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Midterm - INTD290

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1 How to Submit this Midterm

1. Complete your work on this midterm.
2. Scan it into PDF form using a smartphone app, scanner, or digital picture
3. Alternatively you can type up your answers in a separate file, but it still must be a PDF
4. Submit it using the link on Moodle

2 Maps of The New World

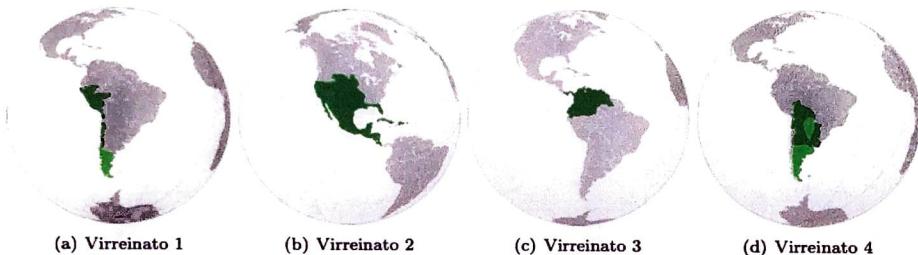


Figure 1: There were up to four *virreinatos* during the Spanish colonial period of Latin American history.

1. In which of the four virreinatos of the Spanish colonial empire (shown in Fig.1) was the te huiztilin classified by the indigenous?

(b) Virreinato 2

2. Which of the four virreinatos excelled at the exportation of rum?

(b) Virreinato 2

3. Which of the four virreinatos was characterized by an indigenous empire that mastered agriculture in the Andean mountains?

(a) Virreinato 1

4. The low-latitude aurora of 1789 was observed in which cities? In which of the four virreinatos are these cities? List some other countries in which corresponding observations were made.

(b) Virreinato 2

5. List some of the locations explored by La Condamine and his Latin American colleagues, and cite the virreinato or virreinatos they explored together.

(d) Virreinato 4

6. The Expedición Botánica of Jose Celestino Mutis took place in which virreinato?

(c) Virreinato 3

7. José Celestino Mutis took place in which virreinato? Mutis was the inaugural chair of the department of mathematics at the Colegio del Rosario. In which city is this?

• (b) Virreinato 2

• Bogotá, Colombia

8. In which country is the Pierre Auger Observatory located? In which virreinato would this country have been in the 18th century?

Argentina

Virreinato del Río de la Plata (d)



Figure 2: (Left) A physics detector near Pico de Orizaba in Mexico. (Right) A town in central Mexico.



Figure 3: A historical location in Latin America known for driving a particular economic sector.

3 Asynchronous Activity Review I

- What is the physics detector shown in Fig. 2 (left)? Explain in basic terms the purpose of this detector and how it works. *A physics detector gathers clues about the particles (speed, mass, & charge).*
- What is the significance of Mexican cities as pictured in Fig. 2 (right), in the context of the development of colleges and the scientific community in 18th century Mexico? *The significance of Mexican cities in the context of the development of colleges and the scientific community is that all of the findings would be known and the Enlightenment ideology would be taught.*
- What city is being shown in Fig. 3? In which country is it located, and what was the historical significance of this city for international trade? Who controlled it? From where the commodity produced here originate, and how was it shipped to Europe and Africa?

- Potosí is being shown in figure 3.*
- It is located in Bolivia; international trade signified a relationship internationally.*
- Trade was controlled by the church.*
- Shipping happened via boat.*

4 Asynchronous Activity Review II

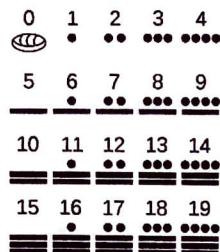
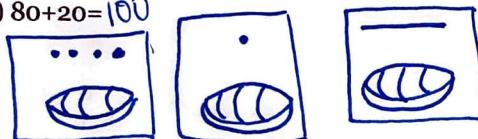


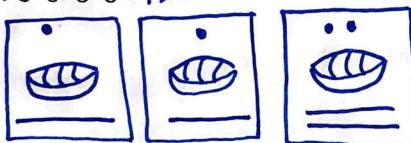
Figure 4: A list of the numerical digits used by the Maya.

