Bali

21 April 2005

Captain Soh Cah Toa's Math

Captain Nick

This is my neighbor relaxing before setting out his nets.

These girls are Ni Wayan's age. They live high above the shore towards Klungclun. Klungclun is named after the last King of Bali.

Listen up !

No Monkey Business In the Wheelhouse

Ok !

Copyright Declaration

Where-as the Laws of the Sea
are common to all who come upon her waters,
so also may this publication be reproduced
for home schooling; a Family Copy,
without further authorization.

The sheer joy of meeting my maker face to wind and
wave was payment enough to encourage all coming
generations and those here-with to learn
The Laws of the Sea.

Captain Soh Cah Toa's Math
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May 17, 2006

Copyright Extensions for Lessons 1-12 Pending

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Introduction

It is a warm day in Bali. Our two main characters are children. The boy is named I Wayan. The girl is named Ni Wayan. However, Wayan is not their family name. Wayan means first born in the language of Bali.

{I} represents the male gender in Bali.
{Ni} represents the female gender in Bali.

Thus it is that this first born brother & sister team are determined to go fishing out beyond the reef. Our story begins as the children wait for Captain Soh Cah Toa to arrive.

"I Wayan" is Pronounced **{Eye Why-an}**

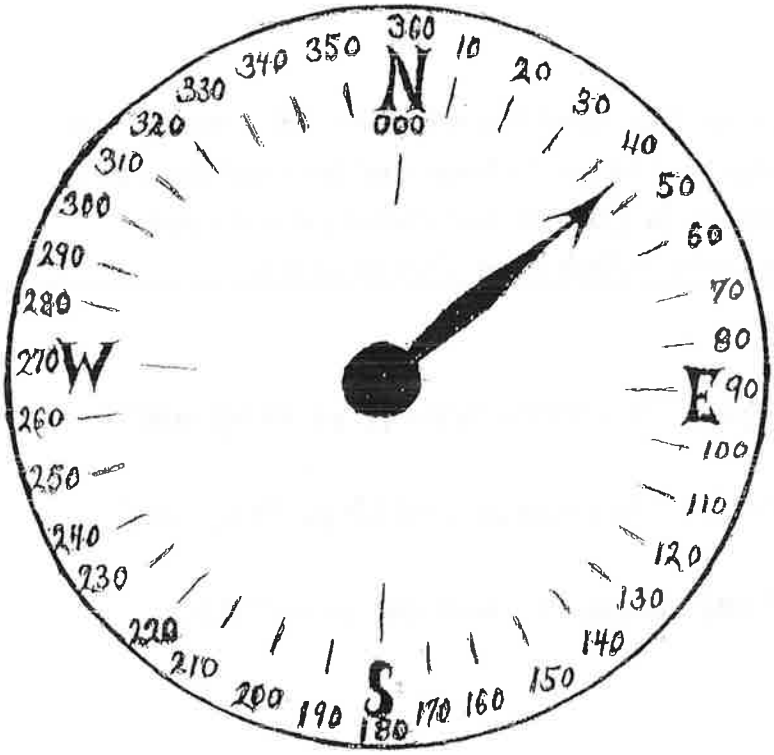
"Ni Wayan" is Pronounced **{Nye Why-an}**

The **{an}** sound is a soft **{a}** as in **"Ah!"**

Our Nautical Compass

000-Degrees North
090-Degrees East
180-Degrees South
270-Degrees West
360-Degrees North

North



West ***East***

South

Bali

21 April 2005 – 21 April 2010

Captain Soh Cah Toa's Math

By Captain Nick

"Look at that." Said the boy on the dock. *"That's the Captain's cat, Clock-talk. He's fishing."* Said his sister. Ni Wayan thought about it for a moment. Clock-talk sure looked as if he was fishing with his tail. *"He is just twitching his tail back and forth above the water, I Wayan." "He is almost asleep and about to get his tail bitten by a fish. That's for sure".* Ni Wayan and I Wayan are brother and sister. The children lived in the house that looked down on the dock where the Captain kept his boat. Their father built the outrigger that Captain Toa uses today. Captain Soh Cah Toa will sit and mend net with the children's father from time to time in the off season just to relax.

"Here comes Captain Toa." Said: Ni Wayan. *"Lets go visit with the Captain, I Wayan. He may take us fishing."!" "Biak !"* ***#1:** **"Good !"** said: I Wayan. With that the Captain's cat, Ni Wayan, and I Wayan strolled down the pier out to the Captain's boat.

"Salamat Pagi, Captain." ***#2:** **" Good Morning, Captain."** Said: Ni Wayan. *"Are you going fishing today ?"*

***#1: "Biak" {Pronounced: be -auk} & means "good" in Indonesian.**
***#2: "Salamat pagi" {Pronounced: sal-a-mat pa-gee} & means "Good morning" in Indonesian.**

Without another word spoken the Captain's cat jumped aboard the boat and walked between the Captain's legs with a purrrrr. Then, just like a thousand times before Clock-talk made his inspection tour for fish left on the deck. He would bat a fly if he saw one and send him on his way. As a matter of fact the Captain's cat was doing just that.

"Can you take us fishing ?" Said: I Wayan to Captain Soh Cah Toa as they stood on the deck. *"Well, come on back later this afternoon and we'll see what the weather is like."* Captain Toa knew he did not have enough fuel for a days fishing today. There was enough water and food. All he needed now was a call to the fuel dock, get the OK, warm the engines, and round the bend.

When Ni Wayan and I Wayan came back guess what they saw.

Clock-talk was asleep in the Captain's hat. The breeze was cool and the afternoon sun was warm. The Captain was sleeping on his nets. Nothing could be more relaxing than this thought I Wayan. *"Maybe the Captain would take them fishing tomorrow."* Being on the other side of the reef where the water is clear, is a nice a day of fishing. I Wayan and Ni Wayan's father would spearfish on the other side of the reef as well. I Wayan & Ni Wayan's family outrigger was fishing by net this month. *"Well, we cannot wake the Captain in the middle of his afternoon nap." "What are we going to do?"* Asked: I Wayan. *"We can wait. Remember how long it took the time the boat was up and dried for paint. It will never be that long again. Let's go home and see what's for dinner."* said: Ni Wayan. Off they went as happy as they could be.

It was not a half hour later when the Captain came a knocking at the door. ***"So you want to go fishing do ya ?????"***

"YAAAAAAAAAAAAAA!!!! YA! Ya!"

***#3: "Sama sama" {Pronounced: Saum-ma saum-ma} & Means: "You are most welcome" in Indonesian.**

"Well, we will be a leaving before the sun and I'm going to work ya to know your longitude and latitude mind you." "OK." Said: Ni Wayan. *"OK."* Said: I Wayan. *"OK."* Said: their mom. *"I'll walk them down to your boat around 06:00, well before sunrise."* Then the Captain made a swoop pointing his finger to the far right and high above his head and then to the far left and said: *"Now remember that's 180-degrees." "What you see from the land or from your boat to the sky as you look out of both eyes toward the horizon mind you." "Is how many degrees?" "180-degrees."* was sounded with a smile by both the children.. *"OK !":* He spouted as he went his way.

Early the next morning the children and their mom met the Captain at the boat. *"Salamat Pagi."* ***#2 "Good Morning"** Said: the Captain. *"Salamat Pagi."* ***#2 "Good Morning"** echoed with giggles sounding about as the Captain introduced his new puppy. *"Children, I look for planets and bright stars in morning's twilight." "Why ?"* Asked I Wayan. *"What you can see in the morning twilight to the West will be what you can see overhead the following evening around midnight on your way home. The sun, moon, planets, and stars appear to move across the sky at 15-Degrees an hour from the East to the West because the Earth spins on its axis from the West to the East. Some of this navigating by the sun and stars may be the most difficult math you'll ever learn. One thing for sure; it is in itself, a key to financial success."*

The Captain's cat was asleep in the Captain's hat again. The Captain's pup was asleep at the children's feet. The waves rippled against the hull. *"What time is it now Ni Wayan ?" "06:12 Captain." "She is right Captain. 12-Minutes after 6-O'clock and I'm sleepy."* Said: I Wayan with a yawn. *"Awhhhhhhhhhhhhhh." "Well the sun is almost up. I'll take care of the math and double-check the fuel & water. You two put your lunches & drinks below."*

***#2 "Salamat Pagi" {Pronounced: Sal-a-maut pa-gee} & means "Good Morning" in Indonesian.**

"Curl up below and when you wake up we will be ready to fish." *"Terima kasih,* Captain." *#3 ***"Thank you, Captain."*** *"I'm sleepy too." Said: Ni Wayan."* And off they went to sleep.

