

Name \_\_\_\_\_

Bell \_\_\_\_\_ Due Date \_\_\_\_\_

ACTIVITY: Circumpolar Constellations

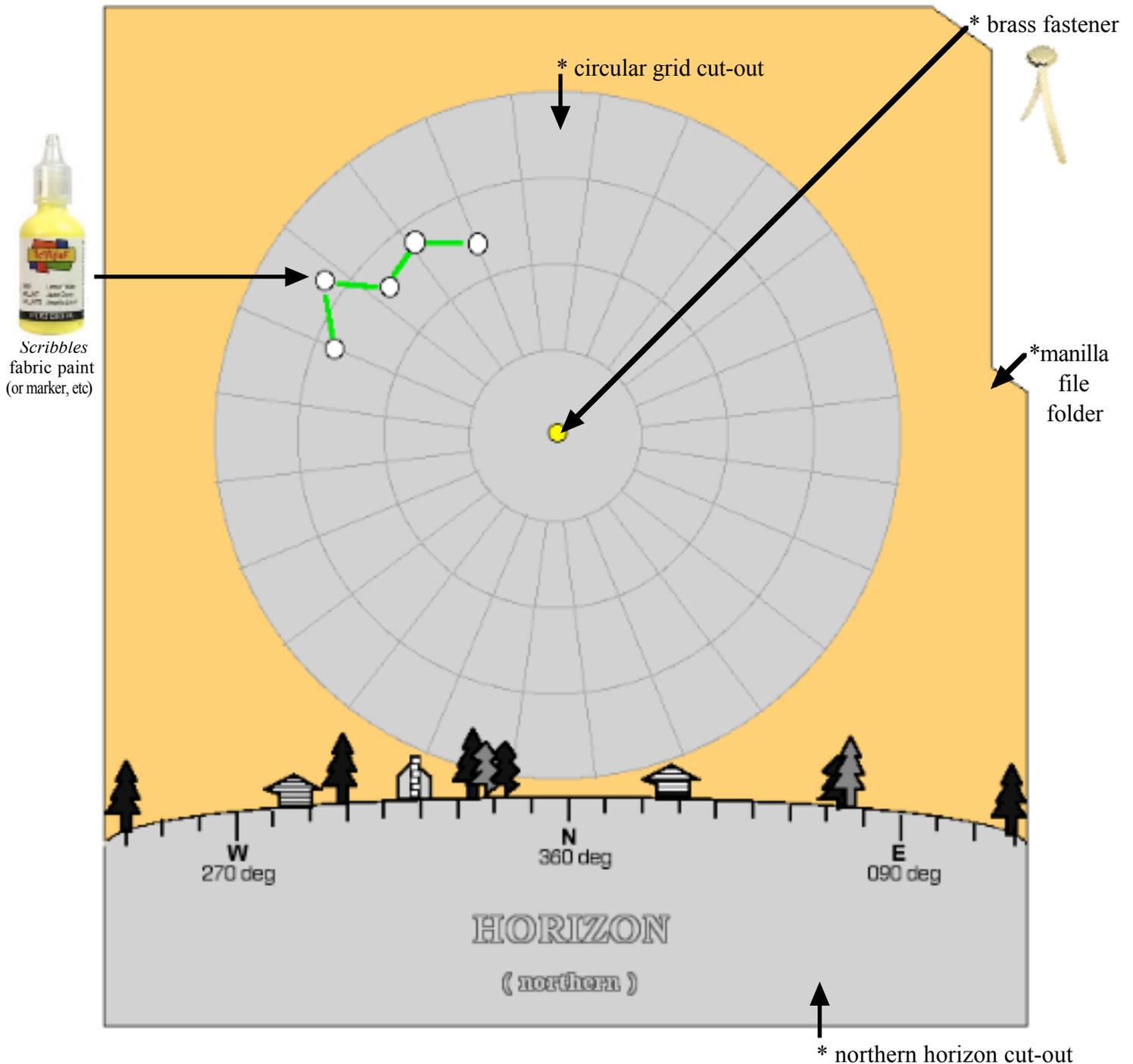
## Circumpolar Constellations (part A)

### Part A: CONSTRUCT the MODEL of Circumpolar Constellations

- \* Obtain a **manilla file folder** (or sheet of cardstock).
- \* **Cut out a northern horizon** silhouette, and paste it to the very bottom of the file folder / cardstock.
- \* Mark locations of circumpolar stars (fabric paint, marker, etc.) on the circular grid & then **cut out circular grid**.
- \* Position circular grid so that it just clears the northern horizon, then attach it to folder w/ **brass fastener**.

### Part B: RESEARCH the Circumpolar Constellations

- \* For each circumpolar constellation, use internet sources to find out about:
  1. Mythology or story behind the constellation.
  2. Names and locations of stars in the constellation.
  3. Colors / classes of stars in the constellation.

