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Article

A Novel Optimization Algorithm to Create Perennial Calendar System based on Gregorian and International Fixed Calendards

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Abstract: Has anyone ever missed an event because he was confused in days and dates? Do we remember the date of any day without looking at a calendar? Is the current Gregorian Calendar efficient enough for use, and does it facilitate our life or make it more complicated? Have you ever thought about a much simpler way to calculate days and dates in a year? All these questions are answered in this paper, in which the author proposes original optimization algorithm that creates optimal perennial calendars. Results show that there is more than one way to create a perennial calendar, in which the number of days in each month does not change, neither the dates. Hence, all months have the same sequence of days and dates. In other meaning, Monday becomes the first day of every month, and Sunday becomes the last day. Consequently, the calendars become much easier to memorize and very simple to predict the days and dates in any year.

Keywords: Gregorian Calendar; Weekly-based Calendar; Original Calendar; Optimization algorithm; Energy saving.

1. Introduction

1.1. Background and Motivation

From the early beginning of human civilizations, people realized the importance of organizing their daily [1]. Many cultures created their calendars and dating systems that helped them to save religious and social activities and events [1]. The most recognized calendars in the ancient time include but not limited to, Roman calendar [2], [3], Sumerian calendars [4], [5], Babylonian calendar [6], Zoroastrian calendar [7], Hebrew calendar [8], Hellenic calendars [9] and Julian calendar [10]. In the late of the sixteenth century, the Gregorian calendar (GC) was introduced by Pope Gregory XIII on October 15, and was later adopted worldwide [11]. In the Gregorian calendar, a year is composed of 12 months. Each month has a different number of days. For example, January has 31 days, February has 28 days, and 29 in a leap year, April has 30 days, and so on. One of the main critics of the Gregorian calendar is that it is very difficult to find a simple relationship between dates and days [12]. Sometimes, the dates become confusing especially when a particular day like Monday, is the first day in a month, and the second or even the seventh in another month, sometimes holidays which are on a specific date such as December 24, could be located during the weekdays (e.g., in 2019), while it can be in weekends in another year (e.g., 2022). Hence, calculating days and dates is a difficult task, because of the irregularities in the Gregorian calendar. It appears that the existing calendar system becomes a little bit confusing for most of the people, and a much simpler calendar is needed. In addition, billions of calendars are printed every year worldwide, in which millions of trees are used every year to supply the demand. The emission of CO_2, the pollution, the waste, and the energy used to print out Gregorian calendar cannot be neglected especially when around billions of calendars are thrown every year. Therefore, Gregorian calendar imposes negative impact on the society, the economy, and the environment, in which a solution should be proposed to facilitate the life of people and create a more sustainable and greener society.

Some questions may arise. What happens if we create a more organized calendar in which the days and dates in a month do not change? For example, Monday will always be the first day of any month. The holidays will have the same dates and days in any year. For example, December 24, will always be on Wednesday, whatever is the year. Can we create an eco-friendly calendar, which is very easy to memorize without the necessity to print a hard copy to reduce the pollution? Moreover, human beings always tend to develop and invent new things every day to facilitate their lives. So why do we not develop an easier way to count days, weeks, and months in a year?

1.2. Gregorian vs. Julian Calendars

A year is the time a given celestial object (e.g., Earth, Mars, etc.) takes to complete one orbit around another celestial object (e.g., Sun), also called orbital period. However, astronomical years do not have integer numbers of days; for example, the Earth orbits the Sun in about 365.2425 days; therefore, it is necessary to introduce the intercalation system such as leap years. Julian and Gregorian calendars are the most common ones these days. A Julian calendar counts 365.25 days in a year, while 365.2425 days are considered in the Gregorian calendar. In total, a leap year occurs every four years in the Julian calendar, in which one day is added to the month of February. The Gregorian calendar follows almost the same concept; however, some new rules were added to reduce the gap with the reference (365.2422 days per year). These new rules are cited as follows:

> *Every year that is exactly divisible by four is a leap year, except for years that are exactly divisible by 100, but these centurial years are leap years if they are exactly divisible by 400. For example, the years 1700, 1800, and 1900 are not leap years, but the years 1600 and 2000 are [13].*

These new rules reduce the error by 1.2 days every 4,000 years, as shown in the following table, while the Julian calendar shows an error of 31.2 days. From this place, the Gregorian calendar was adopted until this time.