Sure enough the children were asleep as the sun rose. The captain stowed all his books and papers in the chart table draw, he began to dwell. *"Oh what would Captain Bowditch have to say?* How would he share a passage of time with these youngsters below? Out came the Captain's BOWDITCH Volume 1 & Volume 2. The children have just started to read. "*How can I make sense of all this? What will I say? What will I say? **'Cast the lines.'** That is what I'll say. But I'll wait a little while before I set to sea."* The Captain reviewed his books. The Captain always kept his books safe from storm and sea. He checked his water and fuel. He thought over his books. A few minutes went by, he started his engines. All was well. He thought as he brought in *his mooring lines and slowly headed seaward. "How should I start ? How can I make this more interesting for the children ? I know ! I will start with time".*

*"I'll start with the **Two Circles of Time."***

Real Earth Time or just **Real Time** is where you are on earth in relation to other physical objects or a **GPS Latitude & Longitude** position. Close to shore we can use a large building, school, factory smoke stacks, lights on antennas, mountains, shoreline, a lighthouse, or buoys to help us know where we are. Far away at sea we can use a **GPS Location** or a fix taken on the sun, moon, stars, & planets to help us know where we are.

Real Clock Time or just **Time** is when we observe a physical object or event at a specific Hour, Minute, & Second of a particular Calendar Year, Month, & Day.

*** Captain Bowditch: 1773-1838, Author "The American Practical Navigator"**
***#3 "Terima kasih" {Pronounced: Tear-e-ma ka-see} & means "Thank you" in Indonesian**

The Two Circles of Time

Real Earth Time

or

Real Time

Stars

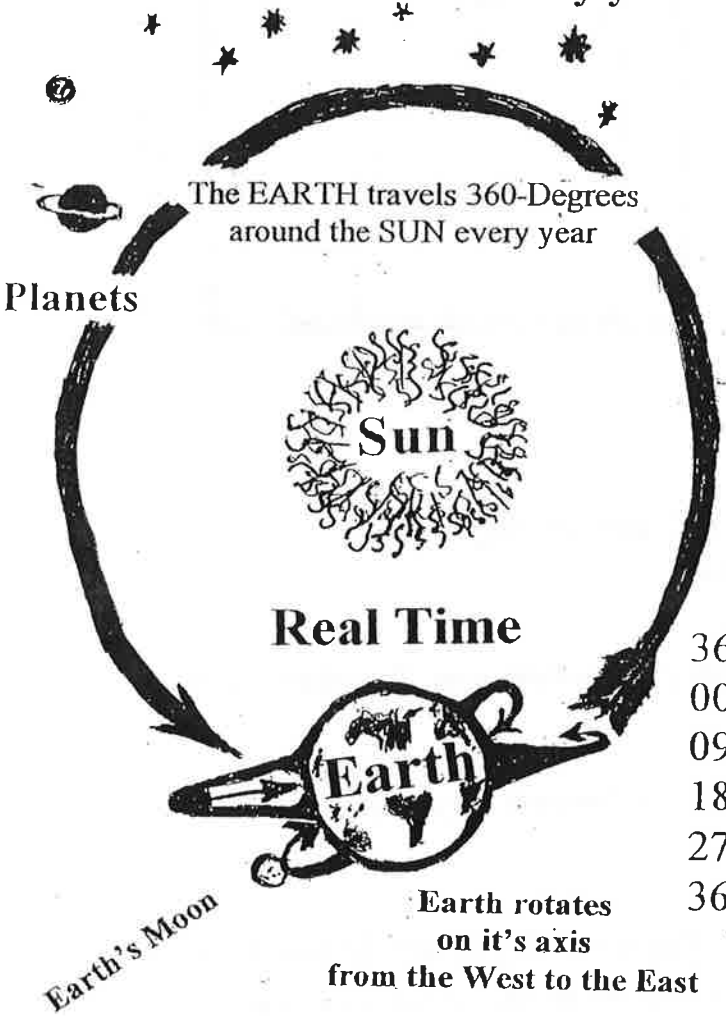
Real Clock Time

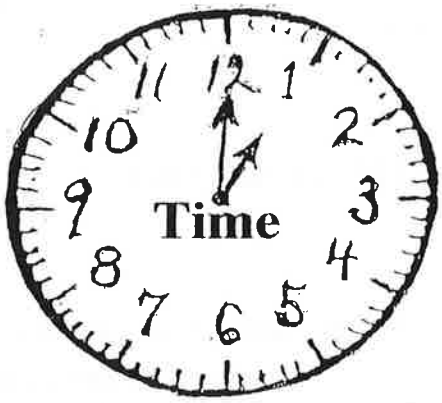
or

Time

The EARTH travels 360-Degrees around the SUN every year

12-Hours of Day
12-Hours of Night
24-Hours a Calendar Day
60-Minutes an Hour
60-Seconds a Minutes



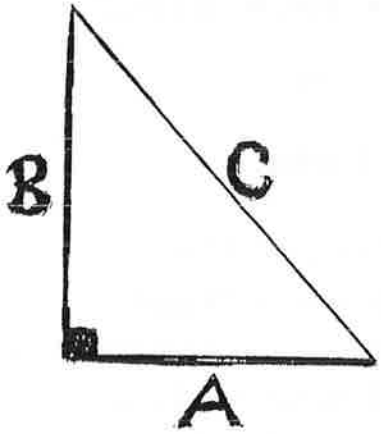


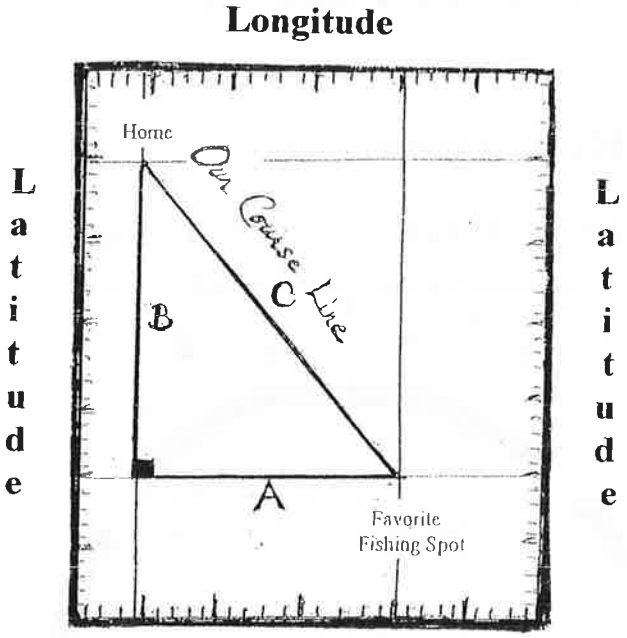
360-Degrees = North, Full Circle
000-Degrees = North, Beginning
090-Degrees = East or ¼ Circle
180-Degrees = South, ½ Circle
270-Degrees = West, ¾ Circle
360-Degrees = North, Full Circle

The EARTH rotates 360-Degrees on its axis every day

The MOON travels 360-Deg. around the EARTH every month

Then I'll show them the **Navigation Triangle: 1, 2, 3, & A, B, C**





1st "A" is Latitude

2nd "B" is Longitude

3rd "C" is our Course Line or Line of Sight to a Celestial Observation

I'll tell them the shortest distance between any 2-points is a Straight Line.

I'll tell them the shortest distance between any 3-points is a Triangle.

"I wonder when I Wayan & Ni Wayan will get up. It has been almost an hour @ 6 Knots. Starting from the inner reef on a Northeasterly course of 045 degrees true. Check the time: 08:36. Left the inner reef @ 07:36. We'll drop anchor over there. That puts us about here on the chart, 6 miles from home. I better wake them up. Hmmmmm. Well maybe I'll just take a nap as well."

Only 15-minutes later Captain Toa was asleep in his chair with his fishing pole in hand. The Captain's cat; Clock-talk, was in his lap. The puppy was asleep at his feet. The air was warm. The sun was elevated 30-degrees in the sky and the sky was a swirl of bright white & bright blue.

"Look, the Captain is asleep in his chair." Said: Ni Wayan. *"Well, let's catch some fish Ni Wayan."* And catch fish they did; one, two, three.

Captain Toa awoke to the happy sounds of children fishing. *"Ha!"* Said: the Captain. *"Look at all those fish."* "*We are doing OK."* Said: I Wayan. *"Well I'll go down and fix us some breakfast and you two keep catching the fish."*

After I Wayan caught the next fish he said: "That breakfast smells awfully good Ni Wayan." "Yes, Let's go see." Answered: Ni Wayan

They were as happy as they could be scampering up to the galley table. They sat silently breathing in the good smells of breakfast. Then the Captain started in. *"Let me show you some Celestial Navigation from as far as the eye can see into the stars where; { "A" Squared + "B" Squared = "C" Squared }.* And before he could finish both Ni Wayan and I Wayan were in tears.

The Captain turned off the stove. ***"What did I do ?"*** *"What did I do Ni Wayan ?" "I Wayan, talk to me." "I'm sorry, I'm sorry, I'm Sorry." "What did I do?"*

"I do not know what {"A" Squared } is. I just wanted to go fishing." came out of I Wayan's mouth with the taste of tear on his tongue. ***"Captain!"*** Said: Ni Wayan while wiping her eyes.

"OK ! I'll stop. I'm SORRY." And that's all that was said all the way through breakfast.

Not another word was spoken until I Wayan was done eating that is. Then I Wayan said: *"Ni Wayan would you like to go outside and go fishing?" "Yes I Wayan, I would like to go fishing." "OK, let's go."* Answered I Wayan.

