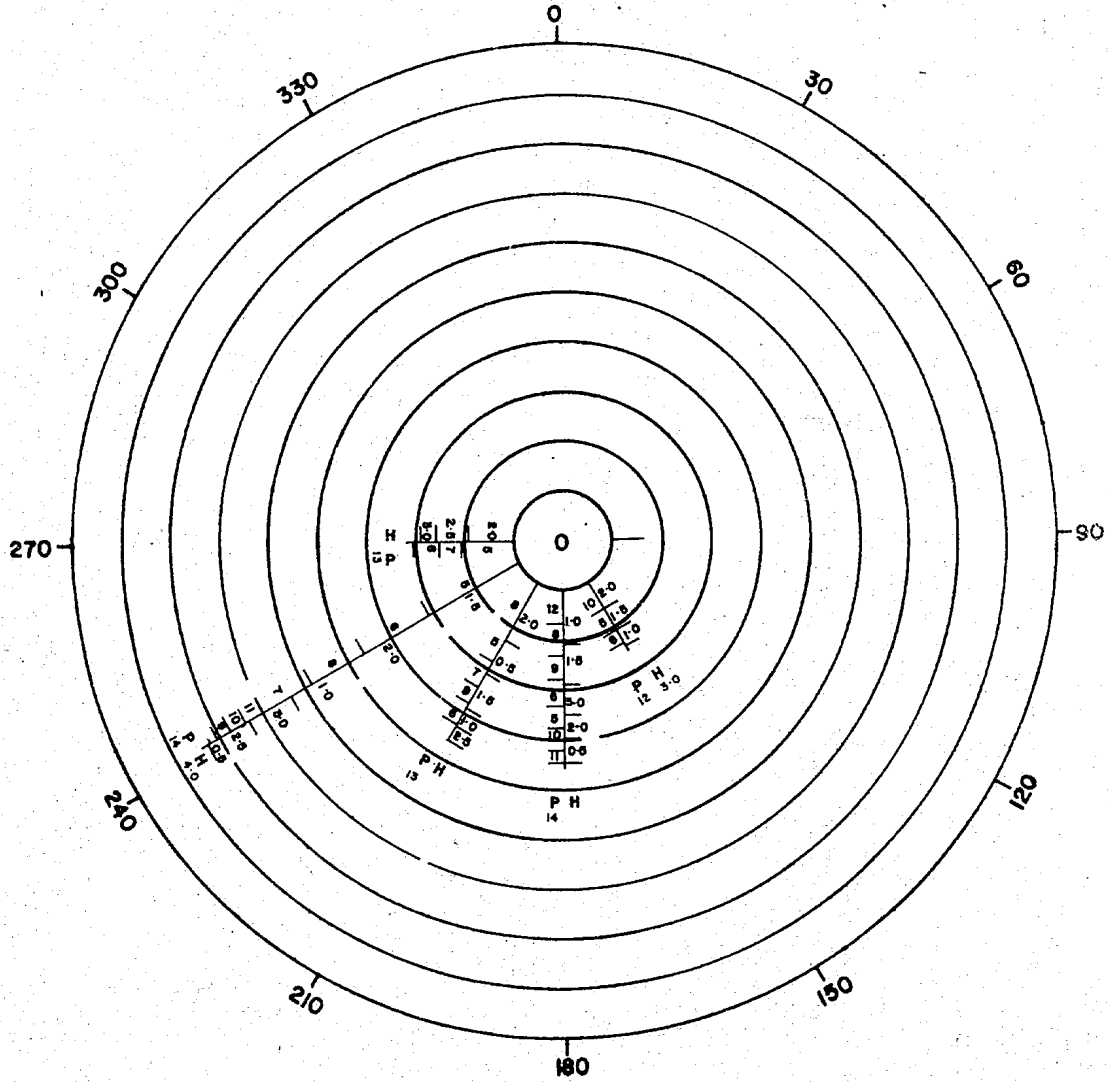
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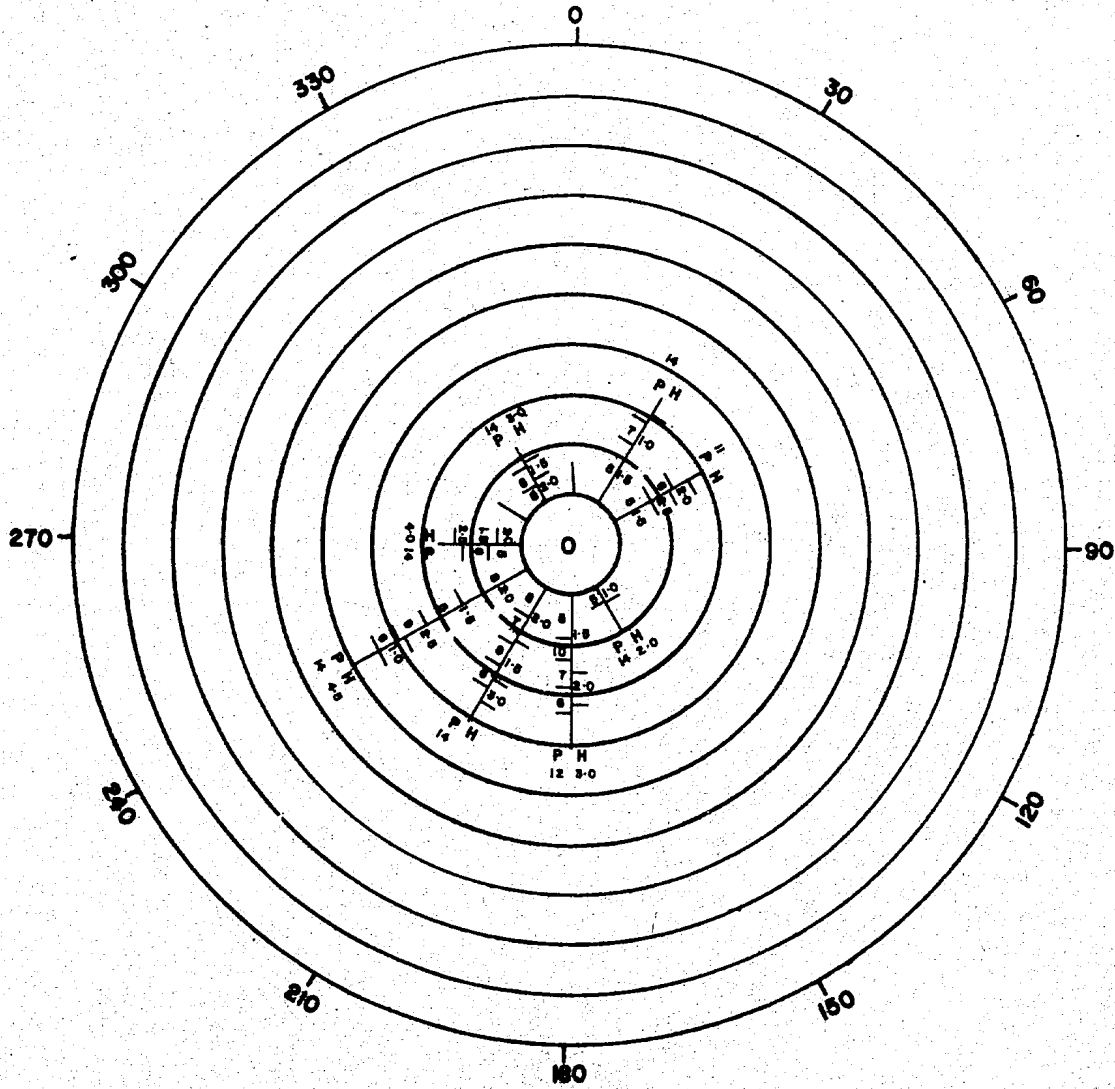
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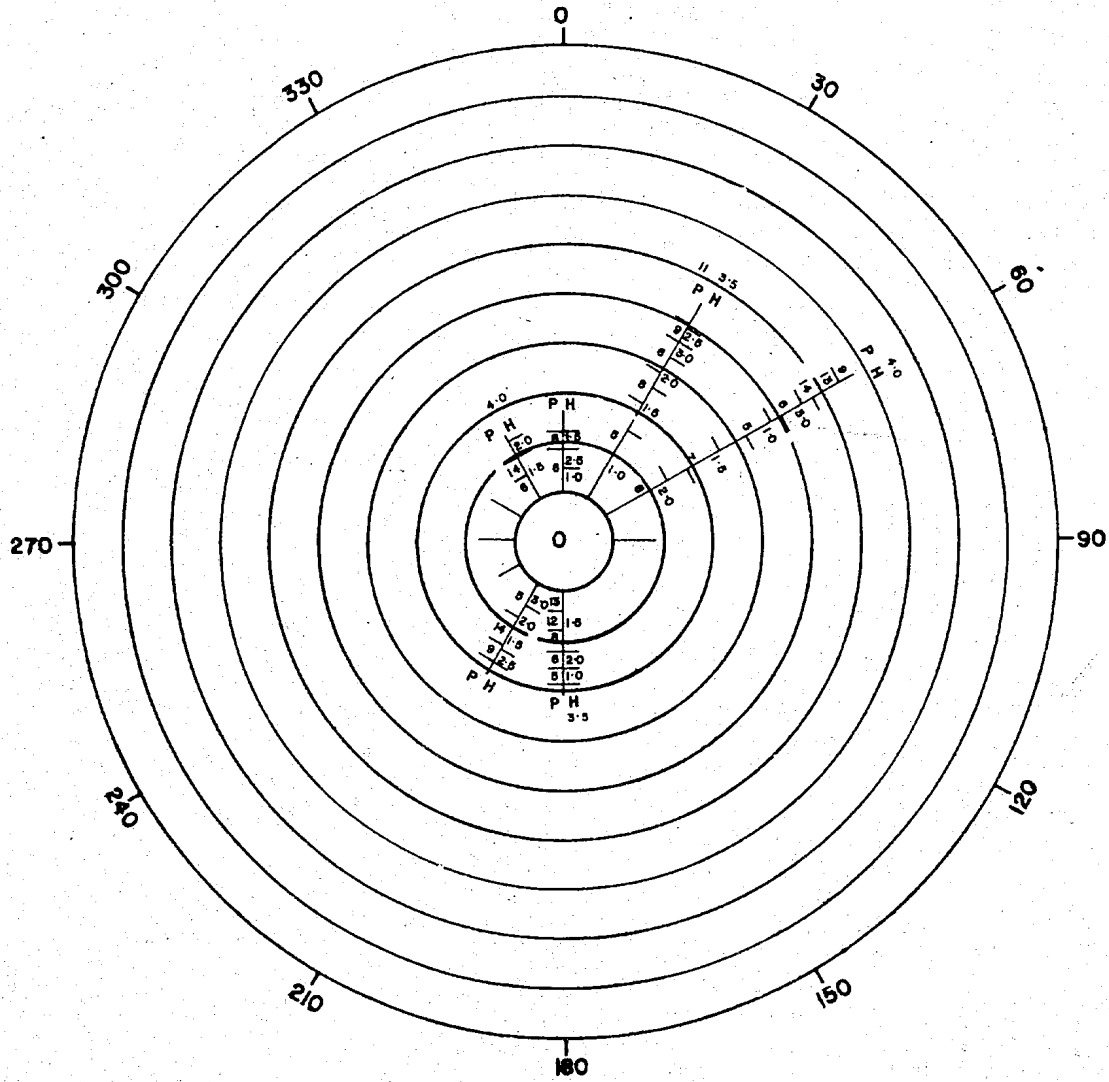
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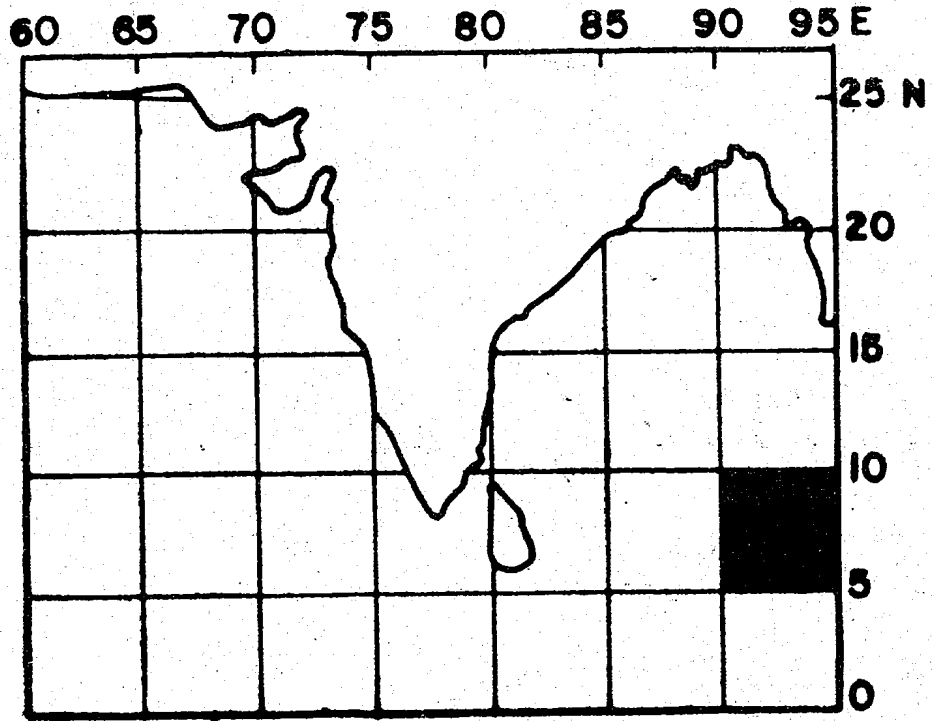
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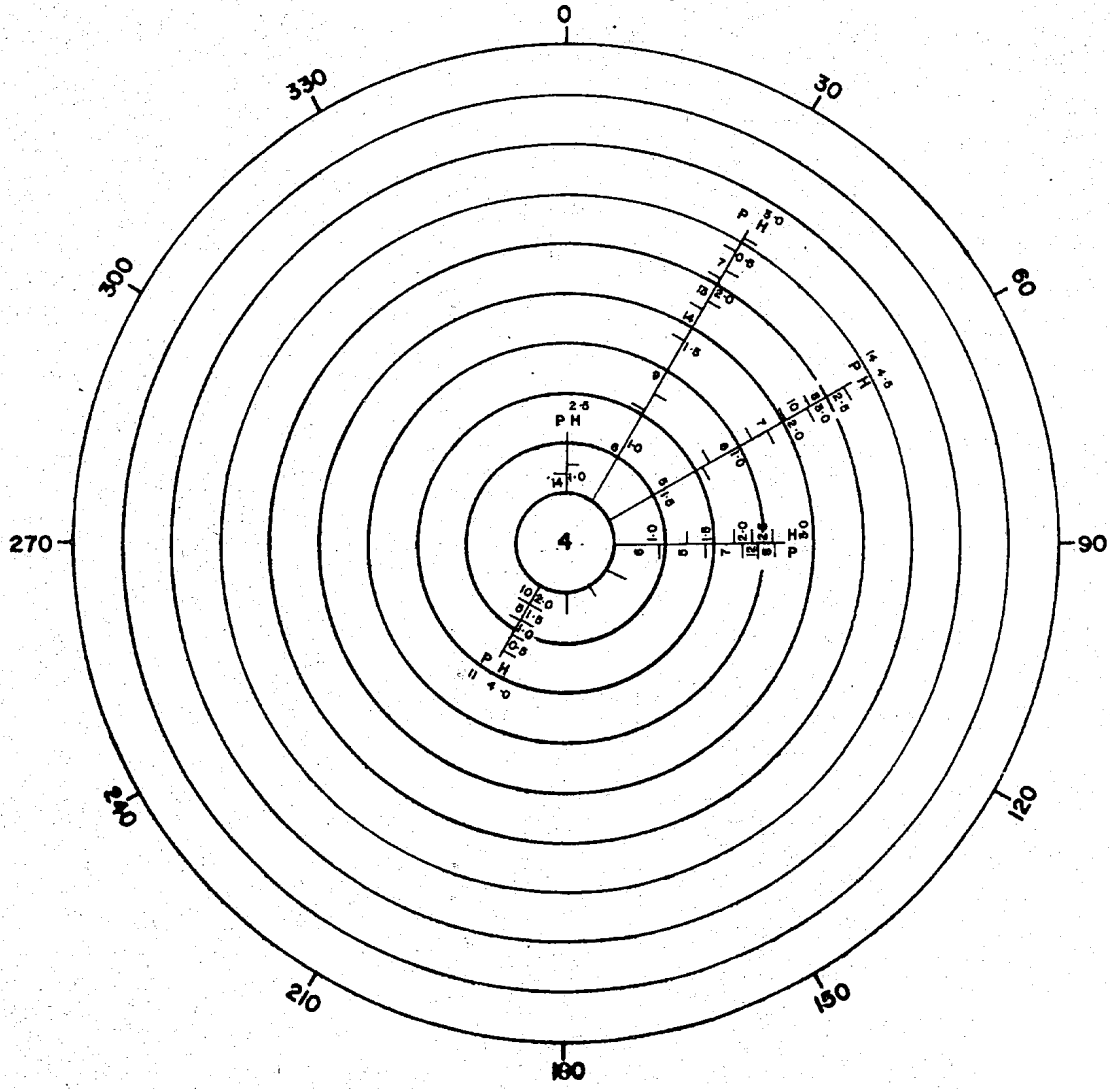


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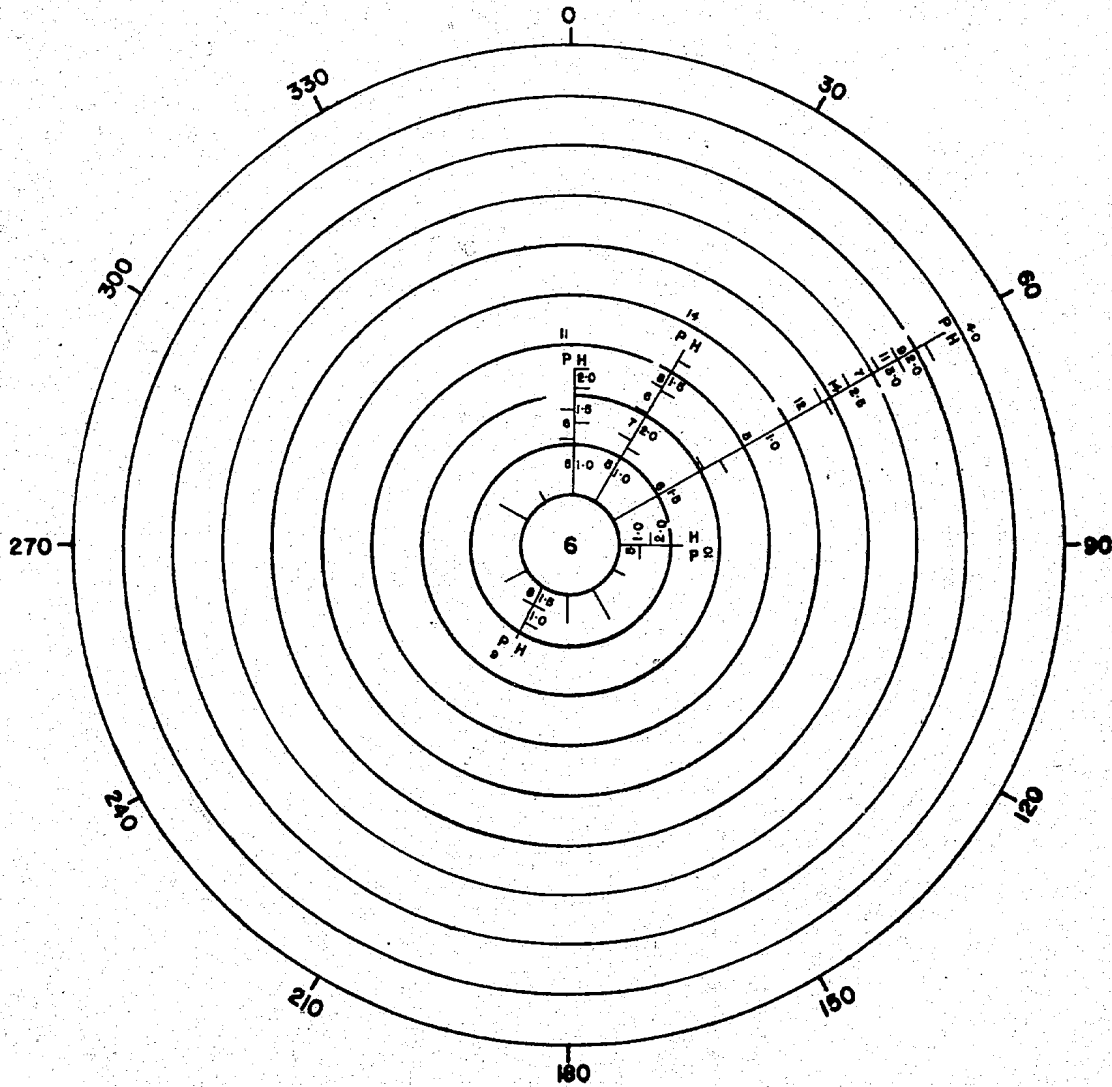


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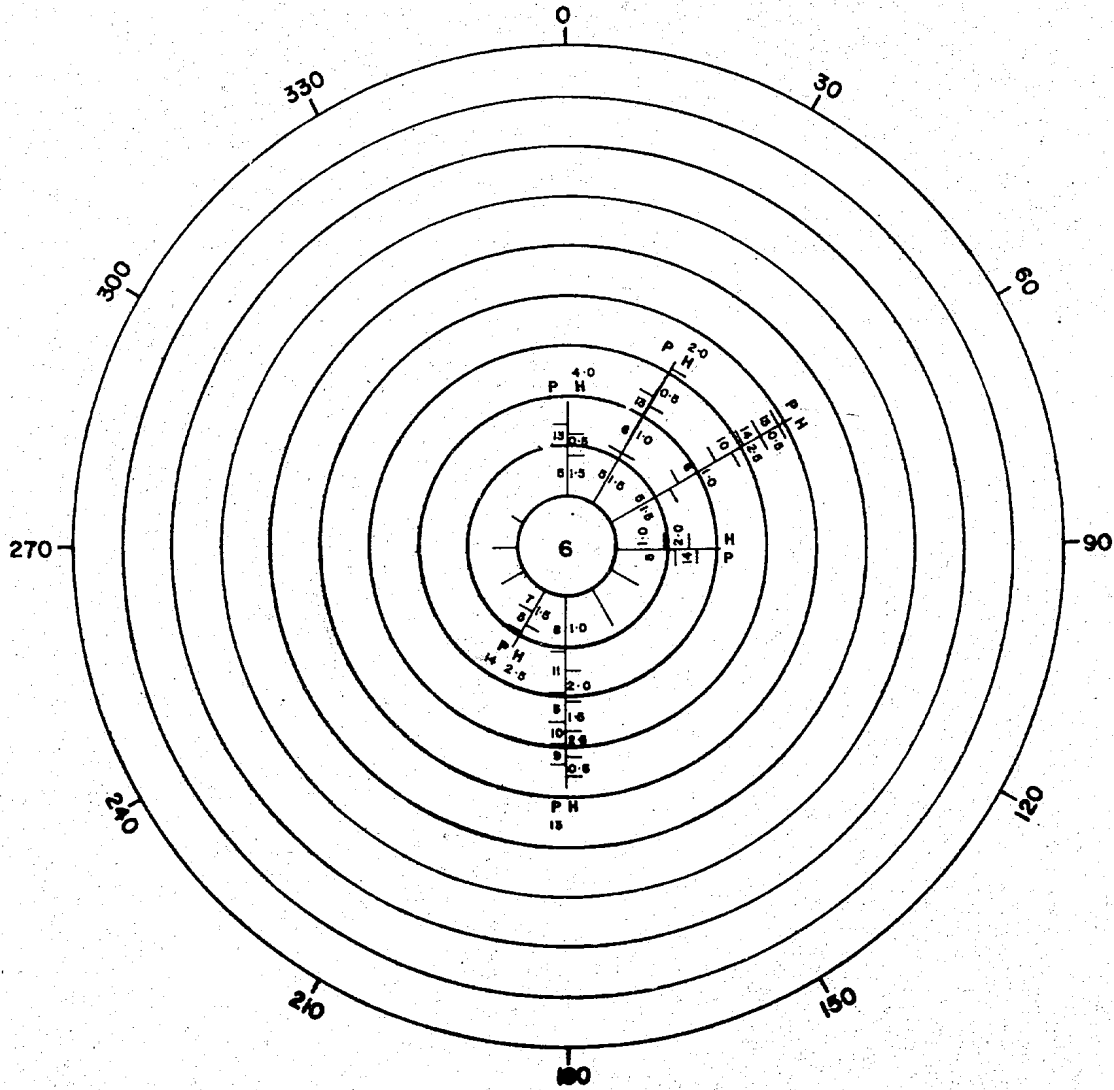




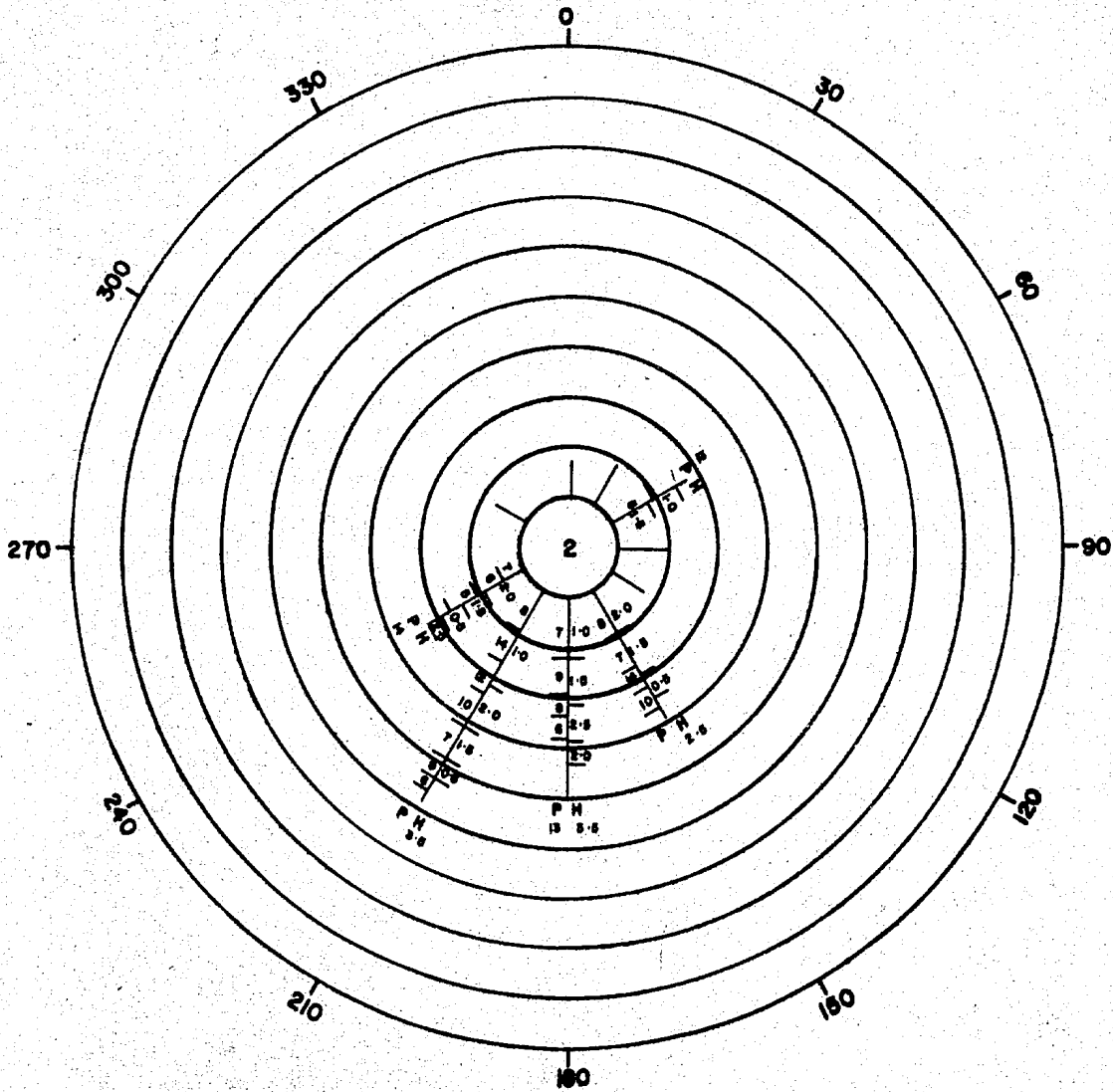
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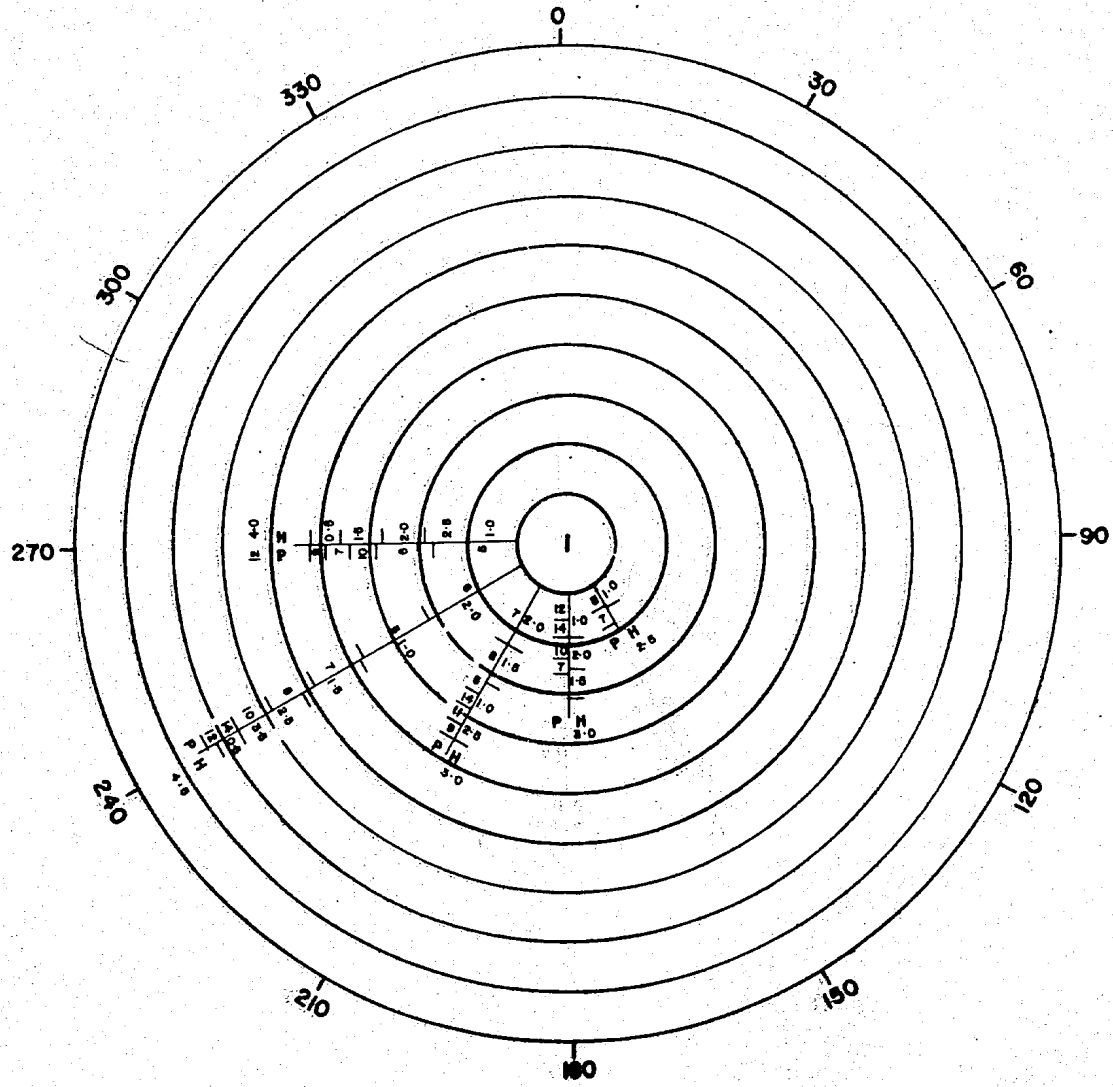
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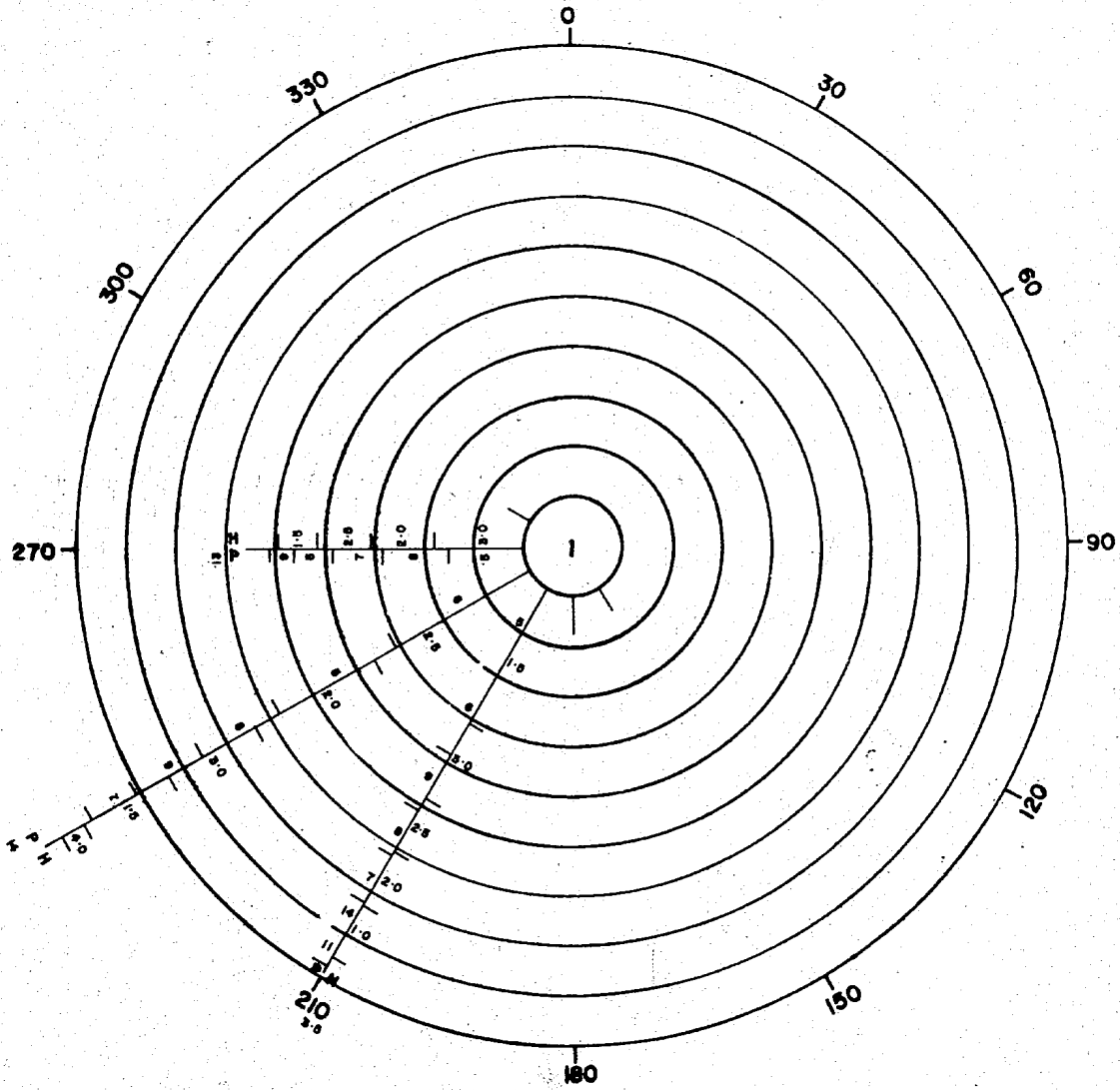
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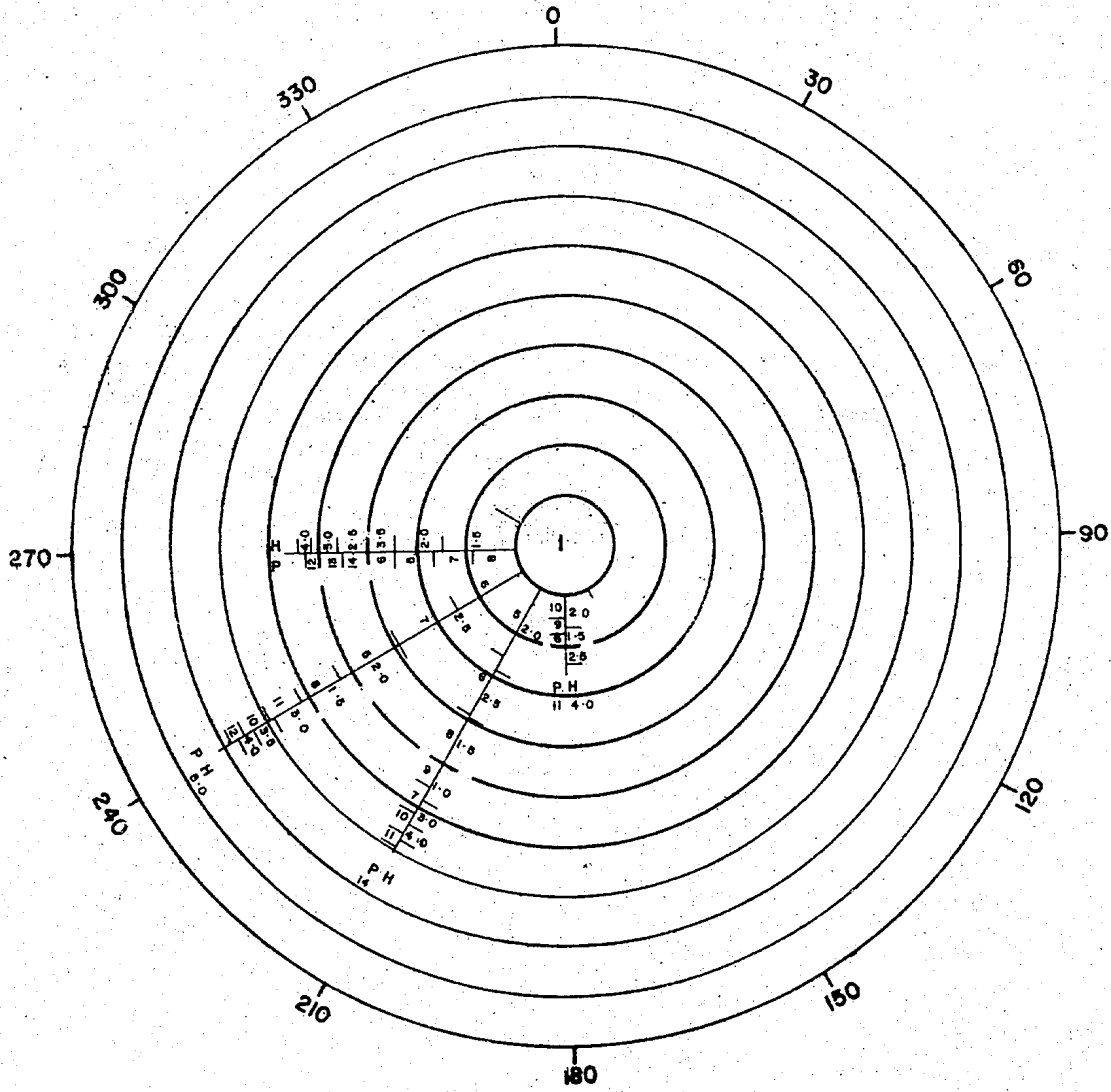
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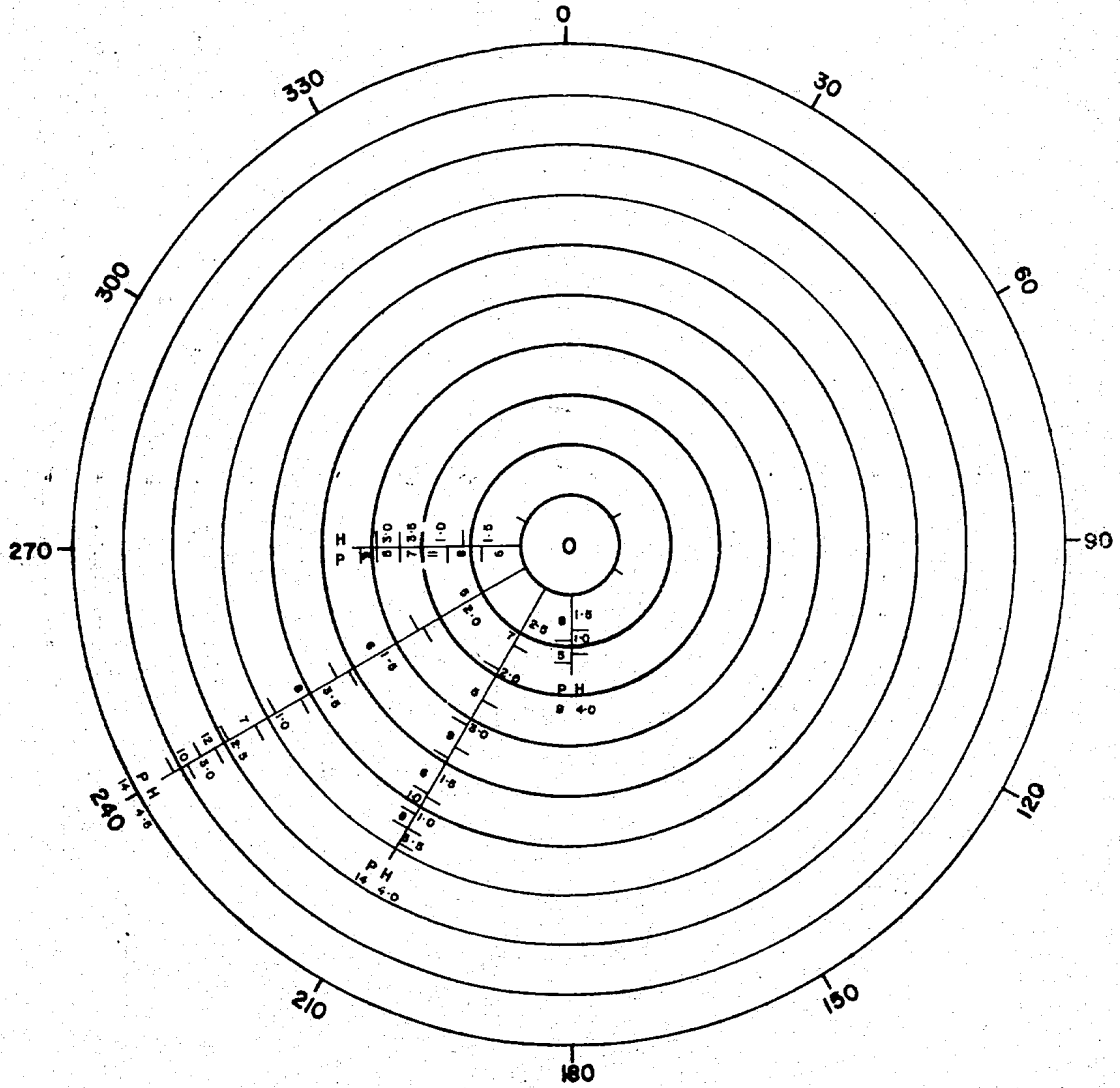
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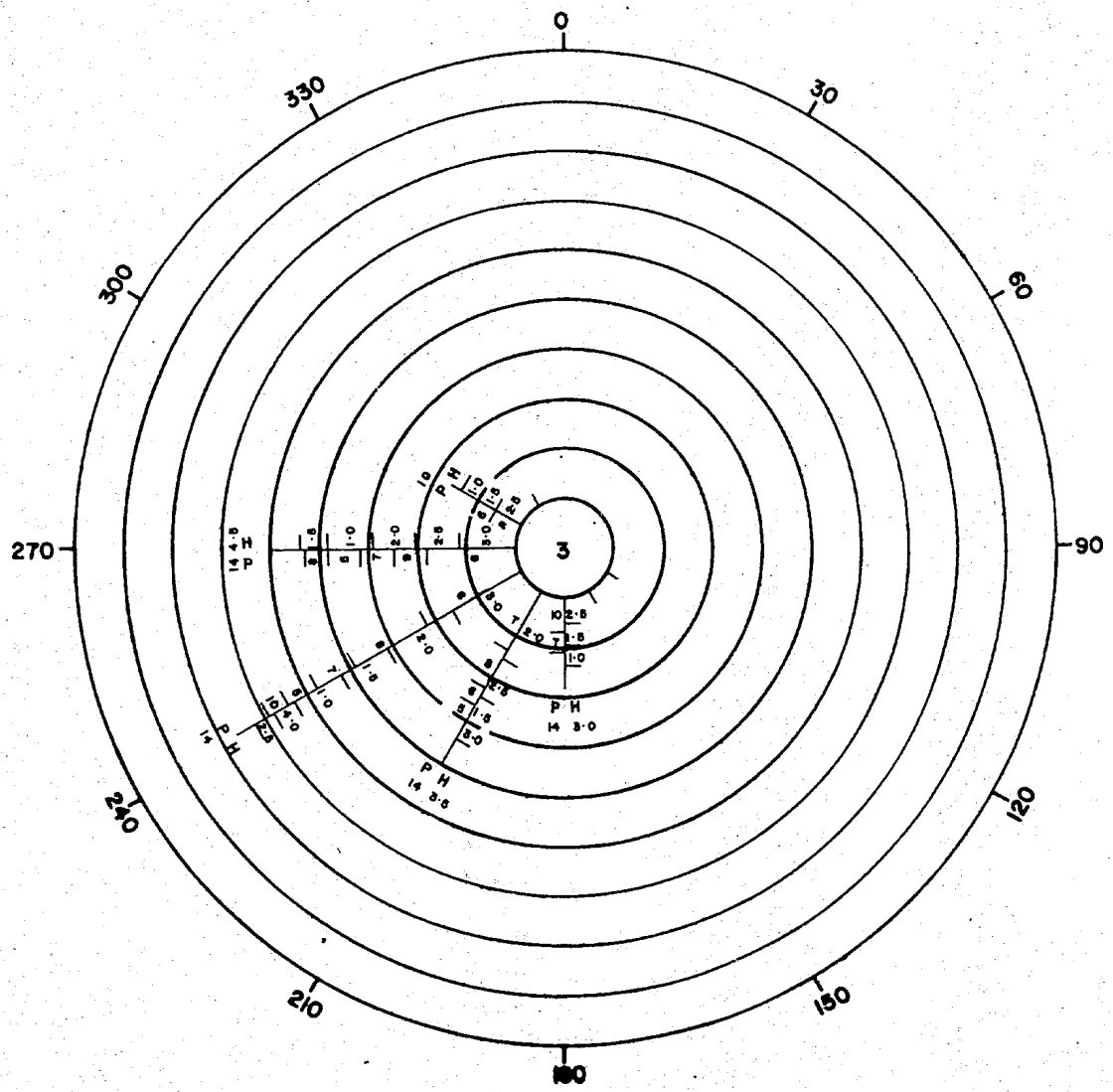
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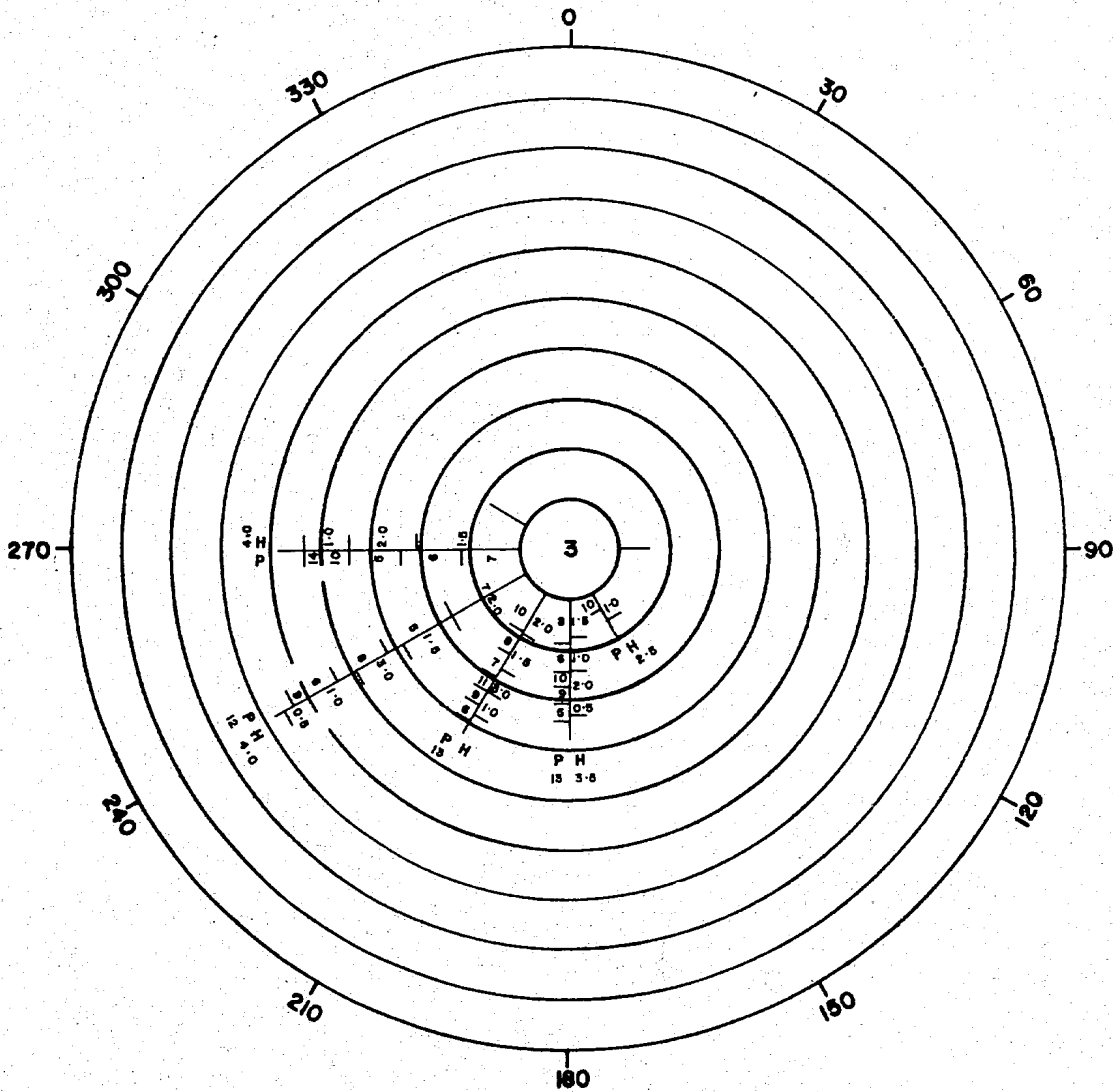
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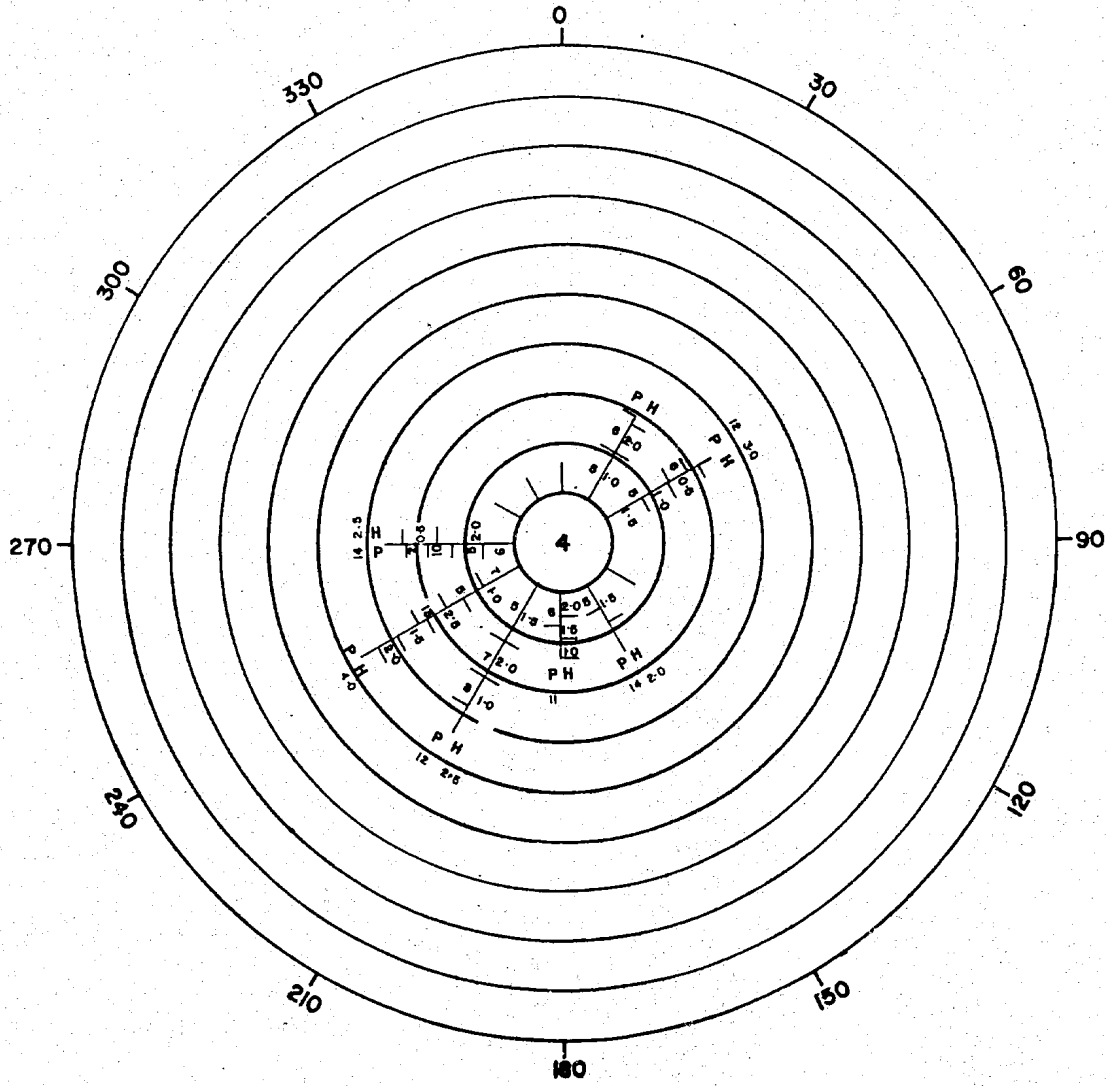
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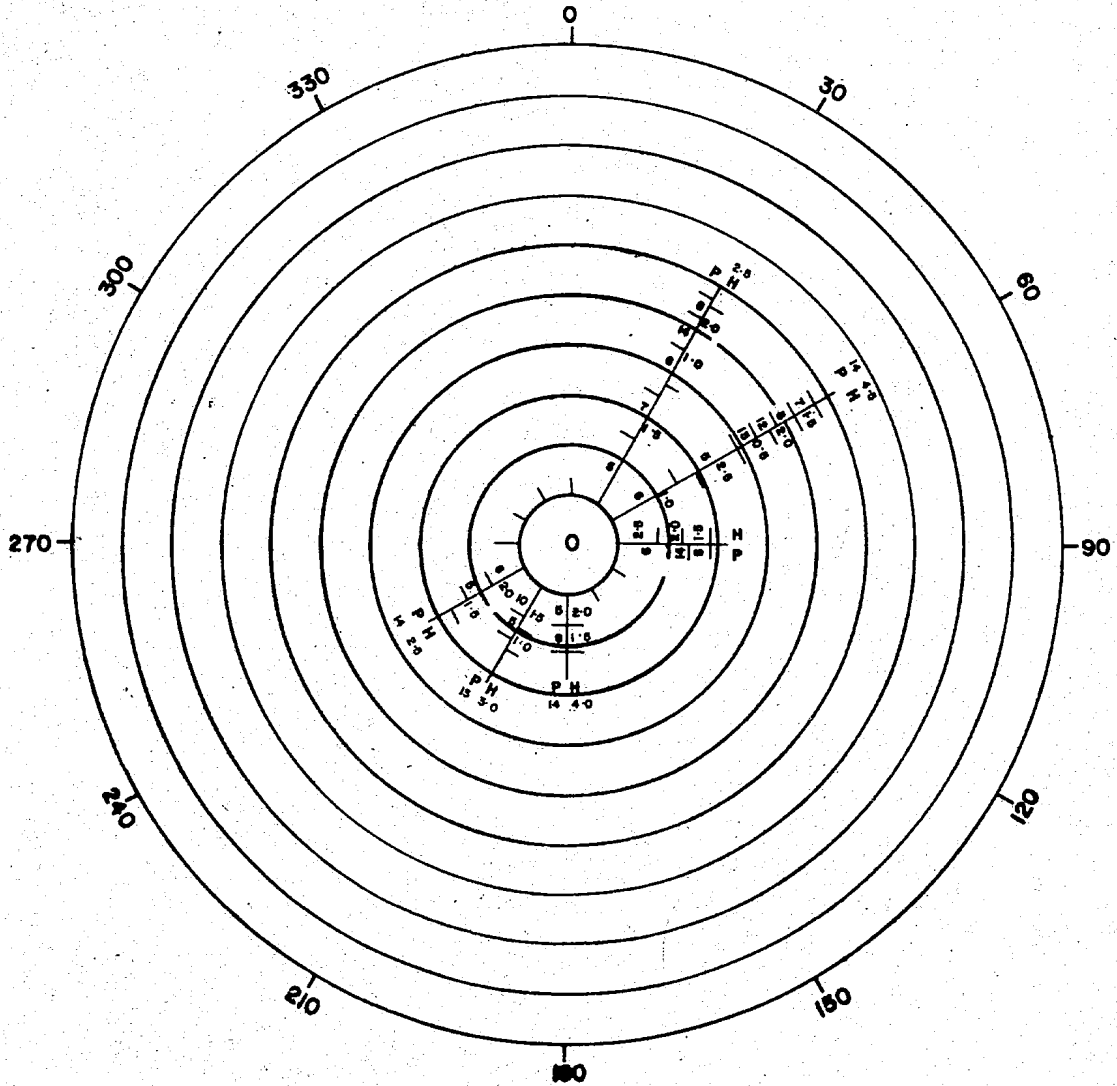
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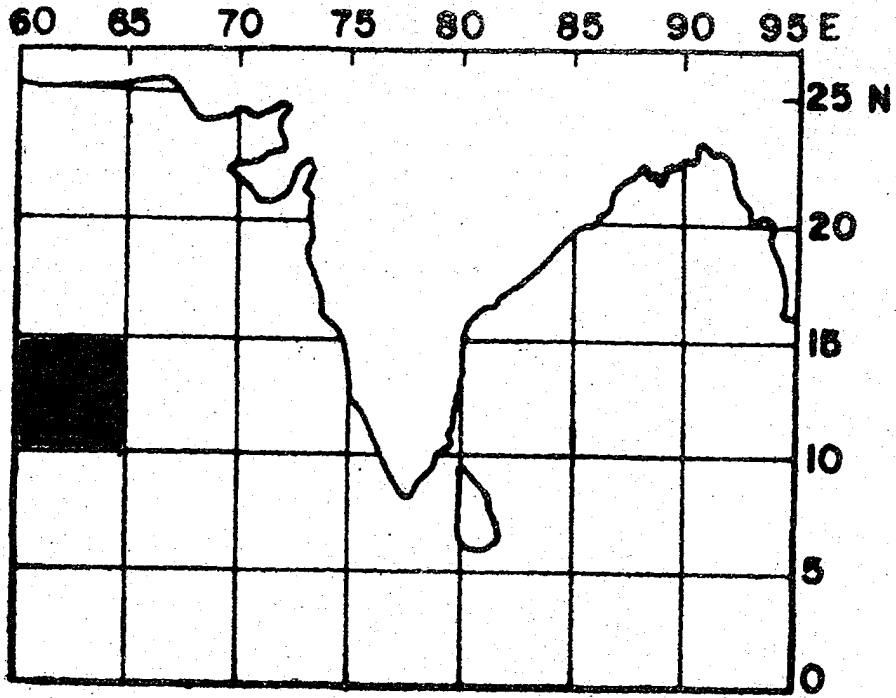
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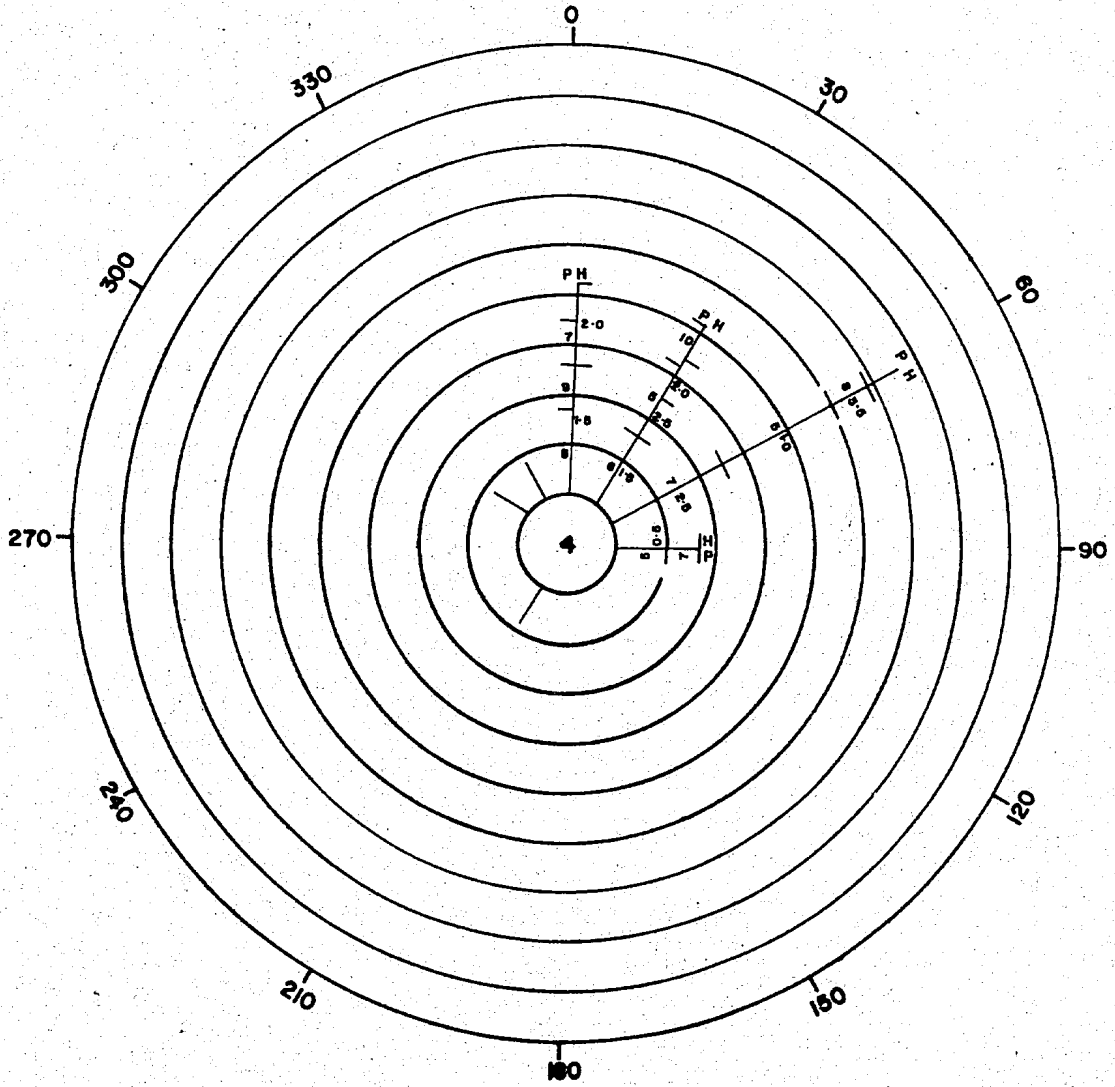


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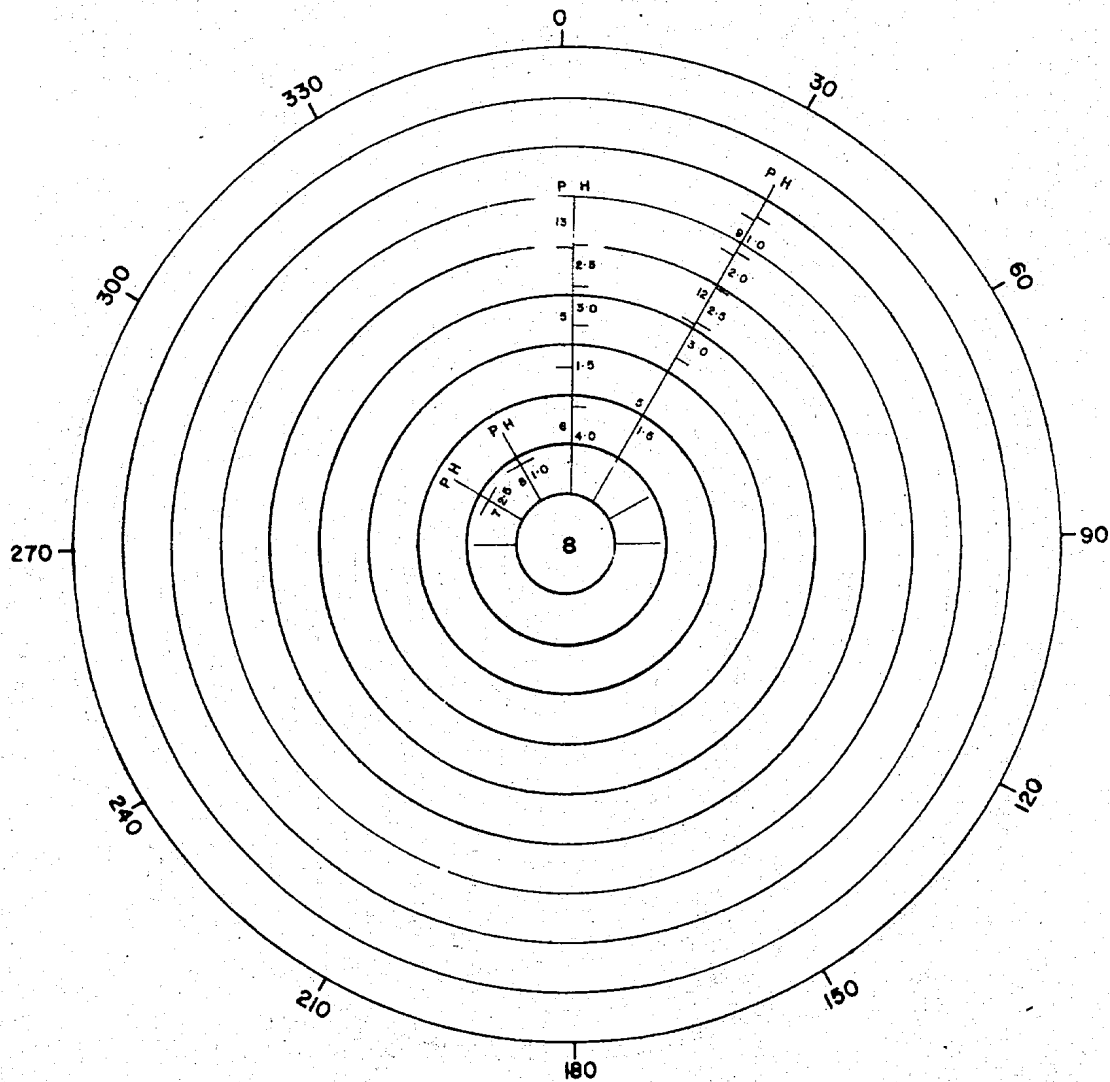


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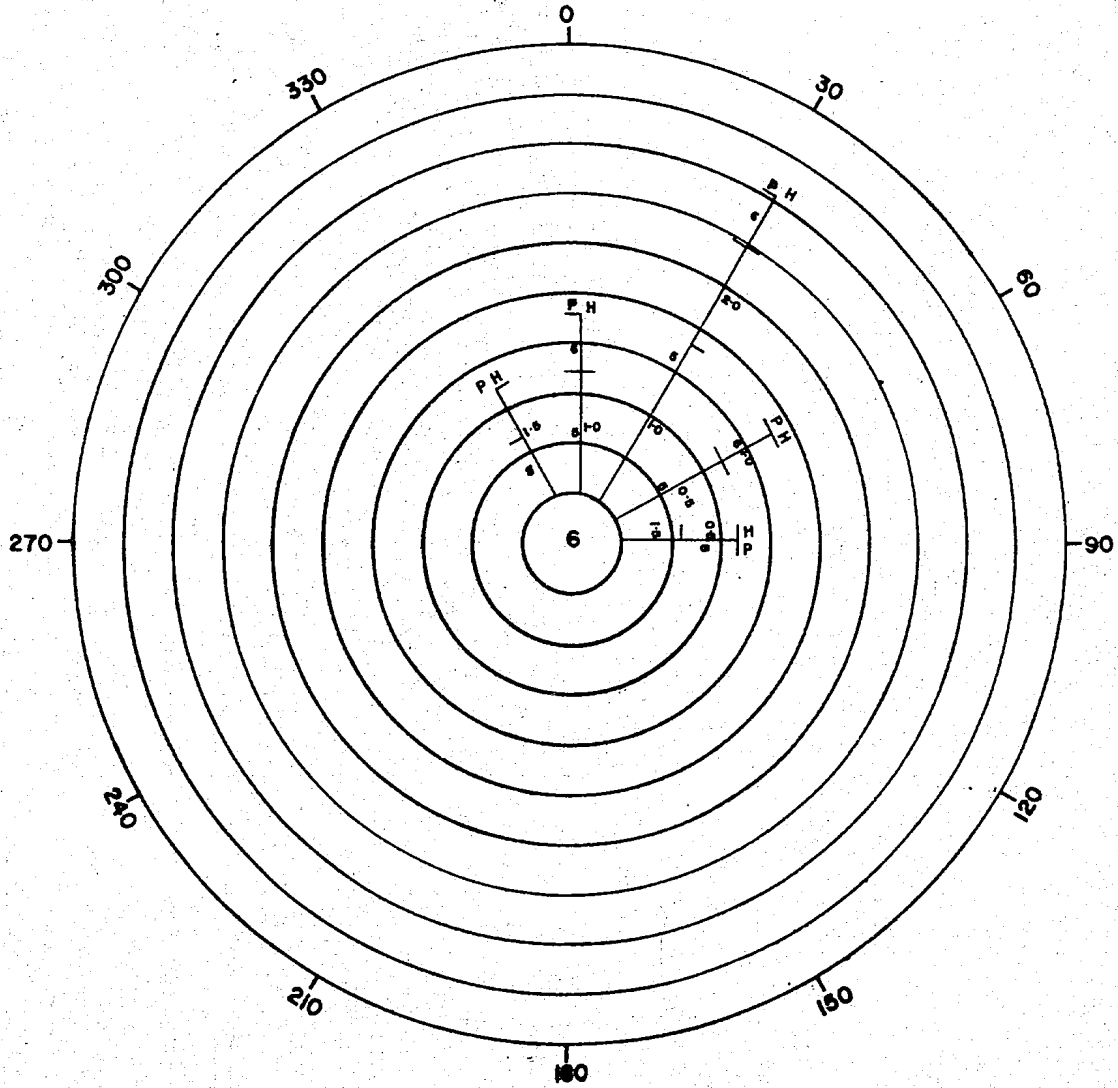




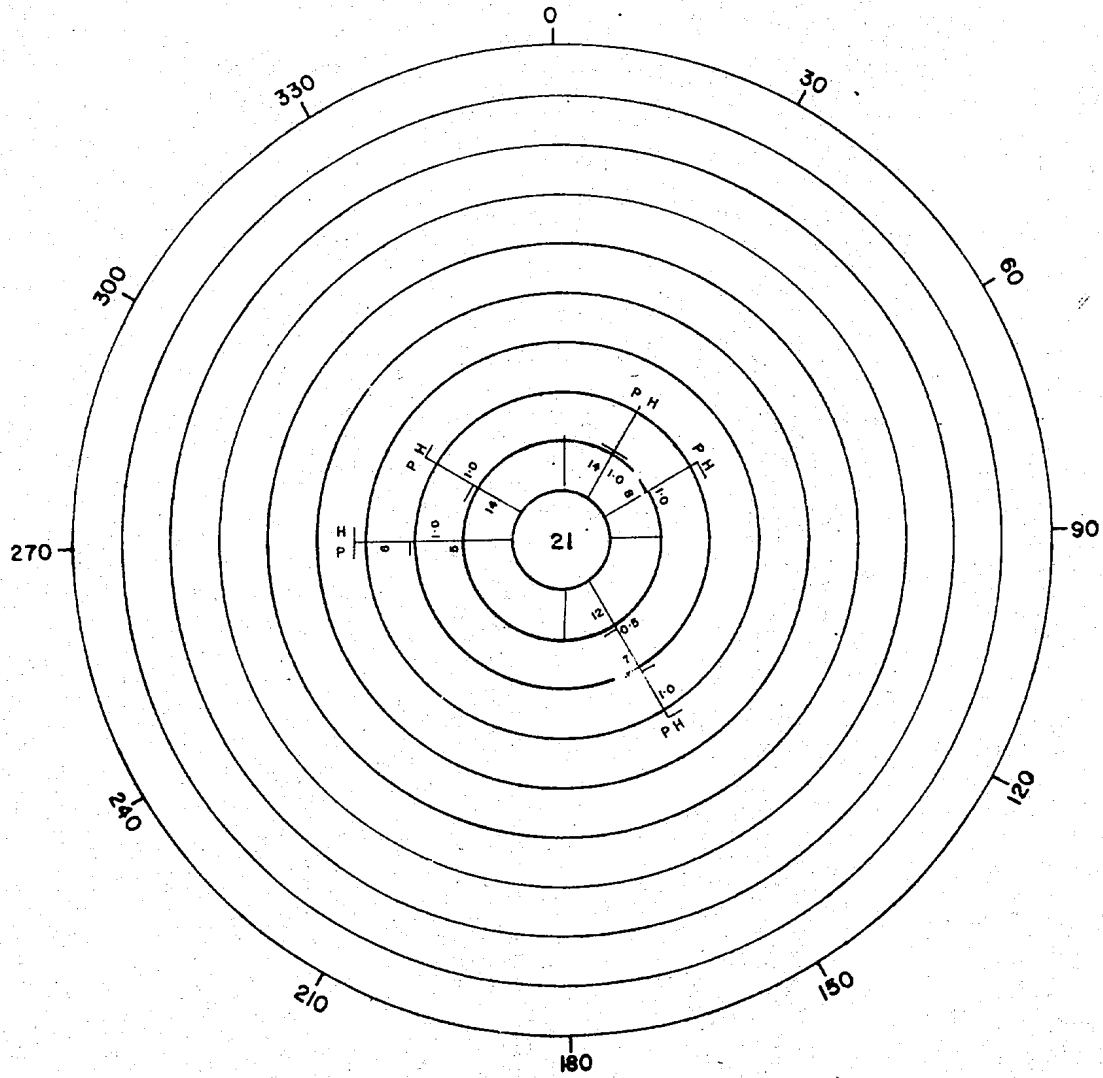
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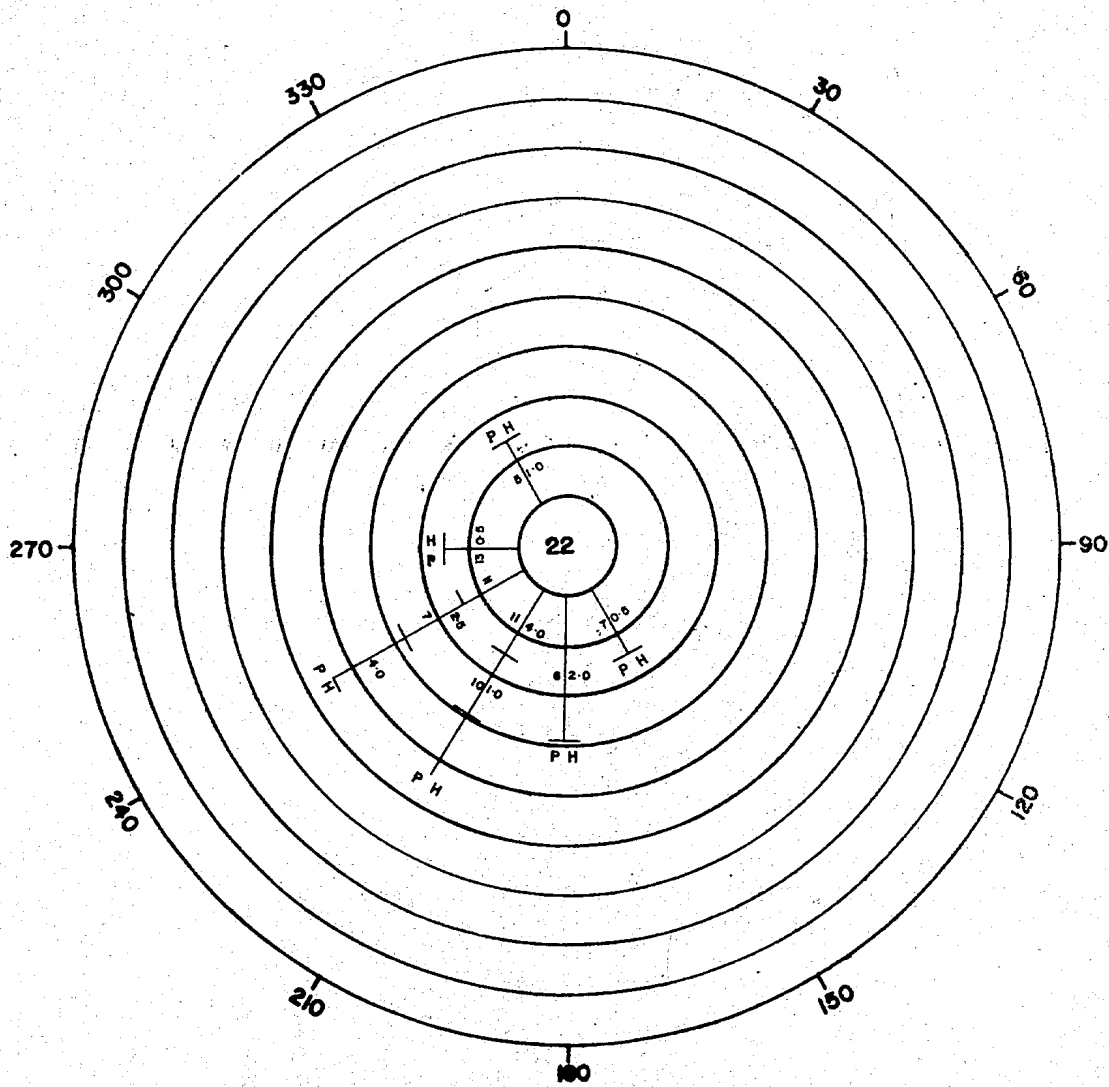
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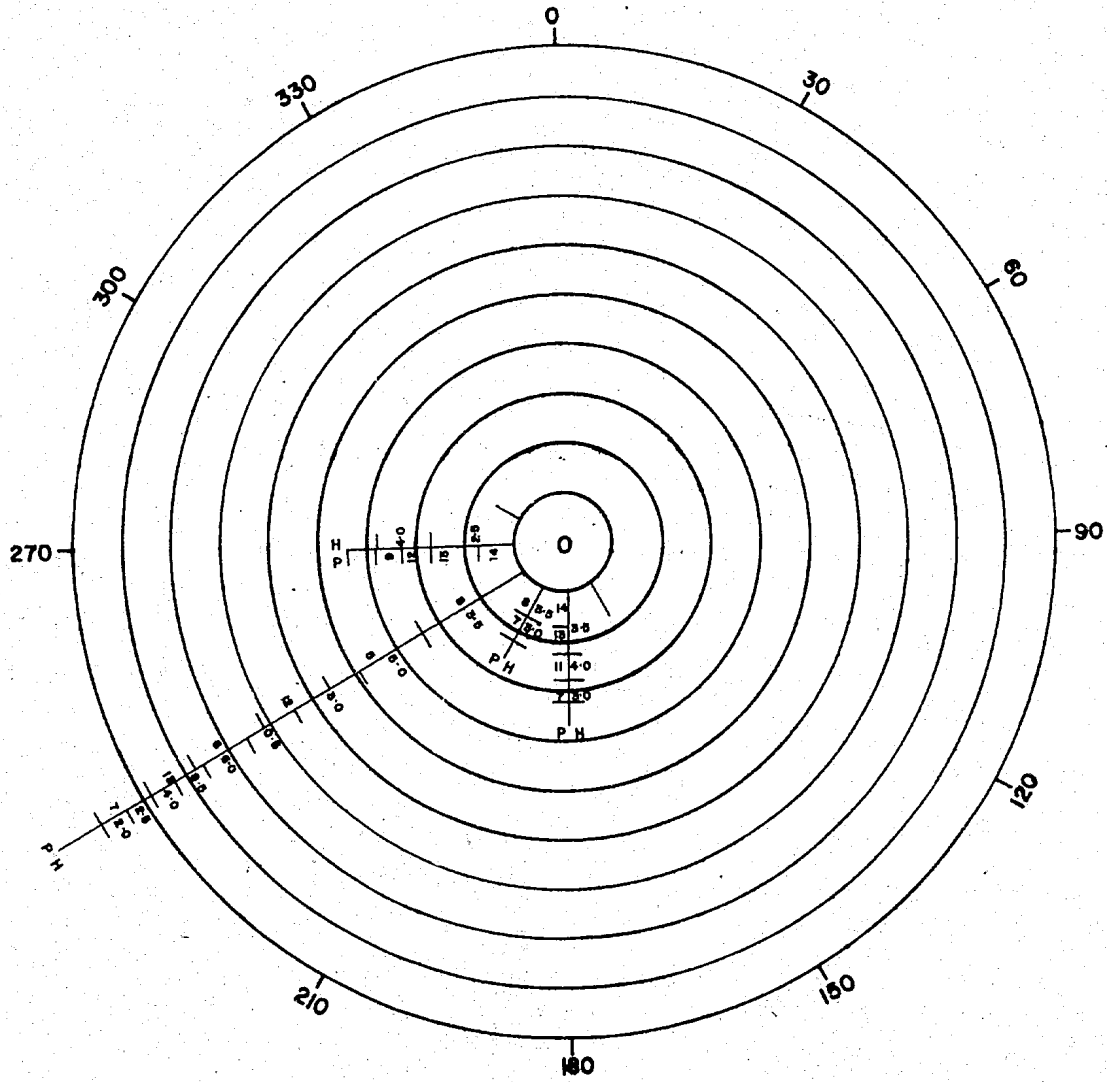
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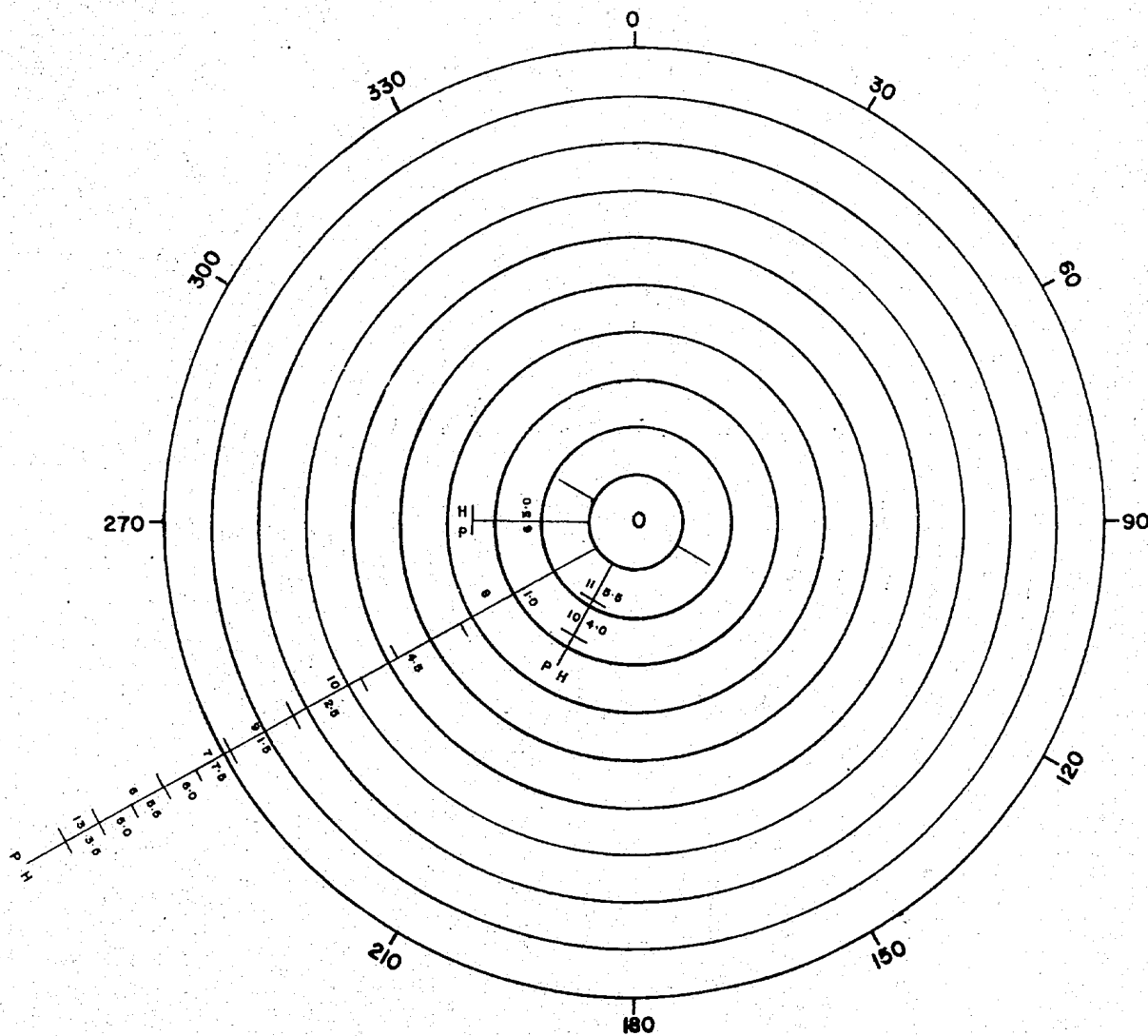
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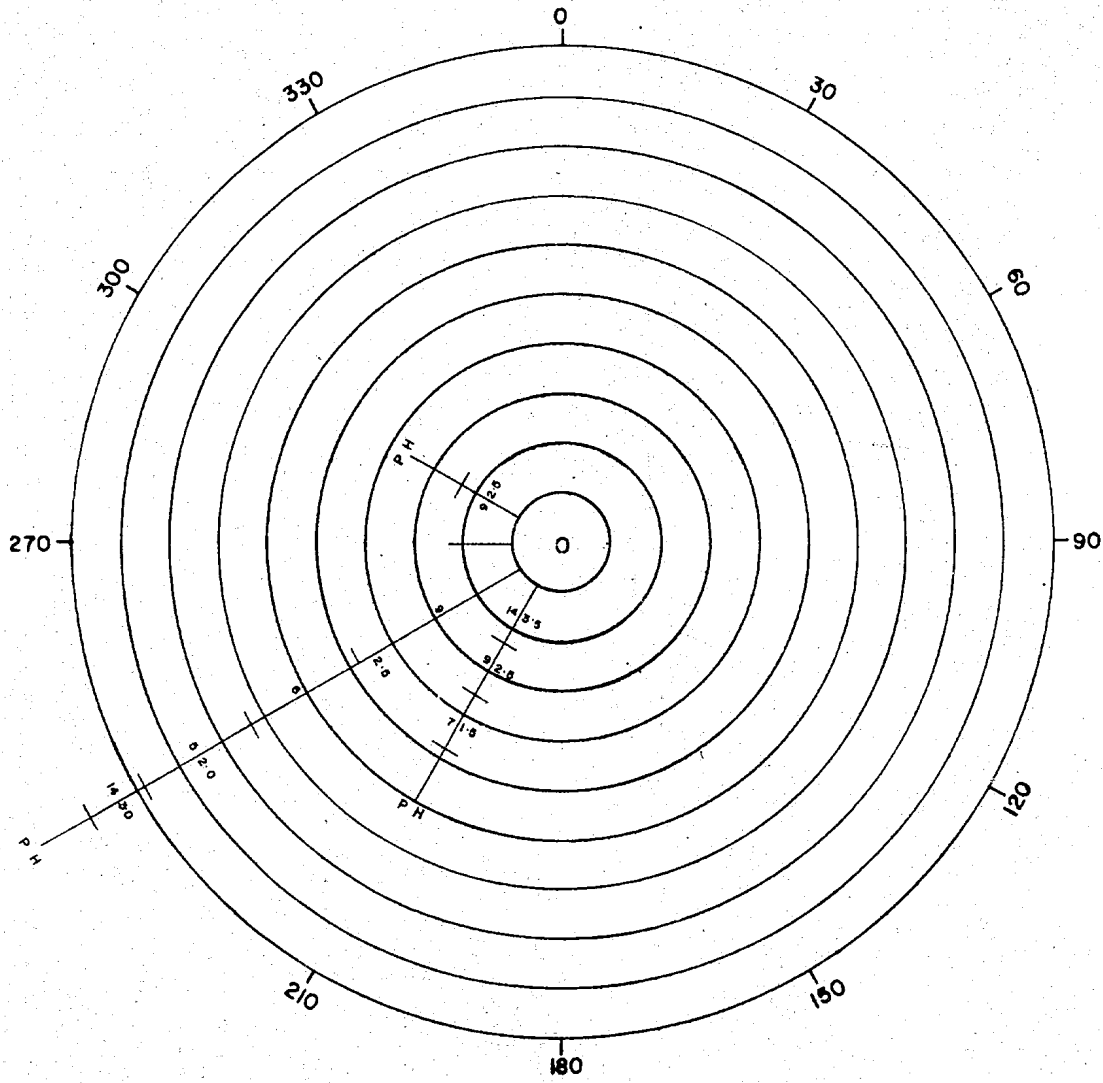
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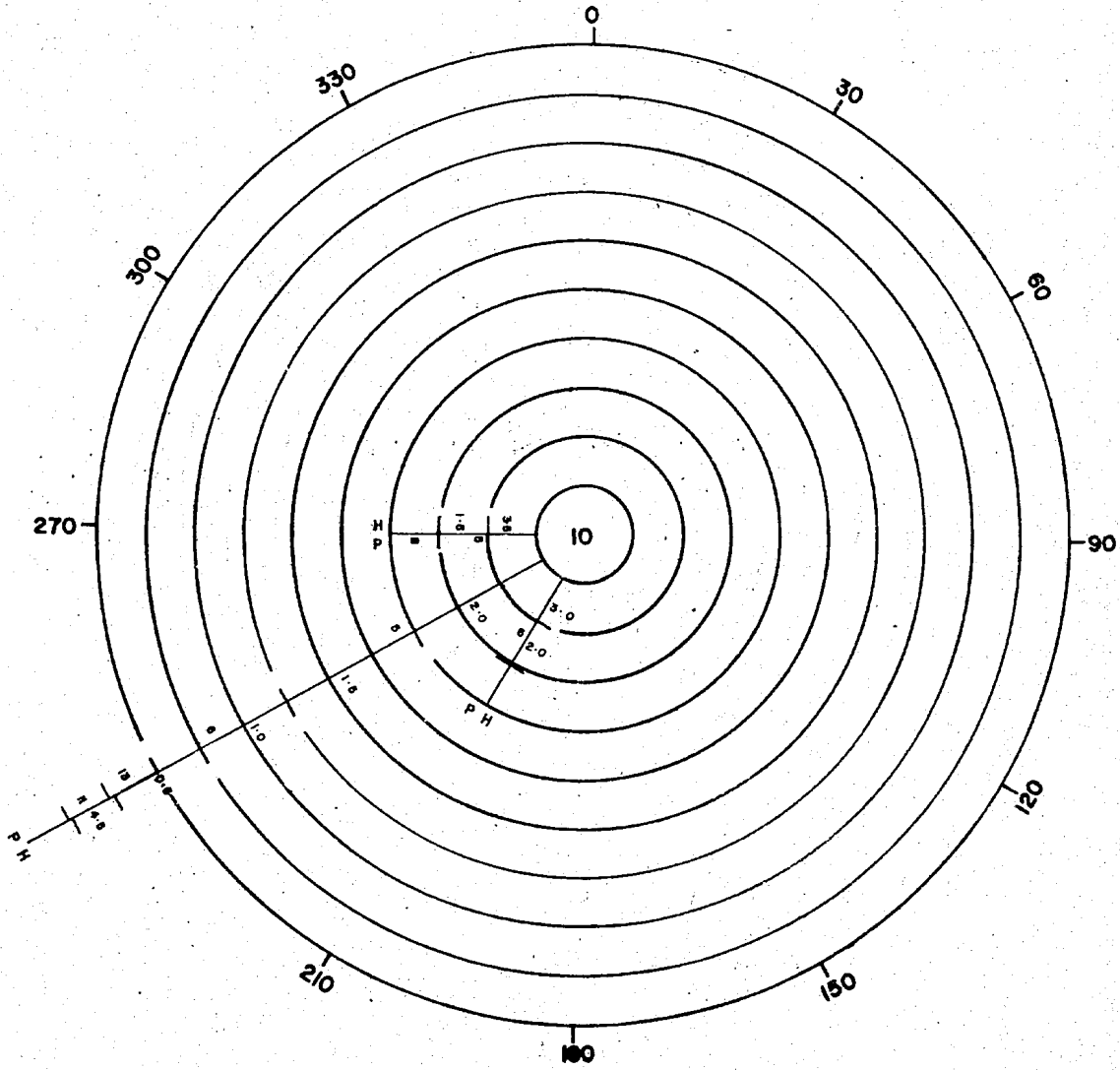
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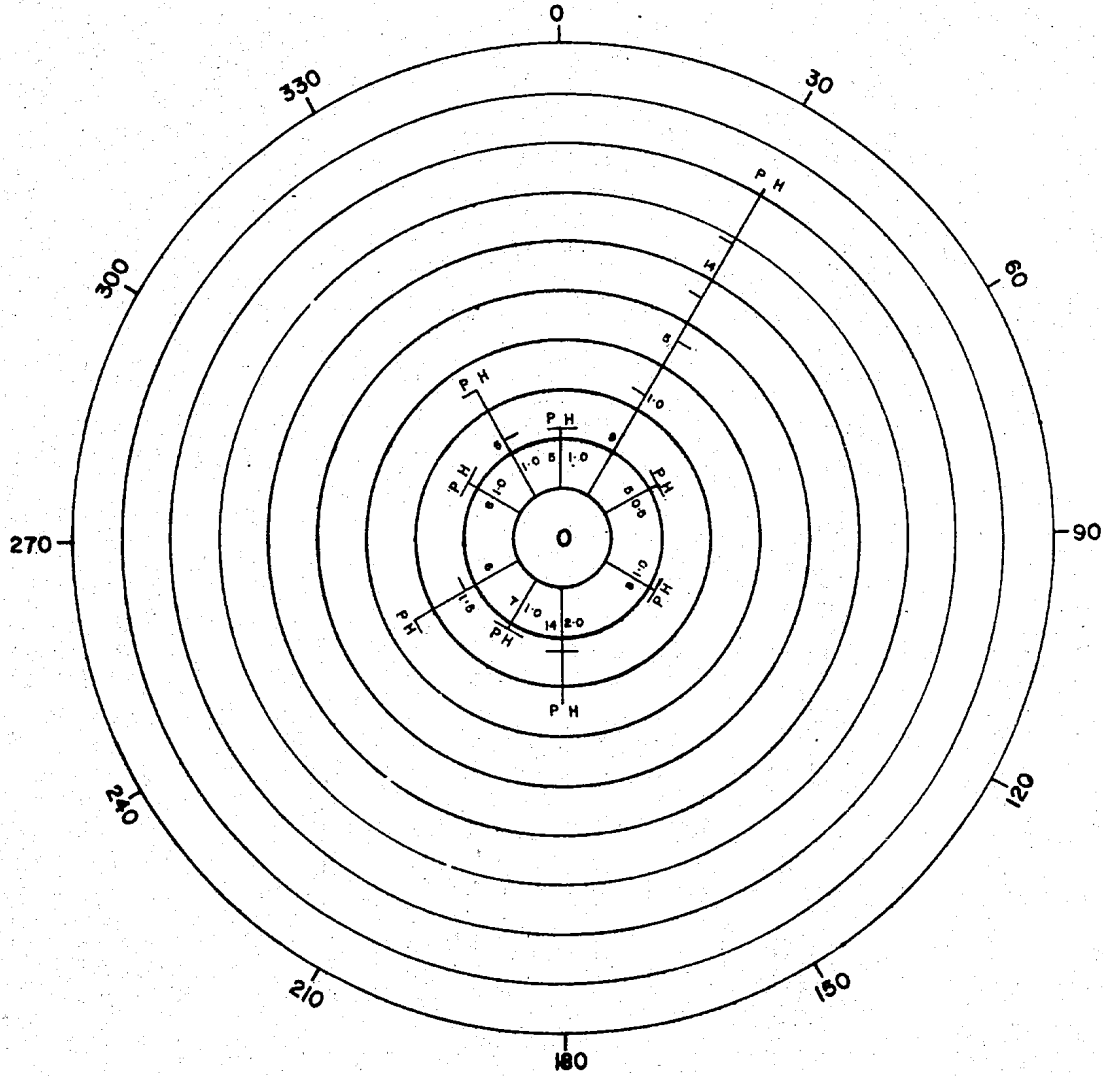
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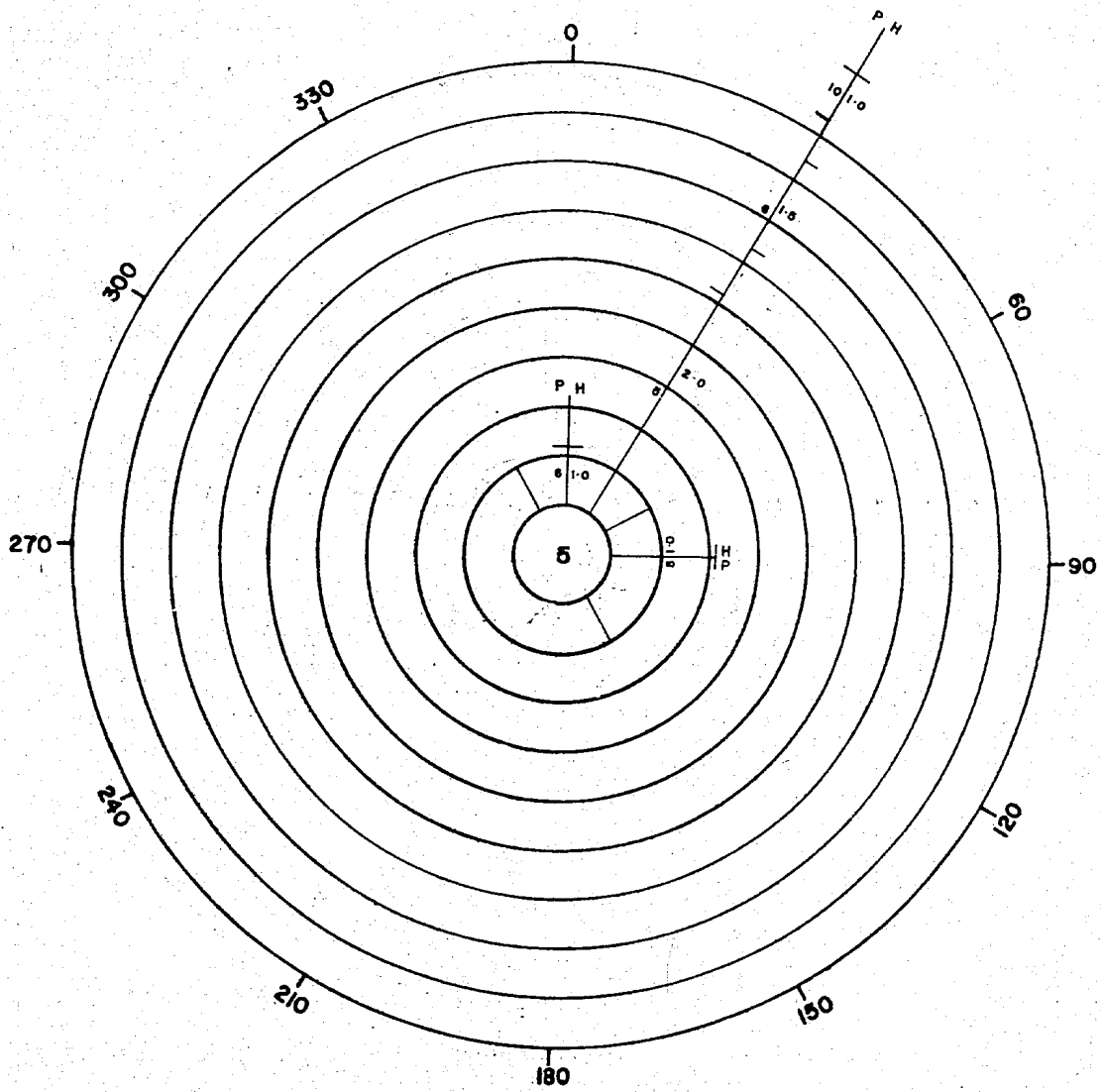
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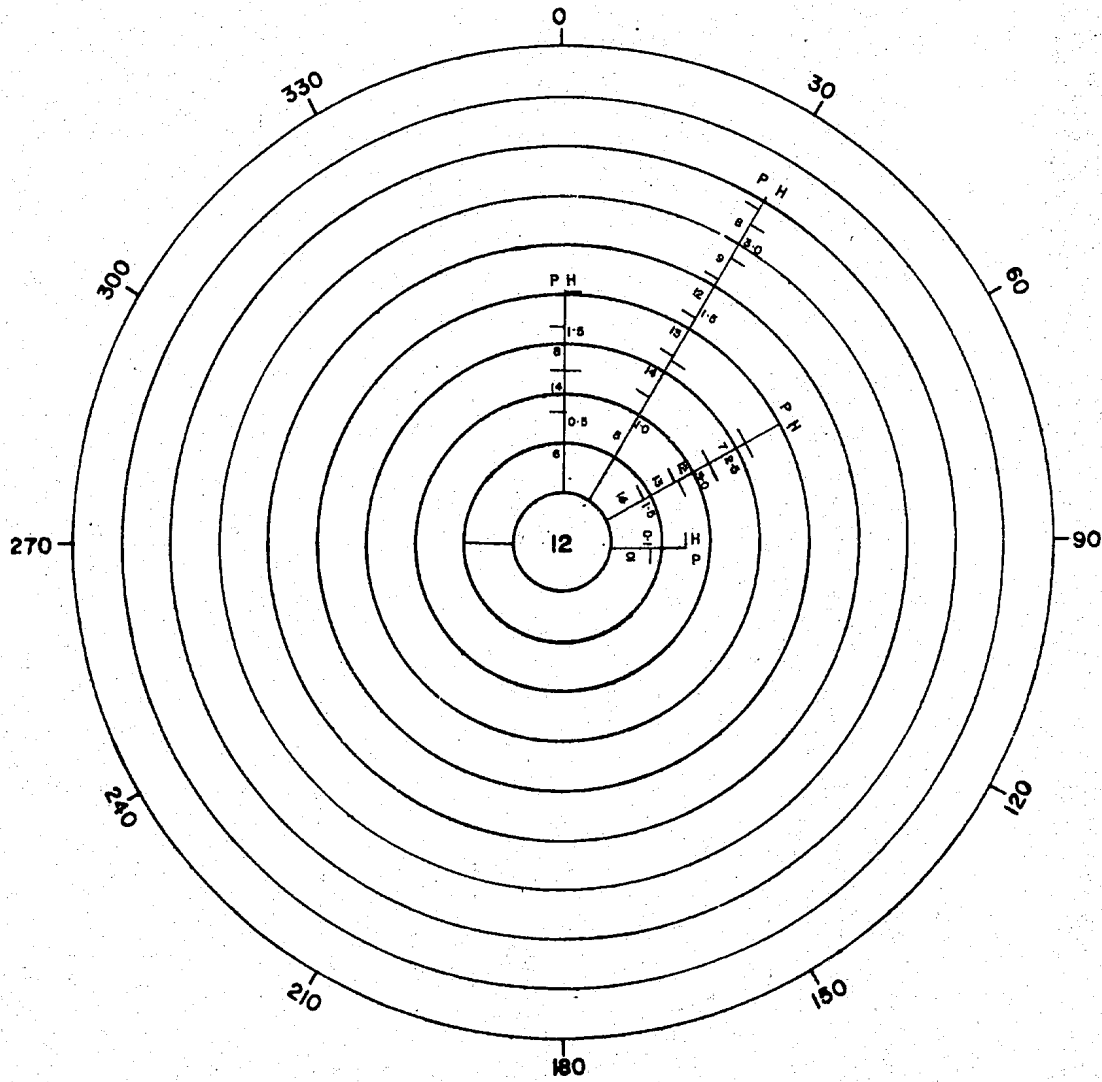
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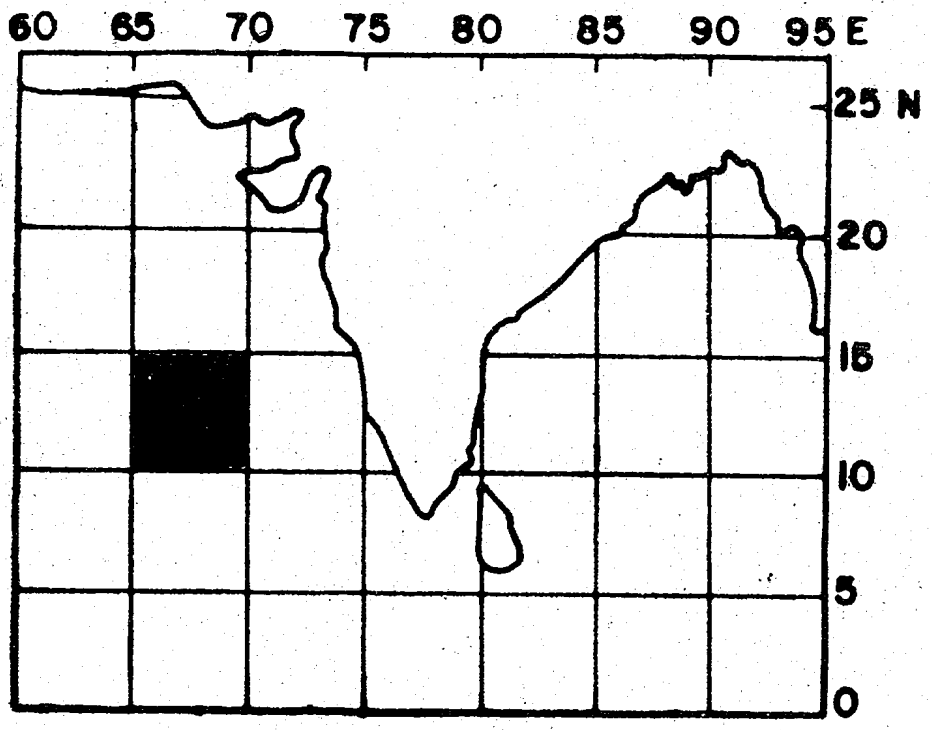
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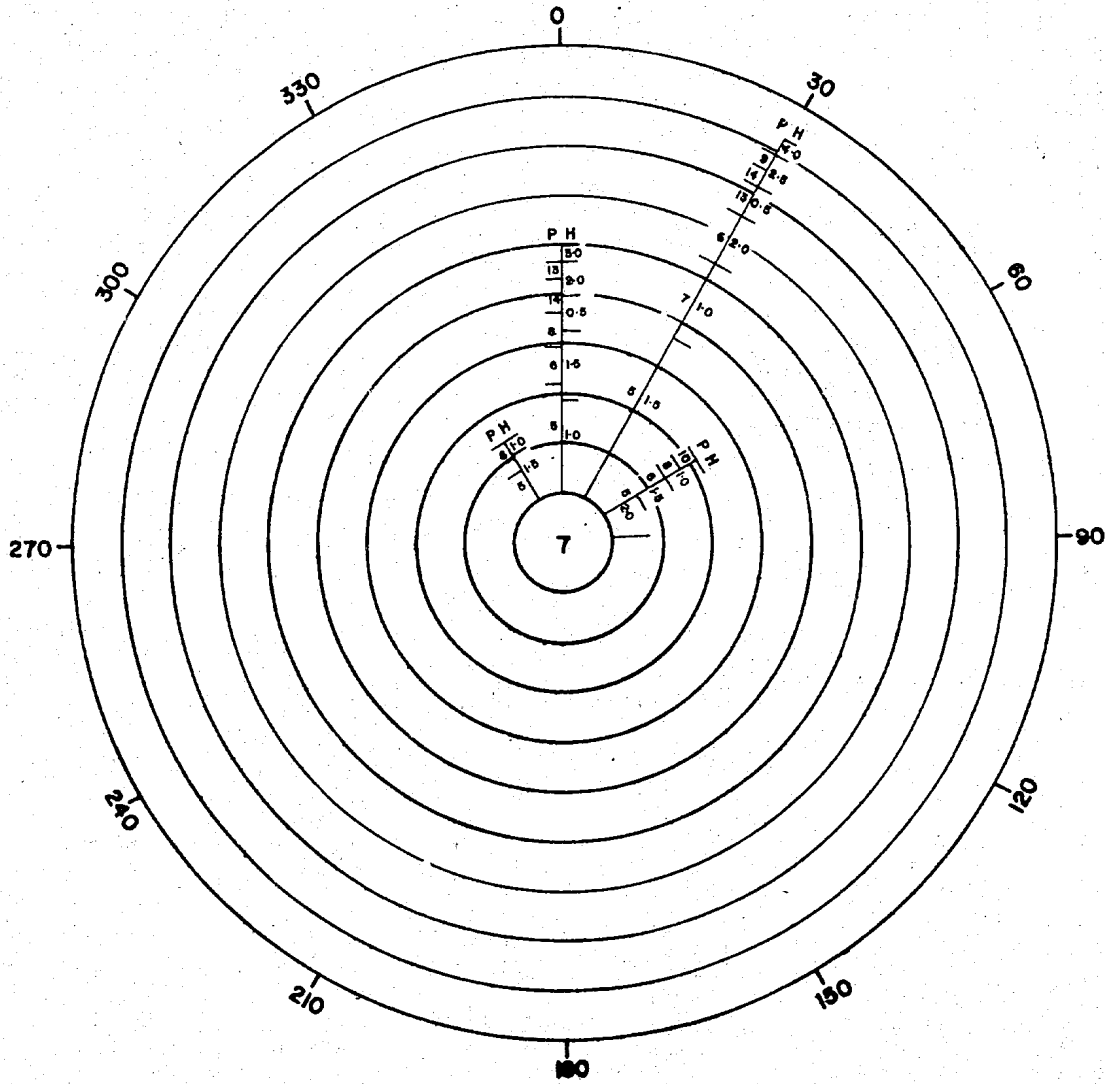


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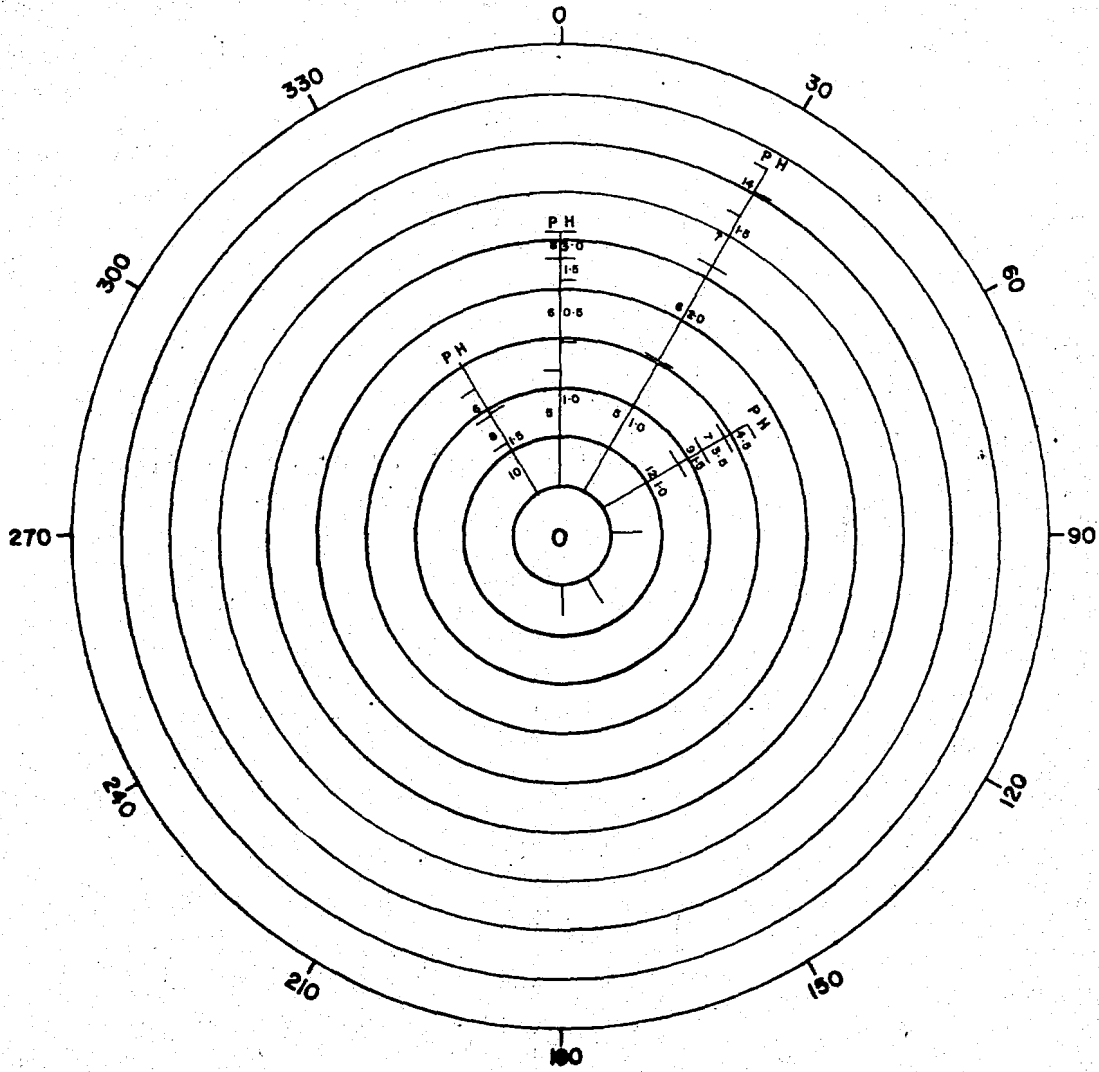


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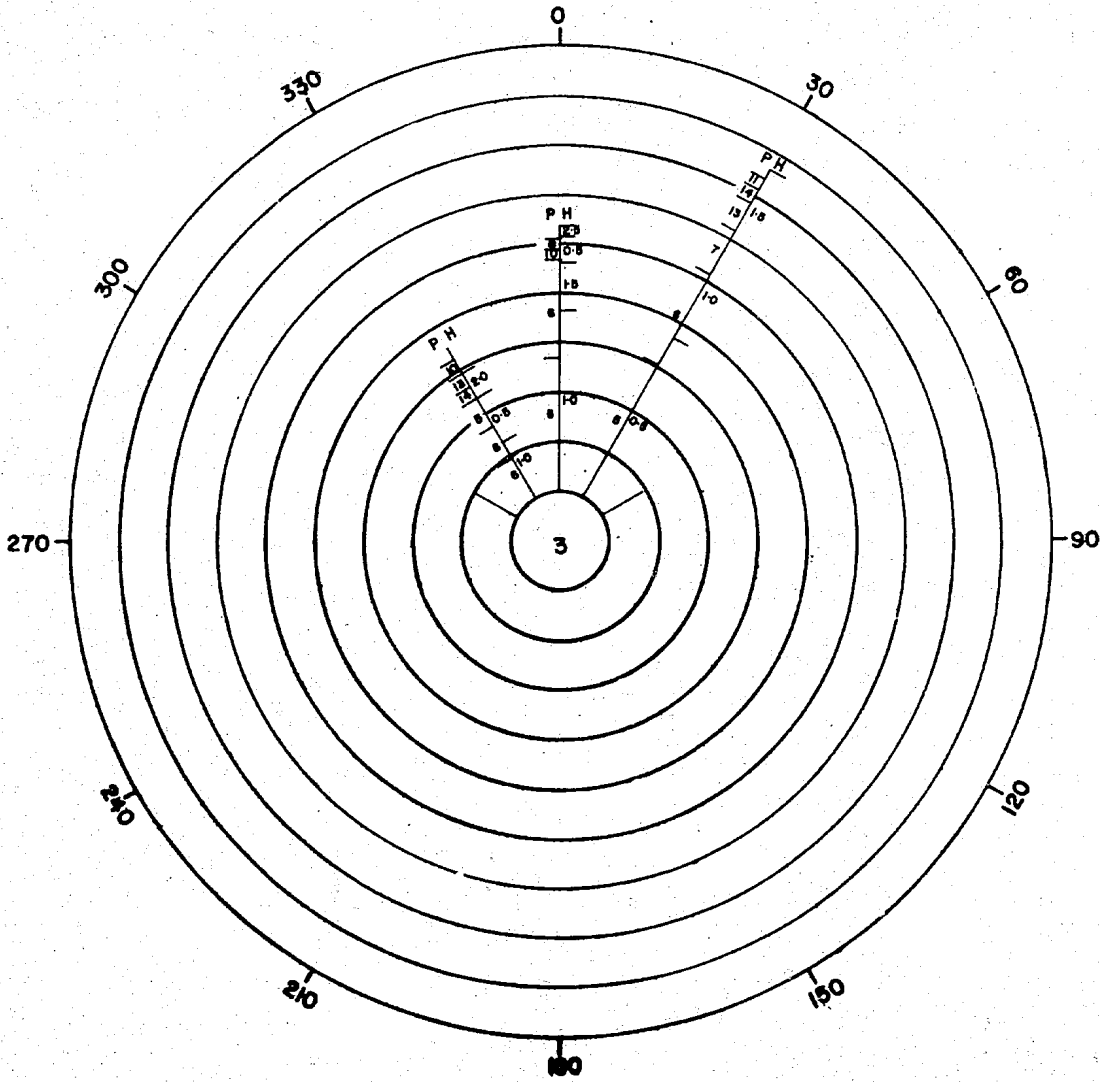




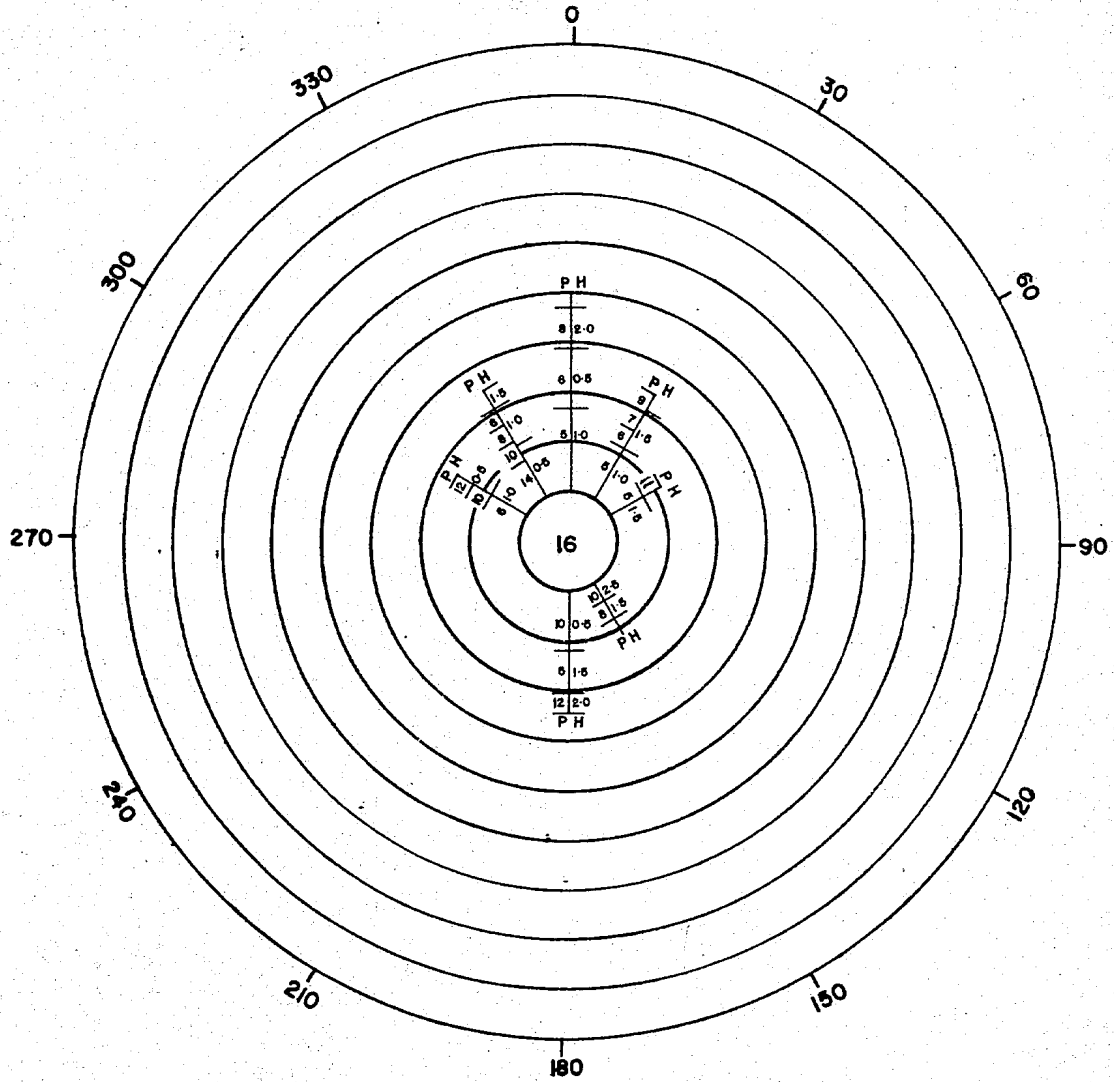
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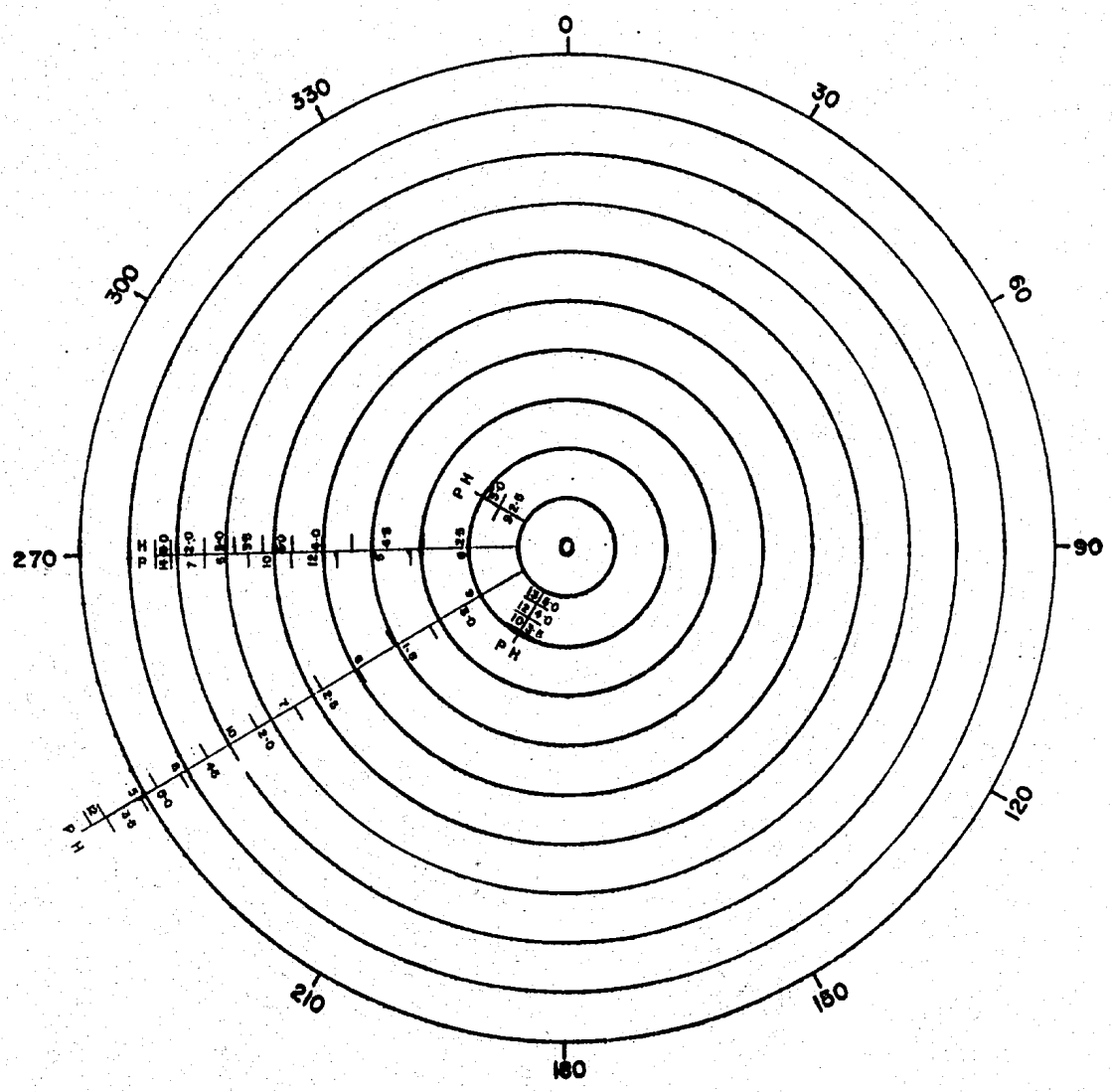
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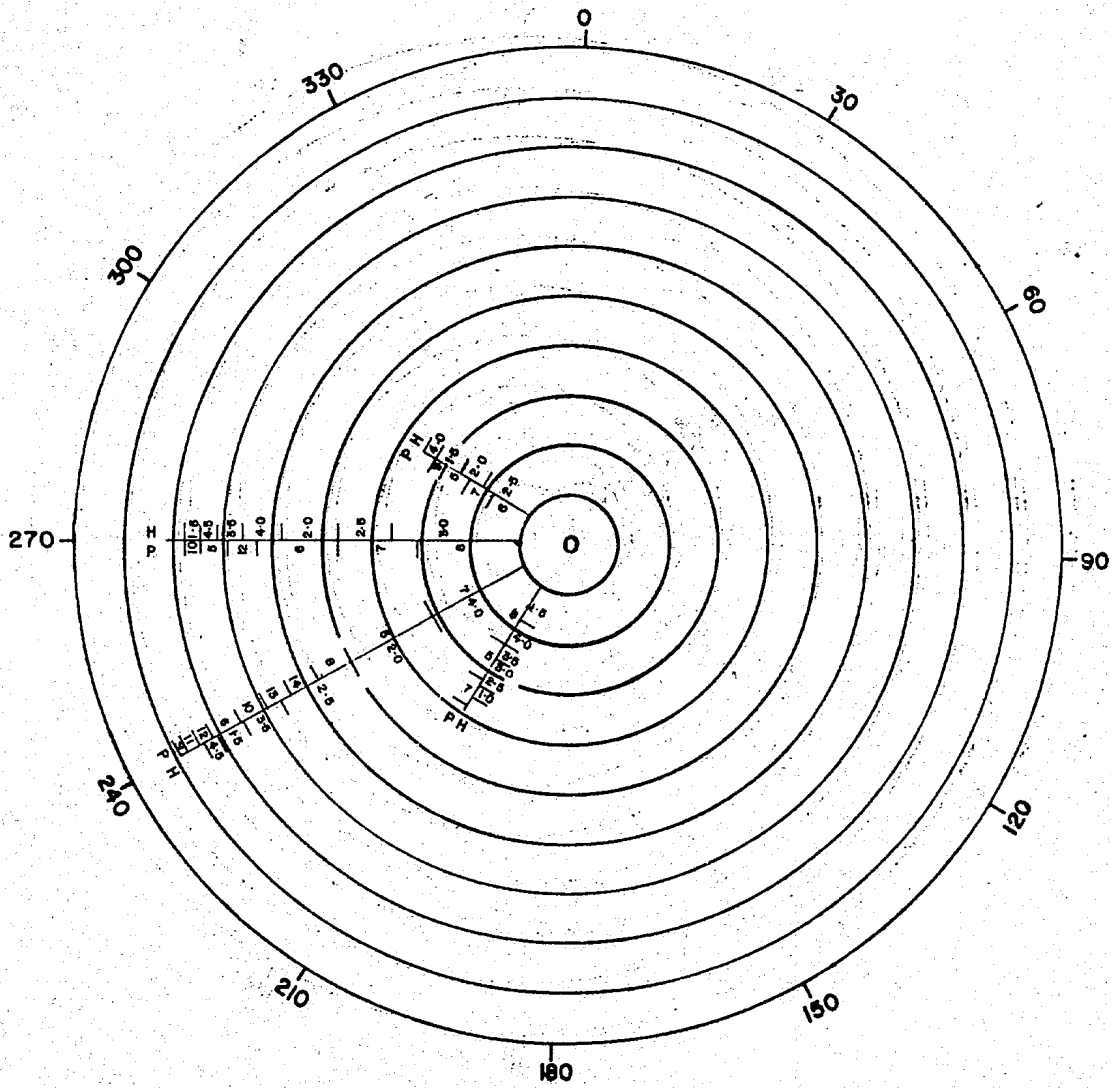
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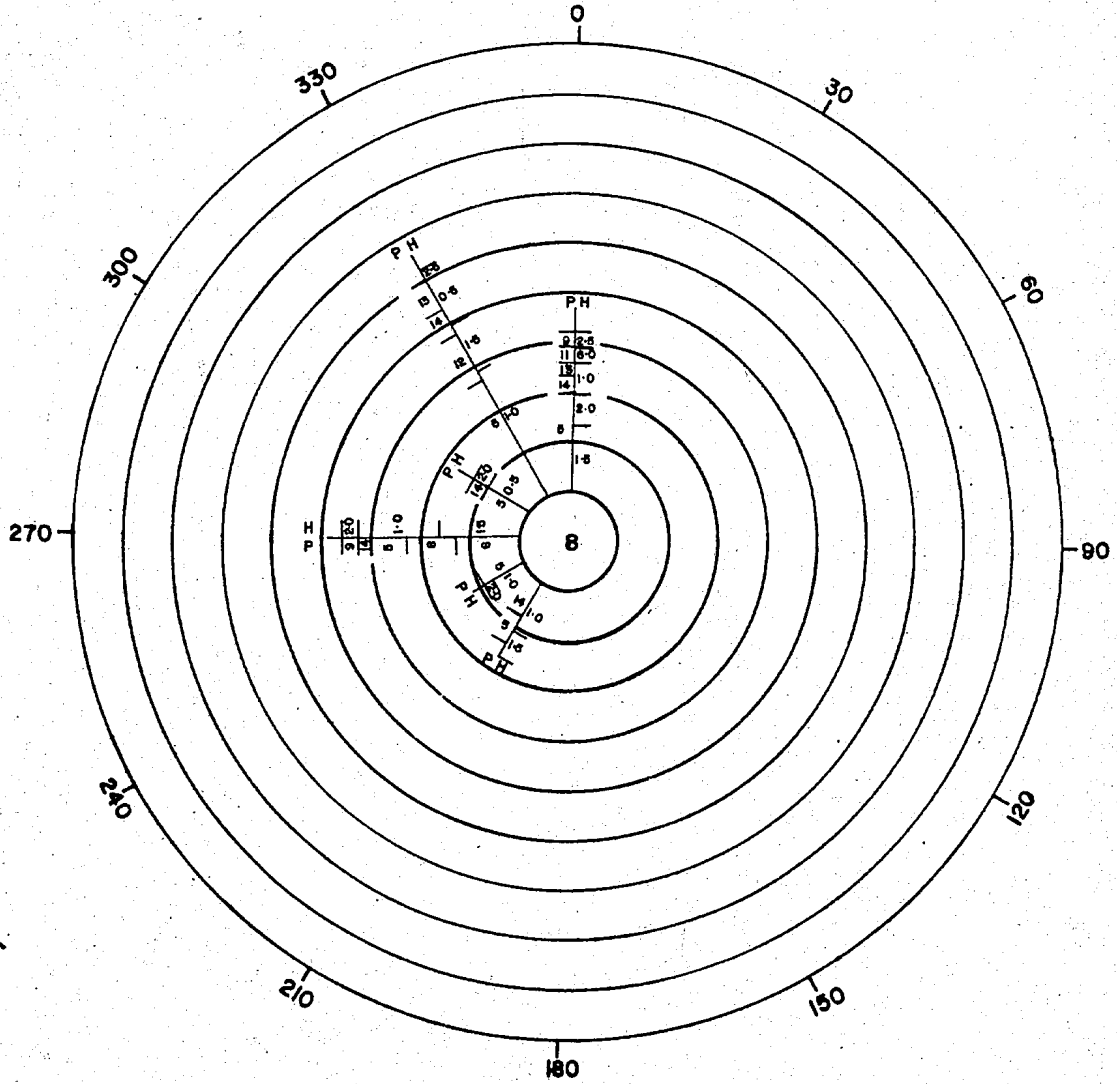
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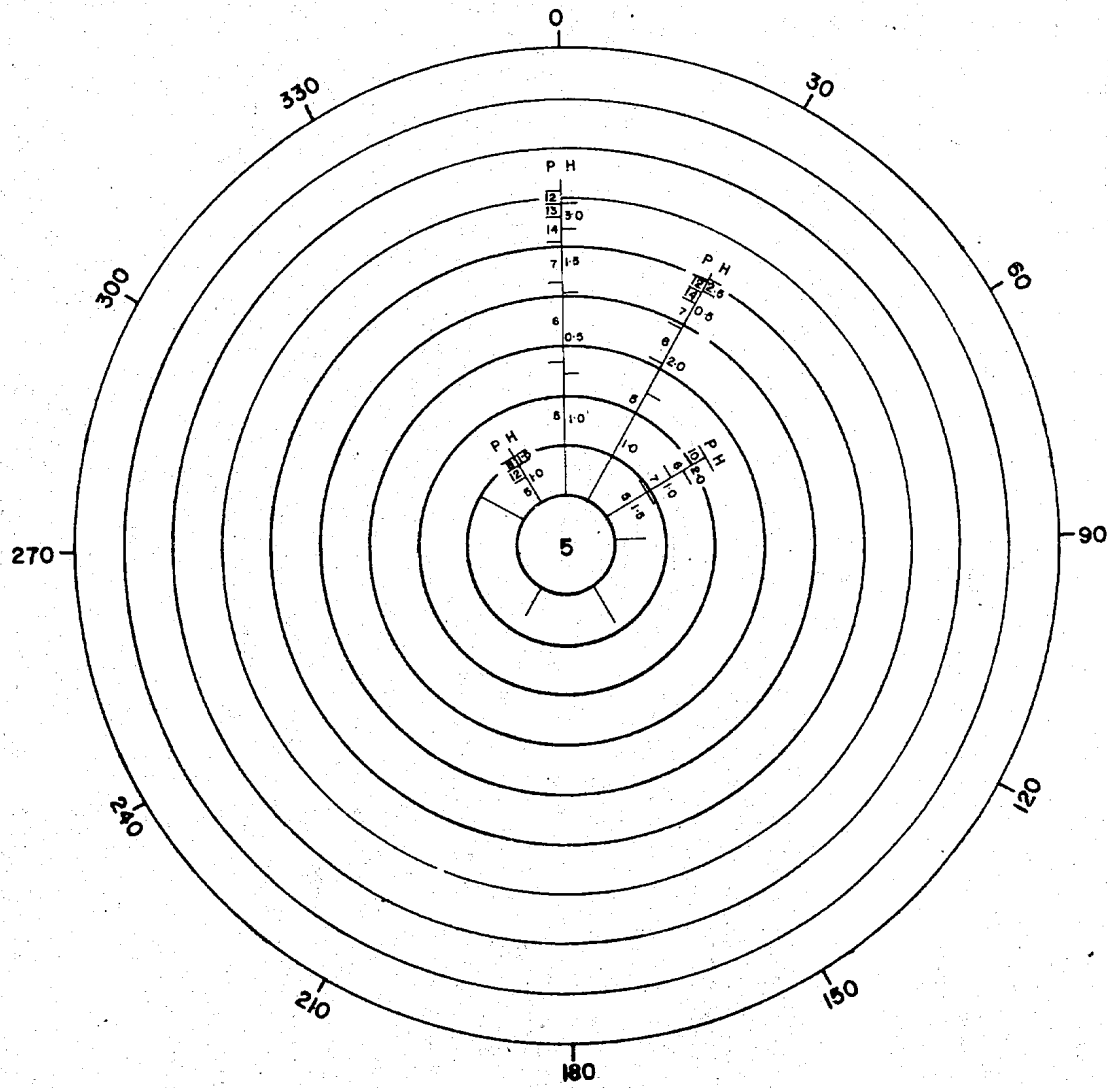
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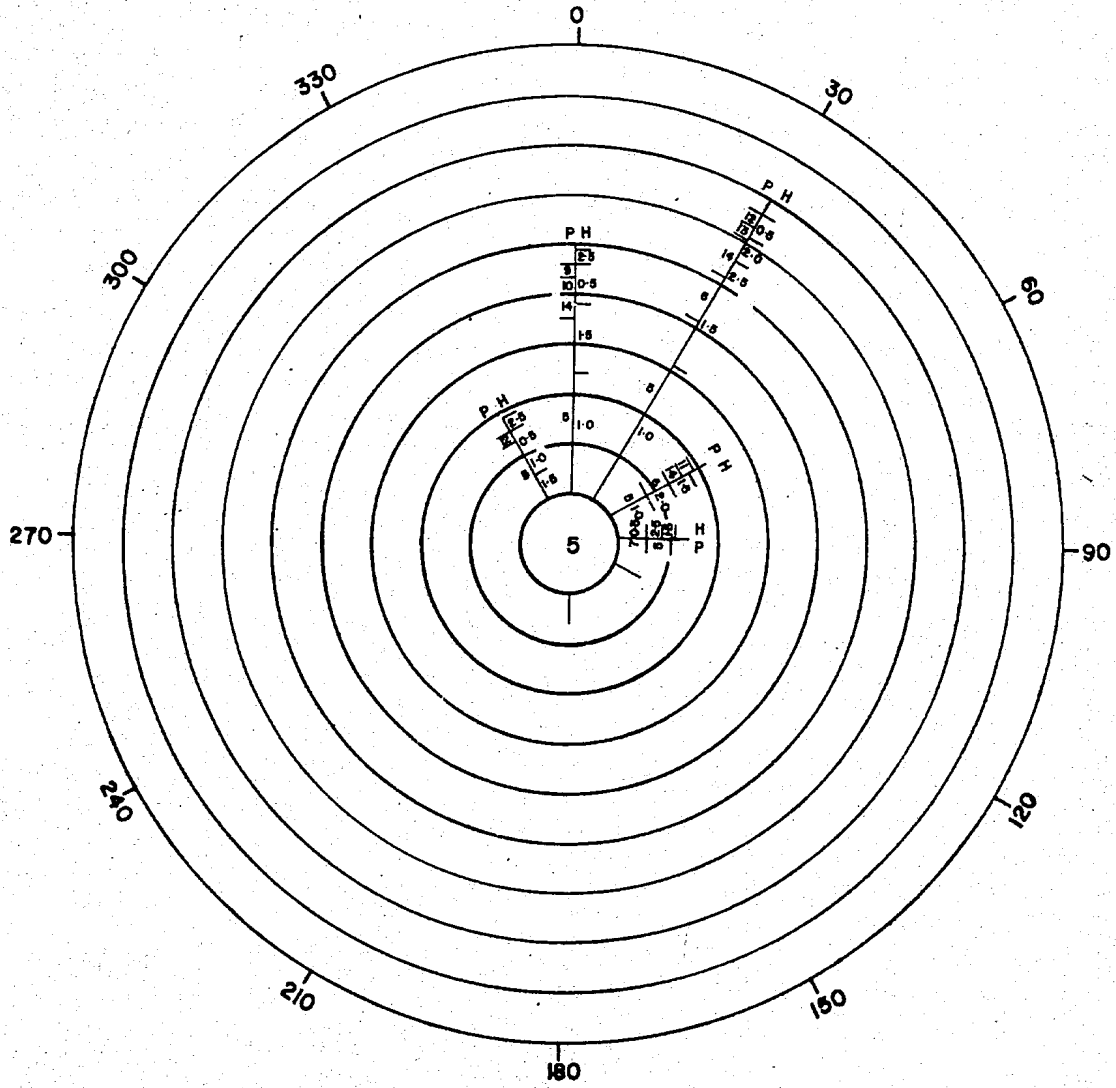
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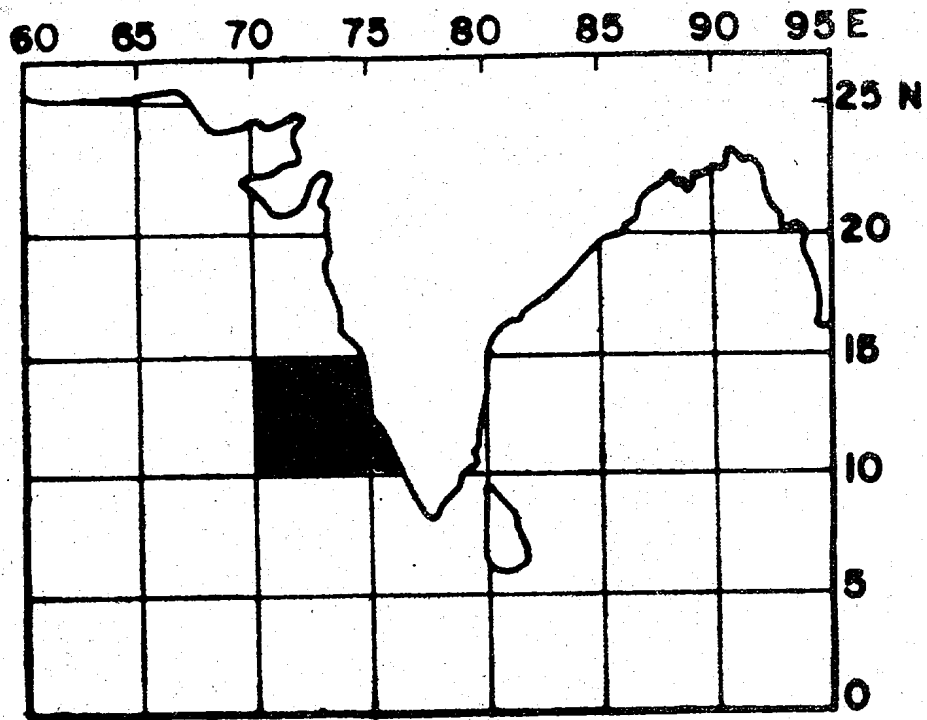
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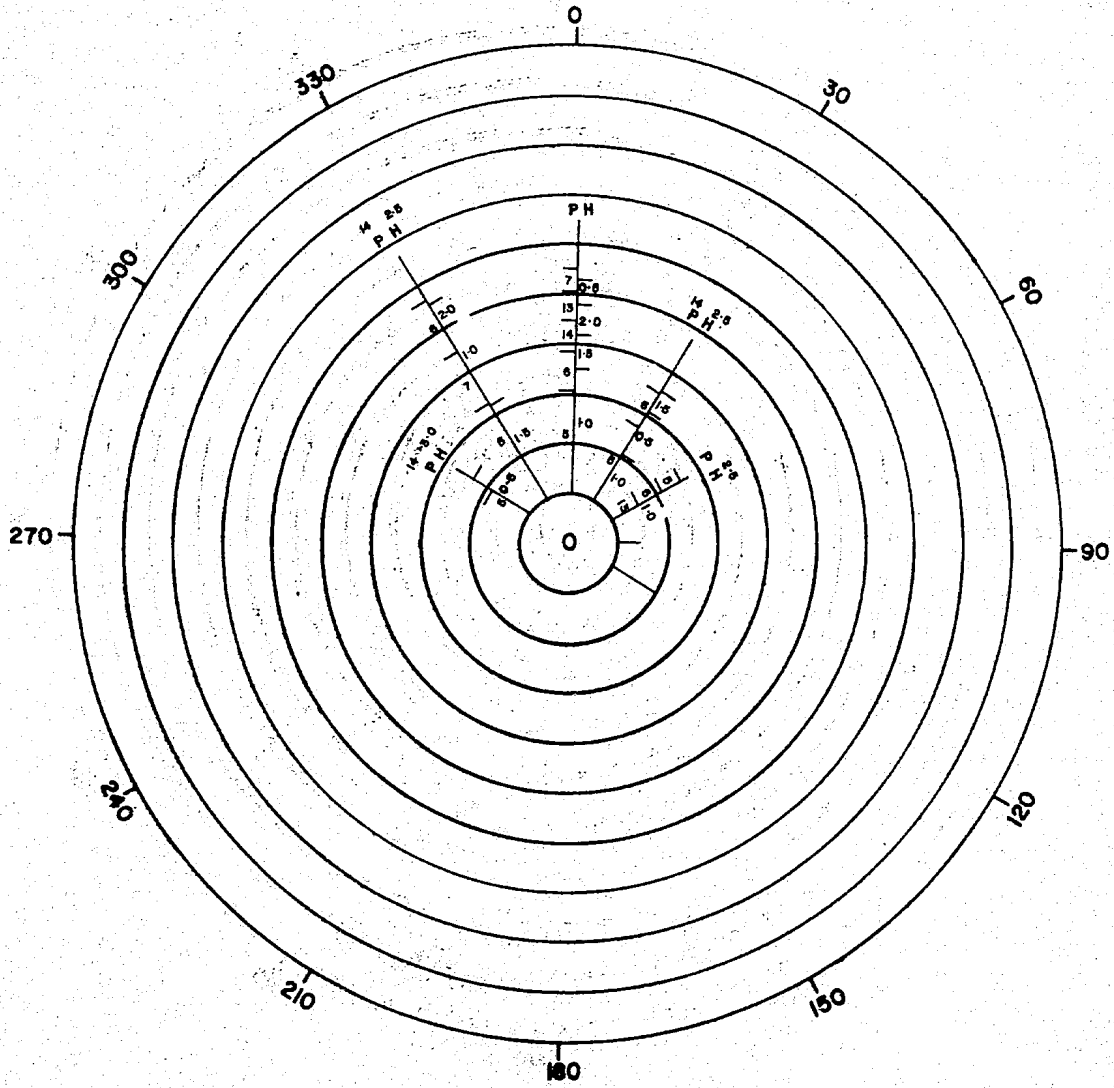


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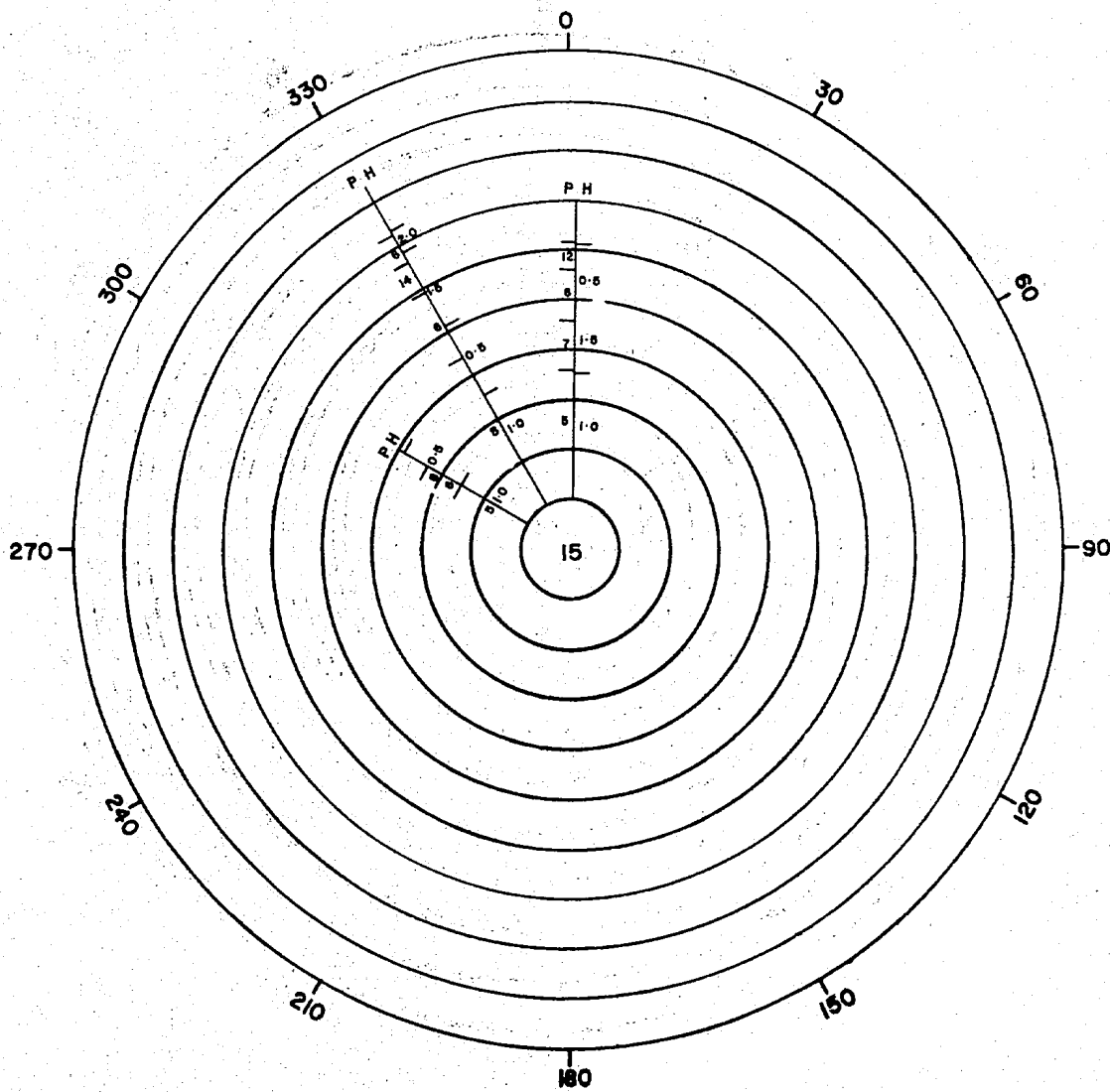