Calendar	**Number of days in a year**	**Number of days in 4 years**	**Number of days in 400 years**	**Number of days in 4,000 years**	**Error per 400 years with respect to the reference**	**Error per 4,000 years with respect to the reference**
Julian	365.25	1,461	146,100	1,461,000	3.12	31.2
Gregorian	365.2425	1,460.97	146,097	1,460,970	0.12	1.2
Reference	**365.2422**	**1460.9688**	**146096.88**	**1,460,968.8**	**-**	**-**

1.3. International Fixed Calendar

The Gregorian calendar has serious problems and flaws. The main problem of the Gregorian calendar is that the number of days in months is not fixed, and it may vary between 28 and 31 days per month. Moreover, a month can start on Monday (June 1, 2020) and the next one on Wednesday (July 1, 2020). Therefore, there is no consistency between days and dates. The date of February 29 occurs every four years, which seems unpleasant to some people. Moreover, a year is divided into four quarters (3 months each quarter). If the number of days is counted in each quarter, it appears that the first quarter has 90 days, the second one has 91 days, and the third and fourth one has 92 days. The quarters are not symmetrically distributed. Therefore, two additional working days in a quarter can make a difference in the statistics for a big company. In addition, holidays are not stable during the year, for example, Christmas on December 24 is on Thursday in 2020, while it is on Saturday in 2022. In conclusion, the Gregorian calendar is difficult to handle and to memorize. To solve the problem, other sophisticated calendars were proposed to facilitate our lives []. The most famous calendar is called International Fixed Calendar and also called Cotsworth calendar, which was introduced by Moses B. Cotsworth in 1902 [14]. The calendar divides the solar year into 13 months of 28 days each. This kind of calendars is defined as a perennial calendar, in which every weekday has a fixed date every year. The International Fixed Calendar has some rules to follow, as described below [14]:

- One year has 13 months
- Each month has exactly 4 weeks
- Each week has 7 days. Therefore, the total number of days in a year becomes equal to 364 (7 days x 4 weeks x 13 months)
- An extra day is added as a holiday at the end of the year, and it is called Year Day
- The Year Day does not belong to any week. Therefore, the total number of days, including the Year day in a year, becomes equal to 365 days.
- The Cotsworth calendar is correlated to the Gregorian calendar in which it has the same number of days, and each year starts on the same date, which is January 1.
- Costworth calendar has the same month's names and order as the Gregorian calendar, except the same as those of the Gregorian calendar, except that the extra month (called Sol), which is inserted between June and July [15].
- A leap year has 366 days, and its occurrence follows the Gregorian rules.
- The Leap-Day is inserted on June 29 (between Saturday, June 28, and Sunday, Sol 1).
- Each month starts on a Sunday and ends on a Saturday.
- Both Year-Day and Leap-Day do not belong to any week. They are preceded and followed by a Saturday and a Sunday, respectively.

Table 1 presents the International Fixed Calendar, in which the Leap-Day and the Year-Day are added to the end of months June and December.

Despite the success of this calendar, it received many critics, and it has some drawbacks. The most common critics can be presented as follows:

a. The calendar claimed to have exactly 28 days in each month. However, when the leap day is added, June month will contain 29 days and not 28. The same for the leap-year, in which it is added to the month of December. Hence, the total number of days becomes equal to 29.
b. The calendar has 13 months, which is a prime number and cannot be divided by 2, nor by 3 neither by 4. Therefore, it becomes difficult to categorize activities based on a biannually, triannually, or quarterly basis. Thus, activities will be out of alignment with months.
c. The week starts with a Sunday. Hence, the calendar disagrees with ISO 8601, in which the first day is Monday and not Sunday.
d. Adding a day between Saturday and Sunday is considered confusing, especially when leap-day and year-day are added to the month of June and December.
e. Some people are pessimistic about the date Friday 13th.
f. Actually, the weekday starts on the second of each month and not on the first.

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Table 1: International Fixed Calendar.

