ORANGE HIGH SCHOOL
MATHEMATICS

YEAR 9 2015 - Assignment 1

TIME ALLOWED - 2 weeks

Due 06/03/15

INSTRUCTIONS

- Section 1 – Ratios
- Section 2 – Data
- Read all questions carefully and answer each question in the space provided.
- All necessary working should be shown in every question.
- The mark for each question is indicated.

| Section 1: |  /33 |
| Section 2: |  /28 |
| Total:     |  /61 |
Ratios – Astronomical proportions

Answer the following questions in the space provided, ensuring you use full sentences and correct spelling, grammar and punctuation.

Ratios are frequently used to compare quantities of the same type. They can be very useful in building a picture of the differences between two things or situations. Consider the differences between the Earth and the other planets in the solar system. How do the planets differ? How does life on the other planets compare with life on Earth?

1. The table below shows the radius and distance from the Sun for the planets in our solar system.

   a) Compare the radius of each planet with the radius of the Earth by calculating the ratio of its radius to that of Earth, e.g. \( \frac{6052}{6378} \approx 0.95 \) for Venus. Express your answer as a whole number percentage. \( \text{(8)} \)

<table>
<thead>
<tr>
<th>Name</th>
<th>Radius (km)</th>
<th>Radius compared to radius of Earth (%)</th>
<th>Distance from the Sun ('000 km)</th>
<th>Distance from Sun compared to the Earth (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>2440</td>
<td></td>
<td>57910</td>
<td></td>
</tr>
<tr>
<td>Venus</td>
<td>6052</td>
<td></td>
<td>108200</td>
<td></td>
</tr>
<tr>
<td>Earth</td>
<td>6378</td>
<td></td>
<td>149600</td>
<td></td>
</tr>
<tr>
<td>Mars</td>
<td>3397</td>
<td></td>
<td>227940</td>
<td></td>
</tr>
<tr>
<td>Jupiter</td>
<td>71492</td>
<td></td>
<td>778330</td>
<td></td>
</tr>
<tr>
<td>Saturn</td>
<td>60268</td>
<td></td>
<td>1429400</td>
<td></td>
</tr>
<tr>
<td>Uranus</td>
<td>25559</td>
<td></td>
<td>2870990</td>
<td></td>
</tr>
<tr>
<td>Neptune</td>
<td>24776</td>
<td></td>
<td>4504300</td>
<td></td>
</tr>
</tbody>
</table>

   b) What does a ratio close to 1.0 (100%) mean? \( \text{(1)} \)

   c) What does it mean when a ratio is: \( \text{(2)} \)
      i. Less than 100%:
      ii. Greater than 100%:

   d) How does the radius of Mars compare with that of the Earth (as a ratio)? Explain. \( \text{(2)} \)
e) How does the radius of Neptune compare with that of the Earth (as a ratio)? Explain. (2)

___________________________________________________________________________________
___________________________________________________________________________________

f) How does the distance of Saturn from the Sun compare with the distance of the Earth from the Sun (as a ratio)? Explain. (2)

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___________________________________________________________________________________
___________________________________________________________________________________

___________________________________________________________________________________
___________________________________________________________________________________

2. The length of the day (or the time it takes a planet to rotate once on its axis), is different on different planets as is the length of the year. The table below shows the time to rotate and the length of the year measured in Earth days for each planet.

   a) Complete the table by calculating the ratio of the length of the year on the different planets to that of the Earth, e.g. the ratio of the Mercury year to the Earth year is \( \frac{87.97}{365.26} \approx 0.24 \). Express your answer as a whole number percentage. (4)

<table>
<thead>
<tr>
<th>Name</th>
<th>Time to rotate (Earth days)</th>
<th>Length of year (Earth days)</th>
<th>Length of year (Earth years) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>58.6</td>
<td>87.97</td>
<td></td>
</tr>
<tr>
<td>Venus</td>
<td>-243*</td>
<td>224.7</td>
<td></td>
</tr>
<tr>
<td>Earth</td>
<td>0.99 ( \approx 1 )</td>
<td>365.26</td>
<td></td>
</tr>
<tr>
<td>Mars</td>
<td>1.03</td>
<td>686.98</td>
<td></td>
</tr>
<tr>
<td>Jupiter</td>
<td>0.41</td>
<td>4332.71</td>
<td></td>
</tr>
<tr>
<td>Saturn</td>
<td>0.45</td>
<td>10759.50</td>
<td></td>
</tr>
<tr>
<td>Uranus</td>
<td>-0.72*</td>
<td>30685.00</td>
<td></td>
</tr>
<tr>
<td>Neptune</td>
<td>0.67</td>
<td>60190.00</td>
<td></td>
</tr>
</tbody>
</table>

* A negative rotation time means the planet rotates in the opposite direction to the Earth. Earth rotates anti-clockwise when viewed from above the North Pole.

b) How long in Earth days is a day on Venus? In what direction does Venus rotate? (2)
3. Gravity and surface temperature are two measures of what it would be like to live on another planet, provided you had your own oxygen supply.