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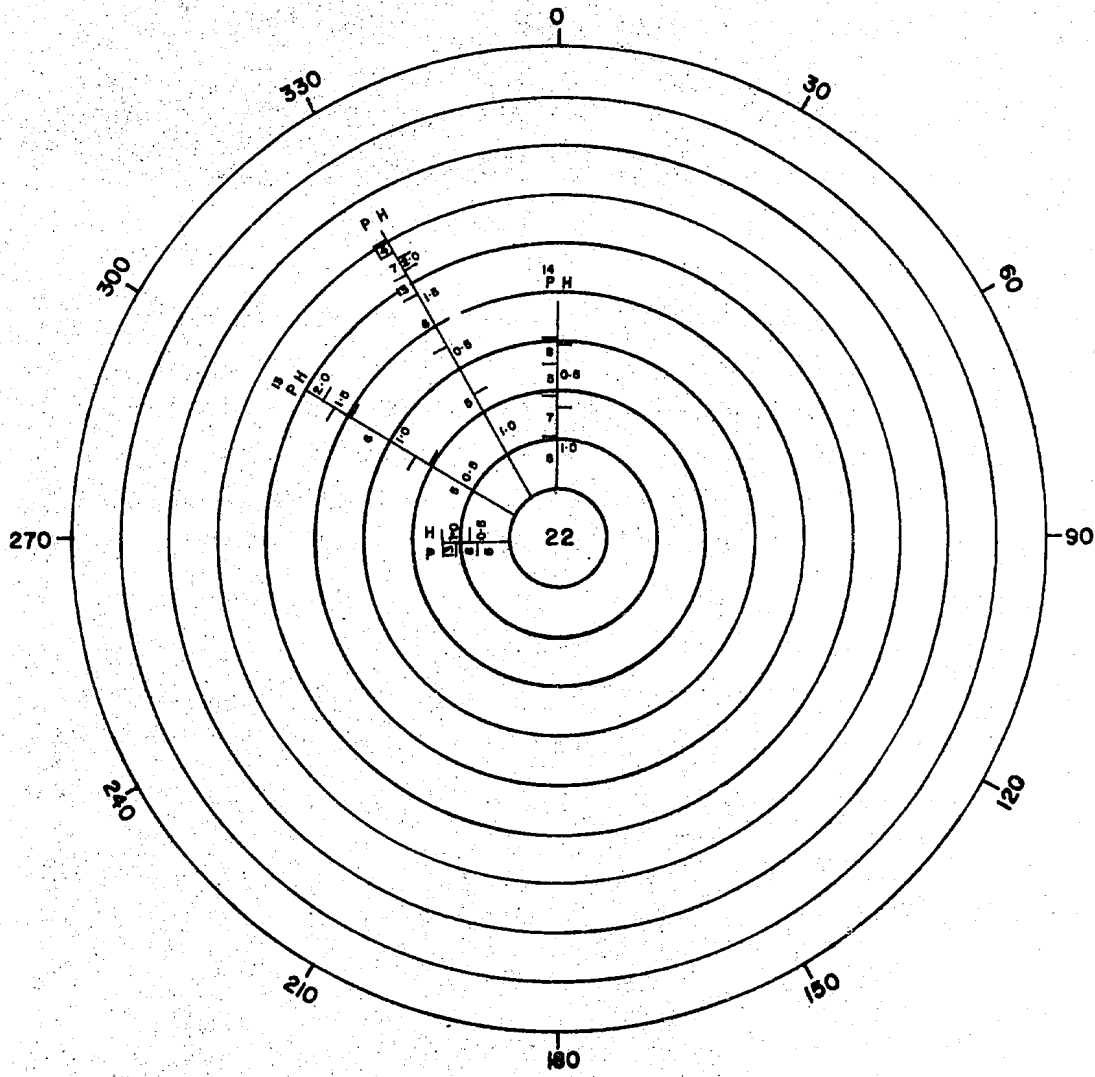




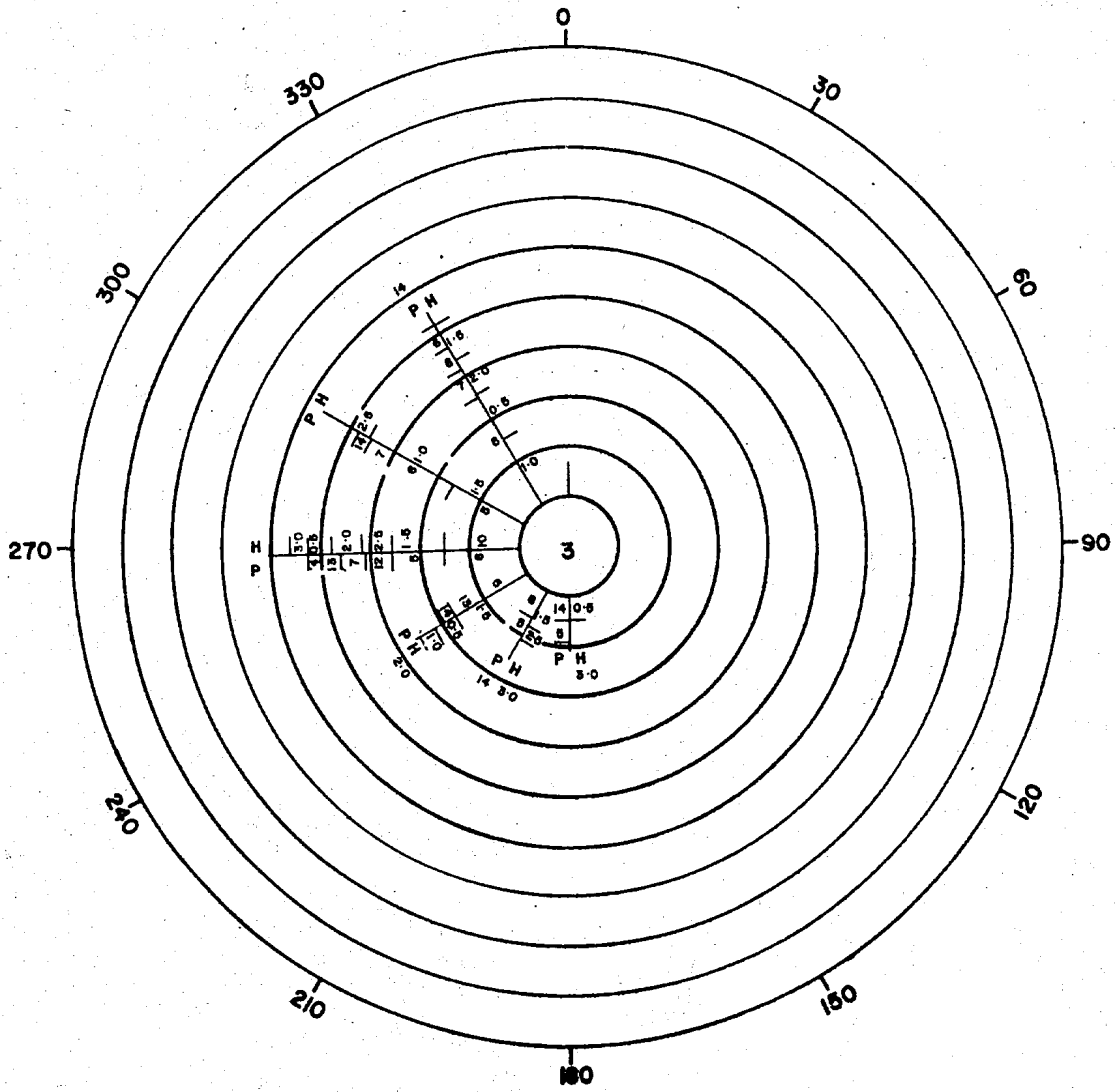
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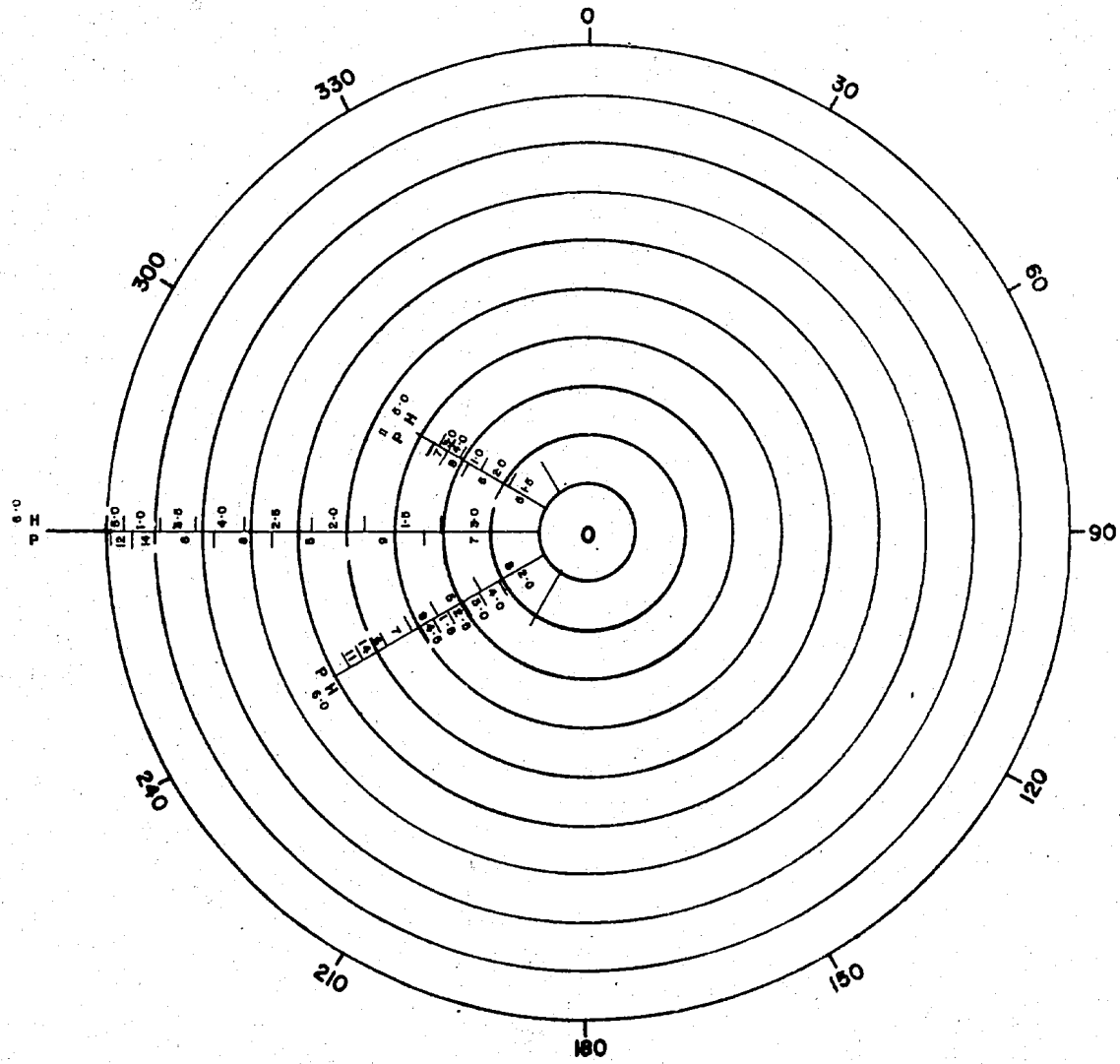
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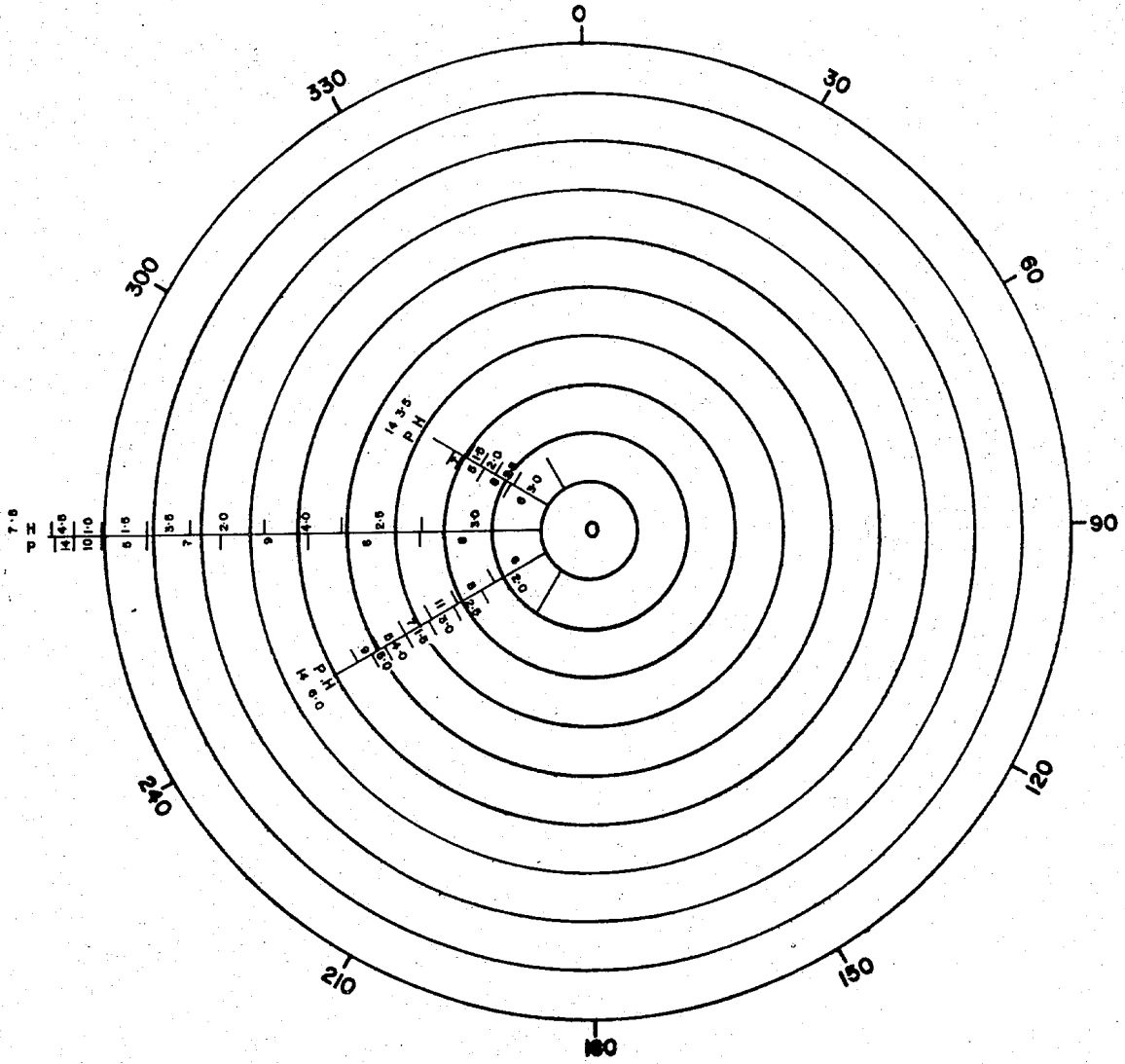
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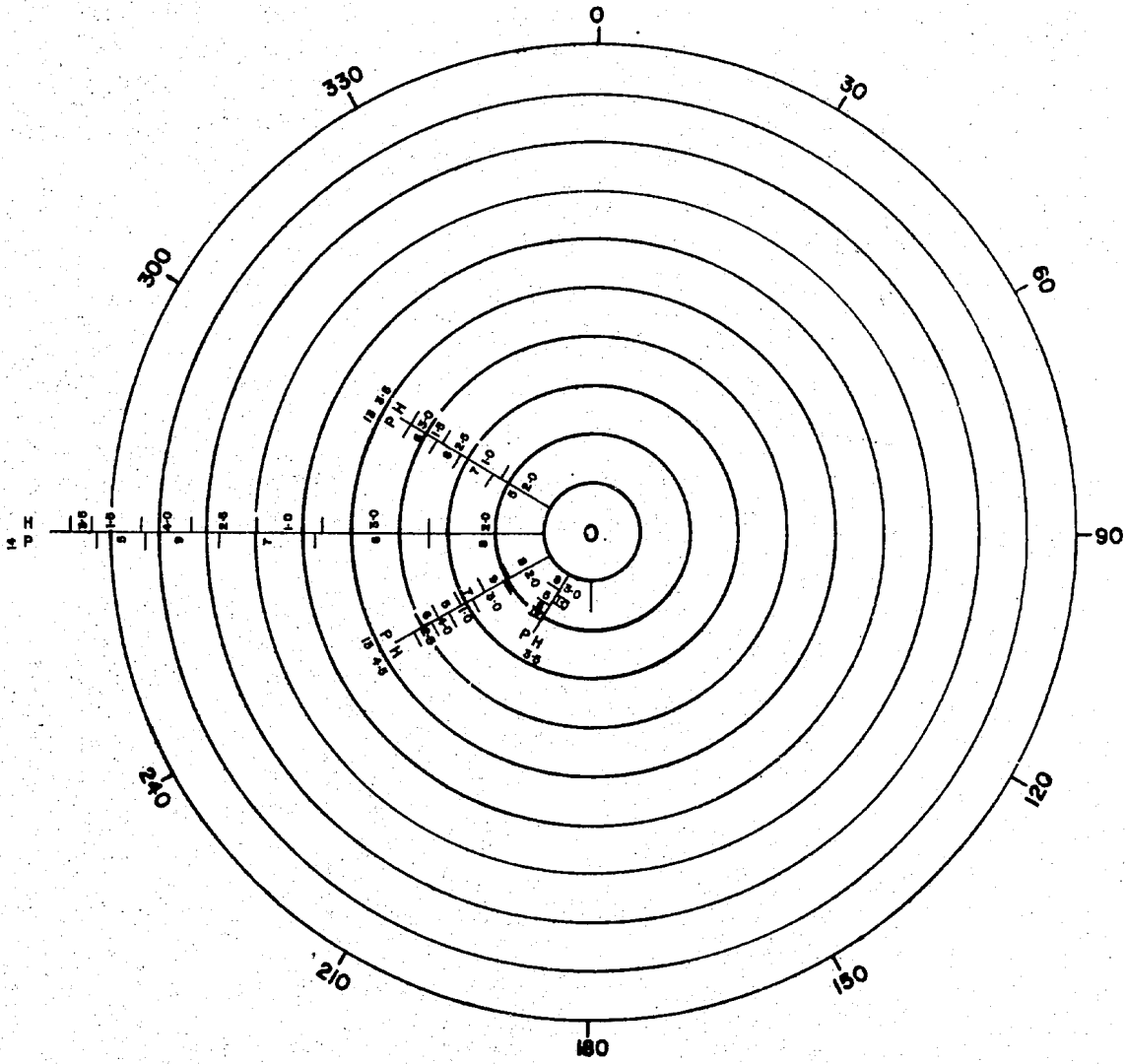
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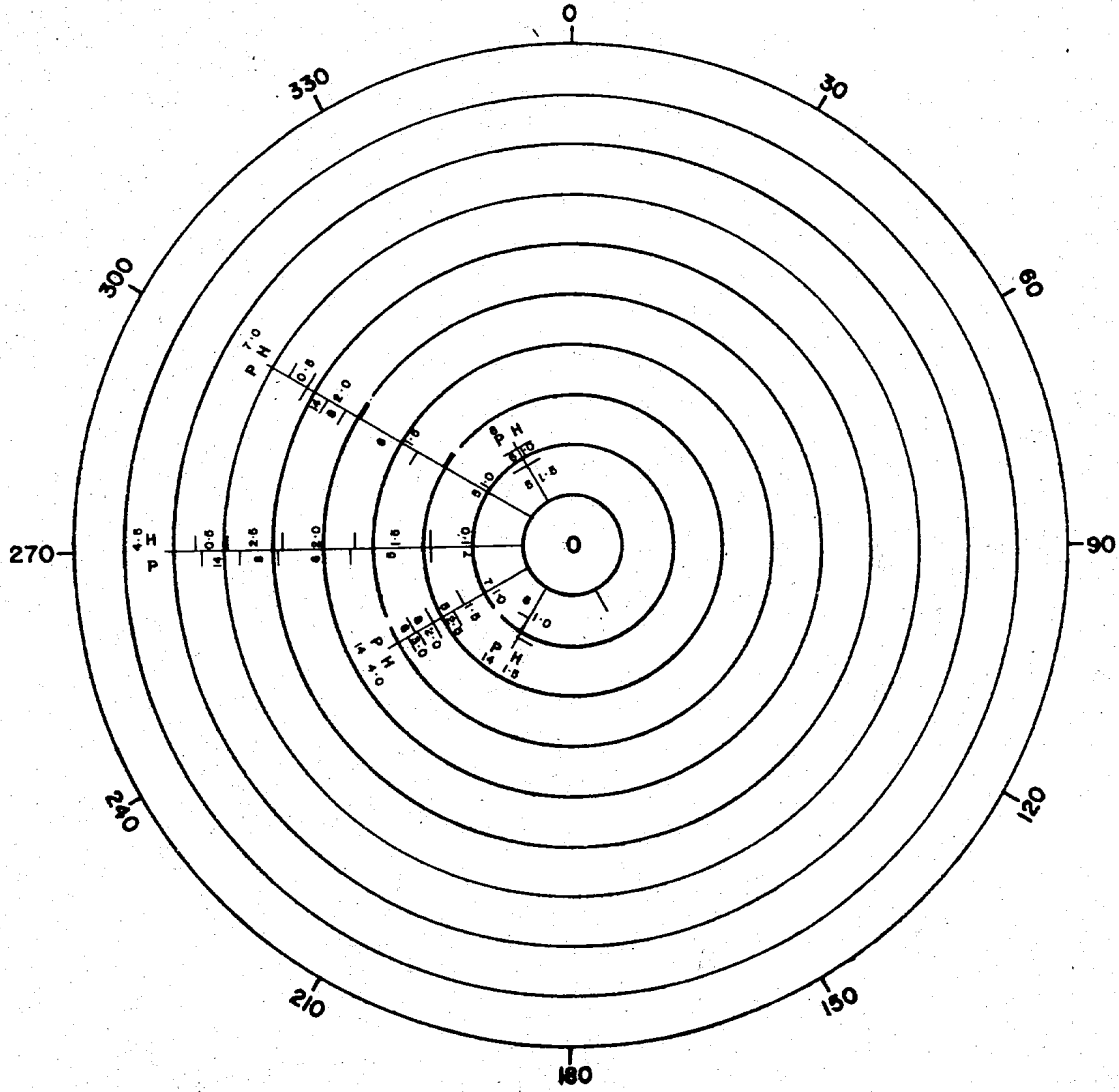
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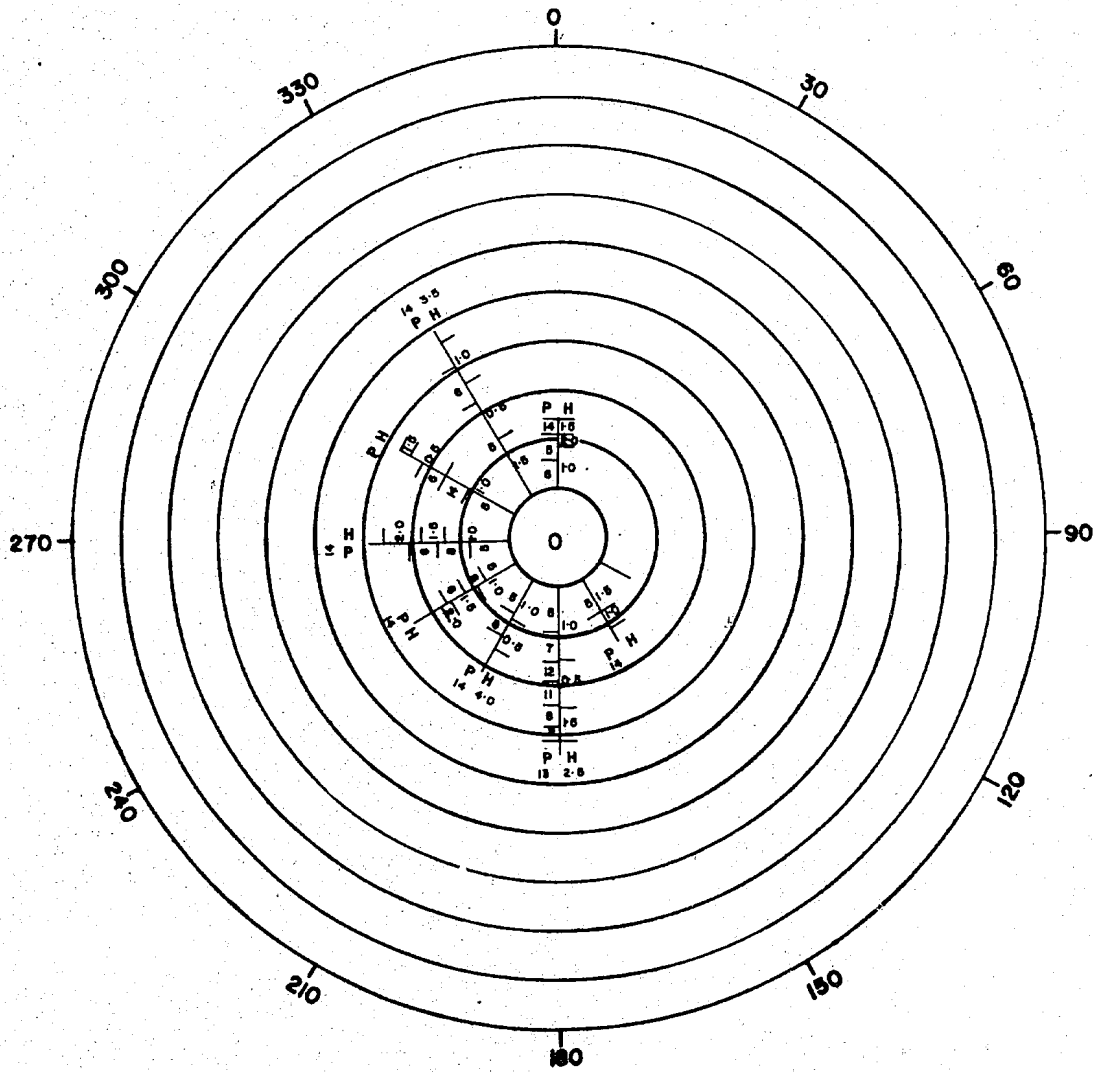
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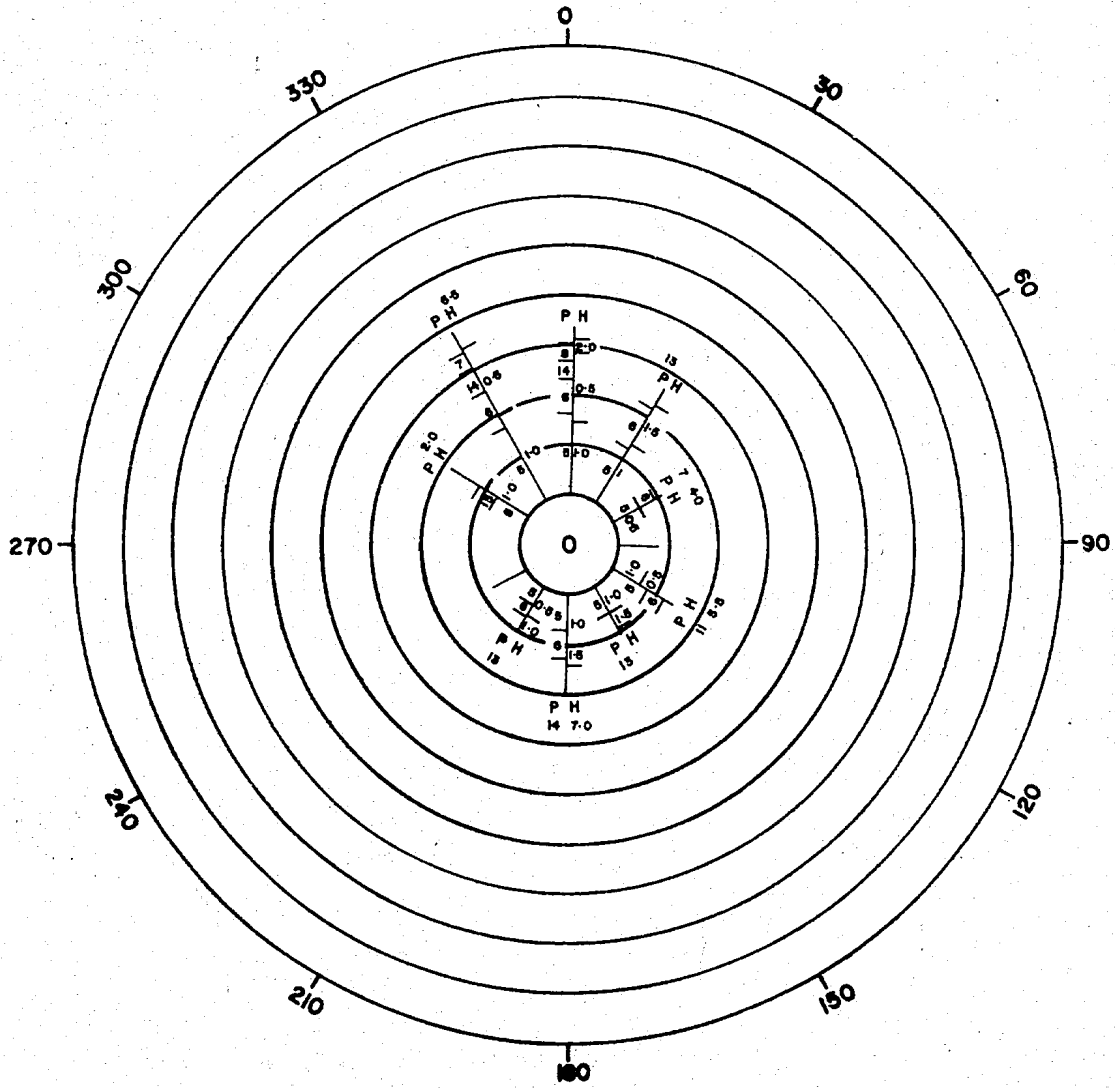
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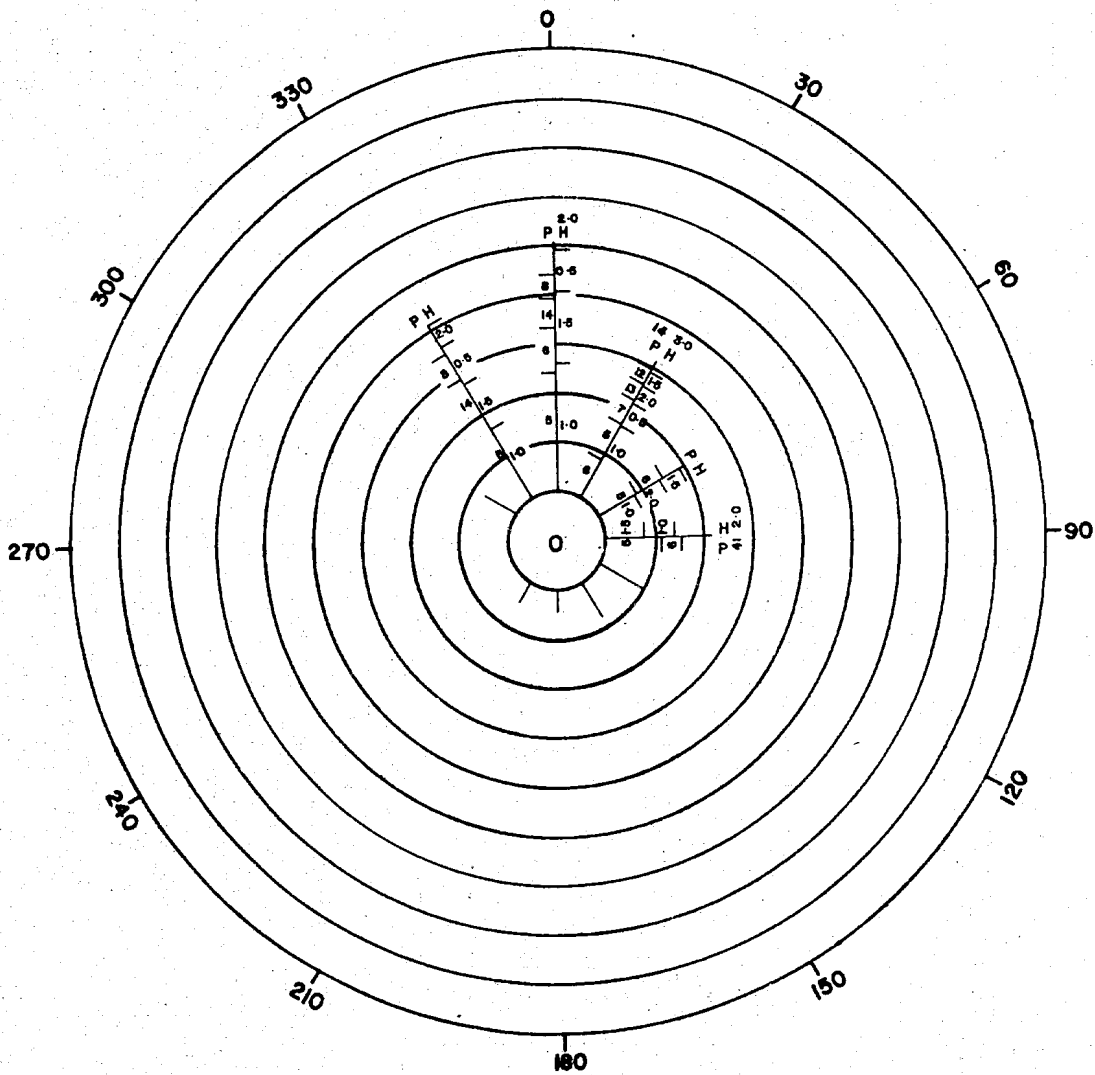
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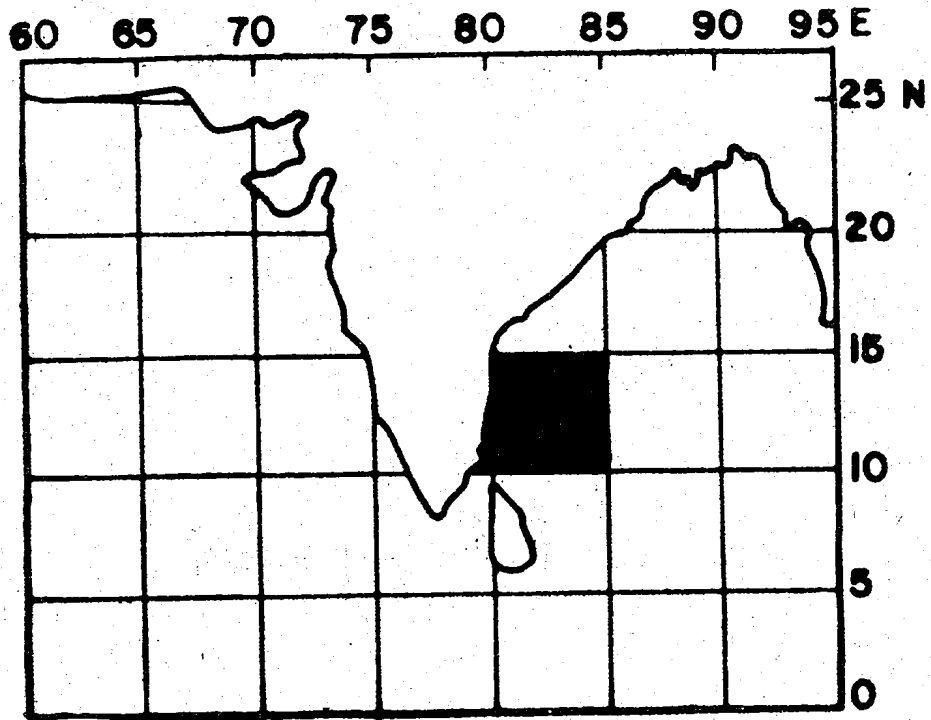
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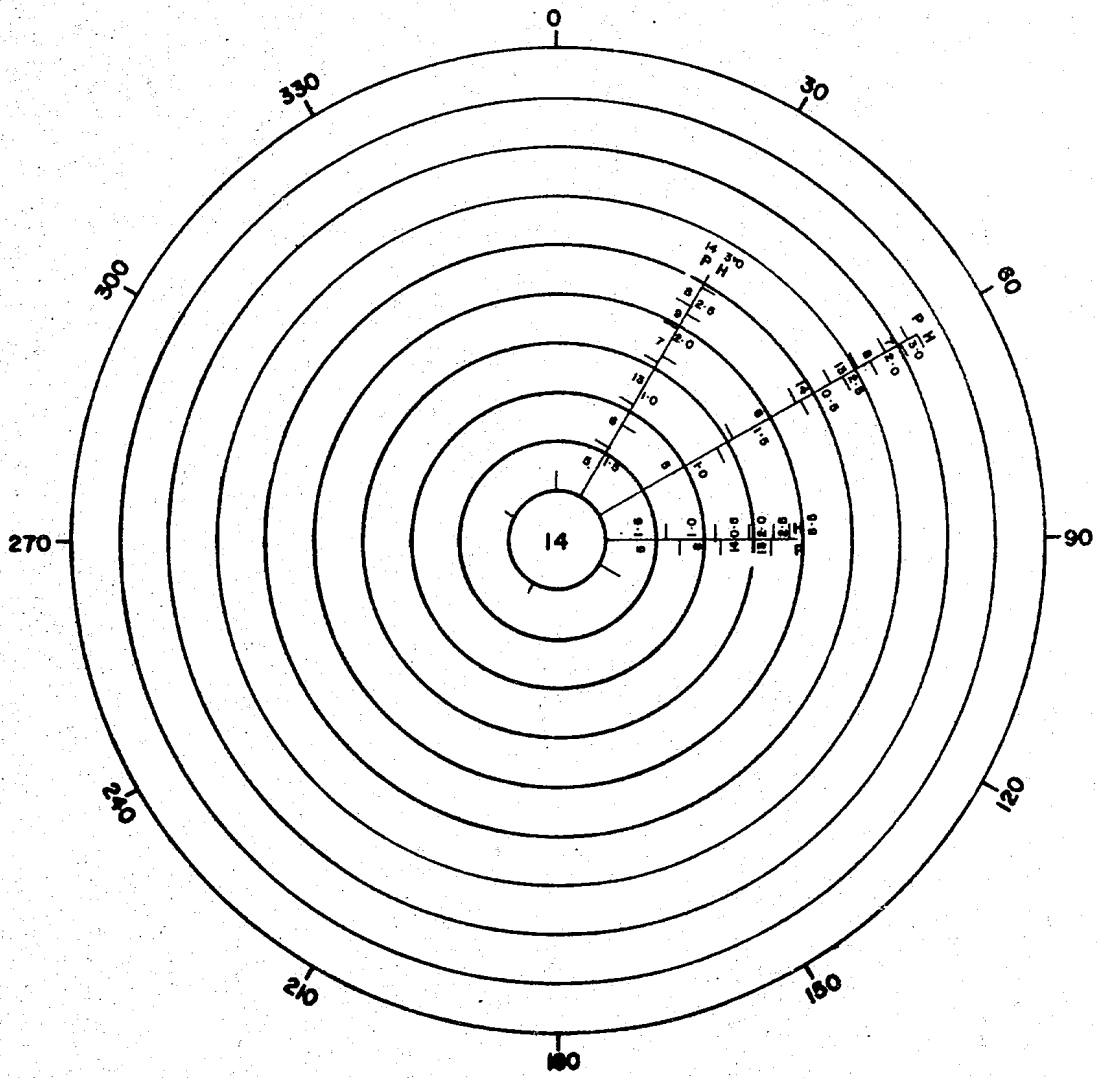


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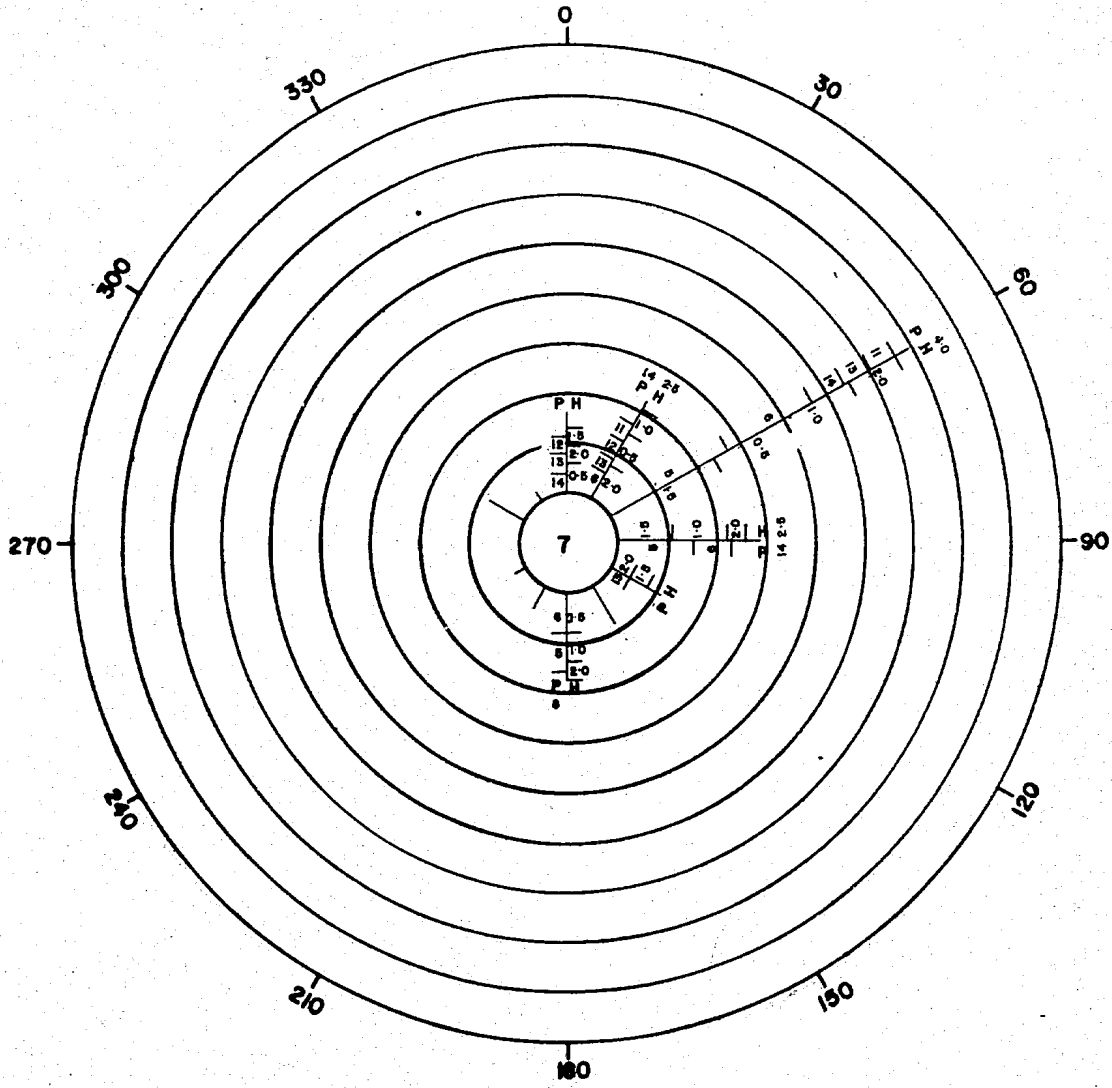


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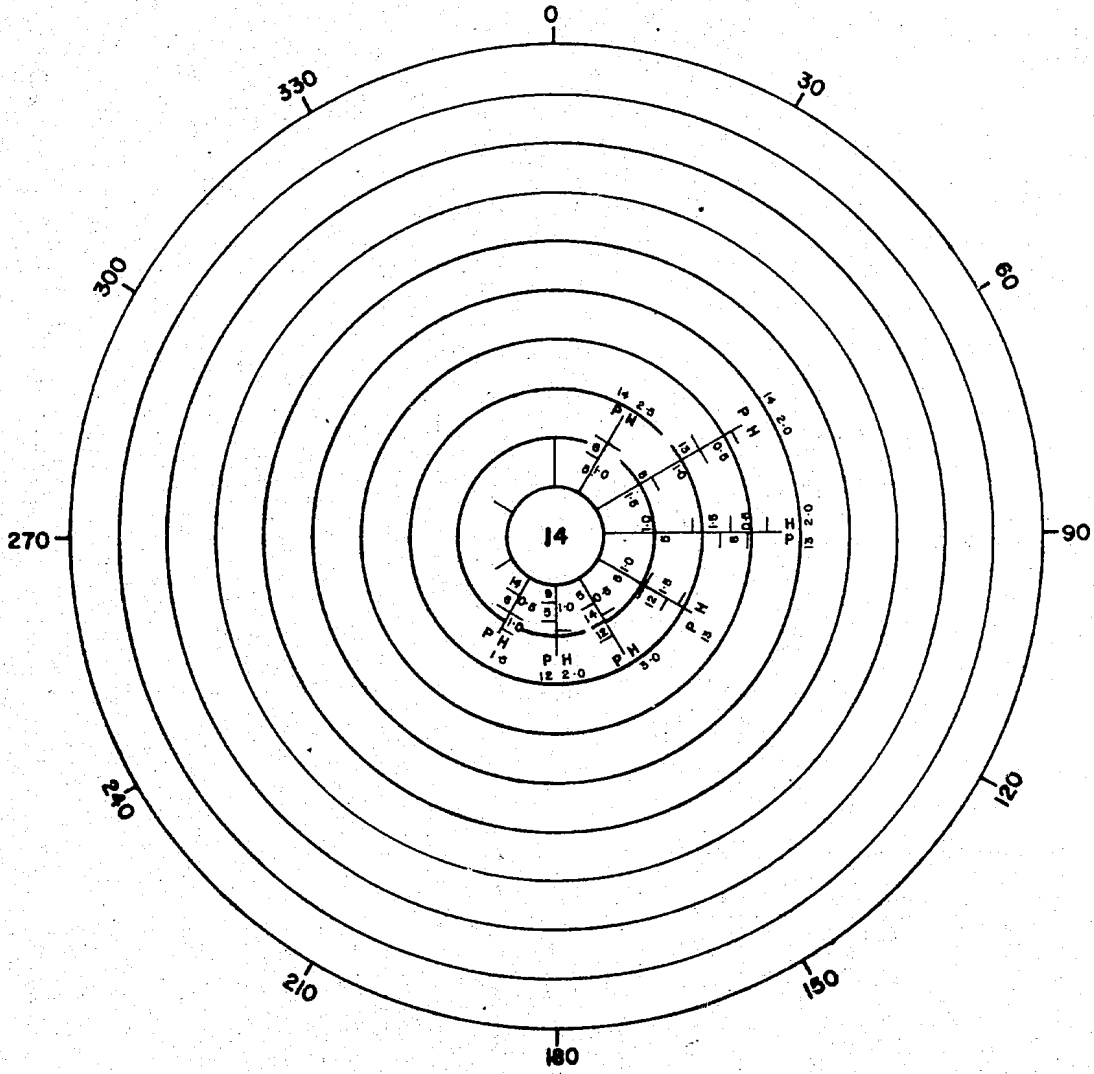




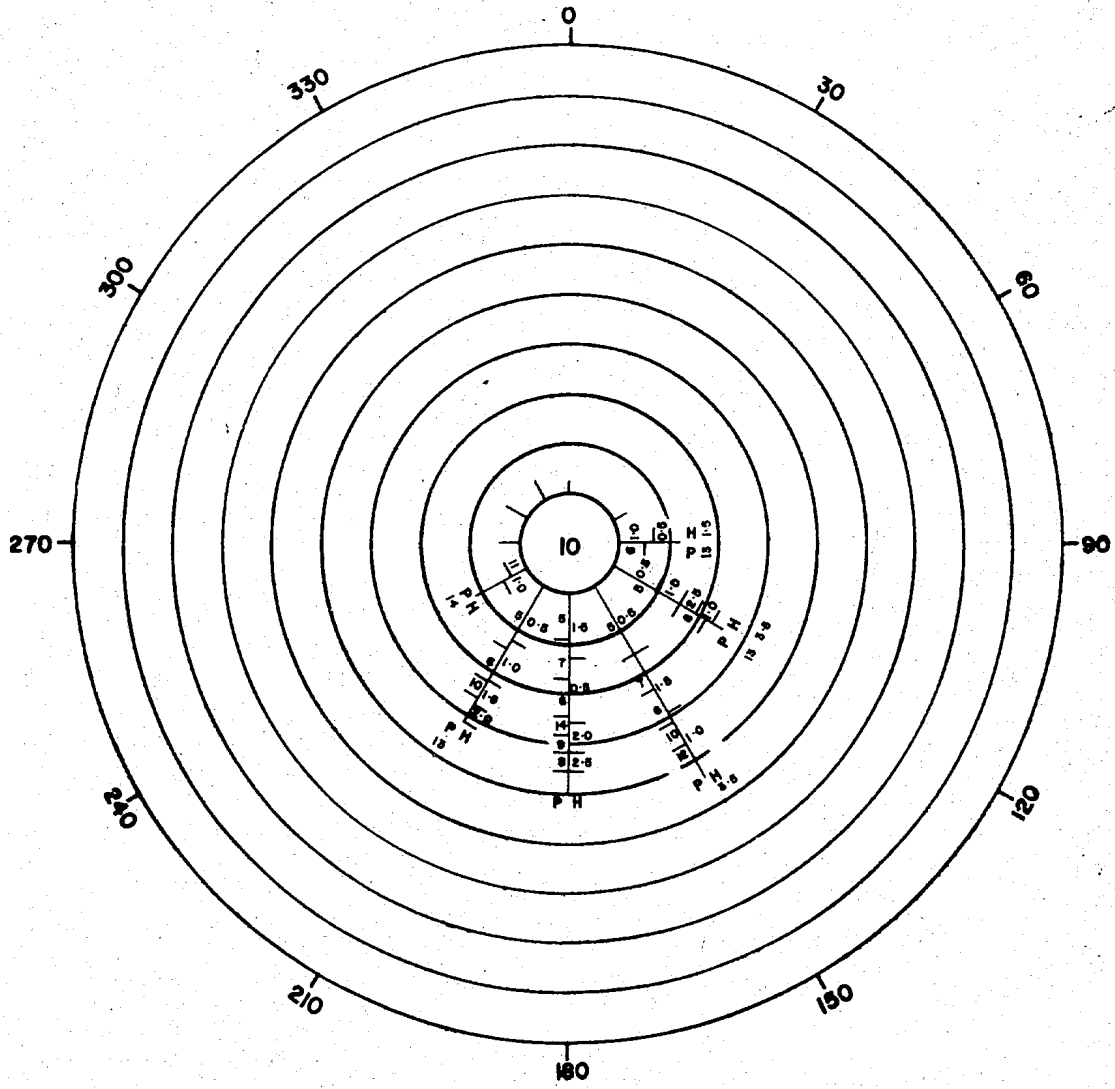
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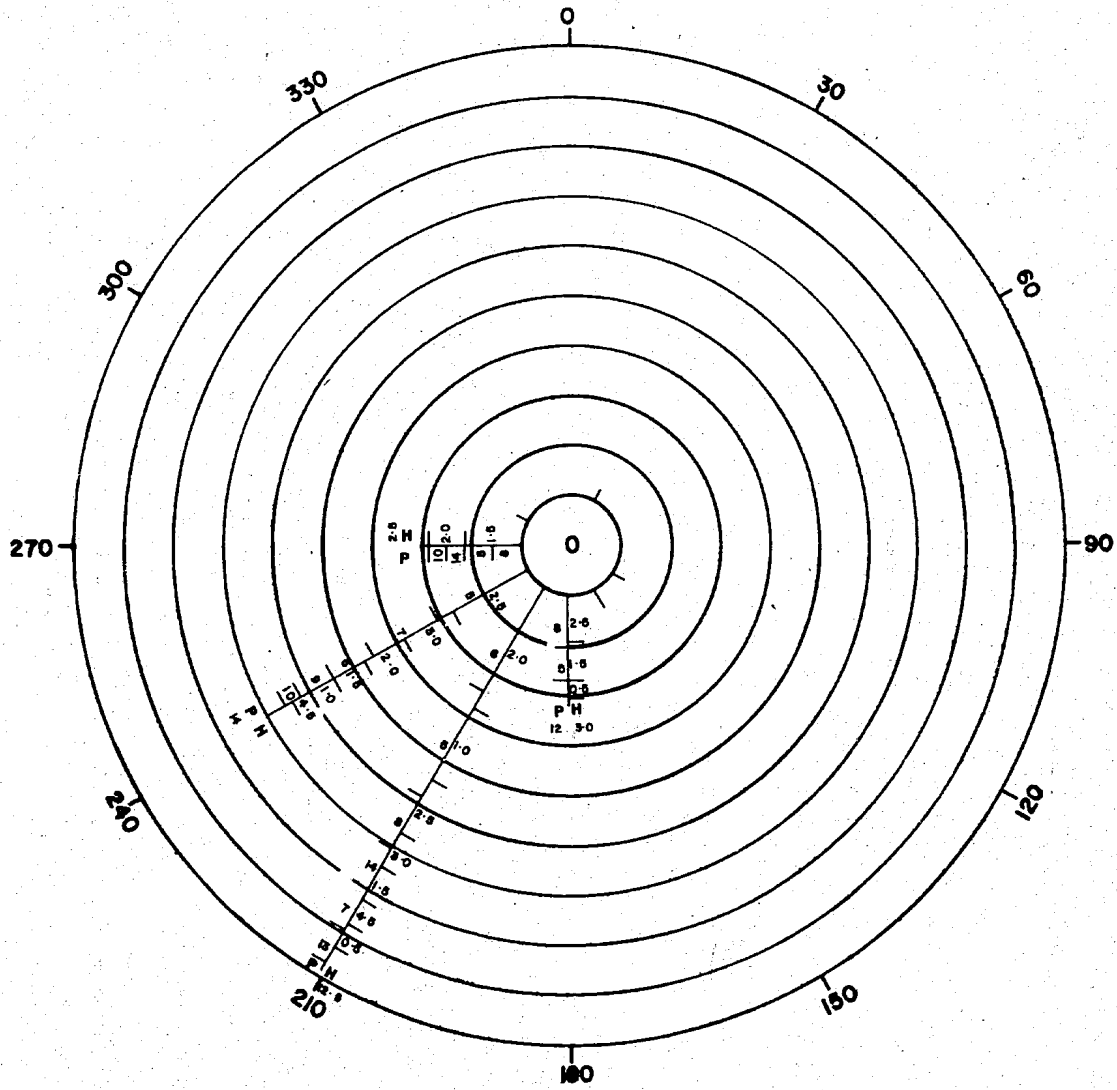
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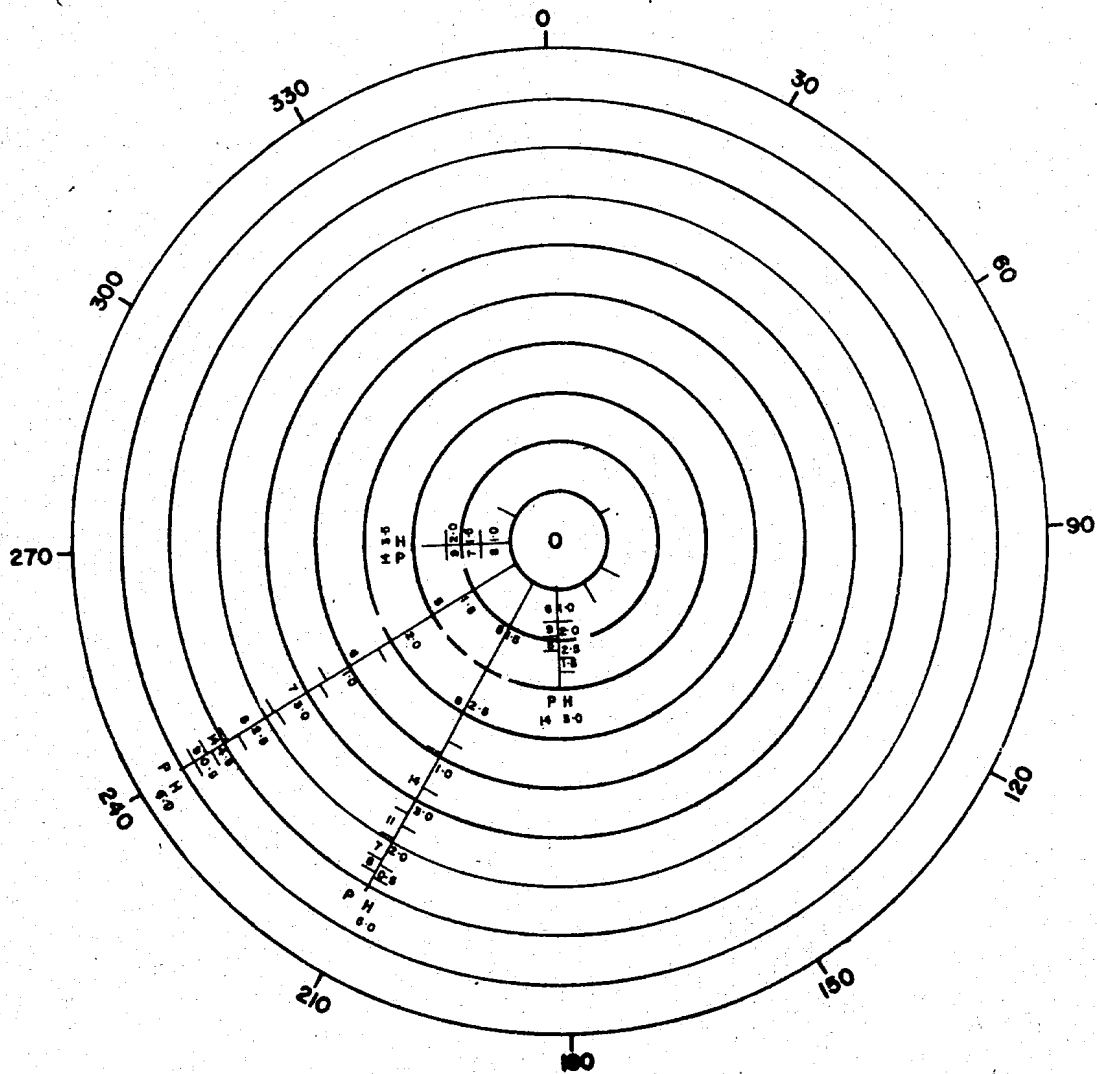
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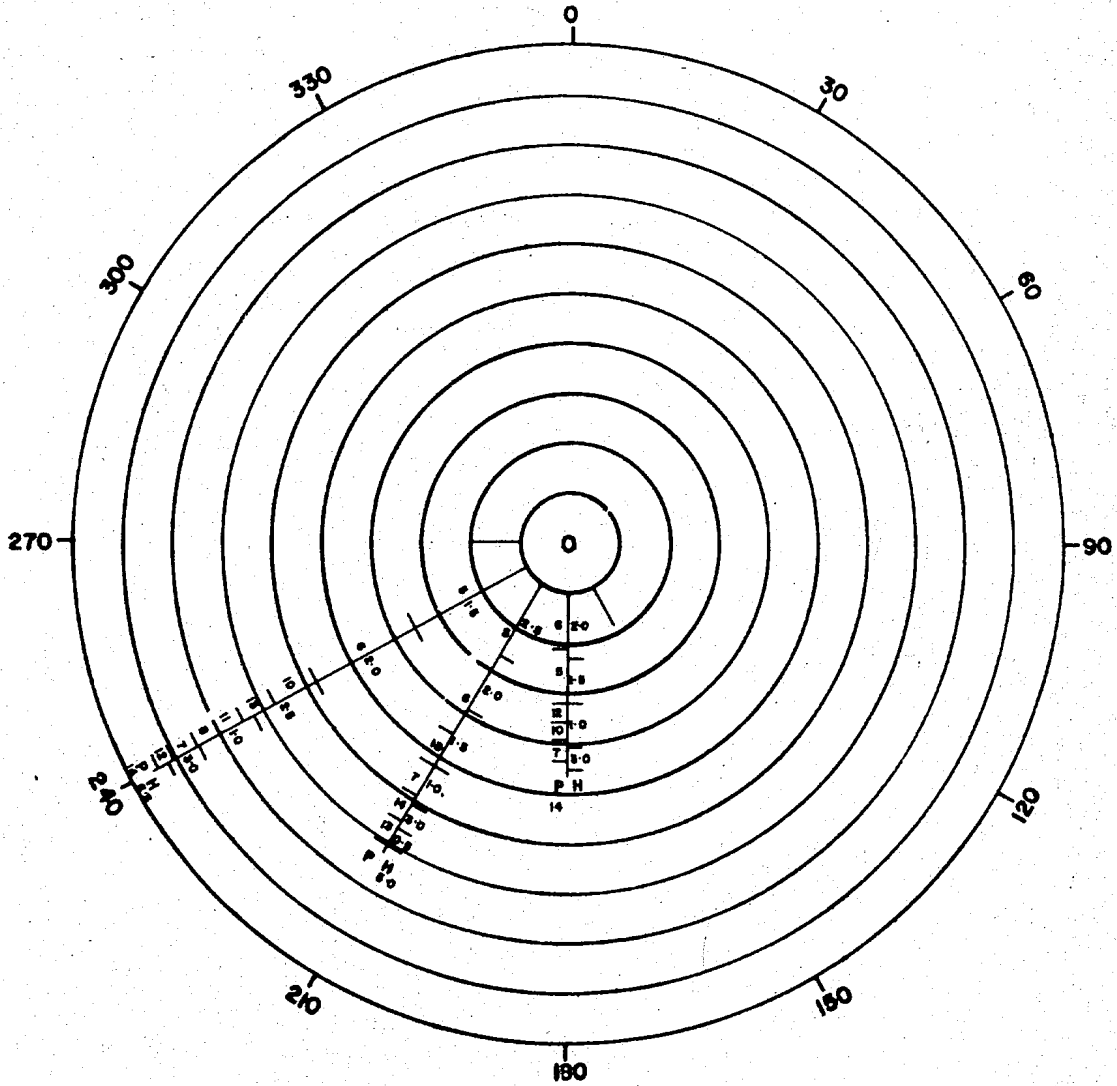
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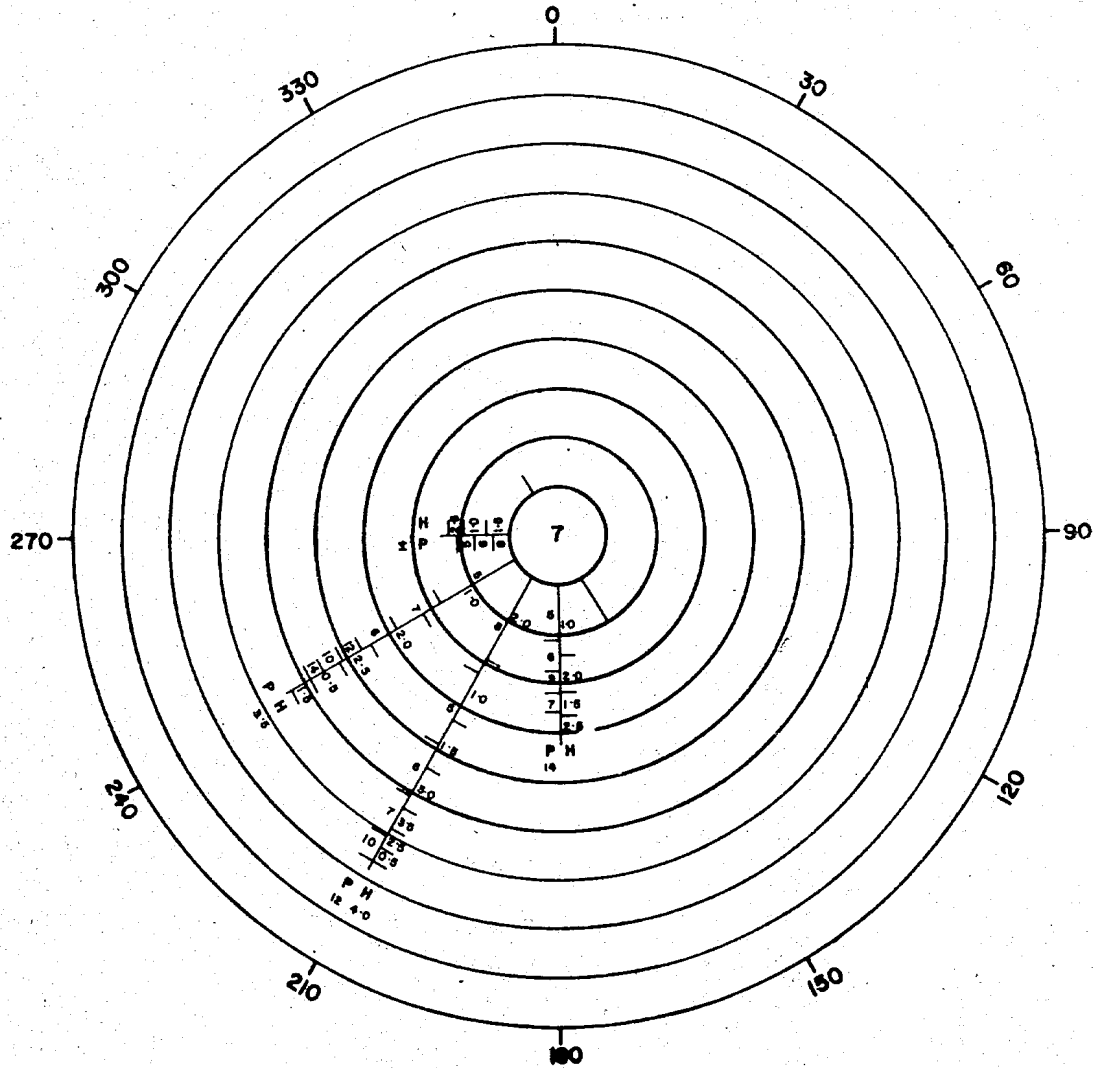
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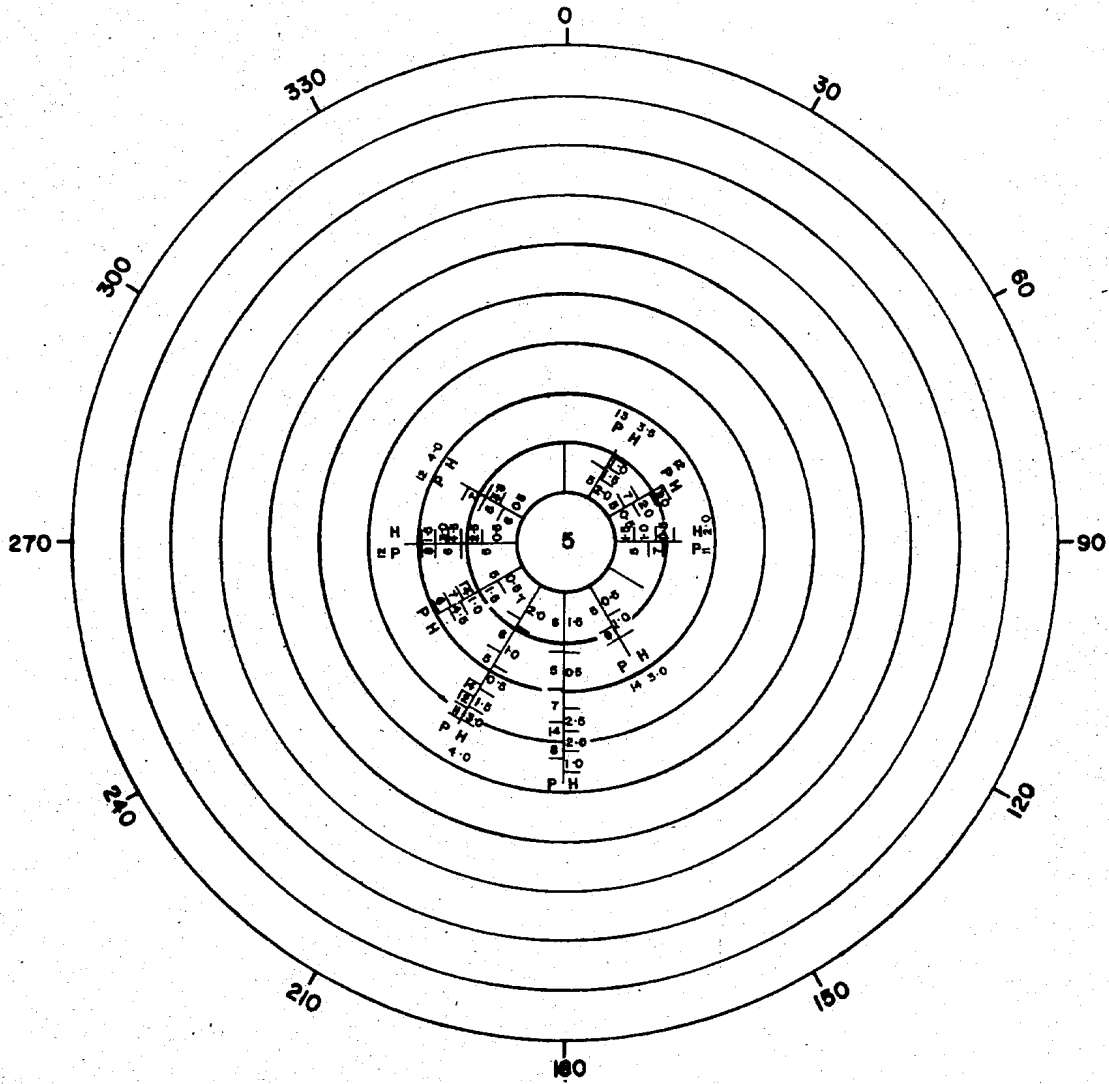
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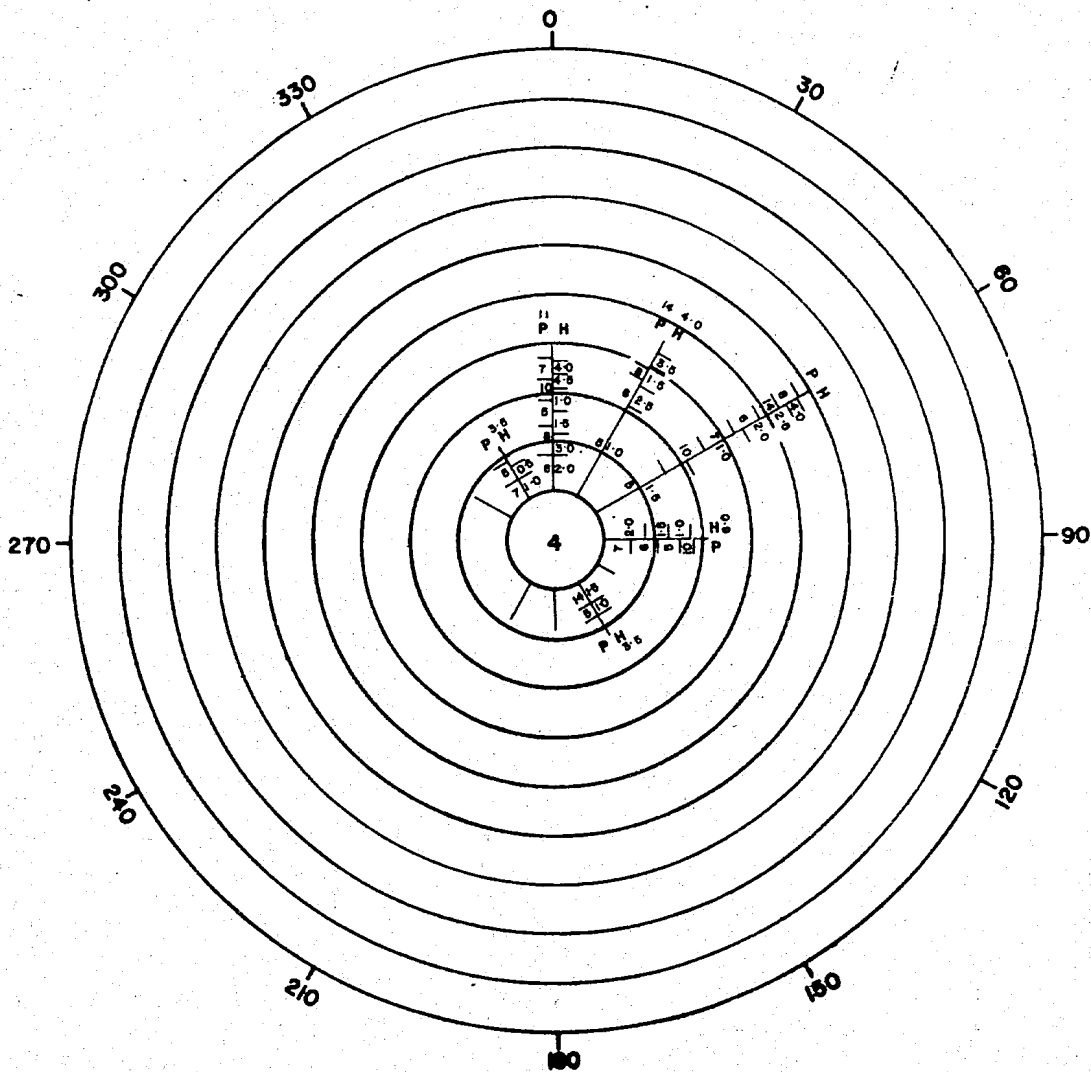
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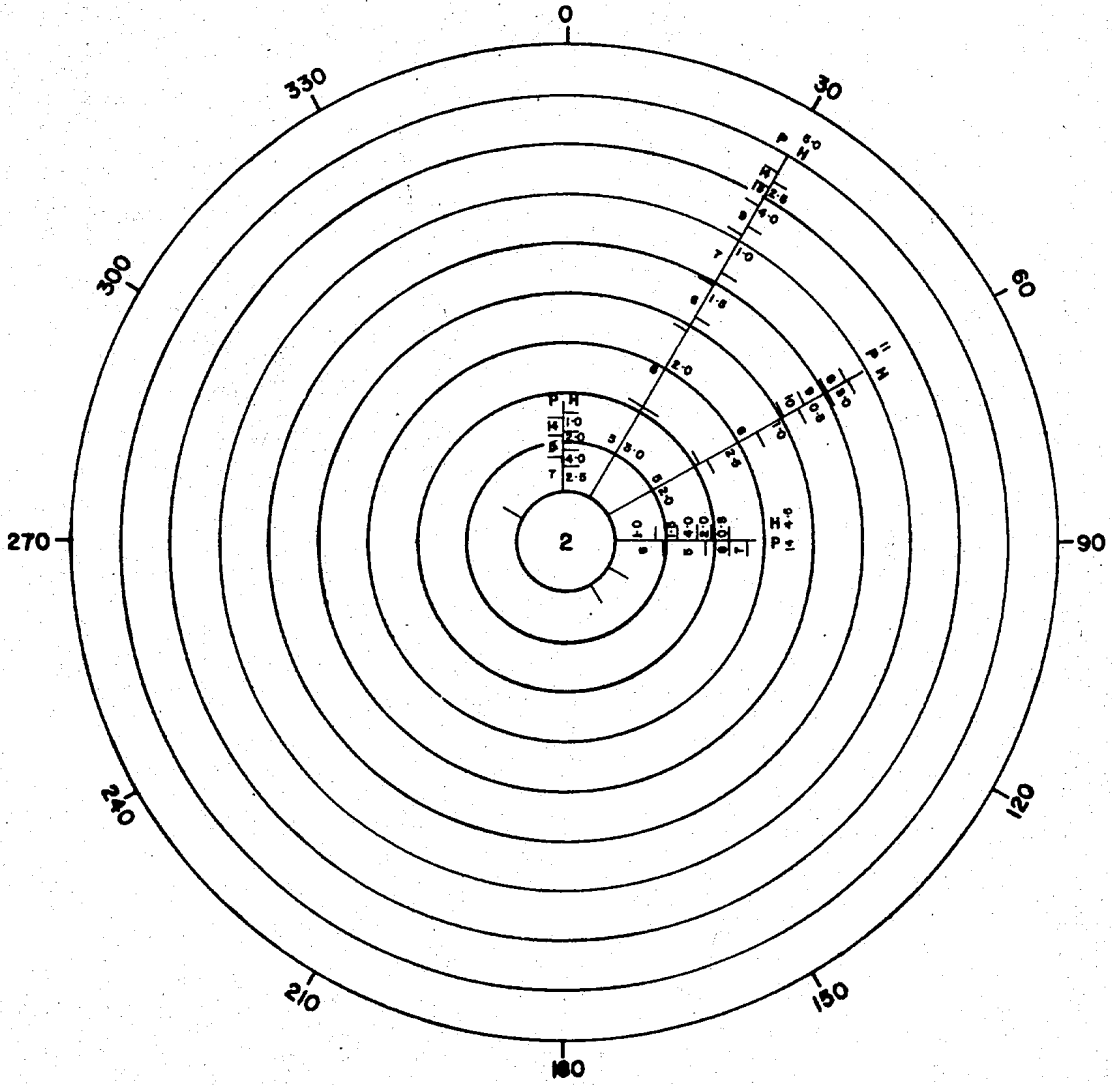
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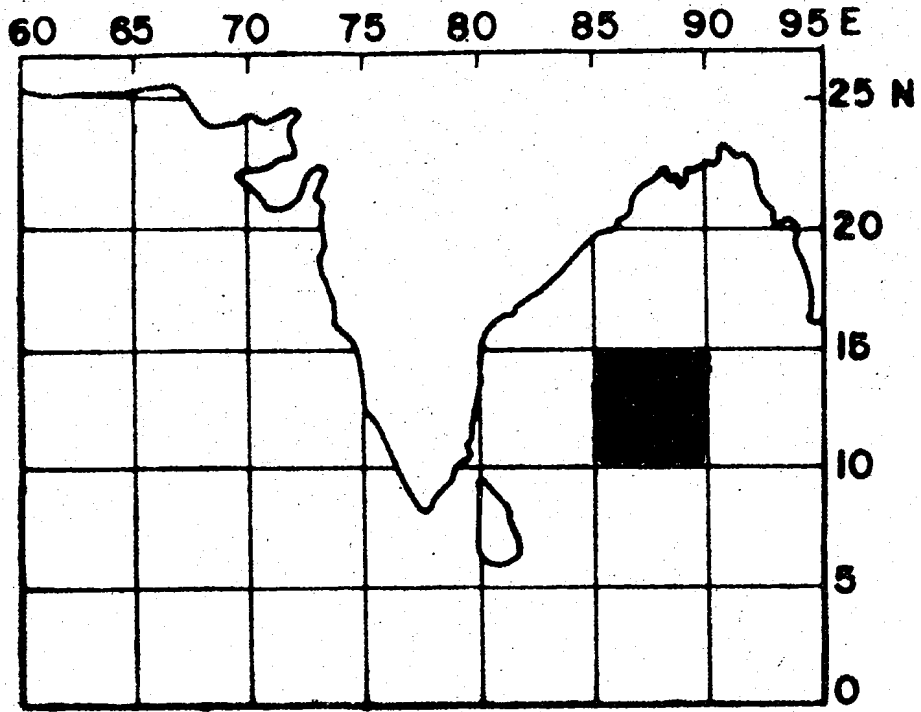
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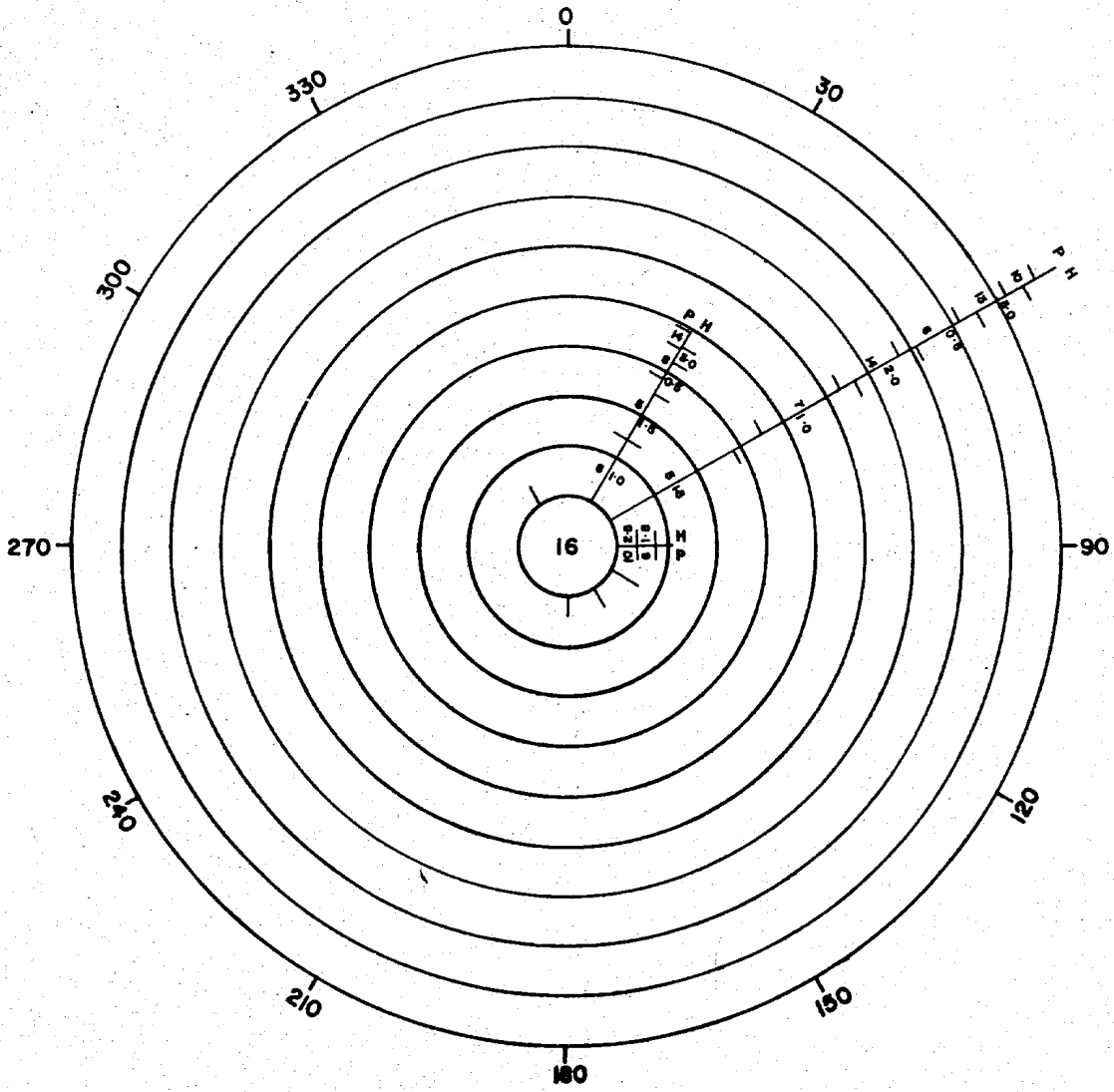


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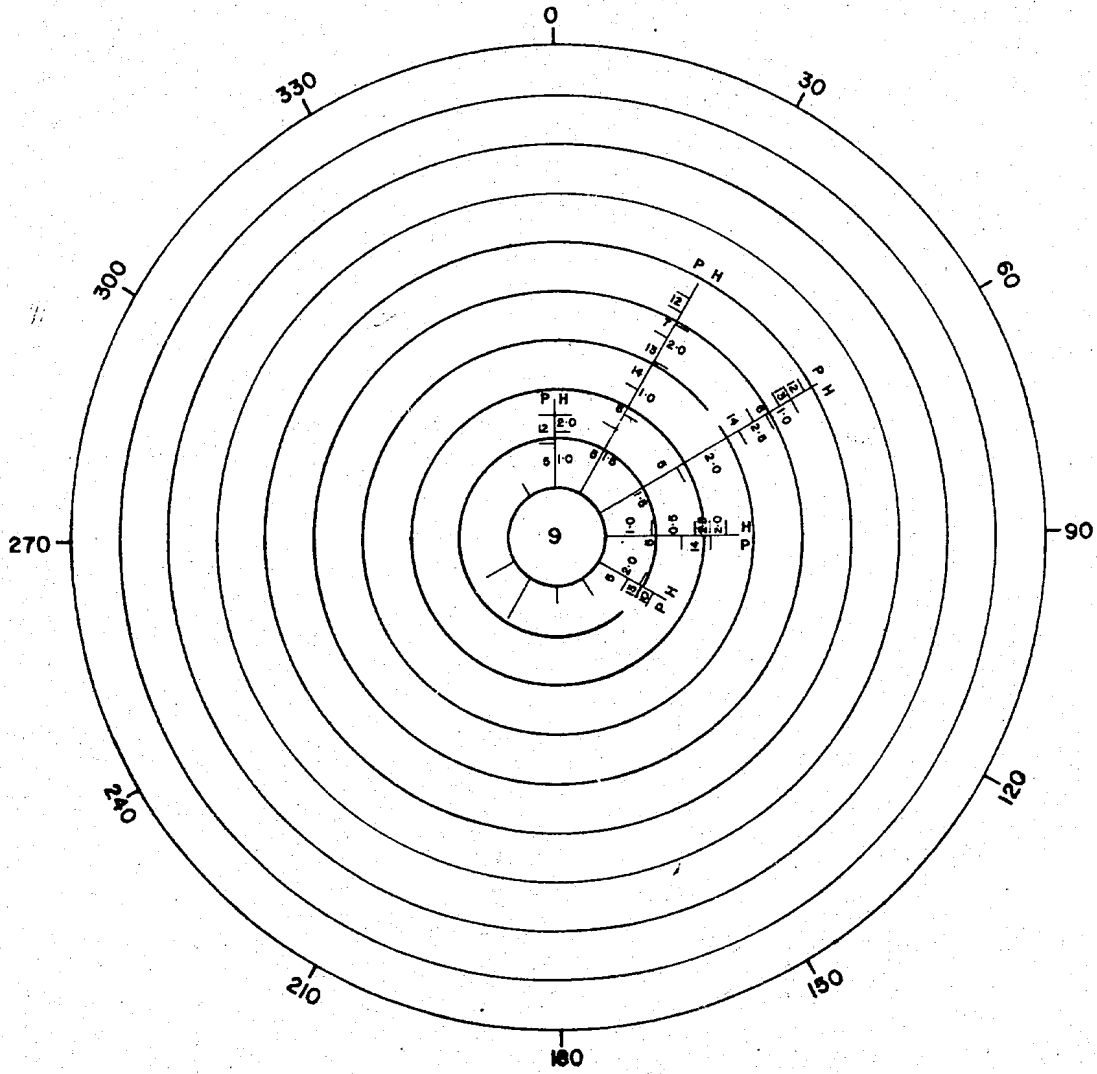


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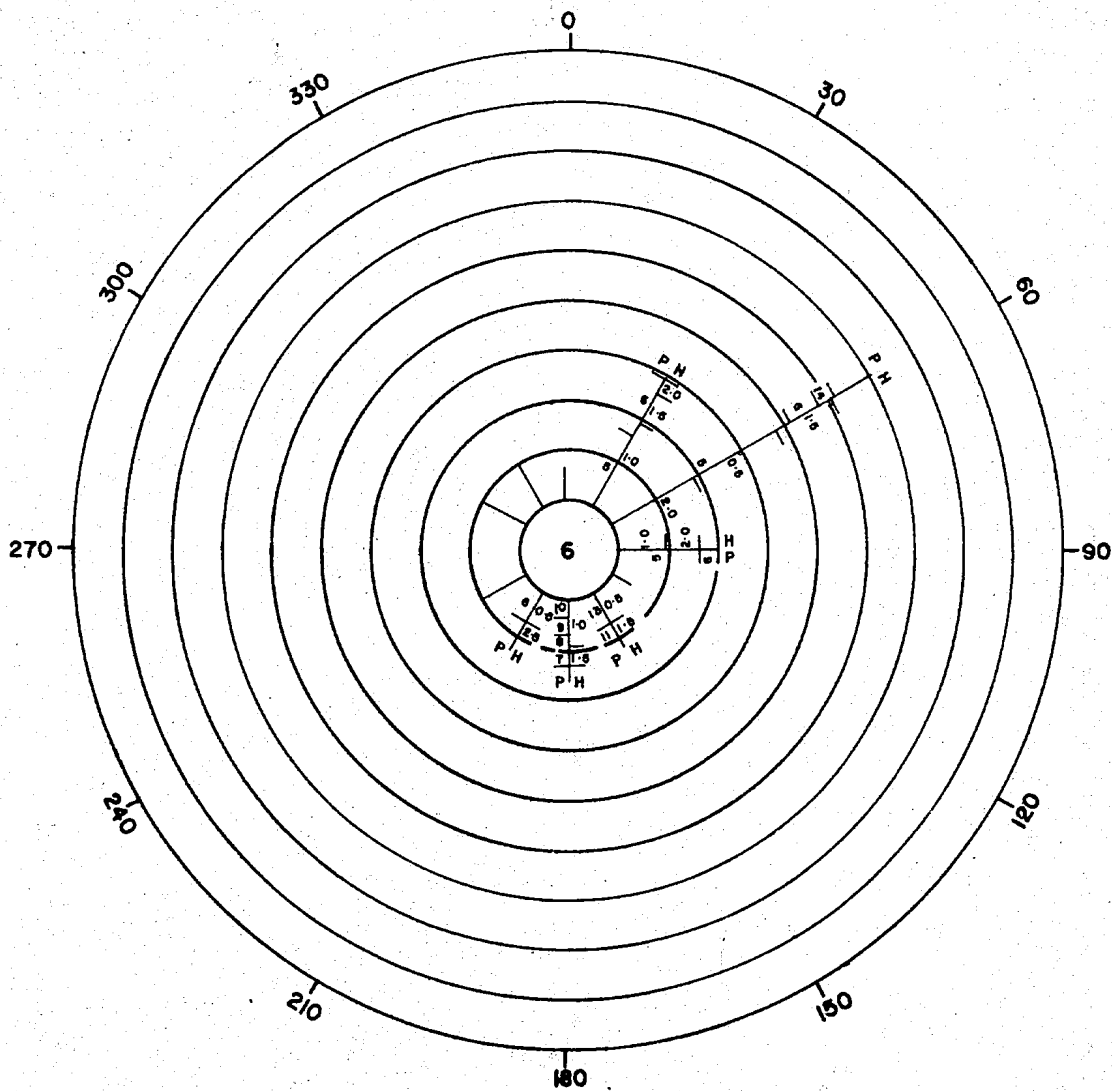




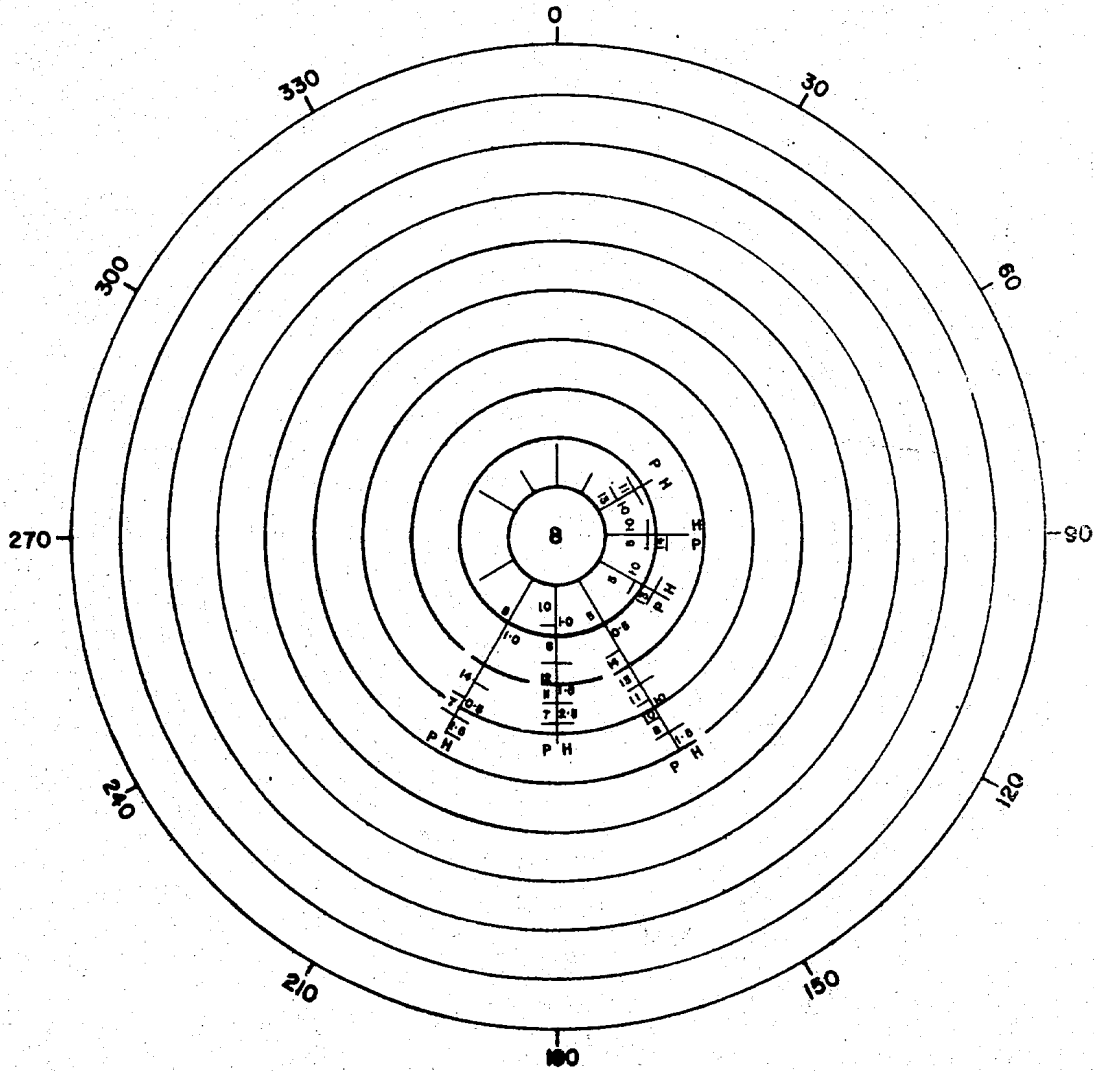
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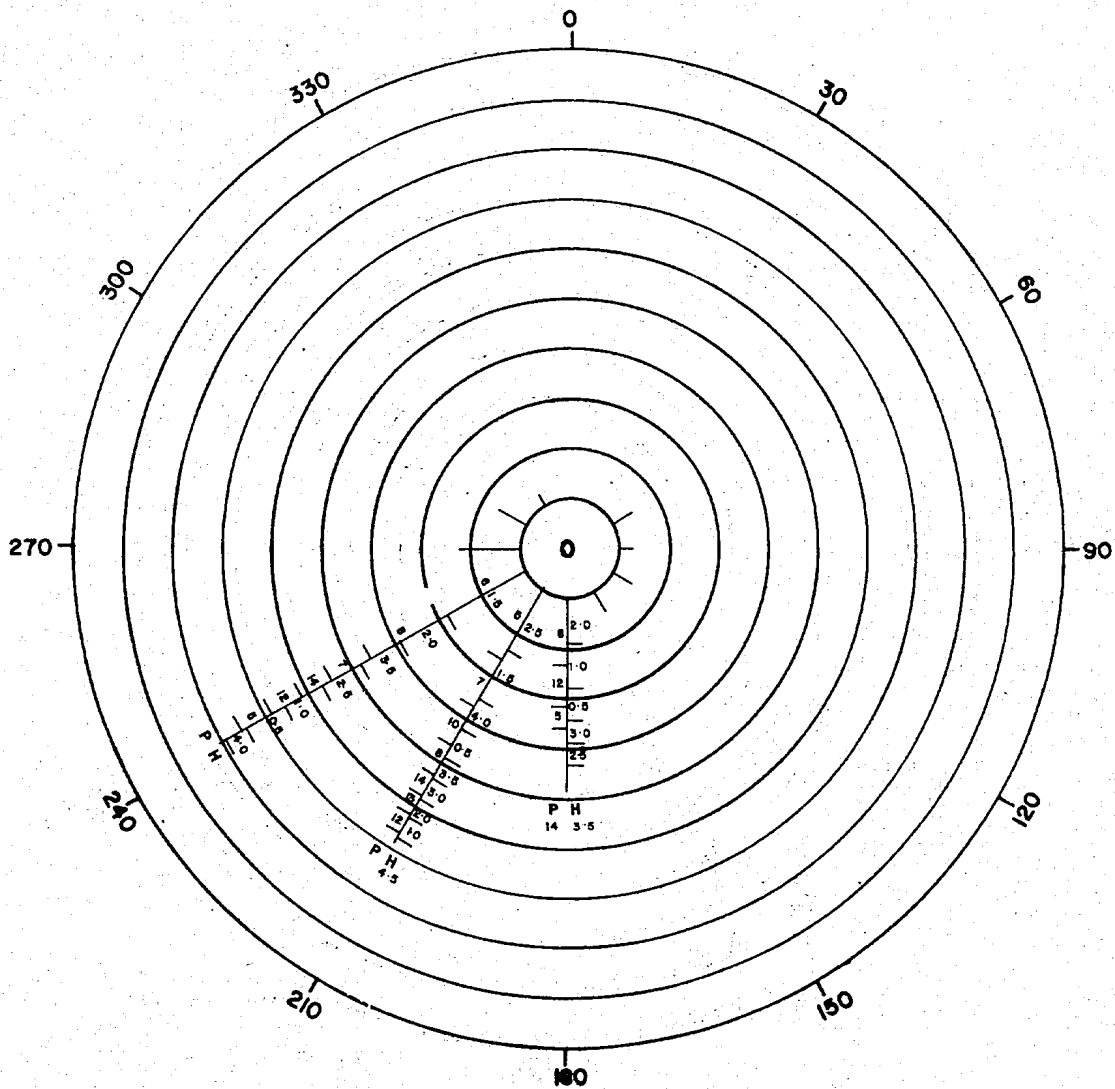
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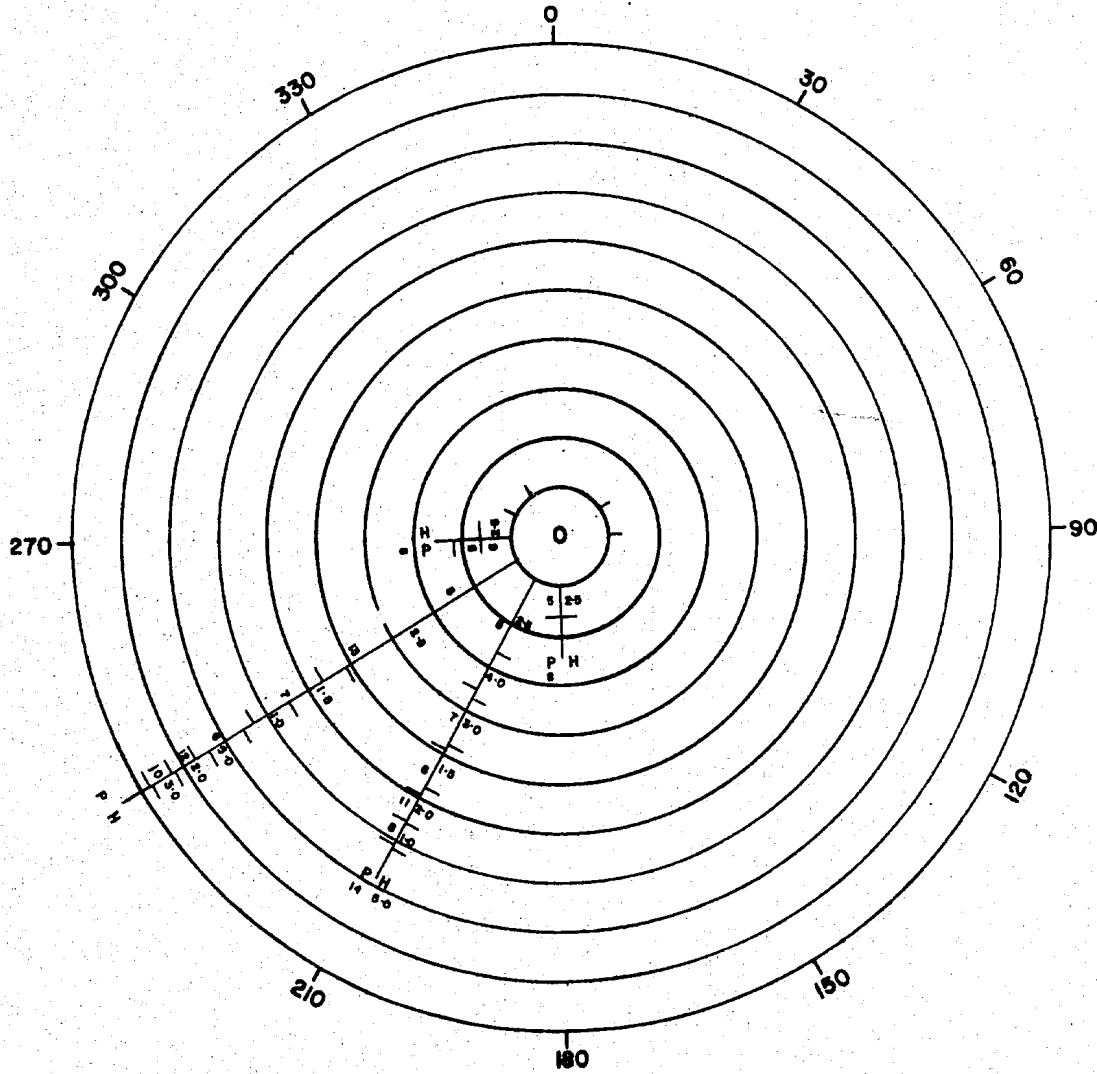
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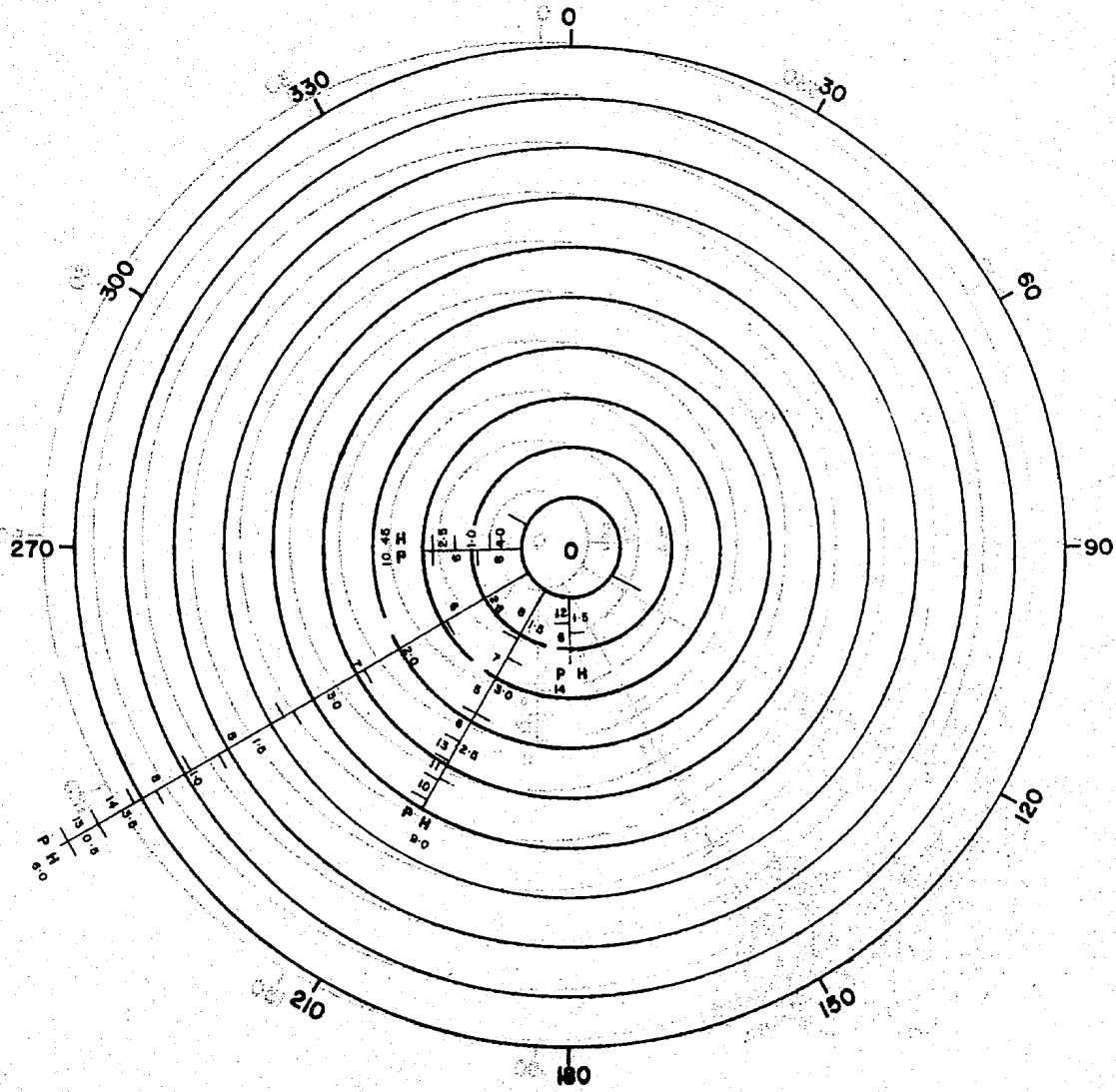
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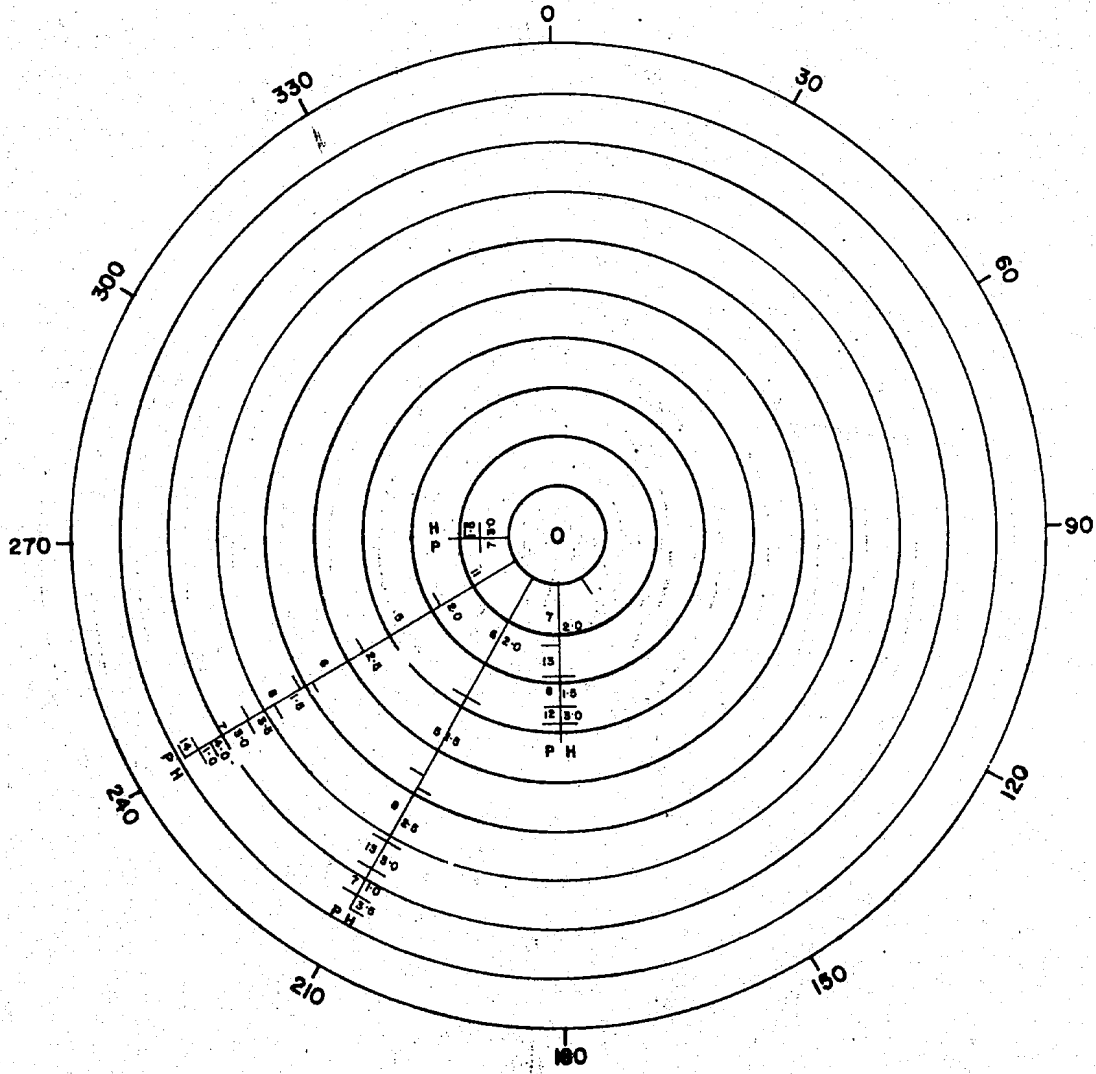
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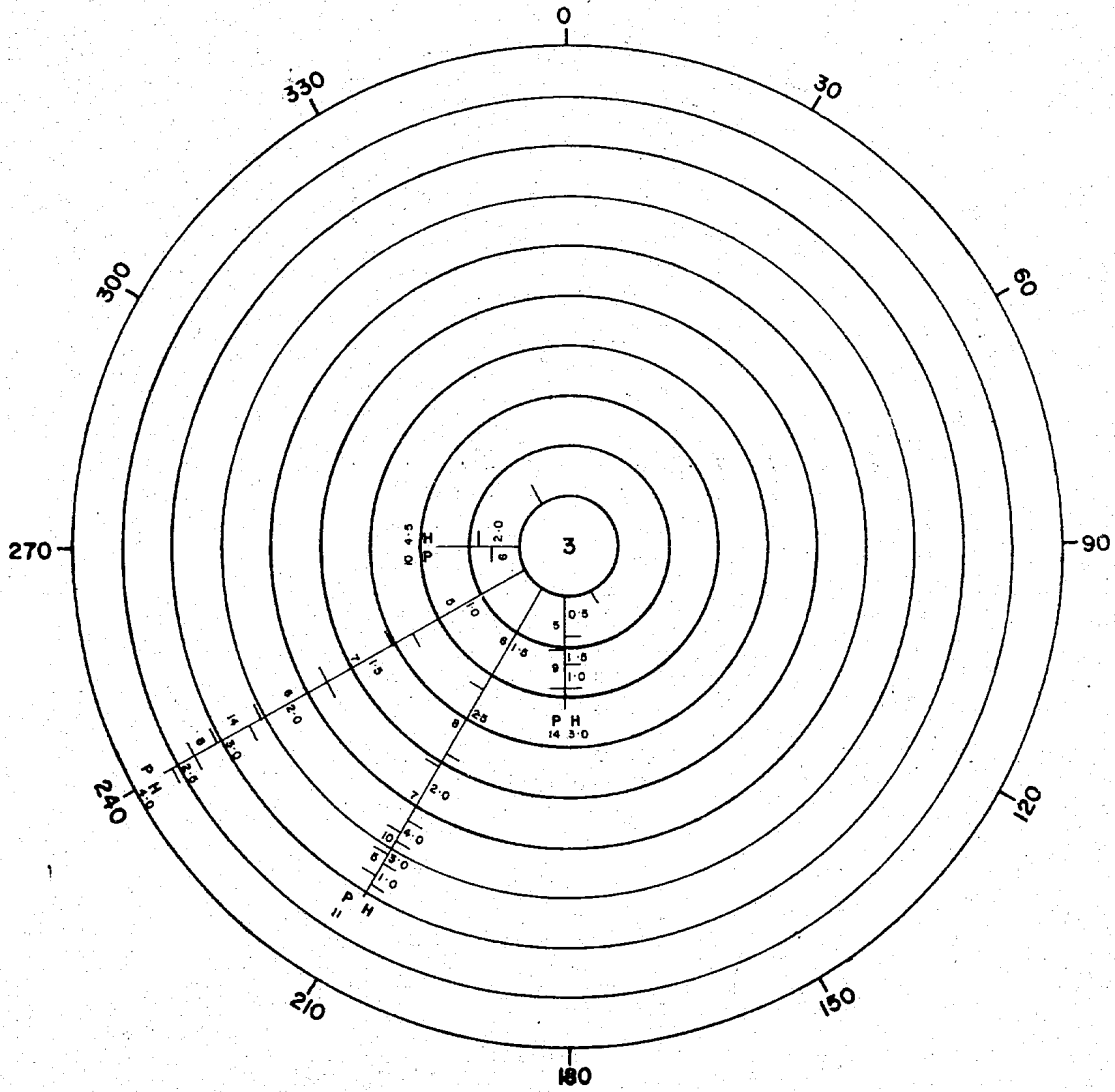
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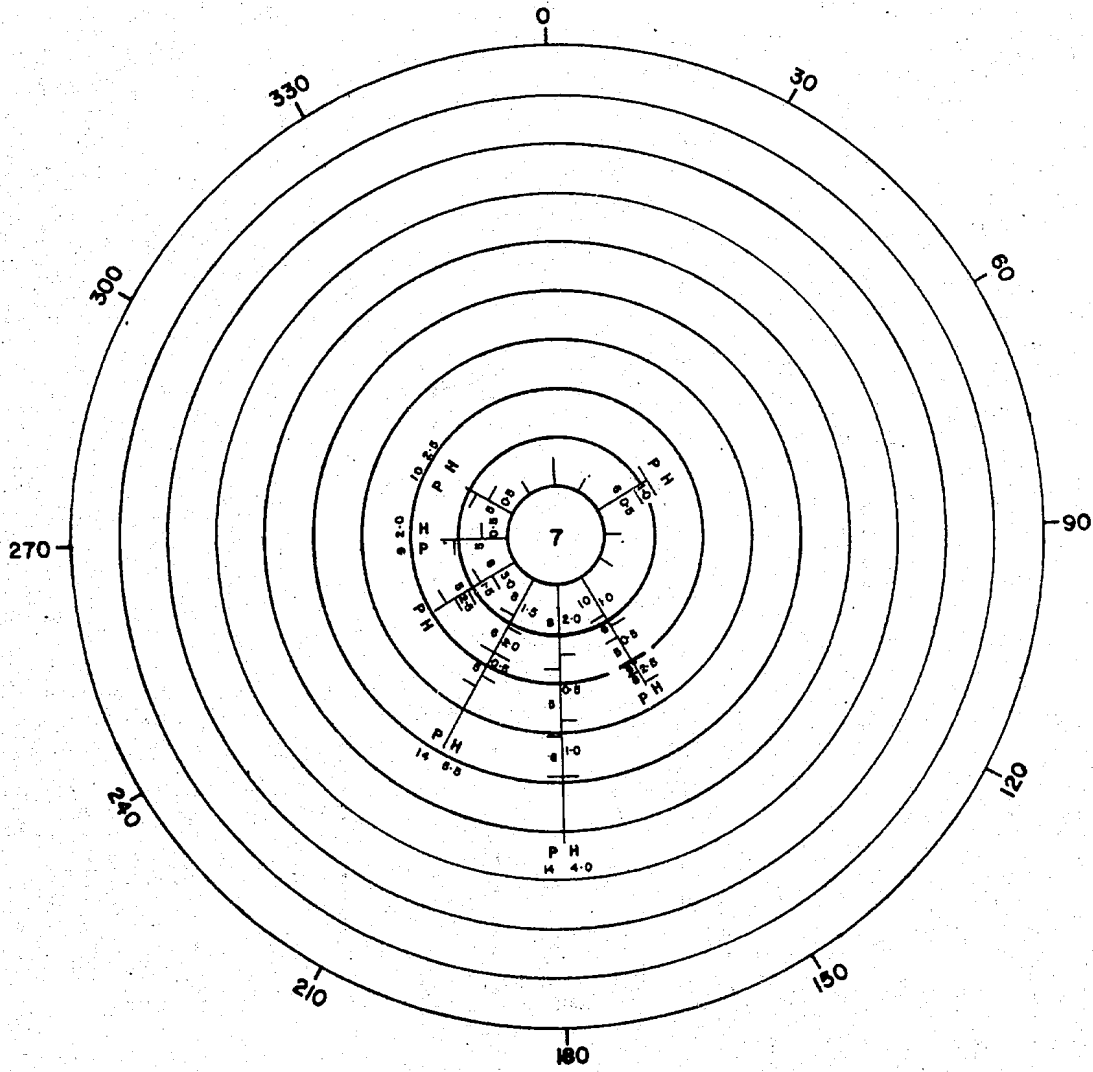
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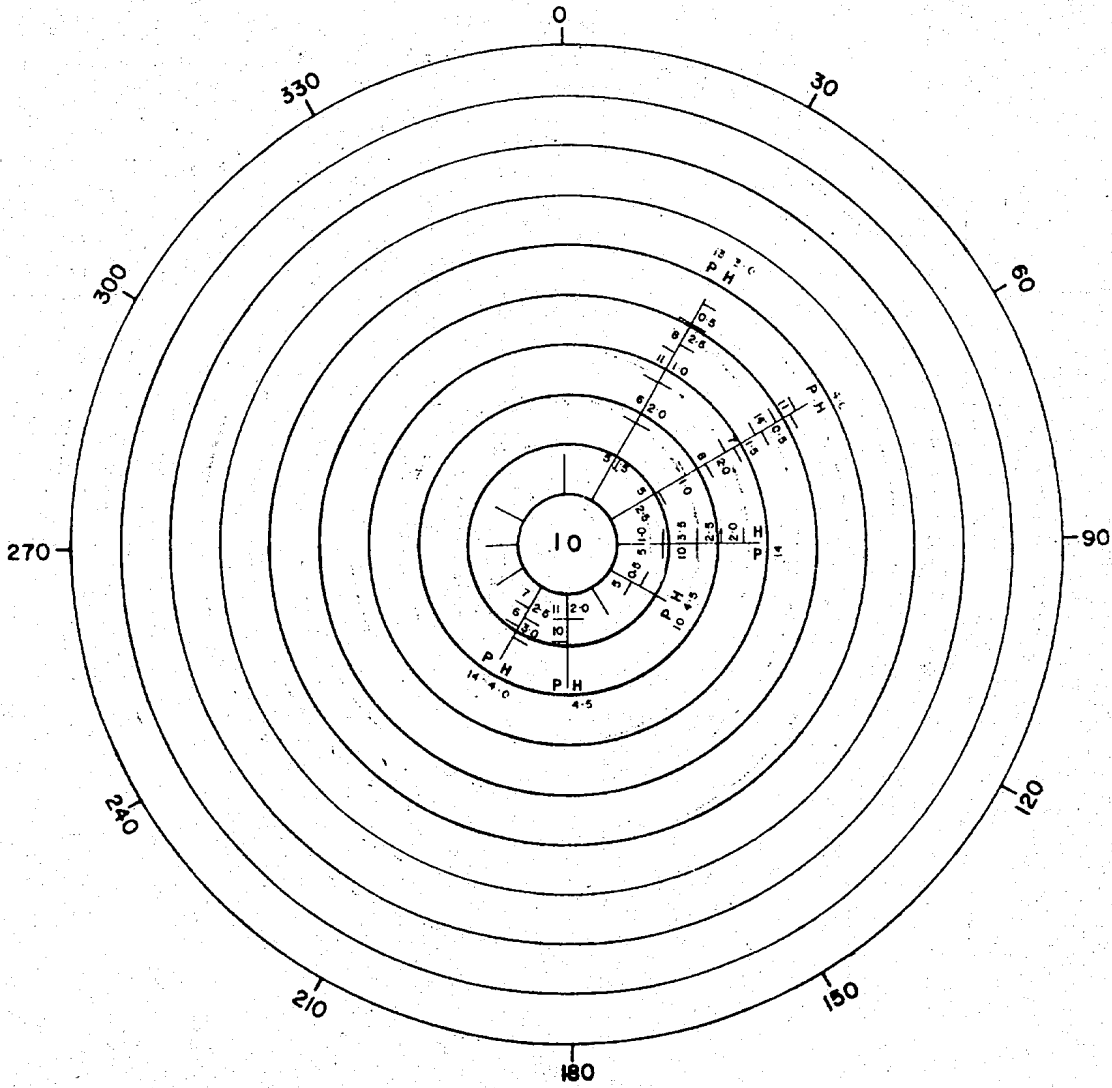
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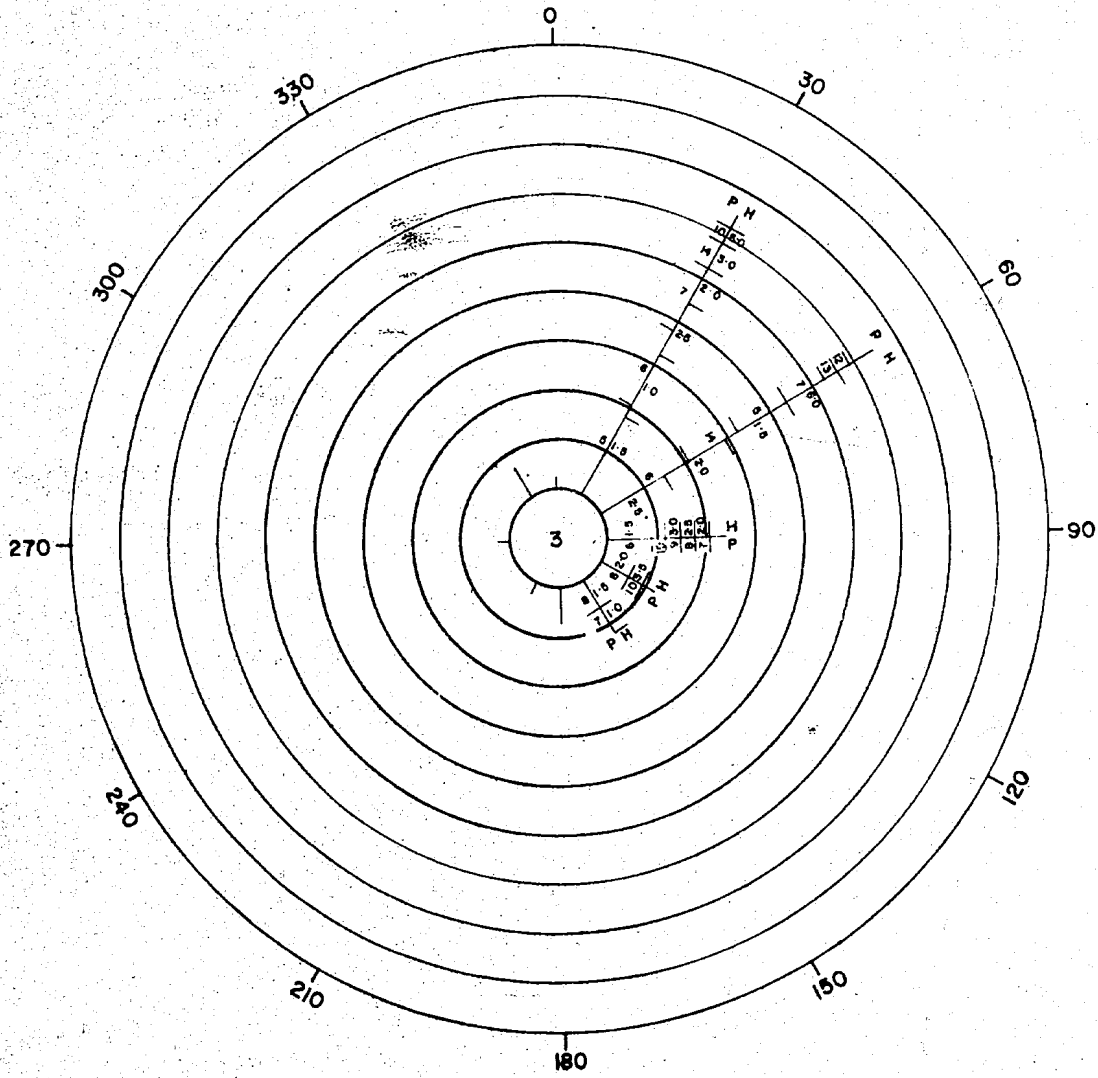
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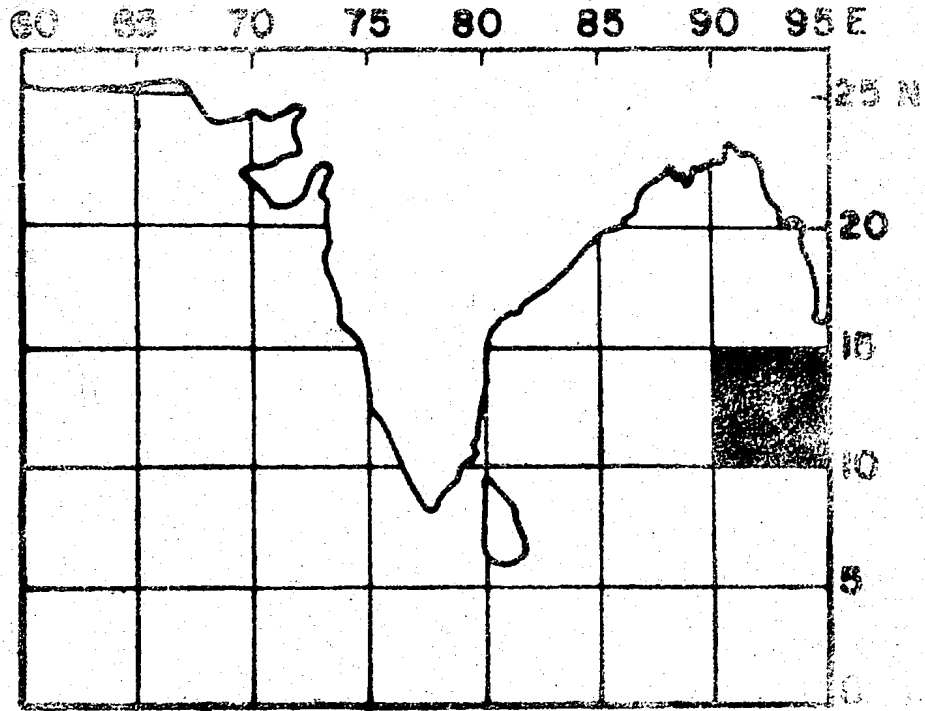
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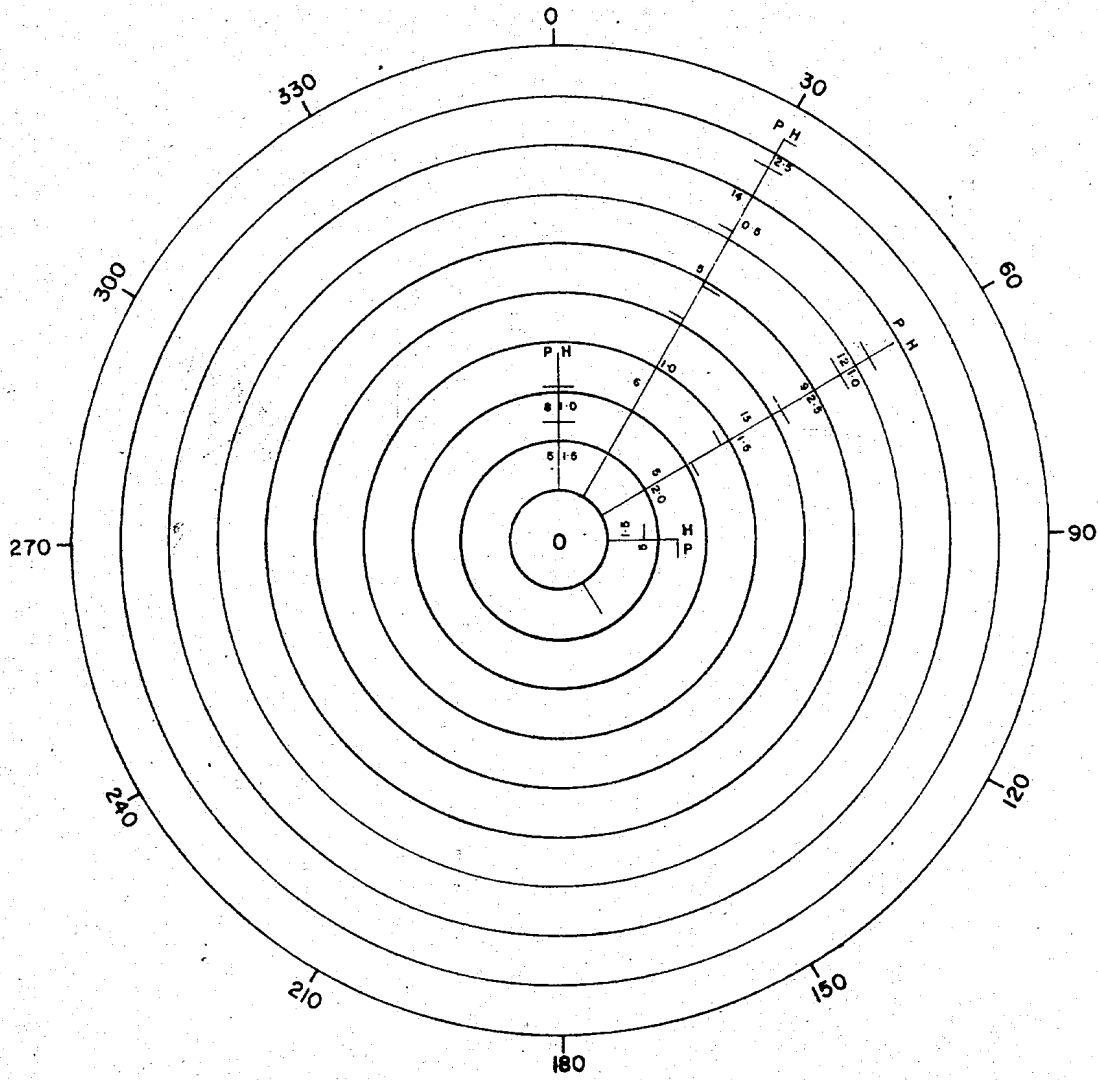


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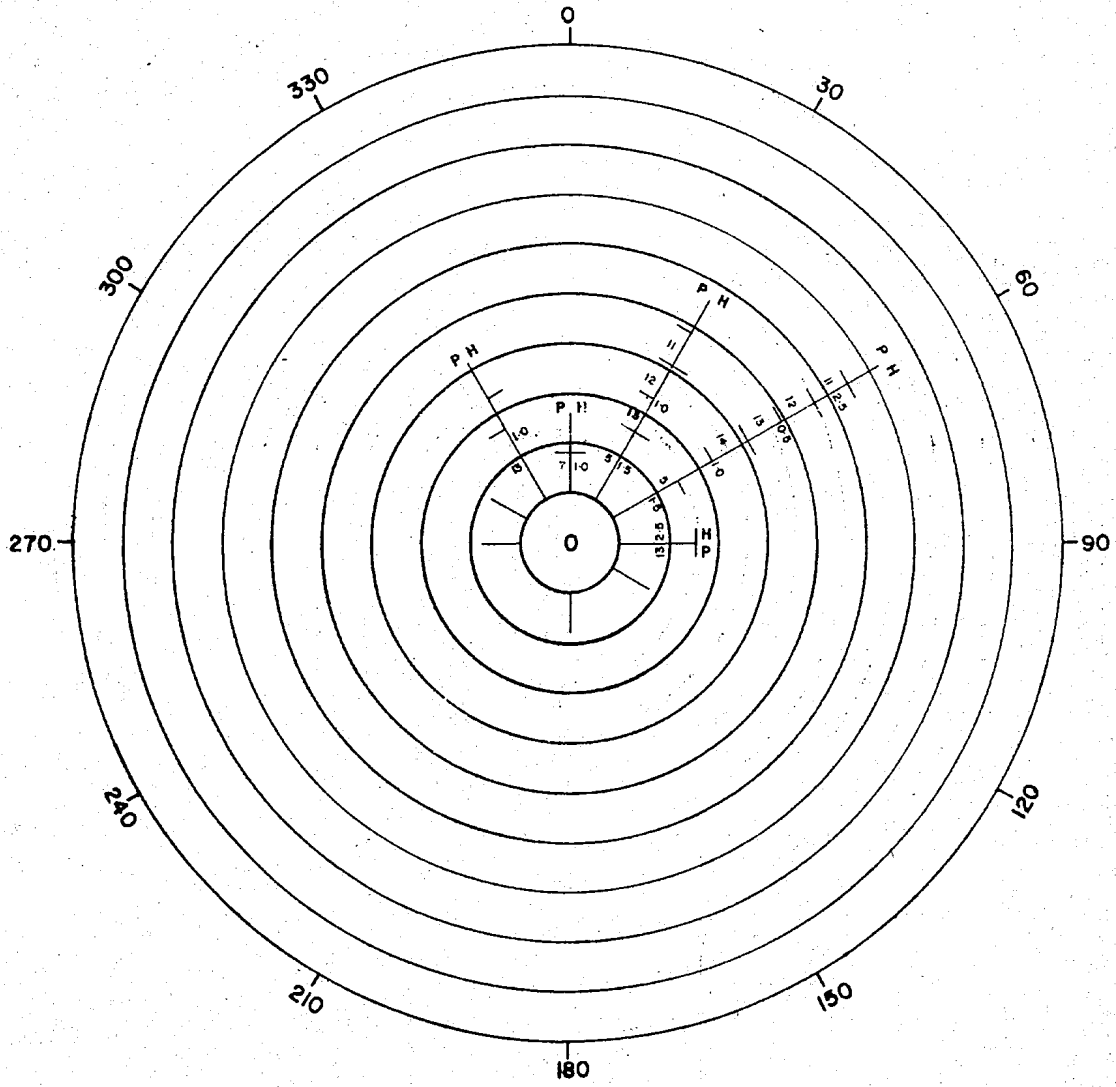


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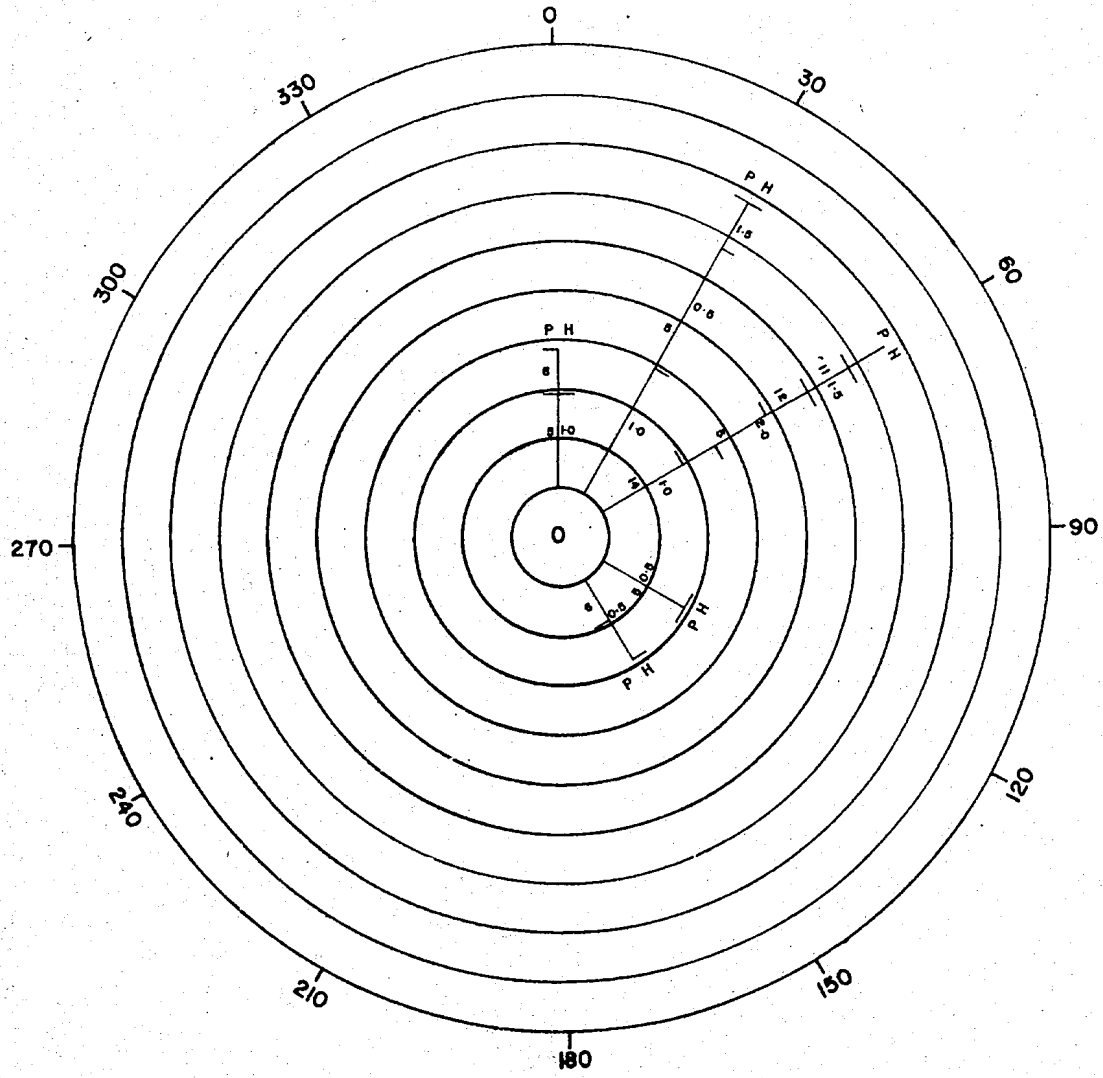