The Captain did not move or say another word. He did not move until a familiar purrrr came from beneath the table. Clock-Talk and the Captain's puppy were rubbing up against his legs.

"What would I do without you two ?" He leaned over & lifted his puppy & his cat to his face and said: *"Terima kasih."* *#3**"Thank you"** *"Sucseme."* *#4**"Thank you"** *"Terima kasih"* *#3**"Thank you".**

Now what am I going to do? The Captain thought as he finished the dishes. *"Hmmm." "I am sorry I made the children cry."*

I'll just do what Captain Bowditch would do.
"Hmmmmmmmmmm." He grabbed his notebook from his desk and drew sketch after sketch and circle after circle as fast as he could. *"I better be careful. If I ruin their day I'll feel like a louse." "God, help me stay out of their way !"*

With all the dishes done & his notebook in his hand, up he went.
He tossed the notebook on the dashboard and gently sat.
Lifting his legs onto the nets he watched as the children fished.

They were whispering about nibbles as they waited. Whispering so the fish would not hear. And soon the Captain was asleep dreaming about a better way to say what he had to say. *"Hmmmmm.":* you could hear him thinking. *"Hmmmmmm."*

***#3: Terima kasih {Pronounced: tear-ee-ma Ka-see} means "Thank you in Indonesian**
***#4: Sucseme {Pronounced: Sooc-say-may} means "Thank you" in the language of Bali**

"Look at that. Here's where we are on the chart. See the little anchor he drew." ***"Ya! Each of the smallest segments of those markings to the right & left are Minutes of Latitude."***

"1-Minute of Latitude = 1-Nautical Mile."

What does that word {Tangent} mean ?" Asked: Sarah Jane. *"I don't know that either ! If we were home we could look it up in the dictionary."* Answered: Charlie. *"Look at that little triangle." "Look there is another triangle over there."* Sounded: Charlie. *"What is all the writing about Charlie ?" "I do not know." "But it must be something about the chart." "If you want to we can ask the Captain when he wakes up." "Let's fish, Sarah Jane." "I do not want to cry anymore."*

"I just want to grow up and understand what ever the Captain is talking about." "Me too, Sarah Jane !" "Do you want to study the Captain's notebook for a little while, Charlie ?" "Yes!" Answered: Charlie. *"I do"*

At the same time that Sarah Jane and Charlie were studying the Captain was dreaming about how he was going to explain Time and Celestial Navigation to Charlie and Sarah Jane.

"I must keep this simple," he thought. *"I'll start with a circle again. Then I'll show the children why we have 12 Hours, 60-Minutes, & 60-Seconds in ever 24-Hours Calendar Day."*

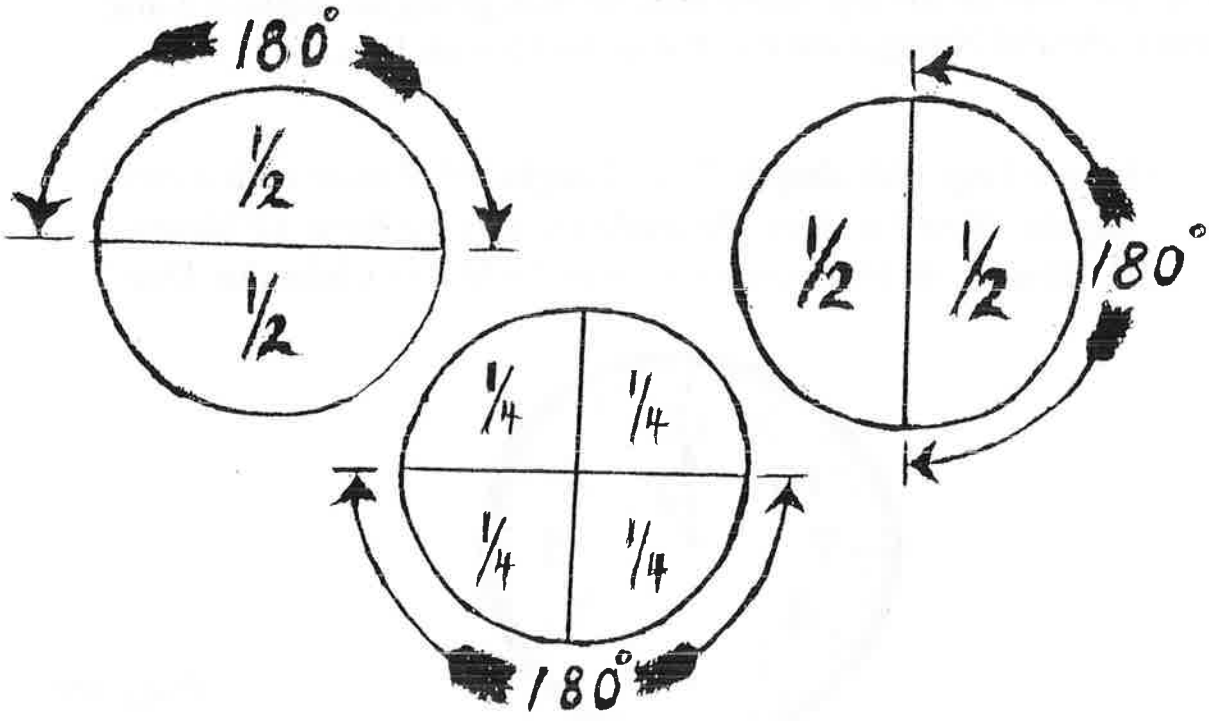
"Yes, I'll start with a circle."

"Go ahead."
"Jump through the circle."
"Roll the circle back and forth."
"Jump through that circle again."
"Now, we can study a paper circle."

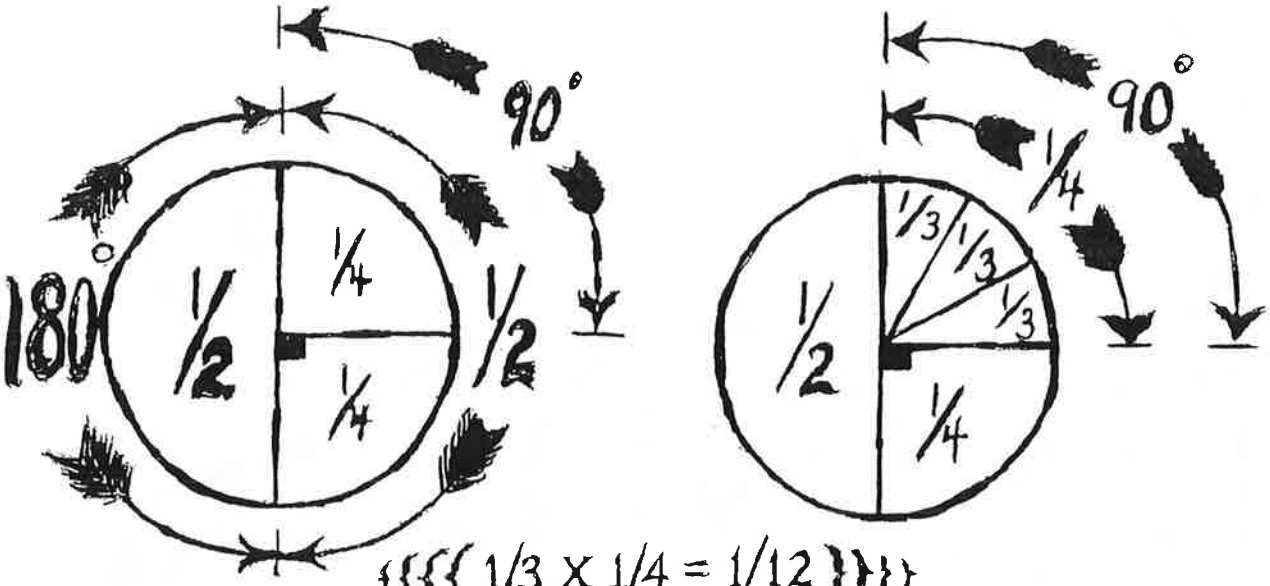
Now, we can ride the sea of Math.

We will first divide a paper circle by 1/2s to find 1/4s. Then we will divide the 1/4s by 1/3s to find the 12-Hours on the face of the clock. Then we divide those 12-Hour sections by 1/5th to find the 60-Minutes & 60-Seconds of every 24-Hour Calendar Day.

