

## Quiz 0\_B

● Graded

Student

Javier Herrera

Total Points

8 / 30 pts

Question 1

Problem 1

4 / 10 pts

- + 2 pts (a) Correct, all work is shown
- + 1.5 pts (a) Partial: almost correct, 1 small computational mistake or a missing step
- + 1 pt (a) Partial: 2 small mistakes, OR some work is missing
- + 2 pts (b) Correct, all work is shown
- + 1.5 pts (b) Partial: Partial: almost correct, 1 small computational mistake or missing steps
- + 1 pt (b) Partial: 2 small mistakes, OR some work is missing
- + 2 pts (c) Correct, all work is shown
- + 1.5 pts (c) Partial: almost correct, 1-2 small computational mistake(s) or missing steps

✓ + 1 pt (c) Partial: answer is correct, no work shown OR formula applied correctly, no computations

- + 2 pts (d) Correct, all work is shown
- + 1.5 pts (d) Partial: almost correct, 1-2 small computational mistake(s) or missing steps

✓ + 1 pt (d) Partial: answer is correct, no work shown OR formula applied correctly, no computations

✓ + 2 pts (e) Correct, all work is shown

- + 1.5 pts (e) Partial: almost correct, 1-2 small computational mistake(s) or missing steps
- + 1 pt (e) Partial: answer is correct, no work shown OR formula applied correctly, no computations
- + 0 pts Incorrect/Not submitted

## Question 2

### Problem 2

0 / 10 pts

- + 2 pts (a) Correct expression
- + 1 pt (a) Partial: A small mistake in the expression
- + 2 pts (b) Correct expression and justification
- + 1 pt (b) Partial: A small mistake in expression and justification
- + 2 pts (c) Correct expression and justification
- + 1 pt (c) Partial: A small mistake in expression and justification
- + 2 pts (d) Correct expression
- + 1 pt (d) Partial: A small mistake in expression and justification
- + 2 pts (e) Correct expression
- + 1 pt Click here to replace this description.

✓ + 0 pts Incorrect/No solution

## Question 3

### Problem 3

4 / 10 pts

✓ + 1 pt (a) Answered (implied) "False", some justification is present

✓ + 2 pts (a) Correct justification  
Can be: counterexample  $x = -1, -3$

+ 1.5 pts (a) Partial: "False", incomplete justification OR "True", reasonable justification with a small mistake

✓ + 1 pt (b) Answered (implied) "True", some justification is present

+ 2 pts (b) Correct justification

+ 1.5 pts (b) Partial justification

+ 0.5 pts (c) Answered (implied) "False", some justification is present

+ 2 pts (c) Correct justification

+ 0.5 pts (d) Answered (implied) "False", some justification is present

+ 2 pts (d) Correct justification

+ 1.5 pts (d) Partial justification

+ 0 pts Incorrect/Not answered

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**CS111 Quiz 0 (B)**

Rules:

- Time: 45 minutes.
- Closed notes, closed book. No electronic devices, including calculators.
- To receive credit, you must show your work and provide justification when appropriate.
- Only the front pages will be scanned! If you need more room, write on the last blank page. If you need scratch space, use the back side of the previous page.

**Problem 1:** (a) Determine the numerical values of the expressions below. To receive credit, you must show your work for each subproblem. Simplify your answer to a single number.

$$3^{\log_9 16} =$$

$$15 \log_3 \frac{1}{81} =$$

$$\binom{20}{18} = \frac{20!}{18! 2!} \quad \frac{n!}{n!(n-m)!}$$

$$\sum_{i=1}^{40} 3i = 3(1) + 3(2) + \dots + 3(40) = \frac{120(121)}{2} = \frac{4920}{2} = 2205$$

$$\sum_{i=0}^{\infty} \left(\frac{1}{5}\right)^i = \frac{1}{1 - \frac{1}{5}} = \frac{1}{\frac{4}{5}} = \frac{5}{4}$$

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**Problem 2:** A university is hosting a hackathon with 150 students participating. Answer the following questions. Express your answer using an appropriate numerical expression (for example,  $\frac{15!}{5!}$  or  $5^{10}$ ). Do not compute the final numerical value. Give a one-sentence justification.

(a) At the opening of the hackathon, every student greets every other student with a handshake exactly once. How many handshakes occur in total?

$$\frac{n!}{n(n-1)!} = \frac{150!}{150!0!}$$

(b) The students are asked to line up to receive their hackathon badges. In how many ways can they line up?

$$2^{150}$$

(c) Each student must decide whether to participate in a coding challenge or a software construction challenge. In how many different ways can the students be divided into these two groups?

$$\frac{n(n+1)}{2} = \frac{150(151)}{2}$$

(d) There are nine hackathon challenges planned for the day. Five of them should be completed in the morning session, and four in the afternoon session. In how many ways could the challenges be divided between the morning and afternoon sessions? (The order of challenges within each session does not matter.)

(e) The organizers want to choose three winners of the hackathon for 1st, 2nd, and 3rd place. In how many ways can the winners be selected?

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**Problem 3:** Determine whether the following statements are true or false. Give justification for your answers. (Reminders:  $\mathbb{R}$  denotes the set of all real numbers,  $\mathbb{Z}$  - the set of all integers,  $\forall$  - the universal quantifier, and  $\exists$  - the existential quantifier.)

(a)  $\forall x \in \mathbb{Z} : x^3 + 3x^2 + 5x + 3 > 0.$

"for every integer of  $x$ , is this true"

$$x^3 + 3x^2 + 5x + 3 > 0$$

$$= (-1)^3 + 3(-1)^2 + 5(-1) + 3 > 0 \quad \text{X} \quad 0$$

(b)  $\forall x \in \mathbb{Z} : 8x^2 - 6x + 1 > 0.$

"for every integer  $x$ , is this true?"

$$8x^2 - 6x + 1 > 0 \rightarrow 8(3)^2 - 6(3) + 1 > 0$$

$$\det = b^2 - 4ac$$

$$= (-6)^2 - 4(8)(1)$$

$$= 36 - 32 = 4$$

$$72 - 18 + 1 > 0$$

$$55 > 0$$

This statement is true since the det is positive and a real number

(c)  $\forall x \in \mathbb{R}, \exists y \in \mathbb{R} : x^2 - y^2 = 4x.$

"for every real number  $x$ , there exists a real number  $y$ "

$$x^2 - y^2 = 4x$$

$$\sqrt{x^2 - 4x} = \sqrt{y^2}$$

$$x - 4 = y$$

$$x = 4$$

$$x^2 - y^2 = 4x$$

$$\sqrt{y^2} = \sqrt{0}$$

$$y = 0$$

This statement is true since, when solving for  $y$ , it's a real number

(d)  $\forall x \in \mathbb{R}, \exists y \in \mathbb{R} : y^2 + 2 = 2x^2.$

"for every real number  $x$ , there exists any real number  $y$ "

$$y^2 + 2 = 2x^2$$

NAME:

SID:

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