Finding Weekday of Any Given Date

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Abstract: *This paper is concerned with calculating weekday of any given date. There are two methods, namely, Direct method and Months code method. Direct method is described briefly with an example. Months code method involves : Whether the Year in the date is leap year or non-leap year, finding the weekday of January 1 of the year of the given date and using the month code corresponding to the month in the date from the months code sequence with January 1 of the year in the date and the relation month day + month code = weekday of the given date and obtaining the remainder when the sum is divided by 7 and the remainder gives the weekday for the given date.*

I. Introduction

The most widely used calendar is Gregorian calendar introduced by Pope Gregory X111 in October , 1582. This calendar uses twelve months, namely, January (31days) , February (28 days in non-leap year and 29 days in leap year), March (31 days), April (30 days), May (31 days), June (30days), July (31 days), August (31 days), September (30 days) , October (31 days), November (30 days) , December (31 days) and seven weekdays, namely, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday and Sunday with Monday assigned 1, Tuesday assigned 2, Wednesday assigned 3, Thursday assigned 4, Friday assigned 5, Saturday assigned 6 and Sunday assigned 7 or 0 and any day of the week as weekday. A year has 365 days with Feb of 28 days in a non-leap year and has 366 days with Feb of 29 days in a leap year where a leap year is defined as one which is divisible by 4 or 400. However, if a year is divisible by 100, it should also be divisible by 400 for the year to be a leap year. Further, a calendar begins always with January 1 and ends with December 31. January 1 is customarily celebrated as New Year day and hence weekday of January 1 is known. There is a great need to know weekday for a given date of important events in the past and future without a calendar. Finding a calendar to get the weekday corresponding to a date is very difficult. Hence a need arises to evolve a method to serve the purpose. A news item 'mathematical codes to help predict exact day of any date in Hindustan Times dated 3rd January 2020 shows an effort by Atul Sexana to achieve that objective. But that work relates to particular year 2020. In this paper we have attempted to solve the problem of finding weekday of any date.
Some very interesting results given below have been obtained.
1.   If January 1 is associated to any weekday, say X day , then December 31 will be X day in non-leap year and will be day next to X day in leap year.
2.   Two consecutive leap years will have three consecutive non-leap years between them.
3.   Group of eight consecutive leap years with intervening non-leap years will form a periodic function with period 28 years and is true in every century. This implies that group of any 28 consecutive years will form a periodic function with period 28 years in every century.
4.   A group of four consecutive centuries also forms a periodic function.
5.   Date involves 4 elements , namely, month day, month, year and weekday and the relation month day +month index = weekday, that is ,month index = weekday - month day.
For example, for date 01.January.1980 with the weekday for January 1 as Tuesday with number 2 assigned to Tuesday, we get
$1+y=2$ resulting in $y=1$, where y is the month code for January.

The problem to get weekday corresponding to a given date can be solved by direct method or by months code method. Whatever method is used it is necessary to know weekday corresponding
to month day of any year. However, it will be convenient to use weekday for January 1 of available year and the available year will be the most recent year.

In **direct method**, one adds all the days from January 1 to the days shown by date and divides the total by 7 and the remainder is used to calculate the weekday. For example,

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if weekday for March 27, 1980 is to be found, one adds 31 days of January , 29 days of February and 27 days of March giving total as 87 and division by 7 gives remainder3 and since January 1 of 1980 is Tuesday, and remainder 3 when counted from Tuesday will end in Thursday as the weekday for 27.03.1980. In months code method, one has to use the relation 145 136 140 250 which is corresponding to the leap year 1980 with January 1 Tuesday. Here 3rd digit in the months code sequence for March is 5. Thus 27 + 5 = 32, and 32/ 7 gives remainder 4 and 4 being code for Thursday results in weekday for the date 27.03.1980 as Thursday. Consecutive years from 1900 to 2310 with weekday of January 1 for every year have been generated and are tabulated in section I I.

Section I I I deals with months code for seven leap years and seven non-leap years.

II. Generating Weekdays For January 1 Of Any Year

Method: Weekday for January 1 for any one year must be known and the best year will be the most recent New year . Presently, it is year 2020.January 1 for 2020 was Wednesday and 2020 being a leap year, weekday for December 31 is Thursday and weekday for January 1 of 2021 is Friday Also since January 1 of 2020 was Wednesday there results Tuesday as the weekday for December 31 of 2019. Same process is used to determine weekday for January 1 of any year.