International Fixed Calendar

Proposed by Moses Costworth in 1908

January

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

February

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

March

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

April

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

May

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

June

Sun	Mon	Tue	Wed	Thu	Fri	Sat	Leap-Day
1	2	3	4	5	6	7	
8	9	10	11	12	13	14	
15	16	17	18	19	20	21	
22	23	24	25	26	27	28	29

Sol

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

July

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

August

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

September

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

October

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

November

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

December

Sun	Mon	Tue	Wed	Thu	Fri	Sat	Year-Day
1	2	3	4	5	6	7	
8	9	10	11	12	13	14	
15	16	17	18	19	20	21	
22	23	24	25	26	27	28	29

1.4. *Contributions*

In this paper, the main contributions are presented as follows:

- An original perennial calendar system is proposed that solves all the above-mentioned problems.
- A 14 months calendar instead of 13 is considered, in which the last one is called Month zero. Month zero has only one day in a year with 365 days and two days in a leap year.
- An original optimization algorithm that generates perennial calendars is proposed. An objective function and some constraints are defined for this purpose. The algorithm is solved with Mixed Integer Genetic Algorithm.

To validate our concept, the proposed calendar is compared to the Gregorian calendar and the International Fixed calendar. The advantages and disadvantages are discussed briefly.

2. Proposed Perennial Calendar

The idea of creating a perennial calendar such as the International Fixed Calendar (IFC), is promising, and it can solve lots of problems. However, the IFC has many drawbacks, as mentioned previously. To reduce these drawbacks, new perennial calendars are proposed based on the idea of the IFC, the Gregorian calendar, and using the optimization model. To do so, a new annotation will be used in this paper to refer to a specific calendar. The annotation is as follows:

MWD+R

Or simply the mathematical Equation can be written as

$$M \times W \times D + R = 366 \text{ days in a leap year} \tag{1}$$

In which, M presents the number of months in a year (e.g., M = 12 months in a year). W shows the number of weeks in a day (e.g., W = 4 weeks in a month). D stands for the number of days in a week (e.g., D = 7 days in a week). R describes the number of remaining days that fill the gap between a perennial calendar and the real number of days in a year. For example, calculate R if there are 12 months a year, 4 weeks a month, and 7 days a week. In this case, M=12, W=4, D=7. Hence,

$$M \times W \times D + R = 12 \text{ months/year} \times 4 \text{ weeks/month} \times 7 \text{ days/week} + R = 366$$

$$R = 366 - 12 \times 4 \times 7 = 30 \text{ remaining days per year}$$

Based on the above-mentioned example, the number of remaining days per year is almost equal to one month for the Gregorian calendar. Therefore, the Gregorian calendar cannot be considered as a good example of a perennial calendar. From this place, the real number of months in a year should be equal to 13 in the above case. An ideal perennial calendar is when the remaining number of days in a year will be equal to zero, hence R = 0. However, this is not possible for the Earth because the number of days in a year does not have an integer value, and it is equal almost to 365.2422. Therefore, it is necessary to rearrange the number days, weeks, and months in order to minimize R. Thus, it becomes an optimization problem in which we need to recalculate the number of months, weeks, and days in a way to minimize R.

2.1. Optimization Model

As discussed previously, to minimize the number of remaining days in a year, an optimization model should be created. The objective function is described in Eq (2), and the constraints are shown in Equations (3) to (7). Where, R_{min} and R_{max} describe the lower and upper bound of the number of remaining days in a perennial calendar. M_{min} and M_{max} are the lower and upper bound of the number of months per year. W_{min} and W_{max} represent the lower and upper bound of the number of weeks per month. D_{min} and D_{max} show the lower and upper bound of the number of days per week. It is obvious that the optimization problem is mixed-integer nonlinear programming in which M, W, D, and R should be integers. To solve the problem, the Mixed-Integer Genetic Algorithm (MIGA) is used in this paper.

Objective function:

$$\text{Minimize } R = Y - M \cdot W \cdot D \tag{2}$$

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Subject to:

$$R_{min} \leq Y - M \cdot W \cdot D \leq R_{max} \quad (3)$$

$$M_{min} \leq M \leq M_{max} \quad (4)$$

$$W_{min} \leq W \leq W_{max} \quad (5)$$

$$D_{min} \leq D \leq D_{max} \quad (6)$$

$$[R,\ M,\ W,\ D] \in \mathbb{N} \quad (7)$$

2.2. *Optimization Algorithm*

To solve the above problem, **Algorithm 1** is proposed and written in MATLAB 2018b. The initial values (such as Mmin, Mmax, etc.) can be changed according to the needs of the user.

