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Triangle Decans

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Abstract

The ancient Egyptians thought that there were two heavens, the northern sky and the southern sky, separated by a channel called "mr-n-xA" and they relied on the stars as timekeepers during the night, which they called **"**BAktiw". This decans measured time for 360 days of the year, with five days remaining to complete the year, known as five days upon the year "diw Hryw rnpt ";where triangle decans are used to measure these five days.

Keywords: Decans, Five Epagomenal Days, Sopdet, Time Measurement, Asyut's Coffin Lids, Sinnamut's Tomb.

1. Introduction

The ancient Egyptians astonished the world with their enormous civilization, in numerous disciplines of science, math, astronomy and life, ancient Egyptian texts demonstrated his superiority and ingenuity. He was noted for his understanding of the numerous calendars, and so he was able to precisely measure time, and there were many methods he used to measure time, which varied depending on whether it was day or night.

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The Celestial sphere was split into three portions by the ancient Egyptians: a northern, southern, and center third in the middle. Because there are 12 months in a year, each of these three portions is divided into 12 pieces, resulting in 36 sections, which are the year's star weeks(1).

The focus of this research is on one of the ways for measuring time. They're known as the "Triangle decans." It's worth mentioning that the word decan is taken from the Latin word Decanus; the word Decans represents the ten days that a star spends in the sky before another star appears, and is derived from the word Deka, which means ten(2).

2. The Decans' concept and significance "BAktiw"

The ancient Egyptians believed that the bAkti were a group of stars or a single star that appeared in the sky to indicate time (3); thus, they divided the month into star groups (decans), allowing him to measure the time at night. Many inscriptions have been discovered, revealing the stars and their names. It is noted that there are approximately 36 stellar decans, each with its own column(4) , and the stellar clocks are divided into squares that read counterclockwise from right to left. In the astronomical scenes, Mars, Jupiter, and Saturn appear first, followed by Sopdet, the decan of the five epagomenal days, Venus, and Mercury(5).

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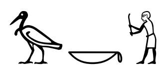
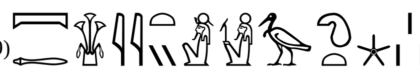
The Egyptians attempted to establish a law based on the movement of celestial bodies, just as Egyptian calendars were developed based on the cycle of the sun, moon, and Sirius.[(6)]

The decanal stars were given the name bAkw by the ancient Egyptians. In new kingdom astronomical sources, the name is most likely unrelated to the ninth decan "bAkti." [(7)]

If the stars were considered as servants of the sun and moon, the term could be derived from "bAk ," which meaning servant. [(8)] Through this text, the meaning becomes evident.

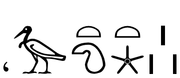
(9) 

pt Xry HAyty bAktyw m-xt .sn

Heaven with the two lights (Ra-xnsw)

The decans with them

By examining the written forms of BAktiw, it was discovered that there are many various ways of writing linguistic signs in ancient Egyptian texts, with instances as follows:

 ,  ,  ,(10)  ,(11).

Since the period of the Pyramids texts, it has been reported that there have been clocks to measure the time at night; on the eastern wall of the pyramid of Unas, the following appeared :[(12)]

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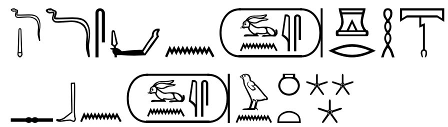

Dd mdw Dsr n Wnis grH sbi.n Wnis wnwt

Holy recitation of Unas who organized the time of the night,

for Unas who sent the clocks

It's worth mentioning, though, that the precise date when the ancient Egyptians began splitting the hours is unknown. The separation of hours did not appear clearly until the New Kingdom era, however the preceding text suggests that it occurred before the New Kingdom era. Because the ancient Egyptians divided the month into three halves, each week containing ten days, and the tables depicted 36 constellations, 36 x 10 = 360 days, they were known as the tens of stars, and by adding the decan of the five epagomenal days to the days on the year, a total of 365 days was achieved.

The decans (tens stars) were used to determine the time at night since they had a star oscillation through which the time was estimated because the length of the night and day varied throughout the year, this is why the ancient Egyptians explained that the length of the night was related to the length of the last hours of the night, as the star's vibration of this time increased in length, and vice versa when the night shortened, and that was related to the shortness of the last hours of the night, and that was a result of the shortening of the star's vibration of this time.

