Properties of Stars
Analyzing Appearance and Properties

Pre-Questions

1. How do <u>absolute magnitude</u> (absmag) and <u>apparent magnitude</u> (mag) differ? How is <u>luminosity</u> related?

2. A star's <u>appearance</u> gives clues about its <u>properties</u>. Since the nearest star would take thousands of years to reach to measure directly, how are these clues helpful to astronomers?

3. Astronomers have made observations of millions of stars, how might knowing the properties of these stars help them understand things like the composition of different parts of the universe or how solar systems form?

PART 1: All the Stars in Our Catalogue

4. The graph you produced shows <u>right ascension</u> on the x-axis and <u>declination</u> on the y-axis. What does the resulting graph actually show?

5. Your code also produced a chart- how are the chart and graph similar to each other? How are they different?

6. Are there any stars you can identify on both of them? What are their names? What aspect of the *graph* allowed you to do that? Is there any information on the chart but not the graph that would make this easier?

PART 2: Relationships Between Two Properties

7. Each point on the scatter plot shows a star's <u>temperature</u> and <u>luminosity</u>. What trends do you see in the data?

8. Around what <u>temperature</u> is the largest range of <u>luminosities</u>? Using the chart below the graph you produced determine the most likely color? If a star is blue, what temperature can you infer it is?

PART 3: Constellations and Star Properties

9. Which constellation did you choose? How many stars in it? Is it visible above Miami right now? Is it visible over Sydney?

10. Using the <u>H-R Diagram</u>, what <u>types of stars</u> make up your constellation? How many of each type are in your constellation?

11. What is the <u>temperature</u> of the hottest star in your constellation? What is its <u>absolute magnitude</u>? What about the coldest constellation?

PART 4: Unstructured Coding

12. Is there a relationship between <u>distance</u> (dist) & <u>apparent magnitude</u> (mag)? Use the coding block from part 2 (hint: you will need to adjust the x & y limits)

13. Is there a relationship between apparent magnitude (mag) & <u>absolute magnitude</u> (absmag)? Use the coding block from part 2 (hint: you will need to adjust the x & y limits)

CODING INSTRUCTIONS

PART 1: All the Stars in Our Catalogue

Run the block of code below. Use the resulting graph and the chart below it to answer questions 4-6. For free coding experiment with changing one or more of the highlighted values.

```python
fig = plt.figure(figsize=(15, 6))
plt.scatter(data.ra,data.dec, s=0.01)
plt.xlim(24, 0)
plt.title("All the Stars in the Catalogue")
plt.xlabel('Right Ascension (Hours)')
plt.ylabel('Declination (Degrees)')
```

PART 2: Relationships Between Two Properties

Run the block of code below. Use the resulting graph and the chart below it to answer questions 7-8. For free coding try changing 1 or 2 of the highlighted values.

```python
# format the points on the graph
transparency = 1
size = 1

# draws a scatter plot
fig = plt.figure(figsize=(20, 4.5))
plt.scatter(data.temp, data.lum, s=size,
plt.xlim(2000,15000)
plt.ylim(0,1000)
plt.title("Does hotter mean brighter?")
plt.ylabel("Luminosity")
plt.xlabel("Temperature (K)")
```

PART 3: Constellations and Star Properties

Run the block of code below. Use the two resulting graphs and the link below them to answer questions 9-11. For free coding try changing the highlighted values.

```python
# format the points on the graph
transparency = 0.2
size = 1

# draws a scatter plot
fig = plt.figure(figsize=(8, 4.5))
plt.scatter(data.temp, data.absmag, s=size, edgecolors='none', alpha=transpa
plt.scatter(data_con.temp, data_con.absmag, color='red', edgecolors='none')
plt.xlim(2000,15000)
plt.ylim(20,-15)
plt.title("Types of stars in a constellation")
plt.ylabel("Absolute Magnitude")
plt.xlabel("Temperature (K)")
```