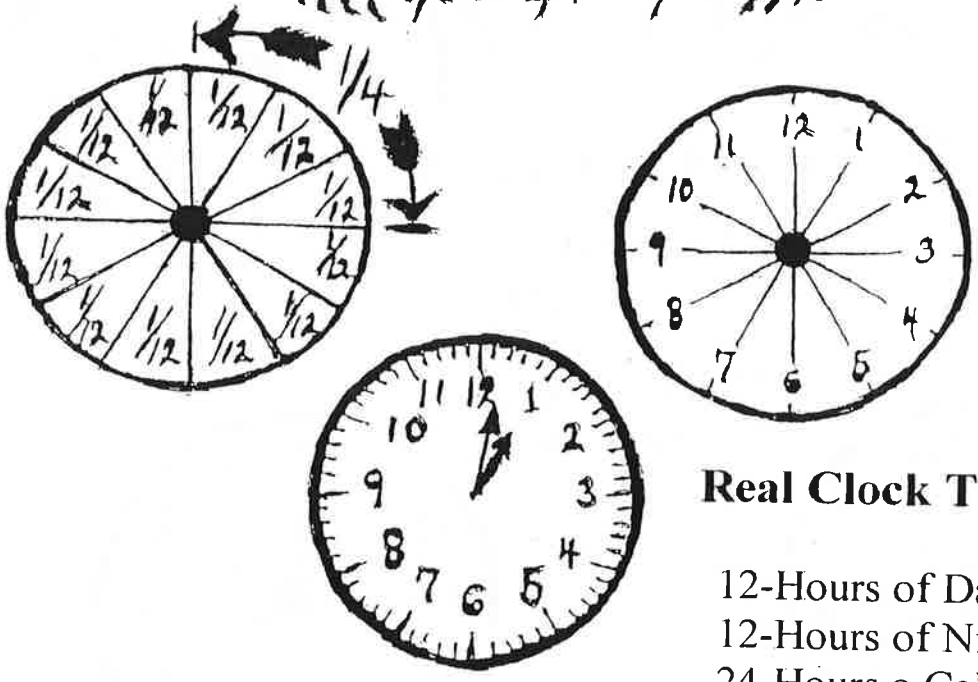
The Captain rested. He closed his eyes. He took a deep breath. The Captain was taking his time not to speak out of turn:
"Charlie and Sarah Jane did you know ½ of ½ is a ¼ ?"



Now we divide each Quarter ¼ by 1/3 to get the 12 Hours of Day



{{{(1/3 X 1/4 = 1/12)}}}

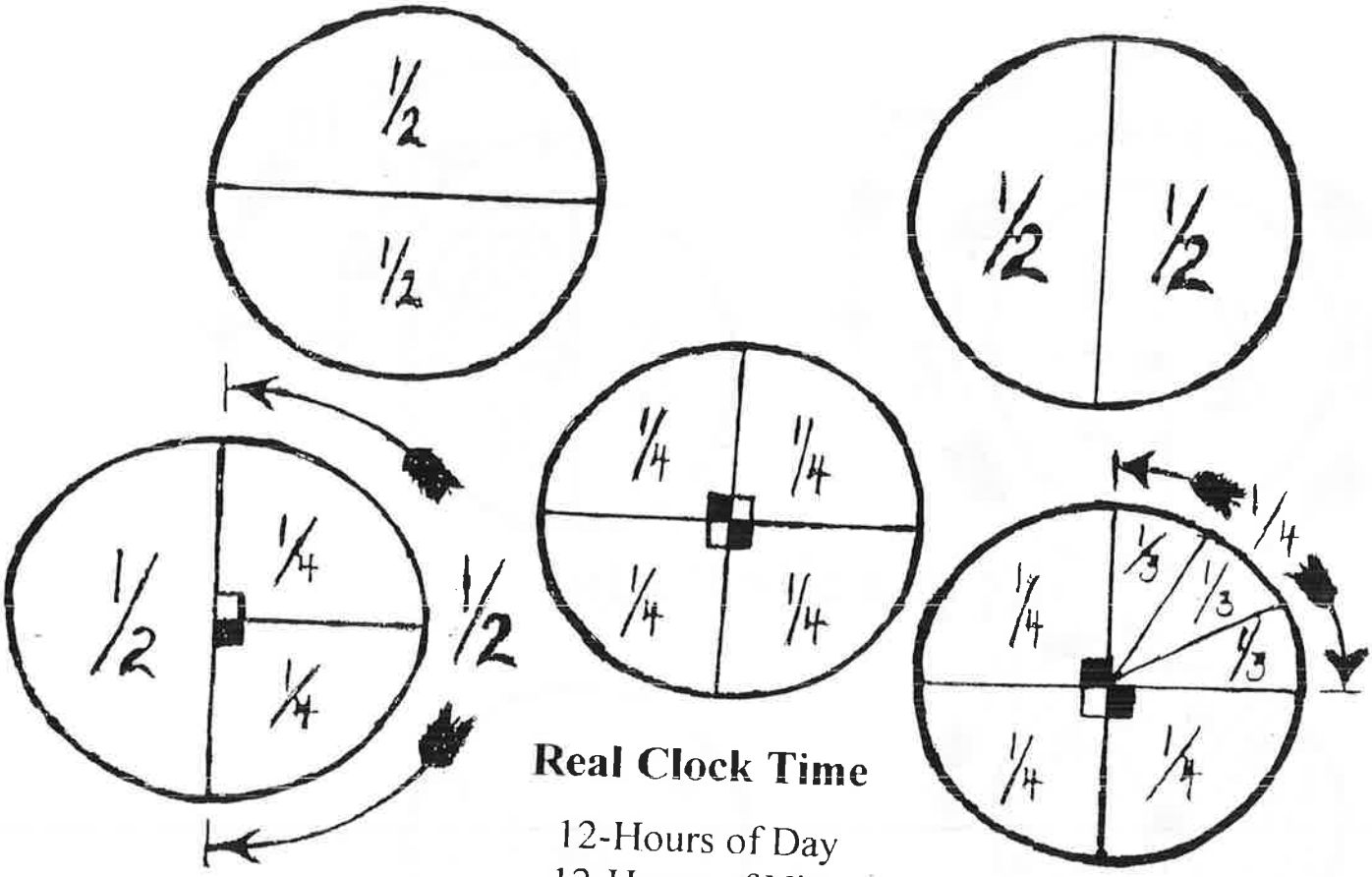


Real Clock Time

12-Hours of Day
12-Hours of Night
24-Hours a Calendar Day
60-Minutes an Hour
60-Seconds a Minute

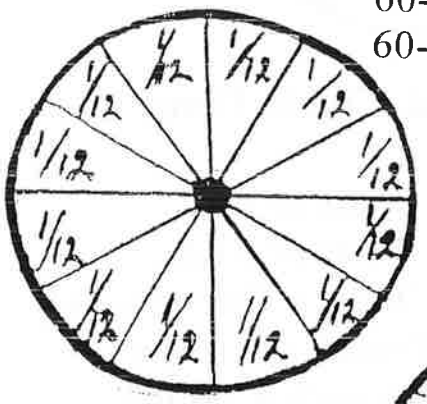
"I think I understand it."
Said: Ni Wayan.

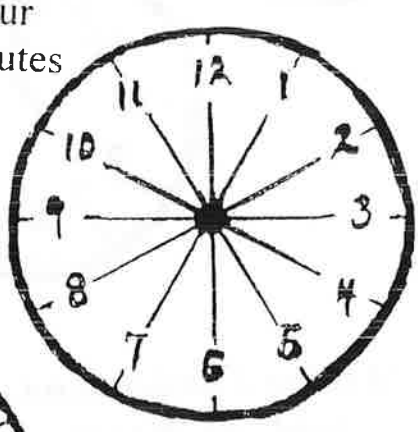
Once again, the 12 Hours of Day and the 12 Hours of Night.

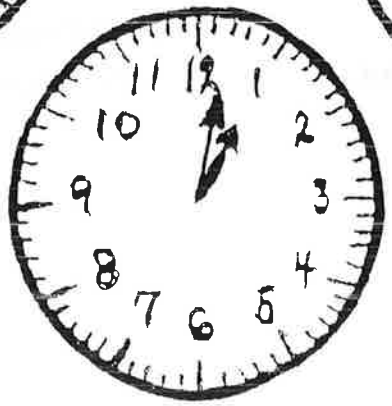


Real Clock Time

12-Hours of Day
12-Hours of Night
24-Hours a Calendar Day
60-Minutes an Hour
60-Seconds a Minutes