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As the stellar hours were determined by the successive burning of the constellations(13) , the passing of the star at a specific point was evidence of a specific hour, and thus its appearance early 40 minutes; As a result, it refers to the previous hour, and the early appearance of the decan is due to the Earth's rotational speed in comparison to the sun and stars. For example, the rising of the star will appear as an indicator of the end of the twelve o'clock hour at night for the first ten days, and then it will become an indicator of the eleventh hour at night, and so on. Thus, at twelve o'clock, another star was determined, which, after ten days, became an indicator of the eleventh hour at night.(14)

3. Triangle Decans and Their Significance

The Egyptians, like their contemporaries, relied on the appearance of the star Sopdet to calculate their calendar, which coincided with the arrival of the flood; this is the same star of "Sirius" known to Arabs as "The Yemeni Sirius." Set the seasons and the calendar year. The Egyptians noticed that the "brightest star," Sirius, appears once a year on a specific day. Around 4236 BC, they considered that day to be the start of the calendar and the beginning of the year.

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They initially thought the year was three hundred and sixty days, but when they calculated the time between the appearances of Sirius twice in a row, they discovered it was three hundred and sixty-five days. The five extra days (epagomenal) were commemorated as deity feasts; it was thought to be the days when deities were born.(15) During the Old Kingdom and until the end of the Greek and Roman eras, the stars played a prominent role in ancient Egyptian beliefs.

During the five Epagomenal days, the Triangle Decans are the constellation of stars in charge of measuring the time at night. The term **diw Hryw rnpt** is thought to have first appeared in a tomb of "Ni kA anx," (16)during the reign of King Userkaf, he was the keeper of the royal estate. His tomb is the second of fifteen tombs carved into the rock(17) in dhnt (18).

4. Time Measurement Techniques

Each clock is essentially a table with twelve rows indicating the hours of the night and 36 columns reflecting the thirty-six decades (10-day periods) that make up the civil year's twelve months. The layout of a hypothetical ideal rising star clock is shown in Table 1. Each decan name is represented by the numbers 1 to 36 and the letters A to L (except I) in the main body of the table. The table's main body accommodates 360 days and is topped by a date row listing 36 decades. The name “diagonal star clock” comes from the diagonal pattern made by the decan names in this section of the table.

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Because of the form they make in the star clock table, the decan names represented by the letters A to L are commonly referred to as triangle decans. Ordinary decans will be from 1 through 36.

The table's four leftmost columns contain a list of all decans, followed by the usual decans in the first three columns, the list columns (which appear to have no timekeeping purpose but may have served as a reference list of decans used in the clock), and the eleven triangle decans A to L and also one extra triangle decan M in the final column. The extra five entire days of the year (the epagomenal days, or 'days upon the year') were kept in this epagomenal column for timekeeping. A horizontal strip with offering inscriptions and 16 vertical strip bearing figures of deities related with the sky split the table into quarters.(19)

[Epagomenal days]				Final decade	Middle decade	IV Shemu 1st decade	Final decade	Middle decade	III Shemu 1st decade	Final decade	Middle decade	II Shemu 1st decade	Final decade	Middle decade	I Shemu 1st decade	Final decade	Middle decade	IV Peret 1st decade	Final decade	Middle decade	III Peret 1st decade
A	25	13	1	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19
B	26	14	2	A	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20
C	27	15	3	B	A	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21
D	28	16	4	C	B	A	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22
E	29	17	5	D	C	B	A	36	35	34	33	32	31	30	29	28	27	26	25	24	23
F	30	18	6	E	D	C	B	A	36	35	34	33	32	31	30	29	28	27	26	25	24
G	31	19	7	F	E	D	C	B	A	36	35	34	33	32	31	30	29	28	27	26	25
H	32	20	8	G	F	E	D	C	B	A	36	35	34	33	32	31	30	29	28	27	26
J	33	21	9	H	G	F	E	D	C	B	A	36	35	34	33	32	31	30	29	28	27
K	34	22	10	J	H	G	F	E	D	C	B	A	36	35	34	33	32	31	30	29	28
L	35	23	11	K	J	H	G	F	E	D	C	B	A	36	35	34	33	32	31	30	29
M	36	24	12	L	K	J	H	G	F	E	D	C	B	A	36	35	34	33	32	31	30

	Final decade	Middle decade	II Peret 1st decade	Final decade	Middle decade	I Peret 1st decade	Final decade	Middle decade	IV Akhet 1st decade	Final decade	Middle decade	III Akhet 1st decade	Final decade	Middle decade	II Akhet 1st decade	Final decade	Middle decade	I Akhet 1st decade
A	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
B	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2
C	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3
D	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4
E	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5
F	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6
G	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7
H	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8
J	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9
K	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10
L	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11
M	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12

The following is how the table would have been used:

During the hours of darkness, an observer can stare at the eastern horizon at any time. He searches the horizon for a decan that is just visible above the horizon. Knowing the date, he searches the rising star clock table for the column of twelve decan names that is headed by either the precise date or a date within the last nine days. He discovers the name of the decan he has noticed in that column.

