

A “Handy” Measuring Tool

Learn how to use your hands to measure the size to distance ratio of a familiar astronomical object-- the Moon.

Materials Needed

- your hand
- your arm
- meter sticks
- a partner

What To Do:

Using Your “Handy Tool” To Find The Distance To Your Partner

- To start, use the meter stick to measure the height of your partner’s head. Measure from their chin to the top of their head. Save this measurement -- you’ll need it later.
- Make a fist. You will use the *width of your fist* as a unit of measure. Carefully measure the length of your arm (from wrist to the top of your shoulder) in “fists.” Write down this number -- for example, the arm measured in Figure 1 is “6 fists” long (see **Figure 1**).

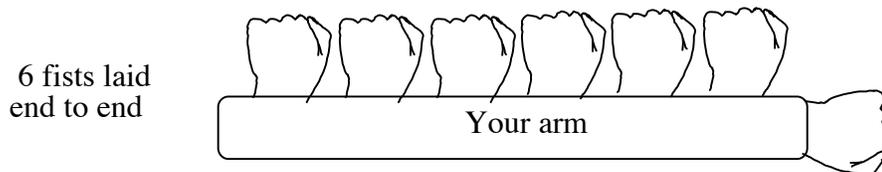
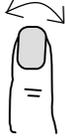
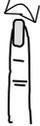


Figure 1

- Extend your arm straight out in front of you and make a fist. Close one eye and look at your fist, extended at arms length. Move your partner away from you until your closed fist just barely covers their head. Believe it or not, you now have enough information to estimate how far away your partner is standing from you.
- Let’s say that your arm is 6 fists long. That means that anything you can barely cover with your closed fist is 6 times further away than it is high. So, in this example, your partner’s head would also be 6 times further away than it is high.
- Using the height of your partner’s head (measured earlier) and the length of your arm in fists, estimate how far your partner is away from you. Check your answer with the meter stick.
- Below is a table of other “handy measuring tools” and the distance to size ratios for each. For example, anything you can just cover with the tip of your outstretched thumb will be 30 x farther away from you than it is big.

Part Of Hand To Compare ...	Sketch	Distance to size ratio	Angular Degrees (approximate)
Outstretched Thumb & Pinkie		3:1	20°
Clenched Fist		6:1	10°
Thumb		30:1	2°
Pinkie		60:1	1°

Using Your “Handy Tool” To Find The Distance To The Moon

- Look at a calendar and find a night when the Moon will be full. (During this phase, the Moon will rise at sunset and set at sunrise.) Before going outside to look at the full moon, make the following guess -- what part of your hand (extended at arm's length) will you need to hold out in front of you to just barely cover the full moon? Your fist? Your thumb? Your pinkie? Less than a pinkie? More than your clenched fist?
- Find the full moon and check your prediction. *Were you surprised that the full moon appeared smaller than any of your fingers?*
- As best you can, estimate the apparent size of the full moon in “pinkie nail widths.” For most people, the full moon is about 1/2 pinkie nail widths in apparent size.
- The Moon is about 2000 miles in diameter. Let’s say that the moon looked like it was about 1/2 pinkie nail width in apparent size. Anything you can just barely cover with the tip of your entire pinkie is 60 times farther away than its diameter. Since the moon appeared to be only 1/2 pinkie in size, this means that the moon is 120 times further away than it is big. In other words, the moon is *120 X 2000 miles = 240,000 miles away from the Earth.*