

Survivor Series Level 5

Year 9, 10 and 11 students.

Survivor Series 2017

Level 5



**For Year 9, Year 10, Year 11 students.
Curriculum level 5.**

What to do.

For students.

1. You can work with a friend or two friends!
Teams can be different each day.
2. Do the tasks and enter your answers in your maths book and show your teacher.
3. If you are right you will get the next task.
4. If you are wrong, answer the task again.
5. When you have finished each day you will get a code word.
6. At the end of the week you will have 5 code words. Put them together and this will tell you where your school's Maths Week treasure is.
7. Good luck !



Tuesday:
Survivor Series
For Year 9, 10, 11 students.

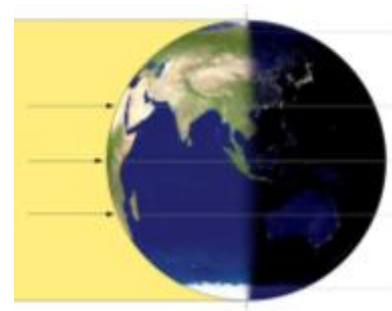
The Calendar.
Level 5
Curriculum Level 5.

The making of the Calendar.

There are three natural cycles a calendar can be built around.

1. The day-night cycle.

This gives us the length of the day.
It is taken from the time the sun is at its greatest height in the sky until the next time the sun is at its greatest height in the sky.
This is called one day.
It's the time for the earth to rotate completely on its axis.
This time is divided into 24 parts called hours.
One hour is divided into 60 parts and called minutes.
One minute is divided into 60 parts and called seconds.



Task One.

How many minutes are in a day?
How many seconds are in a day?

2. The moon cycle.

The moon cycle is the length of time it takes for a full moon to rotate around the earth. It is measured as the time between full moons. It does this every $29\frac{1}{2}$ days.

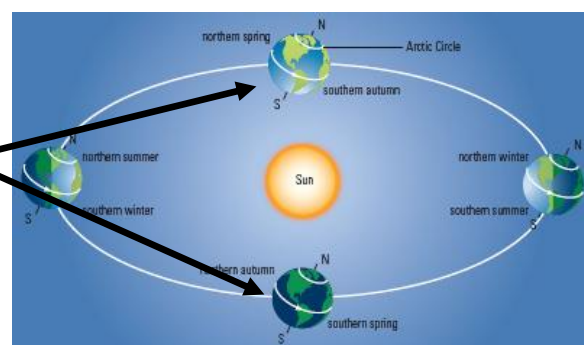


Task Two.

What is the moon cycle usually called?

3. The season's cycle.

The season's cycle gives us the length of the year. The length of this cycle is measured, from the day when the day-time length is exactly the same as the night-time length, until the next time it happens. This occurs twice in a season's cycle.
One complete season's cycle is one year.



Task Three.

What is it called when the day-time length is exactly the same as the night-time length? It happens twice in a year.

From the three natural cycles a calendar can be built.

- There are just over 365 days in a complete season's cycle.
In fact 365.2422 days. This is called a year. The Romans used this as a base for their calendars.
- There are $365.2422 \div 29.5 = 12.3811$ moon cycles in a complete season's cycle. The Babylonians who wrote one of the earliest calendars based a year on 12 moon cycles.
This gave $12 \times 29.5 = 354$ days.
This didn't work. Remember the year is 365.2422 days!
The seasons become completely out of order.
Spring became winter. Winter became autumn.
Autumn became summer. Summer became spring.
It was a mess...
- Other calendars such as the Chinese, the Mayan, and the Hebrew all tried to relate to the moon cycle. The moon cycle didn't work.



Task Four.

Please check the maths!

$$365.2422 \div 29.5 = 12.3811$$

$$12 \times 29.5 = 354$$

The Roman Calendar.

This was the calendar that influenced most of the world from 753BC to 46BC.

It was first used by Romulus the founder of Rome.

The calendar had 10 months with different days.

