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Part IV. Work Out: Show all the necessary steps clearly.

1. Write mathematical representation of the given argument and show that it is
formal proof (rules of inference) technique.

Tom is a Math Major or a Computer Science Major. If Tom does not kn
then he is not a Math Major. If he knows discrete math, then he is sm
Computer Science major. Therefore, Tom is smart.

let, P: Tom is Math Major

Q: Tom is a Computer Science Major

R: Tom knows discrete Math

S: He is smart

- The Statement is: $P \vee Q, \neg R \Rightarrow P, R \Rightarrow S, \neg Q \vdash S$

1. $P \vee Q$ (Premise)
2. $\neg R \Rightarrow P$ (Premise)
3. $R \Rightarrow S$ (Premise)
4. $\neg Q$ (Premise)
5. $\neg S \Rightarrow \neg R$ (Contrapositive of (3))
6. $\neg S \Rightarrow P$ (Using (2) & (5) Principle of syllogism)
7. ?

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Part I: Write "True" if the statement is correct and "False" if it is incorrect. (1pt. ea

True ✓ 1. For any real number a, b and c, $a > b \Rightarrow ac > bc$.

True ✓ 2. If the truth value of $(\neg p \Leftrightarrow \neg q) \Rightarrow (p \vee \neg r)$ is false, then $(q \Rightarrow r)$ is true.

True ✓ 3. If the power set of the set A has one element, then A is empty set.

True ✗ 4. Every subset of the set of natural numbers has smallest element.

True ✓ 5. An argument is valid if and only if it is impossible for the conclusion to b while the premises are all true.

True ✗ 6. The product of any two irrational numbers is always rational.

False ✓ 7. There exist a set with exactly 24 subsets.

(4)

Part II: Choose the best answer from the given four alternatives. (1pt. e

C ✗ 1. Which of the following sets is equal to the set $A = \{x \in \mathbb{N} \mid x + 7 < 11\}$?

A. $\{a, b, c\}$

(B) $\{1, \sqrt{4}, \sqrt{9}\}$

C. $\{x \in \mathbb{R} \mid 1 \leq x \leq 3\}$

D. $\{8, 9, 10\}$

D ✓ 2. If number of elements of a set A is 4, then the number of a non-empty proper sub of a set A is?

A. 16

(B) 14

C. 32

D. 15

A ✗ 3. Let P: If the team is late, then it cannot play the game.
Q: If the referee is here, then the team can play the game.
If P is true and Q is false. Which one of the following is necessary true?

A. The team is late and it cannot play the game.

B. The referee is not here and the team cannot play the game.

(C) If the team is late, then the referee is here.

D. The referee is not here.

D ✗ 4. The negation of the proposition "If 3 is an odd number, then 27 is prime number" is?

A. 3 is not odd number and 27 is prime number.

B. If 3 is an odd number, then 27 is not prime number.

(C) 3 is an odd number and 27 is not prime number.

D. 3 is not an odd number and 27 is not prime number.

C ✓ 5. Which of the following statement is not true?

A. Every integer number has an additive inverse.

B. Every counting number is a whole number.

C. Every decimal number is rational number.

D. Every rational number is real number.

(2)

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2. Use Principle of Mathematical Induction to prove that.

$$3^1 + 3^2 + 3^3 + \dots + 3^n = \frac{3^{n+1} - 3}{2}, \quad \text{for } n \geq 1$$

Basis

$= 3^1 + 3^2 + 3^3 + \dots 3^{n-1} + 3^n = \frac{3^{n+1} - 3}{2}$

$3 \quad 3^{n-2}, 3^{n-1} + 3^n$

$3^1 + 3^2 + 3^3 \dots + 3^n = \frac{3^{n+1} - 3}{2}$

$\frac{3^{n+1} - 3}{2} = \frac{3^{1+1} - 3^1}{2} = \frac{3^2 - 3^1}{2} = \frac{3}{2}$

$\frac{3^{2+1} - 3}{2} = \frac{3}{2}$

$\frac{3^{3+1} - 3}{2} = \frac{3^4}{2} \Rightarrow$ Basis

$3^1 + 3^2 + 3^3 + \dots + 3^n = \frac{3^{n+1} - 3}{2} \Rightarrow$ False

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