1. Work out the following addition problems using the Mayan system.

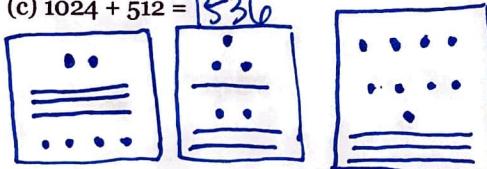
(a) $80 + 20 = 100$



(b) $365 + 365 = 730$



(c) $1024 + 512 = 1536$

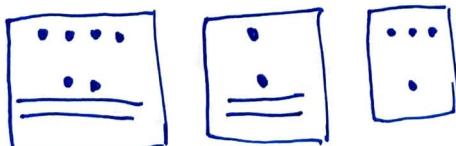


2. Work out the following subtraction problems using the Mayan system.

(a) $1024 - 512 = 512$

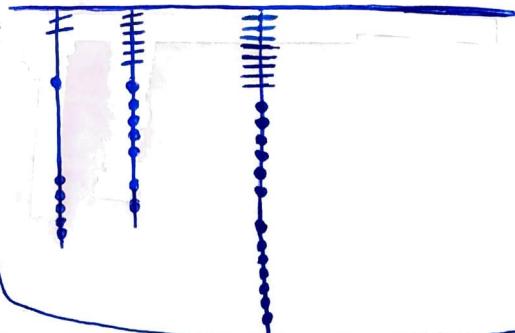


(b) $92 - 31 = 61$



3. Work out the following addition problems using the Incan quipu:

(a) $512 + 256 = 768$



(b) $11 + 89 = 100$

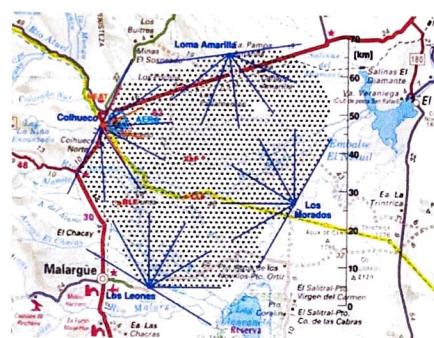
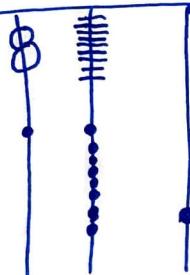
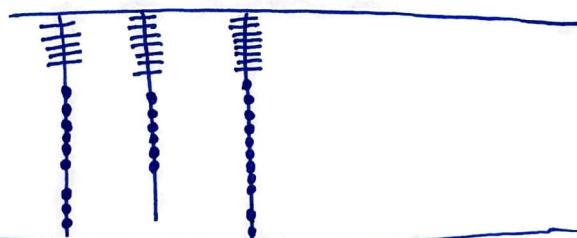


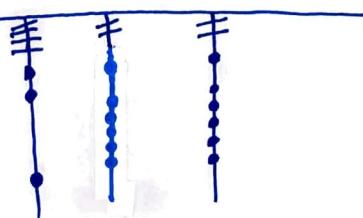
Figure 5: A physics detector near Malargüe, Argentina.

4. Work out the following subtraction problems using the Incan quipu:

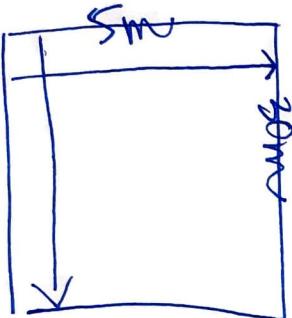
(a) $365 - 67 = 298$



(b) $1024 - 512 = 512$



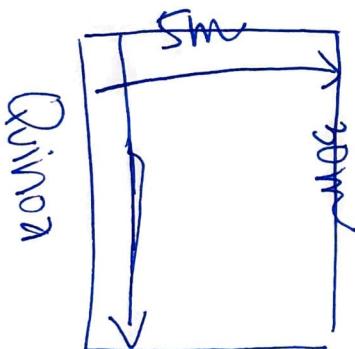
5. Suppose you have six terrace plots in the Andean mountains to use to survive. You and your cohort of fellow Incans decide to grow potatoes and quinoa. Quinoa actually do better at higher altitudes than potatoes. So the plan is to use the two lowest terraces for potatoes, and the upper four for quinoa. Each terrace is 30 meters by 5 meters. A potato plant requires a 0.2 meter by 0.2 meter patch, and a quinoa plant requires a 0.3 meter by 0.3 meter patch. How many potato plants and how many quinoa plants can you plant? Store the results in a diagram of the quipu knot system.



$$5m \times 30m = 150m^2$$

$$\frac{1}{5}m \times \frac{1}{5}m = \frac{1}{25}m^2$$

$$\frac{150 \text{ m}^2}{\frac{1}{25} \text{ m}^2} = 3750$$



$$5m \times 30m = 150m^2$$

$$\frac{3}{10}m \times \frac{3}{10}m = \frac{9}{100}m^2$$

$$\frac{150 \text{ m}^2}{\frac{9}{100} \text{ m}^2} = 1666\frac{2}{3}$$

- Since there are 2 terraces for potatoes there will be 7500 potatoes.
- Since there are 4 terraces for quinoa there will be 1666 $\frac{2}{3}$ quinoa plants.

