6 Time

By studying this lesson you will be able to

- identify months, years, decades, centuries and millenniums as units of time
- identify a leap year,
- identify the relationships between units of time, and
- add and subtract units of time.

6.1 Units of time

You have already learnt that the units seconds, minutes , hours and days are used to measure time.

You have also learnt to find the time it takes to do different daily activities.

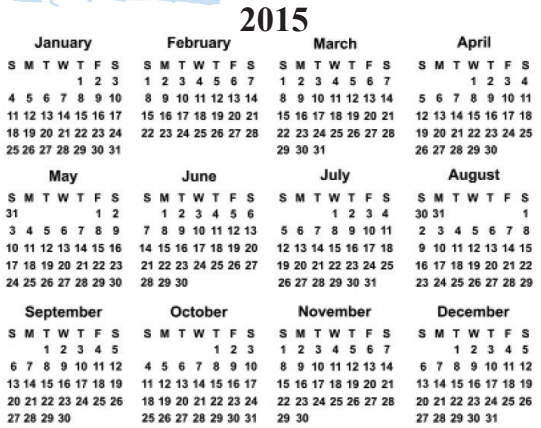
Now, let us learn more on the units of measuring time - months, years, decades, centuries and millenniums.

• Months and years

If we want to calculate the time taken for an event which commences on a particular date and ends on another date, in terms of days, weeks or months, we can do so by looking at a calendar.

A calendar is made up of the units days, weeks and months. You will see that there are 12 months in a calendar.

The calendar of year 2015 is shown below. The table shows the number of days in each month.



2015

January

S	M	T	W	T	F	S
				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

S	M	T	W	T	F	S
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

S	M	T	W	T	F	S
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

S	M	T	W	T	F	S
			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

S	M	T	W	T	F	S
31					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

June

S	M	T	W	T	F	S
	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

S	M	T	W	T	F	S
			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

S	M	T	W	T	F	S
30	31					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

September

S	M	T	W	T	F	S
		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

S	M	T	W	T	F	S
				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

S	M	T	W	T	F	S
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

S	M	T	W	T	F	S
		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		

The months having 31 days	The months having 30 days	The months having 28 days
January	April	February
March	June	
May	September	
July	November	
August		
October		
December		

The calendar of a particular year provides information on a period of a year, starting from the first of January and ending on the thirty first of December of that year.

According to the year 2015 calendar, the total number of days in the year is 365. There are 365 days in a year which is not a leap year. We will be studying about leap years later.

- ☞ The day 2015-08-01 means, the time period from 00:00 on 2015-08-01 to 24:00 on 2015-08-01.
- ☞ The time at which a particular day ends ,is the time at which the next day starts. So the time 24:00 on 2015-08-01 is the same as the time 00:00 on 2015-08-02.
- ☞ The year 2015 means, the time period from 00:00 on 2015-01-01 to 24:00 on 2015-12-31.

Note :
The international convention for measuring years is by considering the year of the birth of Jesus.

BC and AD are commonly used to count years in time. Jesus Christ's birth is used as the starting point to count years that existed before (BC) and after (AD) he was born.

• Decades

A time period of ten years is considered as a decade. Let us consider 1948.

The first year in the decade that contains the year 1948 is 1941, and the last year in that decade is 1950.

The time period from AD 1 to AD 10 is called the first decade.
The time period from AD 11 to AD 20 is called the second decade.
The time period from AD 1811 to AD 1820 is called the hundred and eighty second decade.
The time period from AD 1951 to AD 1960 is called the hundred and ninety sixth decade.
The time period from AD 2011 to AD 2020 is called the two hundred and second decade.

That is, the time period from time 00:00 on 1941-01-01 to time 24:00 on 1950-12-31 is a decade. This decade is identified as the 195th decade.

• Centuries

A time period of a hundred years is called a century.

AD 1 to AD 100 is the first century.
AD 101 to AD 0200 is the second century.
AD 1801 to AD 1900 is the nineteenth century.
AD 1901 to AD 2000 is the twentieth century.
AD 2001 to AD 2100 is the twenty first century.

The time period from 00:00 on 2001-01-01 to 24:00 on 2100-12-31 is the twenty first century.

• A Millennium

A time period of a 1000 years is known as a millennium. According to the calendar, at this moment we are living in the third millennium.

The time period from AD 1 to 1000 is the first millennium.
The time period from AD 1001 to 2000 is the second millennium.