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The first place denotes the first hour of the night, and so on until the twelfth position, which denotes the twelfth hour.

For example decan 20 is seventh in that column, therefore it is the seventh hour of the night, if it is rising beyond the eastern horizon and the day is in the middle decade of the first month of Peret.

5.Triangle Shape Symbolism

During the five epagomenal days, the ancient Egyptians used 12 triangular stars to measure time. Because of the shape they make in the star clock table, it was given this name. (20)

The triangle arose as a result of two major factors. First, the ancient Egyptian week was made up of ten days. The second is known as the sidereal day, which means that it takes the star 23 hours, 56 minutes, and 4 seconds to complete a full cycle, and by applying this sidereal day and continuing to record observations, the observing star appears to move to replace another star in its place, resulting in what is known as the angle of the clock. It is the angle between the observer's meridian plane and the plane of the celestial body's location, where the angular units can be converted into hours, minutes, and seconds, as shown in the table below(21) .

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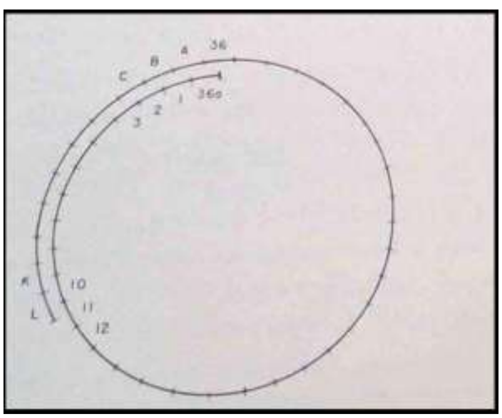
الوحدات القوسية "الزاوية" (درجة، دقيقة، ثانية)	الوحدات الزمنية (ساعة، دقيقة، ثانية)
360°	24^h
15°	1^h
1°	4^m
$15'$	1^m
$1'$	4^s
$15''$	1^s

Whereas the angle between the first observing star and the next is 9.9 degrees until we reach the 36th star, the angle difference is 345 degrees, and after ten days, the first day of epagomenal days begins after the appearance of the 36th star, so the angle difference becomes 345.8 degrees with the appearance of star A, expressing the first day of epagomenal days. (22)



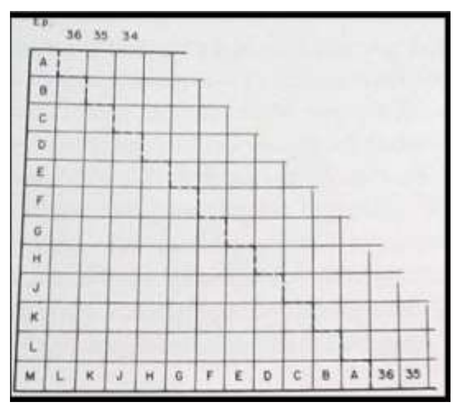


Diagram demonstrating the operation of triangle stars

EAT, I, p.109, fig 32.

It is in charge of determining the hours of the night during the five days of the epagomenal, and their number reached 12 stars during the era of the first transition and the middle kingdom(23),

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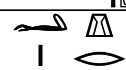
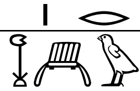
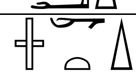
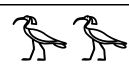
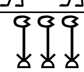
which are immediately following the main 36 stars, but they did not appear completely during the new kingdom, with only 6 of them appearing, and planets replacing the rest stars. These stars first appeared in Sinnamut's tomb and later in Ramesses' tombs.[24]

5. Astronomical Monuments with Triangle Decans

N	Decans	Transliteration	
1		smd rsyt	*Msht* IX-Xth dynasty, from Asyut [25]
2		smd mHty	
3		nTr DA pt	
4		rmn Xry	
5		XAw	
6		tpy- a spd	
7		imy –xt spd	
8		Axwy	
9		XAw	
10		nTr DA pt	
11		////////	
12		pHwy sAbw	

The same decans appeared on the it- ib sarcophagus[26] with some smashed, and completely smashed on coffins of [27] xw-n-sqr and idy [28] and fully featured on coffins of [29] aSyt and iqr [30] with the eleventh decan also smashed.

