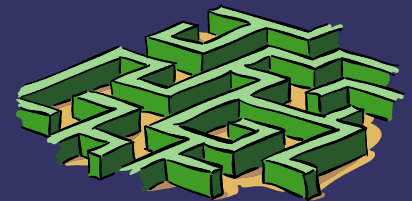


Time and Dates

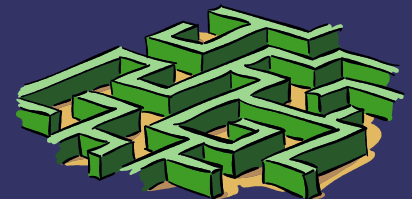
Clocks and Calendars



Bad Joke Time

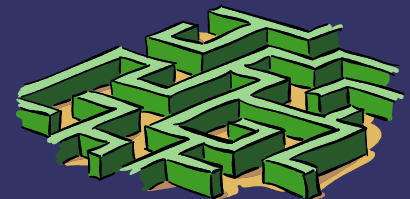
What time does your watch say?

It doesn't say anything – You have to look at it.



Questions

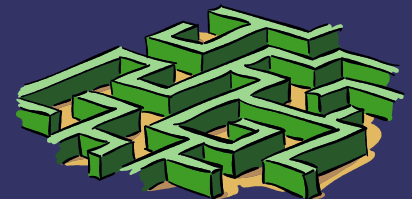
- ➔ Why do clocks run clockwise?
- ➔ What time is it? (*This is not a simple question.*)
- ➔ How can having a good clock on a ship help keep it from sinking?
- ➔ Why does February have 28 days?
- ➔ What happened September 10, 1752?
- ➔ What happened at 2:30 AM ## 2003.



Calendars

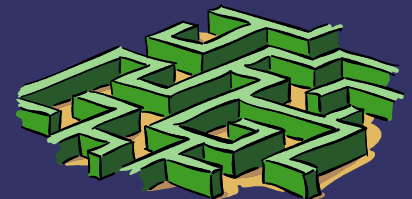
Why are calendars important?

How were calendars originally invented?



The Original Calendar

First calendar was invented by the Egyptians.
To determine when the Nile would flood.



Egyptian Calendar

30 days per month

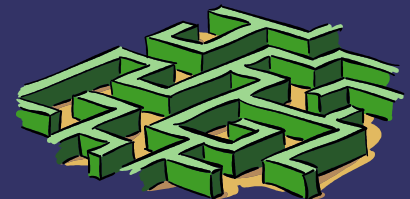
12 months

5 holidays – the Gods' birth-
days



Problems with the Calendar

The Egyptian calendar was a little short.
A year is about $365\frac{1}{4}$ days a year, not 365.
After a while the seasons got out of sync with
the calendar.

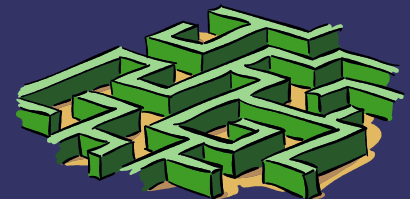


Roman Calendar Problems

Calendar didn't match the seasons big time.

They tried “solving” the problem by adding extra *months* to the year!

Not a good idea when the ruler of the country rules for a given number of years!

