Astronomy Ranking Task:
The Seasons

Exercise #1

Description: The figure below shows the Earth in its nearly (but not quite) circular orbit around the Sun, and the Earth-Sun distance for each season.

<table>
<thead>
<tr>
<th>Northern Hemisphere Season</th>
<th>Southern Hemisphere Season</th>
<th>Earth-Sun Distance (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring</td>
<td>Fall</td>
<td>151 million</td>
</tr>
<tr>
<td>Summer</td>
<td>Winter</td>
<td>154 million</td>
</tr>
<tr>
<td>Fall</td>
<td>Spring</td>
<td>152 million</td>
</tr>
<tr>
<td>Winter</td>
<td>Summer</td>
<td>150 million</td>
</tr>
</tbody>
</table>

A. Ranking Instructions: For a person in the Northern Hemisphere, rank the Earth-Sun distance (from greatest to least) by season. (Use season names.)

Ranking Order: Greatest distance 1 _______ 2 _______ 3 _______ 4 _______ Least distance

Or, the Earth-Sun distance at any season is the same. ________ (indicate with check mark).

Carefully explain your reasoning for ranking this way:
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_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________

B. Ranking Instructions: For a person in the Southern Hemisphere, rank the seasons (naming the seasons) by distance from the Sun (from greatest to least).

Ranking Order: Greatest distance 1 _______ 2 _______ 3 _______ 4 _______ Least distance

Or, the Earth-Sun distance at any season is the same. ________ (indicate with check mark).

Carefully explain your reasoning for ranking this way:
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_____________________________________________________________________________
_____________________________________________________________________________
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Exercise #2

Description: In each figure below a flashlight is shown projecting identical beams of light onto pieces of paper (A – D) inclined at various angles.

A. Ranking Instructions: Rank the size of the illuminated area (from largest to smallest) on each piece of paper (A – D).

Ranking Order: Largest  1 _____ 2 _____ 3 _____ 4 _____ Smallest

Or, the illuminated areas are all the same size. ________ (indicate with check mark).

Carefully explain your reasoning for ranking this way:

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_____________________________________________________________________________

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B. Ranking Instructions: Rank the brightness (from brightest to dimmest) of each illuminated area on the pieces of paper (A – D).

Ranking Order: Brightest 1 _____ 2 _____ 3 _____ 4 _____ Dimmest

Or, the areas are all the same brightness. ________ (indicate with check mark).

Carefully explain your reasoning for ranking this way:
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_____________________________________________________________________________

C. Ranking Instructions: Imagine that you placed a very sensitive thermometer against the illuminated area of each piece of paper and measured its temperature. Rank the temperature (from coolest to hottest) of each illuminated area (A – D).

Ranking Order: Coolest 1 _____ 2 _____ 3 _____ 4 _____ Hottest

Or, the temperatures of each illuminated area would all be the same. ________ (indicate with check mark).

Carefully explain your reasoning for ranking this way:
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_____________________________________________________________________________
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**Exercise #3**

**Description:** In the figure below parallel beams of sunlight are projected through equal sized cutouts of a screen and then strike a spherical globe at locations A - D. Note that A and C are at the same “latitude” on the globe.

**Ranking Instructions:** Rank the size (from largest to smallest) of the illuminated areas (A – D) on the globe.

**Ranking Order:** Largest  1 _____ 2 _____ 3 _____ 4 _____ Smallest

Or, each of the illuminated areas are equal. ________ (indicate with check mark).

**Carefully explain** your reasoning for ranking this way:

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**B. Ranking Instructions:** Rank the brightness (from brightest to dimmest) of each illuminated area on the globe (A – D).

**Ranking Order:** Brightest  1 _____ 2 _____ 3 _____ 4 _____ Dimmest

Or, the areas are all the same brightness. ________ (indicate with check mark).

**Carefully explain** your reasoning for ranking this way:

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C. **Ranking Instructions:** Imagine that you placed very sensitive thermometers against each illuminated area on the globe and measured its temperature. Rank the temperature (from coolest to hottest) of each illuminated area (A – D).

**Ranking Order:** Coolest 1 2 3 4 Hottest

Or, the temperatures of each illuminated area would all be the same. ________ (indicate with check mark).

**Carefully explain** your reasoning for ranking this way:

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_____________________________________________________________________________
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Exercise #4

Description: In the figure below six different locations (A - F) on Earth are shown during a particular time of the year. Note that each location is the same distance away from the equator.

A. Ranking Instructions: Rank the time it takes (from longest to shortest) for each location (A – F) to complete one full rotation.

Ranking Order: Longest time 1 _____ 2 _____ 3 _____ 4 _____ 5 _____ 6 _____ Shortest time

Or, the time it takes each location to make one full rotation is the same. ________ (indicate with check mark).
Carefully explain your reasoning for ranking this way:

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B. Ranking Instructions: Rank the time (from longest to shortest) that each location spends in daylight during each 24 hour period.

Ranking Order: Longest time 1 _____ 2 _____ 3 _____ 4 _____ 5 _____ 6 _____ Shortest time.

Or, the time each location spends in daylight is the same. ________ (indicate with check mark).

Carefully explain your reasoning for ranking this way:

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C. Ranking Instructions: Imagine that you placed identical glasses of water at each location (A - F). Rank the highest temperature (from coolest to hottest) a glass of water would reach during a 24 hour period at each location.

Ranking Order: Coolest 1 _____ 2 _____ 3 _____ 4 _____ 5 _____ 6 _____ Hottest

Or, the temperature of each glass of water would be the same. ________ (indicate with check mark).

Carefully explain your reasoning for ranking this way:

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Exercise #5

Description: In the figures (A – E) below parallel beams of sunlight illuminate globes tilted at various angles. Like the Earth, the globes rotate so that each location (indicated by an X) on each globe is sometimes in sunlight and sometimes in darkness. Assume that the globes make one full rotation every 24 hours, and that the distance of each “X” above the equator is the same on each globe.

A: Tilt=45°  B: Tilt=0°  C: Tilt=23°  D: Tilt=90°  E: Tilt=23°

A. Ranking Instructions: Rank the time (from longest to shortest) that each location spends in daylight during the 24 hour rotation period.

Ranking Order: Longest time 1 _____ 2 _____ 3 _____ 4 _____ 5 _____ Shortest time

Or, the time spent in daylight for each location is the same. ________ (indicate with check mark).

Carefully explain your reasoning for ranking this way:

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_____________________________________________________________________________
_____________________________________________________________________________
B. Ranking Instructions: Imagine that you placed identical glasses of water at each location indicated by an “X” for globes A - E. Rank the highest temperature (from coolest to hottest) a glass of water would reach during a 24 hour period at each location.

**Ranking Order:** Coolest 1 2 3 4 5 Hottest
Or, the temperature of each glass of water is the same. ________ (indicate with check mark).

**Carefully explain** your reasoning for ranking this way:

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_____________________________________________________________________________
_____________________________________________________________________________
_____________________________________________________________________________