

MATH325: Discrete Mathematics II
Quiz q080501Name: nweadick1@cougars.ccis.eduScore:

Open `main.tex` and enter answers (look for `answercode`, `answerbox`, `answerlong`). Turn the page for detailed instructions. To rebuild and view pdf, in bash shell execute `make`. To build a gzip-tar file, in bash shell execute `make s` and you'll get `submit.tar.gz`.

This is a closed-book, 5-min quiz.

Q1. There are 200 students who has taken a course in Physics, 100 who have taken a course in Chemistry, 50 who has taken a course in Physics and Chemistry. How many students have taken either Physics or Chemistry? Write ERROR if the problem cannot be solved.

ANSWER:

Let P be the set of students who has taken a course in Physics.
Let C be the set of students who has taken a course in Chemistry.
Let $|P| = 200$
Let $|C| = 100$
Then, $|P \cup C| = 300$ and $|P \cap C| = 50$
Therefore" is about the sum of terms in the PIE formula.
 $|P \cup C| - |P \cap C| = 300 - 50 = 250$

(You only need to state the answer.)

Q2. How many elemets are in the union of 4 sets if each of the sets has 100 elements, each pair of the sets shares 40 elements, each three of the sets share 25 elements, and there are 5 elements in all four sets? Write ERROR if the problem cannot be solved.

ANSWER:

Let the four sets be A, B, C, D
 $|A \cup B \cup C \cup D| = 400$
The sum of the size of intersections of two distinct sets is therefore, $6 \cdot 40 = 240$.
The sum of the size of intersections of three distinct sets is therefore, $25 \cdot 4 = 100$.
The sum of the size of intersections of four distinct sets is therefore, $1 \cdot 5 = 5$.
Therefore" is about the sum of terms in the PIE formula,
 $400 - 240 + 100 - 5 = 255$

(You only need to state the answer.)

INSTRUCTIONS

In `main.tex` change the email address in

```
\renewcommand\AUTHOR{jdoe5@cougars.ccis.edu}
```

yours. In the bash shell, execute “`make`” to recompile `main.pdf`. Execute “`make v`” to view `main.pdf`. Execute “`make s`” to create `submit.tar.gz` for submission.

For each question, you’ll see boxes for you to fill. You write your answers in `main.tex` file. For small boxes, if you see

```
1 + 1 = \answerbox{}
```

you do this:

```
1 + 1 = \answerbox{2}.
```

`answerbox` will also appear in “true/false” and “multiple-choice” questions.

For longer answers that needs typewriter font, if you see

```
Write a C++ statement that declares an integer variable name x.  
\begin{answercode}  
\end{answercode}
```

you do this:

```
Write a C++ statement that declares an integer variable name x.  
\begin{answercode}  
int x;  
\end{answercode}
```

`answercode` will appear in questions asking for code, algorithm, and program output. In this case, indentation and spacing is significant. For program output, I do look at spaces and newlines.

For long answers (not in typewriter font) if you see

```
What is the color of the sky?  
\begin{answerlong}  
\end{answerlong}
```

you can write

```
What is the color of the sky?  
\begin{answerlong}  
The color of the sky is blue.  
\end{answerlong}
```

For students beyond 245: You can put \LaTeX commands in `answerbox` and `answerlong`.

A question that begins with “T or F or M” requires you to identify whether it is true or false, or meaningless. “Meaningless” means something’s wrong with the statement and it is not well-defined. Something like “ $1+_2$ ” or “ $\{2\}^{\{3\}}$ ” is not well-defined. Therefore a question such as “Is $42 = 1+_2$ true or false?” or “Is $42 = \{2\}^{\{3\}}$ true or false?” does not make sense. “Is $P(42) = \{42\}$ true or false?” is meaningless because $P(X)$ is only defined if X is a set. For “Is $1 + 2 + 3$ true or false?”, “ $1 + 2 + 3$ ” is well-defined but as a “numerical expression”, not as a “proposition”, i.e., it cannot be true or false. Therefore “Is $1 + 2 + 3$ true or false?” is also not a well-defined question.

When writing results of computations, make sure it’s simplified. For instance write 2 instead of $1 + 1$. When you write down sets, if the answer is $\{1\}$, I do not want to see $\{1, 1\}$.

When writing a counterexample, always write the simplest.

Here are some examples (see `instructions.tex` for details):

1. T or F or M: $1 + 1 = 2$ T

2. T or F or M: $1 + 1 = 3$ F

3. T or F or M: $1+_2 =$ M

4. $1 + 2 =$ 3

5. Write a C++ statement to declare an integer variable named **x**.

`int x;`

6. Solve $x^2 - 1 = 0$.

Since $x^2 - 1 = (x - 1)(x + 1)$, $x^2 - 1 = 0$ implies $(x - 1)(x + 1) = 0$. Therefore $x - 1 = 0$ or $x = -1$. Hence $x = 1$ or $x = -1$.

7. Which is true? C

(A) $1 + 1 = 0$

(B) $1 + 1 = 1$

(C) $1 + 1 = 2$

(D) $1 + 1 = 3$

(E) $1 + 1 = 4$