



Note your lowest exam score can twill be replaced by your score on the final (if its higher)

Final

15 MC Questions -> 80 pts

FR ouestion -> 20 pms

110 minutes

Given two integers $a, b \in \mathbb{Z}$, the Euclidean Algorithm...

ightharpoonup ightharpoonup fails if either a or b is prime.

c) \bigcirc can be used to determine if a and b are relatively prime.

ightharpoonup ightharpoonup tells us whether or not a or b is prime.

 \bigcirc tells us that the prime number 11 either divides a or divides b.

570p at 0

remainder above = ged (a, b)

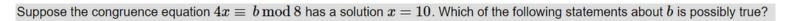
gcd(a, b)=1 <=> cut b
are releatively

Let S_3 denote the subset of length-7 binary strings with the following property: the number of 1's in each string is a multiple of 3. In other words

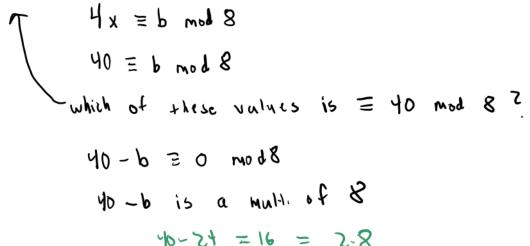
 $S_3 = \{$ all length-7 binary strings whose total number of 1's equals a multiple of $3\}$

Which, if any, of the following statements is true?

$$S_3 = \begin{cases} 2e_{10} & 1'_{5} \end{cases} \cup \begin{cases} 3 & 1'_{5} \end{cases} \cup \begin{cases} 3 & 1'_{5} \end{cases}$$
only 1
0000000
 $\begin{pmatrix} \frac{7}{3} \end{pmatrix}$

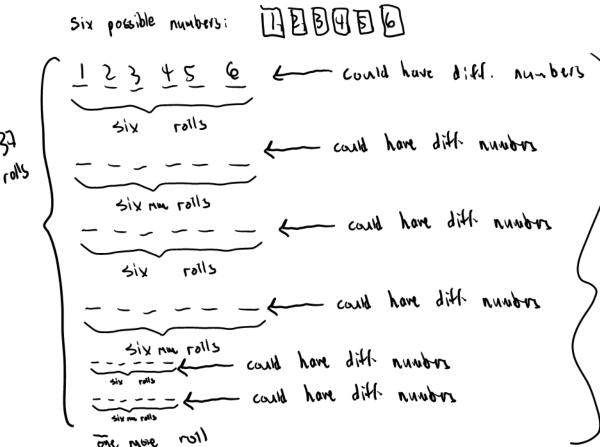


- a) \bigcirc It is possible that b=28
- c) \bigcirc It is possible that b=9
- d) \bigcirc It is possible that b=39
- e) igcirc It is possible that b=24



A six-sided die is rolled 37 times. Which of the following statements is true?

- a) O At least 37 rolls produced the same number.
- b) At least 12 rolls produced the same number.
- c) At least 6 rolls produced the same number.
- d) O At least 7 rolls produced the same number.
- e) Exactly 4 rolls produced the same number.
- f) None of the above.



lave same
lave same
lemainder
when
divided by 8
28 has r=4
9 has r=1
1,39 has r=7
1,24 has r=0
1,40 has r=0

PH
one number
repended 7 yims

Given the set $X=\{0,1,2,\cdots,7\}$ we define the subset $T\subseteq\mathcal{P}\left(X\right)$ by $T=\left\{S\in\mathcal{P}\left(X\right):\left|S\right|=5\right\}$

Which, if any, of the following statement is true?

- a) $\bigcirc |T| = 56$
- b) $\bigcirc |T| = 0$
- c) |T| = 128
- d) $\bigcirc |T| = 2520$
- e) $\bigcirc |T| = 21$

 $|T| = {8 \choose 5}$

other possibilities...

it was easy to get this question wrong by miscounting 1x1

note:
$$|x| = 8$$
 $\left(|x| \neq 7\right)$

For this problem P,Q, and R are statements that satisfy the following:

 $(P \iff Q) \wedge R$ is false, and Q is true.

If possible, use this information to determine the truth value of $P.\,$

- a) igcup The truth value of P cannot be determined by the given information.
- **b)** \bigcirc P is a true statement.
- **c)** \bigcirc P is a false statement.

eight Pl=>Q is F or R is F

Q is true

we can't conclude truth value of P

P is true

Q is true

Q is true

R is false

R is false

For this problem P,Q, and R are statements that satisfy the following: $(P \iff Q) \land R \text{ is } \text{frace} \quad \text{and } Q \text{ is true.}$ If possible, use this information to determine the truth value of P.

a) \bigcirc The truth value of P cannot be determined by the given information.

b) $\bigcirc P$ is a true statement.

(PZ=>Q) A R is True

Both PZ=>Q is True and R is True

PJQ have the same trush value

Q is True

.. P is True

Consider the following proposition:

Proposition. $\forall n \in \mathbb{N}$, at least one of the consecutive natural numbers, n, n+1, and n+2, is divisible by 3

Suppose a mathematician wishes to prove this proposition using a Proof by ("Regular" or "Weak") Induction. Which of the following statements best describes or summarizes the inductive step she could use in her proof?

 \swarrow \cap Let $k\in\mathbb{N}$ be arbitrary, and show that one of the numbers k,k+1, or k+2 is divisible by 3. and then what \nearrow

 $\mathbb{A}_{k} \cap \mathbb{A}_{k} \in \mathbb{N}$ be arbitrary, and suppose the number k is divisible by 3. Use this Inductive Hypothesis to show that this implies k+1 is divisible by 3.

b) \bigcirc Let $k \in \mathbb{N}$ be arbitrary, and suppose one of the numbers k, k+1, or k+2 is divisible by 3. Use this Inductive Hypothesis to show that this implies one of the numbers k+1, k+2 or k+3 is divisible by 3.

Chis is a trick question. A proof by Induction cannot be used for this proposition since it involves the natural numbers.

 \bigcirc Show that the proposition is true when n=0.

- a base case

wrong inductive hyp.