Algorithm 1: Optimization Model of the Proposed Original Perennial Calendar

```
%% An Original Optimal Perennial Calendar
clc; clear; close all; %Clear all previous data on MATLAB

%% Optimization Model-----------------------------------------------------
for section1=1:1%Initial Values
    Y=366; %Number of days per year including the leap days
    Mmin=0; Mmax=20; %minimum and maximum number of months in a year
    Wmin=0; Wmax=20; %minimum and maximum number of Weeks in a Month
    Dmin=0; Dmax=20; %minimum and maximum number of Days in a Week
    Rmin=0; Rmax=10; %minimum and maximum number of remaining Days in a Year
end
for section1=1:1%Optimization Model
    %Decision variable: X, X(1)=Month, X(2)=Week, X(3)=Day
    OF=@(X)(Y-X(1).*X(2).*X(3)); %Objective Function
    %Constraints of the Form A*x<=B
        A=[1 0 0 ; 0 1 0 ; 0 0 1]; B=[Mmax, Wmax, Dmax]';
    %Constraints of the Form Aeq*x=Beq
        Aeq=[]; Beq=[];
    %Constraints of the Form lb<=x<=ub
        LB=[Mmin Wmin Dmin]'; %Lower Bound
        UB=[Mmax Wmax Dmax]'; %Upper Bound

    X0=zeros(3,1);%Starting point

    %Solution of the Optimization
    nvar=3; %Number of studied variables
    IntCon=[1,2,3]; %Variable that should be integer
    [X,Value,exitflag,output]=ga(OF,nvar,A,B,Aeq,Beq,LB,UB,@C_Matrix,IntCon);
    X %Show the number of Variable
```

```
    R=Value %Show the remaining number of days
    MWD=X(1).*X(2).*X(3) %Show total number of days in a year except the
remaining days
    fprintf('M=%2.0f , W=%2.0f, D=%2.0f, R= %2.0f , MWD= %2.0f \n',X,R,MWD)
end

function [C,Ceq] = C_Matrix(X)
    Y=366;
    Rmin=0; Rmax=10;
    C(1)= X(1).*X(2).*X(3)-Y+Rmin;
    C(2)= Y-X(1).*X(2).*X(3)-Rmax;
    Ceq=[];
end
```

3. Results and Discussions

3.1. *Assumptions*

After defining the optimization model and algorithm, it is necessary to present the assumptions that are considered in this paper. The optimization model requires the user to set the boundaries of the constraints. For this purpose, the limits are defined as follows:

- ***The remaining number of days in a year***: Rmin=0 and Rmax=10. By increasing the range, more options appear to the user to choose the best calendar that fits his needs.
- ***The number of months in a year***: Mmin=10 and Mmax=20. We do not want a number of months less than 10 because they become very long.
- ***Number of Weeks in a month***: Wmin=0 and Wmax=20. We set the number of weeks flexible in order to get more options.
- ***Number of Days in a week***: Dmin=5 and Dmax=8. A number less than 5 represents a too-short week, and a number greater than 8 is considered too long for a week.

3.2. *Output Results of the Algorithm*

Table 2 presents the output results for the number of months, weeks, days, and remaining days per year for the proposed perennial calendars. The values can change when the boundaries of the constraints change.

