Columbus equipment

Compass
Dividers
Quadrant,
lead line
Sea chart
Ruler
Traverse tables
Multiplication tables
Ephemerides of Johannes Muller
Astrolabe on first voyage (not used)

Nov. 2 1492

Polaris, Puerto Gibara (Cuba N. coast)
Actual = 21^{o} 06', sight = 42^{o}
Speculation (Morison) – sighting Alfirk (β Cephei) – declination 70^{o} 34 RA 21h 28m
Mag. 3.2'
Quadrant

Polaris = +89° 15′ 51″ 02^{h} 31^{m} 48.7^{s} Mag. 1.97

Nov. 21 1492

Polaris, Caribbean, DR est 20^{o} 52' ,
Sight = 42^{o} again, speculation of Alfirk
Quadrant

Dec. 12 1492

Polaris, Moustique Bay, Haiti
Actual = 21^{o} 06', sight = 34^{o}
Speculation (Morison) – sighting Alrai (γ Cephri) – declination 77^{o} 38, RA 23h39m
Mag 3.4
Quadrant

Feb. 2 1493

Polaris, N. Atlantic, approaching Azores, DR est 34^{o}
37^{o}
Sight done by eye – sea conditions difficult for astrolabe or quadrant

Sept. 14 1494
Lunar eclipse, Saona, Dominican republic
Uses Ephemerides of Regiomontanus, timing of eclipse in Nurenberg, difference time of 5 and a half hours west of Cape St. Vincent.

Saona longitude = 68^o 15' W
Cape St. Vincent = 9^o

4 hours= actual

Speculation – stretching distances? Rough Ephemerides?

July 20 1498

Polaris, mid-Atlantic, doldrums, DR est. 9^o 30' (N)
Sight = 9^o (N), deduced 5 N – but didn't apply corrections properly
Quadrant

July 22-31 1498

Polaris, multiple sightings
At sea, mid-Atlantic, est 9^o ,
Nightfall altitude = 5^o , Midnight = 10^o , dawn = 15^o
At that time, Polaris had a circumpolar amplitude of about 4 degrees, so approximately 10^o , if one throws out the dawn measurement.
Quadrant

Aug 16 1498

Polaris, Caribbean near Trinidad
DR est. 13^o (N), sighting 14^o (N)
Quadrant

May 1 1503

Polaris, San Blas point, Panama
Actual = 9^o 30'
Sighting = 13^o 30' not clear this was done by Columbus
Quadrant

Feb. 29 1504

Polaris, St. Anne's Bay, Jamaica

Actual = 18^{o} 27'
Sighting = 18^{o}

Note – lunar eclipse occurred that night, Regiomontanus' Ephemerides predicted eclipses 30 years out. By timing the eclipse, Columbus notes that St. Anne's bay is 7 hours, 15 minutes later than Cadiz by timing the time between nightfall and when the moon first began to reappear. "there was an eclipse of the moon, and as the beinning thereof was before the sun set, I could only note the end of it, when the moon had just returned to its light, and this was certainly two hours and a half after the night fell, five *ampolletas* most certainly. The difference between the middle of the island of Jamaica in the Indies and the island of Cadiz in Spain is seven hours and fifteen minutes, so that in Cadiz the sun sets seven hours and fifteen minutes earlier than in Jamaica (see almanac)."

Cadiz = 6^{o} 17' W, 77^{o} 28' W – so real difference would have been 4 hours, 48 minutes.

Speculation – accuracy of tables? Trying to make it further west than it really is?