Table1 showing weekday for Jan 1 for each year from 1900 to 2310

1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910
Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1
Mond	Tues	Wed	Thur	Frid	Sund	Mond	Tues	Wed	Frid	Satur
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31
Mond	Tues	Wed	Thur	Satur	Sund	Mond	Tues	Thur	Frid	Satur

1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1
Satur	Sund	Mond	Wed	Thur	Frid	Satur	Mond	Tues	Wed	Thur
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31
Satur	Sund	Tues	Wed	Thur	Frid	Sund	Mond	Tues	Wed	Frid

1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930
Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1
Thur	Satur	Sund	Mond	Tues	Thur	Frid	Satur	Sund	Tues	Wed
Dec31	Dec31	Dec31	Dec3	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31
Frid	Satur	Sund	Mond	Wed	Thur	Frid	Satur	Mond	Tues	Wed

1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940
Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1
Wed	Thur	Frid	Sund	Mond	Tues	Wed	Frid	Satur	Sund	Mond
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31
Wed	Thur	Satur	Sund	Mond	Tues	Thur	Frid	Satur	Sund	Tues

1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950
Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1
Mond	Wed	Thur	Frid	Satur	Mond	Tues	Wed	Thur	Satur	Sund
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31
Tues	Wed	Thur	Frid	Sund	Mond	Tues	Wed	Frid	Satur	Sund

1950	1951	1952	1953	1954	1955	1956	1967	1958	1959	1960
Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1
Sund	Mond	Tues	Thur	Frid	Satur	Sund	Tues	Wed	Thur	Frid
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31
Sund	Mond	Wed	Thur	Frid	Satur	Mond	Tues	Wed	Thur	Satur

1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1
Frid	Sund	Mond	Tues	Wed	Frid	Satur	Sund	Mond	Wed	Thur
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31
Satur	Sund	Mond	Tues	Thur	Frid	Satur	Sund	Tues	Wed	Thur

1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1
Thur	Frid	Satur	Mond	Tues	Wed	Thur	Satur	Sund	Mond	Tues
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31
Thur	Frid	Sund	Mond	Tues	Wed	Frid	Satur	Sund	Mond	Wed

1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Jan1	Jan1	Jan1	Jan 1	Jan1	Jan 1	Jan1	Jan 1	Jan 1	Jan1	Jan 1
Tues	Thur	Frid	Satur	Sund	Tues	Wed	Thur	Frid	Sund	Mond
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31
Wed	Thur	Frid	Satur	Mond	Tues	Wed	Thur	Satur	Sund	Mond

1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Jan1	Jan1	Jan1	Jan 1	Jan1	Jan 1	Jan1	Jan 1	Jan 1	Jan1	Jan 1
Mond	Tues	Wed	Frid	Satur	Sund	Mond	Wed	Thur	Frid	Satur
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31
Mond	Tues	Thur	Frid	Satur	Sund	Tues	Wed	Thur	Frid	Sund

2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Jan1	Jan1	Jan1	Jan 1	Jan1	Jan 1	Jan1	Jan 1	Jan 1	Jan1	Jan 1
Satur	Mond	Tues	Wed	Thur	Satur	Sund	Mond	Tues	Thur	Frid
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec3	Dec31	Dec31
Sund	Mond	Tues	Wed	Frid	Satur	Sund	Mond	Wed	Thur	Frid

2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Jan1	Jan1	Jan1	Jan 1	Jan1	Jan 1	Jan1	Jan 1	Jan 1	Jan1	Jan 1
Frid	Satur	Sund	Tues	Wed	Thur	Frid	Sund	Mond	Tues	Wed
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec3	Dec31	Dec31	Dec31	Dec31
Frid	Satur	Mond	Tues	Wed	Thur	Satur	Sund	Mond	Tues	Thur

2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Jan1	Jan1	Jan1	Jan 1	Jan1	Jan 1	Jan1	Jan 1	Jan 1	Jan1	Jan 1
Wed	Frid	Satur	Sund	Mond	Wed	Thur	Frid	Satur	Mond	Tues
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31
Thur	Frid	Satur	Sund	Tues	Wed	Thur	Frid	Sund	Mond	Tues