Table 2: Output Results of the Optimization Model

	Input								Output				
Options	**Rmin**	**Rmax**	**Mmin**	**Mmax**	**Wmin**	**Wmax**	**Dmin**	**Dmax**	**M**	**W**	**D**	**R**	**MWD**
1	0	10	10	20	0	20	5	8	**10**	**6**	**6**	**6**	**360**
2	0	10	10	20	0	20	5	8	**12**	**6**	**5**	**6**	**360**
3	0	10	10	20	0	20	5	8	**12**	**5**	**6**	**6**	**360**
4	0	10	10	20	0	20	5	8	**12**	**3**	**10**	**6**	**360**
5	0	10	10	20	0	20	5	8	**13**	**4**	**7**	**2**	**364**
6	0	10	10	20	0	20	5	8	**15**	**4**	**6**	**6**	**360**
7	0	10	10	20	0	20	5	8	**15**	**3**	**8**	**6**	**360**
8	0	10	10	20	0	20	5	8	**18**	**4**	**5**	**6**	**360**
9	0	10	10	20	0	20	5	8	**20**	**3**	**6**	**6**	**360**

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3.3. *Case Study of a Calendar with 13 Months, 4 Weeks and 7 days (M13W4D7+R2)*

In this paper, only the perennial calendar "M13W4D7+R2" (option 5) is discussed, while others can be interpreted in the same way. **Table 3** presents the proposed perennial calendar "M13W4D7+R2" based on some new rules, as stated below:

- One year has 13 months with an exact number of days and weeks. No days are added to any month nor to any week. Hence, the problem (a) mentioned in section 1.2 is resolved.
- Each month has exactly 4 weeks
- Each week has exactly 7 days. Therefore, the total number of days in a year becomes equal to 364 (7 days x 4 weeks x 13 months)
- A new month is added to the list, which is called "***Month Zero***", in which it contains the remaining days (Year-day and the Leap-day). The reason for adding this month is to separate the remaining days from the normal days, which is not the case of IFC. In addition, it respects the international standard ISO 8601 in which the dates are expressed. For example, 2020-00-01 is the Year-day, 2020-00-02 is the leap-day in a leap year, 2020-01-01 is the first official day of the year 2020, which is Monday, etc. Therefore, there is a consistency in numbering the days, dates, and their expressions.
- We do not celebrate the end of a year as other existing calendars do, such as the GC, JC, and IFC. On the contrary, we celebrate the beginning of a new year. That is why the Month Zero is added at the beginning, which represents a new start and a happy month in our lives. This method has a positive impact on the psychology of the people in which the end is not important as the beginning of a new thing in their life.
- Friday will never occur on the 13th of any month. Therefore, some people who feel pessimistic about this date will be satisfied with the new calendar. Hence, the problem (e) in section 1.2 is solved.
- The Year-Day and Leap-Day only belong to the "Month Zero". Therefore, months still have the same number of days and will never change. Therefore, the problem (d) in section 1.2 is solved.
- A leap year has 366 days, and its occurrence follows the Gregorian rules.
- Each week starts on Monday and ends on Sunday, which agrees with the international standard ISO 8601. Therefore, the problems (c) and (f) in section 1.2 are answered.
- Each month starts on Monday and ends on a Sunday.
- Every year starts on Monday and ends on Sunday. Therefore, Month Zero is considered as a fictive month with a maximum of 2 days, which are feast days that celebrate the beginning of a new year.
- For business purpose, instead of dividing the year into quarters or triannuals, it is recommended to consider weeks which give more accurate results. For example, if we want to divide a year into 4 quarters, in the proposed calendar, each quarter is exactly 13 weeks. For a triannual year, 17 weeks are considered for the first two triannually - based year, and 18 weeks are considered for the third period. Therefore, the problem (b) mentioned in section 1.2 is resolved.

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Table 3: Output Results of the Optimization Model.

The proposed Perennial Calendar M13W4D7+R2

Year: Any year has the same sequence of days and dates

Month Zero	
Year-day	Leap-day
1	2

Month 1 (January)						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 2 (February)						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 3 (March)						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 4 (April)						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 5 (May)						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 6 (June)						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 7 (July)						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 8 (August)						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 9 (September)						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 10 (October)						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 11 (November)						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 12 (December)						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 13 (Undecember)						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Based on **Table 3**, it is clear that the proposed Calendar has a more systematic organization of days and months in a year. The first day of a month always starts on Monday, and the last day of each month is always Sunday. Therefore, counting days becomes an easy task, and there is no need for complex algorithms to predict the days and dates in previous years. The days and dates in the proposed Calendar have strong and correlated relationships, which can be described by simple mathematical equations as in Equation (8).

$$\begin{cases} Monday = 1 + 7(w-1) \\ Tuesday = 2 + 7(w-1) \\ Wednesday = 3 + 7(w-1) \\ Thursday = 4 + 7(w-1) \\ Friday = 5 + 7(w-1) \\ Saturday = 6 + 7(w-1) \\ Sunday = 7 + 7(w-1) \\ Yearday = 365 \\ Leap\ day = 366\ (in\ a\ leap\ year) \end{cases} \quad Where\ w\ is\ the\ week\ number\ in\ a \begin{cases} month: w \in [1,4] \\ year: w \in [1,52] \end{cases} \tag{8}$$

As an example, calculate the date of Monday in the third week of a month.

