Prep 8 Quiz

Due Mar 8 at 9pm	**Points** 5	**Questions** 5	**Available** until Mar 8 at 9pm	**Time Limit** None	**Allowed Attempts** Unlimited

Instructions

Readings

Please read the following parts of the **Course Notes**  .

- Pages 92–100.

General instructions

You can review the general instructions for all prep quizzes on the **Course Syllabus**. Remember that you can submit multiple times! You might consider printing this quiz out so that you can work on paper first.

This quiz was locked Mar 8 at 9pm.

Attempt History

	Attempt	Time	Score
KEPT	Attempt 7	less than 1 minute	5 out of 5
LATEST	Attempt 7	less than 1 minute	5 out of 5
	Attempt 6	less than 1 minute	1 out of 5
	Attempt 5	less than 1 minute	0 out of 5
	Attempt 4	2 minutes	4 out of 5

Attempt	Time	Score
Attempt 3	2 minutes	3.8 out of 5
Attempt 2	4 minutes	3.6 out of 5
Attempt 1	9 minutes	2.75 out of 5

Correct answers are hidden.

Score for this attempt: **5** out of 5

Submitted Mar 6 at 8:31pm

This attempt took less than 1 minute.

Question 1

1 / 1 pts

For the function $f(n) = n + \frac{5}{n}$, to prove that $f(n) \in \mathcal{O}(n)$, we need to find positive real values n_0 and c that satisfy $\forall n \in \mathbb{N}, n \geq n_0 \Rightarrow f(n) \leq c \cdot n$.

Select *every* option below that makes the statement $f(n) \in \mathcal{O}(n)$ true.

- [ ] c = 1 and n_o = 5
- [ ] c = 5 and n_o = 1
- [ ] c = 1 and n_o = 1
- [x] c = 3 and n_o = 2

Question 2

1 / 1 pts

Make each of the following statements true by selecting the correct relationship between the values of $a \in \mathbb{R}$ and $b \in \mathbb{R}$.

1. $n^a \in O(n^b)$ if and only if [Select]
2. $n^a \in \Omega(n^b)$ if and only if $a \geq b$
3. $n^a \in \Theta(n^b)$ if and only if [Select]

Answer 1:

$a \leq b$

Answer 2:

$a \geq b$

Answer 3:

$a = b$

Question 3

1 / 1 pts

For each relationship on the left, select the correct set on the right, **using each set at most once.** (This guarantees that there is a unique correct solution to this question.)

O(1) ⊆ ? ⊆ O(n)	O(log n)
O(n) ⊆ ? ⊆ O(n^2)	O(n log n)
O(log n) ⊆ ? ⊆ O(n log n)	O(n)
O(n^2) ⊆ ? ⊆ O(2^n)	O(n^4)
O(n log n) ⊆ ? ⊆ O(n^3)	O(n^2)

Question 4

1 / 1 pts

Consider the following function.

```
def fun(n: int) -> int:
    i = 3
```

```
while i < n * n:
    print(i)
    if i % 2 == 1:
        i = 2 * i
    else:
        i = i - 1
```

Select *every* true statement below about the function above.

- [x] The number of “steps” performed during ONE iteration of the loop body is 3.
- [x] The number of “steps” performed during ONE iteration of the loop body is 5.
- [x] The number of “steps” performed during ONE iteration of the loop body is 1.
- [ ] The number of “steps” performed during ONE iteration of the loop body is 0.
- [x] The number of “steps” performed during ONE iteration of the loop body is 8.

Question 5

1 / 1 pts

Each of the following functions takes in a list of integers. For each function, select whether its running time depends *only* on the length of its input list, or whether its running time depends on both the length of the input list *and* the values stored in the list.

1.
```
def has_duplicates(lst: List[ int ]) -> bool:
    i = 0
    while i < len(lst):
        j = i + 1
```

```
        while j < len(lst):
            if lst[ i ] == lst[ j ]:
                return True
            j += 1
        i += 1

    return False
```

runtime depends on both the length and the values of input list

2.
```
def mod1(lst: List[ int ]) -> None:
    for i in range(len(lst)):             # Loop 1
        for j in range(i + 1, len(lst)):  # Loop 2
            if (i + j) % 3 == 2:
                # NOTE: this nested break stops Loop 2, but Loop 1 still continues
                break
```

runtime depends only on length of input list

3.
```
def mod2(lst: List[ int ]) -> None:
    for i in range(len(lst)):
        for j in range(i + 1, len(lst)):
            if (lst[ i ] + lst[ j ]) % 3 == 2:
                # NOTE: this nested break stops Loop 2, but Loop 1 still continues
                break
```

[Select]

4.
```
def has_duplicates_bug(lst: List[ int ]) -> bool:
    i = 0
    while i < len(lst):
        j = i                    # HINT: this is the only different line
        while j < len(lst):
            if lst[ i ] == lst[ j ]:
```

```
            return True
        j += 1
    i += 1
```

[Select]

Answer 1:

runtime depends on both the length and the values of input list

Answer 2:

runtime depends only on length of input list

Answer 3:

runtime depends on both the length and the values of input list

Answer 4:

runtime depends only on length of input list

Quiz Score: **5** out of 5