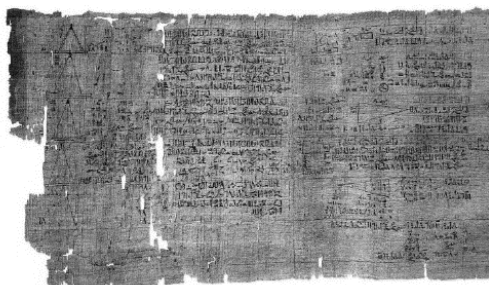


Yosef the Egyptian Mathematician

Rabbi David Debow

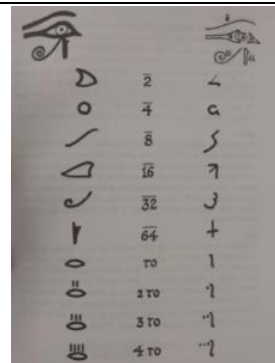
A. Math in Egypt



Rhind Papyrus, 1650 BCE



Nilometer, Roda Island, Cairo



Egyptian Fraction Number System

B. Three Dream Pairs

11 + 2 Sheaves and Stars ↓ Family Chapter 37	<p>(7) "Behold, we were binding sheaves in the field and my sheaf rose and even stood erect, and, behold, your sheaves surrounded and bowed down to my sheaf." (8) His brothers said to him, "Will you indeed reign over us? Will you indeed rule over us?" And they hated him even more for his dreams and for his words.</p>	<p>(9) He dreamed yet another dream and recounted it to his brothers, and he said, "Behold, I dreamed another dream, and, behold, the sun, the moon, and eleven stars were bowing down to me." (10) He recounted it to his father and his brothers. His father berated him and said to him, "What is this dream you dreamed? Will we really come, I and your mother and your brothers, to bow down to you to the ground?"</p>
3 Wine and Baked Goods ↓ Days Chapter 40	<p>(9) The cupbearer recounted his dream to Yosef and said to him, "In my dream, behold, there was a vine before me. (10) And on the vine were three tendrils, and just as it was budding, its blossoms came forth, and its clusters ripened into grapes. (11) And Paroh's cup was in my hand, and I took the grapes and squeezed them into Paroh's cup and I gave the cup into Paroh's palm." (12) Yosef said to him, "This is its interpretation. The three tendrils are three days. (13) In another three days Paroh will lift up your head and return you to your post and you will place Paroh's cup into his hand as was your former custom when you were his cupbearer."</p>	<p>(16) The baker saw that he interpreted well, and he said to Yosef, "I, too, in my dream—and, behold, there were three mesh baskets on my head. (17) And in the uppermost basket, a selection of all the food of Paroh, baked goods, and the birds were eating them, from the basket which was on my head. (18) Yosef replied and said, "This is its interpretation. The three baskets are three days. (19) In another three days Paroh will lift up your head from upon you and hang you on a tree, and the birds will eat your flesh from upon you."</p>
7 Cows and Ears of Grain ↓ Years Chapter 41	<p>(1) At the end of two full years, Paroh dreamed, and, behold, he was standing by the river. (2) And, behold, seven cows, nice-looking and fat of flesh, were ascending from the river and they grazed in the rushes. (3) And, behold, seven other cows were ascending from the river after them, ill-looking and lean of flesh, and they stood near the cows on the bank of the river. (4) The ill-looking and leanness-cows ate the seven nice-looking, fat cows; and Paroh awoke.</p>	<p>(5) He slept and dreamed a second time, and, behold, seven ears of grain were coming forth from one stalk, fat and good. (6) And, behold, seven ears of grain, lean and scorched by an east wind, were sprouting up after them. (7) The lean ears of grain swallowed the seven fat, full ears of grain; and Paroh awoke, and, behold, it was a dream.</p>
	<p>(20) On the third day, the birthday of Paroh, he made a feast for all his servants, and he lifted the heads of the chief cupbearer and the head of the chief baker among his servants.</p>	