March	31 days.
April	29 days.
May	31 days.
June	29 days.
Quintilis	31 days.
Sextilis	29 days.
September	29 days.
October	31 days.
November	29 days.
December	29 days.



Romulus's calendar totalled 298 days – not 365 days!

This calendar quickly became a mess!

Festivals such as the harvest festival celebrated in Rome in autumn were becoming before the summer planting season!

The Roman Calendar was changed in 715BC.



Two more months were added.

January 29 days.

February 28 days.

This certainly helped.

But there were still some days short of 365.

Days were then added or subtracted at the whim of the Emperor.



Task Five.

How many more days did the two months give?

What was now the length of the year in the Roman Calendar?

Extra Task Project.

Where did the names for each of the months come from?

Particularly Quintilus and Sextilus.

The Julian Calendar.

Finally, it was the Roman Emperor Julius Caesar in 46BC who cleaned up the mess of the calendar.

Well, it was not really him!

He had an astronomer mathematician named Alexandre Sosigenes who did it for him. Julius Caesar's new calendar ignored the moon or lunar cycles and used years and days. It took effect on 1st January 45BC. This was a huge success and became known as the Julian Calendar.



January 31 days.

February 29 or 30 days.

March 31 days.

April 30 days.

May 31 days.

June 30 days.

July 31 days.

August 30 days.

September 31 days.

October 30 days.

November 31 days.

December 30 days.



Julius Caesar y Alexandre Sosigenes

- The months were rearranged and the New Year start varied on which-ever country you were in. England chose 25 March as their New Year's Day! There is no obvious reason for this.
- The leap year was invented to give an extra day every 4 years to make up for the year cycle of 365.2422
- The year was named and numbered after the person who was the Roman Emperor at the time.

Task Six.

The Julian Calendar was a great success and was adopted by the Christian world 325 years after it was first used. Which year would this have been?

Minor Changes to the Julian Calendar.

After Julius Caesar's death in 44 BC minor changes were made to the calendar by his successor Augustus Caesar.

February was changed to 28 or 29 days.

August was changed to 31 days.

September was changed to 30 days. October changed to 31 days.

November was changed to 30 days. December changed to 31 days.

The extra day for leap year was added every 4th year.

Task Seven.

How many days were in the year while Julius Caesar was alive.

How many days were in the year after Julius Caesar had died?

When was the Year 1 AD ?

It wasn't until about 500 years later that a Jesuit scholar named Dionysius Exiguus suggested to the Roman Catholic Church that the starting point of the calendar should be the birth of Christ. The Church agreed and Dionysius calculated back 525 years to when he thought was the birth of Christ. That year became 1 AD.

The year before 1 AD became 1 BC.

Notice there was no Year 0. In fact the symbol and meaning of zero had not been invented at this time!



... 550BC ... 3BC ... 2BC ... 1BC ... 1AD ... 2AD ... 3AD ... 325 AD ... 525 AD ...

Task Eight.

Unfortunately Dionysius wasn't entirely accurate with his prediction of when Christ's birth was.

Historians and astronomers now agree that Christ was born earlier than 1 AD.

Find which year the latest thoughts on the year Christ was born are.

Dionysius Exiguus 470 AD – 544 AD moved to Rome in 500 AD and was regarded there as foremost scholar for Pope John. He is best known for inventing the term AD and BC. Also the determining of when the calendar starts and making up the table for Easter.



The Gregorian Calendar.

The Julian Calendar was successful for years and years.

But it was not entirely accurate. For every 128 years it lost a day!

Farmers in particular found the seasons were drifting. By the 1500's the date in which the day length and night length were the exactly same had changed to March 11th rather than what it should have been March 21st.

There was something wrong with the Julian Calendar!

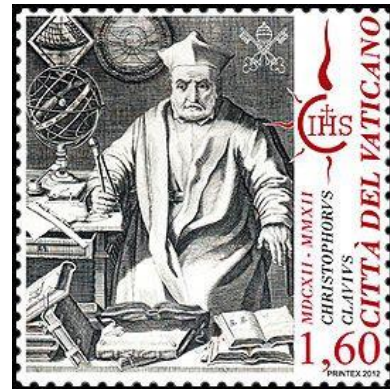
The Julian Calendar was using the length of the year as 365.25 days rather than 365.2422 days.