Answer: $Monday = 1 + 7(3-1) = 15$

March						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Another example, calculate the day number of Wednesday located on the 36th week of the year. Answer: $Wednesday = 3 + 7(w-1) = 3 + 7(36-1) = 248$

July						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
169	170	171	172	173	174	175
176	177	178	179	180	181	182
183	184	185	186	187	188	189
190	191	192	193	194	195	196

August						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
197	198	199	200	201	202	203
204	205	206	207	208	209	210
211	212	213	214	215	216	217
218	219	220	221	222	223	224

September						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
225	226	227	228	229	230	231
232	233	234	235	236	237	238
239	240	241	242	243	244	245
246	247	248	249	250	251	252

October						
Mon	Tue	Wed	Thu	Fri	Sat	Sun
253	254	255	256	257	258	259
260	261	262	263	264	265	266
267	268	269	270	271	272	273
274	275	276	277	278	279	280

3.4. Comparison between the proposed calendar and the Gregorian calendar

In this subsection, a comparison between the proposed and Gregorian calendars is presented. **Table 4** shows both calendars, in which it is obvious that the proposed one is much easier to memorize because all months look the same. A more detailed comparison is presented in **Table 5**.

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Table 4: Comparison between the proposed and Gregorian calendars.

The proposed Perennial Calendar M13W4D7+R2

Year: Any year has the same sequence of days and dates

Month Zero

Year-day	Leap-day
1	2

Month 1 (January)

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 2 (February)

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 3 (March)

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 4 (April)

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 5 (May)

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 6 (June)

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 7 (July)

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 8 (August)

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 9 (September)

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 10 (October)

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 11 (November)

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 12 (December)

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Month 13 (Undecember)

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28

Gregorian Calendar

Only for the year 2020, the dispalcement of dates and days change from year to year

January 2020

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

February 2020

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

March 2020

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

April 2020

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

May 2020

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

June 2020

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

July 2020

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

August 2020

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

September 2020

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

October 2020

Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

November 2020

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

December 2020

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

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Table 5: Comparison between three calendars, the proposed one, Gregorian, and IFC

Aspects	Description	Proposed Calendar	Gregorian Calendar	IFC
Technical	Number of weekends in a year	**Up to 106**	Up to 104	**Up to 106**
	Complexity of the system	**Very easy**	Complex	Easy
	Computation time	**Very low**	Very high [16]	Low
	Reduce wasted time to check days and dates on a calendar	**Very low**	Very high	Low
	Do we need a Calendar to check the dates	**No**	Yes	**No**
	Considered as Perennial Calendar	**Yes**	No	**Yes**
	The date of days does not change (e.g., the 17th always falls on a Tuesday)	**Yes**	No	**Yes**
	Calendar respects international standards	**Yes**	No	No
Economic	Number of payable months	**13**	12	**13**
	Easy scheduling for institutions and industries with extended production cycles	**Yes**	No	**Yes**
	Accurate statistical comparisons by months, since all months have exactly the same number of business days and weekends	**Yes**	No	**Yes**
	Possibility of error in printing the calendar and calculating the dates	**No**	Yes [17]	**No**
	Can be considered as a financial calendar in which years can be divided into quarters, triannuals, and biannuals	**Yes (based on weeks instead of months)**	**Yes**	No
Environmental	Eco-friendly	**Yes**	No	**Yes**
	Reduce the number of printed hard-copies	**Yes**	No	**Yes**
	Reduce pollution and waste from printing the calendars	**Yes**	No	**Yes**
	Reduce energy consumption	**Yes**	No	**Yes**
Individual	Better organization of personal life	**Yes**	No	**Yes**
	Accurate appointments and events	**Yes**	No	**Yes**
Social	Movable holidays celebrated on the *n*th certain weekday of a month, (e.g., Thanksgiving Day), would be able to have a fixed date while keeping their traditional weekday	**Yes**	No	**Yes**
	Better organization of social activities	**Yes**	No	**Yes**
	Less conflict because of missing some events, meetings, and appointments	**Yes**	No	**Yes**