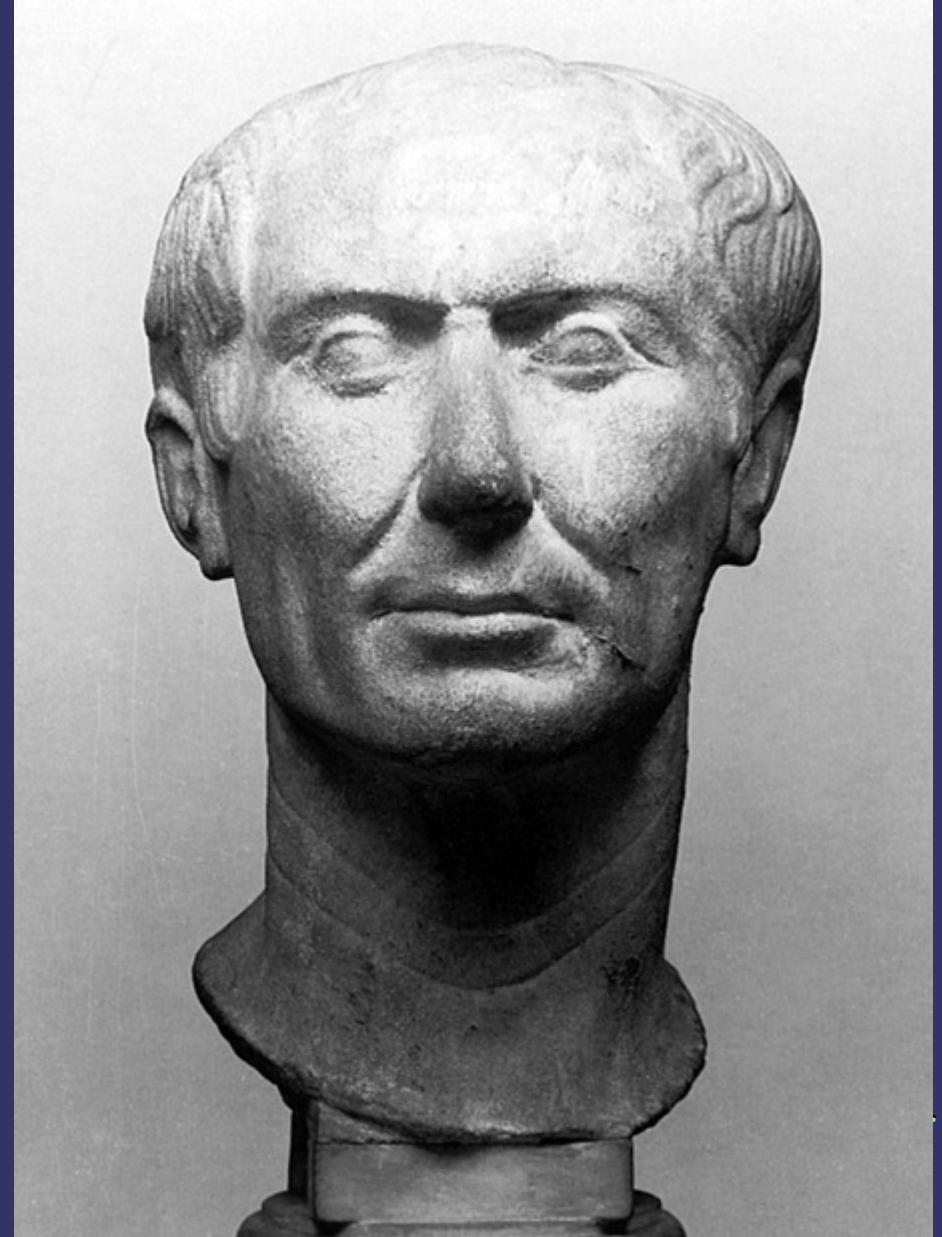


Julius Caesar

Roman Emperor

Inherited a real
calendar mess about
50BC.

Decided to fix things.



Julian Calendar

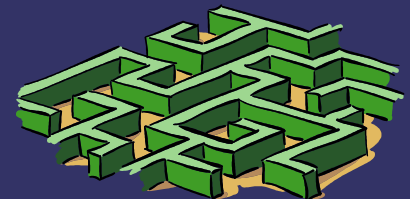
12 months of 30 and 31 days alternating.

A leap year every 4 years in which February got an extra day.

First year used 45BC.

The previous year, 46BC, called “The Long Year” or “Year of Confusion” was made to catch things up (66 extra days).

Two temporary months: *Intercalaris Prior* and *Intercalaris Posterio*.



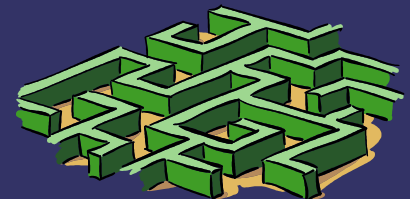
Stealing from February

February						
	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				

Julius named a month after himself.

July which had 30 days.

He wanted 31 so he stole one from February



Caesar Augustus

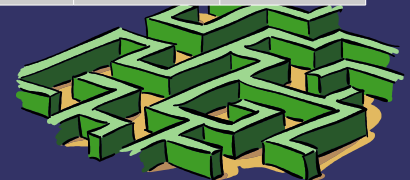
Julius's had a son Augustus.

He had a month with 30 days.

He wanted as many days as daddy.

February lost another day.

February						
	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				

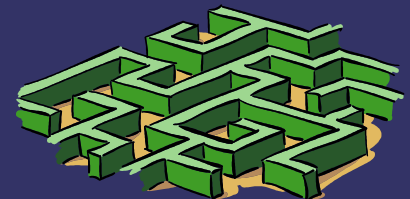


1600 Years Later

The Julian calendar is 11 minutes too long.

Seasons get out of sync with the calendar.

1582 Pope Gregory XIII introduces a new calendar.



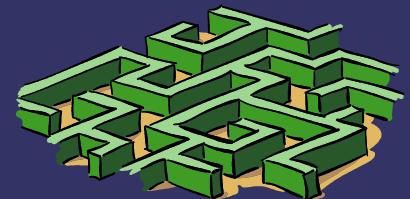
Gregorian Calendar

Lots of rules – but an accurate calendar

Every 4th year is a leap year

Years that are multiples of 100 are not leap years.

Years that are multiples of 400 are leap years.



English Adoption

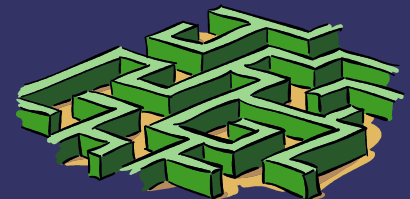
In England they think about Pope Gregory's idea.

For almost 200 years!

Finally adopted in 1752.

Calendar was out of sync so an adjustment had to be made.

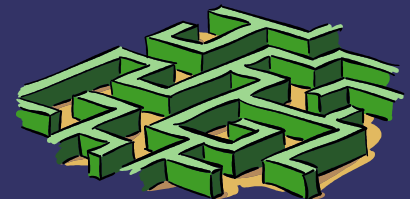
September 1752						
		1	2	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30



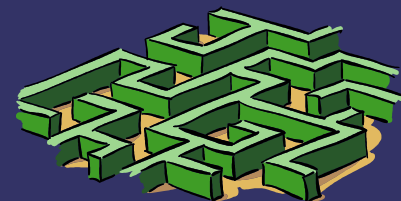
Easiest History Question in the World

What happened on September 10, 1752?

Answer: Nothing, it
doesn't exist!