Task Nine.

In 1582 Pope Gregory XIII asked for advice from his mathematician and astronomer Christoph Clavius.

Christoph gave him the calculation
 $(365.25 - 365.2422) \times (1582 - 325) = ?$

This gives the number of days the Julian Calendar was behind what it should be. How many days does the calculation give?



Pope Gregory decided the Julian Calendar would be revised and he decided the new calendar would be called the Gregorian Calendar!

The leap year was changed so that the years 1700, 1800, 1900, 2100, 2200,... would not become leap years and have 365 days. The years 1600, 2000, 2400, ... would be leap years and have 366 days.

Task Ten.

How close to 365.2422 days per year does this now become?



Clue: How many days are there in 400 years from 1700 to 2000 inclusive.

$$1700 \quad 365 \times 76 + 366 \times 24 = 36524$$

$$1800 \quad 365 \times 76 + 366 \times 24 = 36524$$

$$1900 \quad 365 \times 76 + 366 \times 24 = 36524$$

$$2000 \quad 365 \times 75 + 366 \times 25 = 36525$$

1700 is not a leap year.

1800 is not a leap year.

1900 is not a leap year.

2000 is a leap year.

Total days in the 400 years is $36524 \times 3 + 36525 = 146097$

For each year the number of days is now $146097 \div 400 = 365.2425$

Compare this to what it should be 365.2422 days.

In the Julian Calendar it was 365.25 days.

1582		OCTOBER					1582
SUN	MON	TUE	WED	THU	FRI	SAT	
	1	2	3	4	15	16	
17	18	19	20	21	22	23	
24	25	26	27	28	29	30	
31							

Pope Gregory XIII also decided that for Roman Catholic countries his new calendar would be adopted on October 5th, 1582. The 10 days the Julian Calendar was behind would be caught up and October 5th, 1582 would become October 15th, 1582. By doing this the seasons cycle of both the sun and the new calendar would match up.

Most Roman Catholic countries accepted this but not surprisingly it was ignored by nearly all Protestant countries including Britain and the Americas.

Task Eleven.

What are some of the Roman Catholic countries?



For several years until 1751 the calendars of Europe and Britain were different!

It was common sense that finally forced Britain to change to the Gregorian Calendar and change the beginning of the year to start on January 1st.

1751 was a remarkable year!

It started on March 25th and finished on December 31st.

March 1750/1751						
Su	Mo	Tu	We	Th	Fr	Sa
					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						



Task Twelve.

How many days were in the year 1751 ?

1752 was an even more remarkable year!!

It started on January 1st but 11 days were added during the year in September to put it in line with the Gregorian Calendar.

September						
Sun	Mon	Tues	Wed	Thur	Fri	Sat
		1	2	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

Task Thirteen.

$$(365.25 - 365.2422) \times (1752 - 325) = ?$$

How many days is this?

Wednesday September 2nd was followed by Thursday September 14th. Many people in Britain felt cheated. They felt that 11 days had been cheated out of their lives! It was not a popular decision and was the cause of several riots!! The protest slogan was “give us back our 11 days”.



Task Fourteen.

How many days were there in 1752 ?

1753 was back to normal with 365 days, the seasons back to normal, and January 1st being the start of the year.



The Gregorian Calendar.

The Gregorian Calendar was used
In Europe (Roman Catholic countries) from 1582.
In Germany from 1700.
In Holland from 1700.
In Britain from 1752.
In America from 1752.
In Russia from 1919.



Leap Years.

Every year that is exactly divisible by four is a leap year,

- except for years that are exactly divisible by 100, which are not leap years,
- except for years that are exactly divisible by 400, which are leap years.
- For example, the years 1700, 1800, and 1900 are not leap years, but the years 1600 and 2000 are.

Task Fifteen.

When was the Gregorian Calendar used in New Zealand?

