

**JEWISH CALENDAR TUTORIAL WORKSHEET 2 (515BC CHANGED SEQUENCE)**

**YEAR BEING CALCULATED: 515 B.C. CHANGED SEQUENCE**

**PART II: CALCULATION OF THE DAY OF THE MONTH FOR THE MOLAD IN THE ROMAN CALENDAR**

COMMENT: POINTS 1 - 4 CAN BE COPIED OVER FROM THE FIRST CALCULATION FOR THIS PARTICULAR YEAR.

**1.**

STARTING DATE YEAR: 3761 B.C.

STARTING DATE MOLAD OF TISHRI: OCTOBER 7 or SEPTEMBER 37

STARTING DATE EXACT TIME: D2 H5 P204

**2.**

YEAR BEING CALCULATED: 515 B.C.

**3.**

THE DIFFERENCE IN YEARS: 3246 YEARS

**4.**

CONVERTING THIS DIFFERENCE INTO THE NUMBER OF 19-YR CYCLES PLUS REMAINING COMMON YEARS AND LEAP YEARS:

170 cycles plus a remainder of 16 years

The remainder of 16 years = 10 Common Years + 6 Leap Year

**5.**

WE ARE NOW GOING TO CALCULATE THE DIFFERENCE BETWEEN THE JEWISH CALENDAR AND THE ROMAN JULIAN CALENDAR. THIS CALCULATION COULD NOT POSSIBLY HAVE BEEN PERFORMED BEFORE THE JULIAN CALENDAR CAME INTO EXISTENCE.

COMMENT: For calculation purposes we again turn all periods of time into Parts.

A. PER CYCLE EVERY JEWISH 19-YR CYCLE IS SHORTER THAN 19 JULIAN YEARS BY 1H 485P.

SO WE MULTIPLY THIS BY THE NUMBER OF CYCLES INVOLVED: 1H 485P = 1,565P

THUS:  $1565 \times 170 = 266,050P$

B. THE AVERAGE COMMON YEAR IS SHORTER THAN THE AVERAGE JULIAN YEAR BY 10D 21H 204P.

SO WE MULTIPLY THIS BY THE NUMBER OF COMMON YEARS INVOLVED: 10D 21H 204P = 282,084P

THUS:  $282,084 \times 10 = 2,820,840P$

C. THE AVERAGE LEAP YEAR IS LONGER THAN THE AVERAGE JULIAN YEAR BY 18D 15H 589P.

SO WE MULTIPLY THIS BY THE NUMBER OF LEAP YEARS INVOLVED: 18D 15H 589P = 483,349P

THUS:  $483,349 \times 6 = 2,900,094$

**6.**

NOW DO THE FOLLOWING CALCULATION:

(AMOUNT FOR LEAP YEARS) - (AMOUNT FOR CYCLES + AMOUNT FOR COMMON YEARS)

IF THE ANSWER IS A NEGATIVE VALUE, THEN IT MUST BE SUBTRACTED FROM THE STARTING DATE MOLAD VALUE, THUS MAKING THE MOLAD EARLIER. AND IF THE ANSWER IS A POSITIVE VALUE THEN IT MUST BE ADDED TO THE STARTING DATE MOLAD VALUE, THUS MAKING THE MOLAD LATER.

THUS:

$$(2,900,094P) - (266,050P + 2,820,840P) \\ = 2,900,094 - 3,086,890 = -186,796P$$

**7.**

THIS TOTAL WE NOW CONVERT BACK INTO DAYS, HOURS, PARTS.

$$-186,796 / 1080 = -(172 \text{ HOURS plus } 1036P)$$

$$-172 / 24 = -(7 \text{ DAYS plus } 4H)$$

THUS THE TOTAL IS: -(7 DAYS plus 4 HOURS plus 1036 PARTS)

**8.**

NOW WE ADD ADJUSTMENTS FOR DATES THAT ARE LATER THAN 1582 A.D. AND FOR NON-ROMAN LEAP YEARS AS FOLLOWS:

AFTER 1582 = ADD 10 DAYS

AFTER 1700 = ADD 1 DAY

AFTER 1800 = ADD 1 DAY

AFTER 1900 = ADD 1 DAY

AFTER 2100 = ADD 1 DAY, etc.

CORRECTION FOR YEARS AFTER A ROMAN LEAP YEAR ARE THUS:

6H or 12H or 18H FOR 1 or 2 or 3 YEARS AFTER A ROMAN LEAP YEAR.

TOTAL ADJUSTMENT TO ADD FOR THIS YEAR = 12 HOURS

[Comment: 517 B.C. was a Julian Calendar leap year (as there is no year Zero) and so 515 B.C. requires a 12-hour adjustment.]

