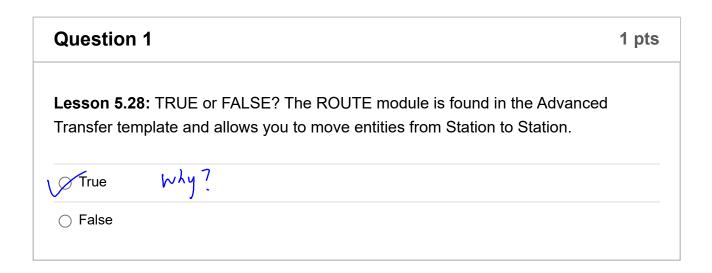
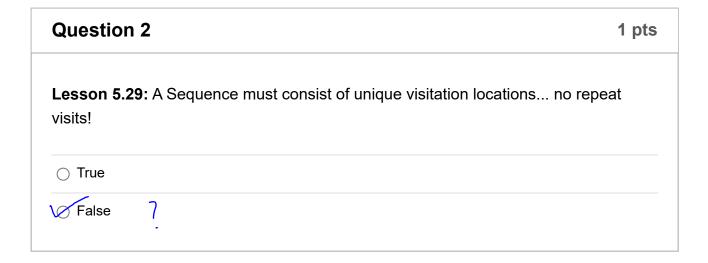
Week 8 Homework

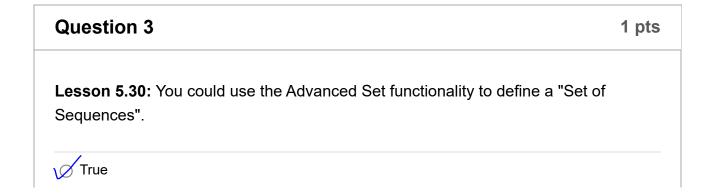
(!) This is a preview of the published version of the quiz

Started: Jul 2 at 7:50am

Quiz Instructions







○ False	
Question 4	1 pts
Lesson 5.30: The name of the automatically supplied A particular entity's sequence is Entity. Sequence (what a sequence)	
True	
○ False	
Question 5	1 pts
Question 3	
Lesson 5.31: Cell 3 actually had TWO servers an "old "younger"/fast guy.	d"/slow guy and a
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Lesson 5.31: Cell 3 actually had TWO servers an "old "younger"/fast guy. True	d"/slow guy and a
Lesson 5.31: Cell 3 actually had TWO servers an "old "younger"/fast guy. True False	1 pts
Lesson 5.31: Cell 3 actually had TWO servers an "old "younger"/fast guy. True False Question 6	1 pts

Question 7 1 pts

esson 5.32: An ENTER module is usually paired with what other module?		
DEPART		
DISPOSE		
TERMINATE		

Question 8	1 pts
(Lesson 6.1: Introduction to Uniform Random Numbers.) TRU actually a good thing for you to be able to reproduce a sequen you so desire.	

(Lesson 6.2: Some Lousy Generators.) Consider von Neumann's mid-square PRN method, and suppose that $X_0=6632$. What is $R_3=X_3/10000$? [Note: For purposes of this problem, treat all X_i 's as if they were 8 digits, e.g., treat 123456 as if it were 00123456.] $\begin{array}{c} \chi_0=6632 & \longrightarrow 6632^2=43\,983\,\pm2\,4 \\ \\ 0 \text{ a. }9834 & \chi_1=9834 & \longrightarrow 9834^2=96\,7075\,56 \\ \\ 0 \text{ b. }0.9834 & \chi_2=7075 & \longrightarrow 7075^2=50\,055625 \\ \\ 0 \text{ c. }50055625 & \chi_3=0556 & \longrightarrow 556^2=30\,9136 \\ \\ 0 \text{ d. }556 & \underbrace{556}_{10\,000}=0.0556 \\ \\ \end{array}$

1 pts

Question 9

Question 10 1 pts

CHECK

(Lesson 6.3: Linear Congruential Generators.) YES or NO? Does

 $X_i = (X_{i-1} + 12) \operatorname{mod}(13)$ have full period?

Theorem: Xi = (a Xi-1+c) mod m (with C>O) has full cycle if (i) C and m are coprime; (ii) a-1 is a multiple True of every prime which divides m; and (iii) a-1 is a multiple

of 4 if 4 divides m. False

(i) 12 and 13 are coprime

(ii) a-1=0 which is a multiple of all integers (iii) does not hold. Tovial.

Question 11 Corollary: $X_i = (aX_{i-1} + c) \mod 2^n (c, n > 1) \mod 4$ full cycle if c is old and a = 4k+1, $\exists k$. 1 pts

(Lesson 6.3: Linear Congruential Generators. Problem 7.1 from Law 2015). Consider X500 will the generator

 $X_i = (5X_{i-1} + 3) \mathbf{mod}(16)$. \times = 38 mod | 6 = 6 have 31 full against the stop at the stop at

(i) 3 & 16 coprime $x_3 = 8 \mod 16 = 8$ $x_{496} = x_0 = 7$ O a. 0 (ii) 5 - 1 = 4 = a - 1 $x_4 = 43 \mod 16 = 11$. $x_{497} = x_1 = 6$

0 b.6 primes that divide m X = 58 mod 16 = 10 X498 = X2

are 2 and only 2

X499=X3 ○ c. 7

3 is odd and $\alpha = 4(1) + 1$ X=== X = 11 d. 11 Thur full cycle by cocollary

○ e. 38

Question 12 1 pts

(Lesson 6.3: Linear Congruential Generators.) Which uniform generator was recommended in class, at least as a desert island" generator?