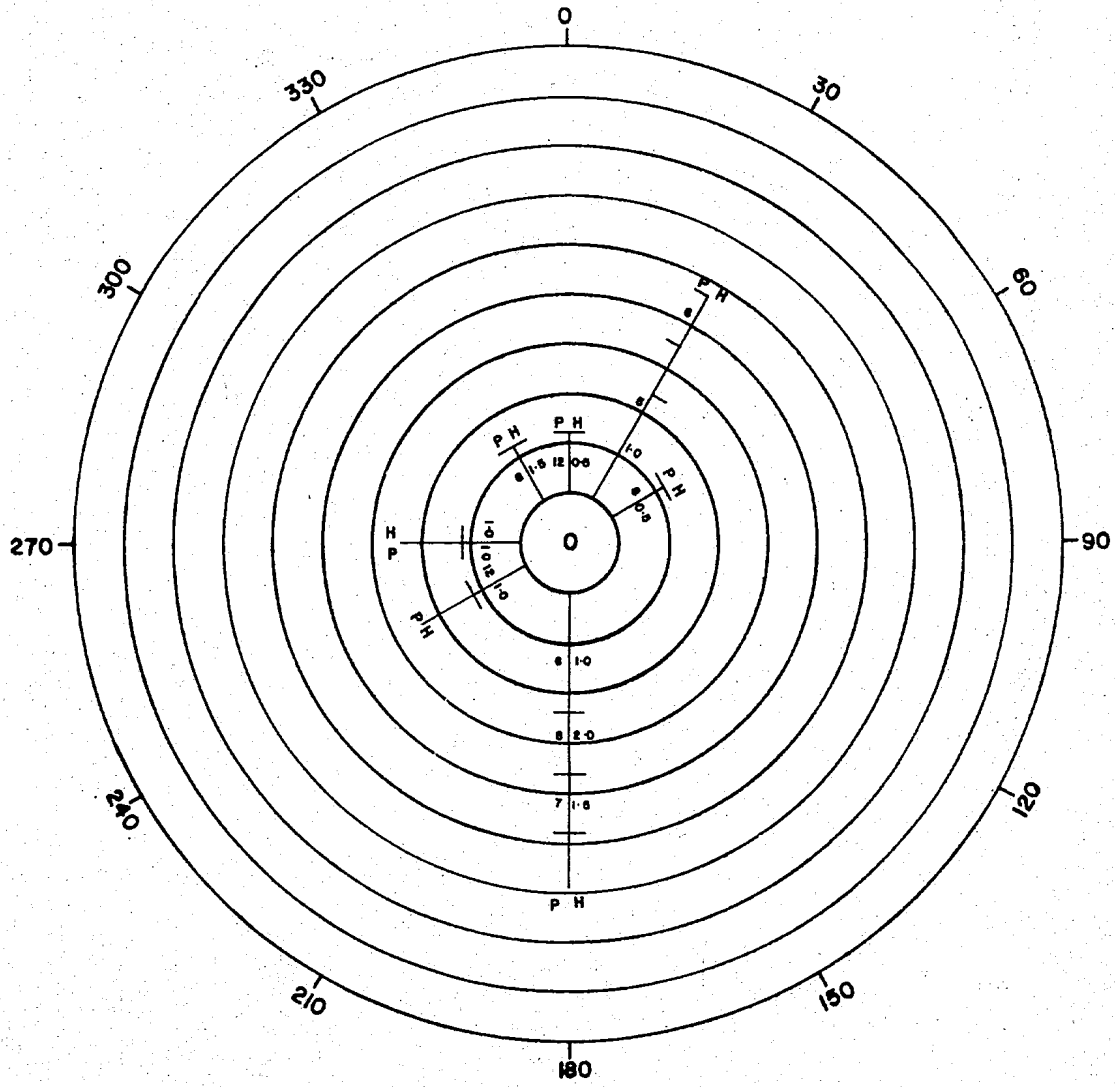
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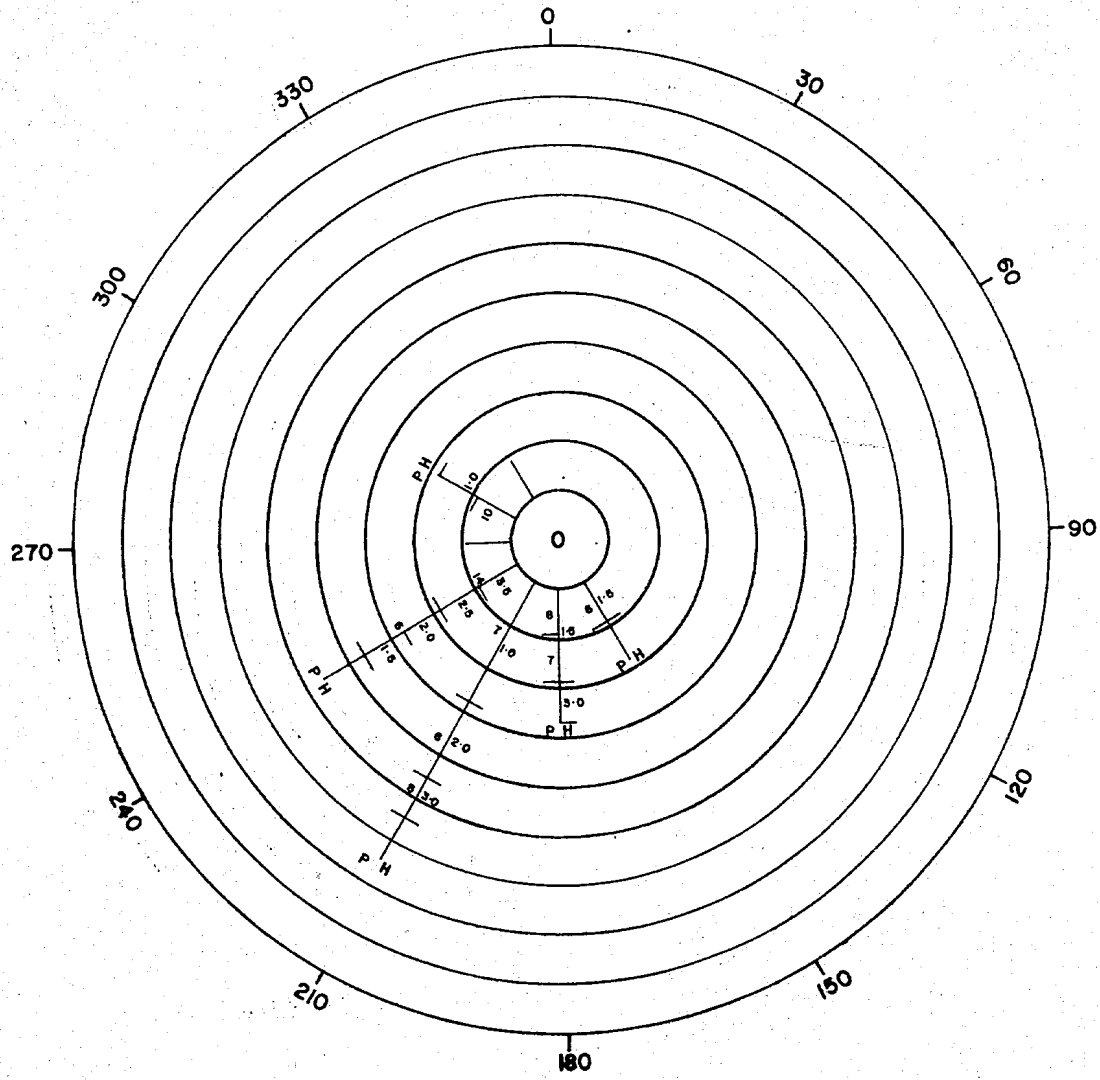
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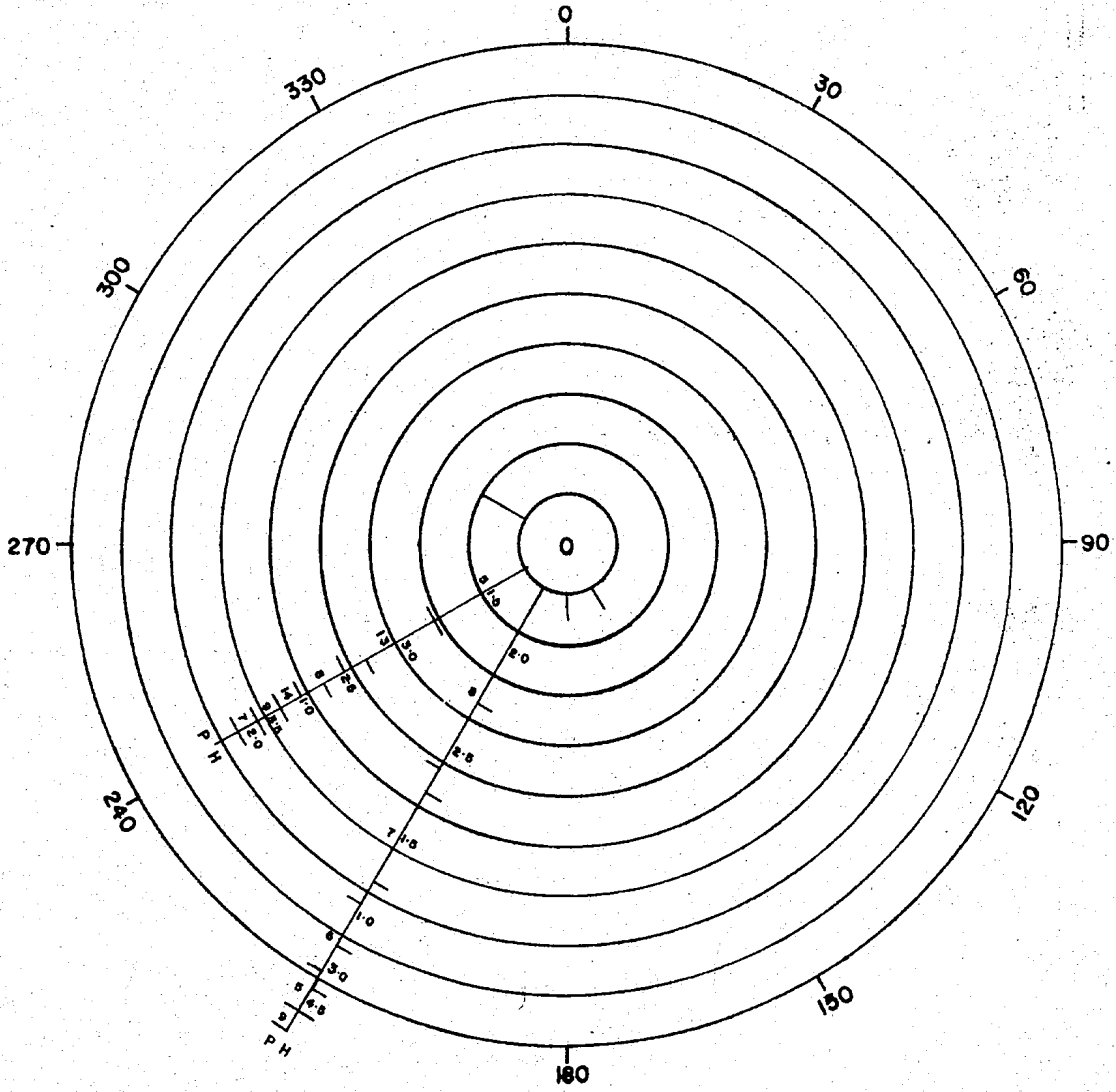
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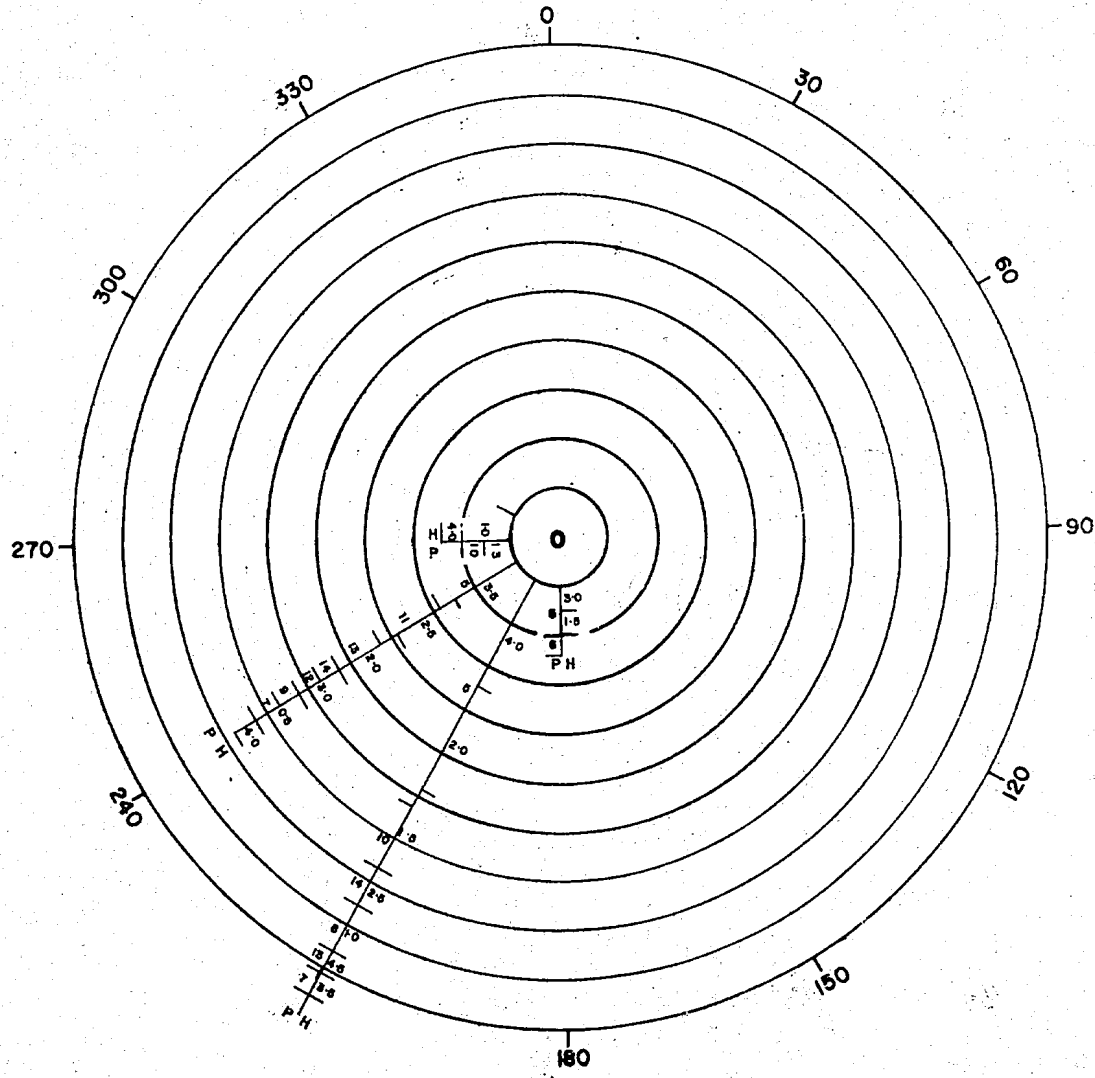
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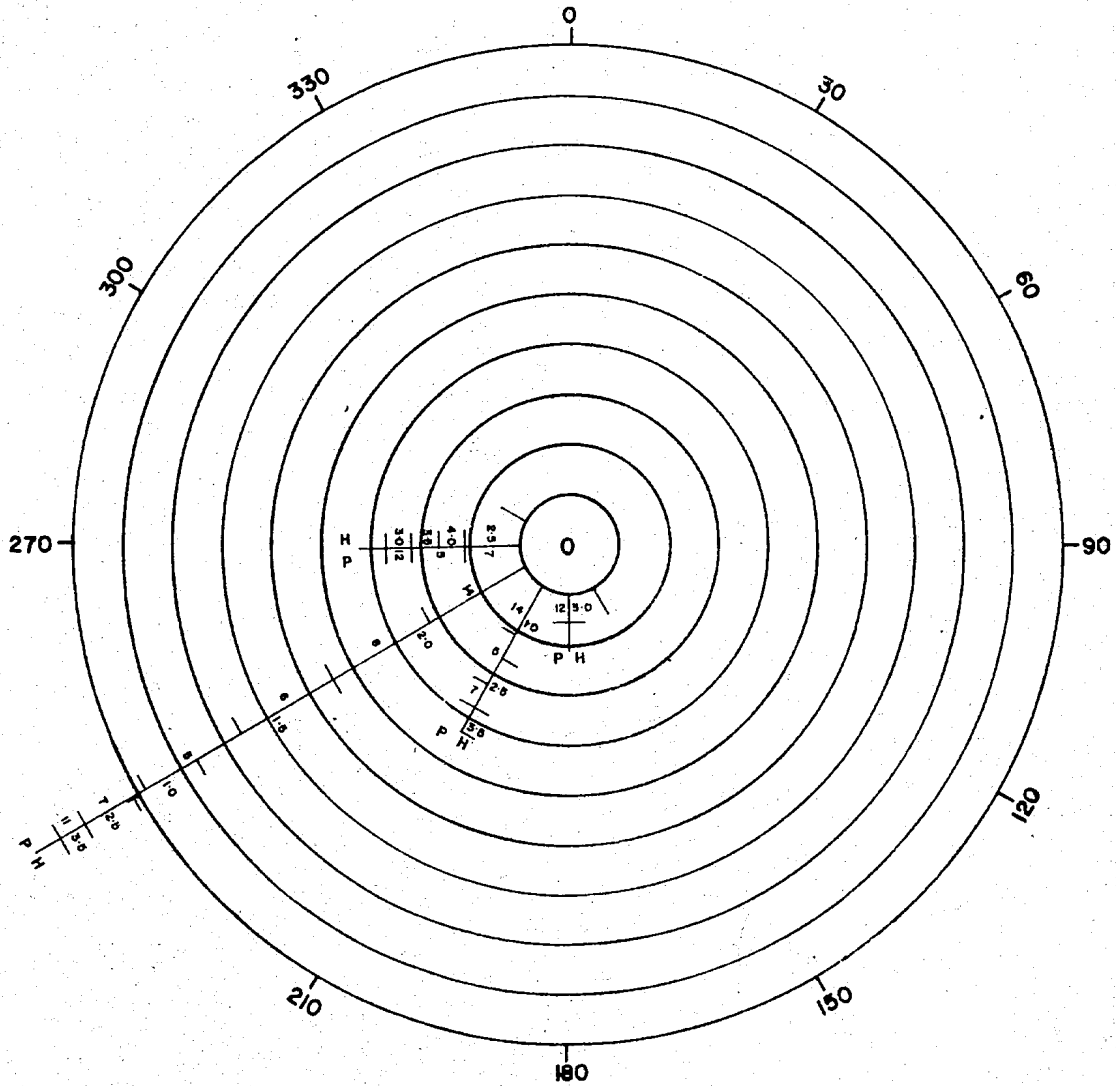
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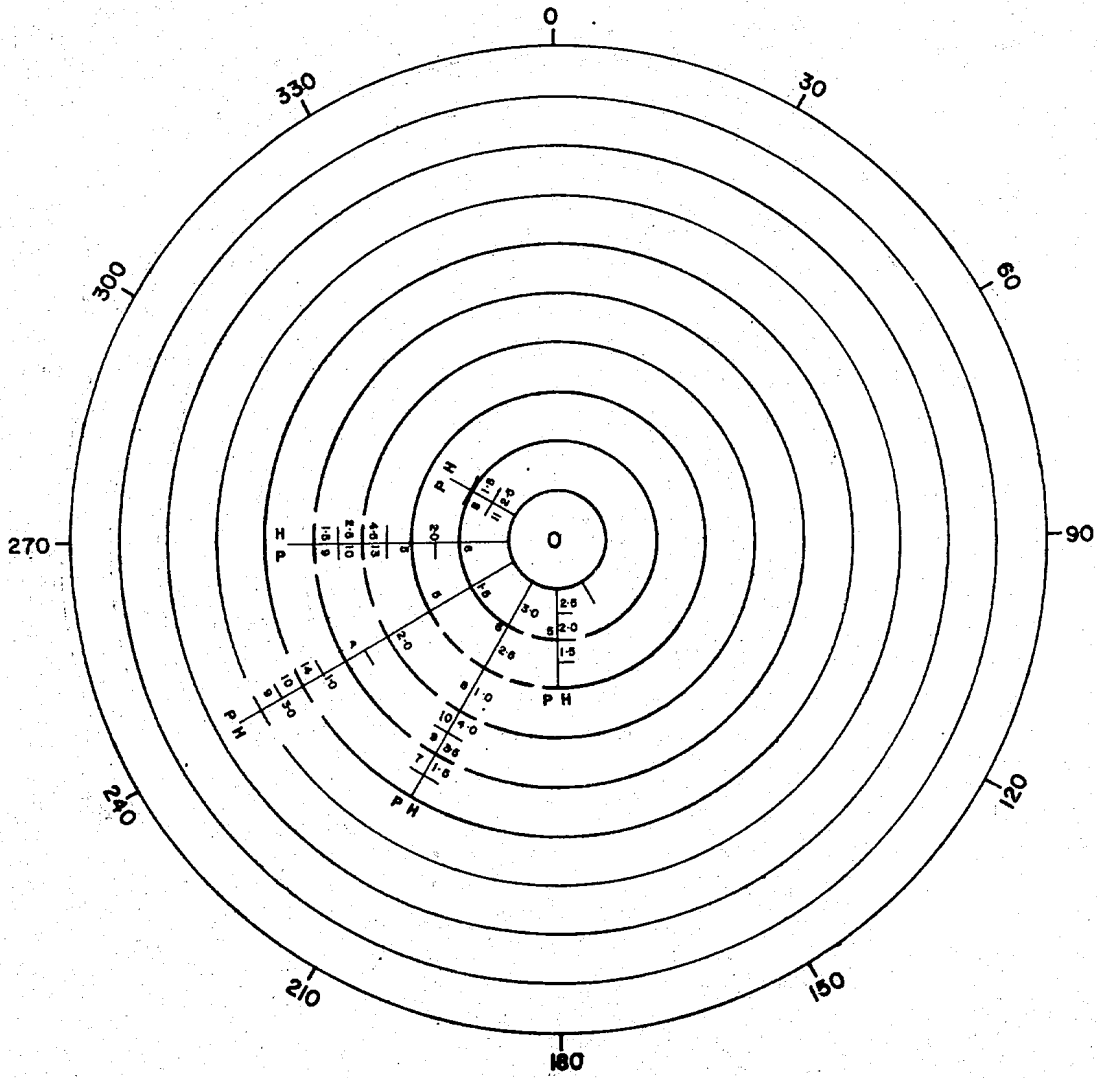
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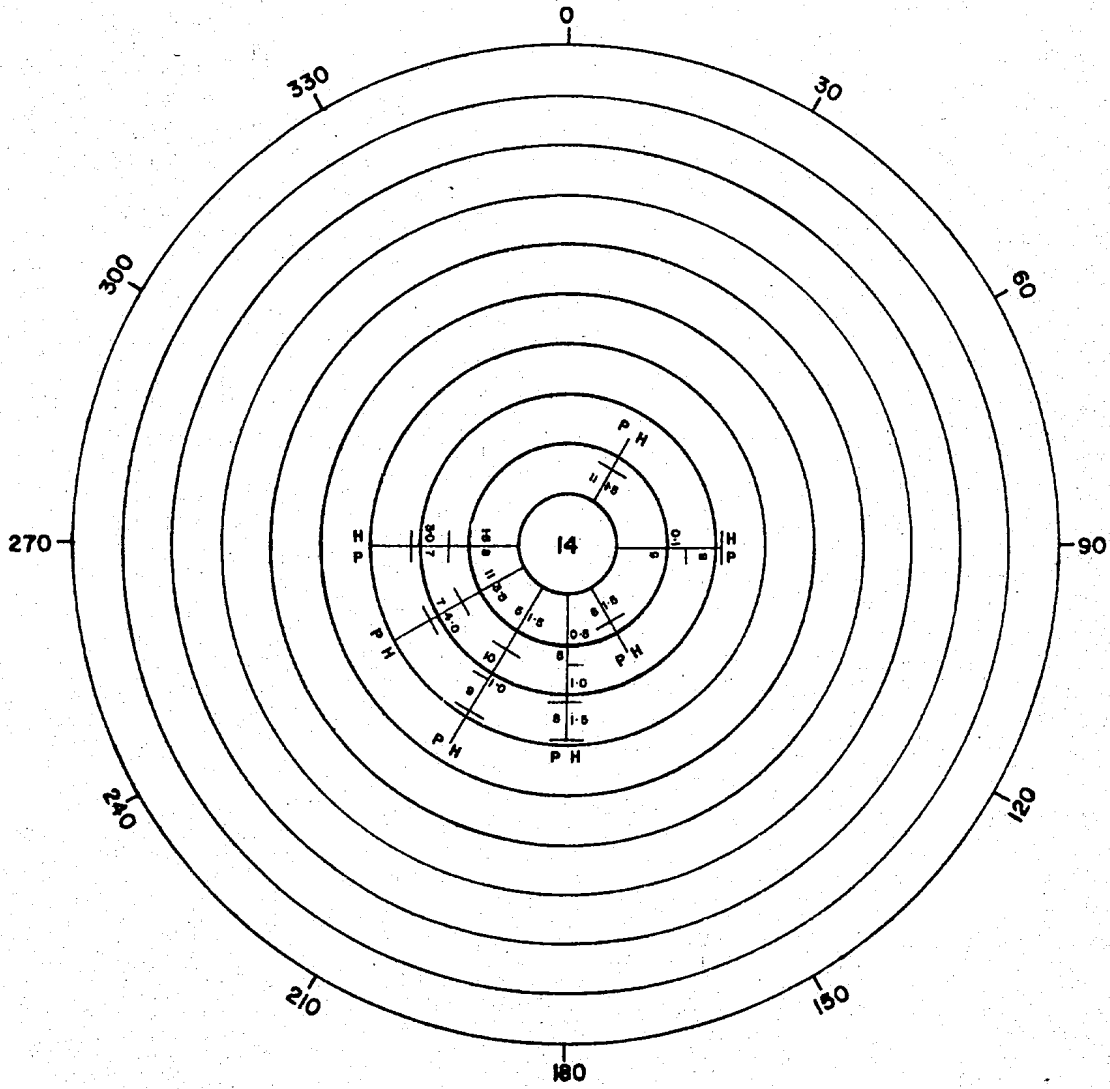
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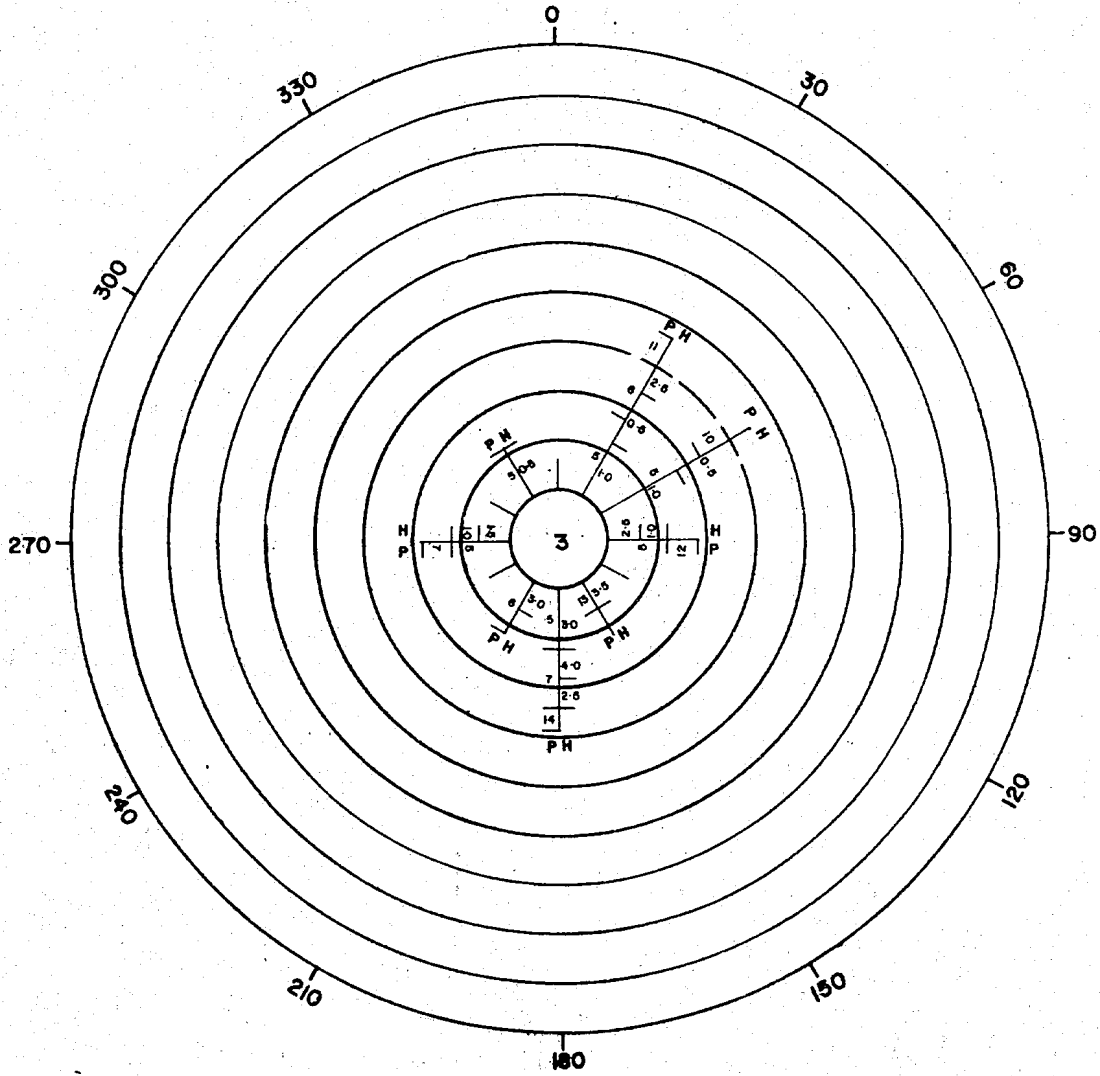
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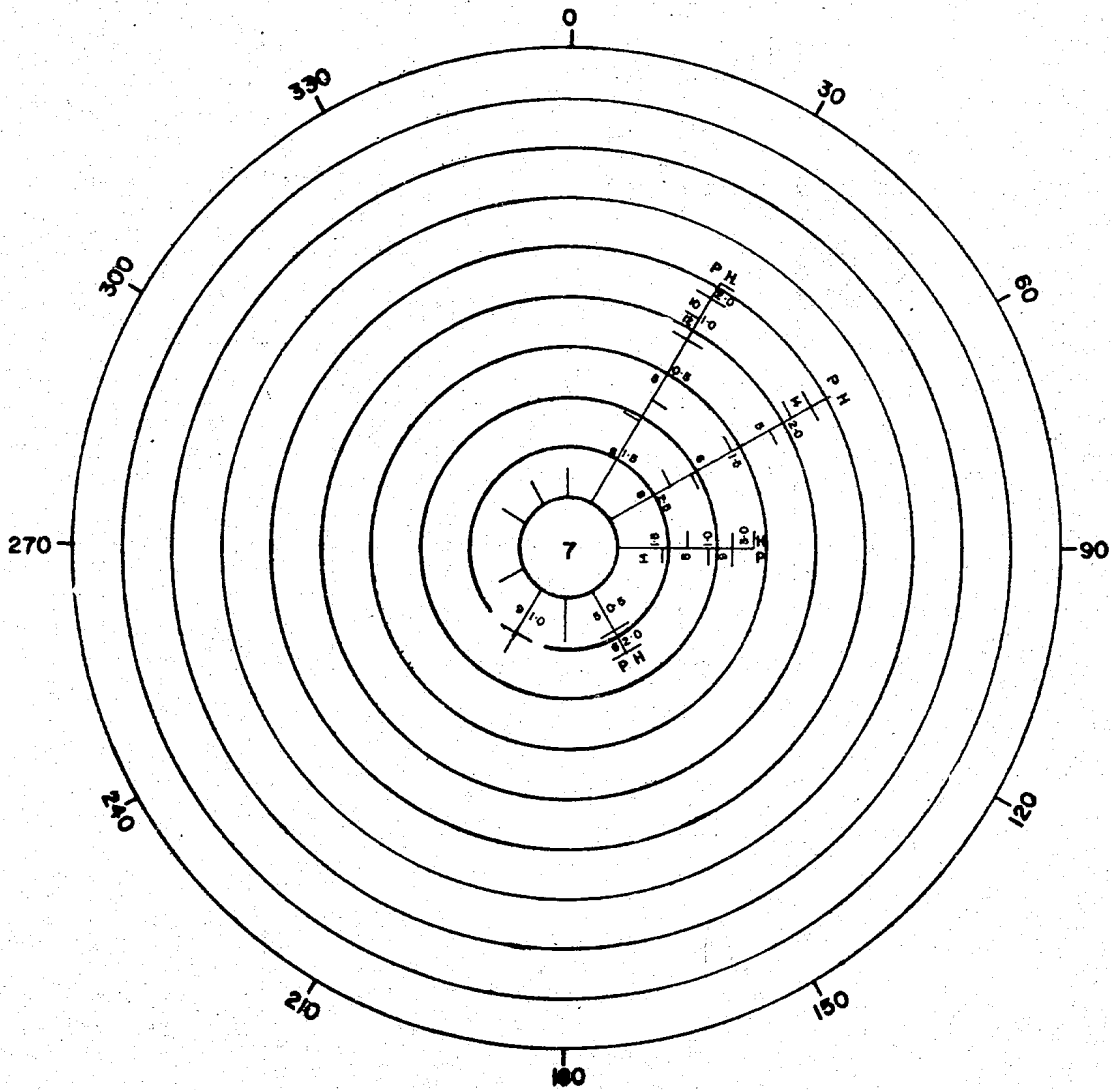
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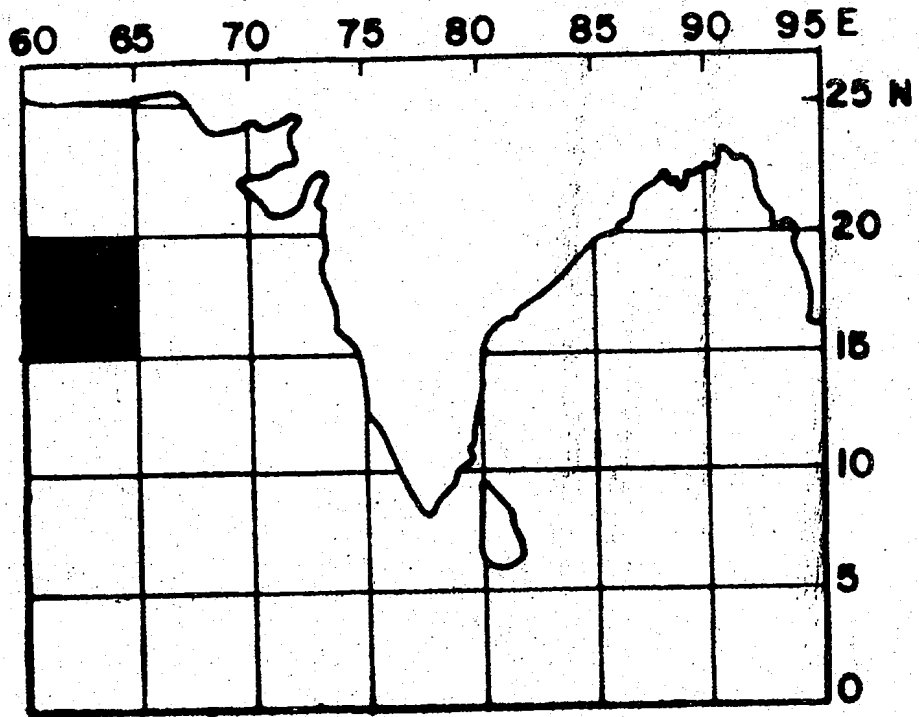
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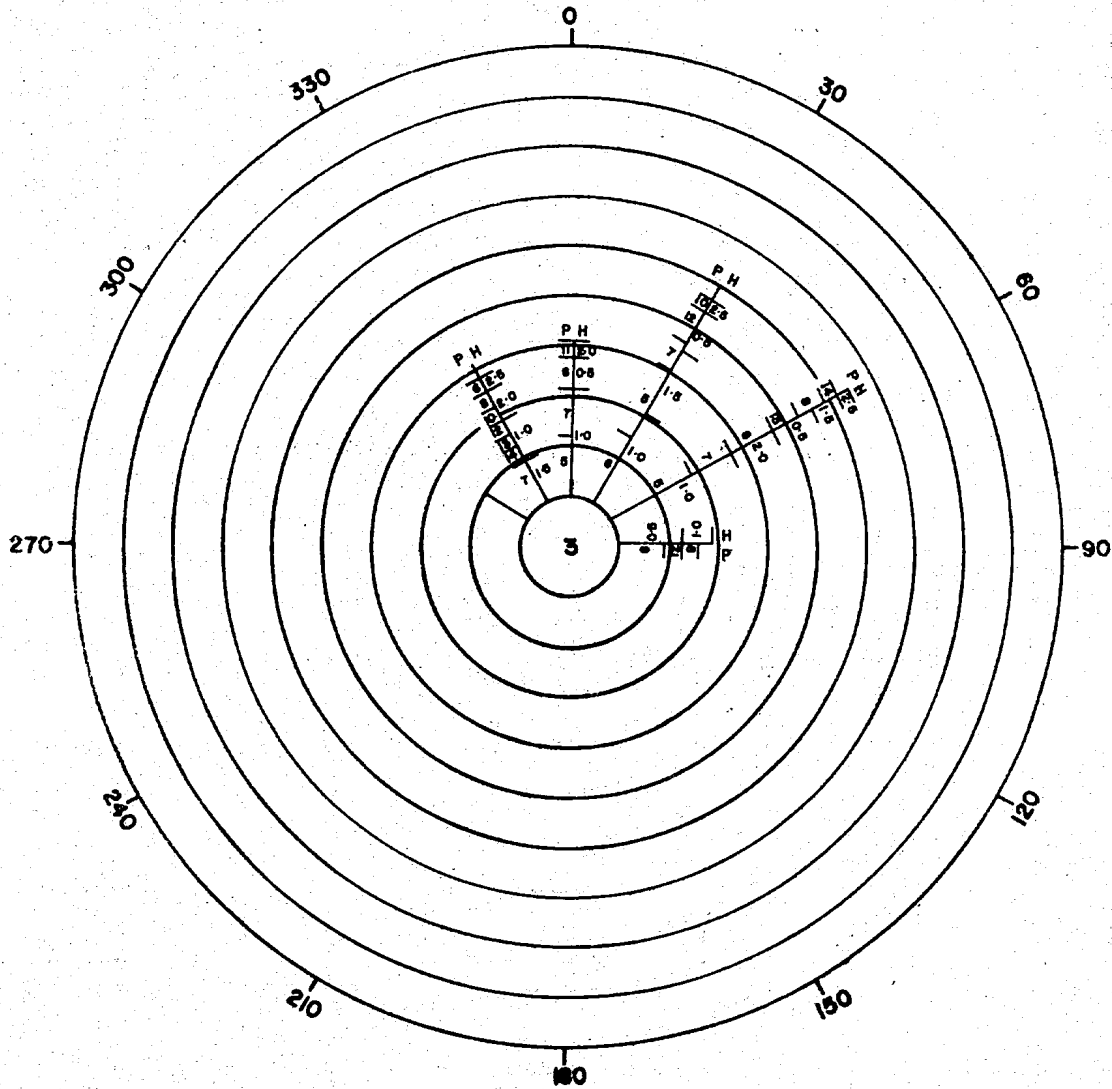


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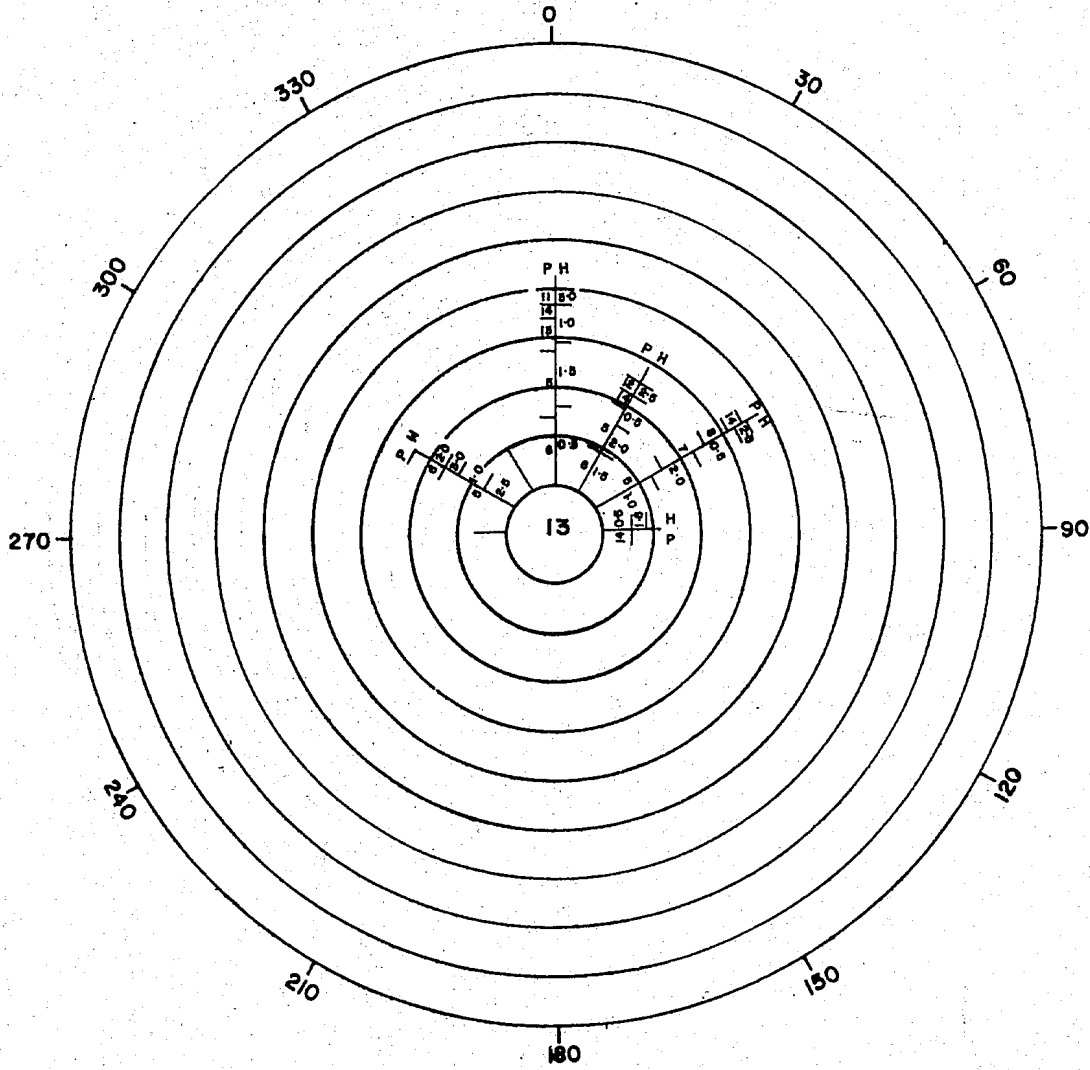


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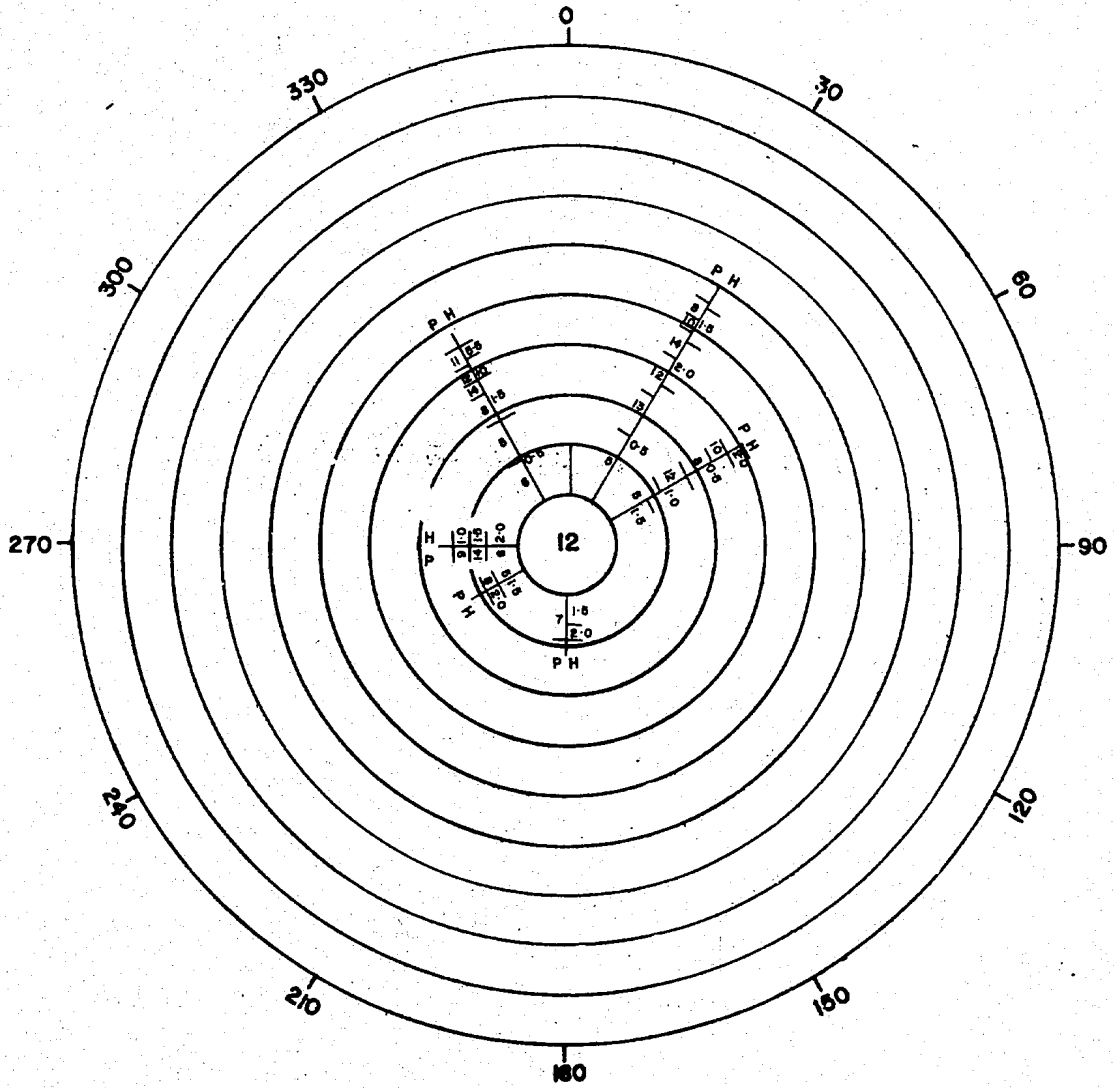




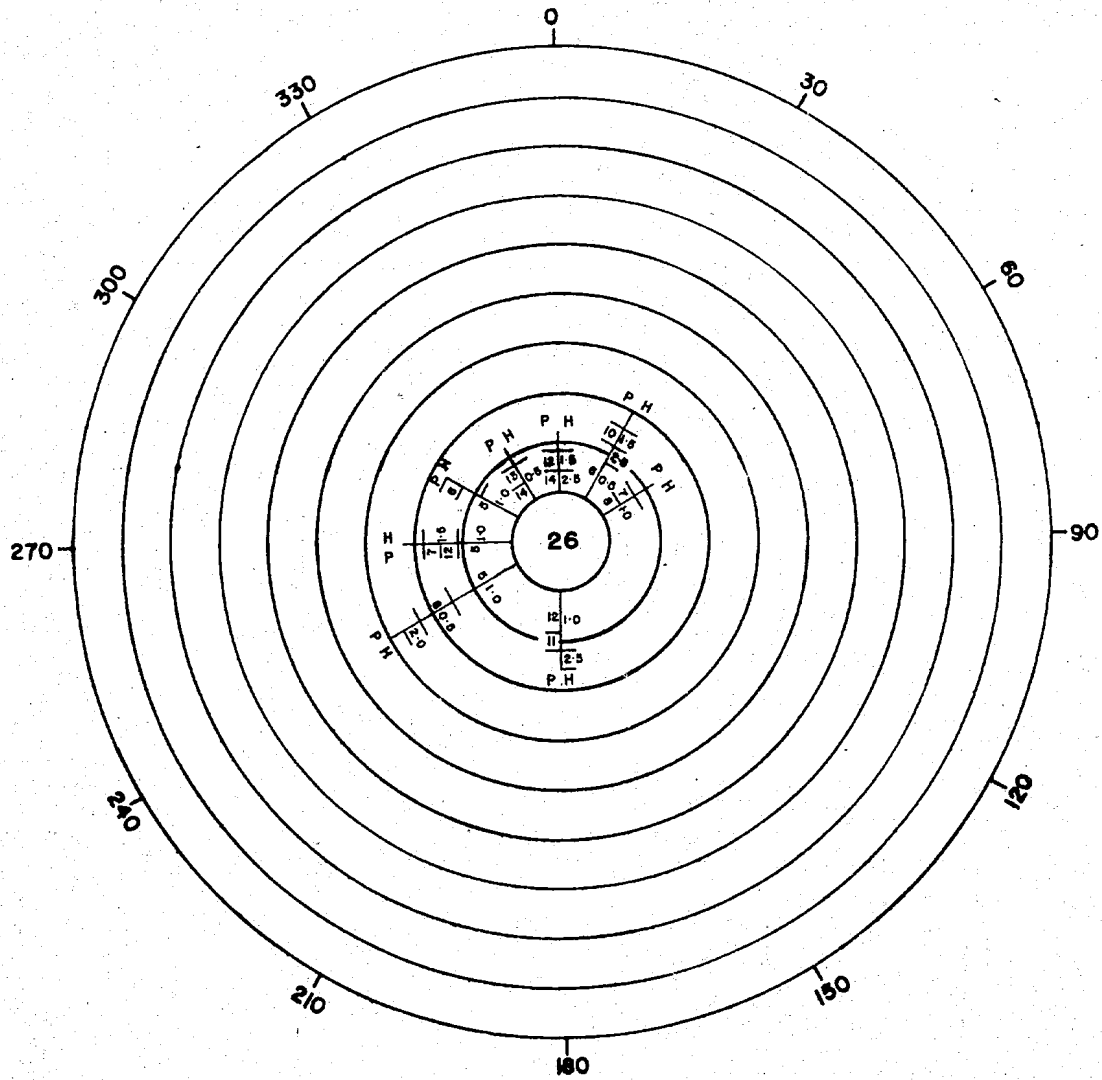
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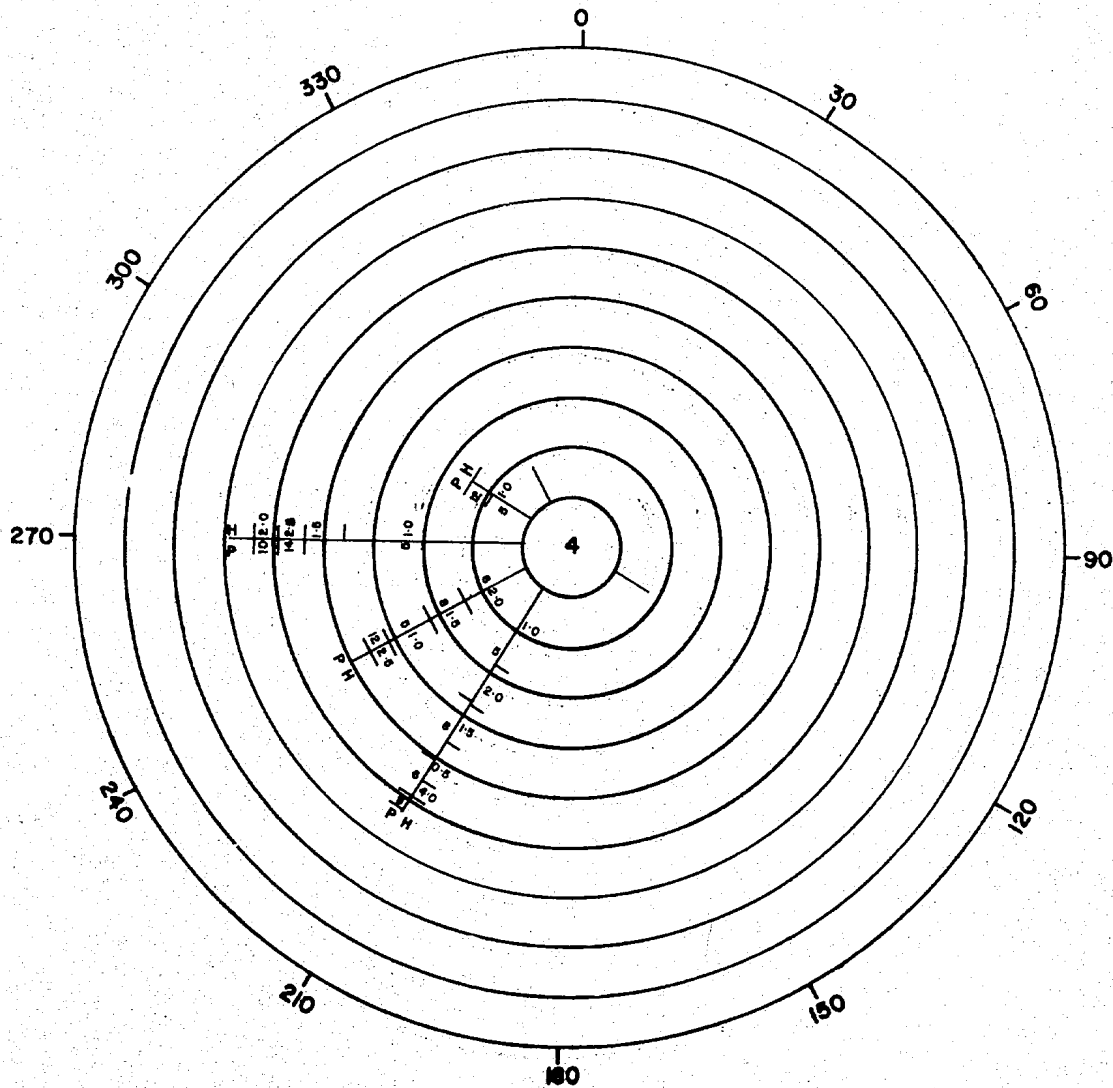
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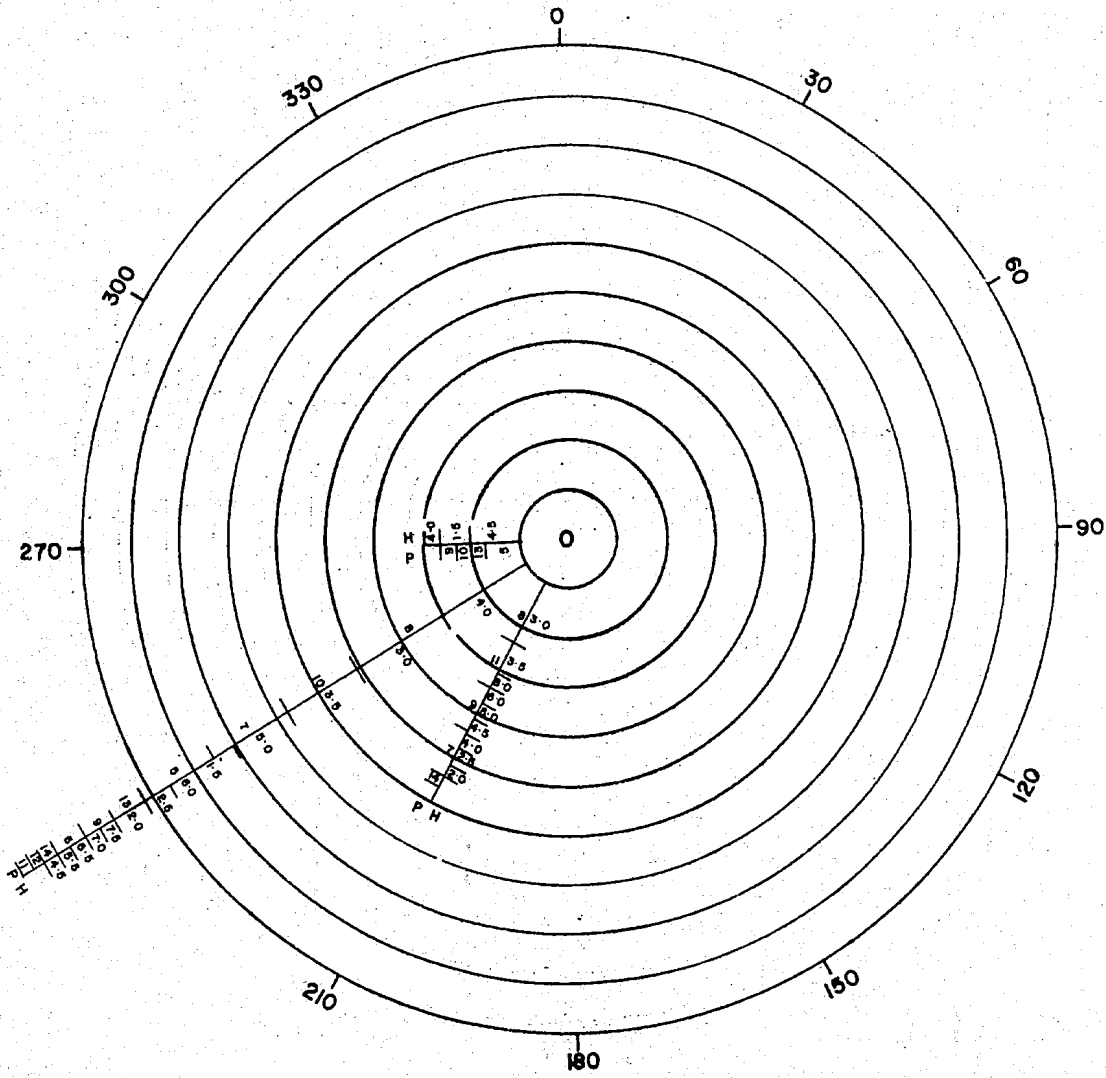
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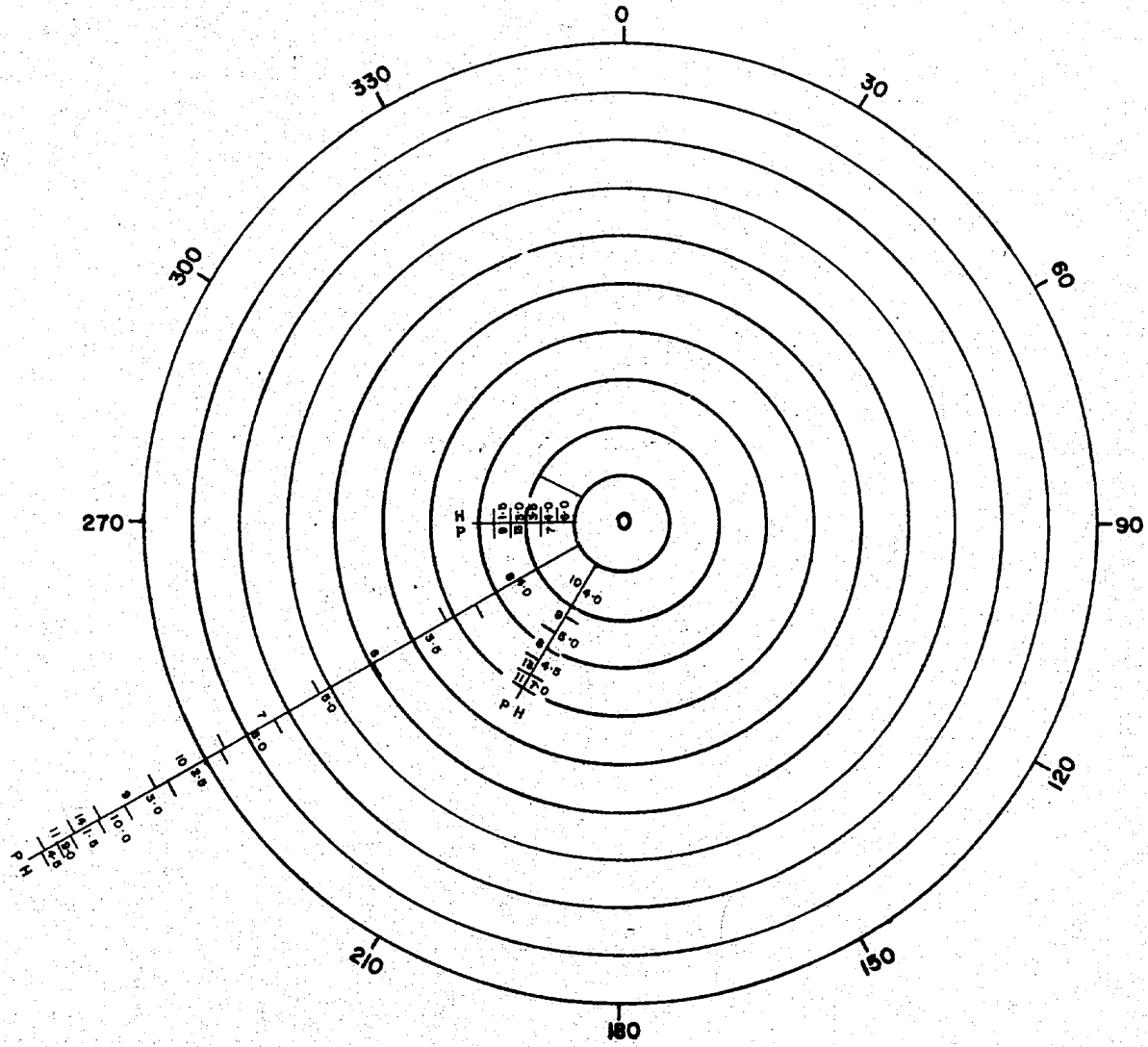
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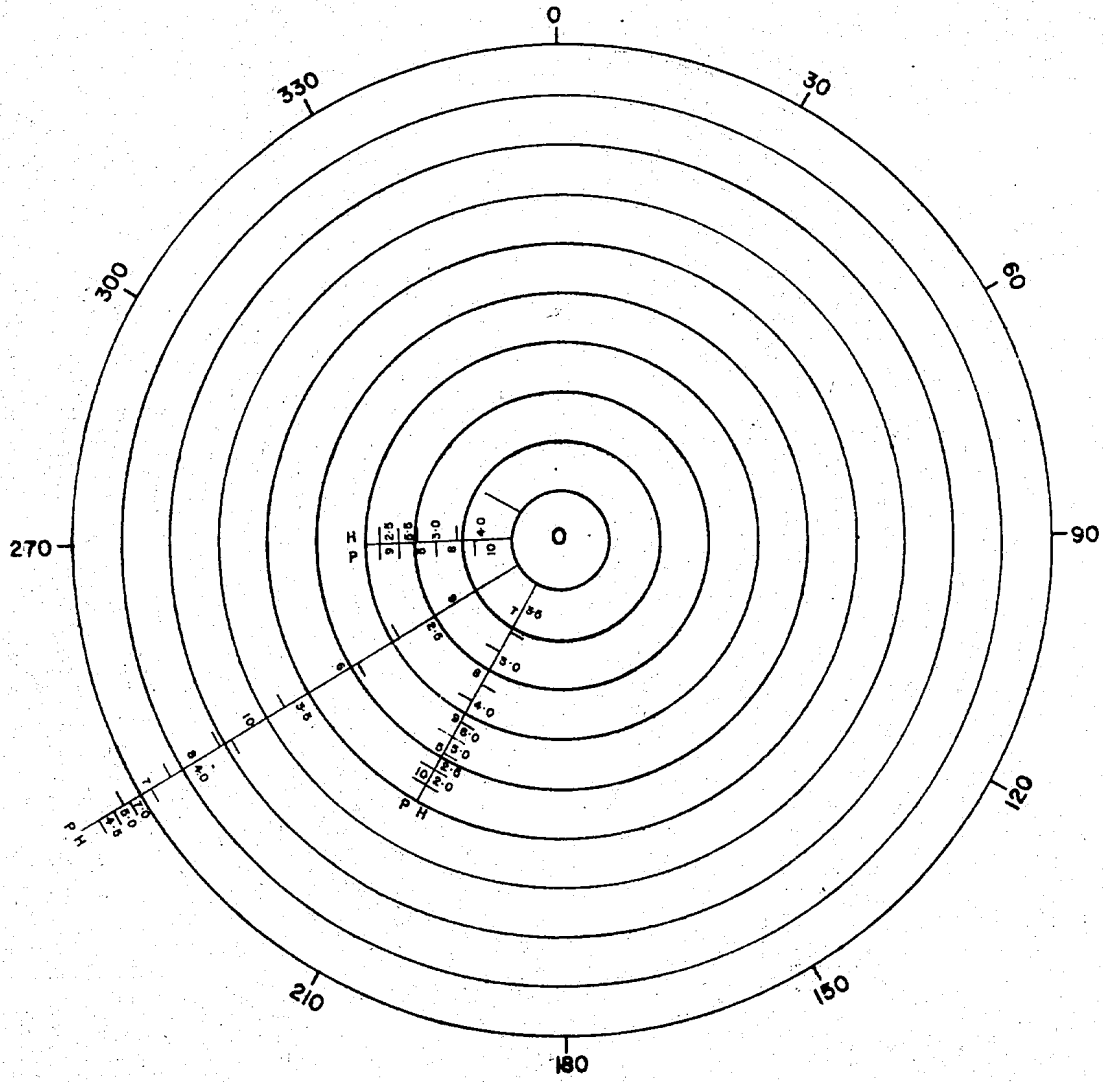
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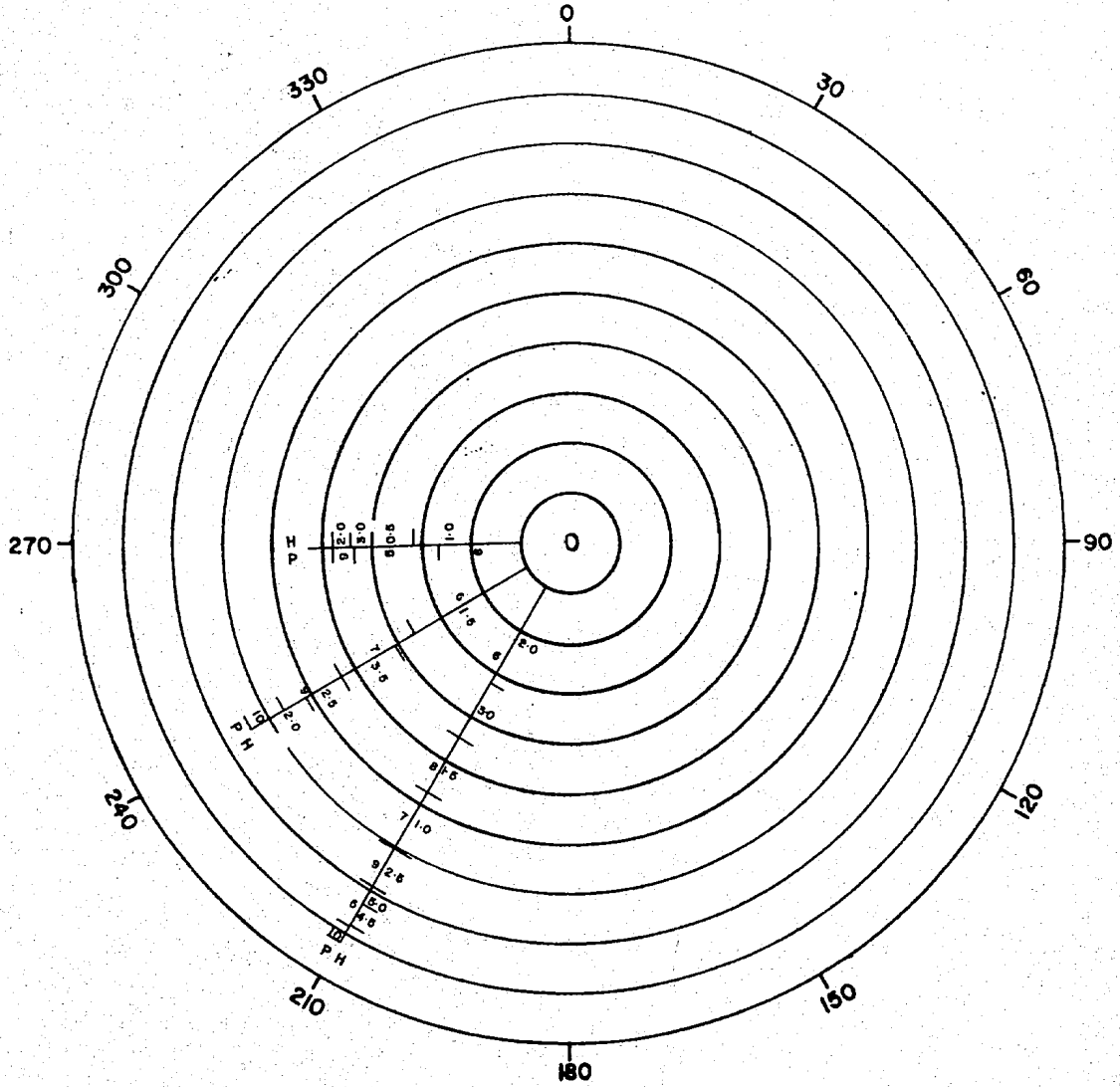
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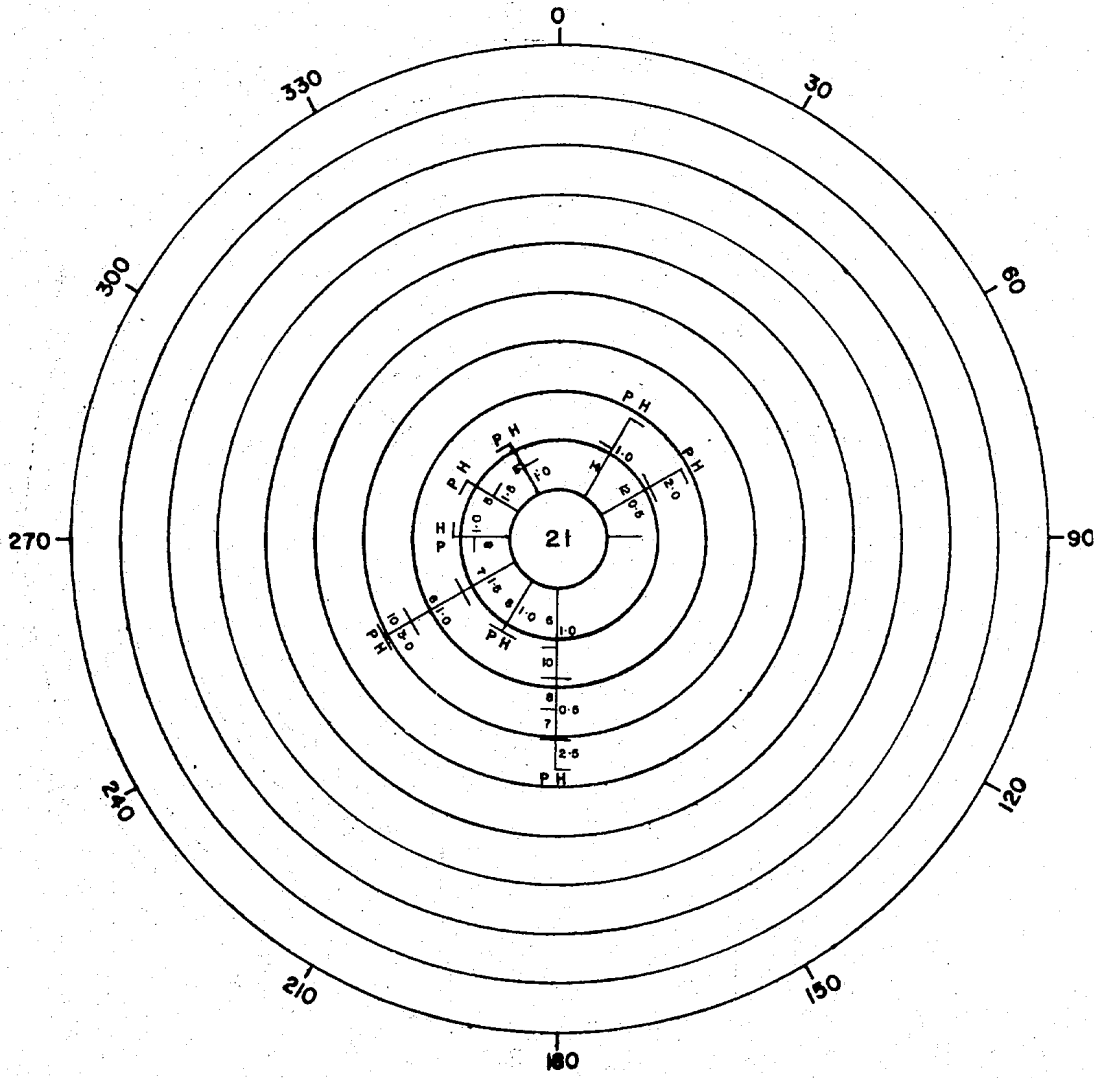
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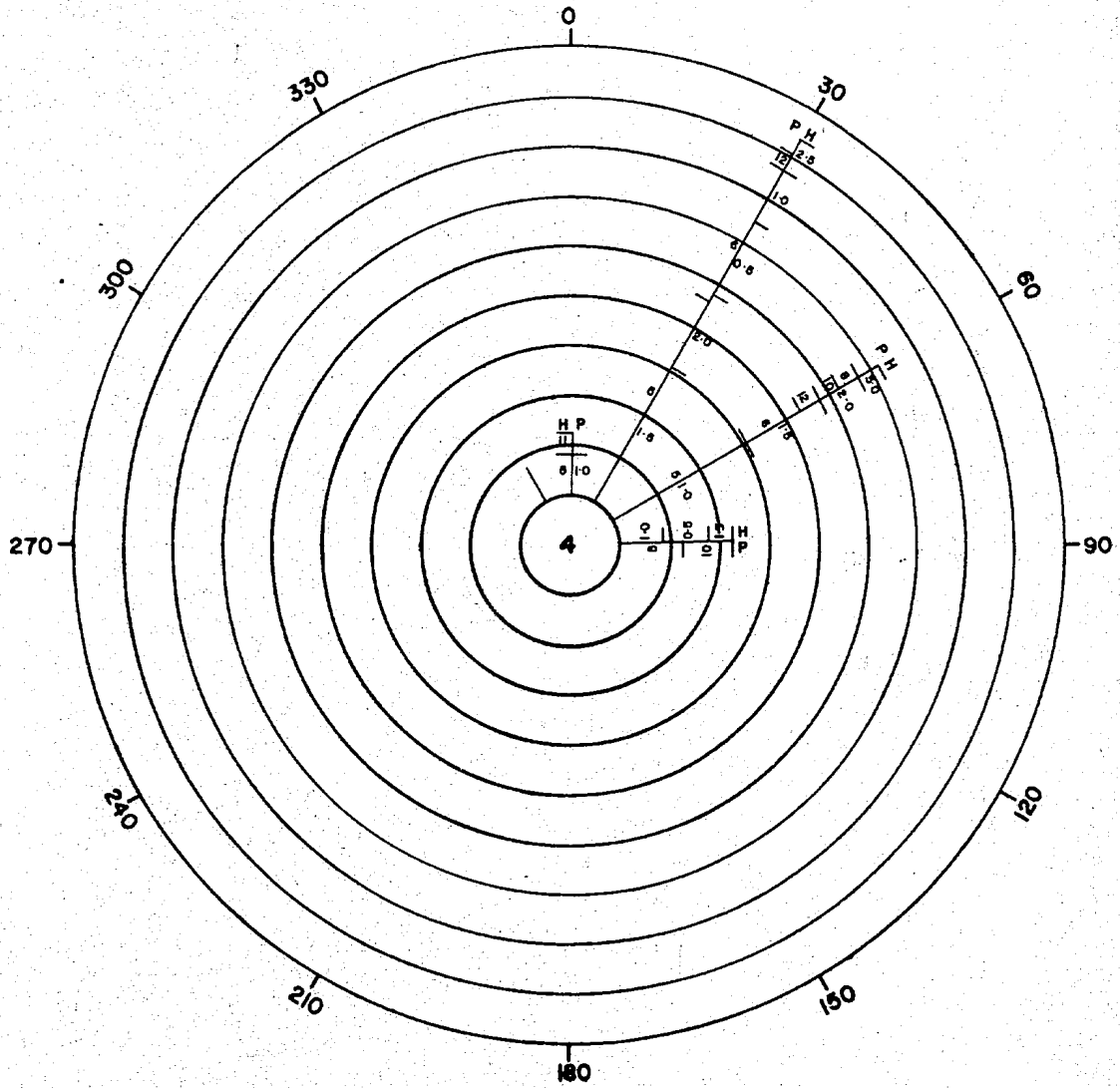
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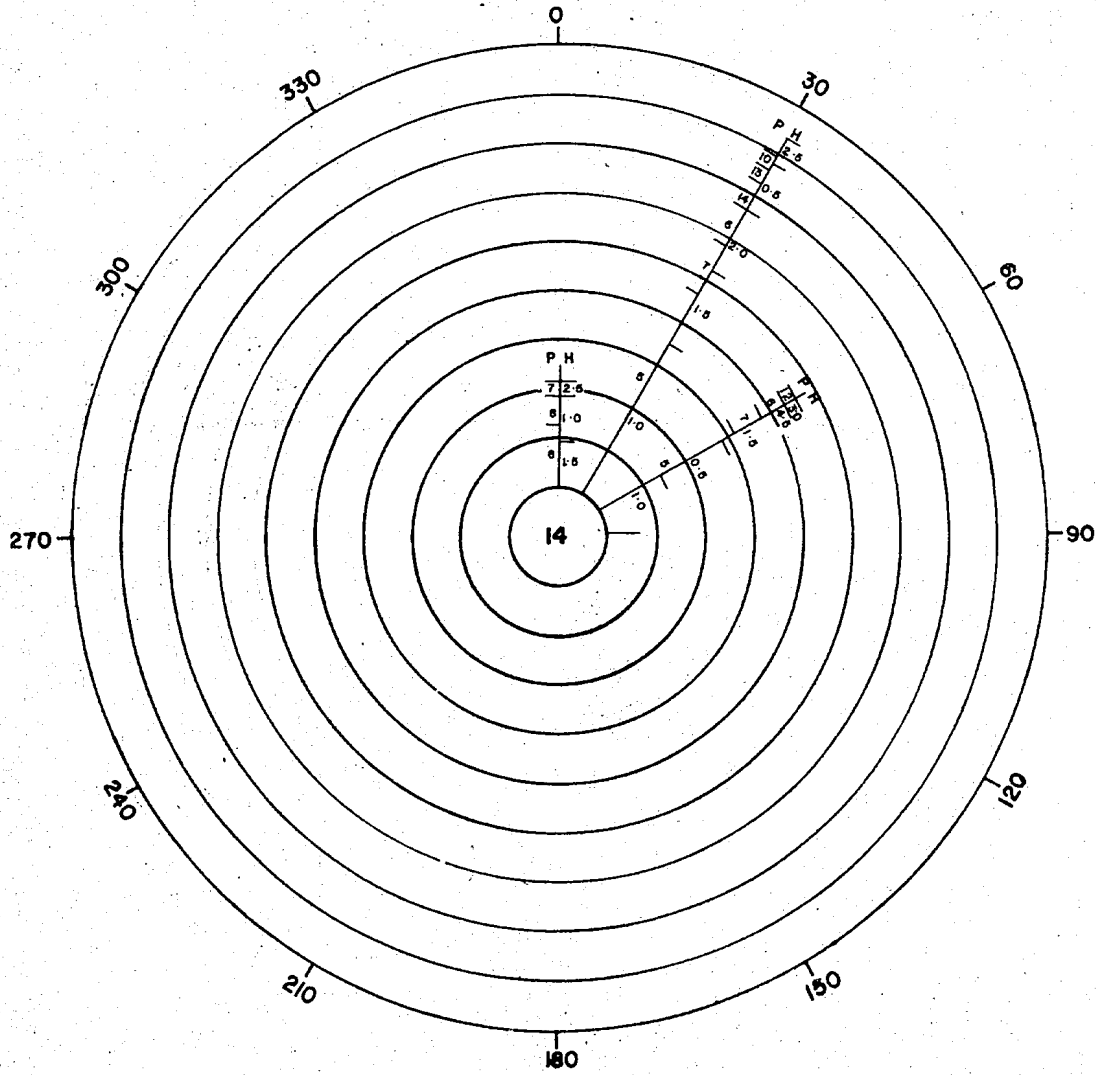
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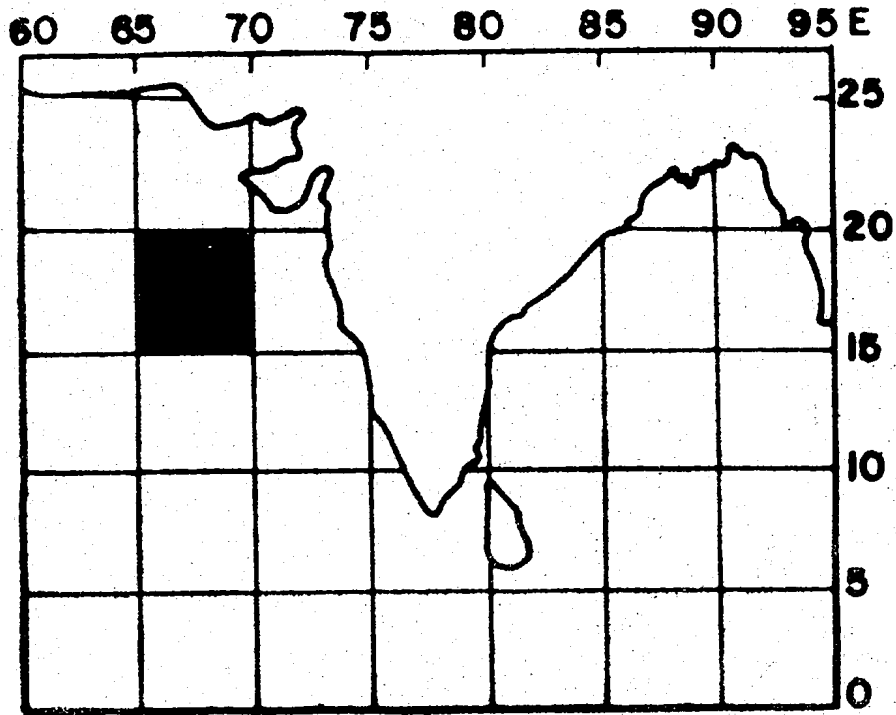
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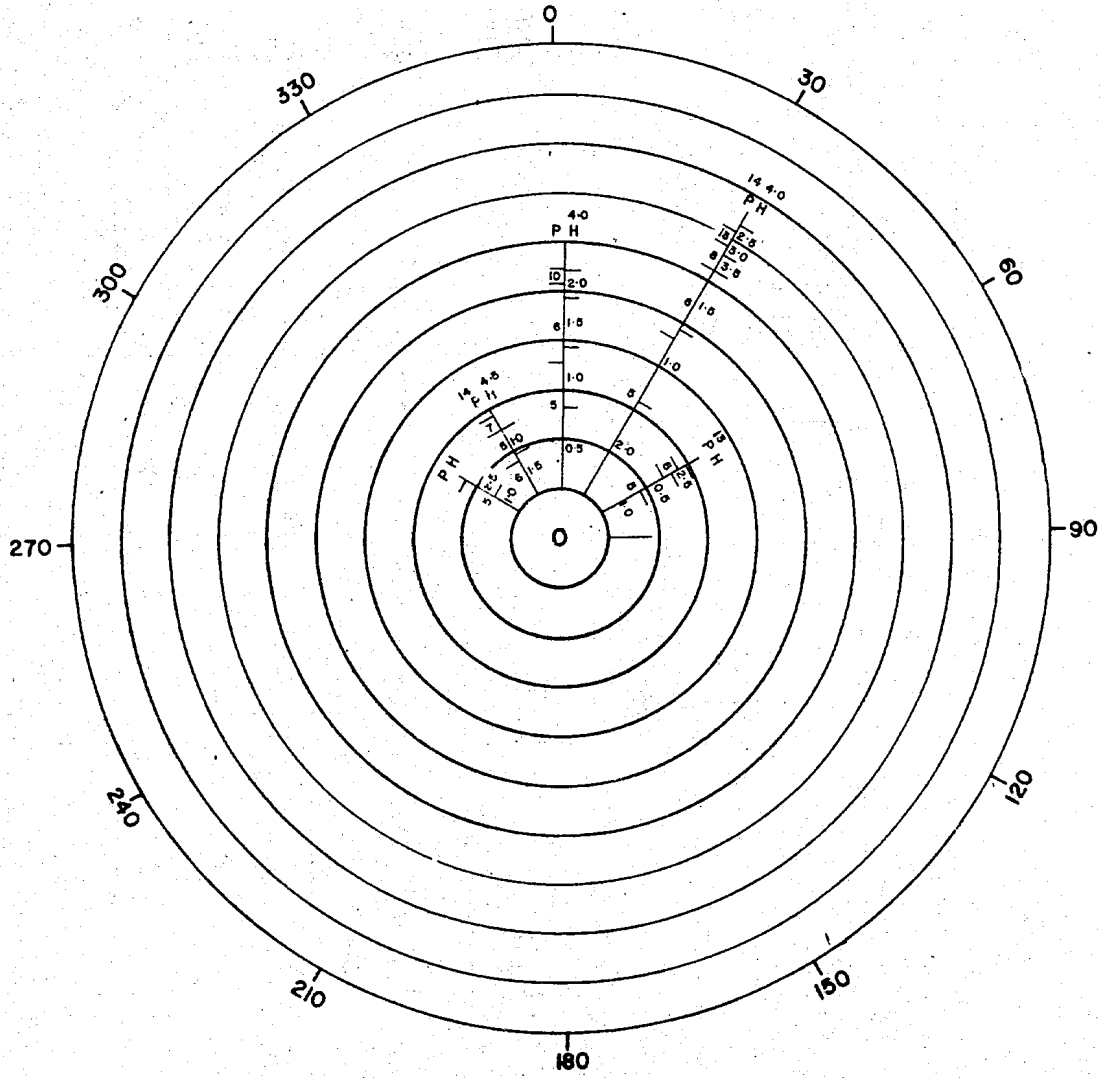


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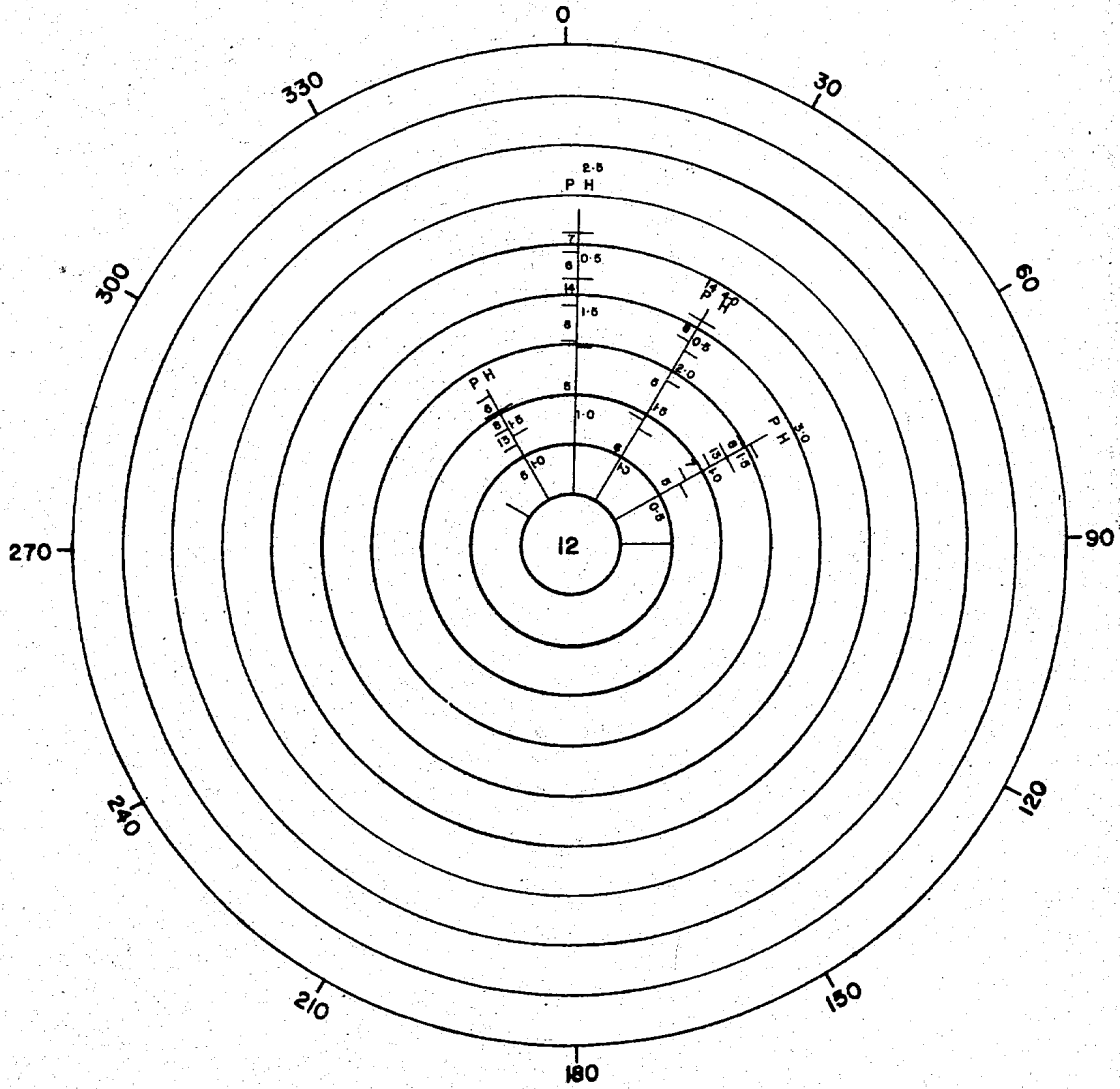


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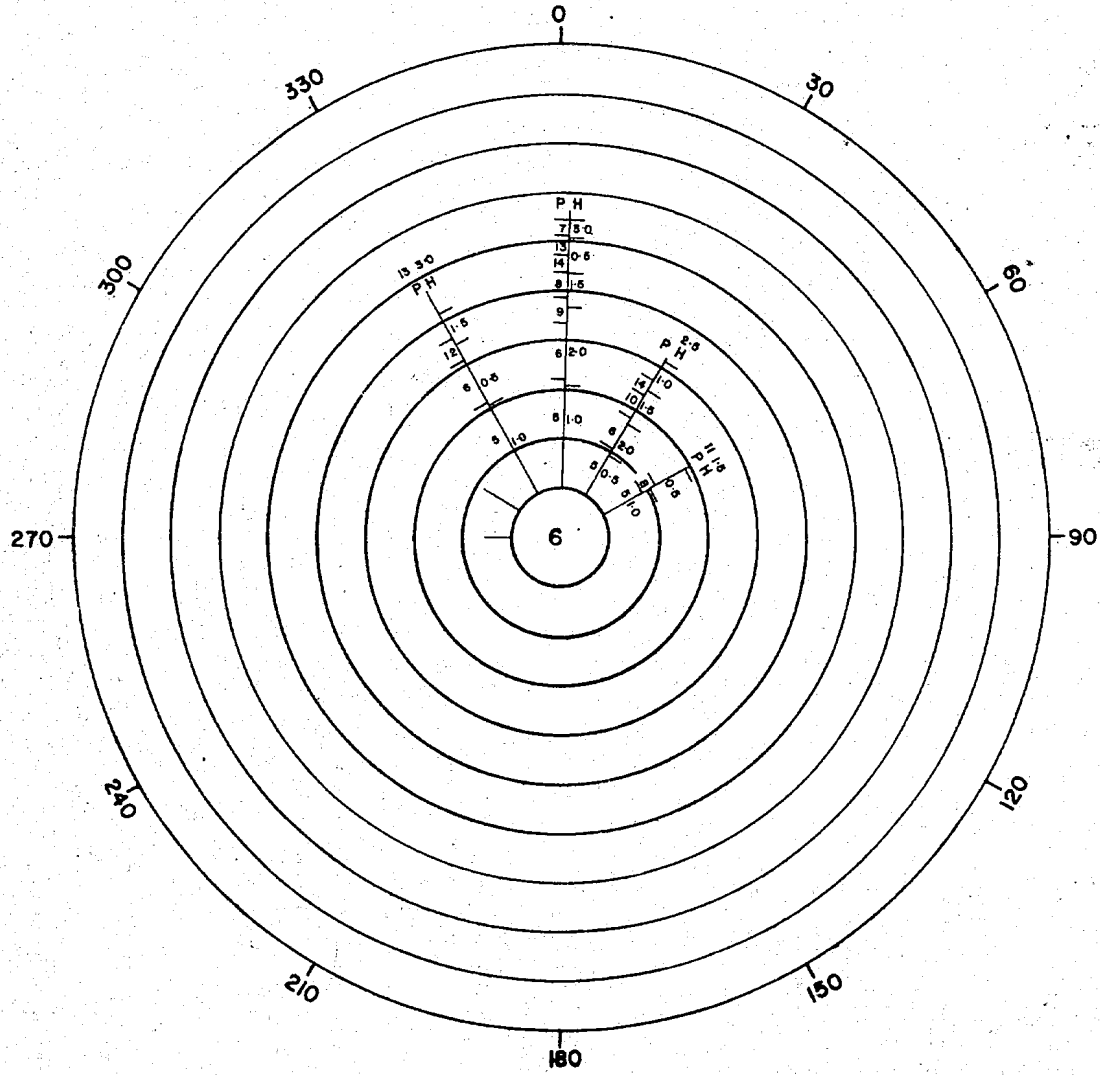




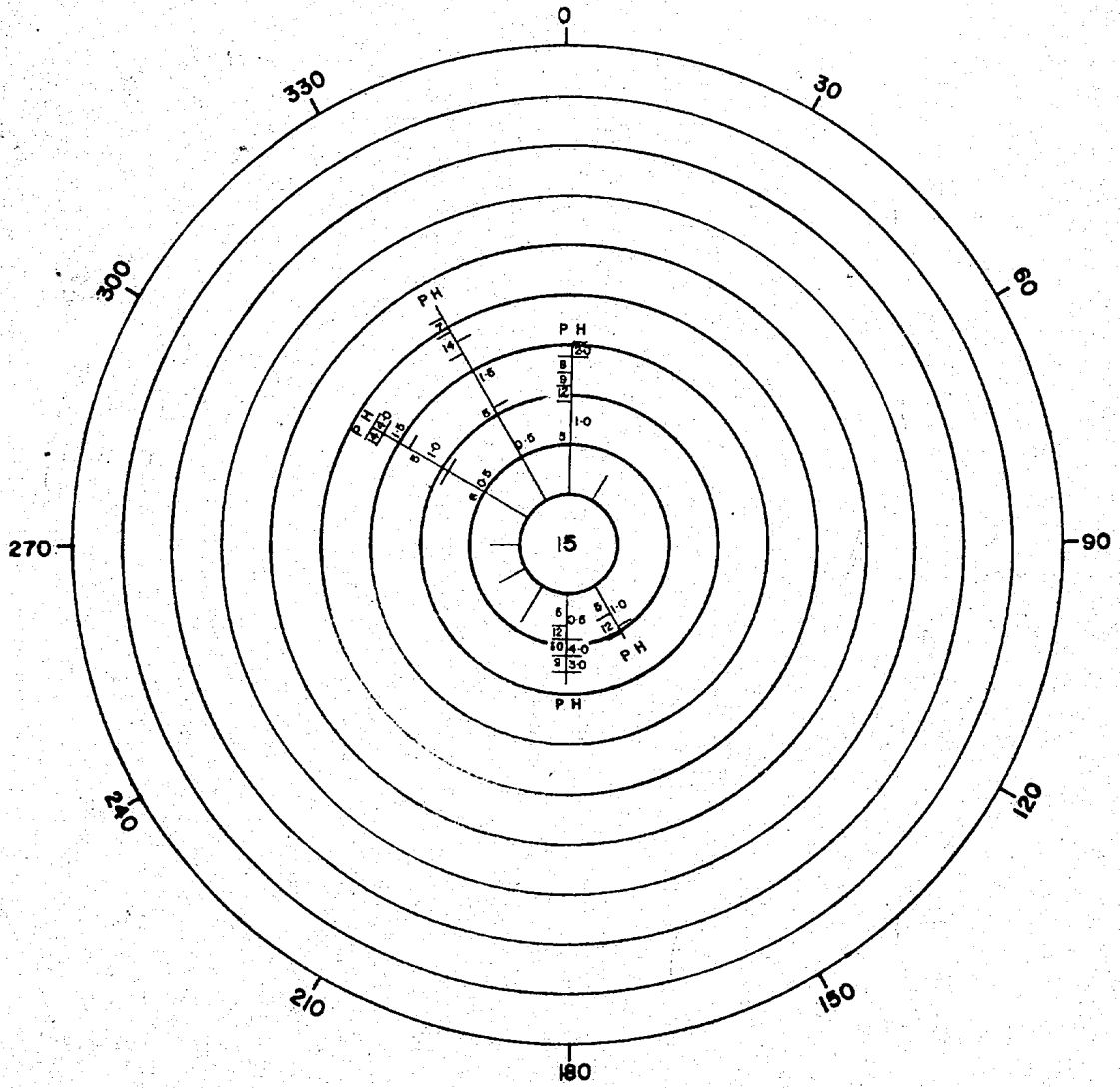
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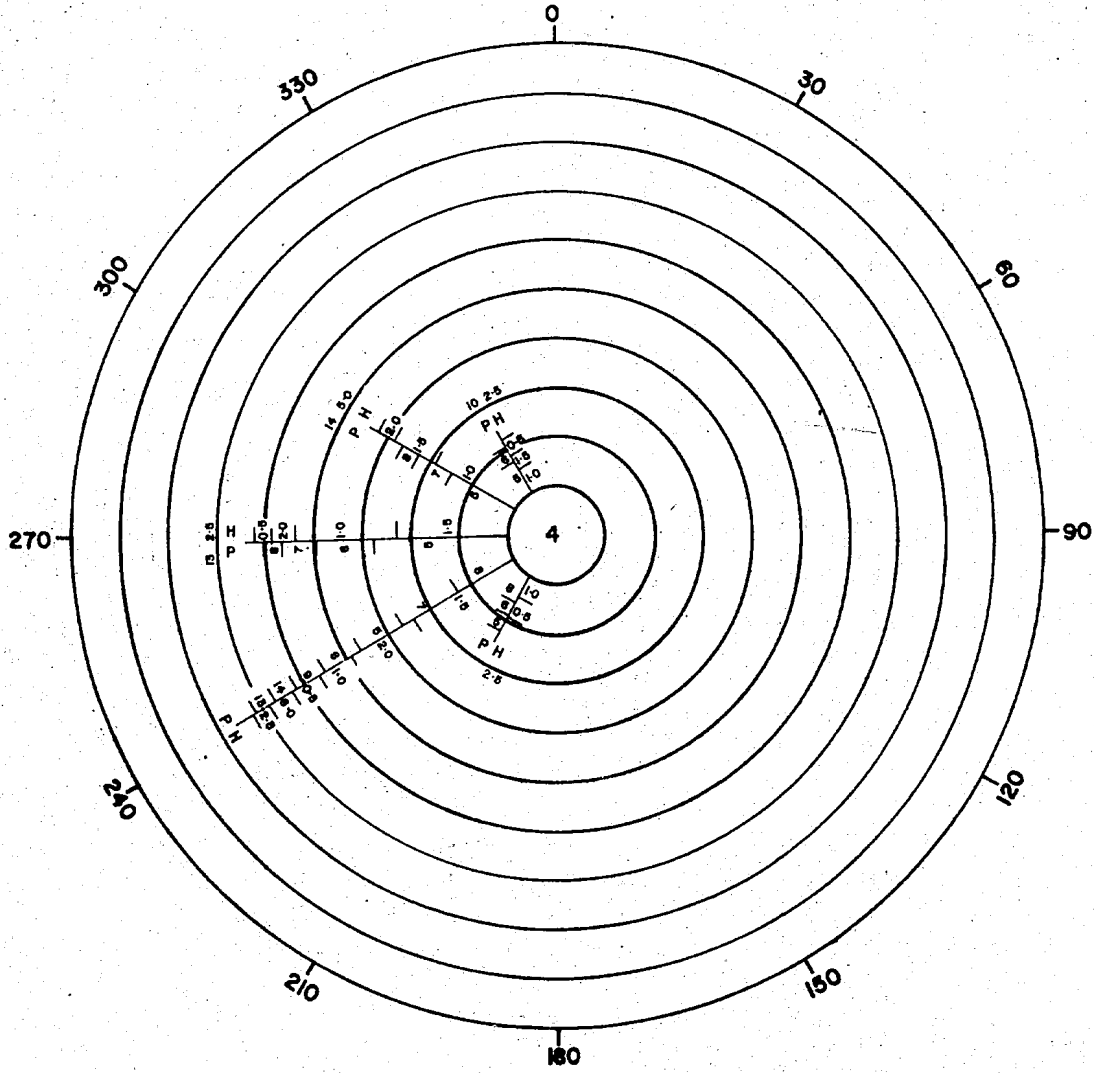
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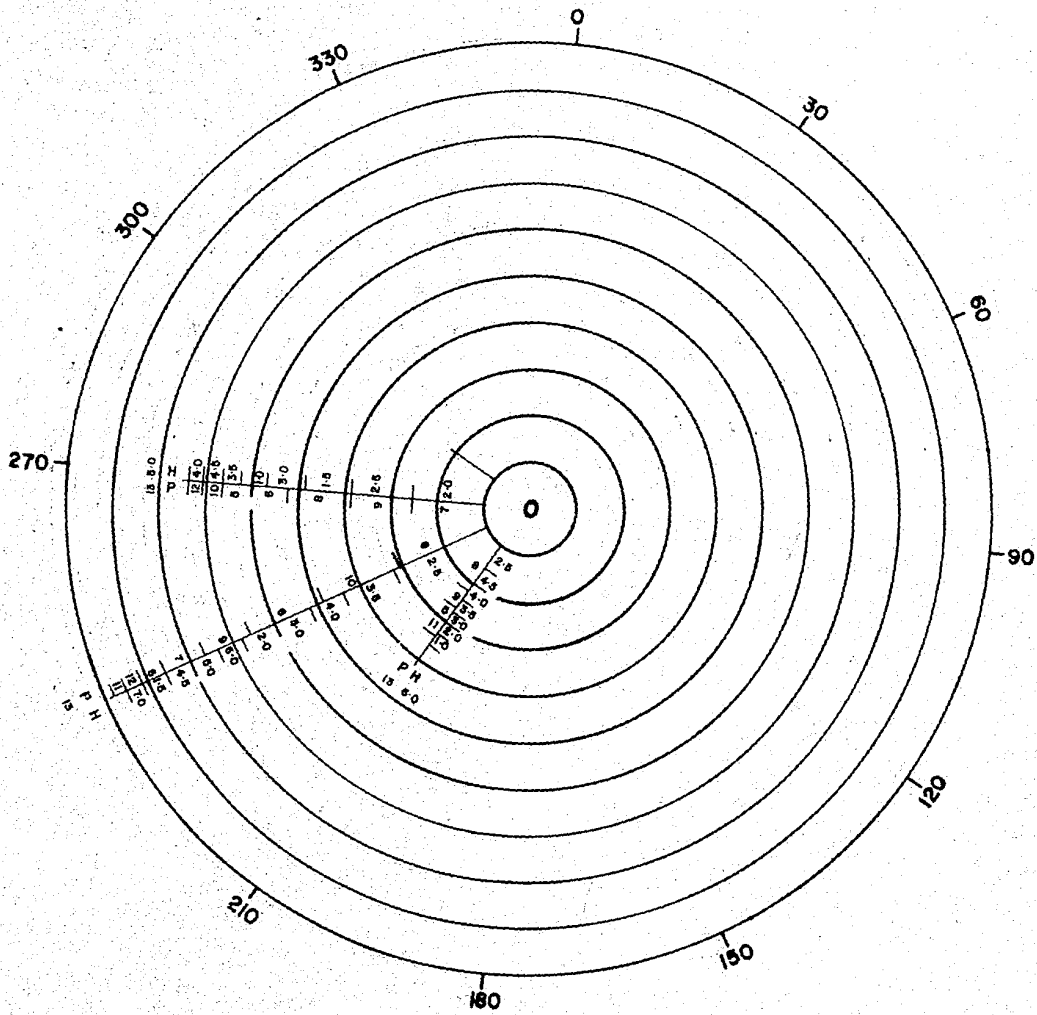
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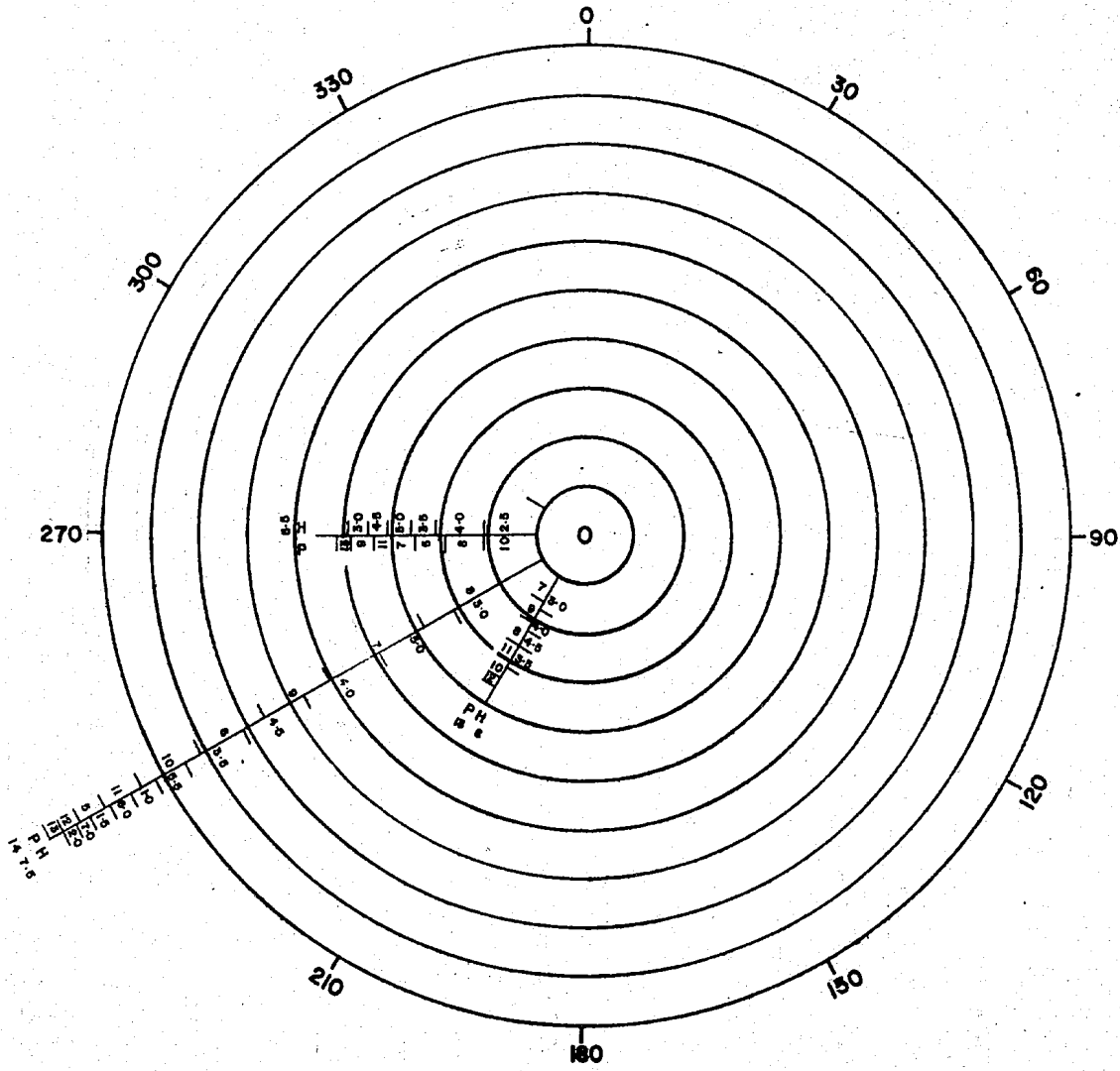
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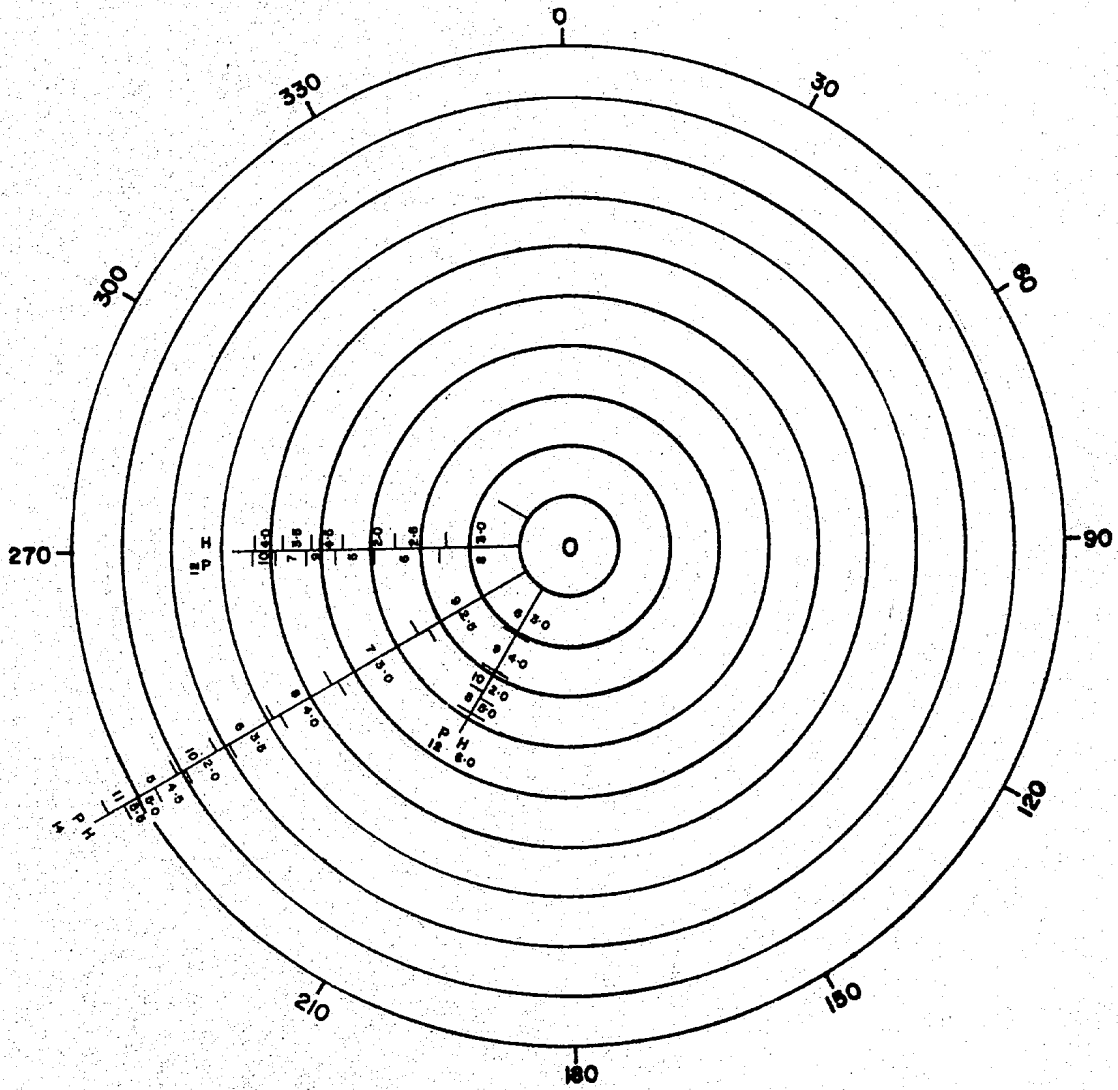
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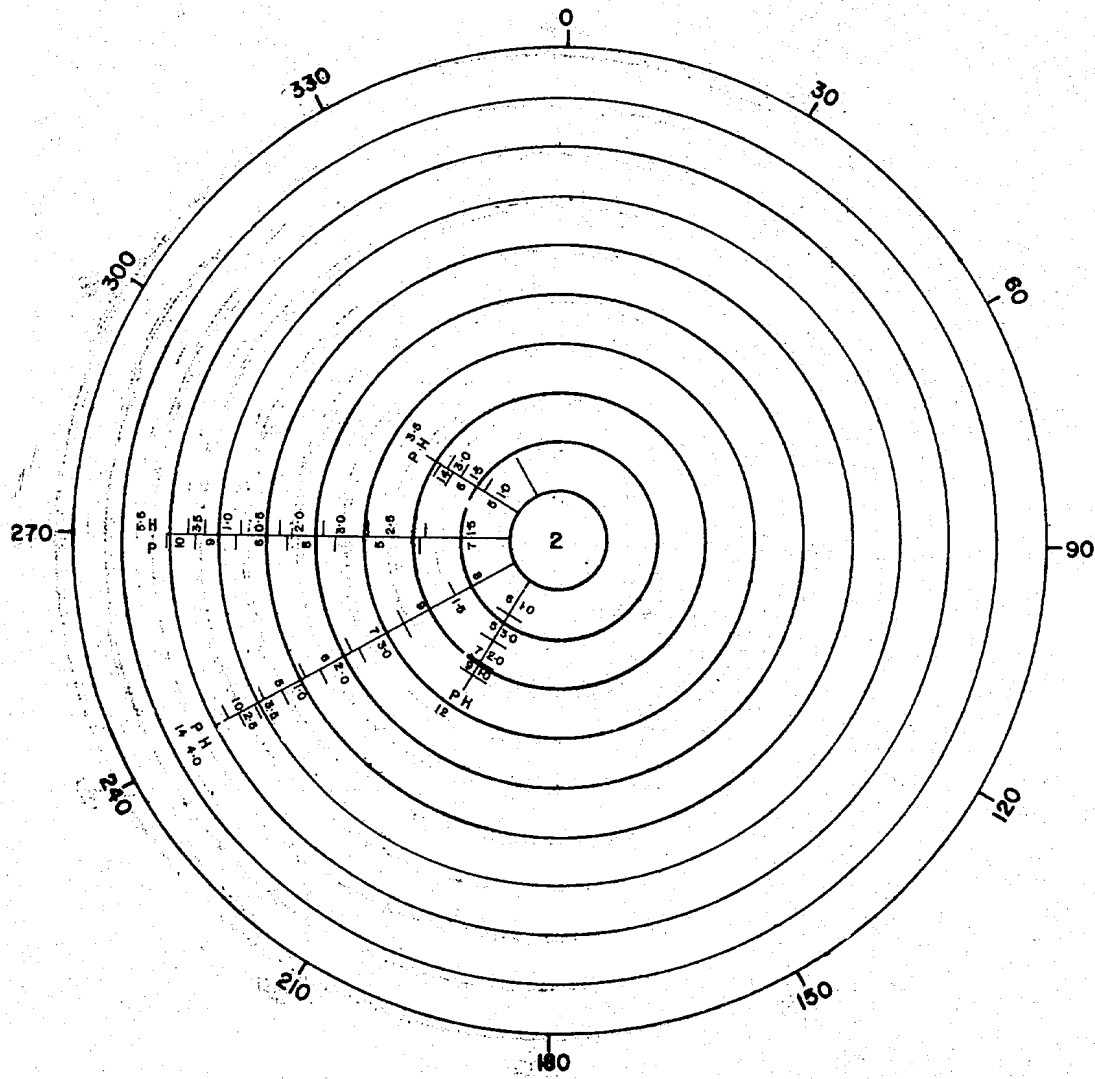
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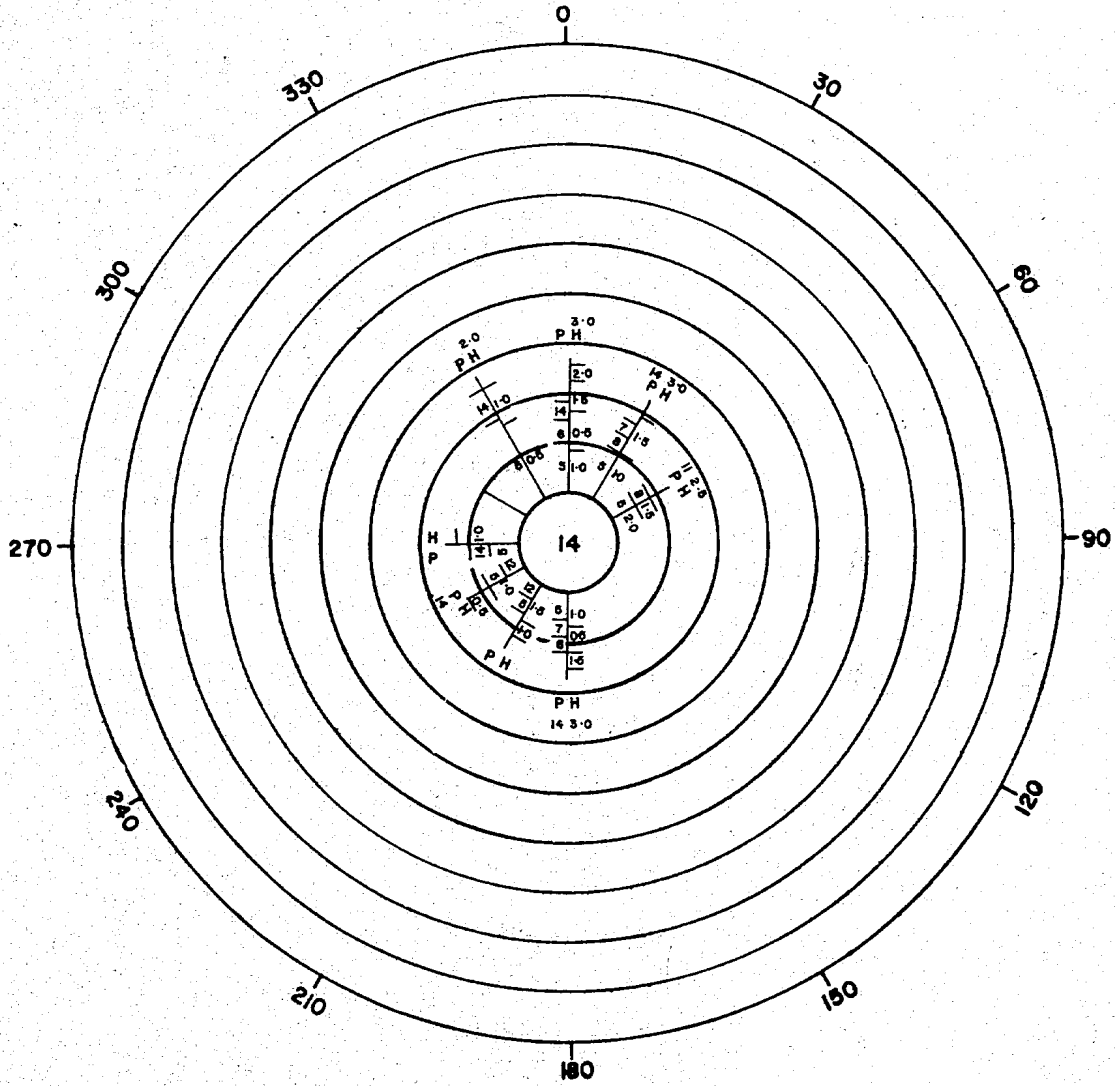
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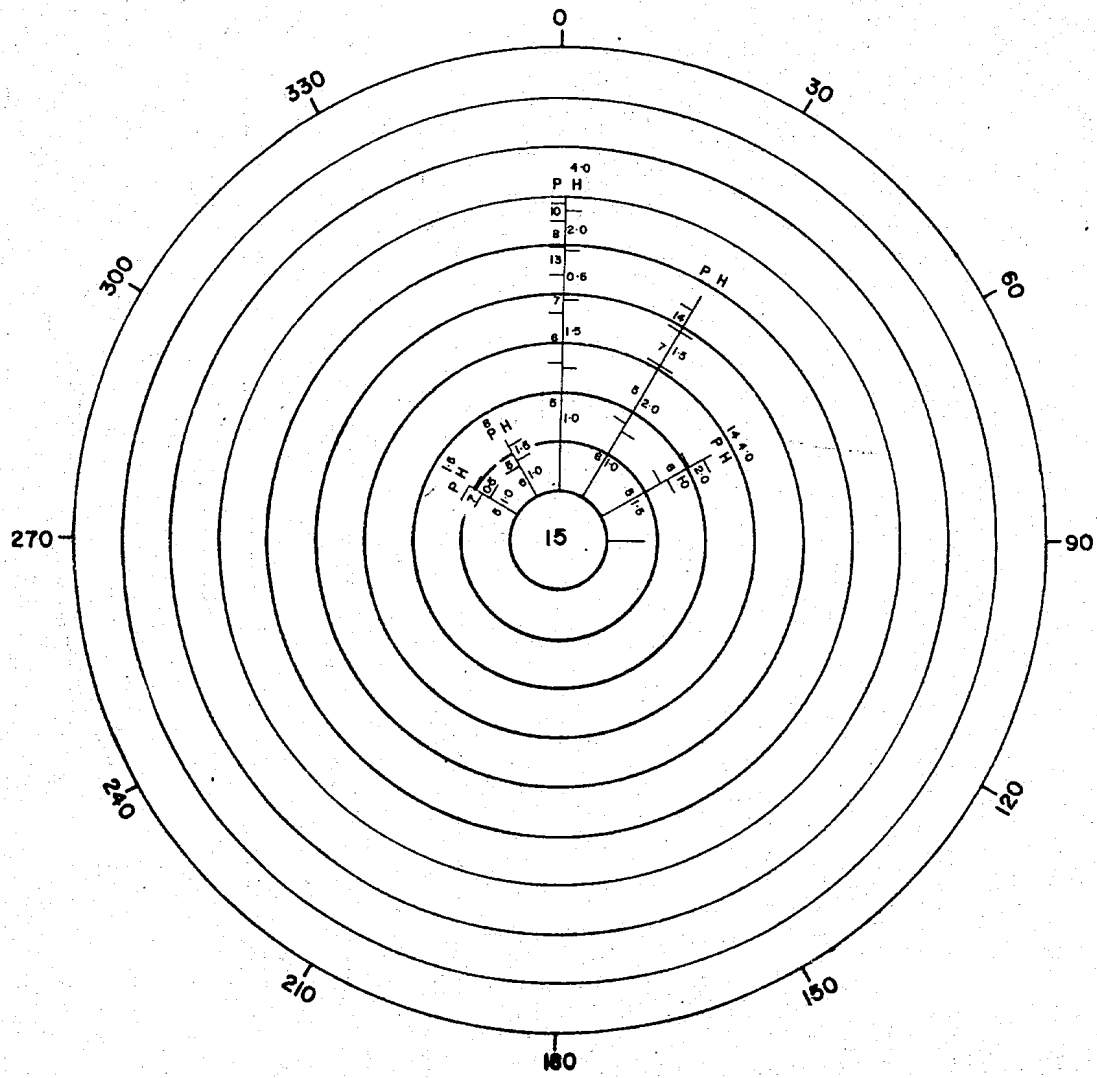
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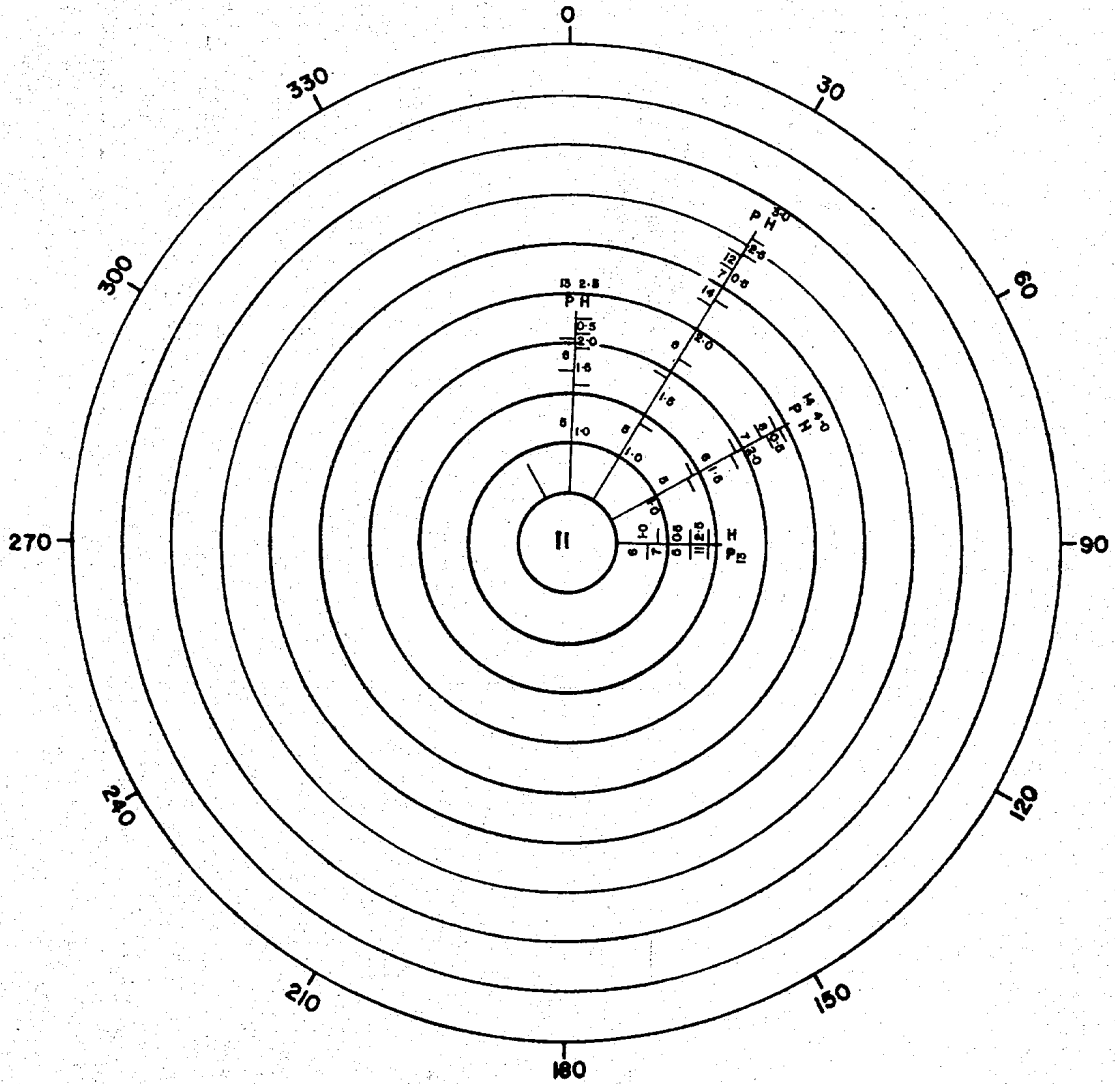
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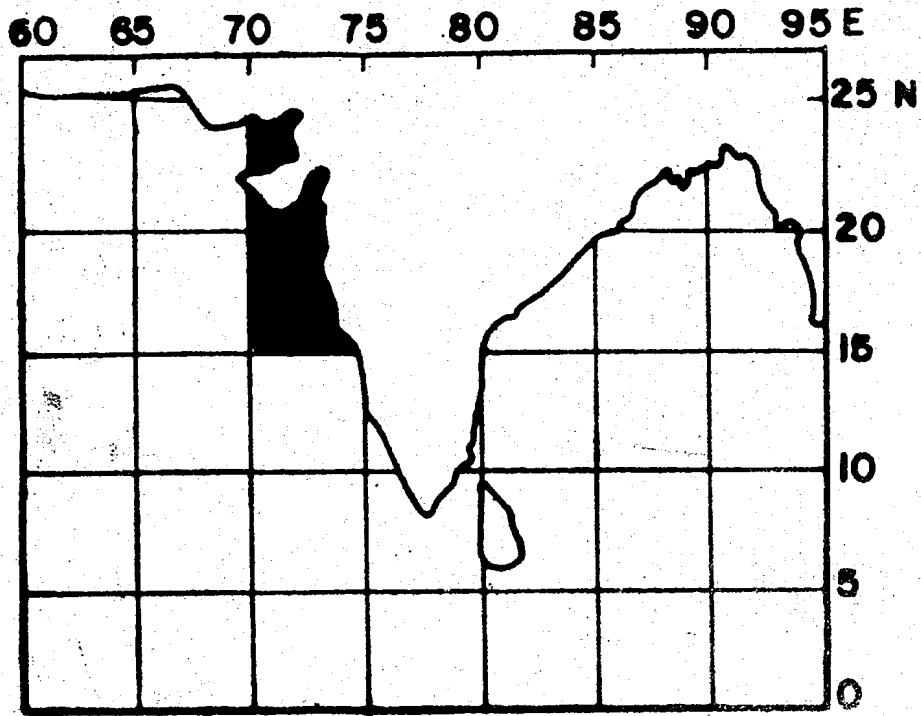
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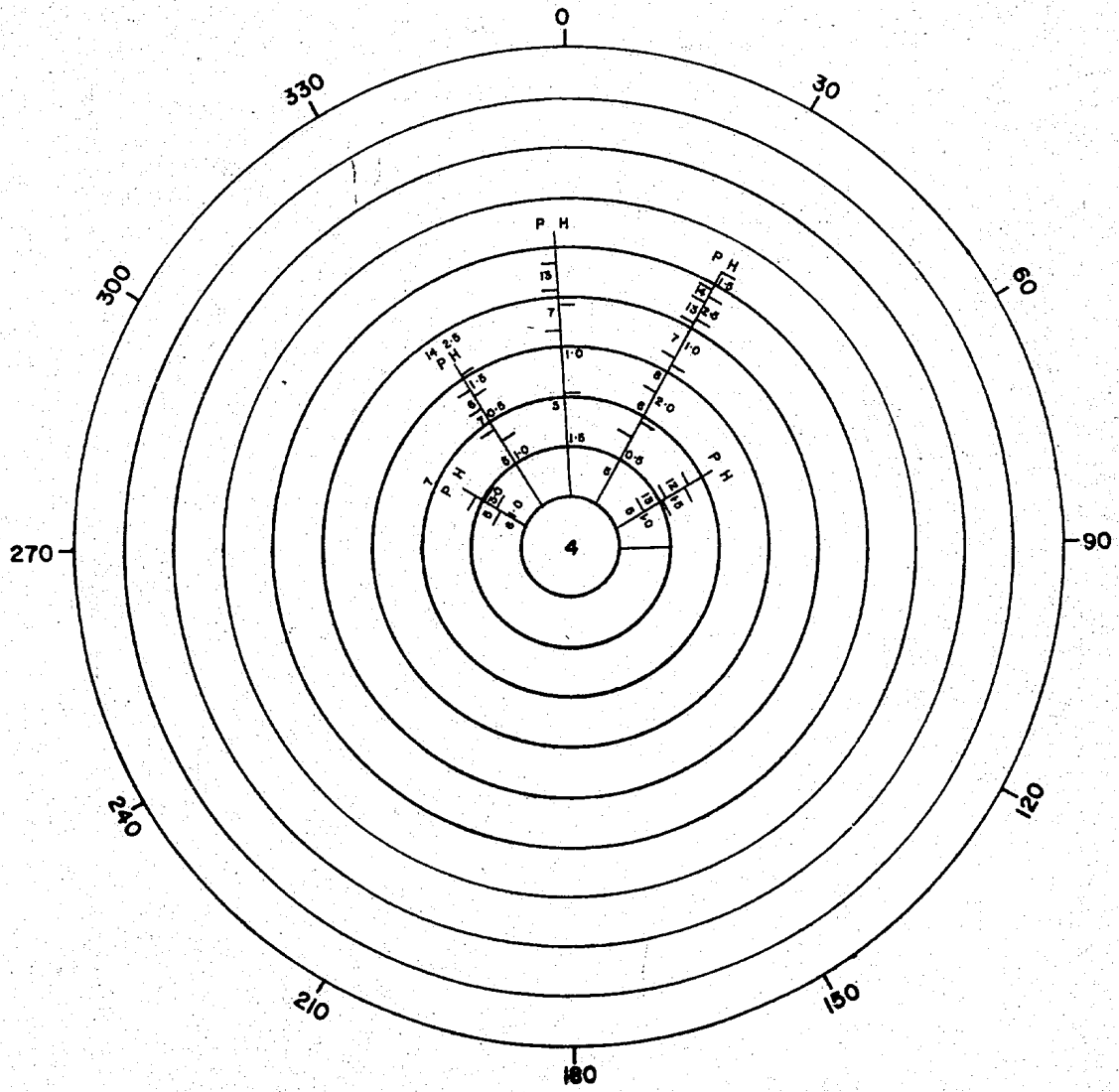


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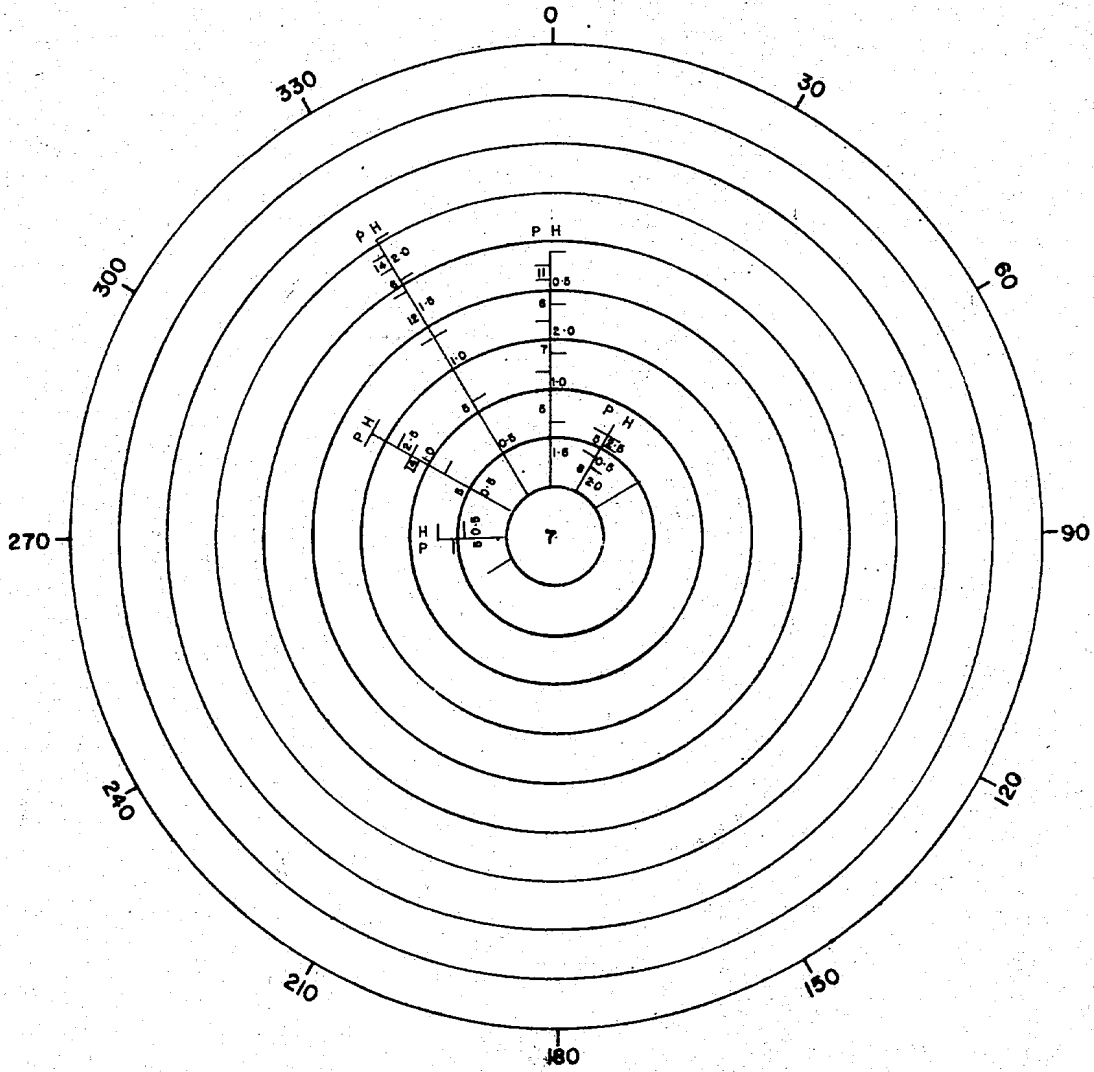


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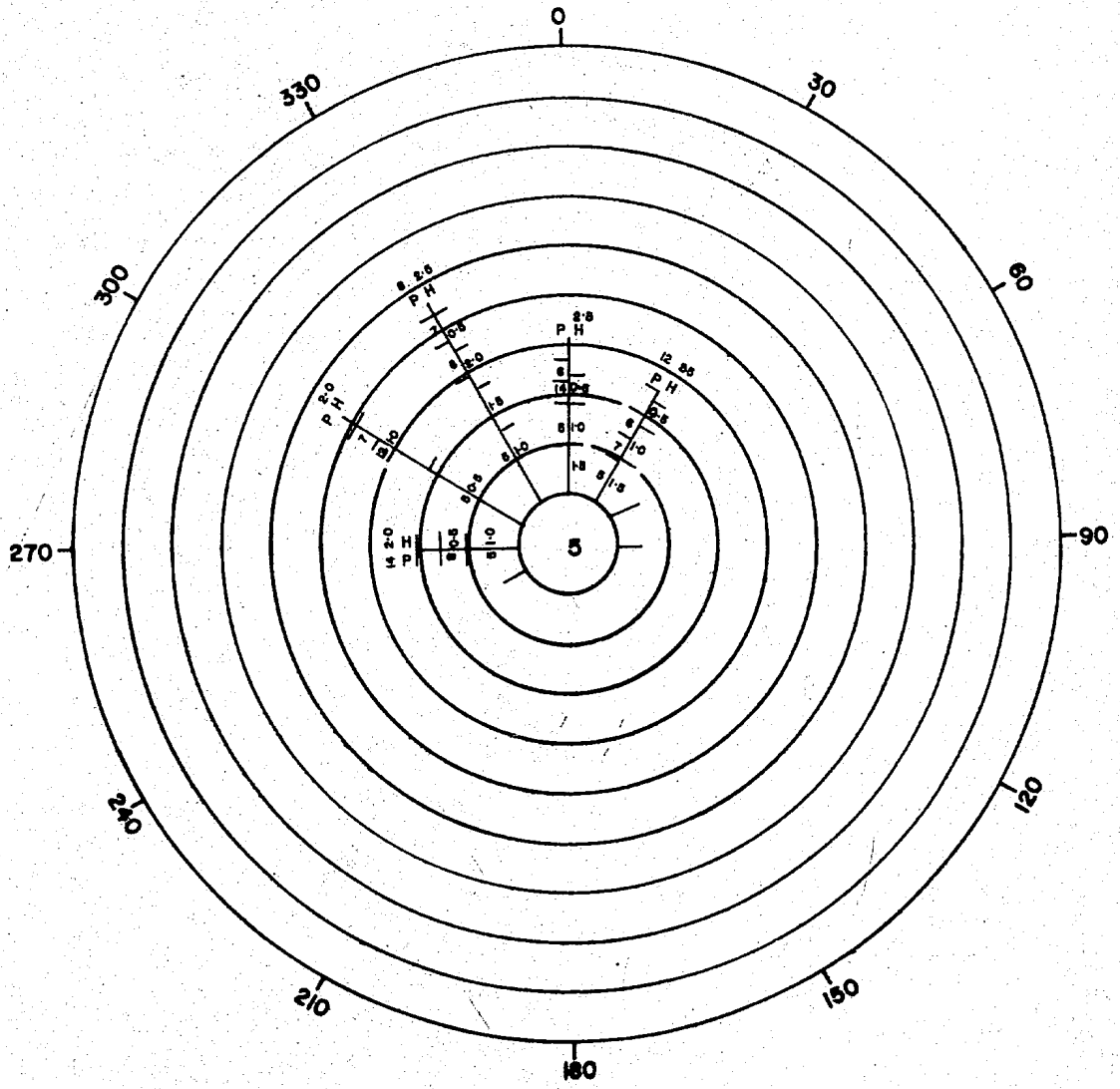




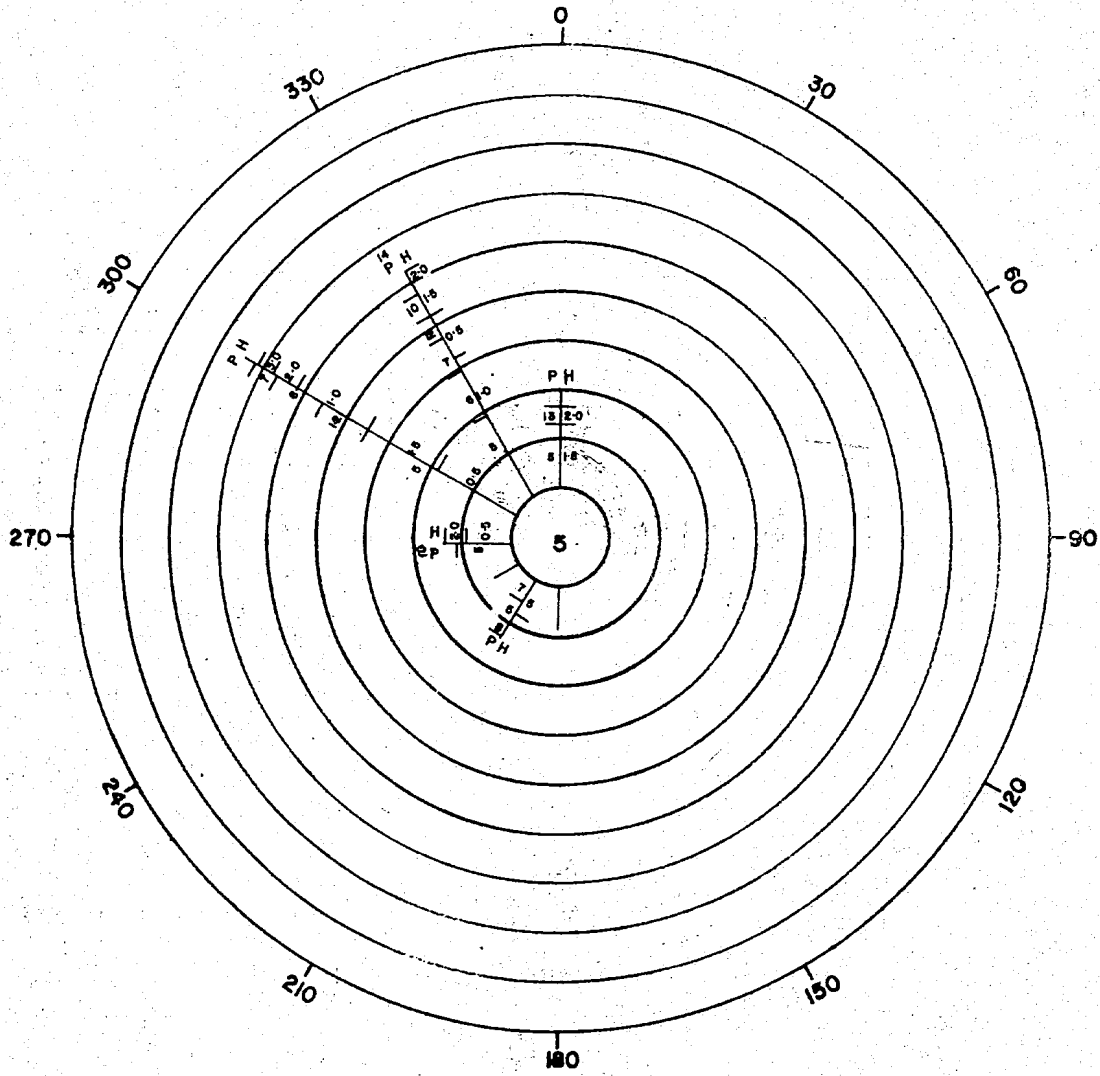
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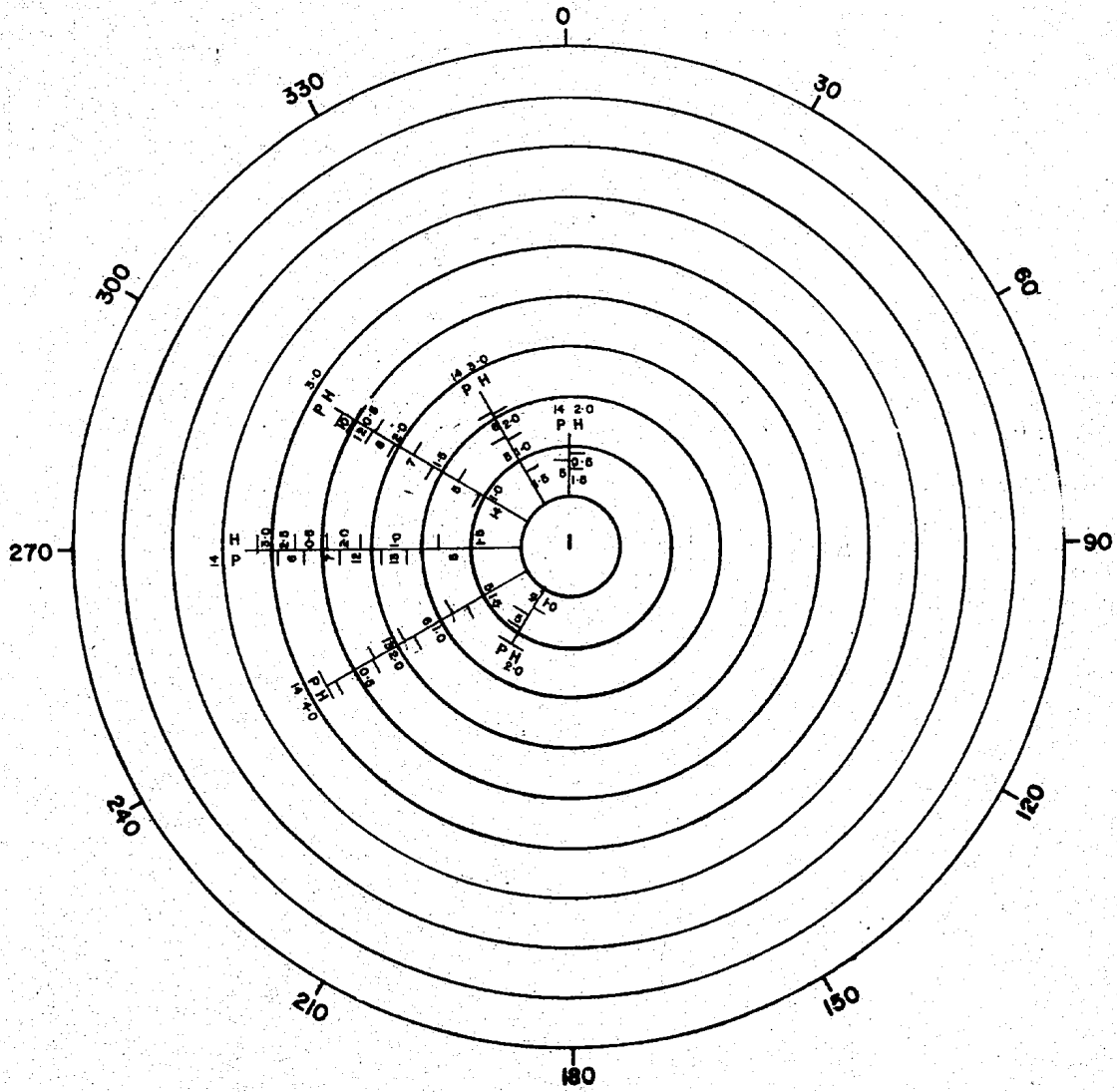
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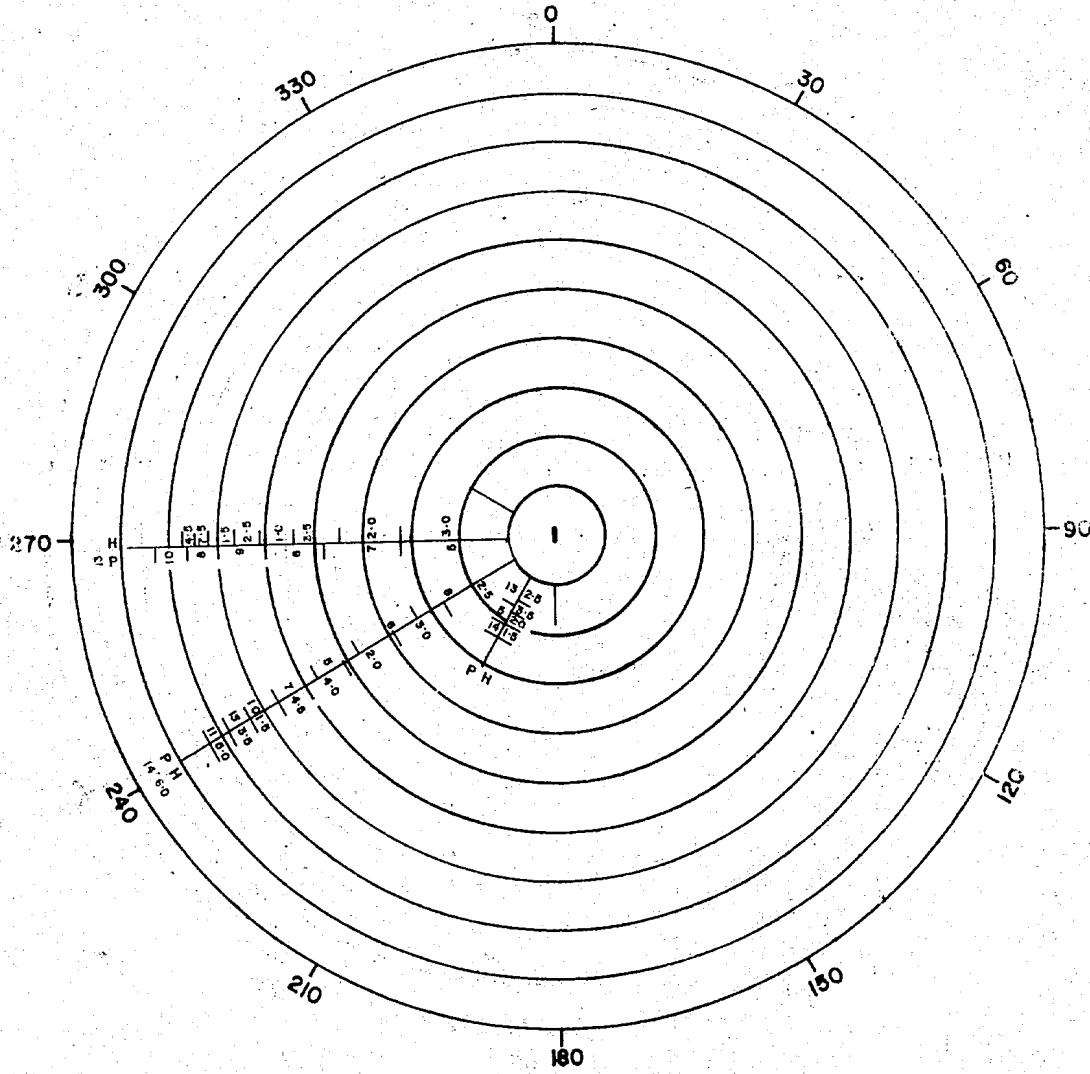
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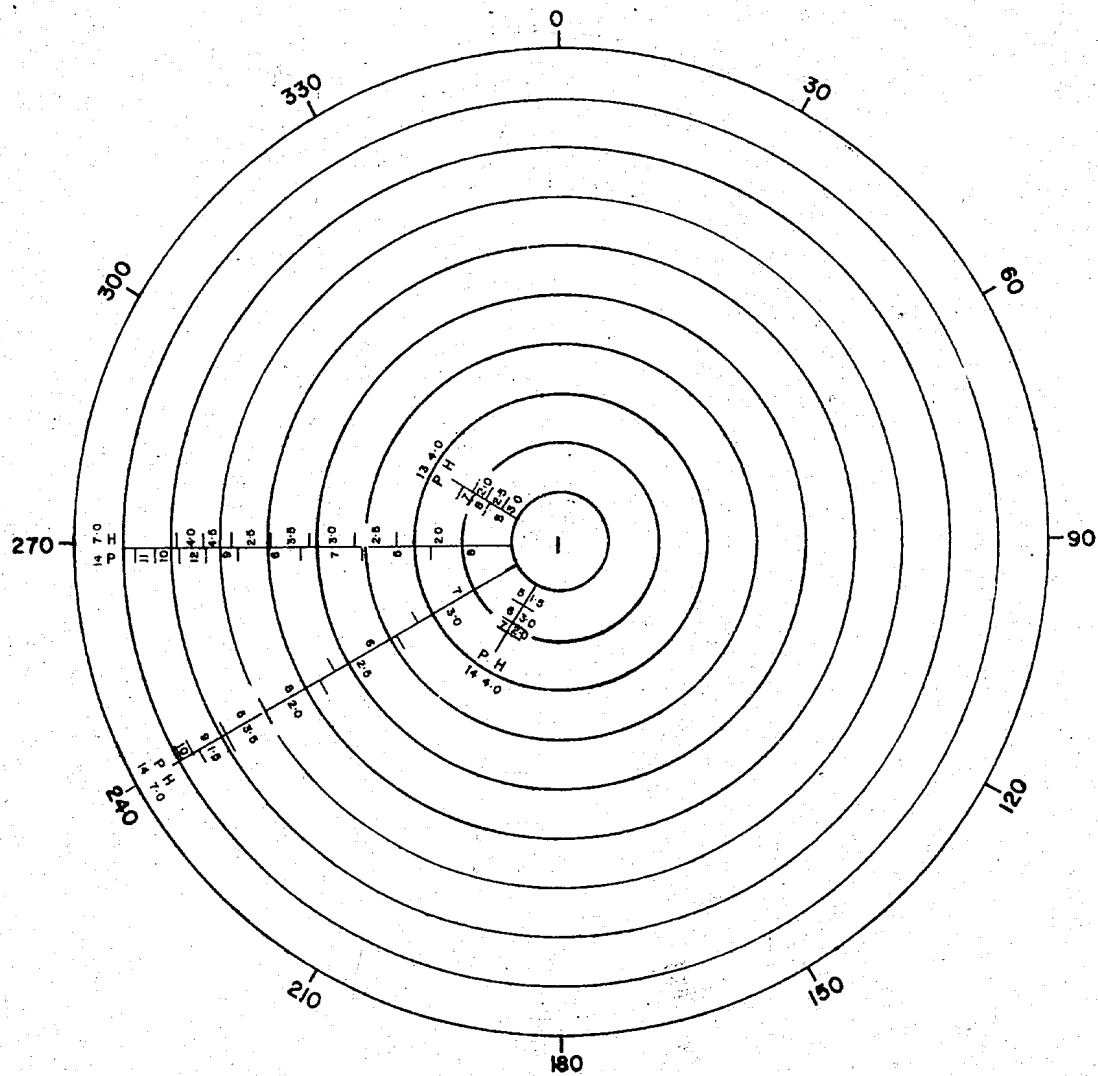
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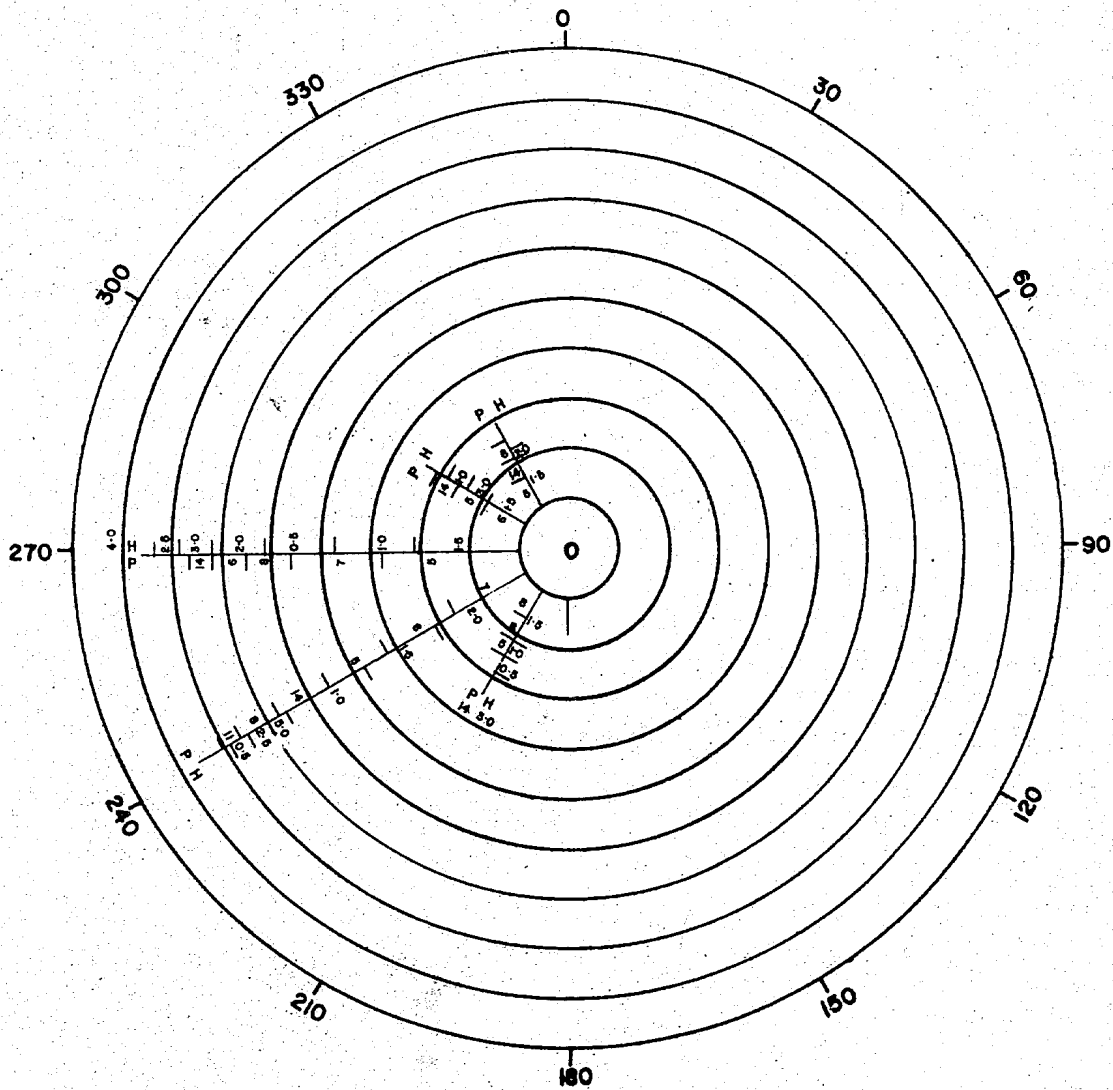
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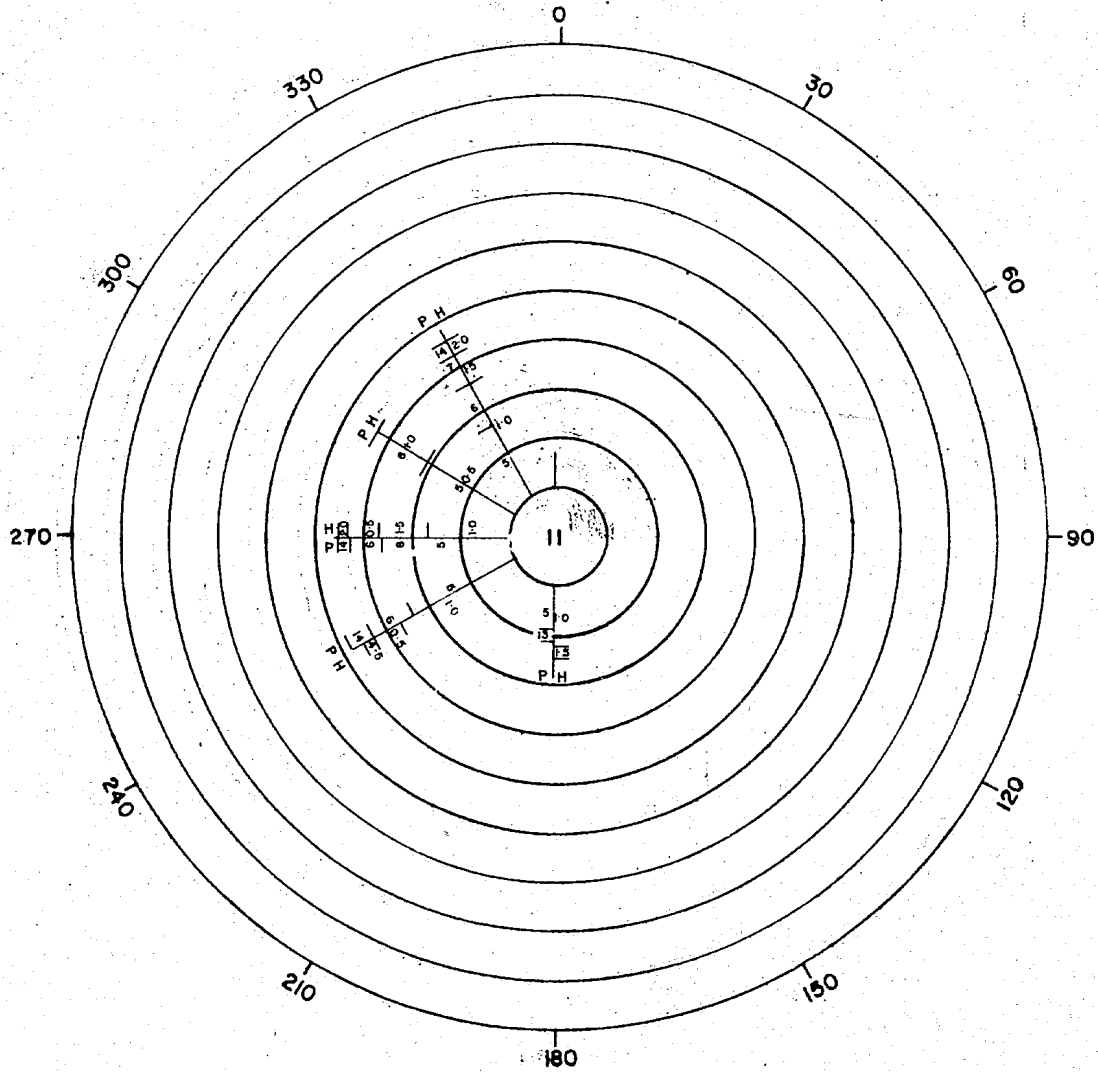
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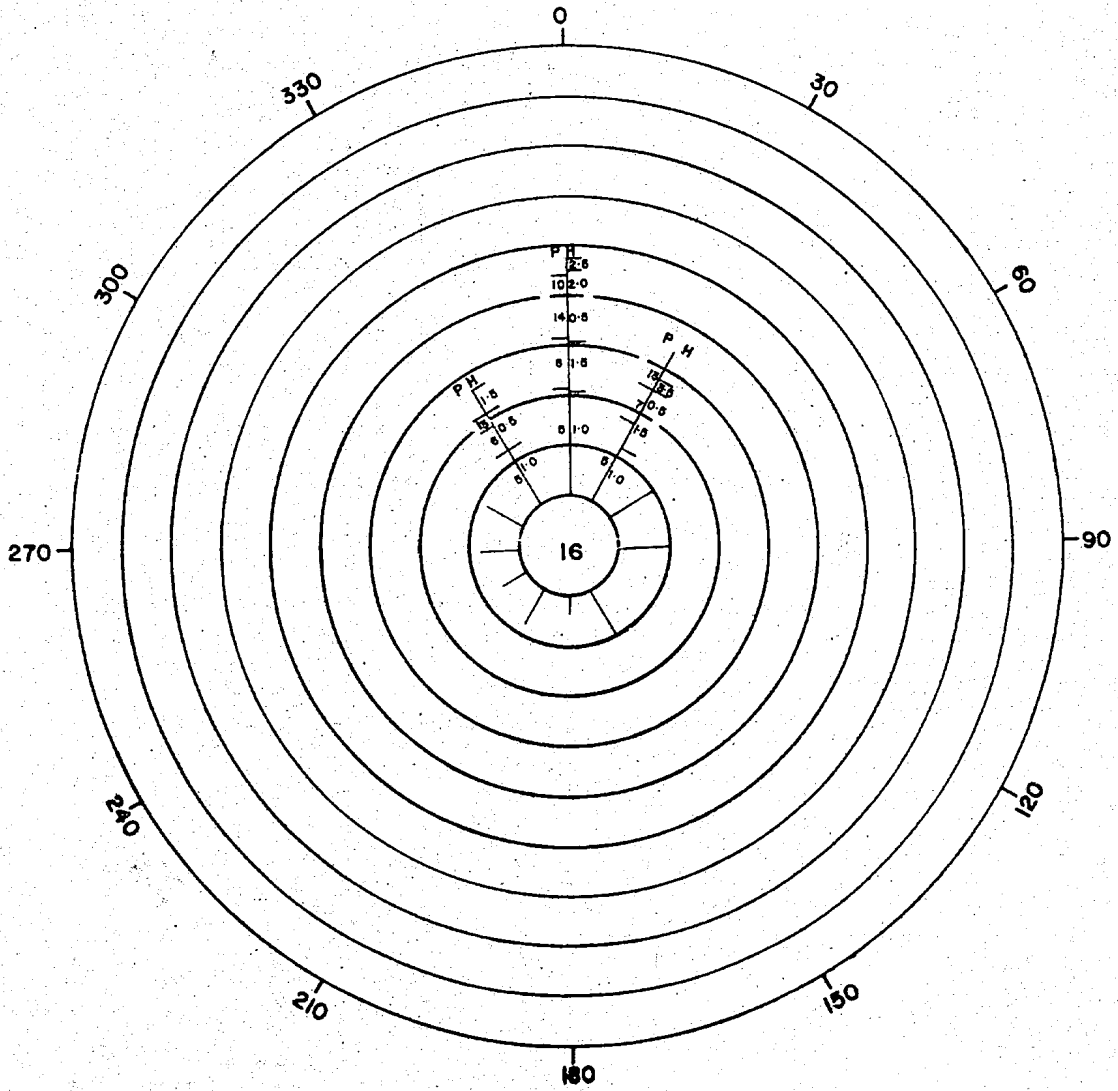
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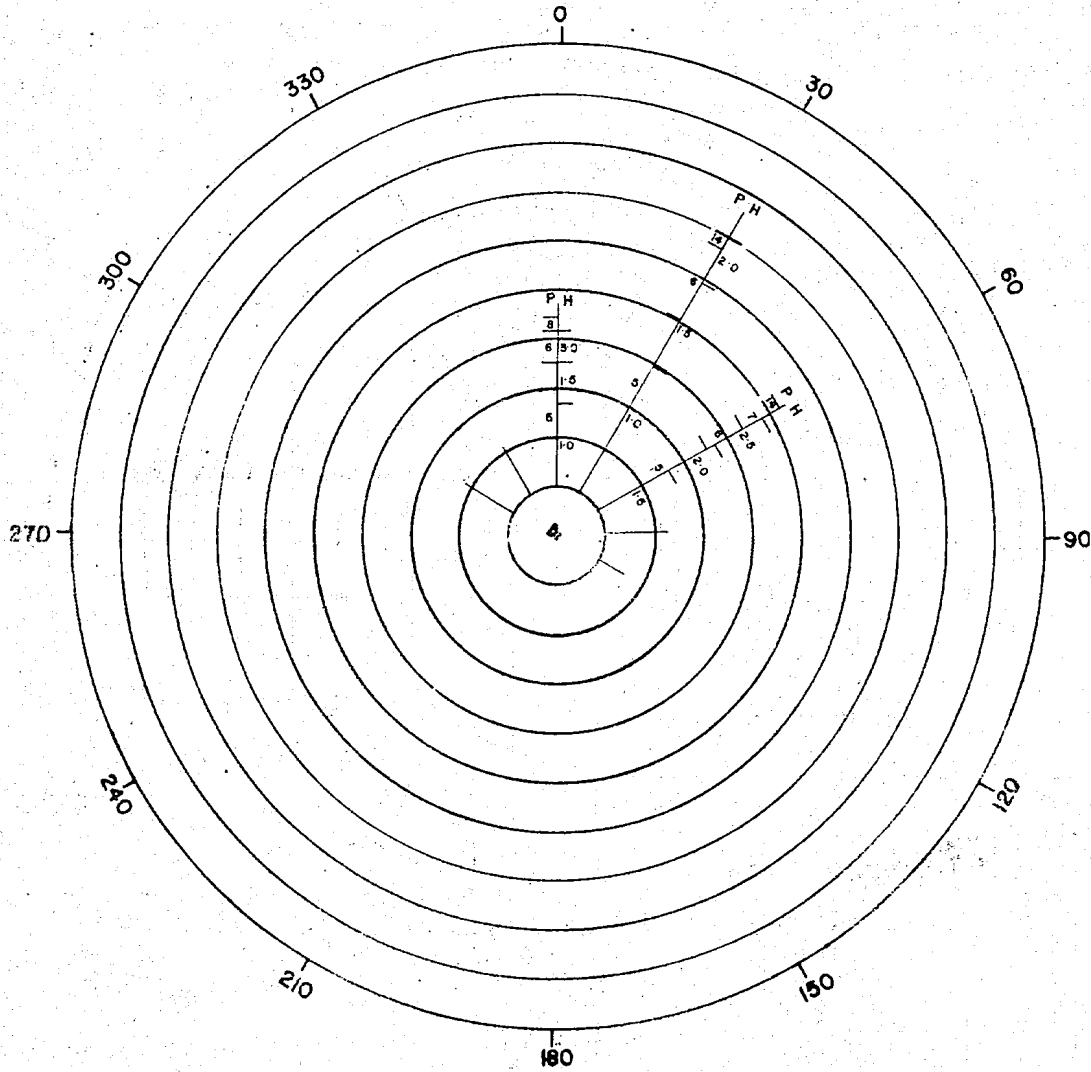
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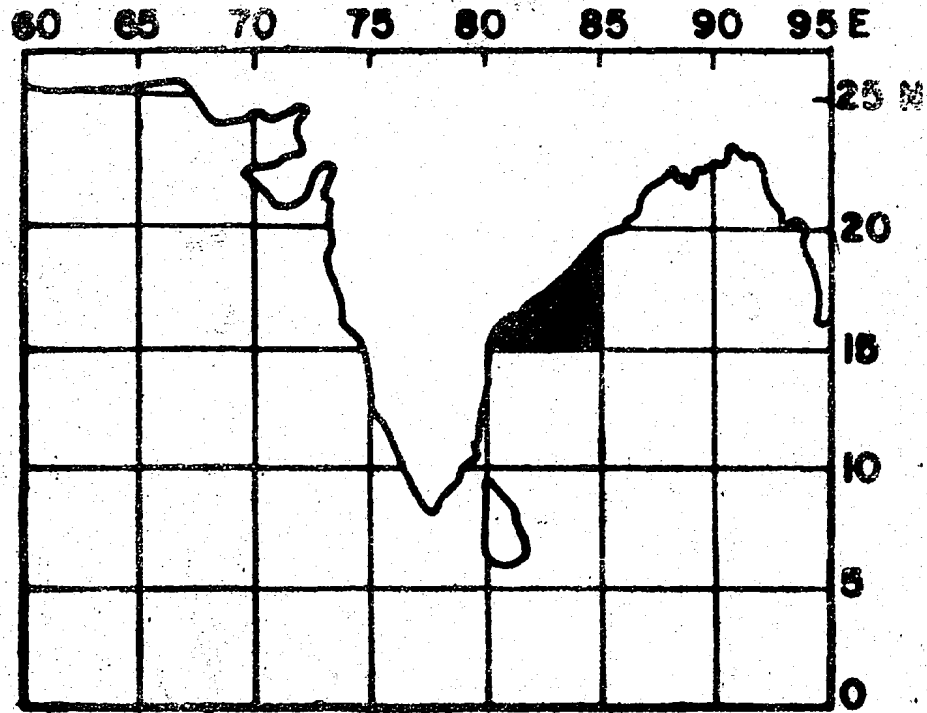
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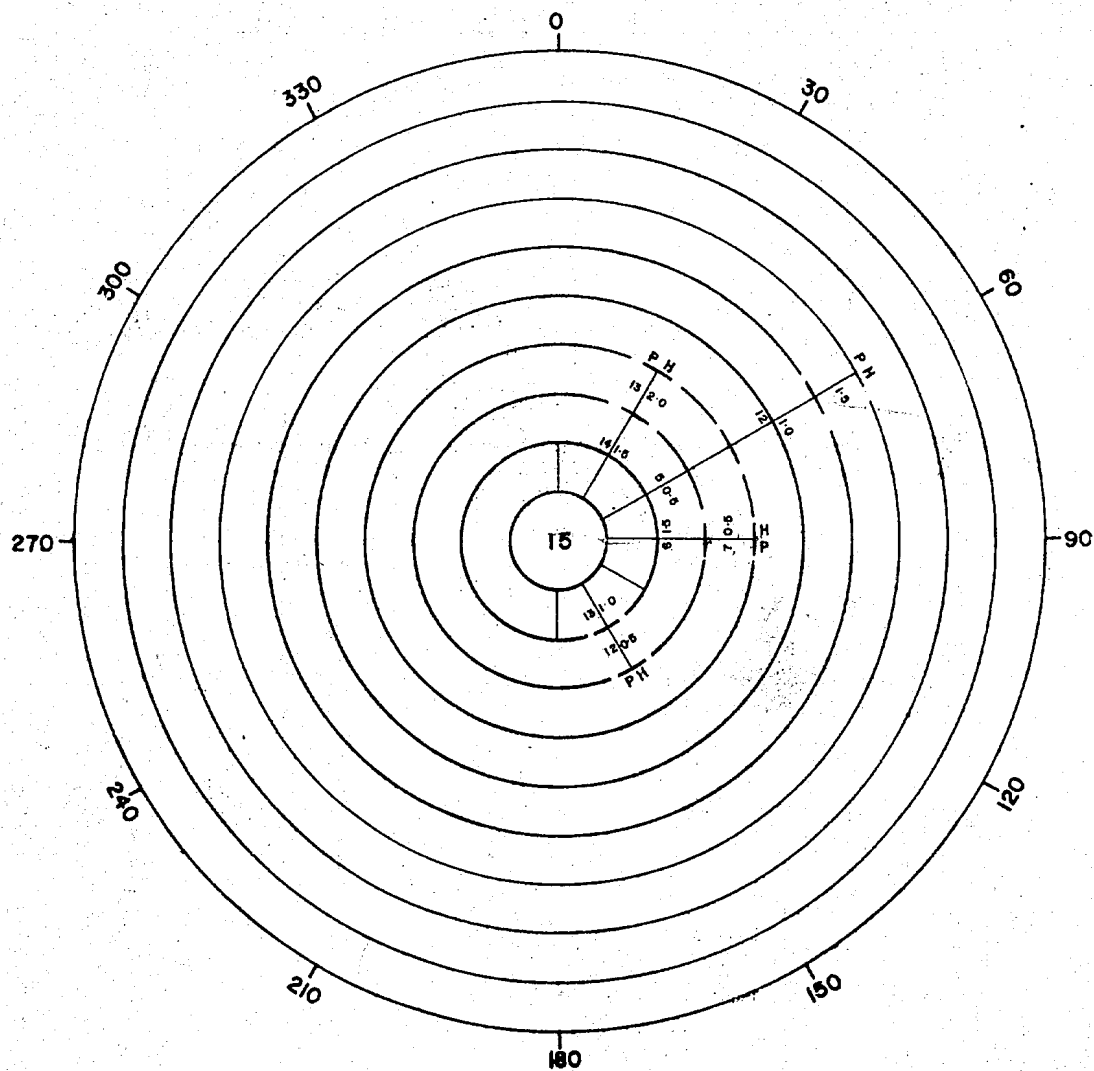