2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Jan1	Jan1	Jan1	Jan 1	Jan1	Jan 1	Jan1	Jan 1	Jan 1	Jan1	Jan 1
Tues	Wed	Thur	Satur	Sund	Mond	Tues	Thur	Frid	Satur	Sund
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec 31	Dec31	Dec31	Dec31
Tues	Wed	Frid	Satur	Sund	Mond	Wed	Thur	Frid	Satur	Mond

2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Jan1	Jan1	Jan1	Jan 1	Jan1	Jan 1	Jan1	Jan 1	Jan 1	Jan1	Jan 1
Sund	Tues	Wed	Thur	Frid	Sund	Mond	Tues	Wed	Frid	Satur
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec 31	Dec31	Dec31	Dec31
Mond	Tues	Wed	Thur	Satur	Sund	Mond	Tues	Thur	Frid	Satur

2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060
Jan1	Jan1	Jan1	Jan 1	Jan1	Jan 1	Jan1	Jan 1	Jan 1	Jan1	Jan 1
Satur	Sund	Mond	Wed	Thur	Frid	Satur	Mond	Tues	Wed	Thur
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec 31	Dec31	Dec31	Dec31
Satur	Sund	Tues	Wed	Thur	Frid	Sund	Mond	Tues	Wed	Frid

2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070
Jan1	Jan1	Jan1	Jan 1	Jan1	Jan 1	Jan1	Jan 1	Jan 1	Jan1	Jan 1
Thur	Satur	Sund	Mond	Tues	Thur	Frid	Satur	Sund	Tues	Wed
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec 31	Dec31	Dec31	Dec31
Frid	Satur	Sund	Mond	Wed	Thur	Frid	Satur	Mond	Tues	Wed

2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080
Jan1	Jan1	Jan1	Jan 1	Jan1	Jan 1	Jan1	Jan 1	Jan 1	Jan1	Jan 1
Wed	Thur	Frid	Sund	Mond	Tues	Wed	Frid	Satur	Sund	Mond
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec 31	Dec31	Dec31	Dec31
Wed	Thur	Satur	Sund	Mond	Tues	Thur	Frid	Satur	Sund	Tues

2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090
Jan1	Jan1	Jan1	Jan 1	Jan1	Jan 1	Jan1	Jan 1	Jan 1	Jan1	Jan 1
Mond	Wed	Thur	Frid	Satur	Mond	Tues	Wed	Thur	Satur	Sund
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec 31	Dec31	Dec31	Dec31
Tues	Wed	Thur	Frid	Sund	Mond	Tues	Wed	Frid	Satur	Sund

2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
Jan1	Jan1	Jan1	Jan 1	Jan1	Jan 1	Jan1	Jan 1	Jan 1	Jan1	Jan 1
Sund	Mond	Tues	Thur	Frid	Satur	Sund	Tues	Wed	Thur	Frid
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec 31	Dec31	Dec31	Dec31
Sund	Mond	Wed	Thur	Frid	Satur	Mond	Tues	Wed	Thur	Frid

2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110
Jan 1	Jan1	Jan1	Jan1	Jan 1	Jan1	Jan 1	Jan1	Jan 1	Jan 1	Jan1
Frid	Satur	Sund	Mond	Tues	Thur	Frid	Satur	Sund	Tues	Wed
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec 31	Dec31	Dec31	Dec31
Frid	Satur	Sund	Mond	Wed	Thur	Frid	Satur	Mond	Tues	Wed

	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120
Jan 1	Wed	Thur	Frid	Sund	Mond	Tues	Wed	Frid	Satur	Sund	Mond
Dec31	Wed	Thur	Satur	Sund	Mond	Tues	Thur	Frid	Satur	Sund	Tues

	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130
Jan 1	Mond	Wed	Thur	Frid	Satur	Mond	Tues	Wed	Thur	Satur	Sund
Dec31	Tues	Wed	Thur	Frid	Sund	Mond	Tues	Wed	Frid	Satur	Sund