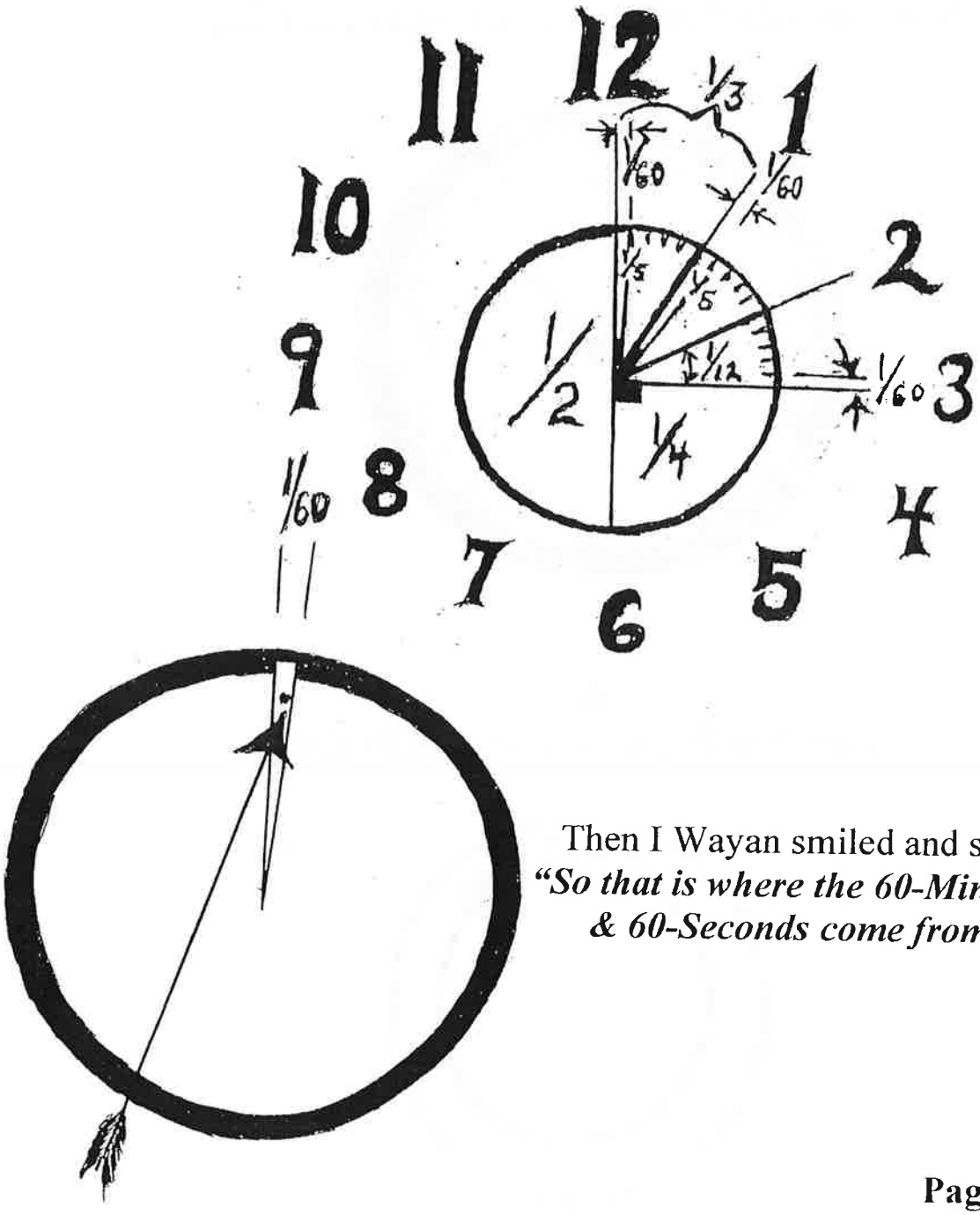






Now we divide those 12-Hour sections by 1/5 to find the 60-minute and 60-second portion of time.

{{{ 1/12th Divided by 1/5th = 1/60th }}}

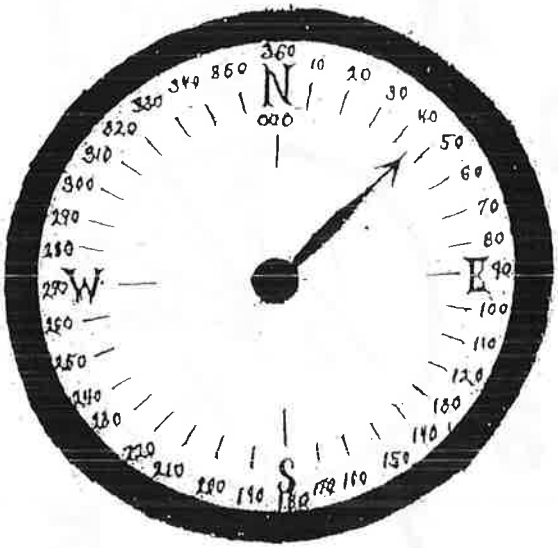


Then I Wayan smiled and said:
"So that is where the 60-Minutes & 60-Seconds come from."

What do you think happens when we divide the 60-Minute & 60-Second sections by {1/6th} ?

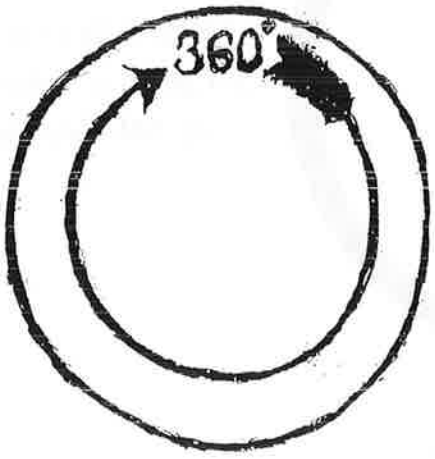
{{{ 1/60th x 1/6th = 1/360th }}}

We find the 360-Degrees of our Nautical Compass



&

The 360-Degrees of the CIRCLE

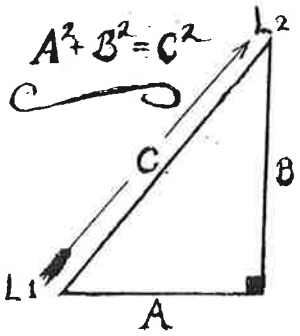


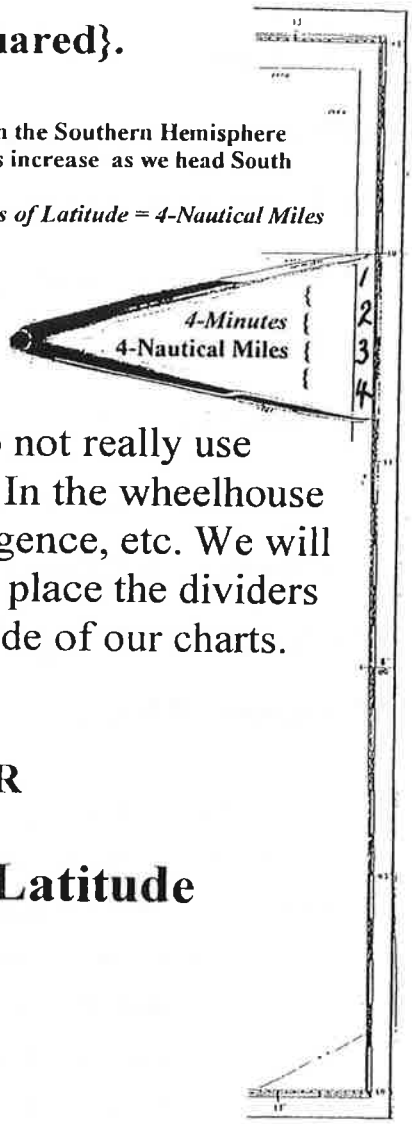
Captain Toa started to draw sketch after sketch.

The children are old enough to know **Pythagorean Theorem . Pythagoras** was born in 580 BC. That was 2587 years ago. Knowledge in the right hands lasts a forever. This is knowledge in your hands children. You do **NOT** have to understand **WHY** Pythagorean Theorem works to trust it and use it as you grow-up.

$$\{A^2 + B^2 = C^2\}$$

{"A" Squared + "B" Squared = "C" Squared}.





Children this part is quick and easy. We do not really use Pythagorean Theory in the wheelhouse per-say. In the wheelhouse we use calculators, radar, GPS, electronic intelligence, etc. We will also measure a distance with our dividers. Then place the dividers on the minutes of latitude to the left or right side of our charts.

The
COMMON DENOMINATOR
at sea is

1-Nautical Mile = 1-Minute of Latitude

L1 is our Departure Point.

L 2 is on our Arrival or Destination Point.

■ = 90-Degree Angle

Then Captain Toa smiled and thought:
"That should make the children happy."

Still the Captain Thought: *"There are so many wonderful things for the children to know ! **360-Degress** is the highest number we use for directions; **North, South, East,** or **West**. Hmmmmmmm !"*

Children, there are:

360-Degrees to a Compass

180-Degrees of East Longitude,

180-Degrees of West Longitude,

180-Degrees within a Right Triangle

90-Degrees of North Latitude

90-Degrees of South Latitude

90-Degrees in a Right Angle

60-Minutes to the Hour

60-Seconds to the Minute

24-Hours to a Calendar Day,

12-Hours of Daylight

12-Hours of Night

And with every Passage of Time the Universe Turns.
We take a sight on whatever part of our surroundings we can and keep a record of the **Time** on **Charts** and in our **Ship's Log**.
I'll show them some diagrams and leave it at that.
"That was quick." Said the Captain to himself.
"I will keep this simple." Thought the Captain.
"The children are happy now. I will let them fish and stay happy."

"I must keep my place and let the children learn as they grow."

Children, I really do want you to learn all about the

Two Circles of Time.

Real Earth Time or just **Real Time** is what you see around you. Stay alert & safe.

Real Clock Time or just **Time** is when you see something or do something explained in Hours, Minutes, & Seconds of a Calendar Day. On ships we always write the time of an entry in the ship's log. This is a good starting place for you two. Always know where you are & keep track of the time.

Later on you can learn how the **Right Triangle** connects the **Two Circles of Time** on **Charts** in what we call the **Navigation Triangle**. Why, one day you may even learn **Great Circle Sailing.** Then you will understand where my name came from. My name ! Hmmmmmm!