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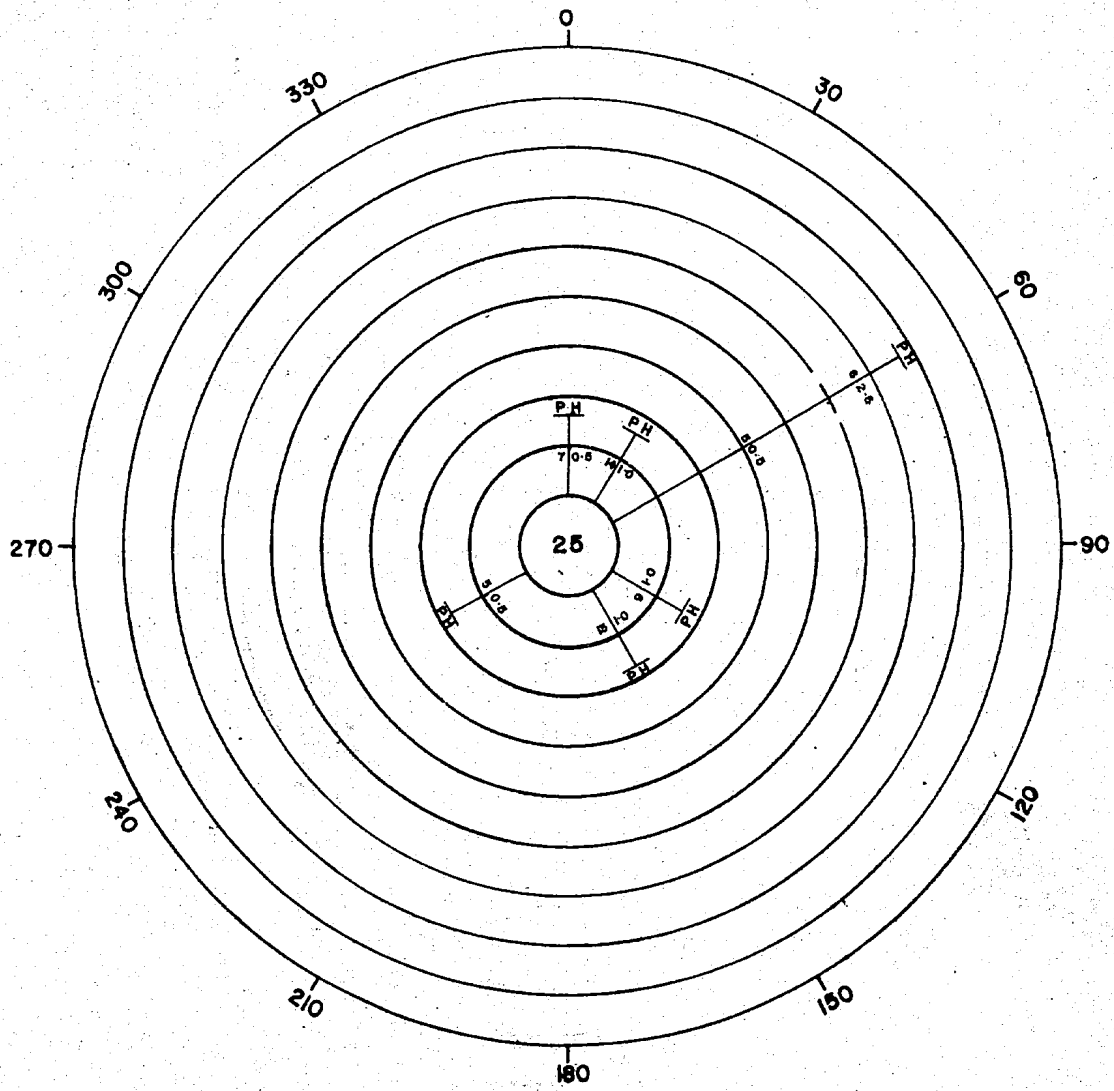


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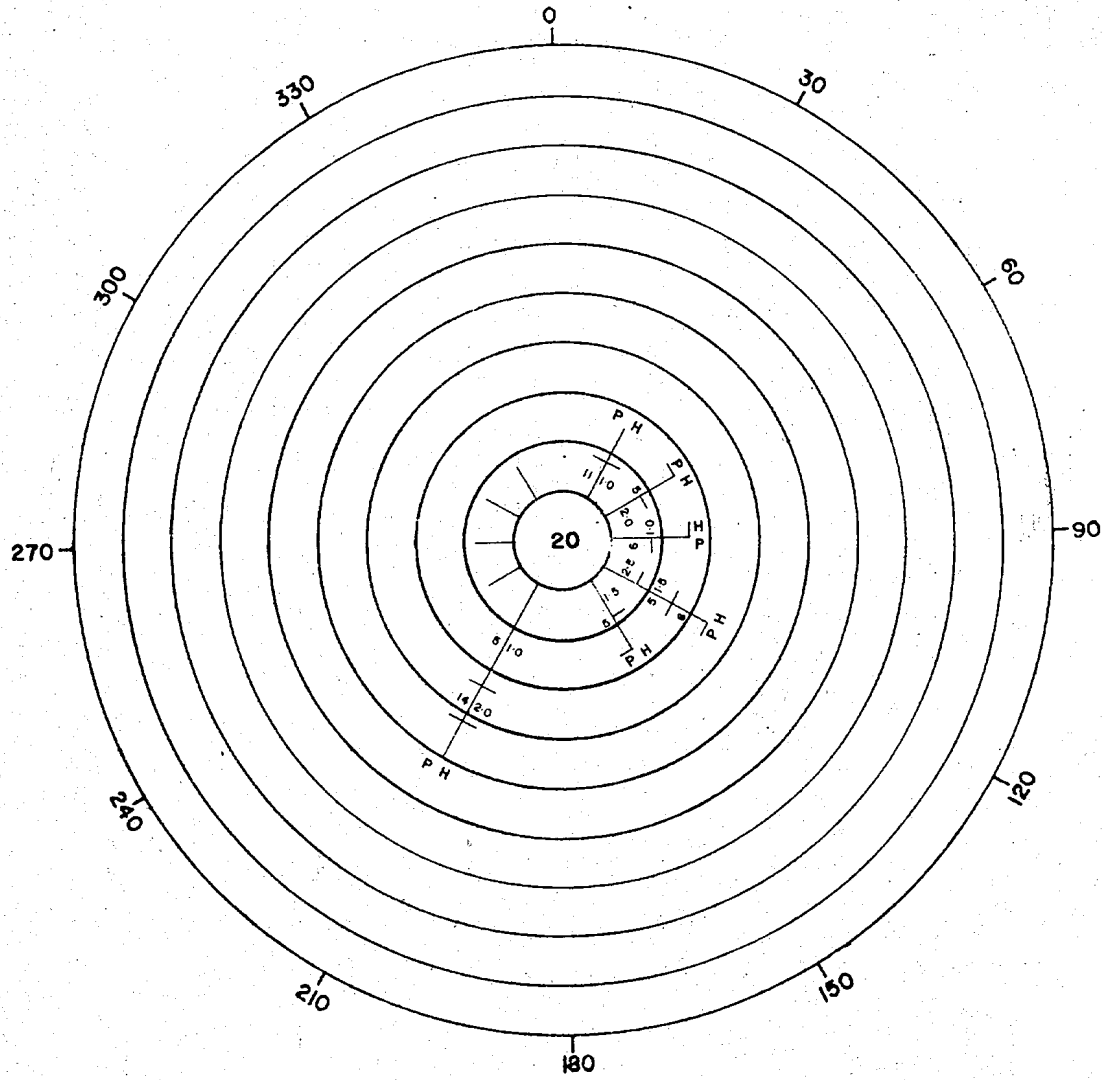




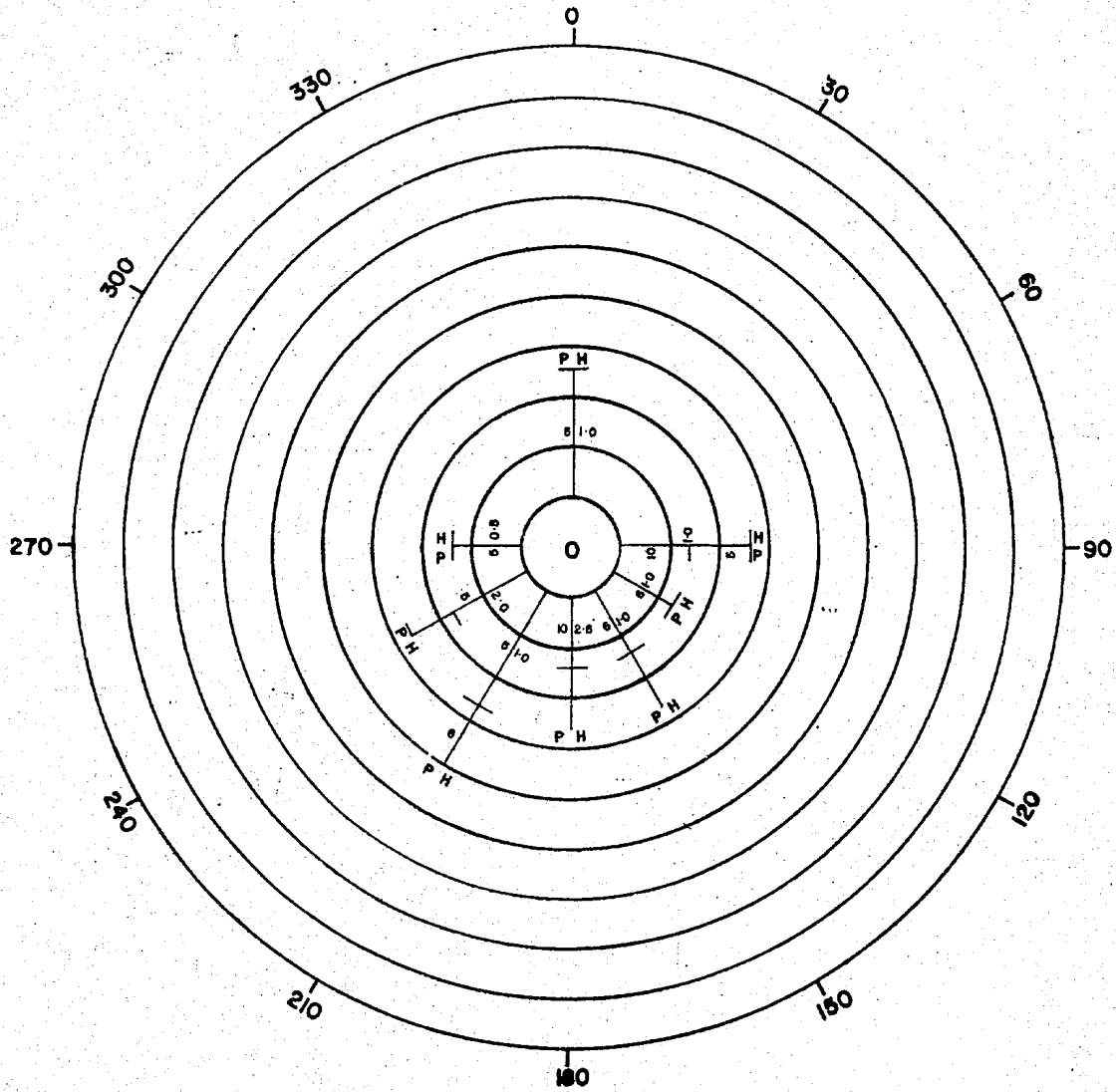
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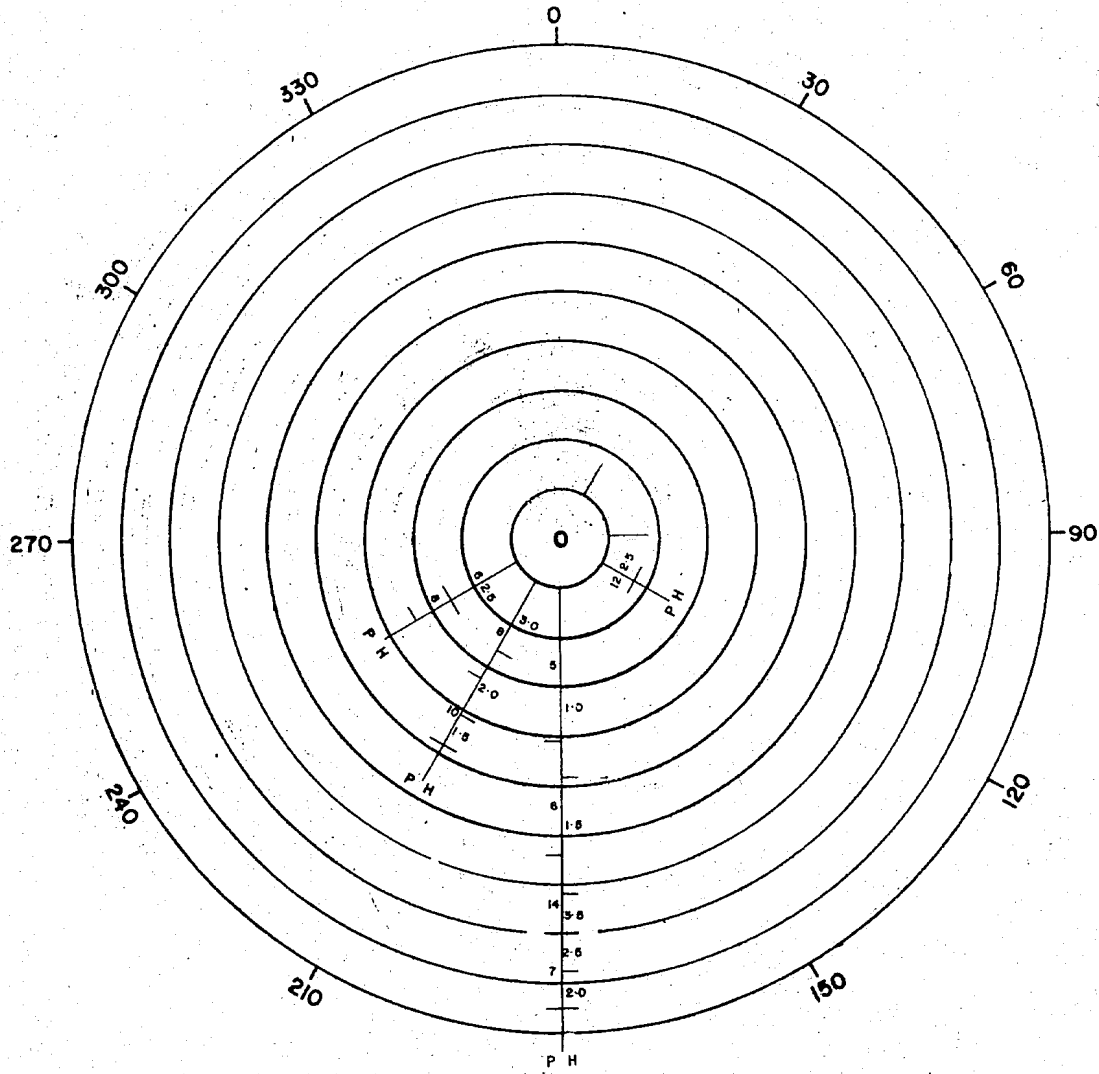
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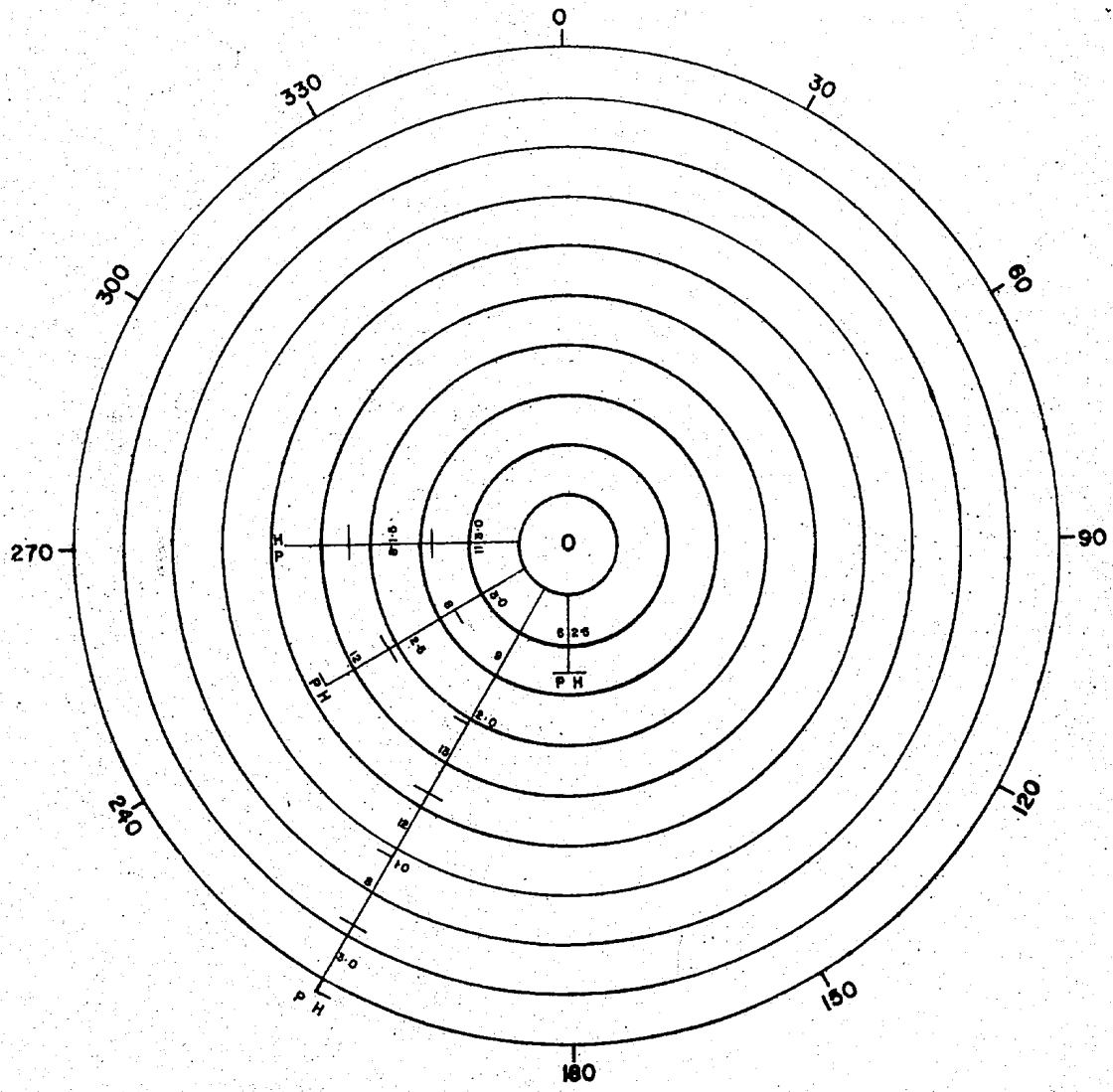
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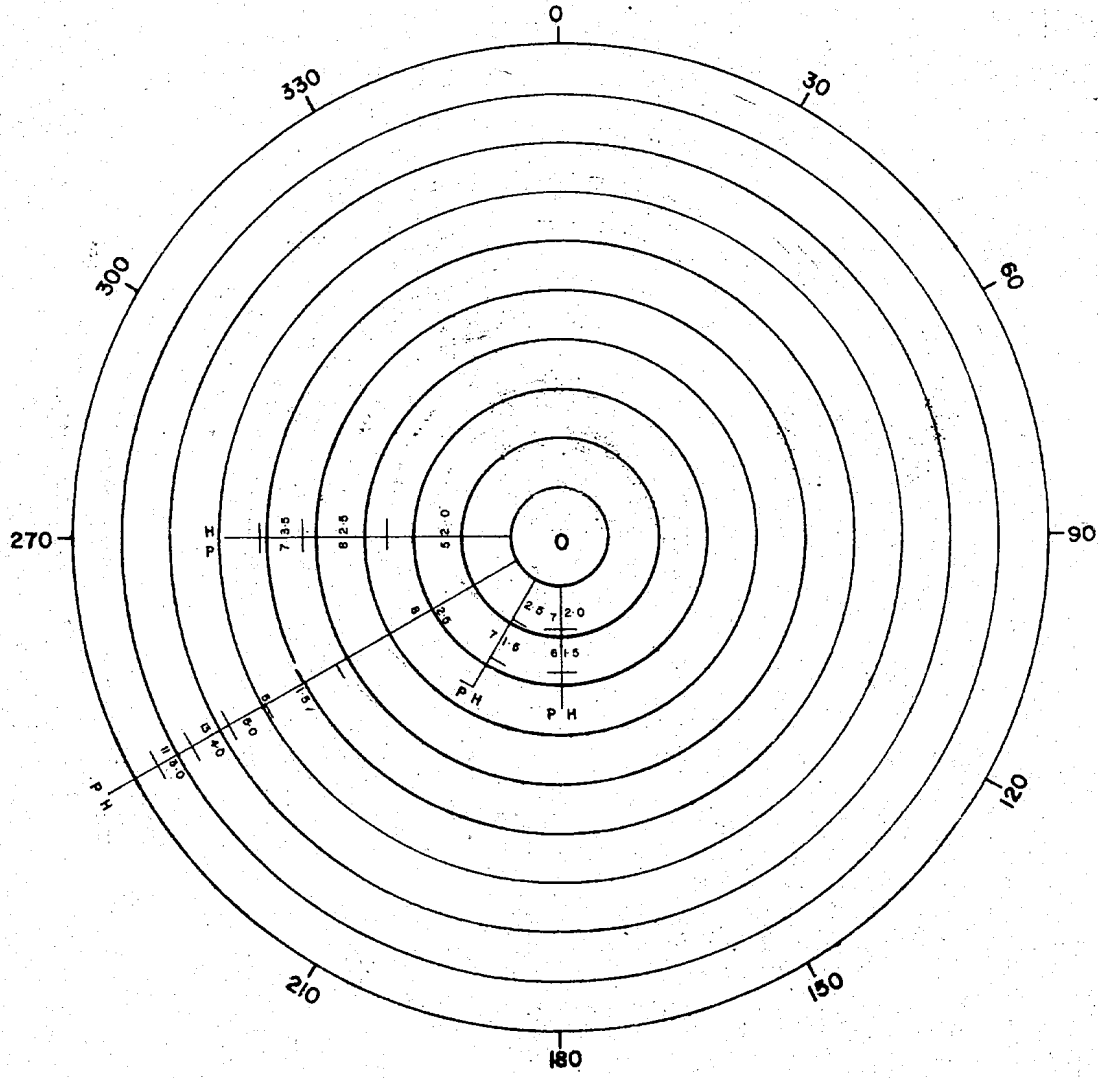
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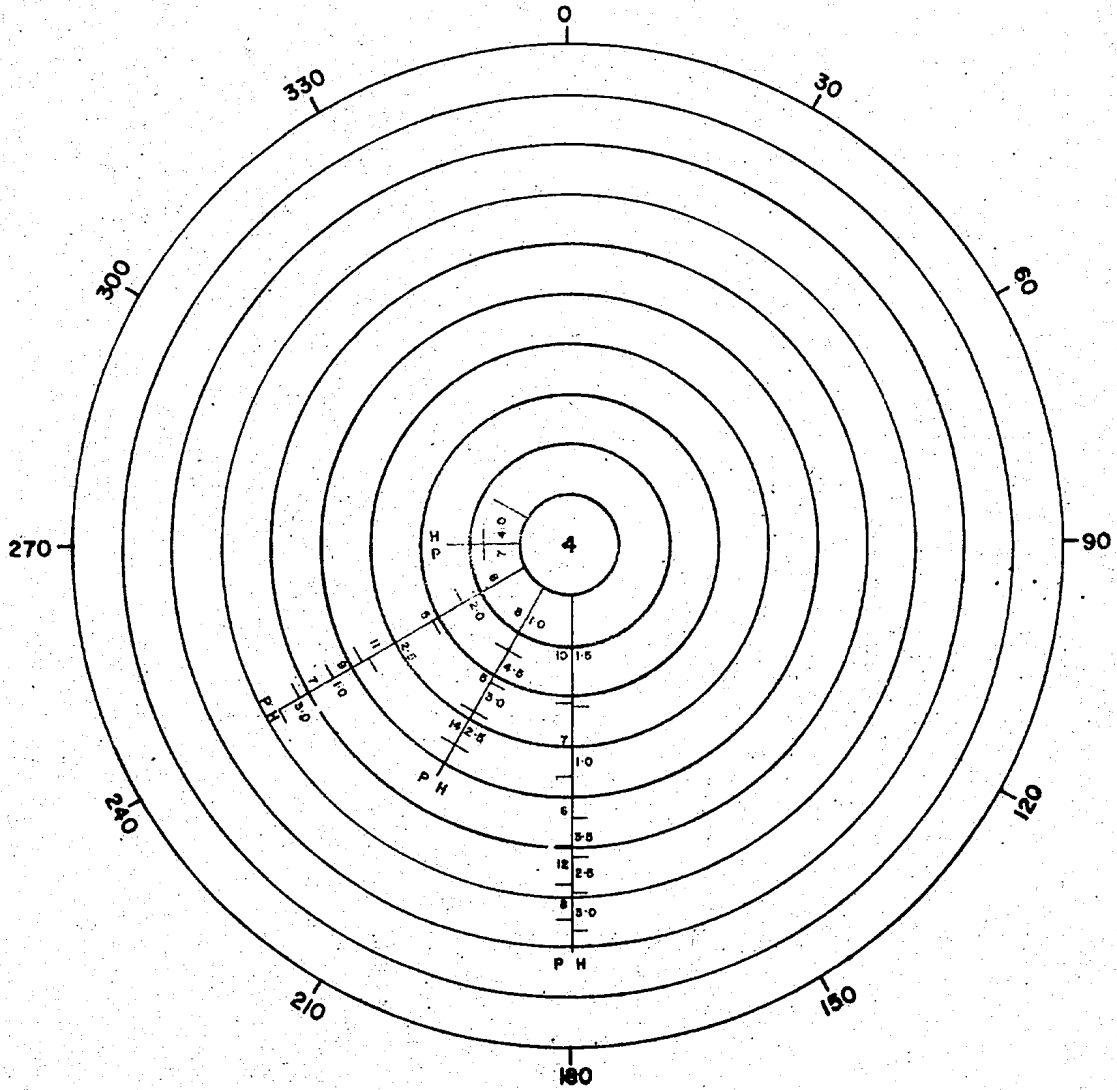
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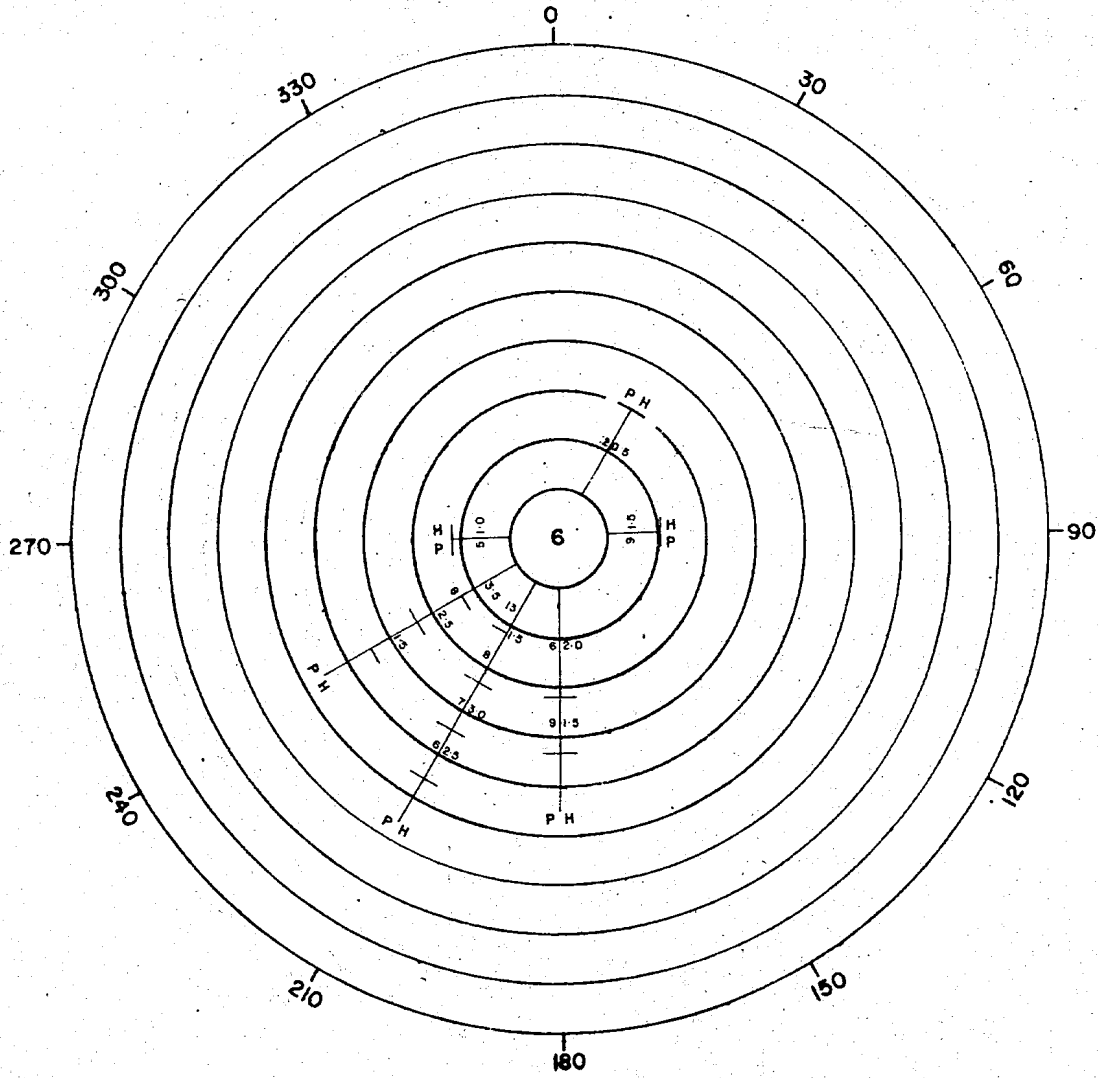
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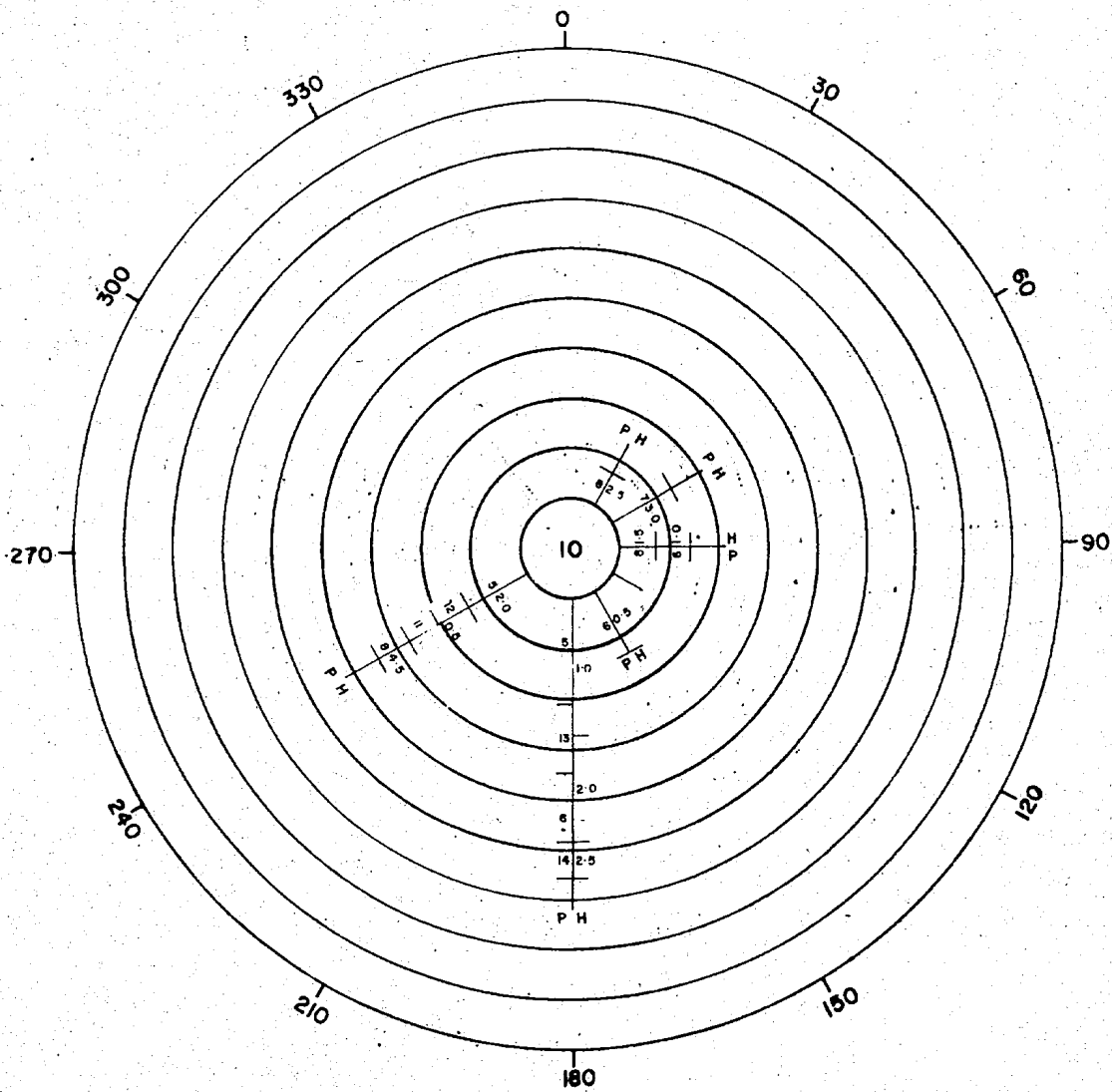
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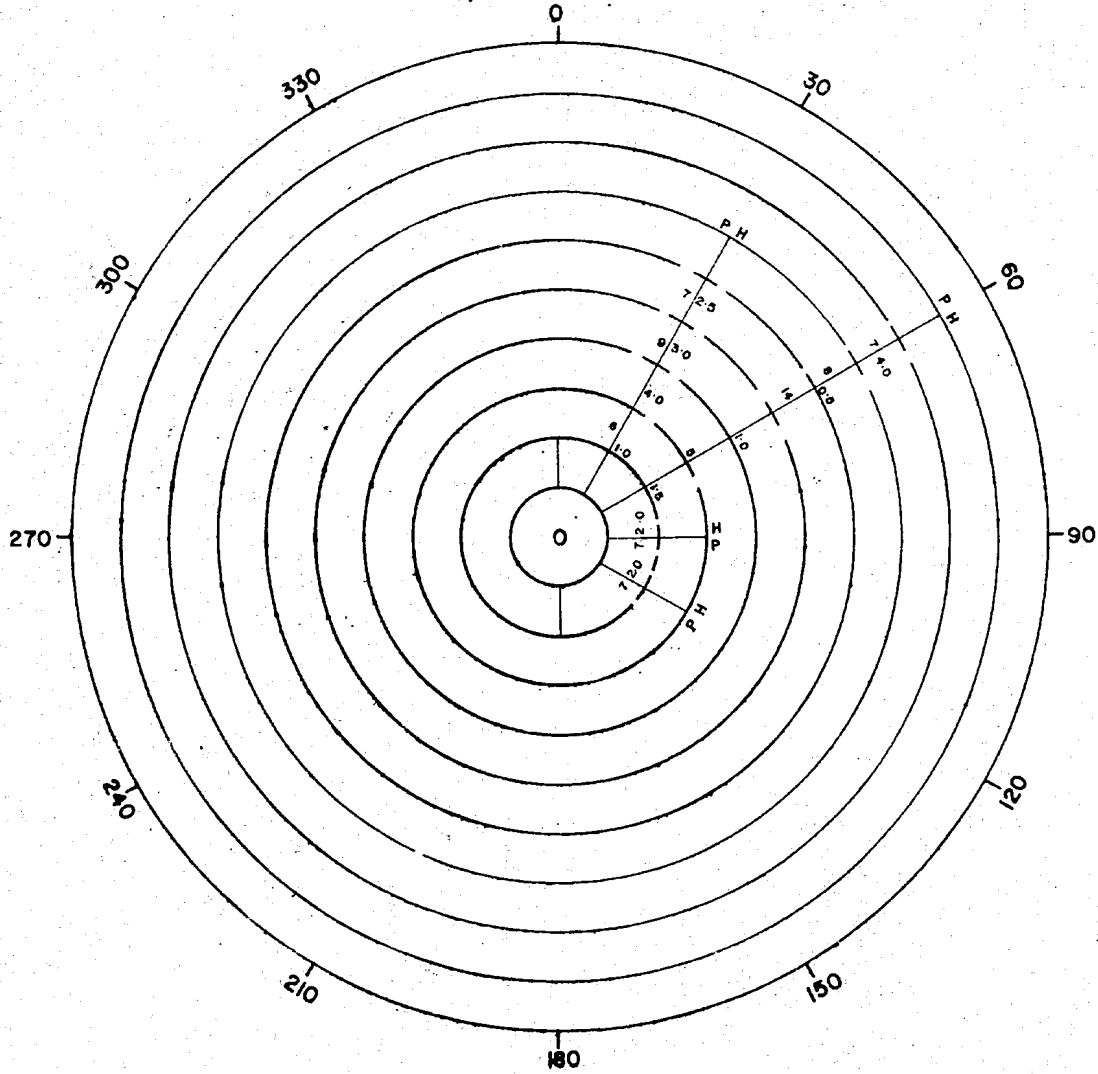
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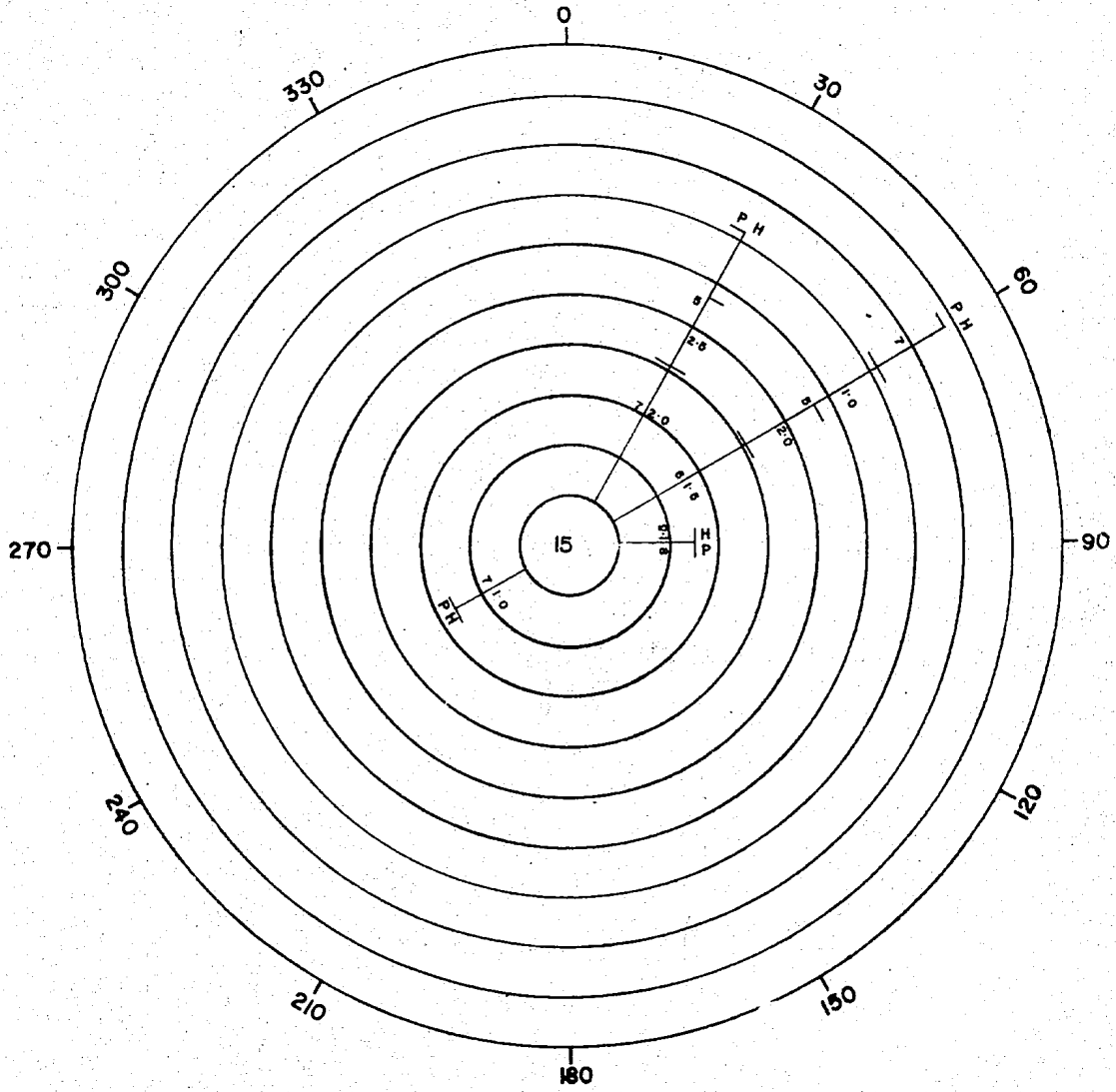
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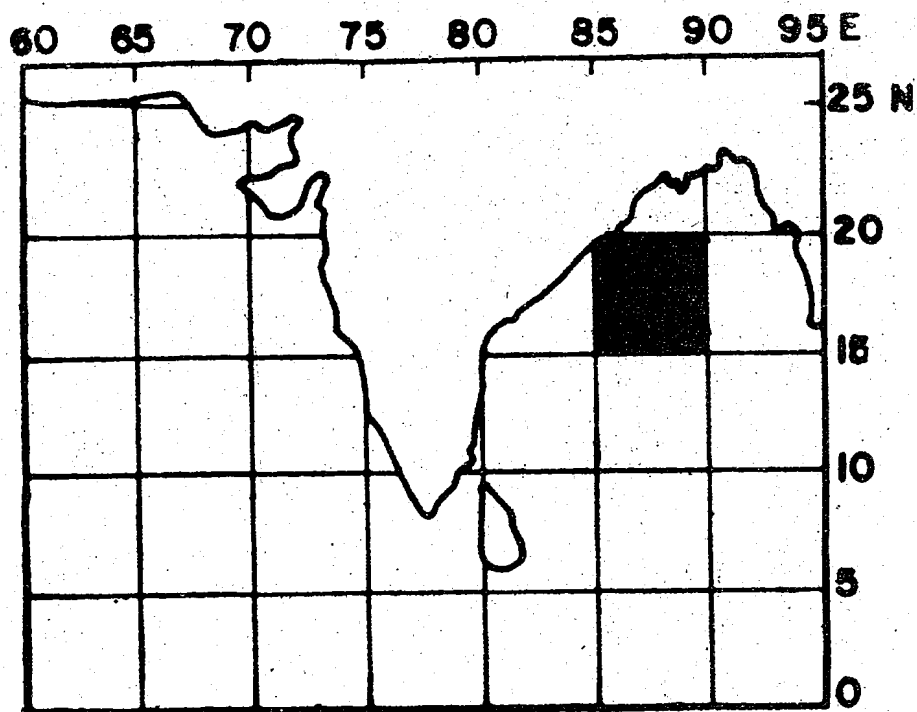
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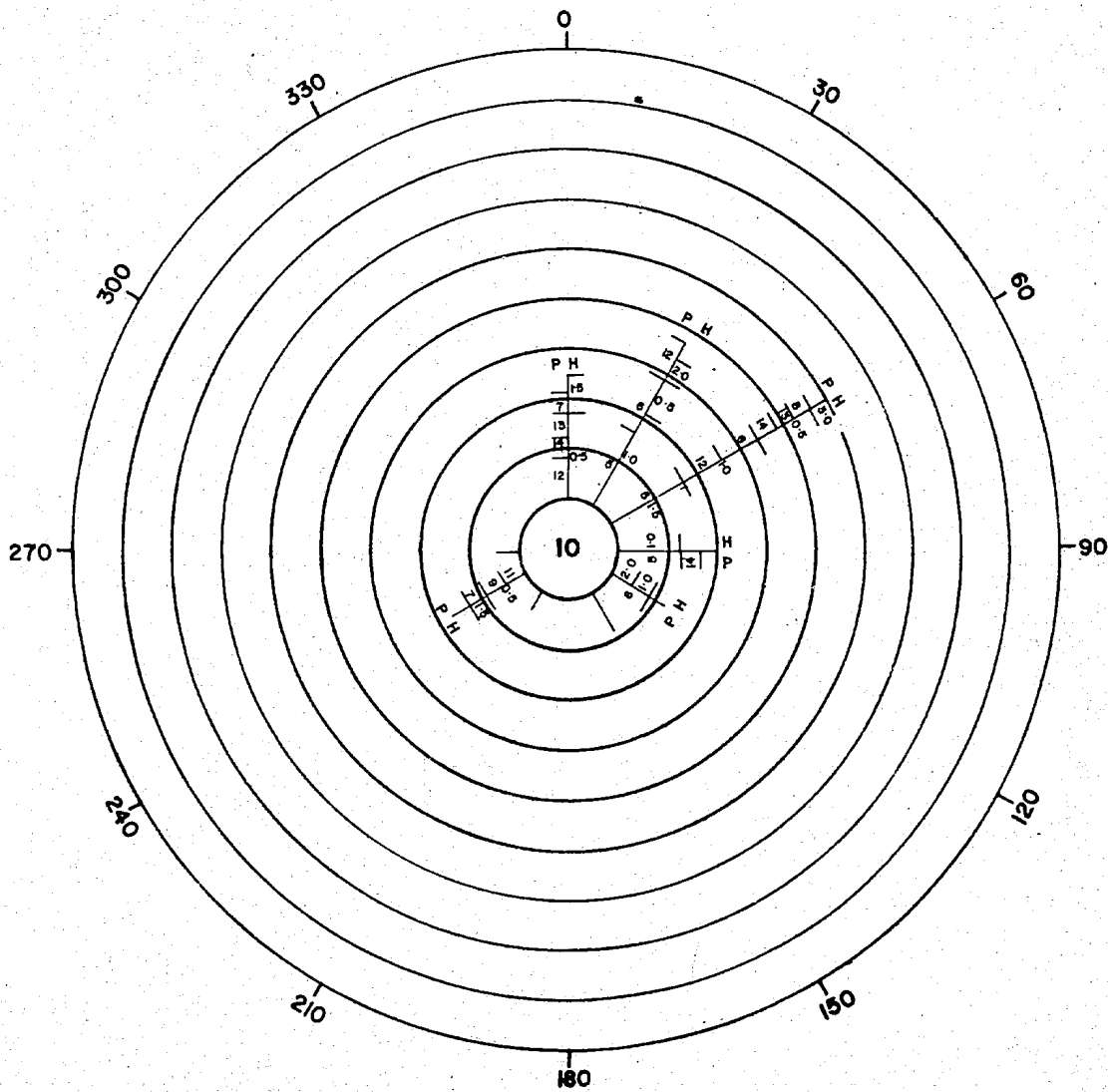


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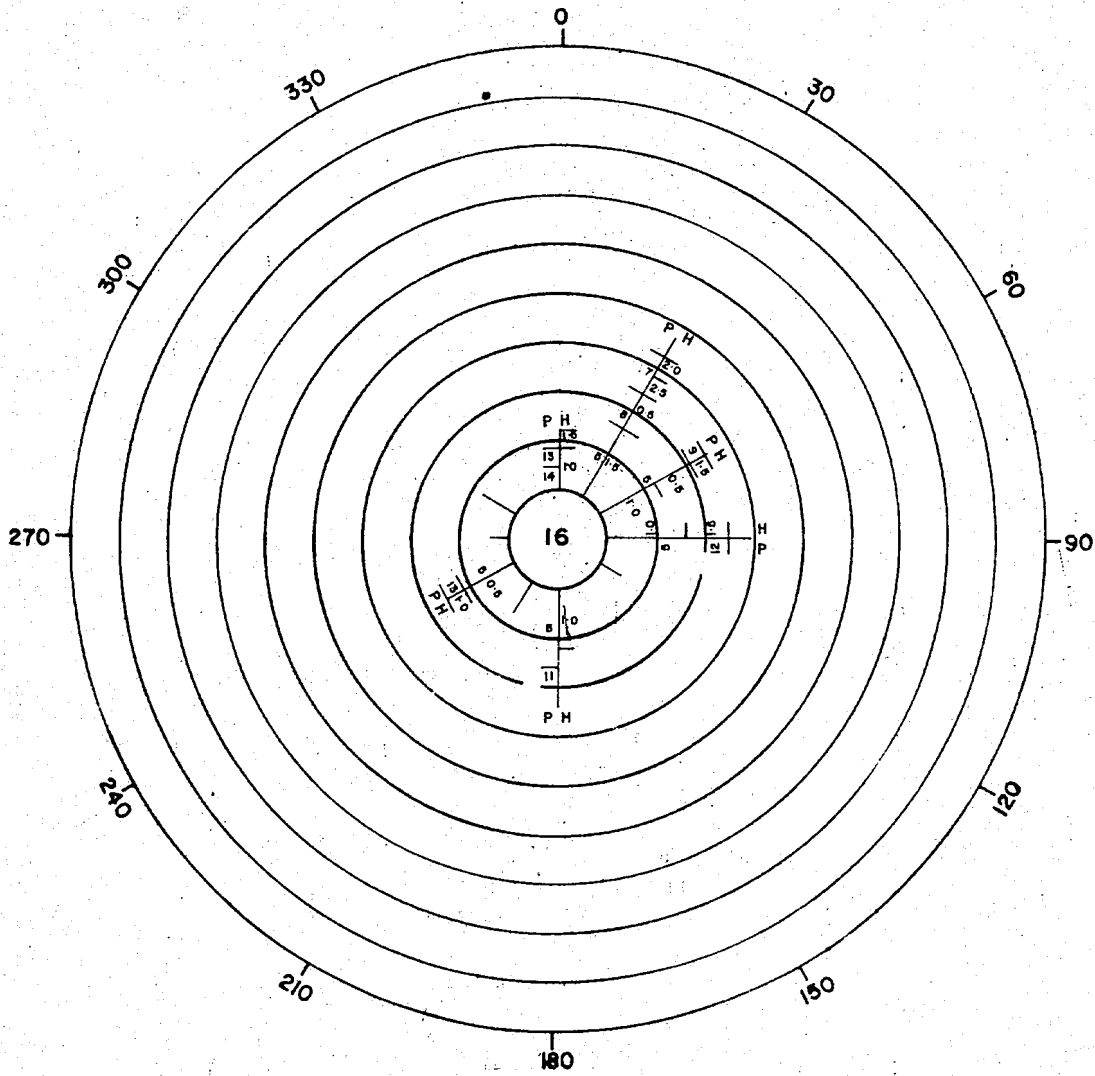


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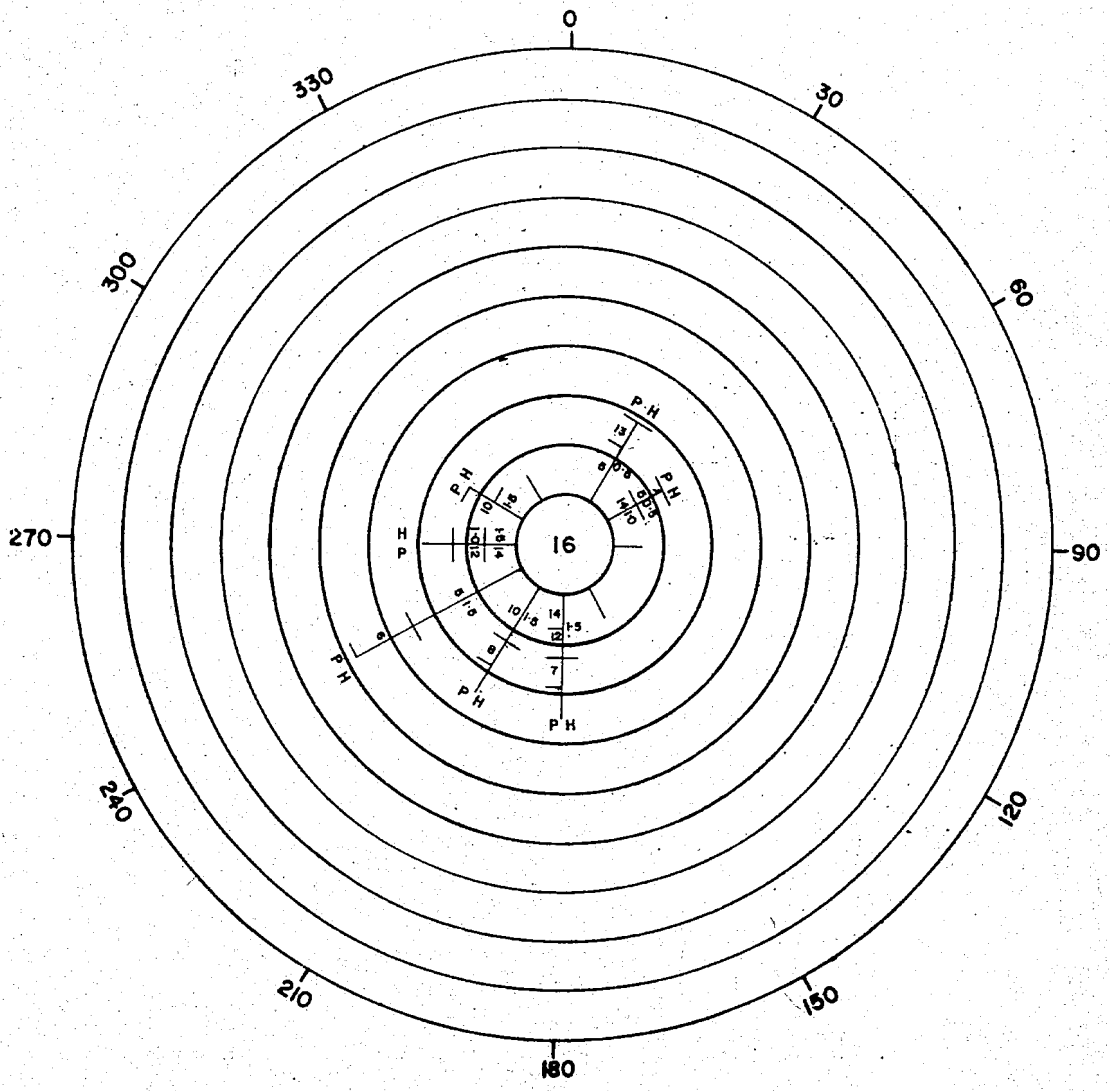




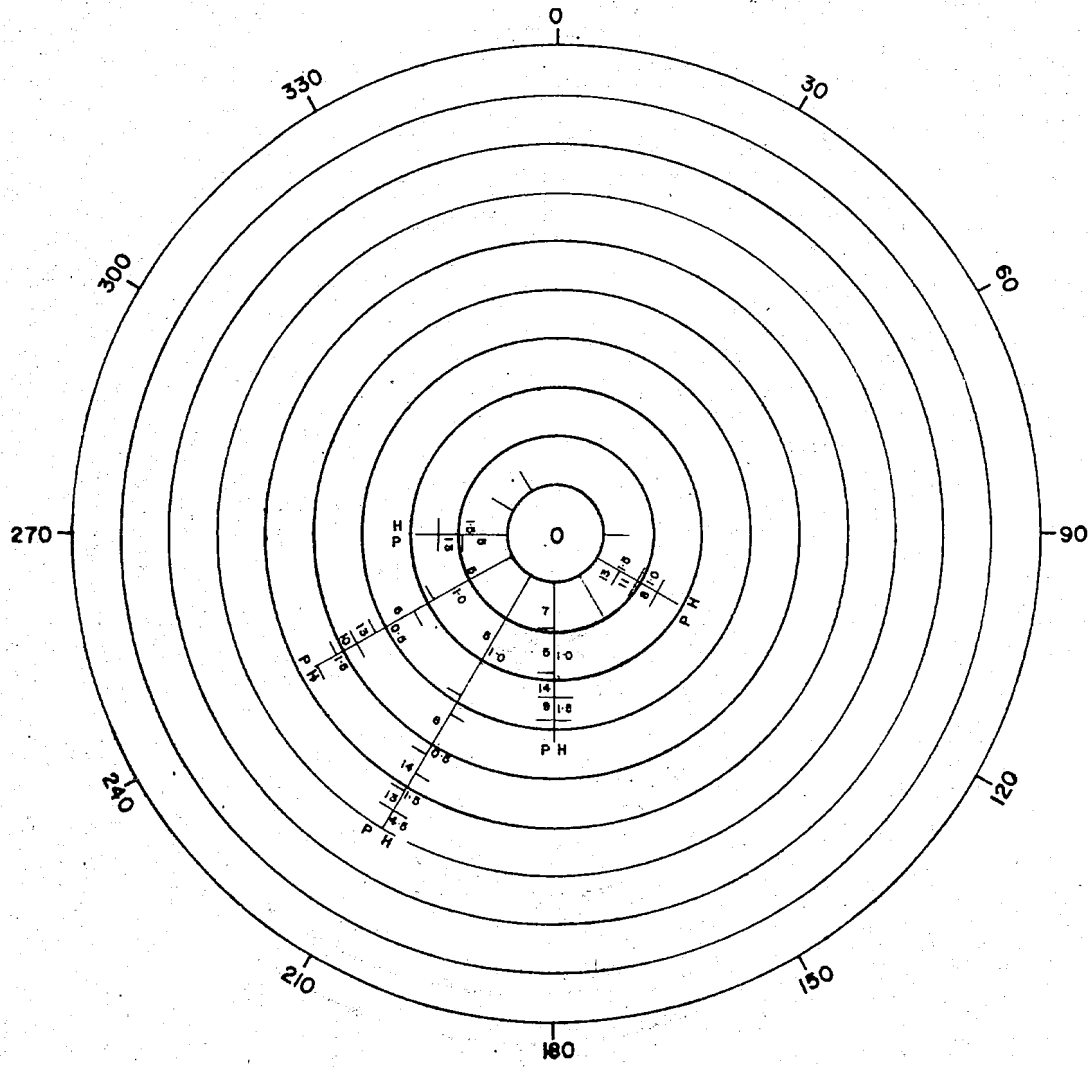
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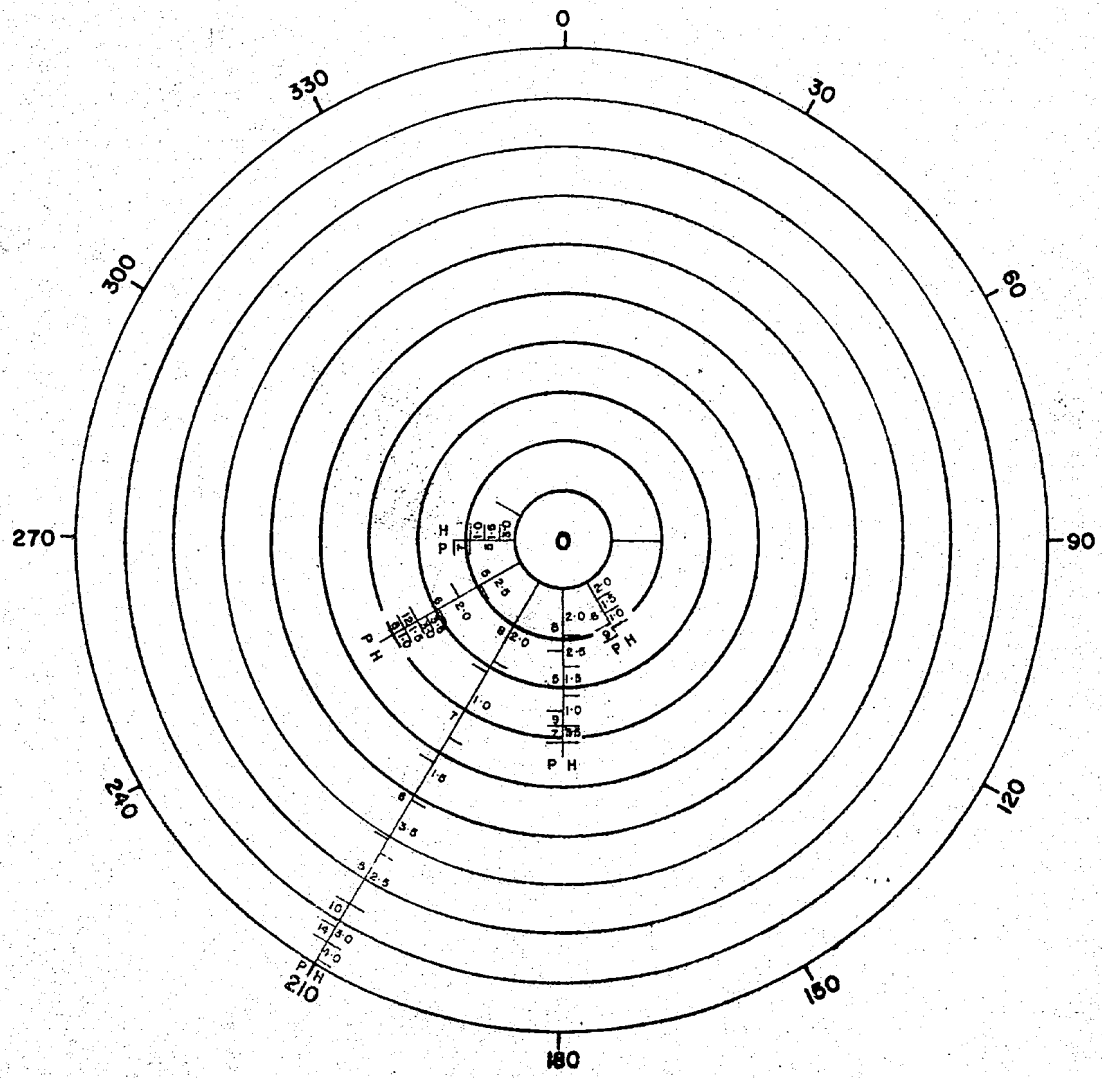
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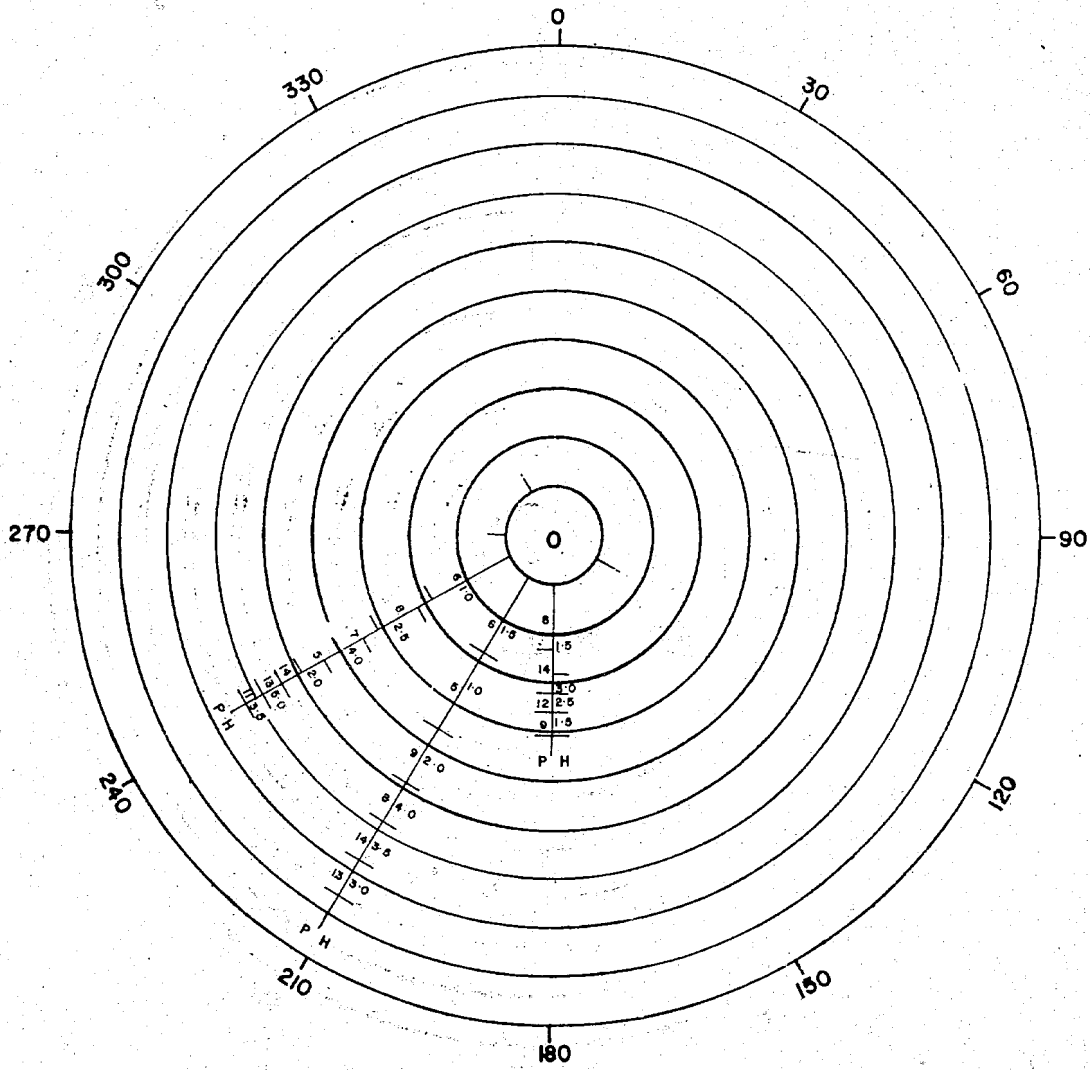
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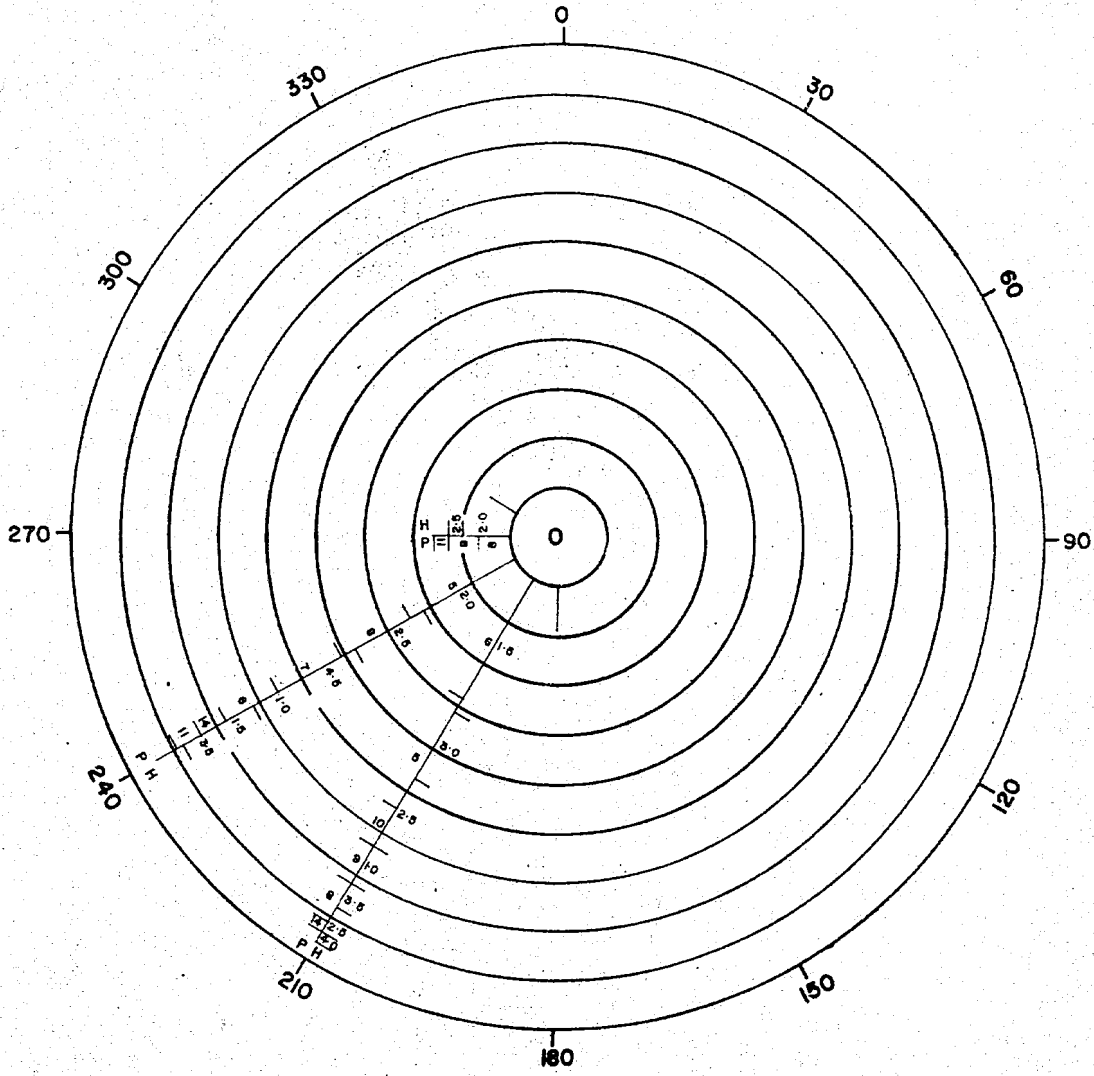
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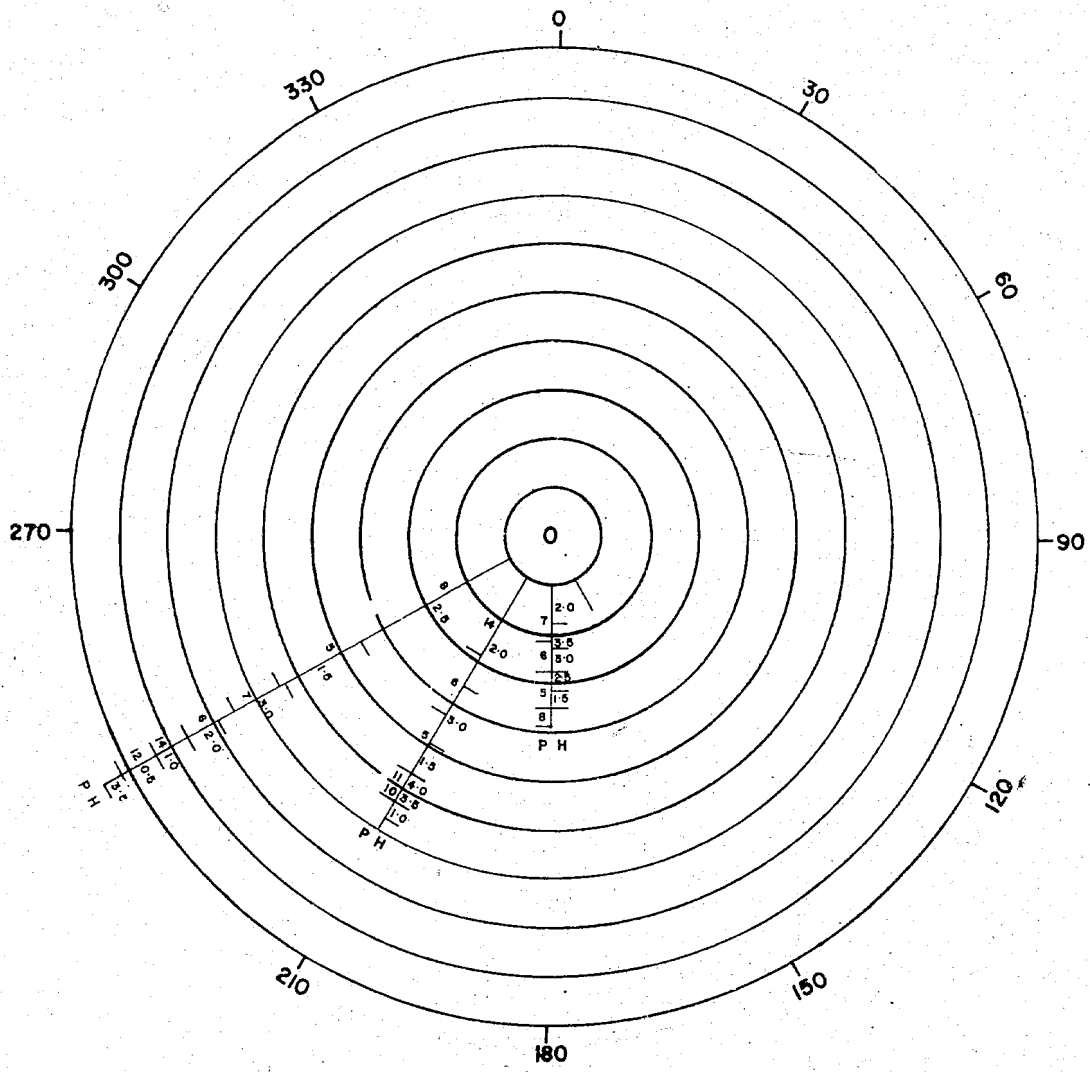
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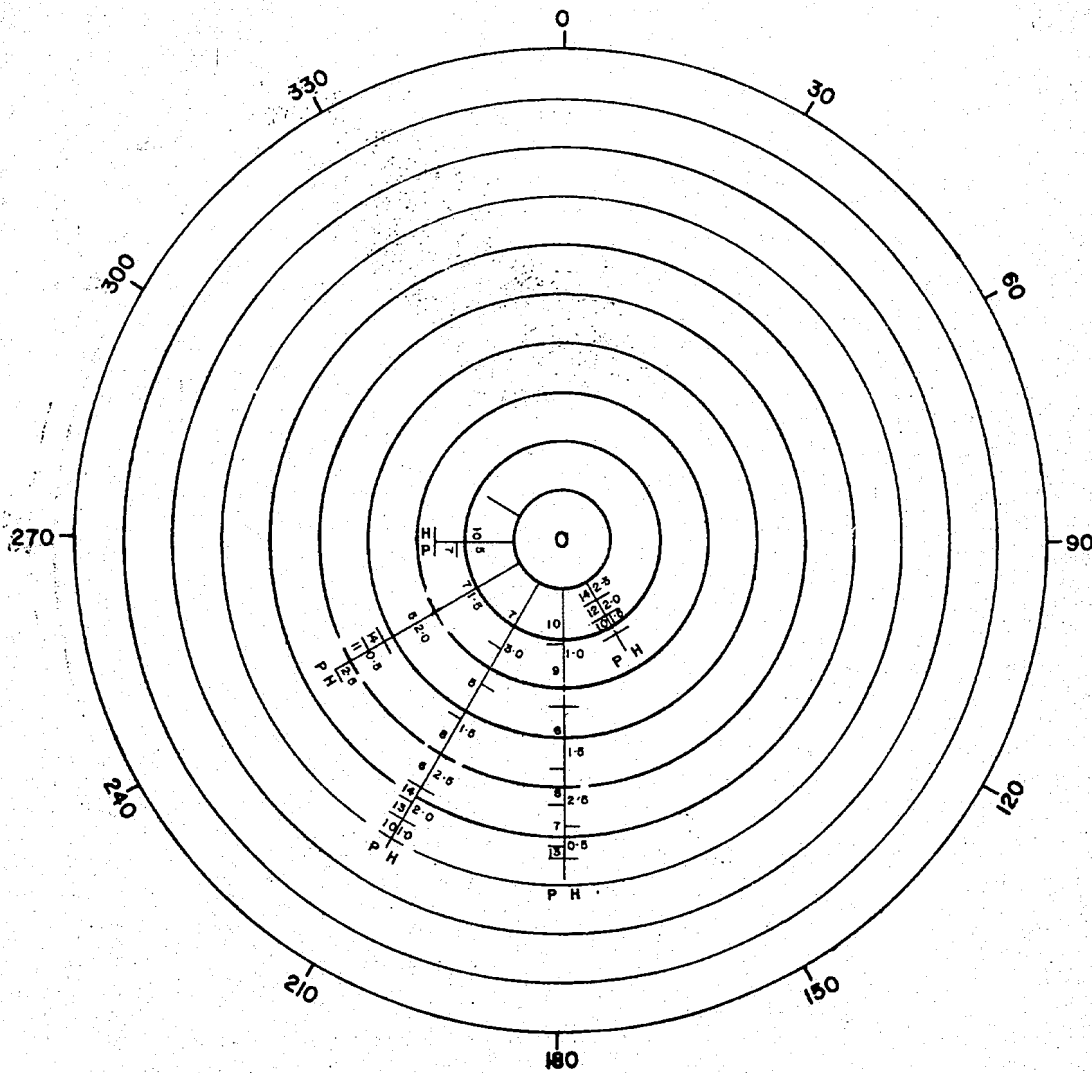
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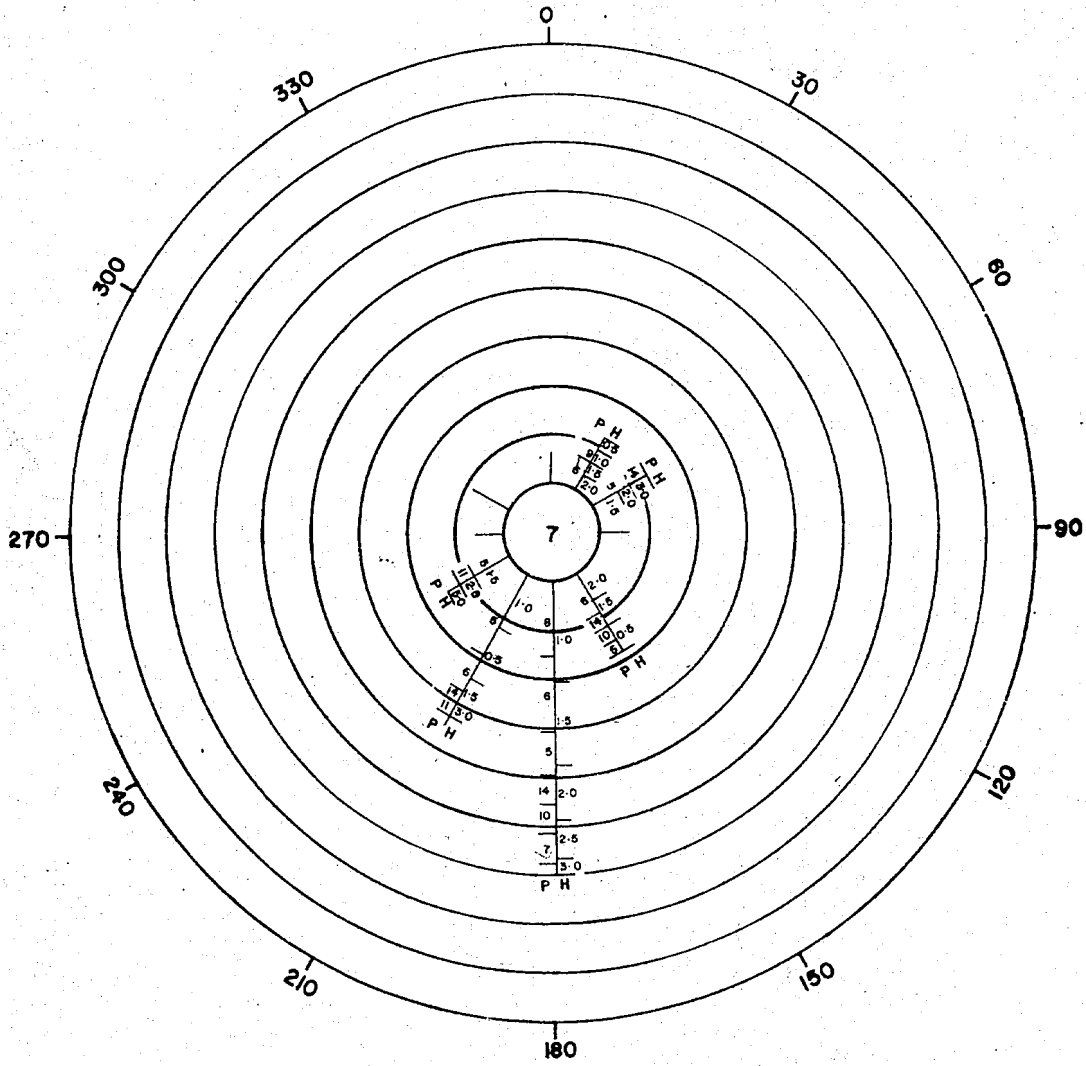
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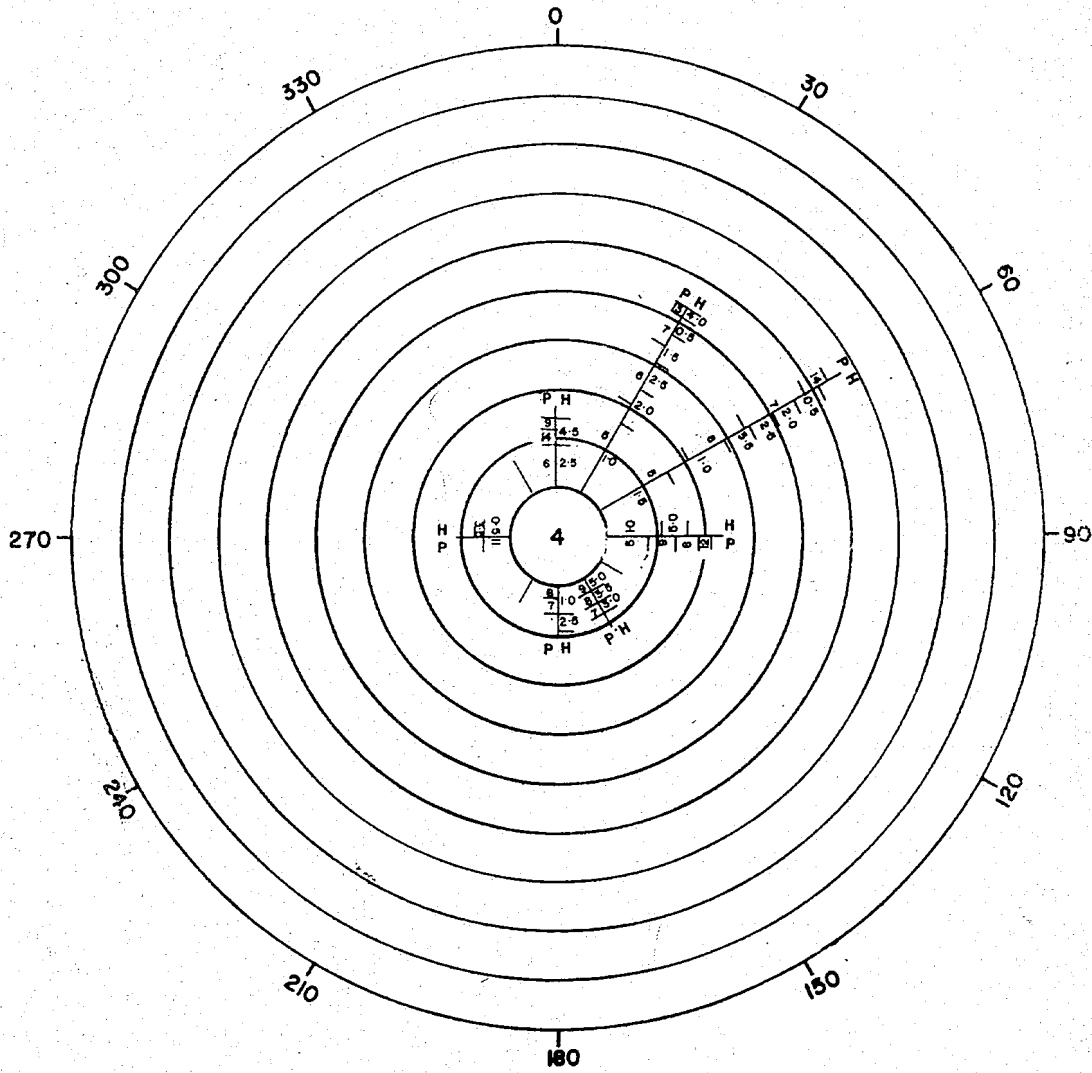
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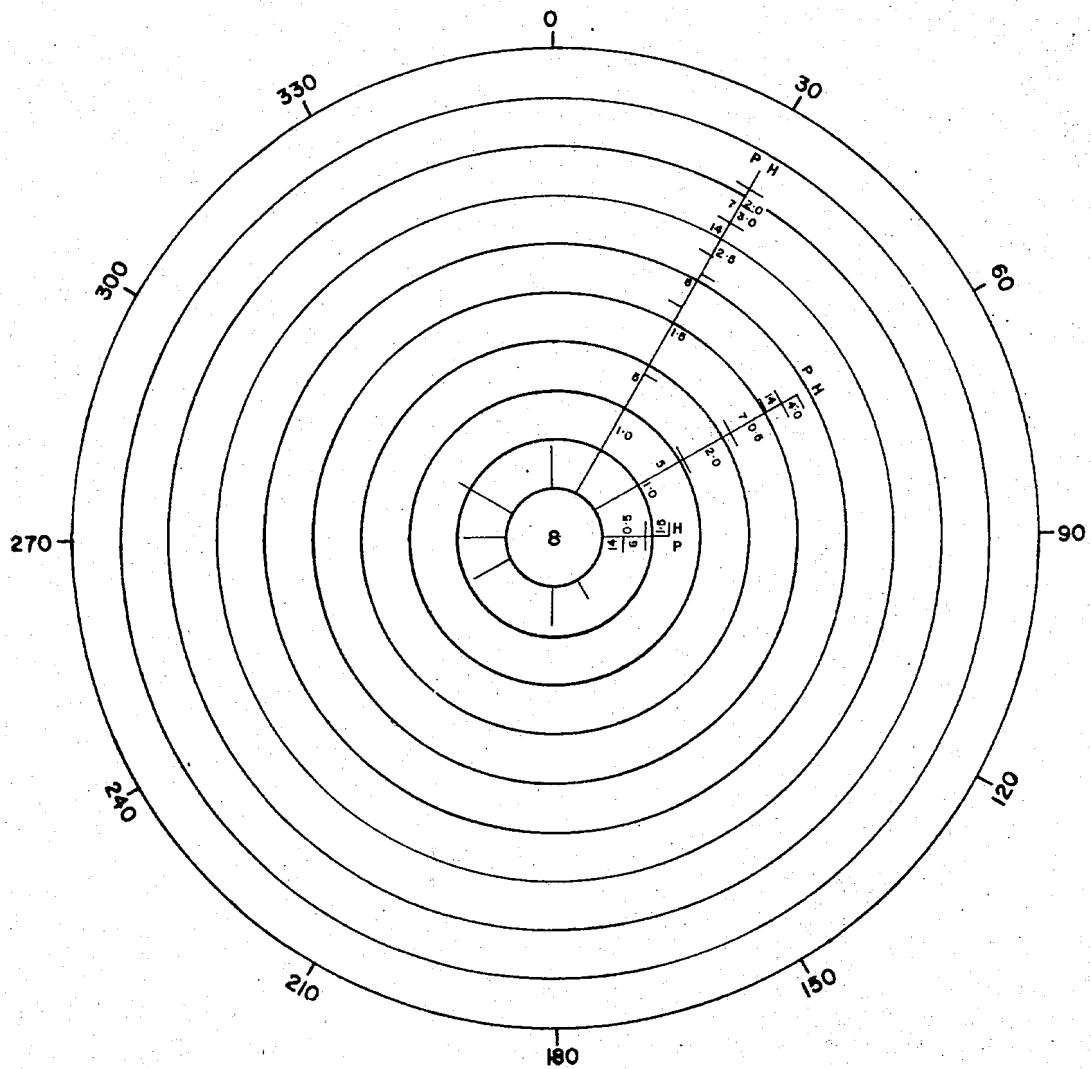
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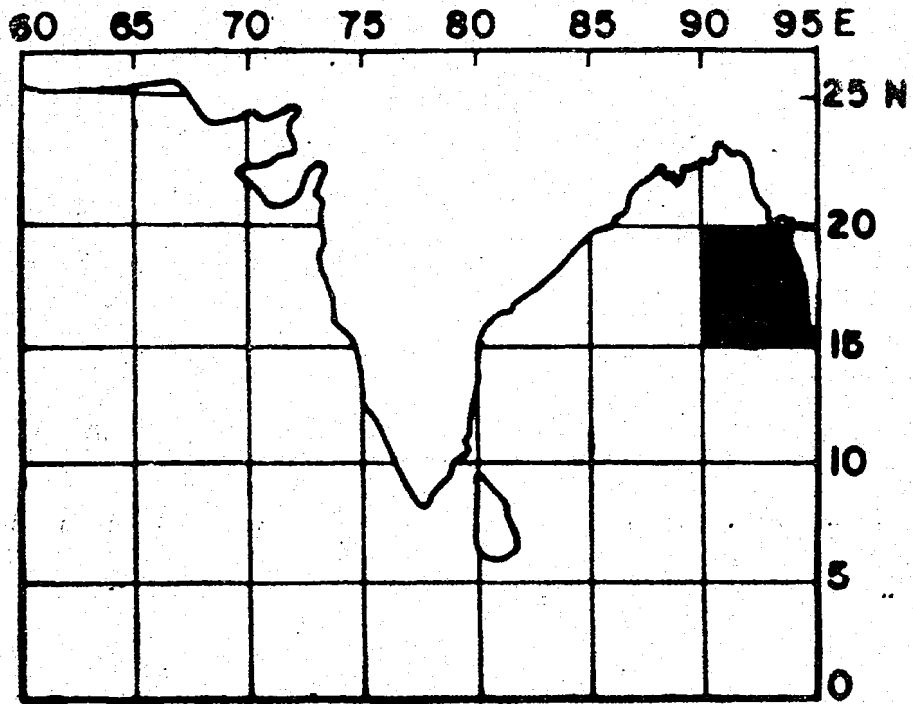
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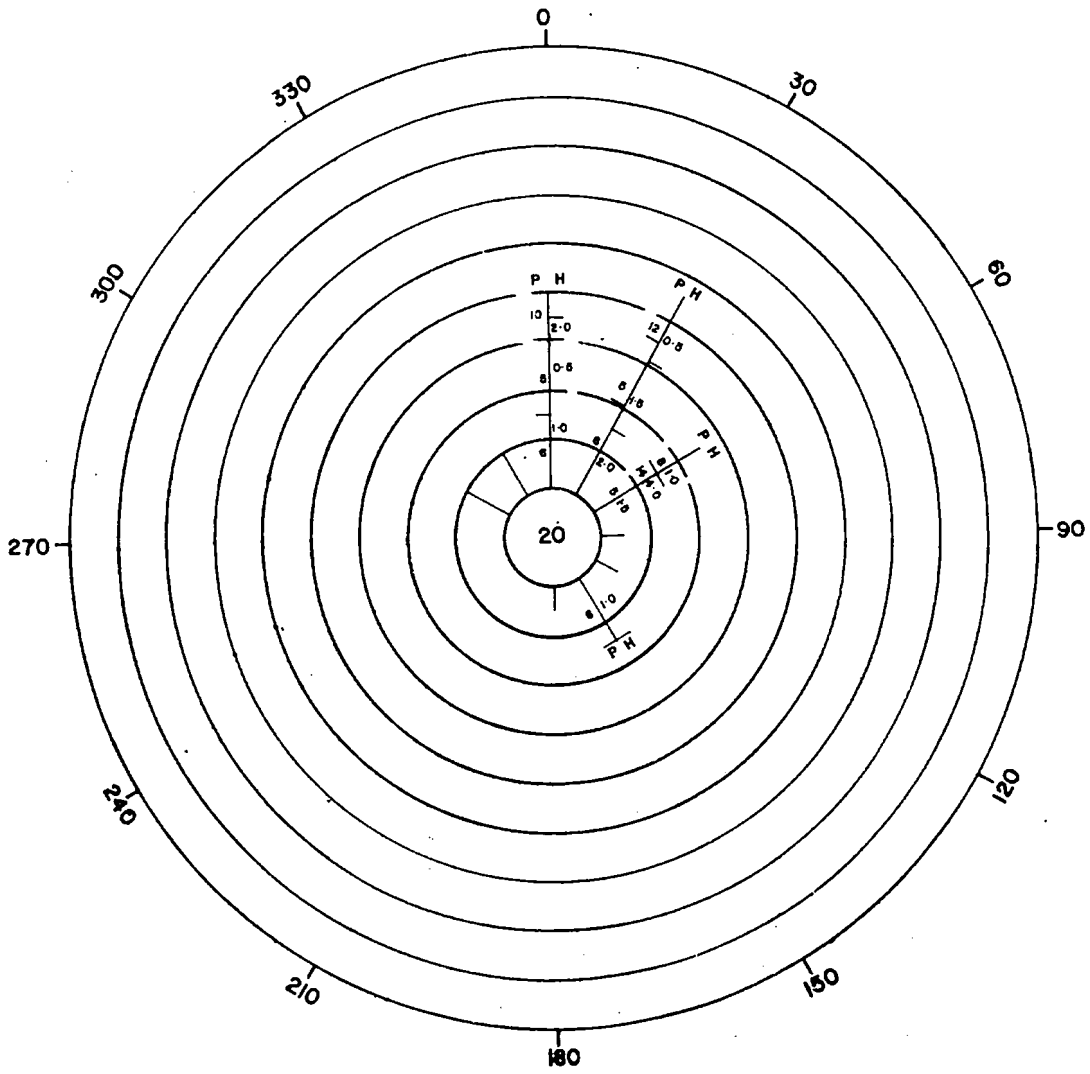


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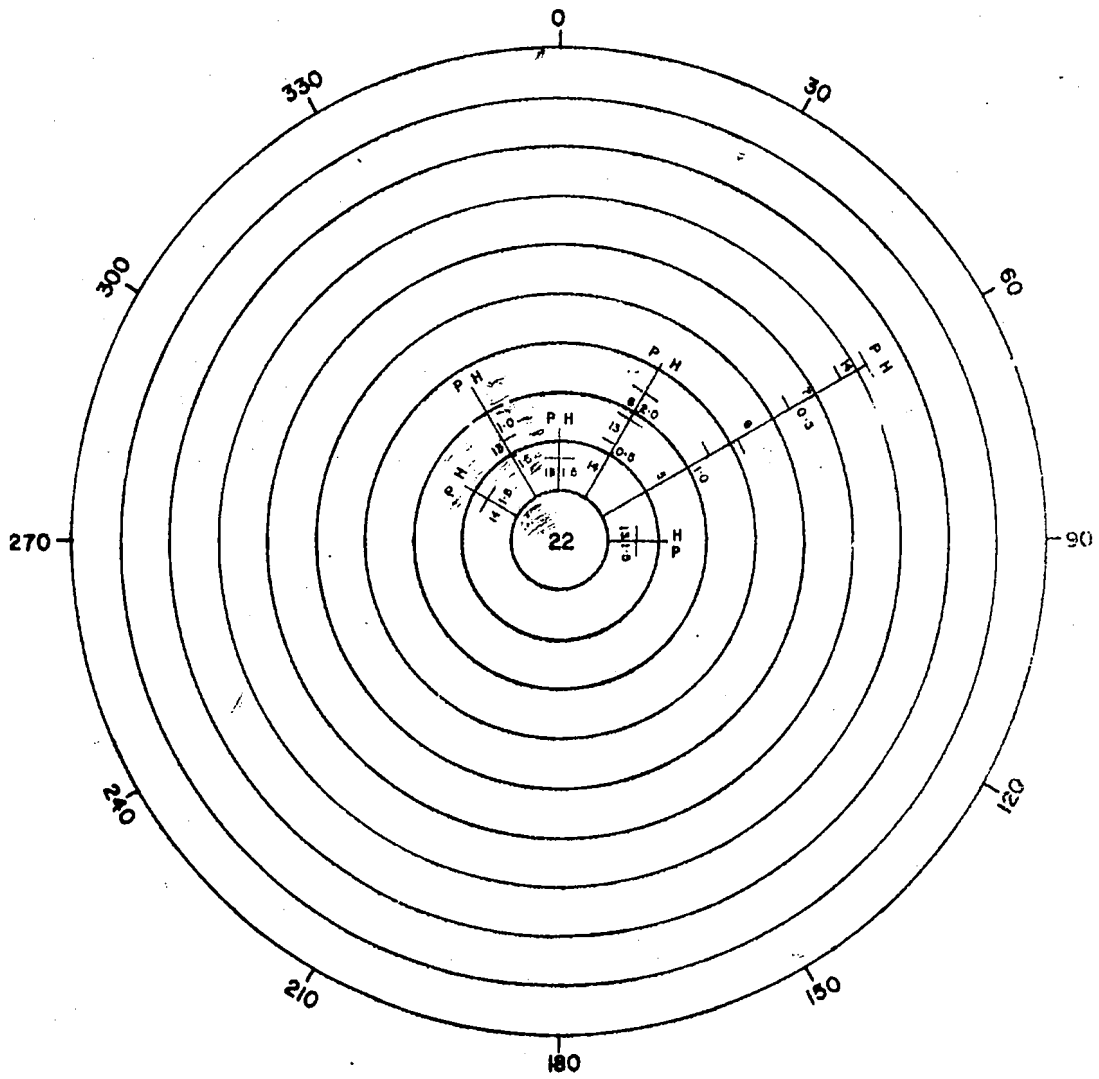


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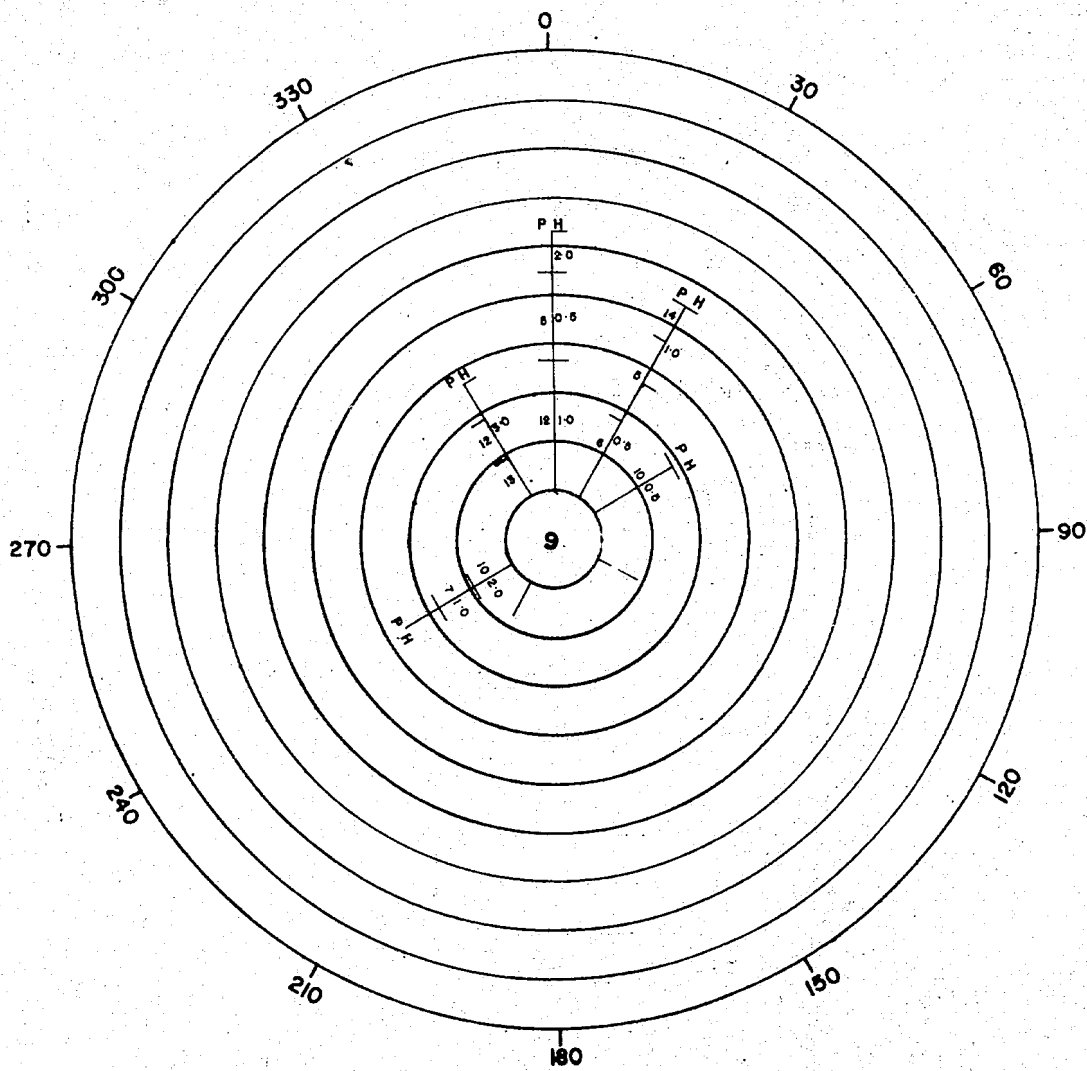




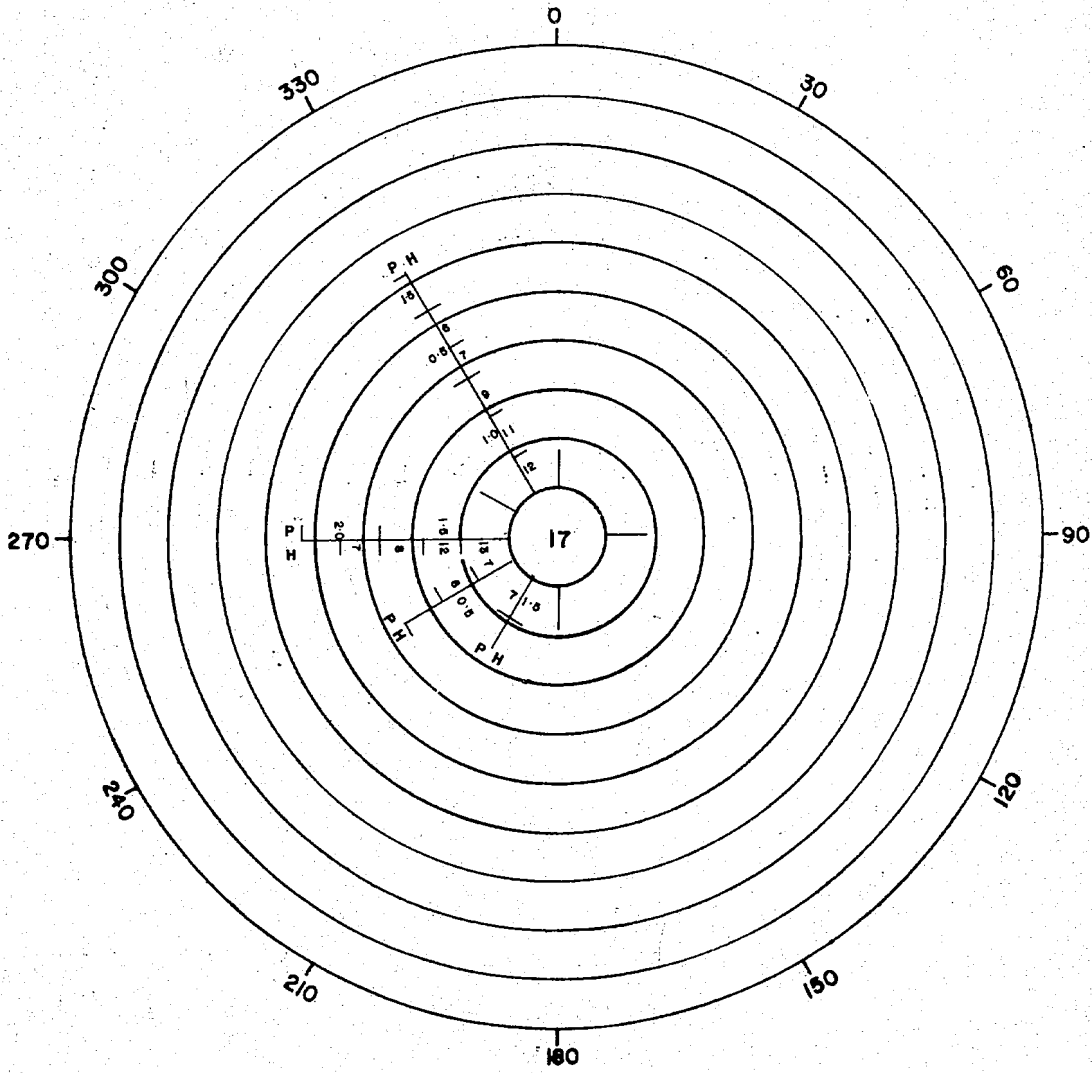
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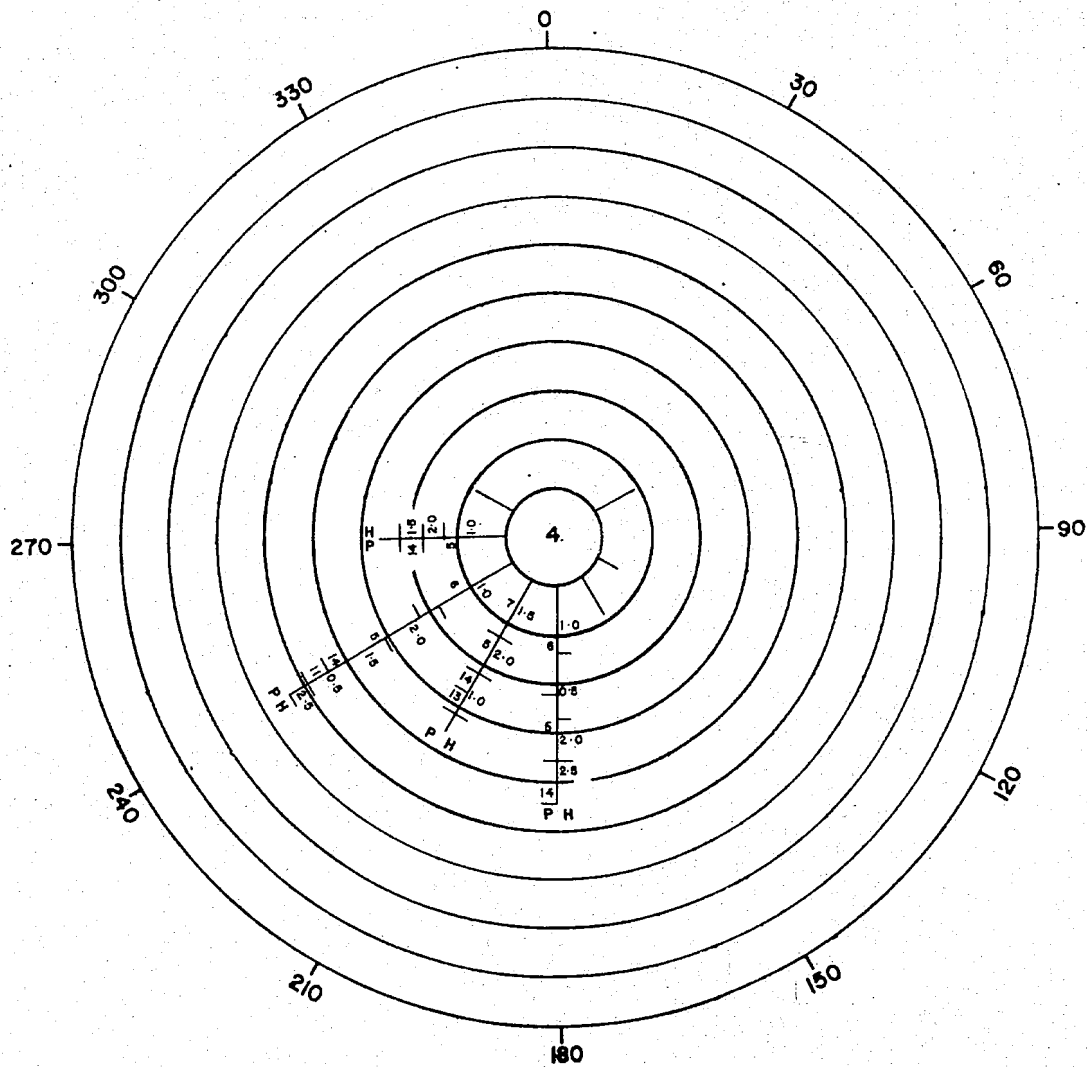
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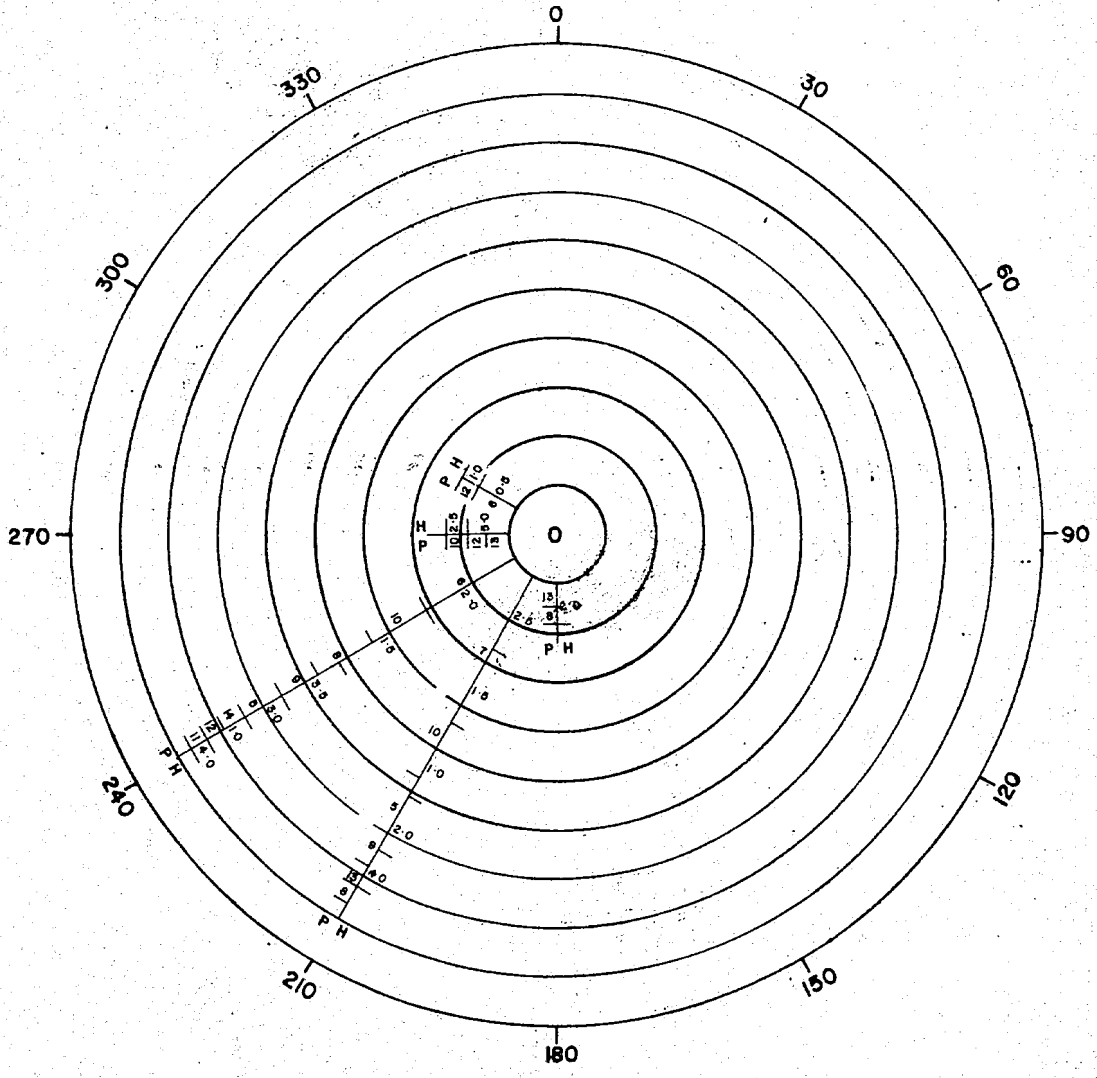
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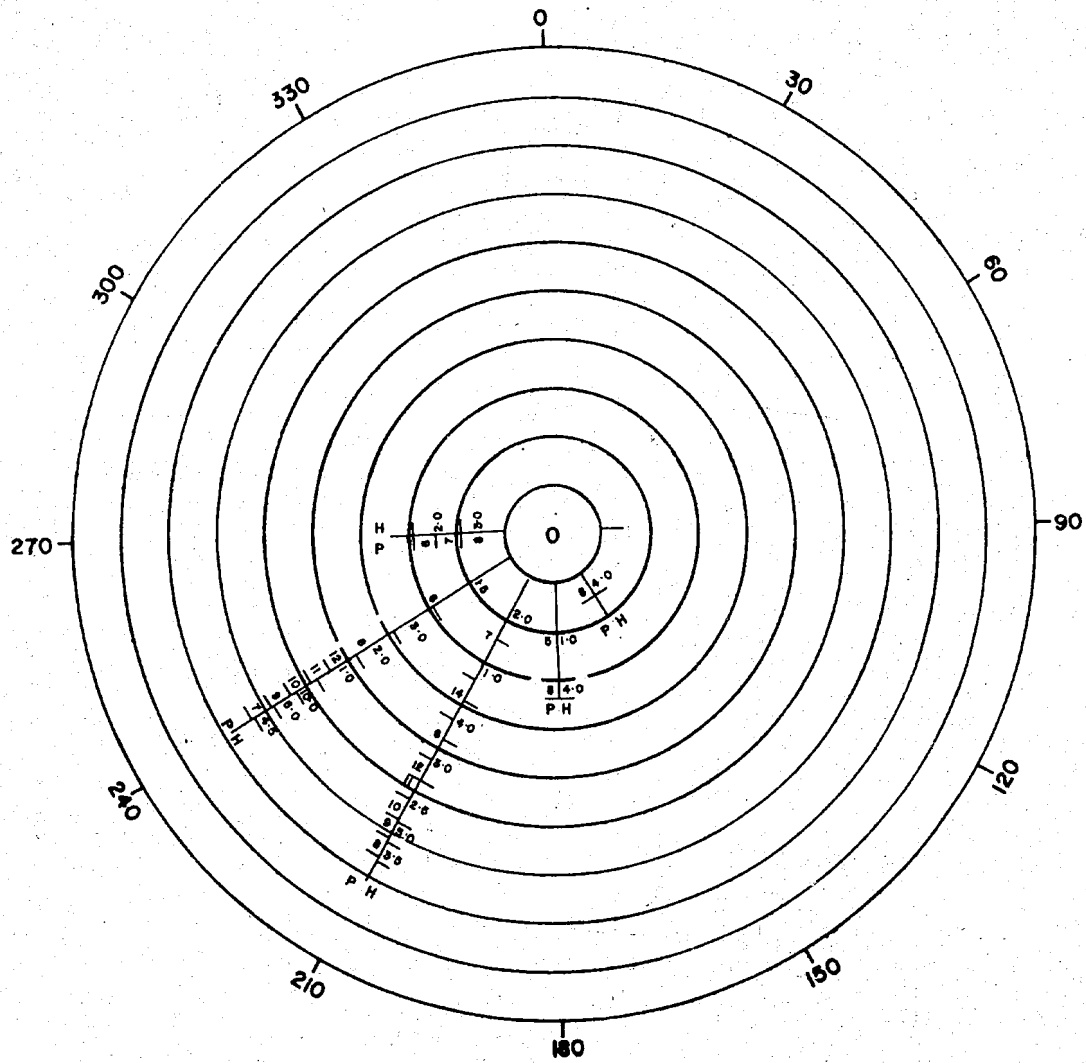
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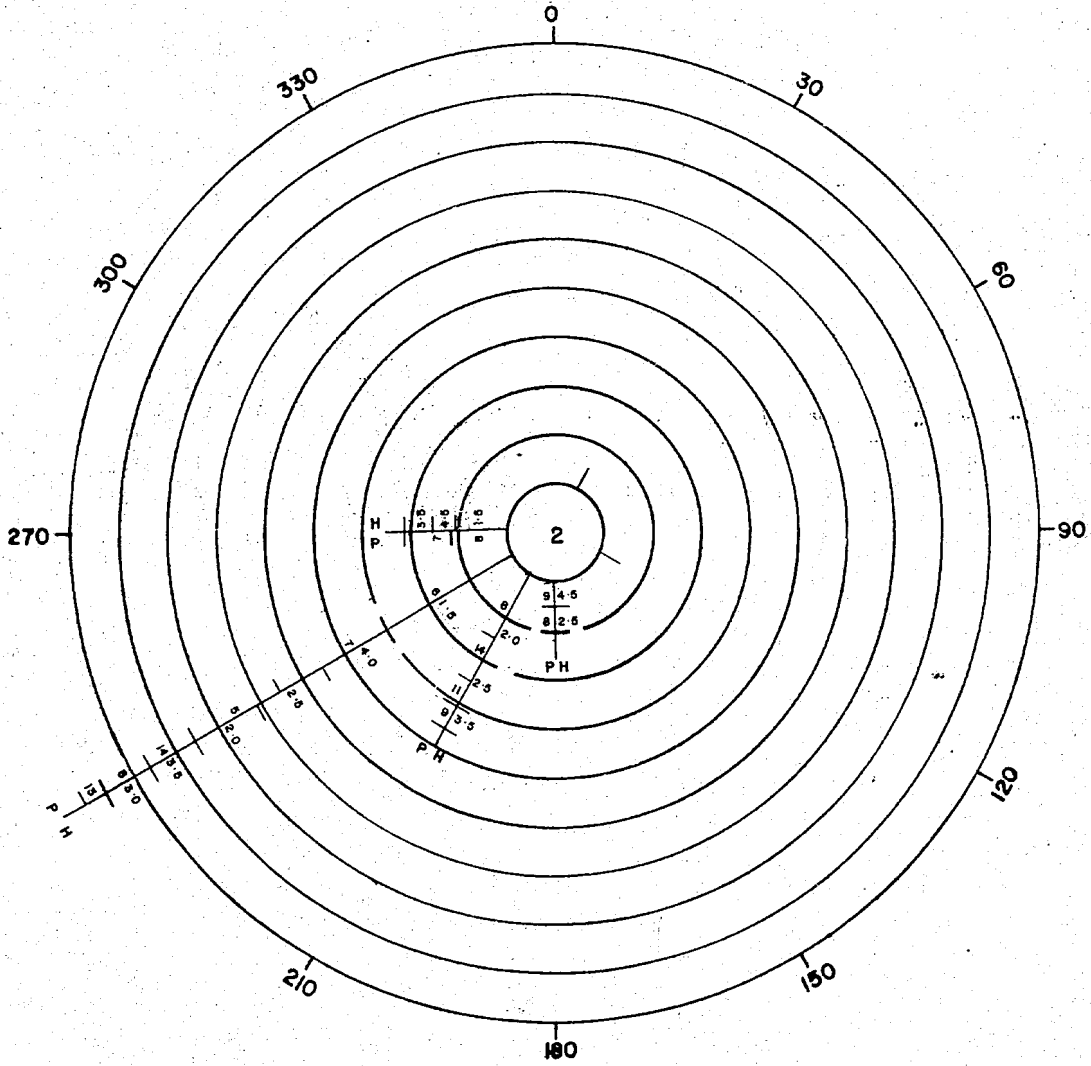
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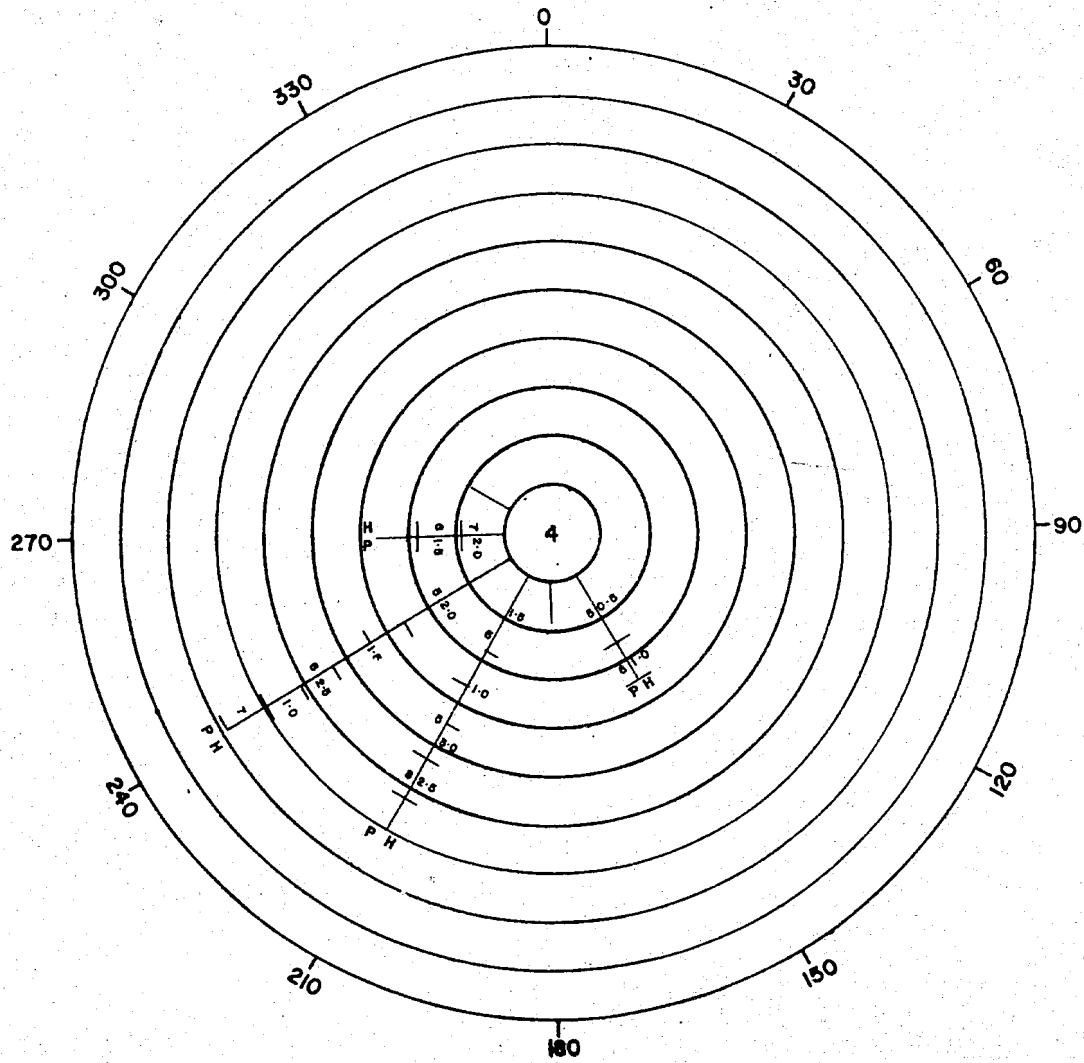
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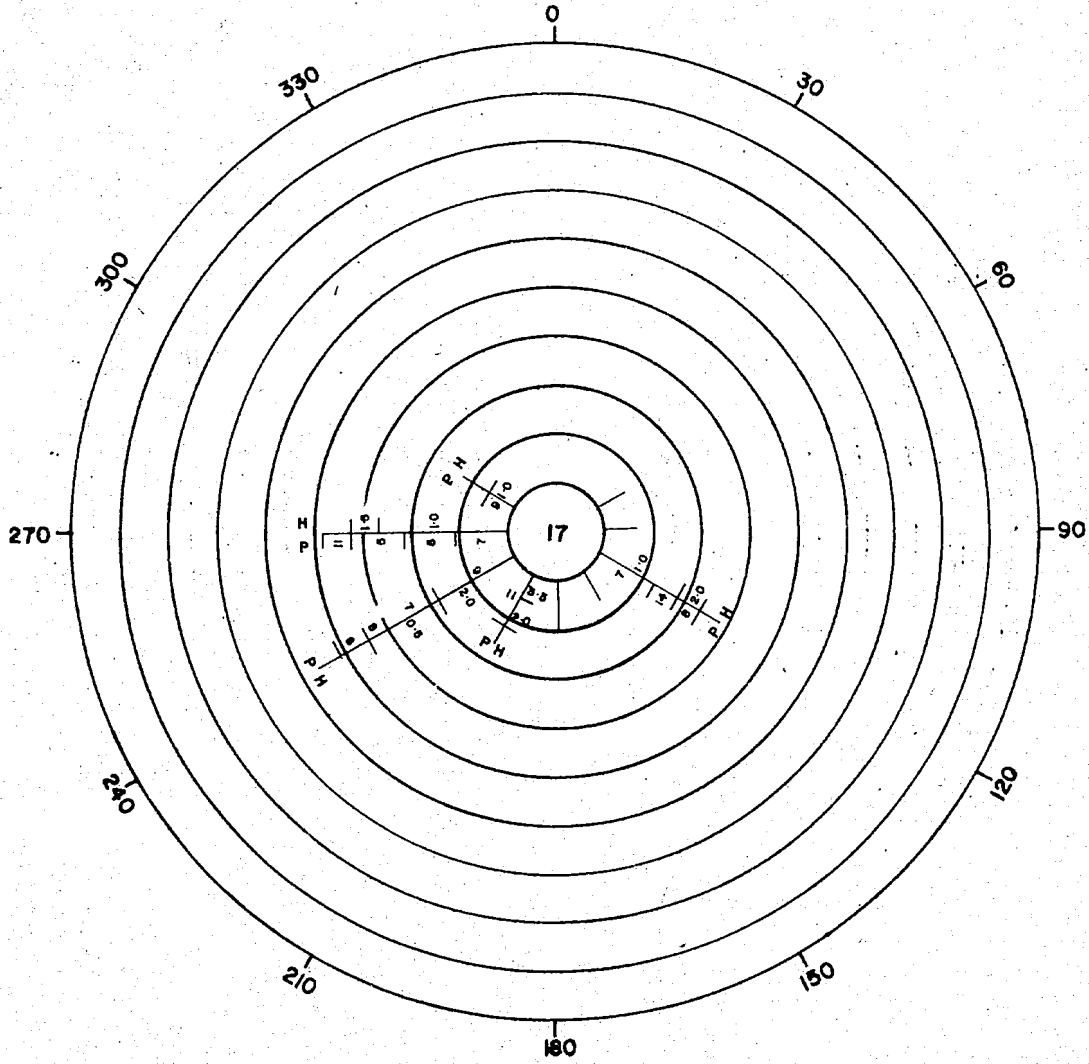
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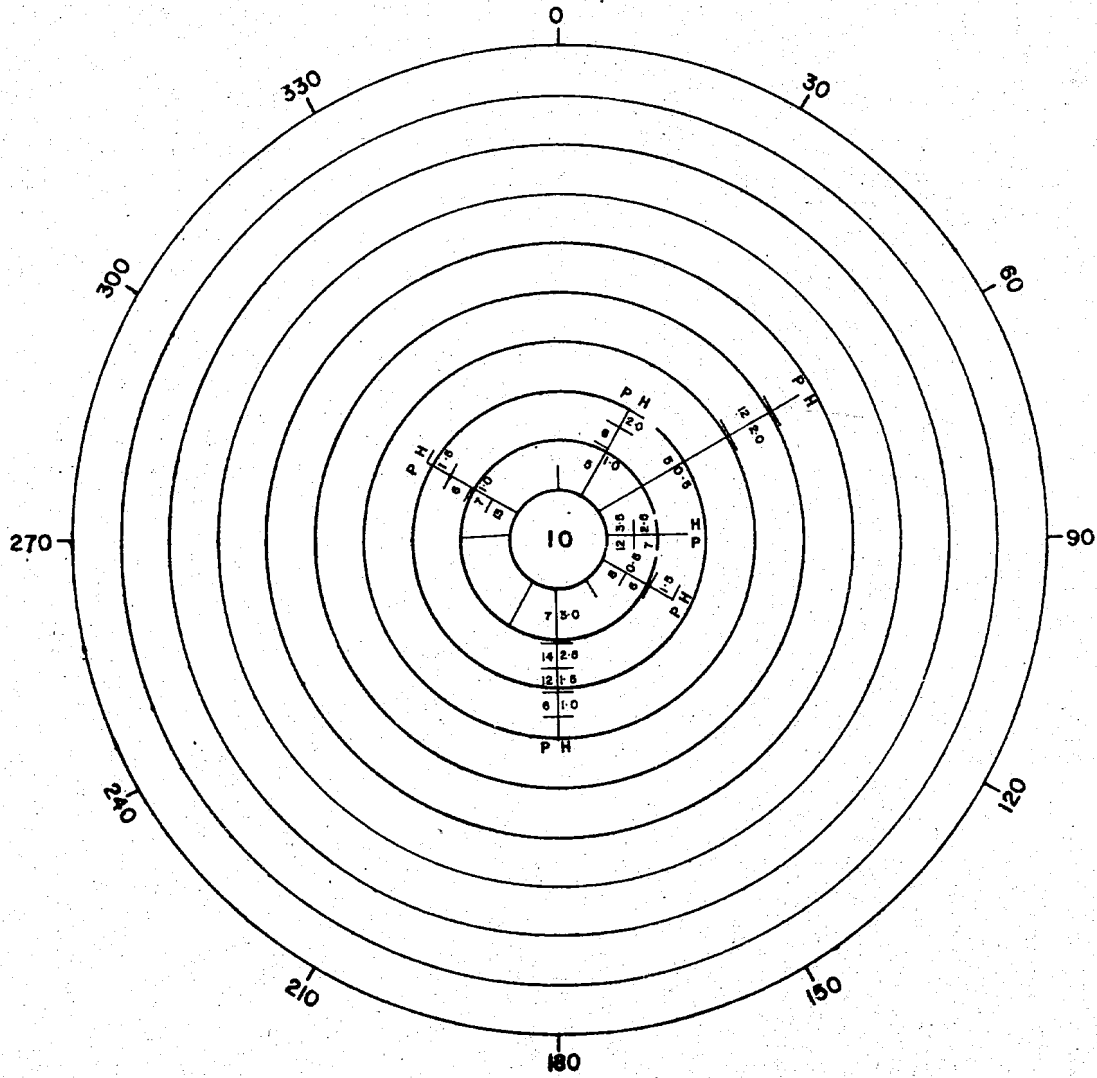
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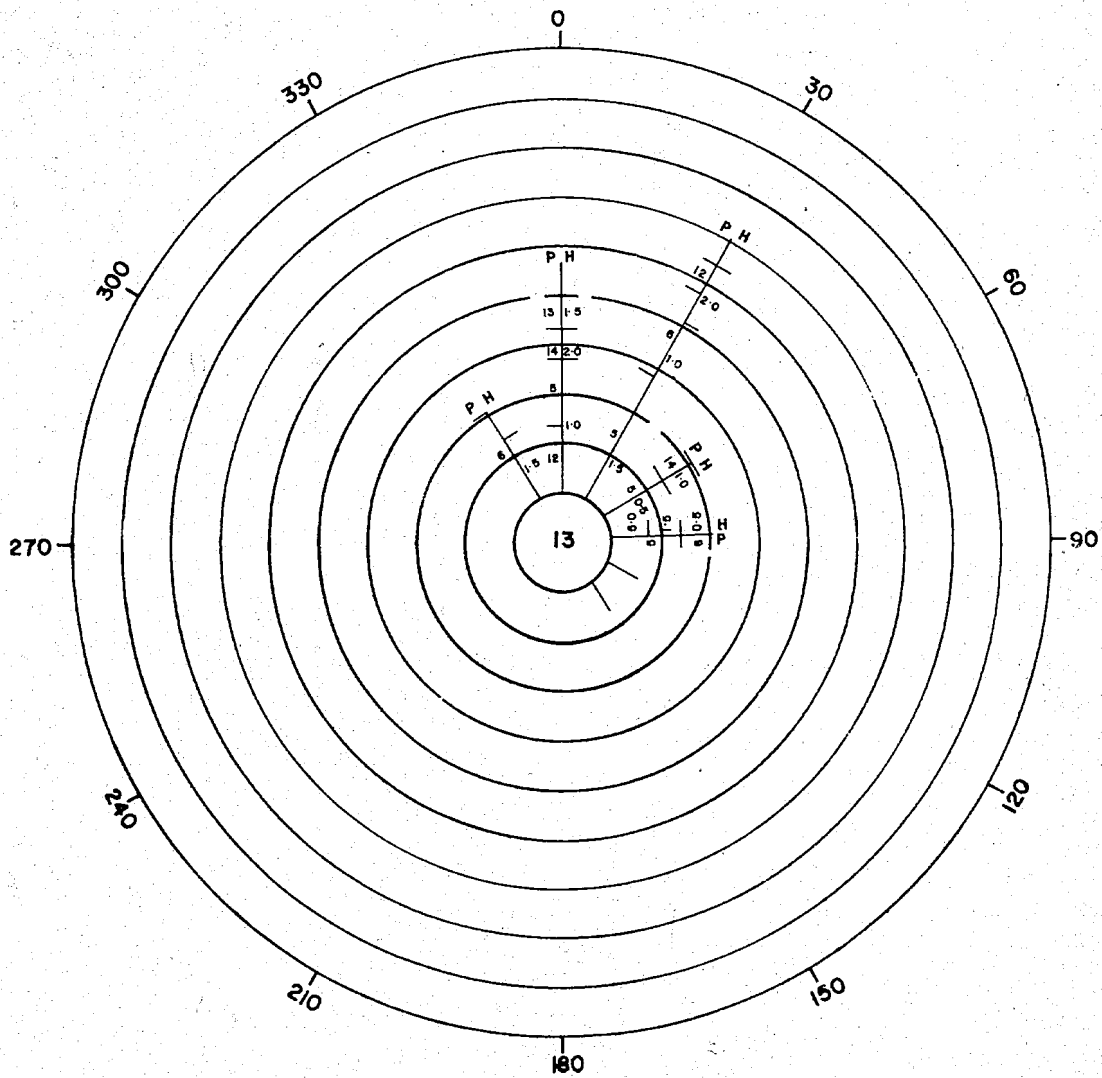
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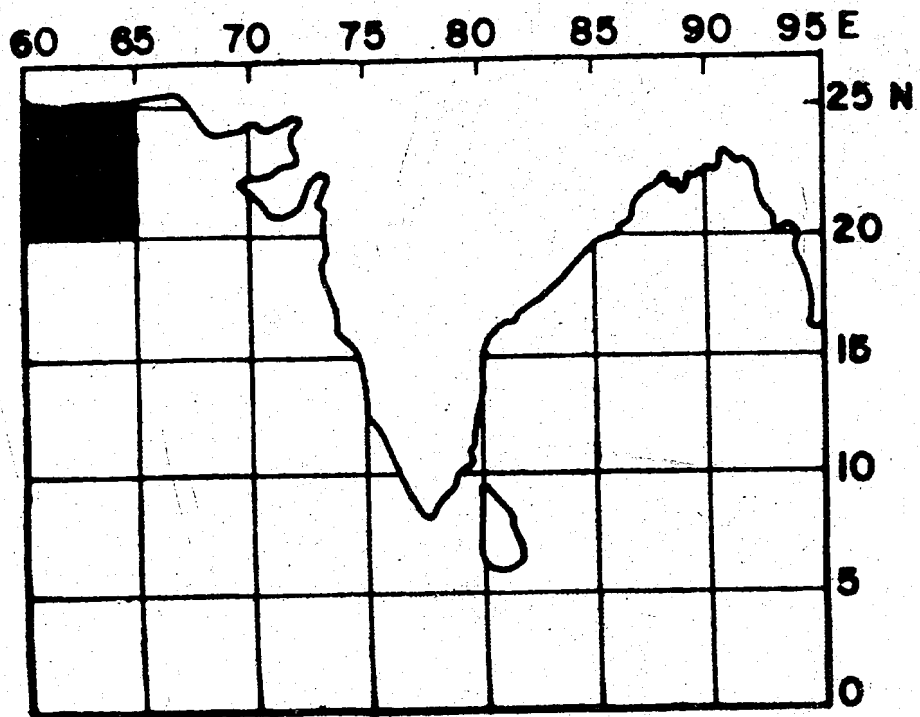
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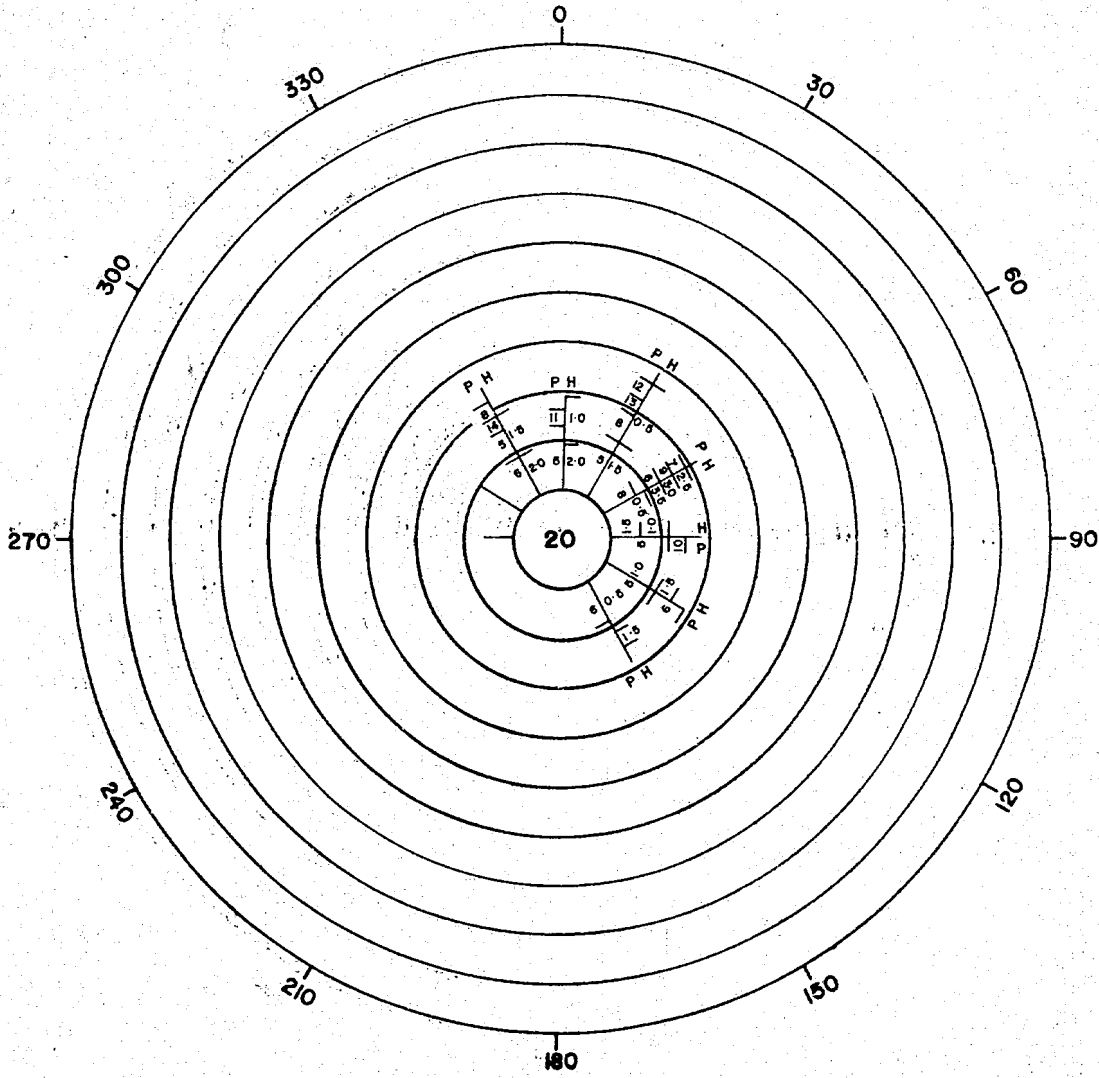


