Saturn and Jupiter are getting closer and closer in the night sky. Check it out. Just after sunset the two planets appear low in the southwest sky.

Of course, they are millions of miles away from each other, but as seen from Earth, when they reach conjunction, they will appear to be lined up just right to be almost overlapping.

**That night this year is December 21st. They should appear to be one really bright star in the sky.**

This conjunction of planets is called a great conjunction because the two planets, Saturn and Jupiter, are the largest planets in our solar system.

1. How big a deal do you think this will this be? What, if anything, have you heard about this?
Hold one of your hands at arm's length in front of your face. Now raise your little finger. The width of the tip of your little finger at arm's length is about one degree of apparent diameter in the night sky.

2. How many degrees wide do you think the full moon is?

On December 21st Jupiter and Saturn will appear to be 0.1 degree apart.

3. What are your thoughts about this? Do you think you will be able to distinguish between them?

We thought that a way of finding when the two planets would be aligned might be to measure the apparent change of Saturn's and Jupiter's angle motion in the night sky. When the change of their apparent diameters reaches about 0 degrees then they will be close to alignment.

4. What information would be helpful to know in order to make those calculations.

| Jupiter's orbit about the Sun = about 11.86 Earth years to orbit Sun |
| Saturn's orbit about the Sun = about 29.4 Earth years to orbit Sun |

5. How many days does it take for Jupiter and Saturn to each orbit the Sun?

6. Which planet will seem to move faster across the sky?

7. After one Earth day, what angular section of their orbits will they have each traveled. (hint: When they have finished their orbits around the Sun they will each have traveled 360 degrees around the Sun.)

So, if you observe the night sky for several weeks before December 21, it might look like Jupiter is gaining on Saturn as they near their conjunction.

8. By how many degrees per day is Jupiter gaining on Saturn as they orbit the Sun?

9. How might you calculate how long it would take for Jupiter to circle its orbit and again be aligned with Saturn as seen from the Sun?

10. Calculate the time needed to be in conjunction again.
11. From your calculations on problem #10, do you think that this event would happen many times in your lifetime?

But maybe there is more to this event than we have considered so far.

12. Do you think there are times when we wouldn't be able to see the conjunction? Please explain.

We've drawn some sketches (not to scale) of where the planets might be when they would be in conjunction. We've colored Earth so that you can easily note where in Earth's seasonal orbit it will be and have tried to show Earth's daytime or nighttime state.

13. Describe each of the Earth's position in these diagrams and how well you might be able to see a Jupiter/Saturn conjunction.

The last great conjunction was on May 28, 2000. This event was difficult to observe because the viewing angle from Earth was about 15° west of the Sun.

The last close easily visible great conjunction of Saturn and Jupiter was in 1226, during medieval times. It has been awhile since then.

14. How long has it been since that last, easily visible great conjunction?

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