Math History: Final Exam Study Guide

1. Tallying, Hieroglyphics, Cuneiform, Rosetta Stone, Behistun Rock, Rhind Papyrus, Plimpton 322.
2. Egyptian whole number arithmetic (addition and multiplication)
3. Egyptian rules for "unit" fractions; simple examples
4. General nature of Egyptian math, including geometry
5. Sexagesimal notation (e.g. $20/9 = 2;13,20$) and simple arithmetic
6. What Babylonians knew (Pyth. Thm. and Pyth. triples, $\sqrt{2}$, etc.)
7. Early Greek math: Thales (contributions), the Pythagoreans (triangular numbers, incommensurability, philosophy of number)
8. Nature of Greek society; Plato and philosophy
9. Alexandria: its history, museum, library
10. Euclid's Elements: logical structure, meaning of *axioms/postulates, lemmas, theorems, corollaries, definitions and undefined terms*
11. The 5 Euclidean axioms, including the *parallel postulate*.
12. Euclidean number theory: nature of numbers, definitions of divisibility and prime number; the division algorithm (when dividing b by a: $b = qa + r$, r is remainder, with $0 \leq r < a$. Euclidean algorithm.for finding $\gcd(m, n)$.
13. Eratosthenes, Archimedes, Diophantus, Claudius Ptolemy (approx. dates, major contributions)
14. Decline of Greek mathematics and Alexandria; fate of Hypatia
15. Mathematics in India: Arhyabata, Brahmagupta (approx. dates, major contributions)
16. Islamic mathematics; Caliph al Ma'mun and the House of Wisdom; al-Khowarizmi and "al-jabr"; Omar Khayyam.
17. Chinese mathematics (calculation of pi, positional base-10 notation, solution of simultaneous equations)
18. The "Hindu-Arabic" numerals and "algorithms" for using them
19. Fibonacci's contributions: *Liber Abaci* and *Liber Quadratorum*, famous "sequence"
20. Astronomy: Heliocentrism vs. Geocentrism, Ptolemy's *Almagest*, Copernicus, Galileo, Tycho, Kepler.
21. Logarithms (Napier) and Modern Notation (Simon Stevin, Vieta)
22. Descartes and the "Clockwork Universe"; Newton: Calculus and laws of motion, theory of gravity;

Math You Should Know:

23. Proof of Pythagorean Theorem
24. Irrationality of $\sqrt{2}$.
25. Euclid's proof that there can't be only finitely many primes (you may assume any number greater than 1 has a prime factor).
26. Sieve of Eratosthenes: be able to describe the algorithm precisely and use it.

You should be able to give dates for historical developments or for specific mathematicians to the nearest century. In writing essays or answering questions, the more *specifics* you are able to give, the more credit you will get; adding historical background is also helpful. If possible, give mathematical examples to illustrate what you are writing about. Be able to compare the mathematical "style" and contributions of the Egyptian, Babylonian, Greek, Indian and Arab cultures.