ימי עיון בתנ"ך תשפ"ד

C. Counting and Recounting – סיפור ומספרים

Stars so numerous it's uncountable	ויוצא אתו החוצה ויאמר הבט נא השמימה וספר הכוכבים אם תוכל לספר אתם ויאמר לו כה יהיה זרעך. (בראשית ט"ו:ה')
Seed so numerous it's uncountable	ויאמר לה מלאך ה' הרבה ארבה את זרעך ולא יספר מרב. (בראשית ט"ז:י')
Recounting a story	ויספר העבד ליצחק את כל הדברים אשר עשה. (בראשית כ"ד:ס"ו)
Recounting a story	ויהי כשמע לבן את שמע יעקב בן אחתו וירץ לקראתו ויחבק לו וינשק לו ויביאהו אל ביתו ויספר ללבן את כל הדברים האלה. (בראשית כ"ט:י"ג)
Seed and sand so numerous it's uncountable	ואתה אמרת היטב איטיב עמך ושמתי את זרעך כחול הים אשר לא יספר מרב. (בראשית ל"ב:י"ג)
Recounting a dream	ויחלם עוד חלום אחר ויספר אותו לאחיו ויאמר הנה חלמתי חלום עוד והנה השמש והירח ואחד עשר כוכבים משתחווים לי. (בראשית ל"ז:ט')
Recounting a dream	ויספר אל אביו ואל אחיו ויער בו אביו ויאמר לו מה החלום הזה אשר חלמתי הבוא נבוא אני ואמך ואחיד להשתחות לך ארצה. (בראשית ל"ז:י')
Recounting a dream	ויאמרו אליו חלום חלמנו ופתר אין אתו ויאמר אליהם יוסף הלוא לאלקים פתרנים ספרו נא לי. (בראשית מ"ח:')
Recounting a dream	ויספר שר המשקים את חלמו ליוסף ויאמר לו בחלומי והנה גפן לפני. (בראשית מ"ט:')
Recounting a dream	ויהי בבקר ותפסעם רוחו וישלח ויקרא את כל חרטמי מצרים ואת כל חכמיה ויספר פרעה להם את חלמו ואין פותר אותם לפרעה. (בראשית מ"א:ח')
Recounting a dream	ושם אתנו נער עברי עבד לשר הטבחים ונספר לו ויפתר לנו את חלמתינו איש בחלמו פתה. (בראשית מ"א:י"ב)
Grain so numerous it's uncountable	ויצבר יוסף בר כחול הים הרבה מאד עד כי חדל לספר כי אין מספר. (בראשית מ"א:ט')
Recounting God's power	ואולם בעבור זאת העמידתך בעבור הראתך את כחי ולמען ספר שמי בכל הארץ. (שמות ט"ז:ט')
Recounting God's power	ולמען תספר באזני בנך ובן בנך את אשר התעללתי במצרים ואת אותי אשר שמתי בהם וידעתם כי אני ה'. (שמות י"ב:')
Recounting God's power	ויספר משה לחתנו את כל אשר עשה ה' לפרעה ולמצרים על אודת ישראל את כל התלאה אשר מצאתם בדרך ויצלם ה'. (שמות י"ח:ח')
Recounting God's words	ויבא משה ויספר לעם את כל דברי ה' ואת כל המשפטים ויען כל העם קול אחד ויאמרו כל הדברים אשר דבר ה' נעשה. (שמות כ"ד:ג')
Counting 7 days	וכי יטהר הזב מזובו וספר לו שבעת ימים לטהרתו וכבס בגדיו ורחץ בשור במים חיים וטהר. (ויקרא ט"ו:י"ג)
Counting 7 days	ואם טהרה מזובה וספרה לה שבעת ימים ואחר טהרה. (ויקרא ט"ו:כ"ח)
Counting 7 weeks	ויספרתם לכם ממחרת השבת מיום הביאכם את עמר התנופה שבע שבתות תמימות תהיינה. (ויקרא כ"ג:ט"ו)
Counting 50 days	עד ממחרת השבת השביעת תספרו חמשים יום והקרבתם מנחה חדשה לה'. (ויקרא כ"ג:ט"ז)
Count 7 years	ויספרת לך שבע שבתות שנים שבע שנים שבע פעמים והיו לך ימי שבע שבתות השנים תשע וארבעים שנה. (ויקרא כ"ה:ח')
Recounting of the spies	ויספרו לו ויאמרו באנו אל הארץ אשר שלחתנו וגם זבת חלב ודבש הוא וזה פריה. (במדבר י"ג:כ"ז)
Counting 7 weeks	שבעה שבעת תספר לך מהחל חרמש בקמה תחל לספר שבעה שבועות. (דברים ט"ז:ט')

	Uncountable	Recounting a story	Recounting a dream	Recounting God's Strength	Recounting God's words	Counting for a Mitzva
Object of Count	Stars, Seed, Grain, Sand	Avraham's servant, Spies	Dreams	Exodus	Words	Omer, days, weeks, years
# of verses	4	3	6	3	1	6

D. Intercalation – Balancing Interests

Sanhedrin 11a – 13b (Selections)

The Sages taught in a *baraita* (*Tosefta* 2:2): The court **may intercalate the year for three matters:** For the ripening of the grain, if it is not yet time for the barley to ripen; for the fruit of the trees, if they have not yet ripened; and for the equinox, i.e., to ensure that the autumnal equinox will precede *Sukkot*. If **two of these concerns** apply, the court **intercalates** the year even if the third factor does not apply; **but for only one of them** the court **does not intercalate** the year.

The *baraita* continues: **And when the ripening of the grain is one of the concerns, everyone is happy.**

The Sages taught: The year may be intercalated **only if it is necessary due to damage to the roads**, if the rain has damaged them in such a way that they are inaccessible for those ascending to Jerusalem for Passover; **or due to the bridges** that are likewise in disrepair; **or due to the ovens** for the Paschal offerings that are damaged and unfit for roasting the offerings; **or due to the Diaspora Jews who have left their homes and still have not arrived** due to delays in travel. **But** the year may **not** be intercalated **due to the snow, and not due to the cold, and not due to the Diaspora Jews who have not yet left from their homes**, even if they no longer have enough time to reach Jerusalem.