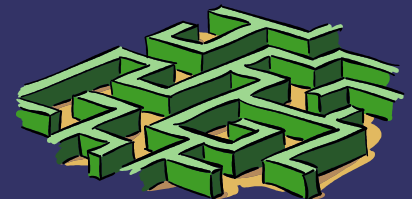
Time



What time is it?

What time is it?

How do you know?



What time is it?

I looked at my watch.

How did it get the time?

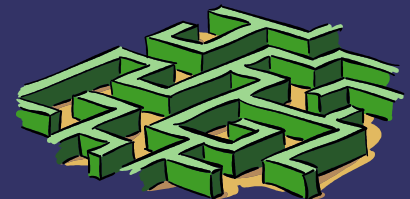
I set it from a clock.

How did it get the time?

It was set from a more accurate clock.

so on so on ... so on

It came from God!



Telling Time

How do we get the time from God to our watch?

An astronomer looks at the sun and stars and uses their position to compute the current time.

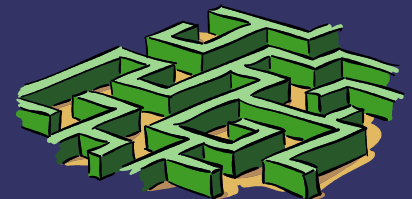


Telling time

Clocks and watches do not tell time.

Clocks and watches keep time.

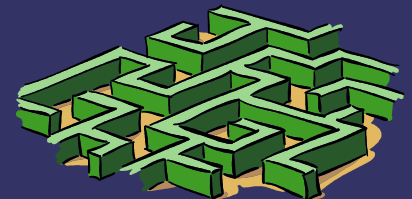
Astronomers tell time using the sun and the stars.



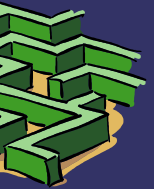
Telling time

Can you think of something simple that will tell time. (Not keep it.)

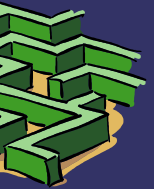
Hint: Think of the oldest type of clock you can think of.



Sundial

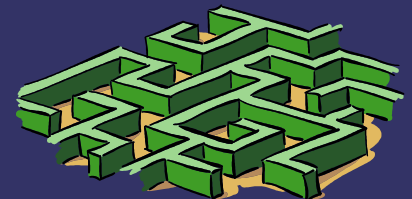


Why do clocks run clockwise?

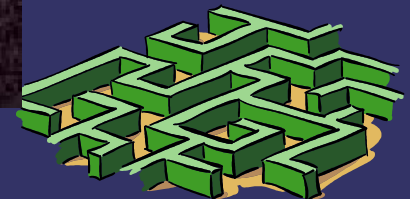


Building a Sundial

At the end of this class we'll build our own sundial.

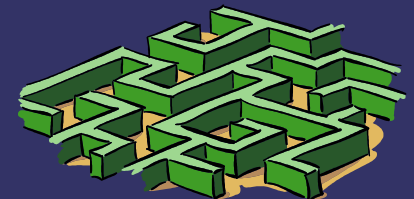
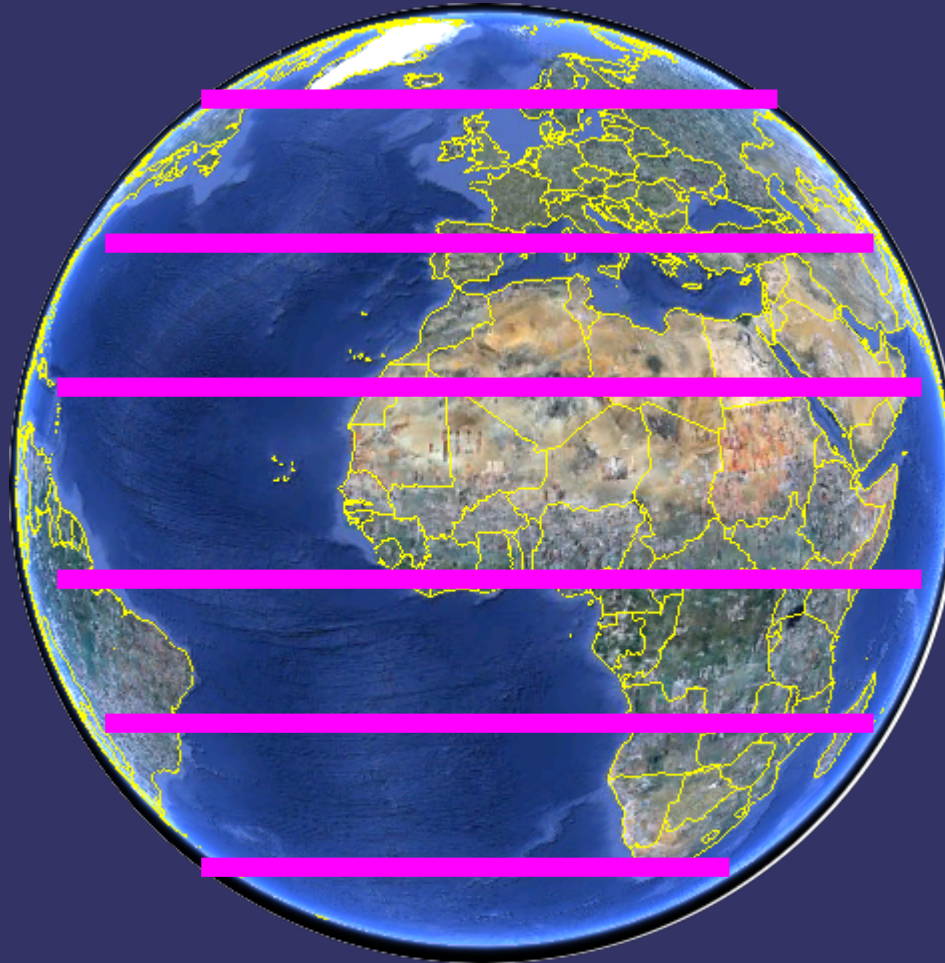


Why time become important in the 15th century?