Example 1

(i) To which millennium does AD 1505 belong? Second millennium

(ii) To which century does AD 1505 belong ? 16th century

(iii) To which decade does AD 1505 belong? Hundred and fifty first decade.

Exercise 6.1

(1) Write down the decade to which each one of the following years belongs.

(i) AD 1856 (ii) AD 1912 (iii) AD 1978 (iv) AD 2004

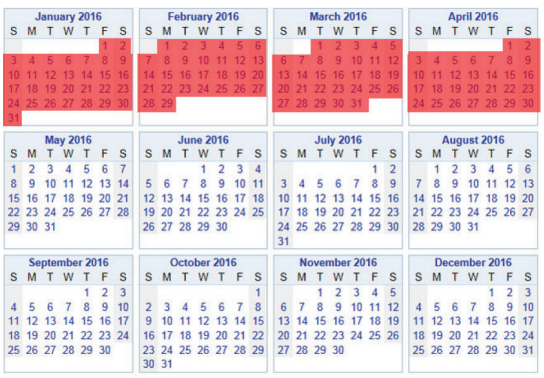
(2) Write the first date and the last date of the 22nd century.

(3) Write down the century to which each one of the following years belongs.

(i) AD 1796 (ii) AD 1815 (iii) AD 1956 (iv) AD 2024

6.2 Leap year

The calendar of 2016 is given below. Consider the number of days in each month . How does this differ from the calendar of 2015 ?



The months having 31 days	The months having 30 days	The months having 29 days
January	April	February
March	June	
May	September	
July	November	
August		
October		
December		

There are 29 days in the month of February. So the total number of days in 2016 is 366.

Any year in which there are 29 days in the month of February has 366 days in total. Such a year is defined as a leap year.

If a number that denotes a year is divisible by 4 but is not a multiple of 100, then that year is a leap year. However years which are denoted by numbers that are multiples of 100 become leap years only if they divisible by 400.

Example 1

Is the year 2000 a leap year?

Since $2000 = 100 \times 20$, 2000 is a multiple of 100.
Since $2000 \div 400 = 5$, 2000 is divisible by 400.
So year 2000 is a leap year.

Example 2

Is the year 1900 a leap year?
1900 is a multiple of 100.
1900 is not divisible by 400.
$\therefore$ 1900 is not a leap year.

Example 3

Is the year 2008 a leap year?
2008 is not a multiple of 100.
$2008 \div 4 = 502$, 2008 is divisible by four .
$\therefore$ 2008 is a leap year.

Example 4

Is 2010 a leap year?
2010 is not a multiple of 100.

The number that is formed by the last two **digits** of 2010, that is 10, is not divisible by 4. Therefore by the rules of divisibility, 2010 is also not divisible by 4.

Hence, 2010 is not a multiple of 4. Therefore 2010 is not a leap year.

Note : Any year which is not a multiple of 4 is not a leap year.

• Further units of time

60 seconds = 1 minute
60 minutes = 1 hour
24 hours = 1 day
There are months consisting of 28 days, 29 days, 30 days and 31 days.

However a time period of 30 days is considered as a month.
12 months = 1 year
365 days = 1 year
366 days = 1 leap year

A time period given in years can be represented in days, by multiplying it by 365.

A time period given in years can be represented in months, by multiplying it by 12.

Note :
We consider 30 days as a month. However, because a year consists of 12 months, you should not think that the number of days in a year is 360 (12 × 30 days). A year consists of 365 days.

Example 1

(i) Indicate 280 days in months and days.

$$\begin{array}{r|l} & 9 \\ 30 & 280 \\ & 270 \\ \hline & 10 \end{array}$$

Therefore, 280 days is 9 months and 10 days.

Example 2

(i) Indicate 3 years in months.
(ii) Indicate 3 years in days.

(i) 3 years = 3 × 12 months
= 36 months

(ii) 3 years = 3 × 365 days
= 1095 days

6.2 Exercise

(1) Choose the leap years from the years given below.

(i) AD 1896 (ii) AD 1958 (iii) AD 1960
(iv) AD 1400 (v) AD 1600 (vi) AD 2016

(2) (a) Indicate the days given below, in months and days.

(i) 225 days (ii) 100 days (iii) 180 days

(b) How many months are there in 5 years? How many days are there in 5 years?

