

KEY

Part 1 Open Book – Quantitative Style Problem Solving. SHOW ALL OF YOUR MATH WORK.

1. A cylindrical sample of rock has a length of 20 cm and a diameter of 4.5 cm. The mass of the sample is 3500 grams

$$\text{MASS} = 3500 \left(\frac{1 \text{ kg}}{1000 \text{ g}} \right) = 3.5 \text{ kg}$$

$$d = 4.5 \text{ cm} \quad r = \frac{d}{2} = \frac{4.5 \text{ cm}}{2} = 2.25 \text{ cm}$$

- A. Draw a sketch and show dimensions



$$L = 20 \text{ cm}$$

- B. Determine the volume of the same in cubic centimeters and cubic meters. Show all of your math work

$$\text{Vol}_{\text{cylinder}} = \pi r^2 h = (3.14) (2.25 \text{ cm})^2 (20 \text{ cm}) = 318.1 \text{ cm}^3$$

$$\text{Vol} = (318.1 \text{ cm}^3) \left(\frac{1 \text{ m}}{100 \text{ cm}} \right)^3 = 3.18 \times 10^{-4} \text{ m}^3$$

- C. Given that the acceleration due to gravity $g = 9.8 \text{ m/sec}^2$, determine the unit weight of the rock mass in N/m^3 . (newtons per cubic meter). Show all of your math work

$$\text{Unit Weight} = \gamma = \frac{D}{V} \cdot g = \frac{\text{MASS}}{\text{Vol}} \cdot g = \left(\frac{3.5 \text{ kg}}{3.18 \times 10^{-4} \text{ m}^3} \right) (9.8 \text{ m/sec}^2) = 1.08 \times 10^5 \frac{\text{kg} \cdot \text{m}}{\text{sec}^2 \cdot \text{m}^3} = 1.08 \times 10^5 \frac{\text{N}}{\text{m}^3}$$

$g = \text{acceleration due to gravity} = 9.8 \text{ m/sec}^2$

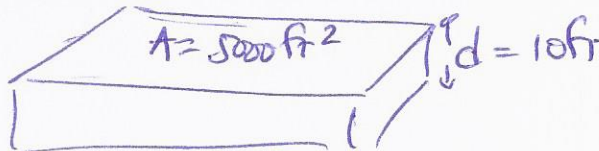
2. A 25.6 m^3 block of rock has a porosity of 23.45%. What is the volume of ground water that could be stored in this rock material. Answer in cubic meters and gallons. Show all of your math work.

$$\text{Vol}_{\text{porosity}} = (25.6 \text{ m}^3) (0.2345) = 6.0 \text{ m}^3$$

$$6.0 \text{ m}^3 = 1585 \text{ GAL} \quad \left(\frac{264.17 \text{ GAL}}{\text{m}^3} \right) = 1585 \text{ GAL}$$

3. A rectangular shaped swimming pool has a surface area of 5000 square feet, and a uniform depth of 10 ft.

- A. Draw a sketch with dimensions labeled.



- B. Determine the total maximum volume of water stored in the swimming pool in cubic meters and gallons. Show all of your math work.