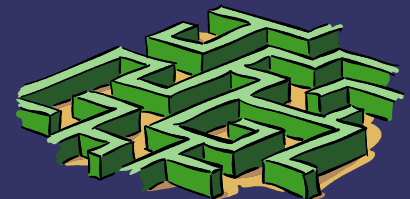
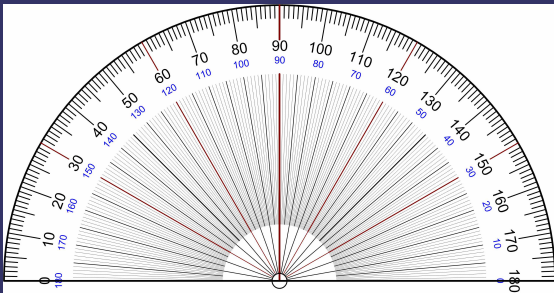
Position: Longitude, Latitude

Latitude



Finding Latitude

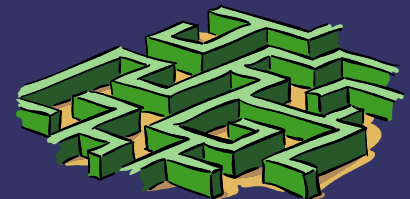
- ➔ What you will need
- 1) Protractor
 - 2) String
 - 3) Paper clip



Finding Latitude

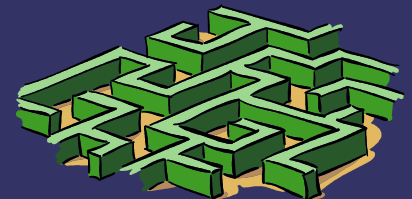
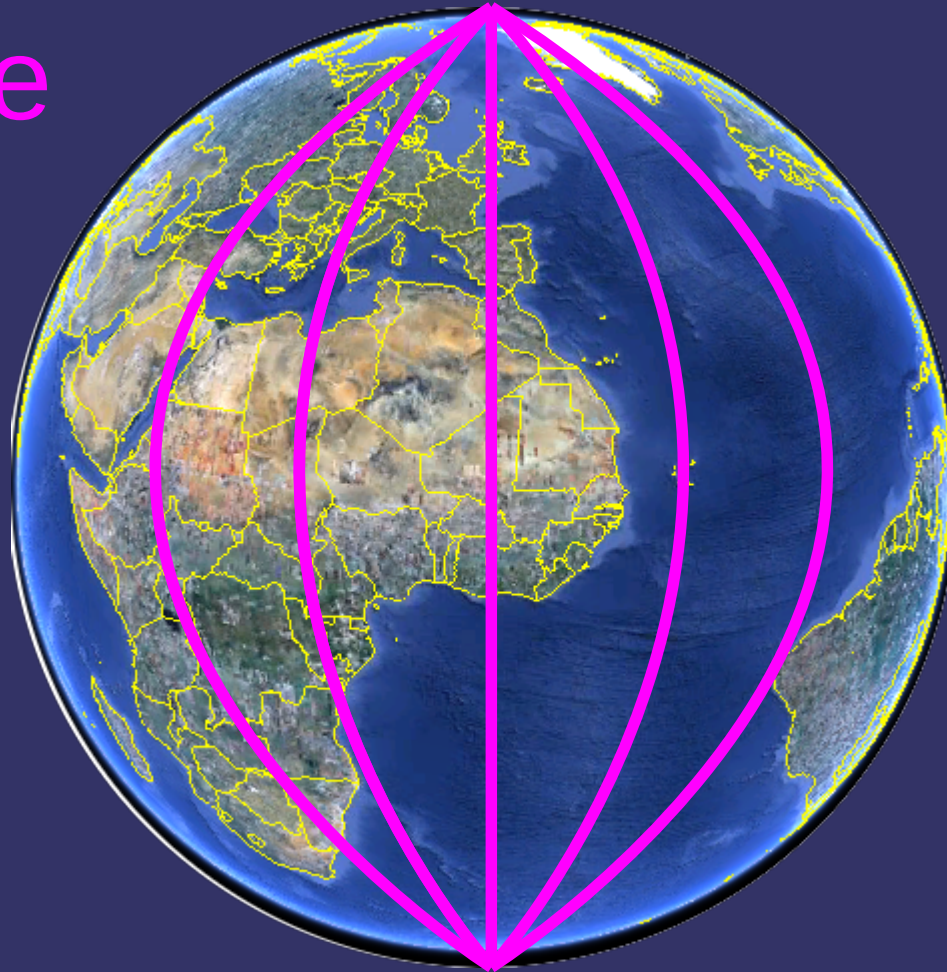
➔ Procedure

- 1) Sight along the top of the protractor to the “North Star”.
- 2) Read the angle off your string.



