Sets and Logic
MHF3202 8768

Quizzes Q

10Jan2012

Q1: Wedn. 18 Jan May lightning ↯ strike this table! (I.e, please fill in.)

n	r_n	q_n	s_n	t_n
0	100	—	**1**	**0**
1	23		**0**	**1**
2				
3				
4				
5				

So GCD(100, 23)= ____ =[________ $\cdot 100] + [$ ________ $\cdot 23]$.
And x= ____________ $\in [0\,..\,100)$ solves congr. $23x \equiv_{100} 8$.

Q2: Wedn. 25 Jan Mod K:=51, the recipr. $\langle \frac{1}{20} \rangle_K$= ______ $\in[0\,..\,K)$.
[*Hint:* ↯] So x= ____________ $\in[0\,..\,K)$ solves $5 - 20x \equiv_K 2$.

Q3: Wed. 15 Feb $\mathcal{P}(\mathcal{P}(\#\text{suits in a deck}))$ has ____ many elements.

Q4: Fri. 17 Feb Given sets with cardinalities $|B| = 7$ and $|E| = 5$, the number of non-constant fncs in B^E is ______________.

Q5: Wed. 22 Feb Binomial coefficient $\binom{7}{4}$= ____________ = __________.

Multinomial coefficient $\binom{9}{4,2,3}$= __________________ = __________.

[*Note:* Write your ans. ITOf factorials, then **also** write it as a single integer, or product of two, **without** factorials.]

Q6: Wed. 22 Feb Coeff of x^5y^{18} in $[x + 1 + 3y]^{30}$ is ____________.

[You may leave your answer as a product of *posints*, or you may multiply-out.]

Equality $\binom{74}{26,25,23} = \binom{74}{25} \cdot \binom{N}{K}$ suggests that N = ____________ and K = ____________.

Q7: Mon. 27 Feb Mimicking what we did in class: From the 987×200 game-board, cut-out (remove) the **(**35, 150**)**-cell and one other cell at $P = (x, y)$. Circle those choices for P,

(150, 160**)**, **(**14, 35**)**, **(**66, 77**)**, **(**195, 15**)**, **(**123, 4**)**

which, if removed, would leave a board that *definitely* can**not** be domino-tiled.

ii Our invariant property for LBolt is that each row n satisfies: ____.

Q8: Wed. 29 Feb Sequence $\vec{\mathbf{L}} := (L_n)_{n=0}^{\infty}$ is defined by $L_0 := 0$, $L_1 := 1$, and $\boxed{\forall n \in \mathbb{N}:\ L_{n+2} = 3L_{n+1} + L_n}$. This implies $\boxed{\forall k \in \mathbb{N}:\ L_k = [P\cdot\alpha^k + Q\cdot\beta^k]}$, for real numbers α= ________ $> \beta$= ________ , P= ________ , Q= ________ .

Q9: Mon. 12 Mar As a single numeral, ____________ is t.fol sum:

$$1 - 3\cdot\binom{9}{1} + 9\cdot\binom{9}{2} - 27\cdot\binom{9}{3} + 81\cdot\binom{9}{4} \mp \ldots - 3^9\cdot\binom{9}{9}.$$

QA: Fri. 15 Mar On $\mathbb{Z}_+$, write $x \,\$\, y$ IFF $xy < 0$. So \$ is *Circle*

Transitive: *T F*. **Symm.**: *T F*. **Reflex.**: *T F*.

On $\mathbb{Z}$, say that $x \nabla y$ IFF $x - y \leqslant 1$. Then ∇ is:

Trans.: *T F*. **Symm.**: *T F*. **Reflex.**: *T F*.

(Be *careful* on <u>both</u> parts!)

QB: Wed. 28 Mar On $\Omega := [1\,..\,29]\times[1\,..\,29]$, define binary-relation **C** by: $(x, \alpha)\,\mathbf{C}\,(y, \beta)$ IFF $x\cdot\beta \equiv_{30} y\cdot\alpha$. Statement "*Relation* **C** *is an* ***equivalence relation***" is: *T F*

Both $\sim$ and $\bowtie$ are equiv-relations on a set Ω. Define binrels **I** and **U** on Ω as follows.

Define $\omega\,\mathbf{U}\,\lambda$ IFF <u>*Either*</u> $\omega \sim \lambda$ <u>*or*</u> $\omega \bowtie \lambda$ [or both].
Define $\omega\,\mathbf{I}\,\lambda$ IFF <u>*Both*</u> $\omega \sim \lambda$ <u>*and*</u> $\omega \bowtie \lambda$.
So "**U** *is an equiv-relation*" is: *T F*
So "**I** *is an equiv-relation*" is: *T F*

QC: Fri. 20 Apr Euler $\varphi(121000)$ = ______________________.
Express your answer as a product $p_1^{e_1} \cdot p_2^{e_2} \cdot \ldots$ of <u>*primes*</u> to posint powers, with $p_1 < p_2 < \ldots$.

QD: Mon. 23 Apr a Suppose $y \in \mathbb{QR}_N$, where N is oddprime. You compute Bézout mults U and V st. $yU + NV = 1$. Then "*U is a mod-N square*" is: *AT AF Nei* b With $p := 323$, and $H := \frac{p-1}{2}$, note $66^H \equiv_p -2$. Thus p is ....

QE: Wed. 25 Apr ? *No quiz!*