	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140
Jan 1	Sund	Mond	Tues	Thur	Frid	Satur	Sund	Tues	Wed	Thur	Frid
Dec31	Sund	Mond	Wed	Thur	Frid	Satur	Mond	Tues	Wed	Thur	Satur

	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150
Jan 1	Frid	Sund	Mond	Tues	Wed	Frid	Satur	Sund	Mond	Wed	Thur
Dec31	Satur	Sund	Mond	Tues	Thur	Frid	Satur	Sund	Tues	Wed	Thur

	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160
Jan 1	Thur	Frid	Satur	Mond	Tues	Wed	Thur	Satur	Sund	Mond	Tues
Dec31	Thur	Frid	Sund	Mond	Tues	Wed	Frid	Satur	Sund	Mond	Wed

	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170
Jan 1	Tues	Thur	Frid	Satur	Sund	Tues	Wed	Thur	Frid	Sund	Mond
Dec31	Wed	Thur	Frid	Satur	Mond	Tues	Wed	Thur	Satur	Sund	Mond

	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180
Jan 1	Mond	Tues	Wed	Frid	Satur	Sund	Mond	Wed	Thur	Frid	Satur
Dec31	Mond	Tues	Thur	Frid	Satur	Sund	Tues	Wed	Thur	Frid	Sund

	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190
Jan 1	Satur	Mond	Tues	Wed	Thur	Satur	Sund	Mond	Tues	Thur	Frid
Dec31	Sund	Mond	Tues	Wed	Frid	Satur	Sund	Mond	Wed	Thur	Frid

2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200
Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1
Frid	Satur	Sund	Tues	Wed	Thur	Frid	Sund	Mond	Tues	Wed
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec 31
Frid	Satur	Mond	Tues	Wed	Thur	Satur	Sund	Mond	Tues	Wed

2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210
Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1
Wed	Thur	Frid	Satur	Sund	Tues	Wed	Thur	Frid	Sund	Mond
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec 31
Wed	Thur	Frid	Satur	Mond	Tues	Wed	Thur	Satur	Sund	Mond

2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220
Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1
Mond	Tues	Wed	Frid	Satur	Sund	Mond	Wed	Thur	Frid	Satur
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec 31
Mond	Tues	Thur	Frid	Satur	Sund	Tues	Wed	Thur	Frid	Sund

2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230
Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1
Satur	Mond	Tues	Wed	Thur	Satur	Sund	Mond	Tues	Thur	Frid
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31
Sund	Mond	Tues	Wed	Frid	Satur	Sund	Mond	Wed	Thur	Frid

2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240
Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1
Frid	Satur	Sund	Tues	Wed	Thur	Frid	Sund	Mond	Tues	Wed
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31
Frid	Satur	Mond	Tues	Wed	Thur	Satur	Sund	Mond	Tues	Thur

2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250
Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1
Wed	Frid	Satur	Sund	Mond	Wed	Thur	Frid	Satur	Mond	Tues
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31
Thur	Frid	Satur	Sund	Tues	Wed	Thur	Frid	Sund	Mond	Tues

2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260
Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1
Tues	Wed	Thur	Satur	Sund	Mond	Tues	Thur	Frid	Satur	Sund
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31
Tues	Wed	Frid	Satur	Sund	Mond	Wed	Thur	Frid	Satur	Mond

2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270
Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1
Sund	Tues	Wed	Thur	Frid	Sund	Mond	Tues	Wed	Frid	Satur
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31
Mond	Tues	Wed	Thur	Satur	Sund	Mond	Tues	Thur	Frid	Satur

2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280
Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1
Satur	Sund	Mond	Wed	Thur	Frid	Satur	Mond	Tues	Wed	Thur
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31
Satur	Sund	Tues	Wed	Thur	Frid	Sund	Mond	Tues	Wed	Frid

2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290
Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1
Thur	Satur	Sund	Mond	Tues	Thur	Frid	Satur	Sund	Tues	Wed
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31
Frid	Satur	Sund	Mond	Wed	Thur	Frid	Satur	Mond	Tues	Wed

2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300
Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1
Wed	Thur	Frid	Sund	Mond	Tues	Wed	Frid	Satur	Sund	Mond
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31
Wed	Thur	Satur	Sund	Mond	Tues	Thur	Frid	Satur	Sund	Mond