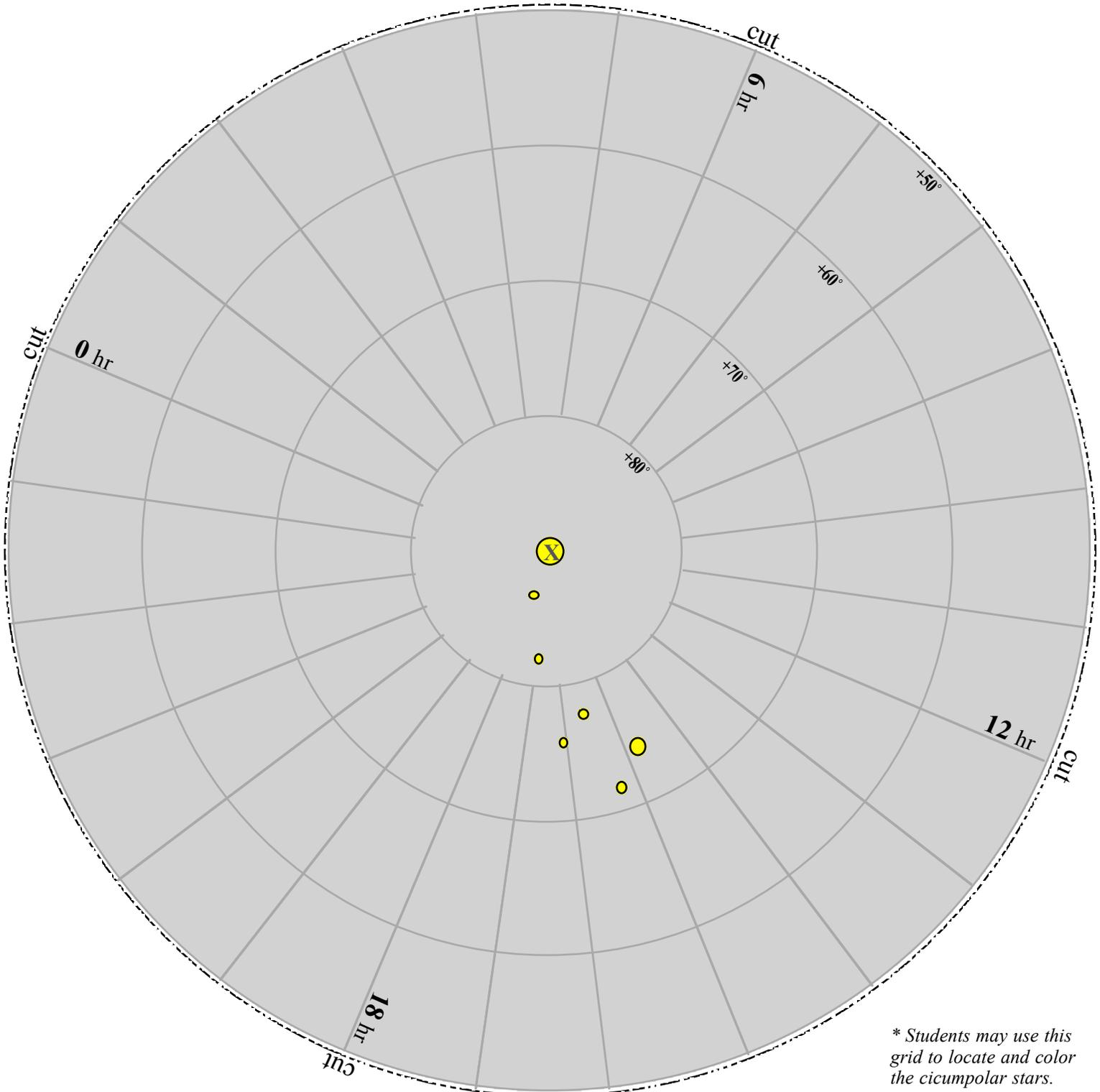


Name \_\_\_\_\_  
Bell \_\_\_\_\_ Due Date \_\_\_\_\_  
ACTIVITY: Circumpolar Constellations

# Circumpolar Constellations (part A)

## Part A: CONSTRUCT the MODEL of Circumpolar Constellations

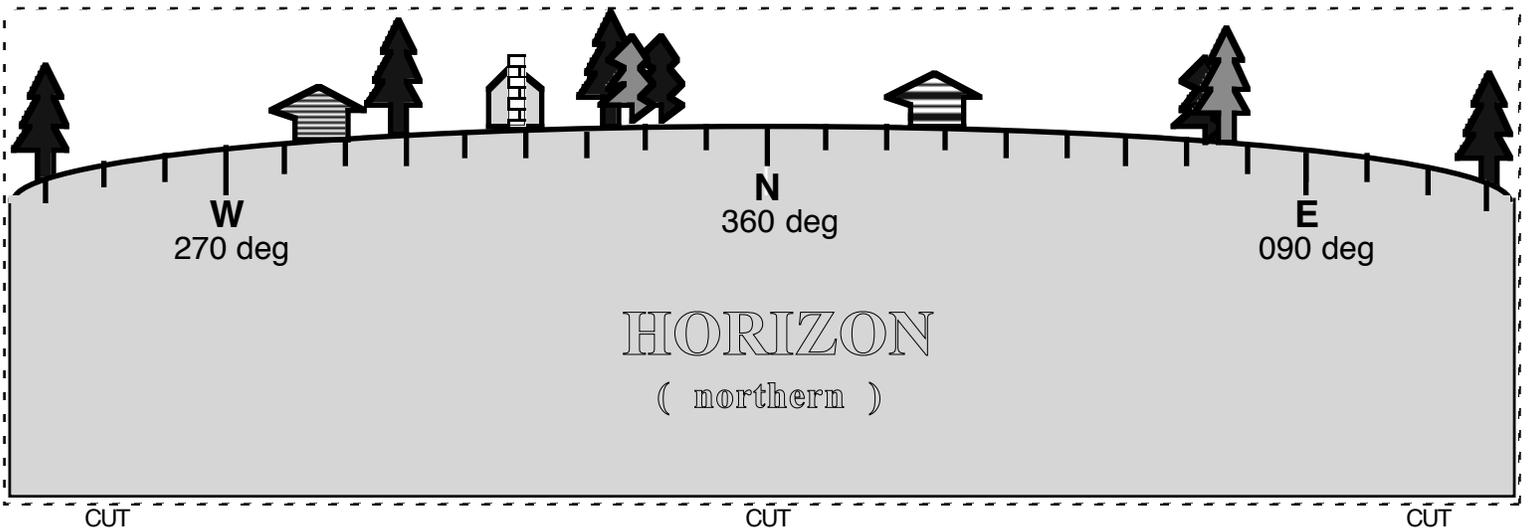
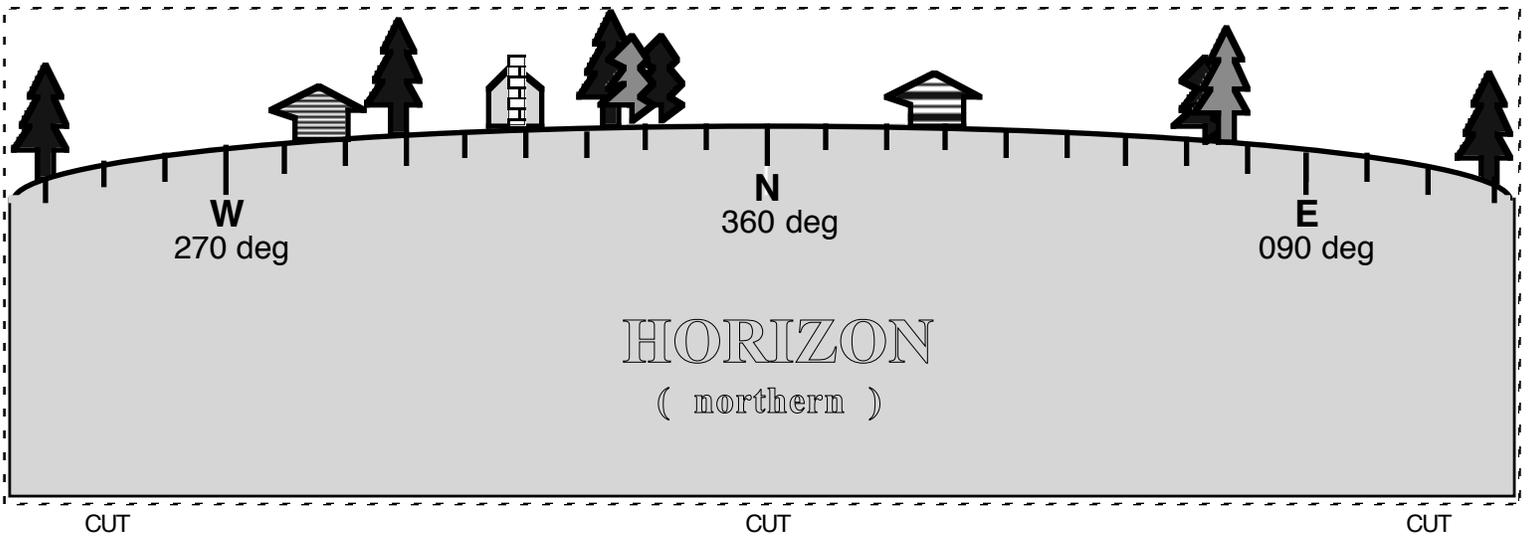
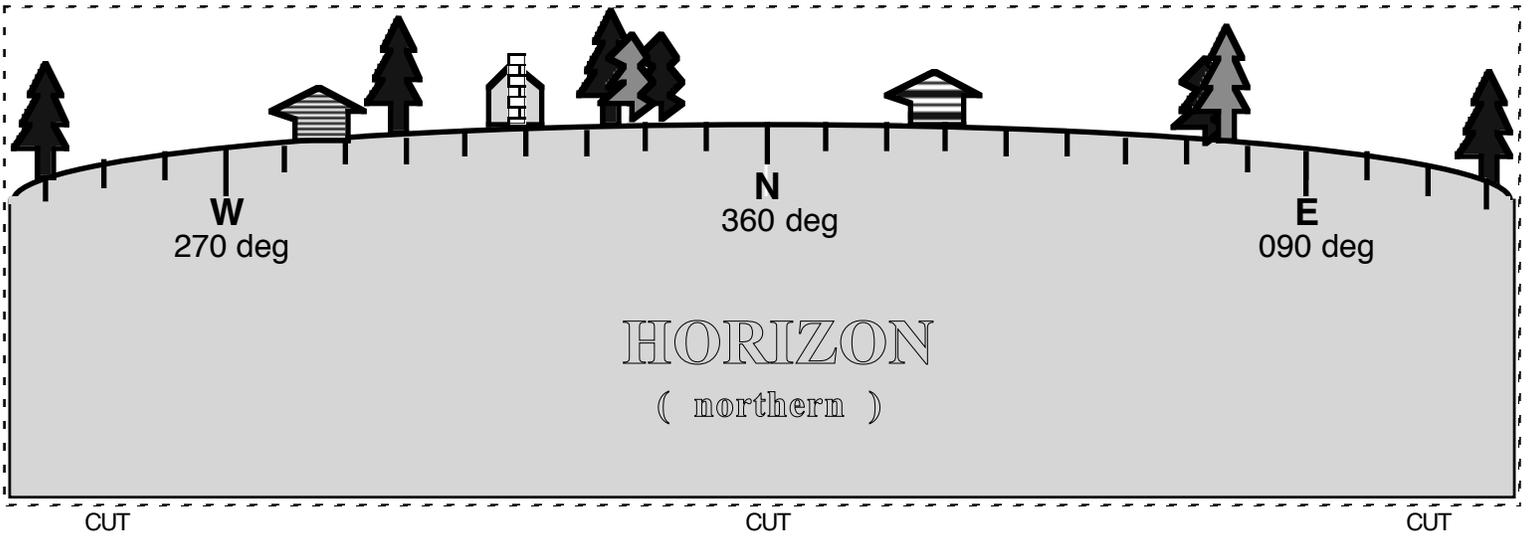
- \* After obtaining manilla file folder & cutting out N. horizon, it's time to mark circumpolar star locations.
- \* Use colored dots to mark locations of all circumpolar stars on one of the **circular grids** provided (v1.0 - v3.0).
- \* Star dots can be glow-in-dark or yellow fabric paint, or use markers to show actual star color (class).
- \* Punch/cut a small hole for **Polaris** (X), as this is where a brass fastener will be used.
- \* Draw faint connecting lines between a constellation's stars to show its asterism (form, shape).
- \* Label each constellation (and important stars) by name, and then cut out the circular grid around outer edge.
- \* Position the completed circular grid on top of the file folder (or cardstock) so that it just clears the N. horizon.
- \* Push a brass fastener through the circle center (*Polaris*) & also thru the file folder. Rotate the circular grid.