1. If gravity is a measure of how heavy you feel and 1.0g is the normal measure of gravity on Earth, would you feel heavier or lighter on Jupiter? (1)

2. Not all quantities are compared using ratios. How would you compare the average temperature on Jupiter with that on Earth? (1)

<table>
<thead>
<tr>
<th>Name</th>
<th>Gravity (g)</th>
<th>Average surface temperature (Celsius)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>0.4</td>
<td>166.85°</td>
</tr>
<tr>
<td>Venus</td>
<td>0.9</td>
<td>456.85°</td>
</tr>
<tr>
<td>Earth</td>
<td>1.0</td>
<td>13.85°</td>
</tr>
<tr>
<td>Mars</td>
<td>0.4</td>
<td>-55.15°</td>
</tr>
<tr>
<td>Jupiter</td>
<td>2.4</td>
<td>-151.15°</td>
</tr>
<tr>
<td>Saturn</td>
<td>0.9</td>
<td>-185.15°</td>
</tr>
<tr>
<td>Uranus</td>
<td>0.9</td>
<td>-214.15°</td>
</tr>
<tr>
<td>Neptune</td>
<td>1.1</td>
<td>-225.15°</td>
</tr>
</tbody>
</table>

4. Choose a planet and, based on the data in the tables, write a short description comparing life on that planet with life on Earth. (4)
Data – Means and proportions

When comparing data sets, we sometimes compare averages and proportions. When comparing the heights of boys and girls in Year 9, we might say that the average height of a Year 9 girl is 2 centimetres less than the average height of a Year 9 boy. We might say that 1 in 2 Australian girls participate in non-school sport compared with 2 in 3 boys. The Census at School project collected a range of data from boys and girls in Australian schools. In this task you will use a random sample of data from the 2010 survey to compare the reaction times of girls and boys, and consider the proportion of girls and boys with blue eyes.

5. The data below is a random sample of reaction times (in seconds) for 40 girls and 40 boys from the 2010 Census at School data. It shows reaction times for their dominant hand (the hand they use the most). You will notice that both samples list 39 reaction times. There was one non-response for each group.

Girls: 0.33, 0.34, 0.39, 0.26, 0.35, 0.28, 0.37, 0.35, 0.26, 0.43, 0.31, 0.37, 0.35, 0.35, 1.74, 0.34, 0.47, 0.33, 0.37, 0.46, 0.34, 0.31, 0.39, 0.43, 0.25, 0.32, 2.81, 0.34, 0.36, 0.39, 0.37, 0.37, 0.24, 0.29, 13.2, 0.35, 0.59, 0.35

Boys: 0.26, 0.37, 0.32, 0.31, 0.31, 0.29, 0.34, 0.26, 0.4, 0.39, 0.39, 0.34, 0.4, 0.35, 0.39, 0.4, 0.42, 0.17, 0.33, 0.53, 0.55, 0.37, 0.32, 0.27, 0.46, 0.38, 0.32, 0.28, 0.39, 0.28, 0.26, 0.4, 0.34, 0.36, 0.65, 0.57, 0.43, 0.28

Looking at the data for the girls, are there any values that you would consider outliers? What are they? (2)

6. To use Excel to calculate the average (mean) reaction time for the girls and boys, follow the steps below:

- Open a new Excel spreadsheet and enter the reaction time data as shown below. For the girls times do not include the values you considered outliers (as in question 5)

<table>
<thead>
<tr>
<th>Row/Col</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>Reaction times – Dominant hand</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>Girls (s)</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>Boys (s)</td>
</tr>
<tr>
<td>4</td>
<td>0.33</td>
<td>0.26</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0.34</td>
<td>0.37</td>
<td></td>
</tr>
</tbody>
</table>

- To find the average reaction time for girls enter the formula “=average(B4:enter cell reference for the last cell containing data here)”
- Find the average reaction time for boys in the same way.
- On the Number tab, set the number of decimal places to 2 for both cells containing the averages

a. Print your spreadsheet and attach, labelled “Appendix A”. (4)
b. What was the average reaction time for the girls and for the boys? (2)
c. Write a statement (using full sentences and correct grammar and punctuation) comparing the average reaction times for the girls and boys. (2)

In the survey, each student’s eye colour was also recorded. The sample data is shown below.


**Boys:** Hazel, Green, Green, Brown, Brown, Hazel, Green, Blue, Blue, Brown, Brown, Blue, Blue, Hazel, Hazel, Hazel, Hazel, Green, Blue, Blue, Brown, Brown, Blue, Blue, Blue, Blue, Green, Green, Blue, Brown, Brown, Brown, Brown

Follow the steps below to use Excel to find the proportion of girls and boys in the sample with blue eyes:

- Enter the eye colour data as shown below

<table>
<thead>
<tr>
<th>Row/Col</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>Eye colour</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Girls</td>
<td>Boys</td>
</tr>
<tr>
<td>4</td>
<td>Hazel</td>
<td>Hazel</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Hazel</td>
<td>Green</td>
<td></td>
</tr>
</tbody>
</table>

- In cell F45 enter the formula ‘=countif(F4:F43, “Blue”)’ to find the number of girls with blue eyes. In cell G45 enter the formula ‘=countif(G4:G43, “Blue”)’ to find the number of boys with blue eyes.

a) How many girls have blue eyes? (1)________________________________________

b) How many boys have blue eyes? (1)________________________________________

- In cell F47 enter the formula ‘=40/F45’. This formula finds how many girls there are for each girl who has blue eyes. In cell G47 enter the formula ‘=40/G45’ for the boys. Select cells F47 and G47 and set the number of decimal places to zero.

c) Print your spreadsheet and attach it to the assignment, labelled “Appendix 2”. (4)

d) Use the values in cell F47 and G47 to complete these statements:

i. 1 in ______ girls in the sample had blue eyes. (1)

ii. 1 in ______ boys in the sample had blue eyes. (1)
8. It is useful to consider the effect of including outliers in the calculation of averages.

- Add the data values you identified as outliers back into your column for reaction time data for girls in the spreadsheet and recalculate the average reaction time.

a) Print your spreadsheet that includes these new values and attach to the assignment, labelled “Appendix 3”. (4)

b) What is the new average reaction time for girls? (1)  

c) What was the effect on the average reaction time of adding in the outliers? (2)  

_______________________________________________________________________  

d) Which average, the first or the second, more accurately describes the reaction time of most of the girls? Explain your answer, using full sentences. (3)

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