University of Bahrain
Bahrain Teachers College
TC2MA324: Hisotry of Mathematics
Dr. Abdulla Eid
Spring 2015

Mid Term Exam 1

Name: Solution ID: 24 minutes

Instructor's name: Dr. Abdulla Eid

- *Do not* open the exam until you are instructed to do so.
- Show sufficient work to justify each answer.
- Calculators are allowed but cell phones are *not* allowed during the exam.
- Exchange of any material such as calculator, pen, eraser is *not* allowed.
- **No** questions are allowed.
- You have 1 hour and 30 minutes to finish this exam. You can leave only after 1 hour of the exam.
- There are 9 questions and 10 pages in this exam.

Question	Points	Score
1	15	
2	5	
3	8	
4	5	
5	5	
6	6	
7	12	
8	4	
Bonus Question	0	
Total:	60	

Question 1 (15 points)

Choose the correct answer for each of the following:

(1) First civilization to formulate the verbal expression of the Pythagorean theorem is

(A) Greek (B) Chinese (C) Indian (D) Babylonian

(2) Which of the following civilization used the rods for their symbols?

(A) Greek (B) Chinese (C) Indian (D) Babylonian

(3) The number 四千七十三 is

(A) 4073 (B) 410007103 (C) 4703 (D) 41713

(4) Which of the following civilization used the distributive law for the multiplication?

(A) Indian (B) Egyptian (C) Islamic (D) Greek

(5) According to the Indian mathematics, a quadrilateral with orthogonal diagonals with sides $3, 6, 4, 7$ has area of

(A) $2\sqrt{126}$ (B) 504 (C) 20 (D) 10

(6) The number $'\tau\lambda\gamma$ is

(A) 1333 (B) 3033 (C) $\frac{1}{333}$ (D) 333

(7) Which civilization approximated the area of the circle to be $3 \cdot 2 \cdot r$?

(A) Greek (B) Chinese (C) Babylonian (D) Egyptian

(8) Moscow Mathematical Papyrus is one of the few tablet that contains the contribution of mathematics in the civilization of

(A) Russia (B) India (C) Babylon (D) Egypt

(9) A generalization of the Pythagorean theorem is due to

(A) AlKhwarzmi (B) Euler (C) AlKashi (D) Pappus

(10) The formulation of the principal of mathematical induction is due to

(A) Euclid (B) De Nemore (C) Leonardo of Pisa (D) Ben Gershan

(11) First to measure the length of a year very accurately is

(A) AlKayyam (B) AlKashi (C) AlKhwarzmi (D) AlBozjani

(12) An islamic mathematician who find the correct method to create a square from three unit squares is

(A) AlKayyam (B) AlKashi (C) AlKhwarzmi (D) AlBozjani

(13) The number 𓏺𓏺𓏺𓎆𓎆𓍢𓍢𓍢𓍢 is

(A) 3024 (B) 3324 (C) 324 (D) 423

(14) The Hindu–Arabic numerals are driven from the

(A) Bruhami (B) Greek (C) Sheng–tsu (D) Thales

(15) First to use zero as a seperate number was by

(A) Greek (B) Arab (C) Indian (D) Chinese

Question 2 (5 points)

