

1 אמר רב יהודה אמר רב כל עיר שיש בה מעלות ומורדות
 Rav taught that a city with lots of hills causes people to age
 early.
 In fact, רב הונא בריה דרב יהושע attributed his own premature
 aging to the steep roads between the cities that he would
 often travel to.

1 אמר רב יהודה אמר רב...
 כל עיר שיש בה מעלות ומורדות
*A city with lots of hills
 causes people to age early*
 רב הונא בריה דרב יהושע
attributed his own premature aging to this

2 תנו רבנן בא לרבעה -
 The תנא ברייתא teaches that when measuring the תחום of a circular
 city, a square must first be drawn around the city, and only
 then do we measure 2000 אמות from the sides of the square.

2 תנו רבנן בא לרבעה...
 When measuring the תחום
 of a circular city...
*a square
 must first
 be drawn
 around
 it*

*... and only then do we measure
 2000 אמות from the sides of the square*

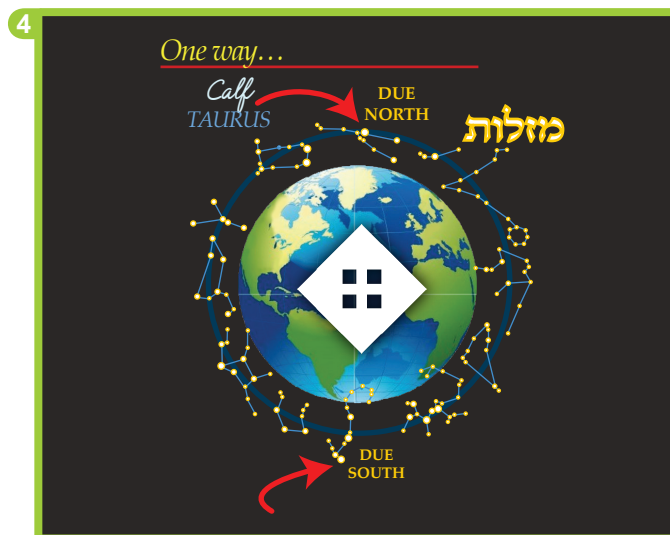
3 This square should be drawn
 בריבוע של עולם -
 with the sides facing in the direction of the world, meaning
 due north, due south etc.

3 This square should be drawn...
 בריבוע של עולם

 NORTH
 SOUTH
 WEST
 EAST

4 The בריתא offers two ways to figure out where due north and south are:

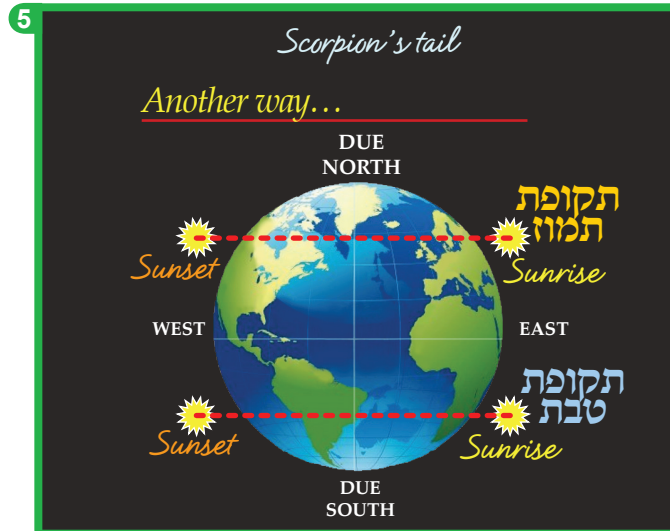
One way would be by looking at the מזלות - constellations. The constellation of the calf points to the north, and scorpion's tail to the south.



5 Another way is by marking off the first sun rise and sunset of תמוז and the Winter and Summer solstices. If we would draw a line from where the sun rises to where the sun sets on תמוז - the longest day of the year, that line indicates due north.

If we draw a line from where the sun rises to where the sun sets on שבט the shortest day of the year, it indicates due south.

For a more in-depth understanding of this, and the following statements, see our video on Birchas Hachamah in the special video section on the Daf Hachaim Home page.



6 רב משרשיא disagrees slightly with the בריתא and points out that

לא יצאה חמה מעולם מקרן מזרחית צפונית ושקעה בקרן מערבית צפונית -

Even on the longest day of the year, the sun does not really rise all the way in the northeastern corner, nor does it set all the way on the northwestern corner of the sky. Rather, it rises halfway between the northeastern corner and directly east, and it sets halfway between the northwestern corner and directly west.