For instance, just to show the importance of the proposed calendar in reducing the pollution, we want to calculate the wasted energy by checking the date and day for each person on Earth. Let us suppose the following assumptions:

- Population worldwide is about 7.8 billion people in 2020,
- Each person as a mobile with a battery capacity of about 10.78Wh (Similar to the Samsung Galaxy),
- The charging efficiency of the mobile is about 92%,

- Efficiency of the lines and cables from the power utility and homes is about 70%,
- We suppose that the power generation is renewable energy based on photovoltaic systems with an efficiency of about 12%,

Steps:

a. The needed energy to charge the mobile for a day is equal to (10.78Wh / (0.92 x 0.7 x 0.12)) = 140Wh/day.
b. We consider that each person spend about 1 minute every day just to check the calendar, the dates and days. Therefore, the total energy spent per day just to check the calendar is equal to 140Wh/day / 24h/day / 60min/h) = 0.0972Wh/day
c. The needed energy to check the calendar for the total population per day is equal to (0.0972Wh/day x 7.8 billion people) = 758,333,333.3 Wh/day = 758.333 MWh/day,
d. The needed energy to check the calendar for the total population in a year is equal to (758.333 MWh/day x 365 day/year) = 276.792 GWh/year

Therefore, almost 276.8 GWh/year are wasted just to check the Gregorian calendar, while this huge amount of energy can be saved for something else. Therefore, the advantage of our proposed calendar system is to minimize as possible the wasted time, energy and conflict.

3.5. *Other proposed Calendars*

In the previous subsection, the proposed calendar "M13W4D7+R2" is discussed. However, **Table 2** shows other possible solutions, in which some of them will be presented briefly in this subsection. In **Table 6** only 4 calendars are presented, which come from **Table 2**. The yellow boxes represent the weekends and the day offs, and the white boxes are for the working days.

Table 6: Proposed calendars: (a) M12W5D6+R6, (b) M12W6D5+R6, (c) M10W6D6+R6, and (d) M15W3D8+R6.

(a)

The proposed Calendar M12W5D6+R6

Year: Any year has the same sequence of days and dates

Month 01

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30

Month 02

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30

Month 03

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30

Month 04

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30

Month 05

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30

Month 06

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30

Month 07

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30

Month 08

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30

Month 09

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30

Month 10

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30

Month 11

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30

Month 12

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30

Month 13 (Year-Month)

YD1	YD2	YD3	YD4	YD5	YD6
1	2	3	4	5	6 ← For the day 366 in a leap year
For days 361 to 365					

# of Working Days:	264
# of Off Days:	102

This calendar has 12 official months. Each month has 5 weeks of 6 days each. At the end of the year, an additional Month is added with only 5 days (+1 leap day in a leap year). These days are called Yeardays, in which they are different from the normal days, and can be considered as holidays or day off for employees.

(b)

The proposed Calendar M12W6D5+R6

Year: Any year has the same sequence of days and dates

Month 01

D1	D2	D3	D4	D5
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30

Month 02

D1	D2	D3	D4	D5
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30

Month 03

D1	D2	D3	D4	D5
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30

Month 04

D1	D2	D3	D4	D5
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30

Month 05

D1	D2	D3	D4	D5
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30

Month 06

D1	D2	D3	D4	D5
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30

Month 07

D1	D2	D3	D4	D5
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30

Month 08

D1	D2	D3	D4	D5
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30

Month 09

D1	D2	D3	D4	D5
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30

Month 10

D1	D2	D3	D4	D5
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30

Month 11

D1	D2	D3	D4	D5
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30

Month 12

D1	D2	D3	D4	D5
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30

Month 13 (Year-Month)

YD1	YD2	YD3	YD4	YD5	YD6
1	2	3	4	5	6 ← For the day 366 in a leap year
For day 365					

# of Working Days:	264
# of Off Days:	102

This calendar has 12 official months. Each month has 6 weeks of 5 days each. At the end of the year, an additional Month is added with only 5 days (+1 leap day in a leap year). These days are called Yeardays, in which they are different from the normal days, and can be considered as holidays or day off for employees.