$$\text{TOTAL VOLUME} = \text{AREA} \cdot \text{DEPTH}$$

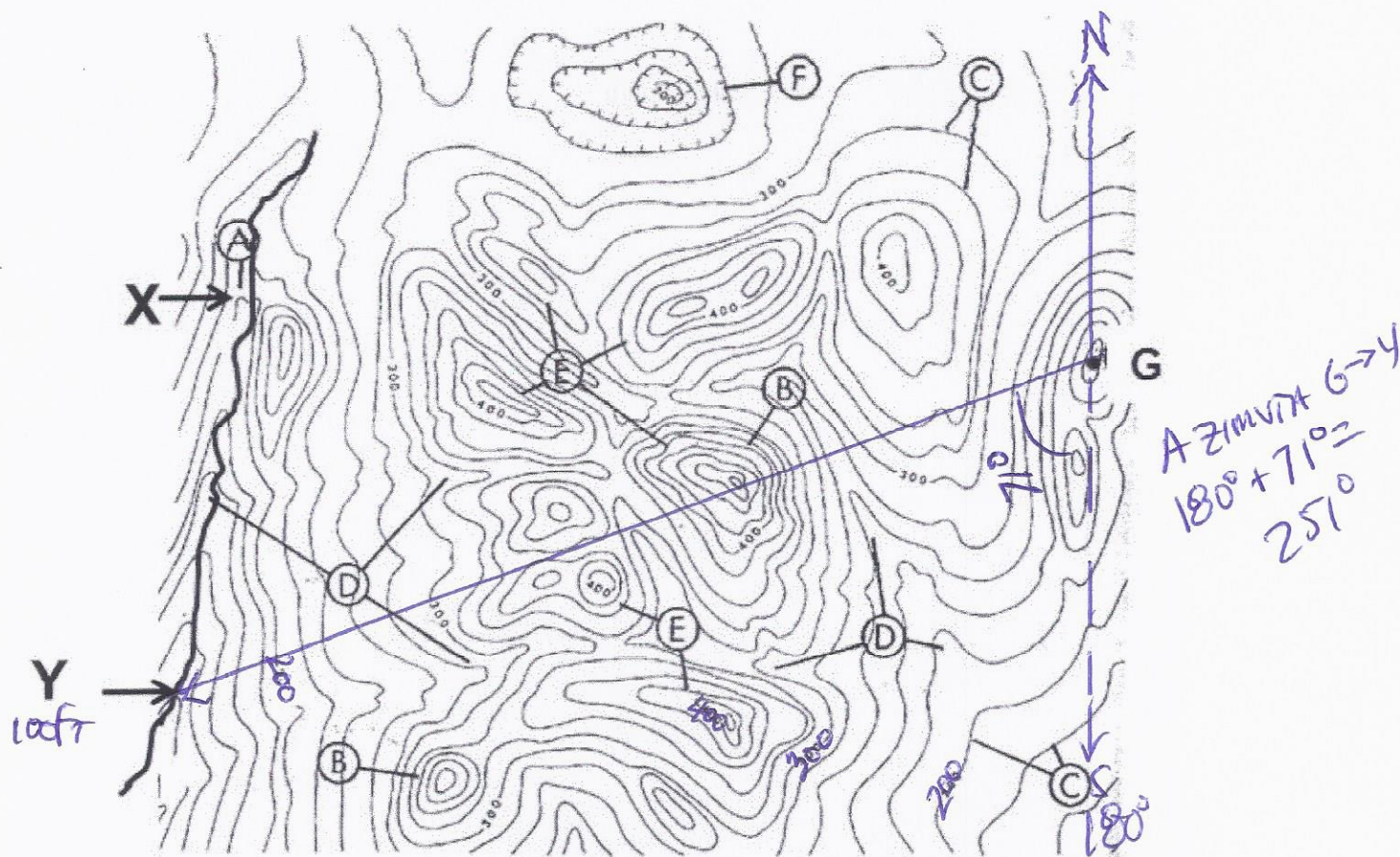
$$\text{Vol} = (5000 \text{ ft}^2) (10 \text{ ft}) = 50,000 \text{ ft}^3 \left(\frac{1 \text{ m}}{3.28 \text{ ft}} \right)^3 = 1416.9 \text{ m}^3$$

- C. A pump has a flow rate of 5 gal/min, how long would it take to pump out all the water in the pool? Show all of your math work, answer in hours and minutes. (5 pts)

$$\text{TOTAL Vol} = (374,302 \text{ GAL}) \left(\frac{1 \text{ min}}{5 \text{ GAL}} \right) = 74,860 \text{ min} \left(\frac{1 \text{ hr}}{60 \text{ min}} \right) = 1248 \text{ hr}$$

$$74,860 \text{ min} = 1248 \text{ hr}$$

4. Examine the topographic map below, and answer the questions that follow. Show all of your math work, and answer in the slots provided to the left of the item letter.