"Captain Soh Cah Toa"

But, not now. Not now while I am dreaming. No more tears on my watch, thought the Captain. The Captain was sound asleep and smiling. The day was calm. The waves rippled against the hull. The breeze was gentle and warm. The fish were biting. The children were happy. The Captain could not be more comfortable. The Captain's cat; Clock-talk, was asleep in the Captain's lap. The Captain's puppy was asleep in the shade under the Captain's chair.

"Captain!" "Wake up!" "Captain" "Wake up a storm is coming!" Sarah Jane was on his right shoulder and Charlie was on his left arm. ***"Captain" " A storm is coming." "Captain" "Wake up a storm in coming."*** Well sure enough, as the Captain woke he saw a black squall with thunder and lightening headed their way. ***"We best be heading home."*** Said: the Captain.

"On with the motor and up with the anchor." Hailed the Captain. *"We will be home before the squall comes this far. It may just miss the Island all together."* Said: the Captain. Sure enough, the squall did miss the island. It was a smooth ride back home. The children played with Clock-talk and the Captain's new puppy all the way home.

When they arrived at the dock safe and sound, there was Ni Wayan & I Wayan's mother waiting at the dock. She greeted the children & Captain saying: *"How are you ?"* The children jumped up and down saying: *"Oh Mom we had so much fun & look at all the fish we caught."*

After the Captain had checked the mooring lines and engine, Captain Soh Cah Toa said: *"Another time we will talk some more."* *"Thank you." Answered both Charlie and Sarah Jane. "See you later."* Said: Sarah Jane to the Captain." *"Thank you !" "See you tomorrow !" "Good by !" "See you later !"* Said: Sarah Jane to the Captain.

" See you tomorrow !"

"Good by !"

"See you later !"

Answered: Captain Soh Cah Toa

On their way home I Wayan looked to his sister and said:
"The Captain once told me that navigating by the stars or sun is like holding one of those small plastic triangles up to the sky and counting how many degrees the stars or sun are above the horizon." "I almost know what the Captain means," Smiled Ni Wayan. *"Then you use the time and angle you wrote down. Using them with other books to find out if you are where you think you are on the chart." "Latitudes stretch East & West."*
"Longitudes stretch North & South."

"You are smart, Ni Wayan." "You are smart too, I Wayan,"
"We will understand all that one day." "Yes, we will !"

The children were relaxed and happy as they
continued their way home."

The End

"Terima Kashi !" ***#3** 'Thank you !"
"Sucseme !" ***#4** "Thank you !"
"Salamat jalan !"* **#8** "Good by !"
"Samui jumpa nanti !"* **#6** "See you later !"
"Sama Sama !" ***#9** "You are most welcome !"

Captain Nick

The End

Glossary
Upper Grades
Great Circle Sailing

Lat.: An abbreviation for Latitude.

Long.: An abbreviation for Longitude.

Latitude: Adapted K.I.S.S. Explanation: Keep It Simple Sailor.
A charting system starting on the Equator with 90 equal horizontal segments to the North; North Latitudes, and 90 equal horizontal segments to the South: South latitudes.

Longitude: Adapted K.I.S.S. Explination: Keep It Simple Sailor.
A charting system starting in Greenwich, England with 180 equal vertical segments to the West; West Longitudes, and 180 equal vertical segments to the East; East Longitudes.

Nautical: Adapted K.I.S.S Explanation: Keep It Simple Sailor.
Having to do with vessels and navigation.

Pythagorean Theory: Adapted K.I.S.S. Explination; Keep It Simple Sailor.
$A^2 + B^2 = C^2$ A formula for solving the distance of C, when both A + B distances are known to be the legs of a 90-Degree Right Triangle.

Off the Books, a Note from Capt. Nick:

Where as Pythagoras is also the father of our modern Deck of Cards with 4-Kingdoms supported with the numbers 1 through 10 abridged with providing us the precursor to our modern navigation principals in Great Circle Sailing; Sine, Cosine, and Tangent. I must make note that using Pythagorean Theory in the wheelhouse to determine a course distance underway is as time-consuming and as distracting as a deck of playing cards occupying the Navigation Watch in a game of chance, while a greater diligence to the ship's navigation is required.

Glossary
Upper Grades
Great Circle Sailing

Triangle: Adapted K.I.S.S. Explanation: Keep It Simple Sailor.
A triangle is a 3-sided object.

Navigation Triangle referred to in our studies as the triangle where A = Latitude, B = Longitude, and C = Our Course Line or a Line of Sight Celestial Observation where A and B connect at a 90-Degree Angle. **Also** a flat clear plastic navigation aid with 180-Degrees etched around the A & B sides of the flat navigation tool; also having a 90-Degree corner at the center where A & B meet.

Right Triangle: A triangle with a 90-Degree Angle with-in.

Vertical: Adapted K.I.S.S. Explanation; Keep It Simple Sailor.
Up and down in appearance, having the appearance of a telephone pole, upright in a vertical stance, straight, standing tall.

Glossary

The Names of our main Characters

Captain Soh Cah Toa: Is a mythical Asian-Malaysian Captain who loved children. His name stands for the advanced mathematical combinations of **1-Angle** {Either **L1** or **L2**} and **2-Sides** of the **Navigation Triangle.**

Soh means: **S**ine Angle = **O**pposite Side divided by the **H**ypotenuse.
Cah means: **C**osine Angle = **A**djacent Side divided by the **H**ypotenuse.
Toa means: **T**angent Angle = **O**pposite Side divided by the **A**djacent Side.

I Wayan means: The name given to the "First born Son" in the language of Bali. **"I Wayan"** is Pronounced **{Eye Why-an}**

Ni Wayan means: The name given to the "First born Daughter" in the language of Bali. **"Ni Wayan"** is Pronounced **{Nye Why-an}**

Foreign Languages spoken by the Children, Captain, & Author.

#1: "Biak" {Pronounced: bee-auk} & Means: "Good" in Indonesian.

#2: "Salamat pagi" {Pronounced: Sal-a-maut pa-gee}
& Means: "Good Morning" in Indonesian
#3: "Terima kasih" {Pronounced: Tear-ee-ma ka-see}
& Means: "Thank you" in Indonesian
#4: "Sukseme" {Pronounced: Sook-say-may}
& Means: "Thank you" in the language of Bali
#5: "Apa kabar" {pronounced: Ah-pa ka-bar}
& Means: "How are you" in Indonesian
#6: "Sampui jumpa nanti" {Pronounced: Sam-poo-ee hum-pa nan-tee}
& Means: "See you later" in Indonesian
#7: "Sampui jumpa bestok" {Pronounced: Sam-poo-ee hum-pa bes-tauk}
& Means: "See you tomorrow" in Indonesian
#8: "Salamat jalan" {Pronounced: Sal-a-maut ha-lan}
& Means: "Good by" in Indonesian
#9: "Sama sama" {Pronounced: Saum-ma saum-ma}
& Means: "You are most welcome" in Indonesian

Credits:

#1: **Navigation Rules**
{International – Inland}
U.S. Department of Transportation
United States Coast Guard
2100 Second Street
Washington, D.C. 20593-0001

#2: **The American Practical Navigator**
Originally by Nathaniel Bowditch
1773-1838, Born Salem Mass.
National Imagery and Mapping Agency
Lighthouse Press, Annapolis, MD

#3: **Pub. No 229, Vol. 1**
Sight Reduction Tables for Marine Navigation
Defense Mapping Agency
Hydrographic / Topographical Center
Washington, DC

#4: **The Nautical Almanac**

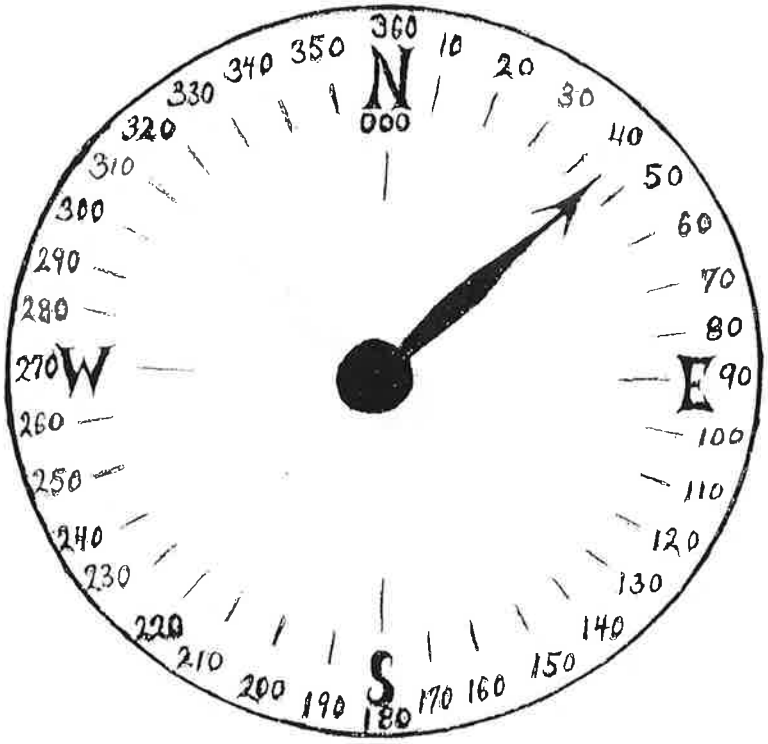
Washington	London
US Naval Observatory	Her Majesty's
Secretary of Defense	Secretary of State for Defense