The day of the equinox concludes the season; this is the statement of Rabbi Yehuda. Rabbi Yosei says: The day of the equinox begins the season.

The Sages taught in a *baraita*: The year may be intercalated **only by those who were invited** by the *Nasi*, the president of the Great Sanhedrin, **for that purpose**. There was **an incident involving Rabban Gamliel, who said to the Sages: Bring me seven of the Sages early tomorrow morning to the loft** designated for convening a court to intercalate the year. He **went to the loft early** the next morning **and found eight Sages there**. Rabban Gamliel **said: Who is it who ascended to the loft without permission? He must descend immediately**. Shmuel HaKatan stood up and **said: I am he who ascended without permission; and I did not ascend to participate and be one of those to intercalate the year, but rather I needed to observe in order to learn the practical *halakha***. Rabban Gamliel **said to him: Sit, my son, sit. It would be fitting for all of the years to be intercalated by you, as you are truly worthy. But the Sages said: The year may be intercalated only by those who were invited for that purpose**. The Gemara notes: **And it was not actually Shmuel HaKatan who had come uninvited, but another person. And due to the embarrassment of the other.**

E. Calendar

Talmud Avoda Zara 8a



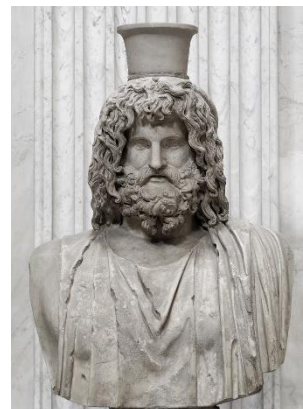
Rav Ḥanan bar Rava says: When are these festivals celebrated? **Kalenda is celebrated during the eight days after the winter solstice, and Saturnalia is celebrated during the eight days before the winter solstice. And your mnemonic, is the verse: “You have hemmed me in behind and before, and laid Your Hand upon me” (Psalms 139:5).** With regard to the dates of these festivals, **the Sages taught: When Adam the first man saw that the day was progressively diminishing**, as the days become shorter from the autumnal equinox until the winter solstice, he did not yet know that this is a normal phenomenon, and therefore he said: **Woe is me; perhaps because I sinned the world is becoming dark around me and will ultimately return to the primordial state of chaos and disorder. And this is the death that was sentenced upon me from Heaven**, as it is written: **“And to dust shall you return” (Genesis 3:19). He arose and spent eight days in fasting and in**

prayer. Once he saw that the season of Tevet, i.e., the winter solstice, had arrived, and saw that the day was progressively lengthening after the solstice, he said: Clearly, the days become shorter and then longer, and **this is the order of the world. He went and observed a festival for eight days. Upon the next year, he observed both these eight days on which he had fasted on the previous year, and these eight days of his celebration, as days of festivities. He, Adam, established these festivals for the sake of Heaven, but they, the gentiles of later generations, established them for the sake of idol worship.**

F. Understanding Yosef

1. Talmud Avoda Zara 43a

As it is taught in a *baraita* that Rabbi Yehuda adds to the list of forbidden figures even a figure of a nursing woman and *Sar Apis*. The figure of a nursing woman is worshipped as it symbolizes Eve, who nurses the entire world. The figure of *Sar Apis* is worshipped as it symbolizes Joseph, who ruled over [*sar*] and appeased [*mefis*] the entire world by distributing food during the seven years of famine (see Genesis, chapter 41). But the figure of *Sar Apis* is forbidden only when it is holding a dry measure and measuring with it; and the figure of a nursing woman is forbidden only when she is holding a child and nursing it.



Bust of **Serapis**. Roman copy after a Greek original from the 4th century BCE, stored in the Serapaeum of Alexandria.

2. Mishna Vessels 17:8

[The measurement of] the olive that was mentioned is neither large and not small, but medium-sized; this is the *egori* [olive]. The barley-grain that was mentioned is not large and not small, but medium-sized; this is *midbarit* [barley]. The lentil that was mentioned is neither large nor small, but medium-sized; this is the Egyptian [lentil]. (9) The *amah* [cubit] that was mentioned is an average *amah*, and two *amah* measures were at the Shushan Habirah [area of the Temple], one in the northeastern corner and one in the southeastern corner. The one which was in the northeastern corner was greater than that of Moses by half a fingerbreadth. The one that was in the southeastern corner was greater than it by half a fingerbreadth; therefore, it is greater than that of Moses by a fingerbreadth. And why did they say [there must be] one large and one small? So that the workmen could take according to the small and return according to the large, so that they would not misappropriate consecrated goods.



Egyptian Royal Cubit 1336 – 1327 BCE (Eighteenth Dynasty)

Yisrael sent forth his right and set it on Ephraim's head, who was the younger, and his left on Menashe's head; he crossed his hands even though Menashe was the first born. (Genesis 48:14)

וישלח ישראל את ימינו על ראש אפרים והוא הצעיר ואת
שמאלו על ראש מנשה שכל את ידיו כי מנשה הבכור.

