



=EQUALS=

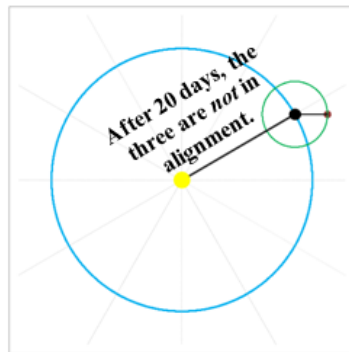
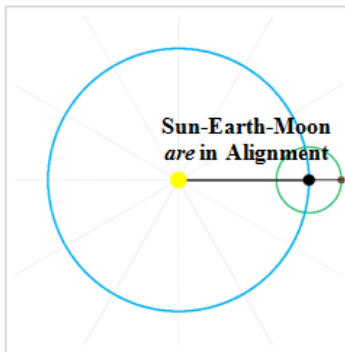
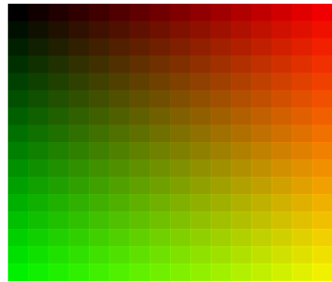
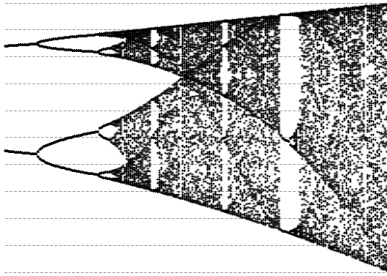
A CLUB OF INVESTIGATION AND
DISCOVERY

DECEMBER MEETING

The Logistic Map

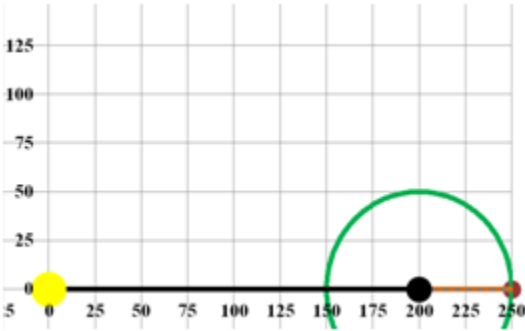
The Color Algorithm in Excel

Problem #2 of *The Kansas City Math Challenge*

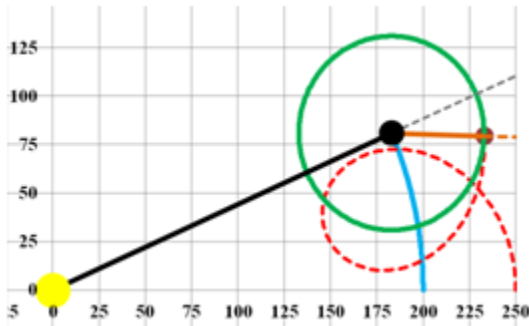


If the moon makes a complete orbit in 20 days, and the earth in 300, how many more days (past 20) will the earth, sun, and moon be in alignment?

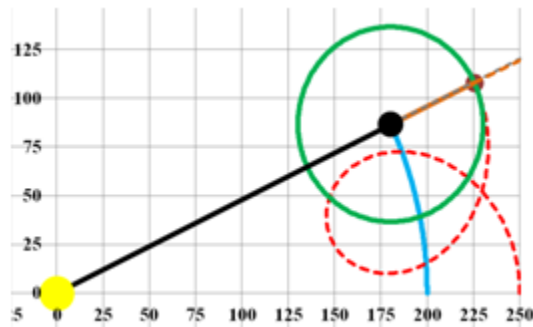
THE GENERAL PROCESS



At zero days, the sun, earth, and moon are in alignment – a full moon!



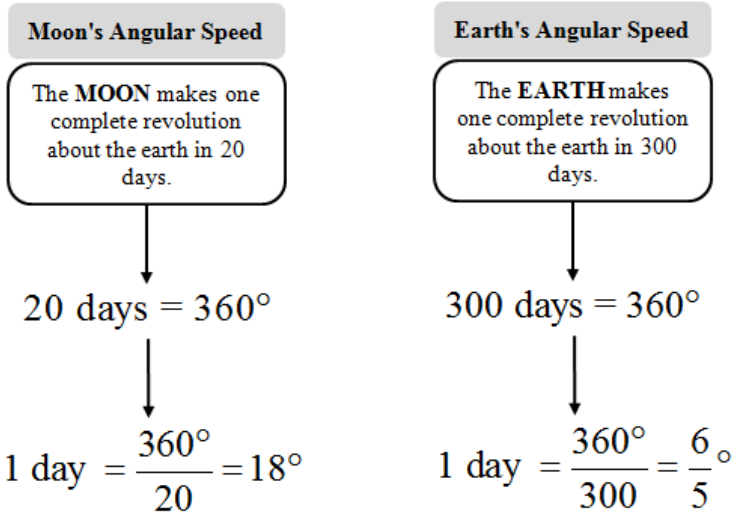
After 20 days, the moon has made a complete orbit. However, because the earth is revolving, we don't have a second full moon yet.