2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310
Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1	Jan1
Mond	Tues	Wed	Thur	Frid	Sund	Mond	Tues	Wed	Frid	Satur
Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31	Dec31
Mond	Tues	Wed	Thur	Satur	Sund	Mond	Tues	Thur	Frid	Satur

III. Generating Months Code For Leap Years And Non-Leap Years

There are seven days in a week and a year starts from January 1. January 1 could be any of the seven weekdays. Since a year can be a leap year or a non- leap year it implies that there will be seven leap years with each leap year associated with different weekday . Similarly, there will be seven non-leap years with each non-leap year associated with different weekday. In the following, months code sequences for leap years and non-leap years are obtained.

Table 2A : Generating Months Code Sequences for Leap years

Months code sequence for leap year with January 1: Monday

	Jan 1	Feb 1	March 1	April 1	May 1	June 1
WD	Mond	Thur	Frid	Mond	Wed	Satur
WD No.	1	4	5	1	3	6
MC	0	3	4	0	2	5

	July 1	Aug 1	Sept 1	Oct 1	Nov 1	Dec 1
WD	Mond	Thur	Sund	Tues	Frid	Sund
WD No.	1	4	7	2	5	7
MC	0	3	6	1	4	6

Months code sequence for leap year with January 1 : Monday is
034 025 036 146   **(2A.1)**

Months code sequence for leap year with January 1: Tuesday

	Jan 1	Feb 1	March 1	April 1	May 1	June 1
WD	Tues	Frid	Satur	Tues	Thur	Sund
WD No	2	5	6	2	4	7
MC	1	4	5	1	3	6

	July 1	Aug 1	Sept 1	Oct 1	Nov 1	Dec 1
WD	Tues	Frid	Mond	Wed	Satur	Mond
WD No	2	5	1	3	6	1
MC	1	4	0	2	5	0

Months code sequence for leap year with January 1 : Tuesday is
145 136 140 250   **(2A.2)**

Months code sequence for leap year with January 1: Wednesday

	Jan 1	Feb 1	March 1	April 1	May 1	June 1
WD	Wed	Satur	Sund	Wed	Frid	Mond
WD No	3	6	7	3	5	1
MC	2	5	6	2	4	0

	July 1	Aug 1	Sept 1	Oct 1	Nov 1	Dec 1
WD	Wed	Satur	Tues	Thur	Sund	Tues
WD No.	3	6	2	4	7	2
MC	2	5	1	3	6	1

Months code sequence for leap year with January 1 : Wednesday is
256 240 251 361   **(2A.3)**

Months code sequence for leap year with January 1: Thursday

	Jan 1	Feb 1	March 1	April 1	May 1	June 1
WD	Thur	Sund	Mond	Thur	Satur	Tues
WD No	4	7	1	4	6	2
MC	3	6	0	3	5	1

	July 1	Aug 1	Sept 1	Oct 1	Nov 1	Dec 1
WD	Thur	Sund	Wed	Frid	Mond	Wed
WD No.	4	7	3	5	1	3
MC	3	6	2	4	0	2

Months code sequence for leap year with January 1 : Thursday is
360 351 362 402   **(2A.4)**

Months code sequence for leap year with January 1: Friday

	Jan 1	Feb 1	March 1	April 1	May 1	June 1
WD	Frid	Mond	Tues	Frid	Sund	Wed
WD No	5	1	2	5	7	3
MC	4	0	1	4	6	2

	July 1	Aug 1	Sept 1	Oct 1	Nov 1	Dec 1
WD	Frid	Mond	Thur	Satur	Tues	Thur
WD No.	5	1	4	6	2	4
MC	4	0	3	5	1	3

Months code sequence for leap year with January 1 : Friday is
401 462 403 513   **(2A.5)**

Months code sequence for leap year with January 1:Saturday

	Jan 1	Feb 1	March 1	April 1	May 1	June 1
WD	Satur	Tues	Wed	Satur	Mond	Thur
WD No	6	2	3	6	1	4
MC	5	1	2	5	0	3

