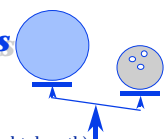


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Some Basic Concepts

- ❖ Primary Measurements
 - ❖ Size (Big/Small)
 - ❖ Dimension (radius, diameter, height, length)
 - ❖ Measured with a ruler
 - ❖ Mass (Heavy/Light)
 - ❖ Total amount of material in an object
 - ❖ Can be measured as weight
 - ❖ Density (Does It Float?)
 - ❖ How much mass is contained within?
mass/volume ("mass per unit volume")
grams/cubic centimeter

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Size and Related Topics

Big and Small !?!

- ❖ Mass of the Sun = 300,000 times that of Earth
- Diameter of Sun = 100 times that of Earth
- ❖ Which is "Bigger", Sun or Earth?
The Sun
- ❖ By How Much?

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Size and Related Topics

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The Sun
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100 times
Not 300,000 times !

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Size and Related Topics

Heavy and Light !?!

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- Diameter of Sun = 100 times that of Earth
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The Sun
- ❖ By How Much?

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Size and Related Topics

Heavy and Light !?!

- ❖ Mass of the Sun = 300,000 times that of Earth
- Diameter of Sun = 100 times that of Earth
- ❖ Which is "Heavier", Sun or Earth?
The Sun
- ❖ By How Much?
300,000 times
Not 100 times !

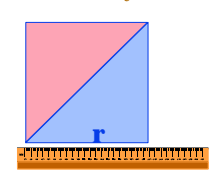
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Size and Related Topics

- ❖ Size is a "Linear" Measure
 - ❖ Measured along a line ... with a ruler
 - ❖ meters, kilometers (yards, miles)



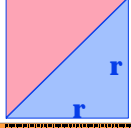
- ❖ length of side = **r**

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Size and Related Topics

- ❖ Area is a “squared (linear)” Measure
- ❖ product of **two** linear measures
- ❖ meters², kilometers² (yards², miles²) etc



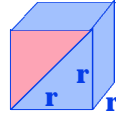
$\text{area of triangle} = \frac{1}{2} r * r = \frac{1}{2} r^2 \propto r^2$

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Size and Related Topics

- ❖ Volume is a “cubed (linear)” Measure
- ❖ product of **three** linear measures
- ❖ meters³, kilometers³ (yards³, miles³) etc



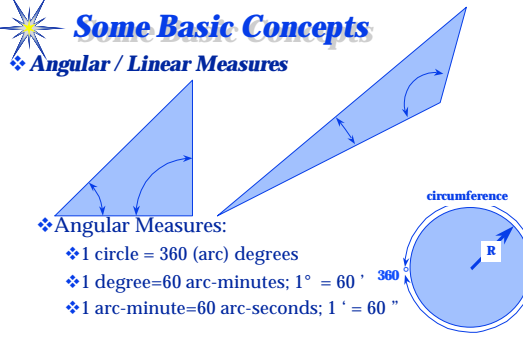
$\text{volume} = r * r * r \propto r^3$

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Some Basic Concepts

❖ Angular / Linear Measures



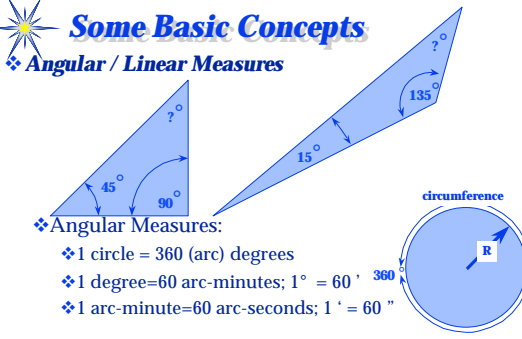
- ❖ Angular Measures:
- ❖ 1 circle = 360 (arc) degrees
- ❖ 1 degree=60 arc-minutes; $1^\circ = 60' \cdot \frac{360}{360}$
- ❖ 1 arc-minute=60 arc-seconds; $1' = 60''$

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Some Basic Concepts

❖ Angular / Linear Measures



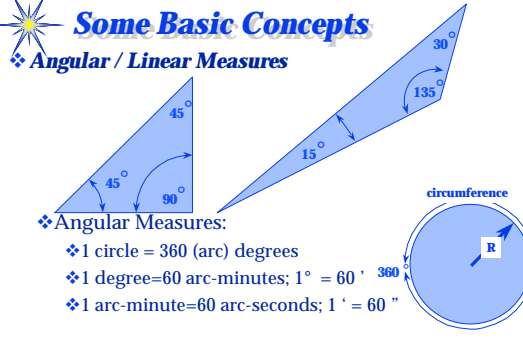
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Some Basic Concepts