\* Students may use this grid to locate and color the circumpolar stars.

**INSTRUCTIONS:**

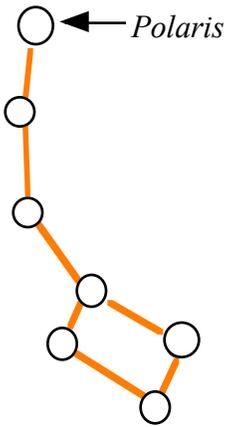
1. Use scissors to **cut out** one northern **HORIZON** for each student constellation model.
2. **Paste** the northern HORIZON to the bottom of the file folder (or cardstock sheet).
3. Position the circular grid w/ circumpolar constellations so that it does not quite go below this northern horizon.



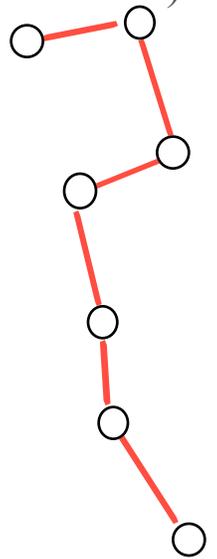
# Research CIRCUMPOLAR CONSTELLATIONS

\* Use internet sources to find 4-5 facts about each constellation including: mythology, star names, locations, & colors.

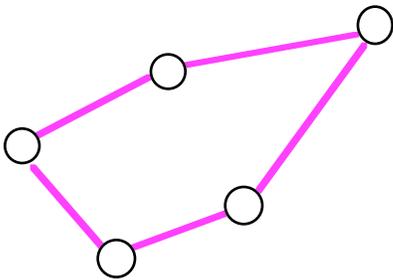
Ursa minor ( *the little dipper* )



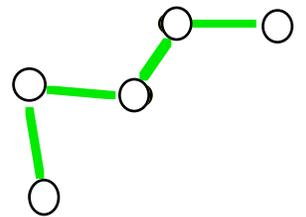
Ursa major ( )



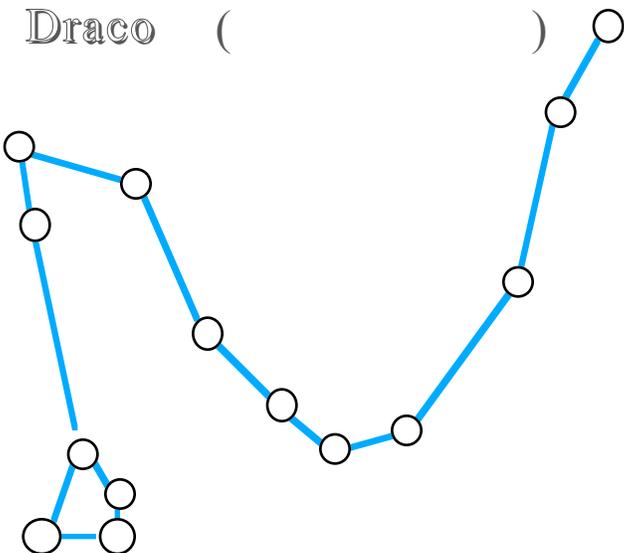
Cepheus ( )