	July 1	Aug 1	Sept 1	Oct 1	Nov 1	Dec 1
WD	Satur	Tues	Frid	Sund	Wed	Frid
WD No.	6	2	5	7	3	5
MC	5	1	4	6	2	4

Months code sequence for leap year with January 1 :Saturday is
   512 503 514 624   (2A.6)

Months code sequence for leap year with January 1: Sunday

	Jan 1	Feb 1	March 1	April 1	May 1	June 1
WD	Sund	Wed	Thur	Sund	Tues	Frid
WD No	7	3	4	7	2	5
MC	6	2	3	6	1	4

	July 1	Aug 1	Sept 1	Oct 1	Nov 1	Dec 1
WD	Sund	Wed	Satur	Mond	Thur	Satur
WD No.	7	3	6	1	4	6
MC	6	2	5	0	3	5

Months code sequence for leap year with January 1 : Sunday is
   623 614 625 035   (2A.7)

Table 2B: Generating Months Code Sequences for non-leap years
Months code sequence for non- leap year with January 1:Monday

	Jan 1	Feb 1	March 1	April 1	May 1	June 1
WD	Mond	Thur	Thur	Sund	Tues	Frid
WD No	1	4	4	7	2	5
MC	0	3	3	6	1	4

	July 1	Aug 1	Sept 1	Oct 1	Nov 1	Dec 1
WD	Sund	Wed	Satur	Mond	Thur	Satur
WD No.	7	3	6	1	4	6
MC	6	2	5	0	3	5

Months code sequence for non-leap year with January 1 :Monday is
   033 614 625 035   (2B.1)

Months code sequence for non-leap year with January 1: Tuesday

	Jan 1	Feb 1	March 1	April 1	May 1	June 1
WD	Tues	Frid	Frid	Mond	Wed	Satur
WD No	2	5	5	1	3	6
MC	1	4	4	0	2	5

	July 1	Aug 1	Sept 1	Oct 1	Nov 1	Dec 1
WD	Mond	Thur	Sund	Tues	Frid	Sund
WD No.	1	4	7	2	5	7
MC	0	3	6	1	4	6

Months code sequence for non- leap year with January 1 : Tuesday is
144 025 036 146   (2B.2)

Months code sequence for non-leap year with January 1: Wednesday

	Jan 1	Feb 1	March 1	April 1	May 1	June 1
WD	Wed	Satur	Satur	Tues	Thur	Sund
WD No	3	6	6	2	4	7
MC	2	5	5	1	3	6

	July 1	Aug 1	Sept 1	Oct 1	Nov 1	Dec 1
WD	Tues	Frid	Mond	Wed	Satur	Mond
WD No.	2	5	1	3	6	1
MC	1	4	0	2	5	0

Months code sequence for non-leap year with January 1 : Wednesday is
255 136 140 250   (2B. 3)

Months code sequence for non-leap year with January 1: Thursday

	Jan 1	Feb 1	March 1	April 1	May 1	June 1
WD	Thur	Sund	Sund	Wed	Frid	Mond
WD No	4	7	7	3	5	1
MC	3	6	6	2	4	0

	July 1	Aug 1	Sept 1	Oct 1	Nov 1	Dec 1
WD	Wed	Satur	Tues	Thur	Sund	Tues
WD No.	3	6	2	4	7	2
MC	2	5	1	3	6	1

Months code sequence for non-leap year with January 1 :Thursday is
366 240 251 361   (2B. 4)

Months code sequence for non-leap year with January 1: Friday

	Jan 1	Feb 1	March 1	April 1	May 1	June 1
WD	Frid	Mond	Mond	Thur	Satur	Tues
WD No	5	1	1	4	6	2
MC	4	0	0	3	5	1

	July 1	Aug 1	Sept 1	Oct 1	Nov 1	Dec 1
WD	Thur	Sund	Wed	Frid	Mond	Wed
WD No.	4	7	3	5	1	3
MC	3	6	2	4	0	2

Months code sequence for leap year with January 1 : Friday is
400 351 362 402   (2B.5)

Months code sequence for non-leap year with January 1: Saturday

	Jan 1	Feb 1	March 1	April 1	May 1	June 1
WD	Satur	Tues	Tues	Frid	Sund	Wed
WD No	6	2	2	5	7	3
MC	5	1	1	4	6	2