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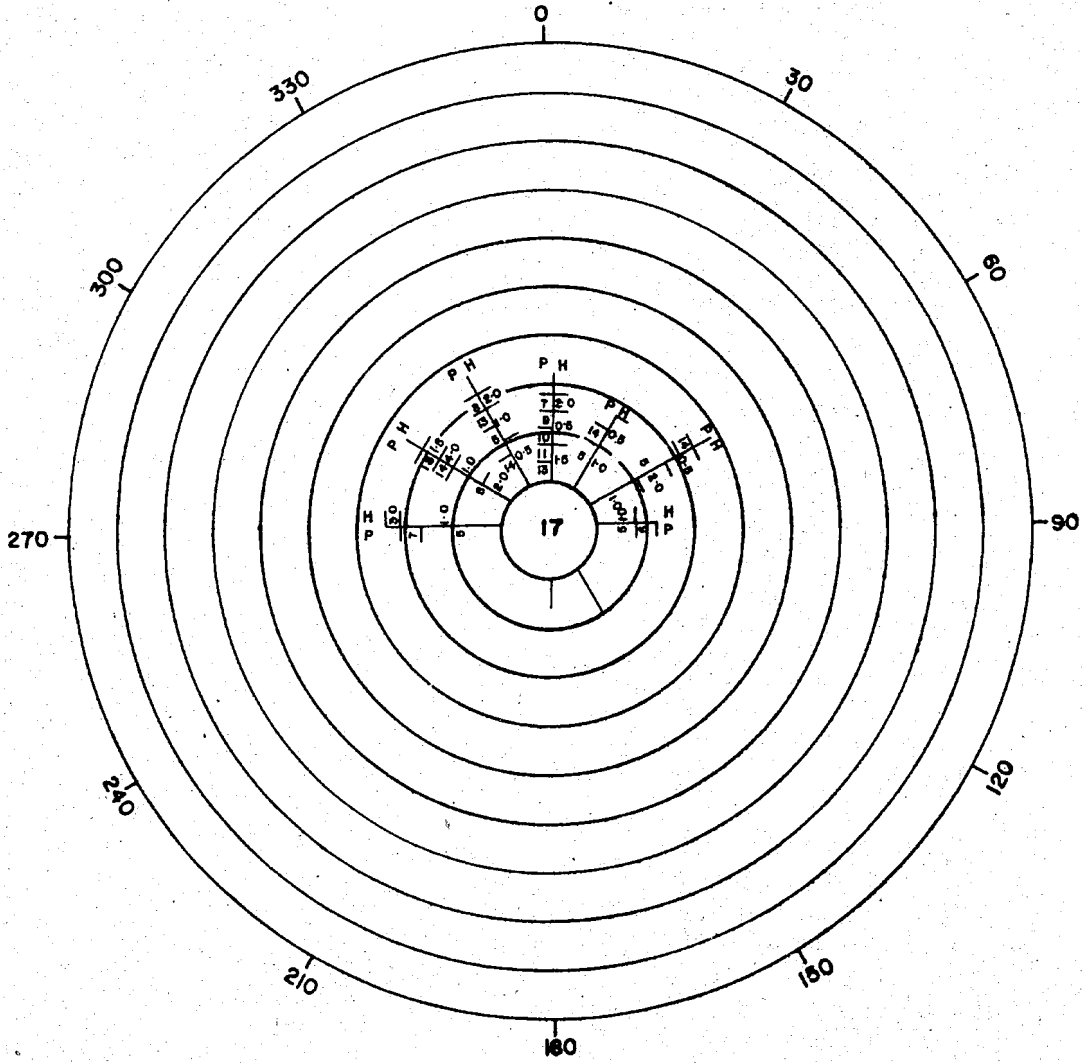


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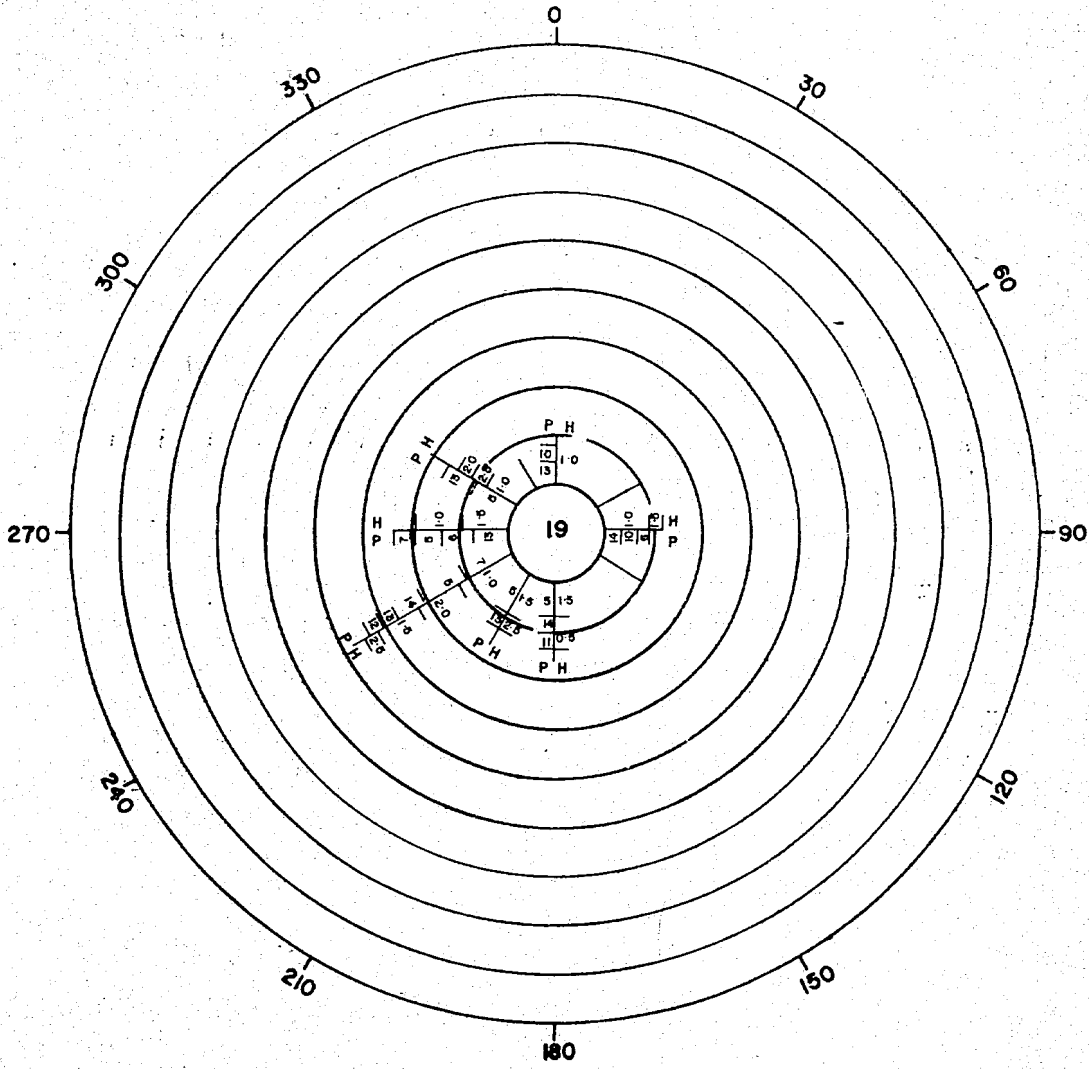




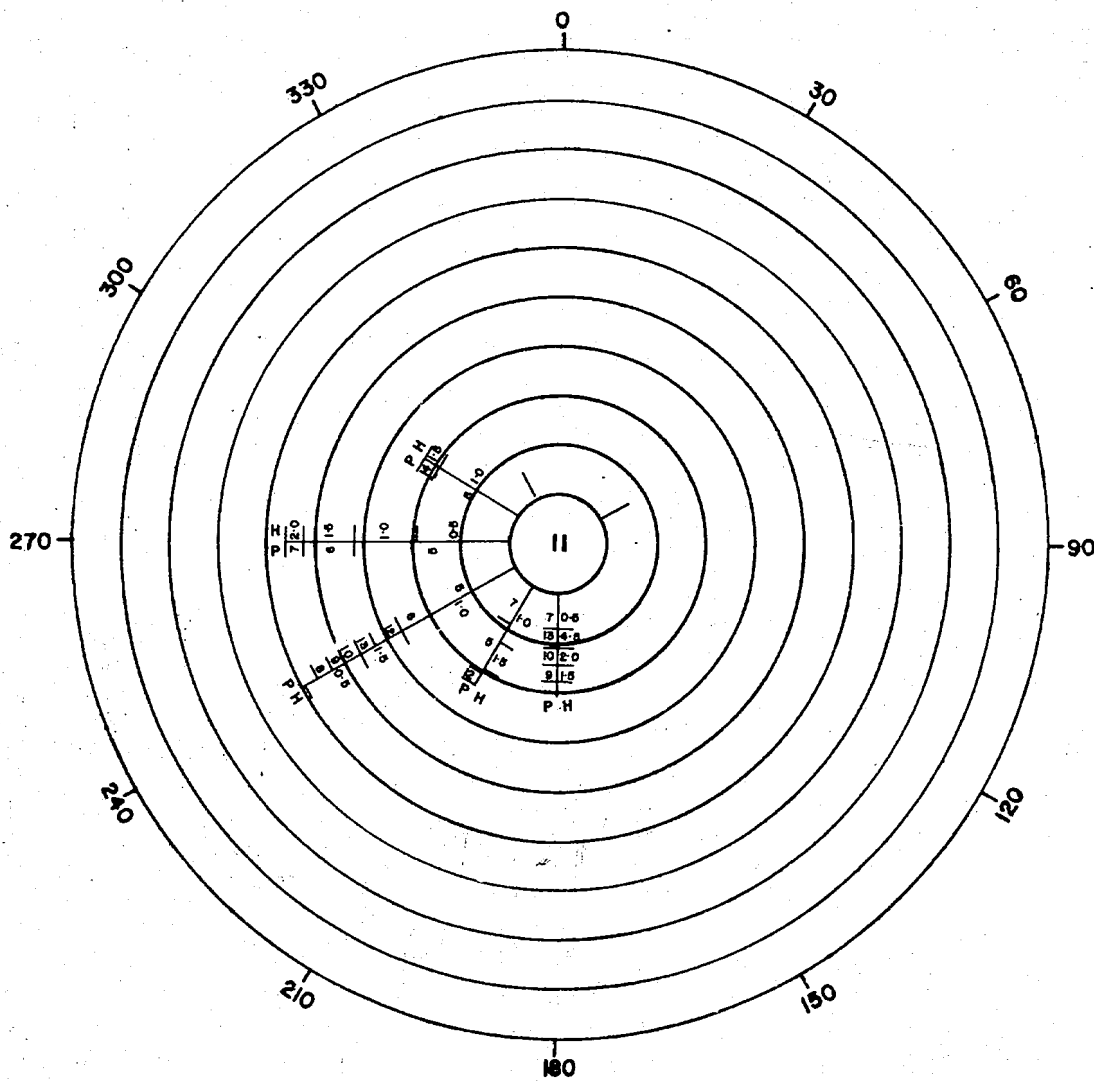
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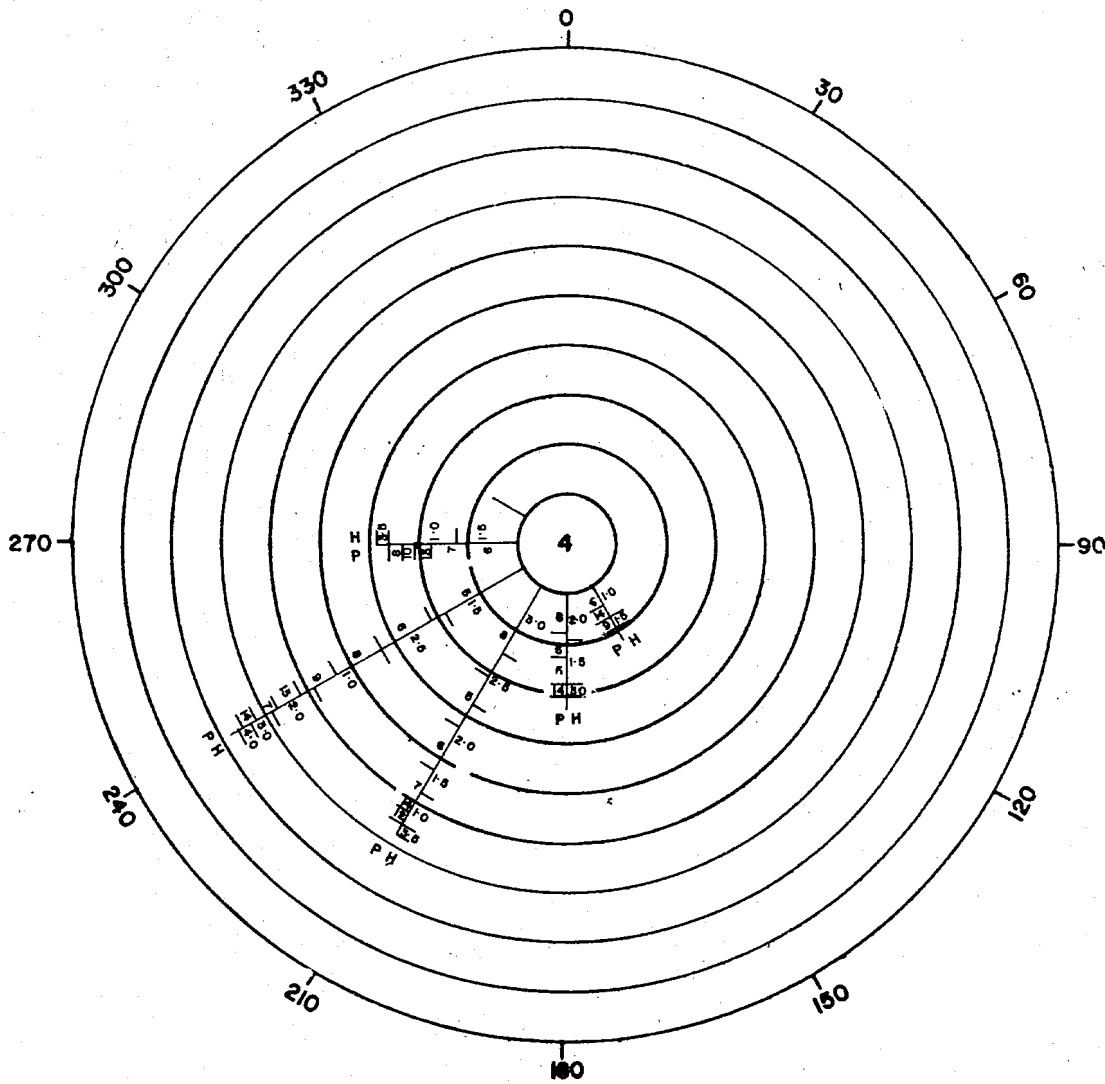
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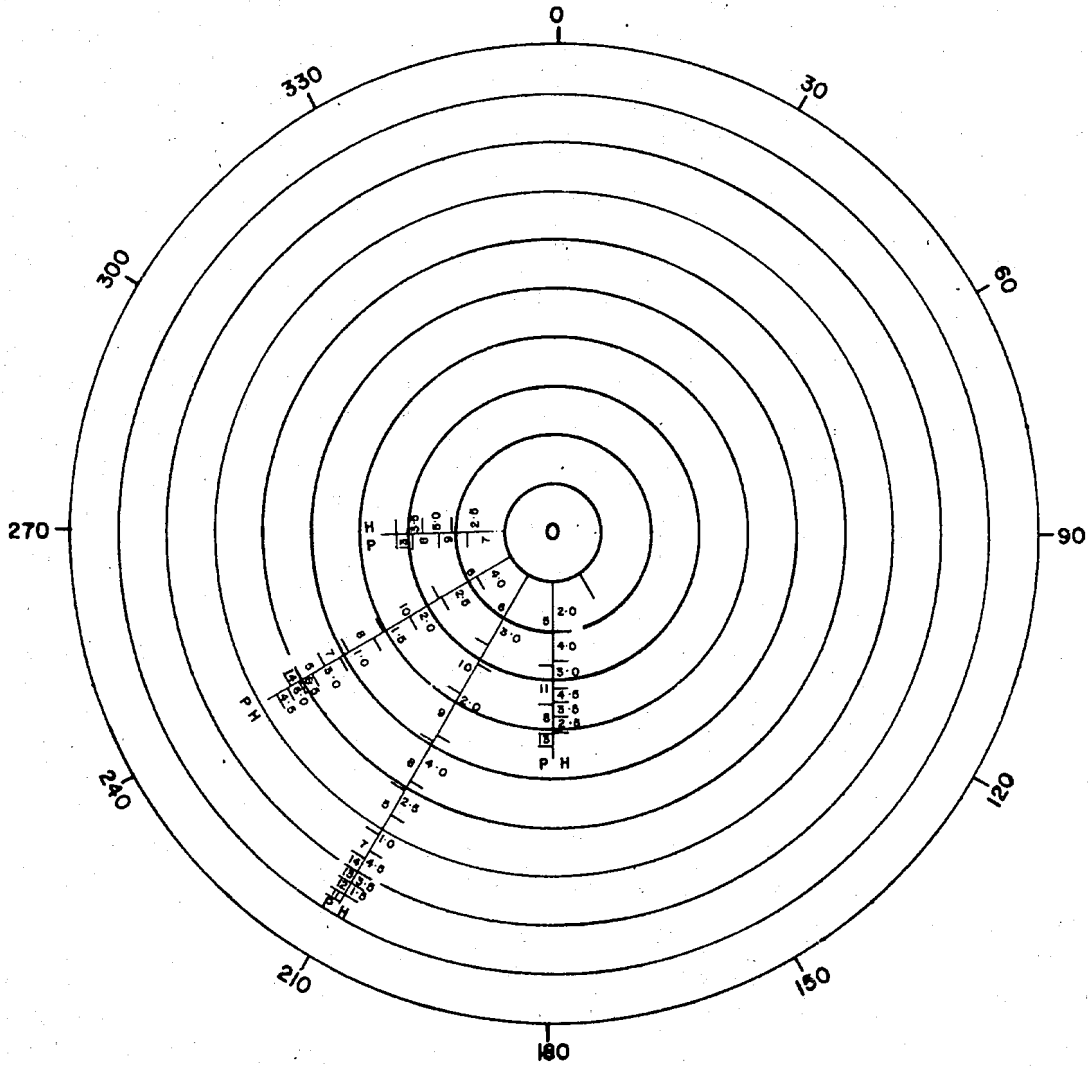
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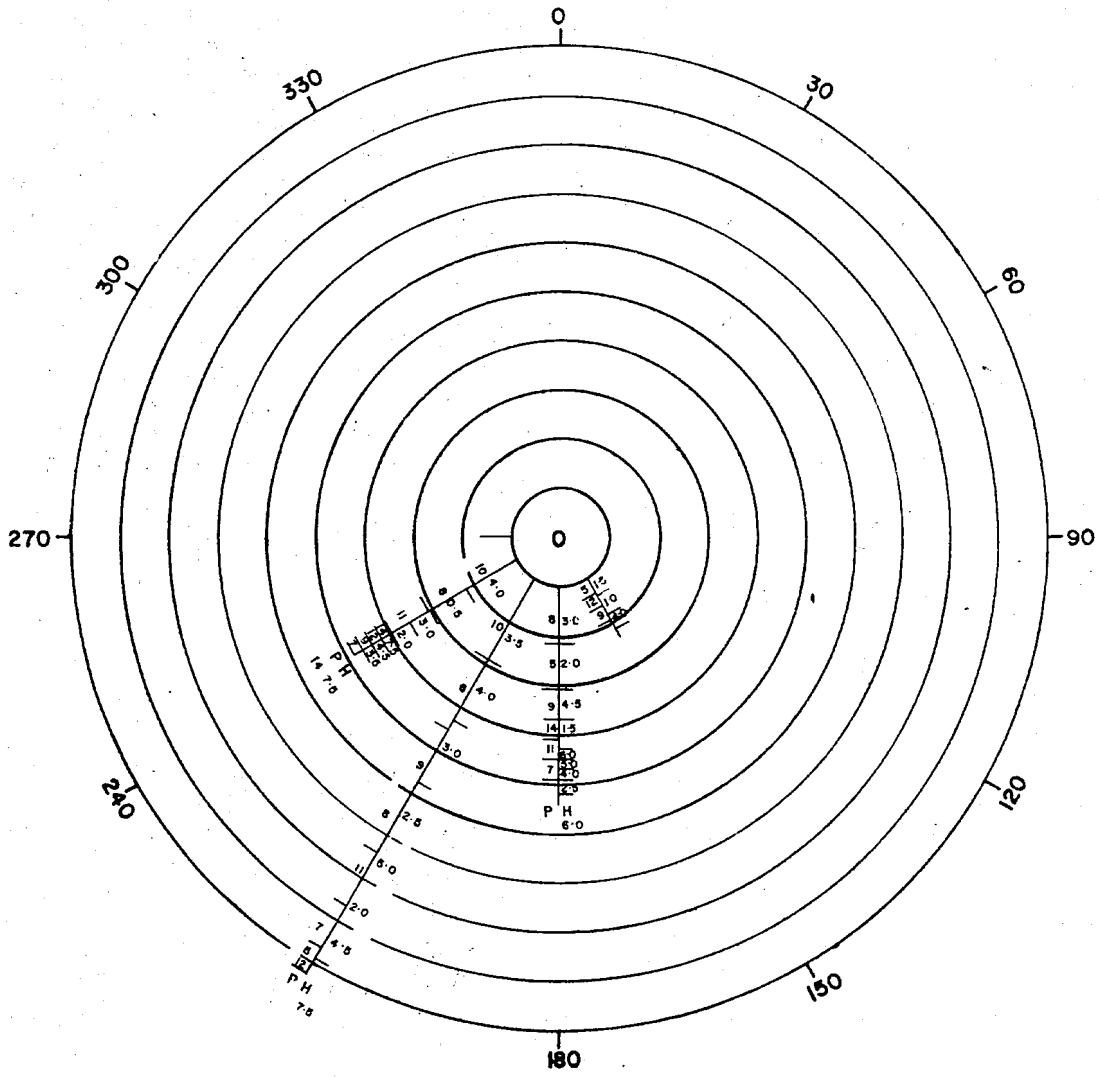
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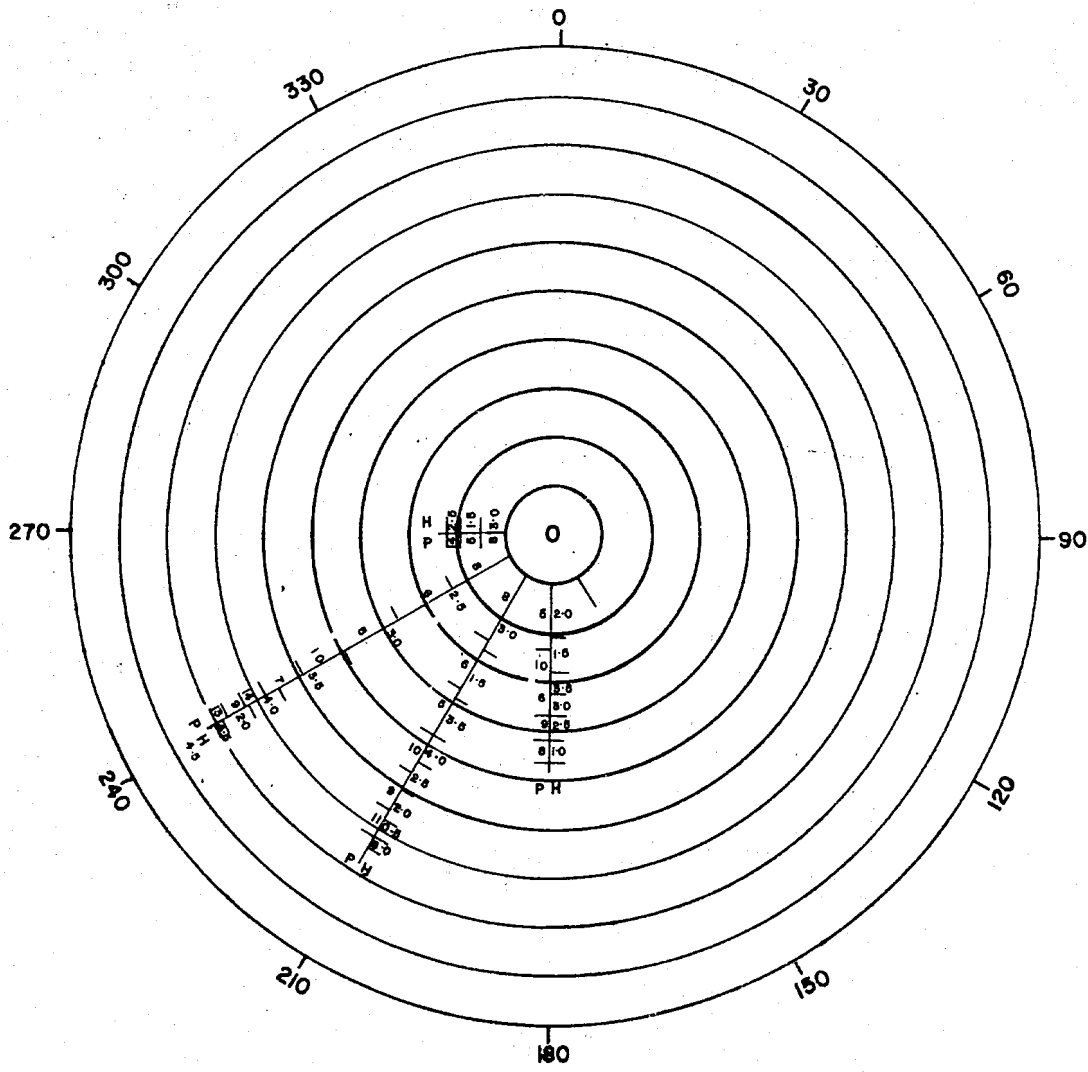
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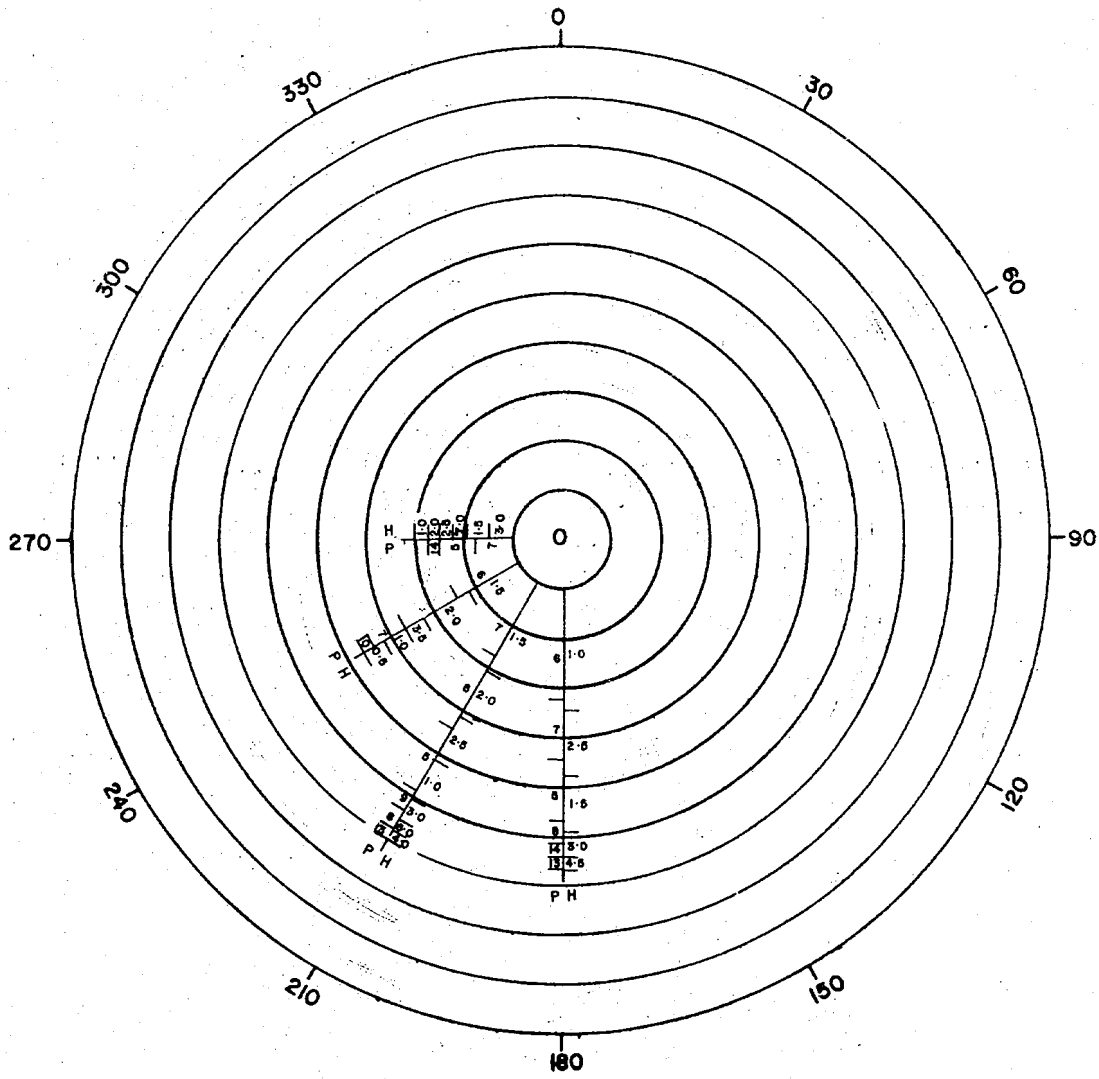
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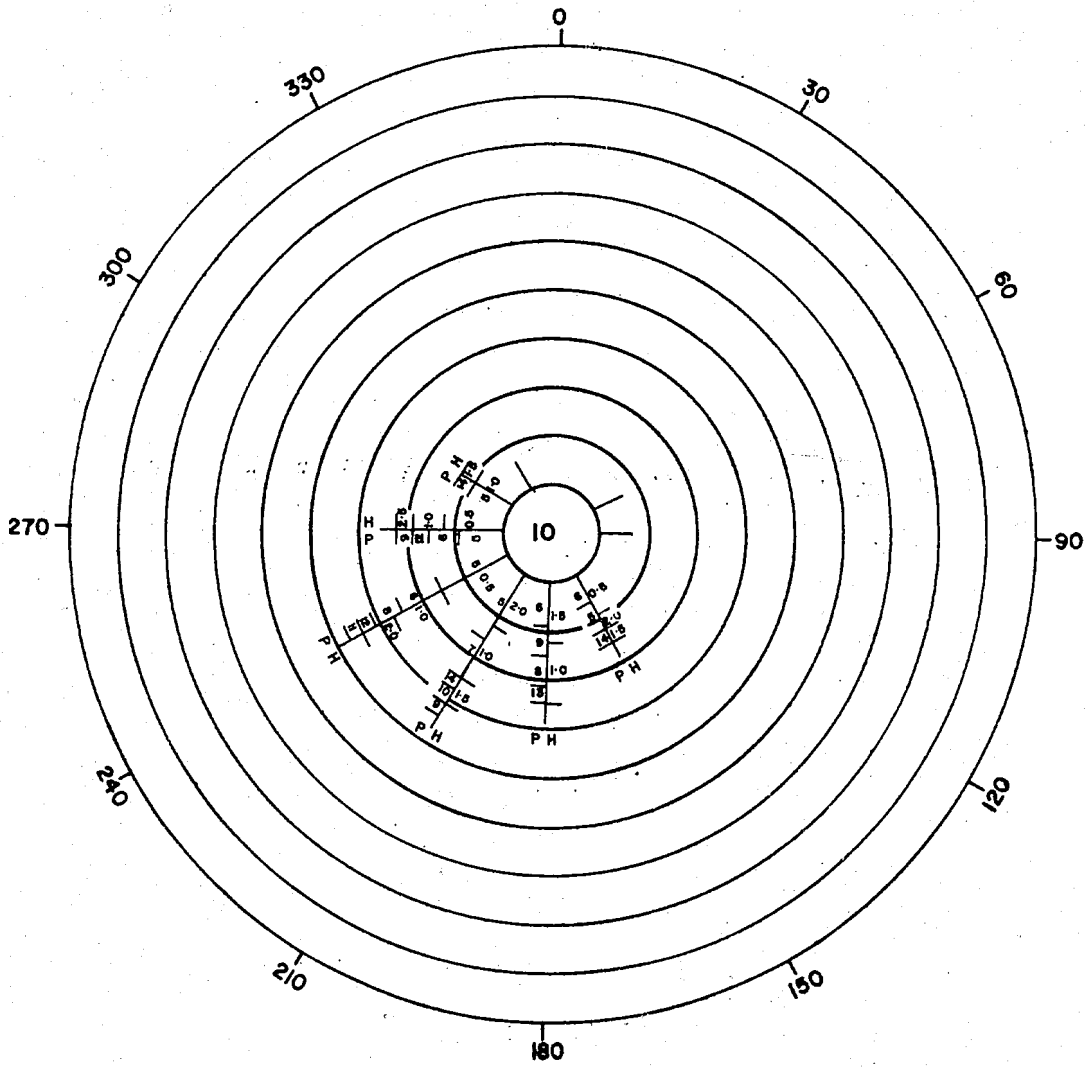
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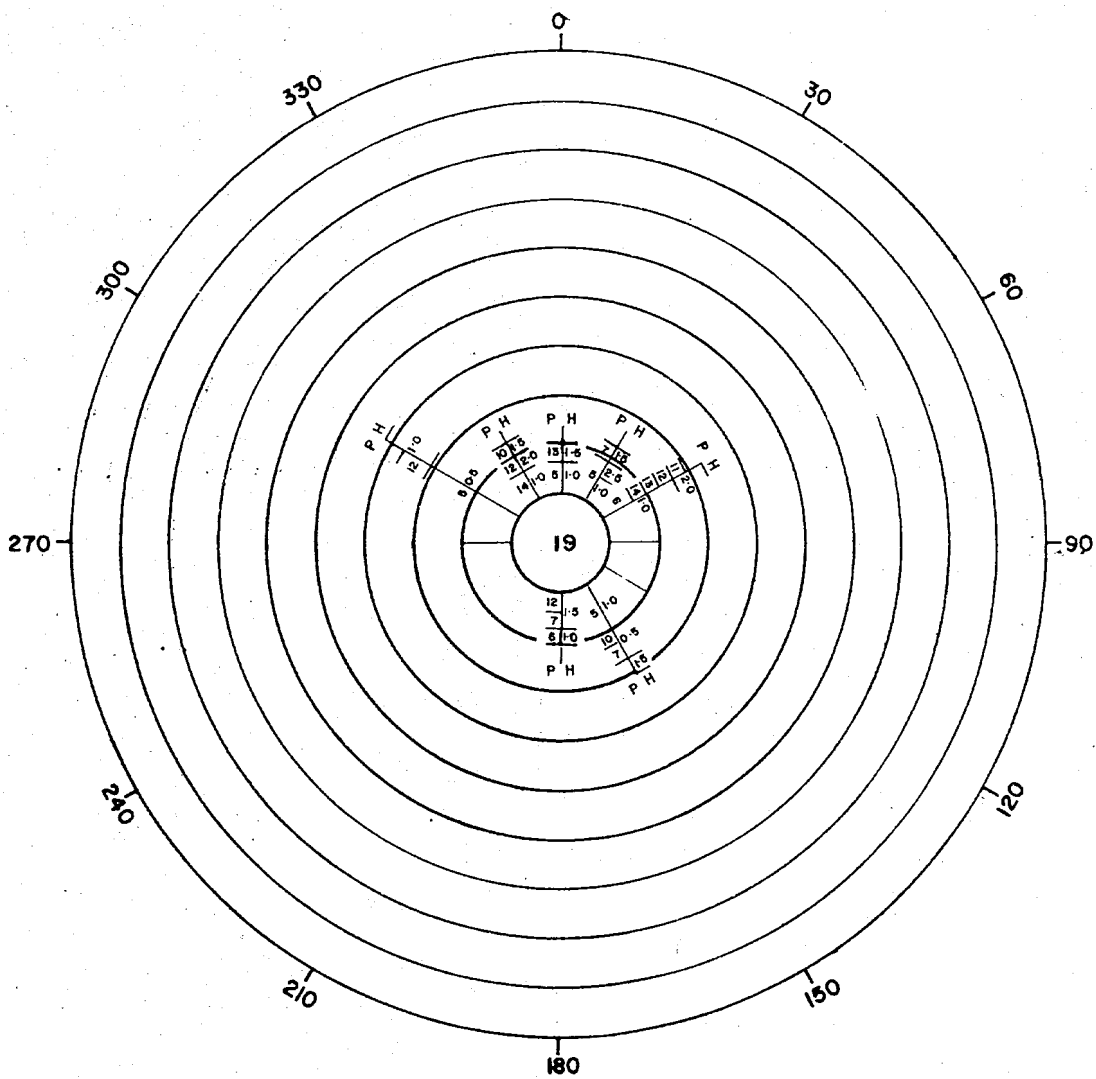
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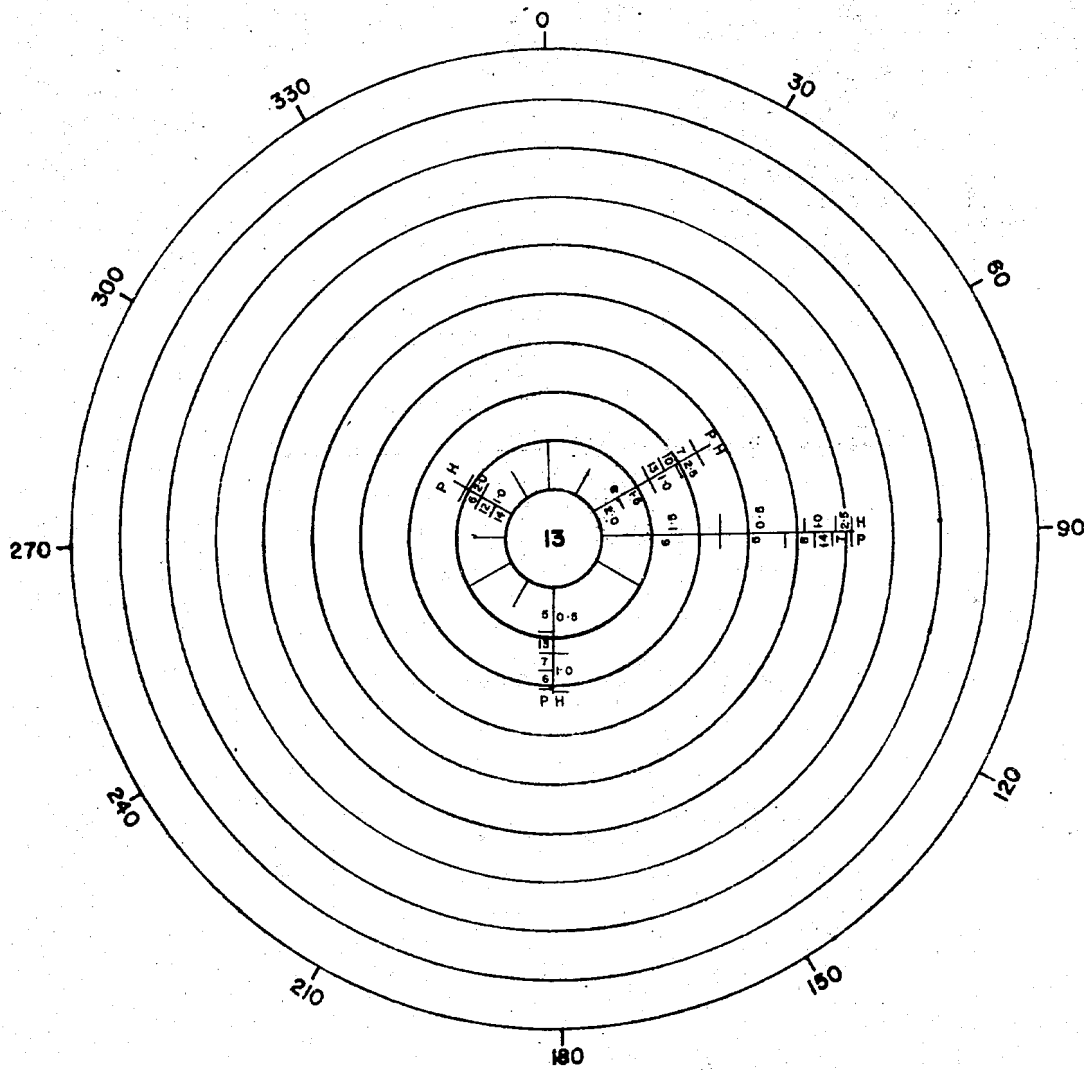
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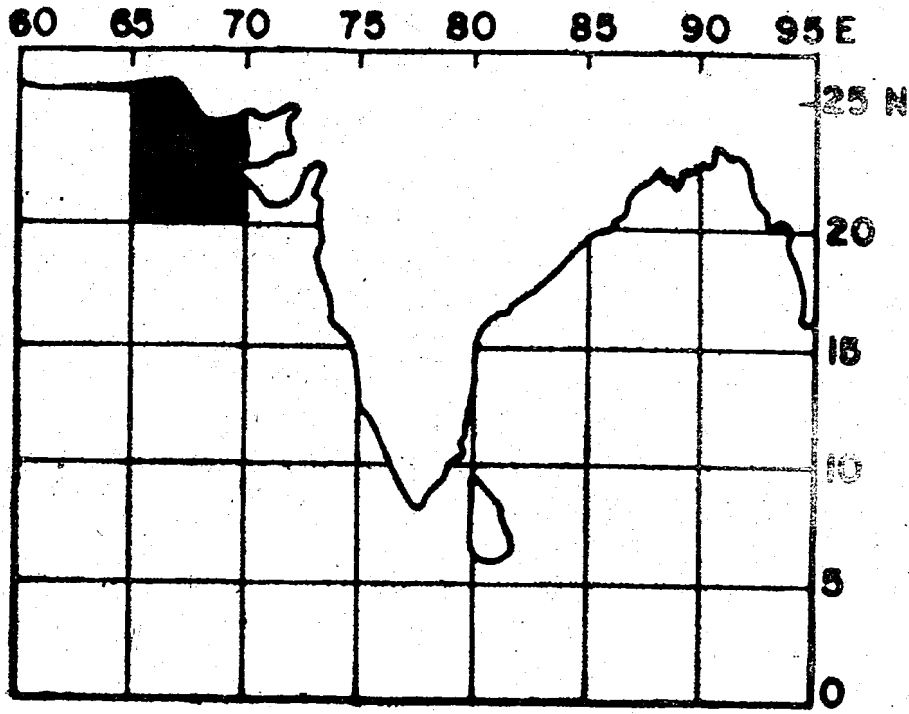
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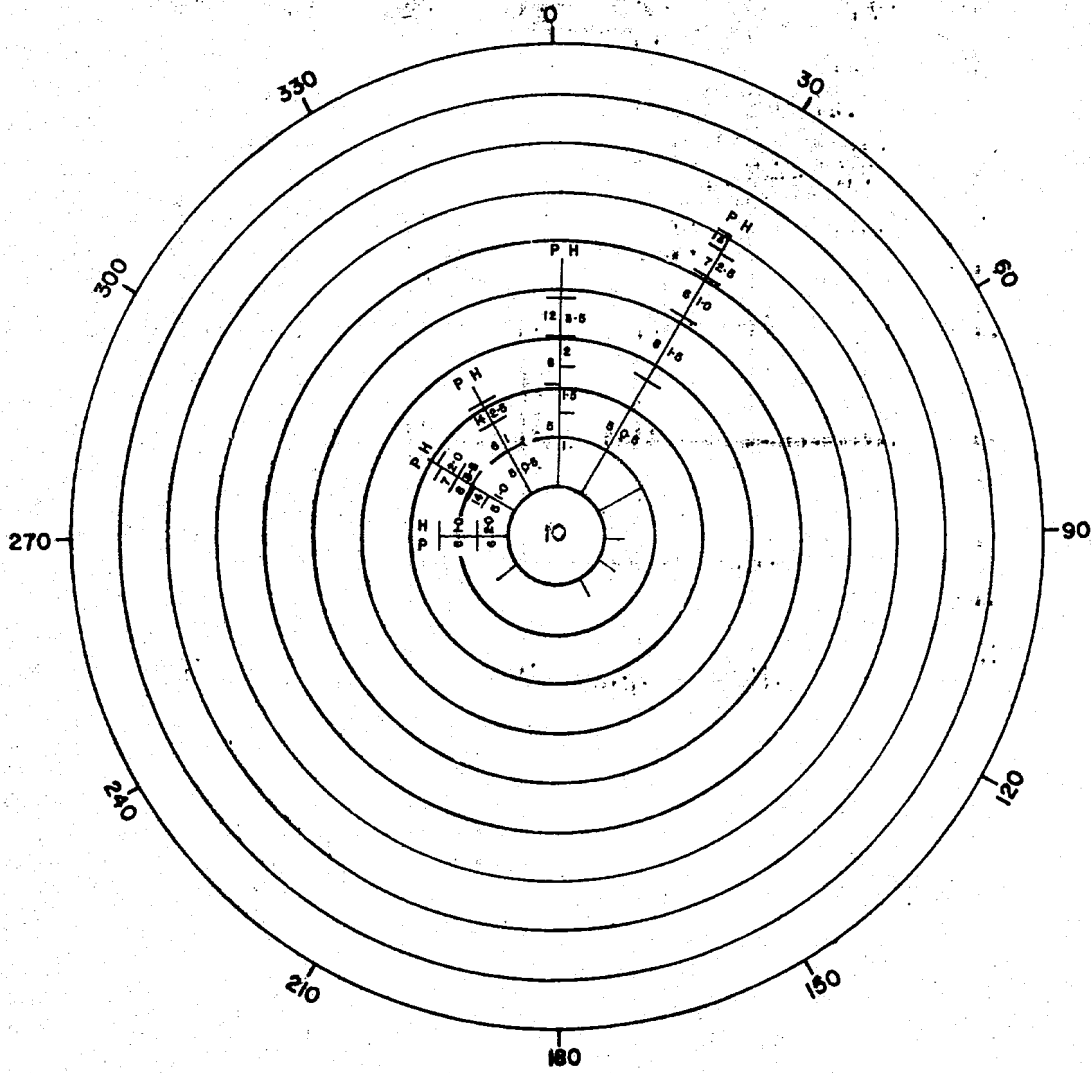


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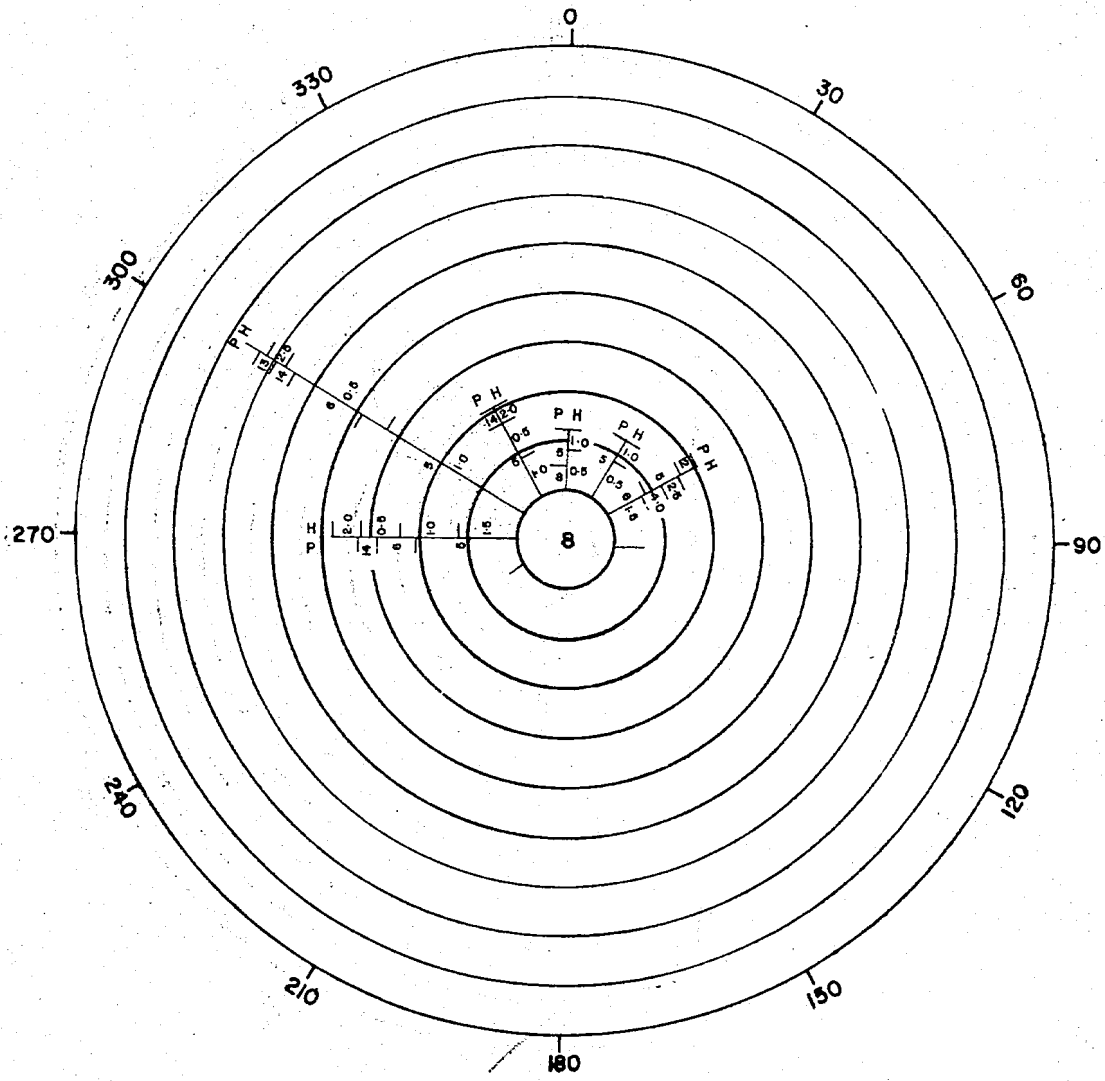


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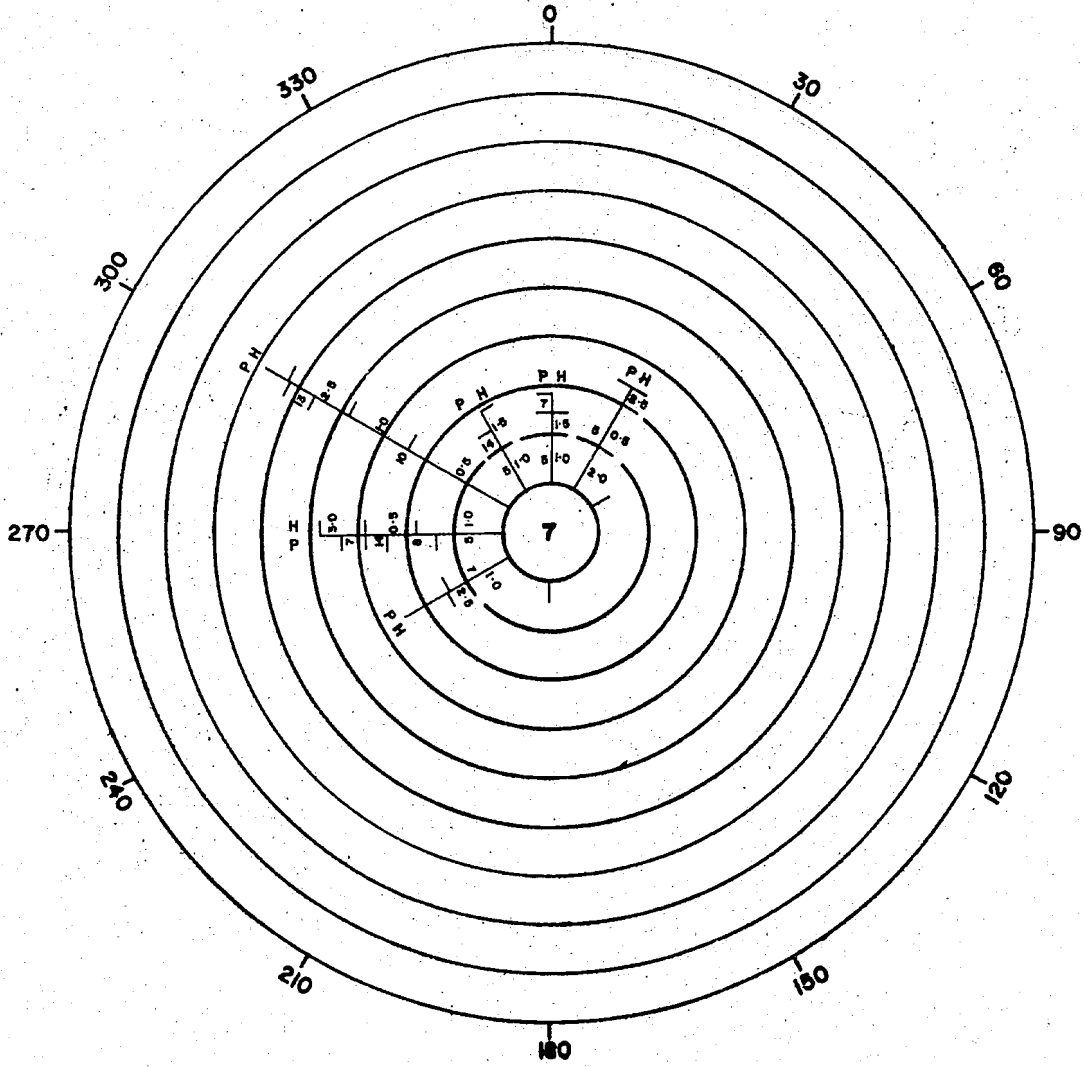




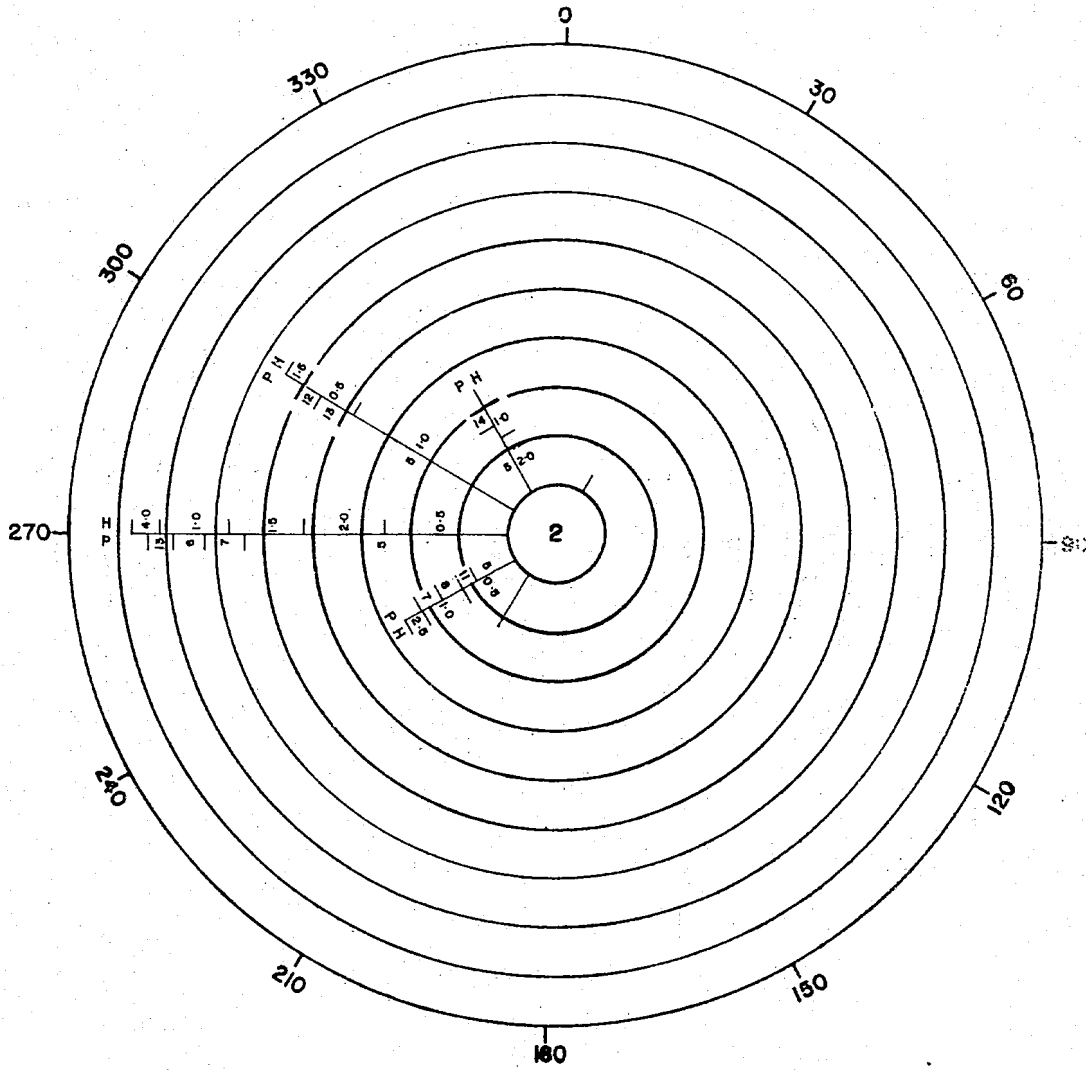
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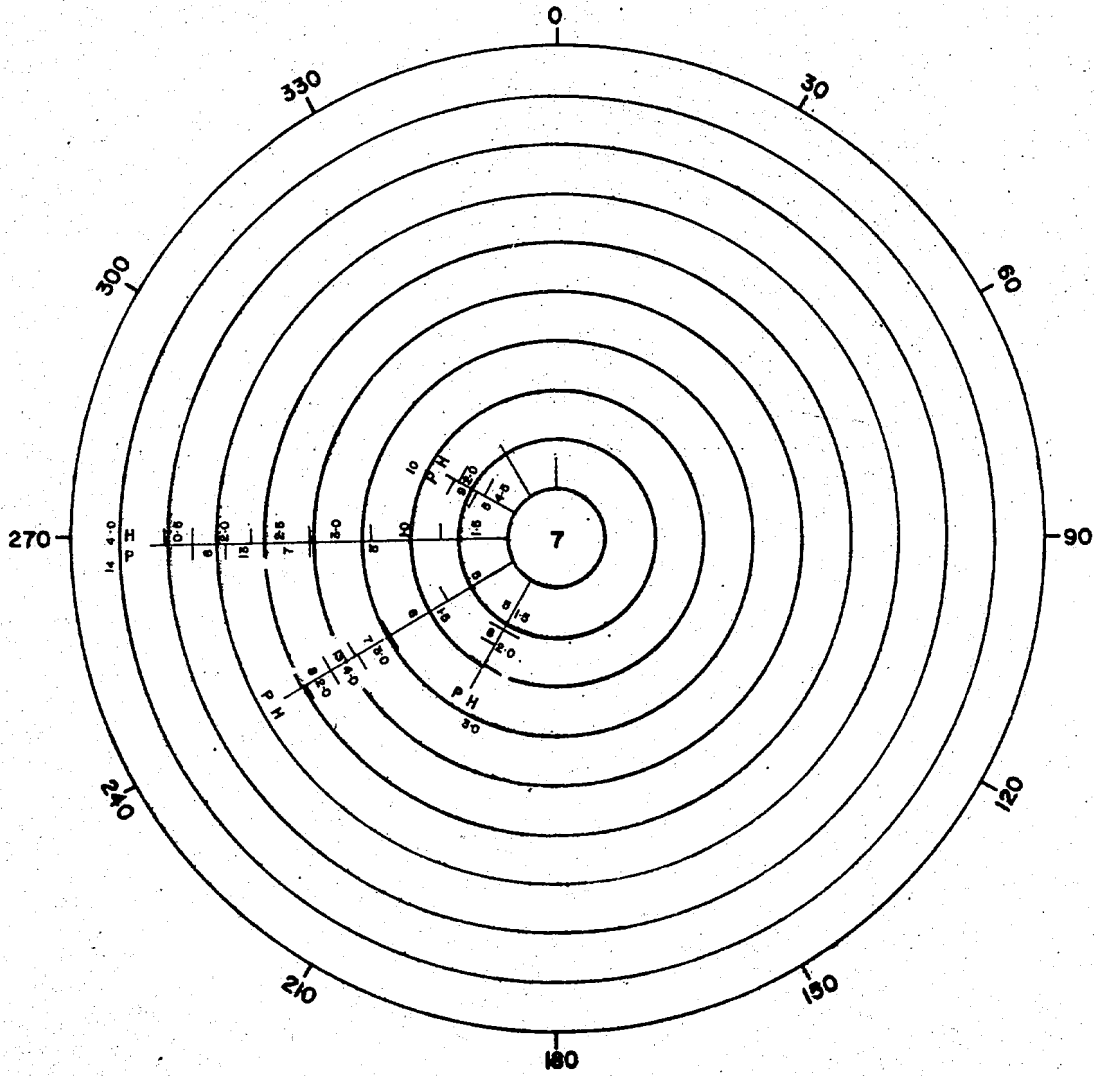
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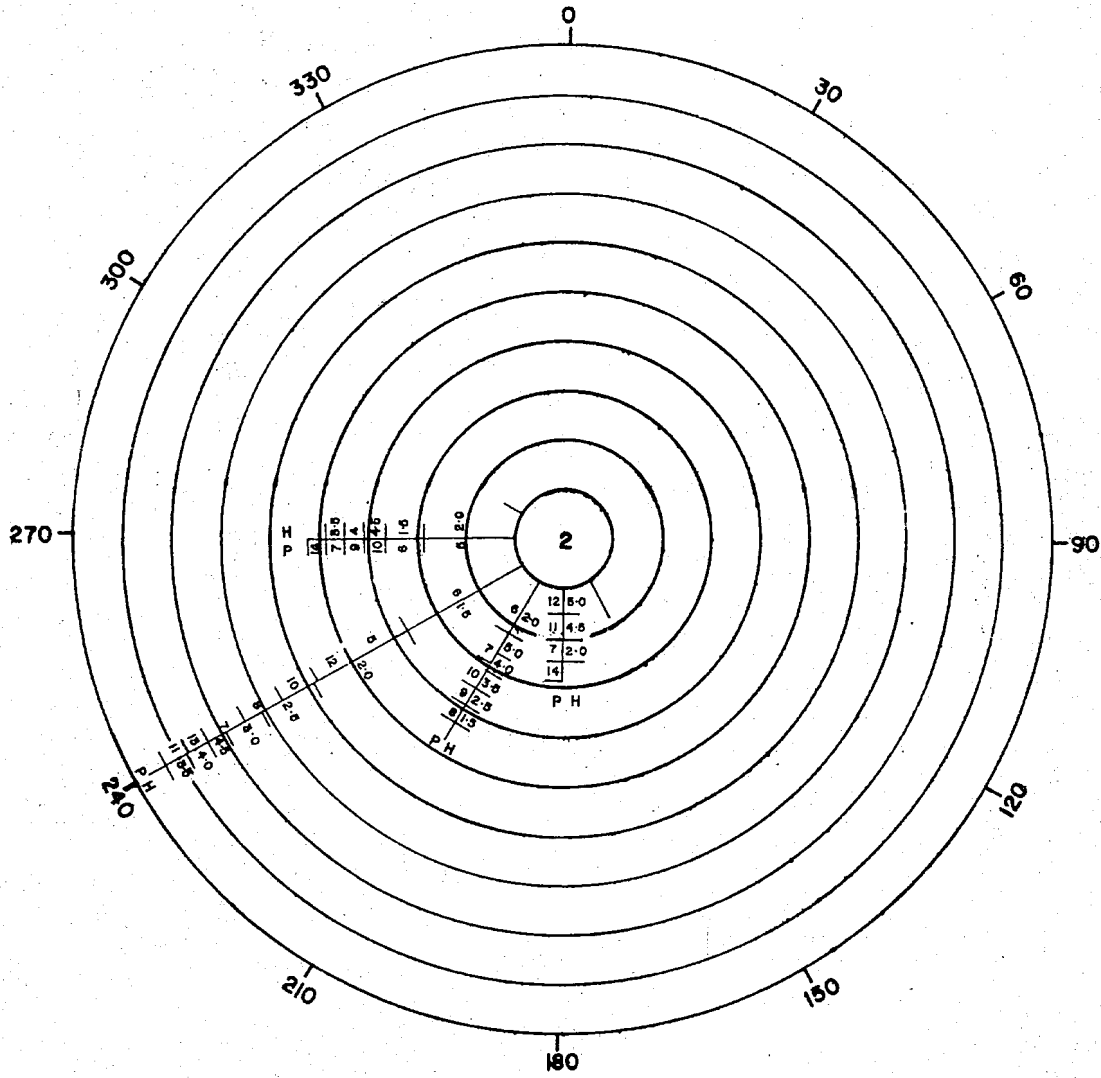
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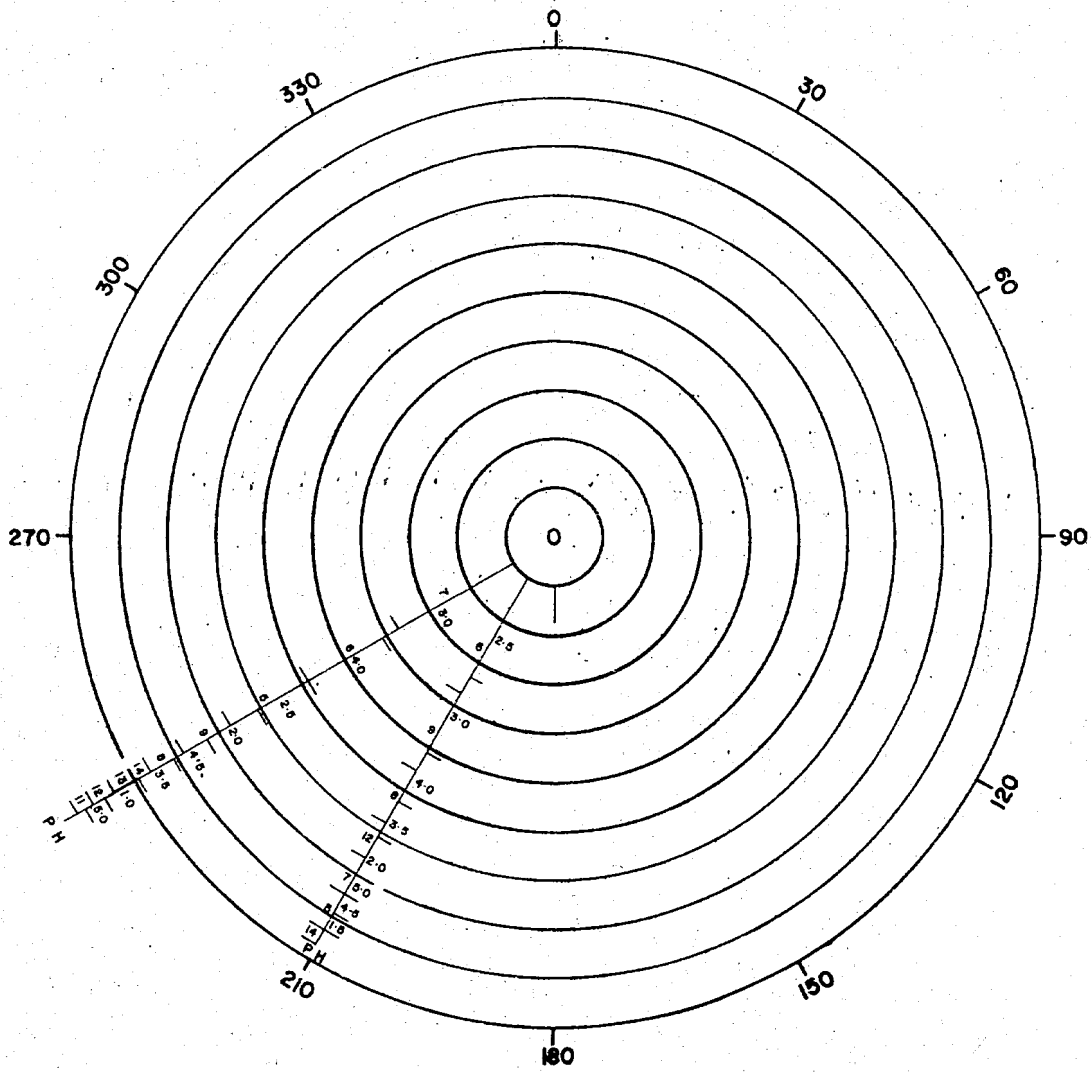
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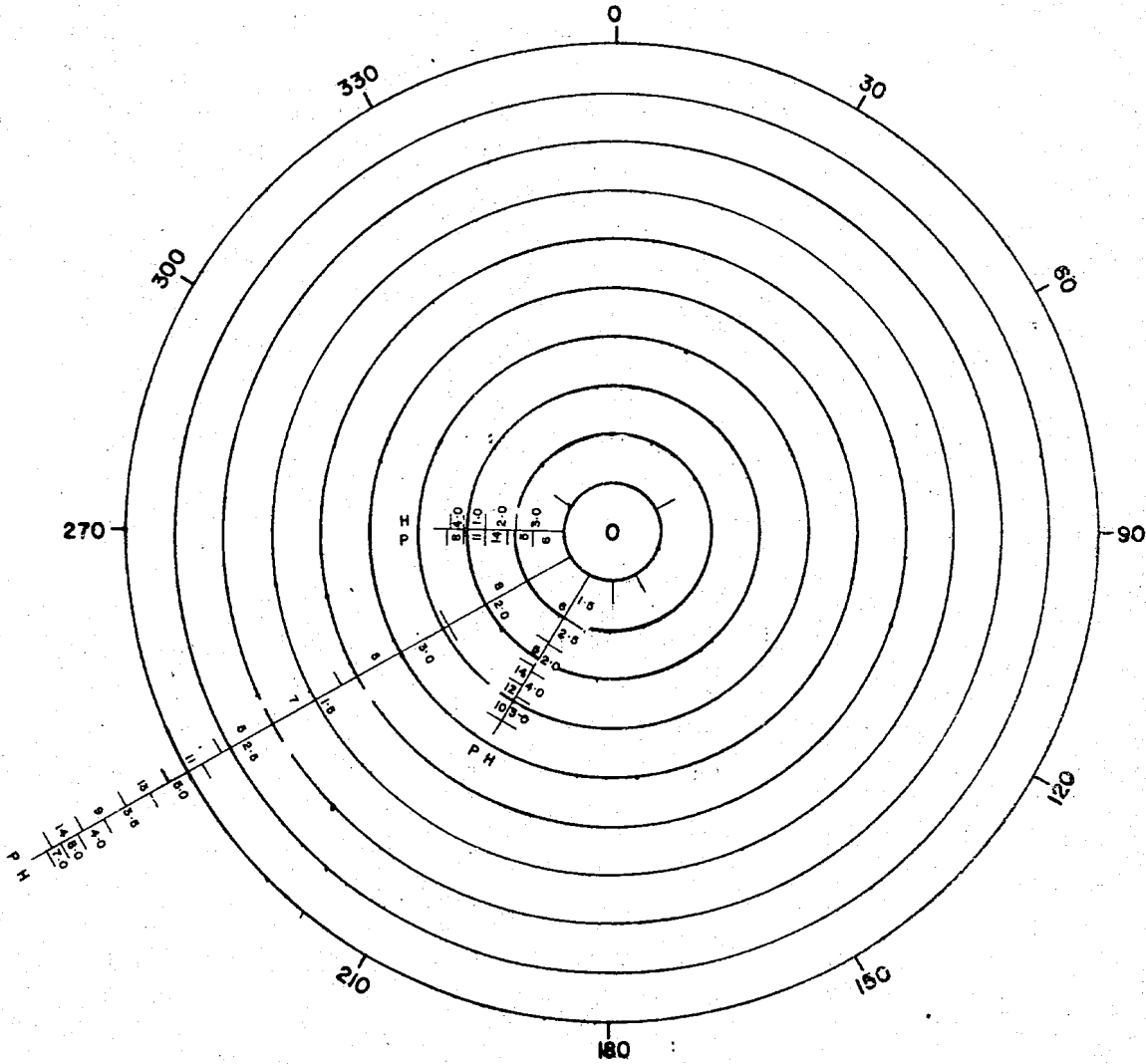
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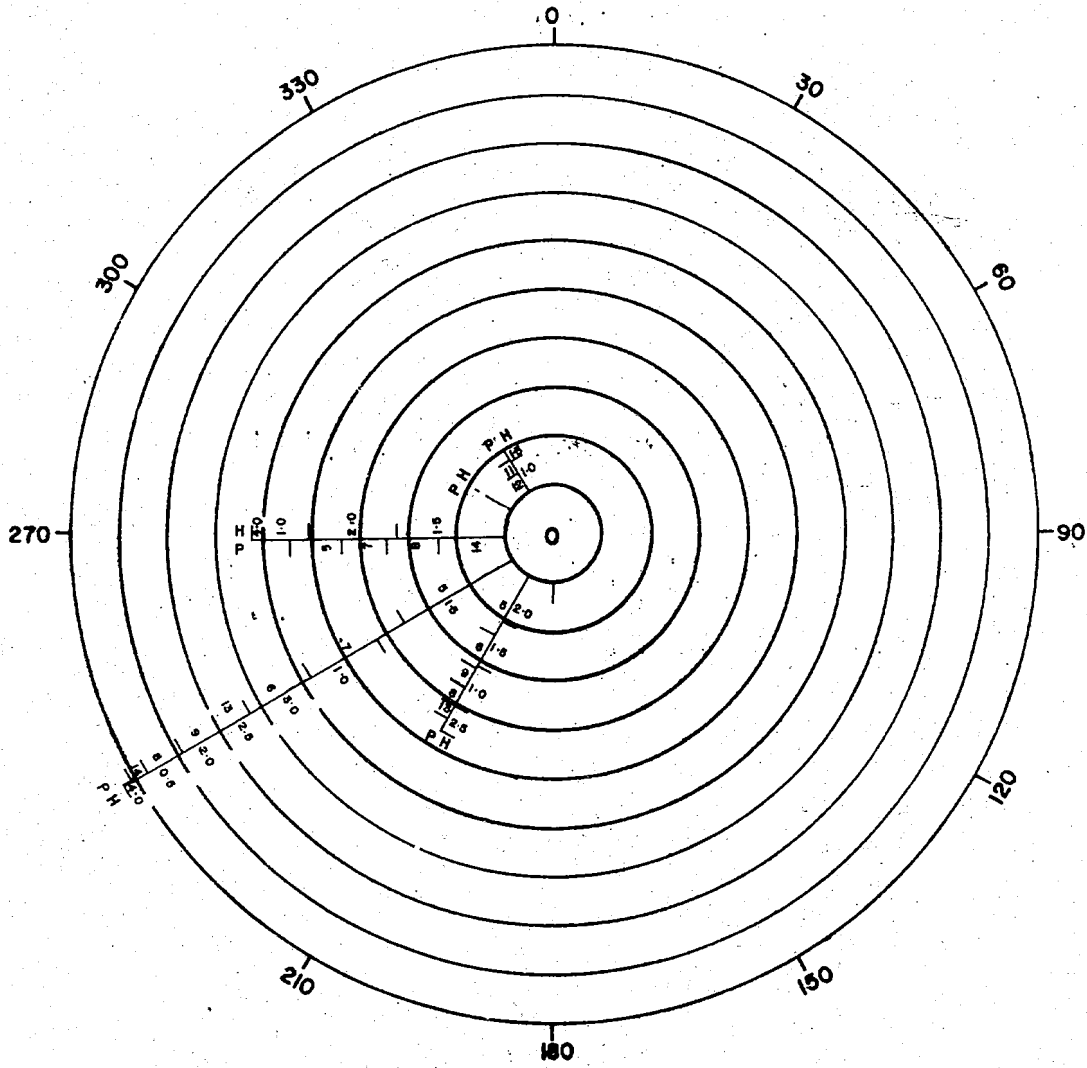
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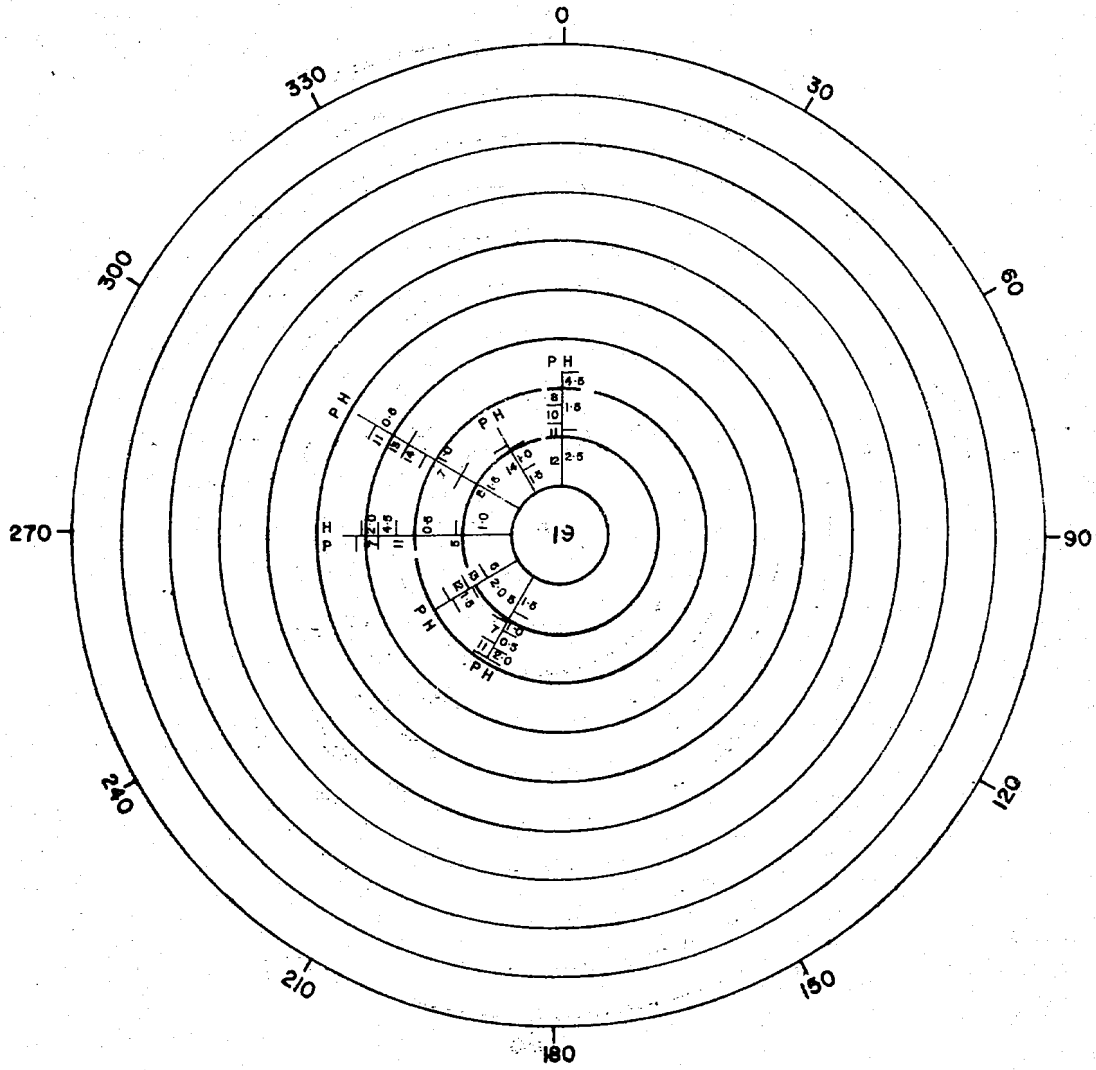
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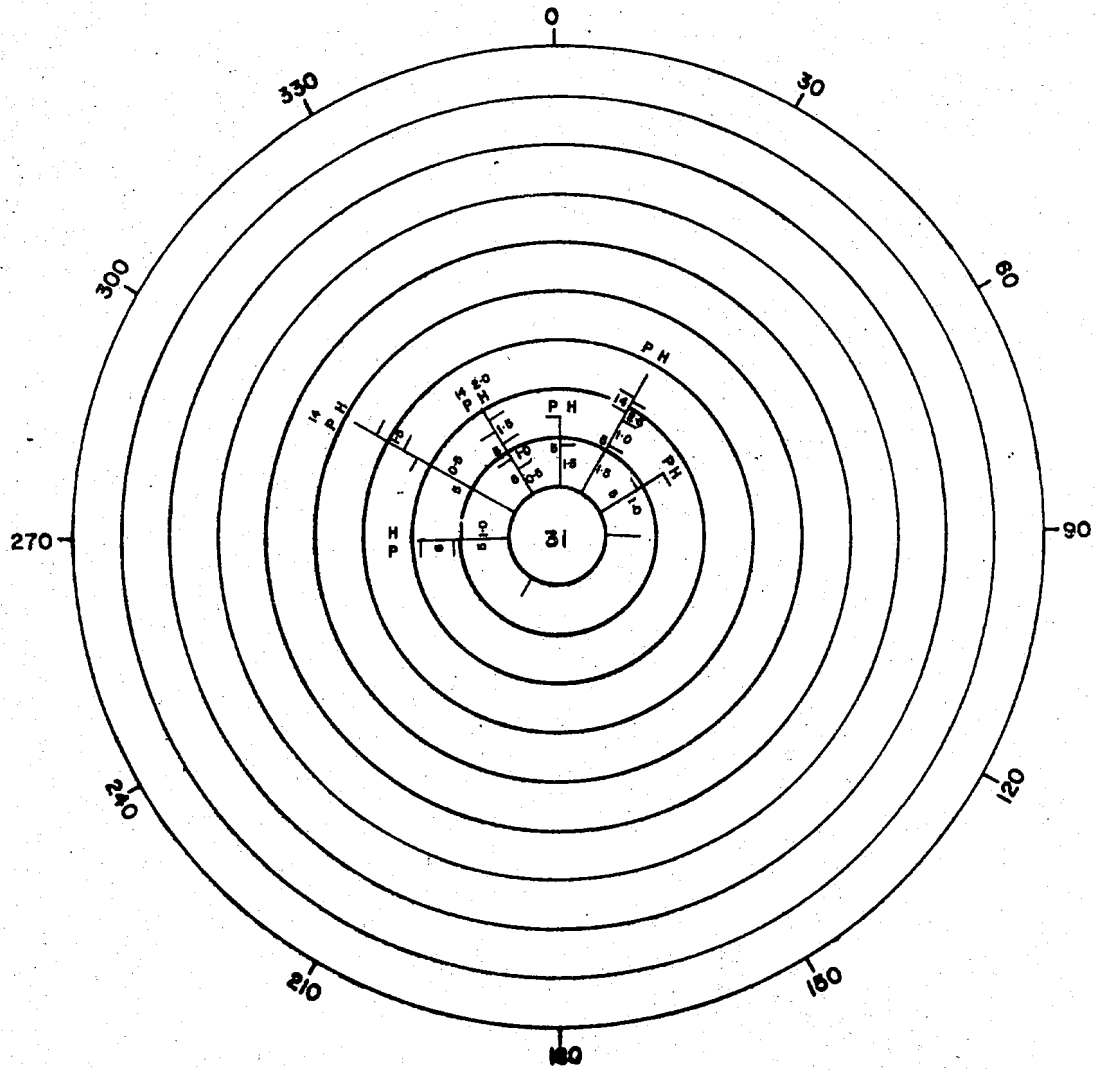
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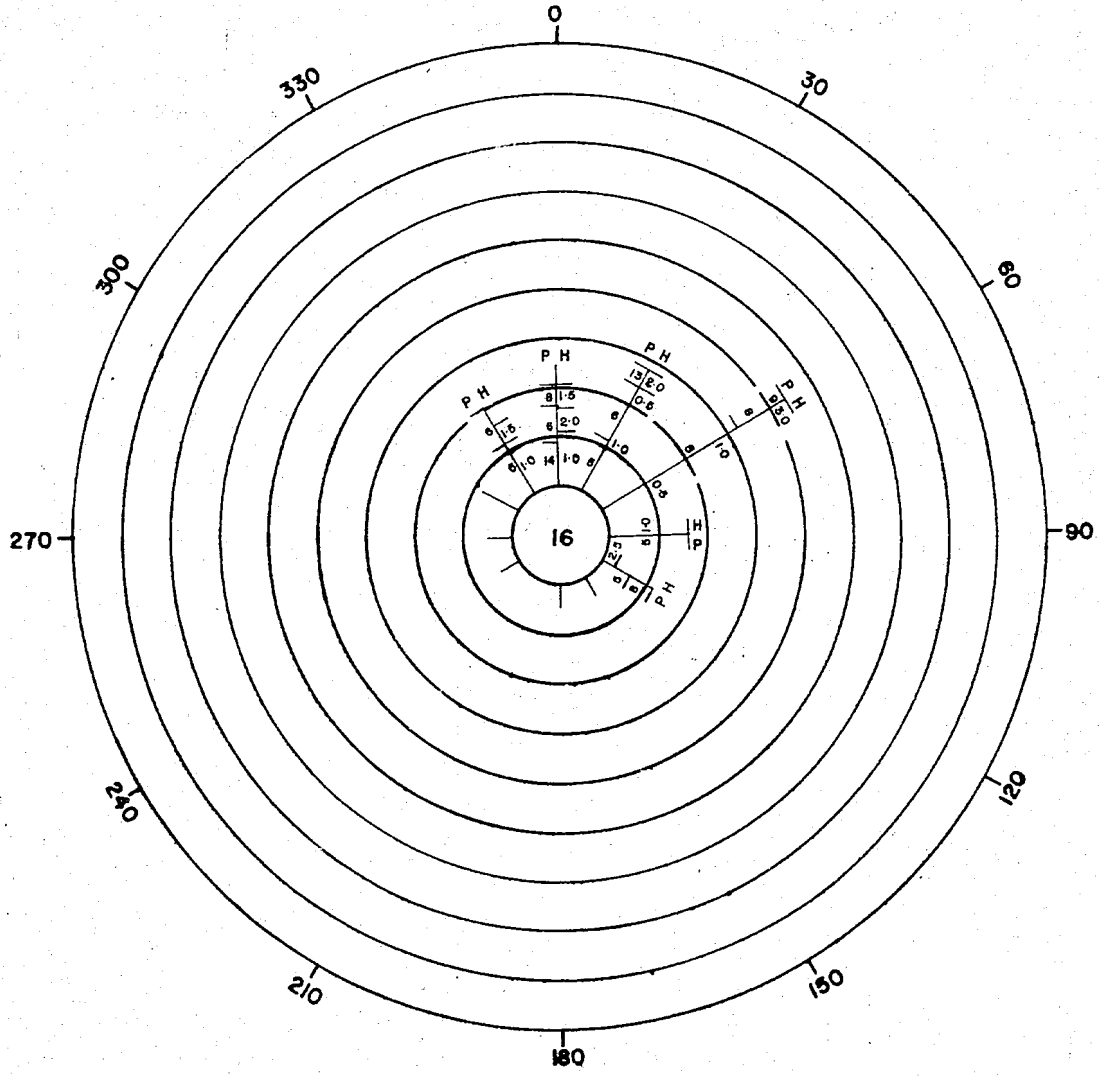
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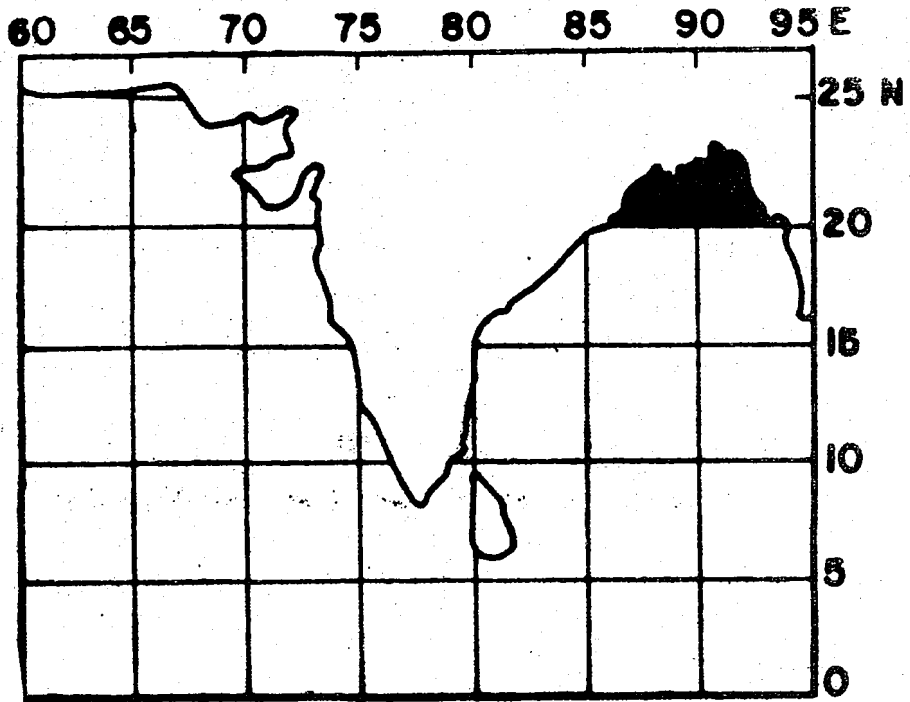
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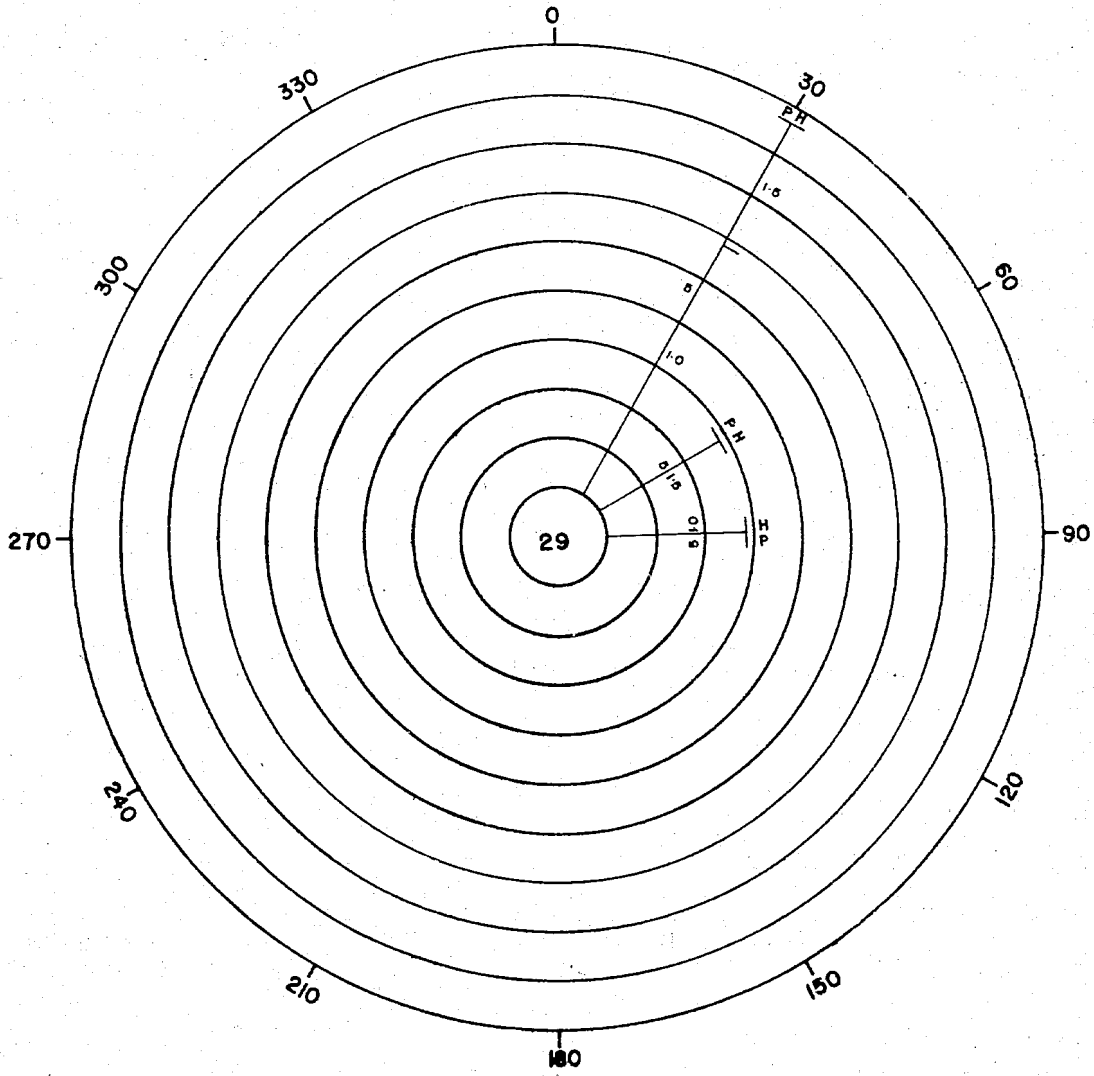


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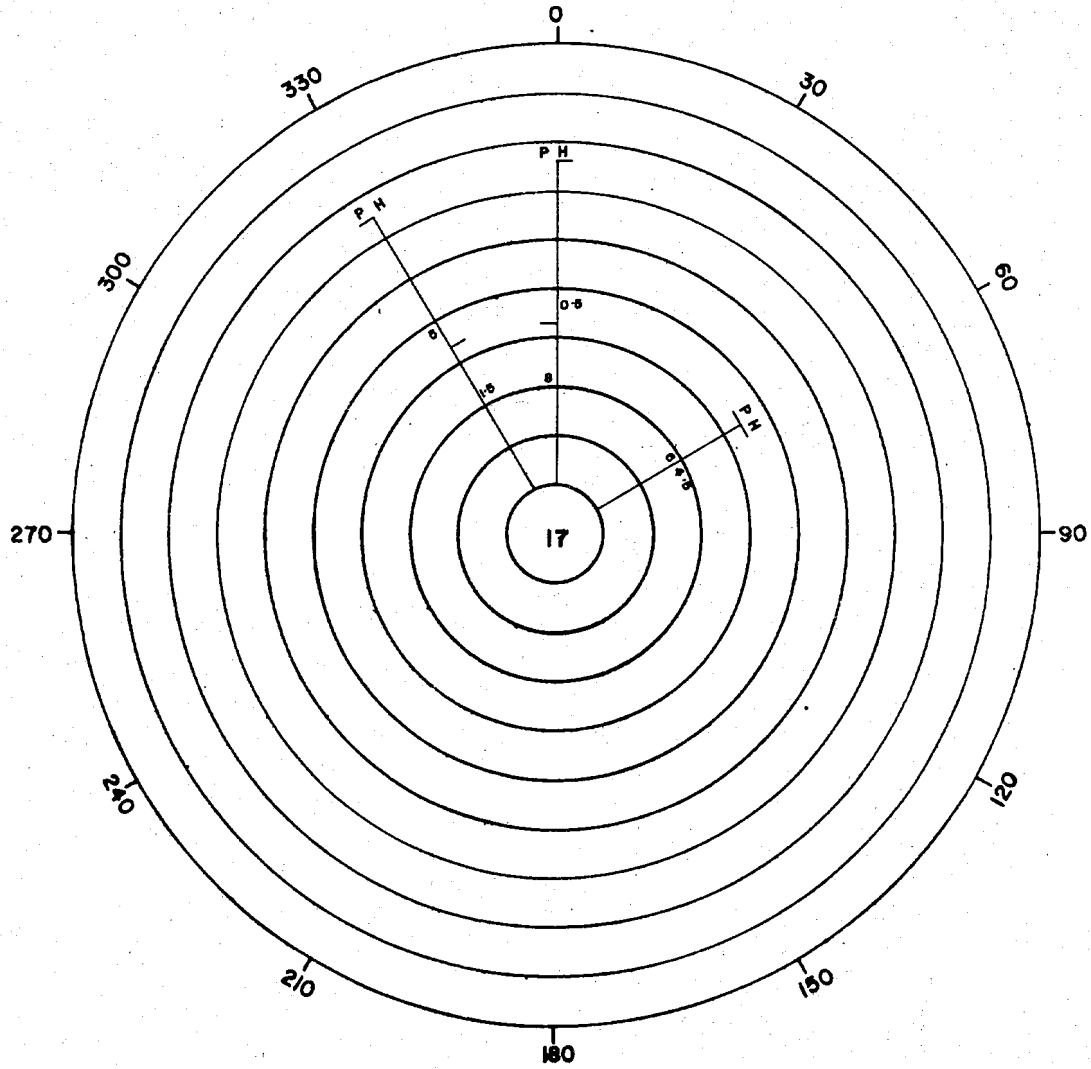


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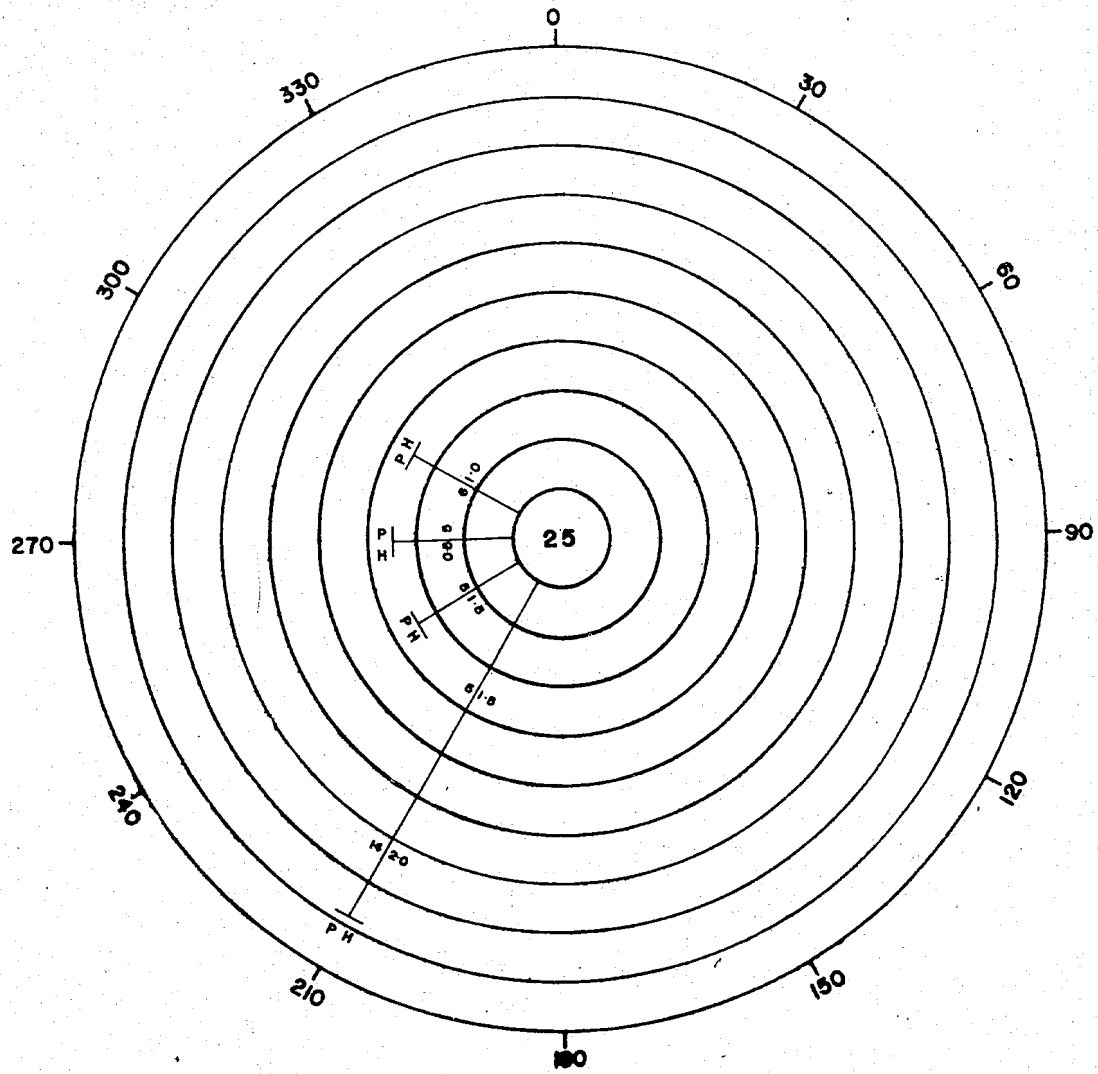




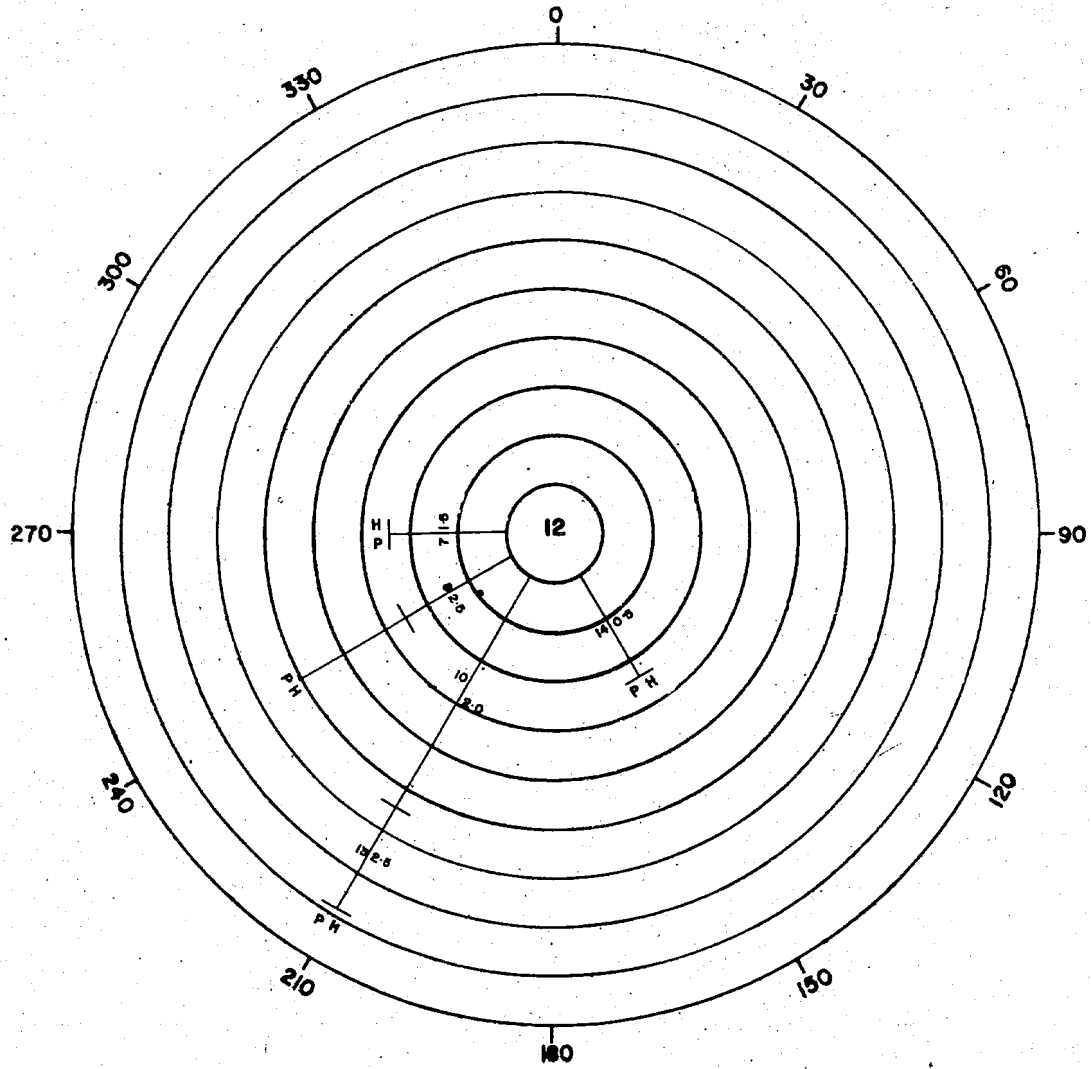
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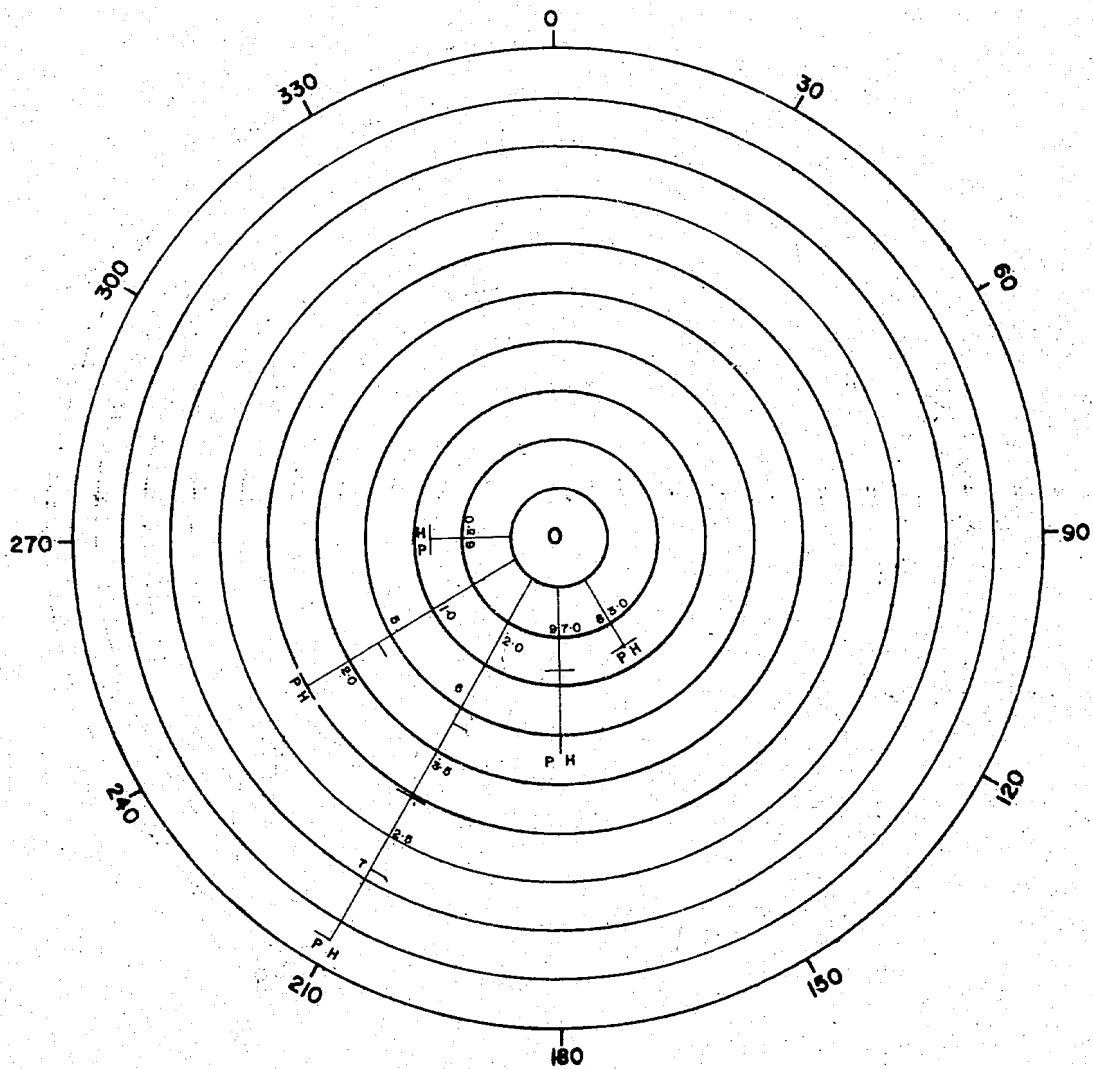
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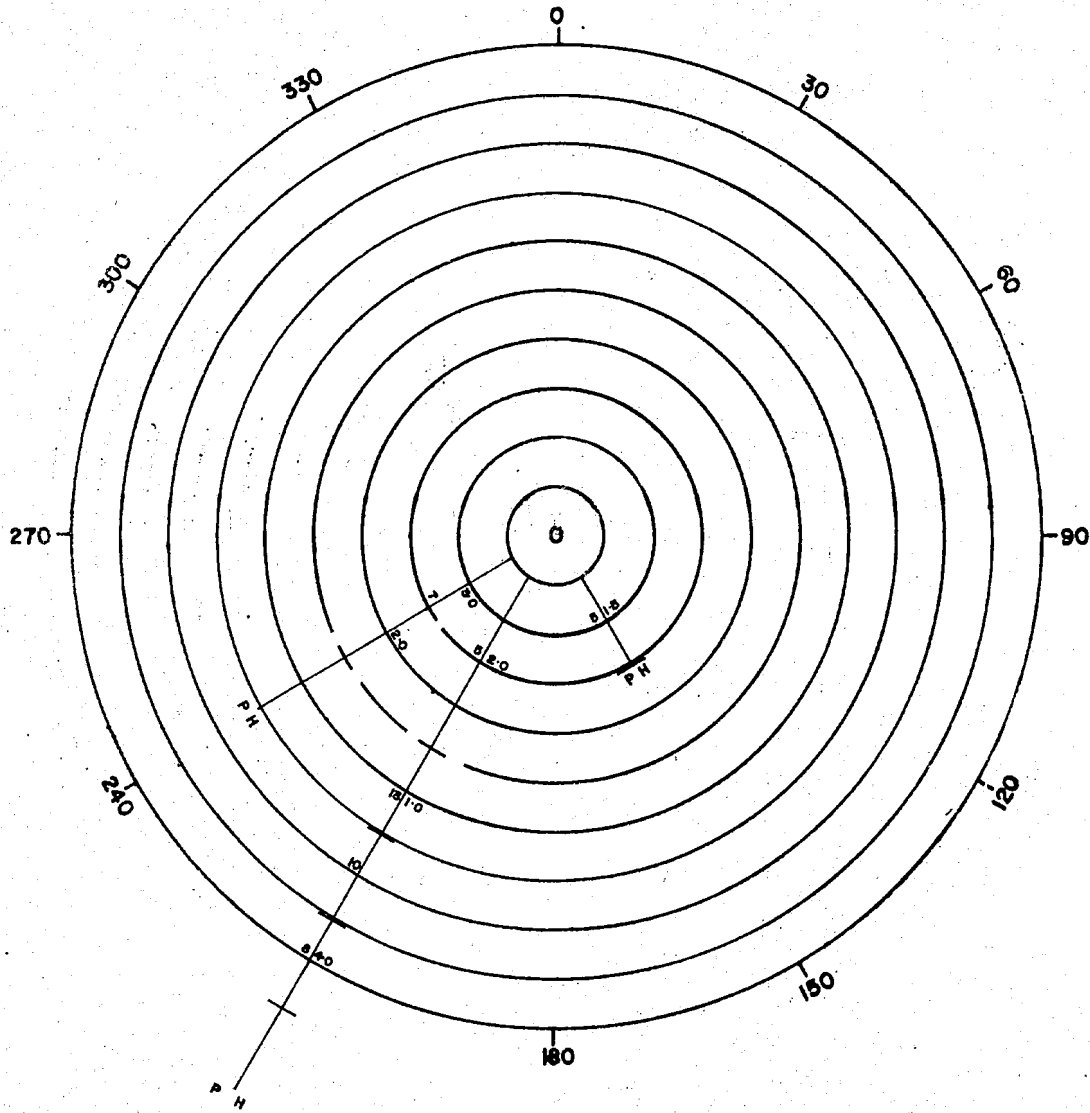
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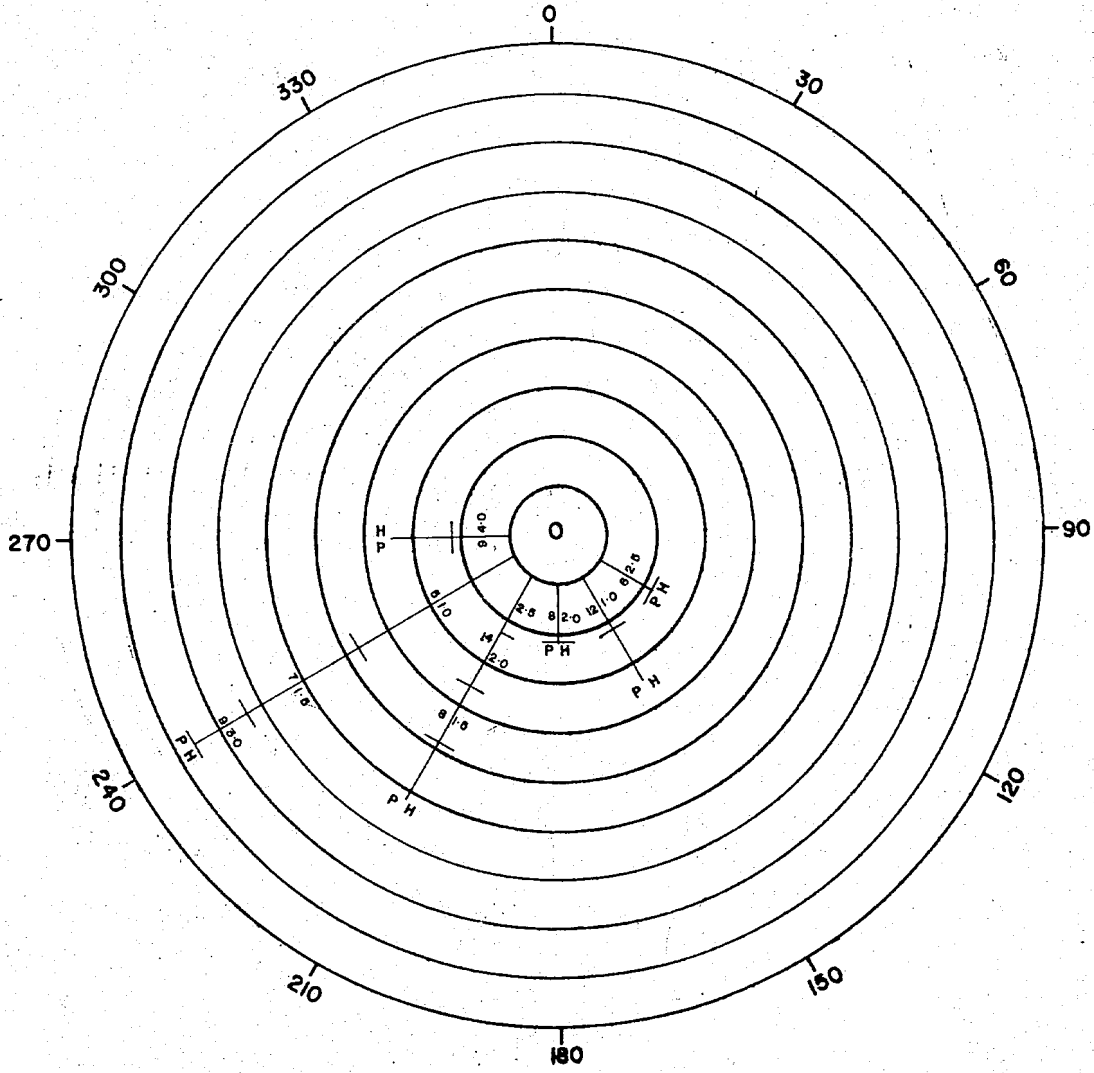
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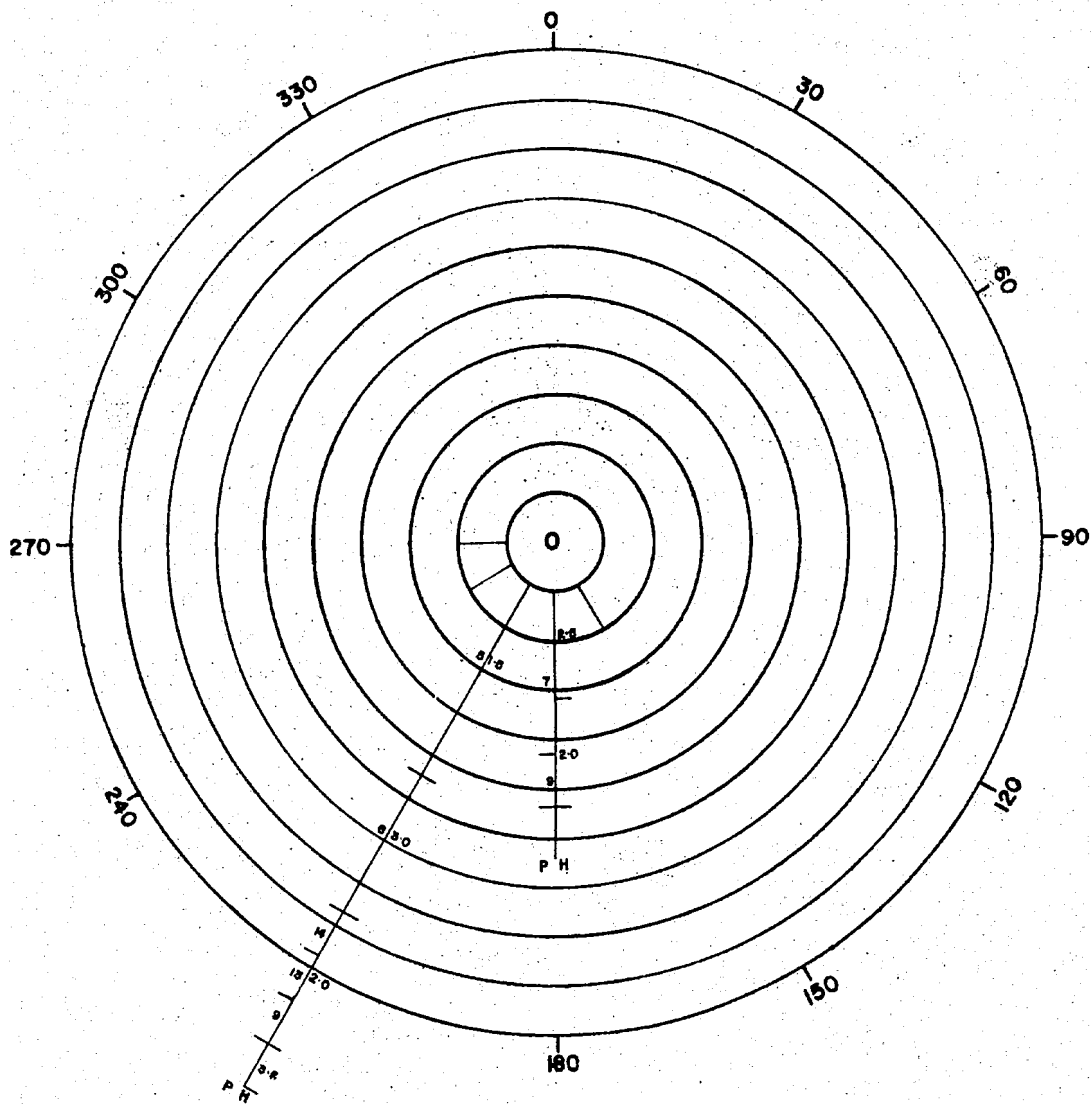
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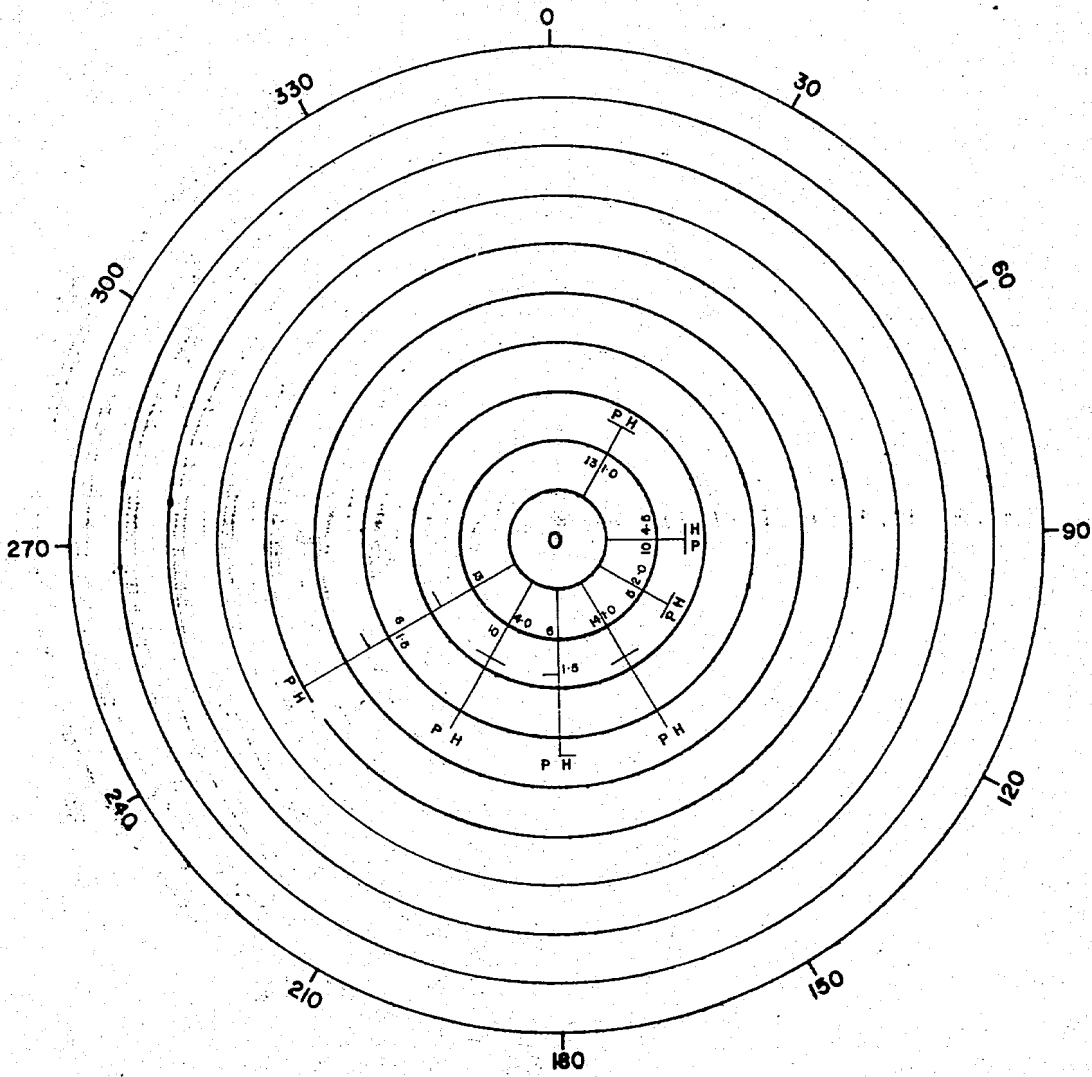
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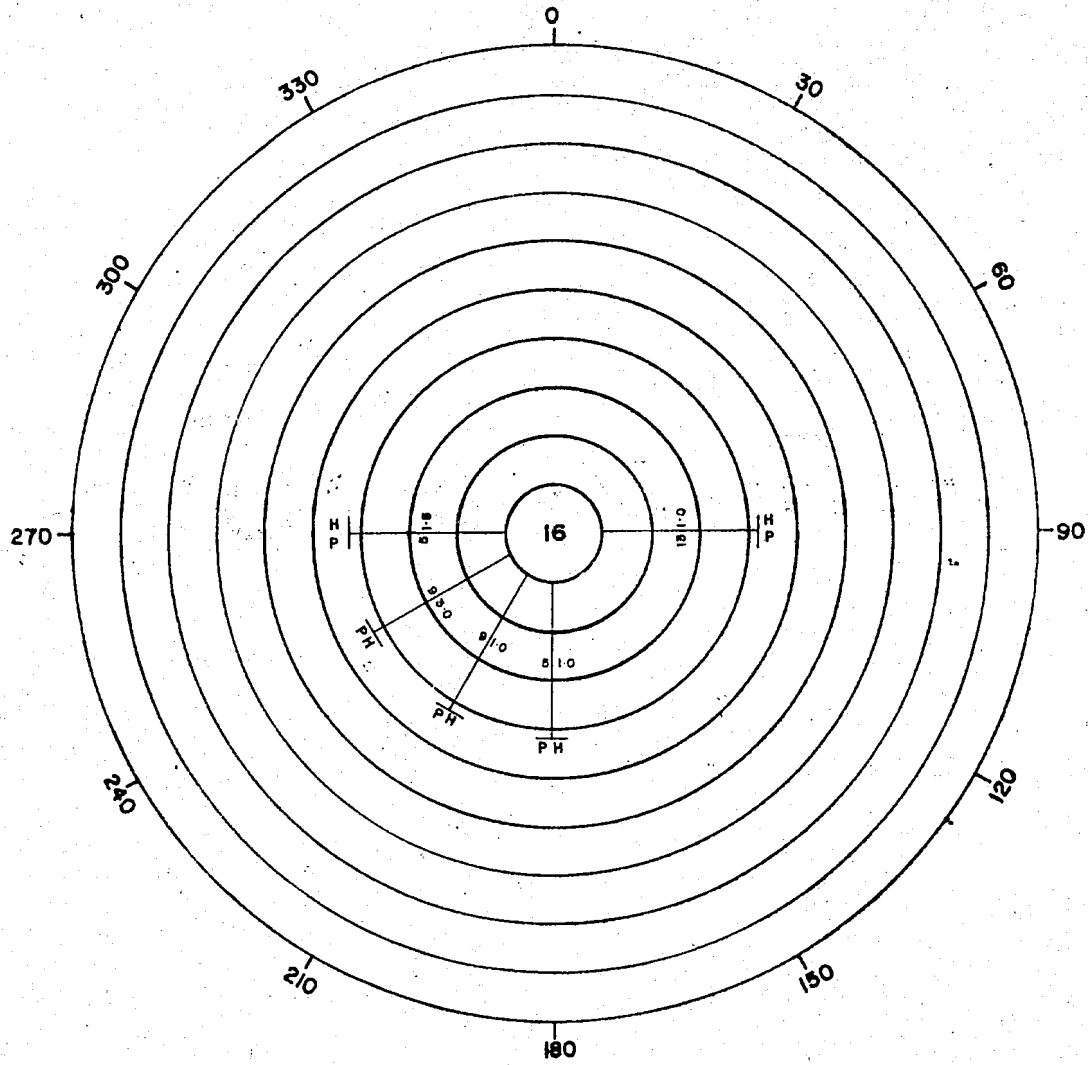
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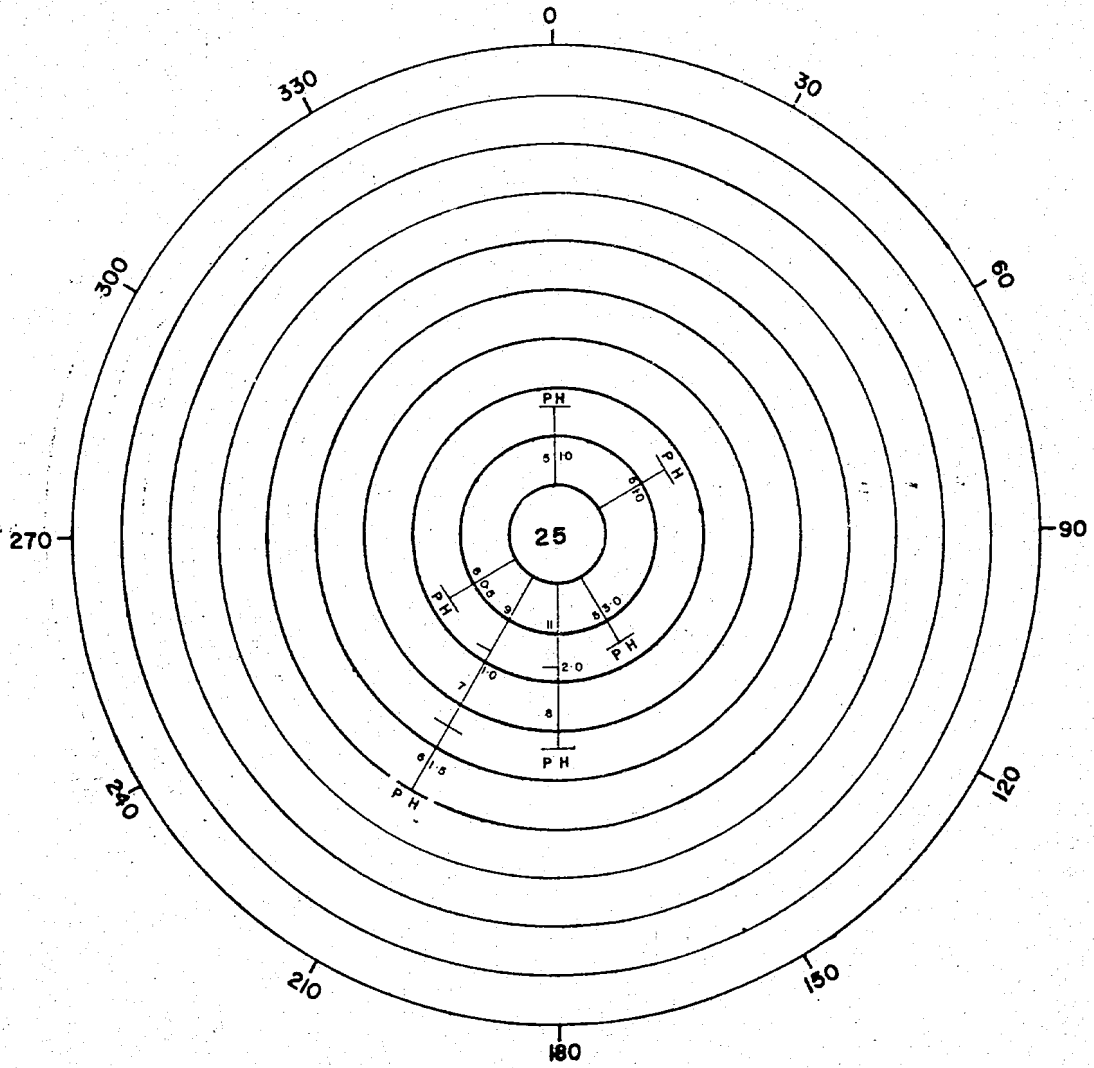
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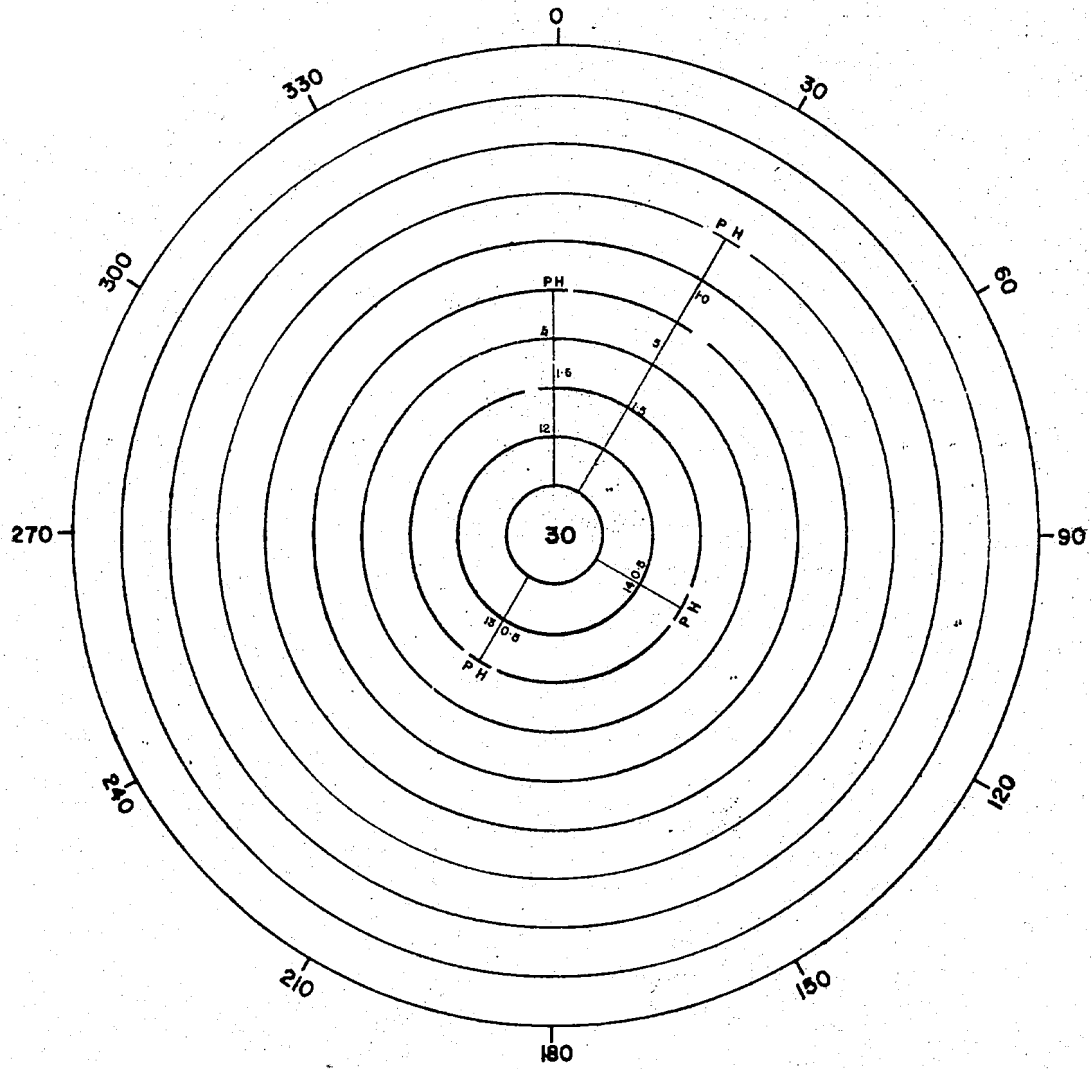
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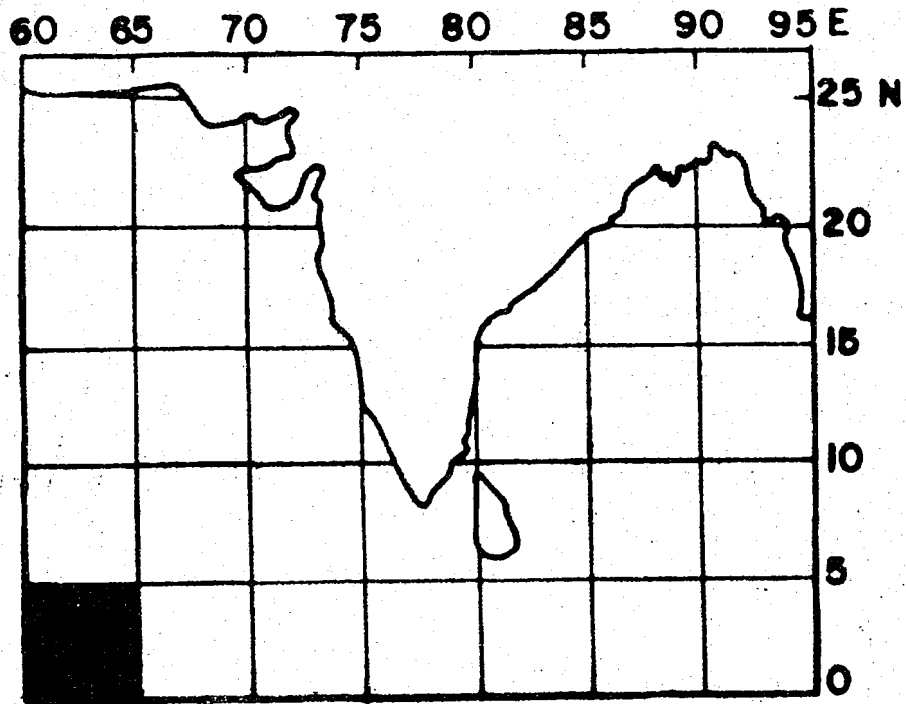
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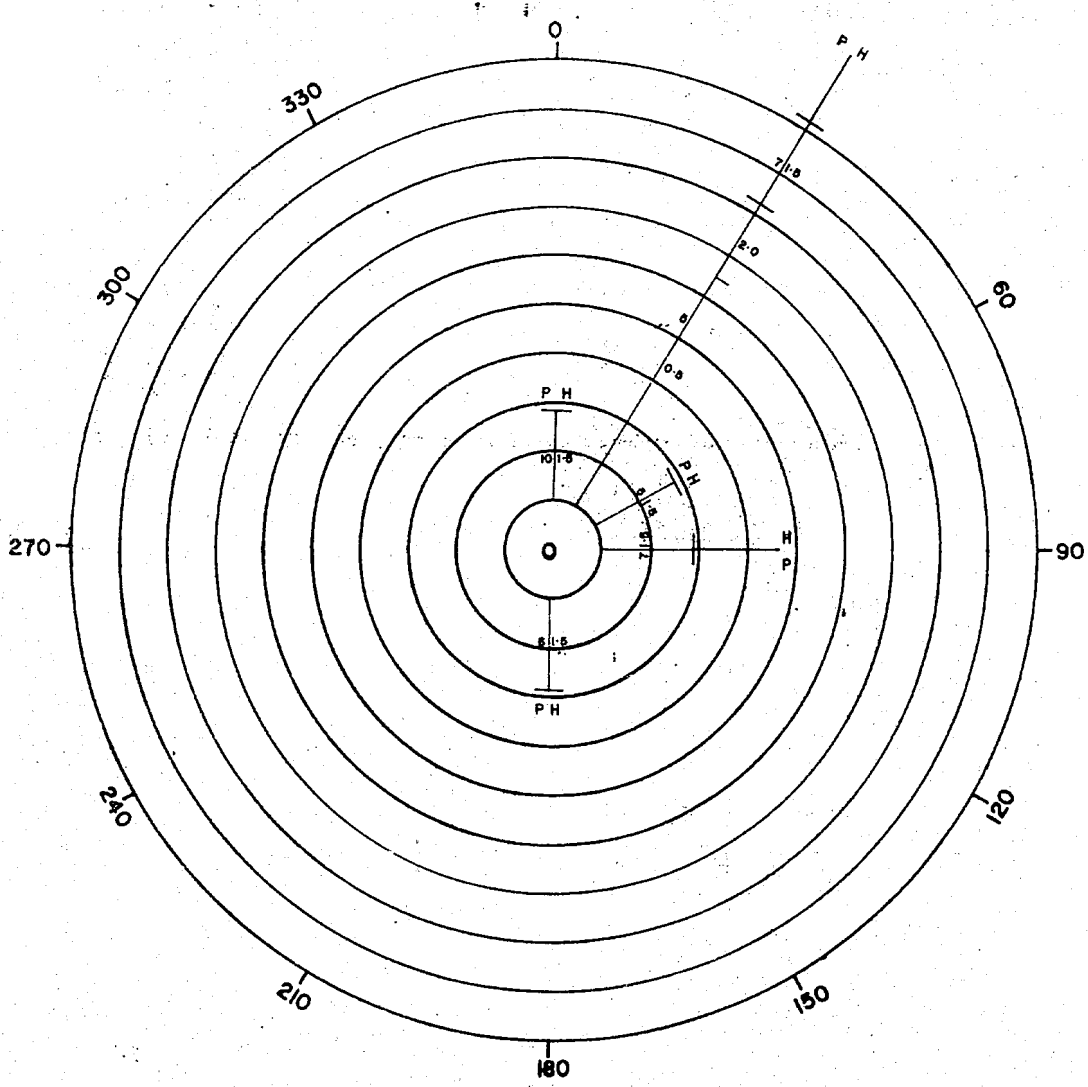


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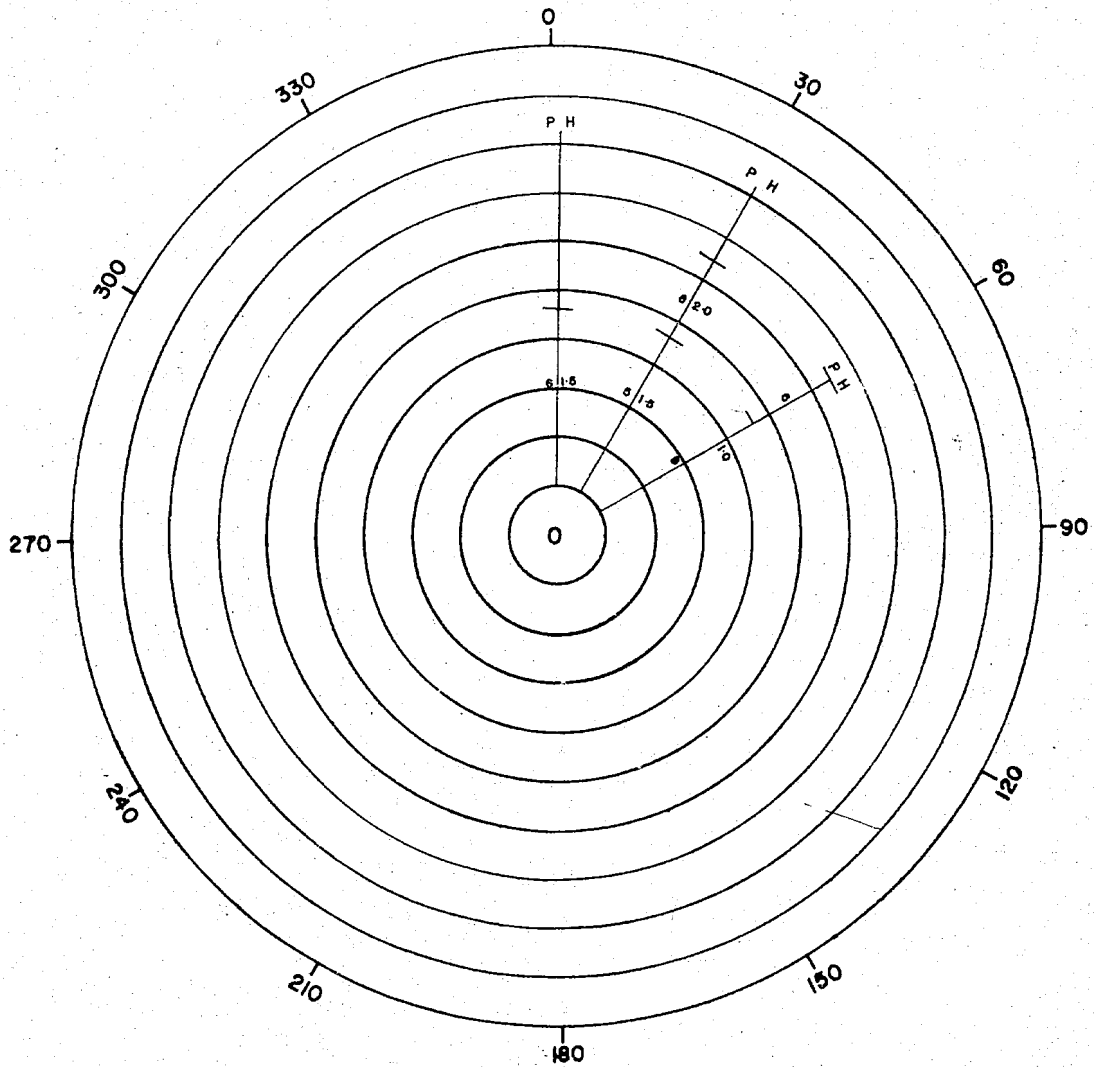


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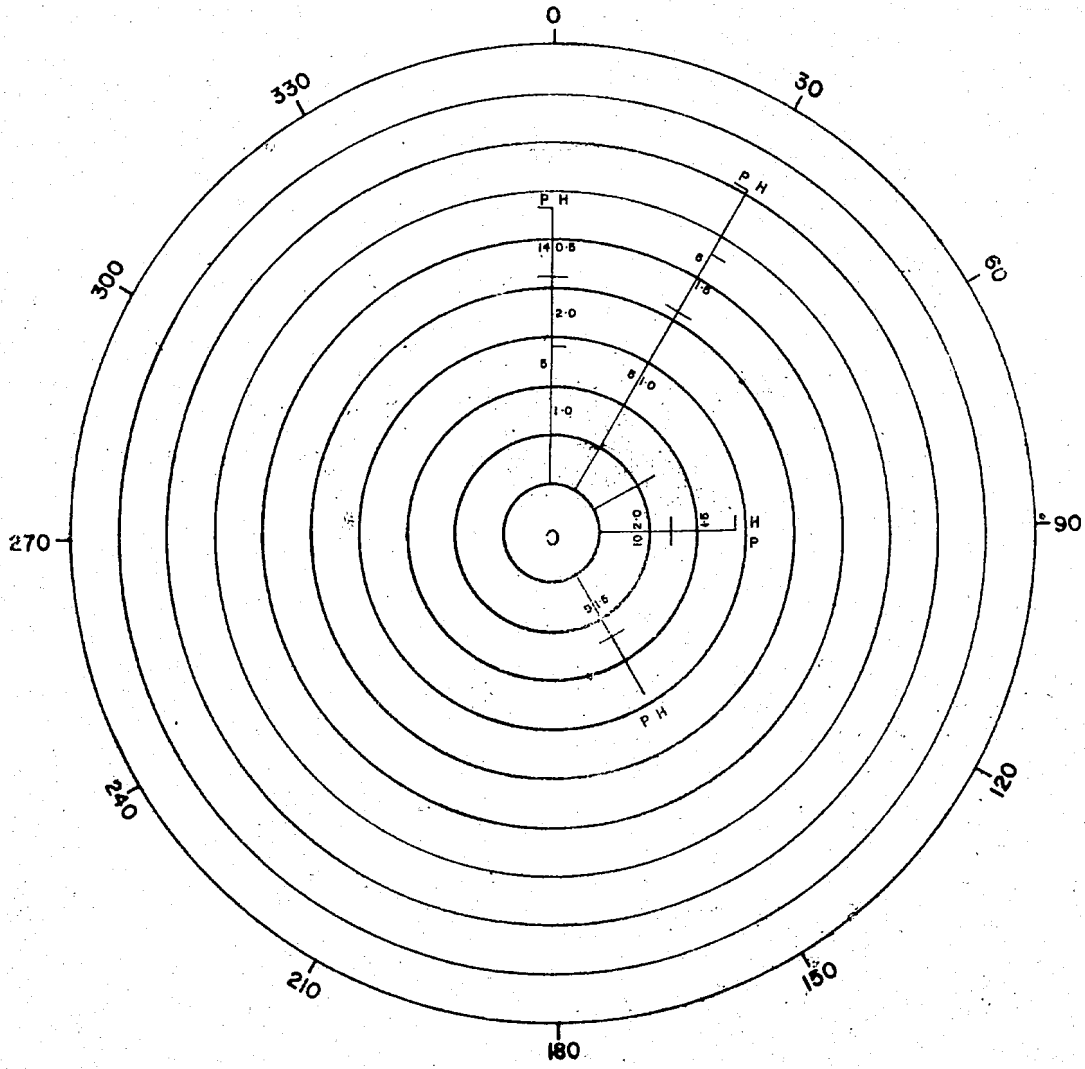