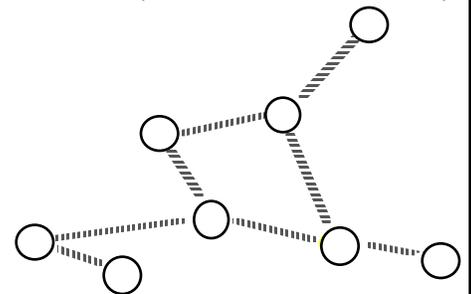
Cassiopeia ( )



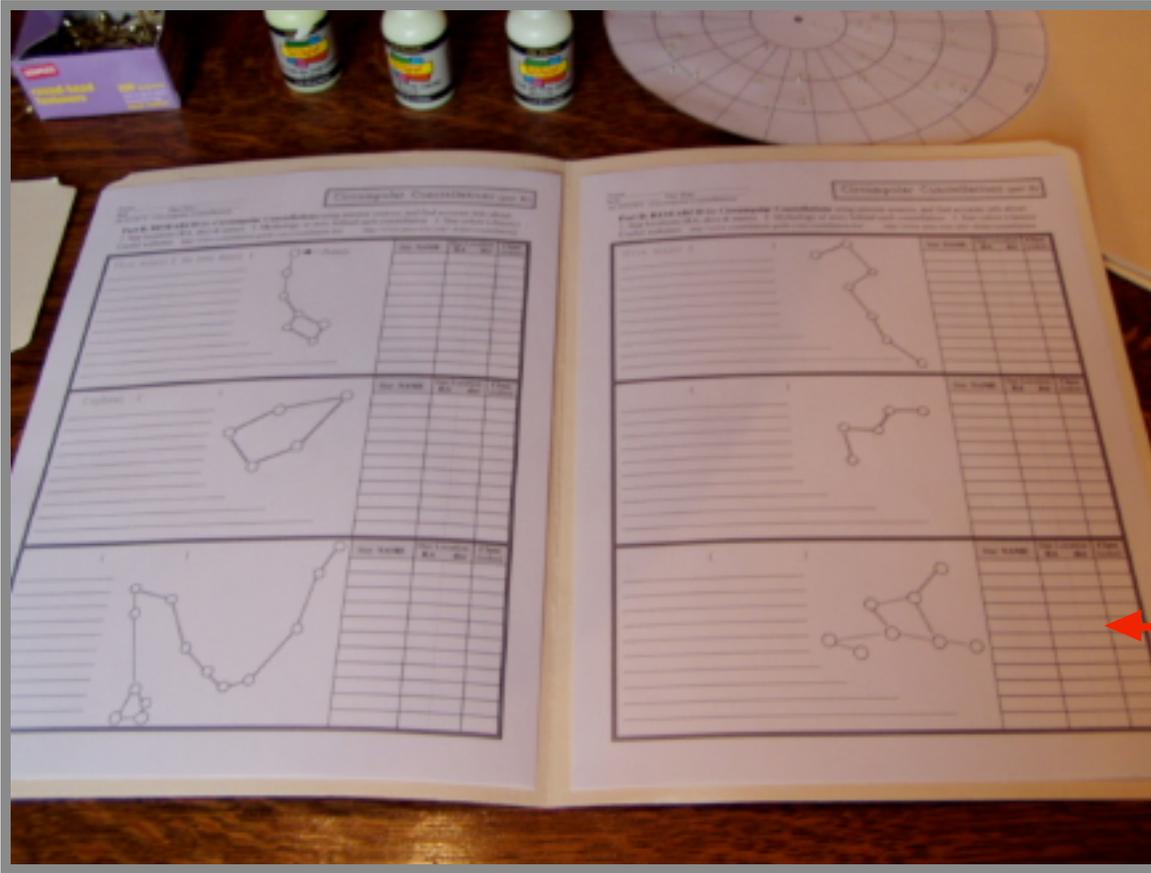
Draco ( )



Camelopardalis ( )



## Part B of the Circumpolar Constellations Activity



\* Part B of the activity includes researching star names, locations, and colors, as well as constellation mythology.

\* When completed, the Part B research sheets can be stapled to the inside of the file folder.

## Pictures of Circumpolar Constellations Activity

\* Part A of the activity includes constructing a model of the circumpolar constellations.

\* Note the fabric paint bottles. Of course, whether 7 yrs or 17 yrs, students prefer "glow-in-the-dark"! (Colored pencils work just fine )

\* Star colors range from red to orange to yellow to yellowish white to bluish white to blue.  
(Classes = OBAFGKM)