Question #2 asks:
“After how many more days will we have another full moon?”

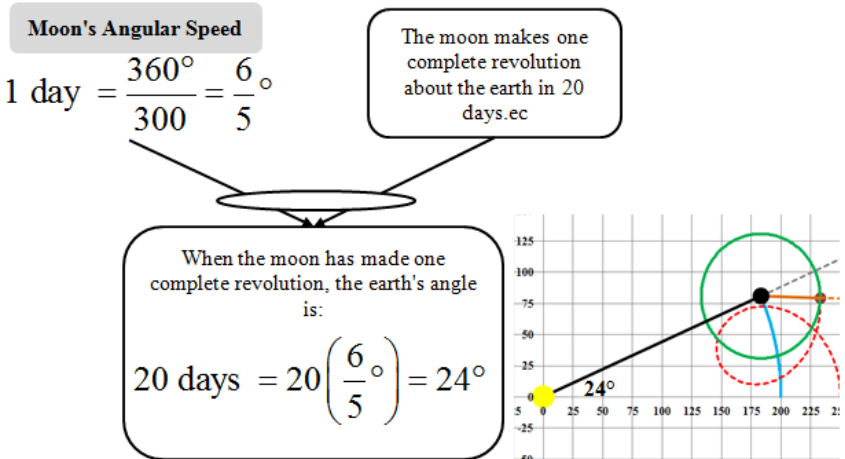
How Fast are the Moon and Earth Moving, Angle-Wise

The moon orbits the earth. The earth is also moving, too, orbiting the sun. How fast are both moving, *angle-wise*?



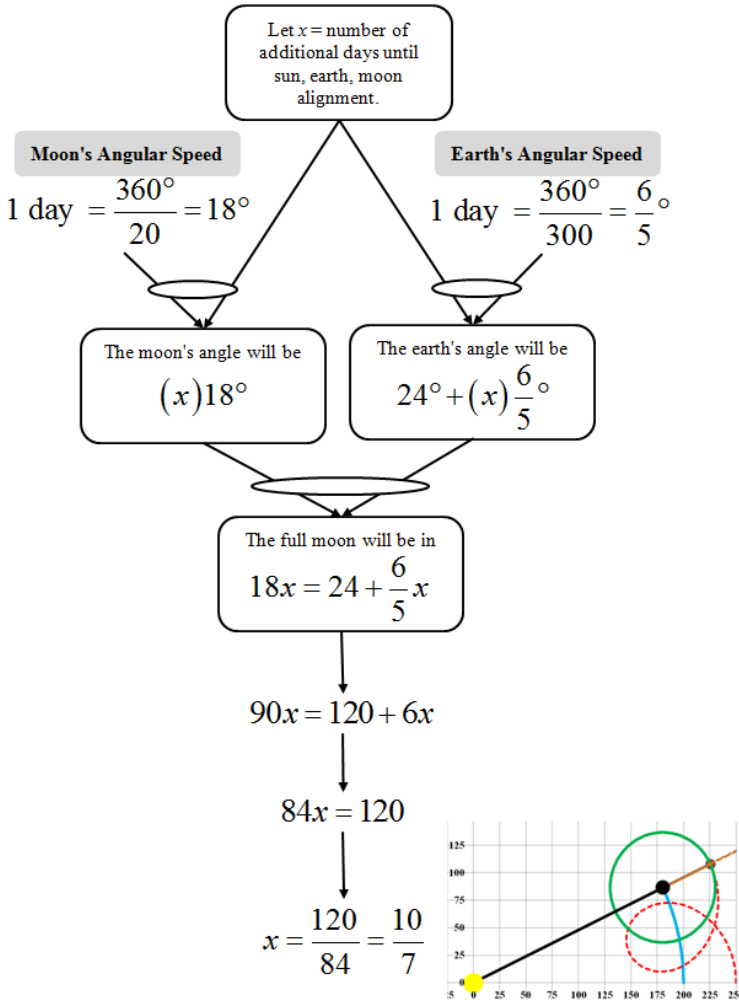
The Earth's Starting Angle After One Moon Orbit

When the moon has made one complete orbit, it's back to 0° . However, the earth's angle has increased. *How much?*



Searching for Alignment

The earth's starting angle is 24° . We're looking for the additional number of days, call it x , where the earth's angle equals the moon's angle. That is, the sun, earth, and moon are in alignment:



Conclusion

Therefore, if we input “20 + 10/7” under “days elapsed”, we see the alignment we were looking for – visual proof!

SOMETHING ELSE

But let's not stop there – let's see if our process works for our actual system: the earth rotates about the sun every 365.25 days (approximately), and the sidereal month is 27.3 days, find the synodic month.

The answer should be 29.5 days.

But let's not stop here, either! Rather than going through this whole process given new parameters, work through the process above to find the general formula for the question, "Given earth and moon orbits e_o and m_o , find x , the number of additional days until the next alignment."

Does it work – for both our examples above?

Are there any examples where the sidereal month **EQUALS** the synodic month?

And what is the apparent paradox of this answer?