Divide using the Babylonian algorithm the following

▼▼▼▼▼ <<▼▼▼▼ by <<<▼▼▼▼▼▼

324 36

step 1: First we find $\frac{1}{36}$ in base 60

$\frac{1}{36} = 0; 1\ 40$

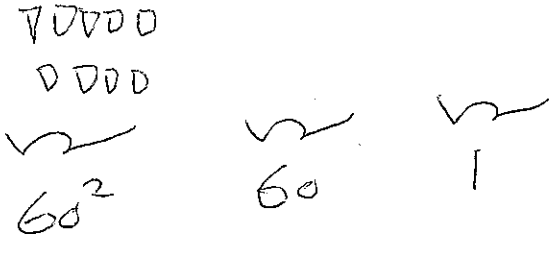
$$36 \overline{)\ 60} \quad 0;\ 1\ 40$$

$$\underline{36}$$

$$24$$

step 2: multiply $324 \times \frac{1}{36}$ to get

$324 \times (1 \times 60 + 40) = 32400$

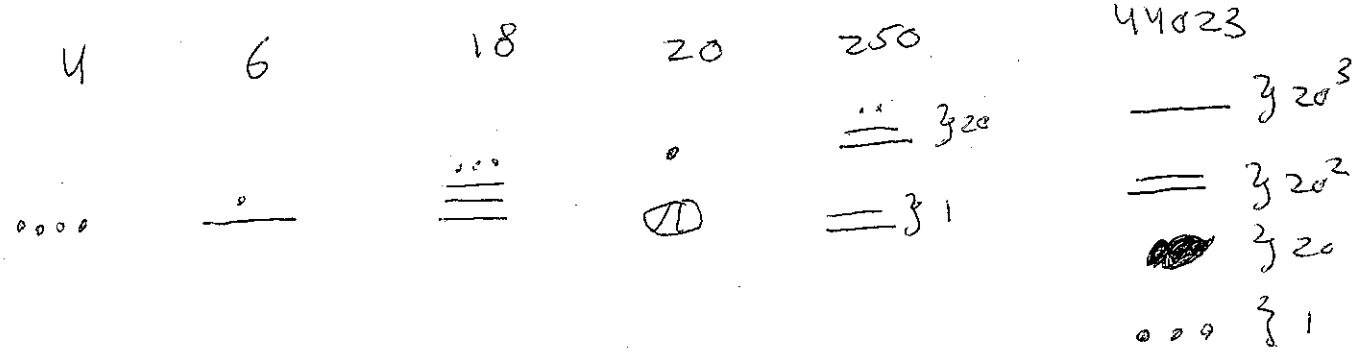


Answer is 9 as expected!

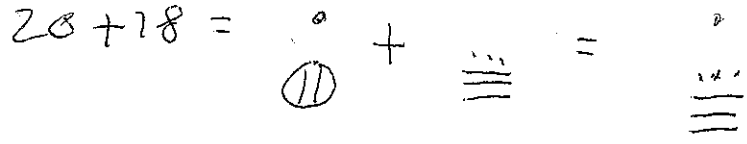
Question 3 (8 points)

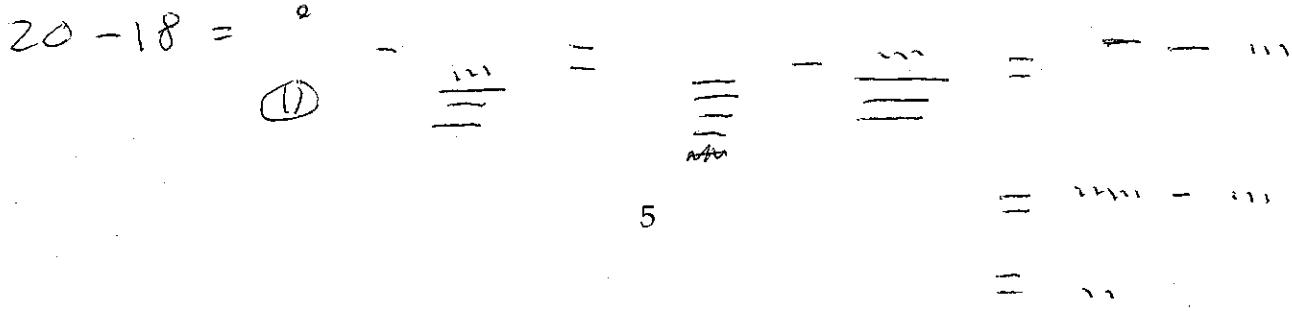
Mayan civilization (300 A.D.) used a base 20 vertical positional numeration system. The numerals are made from three symbols (shell shape for zero, dot for one, and a horizontal bar for five). The dots are aligned horizontally next to each other and stacked over the bars.

(a) Convert each of the 4,6,18, 20, 250, 44023 into Mayan numerals.



(b) Perform the operation 20+18 and 20-18 and suggest an addition/subtraction algorithm.





Question 4 (5 points)

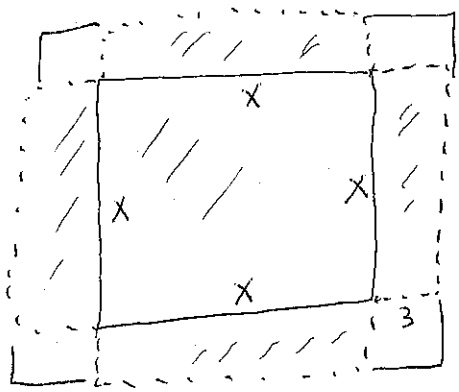
Fill in the blank with the appropriate answer.