(3) A bus which makes 4 trips a day, runs continuously for 6 months daily. Find the total number of trips it makes during this period.

(4) A patient has to take 3 tablets per day for a period of 2 months. How many tablets are required for this purpose?

(5) A person exercises for 1 hour every day.

(i) How many hours does he spend exercising during a year which is not a leap year?

(ii) Indicate this time in days.

(6) A person puts a minimum of 5 Rupees in a till every day. Find the least amount of money he would collect during each time period below.

(i) 6 months (ii) A leap year

6.3 Calculations related to time

A certain school was in session as follows during a certain year.

The first term consisted of 3 months and 6 days, the second term consisted of 3 months and 8 days, and the third term consisted of 3 months and 3 days.

Months	Days
3	6
3	8
+3	3
9	17

Let us express the time period that the school was in session that year, in months and days.

For this we need to add the above time periods to find the total time period.

So the school was in session for 9 months and 17 days.

Example 1

A teacher served for 5 years 6 months and 23 days in a school in the Eastern province and for 6 years 8 months and 15 days in a school in the Central province. He served the rest of his career in a school in the Southern province.

(i) Find in total how long he served in the Eastern and Central provinces.
(ii) If he served for 28 years, 2 months and 2 days in total, then find how long he served in the school in the Southern province.

(i)

Years	Months	Days
5	6	23
+ 6	8	15
		8

Let us add the days in the "days column"
23 days + 15 days = 38 days
38 days = 1 month + 8 days
Let us write the 8 days in the "days column". Let us carry the 1 month to the "months column".

Years	Months	Days
5	6	23
+ 6	8	15
12	3	8

1 month + 6 months + 8 months = 15 months = 1 year and 3 months
Let us write the 3 months in the "months column".
Let us carry the year to the "years column".

1 year + 5 years + 6 years =12 years.

The total service of the teacher in the Eastern and Central provinces is 12 years, 3 months and 8 days.

(ii)

Years	Months	Days
28	2	2
– 12	3	8
		24

Let us subtract the days in the "days column".
Since 2<8 let us take a period of one month, that is 30 days from the "months column" and add it to the "days column".
Then, 30 days + 2 days = 32 days.
32 days - 8 days = 24 days.
Let us write the 24 days in the "days column".

Years	Months	Days
28	2	2
–12	3	8
15	10	24

Now, in the months column we have to subtract 3 months from the remaining 1month. Since this cannot be done, let us carry a period of 1 year, that is 12 months, from the "years column" to the "months column". Then,
12 months + 1 month = 13 months
13 months – 3 months = 10 months
Let us write the 10 months in the " months column".

When 12 years are deducted from the remaining 27 years in the "years column" we get 15 years.

So the amount of time the teacher spent in the school in the Southern province is 15 years, 10 months and 24 days.

Example 2

Sunitha's date of birth is 2008-05-06.

(i) What is her age on 2016-08-24?

(ii) Nimal is younger to her by 3 years, 6 months and 3 days. Find Nimal's date of birth.

(i) The date on which we want to know the age = 2016-08-24

Sunitha's date of birth = 2008-05-06

Let us find Sunitha's age on 2016-08-24.

Sunitha's age is 8 years, 3 months and 18 days.

	Years	Months	Days
	2016	8	24
−	2008	5	6
	8	3	18

(ii) Nimal's date of birth is the ninth of November, 2011.

	Years	Months	Days
	2008	5	6
+	3	6	3
	2011	11	9

Exercises 6.3

(1) Do the following additions.

(i)

Months	Days
8	18
+2	11

(ii)

Months	Days
8	22
+2	16

(iii)

Years	Months	Days
12	6	21
+3	2	19

(iv)

Years	Months	Days
8	9	19
+2	6	23

(2) Do the following subtractions.

(i)

Months	Days
6	23
−3	15

(ii)

Months	Days
6	18
−2	24

(iii)

Years	Months	Days
3	6	15
−2	4	18

(iv)

Years	Months	Days
2	8	12
−1	2	15

(3) Dileepa's date of birth is 2003-09-07.
Sithumini's date of birth is 2000-02-04.

(i) Find how old Dileepa and Sithumini are today.
(ii) Find how much older Sithumini is to Dileepa,
(a) using their ages,
(b) using their dates of birth.

(4) Below are the service periods of two teachers in a certain school.

