

## Summary of problem sets for instructor

### GEOG36 – Climate Extremes in a Warming Planet

#### Overview:

The problem sets were designed to introduce students to important concepts/applications in Python and to connect the lecture content. In order to keep the problem sets simple and not overwhelm the students, the problem sets were broken up into five separate, shorter assignments. The contents of the problem sets are outlined below to indicate after which lectures the problem sets should be introduced.

#### Overall objectives of the problem sets:

1. Demystify scientific computing and programming using Python
2. Recognize commonly used data in climate science
3. Apply Python computing methods to climate data
4. Interpret results generated from scientific computing

#### Content outline:

	Content	Total Quest & Points	Length
1	<b>Learning objectives:</b> <ol style="list-style-type: none"> <li>1. Explore basic principles of Python</li> <li>2. Learn commonly used functions to explore simple, relevant climate data</li> </ol> <b>Python content:</b> <ul style="list-style-type: none"> <li>- Basic variables</li> <li>- Math</li> <li>- Working with lists</li> </ul> <b>Course content:</b> <ul style="list-style-type: none"> <li>- Units in climate science (force; temperature conversion)</li> <li>- Expensive disasters</li> </ul>	5 questions  Total Pts: 21 - Run ex. code: 5 - Correct answers: 11 - Comment annotations to responses: 5	30 – 45 min
2	<b>Learning objectives:</b> <ol style="list-style-type: none"> <li>1. Learn how to use open source packages</li> <li>2. Explore additional data structures in Python</li> </ol> <b>Python content:</b> <ul style="list-style-type: none"> <li>- Numpy (data types, index, axis)</li> <li>- Pandas (data types, index, merge)</li> </ul> <b>Course content:</b> <ul style="list-style-type: none"> <li>- Different disaster reporting sources</li> </ul>	8 questions  Total Pts: 27 - Run ex. code: 5 - Correct answers: 17 - Comment annotations to responses: 5	1 – 1.5 hrs
3	<b>Learning objectives:</b> <ol style="list-style-type: none"> <li>1. Generate various types of plots to visualize climate data</li> <li>2. Interpret results from generated plots</li> </ol> <b>Python content:</b> <ul style="list-style-type: none"> <li>- Matplotlib (Different types of plots)</li> <li>- Spatial plots</li> <li>- Installing outside packages</li> </ul> <b>Course content:</b> <ul style="list-style-type: none"> <li>- NAO/AO*</li> <li>- Disaster numbers</li> <li>- Wave height*</li> </ul>	7 questions  Total Pts: 27 - Run ex. code: 5 - Correct answers: 17 - Comment annotations to responses: 5	1 – 1.5 hrs

<b>4</b>	<b>Learning objectives:</b> <ol style="list-style-type: none"> <li>1. Extend understanding of additional, useful functions</li> <li>2. Create own functions to calculate simple formulas</li> </ol> <b>Python content:</b> <ul style="list-style-type: none"> <li>- Conditionals</li> <li>- For loops</li> <li>- Writing functions</li> </ul> <b>Course content:</b> <ul style="list-style-type: none"> <li>- Latent heat</li> <li>- Quantifying water as an energetic quantity</li> <li>- Flood return periods</li> <li>- Net radiation equations</li> </ul>	8 questions  Total Pts: 24 - Run ex. code: 5 - Correct answers: 14 - Comment annotations to responses: 5	45 min – 1hr
<b>5</b>	<b>Learning objectives:</b> <ol style="list-style-type: none"> <li>1. Explain data structures commonly used in climate science</li> <li>2. Accumulate and apply skills from previous problem sets</li> </ol> <b>Python content:</b> <ul style="list-style-type: none"> <li>- Understanding climate data is stored</li> <li>- Simple analysis larger real-life climate data</li> </ul> <b>Course content:</b> <ul style="list-style-type: none"> <li>- Heat waves*</li> <li>- Surface pressure*</li> </ul>	4 questions  Total Pts: 21 - Run ex. code: 5 - Correct answers: 11 - Comment annotations to responses: 5	45 min – 1hr
<b>Total</b>		<b>120 points</b>	<b>4 - 5.75 hrs</b>

**\*Note:**

It would be worth reviewing that the links to download are accessible before distribution.