 \bigcirc a. $X_i = 16807X_{i-1}\mathbf{mod}(2^{31})$

b.
$$X_i=16807X_{i-1}\mathbf{mod}(2^{31}-1)$$

$$\bigcirc$$
 c. $X_i = 16807(X_{i-1}-1)\mathbf{mod}(2^{31})$

$$\bigcirc$$
 d. $X_i = 16807(X_{i-1}-1)\mathbf{mod}(2^{31}-1)$

Question 13 1 pts

(Lesson 6.4: Tausworthe Generators.) Suppose that a Tausworthe generator gave you the series of bits 1010101. If you use all 7 bits, what Unif(0,1) random number would that translate to?

would that translate to?
$$(l-bi+s in base 2)/2$$

would that translate to?
$$(l-bi+s)$$
 in base 2)/2
① a. 0.3825 $(1 \times 2^{\circ}) + (1 \times 2^{2}) + (1 \times 2^{+}) + (1 \times 2^{6}) - 2^{+}$
② b. 0.5 $= (1 + 4 + 16 + 64)/2^{+}$
② c. 0.6641 $= \frac{85}{126} = 0.66406$

$$0 \text{ b. 0.5} = (1 + 4 + 16 + 64)/2^{4}$$

Od. 0.9826

Question 14 1 pts

(Lesson 6.5: Generalizations of LCGs.) TRUE or FALSE? There are some great PRN generators out there with incredible cycle lengths $pprox 2^{191}$ and even 2^{19937} !

QR35015 True

False

Question 15 1 pts

(Lesson 6.6: Choosing a Generator --- Theory.) Which of the following statements about the RANDU generator is true?

O b.	. The generator is given by $X_i = 65539 X_{i-1} \mathbf{mod}(2^{31})$
_	The PRNs appear at first glance to be uniform, but funny things happen when you look at the PRNs in multiple dimensions.
(d.	. The PRNs are distributed on just 15 hyperplanes.

Question 16

1 pts

(Lesson 6.7: Statistical Considerations - Intro.) Suppose the guy on trial is actually guilty but you incorrectly acquit him. So you've incorrectly accepted the null hypothesis of innocence. What type of error have you just made - Type I or Type II?

Question 17 1 pts

(Lesson 6.8: Goodness-of-Fit Tests.) Suppose we observe 1000 PRNs to obtain the following data.

$$interval\ i$$
 $[0.00, 0.25)$ $[0.25, 0.50)$ $[0.50, 0.75)$ $[0.75, 1.0]$ $number\ observed$ 240 255 243 262

Conduct a χ^2 goodness-of-fit test to see if these numbers are approximately Unif(0,1). Use level of significance $\alpha=0.05$. Here are some table entries that you may need: $\chi^2_{0.05,3}=7.81$, $\chi^2_{0.05,4}=9.49$, and $\chi^2_{0.05,5}=11.1$. ACCEPT or

REJECT?
$$\chi_{0}^{2} = \sum_{i=1}^{4} \frac{\left(0_{i} - E_{i}\right)^{2}}{E_{i}} = \frac{\left(240 - 250\right)^{2}}{250} + \dots + \frac{\left(262 - 250\right)^{2}}{250}$$

$$= \frac{159}{25} = 1.272$$

O b. Reject $\chi_0^2 = 1.272 < \chi_{0.05,3}^2 = 7.81$

fail to reject Ho.

Question 18 1 pts

(Lesson 6.9: Runs Tests for Independence.) Consider the following $\,n=30\,$ PRNs. (Read from left to right, and then down.)

$$0.79 \quad 0.68 \quad 0.46 \quad 0.69 \quad 0.90 \quad 0.93 \quad 0.99 \quad 0.86 \quad 0.33 \quad 0.22 \quad 0.60 \quad 0.18 \quad 0.59 \quad 0.38 \quad 0.69 \quad 0.76 \quad 0.91 \quad 0.62 \quad 0.22 \quad 0.19 \quad 0.11 \quad 0.45 \quad 0.72 \quad 0.88 \quad 0.65 \quad 0.55 \quad 0.31 \quad 0.27 \quad 0.46 \quad 0.89$$

Let's conduct a runs up and down test to test H_0 : the U_i 's are independent with level α = 0.05. ACCEPT or REJECT?

Tever
$$\alpha = 0.05$$
. ACCEPT OF REJECT?

 $Z_{N_z} = Z_{0.025}$ $N = 30$ $n_1 = 17$ (# of observations ≥ 0.5)

 $= 1.96$ $n_2 = n - n_1 = 13$

(a. Accept $B \approx Nor$ $\left(\frac{2n_1n_2}{n} + \frac{1}{2}, \frac{2n_1n_2(2n_1n_2 - n)}{n^2(n-1)}\right)$

(b. Reject $= Nor$ $\left(\frac{457}{30}, 6.9772\right)$
 $= (B - E[B]) / Vor(B) = \frac{12 - \frac{457}{30}}{16.9772} = -1.224$

Question 19 1 pts

(Lesson 6.9: Runs Tests for Independence.) Suppose that U_1, U_2, U_3 are i.i.d. Unif(0,1). Let's denote the number of runs up-and-down by X. Find the EXACT distribution of X.

○ a. X ~ Unif(0,1)

b. X~ Norm(0,1)

$$\odot$$
 c. $\Pr(X=0)=0.2, \Pr(X=1)=0.3, \Pr(X=2)=0.3, \Pr(X=3)=0.2$

$$\bigcirc$$
 d. $\Pr(X=1)=0.5, \Pr(X=2)=0.5$ Answer is E

$$\bigcirc$$
 e $\Pr(X=1)=1/3, \ \Pr(X=2)=2/3$

Not saved

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