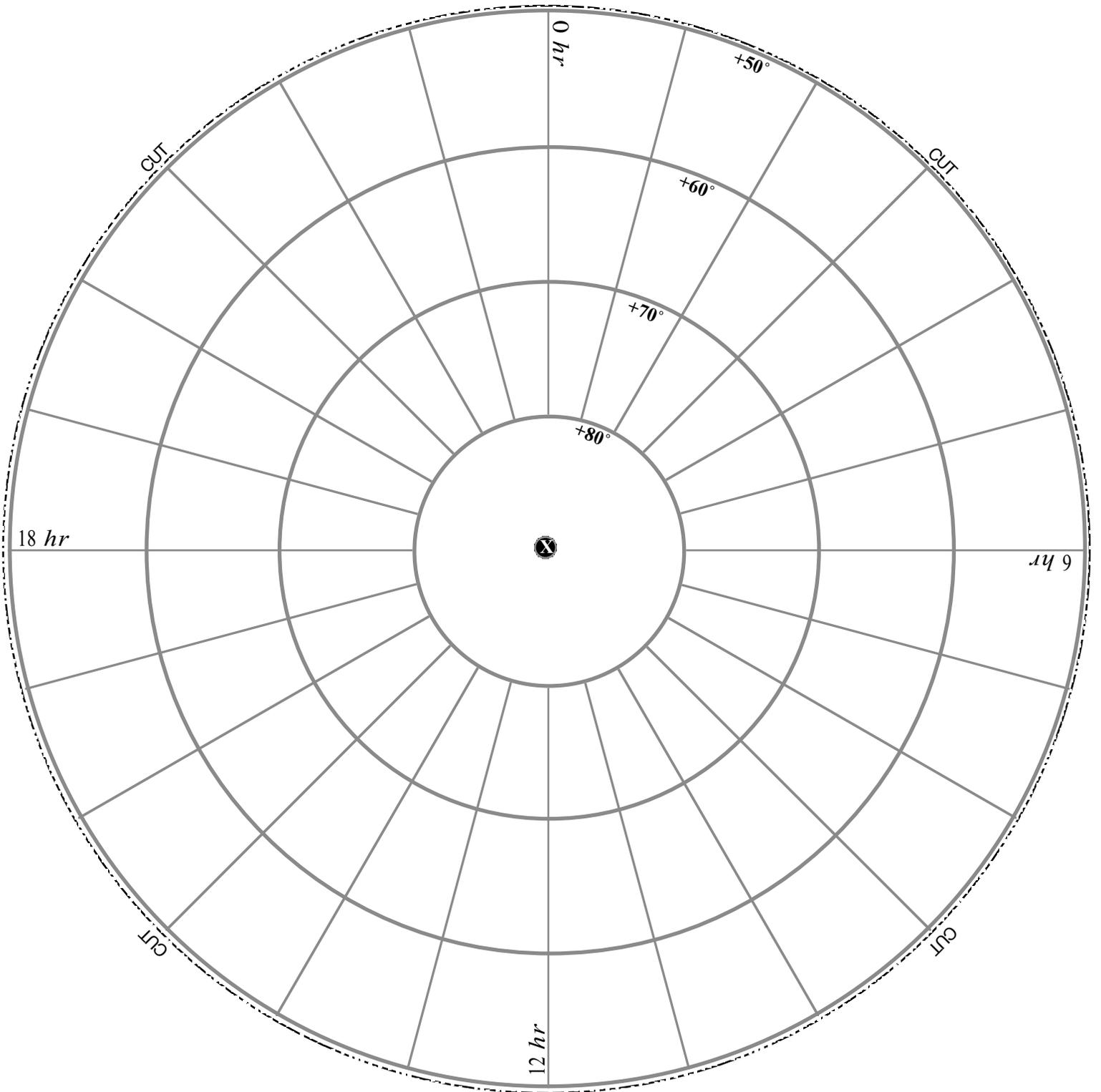


## Part A of the Circumpolar Constellations Activity

# Circumpolar Constellations: CIRCULAR GRID v2.0

( X = Polaris )

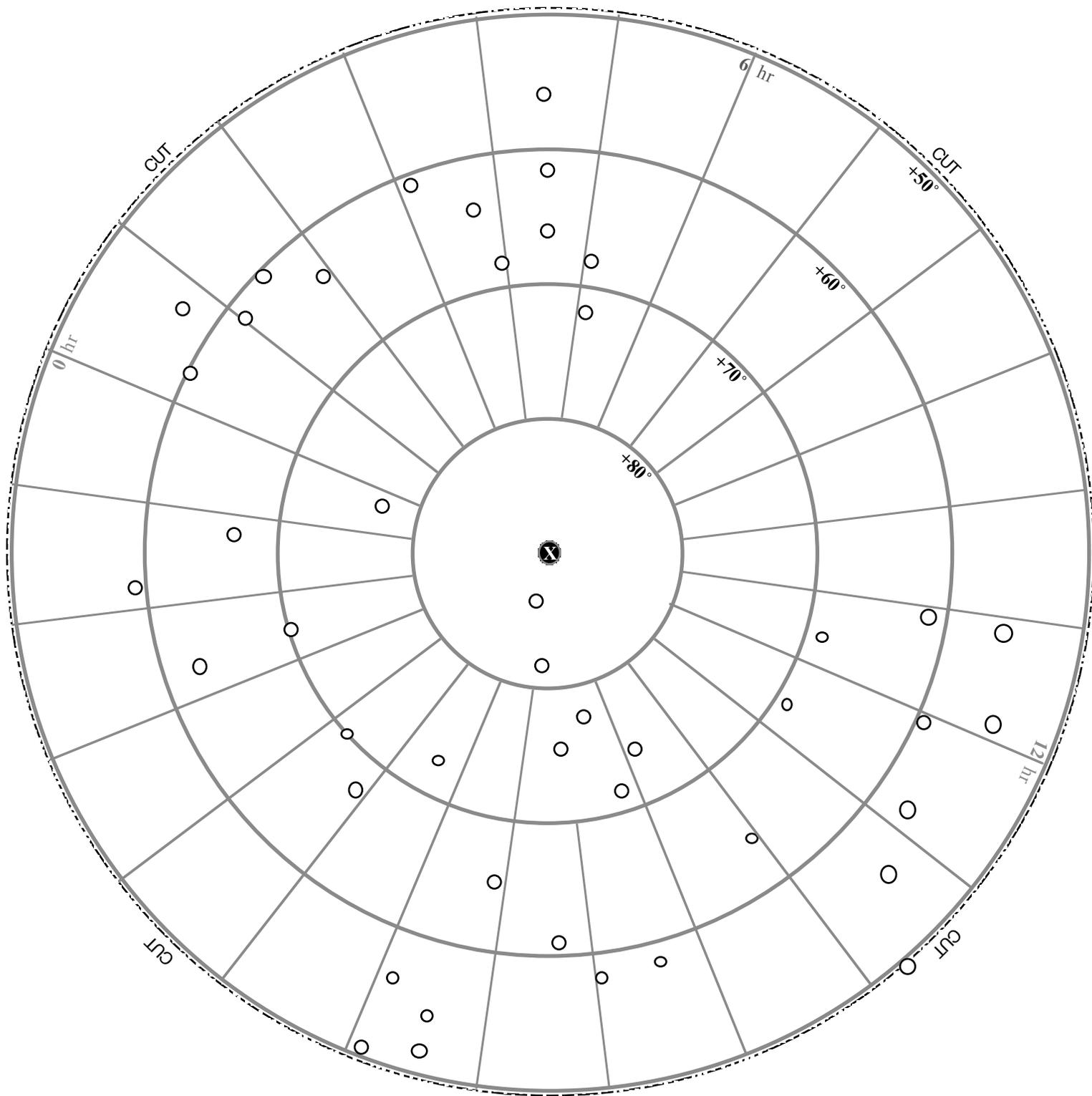
*\* Students must locate and color all circumpolar stars.*



# Circumpolar Constellations: CIRCULAR GRID v3.0

( positions of all circumpolar stars are shown )