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On the `HqAt`[(31)] sarcophagus the identity of the smashed eleventh decan was revealed, and it was named `sAbw`.

N	Decans	Transliteration	Group 1
1		**Stwy**	**Senmut Amenhotep III(clepsydra) Ramses II (Ramessum Temple) Ramses III (Habu Temple)** [(32)]
2		**Nsrw**	
3		**Sspt**	
4		**AbSs**	
5		**Hpds**	
6		**nTr Was**	

Only six decans appeared in the New Kingdom. It is worth mentioning that in various sources some decans have been substituted by others , as well as the various written forms of decans. For example, the `Stwy` decan did not feature in the temples of Habu and Ramesseum. While several decans appeared in the tombs of Ramesses VI, VII and IX, such as the decan `nhs` and the decan , as well as the decan `siAtw`, and the decan `Stwy` also appeared in a different written form.

In the temple of Seti I, and in his tomb and in the tombs of King Rameses II, Merneptah and Tausert, the decan `ipsD` as well as `spSsn` appears.

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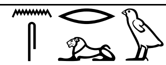
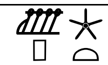
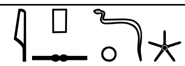
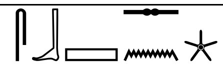
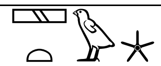
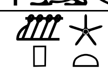
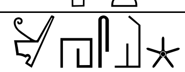
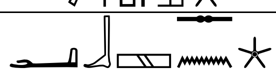
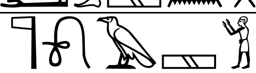
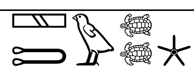
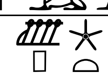
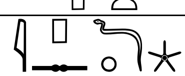
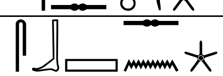
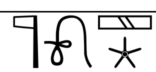
N	Decans	Transliteration	Group 2(A)
1		Stwy	Tombs of: Ramses VI Ramses VII Ramses IX ([33])
2		Nsrw	
3		Sspt	
4		IpsD	
5		SpSsn	
6		nTr Was	

N	Decans	Transliteration	Group 2(B)
1		Stwy	Tombs of: Ramses VI Ramses VII Ramses IX
2		siAtw	
3		Nsrw	
4		Sspt	
5		Nhs	
5		abSsn	
6		nTr Was	

N	Decans	Transliteration	Group 3
1		Stwy	Seti I(Tomb and Temple) Mernbtah Tomb Tawesrt Tomb Ramses II Abydos Temple (34)
2		Nsrw	
3		Sspt	
4		ipsD	
5		spSsn	
6		nTr wAS	

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6. Conclusion

There is a difference between the names of the stars and their numbers, which is due to changes in the locations of the stars and how they are observed, as well as the extent to which some stars appear and disappear.

Scientists disagreed on this, including Neugebauer, Parker, and Simons, who confirmed the development of ancient Egyptian astronomy, to determine the star year, the astronomer used a triangular system of 12 stars.

However, the appearance of the number of stars in the days of epagomenal as six or seven caused confusion in astronomical calculations, leading the researcher to believe that there were unsuccessful results, such as the reappearance of the stars twice in different written forms, or the writing of the star twice on the same coffin.

There is also an explanation for "Daressy" (35), as it is thought that these stars contain planets in their folds, as the star (nTr DA pt) is thought to be Saturn, while the star smd mHty is Mercury, and the star smd rsy is Jupiter.

The emergence of planets after the star Sopdt and then the triangle stars is noted in the New Kingdom and the late era. As a result, it is possible to conclude that the epagomenal has seven stars and five planets.

From the foregoing, it is possible to deduce the ancient Egyptian's knowledge of the days of epagomenal without knowing how to verify their account, which caused him to abandon that in the Ramesses tombs.

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The planets were used to measure time by the ancient Egyptians, as they were one of the twelve stars responsible for measuring time in the star panels.

As Leitz points out, days of forgetfulness are not always placed on religious and national occasions, so the twelve stars are sometimes placed symbolically rather than for astronomical calculations. [36]

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([17]) In 1853, German “Brugsch” found fifteen rock-cut tombs belonging to the “Tahna al-Jabal”, belonging to the supervisors of the royal estates in the Fourth and Fifth Dynasties, and among them were the priests of the goddess Hathor. It was known as the Frieze Tombs, In relation to the architect George Fraser because he was the first to document them in his book “The Early Tombs at Tehneh”., Tahna al-Jabal is a village in Minya Governorate, known in ancient Egyptian texts as “tA dhnt" means vanguard or front and also known mrt nfrt ‹ pr Imn mt xnty ".

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