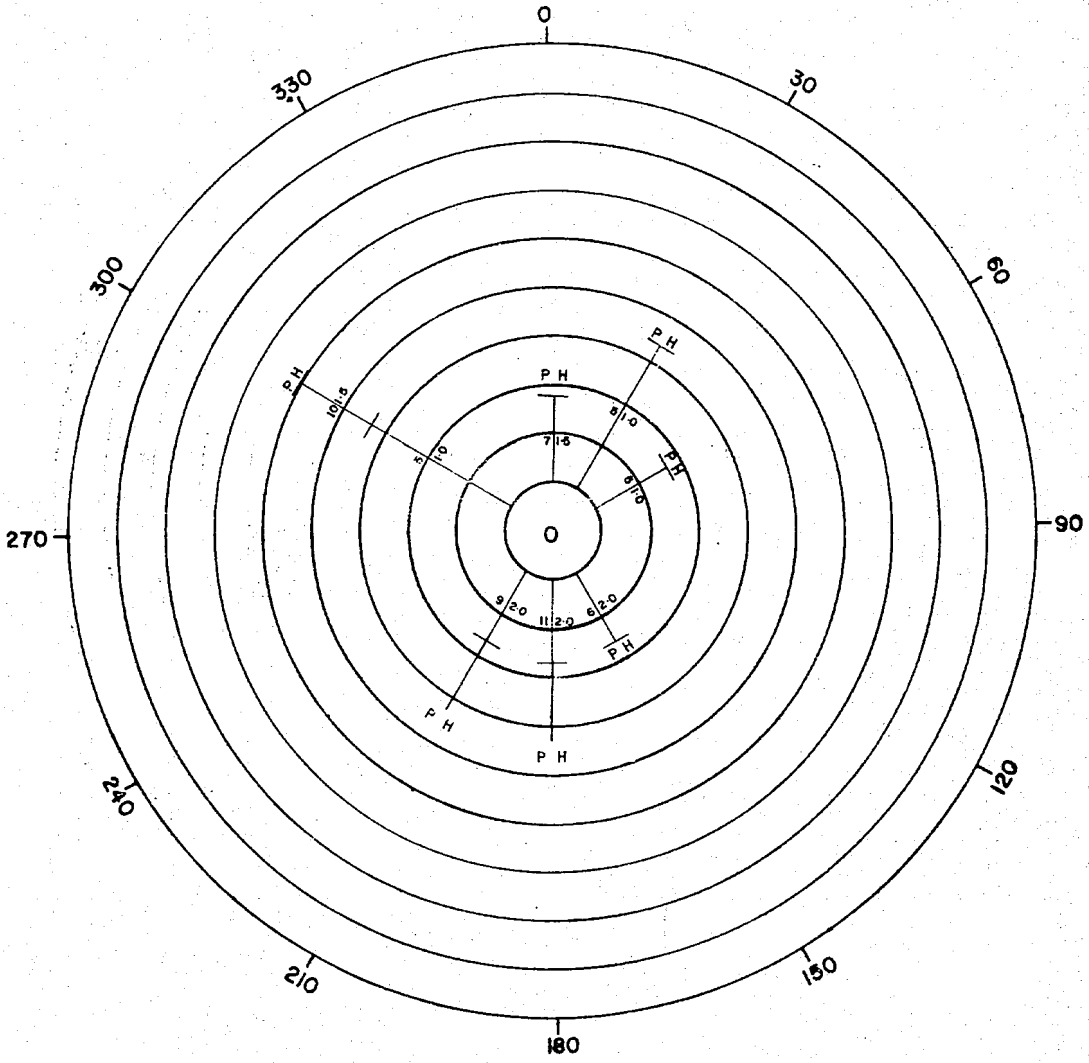
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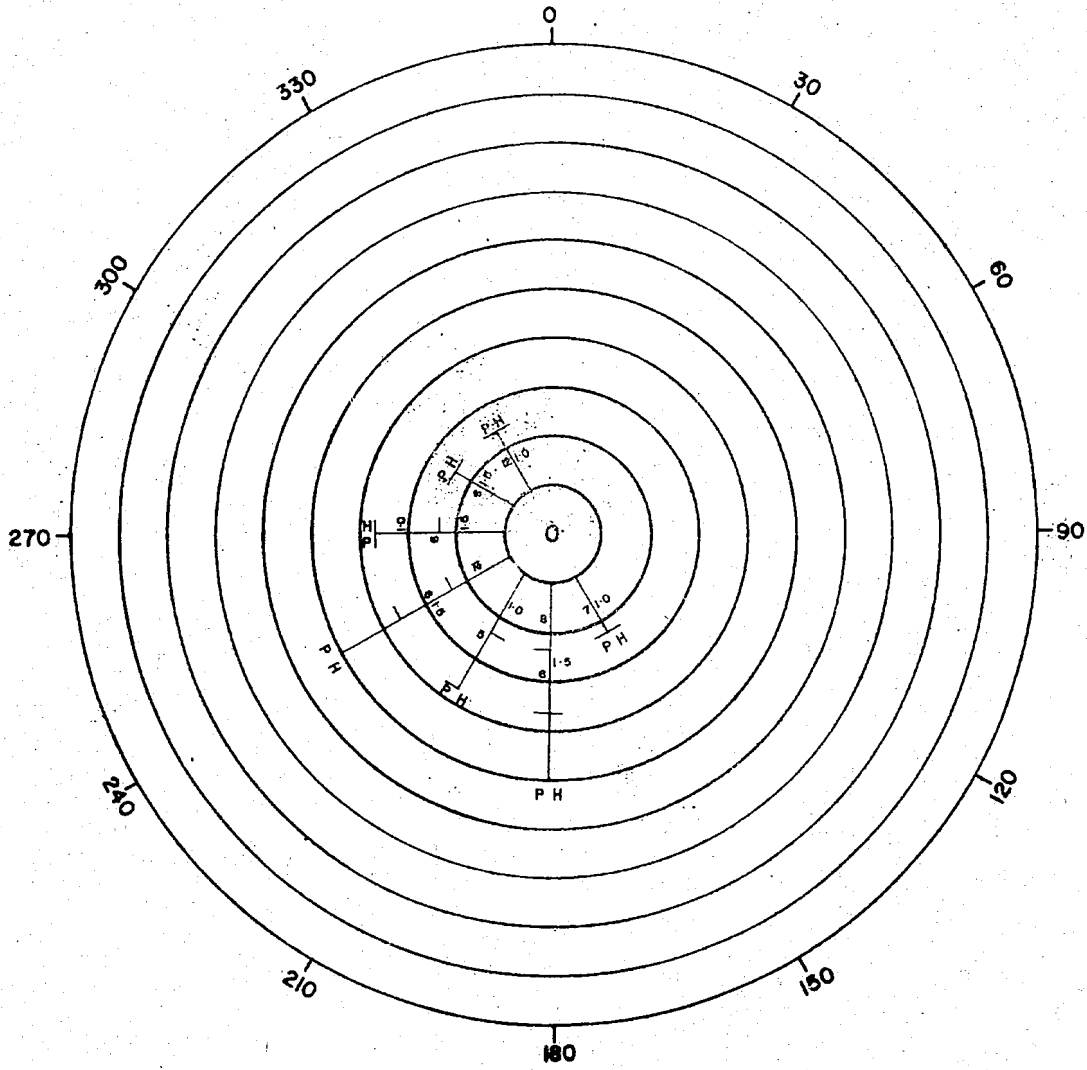
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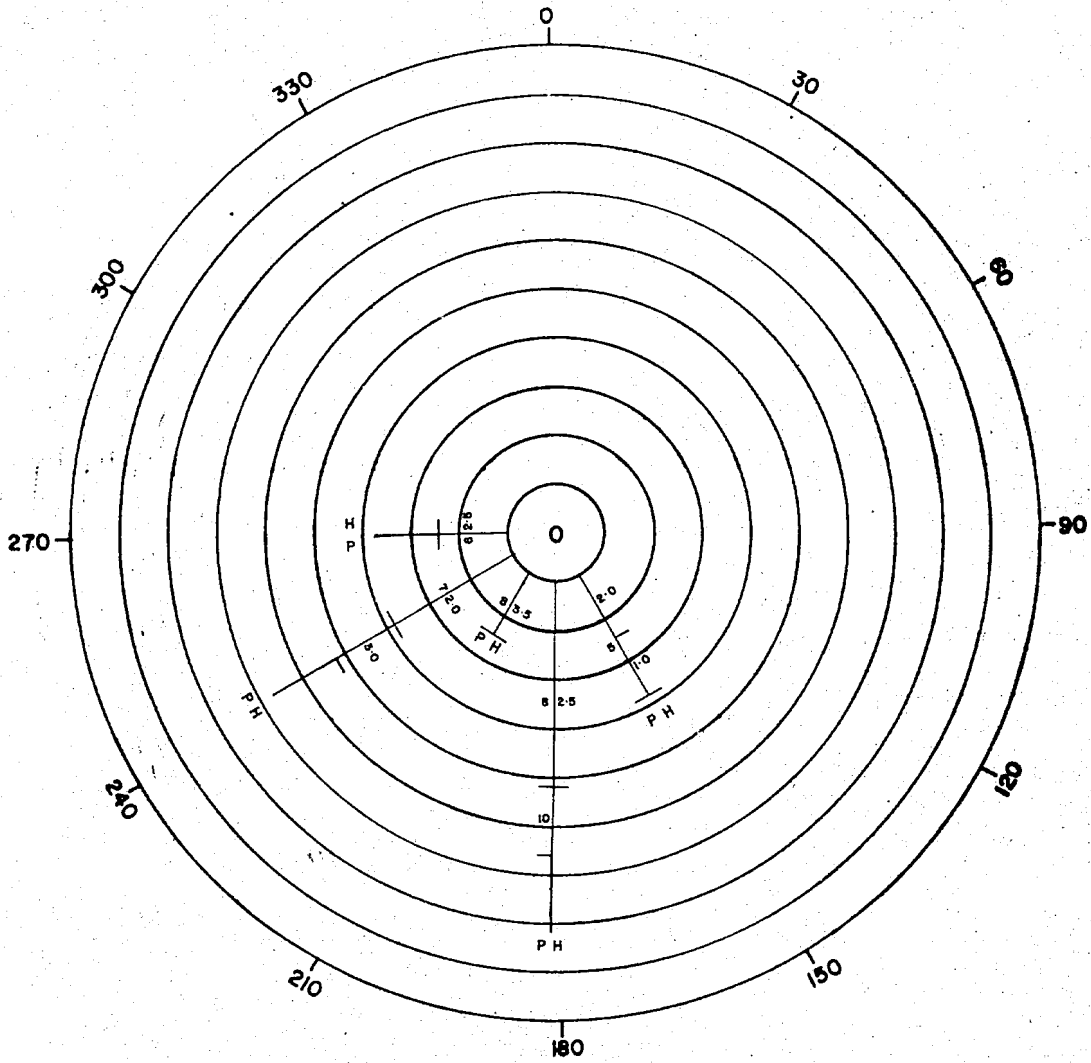
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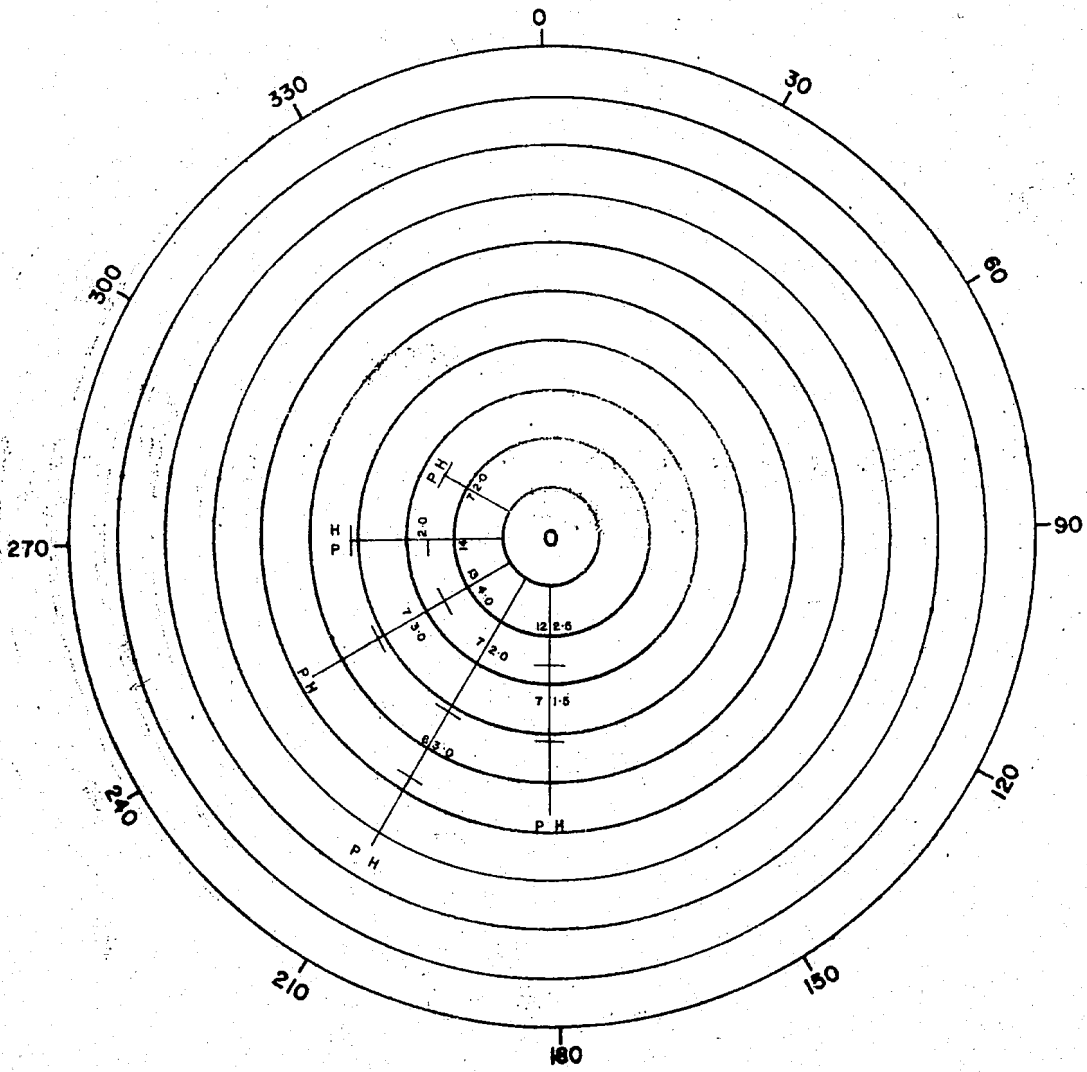
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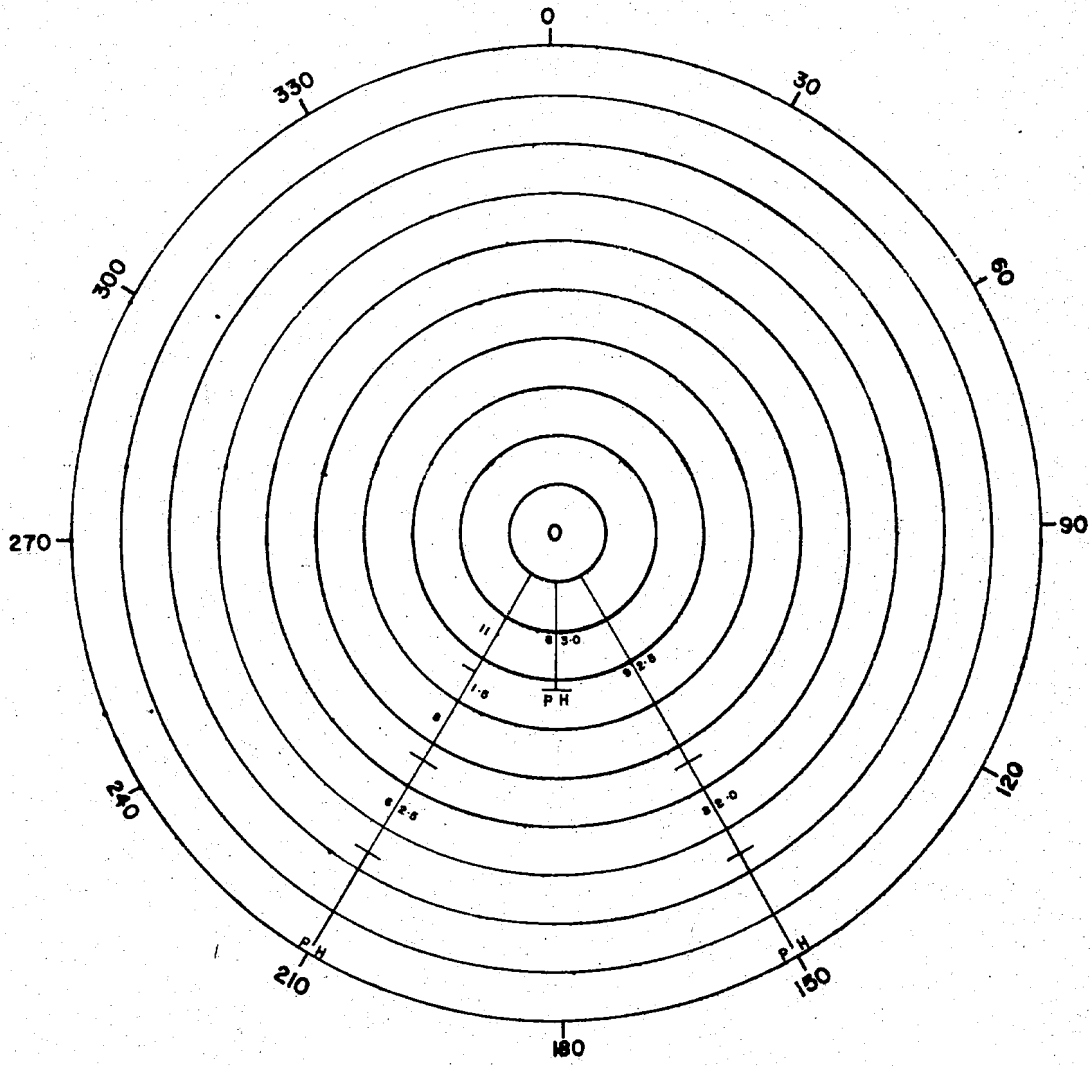
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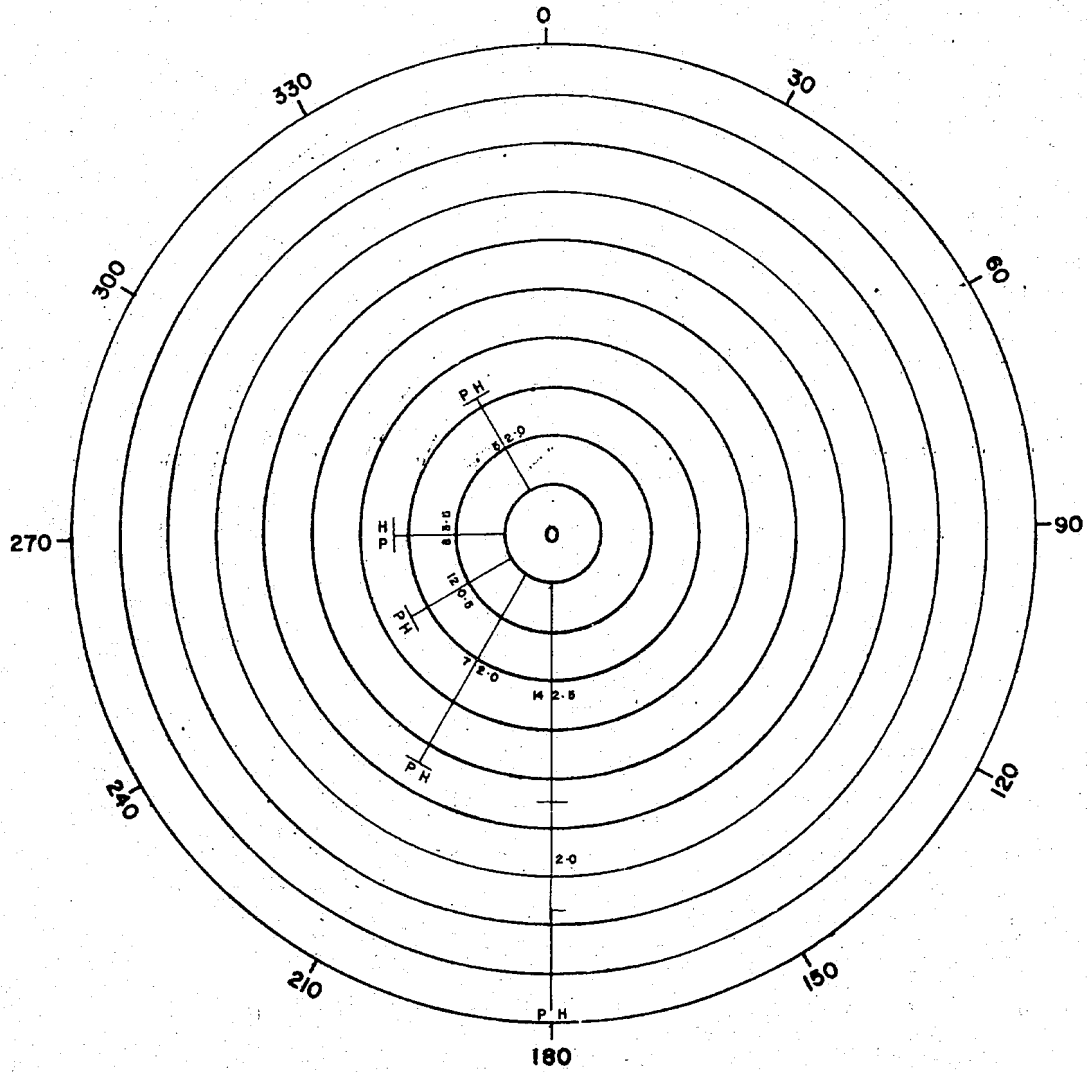
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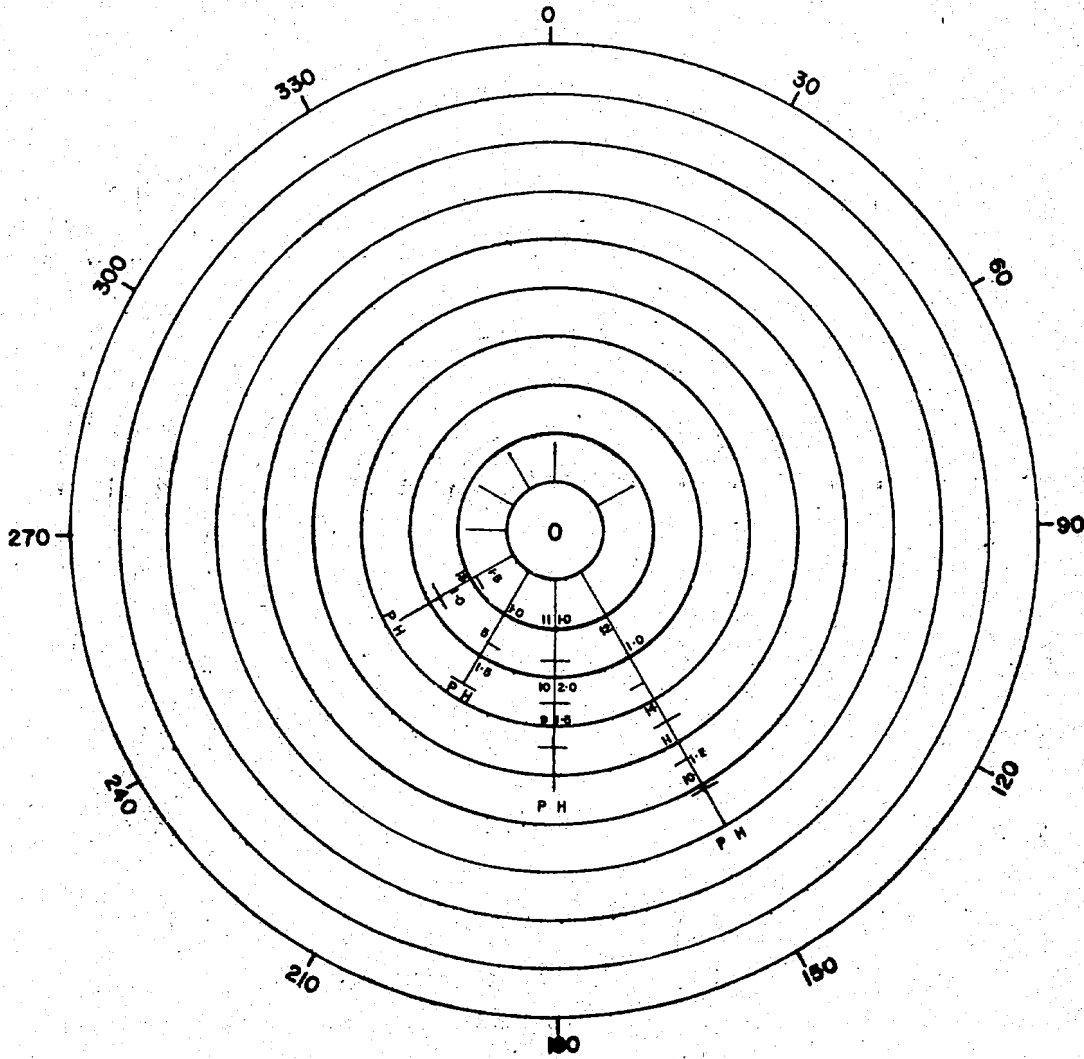
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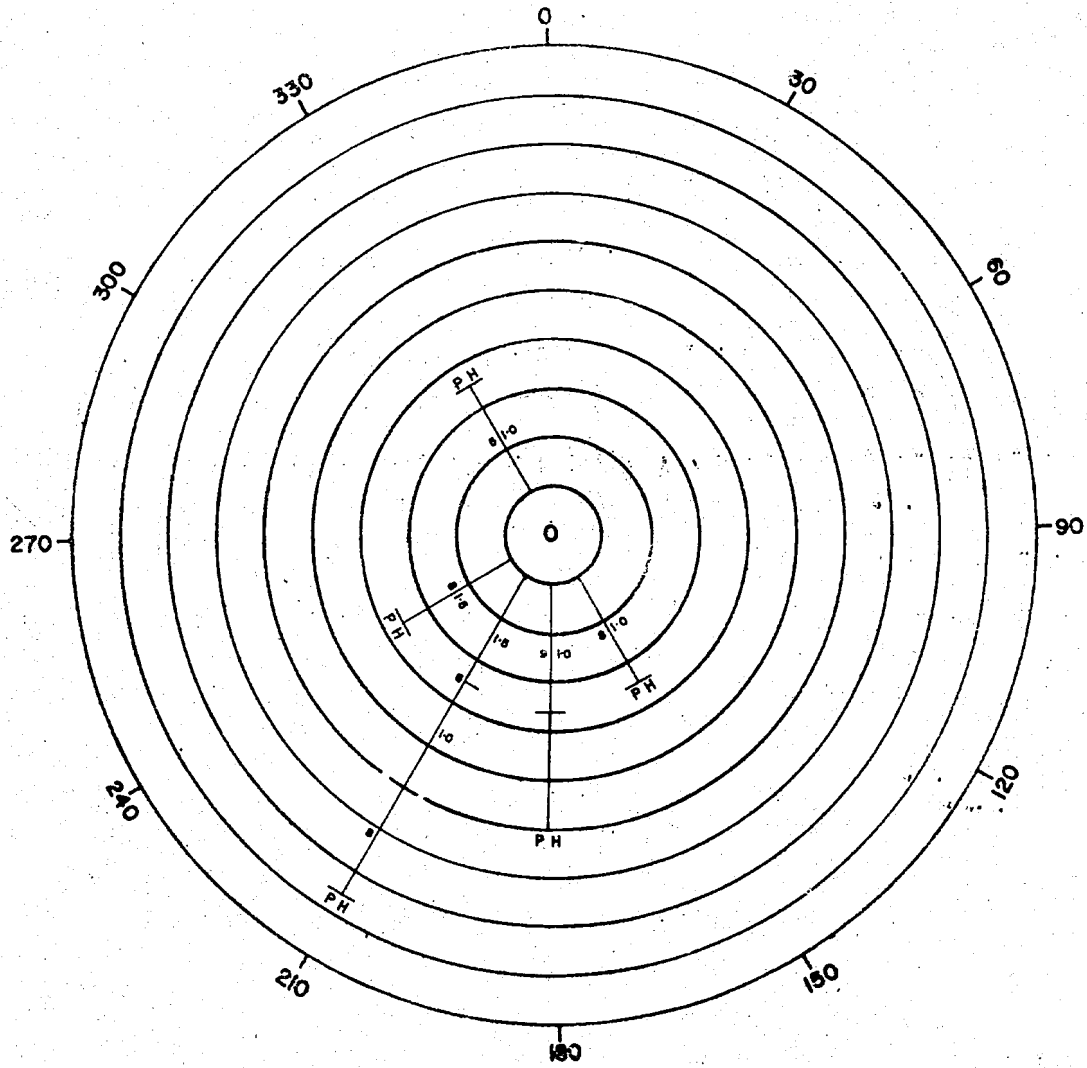
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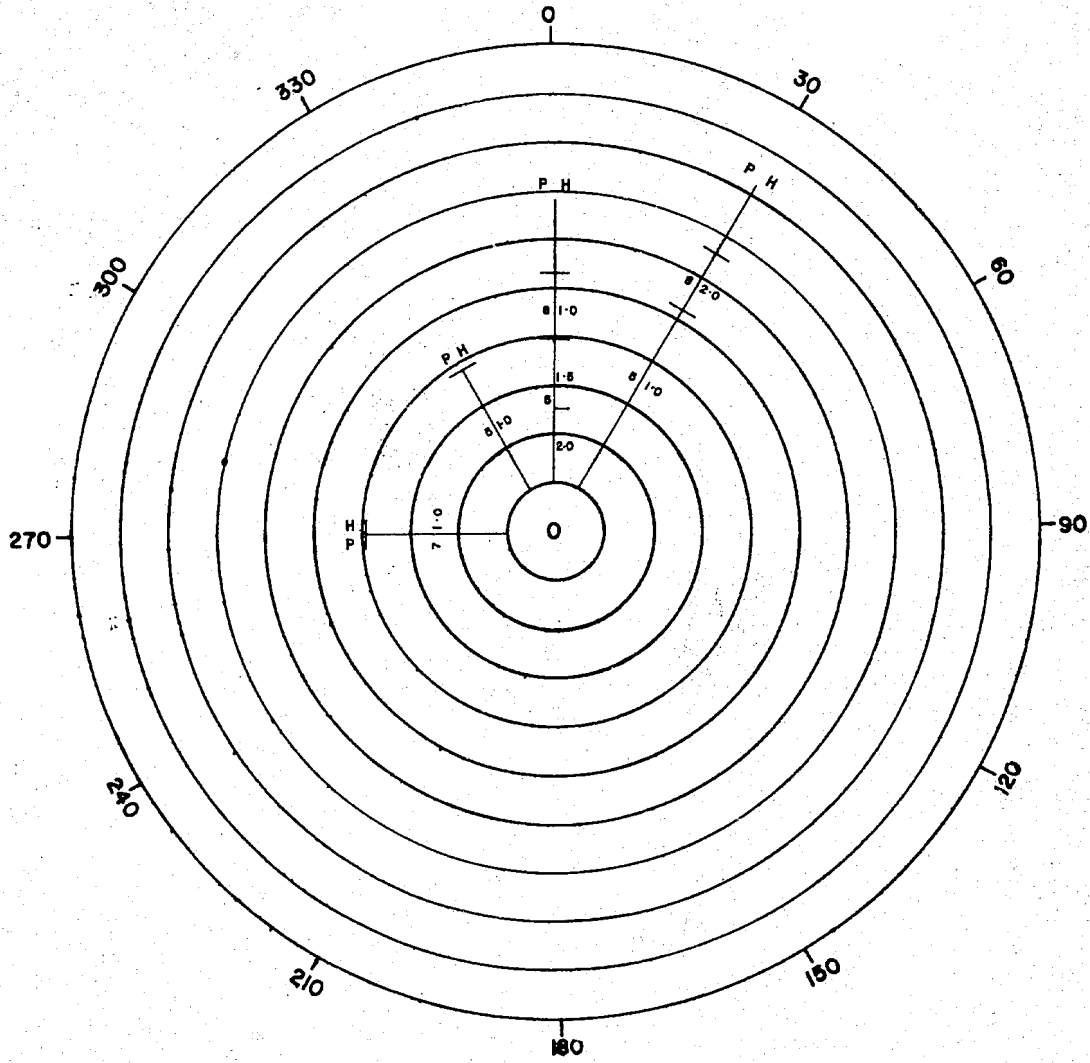
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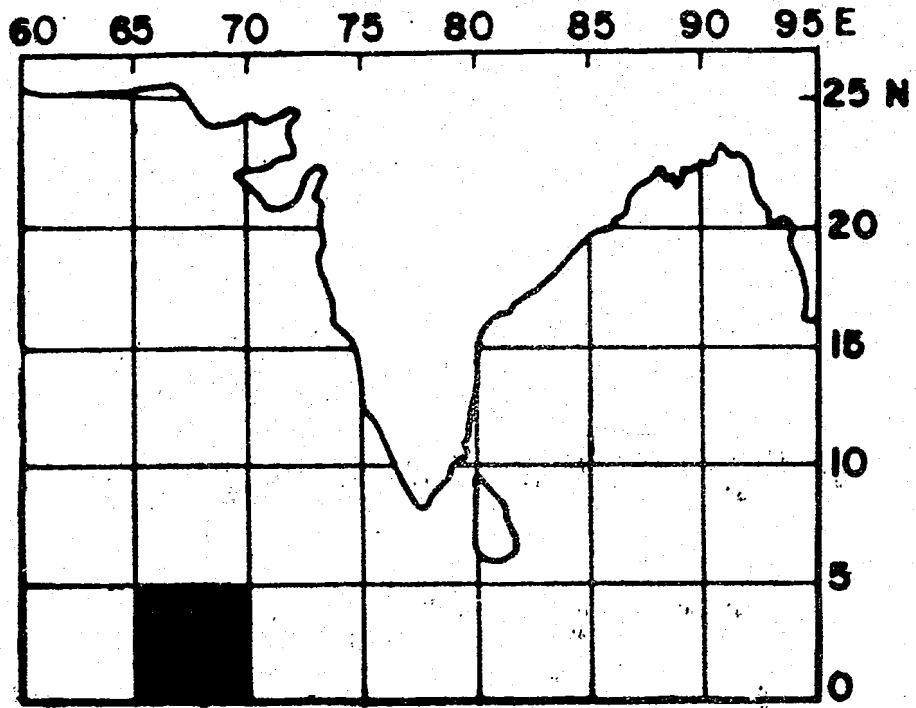
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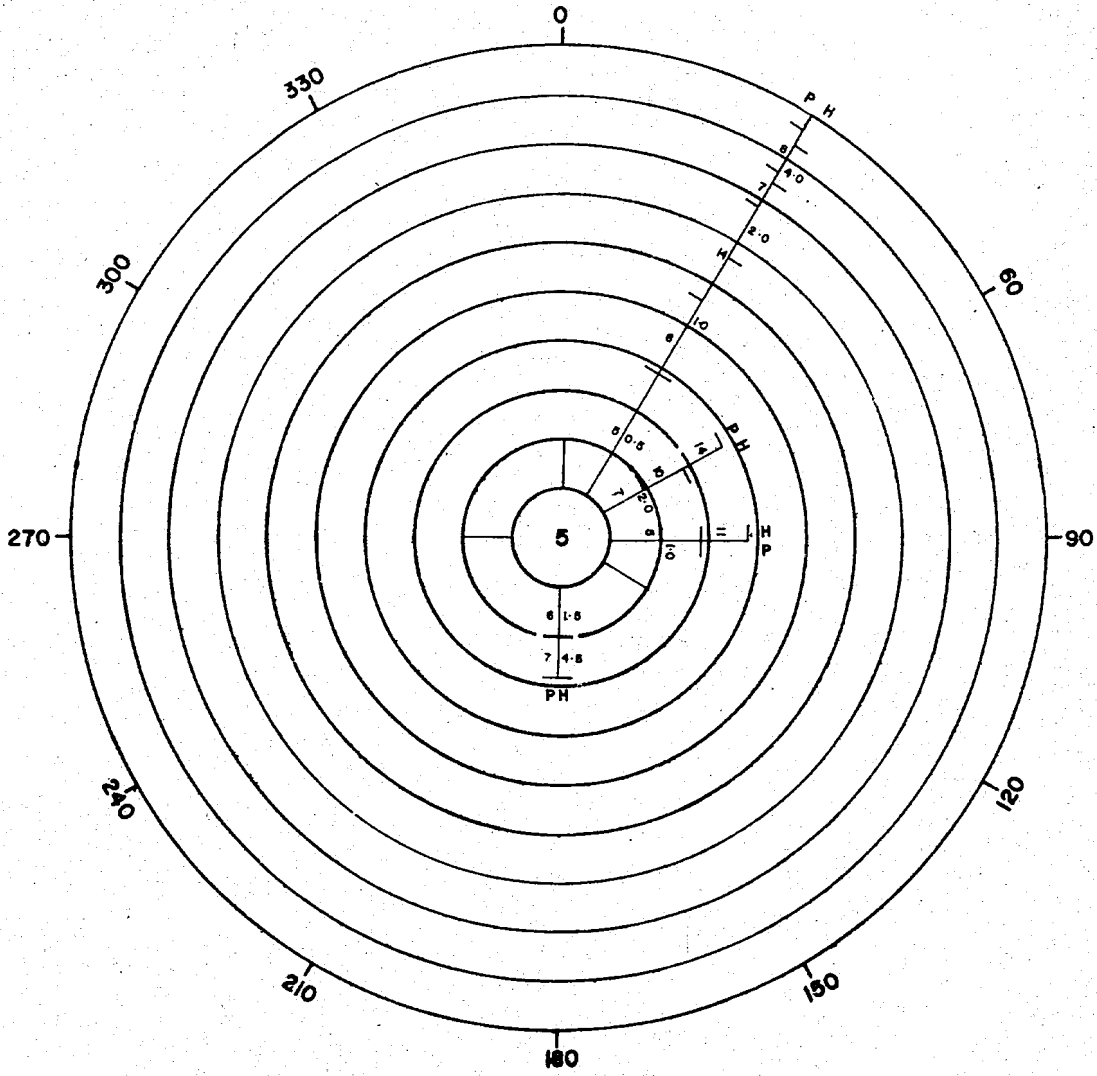


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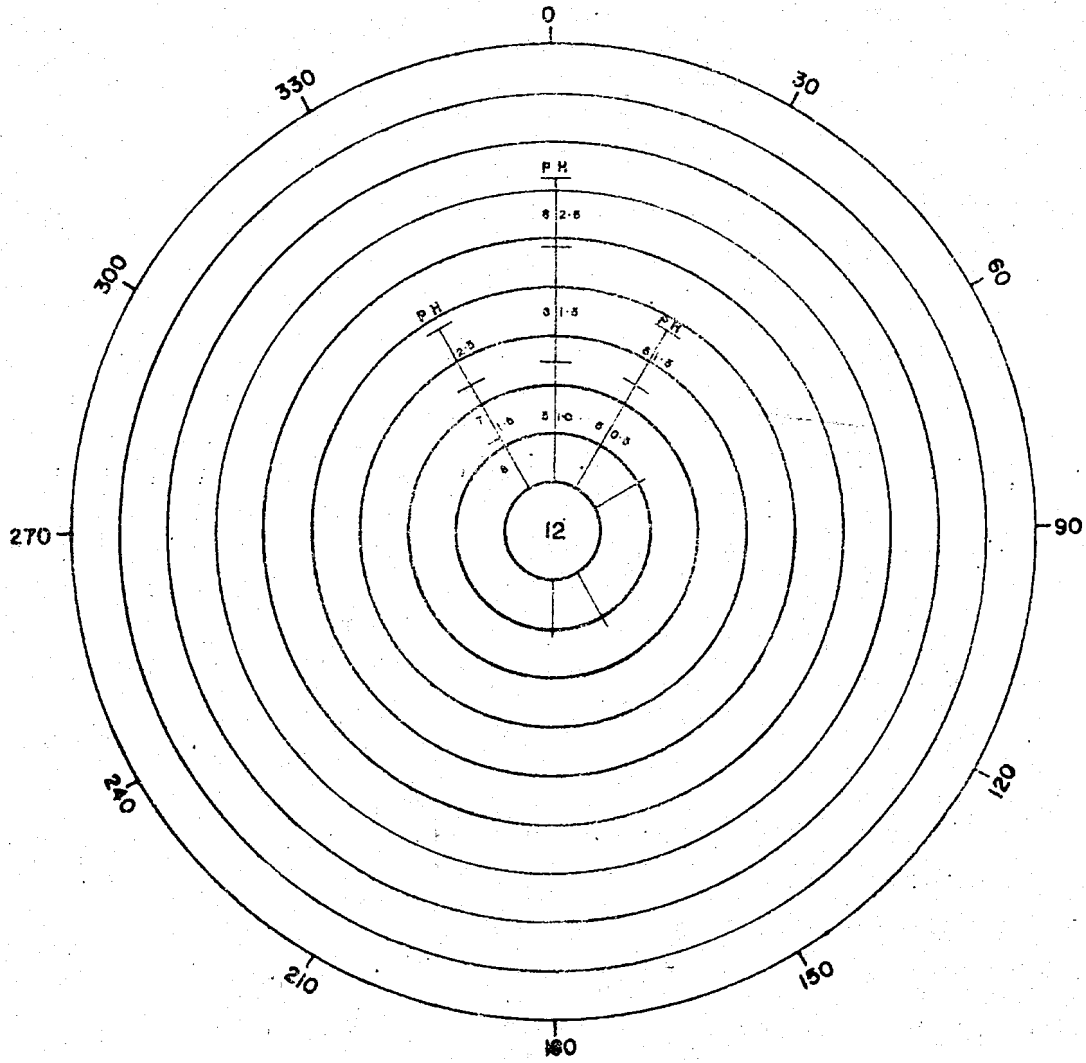


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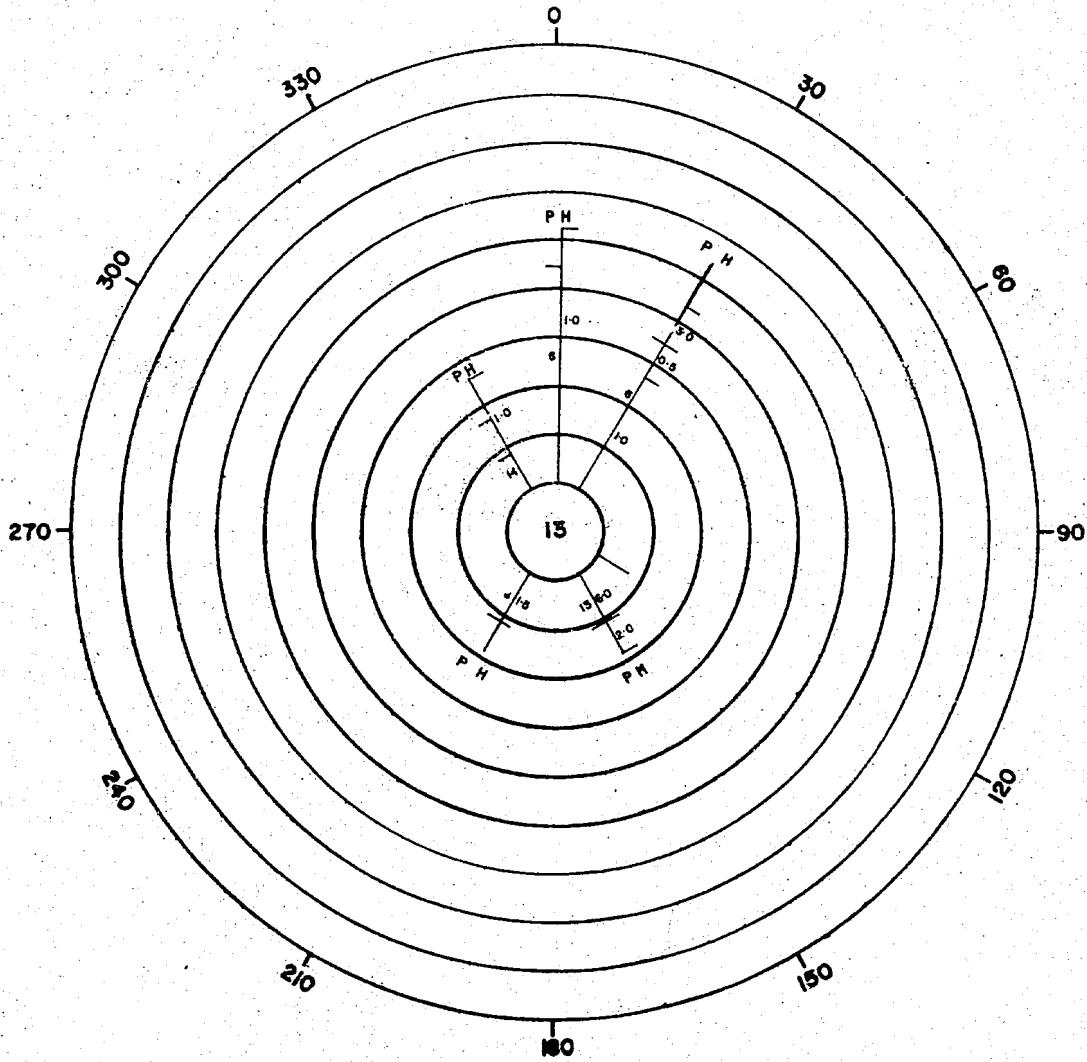




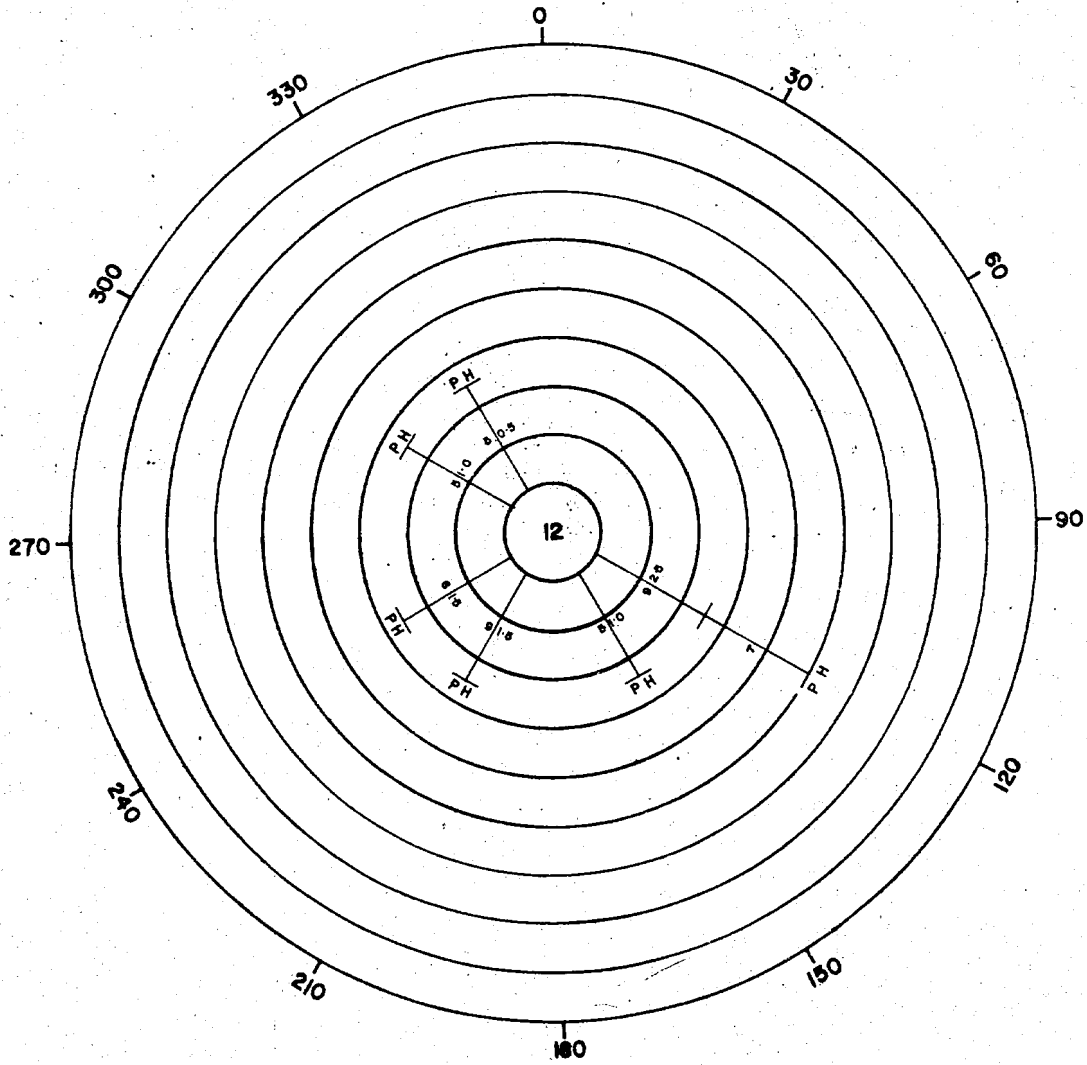
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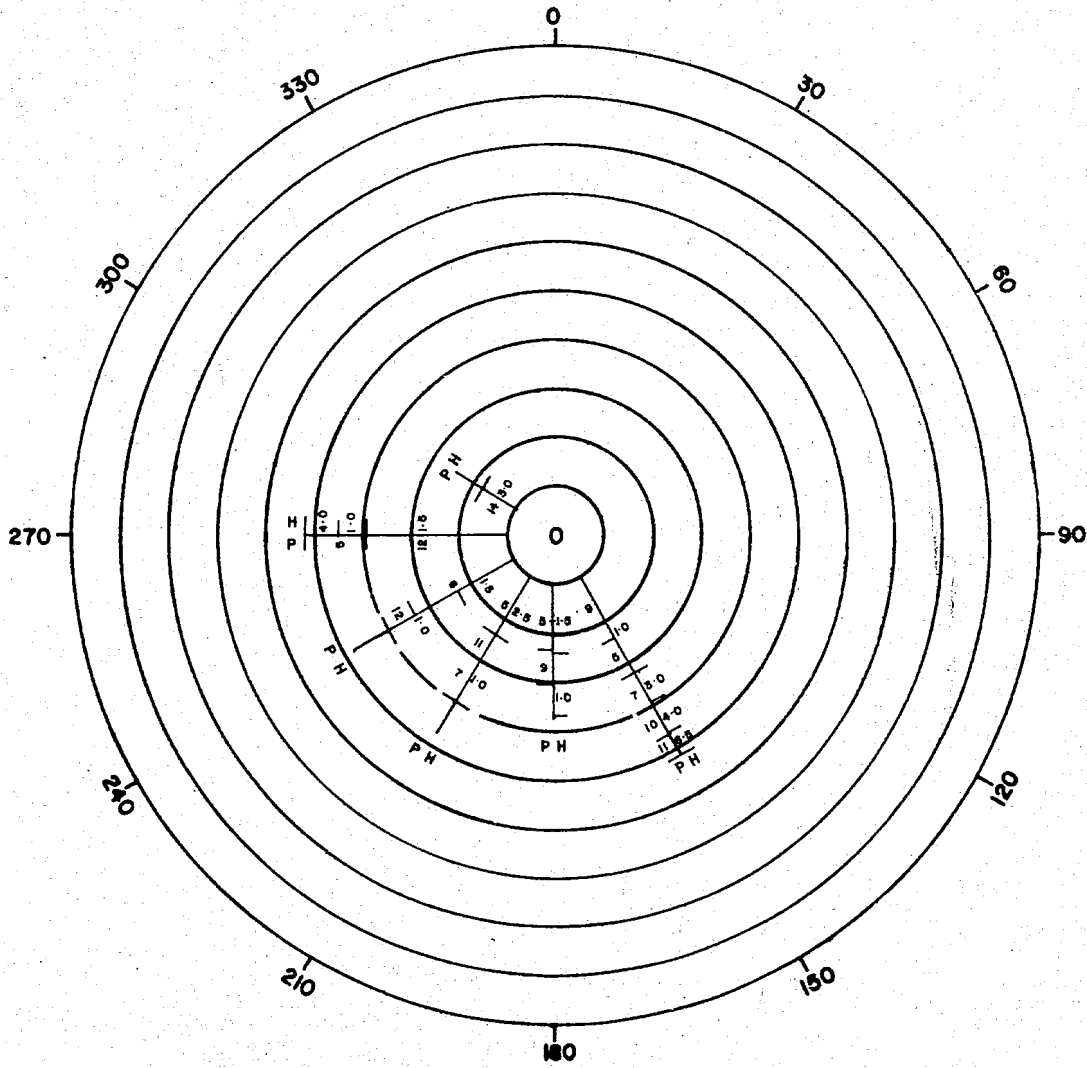
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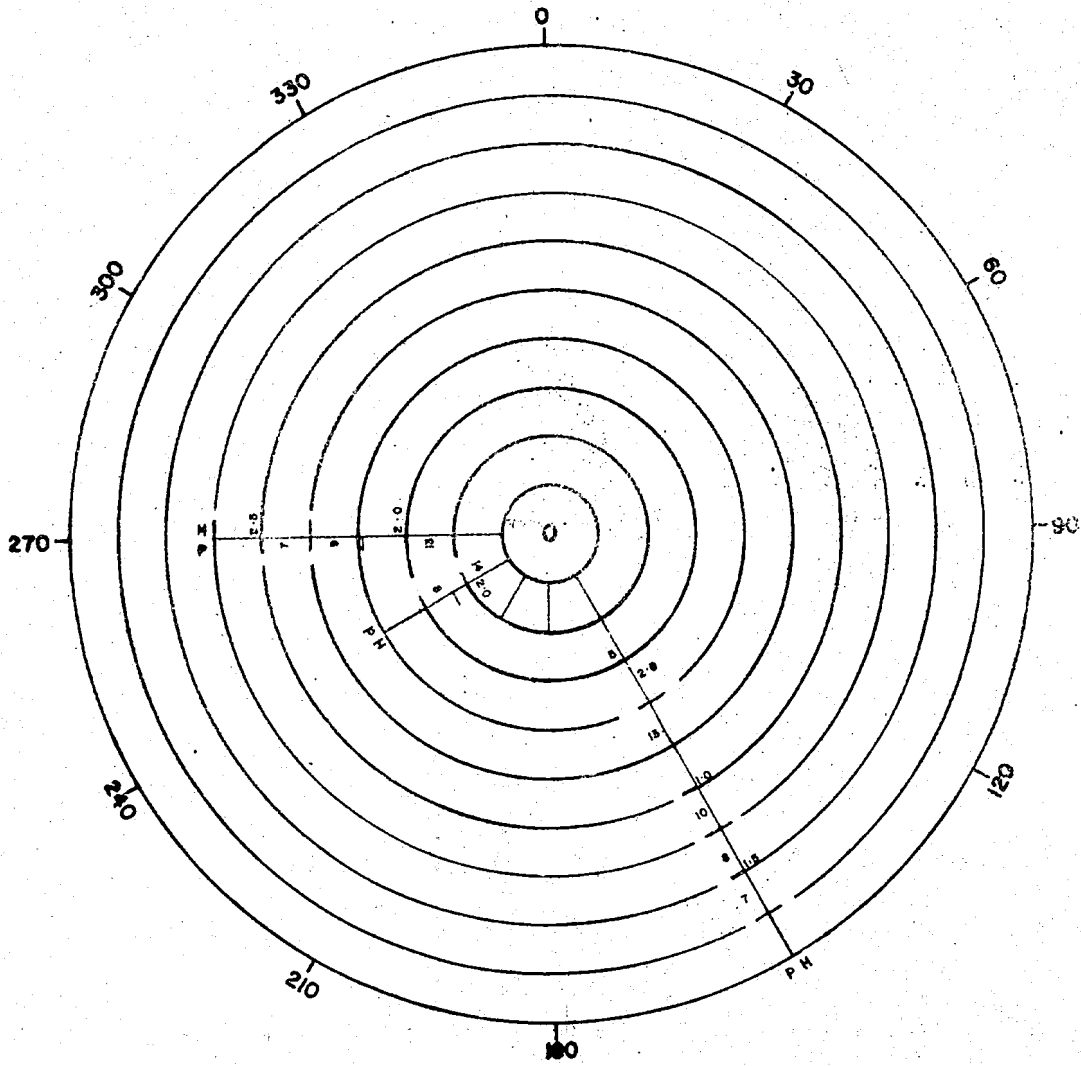
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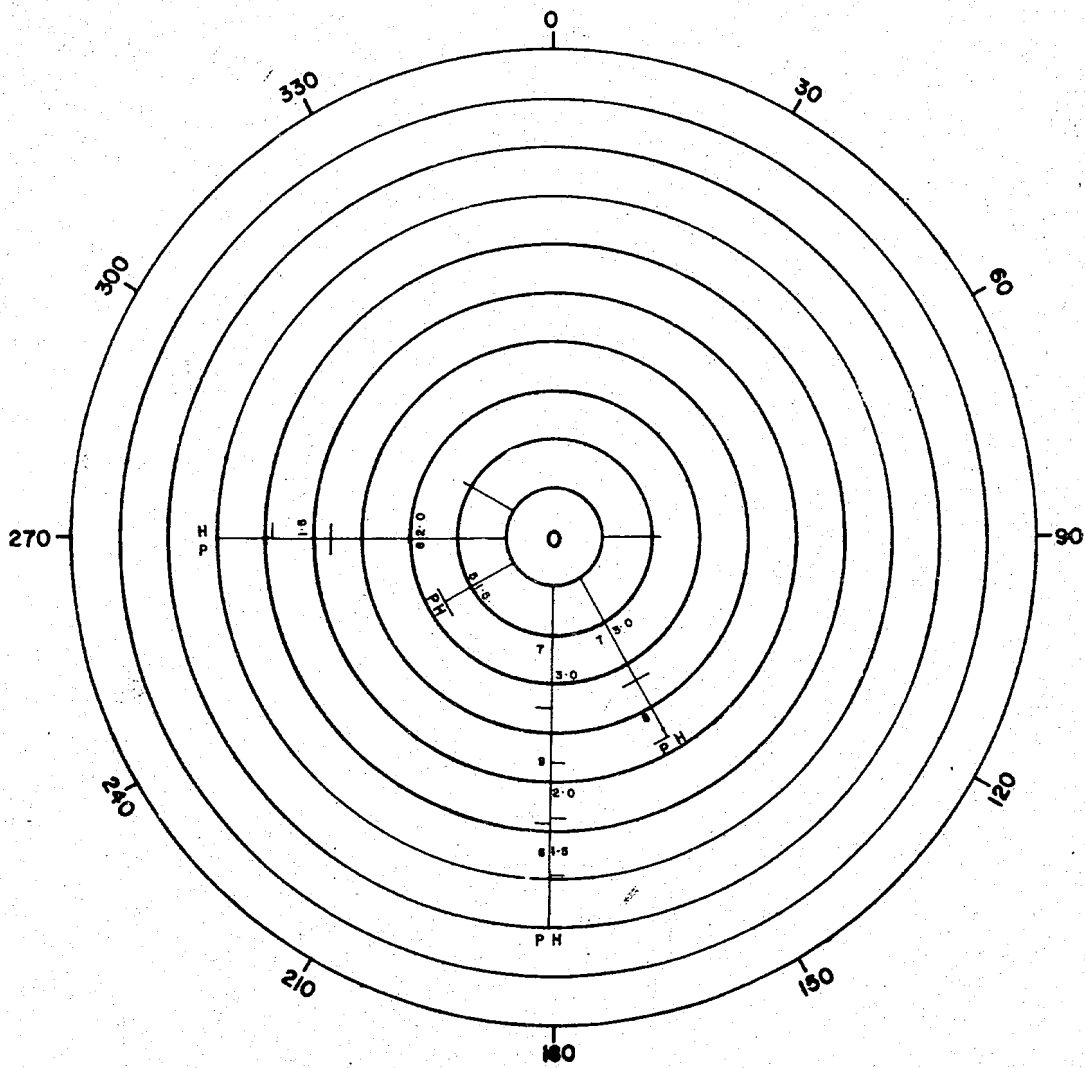
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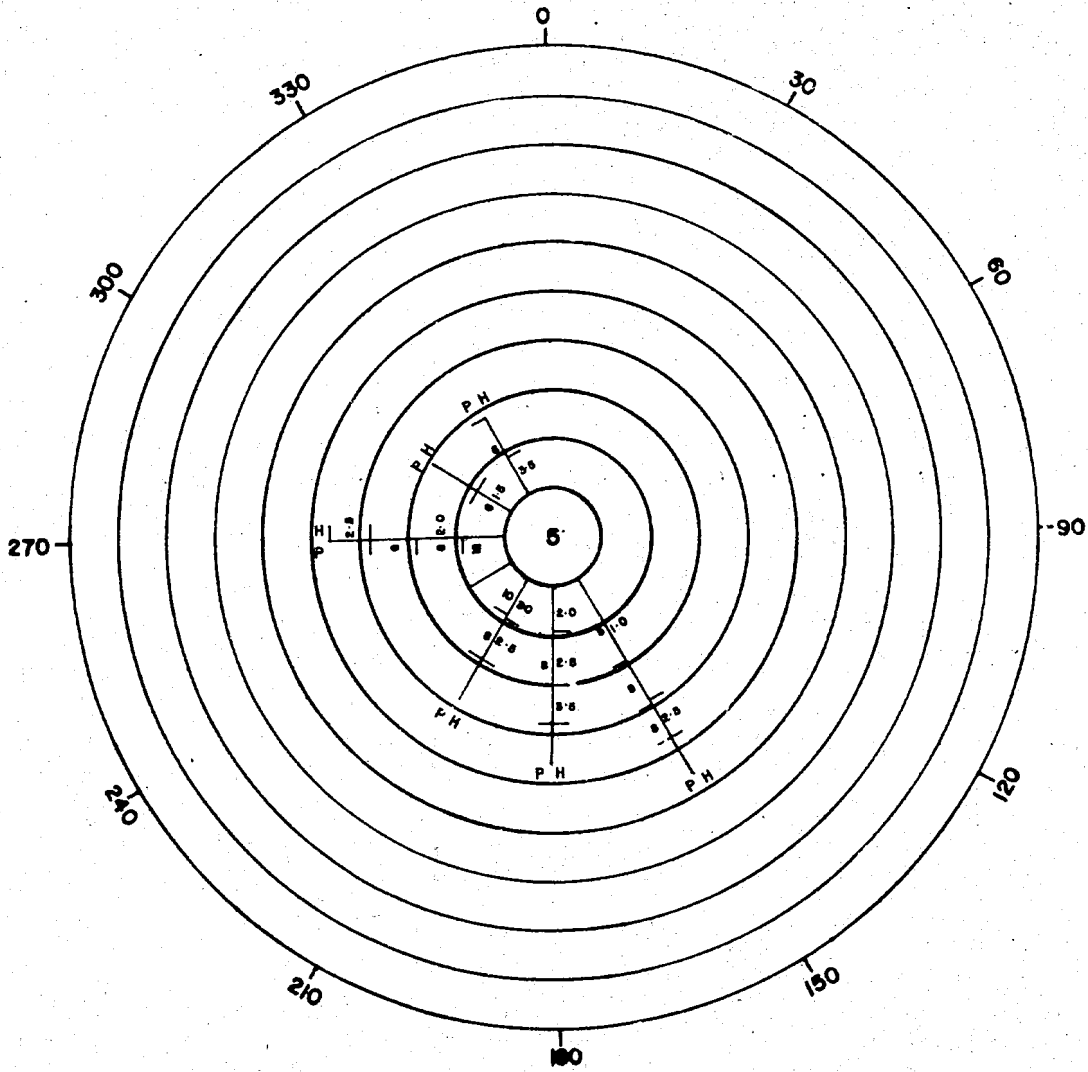
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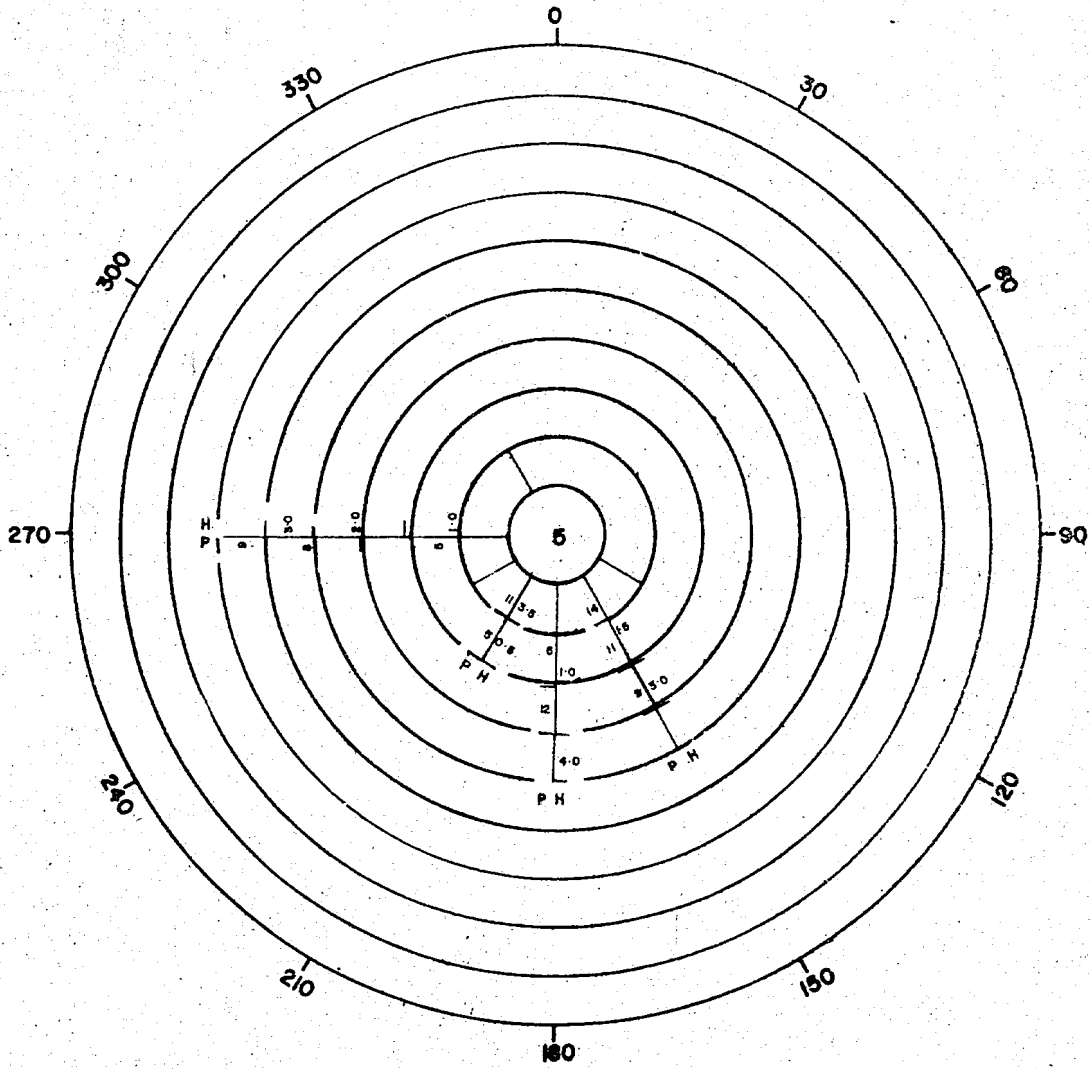
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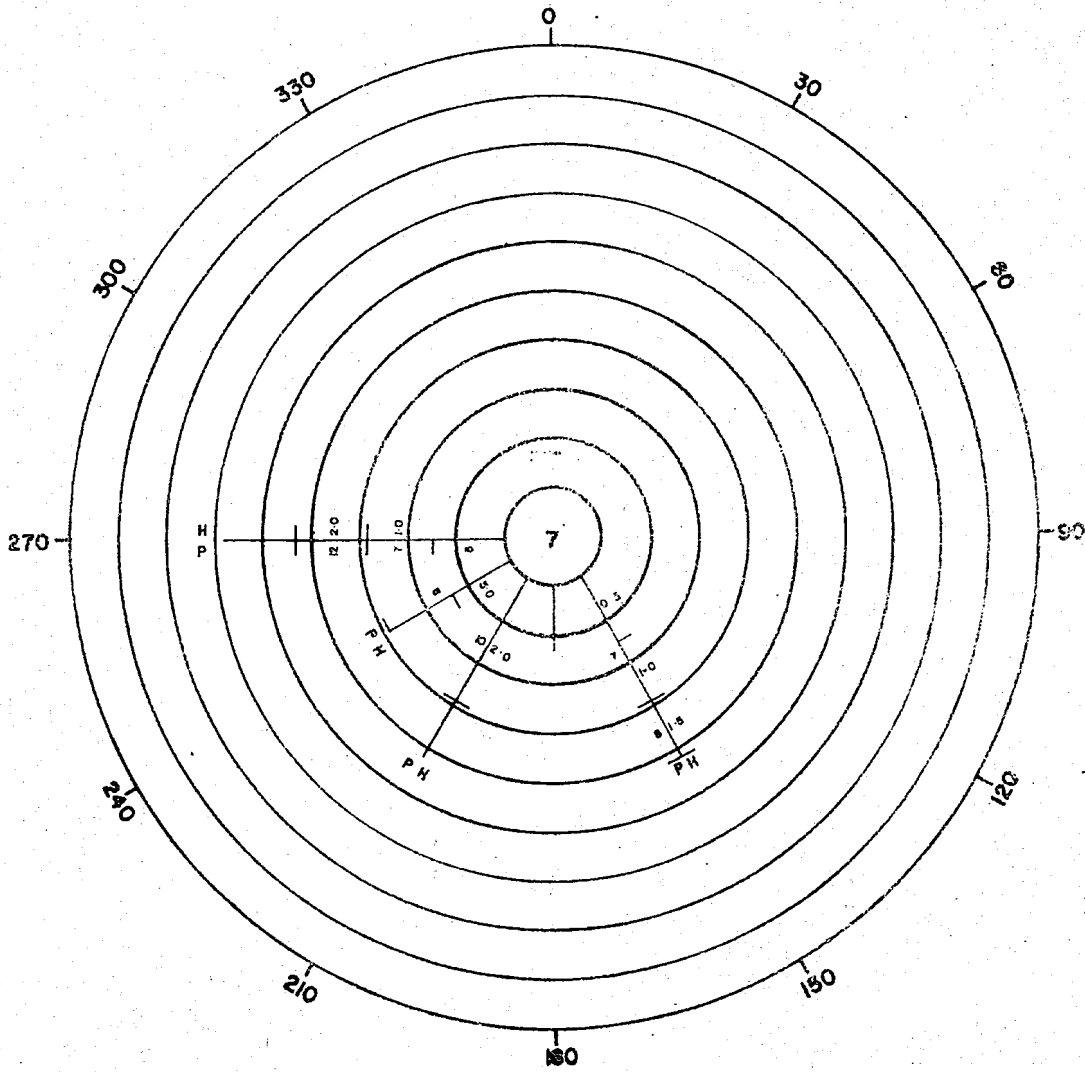
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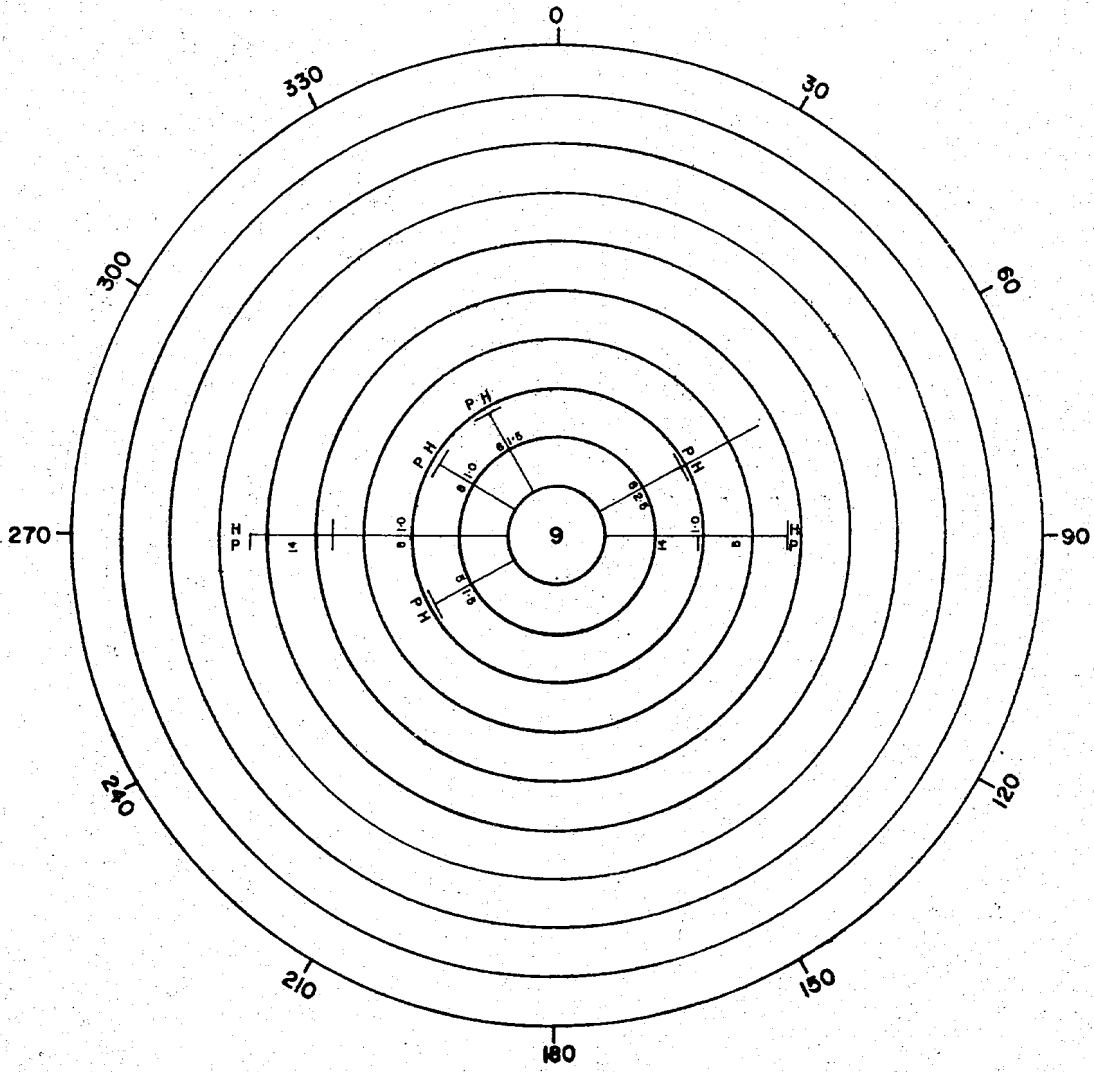
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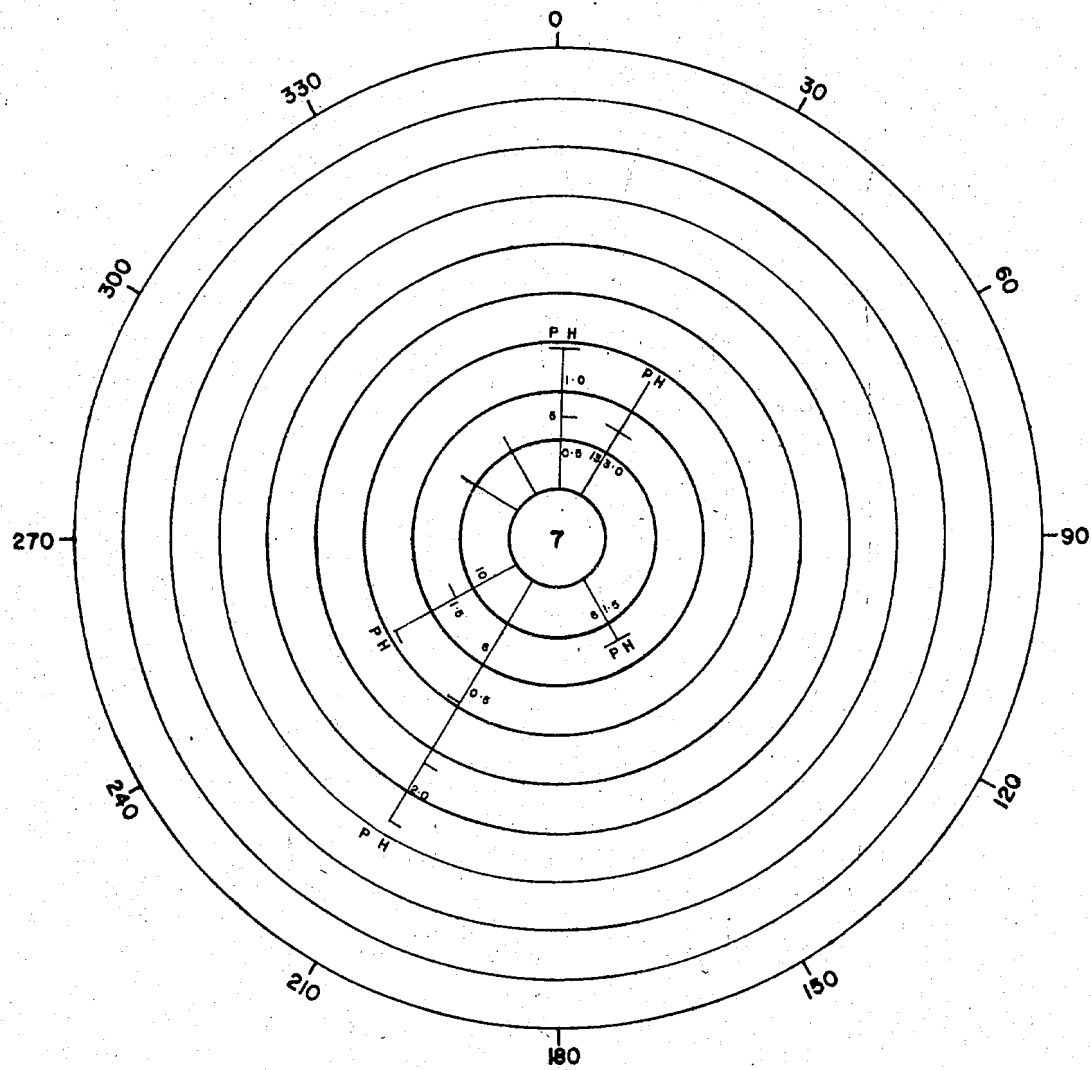
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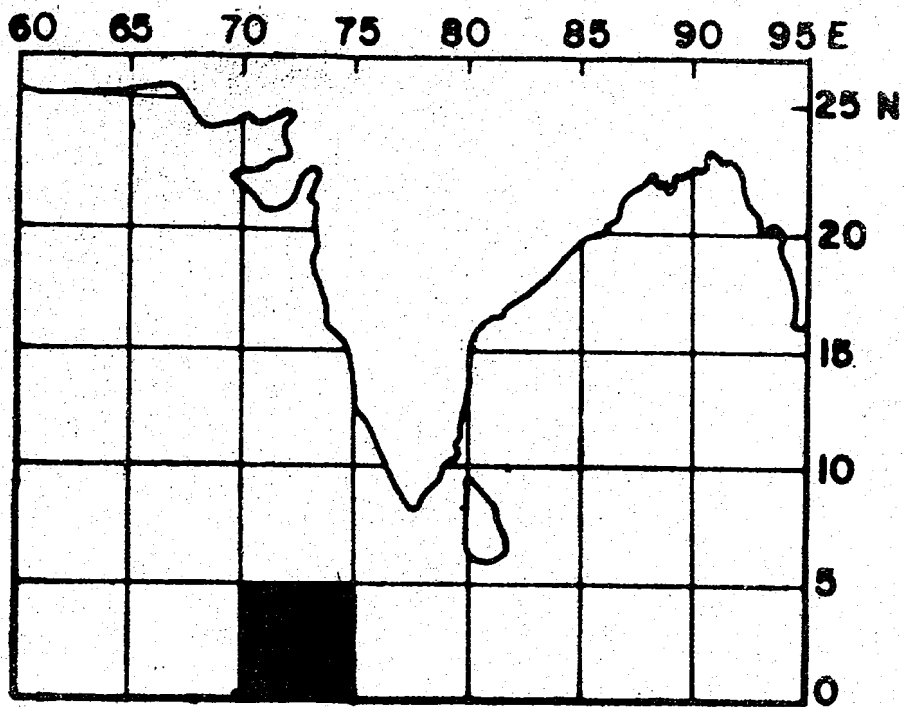
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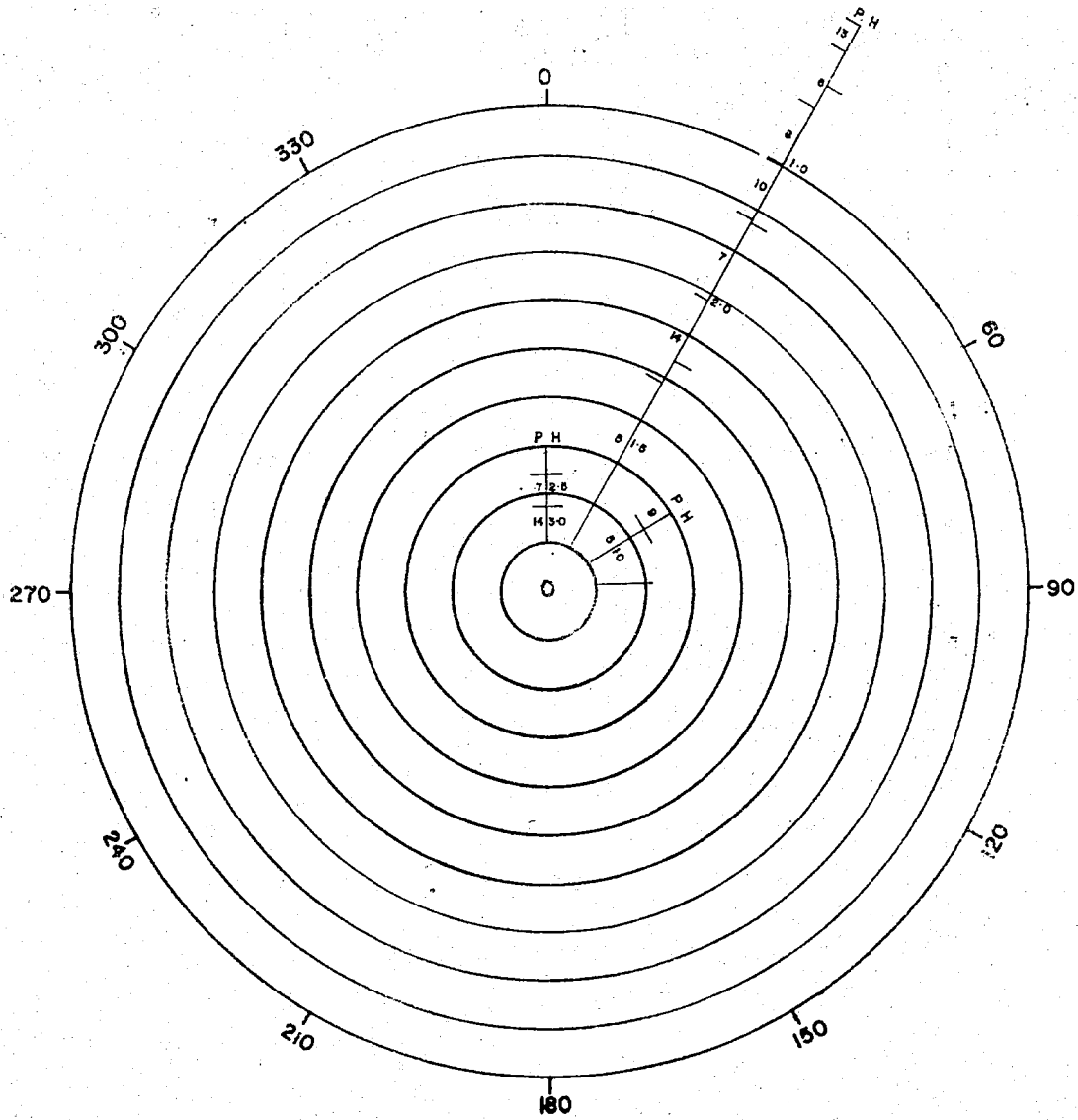


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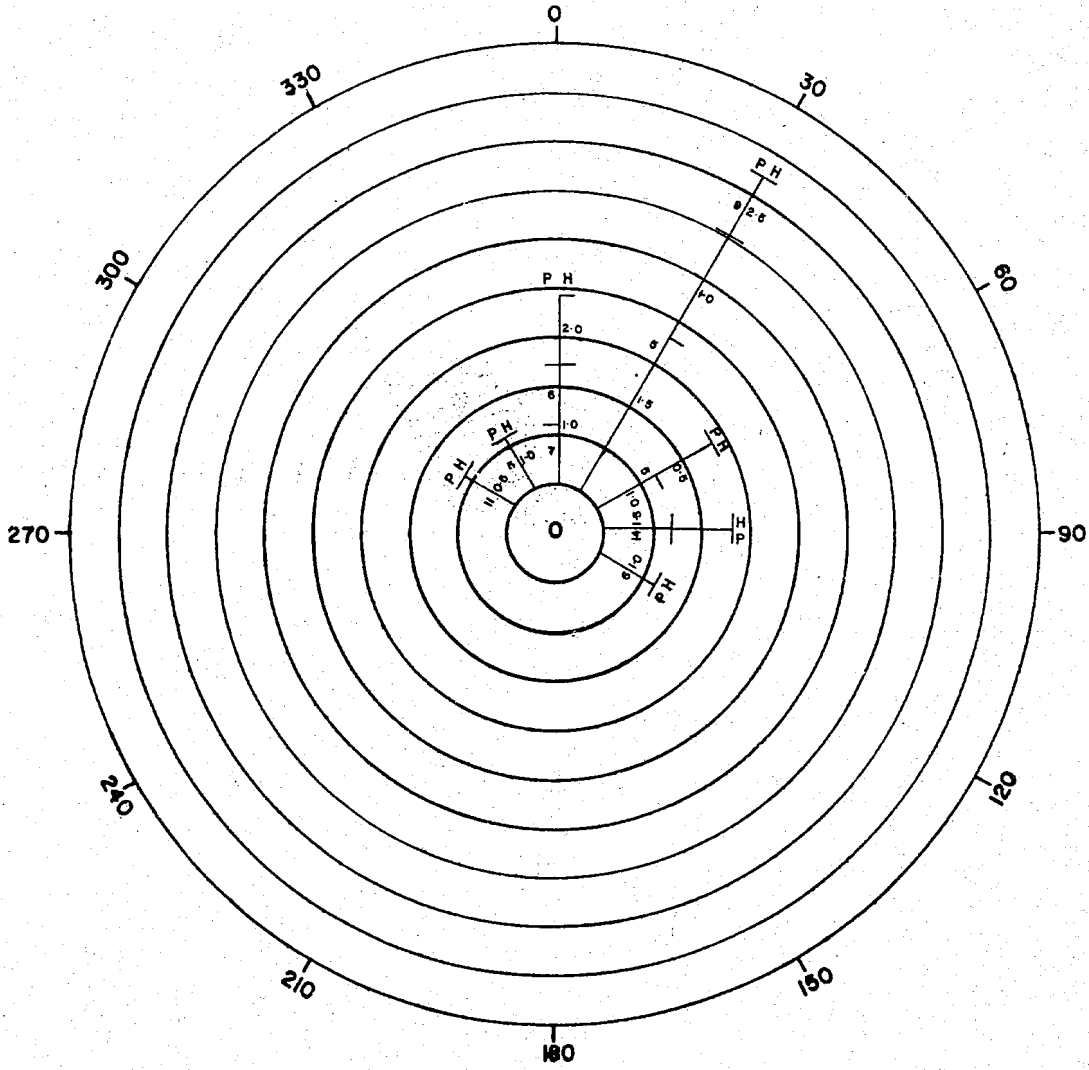


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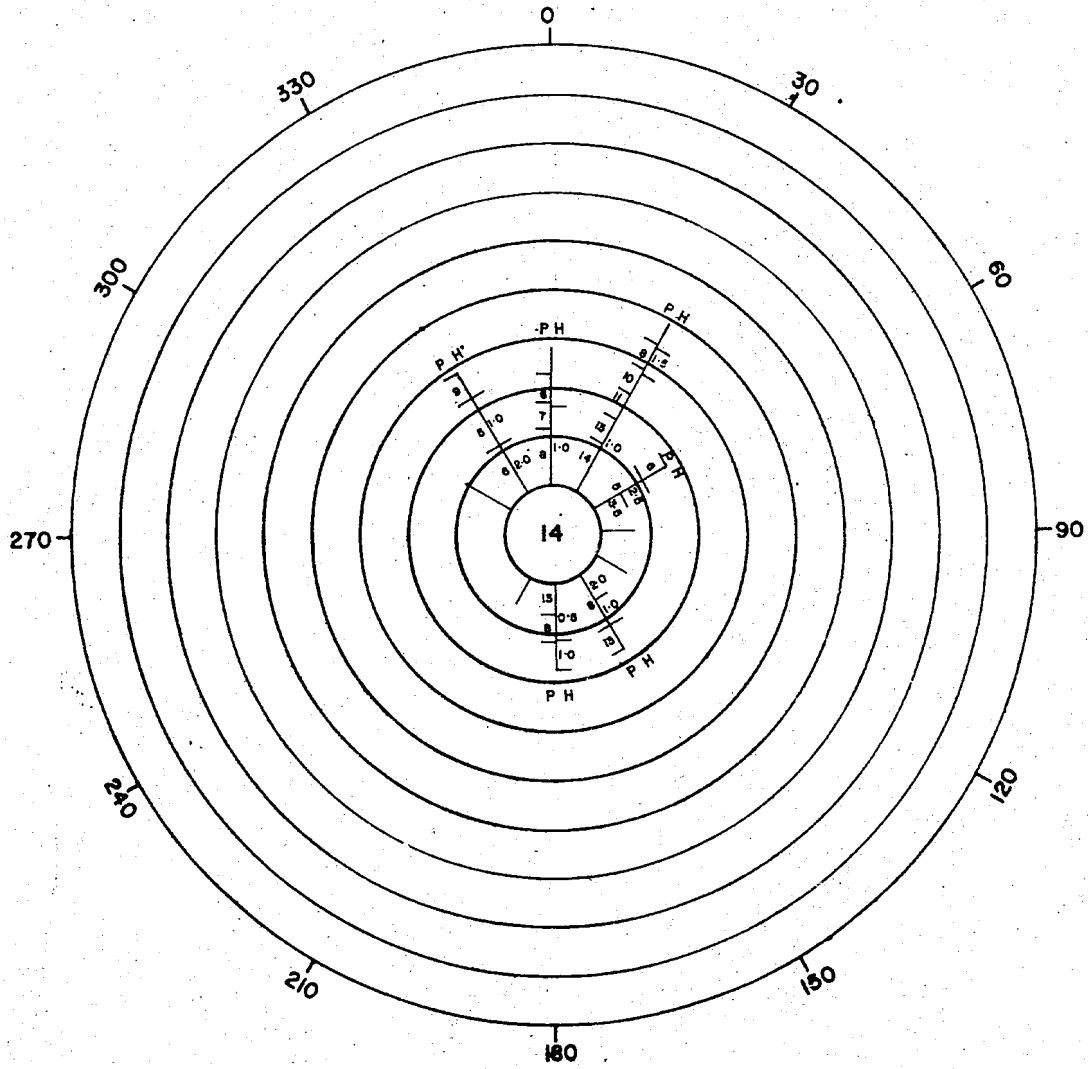




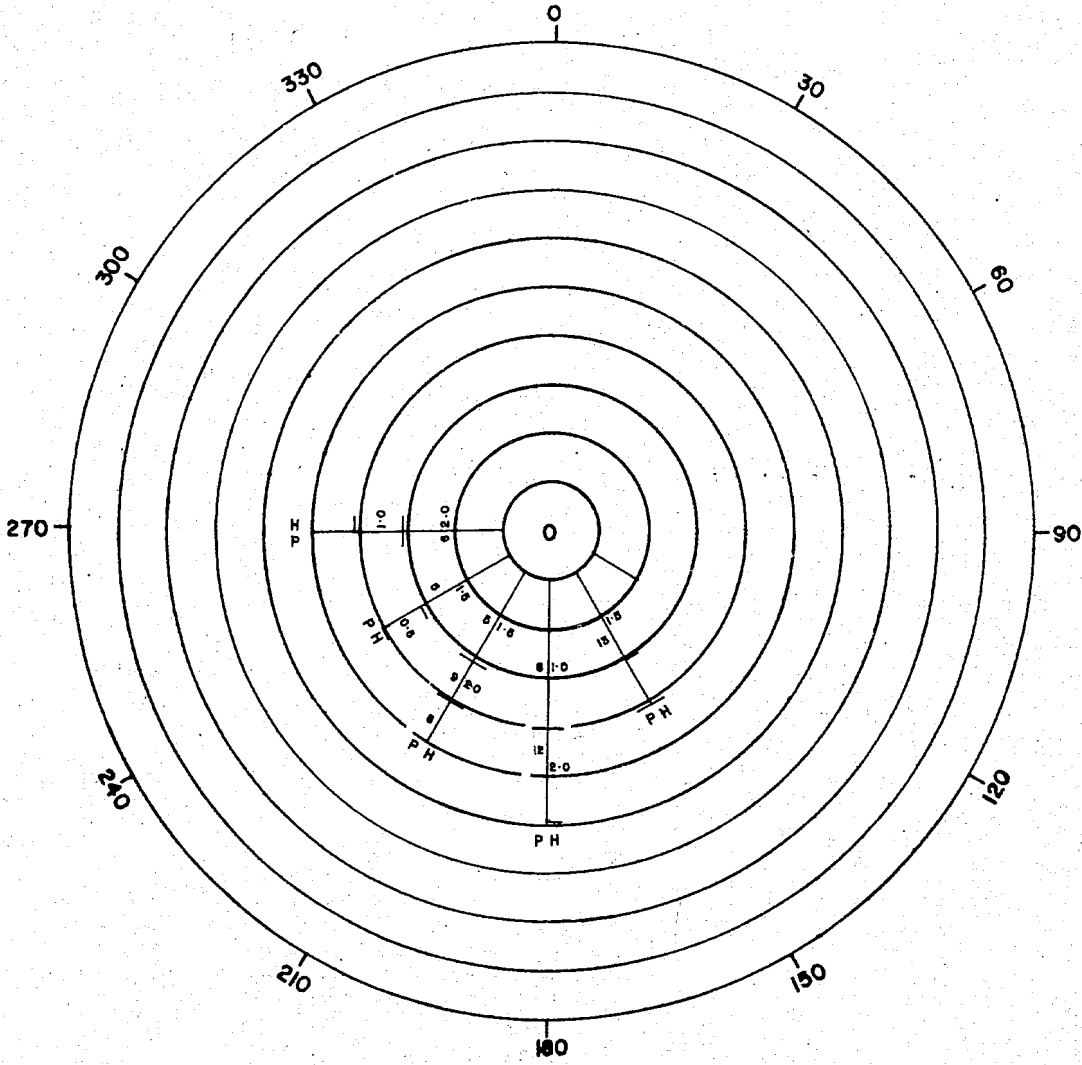
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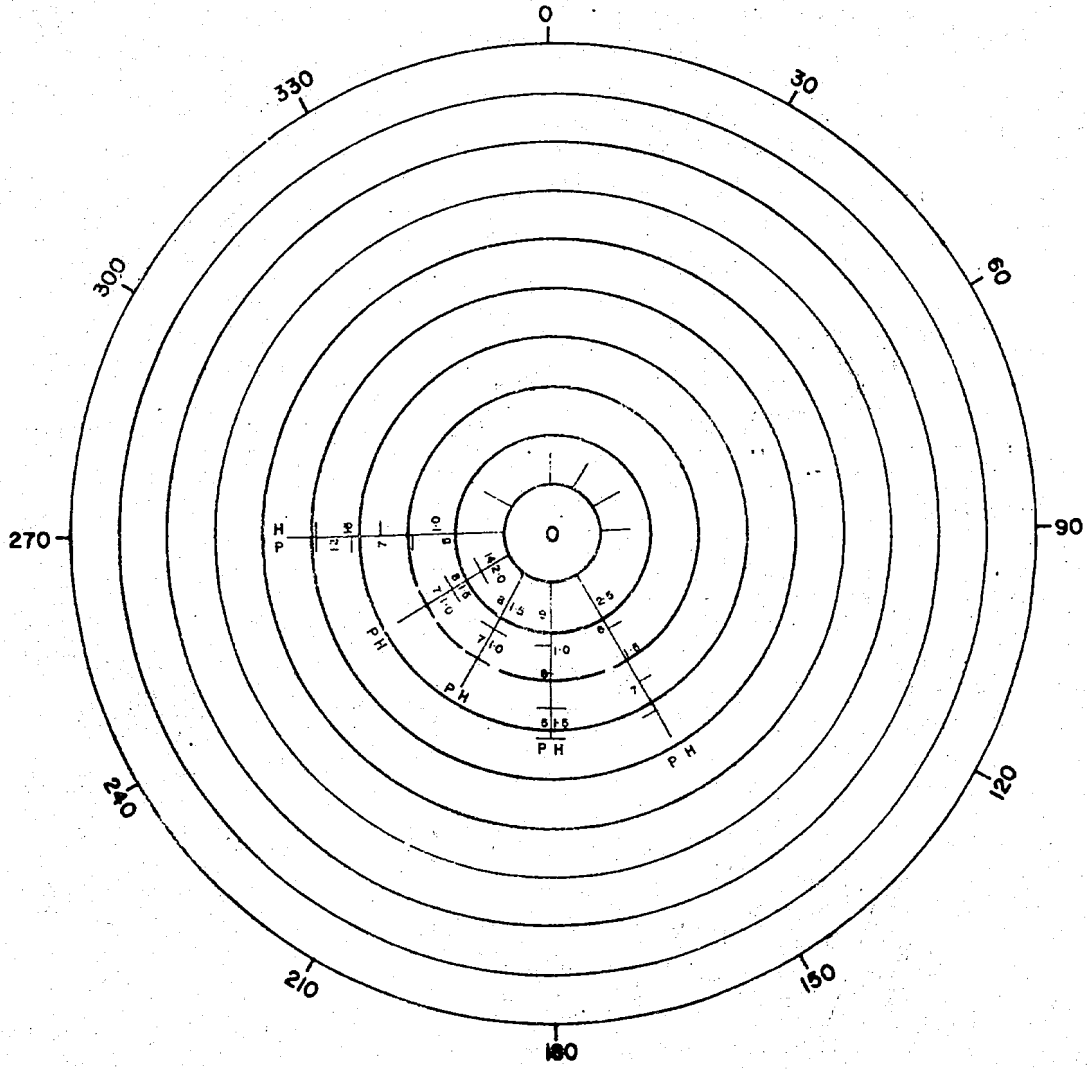
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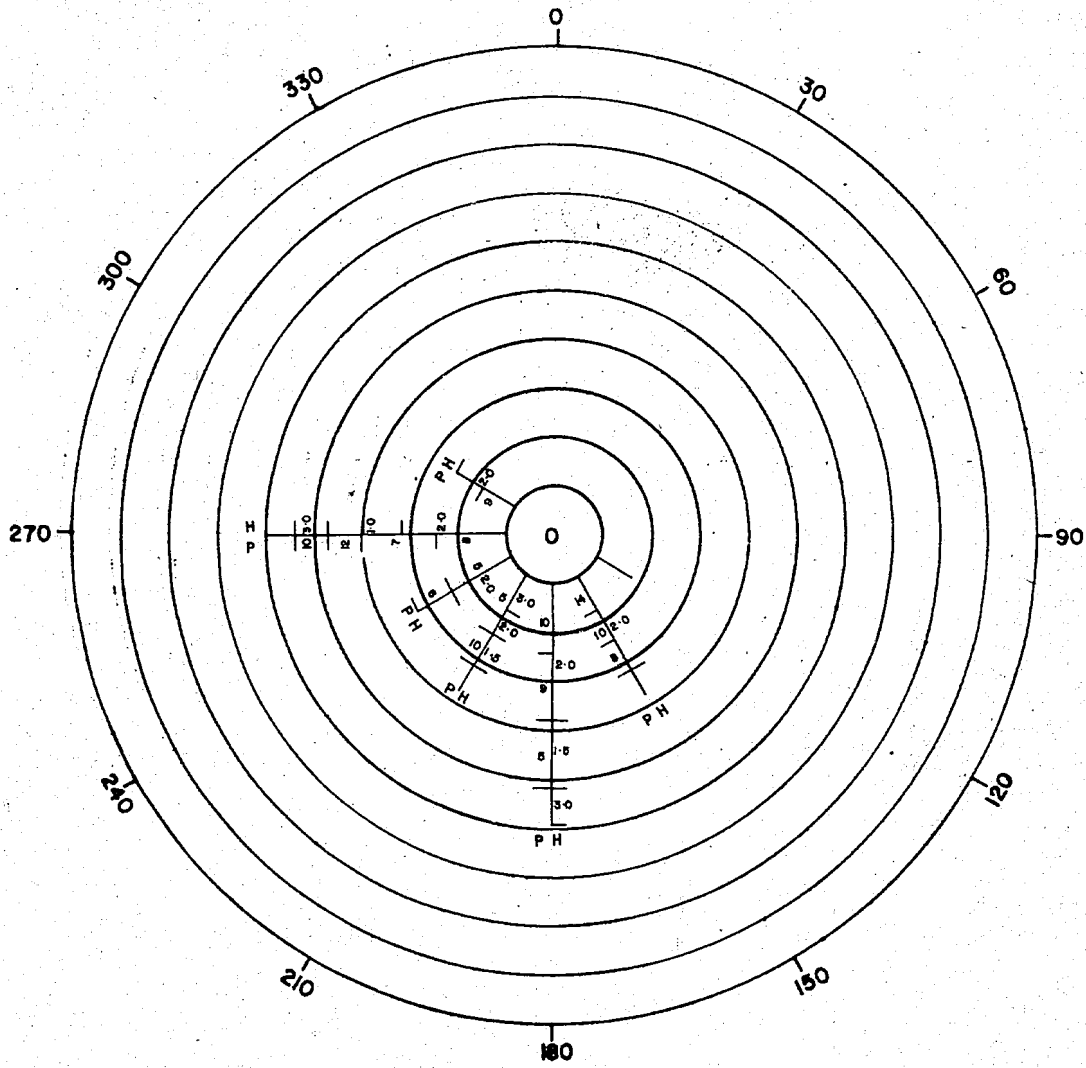
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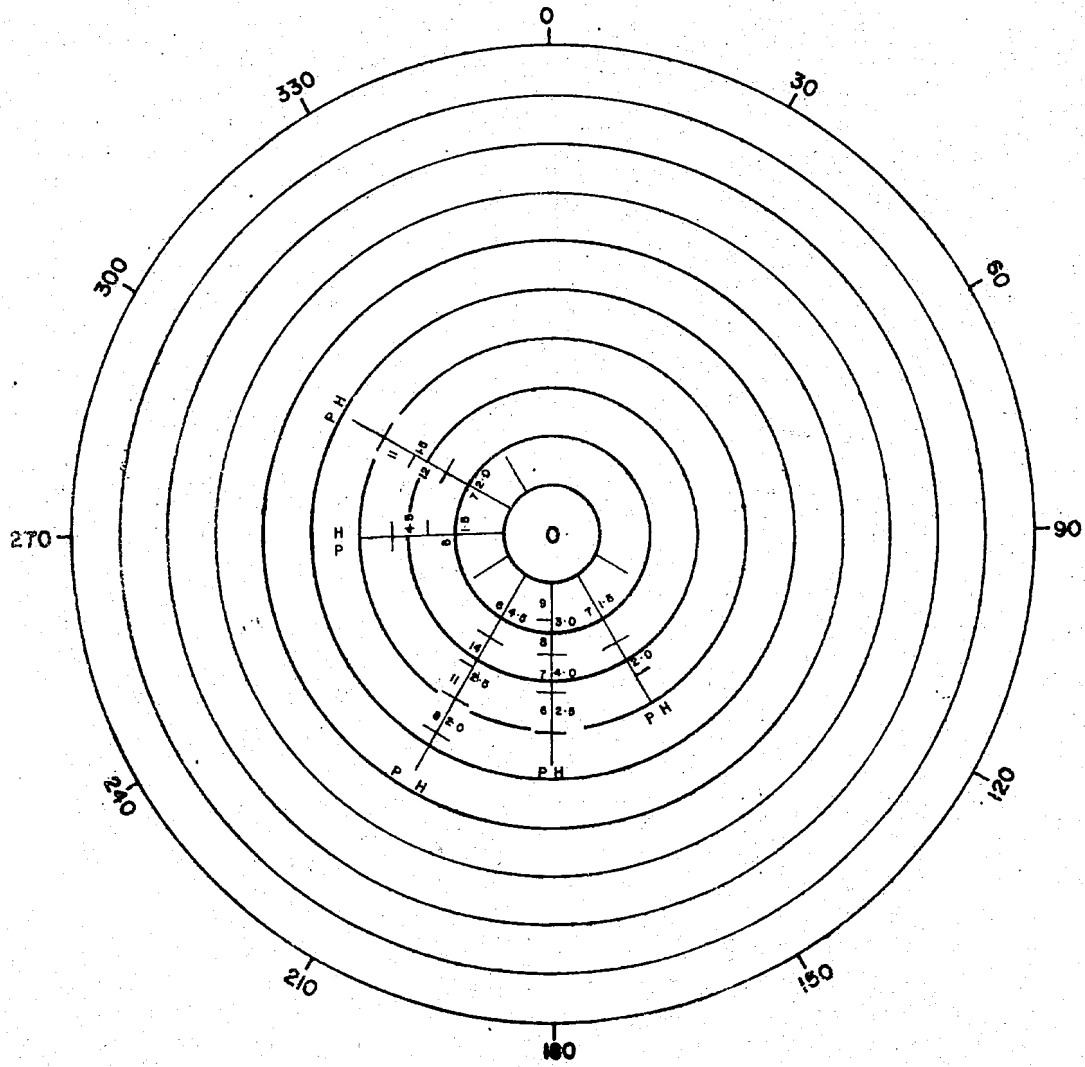
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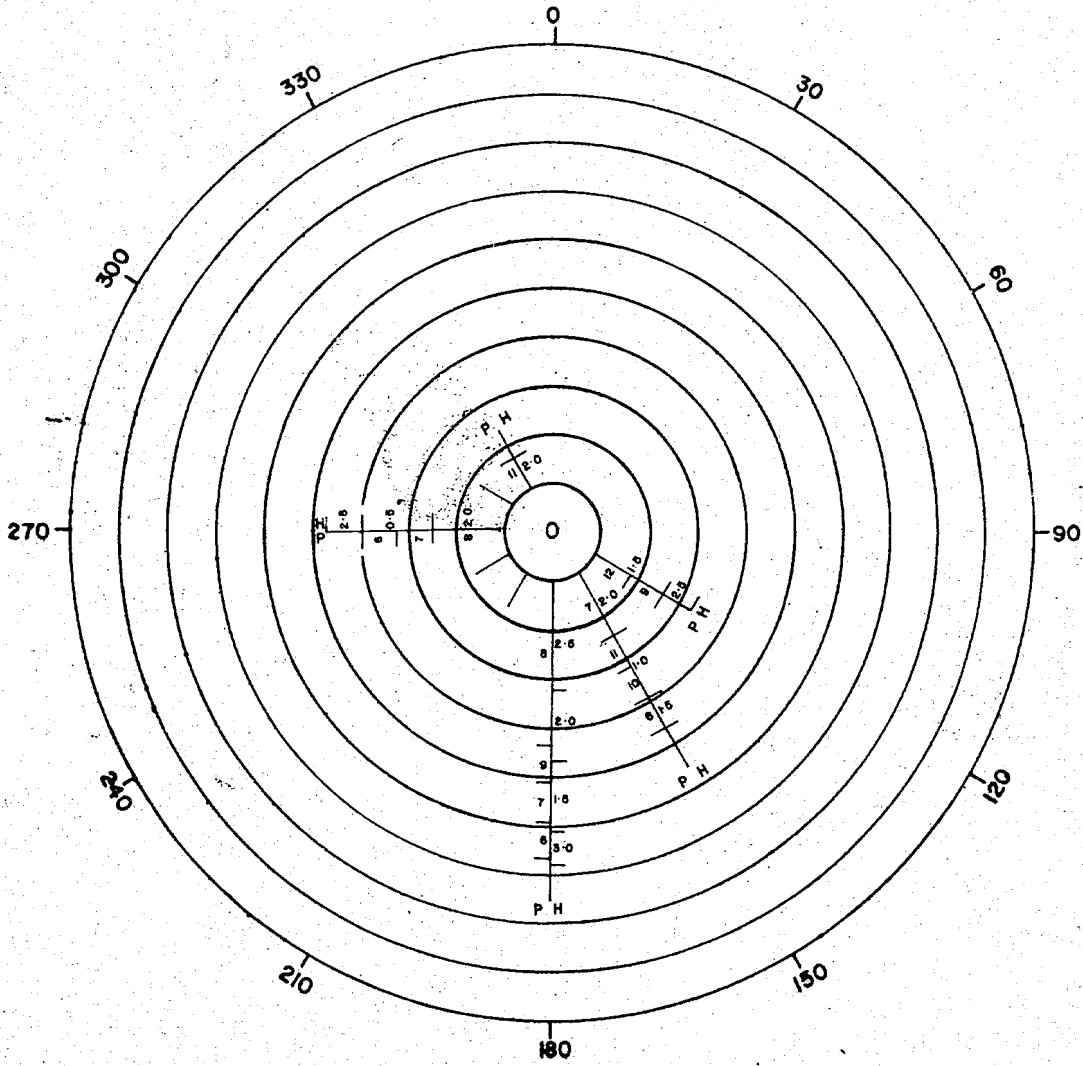
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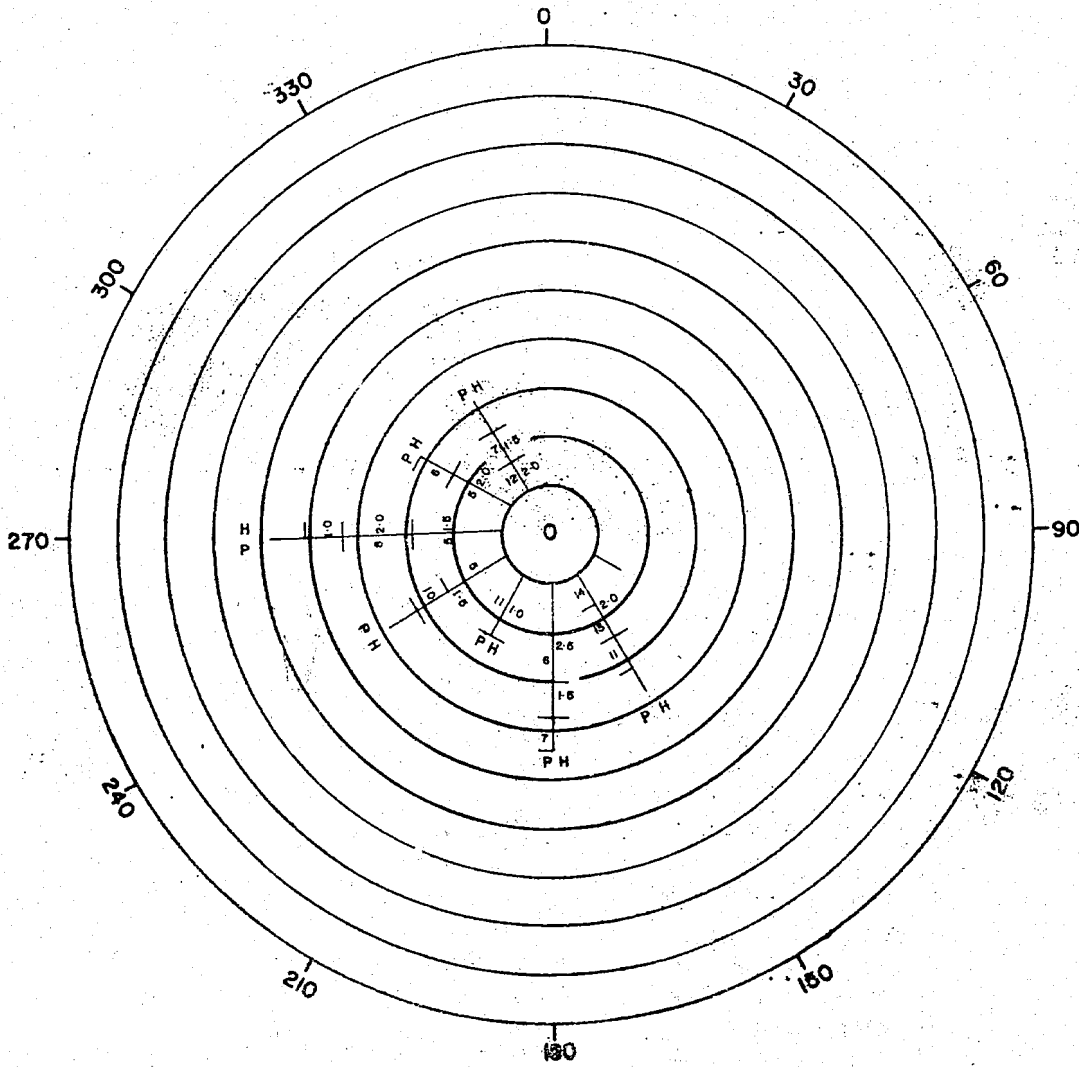
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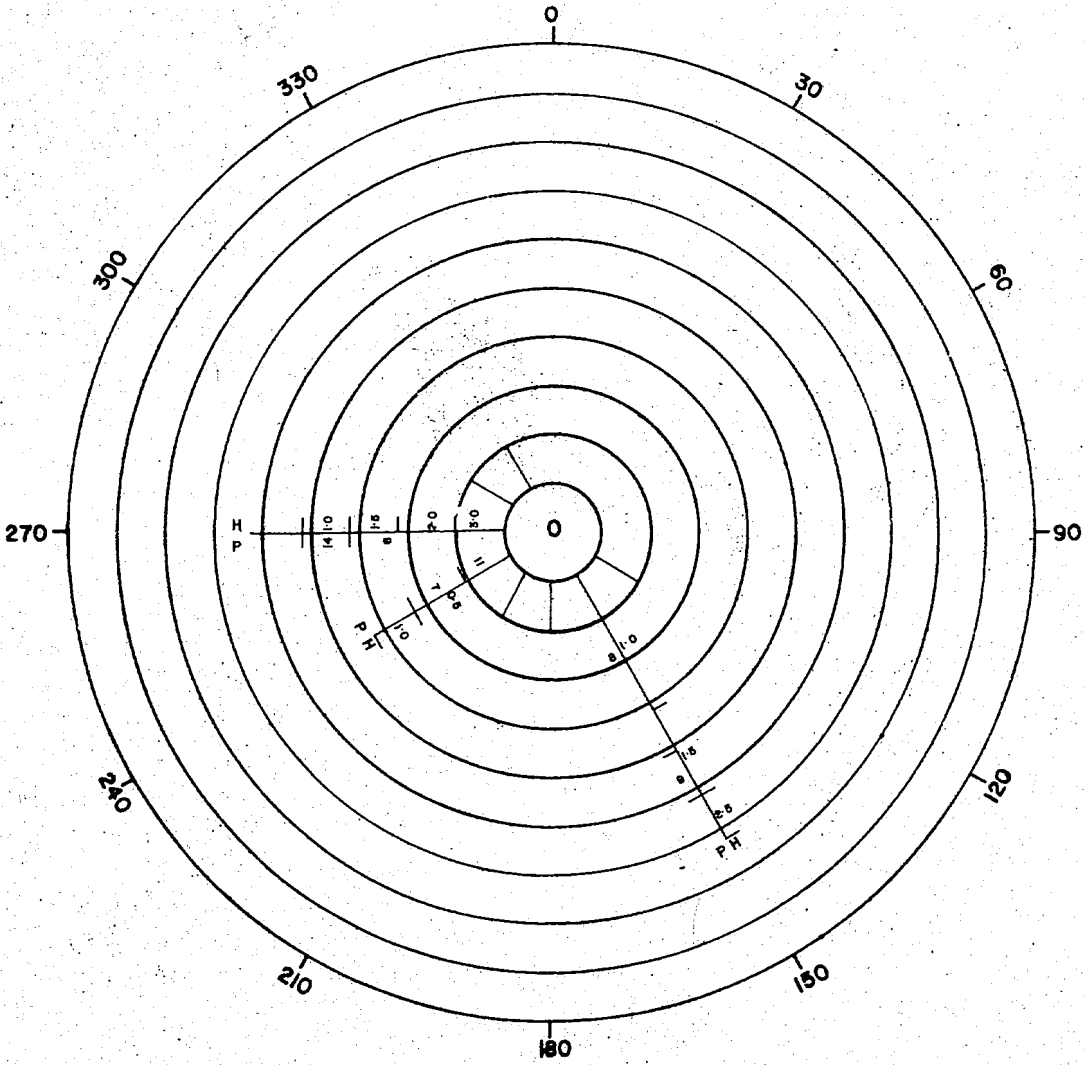
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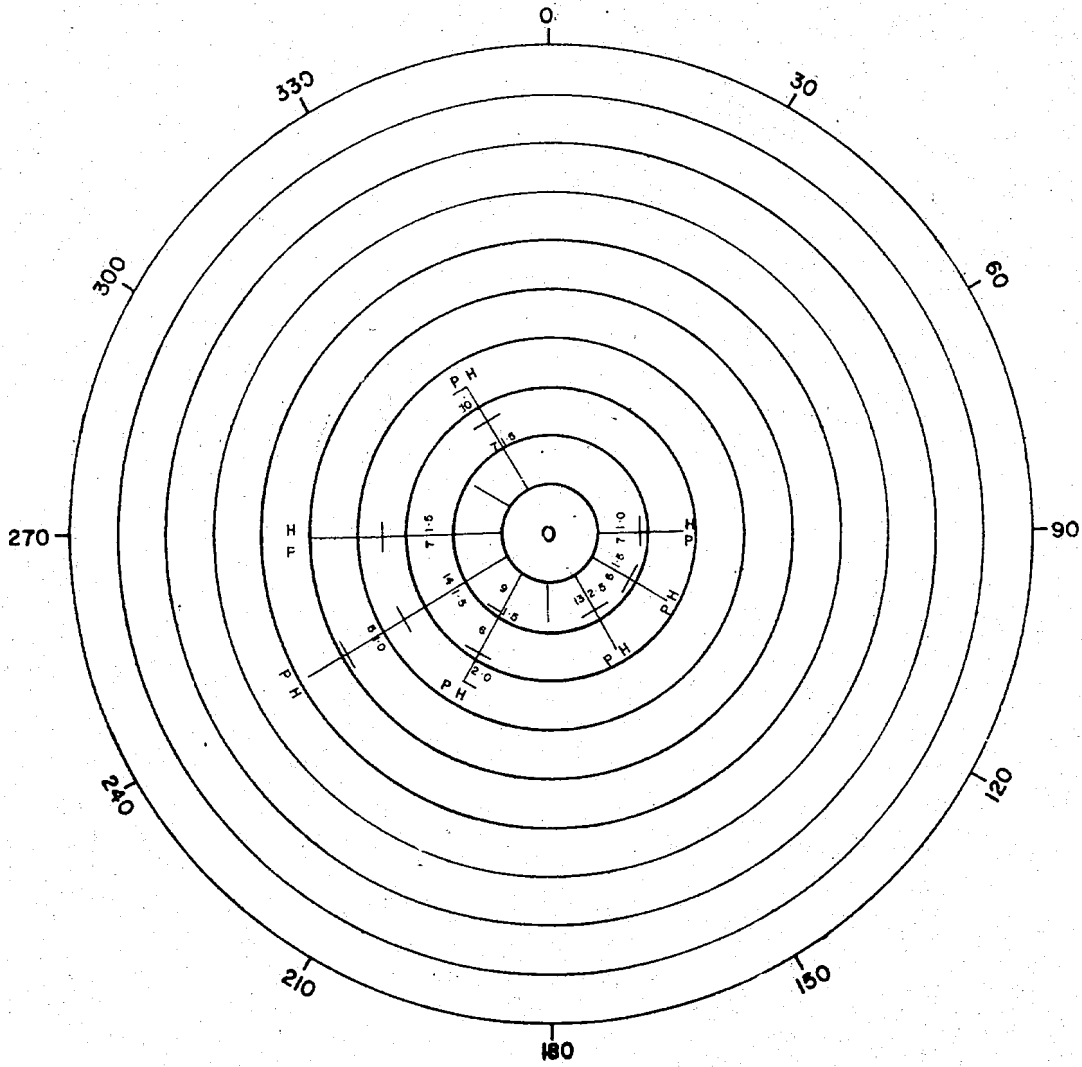
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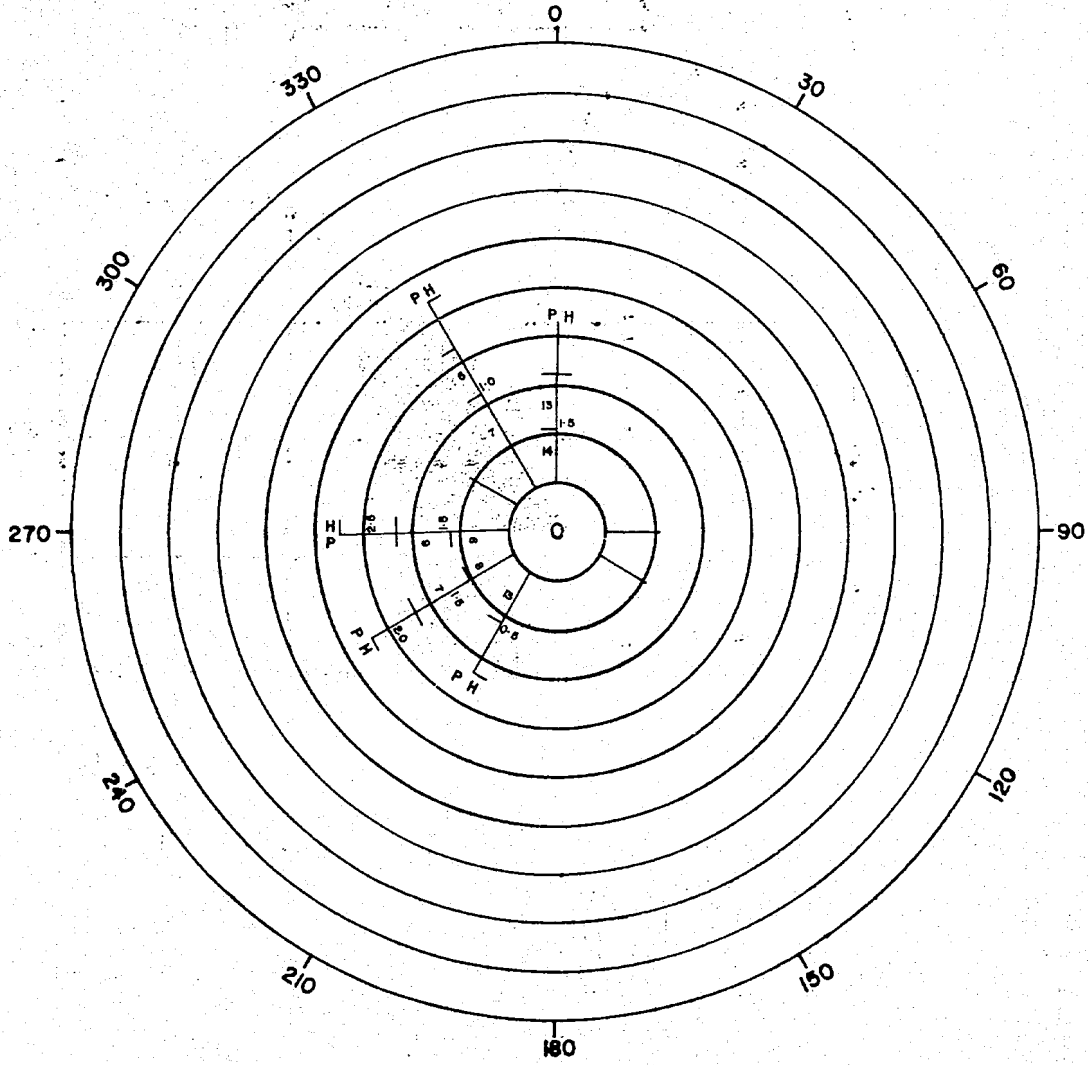
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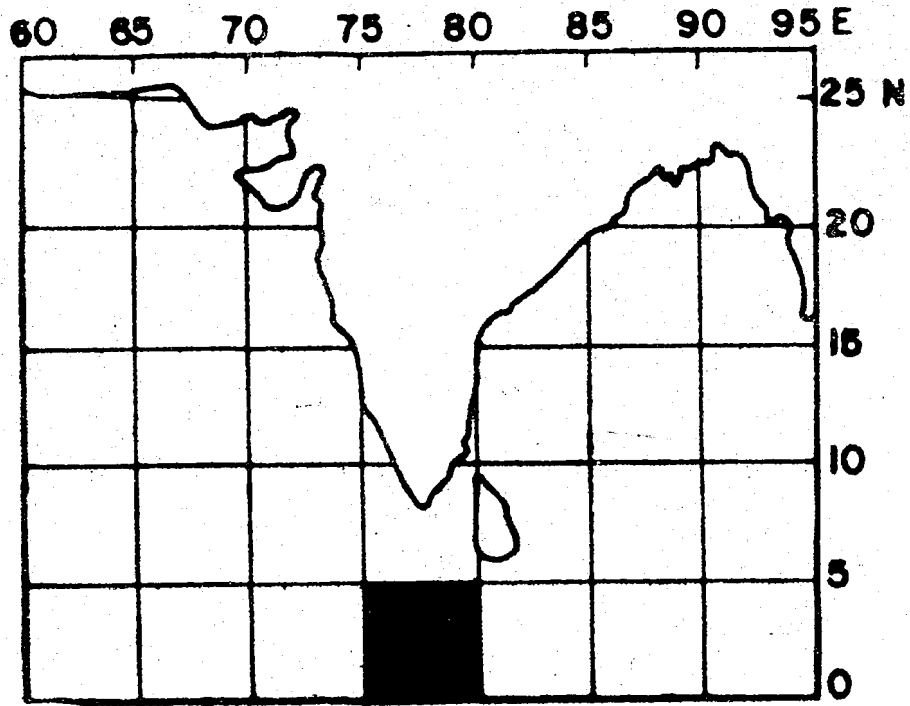
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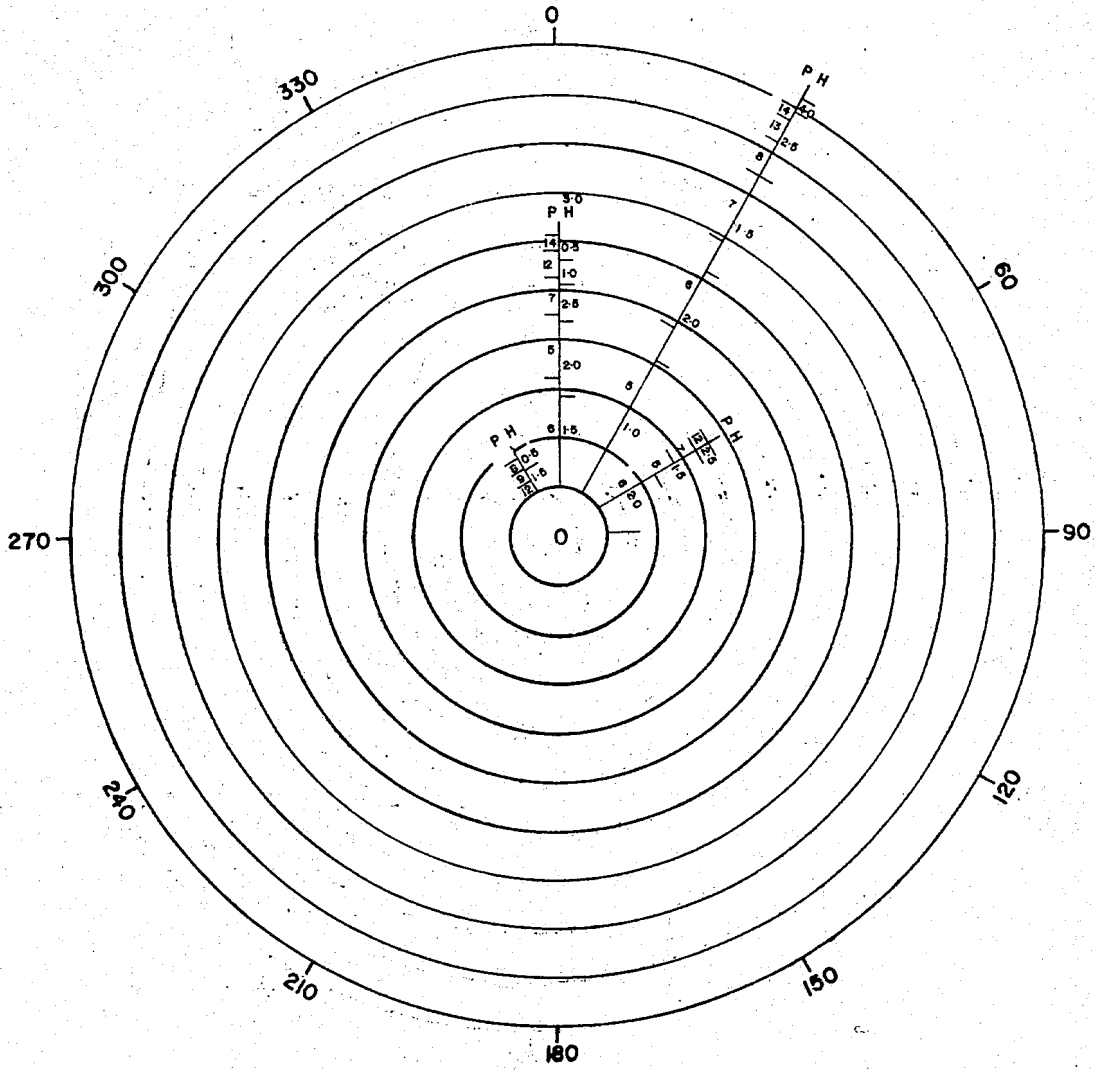


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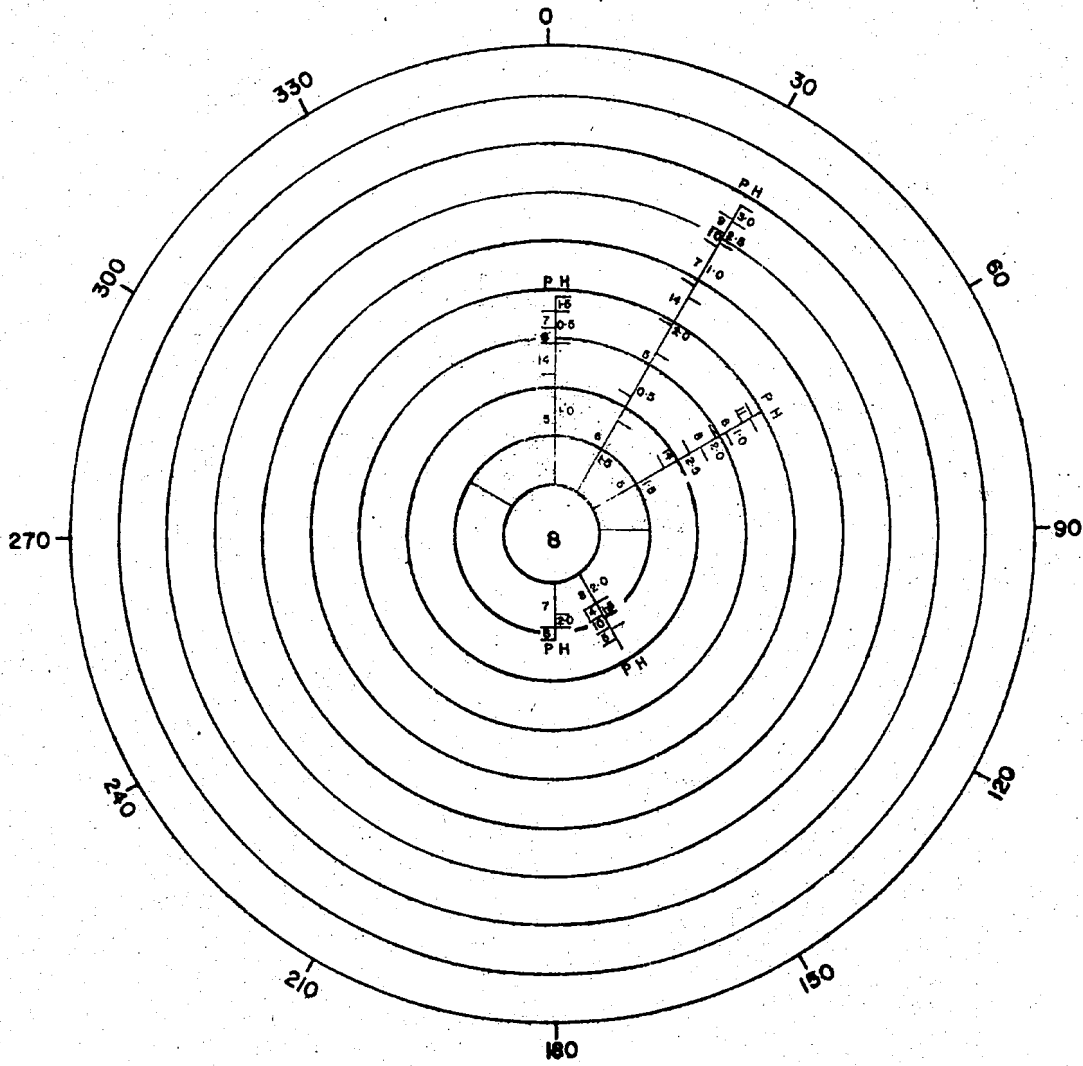


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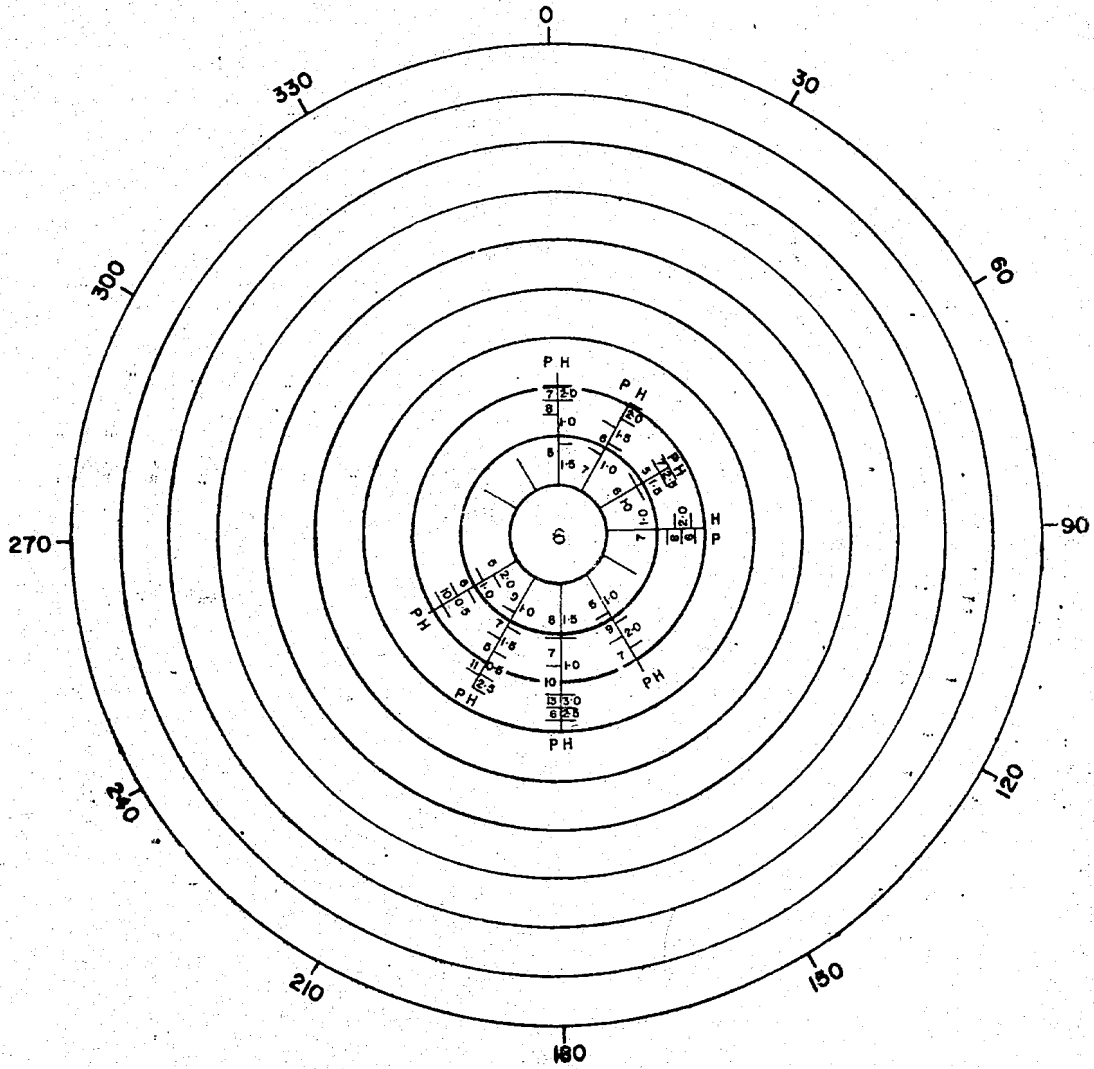




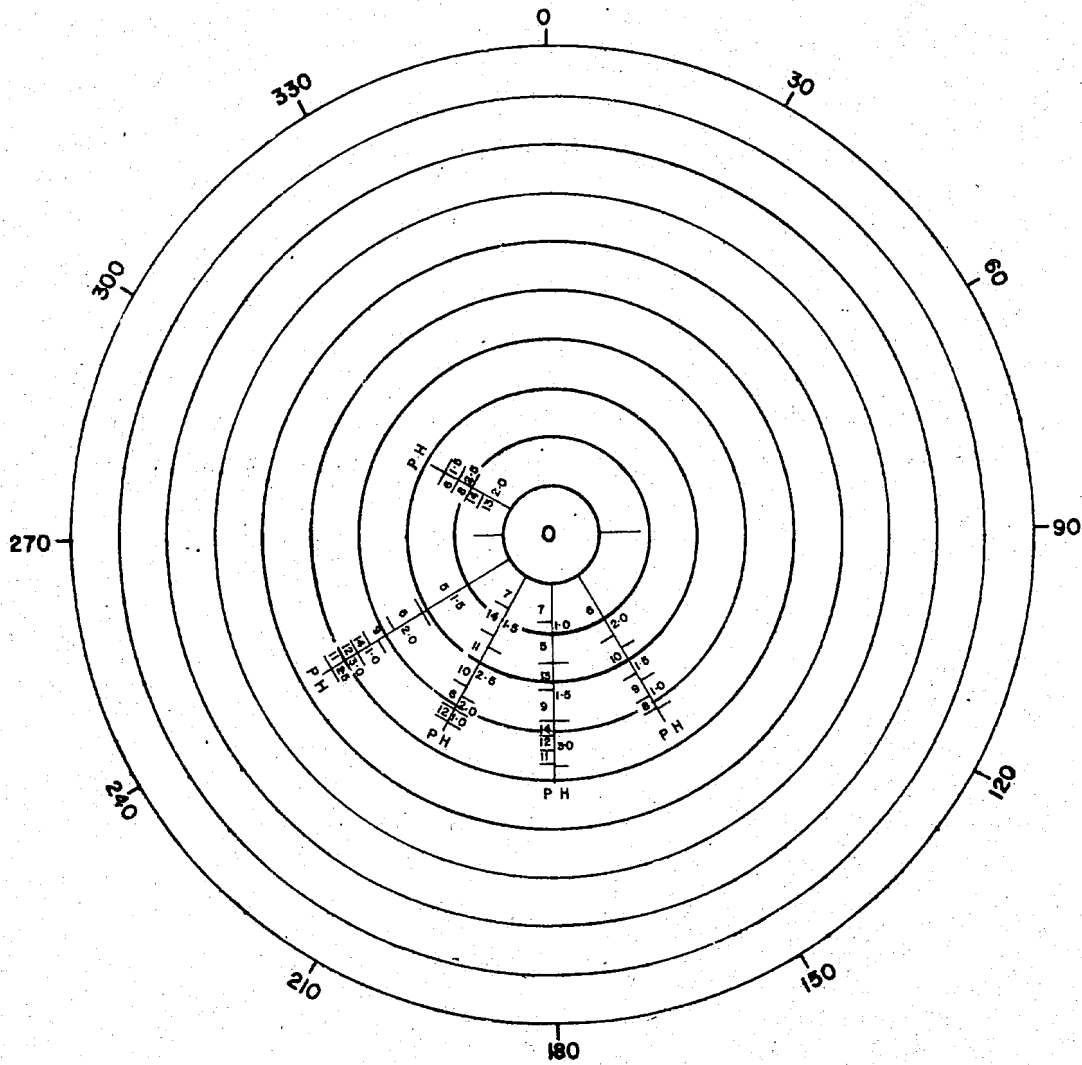
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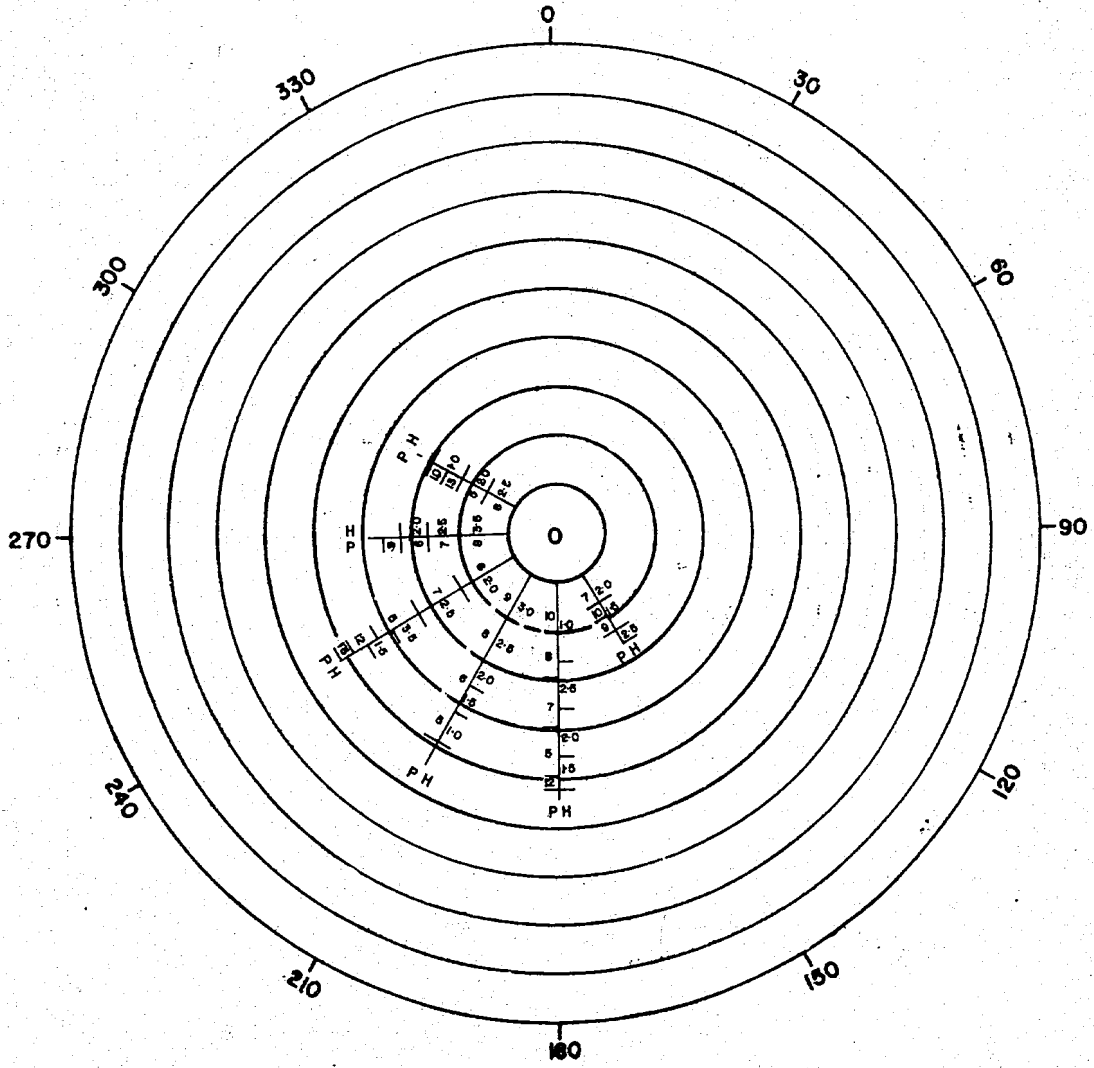
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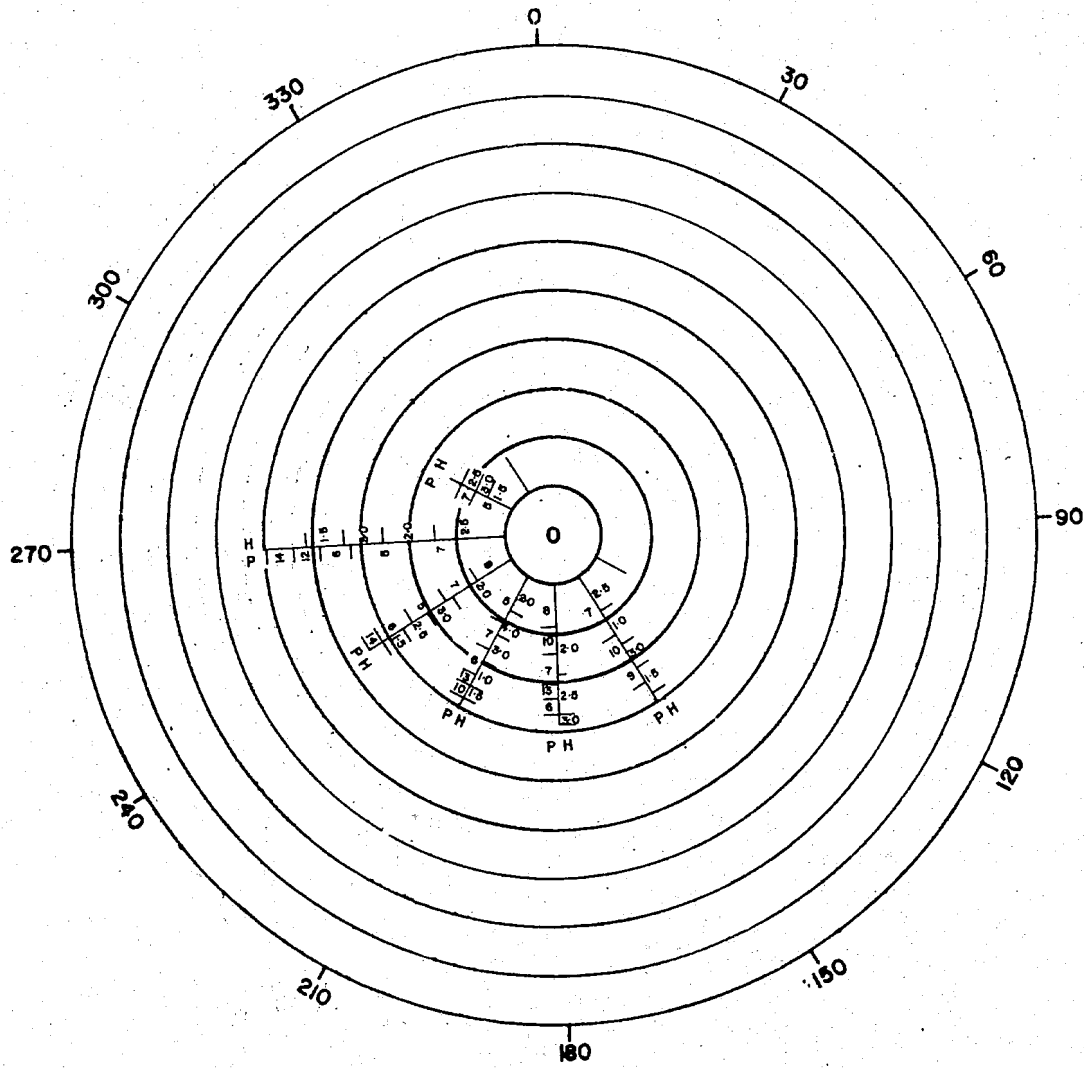
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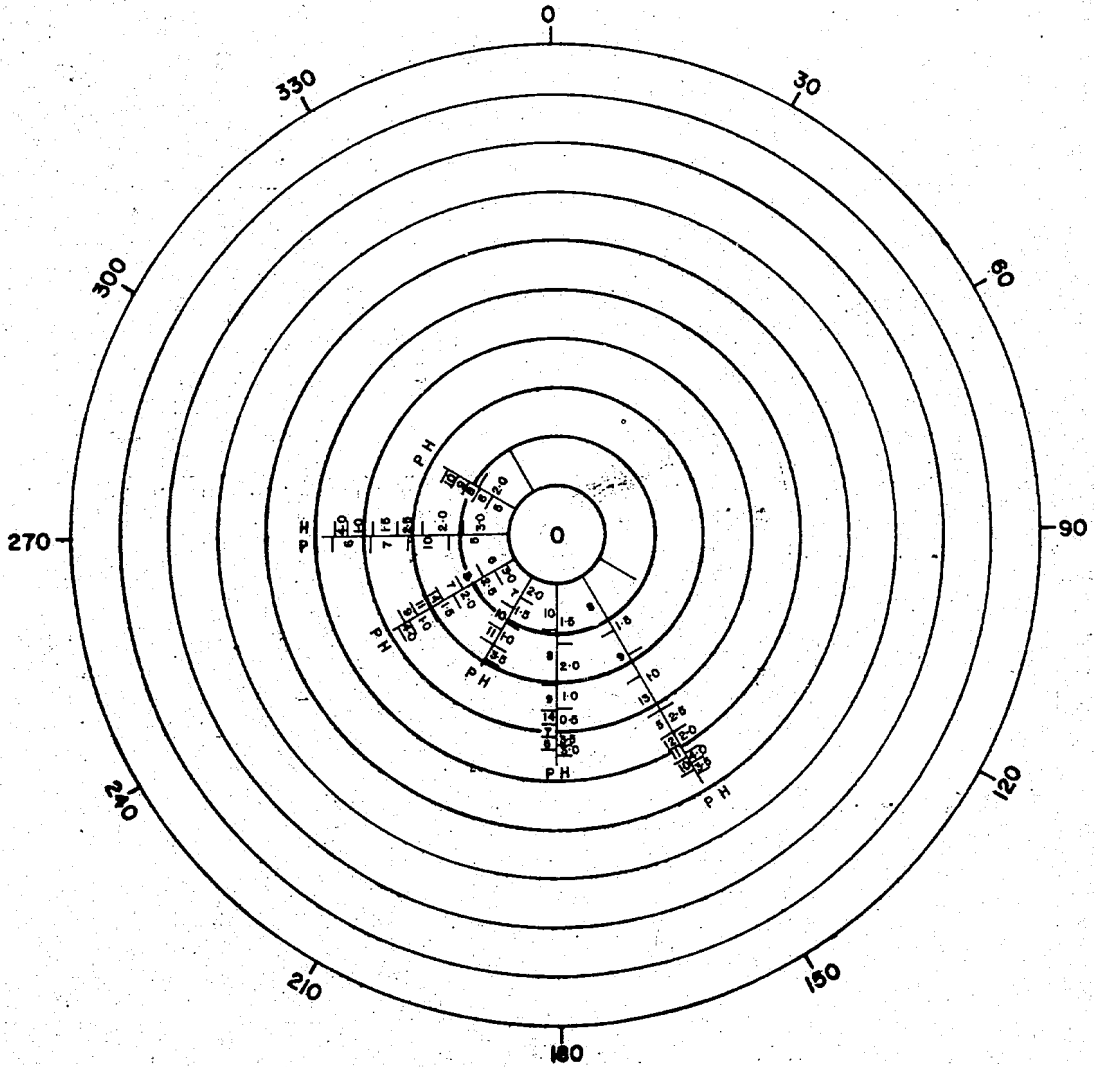
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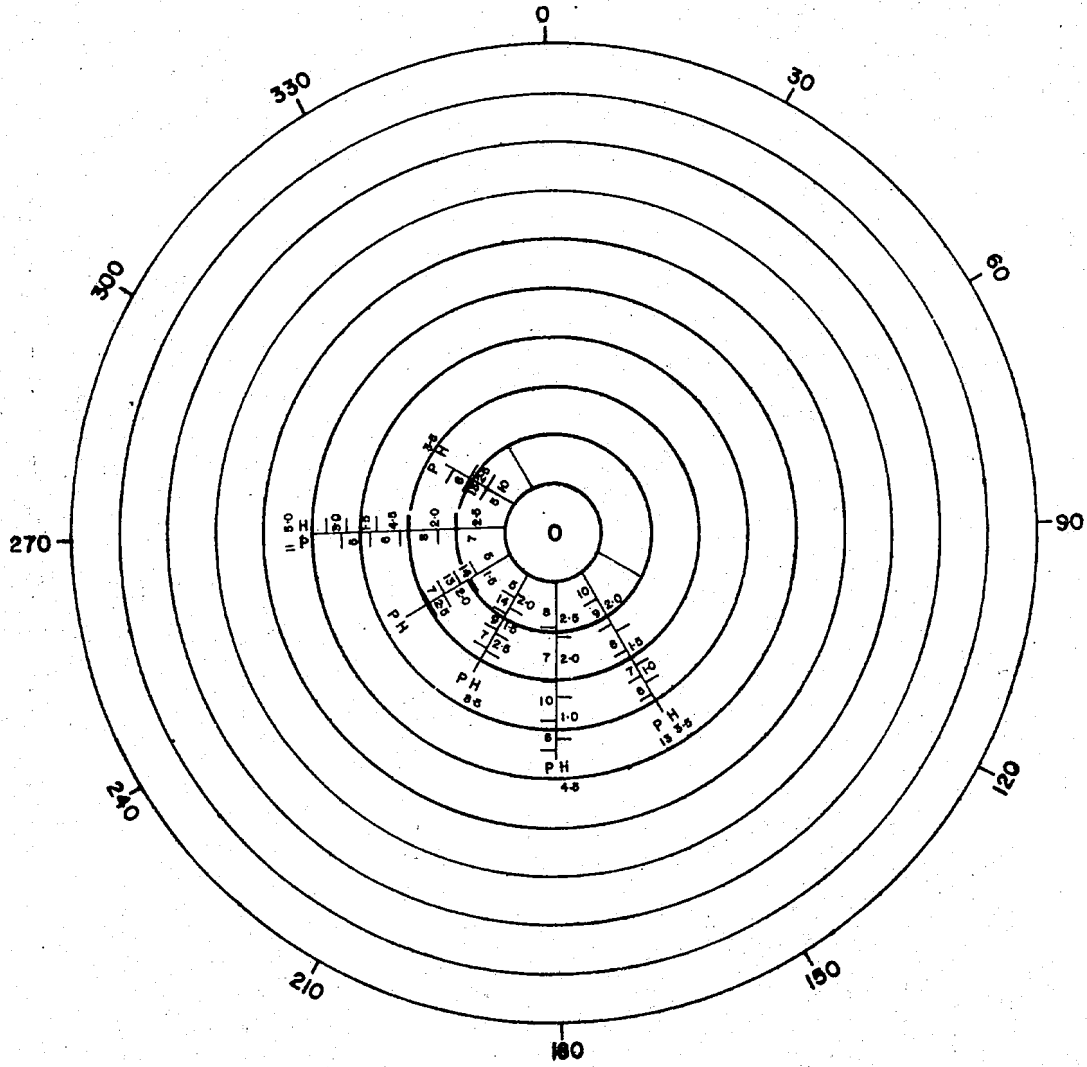