**9.**

NOW WE ADD THE TOTAL FOR THESE TOTAL ADJUSTMENTS TO THE PREVIOUS TOTAL: -(7D 4H 1036P) + 12H = -(6D plus 16H plus 1036P)

**10.**

IF THIS FINAL FIGURE IS A POSITIVE VALUE, THEN WE ADD IT TO THE STARTING DATE. IF THIS FINAL FIGURE IS A NEGATIVE VALUE, THEN WE SUBTRACT IT FROM THE STARTING DATE.

COMMENT: IF THIS IS A NEGATIVE VALUE GREATER THAN "6D 5H 205P", THEN WE USE SEPTEMBER 37 AS THE STARTING DATE, OTHERWISE WE USE OCTOBER 7 AS THE STARTING DATE. THIS MAKES CALCULATIONS EASIER WITHOUT ACTUALLY CHANGING ANYTHING.

**11.**

THUS: STARTING DATE +/- THIS FINAL TOTAL = THE DAY OF THE MONTH FOR THE MOLAD OF TISHRI. THUS:

$$\text{THUS: SEPT 37 H5 P204} - (6D 16H 1036P)$$

$$= \text{SEPT 37 H5 P204} - 1036P = \text{SEPT 37 H4 P248}$$

$$= \text{SEPT 37 H4 P348} - 16H = \text{SEPT 36 H12 P248}$$

$$= \text{SEPT 36 H12 P348} - 6D = \text{SEPTEMBER 30 H12 P248}$$

**12.**

WE NOW COMPARE THE HOURS AND PARTS FROM THIS RESULT WITH THE HOURS AND PARTS IN THE DAY OF THE WEEK CALCULATION. THUS:  
EXACT TIME FOR DAY OF WEEK CALCULATION = H12 P248  
EXACT TIME FOR DAY OF MONTH CALCULATION = H12 P248  
IF THESE TWO RESULTS ARE 100% IDENTICAL, THEN OUR CALCULATIONS ARE CORRECT. IF THEY ARE NOT 100% IDENTICAL, THEN WE MUST LOOK FOR WHERE WE MADE AN ERROR.

**13.**

OUR ASSESSMENT: THE RESULTS ARE 100% IDENTICAL!

**14.**

CONCLUSION: WE NOW HAVE THE PROOF THAT WE HAVE CALCULATED THE MOLAD OF TISHRI CORRECTLY! OUR RESULT IS:  
FOR 515 B.C. THE MOLAD OF TISHRI WAS FRIDAY, SEPTEMBER 30 AT H12 P248, THIS BEING 6:13:47 a.m.

THIS CONCLUDES THE ACTUAL MOLAD CALCULATIONS. NOW THE MOLAD MUST STILL BE EVALUATED AGAINST THE 4 POSTPONEMENT RULES.

HOWEVER:

AS A MATTER OF INTEREST, WE ARE NOW READY TO COMPARE THIS MOLAD WITH THE REAL NEW MOON CONJUNCTION (expressed in LOCAL JERUSALEM TIME), AS DETERMINED BY MODERN ASTRONOMERS. FOR THIS PURPOSE WE USE THE TIME EXPRESSED IN MINUTES AND SECONDS, RATHER THAN EXPRESSED IN PARTS (i.e. HALAKIM).

MOLAD OF TISHRI FOR 515 B.C.: SEPTEMBER 30 at 6:13:47 a.m.  
REAL NEW MOON CONJUNCTION: SEPTEMBER 29 at 6: 00 p.m.

[Comment: In 515 B.C. September 29 Julian was the same as September 23 Gregorian, and on September 23 the sun sets in Jerusalem at 5:55 p.m. local time. Thus this new moon conjunction was very likely in the first few minutes of the new day, September 24 Gregorian, or September 30 Julian.]

EVALUATION OF THE JEWISH MOLAD: IS IT TOO EARLY? IS IT BASICALLY CORRECT? IS IT TOO LATE?

ASSESSMENT:THE MOLAD WAS ALMOST 12 HOURS AFTER THE REAL NEW MOON CONJUNCTION! IT WAS ABOUT 12 HOURS LATE, THOUGH IT WAS STILL ON THE SAME DAY (sunset to sunset reckoning) AS THE ACTUAL NEW MOON CONJUNCTION.

IN THE GREGORIAN CALENDAR (WHERE THE AUTUMN EQUINOX IS ON SEPTEMBER 23) THIS MOLAD DATE IS REALLY SEPTEMBER 24!

WE ARE NOW READY TO LOOK AT WHETHER THE JEWISH CALENDAR FOR THIS MOLAD APPLIES ANY POSTPONEMENTS OR NOT.

We have now completed ALL the calculations that are required for determining the Molad of Tishri. We have also compared this Molad of Tishri to the real astronomical new moon conjunction of the Seventh

Month. What remains to be done is the easy part: examining the Molad of Tishri against all 4 of the postponement rules, and thereafter determining all the dates for the Feasts and the Holy Days for the year.

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