Position: Longitude, Latitude

Longitude



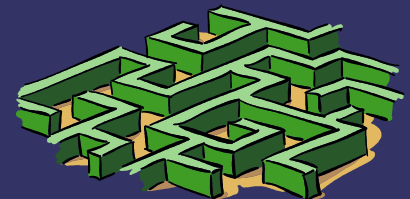
Class Lab: Telling Longitude

⇒ You will need:

- 1) A protractor
- 2) A ruler

⇒ Procedure:

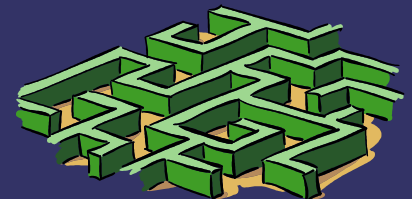
- 1) Sight along the bottom of the protractor to the “known location”
- 2) Sight along the ruler to the “sun”.



Sun's Problem

What is wrong with sighting the sun?

The SUN Moves!!!



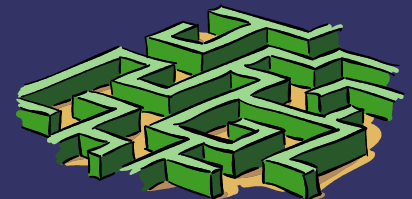
To Find Longitude

You need to sight the angle to the sun.

And -----

You need to know the time where you started.

For that you need an accurate clock.



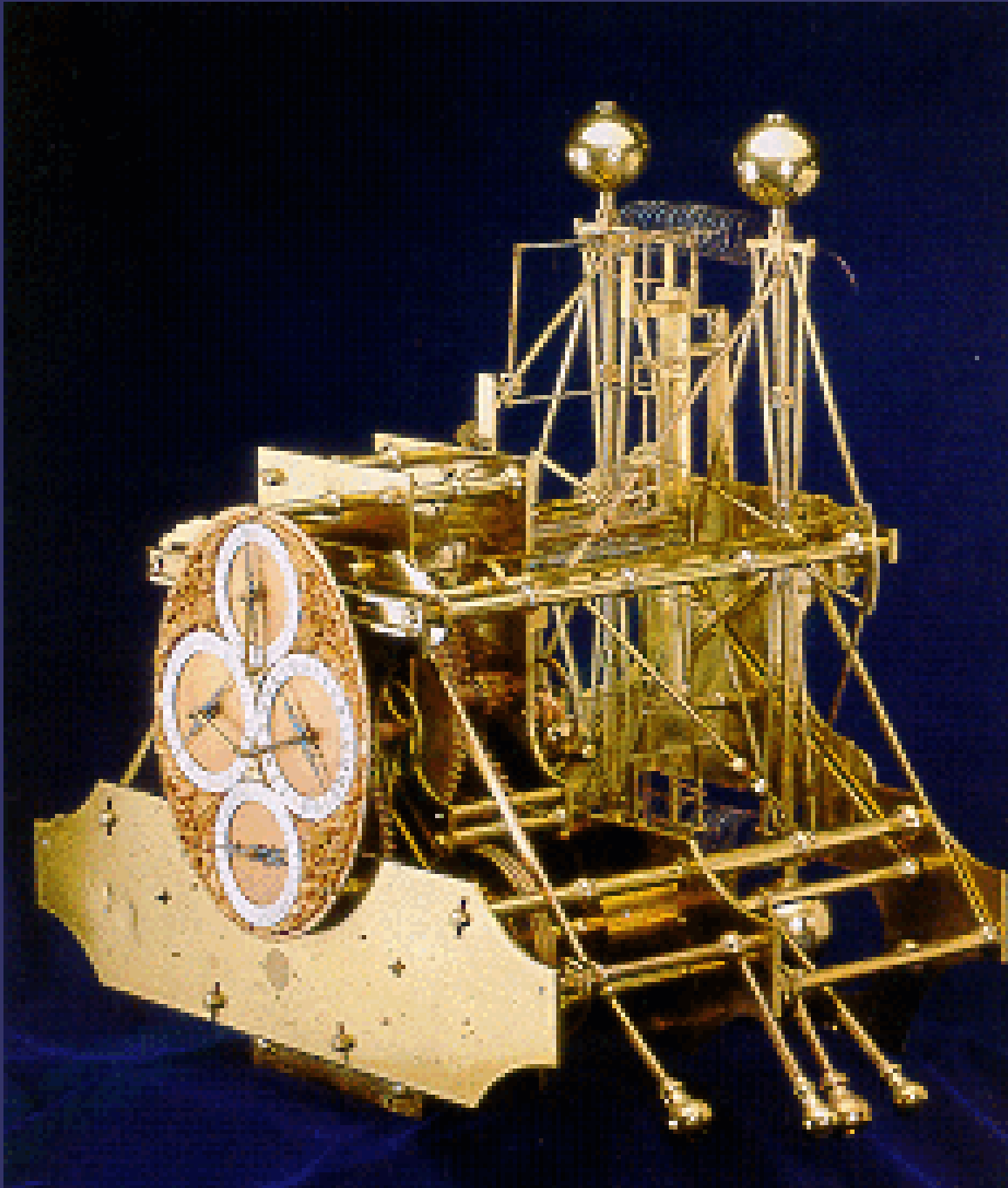
John Harrison

Invented temperature compensation

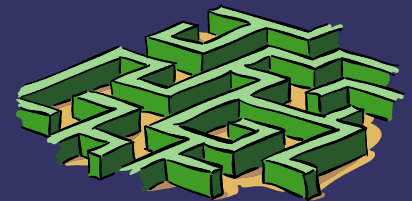
Invented the roller bearing

Invented the first sea-going clock.