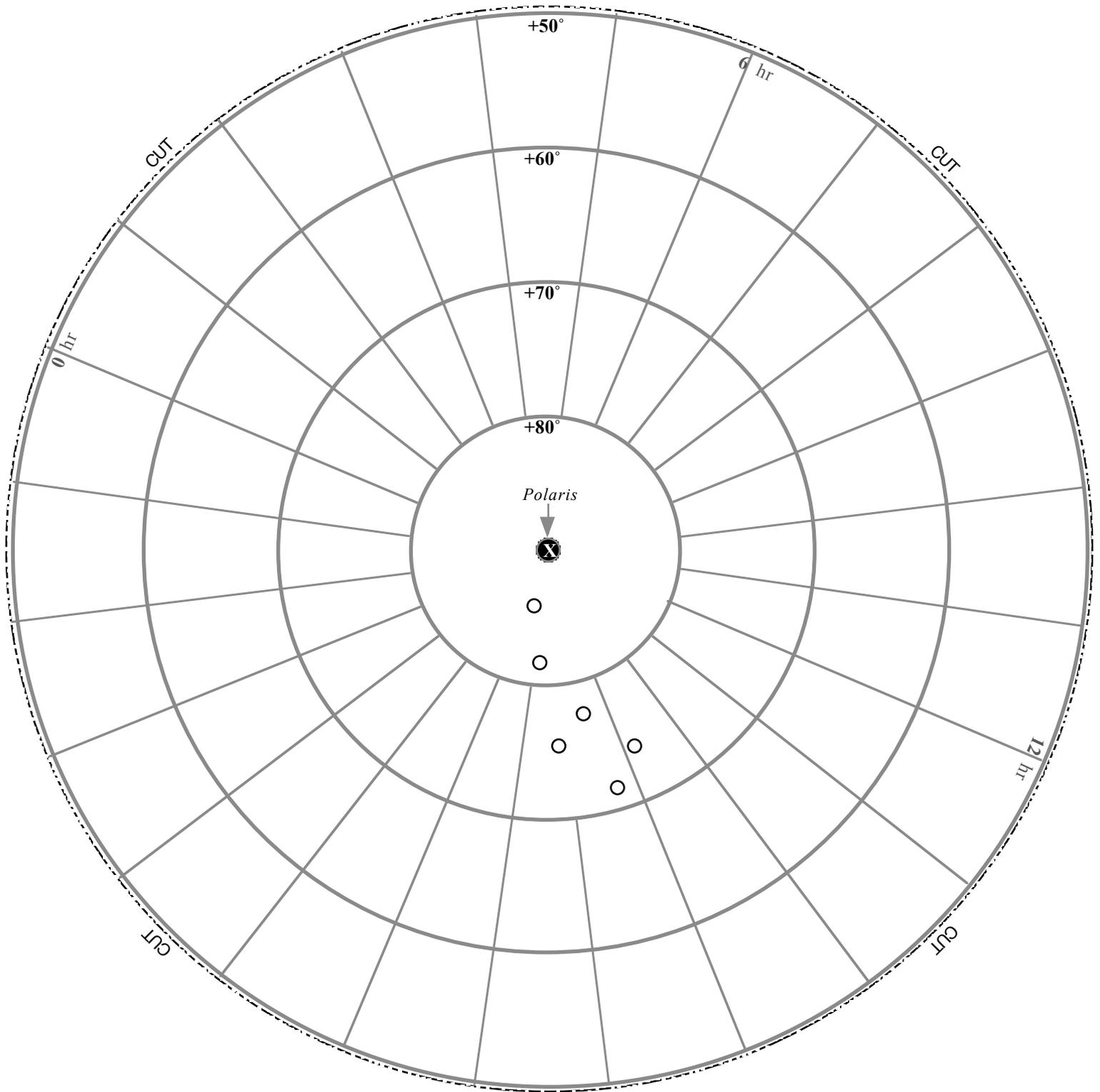
*\* Students must color all circumpolar stars.*



# Circumpolar Constellations: CIRCULAR GRID v1.0

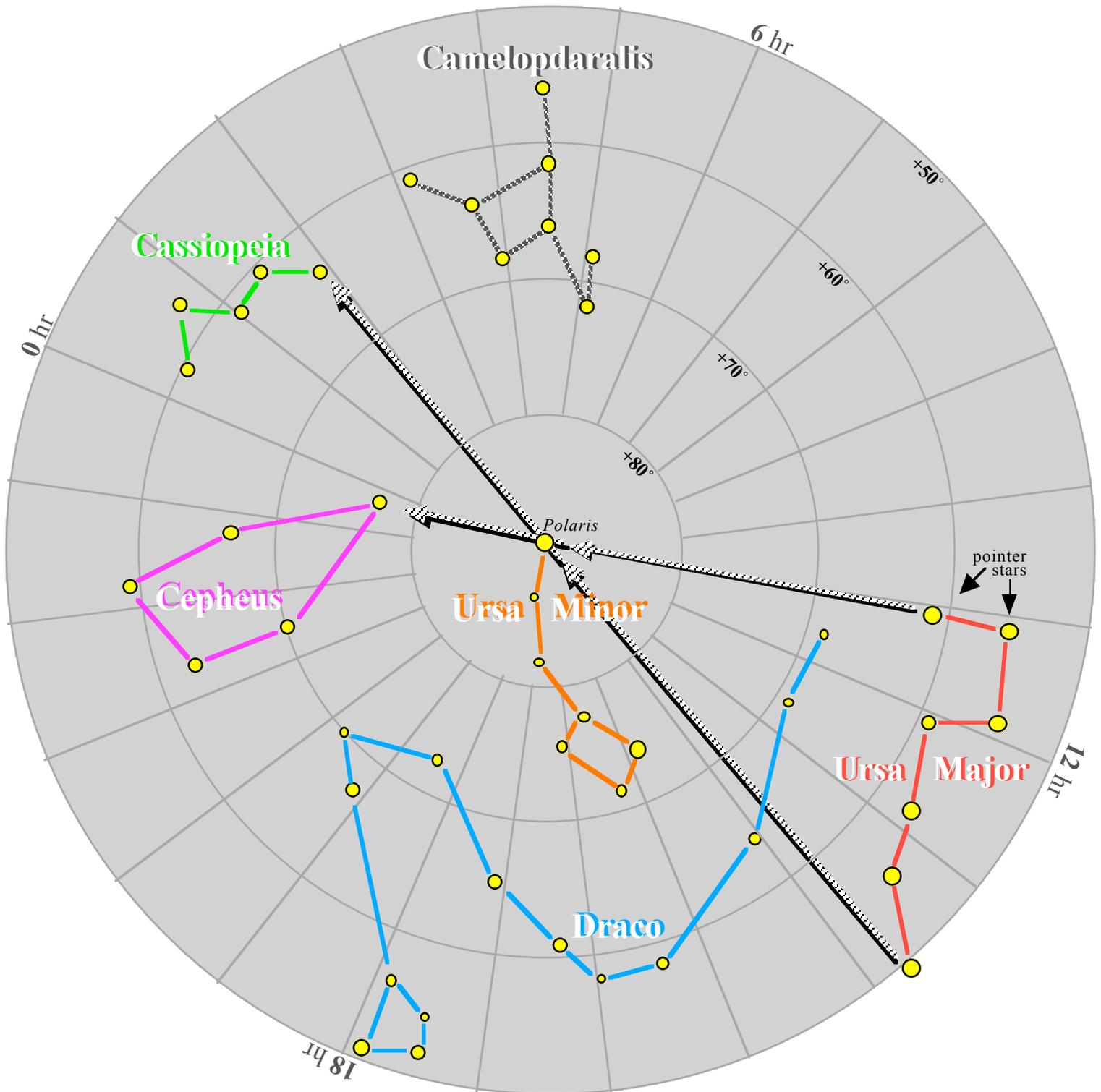
( positions of Little Dipper's stars are shown )

\* Except for stars in Ursa minor, students must locate and color all the circumpolar stars.