Elevations in feet

- 20ft A. What is the contour interval of the map?
- To South B. Which direction is stream "A" flowing, assume standard map orientation relative to north.
- 1:24,000 C. If one inch on the map is equivalent to 2000 feet on the ground, determine the fractional scale of the map in standard ratio. Show all of your math work. $\frac{1 \text{ in}}{1 \text{ in}} = \frac{2000 \text{ ft}}{\left(\frac{12 \text{ in}}{1 \text{ ft}}\right)} = \frac{24,000 \text{ in}}{1 \text{ in}}$
- 100ft D. what is the elevation of point "Y" in feet
- 251° E. Using a protractor, determine the azimuth compass direction traveling from Pt. G to Pt. Y
- FALSE VALLEY F. True or False: the topographic features labeled "D" are upland ridges. Explain your answer.
- FALSE G. True or False: if you were standing at the circle inscribing the letter "C", you would be able to visually see Pt. "F" from your vantage point. Explain your answer.
- PT F is in a depression, below RIGGE LINE, NO VISIBLE SITE DIRECTION from C

Part 2. Closed Book Content Knowledge Survey

Answer in the spaces to left of question no.

- A 1. What is the major end product of the weathering process, at the modern Earth's surface?
☒ A. regolith B. leaching C. B horizon D. sandstone E. Sedimentary Rocks
- C 2. Carbon dioxide dissolved in water reacts to form what substance, that is especially important for rock weathering?
 A. sulfuric acid B. acid dioxide ☒ C. carbonic acid D. acidic water
 E. carbon dioxide can not dissolve in water, it's a gas (man)
- D 3. If a map has a scale of 1:24000 then 5 inches on the map equals:
 A. 100 ft B. 100 Miles C. 24000 inches ☒ D. 10,000 Ft E. None
- B 4. The Earth is estimated to be 3.9 billion years old. A. True ☒ B. False
- A 5. Convergent tectonic margins are associated with subduction zones and development of a volcanic arc on top of the over-riding plate. ☒ A. True B. False

$$1 \text{ m} = 24,000 \text{ in} \quad \frac{1 \text{ ft}}{12 \text{ in}} = 2000 \text{ ft}$$

$$(5 \text{ in}) \left(\frac{2000 \text{ ft}}{1 \text{ in}} \right) = 10,000 \text{ ft}$$

- GRAVITY
SOLAR CLIMATE
GEO TECTONICS
6. List the three ultimate driving forces of geologic processes.

- B 7. How high will the level of water in wells drilled into an unconfined aquifer rise?
☒ A. 10 feet above the water table C. 20 feet below the potentiometric surface
☒ B. level with the water table D. to the surface of the Earth E. the well will be dry
- C 8. You are floating in a raft on a river. At point A you are at 5373 feet elevation, at point B you are at 2457 feet elevation. The two points are separated by 3.6 miles. What is the gradient of the river between the two points in ft/ft? (hint: 1 mi = 5280 ft)
 A. 810 B. 1023 ☒ C. 0.15 D. 0.789 E. None of the above

$$\text{GRAD} = \frac{\text{rise}}{\text{run}} = \frac{(5373 \text{ ft}) - (2457 \text{ ft})}{(3.6 \text{ mi}) \left(\frac{5280 \text{ ft}}{1 \text{ mi}} \right)}$$

$$\text{GRAD} = \frac{2916 \text{ ft}}{19,008 \text{ ft}} = 0.153$$

- CONVERGENT
DIVERGENT
TRANSFORM
9. List the three types of plate tectonic boundaries.

- RECHARGE
10. Replenishment of infiltrated groundwater into an aquifer is termed _____

- PERMEABILITY
11. The measure of the ease with which water flows through and earth material is referred to as _____.

- F 12. True or ☒ False: the lower Willamette Valley was extensively glaciated 20,000 years ago.
- T 13. ☒ True or ☒ False: a slump is a type of landslide that occurs on a curved failure surface.
- F 14. True or ☒ False: anadromous salmonid fish spend the majority of their adult lives in mountain streams of the Pacific Northwest. \rightarrow OCEAN
- B 15. Which sedimentary rock is generally the best aquitard?
 A. sandstone ☒ B. shale C. dissolved limestone D. fractured siltstone E. All of the above

impermeable