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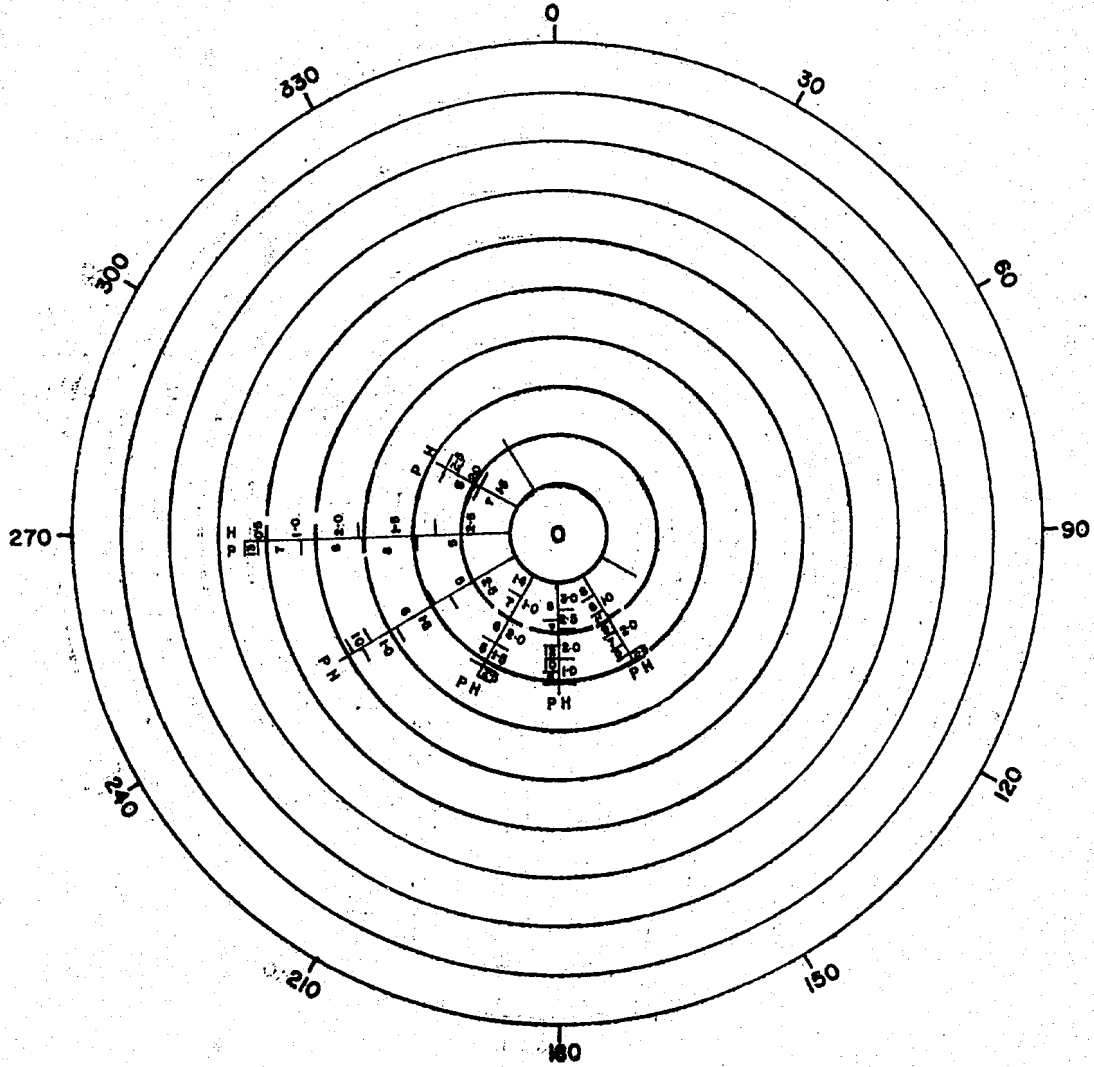


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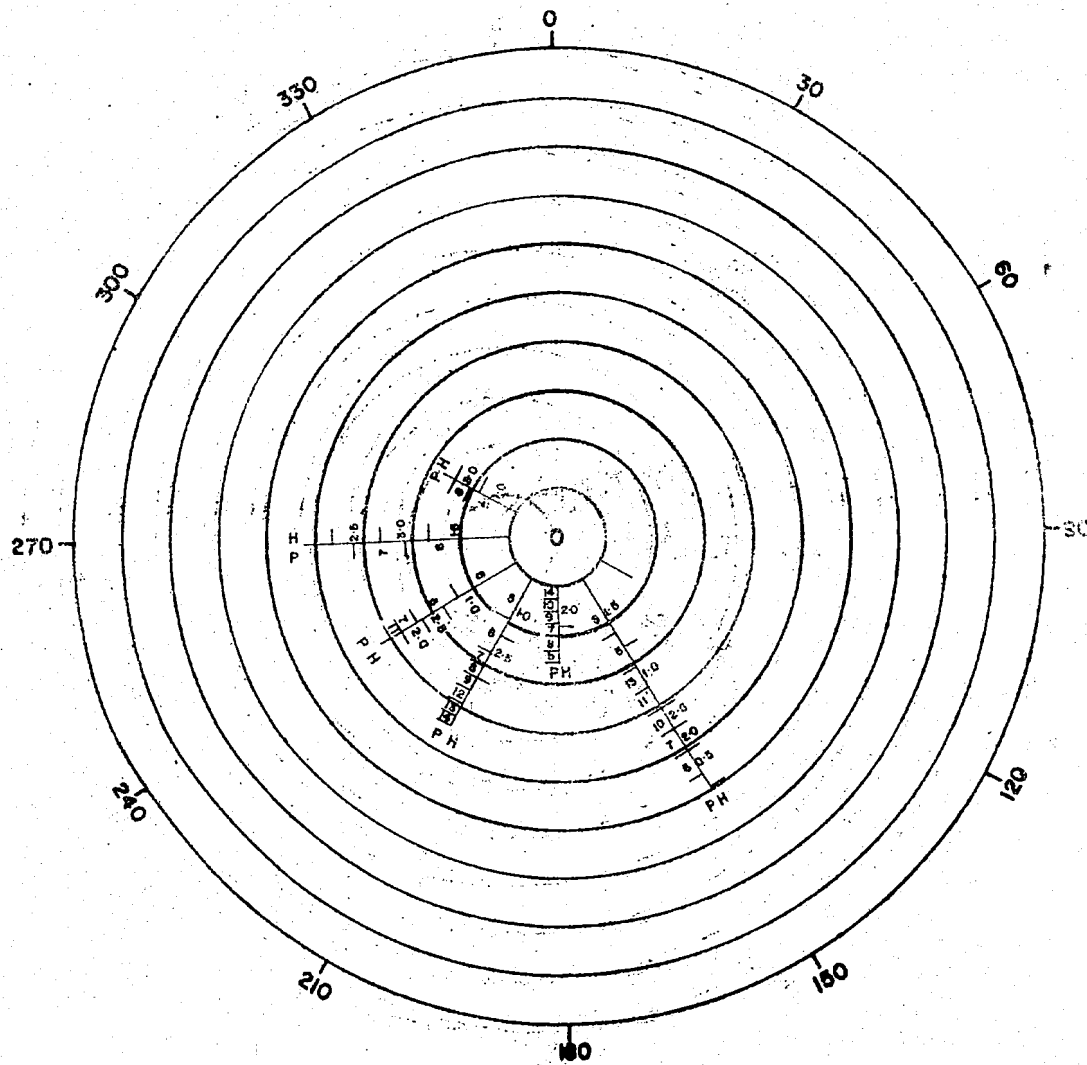
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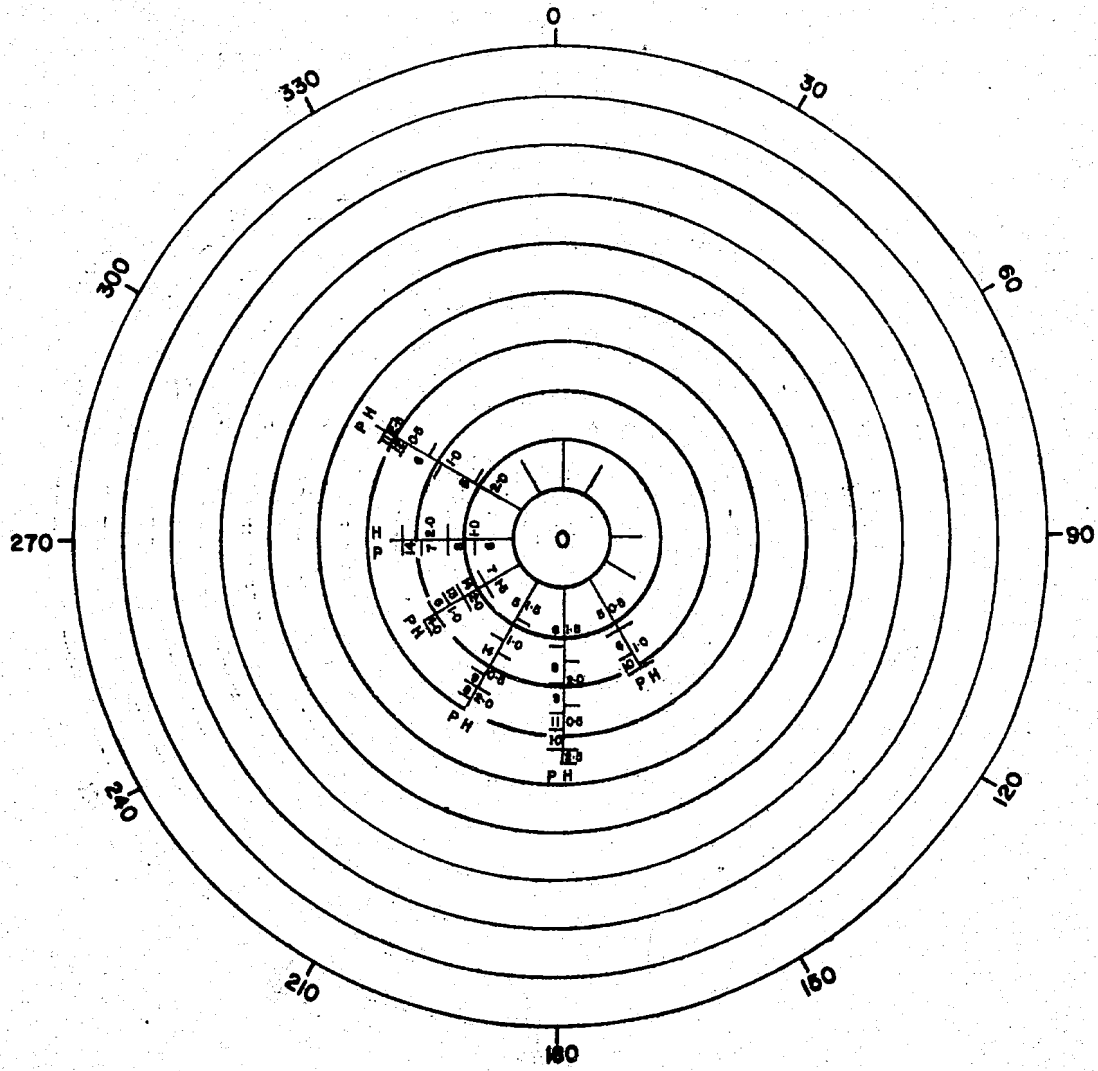
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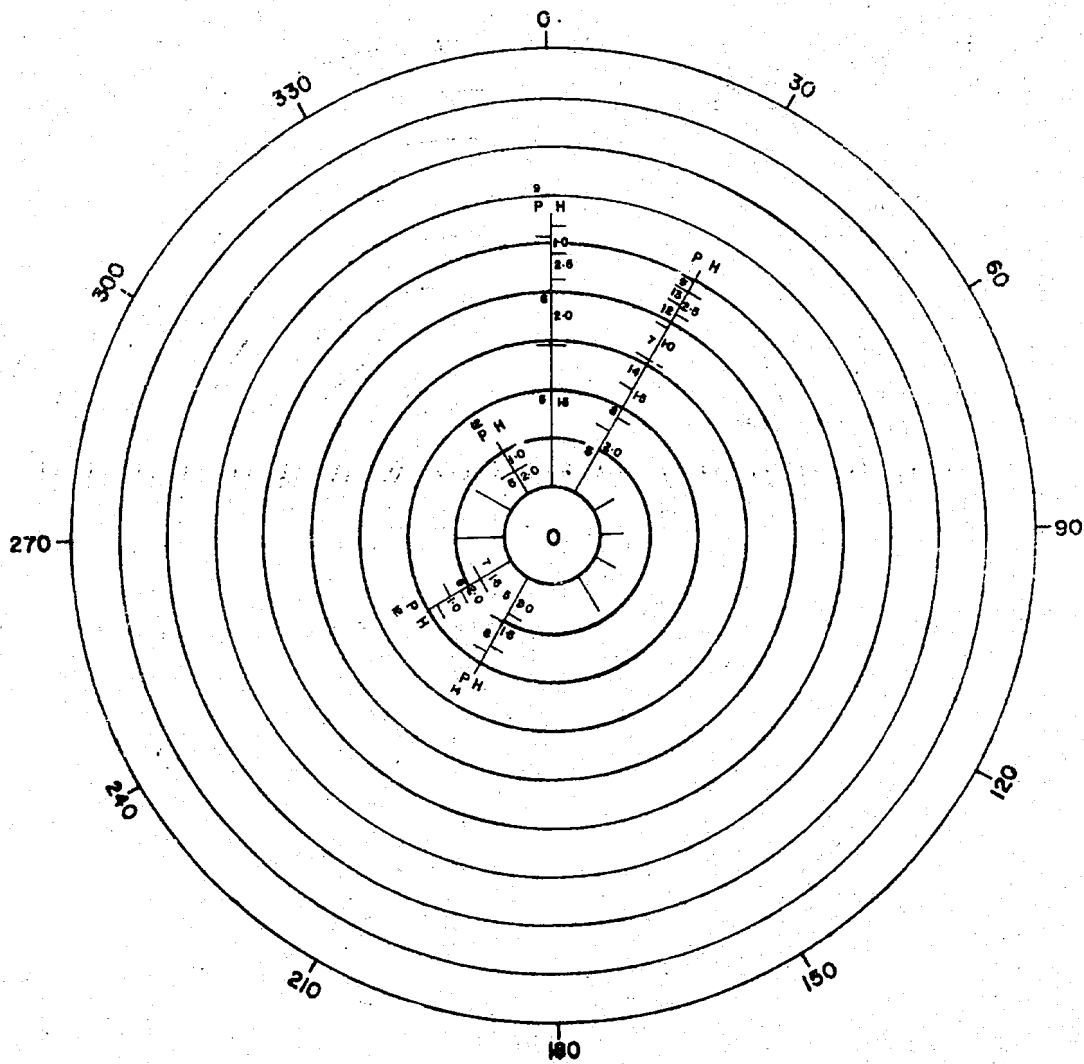
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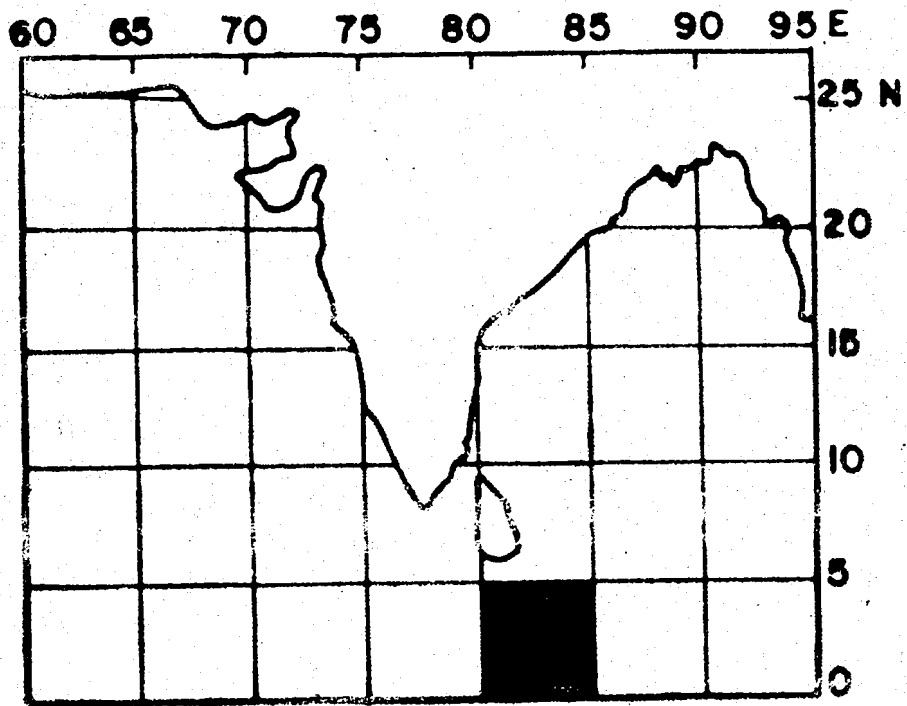
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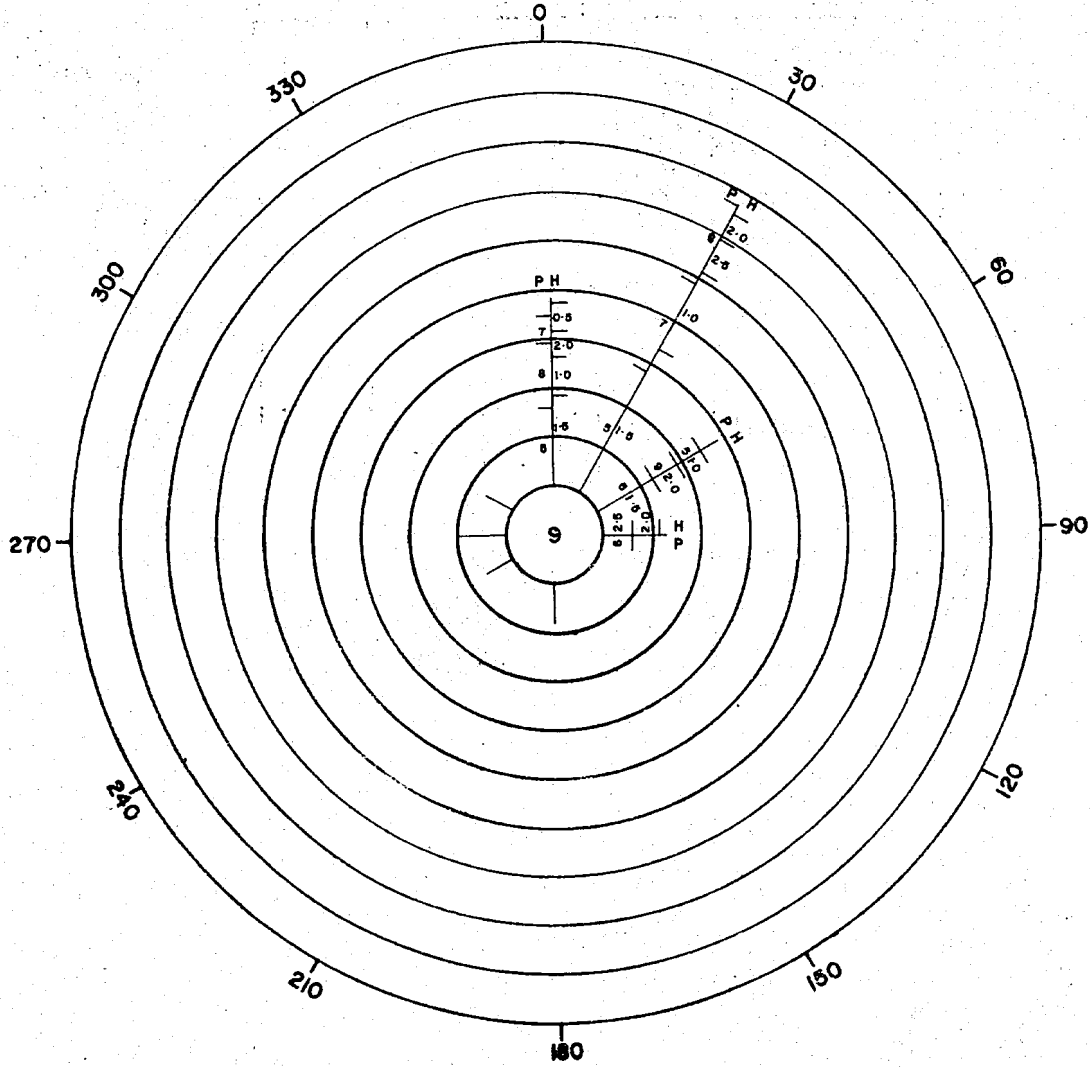


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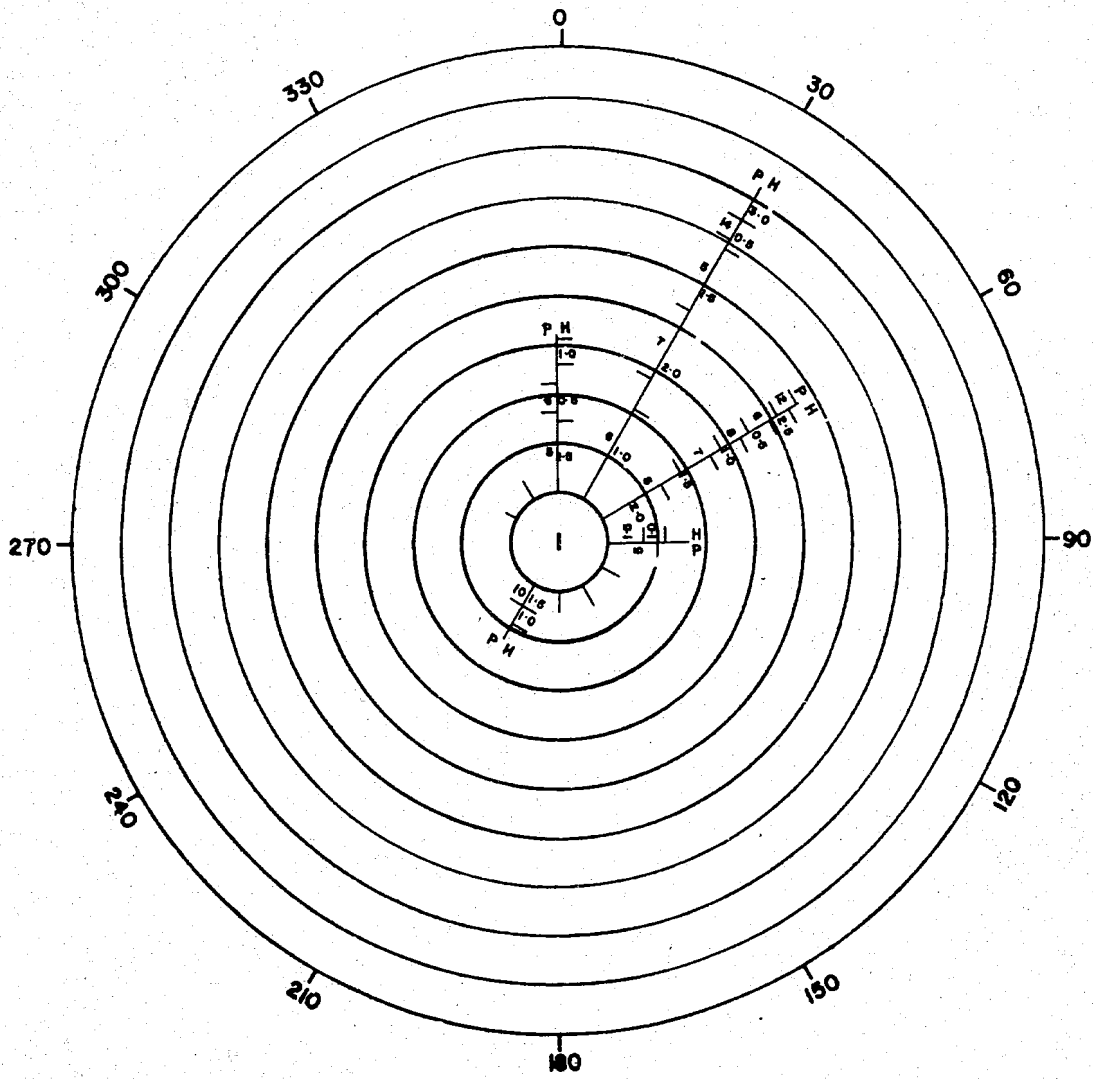


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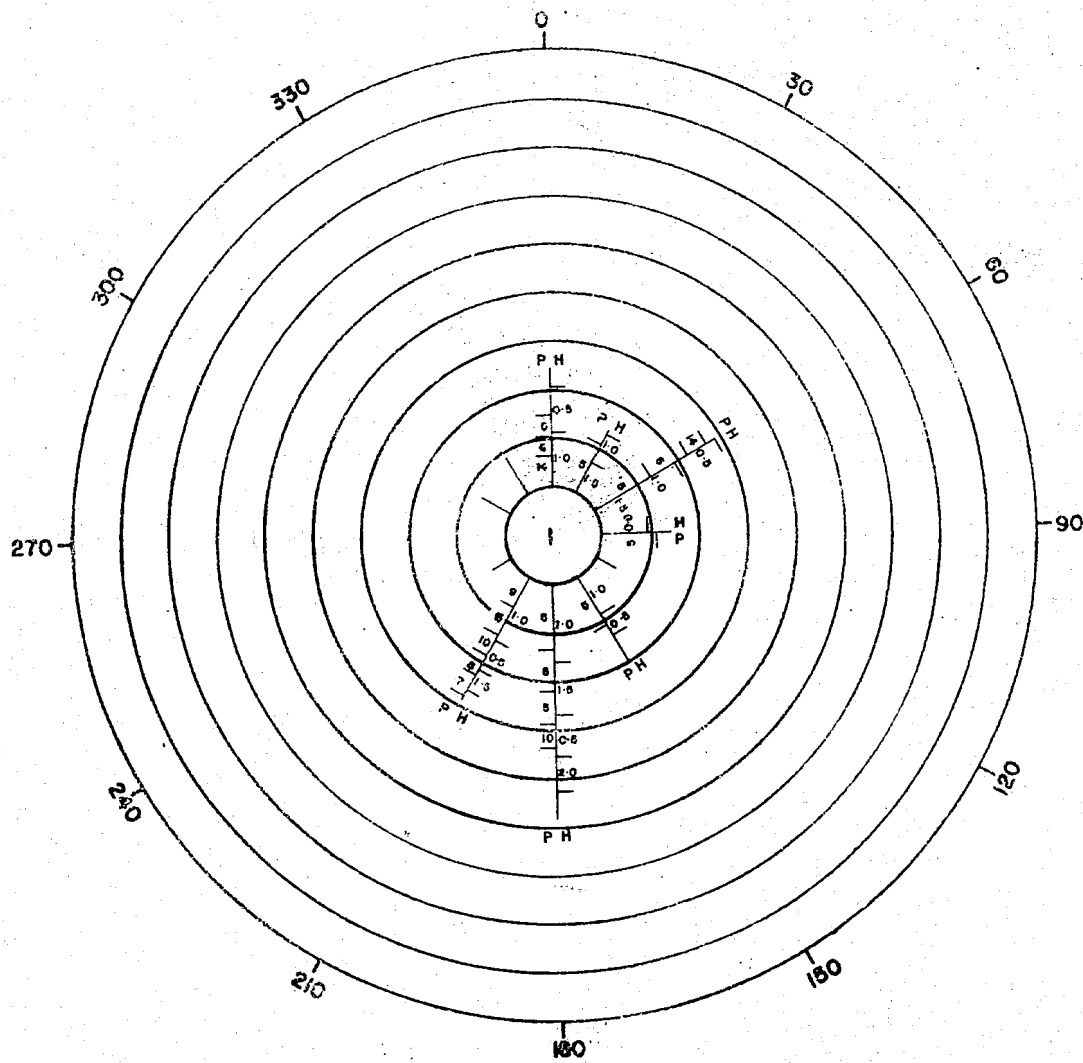




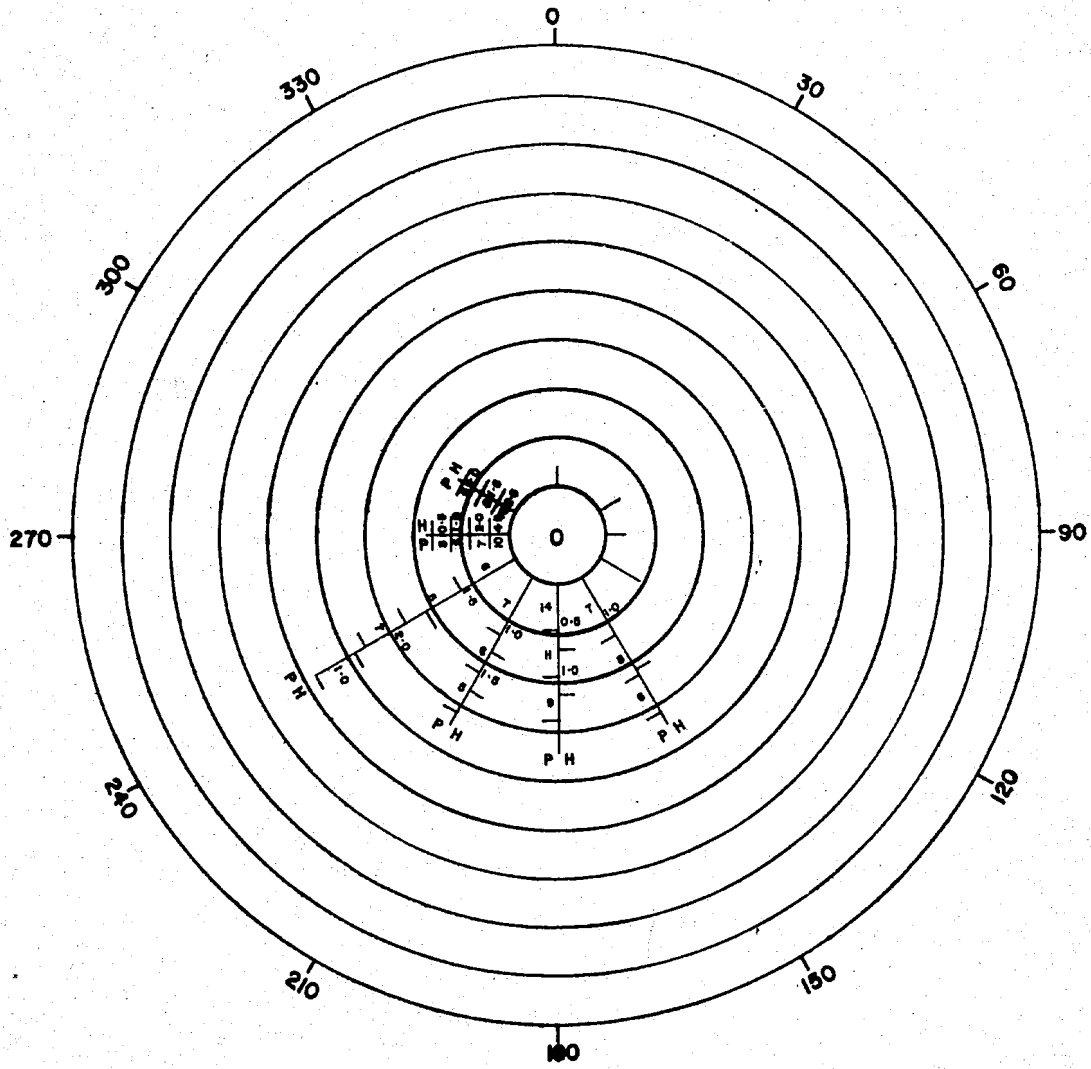
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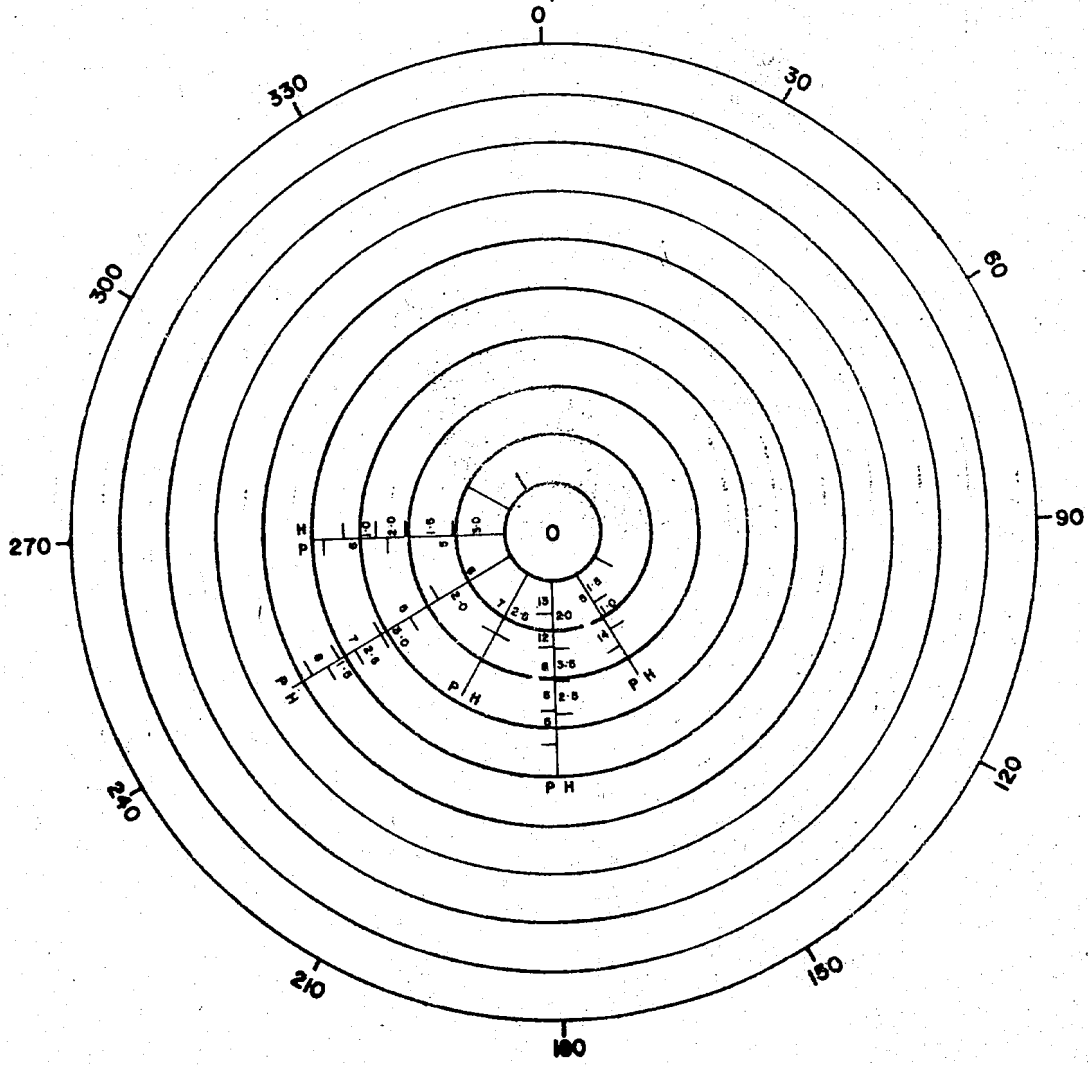
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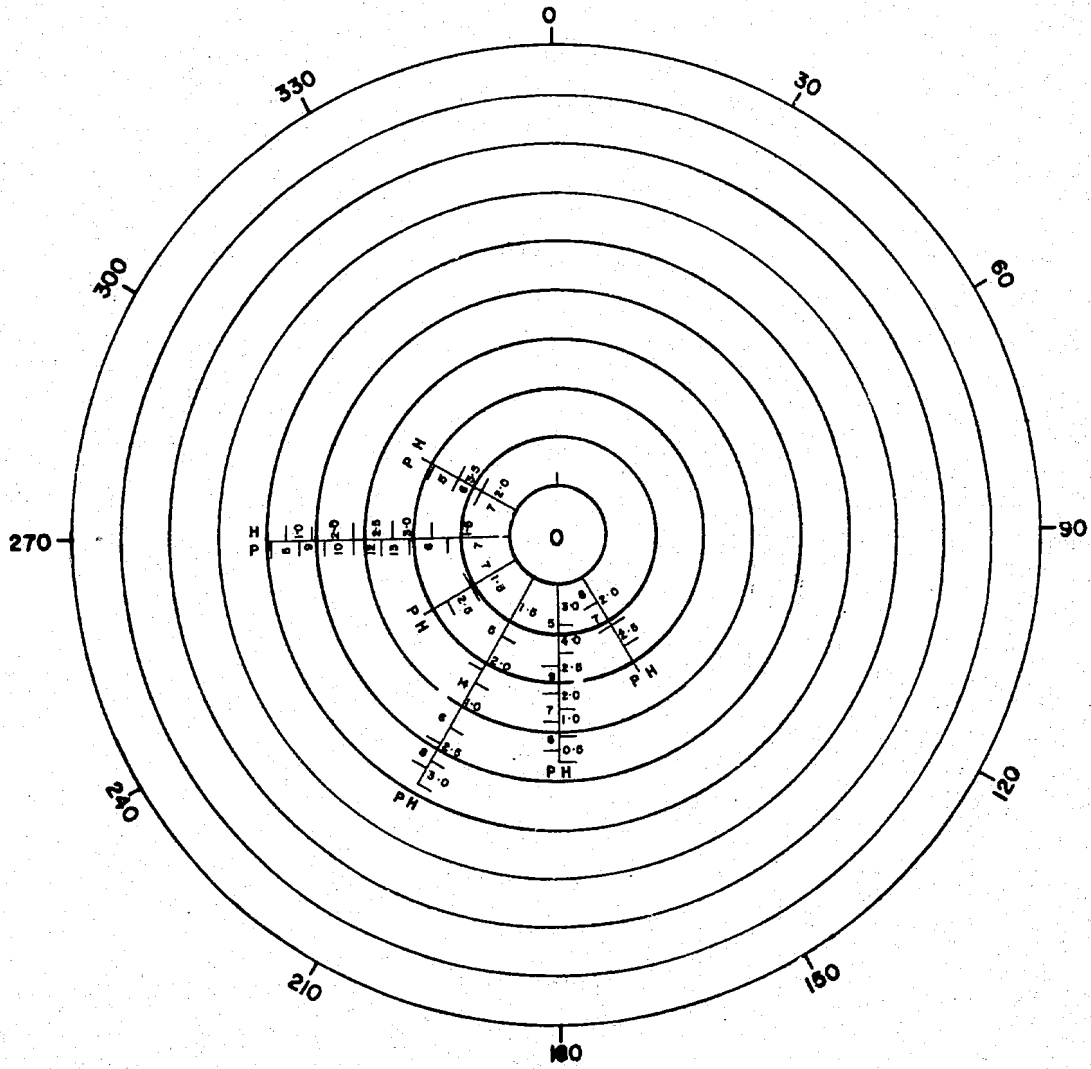
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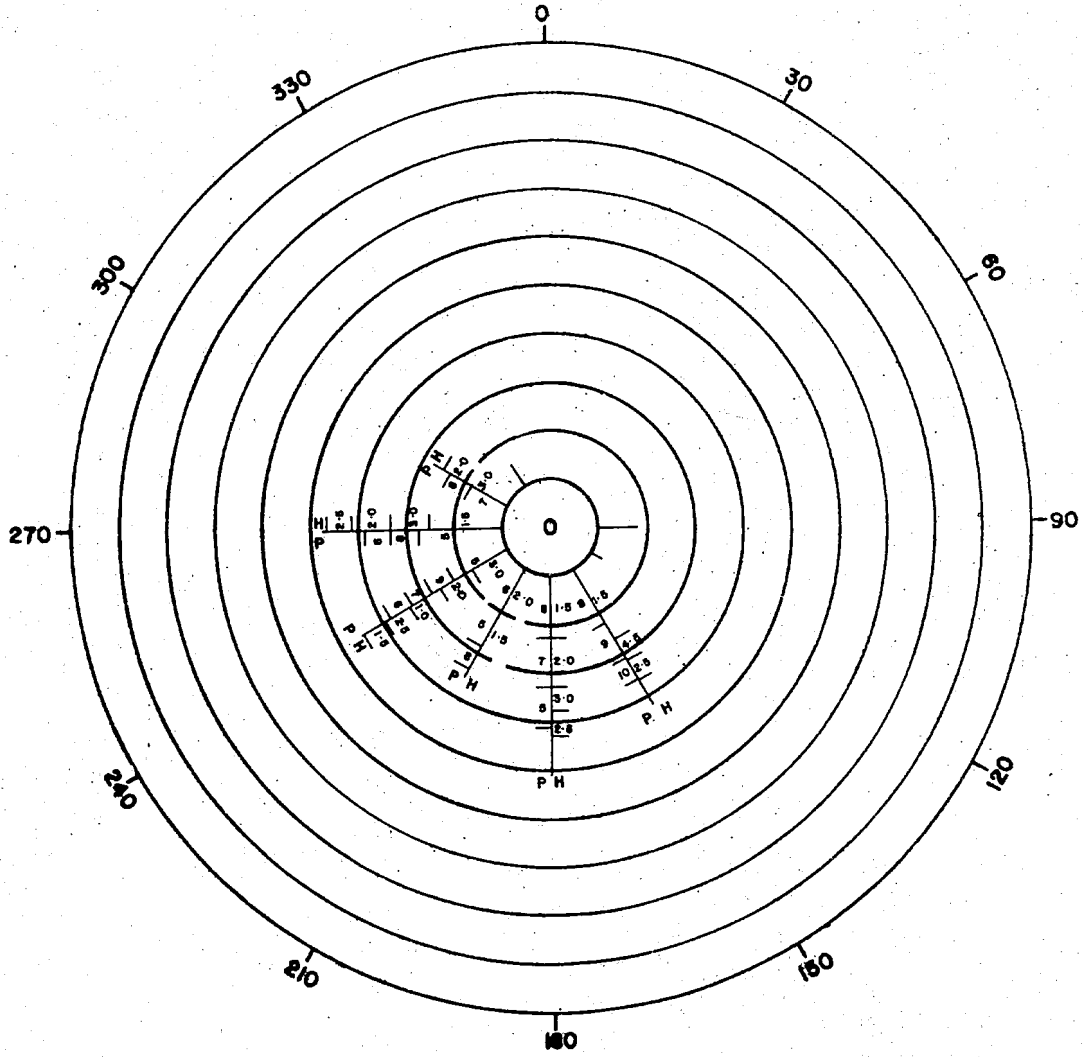
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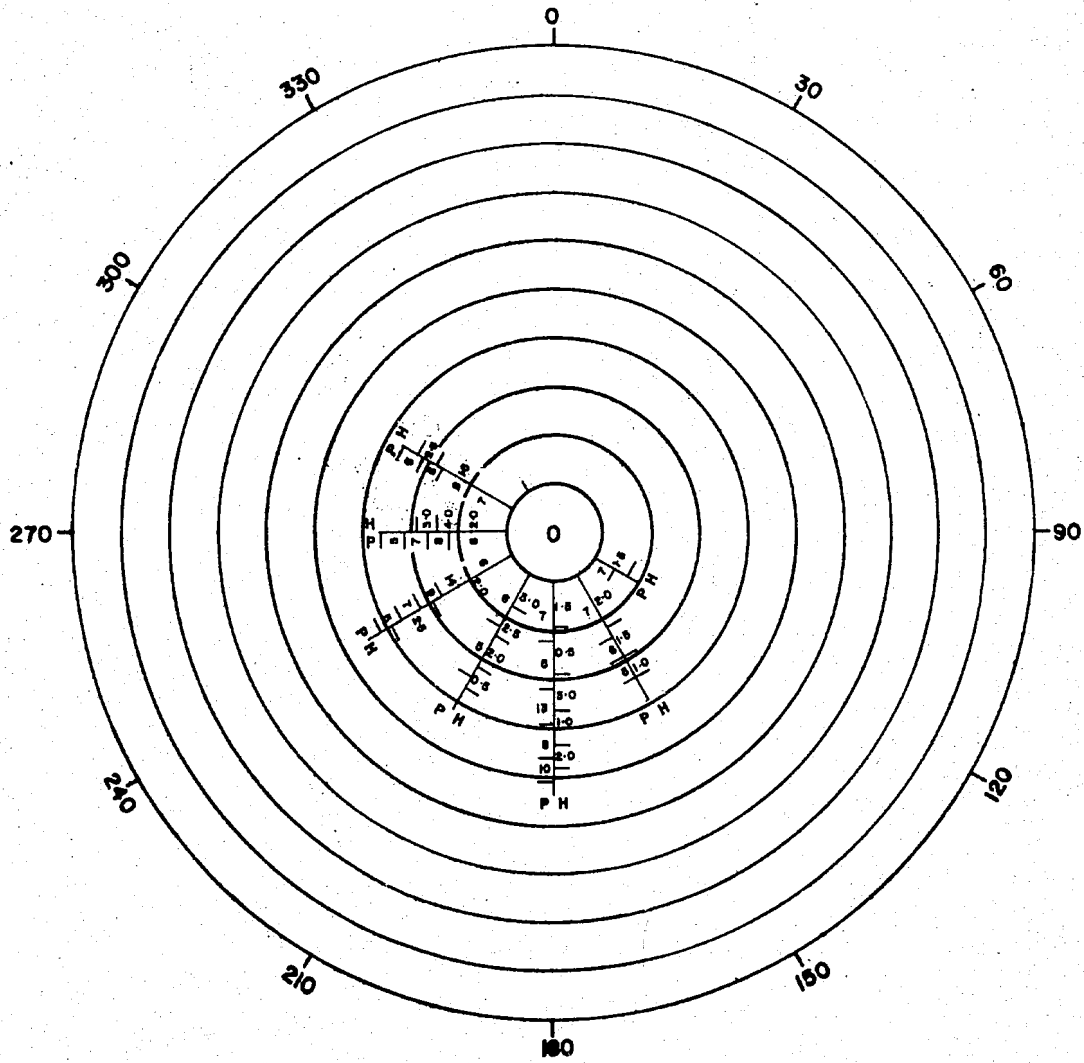
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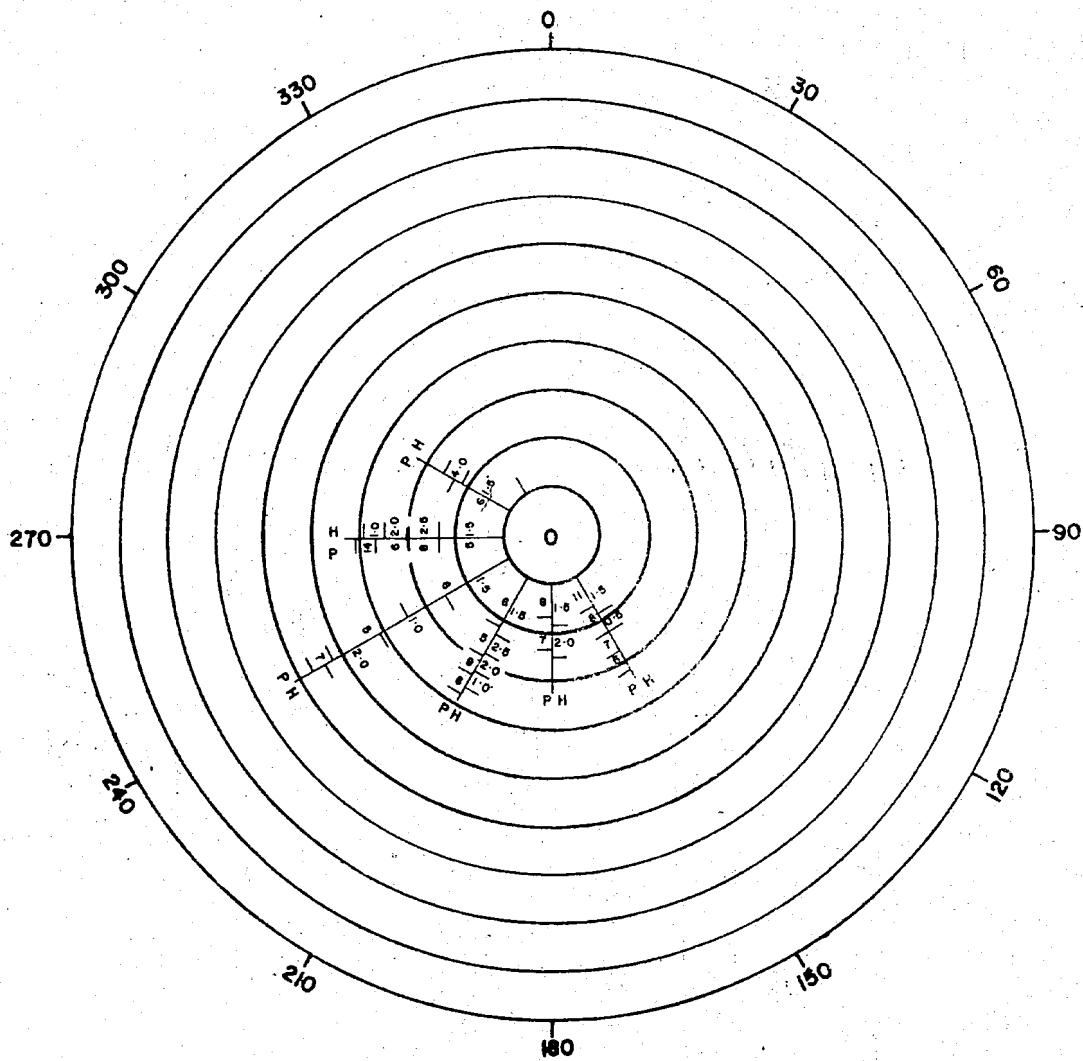
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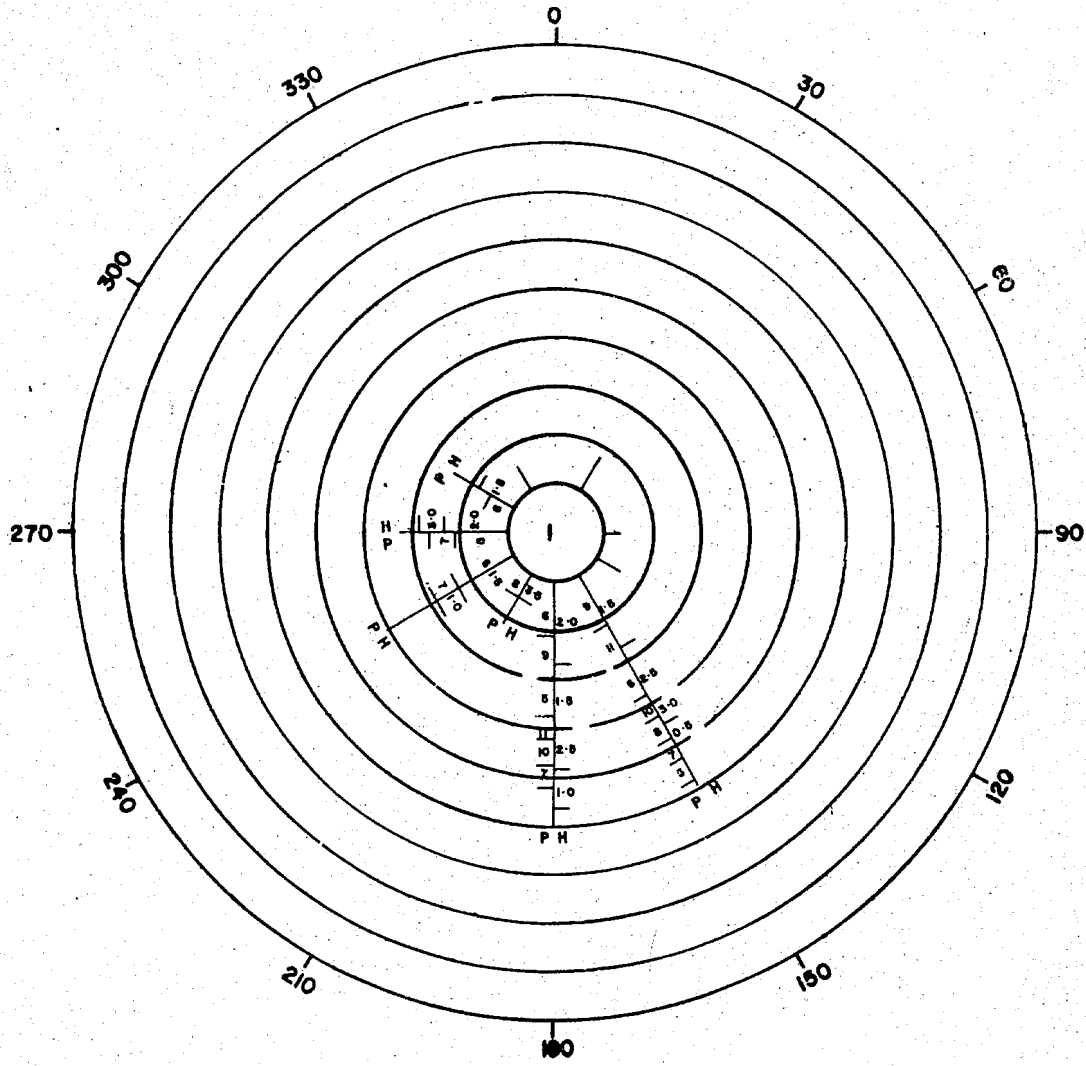
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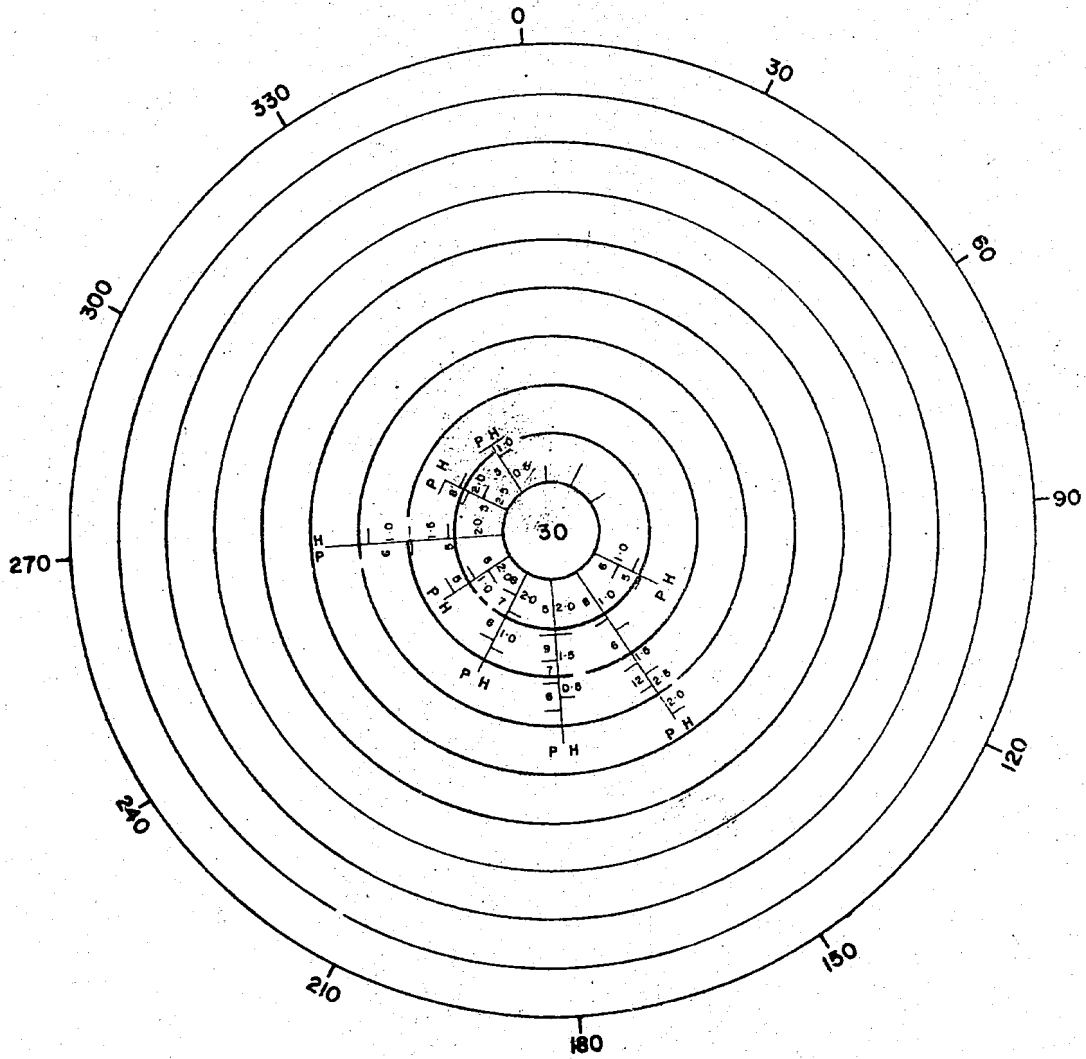
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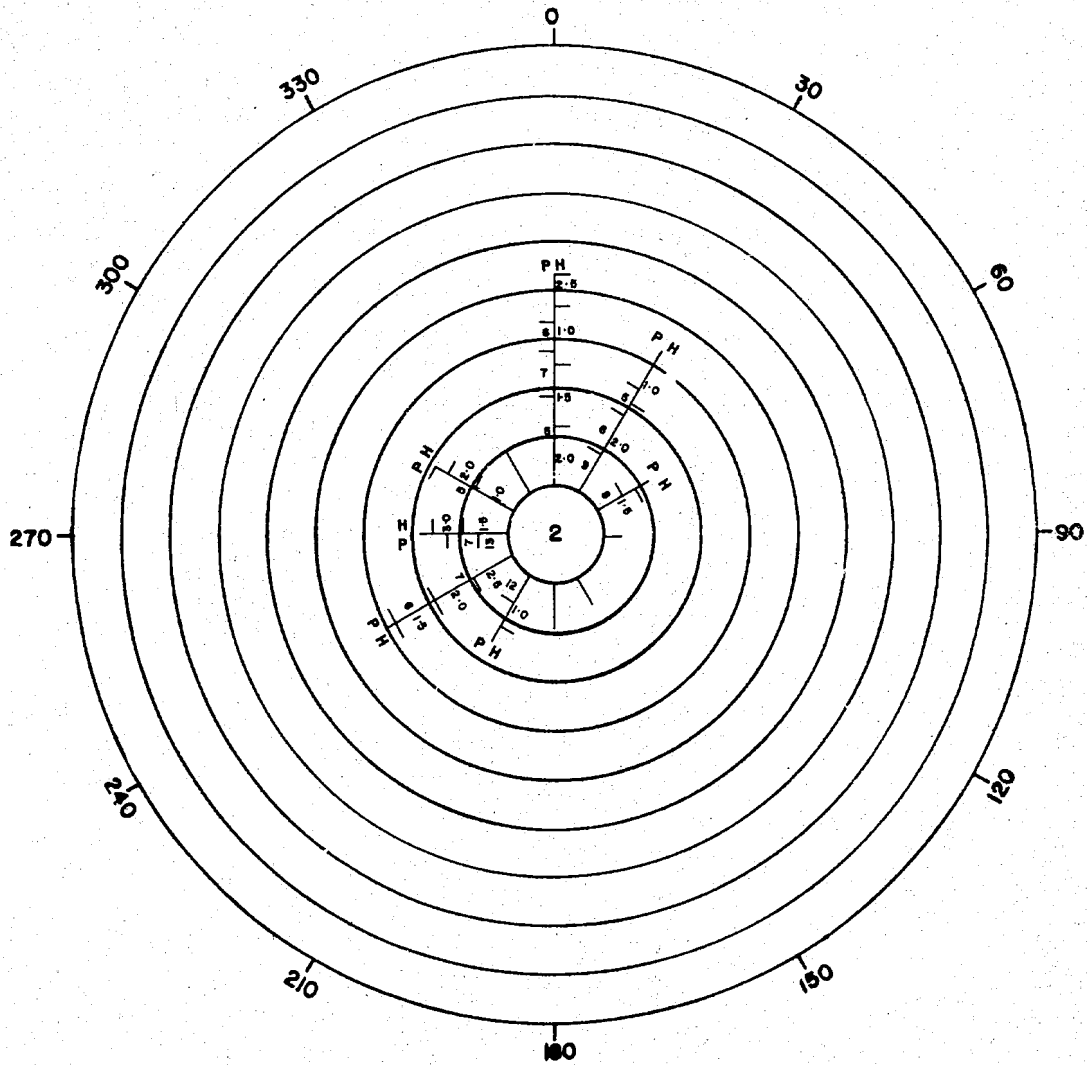


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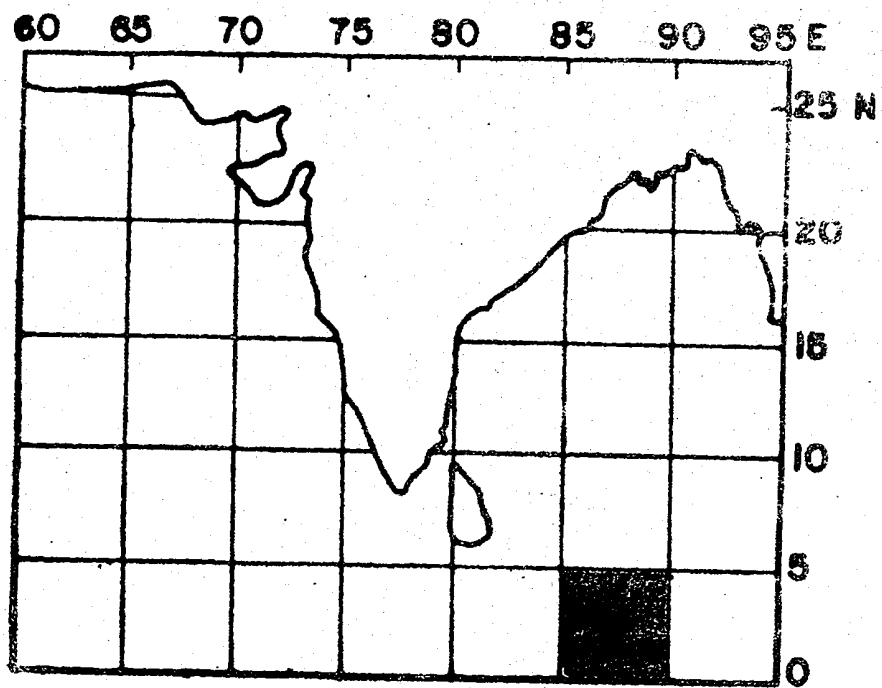


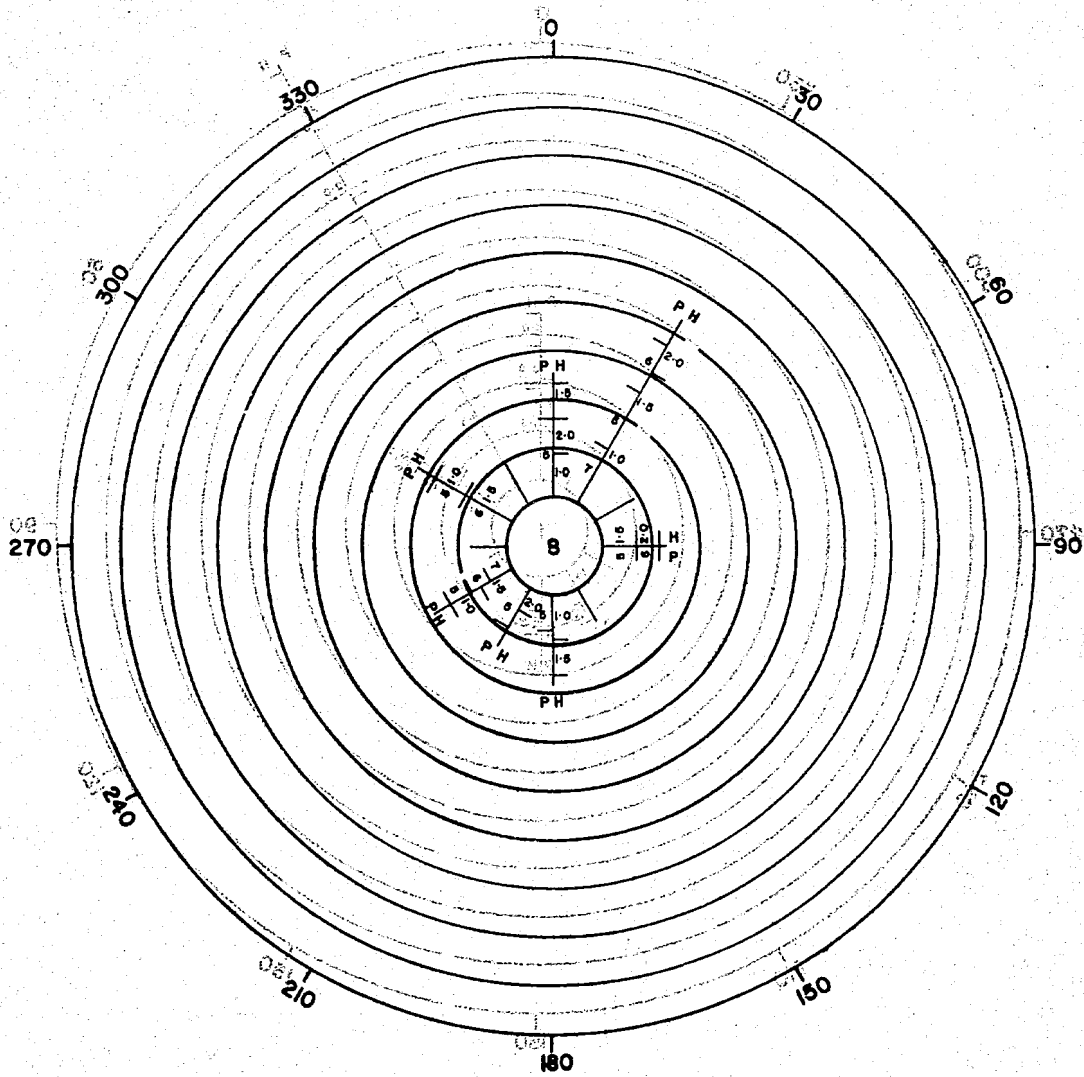
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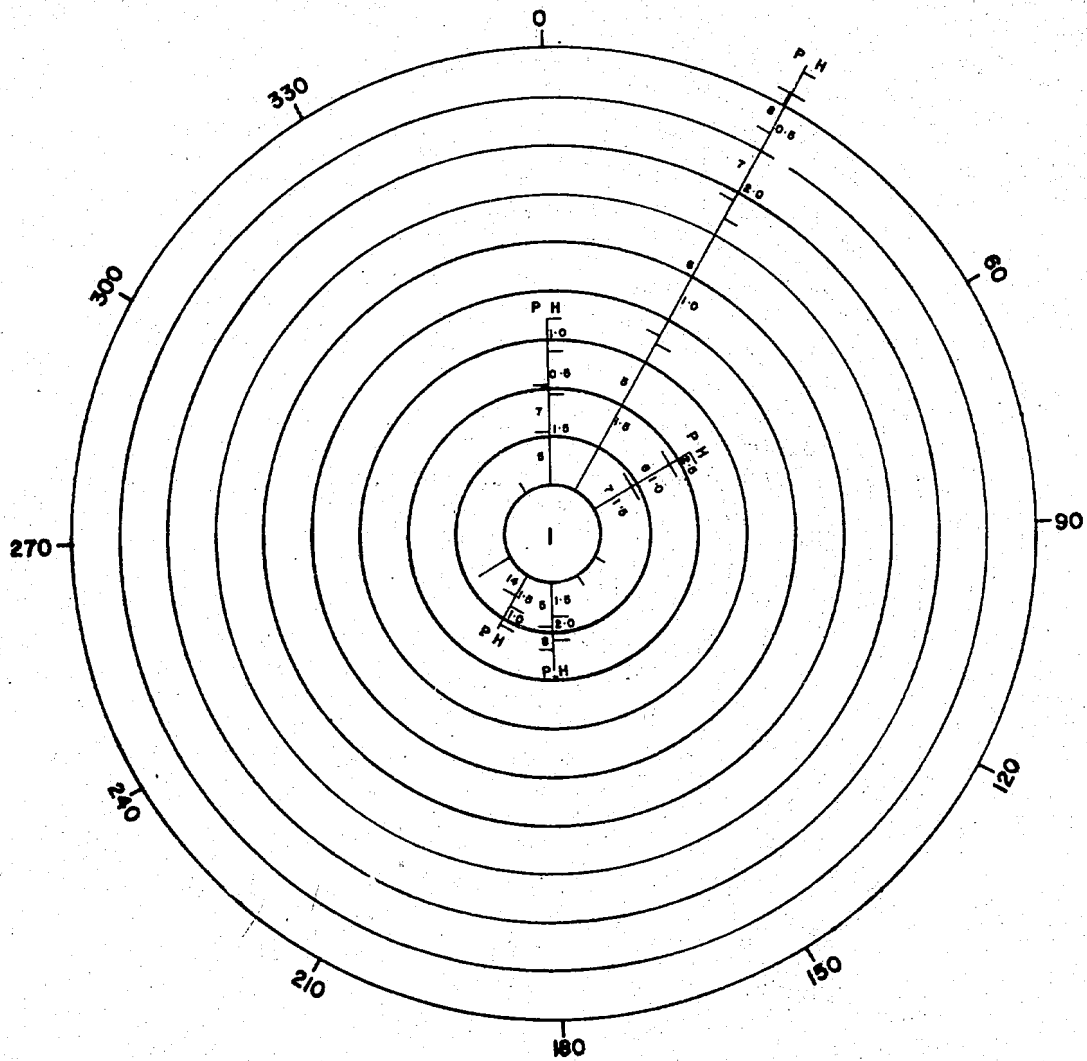


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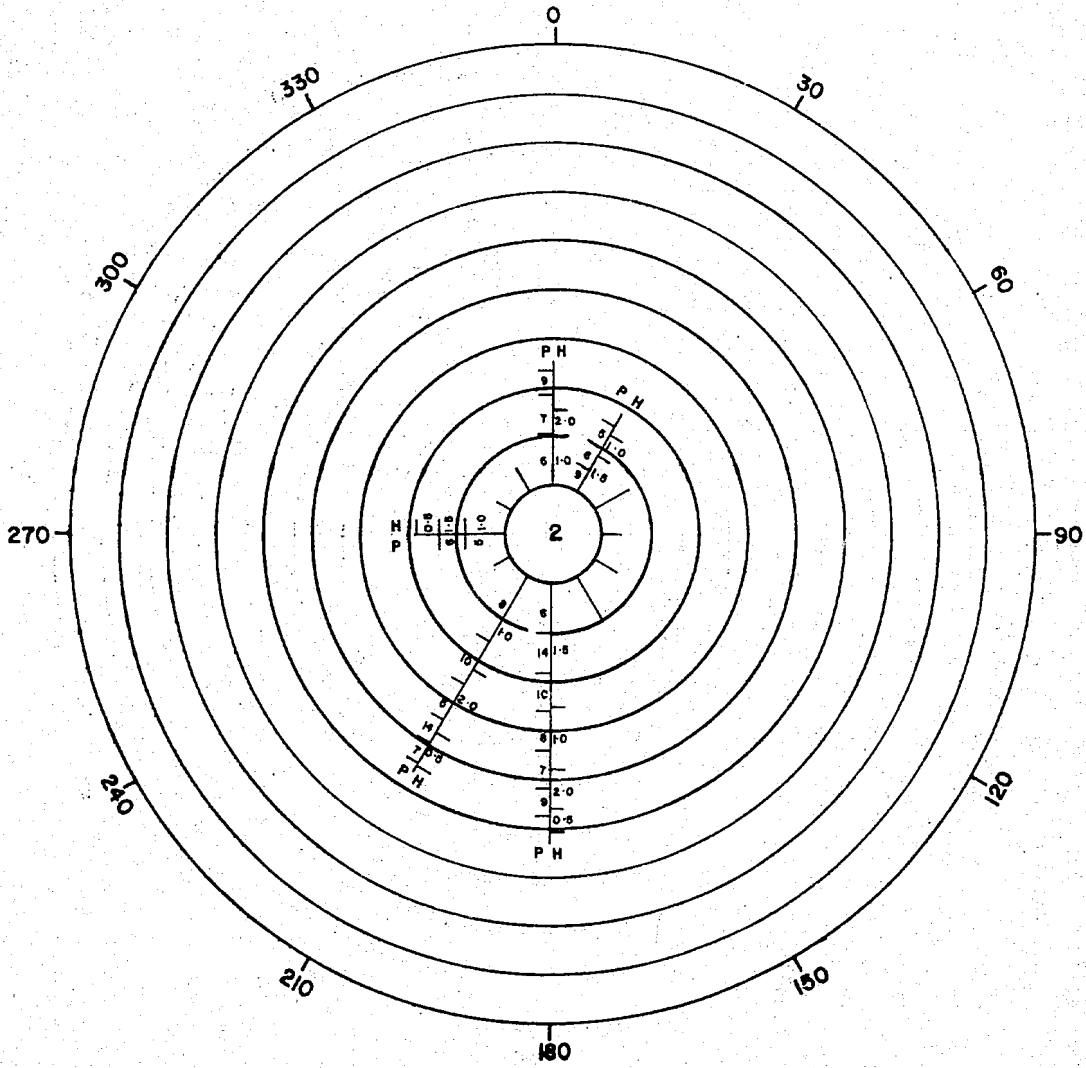




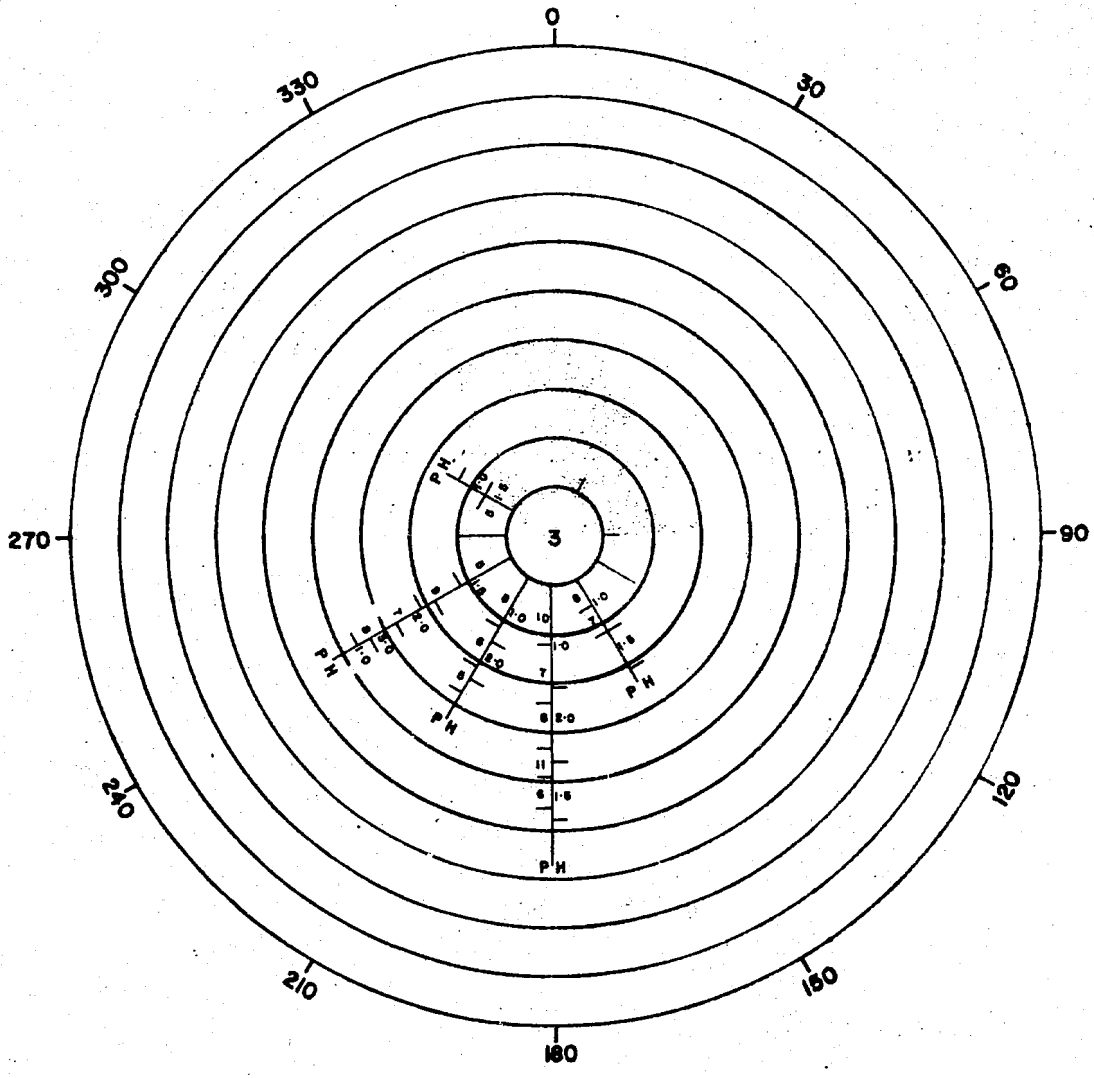
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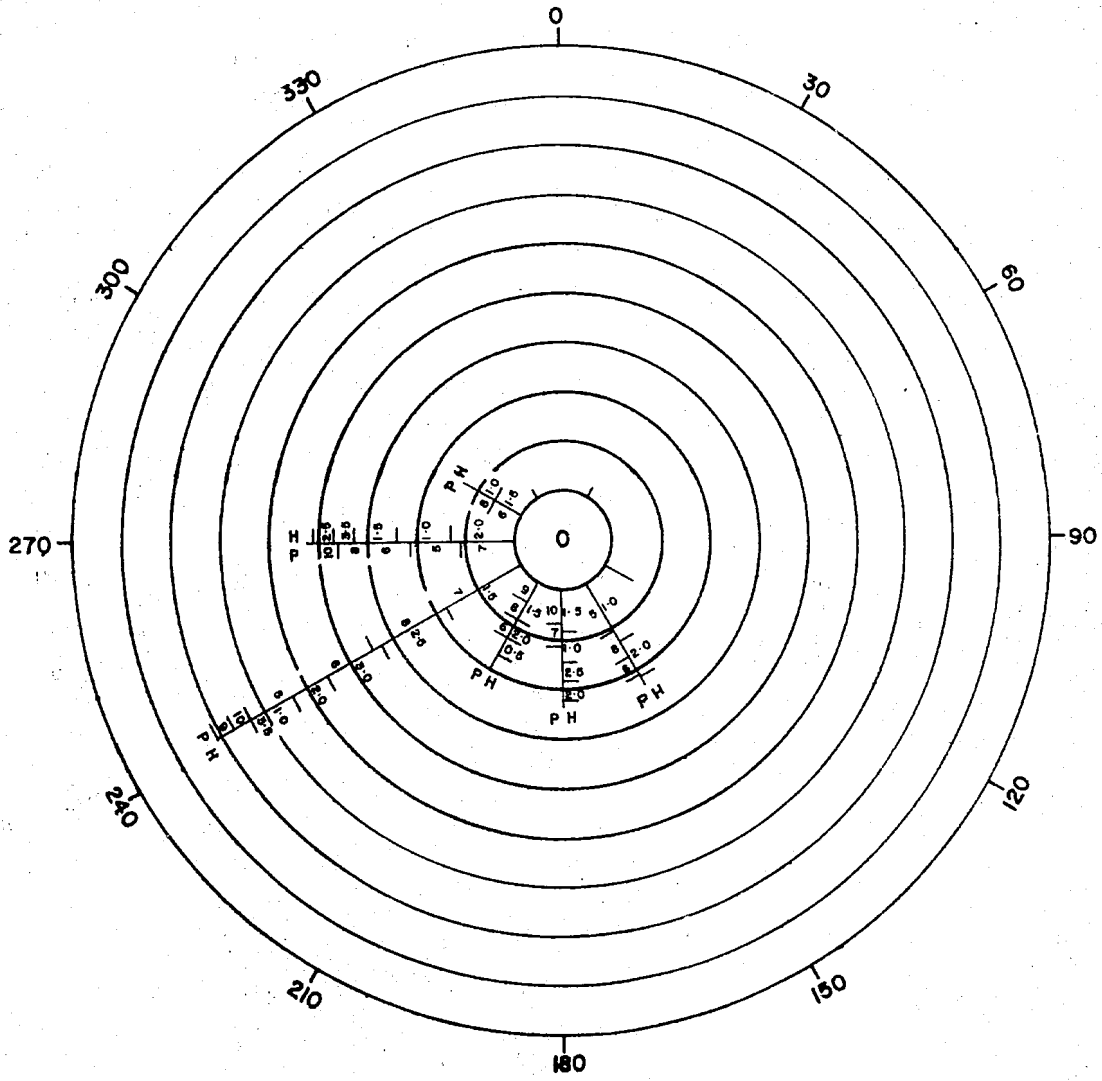
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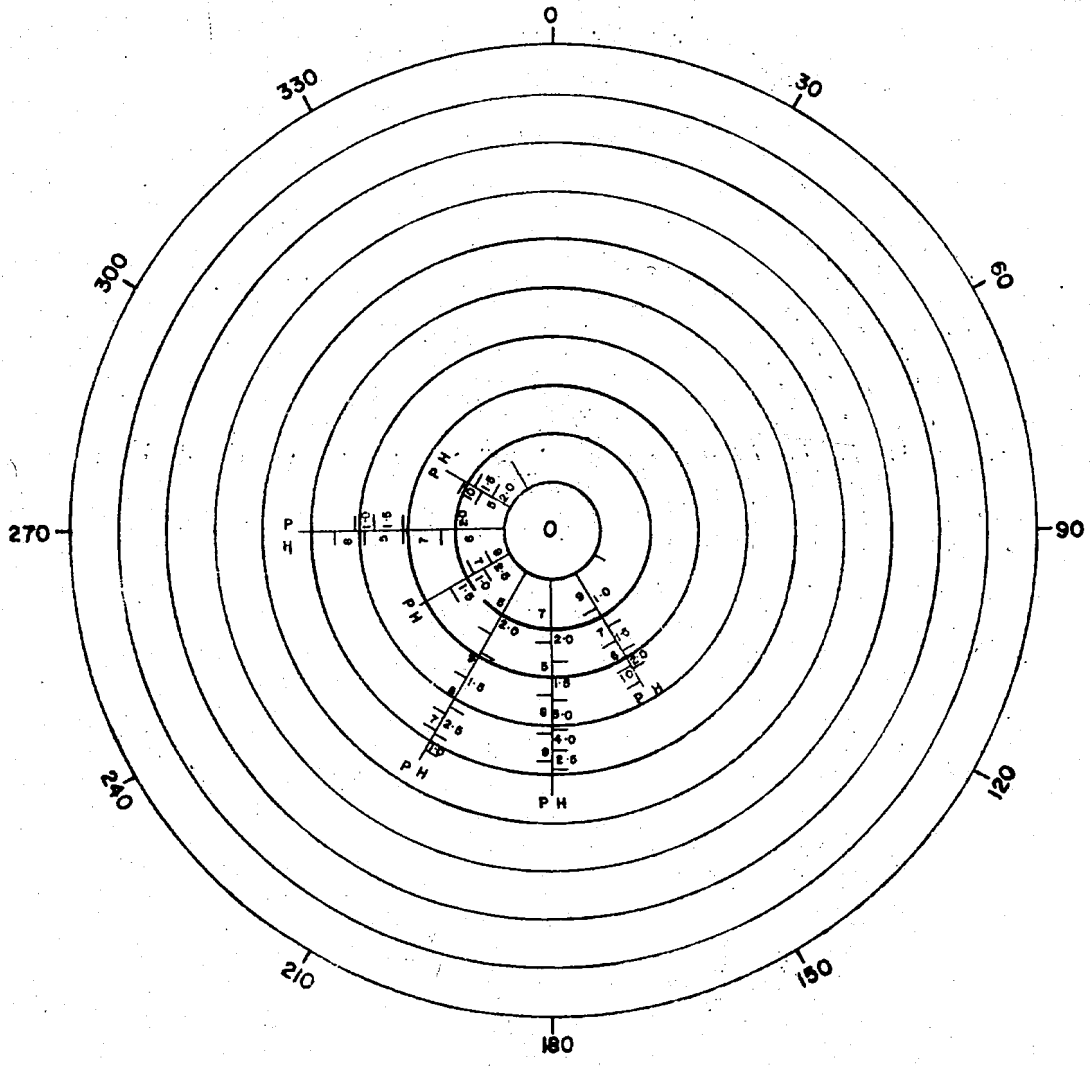
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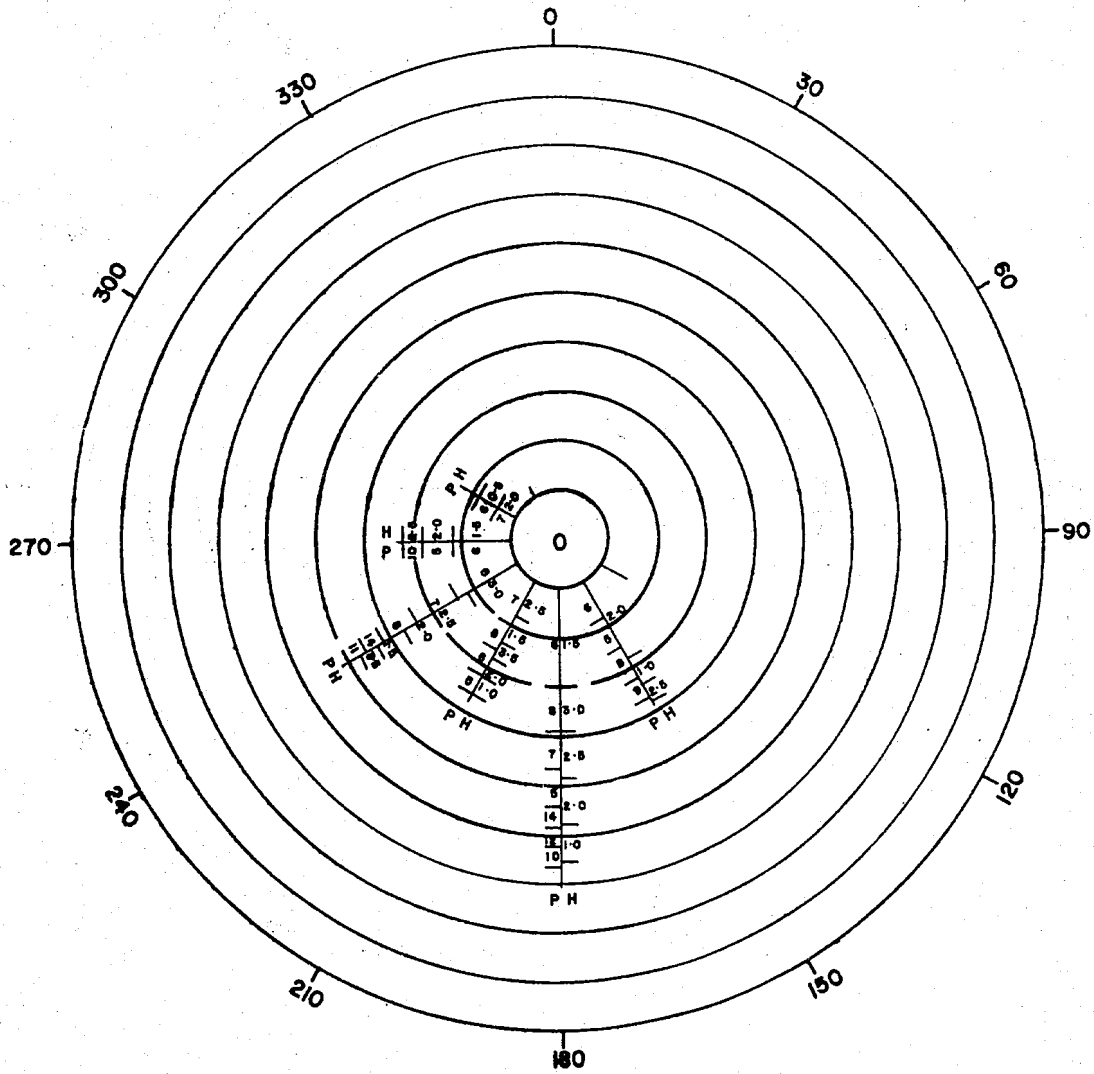
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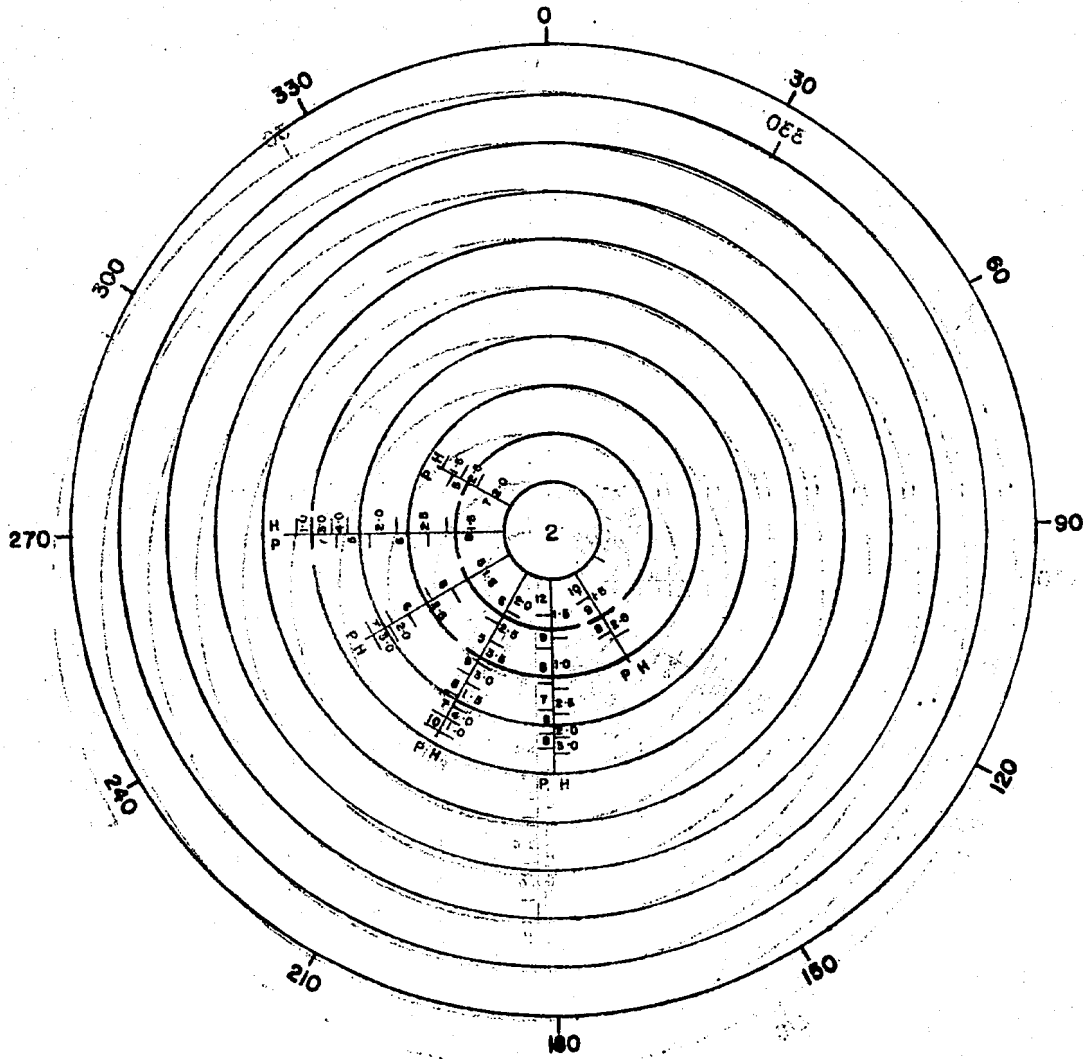
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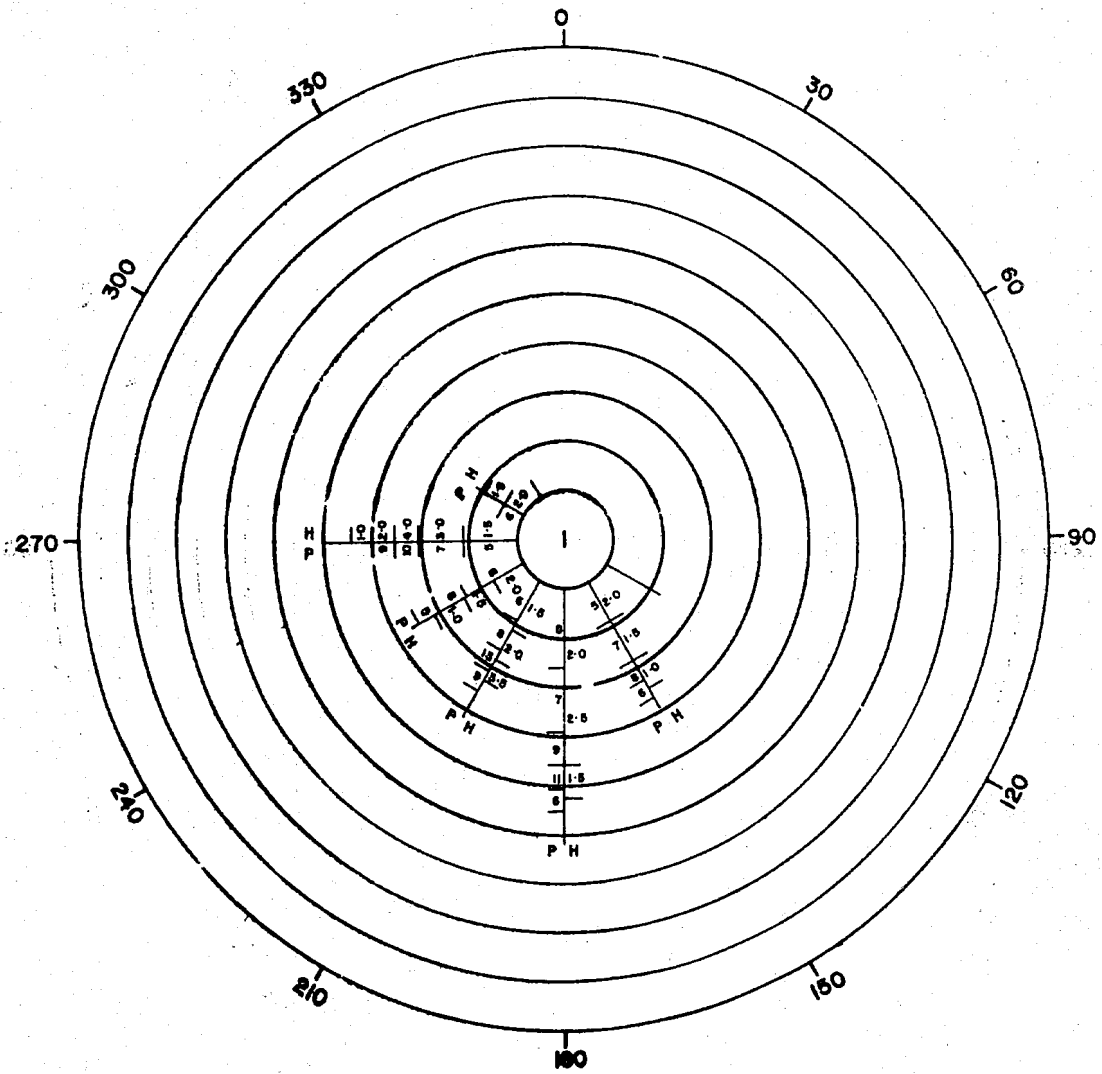
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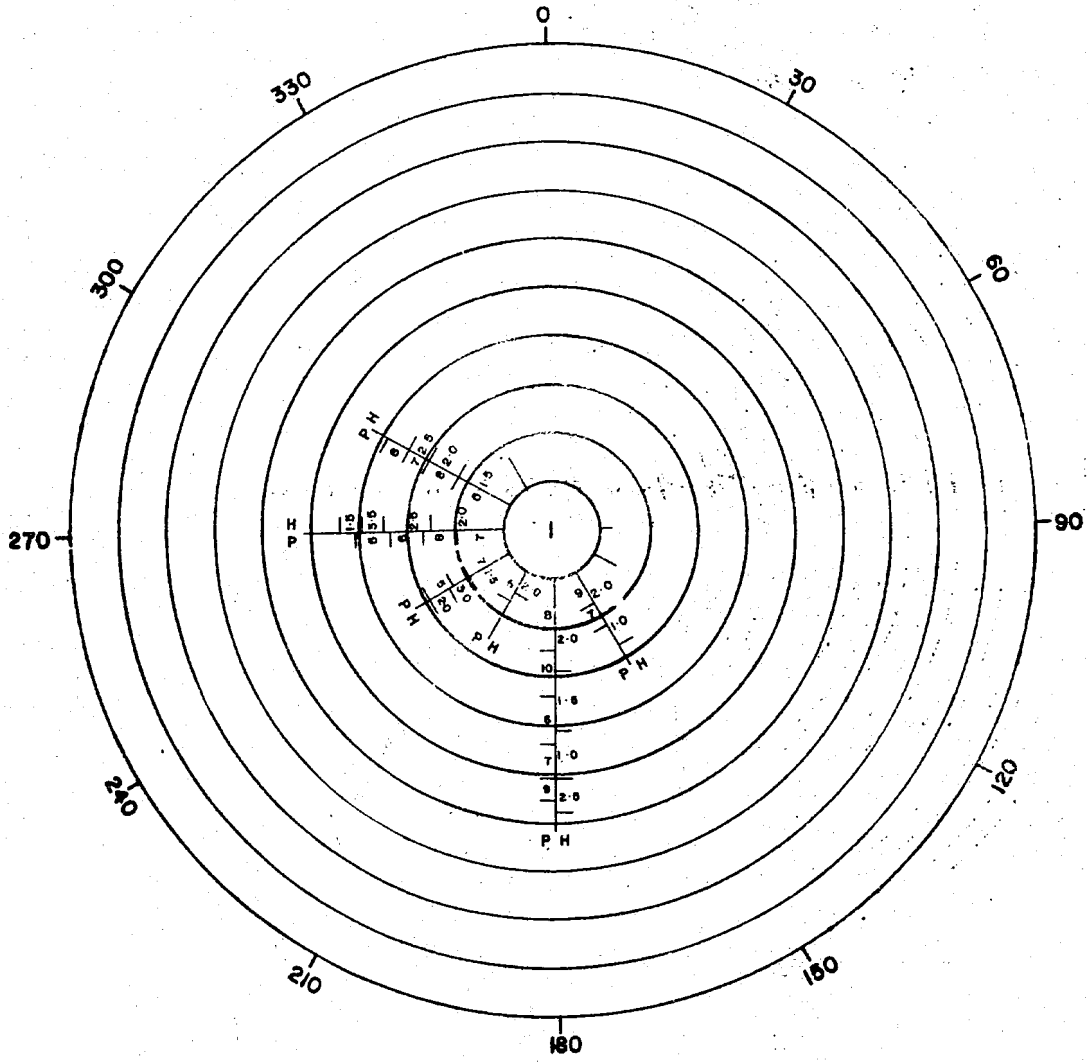
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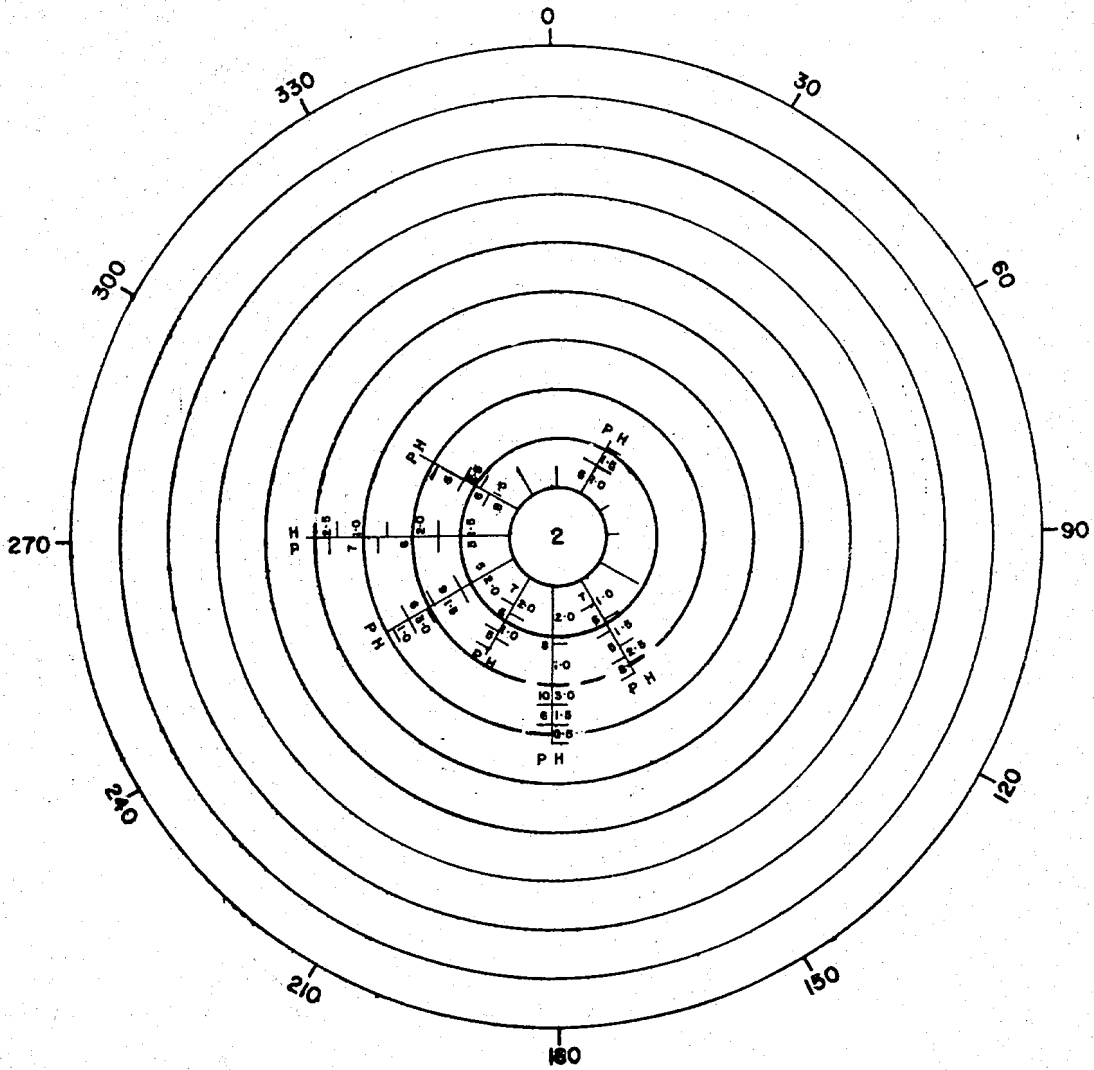
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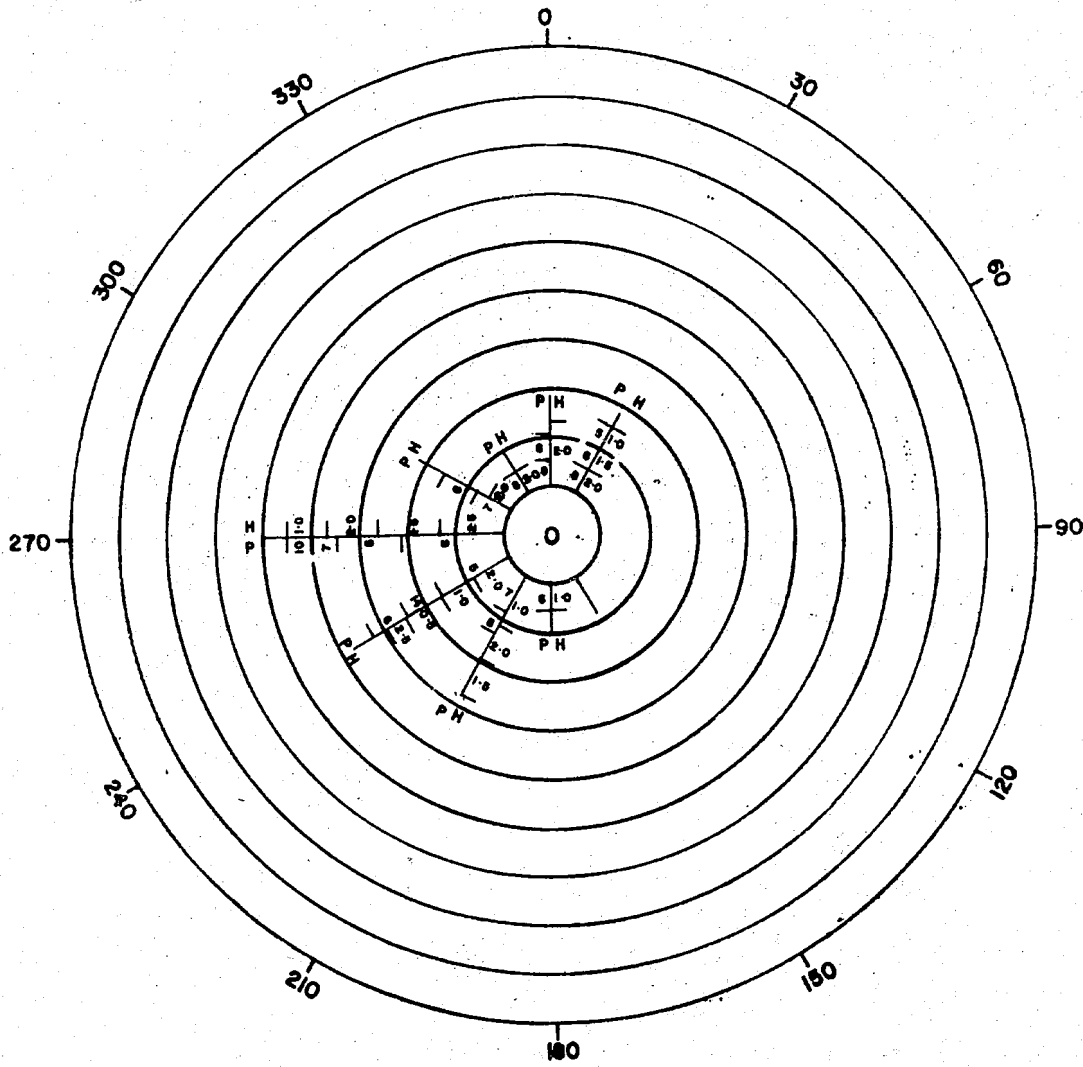
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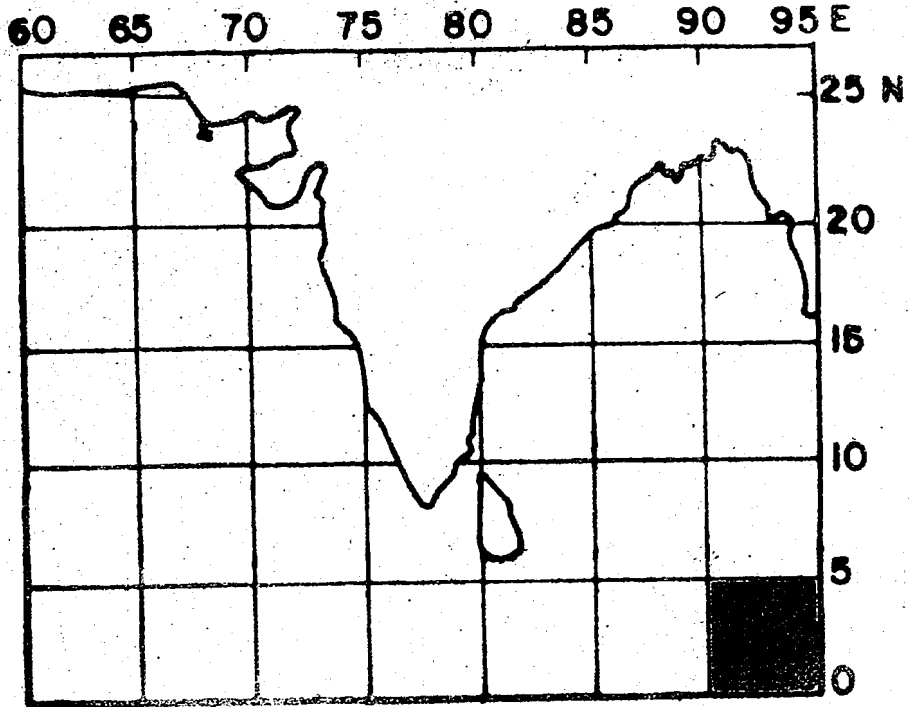
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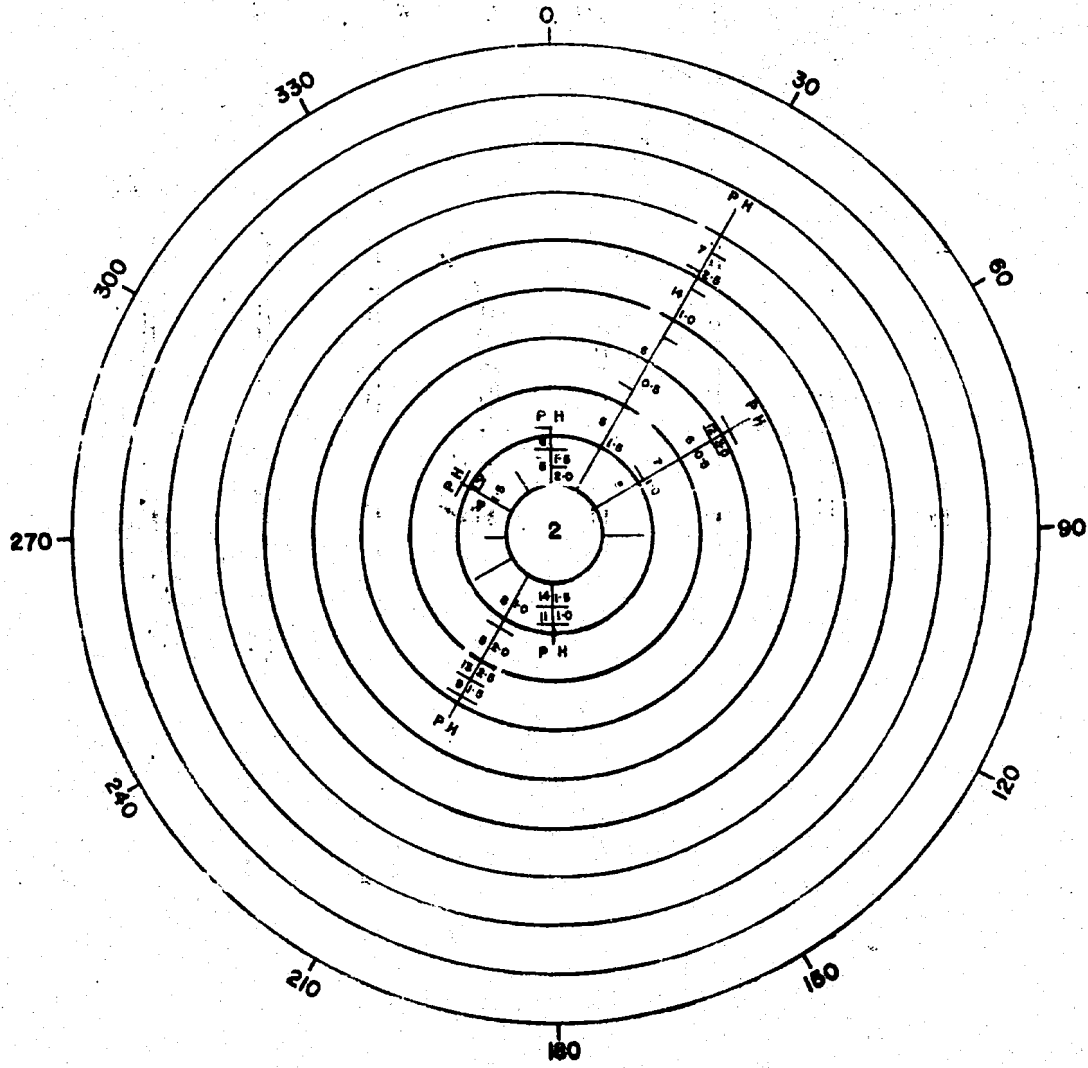


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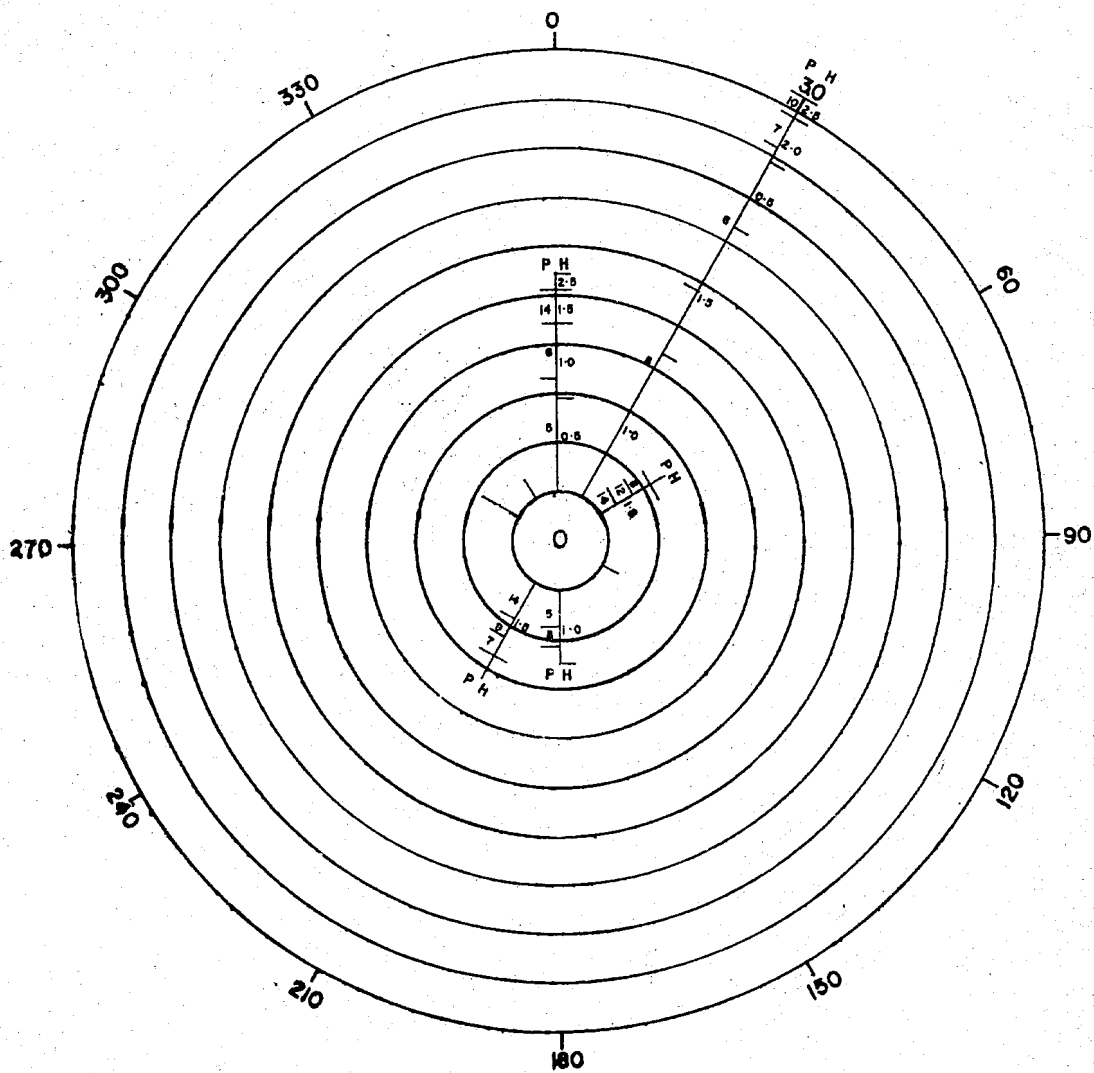


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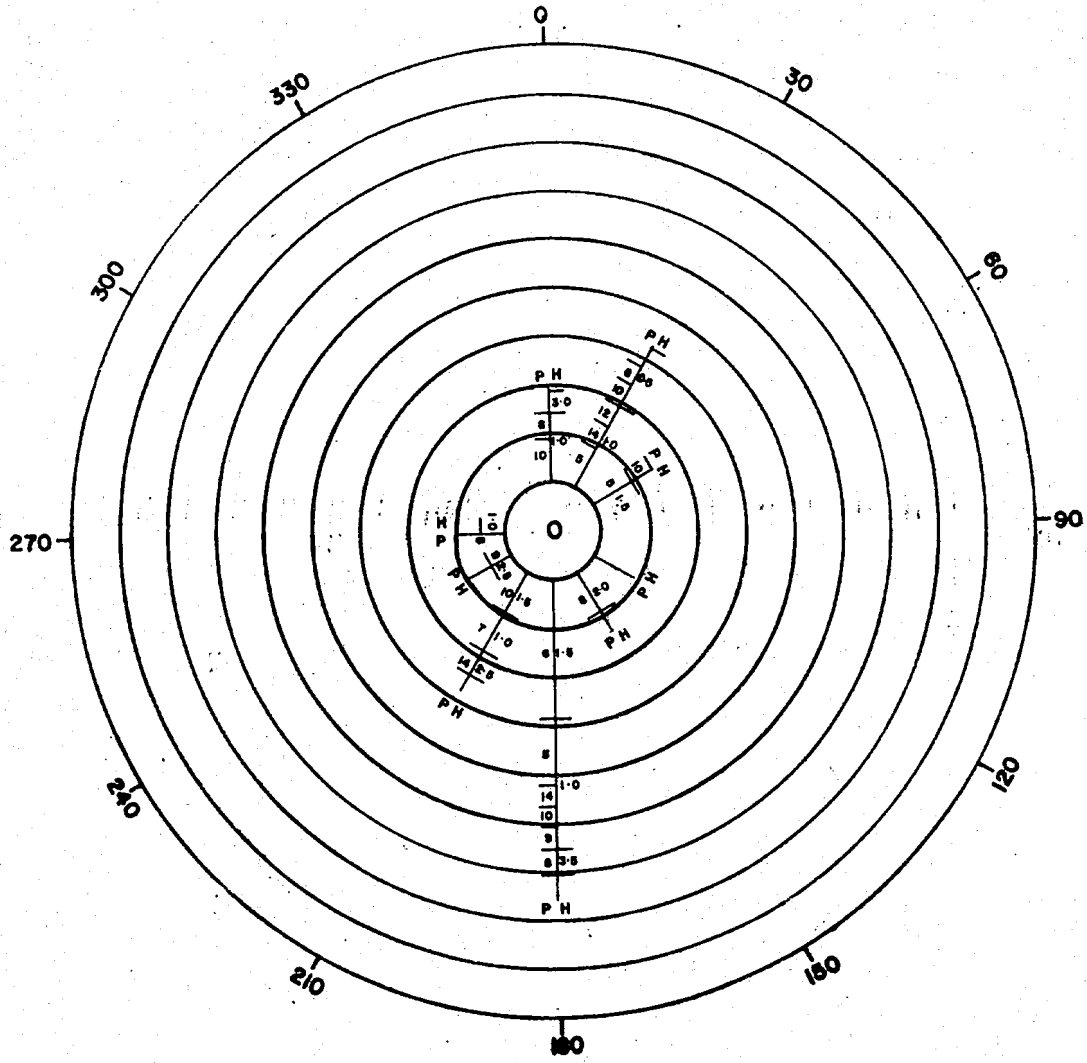




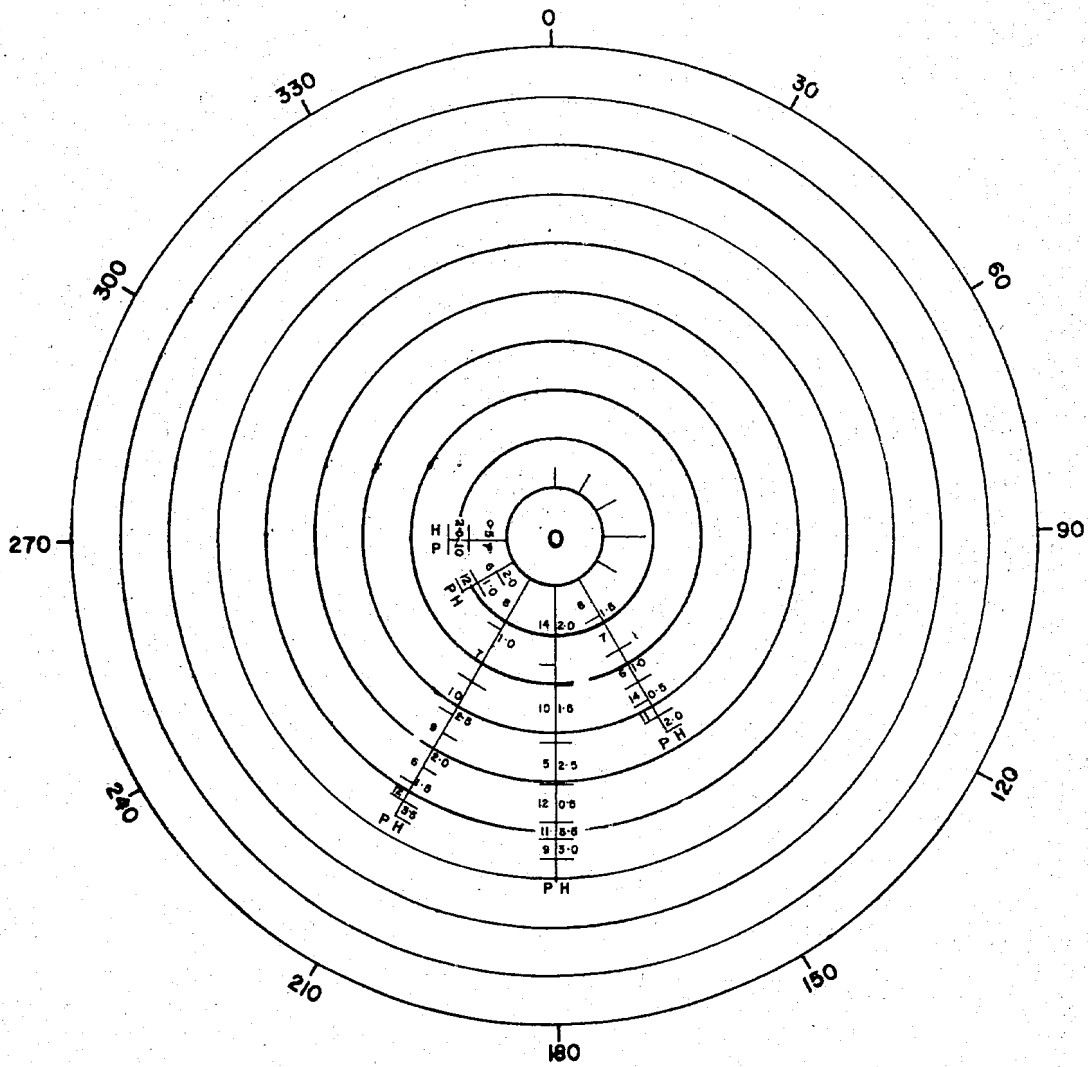
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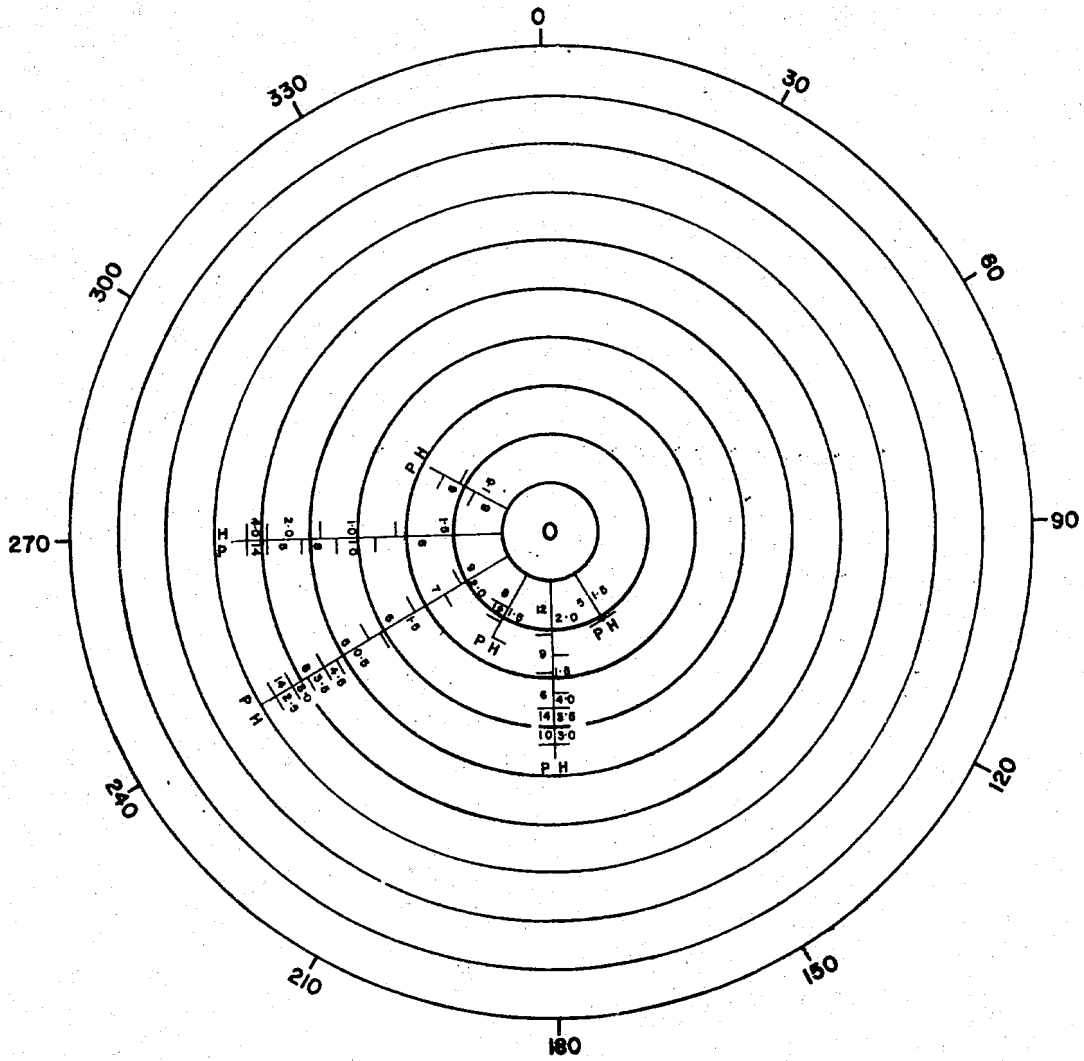
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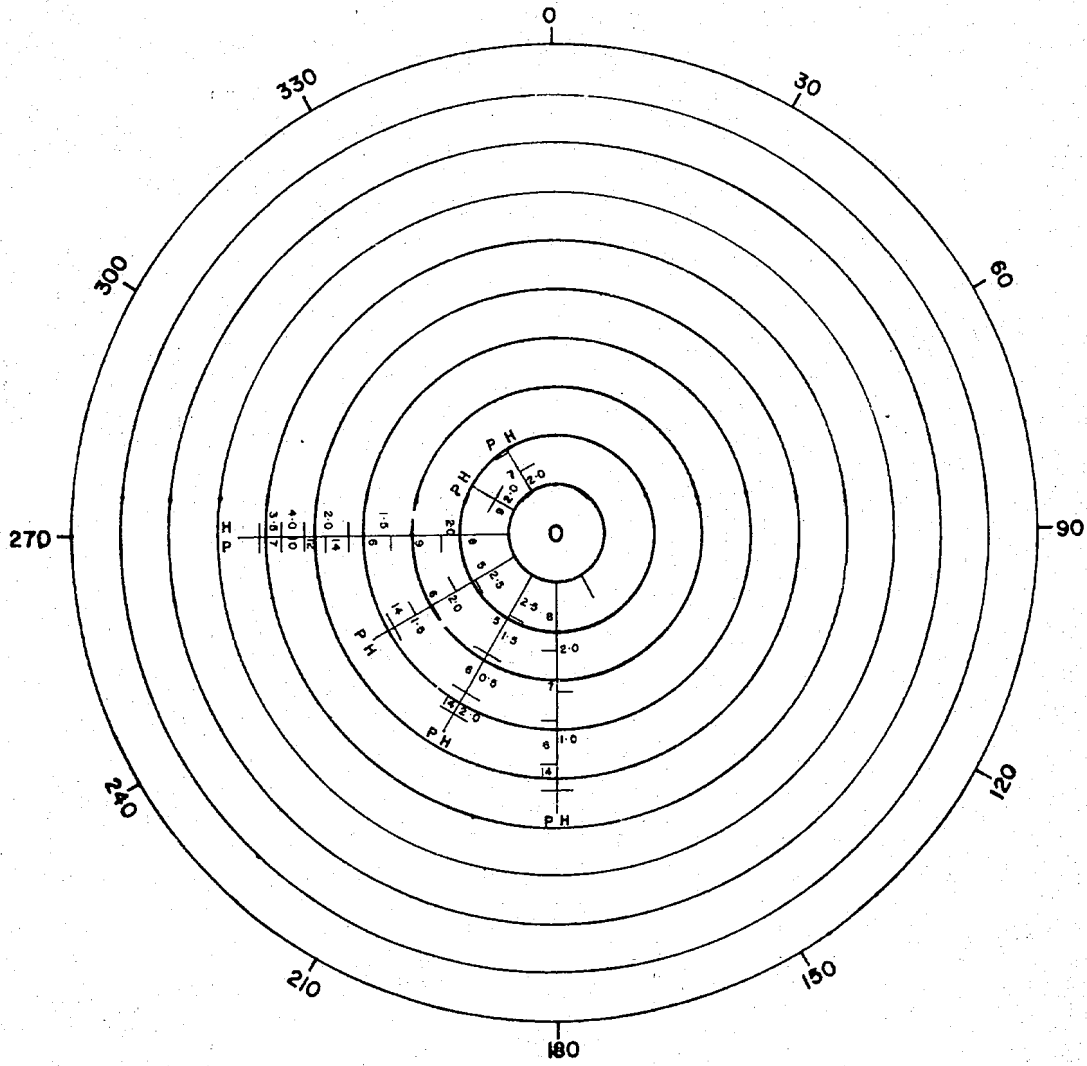
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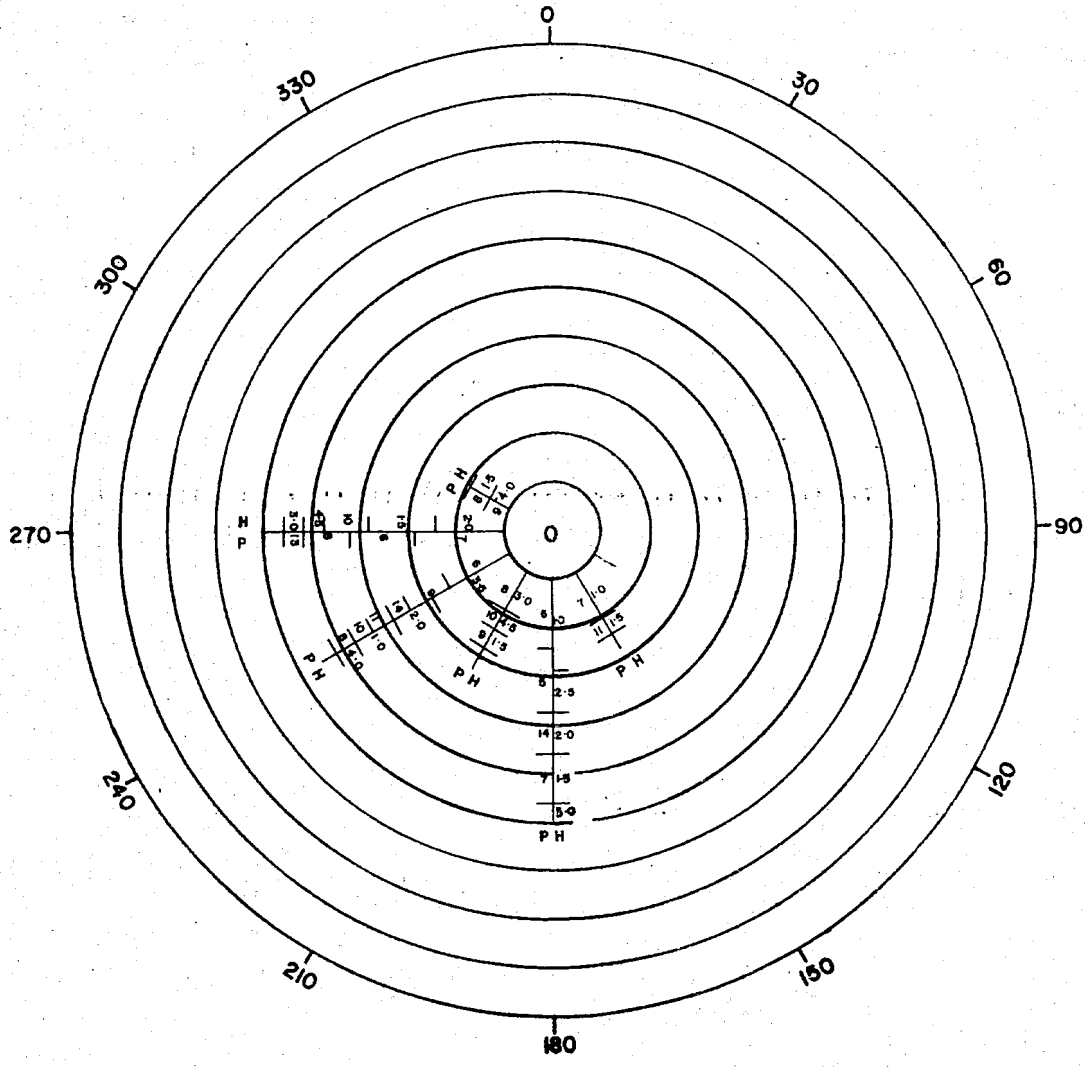
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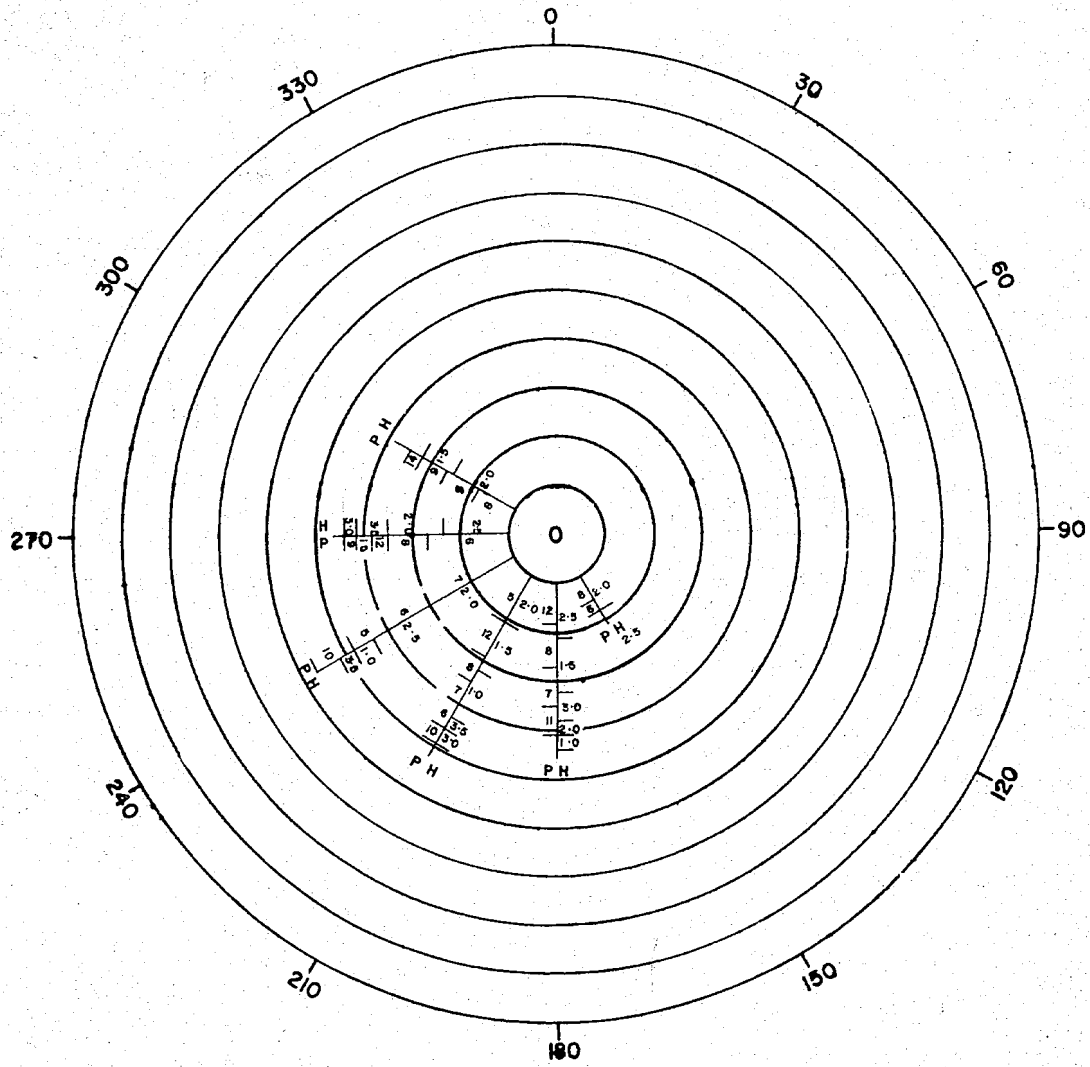
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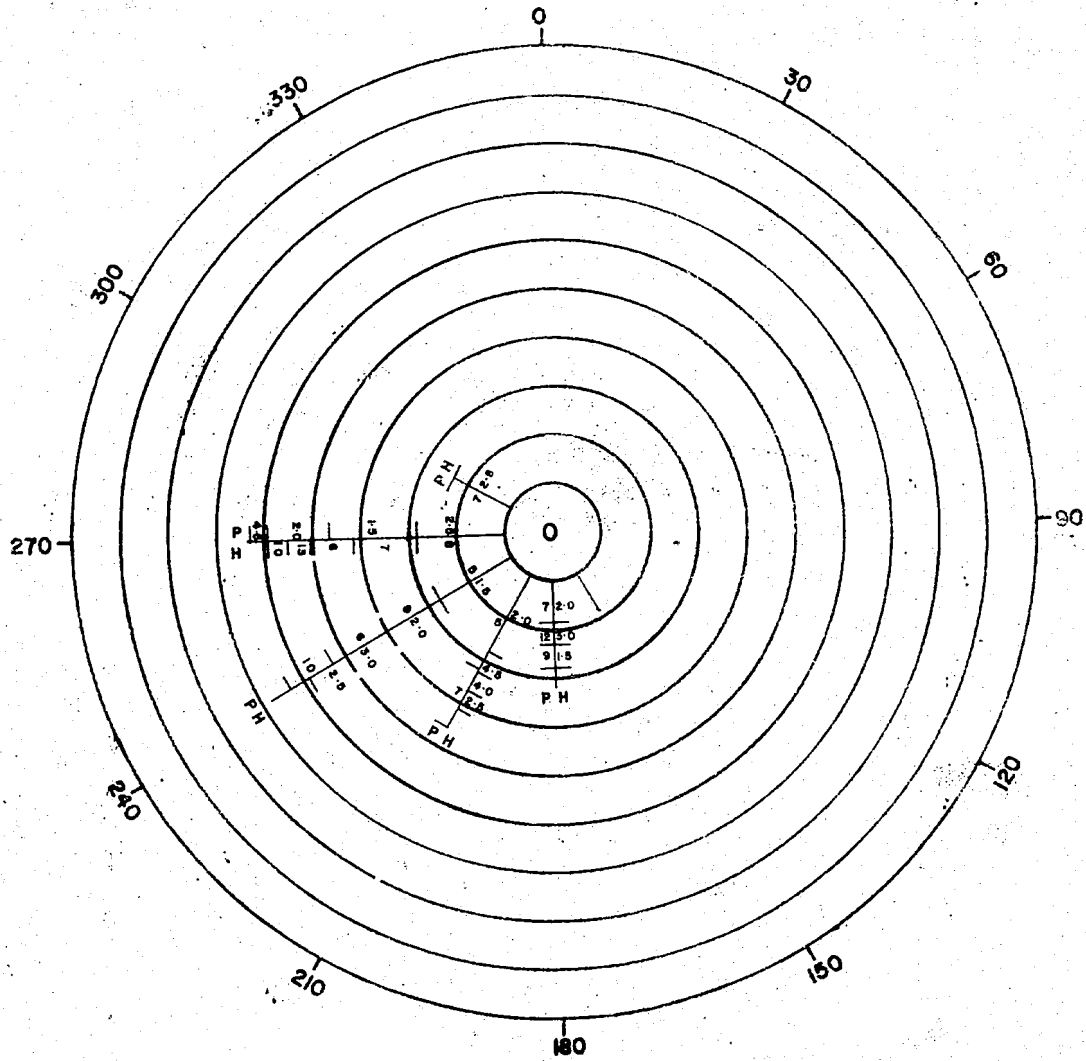
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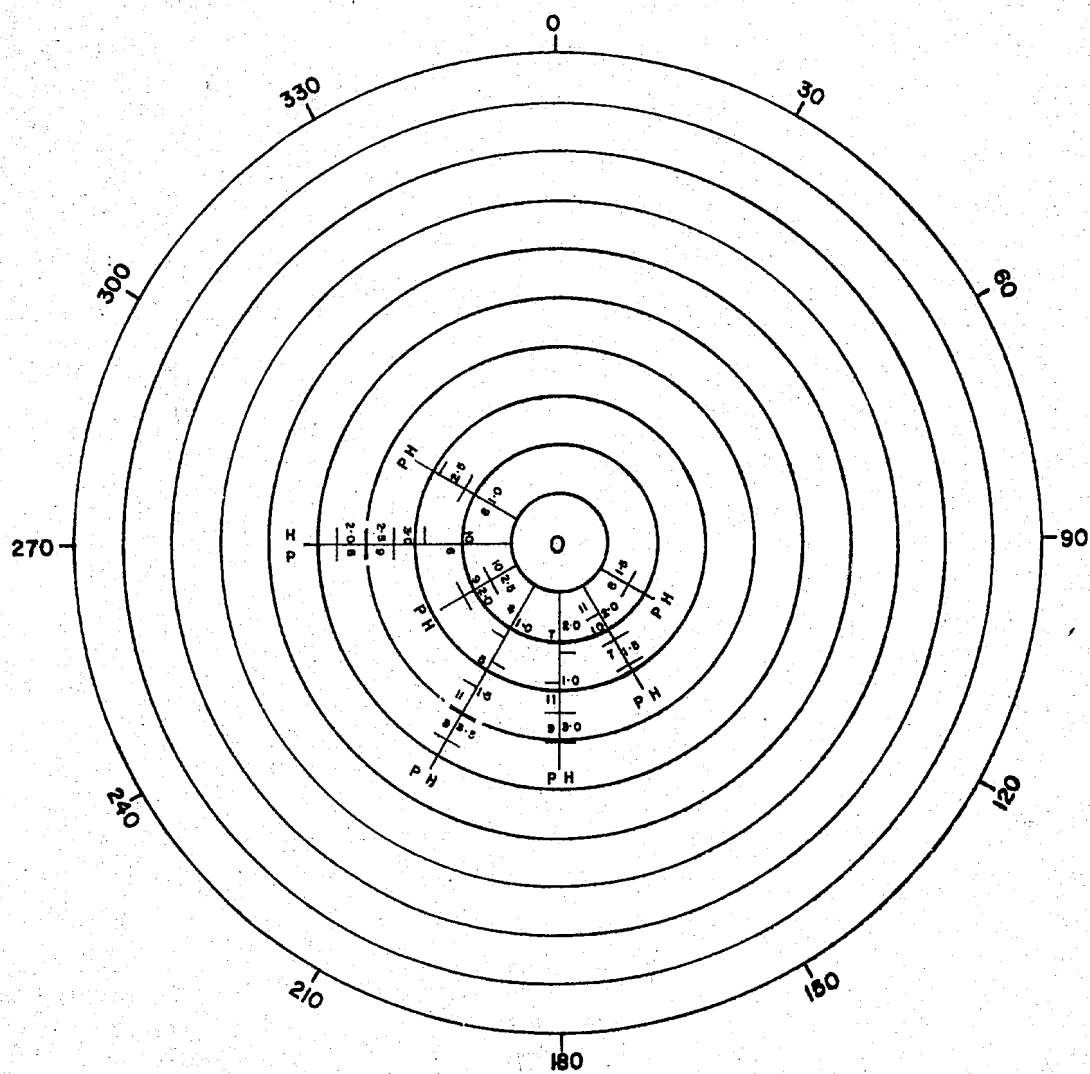
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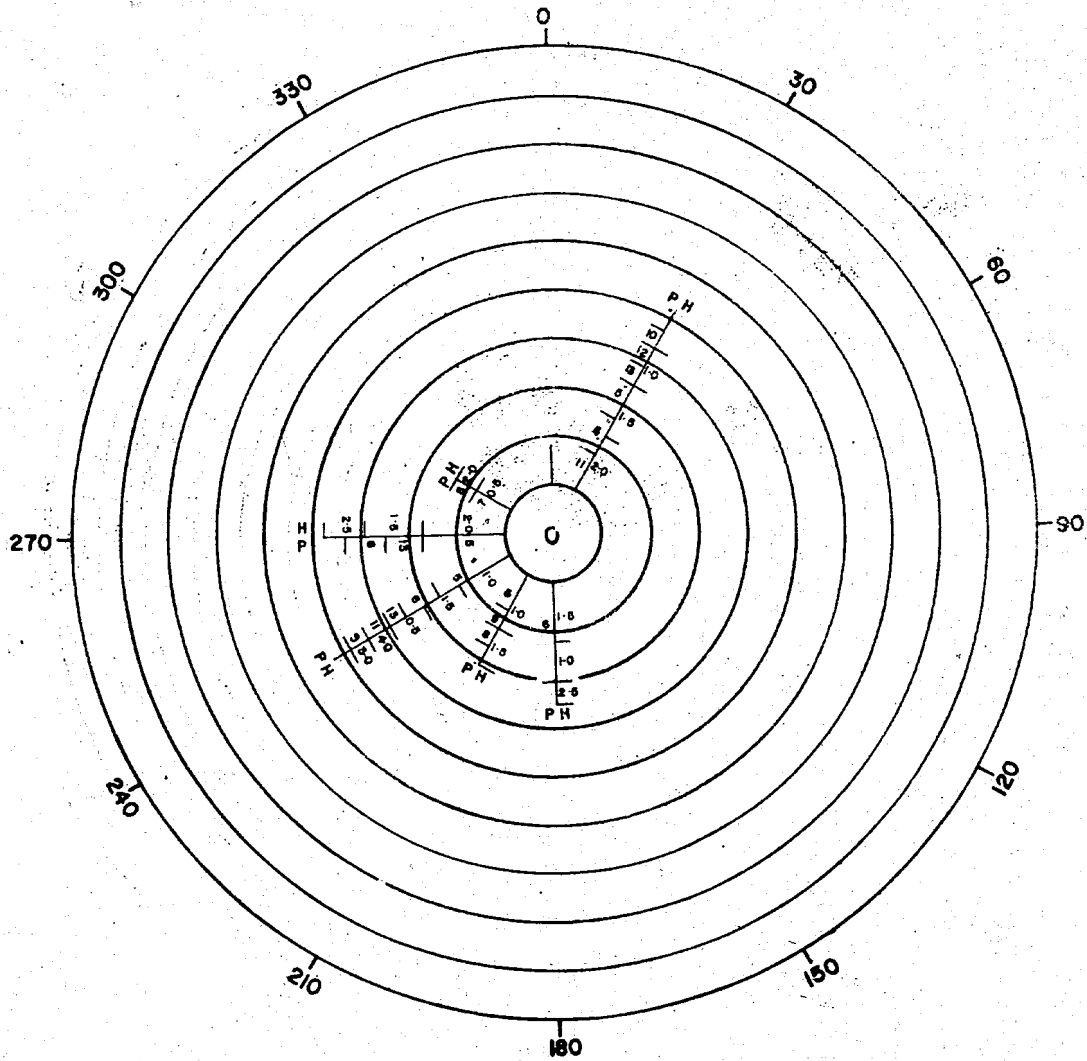
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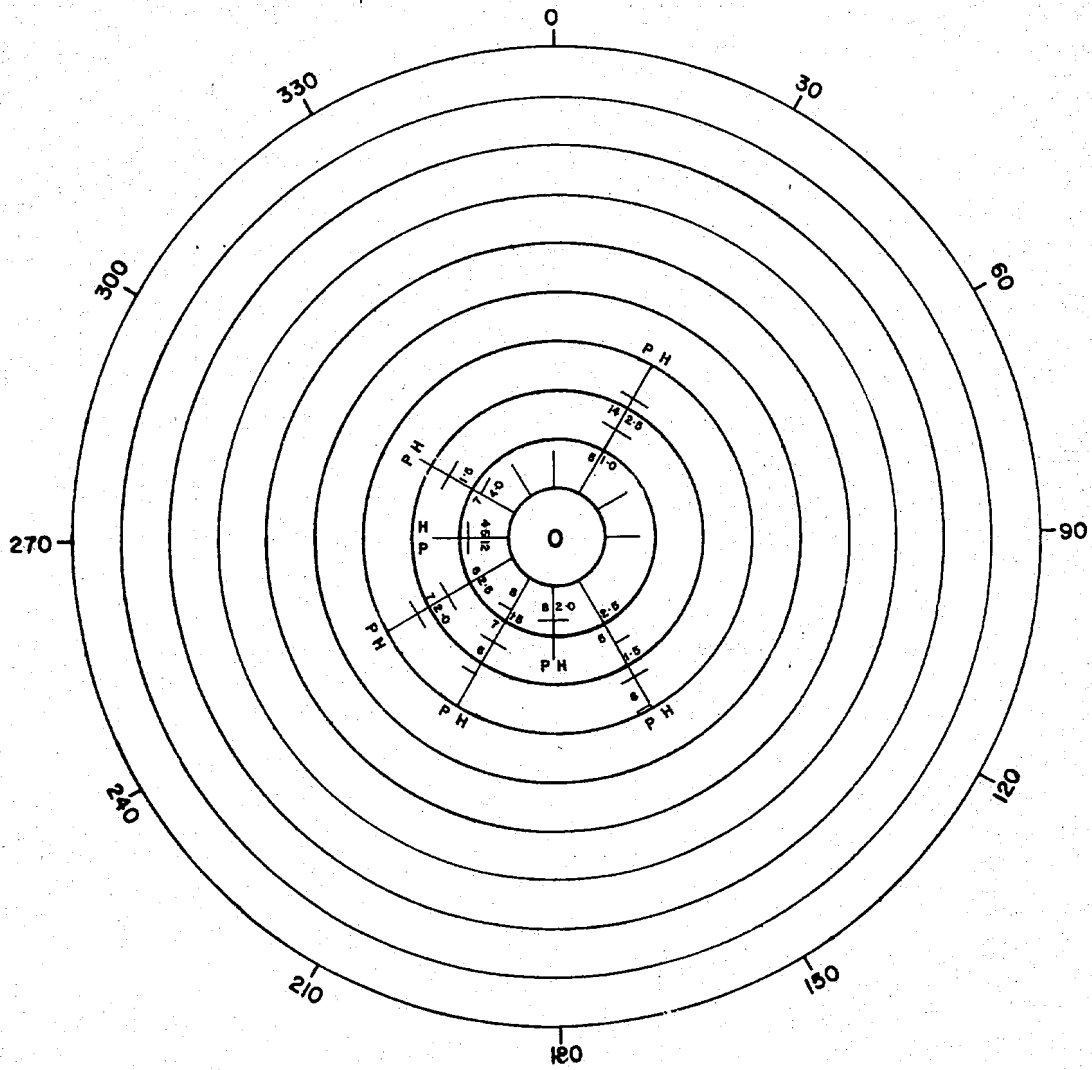
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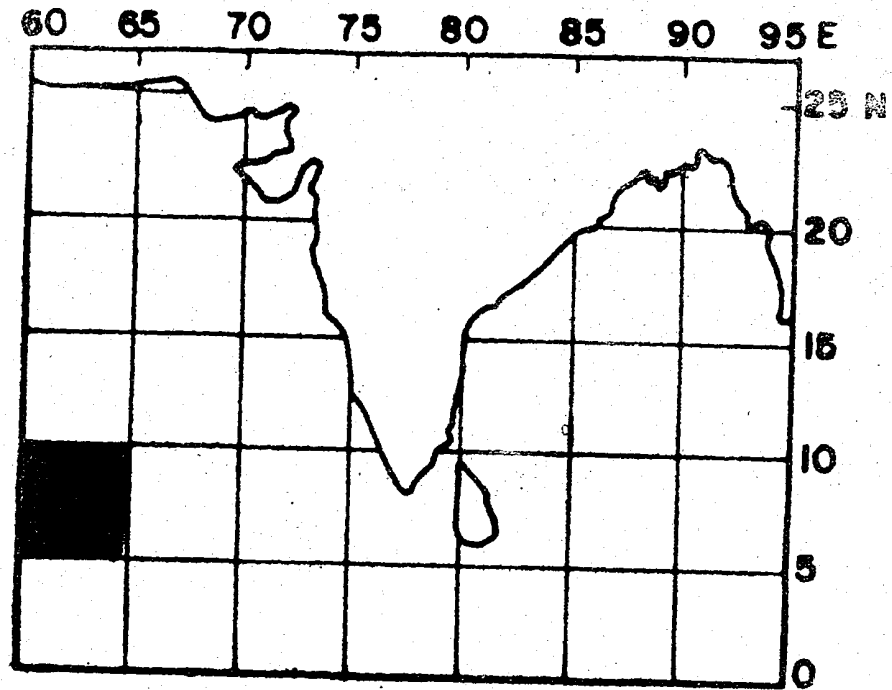