The same is true for where it rises and sets along the southern horizon on the shortest day of the year.



7 The gemora then goes on to present some general rules about the
 the
 ארבעה תקופות השנה - the 4 seasons of the year.

אמר שמואל
 אין תקופת ניסן נופלת
 אלא בארבעה רבעי היום
 או בתחלת היום או בתחלת הלילה
 - או בחצי היום או בחצי הלילה

The spring equinox always falls out at exactly one of the quarter points of the day - midnight, midday, six in the evening, or six in the morning.

The summer solstice is always at 1 and a half, or 7 and a half hours of the day or night.

The fall equinox is always at 3 or 9 hours of the day or night.

The winter solstice is always at 4 and ½ or 10 and ½ hours of the day or night.

Second, there are exactly 91 days plus 7 and ½ hours between each תקופה or season.

Also, there is a cycle of seven מזלות - stars or planets, where each serves in consecutive hours of each day.

Now since 91 days equals exactly 13 weeks, plus 7 and ½ hours, the מזל which served at the beginning of one season will also serve for the first half hour of the next season.

7 **ארבעה תקופות השנה**
the 4 seasons of the year

אמר שמואל
 אין תקופת ניסן נופלת אלא בארבעה רבעי היום
 או בתחלת היום או בתחלת הלילה
 או בחצי היום או בחצי הלילה

Winter Solstice	Fall Equinox	Summer Solstice	Spring Equinox
תקופת טבת	תקופת תשרי	תקופת תמוז	תקופת ניסן
10:30 am 10:30 pm	3 am 3 pm	1:30 am 1:30 pm	12 am 12 pm
4:30 am 4:30 pm	9 am 9 pm	7:30 am 7:30 pm	6 am 6 pm

91 Days & 7-1/2 Hours between each season

13 Weeks plus 7-1/2 hours

Cycle of seven מזלות
 each serves in consecutive hours of each day

כוכב - צדק - נוגה - שבתאי - חמה - לבנה - מאדים

8 Finally, some physical calamities can strike if the season starts while certain מזלות are serving:

If תקופת ניסן begins in the hour of צדק / Jupiter, the trees will be ruined.

Also if תקופת טבת begins in the hour of צדק / Jupiter, the seeds will all dry out.

The gemora then returns to discuss the laws of establishing a תחום שבת.

8 *Some physical calamities can strike...*

If תקופת ניסן begins in the hour of צדק, the trees will be ruined.

Also if תקופת טבת begins in the hour of צדק, the seeds will all dry out.

9 - תנו רבנן המרבע את העיר
 When figuring out the תחום of a circular city, we draw a square around the city, and measure 2000 אמות from the edges of the square.
 וחוזר ומרבע את התחומין
 We also square off the תחום.
 In other words, we do NOT measure 2000 אמות from the corners of the square, which would result in rounded corners of the overall תחום.

9 תנו רבנן המרבע את העיר
 When figuring out the תחום of a circular city, we draw a square around the city, and measure 2000 אמות from the edges of the square
 וחוזר ומרבע את התחומין
 We do NOT measure 2000 אמות from the corners of the square

10 Rather, after measuring out 2000 אמות from all sides of the squared city, we add a square of 2000 x 2000 אמות in all four corners of the תחום, resulting in a square תחום as well.
 This way, we gain additional area in the corners of the תחום.

10 We square off the תחום

11 Based on the principle that the diagonal of a square is 1.4 times the length of its side, the diagonal of a square of 2000 by 2000 אמות, is 2800 אמות.
 Therefore, in the case of a round city with a diameter of 2000 אמות, we would gain an extra 400 אמות in the corner when squaring it off, and the תחום would measure 2800 אמות diagonally from the corners of the squared off city, to the corner of the תחום. At that point, the שבת תחום would be 3200 אמות away from the city!

11

- 12 תניא אמר רבי אליעזר ברבי יוסי תחום ערי לויים אלפים אמה - צא מהן אלף אמה מגרש נמצא מגרש רביע והשאר שדות וכרמים - The תחום around the cities of לויים was 2000 אמות of uninhabited land.
The first 1000 אמות was called מגרש - an empty area left uncultivated to enhance the beauty of the city.
The other 1000 אמות was for שדות וכרמים - fields and vineyards.