The H1 Clock



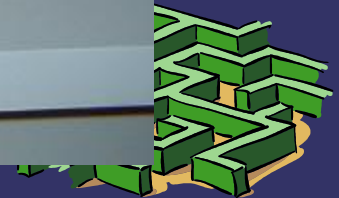


The H4 Clock



Harrison's fourth marine timekeeper, H4, 1755-1759
With its relatively large balance and sophisticated temperature compensation, this is the forerunner of all precision watches. It is probably the most important timekeeper ever made.

On loan from the Hydrographer of the Navy



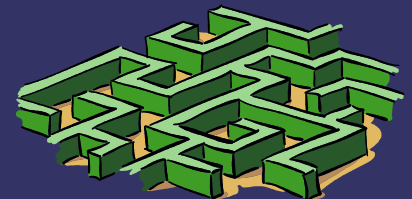
Where is longitude line 0?

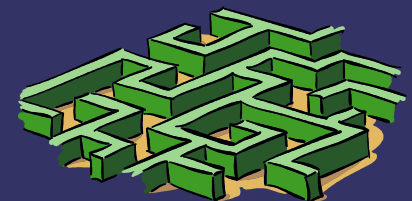
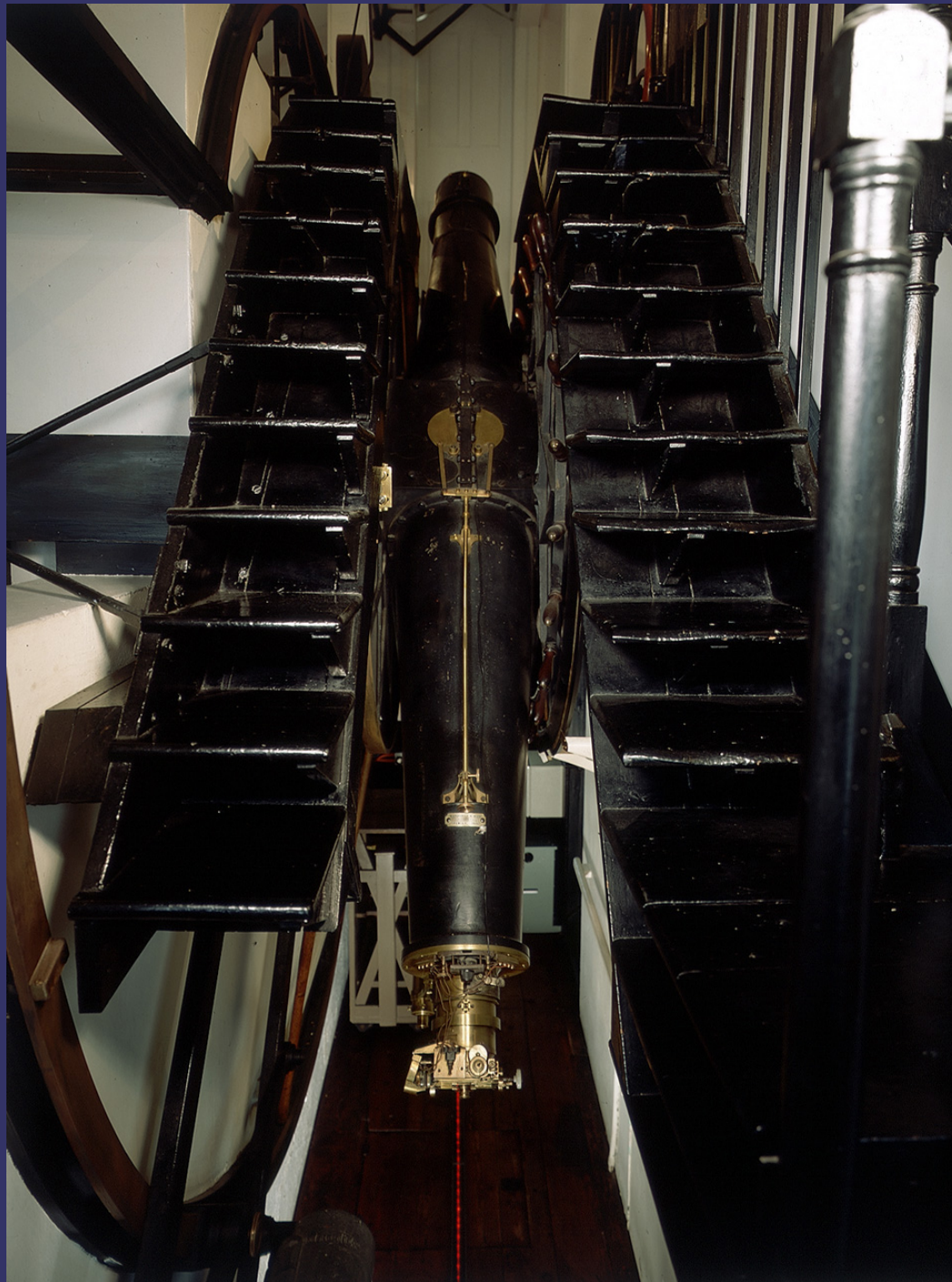
London (actually Greenwich)

Click for Google Earth



Longitude 0 – The line

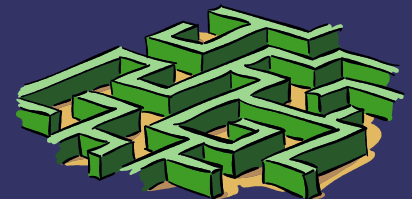




The “local time”

Noon used to be when the sun was highest in the sky.