(c)

The proposed Calendar M10W6D6+R6

Year: Any year has the same sequence of days and dates

Month 01

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

Month 02

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

Month 03

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

Month 04

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

Month 05

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

Month 06

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

Month 07

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

Month 08

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

Month 09

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

Month 10

D1	D2	D3	D4	D5	D6
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

Month 11 (Year-Month)

YD1	YD2	YD3	YD4	YD5	YD6
1	2	3	4	5	6

For days 361 to 365 ← For the day 366 in a leap year

# of Working Days:	260
# of Off Days:	106

This calendar has 10 official months. Each month has 6 weeks of 6 days each. At the end of the year, an additional Month is added with only 5 days (+1 leap day in a leap year). These days are called Yeardays, in which they are different from the normal days, and can be considered as holidays or day off for employees.

(d)

The proposed Calendar M15W3D8+R6

Year: Any year has the same sequence of days and dates

Month 01

D1	D2	D3	D4	D5	D6	D7	D8
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24

Month 02

D1	D2	D3	D4	D5	D6	D7	D8
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24

Month 03

D1	D2	D3	D4	D5	D6	D7	D8
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24

Month 04

D1	D2	D3	D4	D5	D6	D7	D8
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24

Month 05

D1	D2	D3	D4	D5	D6	D7	D8
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24

Month 06

D1	D2	D3	D4	D5	D6	D7	D8
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24

Month 07

D1	D2	D3	D4	D5	D6	D7	D8
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24

Month 08

D1	D2	D3	D4	D5	D6	D7	D8
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24

Month 09

D1	D2	D3	D4	D5	D6	D7	D8
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24

Month 10

D1	D2	D3	D4	D5	D6	D7	D8
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24

Month 11

D1	D2	D3	D4	D5	D6	D7	D8
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24

Month 12

D1	D2	D3	D4	D5	D6	D7	D8
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24

Month 13

D1	D2	D3	D4	D5	D6	D7	D8
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24

Month 14

D1	D2	D3	D4	D5	D6	D7	D8
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24

Month 15

D1	D2	D3	D4	D5	D6	D7	D8
1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24

Month 11 (Year-Month)

YD1	YD2	YD3	YD4	YD5	YD6
1	2	3	4	5	6

For days 361 to 365 ←For the day 366 in a leap year

# of Working Days:	255
# of Off Days:	111

This calendar has 15 official months. Each month has 3 weeks of 8 days each. At the end of the year, an additional Month is added with only 5 days (+1 leap day in a leap year). These days are called Yeardays that they are different from the normal days, and can be considered as holidays or day off for employees

4. Conclusions

The Gregorian calendar has been used for several centuries, in which it was introduced to correct the Julian calendar. Despite the success of the Gregorian calendar worldwide, and despite its accuracy, it is not easy to deal with the dates and days and sophisticated software is needed, and billions of hard copies of the calendar are printed every year to help people organize better their life. Thus, millions of trees are cut every year to produce calendars and planners, which increases pollution and the emission of CO2. To minimize pollution and to go a further step toward a more sustainable society, this paper proposes an original perennial calendar system that is user- and eco-friendly. The proposed calendar system is very easy to interpret and memorize. Thus, there is no need to print hard copies of the calendar; therefore, millions of trees are saved every year, and less pollution is emitted. The proposed calendar system uses optimization algorithms and mathematical modeling in order to obtain the optimal distribution of days, weeks, and months in a year. This paper compared the proposed calendar system with the Gregorian calendar and the International Fixed Calendar. Results show that the proposed one in this paper has more advantages compared to the other ones. Further statistical analysis is required to see how people react regarding the idea of changing the calendar system and what will be the next step to do in order to implement the system.

5. Nomenclature

GC	Gregorian Calendar
IFC	International Fixed Calendar
JC	Julian Calendar
PC	Perennial Calendar

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