12 תניא אמר רבי אליעזר ברבי יוסי...
תחום ערי לויים אלפים אמה...
צא מהן אלף אמה מגרש נמצא מגרש רביע והשאר שדות וכרמים

- 13 The ברייתא says;
נמצא מגרש רביע - This means that the empty space is one quarter of the total area.
The גמרא asks רביע - ?מגרש פלגא -
The math seems to be incorrect because 1000 אמות is not one quarter, but one half, of the 2000 אמות of תחום?!
The ברייתא gives four explanations of the גמרא:

13 The ברייתא says...
נמצא מגרש רביע - ?
 $1/4$
 $1/2$

- 14 אמר רבא - If the city is a circle with a diameter of 2000 אמות, after squaring off the city and the תחום around it, the total area of the city and its תחום is 6000 by 6000 אמות, which is 36 million square אמות.
The מגרש - the circle of 1000 אמות empty area around the city was not squared, but round, creating a circle - consisting of the city and the מגרש - of 4000 אמות in diameter.

14 אמר רבא
The city is a circle with a diameter of 2000 אמות
36,000,000 אמות Square
4,000 אמות
6,000 אמות

15 To calculate the area of a circle the Gemara first squares it off into a square of 4000 by 4000, which is 16 million square אמות.
 Based on the principle of rounding off the circumference as three times the diameter, the area of the circle is 3/4 of the area of the square, and stands at 12 million square אמות.
 Subtract the area of the round city itself - which based on the same calculations is 3 million square אמות, leaving us with 9 million square אמות - one quarter of the total area of 36 million square אמות.

15

$$\begin{array}{r}
 4,000 \\
 \times 4,000 \\
 \hline
 16,000,000 \text{ Square אמות} \\
 \times .75 \\
 \hline
 12,000,000 \text{ Square אמות} \\
 - 3,000,000 \\
 \hline
 9,000,000 \text{ Square אמות}
 \end{array}$$

$9,000,000 \text{ Square אמות} \left\{ \frac{1}{4} \right\} 36,000,000 \text{ Total Square אמות}$

16 אמר אביי - Abaye makes a similar calculation with a round city of 1000 אמות in diameter, where the מגרש will be approximately 6 million square אמות - one quarter of the overall area of approximately 24 million square אמות.
 The difference between Abaye and Rava is that in the calculation of the overall area Rava included the area of the city, while Abaye did NOT include the city.

16

אמר אביי

The city is a circle with a diameter of 1000 אמות

$$\begin{array}{r}
 6,000,000 \text{ Square אמות} \\
 \left\{ \frac{1}{4} \right\} 24,000,000 \text{ Total Square אמות}
 \end{array}$$

רבא included the area of the city
 אביי did NOT include the city

17 רבינא אמר מאי רביע רביע דתחומין -
 We are speaking of a square city that is 2000 אמות by 2000 אמות, or 4 million square אמות. The squared off תחום around the city is 6000 אמות by 6000 אמות, or 36 million square אמות. When subtracting the space taken up by the city itself, the area of the תחום is 32 million square אמות.
 Now, according to רבינא the מגרש is only required along the four sides of the city - but not in the corners. Therefore, the מגרש consists of four rectangles of 1000 by 2000 אמות, for a total of 8 million square אמות, which is exactly 1/4 of the total area of the תחום around the city.

17

רבינא אמר

מאי רביע רביע דתחומין

the מגרש consists of four rectangles of 1000 אמות x 2000 אמות

$$\begin{array}{r}
 8,000,000 \text{ Square אמות} \\
 \left\{ \frac{1}{4} \right\} 32,000,000 \text{ Total Square אמות}
 \end{array}$$

No מגרש in the corners

18 - רב אשי אמר מאי רביע? רביע דקרנות
 According to רב אשי the מגרש is only in the corners, and not along the sides.
 Therefore, regardless of the size of the city, each corner מגרש is 1000 x 1000 אמות, for an area of 1 million square אמות.
 This is 1/4 of the corner of the תחום, which is always 2000 x 2000 אמות, for an area of 4 million square אמות.
 According to רב אשי - even though the Torah uses the term סביב to describe the open area of the מגרש, it can be referring to the corners, as we find regarding זריקת הדם, where the פסוק says;
 על המזבח סביב - around the מזבח - even though the blood was thrown only on the corners.

18

רב אשי אמר
 מאי רביע
 רביע דקרנות
 the מגרש is only in the corners, and not along the sides

1,000 אמות X 1,000 אמות = מקל {1/4} מקום
 2,000 אמות X 2,000 אמות

According to רב אשי...
 the term סביב and the term מגרש, can be referring to corners
 as with the זריקת הדם על המזבח where the term סביב is used - but refers only to the corners!