So noon in San Diego would be a couple of minutes after Ramona.

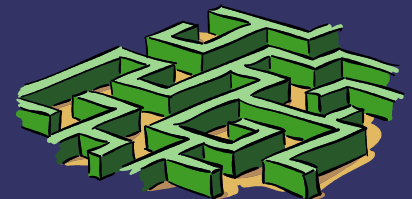


Time Zone

Time Zones makes time consistent across distances.

Time in Ramona and San Diego is now the same.

Why did time zones come about?



Why Time Zones?

➔ Americans built a lot of railroads

➔ Americans are cheap



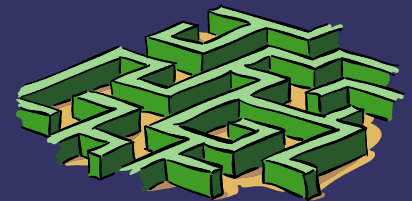
British / American Styles

- ⇒ The British built railroads to last 100 years.
 - Strong
 - Double track
 - Expensive
- ⇒ Americans
 - Quickly
 - Cheap
 - Single Track



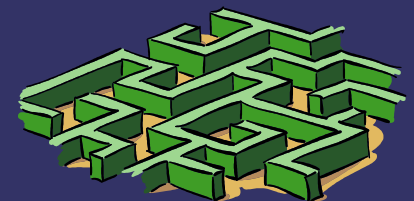
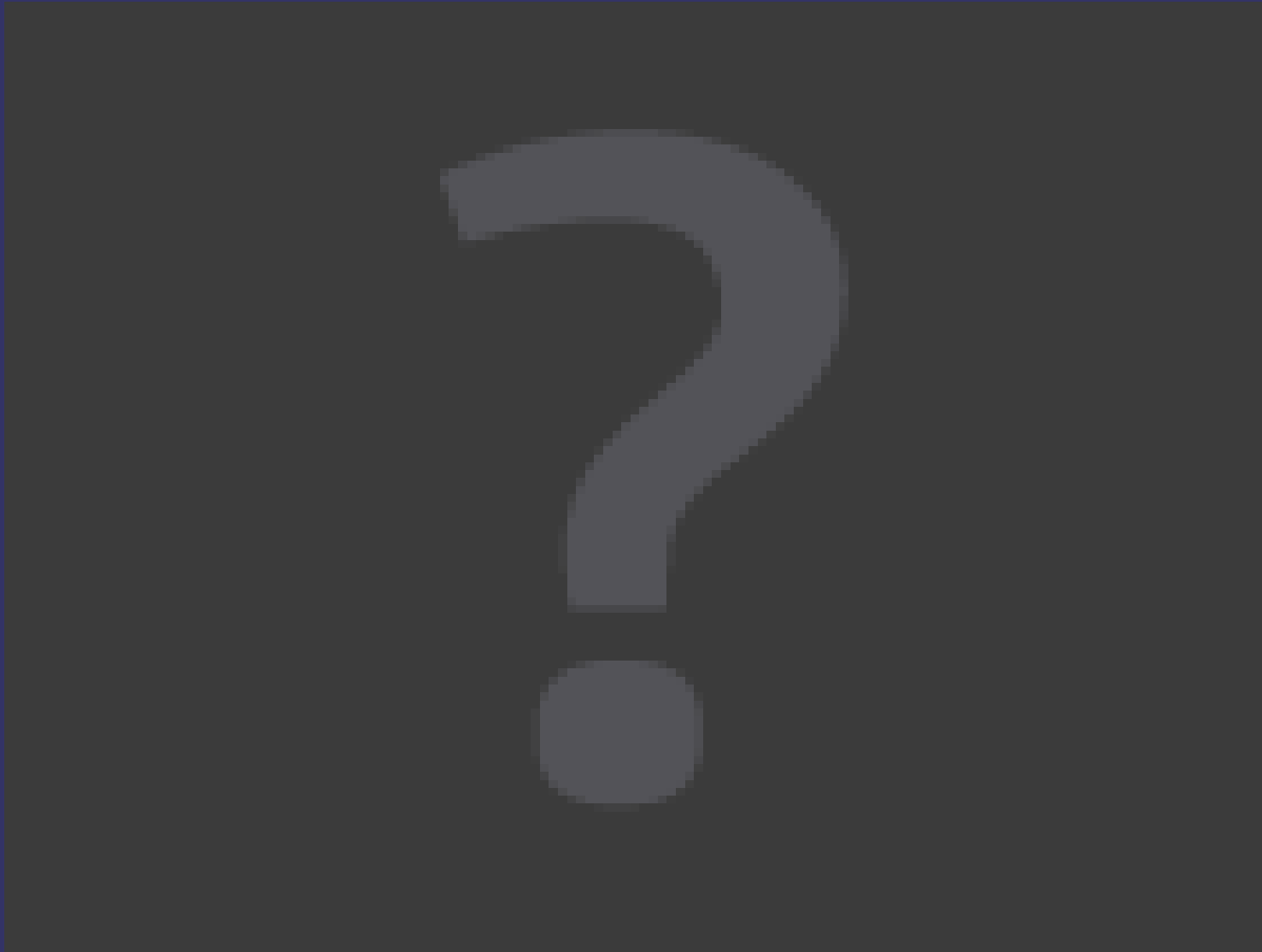
What's the problem with a single track?