#5: **Pub. 143, Sailing Directions {Enroute}**
Revised through: Notice to Mariners
Lighthouse Press
Annapolis, MD

#6 **United Kingdom Hydrographic Office**
Admiralty Way, Taunton, Summerset
TA9 4EX United Kingdom

#7 American Maritime Officer's Union & RTM STAR Center
2 West Dixie Highway, Dania Beach, Florida, 33408
Captain Joe Lobo's, Deck License Program
www.uscgexam.com

"Test Time"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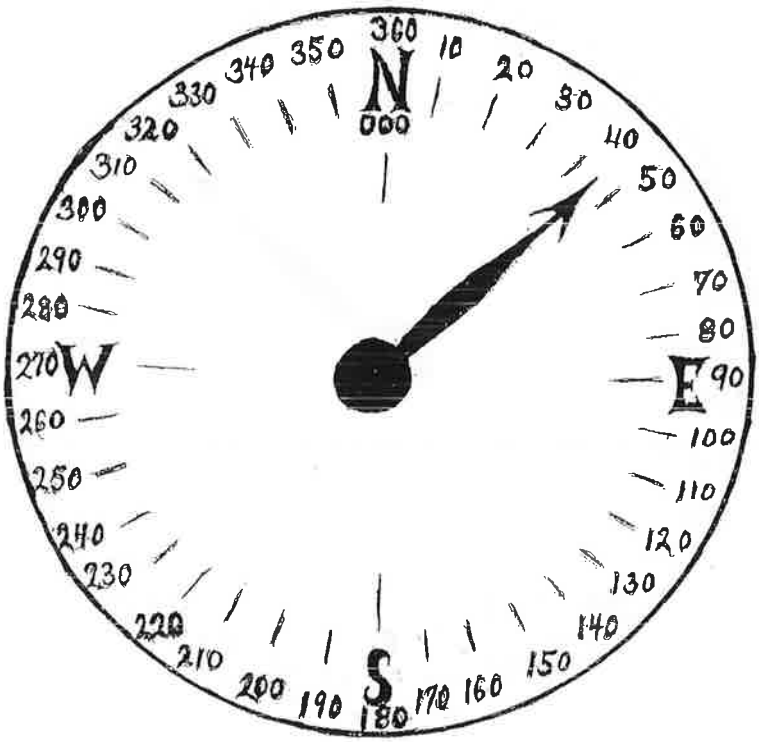
"Test Time"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Two Boats School, Pre-Readers Test

After a complete reading of "Captain Soh Cah Toa's Math", Bali 2005

Student's Name: _____ Grade in school: _____
Test score after being read to: _____

3- Multiple Choice Questions

#1: What was the name of the Captain's cat ?

A. 4-Paws
B. Whiskers ***Answer _____***
C. Clock-talk

#2: Where did the children want to go ?

A. Fishing
B. Mountain Climbing ***Answer _____***
C. To the city

#3: True or False: The Two Circles of Time are as follows:

***Real Earth Time** has rivers, lakes, oceans, seas, stars, planets, moons, sun, trees that grow, Moms & Dads, homes, roads, schools, stores, and people like you, & me.*

***Real Clock Time** has seconds, minutes, and hours in a specific calendar day.*

True _____ False _____

Two Boats School, Pre-Readers Test

{ ANSWERS }

3- Multiple Choice Questions

#1: What was the name of the Captain's cat ?

A. 4-Paws

B. Whiskers **{{ C. Clock-talk }}**

C. Clock-talk

#2: Where did the children want to go?

A. Fishing

B. Mountain Climbing **{{ A. Fishing }}**

C. To the city

#3: True or False: The Two Circles of Time are as follows:

***Real Earth Time** has rivers, lakes, oceans, seas, stars, planets, moons, sun, trees that grow, Moms & Dads, homes, roads, schools, stores, and people like you, & me.*

***Real Clock Time** has seconds, minutes, and hours in a specific calendar day.*

{{ True }}

Student's Name: _____

Date: _____
Grade in School: _____
Pre-Study Test-Grade: _____
After-Study Test-Grade: _____

Two Boats School
Early Grades Test

After a complete reading of "Captain Soh Cah Toa's Math", Bali 2005

#1: How many hours are there on the face of a Clock ?
Answer: _____ Hours

#2: How many hours are there in a whole day ?
Answer: _____ Hours

#3: How many minutes are there in an hour ?
Answer: _____ Minutes

#4: How many seconds are there in a minute ?
Answer: _____ Seconds

Student's Name: _____

Date: _____
Grade in School: _____
Pre-Study Test-Grade: _____
After-Study Test-Grade: _____

Two Boats School
Early Grades Test

{ ANSWERS }

#1: How many hours are there on the face of a Clock ?
Answer: 12 Hours

#2: How many hours are there in a whole day ?
Answer: 24 Hours

#3: How many minutes are there in an hour ?
Answer: 60 Minutes

#4: How many seconds are there in a minute ?
Answer: 60 Seconds

Two Boats School – Two Circles of Time

Student's Name: _____

1, 2, 3, & A, B, C Date: _____

Daily Test

Grade in School: _____
Previous Test Score: _____
Today's Test Score: _____

A = _____ **on Charts**

B = _____ **on Charts**

C = _____ **on Charts**

_____ **in Celestial Navigation**

The shortest distance between any 2-Points is a _____.

The shortest distance between any 3-points is a _____.

Two Boats School – Two Circles of Time

1, 2, 3, & A, B, C

Daily Test

{ ANSWERS }

A = *Latitude* **on Charts**

B = *Longitude* **on Charts**

C = *Course Line* **on Charts**

Line of Sight Observation **in Celestial Navigation**

The shortest distance between any 2-Points is a *Straight Line*.

"We steer in a straight line to save time and fuel."

The shortest distance between any 3-points is a *Triangle*.

"With 2-known factors in a navigation triangle we can find a much needed third factor." "Remember: Common Sense saves time & lives."

Two Boats School, Short Story Test

After a complete reading of "Captain Soh Cah Toa's Math", Bali 2005

Student's Name: _____ **Grade in school:** _____

Test Score Before Reading: _____

Test Score After Reading: _____

Middle Grades Test

#1: How many hours in a full calendar day ? _____

#2: How many minutes in an hour ? _____

#3: How many seconds in a minute ? _____

#4: How many degrees in a circle or a compass ? _____

#5: How many degrees in a 3/4th circle or West ? _____

#6: How many degrees in a 1/2 circle or South ? _____

#7: How many degrees in a 1/4 circle or East ? _____

#8: How many degrees of North Latitude are there ? _____

#9: How many degrees of South Latitude are there ? _____

#10: How many degrees of West Longitude are there ? _____

#11: How many degrees of East Longitude are there ? _____

#12: How many degrees in our nautical compass ? _____

Test Score _____

Two Boats School, Short Story Test Ans.

After a complete reading of "Captain Soh Cah Toa's Math", Bali 2005

Middle Grades Test

{ ANSWERS }

#1: How many hours in a full calendar day ?	24
#2: How many minutes in an hour ?	60
#3: How many seconds in a minute ?	60
#4: How many degrees in a circle or a compass ?	360
#5: How many degrees in a $3/4^{th}$ circle or West ?	270
#6: How many degrees in a 1/2 circle or South ?	180
#7: How many degrees in a 1/4 circle or East ?	90
#8: How many degrees of North Latitude are there ?	90
#9: How many degrees of South Latitude are there ?	90
#10: How many degrees of West Longitude are there ?	180
#11: How many degrees of East Longitude are there ?	180
#12: How many degrees in our nautical compass ?	360

Two Boats School, Upper Grades Test

Student's Name: _____
Date: _____
Grade in School: _____
Lesson #2 Grade: _____
Lesson #3 Grade: _____

How many degrees are there in the following ?

#1: North = _____

#2: East = _____

#3: South = _____

#4: West = _____

#5: North-East = _____ **{[000-degrees + 90-degrees] / 2} = 45-degrees**

#6: South-East = _____ **{[180-degrees + 90-degrees] / 2} = 135-degrees**

#7: South-West = _____ **{[180-degrees + 270-degrees] / 2} = 225-degrees**

#8: North-West = _____ **{[360-degrees + 270-degrees] / 2} = 315-degrees**

#9: Write out Pythagorean Theorem. _____

#10: How many degrees are there in a Right Triangle ? _____

#11: Every Right Triangle has a certain kind of angle in it.
That particular angle is always a _____.

#12: There are how many degrees in a circle ? _____

#13: 1-Nautical Mile is = to _____ of Latitude ?

#14: To take a celestial observation.
You, measure the celestial objects _____ above the _____.

#15: Numerically Latitudes run _____ & _____.