# The North CIRCUMPOLAR Constellations

- \* These constellations do not go below the horizon in the N. hemisphere & are visible year-round.
- \* Follow the pointer stars in big dipper to Polaris. Continue on to Cepheus (shaped like a house).
- \* One third of the way from the pointer stars to Polaris is the tail star of constellation Draco.
- \* Connect ends of dipper handles. Continue on to constellation Cassiopeia ("W" shaped).
- \* Right Ascension lines are like longitude lines in the sky. Circumpolars help identify RA.
- \* 11 hr RA & 12 hr RA lines make edges of the dipper of Ursa Major (23 & 24 hr opposite).
- \* 18 hr RA line is near head of Draco (6 hr RA is directly opposite).







# Teacher Notes:

\* The **circumpolar constellations** are good ones to learn because in the northern hemisphere they never go below the horizon. As a result, students will be able to recognize them in the dark sky no matter what time or what season.

\* Because the Earth's north pole points directly at *Polaris*, it is called the "north pole star", and does not move from its position in the northern sky. However, all other northern stars appear to circle around *Polaris*.

\* As with many of our activities, this one has several parts. The first part is a simple, but interesting model of the circumpolar constellations. The model can be made using materials you should be able to find around the school:

- manilla file folders
- photocopies
- scissors
- glue sticks
- fabric paint ( or colored markers, or colored pencils )
- brass fasteners

\* You will notice that there are several different versions of the circular grid. This is so that your students may do a level of work that you feel is appropriate for them. For example, one of the circular grids has all the stars shown in their proper positions. Another version has only the stars of Ursa minor shown. A third version shows only the north star, *Polaris*. Students will have to do different levels of work in order to locate and color all the circumpolar stars.

\* The second part of the circumpolar constellations activity is a research task. We listed two internet sources that may help your students find information about star names, locations, and colors (class). In addition, these sites also discuss the mythology or story behind the different constellations. Two research forms are included. On one form, all six circumpolars are shown, and students find 4-5 facts about each constellation or its stars. The second form shows three of the circumpolar constellations, and students must do more detailed research in order to find star names, locations (RA & dec), and colors (class).

\* We hope that you find this activity to be both effective and fun!

## Circumpolar Constellations (part B)

**Part B: RESEARCH** the **Circumpolar Constellations** using internet sources, and find accurate info about:  
 1. Star locations (RA, dec) & names 2. Mythology or story behind each constellation 3. Star colors (classes)  
 Useful websites: [http://www.astro.wisc.edu/~dolan/constellations/constellation\\_list.html](http://www.astro.wisc.edu/~dolan/constellations/constellation_list.html)

**Ursa minor** ( *the lesser bear* )

*While this group of stars may have looked like a small bear to the ancients, it is commonly referred to as the "Little Dipper".*

*The dipper's handle is the bear's tail - although my favorite astronomy class pointe out it is a long tail for a bear!*

*The constellation's most famous star is POLARIS, which is the north pole star, around which all other northern stars appear to revolve.*

Star NAME	Star Location RA	dec	Class (color)
$\alpha$ <i>Polaris</i>	02:32	+90°	F7
$\beta$ <i>Kochab</i>	14:51	+74°	K4
$\gamma$ <i>Pherkad</i>	15:21	+72°	A3
$\delta$ <i>Yildun</i>	17:32	+87°	A1
$\epsilon$ <i>Eps Urs Min</i>	16:46	+82°	G5
$\zeta$ <i>Zet Urs Min</i>	15:44	+78°	A3
$\eta$ <i>Eta Urs Min</i>	16:18	+76°	F5
$\theta$			
$\iota$			
$\kappa$			
$\lambda$			

**Cepheus** ( *the king* )

*\* Note sample answer for Ursa Minor. Student answers will vary.*

Star NAME	Star Location RA	dec	Class (color)
$\alpha$ <i>Alderamin</i>	21:19	+63°	A7
$\beta$ <i>Alferk</i>	21:29	+71°	B1
$\gamma$ <i>Alrai</i>	23:39	+78°	K1
$\delta$			
$\epsilon$			
$\zeta$ <i>Zeta Cephei</i>	22:11	+58°	K1
$\eta$			
$\theta$			
$\iota$ <i>Iota Cephei</i>	22:50	+66°	K0
$\kappa$			
$\lambda$			

**Draco** ( *the dragon* )

Star NAME	Star Location RA	dec	Class (color)
$\alpha$ <i>Thuban</i>	14:04	+64°	A0
$\beta$ <i>Rastaban</i>	17:30	+52°	G2
$\gamma$ <i>Etanin</i>	17:57	+51°	K5
$\delta$ <i>Aldib</i>	19:13	+68°	G9
$\epsilon$ <i>Tyl</i>	19:48	+70°	G7
$\zeta$ <i>Aldhibah</i>	17:09	+66°	B6
$\eta$ <i>Eta Draconis</i>	16:24	+62°	G8
$\theta$ <i>Theta Draconis</i>	16:02	+59°	F8
$\iota$ <i>Ed Asich</i>	15:25	+59°	K2
$\kappa$ <i>Kappa Draconis</i>	12:33	+70°	B6
$\lambda$ <i>Gianfar</i>	11:31	+69°	M0

**Circumpolar Constellations (part B)**

**Part B: RESEARCH** the **Circumpolar Constellations** using internet sources, and find accurate info about:  
 1. Star locations (RA, dec) & names 2. Mythology or story behind each constellation 3. Star colors (classes)  
 Useful website: [http://www.astro.wisc.edu/~dolan/constellations/constellation\\_list.html](http://www.astro.wisc.edu/~dolan/constellations/constellation_list.html)

**Ursa major** ( *the great bear* )

*This group of stars looked like a large bear to the ancients. It is commonly referred to as the "Big Dipper".*

*The "Big Dipper" is perhaps the most well known constellation because all its stars are very bright.*

*The "Big Dipper" can be used to find many other constellations. The alpha and beta stars are called the "pointer stars", and point toward the north star, Polaris.*

Star NAME	Star Location RA	dec	Class (color)
$\alpha$ <i>Dubhe</i>	11:04	+62°	K0
$\beta$ <i>Merak</i>	11:02	+56°	A1
$\gamma$ <i>Phad</i>	11:54	+54°	A0
$\delta$ <i>Megrez</i>	12:15	+57°	A3
$\epsilon$ <i>Alioth</i>	12:54	+56°	A0
$\zeta$ <i>Mizar</i>	13:24	+55°	A1
$\eta$ <i>Alkaid</i>	13:48	+49°	B3
$\theta$			
$\iota$			
$\kappa$			
$\lambda$			