5 Connection to Physics

1. In Fig. 5, what physics detector is shown?

- A: The Large Hadron Collider
- B: The IceCube Neutrino detector
- C: The Pierre Auger Observatory
- D: The High Altitude Water Cherenkov detector

2. What is the purpose of the physics project shown in Fig. 5?

- A: To collide protons and nuclei to probe subatomic physics
- B: To detect signals from neutrinos that originate outside the solar system
- C: To detect cosmic rays that originate outside the solar system
- D: To detect gamma rays from space

3. What is a gamma ray?

- A: A photon of light
- B: A proton or nucleus from deep space
- C: A portion of the aurora borealis
- D: An ion floating in the atmosphere

4. What is located at each black dot in Fig. 5?

- A: A water tank designed to record Cherenkov radiation
- B: A radio receiver designed to record radio pulses
- C: An optical sensor designed to record visible light
- D: A telescope designed to detect infrared radiation

6 Vocabulary

1. What is the meaning of the term rationalism?

- A: The idea that reason rather than experience is the foundation of certainty in knowledge

- B: Encapsulating the idea of I think, therefore I am.

- C: Using scientific instruments

- D: Relying on measurements and sensory experience to discover the truth

2. What is the meaning of the Nahuatl term abuizotl?

- A: A horse

- B: A hummingbird

- C: An otter

- D: An alligator

3. What is the meaning of the Nahuatl term tomatl?

- A: Smoked fish

- B: Smoked chili

- C: An herb to help digestion

- D: A tomato

4. What is cinchona?

- A: An herb used to treat indigestion
- B: A shrub or tree used to create quinine
- C: A flower used in religious rituals of the Mexica people
- D: A plant that can form a treatment for syphilis

5. Define the word torpor, as it pertains to animal behavior.

- A: The ability hover in midair during flight using rapid wingbeats
- B: Lowering internal body temperature and metabolism to levels that render the individual immobile and in a hibernating state
- C: The ability to break open the shells of mollusks using tools
- D: The ability to distinguish complex sounds in songs or calls

6. Who were the Jesuits?

- A: Formally known as the Order of Preachers, this is a Catholic order founded by Saint Dominic
- B: Formally known as the Order of Friars Minor, this is a Catholic order founded by Saint Francis
- C: Formally known as Los Amigos del País, these were mining officials who formed guilds to further economic interests of their region
- D: Formally known as the Society of Jesus, this is a Catholic order founded by Saint Ignatius of Loyola

7 Free Response Section

1. **Kepler's Laws, and Newtonian Physics** Discuss the varying levels of acceptance within scientific and academic communities in Nueva Granada and Perú in the late 18th century.

The scientific community in Perú and Nueva Granada were rather accepting of Kepler's Laws and Newtonian Physics. However, the academic community had a harder time accepting these ideas mainly due to the fact that the church was in charge of academics, meaning that all science was basically rejected.

2. **The aurora of 1789** Discuss the significance of the aurora borealis in 1789 that was visible from Mexico City. List several researchers who made observations of this aurora and other auroras, and explain what they found.

The significance of the aurora borealis in 1789 that was visible from Mexico City is that being able to see the aurora borealis at low latitudes is extremely rare. The researchers who made observations of this aurora were: José Antonio Alzate, Antonio de León Gama, and José Francisco Díaz Rangel.

3. **Herbal medicine in the 16th century** Give several examples of treatments for various ailments in the body used by Europeans and indigenous Latin Americans in the 16th century. Explain the theory of the four humors and why this influenced the European treatments but not the indigenous ones.

- Cacao: a tree that was used to treat constipation, urinary tract infections, digestive issues, and to stop menstruation.
- Dry ground manure with wine plastered on to broken ribs.

The four humors are based on the fundamental elements we consume/have to live. It was believed that if one was sick, that one lacked or had an excess of one of the humors (Yellow Bile, Black Bile, Blood, or/and Plegm). Indigenous weren't influenced by this since their treatments didn't fit.

4. The Inquisition, the Catholic Church, and Scientific Traditions Discuss several examples of the following: (a) Catholic censorship of knowledge flowing from Europe to Latin America (b) Catholic censorship of knowledge flowing from Latin America to Europe (c) contributions to Latin American science by Catholic scholars and explorers (d) knowledge that was recorded or translated from indigenous sources by Catholic priests, monks, or nuns.

- (a) The Catholic Church trying to stop people from reading certain literature and philosopher's works due to the fact that they were scared that people would begin to leave the church since they gained knowledge.
- (b) The Catholic Church censored a lot of herbal remedies/medicine that the Indigenous used due to the fact that they were looked down on by the Church.
- (c) José Antonio Alzate publishing a journal that talks about magnetic fields, the physics of the sun, charged particles
- (d) Nahual medicine being translated by the Jesuits, thus, leading to us having some of the info today.