#16: Numerically Longitudes run _____ & _____ .

#17: There are how many degrees of Lat. ? _____ ***-North*** & _____ ***-South***.

#18: There are how many degrees of Long ? _____ ***-East*** & _____ ***-West.***

#19: Vertical lines on a chart stretching N. & S. {like this  } are: _____

#20: Horizontal lines on a chart stretching E. & W. {like this  } are: _____

Two Boats School, Upper Grades Test {ANSWERS}

How many degrees are there in the following ?

#1: North = ***360-degees or 000-degrees***

#2: East = ***90-degrees***

#3: South = ***180-degrees***

{ Answers }

#4: West = ***270-degrees***

#5: North-East = ***45-degrees*** **{[000-degrees + 90-degrees] / 2} = 45-degrees**

#6: South-East = ***135-degrees*** **{[180-degrees + 90-degrees] / 2} = 135-degrees**

#7: South-West = ***225-degrees*** **{[180-degrees + 270-degrees] / 2} = 225-degrees**

#8: North-West = ***315-degrees*** **{[360-degrees + 270-degrees] / 2} = 315-degrees**

#9: Write out Pythagorean Theorem . $\{A^2 + B^2 = C^2\}$

#10: How many degrees are there in a Right Triangle ? ***180-degrees***

#11: Every Right Triangle has a certain kind of angle in it.
That particular angle is always a ***{90-degree angle}*** .

#12: There are how many degrees in a circle ? ***{360-degrees}***

#13: 1-Nautical Mile is = to ***{1-Minute of}*** Latitude.

#14: To take a celestial observation. ***Angle***
You, measure the celestial objects - ***Height*** - above the - ***Horizon*** -

#15: Numerically Latitudes run - ***North*** - & - ***South*** - .

#16: Numerically Longitudes run -***East*** - & - ***West*** - .

#17: There are how many degrees of Lat. ? ***{90-degrees South}*** & ***{90-degrees North}***

#18: There are how many degrees of Long ? ***{180-degrees East}*** & ***{180-degrees West}***

#19: Vertical lines on a chart stretching N. & S. {like this  } are: ***Longitudes .***

#20: Horizontal lines on a chart stretching E. & W. {like this  } are: ***Latitudes.***

Simplified Text Follow-up Discussion

First the desired "Quick Answer"

"They are mathematically compatible."

Does anyone want to tell me why hours, latitudes, and longitudes have 60-minutes that also have 60-seconds ? Why do we have clocks & watches with 12-hours on the face of a 24-hour day, 360-Degrees in a Compass, 180-Degrees East Longitude, 180-Degrees West Longitude, 180-Degrees in a Right Triangle, 90-Degrees North Latitude, 90-Degrees South Latitude, and 90-Degrees to a Right Angle ?

Desired "Quick Answer":

"They are mathematically compatible".

We have set sails for an adventure in time on the Sea of Math. Welcome aboard !

Off the Books, a note from Captain Nick

"I want you students to relax for a minute.
*That number **360** is as high as we are going to go."*

"Now, looking at one hand with 4-fingers and a thumb I agree;
*counting to **360** on one hand would not be much fun."*

"That is why we are memorizing the mathematically compatible numbers with-n the Two Circles of Time:

"You remember; we started with a paper circle and made it into 2-halves. Then we took the 2-halves and made them into 4-quarters. Then we took each quarter by thirds to reach the 12-hours of day and the 12-hours of night. Then we took the 12-hours of day and night by fifths to reach the 60-minutes and 60-seconds of every hour. Then we divided the 60-second/minute sections by a sixth to reach the 360-degrees of our Nautical Compass.
Then we combined the Two Circles of Time with a 90-Degree Right Triangle so that we can see beyond the horizon and plan ahead traveling oceans, rivers and seas North: 360 or 000, North-East: 045, East: 090, South-East 135, South: 180, South-West: 225, West: 270, North-West: 315, and North again: 360 or 000-Degrees."

Where-ever we navigate,
the largest whole number we are going to use is

360

We will stay with-in the 360-Degrees of our Nautical Compass.

Glossary Test

Summa Cum Laude – Advanced Students Only

Match the Letter with the Number

#1: "Biak"	____	**A** "Thank you" in the language of Bali
#2: "Salamat pagi"	____	**B** "How are you" in Indonesian
#3: "Sama sama"	____	**C** "See you later" in Indonesian
#4: "Terima kasih"	____	**D** **T**angent Angle = **O**pposite Side divided by the **A**djacent Side.
#5: Sukseme"	____	**E** "Good" in Indonesian.
#6: "Apa kabar"	____	**F** "Good Morning" in Indonesian
#7: "Sampui jumpa nanti"	____	**G** "You are most welcome" in Indonesian
#8: "Sampui jumpa bestok"	____	**H** **C**osine Angle = **A**djacent Side divided by the **H**ypotenuse.
#9: "Salamat jalan"	____	**I** **S**ine Angle = **O**pposite Side divided by the **H**ypotenuse.
#10: Pythagoras:	____	**J** "First born Daughter" in Bali.
#11: Captain Soh Cah Toa:	____	**K** 1773-1838, Born: Salem, MA "The American Practical Navigator"
#12: Soh	____	**L** "First born Son" in Bali.
#13: Cah	____	**M** "See you tomorrow" in Indonesian
#14: Toa	____	**N** "Thank you" in Indonesian
#15: I Wayan	____	**O** "Good by" in Indonesian
#16: Ni Wayan	____	**P** 580 B.C., Ancient Greek, $A^2 + B^2 = C^2$
#17: Nathaniel Bowditch:	____	**Q** His name represents the Angles & Sides of a Right Triangle when interacting in functions of Higher Math or Trigonometry.

Glossary Test {ANSWERS}

Summa Cum Laude – Advanced Students Only

Match the Letter with the Number

#1: "Biak" = **E**

#2: "Salamat pagi" = **F**

#3: "Sama sama" = **G**

#4: "Terima kasih" = **N**

#5: Sukseme" = **A**

#6: "Apa kabar" =**B**

#7: "Sampui jumpa nanti" = **C**

#8: "Sampui jumpa bestok" = **P**

#9: "Salamat jalan" = **O**

#10: Pythagoras = **M**

#11: Captain Soh Cah Toa = **Q**

#12: Soh = **I**

#13: Cah = **H**

#14: Toa = **D**

#15: I Wayan = **L**

#16: Ni Wayan = **J**

#17: Nathaniel Bowditch: #17 = **K**

5 = **A** "Thank you" in the language of Bali

6 = **B** "How are you" in Indonesian

7 = **C** "See you later" in Indonesian

14 = **D** **T**angent Angle = **O**pposite Side divided by the **A**djacent Side.

1 = **E** "Good" in Indonesian.

2 = **F** "Good Morning" in Indonesian

3 = **G** "You are most welcome" in Indonesian

13 = **H** **C**osine Angle = **A**djacent Side divided by the **H**ypotenuse.

12 = **I** **S**ine Angle = **O**pposite Side divided by the **H**ypotenuse.

16 = **J** "First born Daughter" in Bali.

17 = **K** 1773-1838, Born: Salem, MA "The American Practical Navigator"

15 = **L** "First born Son" in Bali.

10 = **M** 580 B.C., Ancient Greek,

$$A^2 + B^2 = C^2$$

4 = **N** "Thank you" in Indonesian

9 = **O** "Good by" in Indonesian

8 = **P** "See you tomorrow" in Indonesian

11 = **Q** His name represents the Angles & Sides of a Right Triangle when interacting in functions of Higher Math or Trigonometry

Name of School _____ Grades _____ Date _____
Address _____
_____ Contact Person _____

Questioneer: Short Story Primer

Dear Mr., Mrs., Mrs., Principal, Teacher, Parent, Student, **Yes / No**

#1: Was Captain Toa all to aggressive in his approach to teaching ? #1: _____

#2: Would you rather have had the children be the center of the story and never have had to listen to the Captain dreaming about all he knew and wanted to share ? #2: _____

#3: When reading this story to pre-readers did you simple ad-lib through the Captain's dreaming ? The reader could ad-lib through the Captain's dreaming simply pointing at the pictures and explaining something close to but not so lengthy a presentation. Should the reader ad-lib to pre-readers when the Captain is dreaming; not read every word ? #3: _____

#4: Did your pre-readers enjoy the full Short Story Primer ? #4: _____

#5: Did your middle grade students enjoy the Short Story Primer ? #5: _____

#6: Did your upper grade students enjoy the Short Story Primer ? #6: _____

#7: Were the mathematical conclusions drawn closely enough towards every day use for your students to enjoy the math ? #7: _____

#8: Were the children's names hard to pronounce or remember ? #8: _____

#9: Does the clock on the wall mean more to your students after reading this Short Story Primer ? #9: _____

#10: Did you; the teacher, find it comfortable presenting a subject that you were not taught in a traditional classroom situation ? #10: _____

#11: Was the introduction of 2-languages an obstacle to the enjoyment of the Short Story Primer ? #11: _____

Mail to: Captain Nick, 351 Zenith Lane, Juno Beach, Florida, 33408