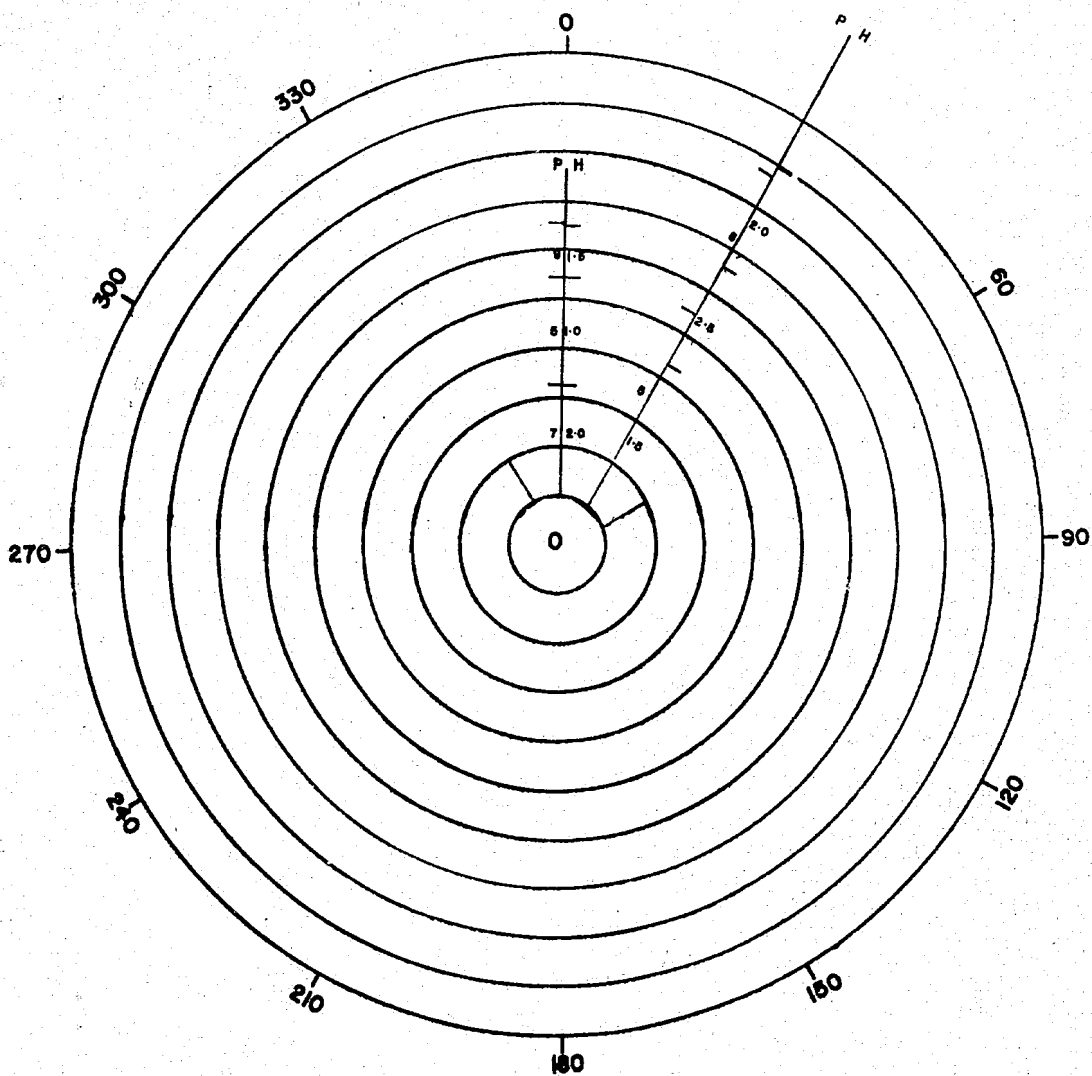
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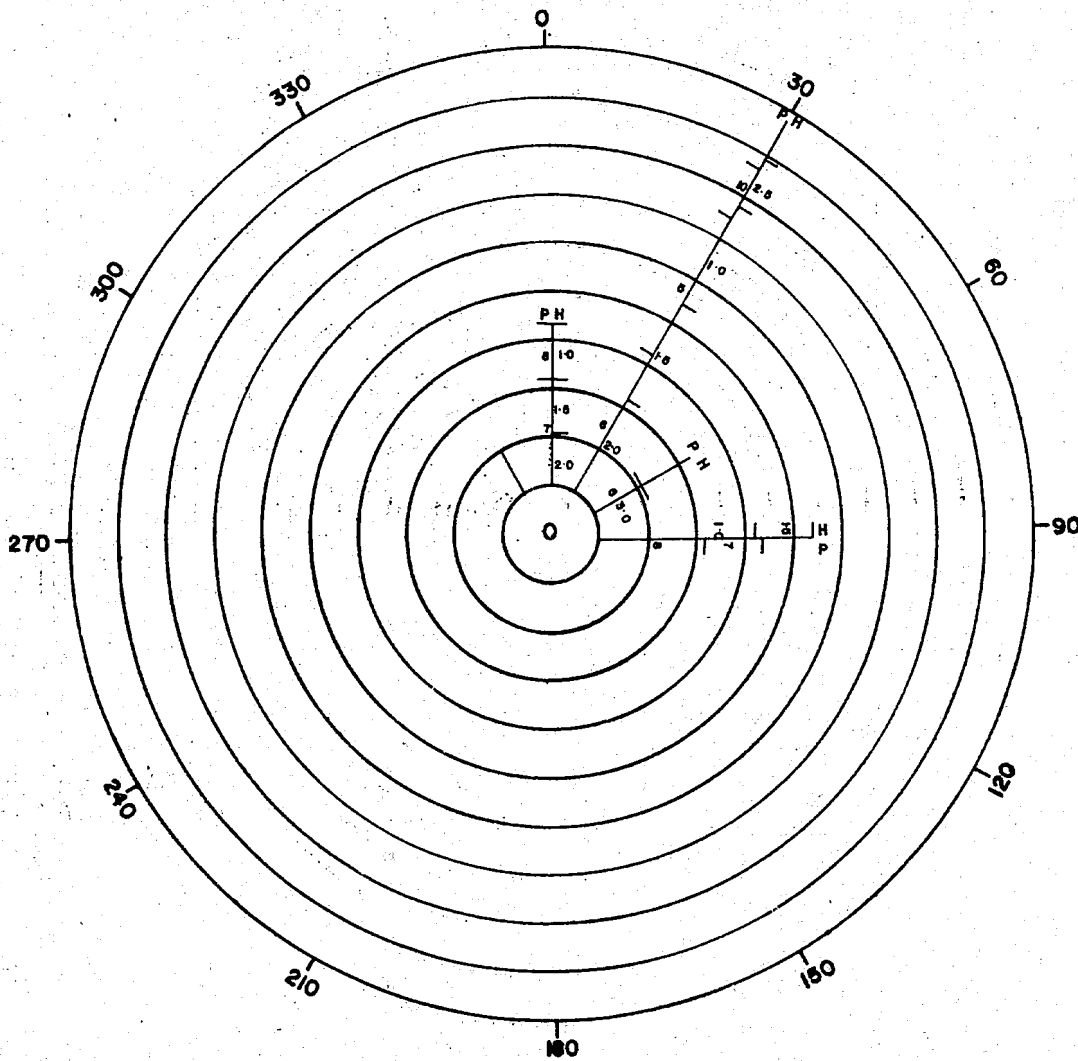
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344

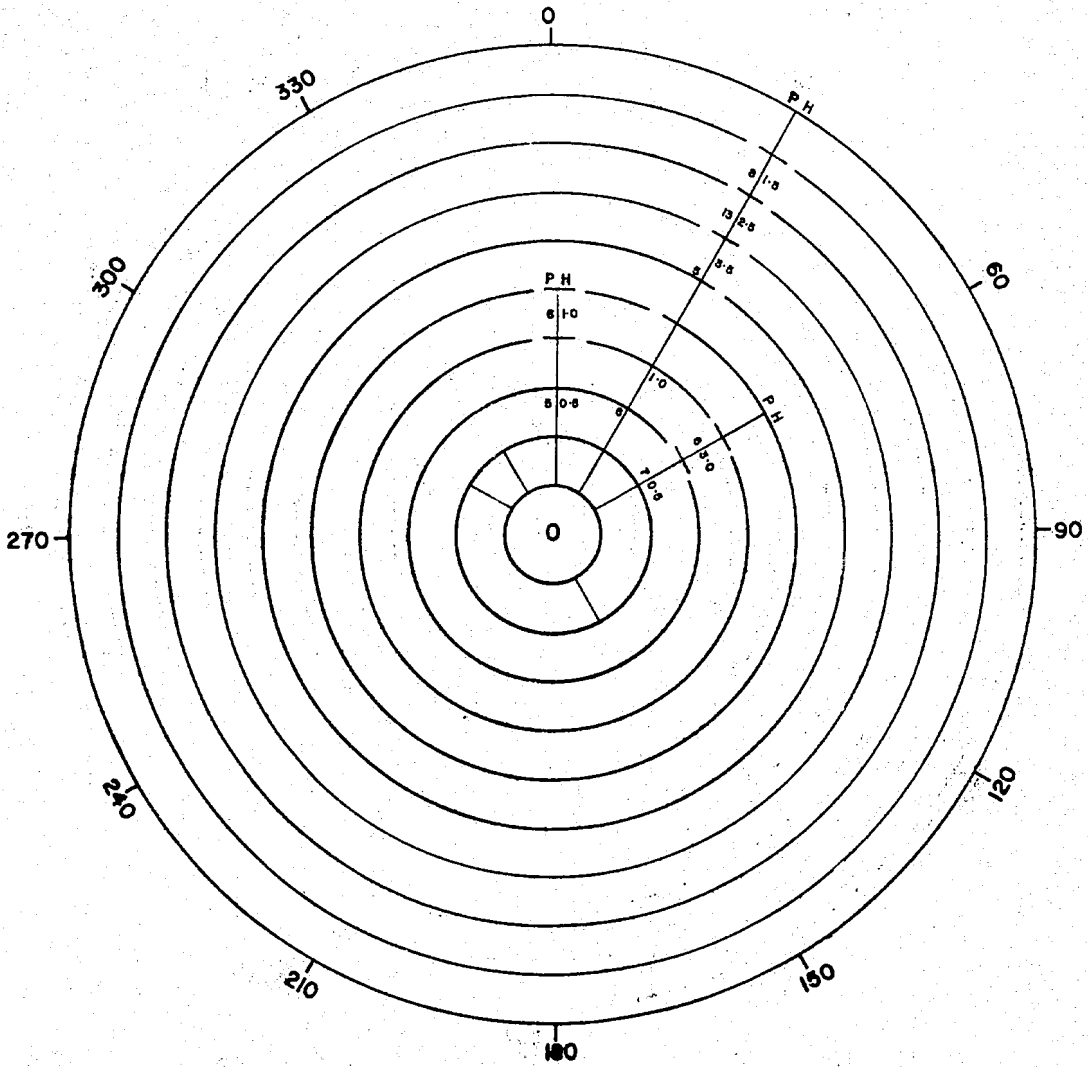




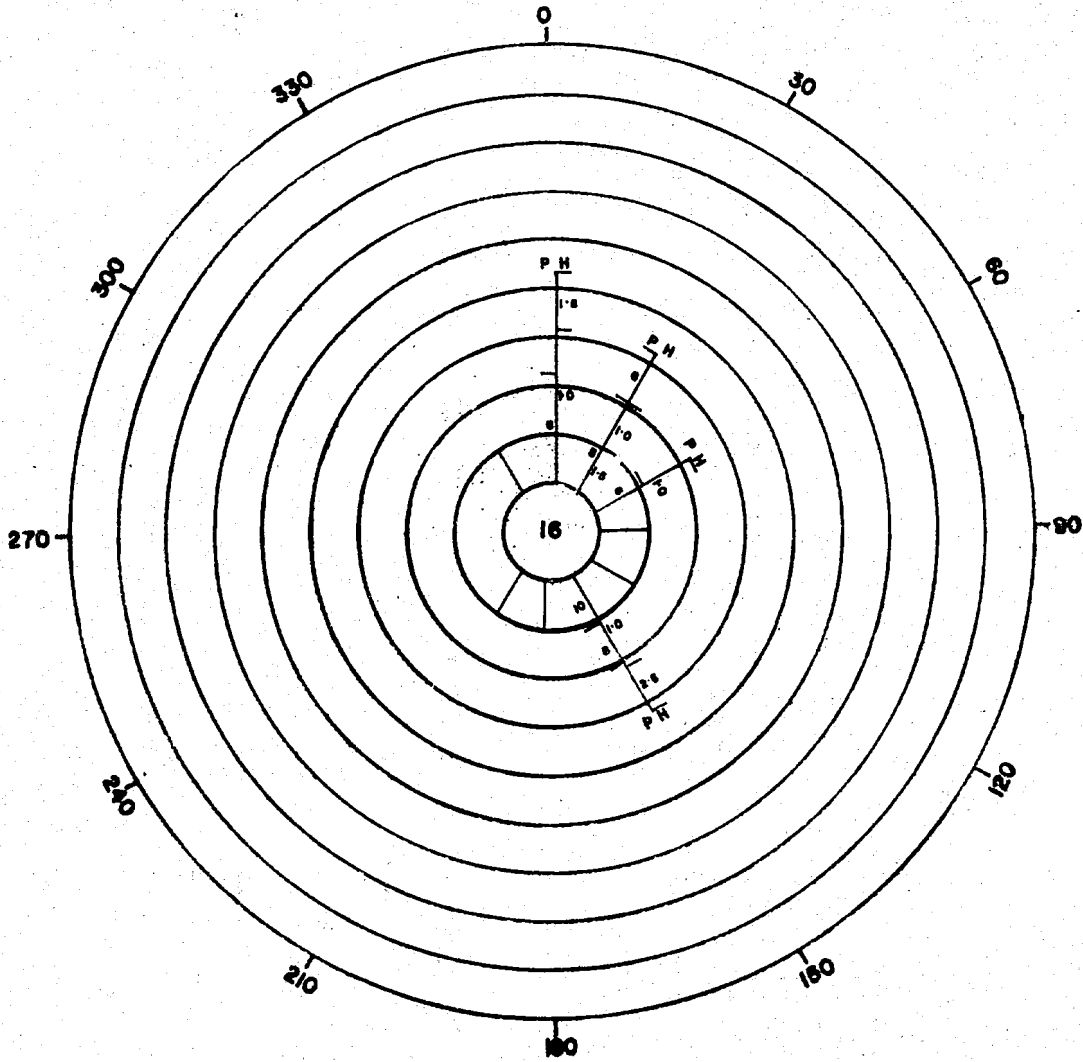
JANUARY



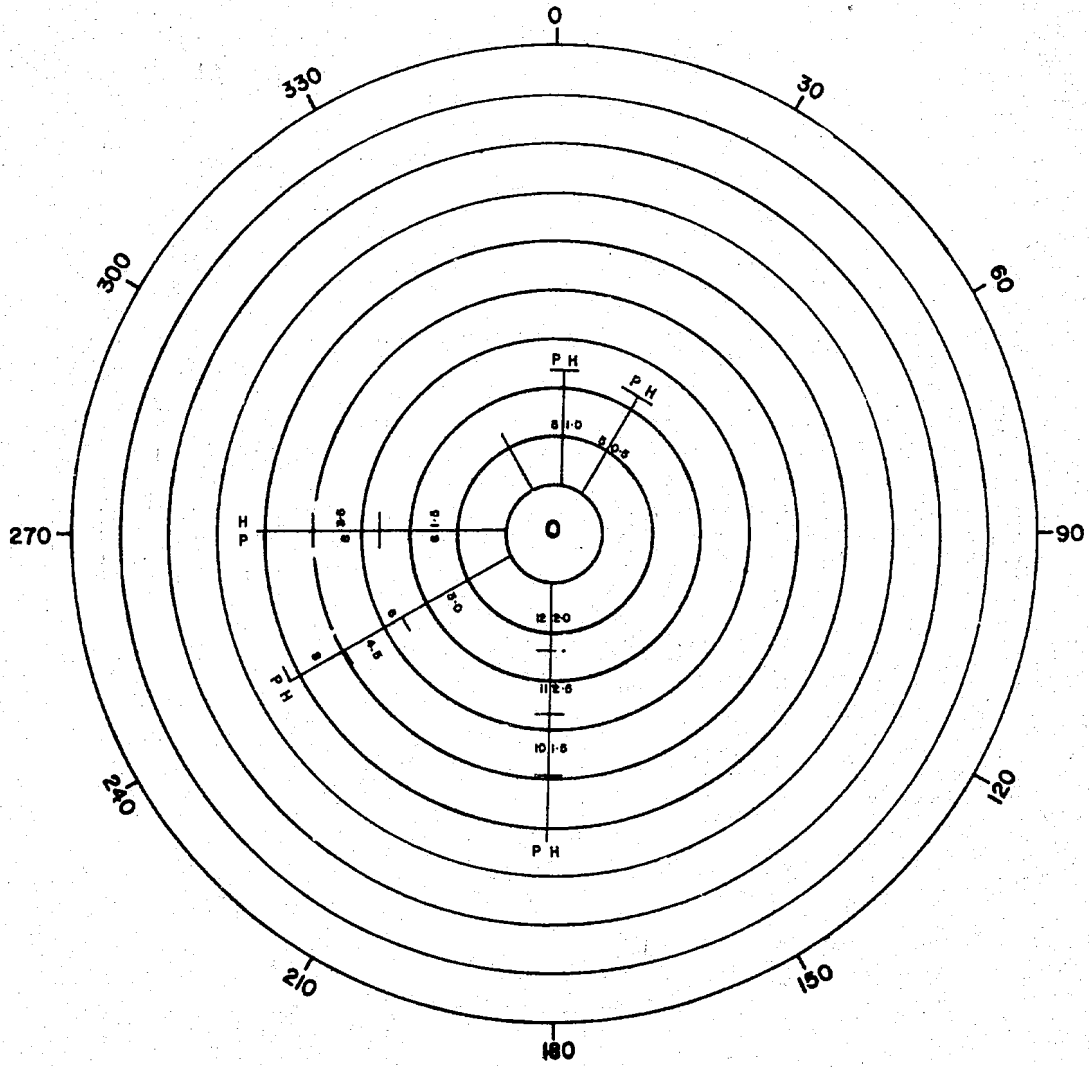
FEBRUARY



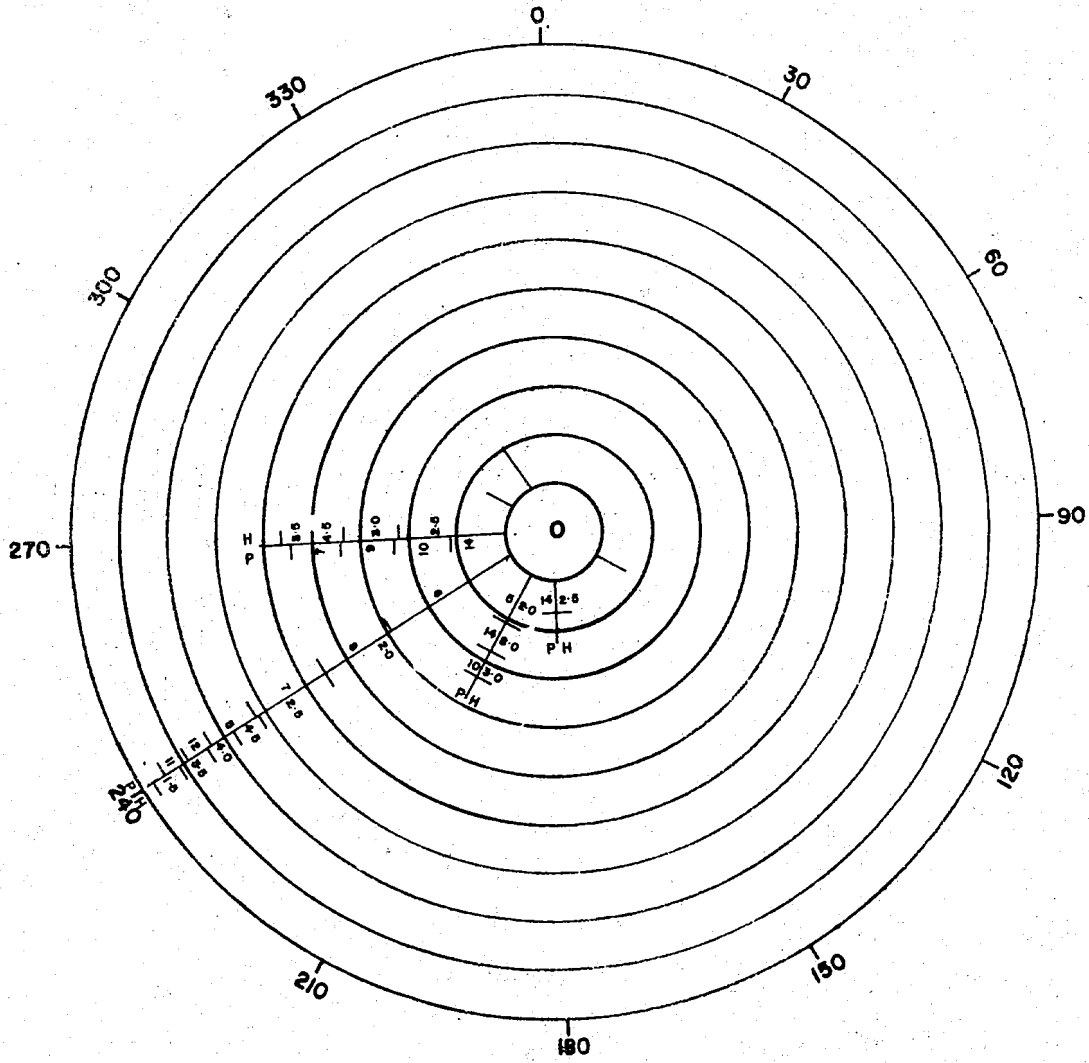
MARCH



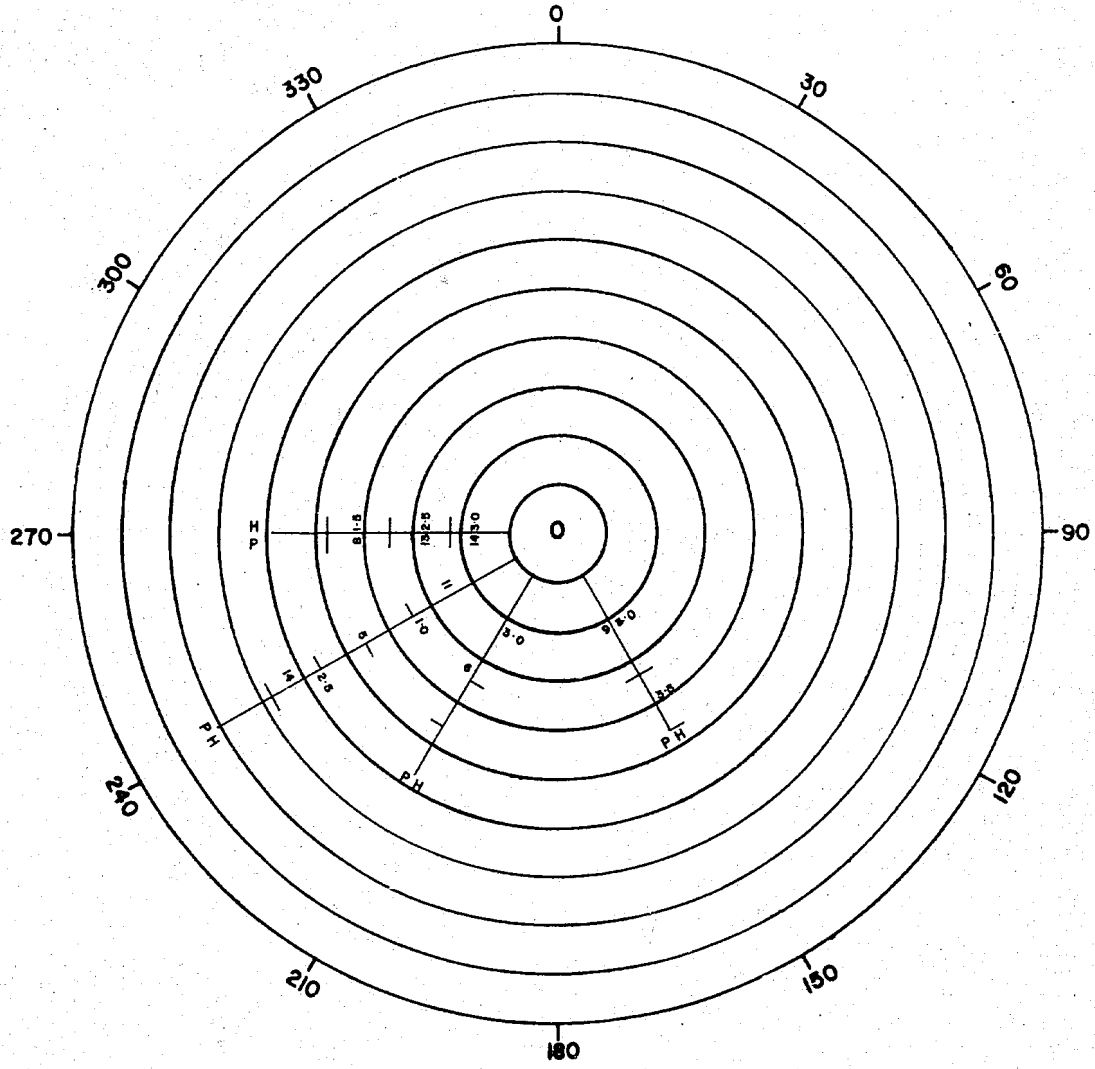
APRIL



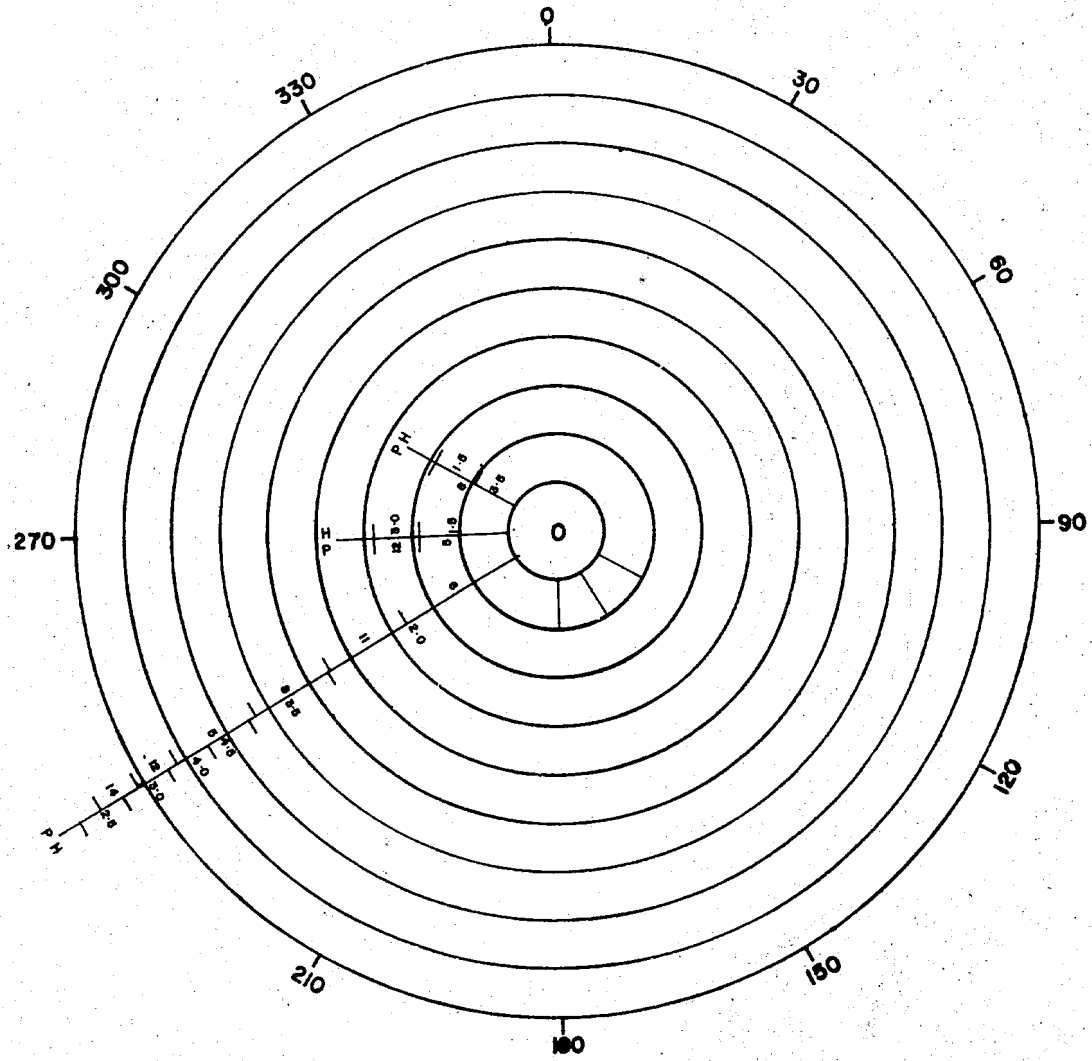
MAY



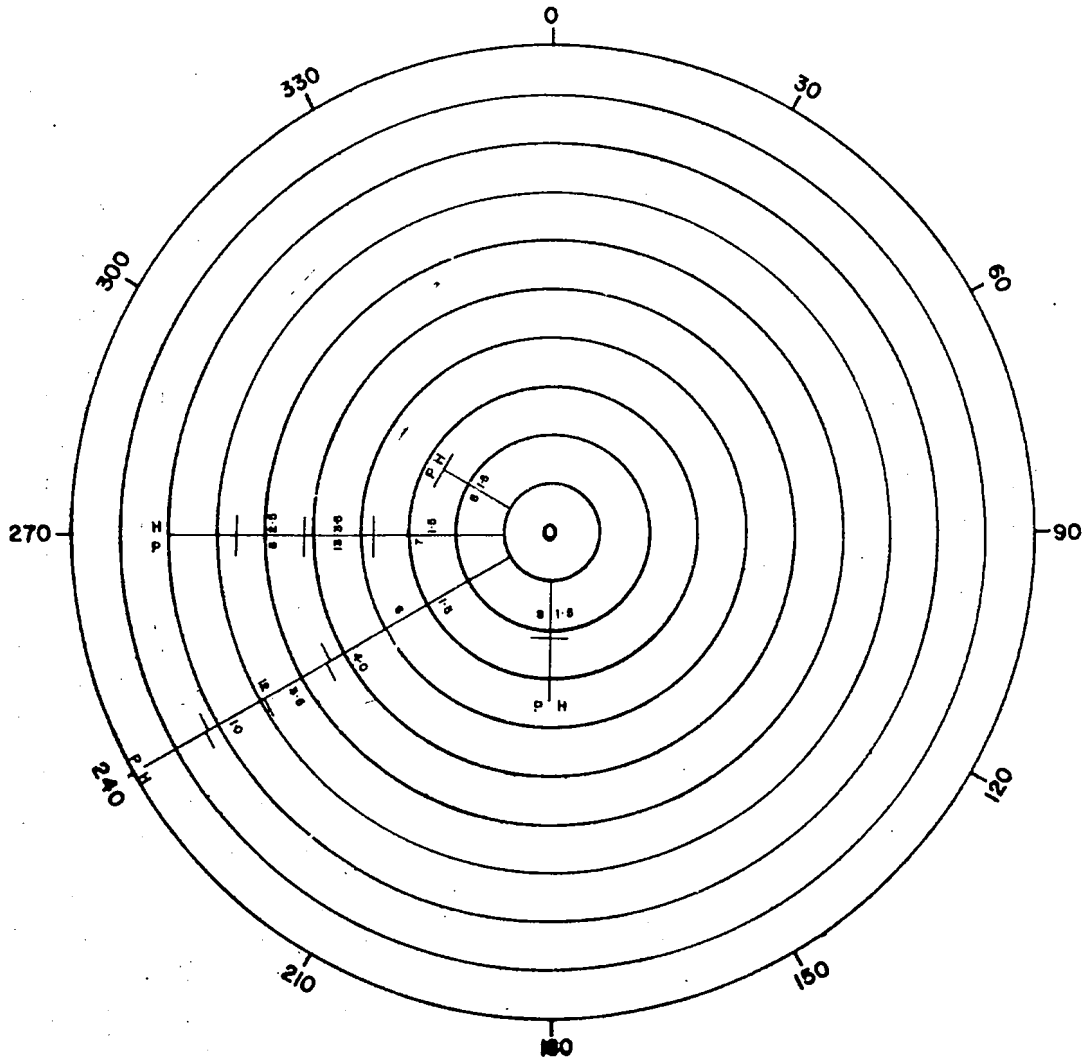
JUNE



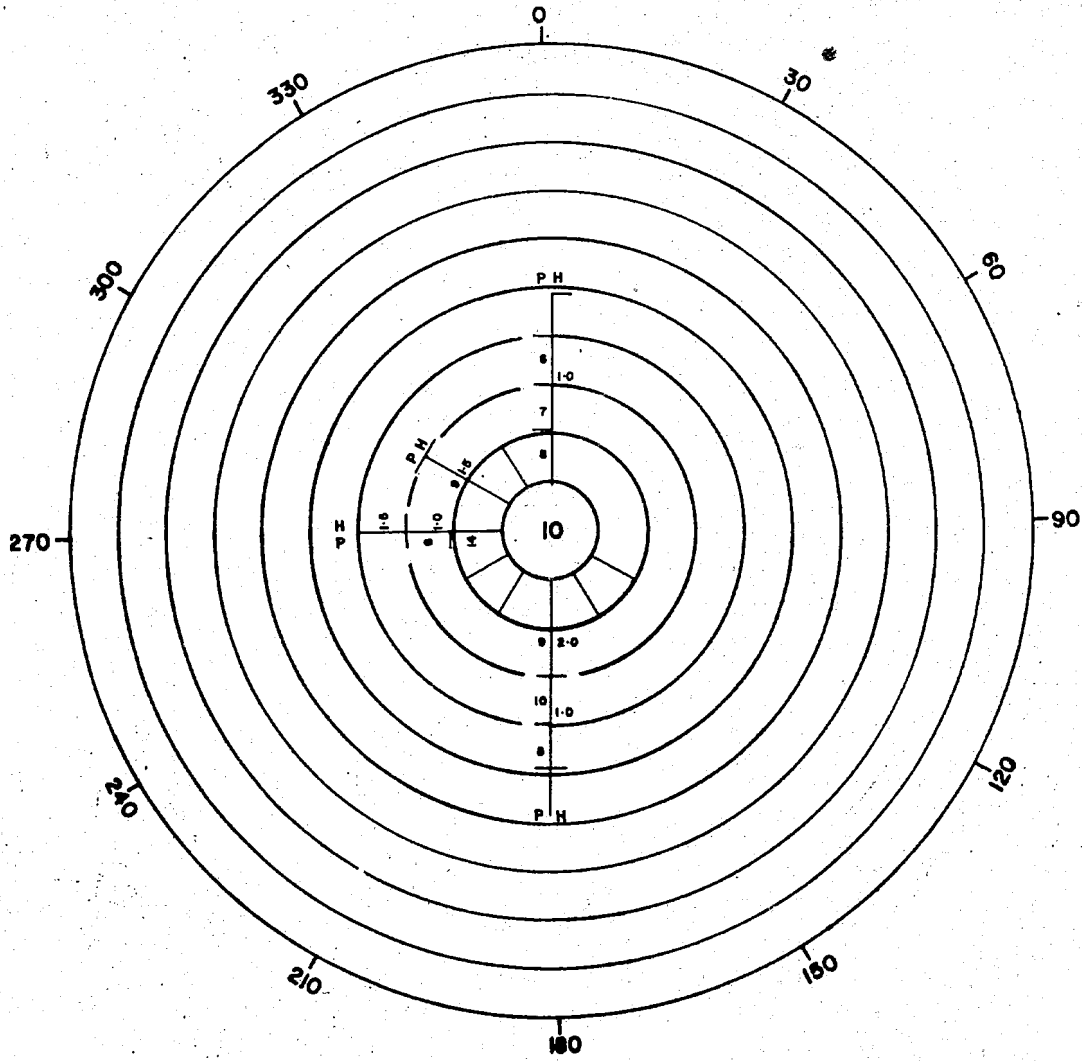
JULY



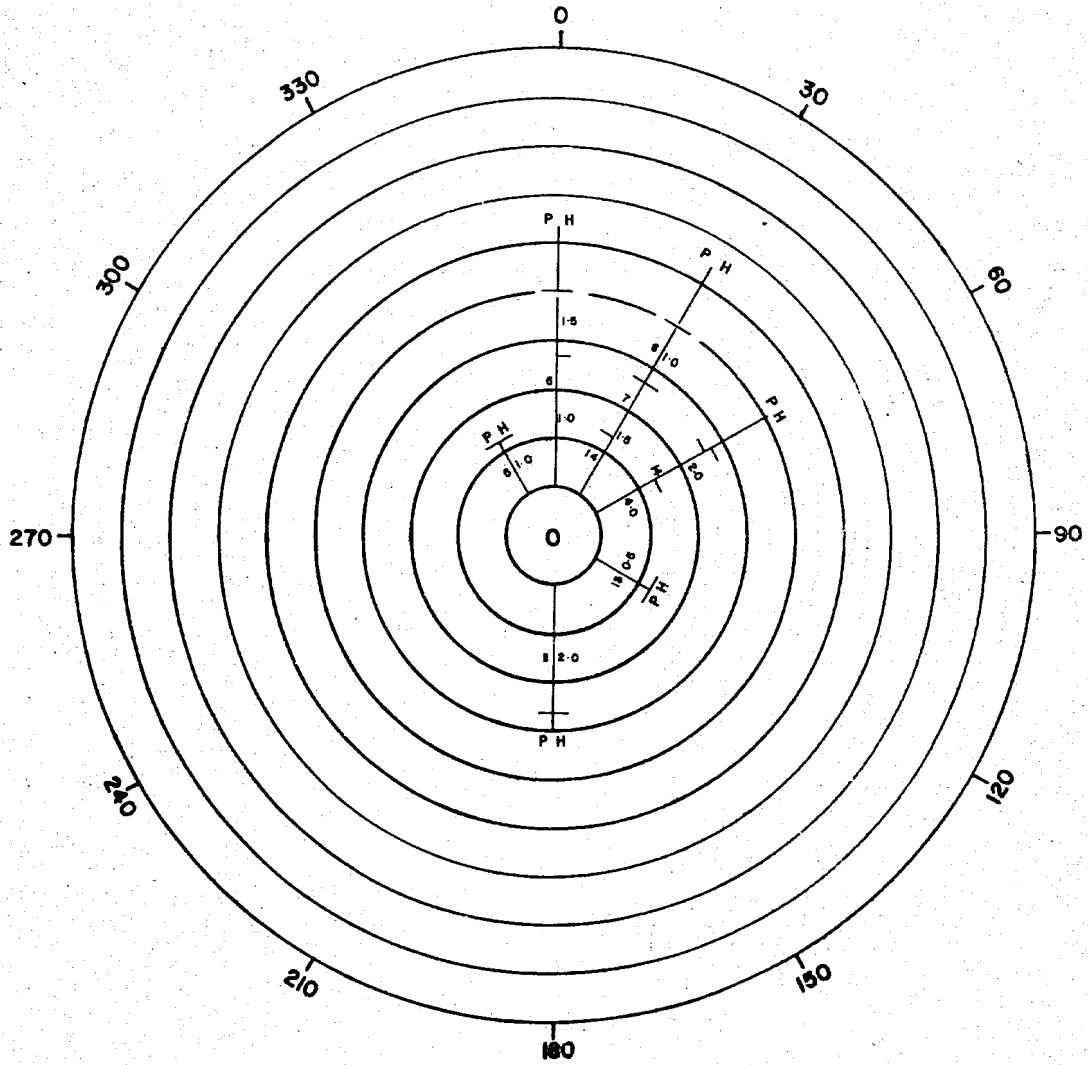
AUGUST



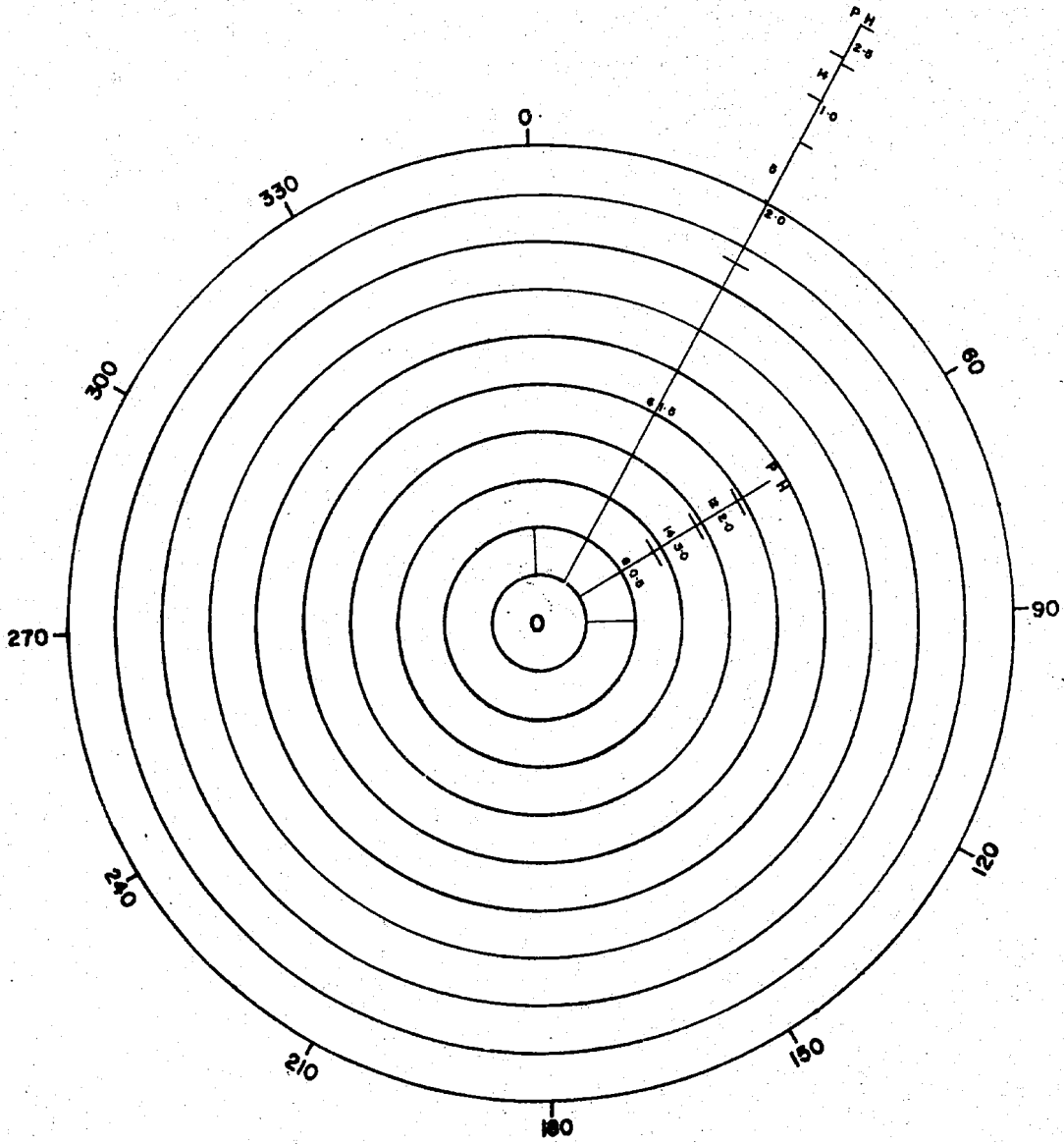
SEPTEMBER



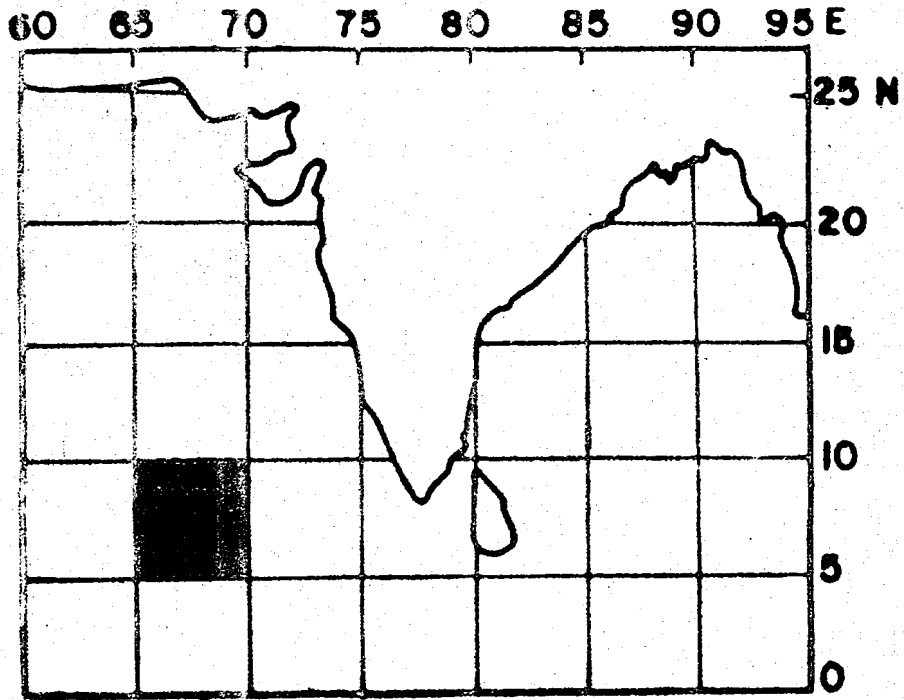
OCTOBER

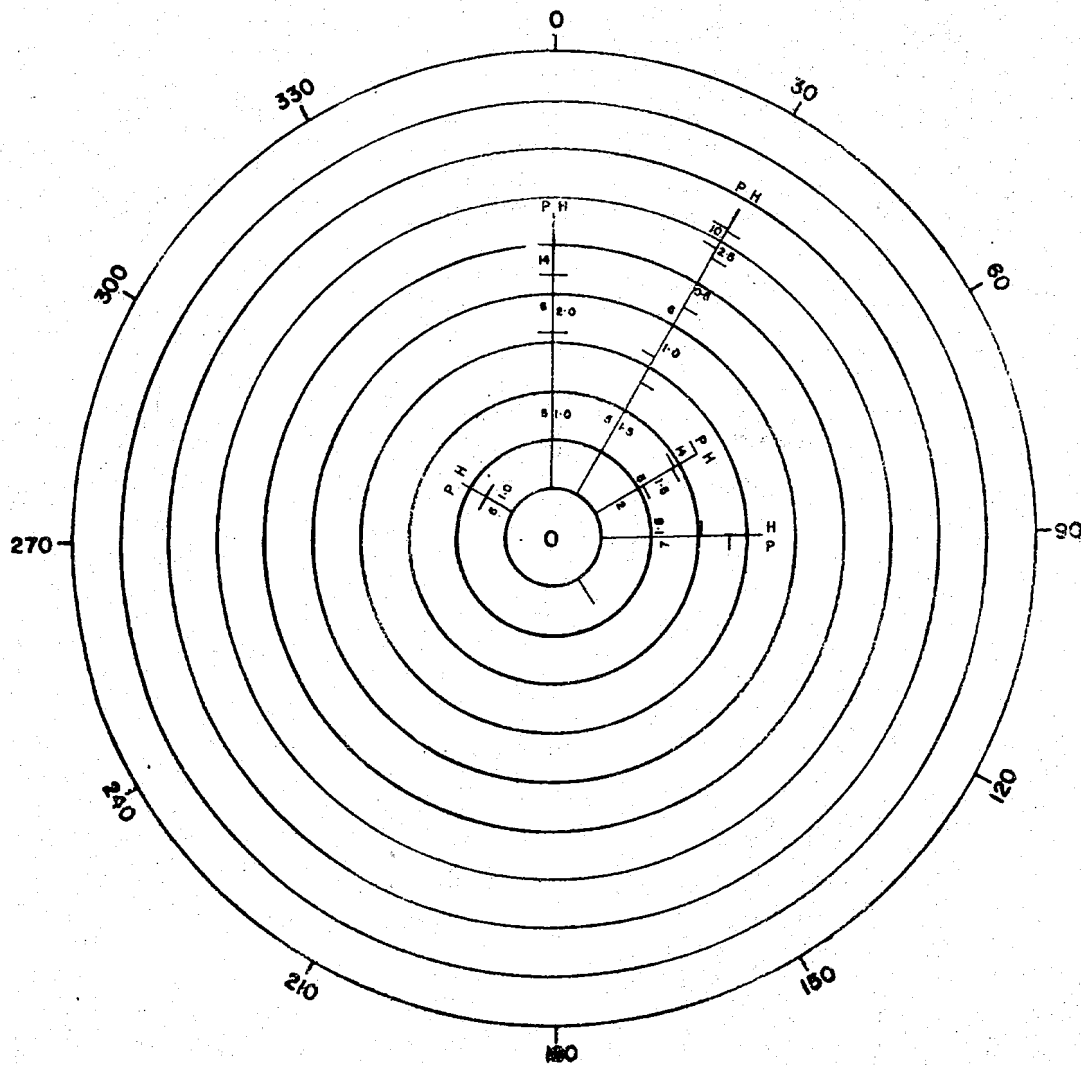


NOVEMBER

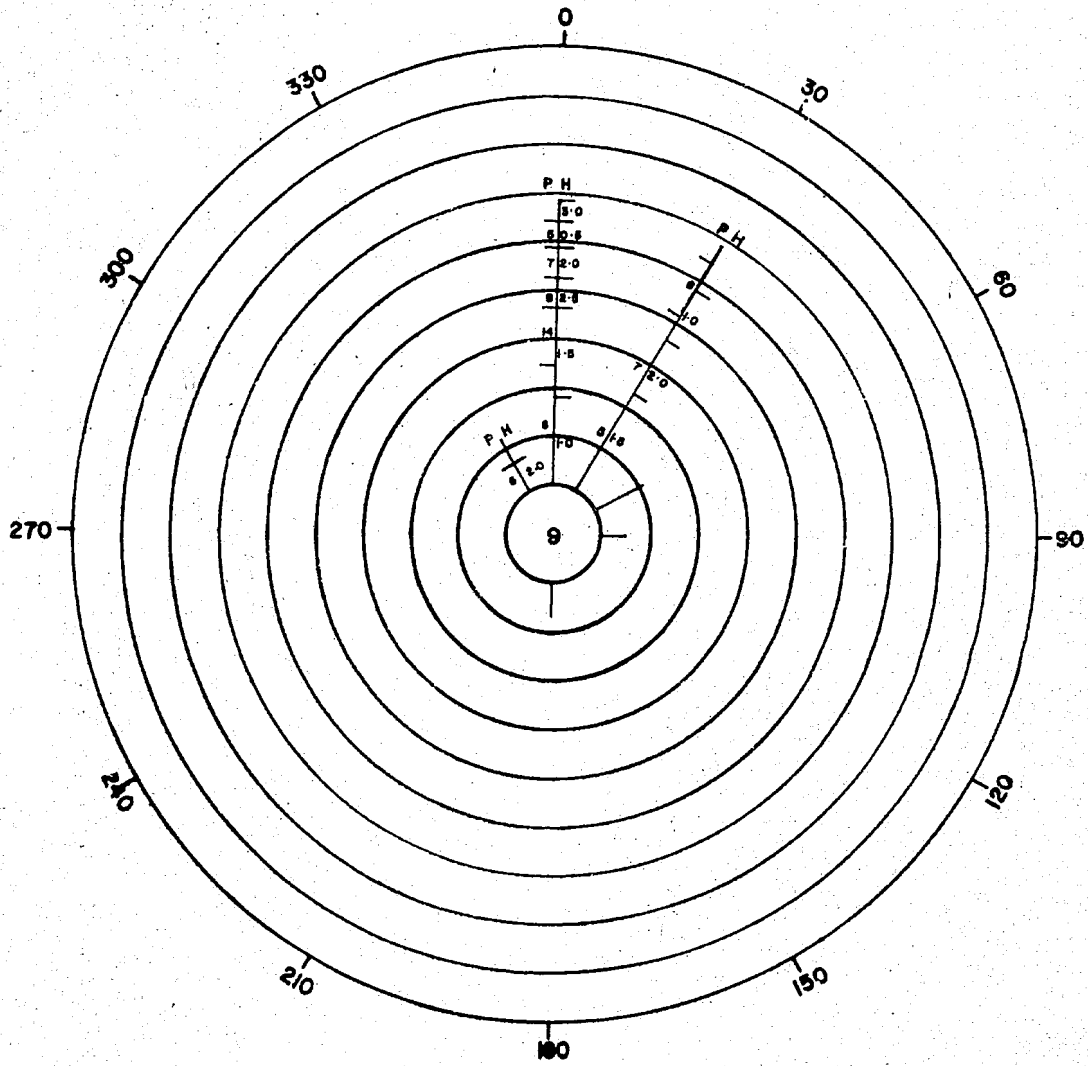


DECEMBER

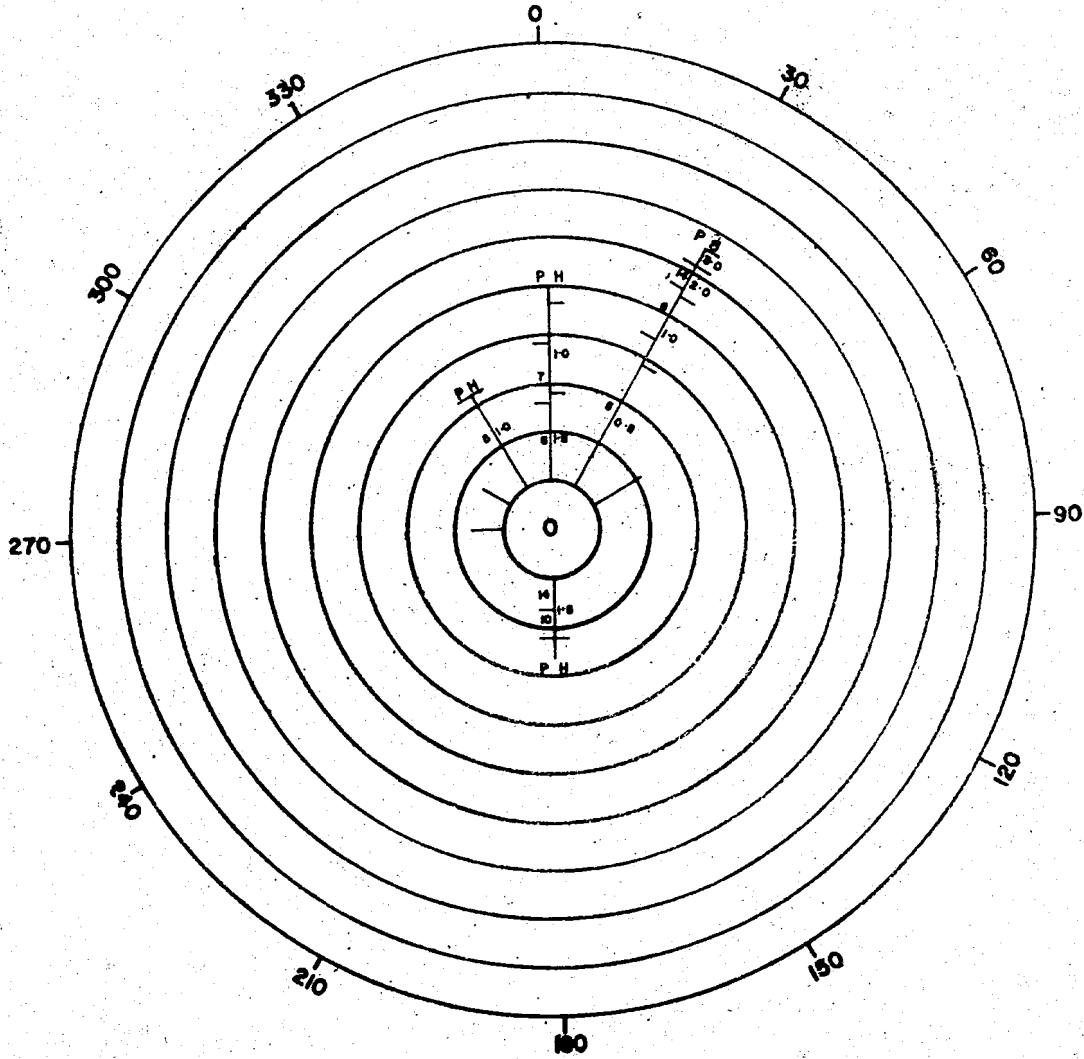




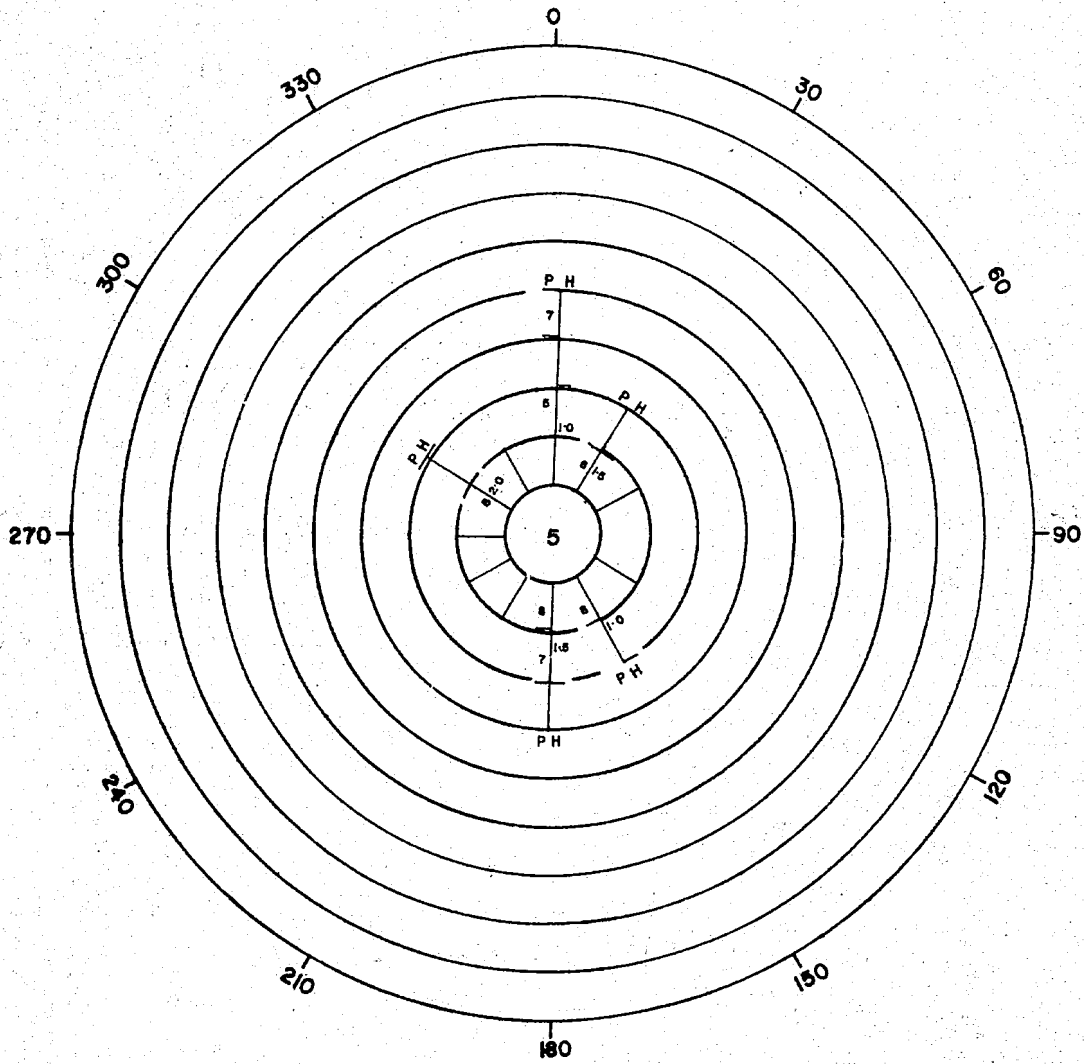
JANUARY



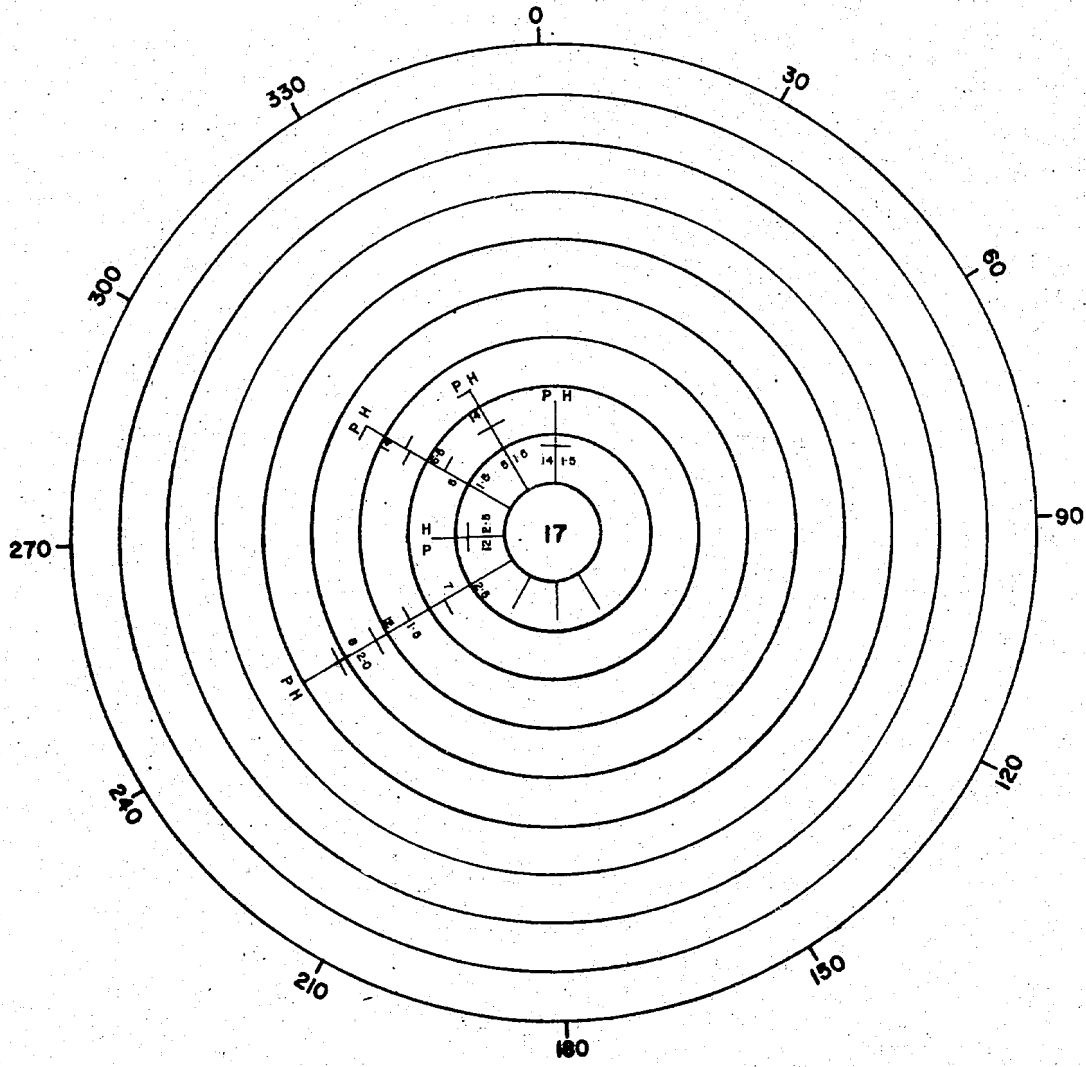
FEBRUARY



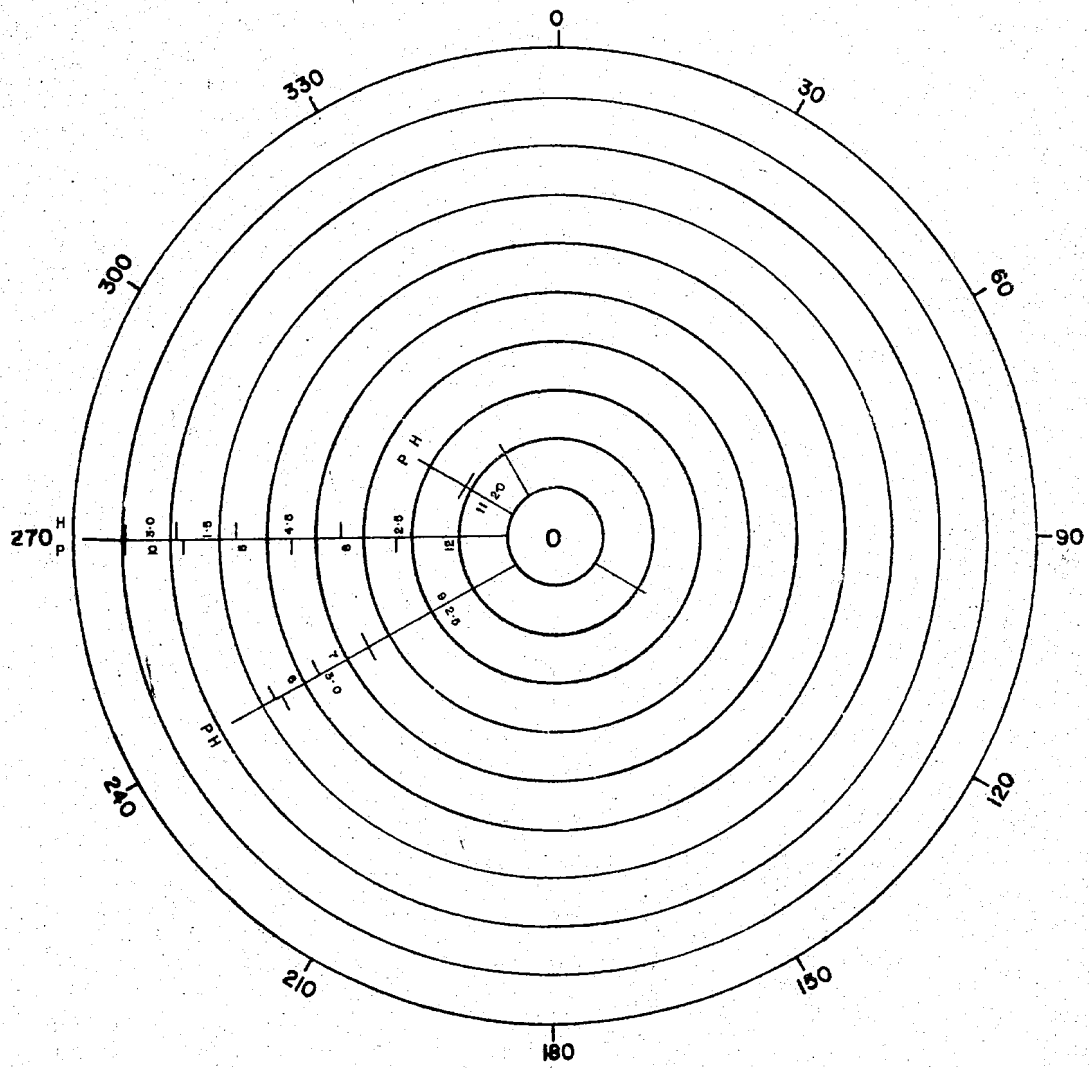
MARCH



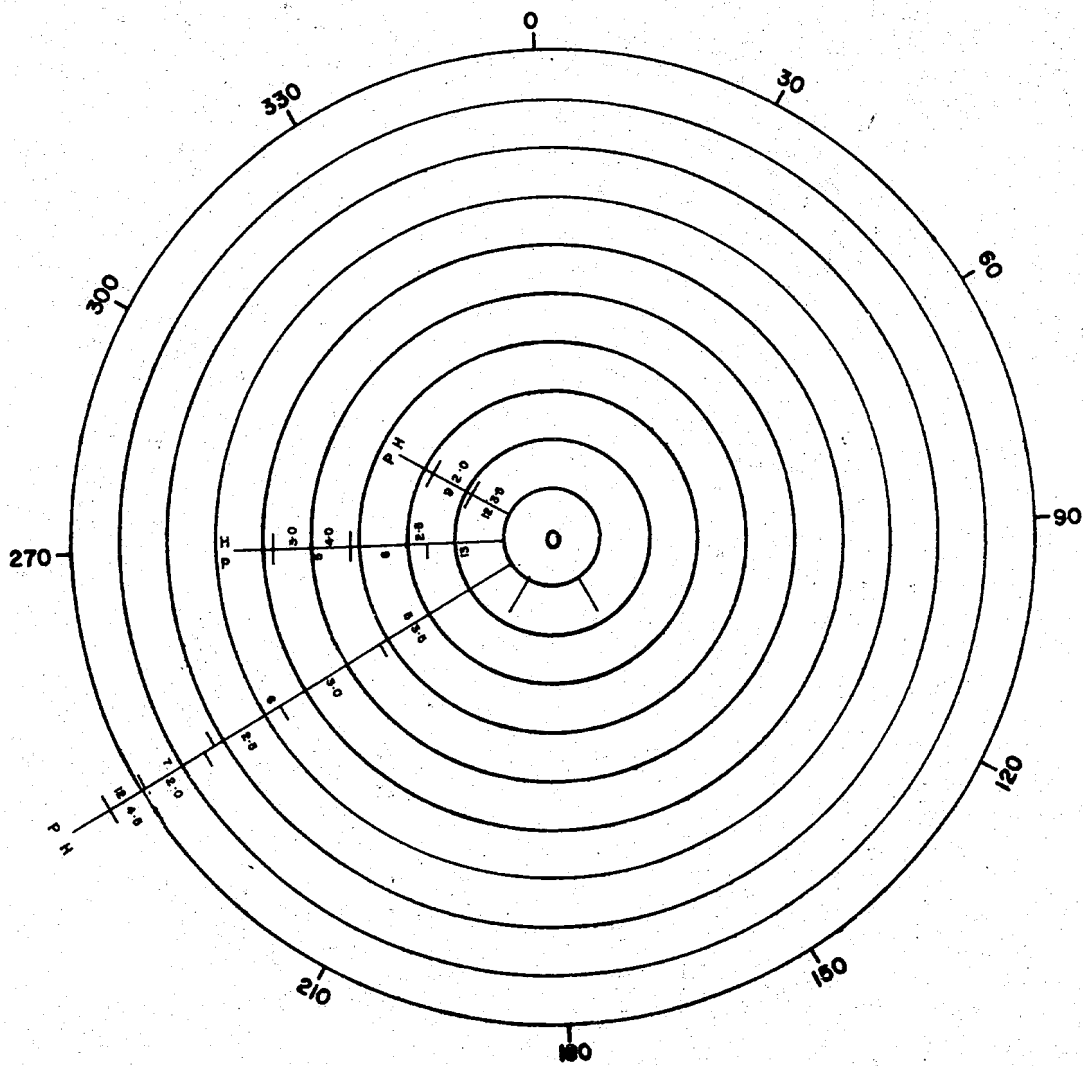
APRIL



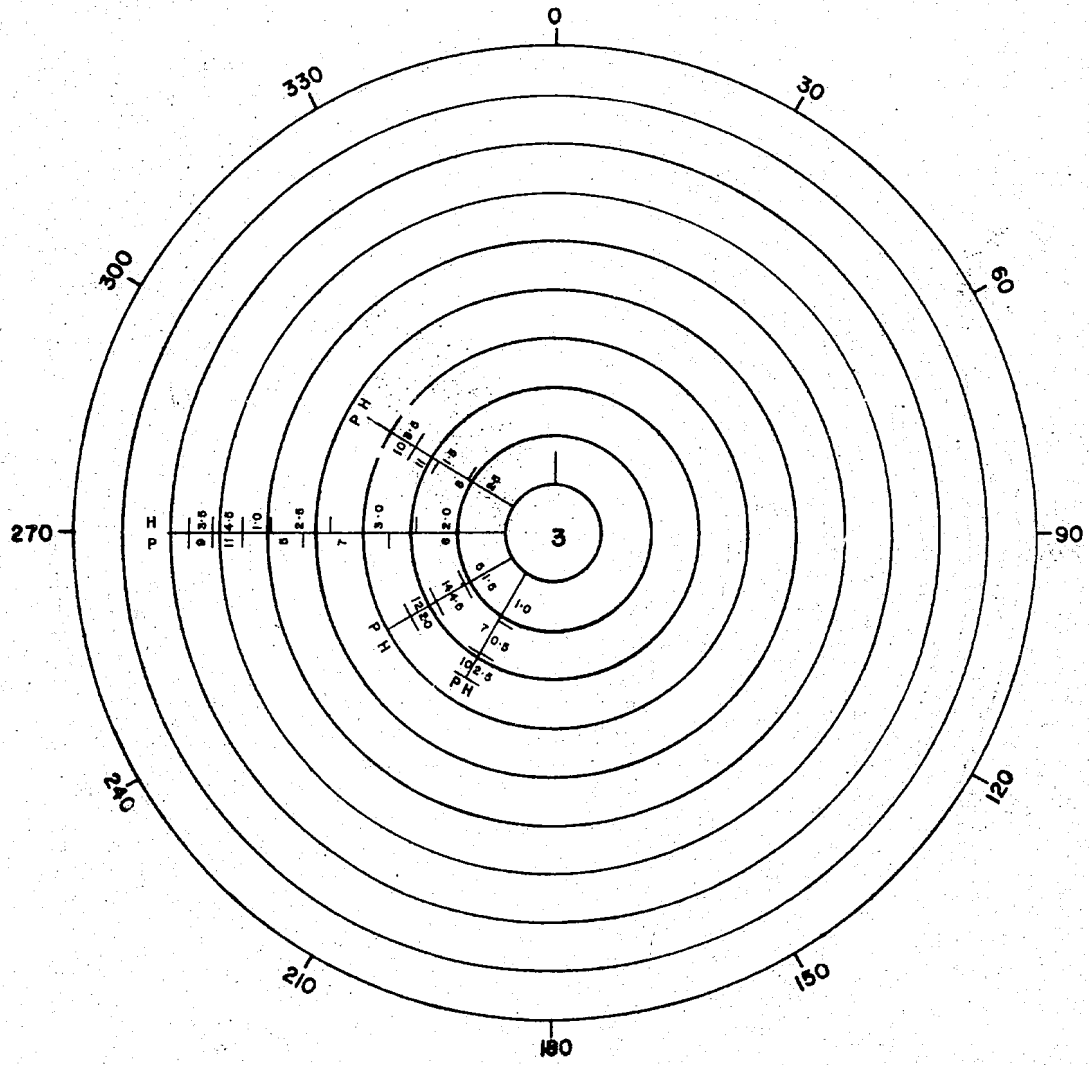
MAY



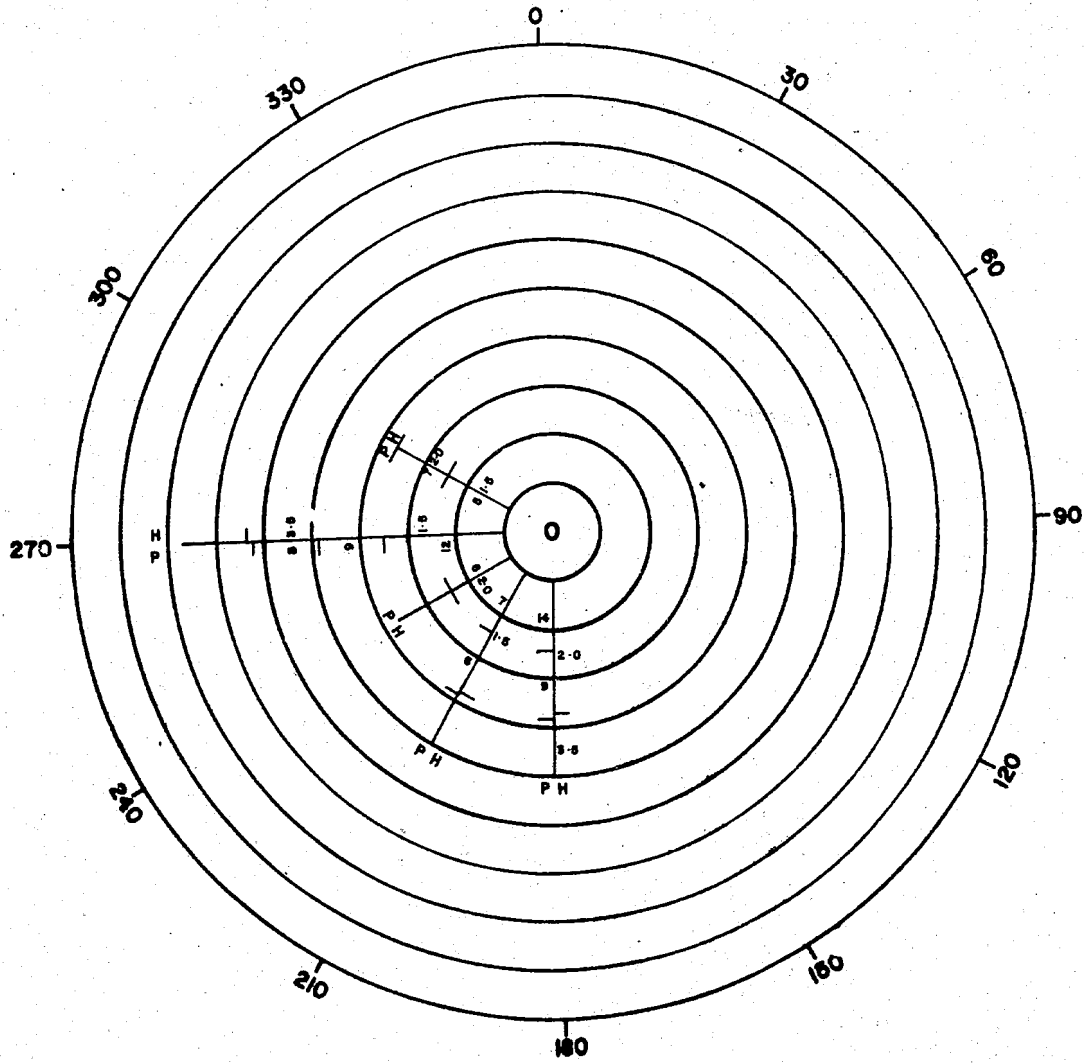
JUNE



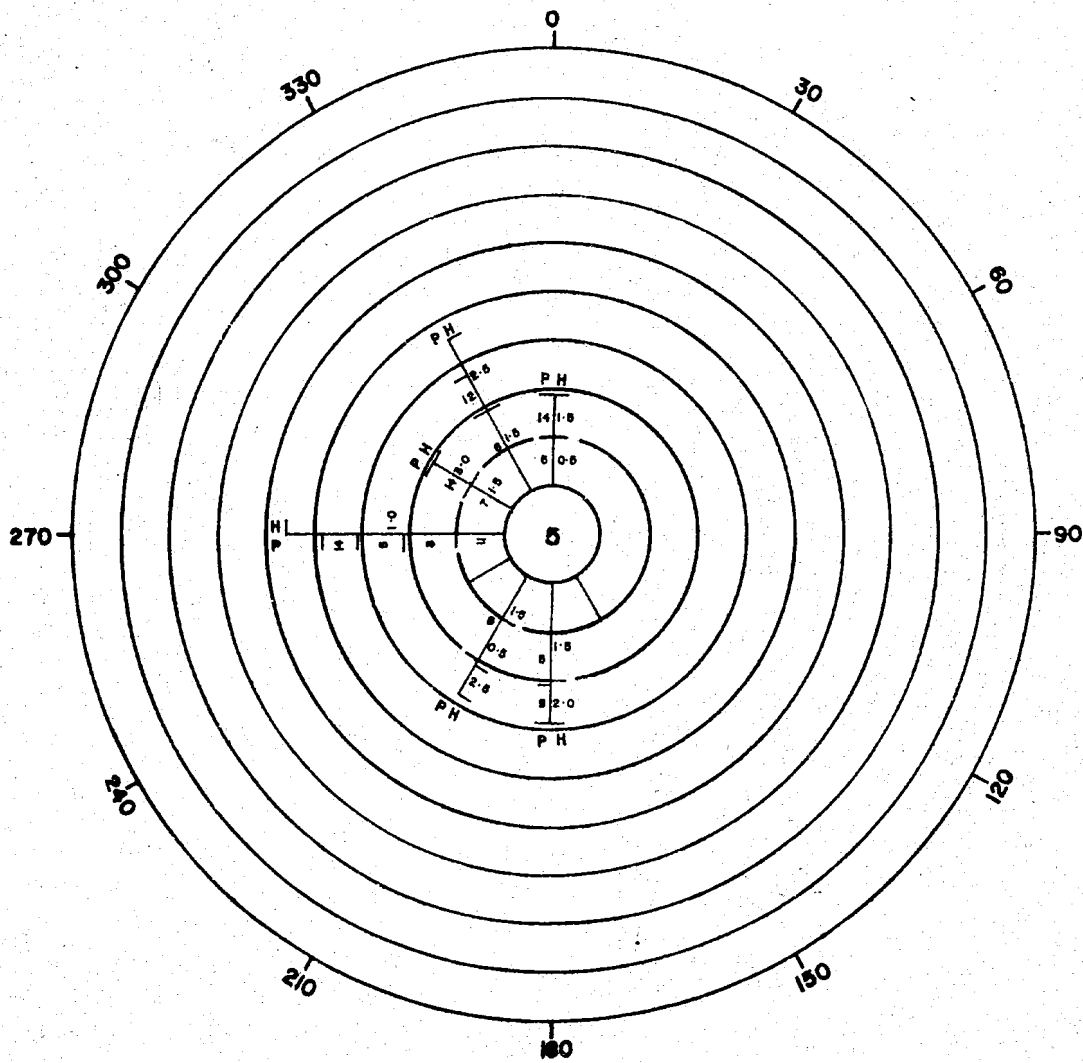
JULY



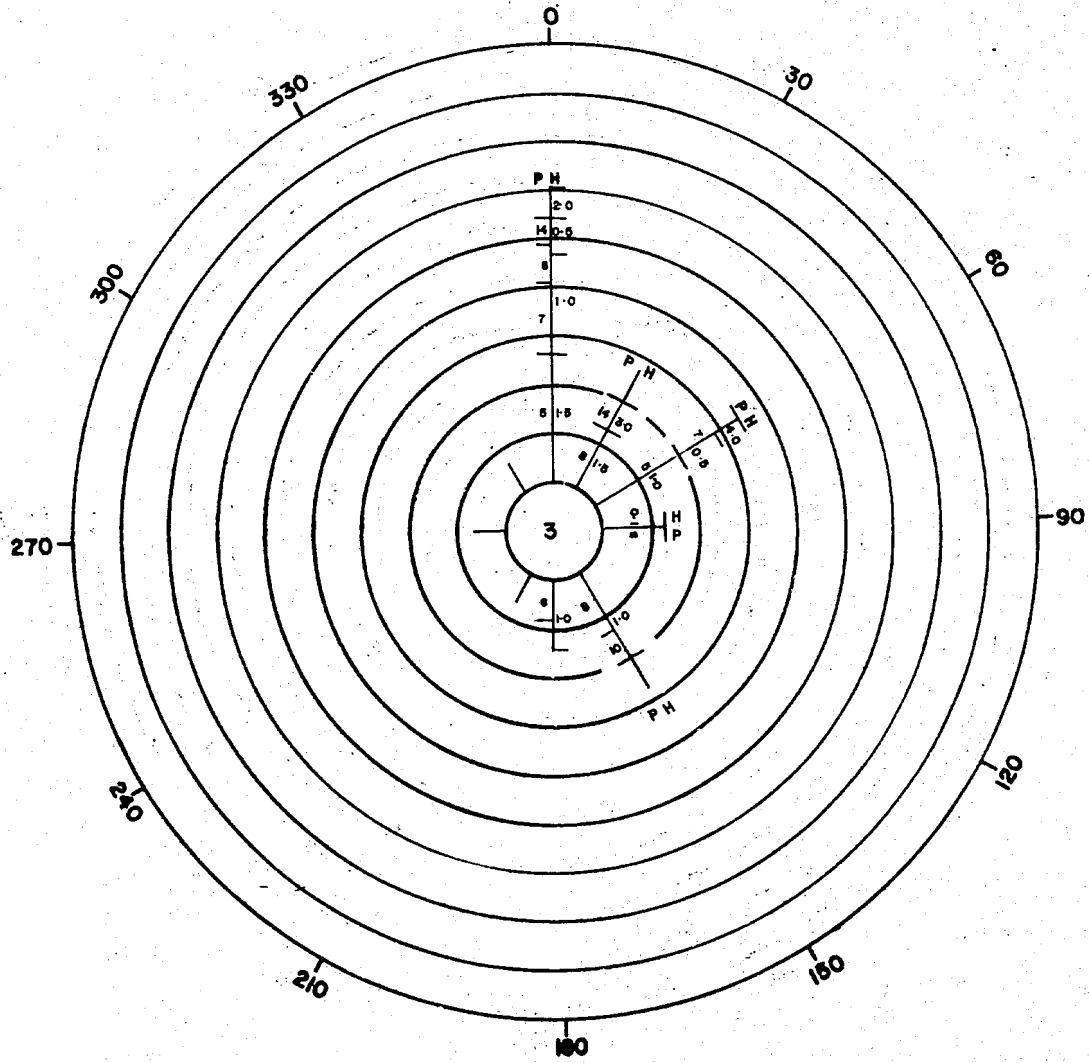
AUGUST



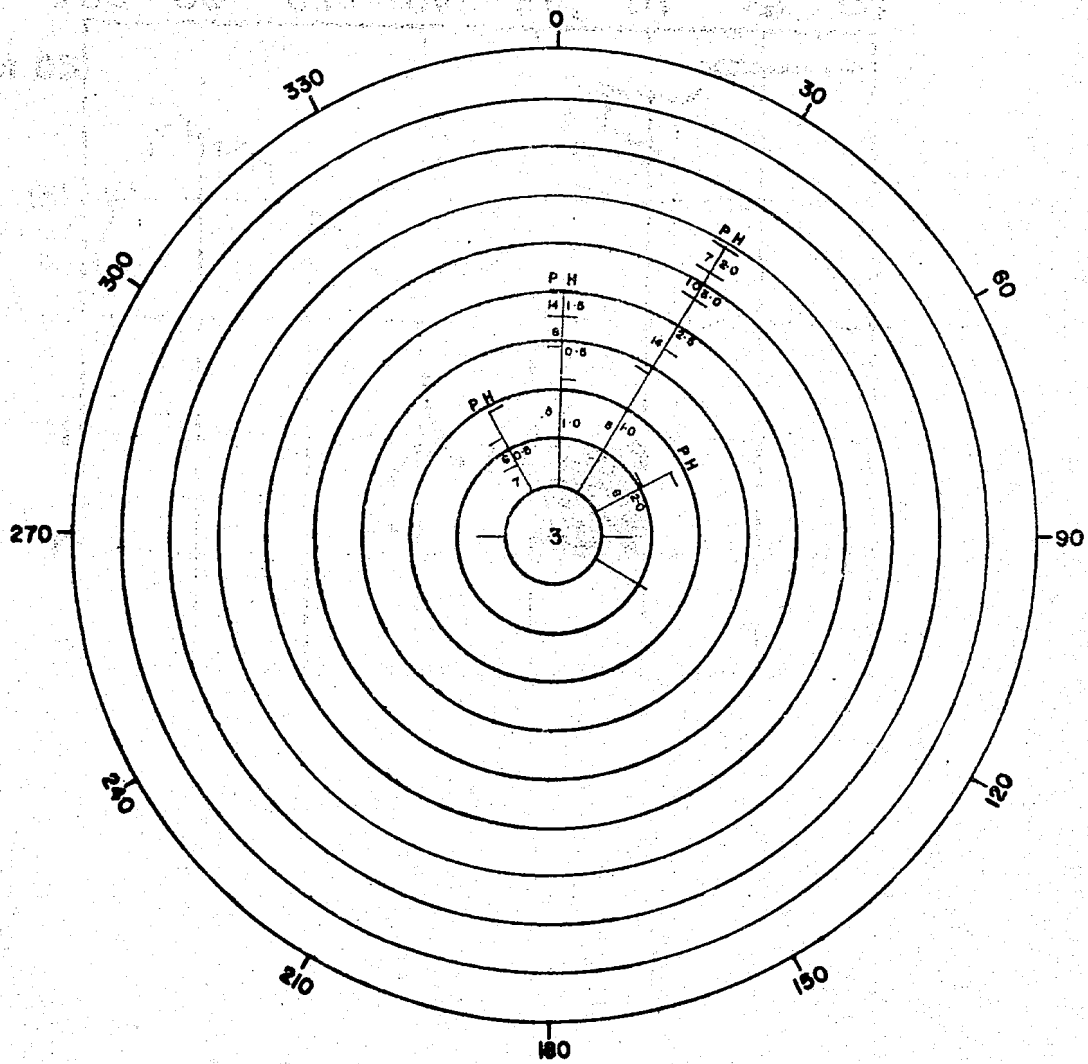
SEPTEMBER



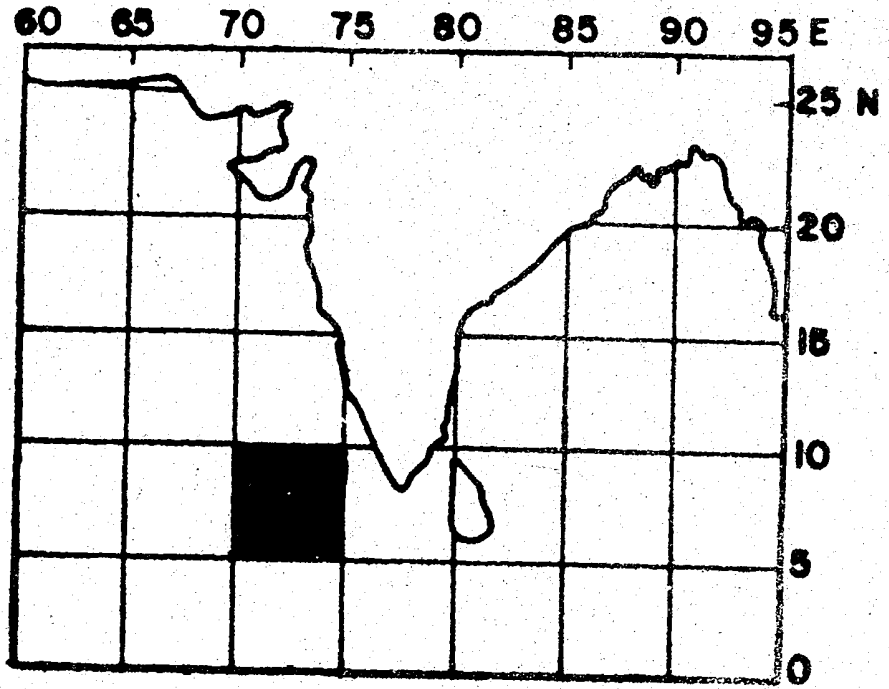
OCTOBER

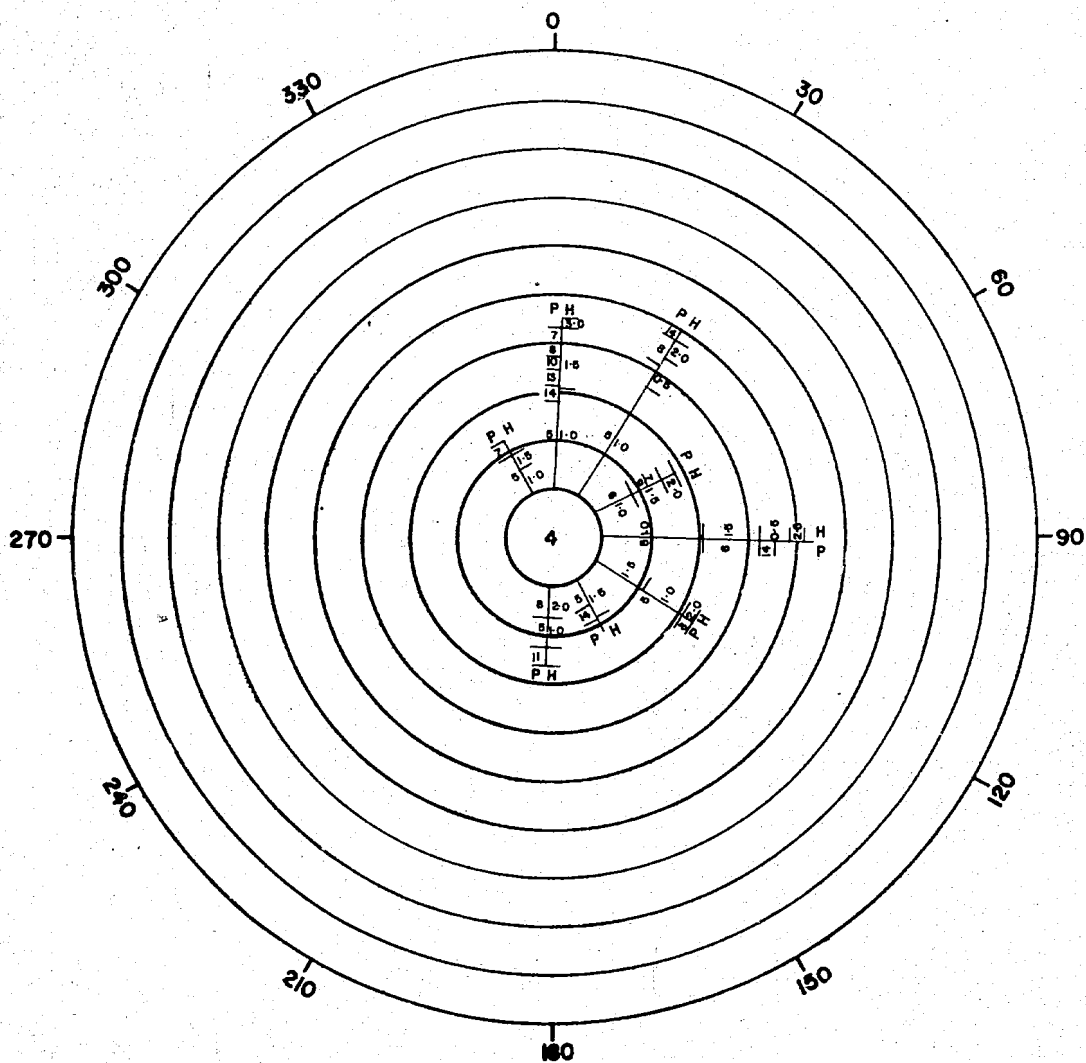


NOVEMBER

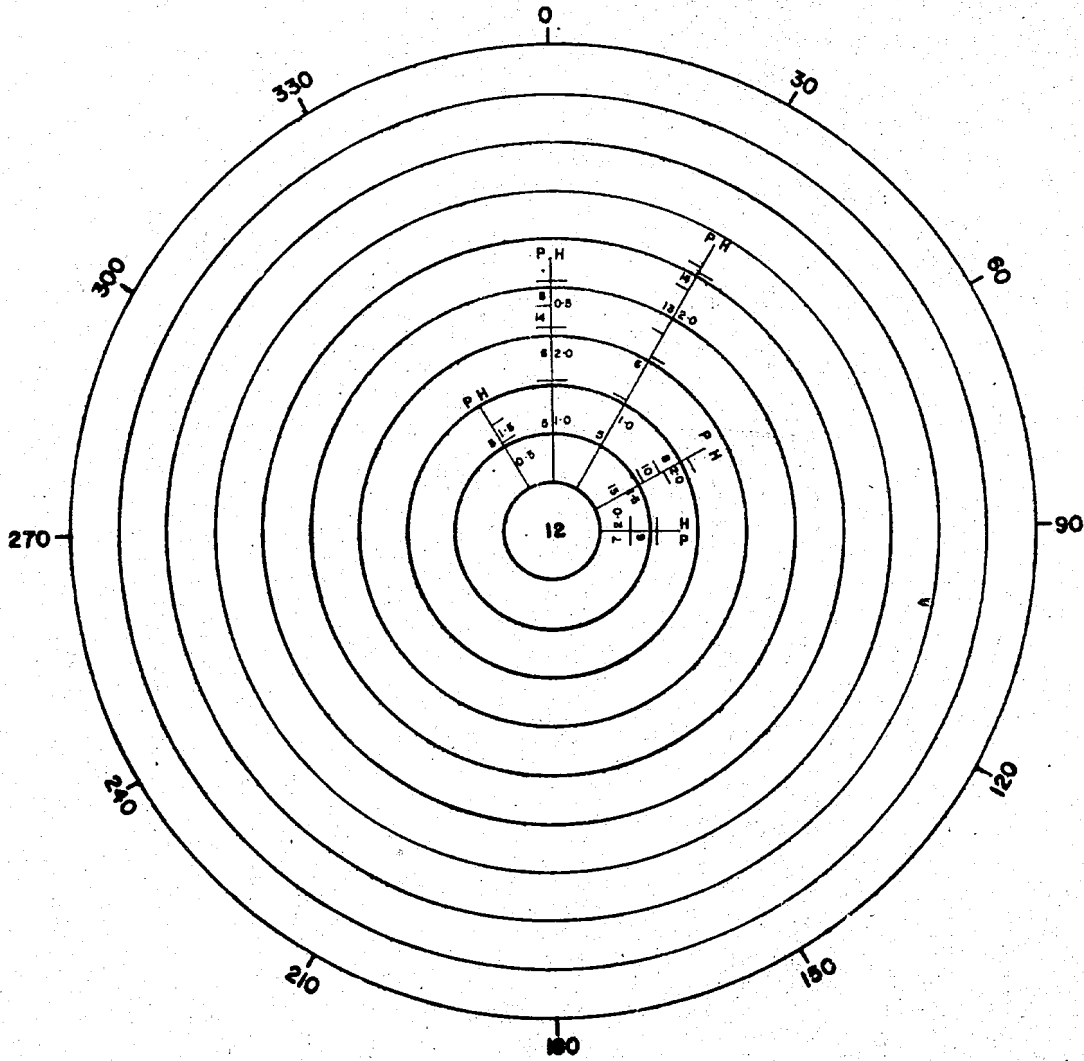


DECEMBER

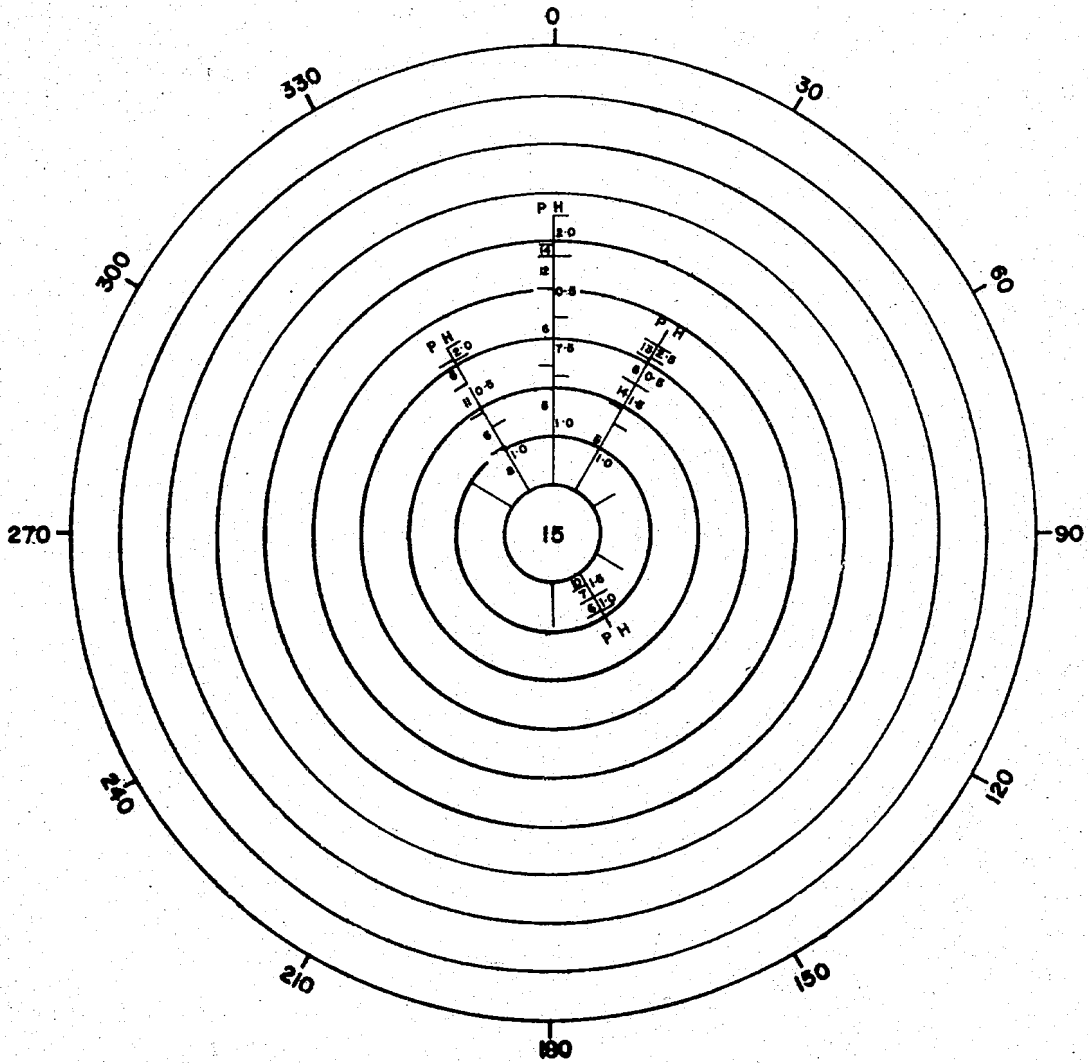




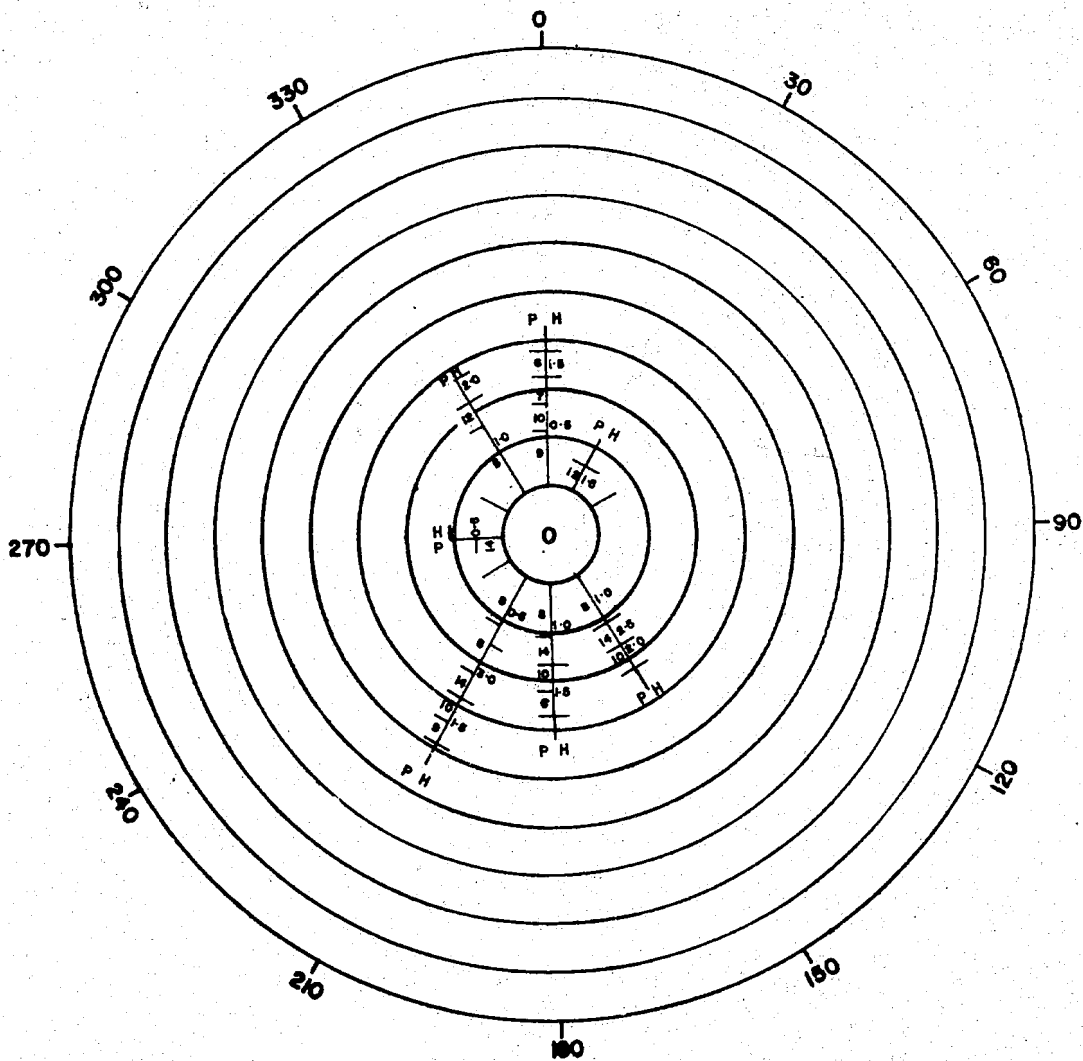
JANUARY



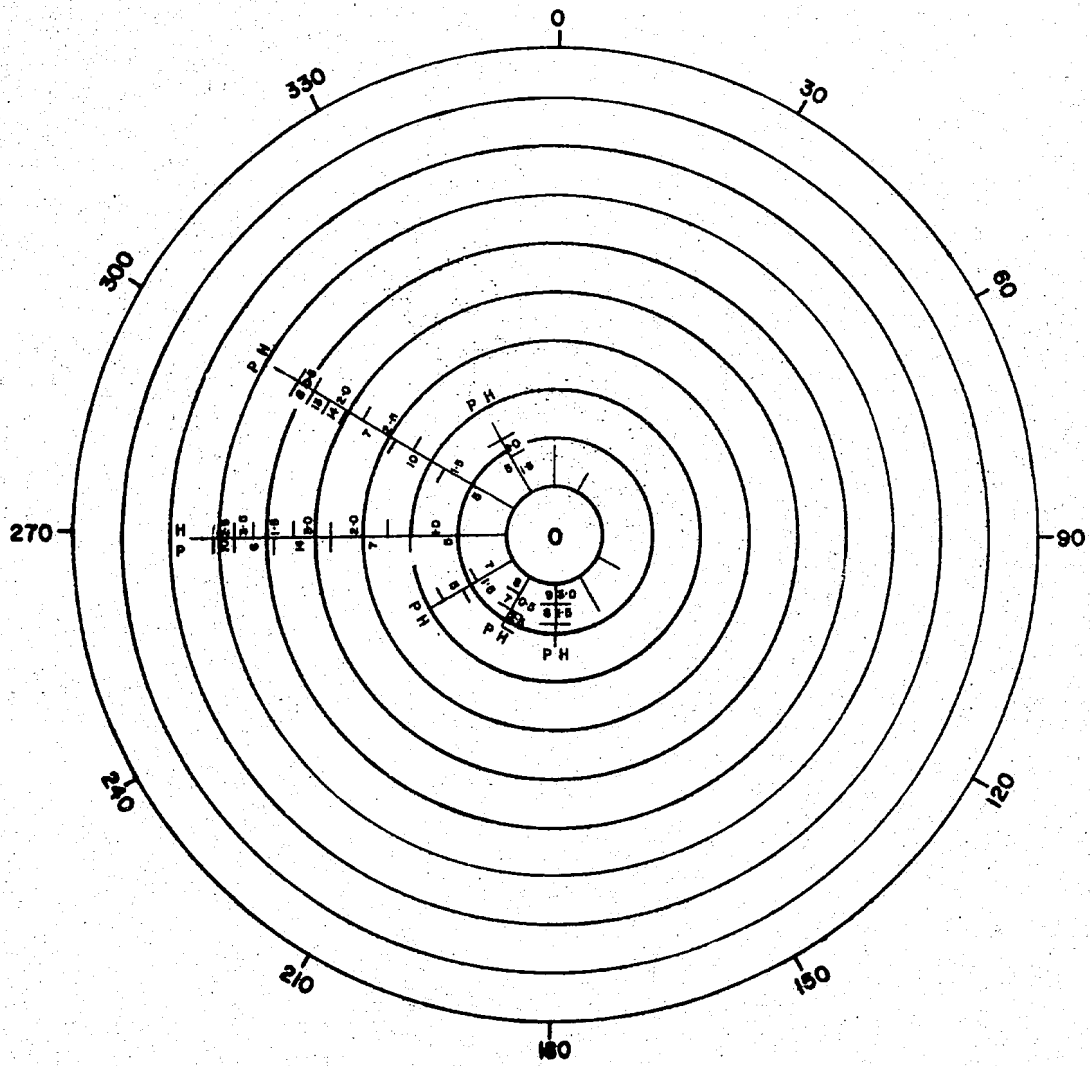
FEBRUARY



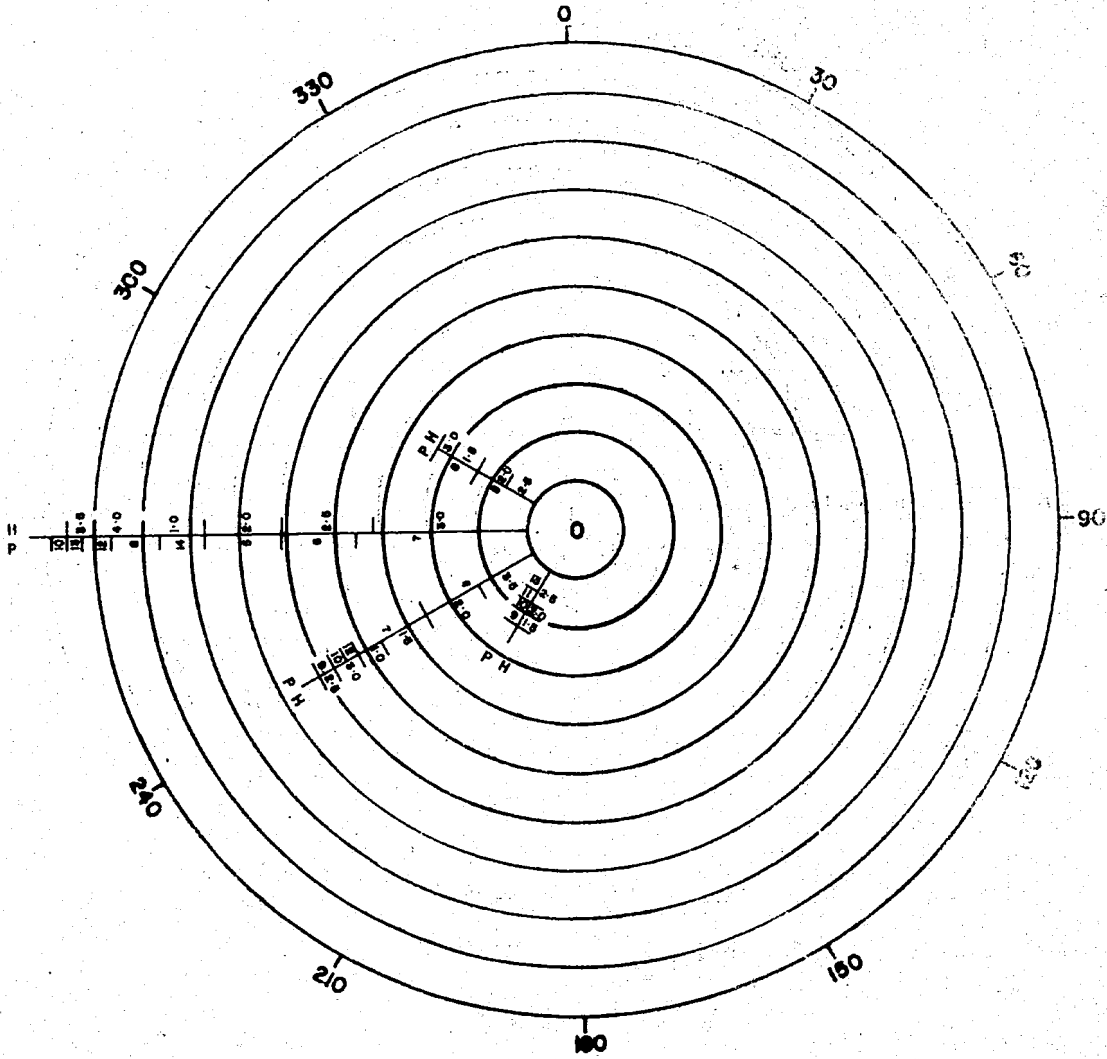
MARCH



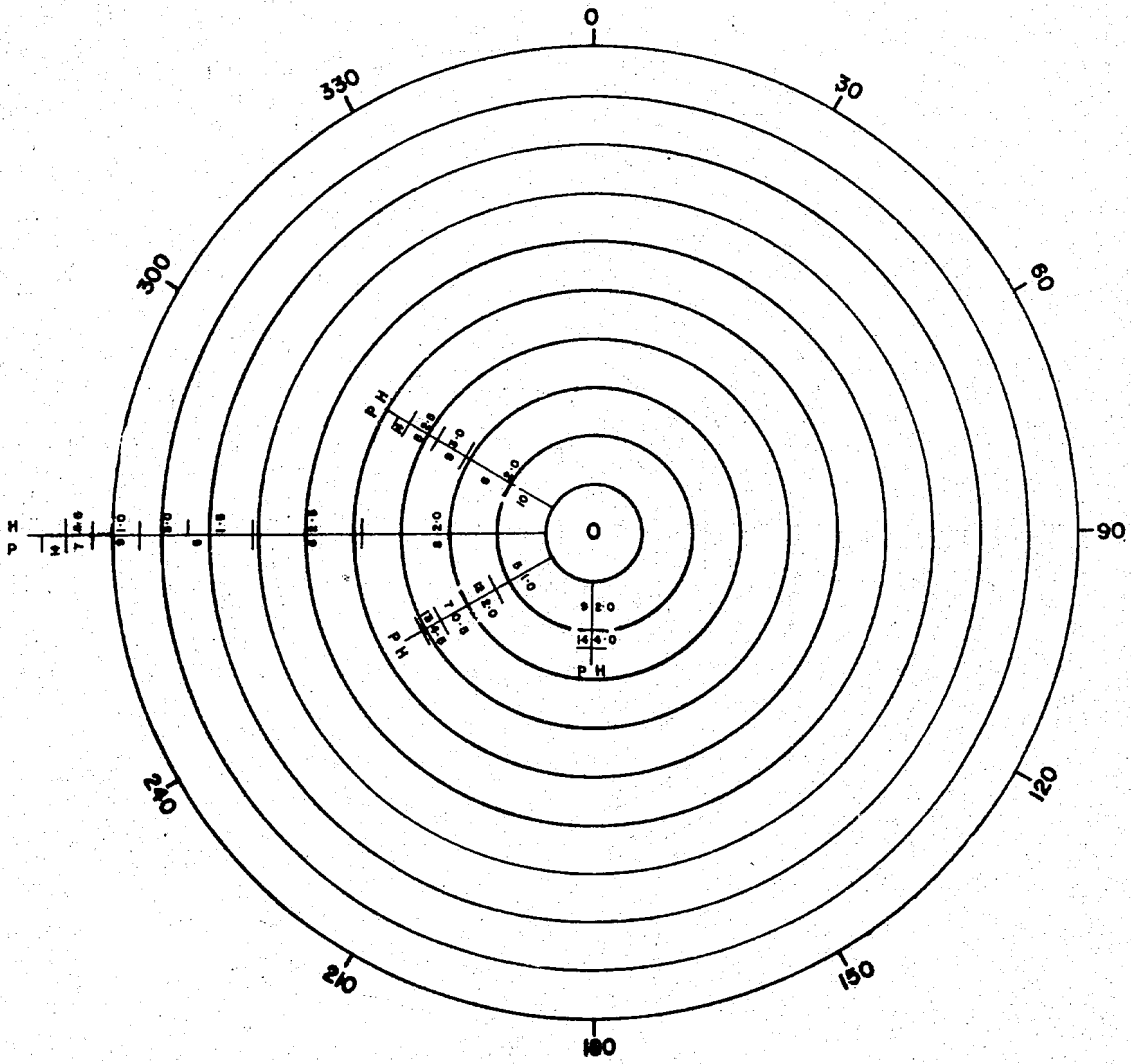
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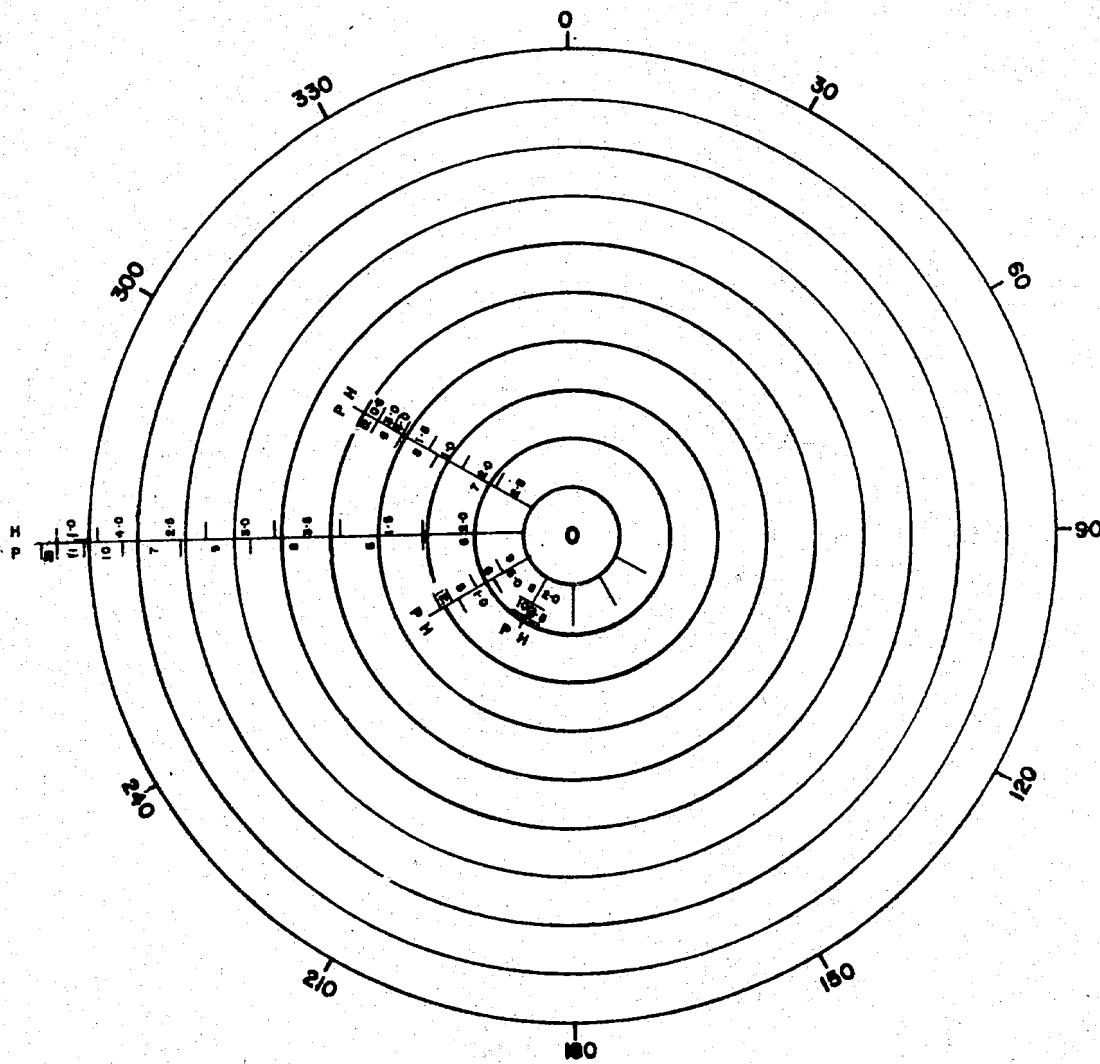
MAY



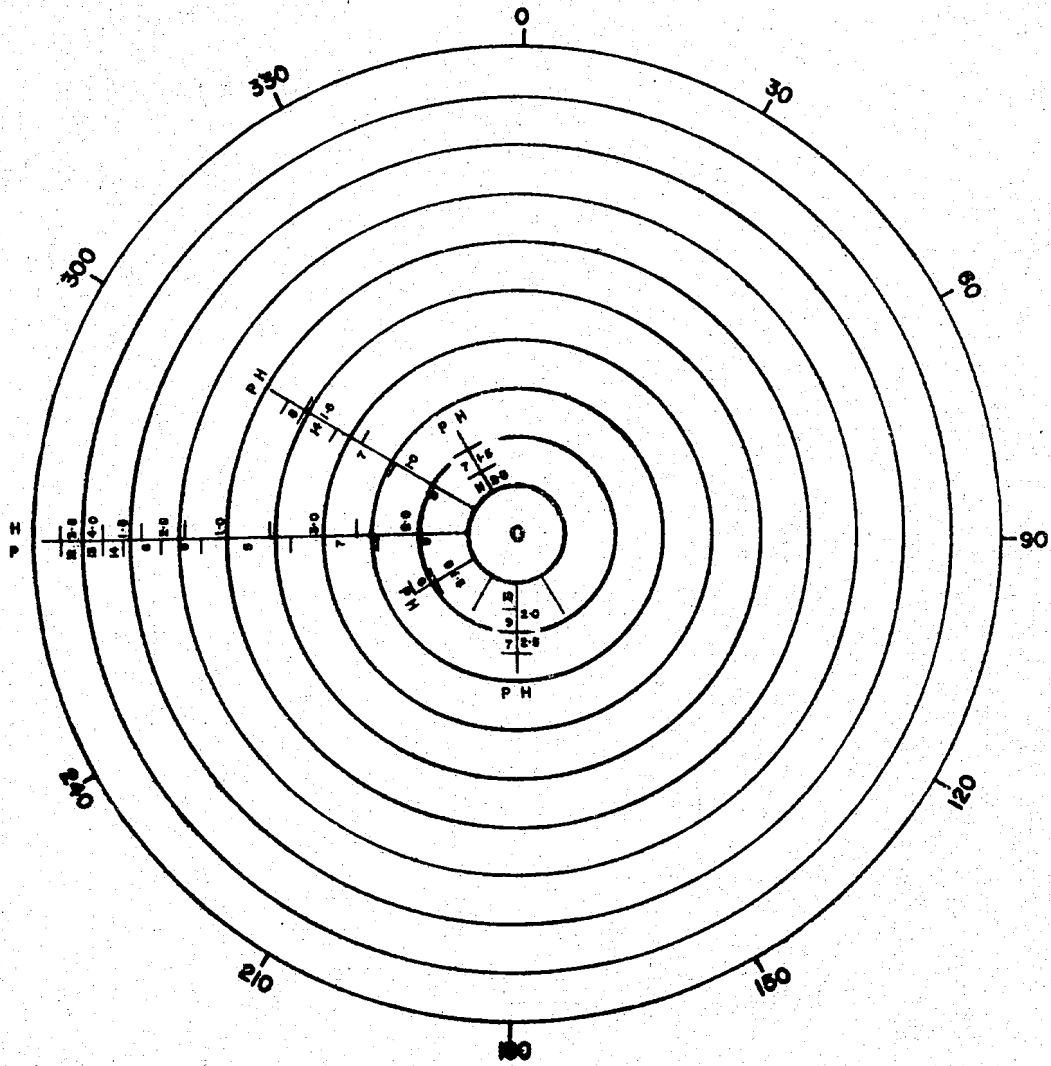
JUNE



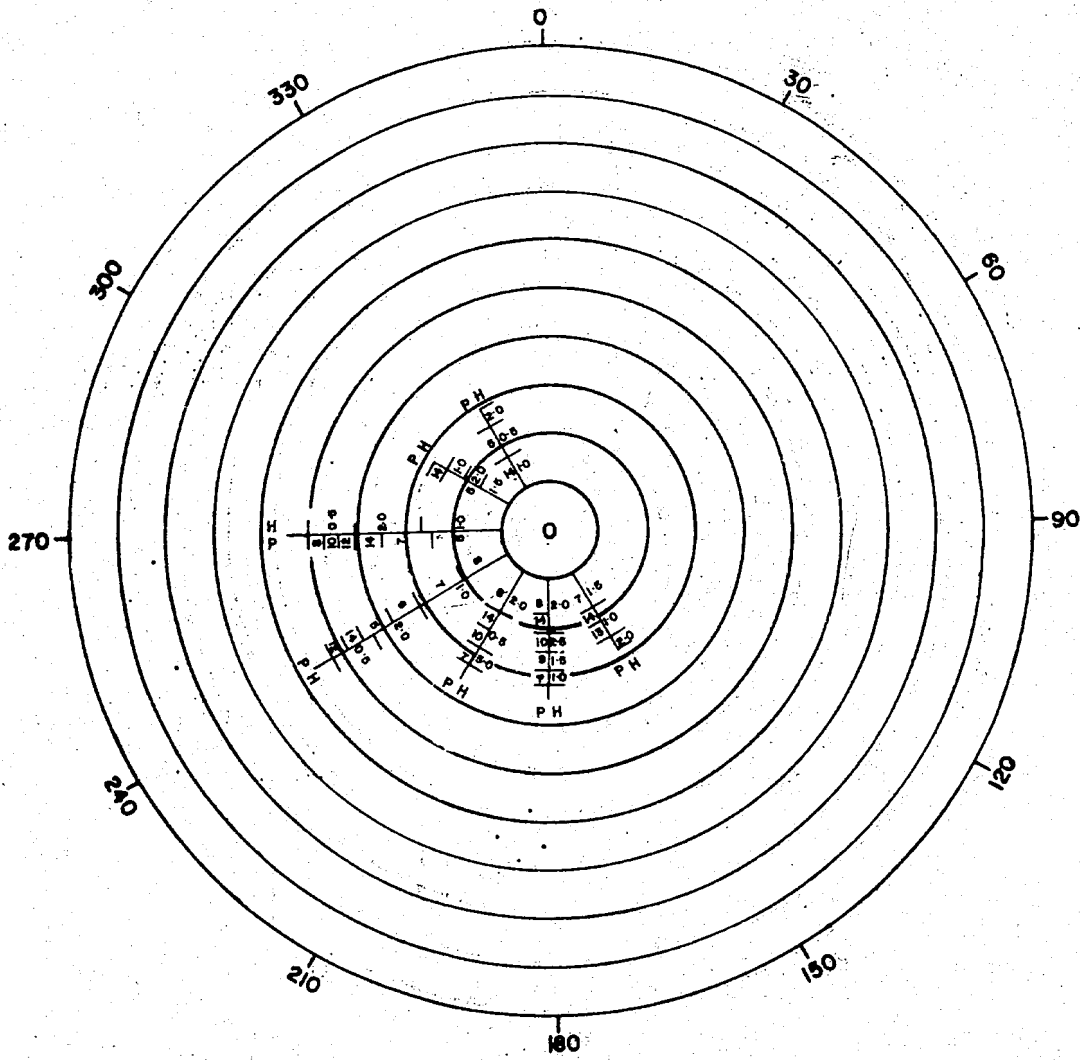
JULY



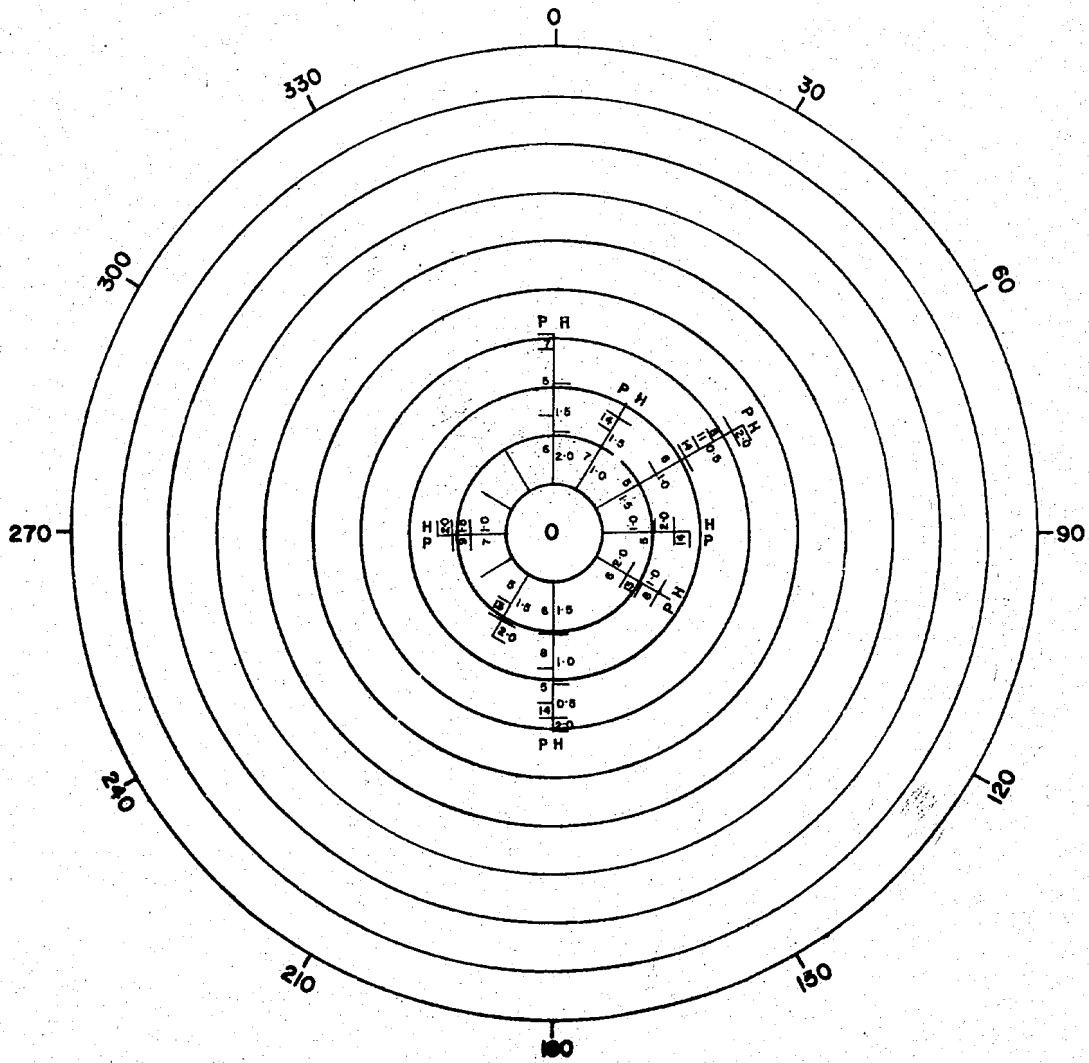
AUGUST



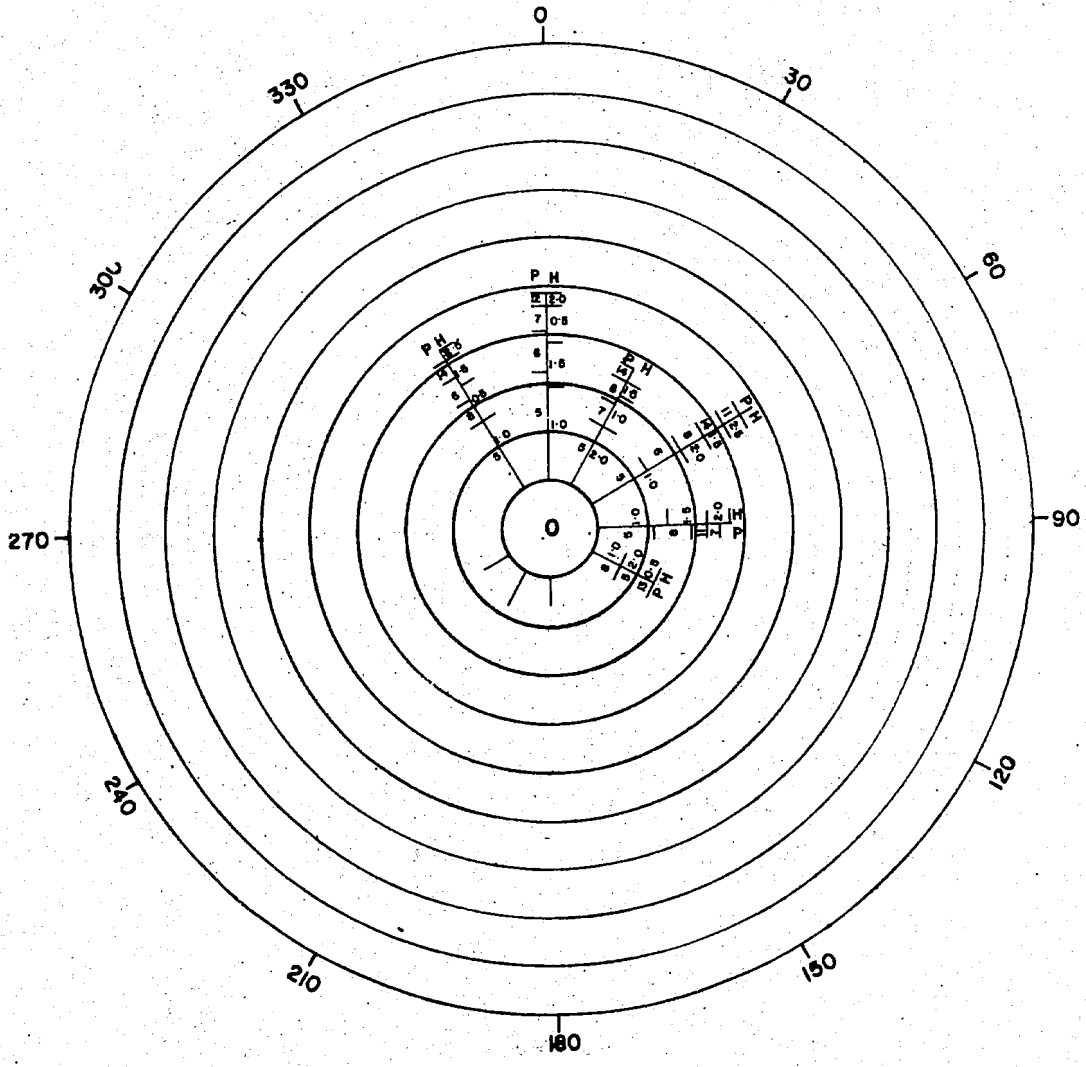
SEPTEMBER



OCTOBER



NOVEMBER



DECEMBER

TABLE - 1

Number of observations in each Zone.

| Month | Zone | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-----------|------|-------|-------|-------|-------|-------|-------|--------------|--------------|-------|-------|
| | | 05-10 | 05-10 | 05-10 | 05-10 | 05-10 | 05-10 | 05-10 | 05-10 | 05-10 | 05-10 |
| Lat. | | 75-80 | 80-85 | 85-90 | 90-95 | 60-65 | 65-70 | 70- Coast | Coast- 85 | 85-90 | 90-95 |
| Long. | | 75-80 | 80-85 | 85-90 | 90-95 | 60-65 | 65-70 | 70- Coast | Coast- 85 | 85-90 | 90-95 |
| January | | 171 | 10 | 222 | 118 | 24 | 55 | 151 | 127 | 57 | 29 |
| February | | 156 | 5 | 212 | 132 | 25 | 34 | 149 | 111 | 67 | 26 |
| March | | 160 | 7 | 210 | 167 | 17 | 61 | 181 | 108 | 63 | 21 |
| April | | 126 | 5 | 158 | 115 | 19 | 48 | 125 | 107 | 50 | 17 |
| May | | 159 | 28 | 196 | 144 | 14 | 53 | 160 | 131 | 91 | 22 |
| June | | 217 | 2 | 218 | 164 | 36 | 67 | 240 | 109 | 74 | 39 |
| July | | 184 | 14 | 236 | 167 | 25 | 68 | 259 | 133 | 96 | 42 |
| August | | 208 | 6 | 234 | 190 | 16 | 72 | 223 | 111 | 67 | 37 |
| September | | 224 | 2 | 197 | 145 | 20 | 69 | 201 | 128 | 80 | 40 |
| October | | 204 | 4 | 220 | 170 | 17 | 62 | 181 | 155 | 73 | 28 |
| November | | 160 | 9 | 212 | 118 | 19 | 74 | 165 | 142 | 92 | 34 |
| December | | 159 | 9 | 217 | 115 | 25 | 73 | 164 | 128 | 69 | 43 |

TABLE - 1—(Contd)

| Month | Zone | | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|-----------|----------|-------|----------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 15-20 | 60-65 | 15-20 | 65-70 | 15-25 | 15-20 | 85-90 | 90-95 | 20-25 | 20-25 | 20-25 |
| Lat. | 70-Coast | | 70-Coast | 85 | 85-90 | 60-65 | 65-70 | 85-95 | 60-65 | 65-70 | 85-95 |
| Long. | 60-65 | 65-70 | 70-Coast | 85 | 85-90 | 60-65 | 65-70 | 85-95 | 60-65 | 65-70 | 85-95 |
| January | 68 | 117 | 78 | 20 | 48 | 40 | 66 | 60 | 7 | | |
| February | 61 | 111 | 76 | 12 | 49 | 32 | 60 | 48 | 6 | | |
| March | 67 | 110 | 95 | 25 | 32 | 23 | 63 | 43 | 8 | | |
| April | 53 | 67 | 76 | 15 | 43 | 24 | 61 | 48 | 8 | | |
| May | 45 | 117 | 113 | 26 | 65 | 45 | 80 | 71 | 12 | | |
| June | 58 | 130 | 116 | 13 | 45 | 48 | 73 | 47 | 10 | | |
| July | 63 | 158 | 148 | 24 | 65 | 48 | 95 | 47 | 16 | | |
| August | 52 | 134 | 150 | 28 | 56 | 40 | 91 | 63 | 19 | | |
| September | 47 | 128 | 98 | 18 | 52 | 24 | 83 | 57 | 12 | | |
| October | 32 | 121 | 63 | 29 | 68 | 36 | 67 | 54 | 6 | | |
| November | 48 | 121 | 79 | 20 | 74 | 39 | 61 | 70 | 12 | | |
| December | 70 | 140 | 72 | 13 | 50 | 31 | 58 | 50 | 10 | | |

TABLE - 1

| Month | Zone | | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 |
|-----------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | Lat. | Long. | 00-05 | 00-05 | 00-05 | 00-05 | 00-05 | 00-05 | 00-05 | 05-10 | 05-10 | 05-10 |
| | | | 60-65 | 65-70 | 70-75 | 75-80 | 80-85 | 85-90 | 90-95 | 60-65 | 65-70 | 70-75 |
| January | | | 11 | 22 | 32 | 80 | 111 | 11 | 78 | 18 | 32 | 70 |
| February | | | 11 | 16 | 17 | 69 | 96 | 13 | 87 | 18 | 29 | 38 |
| March | | | 14 | 23 | 36 | 76 | 96 | 14 | 90 | 20 | 28 | 67 |
| April | | | 12 | 8 | 20 | 70 | 83 | 9 | 47 | 19 | 20 | 37 |
| May | | | 15 | 28 | 31 | 62 | 120 | 22 | 59 | 15 | 24 | 51 |
| June | | | 14 | 20 | 28 | 72 | 79 | 19 | 76 | 36 | 18 | 63 |
| July | | | 13 | 17 | 27 | 79 | 133 | 21 | 81 | 17 | 25 | 60 |
| August | | | 9 | 22 | 28 | 98 | 126 | 24 | 84 | 22 | 29 | 69 |
| September | | | 9 | 20 | 29 | 80 | 91 | 22 | 84 | 14 | 15 | 45 |
| October | | | 23 | 14 | 19 | 77 | 117 | 18 | 73 | 21 | 22 | 57 |
| November | | | 8 | 11 | 25 | 74 | 93 | 15 | 72 | 15 | 30 | 59 |
| December | | | 14 | 14 | 18 | 82 | 82 | 12 | 66 | 21 | 29 | 74 |

38
51

