

Information About Exam 1

The first exam will be given in class on Friday, September 30. It will cover the material in the textbook in sections 1.1 – 1.3, 2.1 – 2.3, and 3.1 – 3.3. The exam will be closed book / closed notes. You may use a calculator if you wish.

The exam will include a few different kinds of questions, concerned with different aspects of learning the material, as described below.

Factual Knowledge. Be prepared to give mathematically correct statements of definitions, theorems, corollaries, and the like, and also to explain any notations we have discussed, such as $a \equiv b \pmod{n}$, $a \mid b$, 1_R , and $R \times S$. This will demonstrate your command of the important facts about the integers and about rings we have covered. This type of knowledge might also be tested with multiple choice or true false items.

Applying Factual Knowledge. Beyond simply stating what is true, be prepared to show you can use the facts in specific settings. For example, you should be able to find all solutions to a congruence such as $x^2 \equiv 2 \pmod{11}$, or find $(28,98)$, or determine whether the odd integers constitute a subring of \mathbb{Z} , or find the zero divisors (if any) in $\mathbb{Z} \times \mathbb{Z}_6$.

Proofs. You should be prepared to find mathematically correct proofs in simple cases. The level of difficulty I have in mind is illustrated by the parts of Theorem 3.5 or 3.12. I will not intentionally ask for obscure or tricky proofs.

Fully Explain and Justify Your Answers. In proofs and also in problems that do not explicitly call for a proof, you will be expected to provide a coherent justification for statements you give in answering a question. In your justifications you may use without proof any definitions, theorems, or other results we have covered, except that you cannot cite a result you have been explicitly asked to prove. For example, if you are asked to prove that in any ring R , $a0_R = 0_R$ for all a in R , it is not acceptable to answer “This is true because it appears as part of a theorem in the text.”

When you do cite a fact from the text, be sure to state the fact fully, or cite it by name. For an example of a citation by name, you could say something like *By the definition of a field ...*, or *By the Fundamental Theorem of Arithmetic ...*. As an example of stating a known result, you could say *As stated in the textbook, b and $-b$ have the same divisors for any integer b .*

In proofs about rings, cite any specific definitions or axioms you use, either by name or by stating the axiom. Thus, you could say

If x and y are elements of a ring R , then $xy + yx$ is also in R by closure under addition and multiplication ...

or

Since R is a ring, by definition $a + b = b + a$ for all elements a and b . Therefore ...