

THE UNIVERSITY OF MARYLAND  
CMSC150

## General Review Drill

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**Instructions:** Click on the [Begin](#) button to view the first randomly selected card. Click on [FS](#) to view the flash cards in full screen mode (works only outside a web browser). The [Home](#) button will bring you to my website. The [Close](#) button closes the document (use outside a web browser).

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Begin

FS

Close

Home

## QUESTION

True or False: For all integers  $a$  and  $n$ , if  $a|n^2$ , then  $a|n$ .

- (a) True
- (b) False

[Hint](#)[Soln](#)[Next](#)[Home](#)

## QUESTION

Let  $B$  be an empty bowl. Let  $D$  be the property of being a dog. True or False:  $\forall x$  in  $B$ , if  $x$  is in  $B$ , then  $D(x)$ .

- (a) True
- (b) False

[Hint](#)[Soln](#)[Next](#)[Home](#)

## QUESTION

A logical expression which is always false is called a

Hint

Soln

Next

Home

## QUESTION

$\{\{1,3\}, \{2\}, \{6,4\}, \{5\}\}$  is a partition of the set  $\{1,2,3,4,5,6\}$ .

- (a) True
- (b) False

[Hint](#)[Soln](#)[Next](#)[Home](#)

## QUESTION

True or false:  $17 \equiv -3 \pmod{5}$

- (a) True
- (b) False

Hint

Soln

Next

Home

## QUESTION

An ordered  $n$ -tuple is the same as a set of  $n$  elements.

(a) False (b) True.

Hint

Soln

Next

Home

## QUESTION

True or false: For any set  $A$ , is it true that  $\emptyset \in A$ ?

- (a) True
- (b) False

Hint

Soln

Next

Home

## QUESTION

A possible partition of the set  $\{1, 2\}$  is the set of sets:  $\{\{1\}, \{2\}, \emptyset\}$ .

- (a) True
- (b) False

[Hint](#)[Soln](#)[Next](#)[Home](#)

## QUESTION

What is the value of  $\sum_{k=-1}^{k=1}(k^2 + 3)$ ?

[Hint](#)[Soln](#)[Next](#)[Home](#)

## QUESTION

Given the function  $f(x) = 2x + 1$ , then the value of  $f^{-1}(3)$  is

[Hint](#)[Soln](#)[Next](#)[Home](#)

## QUESTION

Is it true that  $\{1\} \subseteq \{\{1\}, 2\}$ ?

- (a) Yes
- (b) No

Hint

Soln

Next

Home

## QUESTION

The function  $f(x) = x^3$  where the domain of  $f$  is the set of all real numbers  $R$  is an example of an *injective* or *1-to-1* function.

- (a) Yes
- (b) No

[Hint](#)[Soln](#)[Next](#)[Home](#)

## QUESTION

The negation of the statement: *The number  $n$  is neither divisible by 3 nor 7* is *The number  $n$  is divisible by either 3 or 7*.

- (a) Yes
- (b) No

[Hint](#)[Soln](#)[Next](#)[Home](#)

## HINT

Either find a counterexample or state the general principles that make it true. WARNING: A few special cases showing it is true does not constitute a proof.

Hint

Soln

Next

Home

## ANSWER

It is a false statement as can be seen by the counterexample: let  $n = 6$  and  $a = 12$ . 12 does divide  $6^2 = 36$ , but 12 does not divide  $n$  which is 6.

[Hint](#)[Soln](#)[Next](#)[Home](#)

## HINT

What properties does an element in the empty set NOT have?

Hint

Soln

Next

Home

# ANSWER

This is a true statement.

## ANSWER

Yes, it is called a contradiction. The statement that is always true is called a *tautology*.

# HINT

Recall the definition of a partition of a set.

## ANSWER

Yes, it satisfies the definition of a partition.  
1) the sets must all be disjoint and 2) their union must be the whole set. But there is one other condition. What is it?

Hint

Soln

Next

Home

# HINT

You must, of course, know the definition.

## ANSWER

$x \equiv y \pmod{m}$  means what? It means  $x-y$  is divisible by  $m$ . We are asking if  $17 - (-3)$  is divisible by 5. Since  $17 - (-3) = 20$ , the answer is yes.

[Hint](#)[Soln](#)[Next](#)[Home](#)

## HINT

Is a list the same as a set?

Hint

Soln

Next

Home

## ANSWER

In a set, the ordering of the elements does not matter.

Hint

Soln

Next

Home

# HINT

Read once more about difference between  $\in$  and  $\subseteq$ .

## ANSWER

This is just Theorem 5.2.4. It is true that  $\emptyset \subseteq A$  for any set  $A$ . Do you see the proof without looking it up? It is on page 278, Theorem 5.2.4. Interesting, no?

[Hint](#)[Soln](#)[Next](#)[Home](#)

## HINT

Again, read carefully the definition of a partition.

Hint

Soln

Next

Home

## ANSWER

If you read the definition of a partition, you will note that the set of such sets can NEVER include the empty set.

Hint

Soln

Next

Home

## HINT

You get a few terms here that you must add together as the index starts at  $-1$  and goes to  $1$ . What are the values that  $k$  must assume?

Hint

Soln

Next

Home

## ANSWER

$k = -1, 0, 1$  The values for  $k^2 + 3$  for each of those values (three of them) is: 4, 3, 4. The sum says add them all together:  $4 + 3 + 4 = 11$  I hope no one forgot the element in the summation for the index  $k = 0$ !

[Hint](#)[Soln](#)[Next](#)[Home](#)

## HINT

This involves understanding the notation solving an equation for  $x$  .

Hint

Soln

Next

Home

## ANSWER

$f^{-1}$  is called the inverse function of  $f$ . To find  $f^{-1}(3)$  we must find the value of  $x$  such that  $2x + 1 = 3$  and this value of  $x$  is 1. So 1 is the answer.

[Hint](#)[Soln](#)[Next](#)[Home](#)

## HINT

There is such a thing as a set which can contain sets as elements. For example, the power set of a set.

Hint

Soln

Next

Home

## ANSWER

But it is not true that  $\{1\} \in \{\{1\}, 2\}$ . This can be very confusing. Now is the time to be clear about it.

## HINT

Recall what it means to be an *injective* functions. It means that for any value  $y$  in the range of the function  $f$ , there is a **UNIQUE**  $x$  such that  $f(x) = y$ .

[Hint](#)[Soln](#)[Next](#)[Home](#)

## ANSWER

For any  $y$  how many solutions are there for the equation  $x^3 = y$ ? Since there is only one cube root for any real number, there is only one solution. What is the range for this function? It is actually a bijection or 1 to 1 and onto. If the function were the square function, this would be false, since there are two solutions for  $x^2 = y$  for  $y > 0$ . This function is neither an injection nor is it onto, since there is no square root for a negative number.

[Hint](#)[Soln](#)[Next](#)[Home](#)

## HINT

Be sure you see the logic of this statement. .  
. does it have *ands* or *ors*?

Hint

Soln

Next

Home

## ANSWER

The translation into the formalism of Chapter 1 is *The number  $n$  is not divisible by 3 and the number  $n$  is not divisible by 7*. We use De Morgan's laws to get: *The number  $n$  is divisible by 3 or the number  $n$  is divisible by 7*.

[Hint](#)[Soln](#)[Next](#)[Home](#)