❖ Angular / Linear Measures




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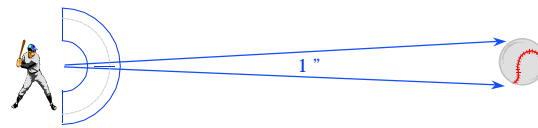
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Some Basic Concepts

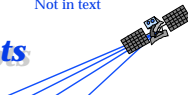
❖ Angular Diameter:

- ❖ The angular size of an object as seen at a particular distance
- ❖ Could be measured with a **Protractor** 
- ❖ A baseball 5 miles away has an **angular diameter** of 1" (1 arc-second)



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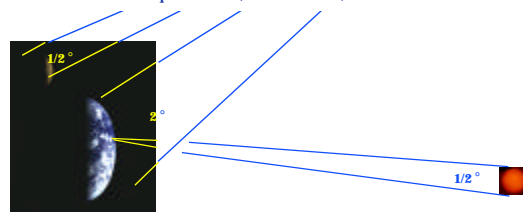
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Some Basic Concepts

❖ **Angular diameter**

❖ From Earth, the Sun has an angular diameter of $1/2^\circ$ which equals $30'$ (arc-minutes)

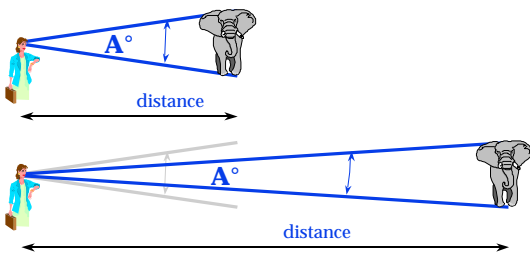


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Angular Diameter

❖ Inversely proportional to distance



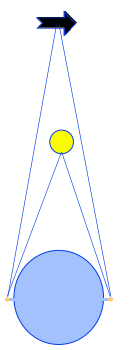
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Parallax

❖ Stellar parallax: the most direct way of getting the distance of a star

❖ Observe direction of an object from each end of a (long) baseline



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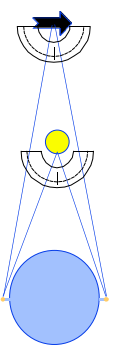
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Parallax

❖ Stellar parallax: the most direct way of getting the distance of a star

❖ Observe direction of an object from each end of a (long) baseline

❖ Note the angle represented by the change in direction



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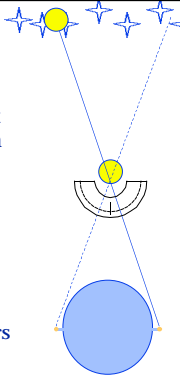
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❖ Note the angle represented by the change in direction

❖ Easier if angle is measured by looking at the background stars



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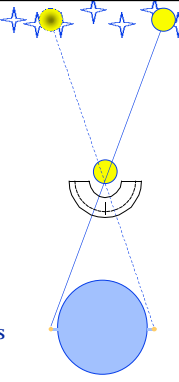
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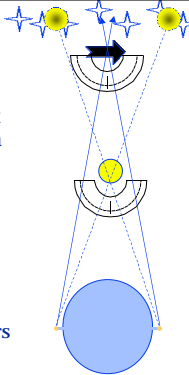
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Parallax


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- ❖ Note the angle represented by the change in direction
- ❖ Easier if angle is measured by looking at the background stars




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Parallax




- ❖ Do it yourself
 - ❖ Hold your thumb at arm's length
 - ❖ Look at it with your left eye
 - ❖ Look at it with your right eye
 - ❖ Note the shift
 - ❖ Repeat with thumb much closer to your eye




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Parallax



- ❖ Do it yourself
 - ❖ Hold your thumb at arm's length
 - ❖ Look at it with your left eye
 - ❖ Look at it with your right eye
 - ❖ Note the shift
 - ❖ A protractor could be used to measure the angle



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Questions and/or Comments?

Let me know at oliver@astro.ufl.edu
 or visit <http://www.astro.ufl.edu/~oliver/>