	Date he started work in the school	The date he was transferred from this school
Mr. Iqbal	2001 - 07 - 13	2015 - 11 - 22
Mr. Subhairudeen	1997 - 03 - 20	2012 - 01 - 10

(i) Find the period of service of each teacher. Who has served longer in this school?
(ii) How many more years has the teacher has served than the other one ?

(5) Shashika's date of birth is 2014-08-13. Aheli is 1 year, 8 months and 25 days older to her. What is Aheli's date of birth?

(6) A school was opened on 1928-03-26.
(i) When is the school's centennial anniversary?
(ii) How many days are there to the centennial anniversary date from today?

(7) Amila participated in Agricultural training progammes in Japan and China. He stayed in Japan from 2012-02-13 to 2014-07-27 and in China from 2014-12-17 to 2015-10-05. Find the total time he spent in Japan and China.

Miscellaneous Exercise

(1) A person borrows a certain amount of money. He has to pay the debt in equal installments once every month, for 10 years. The first installment was paid on 2016-01-01. Find the date on which he has to pay the final installment.

(2) Below are the age limits for participants in an inter-house sportsmeet of a certain school.
Under 11 games – Age should be less than 11 years on 2016-03-31.
Under 13 games – Age should be less than 13 years and greater than or equal to 11 years on 2016-03-31.

(3) Under 15 games – Age should be less than 15 years and greater than or equal to 13 years on 2016-03-31.
Under 17 games – Age should be less than 17 years and greater than or equal to 15 years on 2016-03-31.

The dates of birth of several students are given below.

Name	**Birthday**
Vanthula	2005-12-08
Hashan	2002-05-17
Hasintha	2000-01-16

Find which age group each student qualifies to participate in.

Summary

- A time period of 10 years is defined as a decade.
- A time period of 100 years is defined as a century.
- A time period of 1000 years is defined as a millennium.
- If a number that denotes a year is divisible by 4 but is not a multiple of 100, then that year is a leap year. However years which are denoted by numbers that are multiples of 100 become leap years only if they divisible by 400.

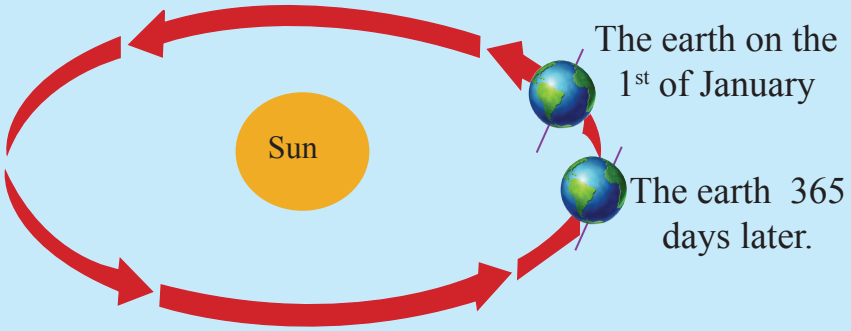
Ponder

(1) A person was born on 2002-09-23 at 9.32 a.m. Find for how long he has lived in years, days, hours and minutes when it is 12 noon of 2015-06-05.

(2) A certain person lived for 20591 days. Find his age in years, months and days at the time he passed away.

Extra Knowledge –More on leap years

• Why Do We Have Leap Years?



In any year which is not a leap year there are 365 days.
A year is defined as the time it takes for the Earth to orbit around the sun once.

However, the exact time it takes for the earth to orbit around the sun is 365 days 5 hours 48 minutes and 46 seconds. This is about $365\frac{97}{400}$ days. So when we say a year has 365 days, we have neglected a time period of 5 hours, 48 minutes and 46 seconds (**which is little less than 1/4 day**). Four of these periods added together is approximately one day. We add this as an extra day to the calendar once every four years. It is added to the month of February. This is how we get a leap year.

A leap year has an extra day. Due to the decision to add an extra day to the calendar once every four years, 3 additional days get included in each 400 year period.

Although an extra day is added once every four years, only 23 hours 15 minutes and 4 seconds should actually be added once every four years. Therefore, due to the decision of adding an extra day once every four years, there are approximately 3 additional days that are included in each period of 400 years.

Therefore three days need to be removed from every 400 year period.

To do this, an extra day is not added to the month of February for the first three century years. (A century year is a year ending in 00)

Non-century years are leap years if they are multiples of four.