	July 1	Aug 1	Sept 1	Oct 1	Nov 1	Dec 1
WD	Frid	Mond	Thur	Satur	Tues	Thur
WD No.	5	1	4	6	2	4
MC	4	0	3	5	1	3

Months code sequence for non-leap year with January 1 : Saturday is
511 462 403 513   **(2B.6)**

Months code sequence for non-leap year with January 1: Sunday

	Jan 1	Feb 1	March 1	April 1	May 1	June 1
WD	Sund	Wed	Wed	Satur	Mond	Thur
WD No	7	3	3	6	1	4
MC	6	2	2	5	0	3

	July 1	Aug 1	Sept 1	Oct 1	Nov 1	Dec 1
WD	Satur	Tues	Frid	Sund	Wed	Frid
WD No.	6	2	5	7	3	5
MC	5	1	4	6	2	4

Months code sequence for non- leap year with January 1 : Sunday is
- 622 503 514 624   **(2B.7)**

It may be observed that
1. Months code sequence comprises of 12 digits with each digit representing each of 12 months: January , February,   March,   April, May, June ,   July, August, September, October, November, December respectively.
2. Months code for January and February are same for leap year and non-leap year.
3. Months code sequences for non-leap years can be obtained from months code sequences for leap year by deducting 1 from digits of months code sequences leaving first two digits.
4. For non-leap years if 1 is added to all digits of first months code sequence results in second months code sequence and repeating the same procedure again and again, all the code sequences can be obtained. Same feature holds for leap years months code sequences.

IV. Application of Months Code Method and Direct Method
To Obtain the Week Day of Any Date
Consider the dates **04.10.1582, 04.07.1776, 15.08.1947, 26.01.1950**

The procedure to obtain weekday of each date is illustrated below in Tabular Form.

Date	Year in Date	Add	Table1	Jan1	Leap or NLY	MC Seq	MC code	Sum	Rem in sum/7	Weekday
4.10.1582	1582	400	1982	Frid	NLY	(2B.5)	4 for Oct	4+4=8	1	**Mond**
4.07.1776	1776	400	2176	Mond	Leap	(2A.1)	0 for July	0+4=4	4	**Thur**
15.08.1947	1947	0	1947	Wed	NLY	(2B.3)	4 for Aug	4+15=19	5	**Frid**
26.01.1950	1950	0	1950	Sund	NLY	(2B.7)	6 for Jan	6+26=32	4	**Thur**

Months code sequences used are
(2B.5)   400   351   362   402
(2A.1)   034   025   036   146
(2B.3)   255   136   140   250
(2B.7)   622   503   514   624

Application of Direct code method to get weekday for dates 15.08.1947 and 26.01.1950   respectively. **For 15.08.1947**, 1947 is a non- leap year and Table1 gives January 1 as Wednesday. Adding days from January 1, 1947 to 15.8.1947 gives 31+28+31+30+31+30+31+15 = 227 and227/7 = 32 X7 + 3 gives remainder 3 which counted from Wednesday gives **weekday for 15.08.1947 as Friday** . It may be noted that since weekday of August 1 is known from Table 2B we can as well count 15 days from Aug1 (Friday) and we get 15/7 = 7x2 +1 with remainder 1 which gives **weekday as Friday for 15.08.1947** .

 For 26.01.1950, 1950 is a non leap year and Table 1 gives Jan1 for 1950 as Sunday.   Here 26 days of January when divided by 7 gives remainder 5 which when counted from Sunday gives Thursday. Hence **weekday for 26.01.1950 is Thursday.**

V. Concluding Remarks
Some very important and useful information given below has been obtained.
1.   Group of 28 consecutive years in a century forms a periodic function with period 28.
2.   Group of 400 consecutive years forms a periodic function with period 400.
3.   Between two consecutive leap years there are three consecutive non -leap years.
4.   If sequence of months code for non leap year or leap year with X weekday for January 1 is known then other months code sequences for other weekdays can be found easily.
5.   Direct method to determine the weekday for a given date is simple compared to months code sequence method.

Reference
[1]. Atul Saxena . Mathematical codes to help predict exact day of any date, Hindustan times January 3, 2020 , pp. 1, reported by SURAJIT DAS.