1. Indian First civilization to invent the ruler.
2. Nine chapter is one of the oldest book in the Chinese mathematics.
3. Indian They could approximate π to as many places as they want using the modern language of power series.
4. In Greek civilization, Euclid was one of the famous mathematician.
5. House of wisdom Established in Baghdad and it was a place where best Islamic mathematics worked in.

Question 5 (5 points)

Solve the following quadratic equation using the geometric method proposed by Al–Khwarzmi:

$$x^2 + 12x = 45.$$



Now the shaded region has area $= x^2 + 4(3x) = x^2 + 12x = 45$

The total area is $(x+3+3)(x+3+3) = 45 + 4 \times 3 \times 3$

$(x+6)^2 = 81 \Rightarrow x+6 = 9$

$\boxed{x = 3}$

Question 6 (6 points)

The Indian mathematician knew how to find the least common multiple (lcm) of two natural numbers using the factorization method. Prove that the same concept can be applied to find the greatest common multiple (gcd) of two natural numbers. More specifically, prove the following:

If $a = p_1^{a_1} \cdot p_2^{a_2} \dots p_r^{a_r}$ and $b = p_1^{b_1} \cdot p_2^{b_2} \dots p_r^{a_r}$. Then,

$$g = \gcd(a,b) = p_1^{\min(a_1,b_1)} \cdot p_2^{\min(a_2,b_2)} \dots p_r^{\min(a_r,b_r)}.$$

we want to show

(1) $g \mid a$ and $g \mid b$

(2) If $d \mid a$ and $d \mid b$, then $d \mid g$.

(1) since $g_i = \min(a_i, b_i) \leq a_i$ and $g_i \leq b_i$

$g \mid a$ and $g \mid b$

(2) Assume $d \mid a$ and $d \mid b$

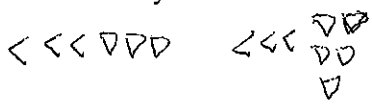
$d_i \leq a_i$ and $d_i \nleq b_i$

$d_i \leq g_i$

$d \mid g$

Question 7 (12 points)

Fill in the following table by converting the given number to the required base. (*No* justifications are needed).

Old base	New base
Decimal: $\frac{1}{17}$	Egyptian: 
Decimal: 2015	Babylonian: 
Decimal: $5\frac{3}{5} = \frac{28}{5}$	Greek: κη ε'
Decimal: $\frac{1}{45}$	Babylonian: 
Decimal: 6003	Chinese: 六千三
Babylonian: 	Decimal: 801

Question 8 (4 points)

Write the four properties that distinguish the mathematics from any other physical or mental sciences. Moreover, explain (in details) two out of them.

1- Universality: There is always an invariant properties of mathematical objects.

2- E g: The theorems & definitions have all the same interpretations.

3- Endurance: True statements remain true statements

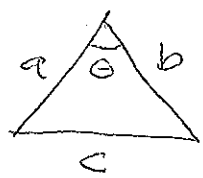
4- Relevance: Mathematics has many applicetion to varions type of mathematics.

Bonus Question (3 points (bonus))

Prove the *triangle inequality*, i.e., if a, b, c are three sides of a triangle, then

$$c \leqslant a + b$$

(Hint: Use Al–Kashi Theorem)



$$c^2 = a^2 + b^2 - 2ac\cos\theta$$

Note:

$$\cos\theta \geq -1$$

$$-2ab\cos\theta \leq +2ab$$

$$a^2 + b^2 - 2ab\cos\theta \leq a^2 + b^2 + 2ab$$

$$c^2 \leq (a+b)^2$$

$$c \leq (a+b)$$

Ancient Egyptian Symbols and their Hindu-Arabic values:

						
1,000,000	100,000	10,000	1,000	100	10	1

Ancient Babylonian Symbols and their Hindu-Arabic values:

	
10	1

Ancient Greek Symbols and their Hindu-Arabic equivalent values:

α	β	γ	δ	ϵ	$\mathcal{S}$	ζ	η	θ
1	2	3	4	5	6	7	8	9
ι	κ	λ	μ	ν	ξ	o	π	$\mathcal{O}$
10	20	30	40	50	60	70	80	90
ρ	σ	τ	υ	ϕ	χ	ψ	ω	$\mathcal{L}$
100	200	300	400	500	600	700	800	900

Chinese Symbols and their Hindu-Arabic equivalent values:

一	二	三	四	五	六	七	八	九
1	2	3	4	5	6	7	8	9
十	百	千						
10	100	1000						