“Cornfield meet”



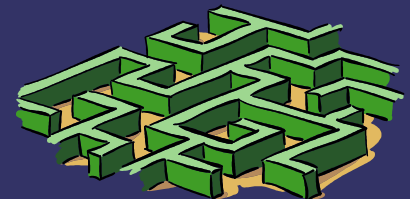
What's the problem with a single track?

“Cornfield meet”



The Timetable

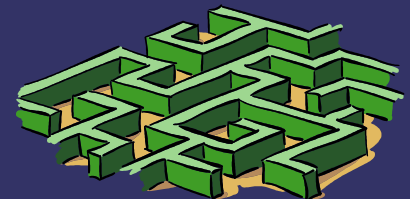
- ➔ Rule 1 of most railroads: You must carry an accurate watch.
 - You must compare it “standard time” at the beginning of the day.



How many hours are there in a day?

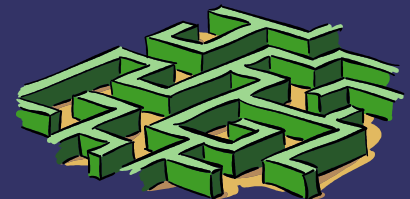
- ★ 24 hours
- ★ 23 hours
- ★ 25 hours
- ★ All of the above

Think about it. If there were 23 hours in a day, we'd have to go around the house changing all the clocks.



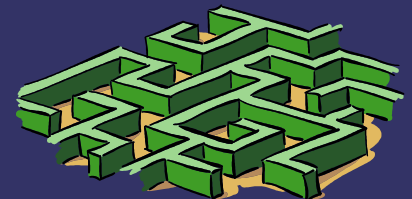
Daylight Savings Time

- ➔ Every spring we turn the clocks ahead 1 hour at 2:00 AM.
- ➔ Every fall we turn the clocks back 1 hour.



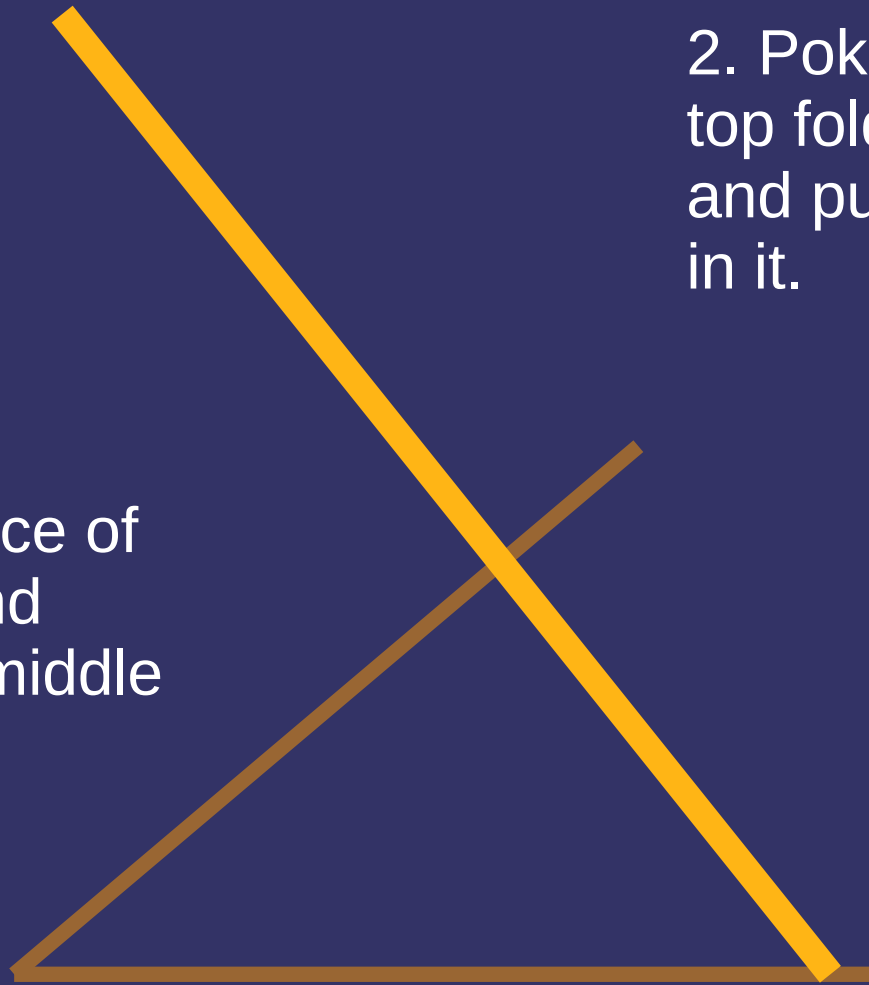
What happened?

- ➔ So what happened at 2:30AM on November 4, 2007?
- ➔ Nothing. That hour didn't exist.



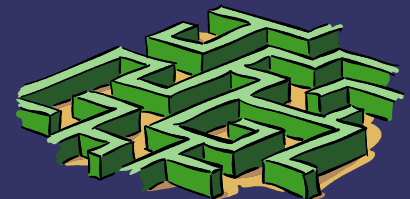
Construction of a Sundial

1. Take a piece of cardboard and fold it in the middle



2. Poke a hole in the top fold (near the top) and put the chopstick in it.

3. Tape the other end the chopstick to the bottom fold



Using the Sundial

- ➔ Put in the sun.
- ➔ Point the chopstick north.
- ➔ Read the shadow

Question: Does the sundial tell accurate time?
Will it match your watch?