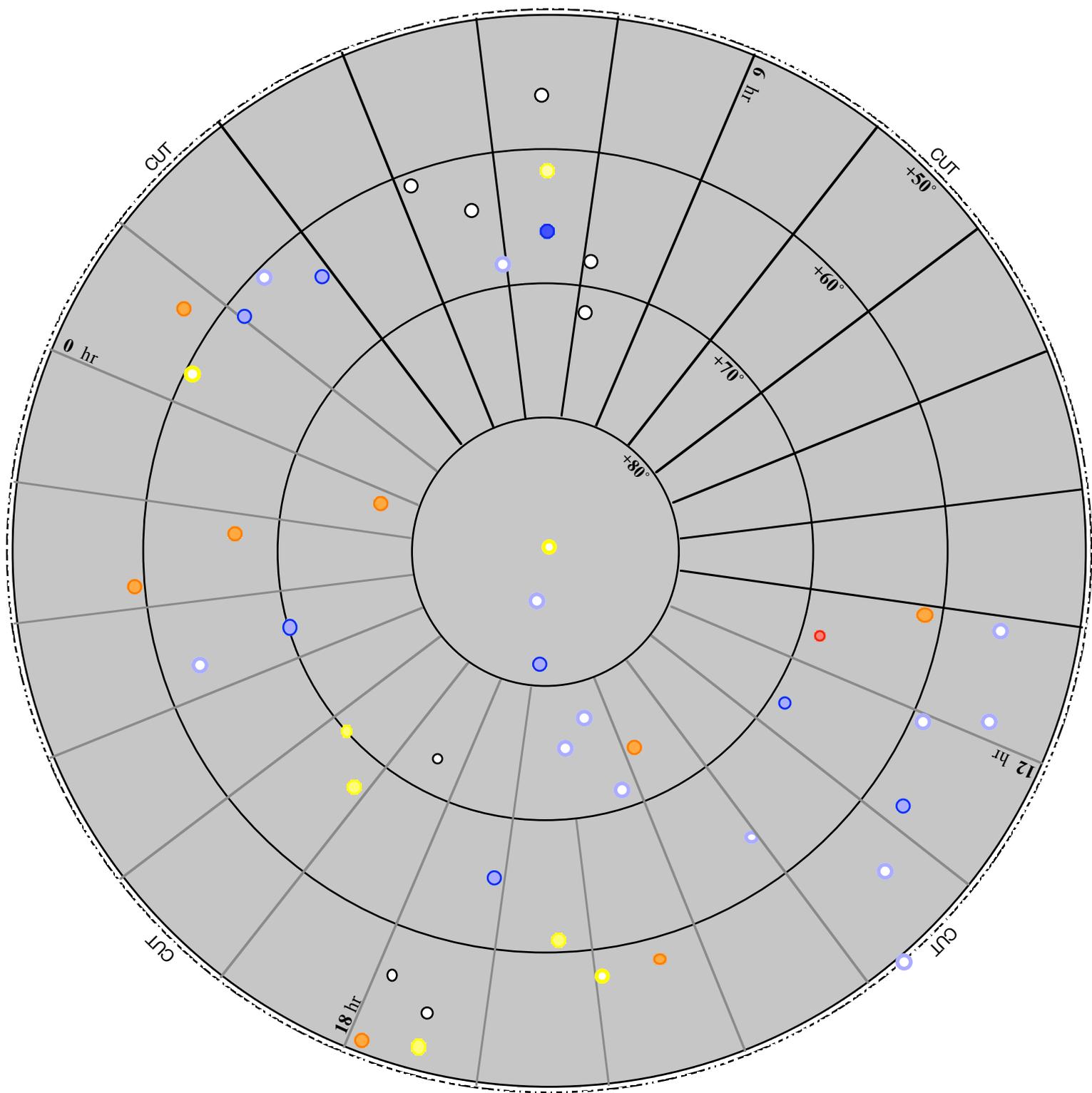
**Cassiopeia** ( *the queen* )

*\* Note sample answer for Ursa Major. Student answers will vary.*

Star NAME	Star Location RA	dec	Class (or color)
$\alpha$ <i>Shedir</i>	0:41	+57°	K0
$\beta$ <i>Caph</i>	0:09	+59°	F2
$\gamma$ <i>"Navi"</i>	0:56	+61°	B0
$\delta$ <i>Ruchbah</i>	1:26	+60°	A5
$\epsilon$ <i>Segin</i>	1:54	+64°	B3
$\zeta$			
$\eta$			
$\theta$			
$\iota$			
$\kappa$			
$\lambda$			

**Camelopardalis** ( *the giraffe* )

Star NAME	Star Location RA	dec	Class (color)
$\alpha$ <i>Alpha Cam</i>	4:54	+66°	O9
$\beta$ <i>Beta Cam</i>	5:03	+60°	G0
$\gamma$ <i>Gamma Cam</i>	3:50	+71°	A2
$\delta$			
$\epsilon$			
$\zeta$			
$\eta$			
$\theta$			
$\iota$			
$\kappa$			
$\lambda$			



- \* **GREEK LETTERS** convey the brightness of stars in each constellation.
  - the brightest star in a constellation is labeled "alpha" (  $\alpha$  )
  - the second-brightest star is labeled "beta" (  $\beta$  ), #3 = gamma (  $\gamma$  ) and so on.

## The Greek Alphabet (lower case)

$\alpha$ alpha	$\iota$ iota	$\rho$ rho
$\beta$ beta	$\kappa$ kappa	$\sigma$ sigma
$\gamma$ gamma	$\lambda$ lambda	$\tau$ tau
$\delta$ delta	$\mu$ mu	$\upsilon$ upsilon
$\epsilon$ epsilon	$\nu$ nu	$\phi$ phi
$\zeta$ zeta	$\xi$ xi	$\chi$ chi
$\eta$ eta	$\omicron$ omnicron	$\psi$ psi
$\theta$ theta	$\pi$ pi	$\omega$ omega

- \* We previously learned that **STAR CLASS** conveys a star's temperature & color.
  - the seven star classes are: **O B A F G K M** (*Oh be a fine girl kiss me*)
  - **O** class stars = blue    **B** = light blue    **A** = bluish white    **F** = yellowish white
  - G** class stars = yellow    **K** = orange    **M** = red

<b>CLASS (color)</b>	(very <b>O</b> blue)	<b>B</b> (blue)	(bluish <b>A</b> white)	(white <b>F</b> yellowish)	<b>G</b> (yellow)	<b>K</b> (orange)	<b>M</b> (red)
<b>TEMP (Surface)</b>	40,000 K (30,000 - 50,000)	20,000 K (20,000 - 30,000)	8,500 K (10,000 - 7,500)	7,000 K (7,500 - 5,000)	5,500 K (5,000 - 5,000)	4,000 K (5,000 - 3,500)	3,000 K (3,500 - 2,500)
<b>Examples</b>	EXAMPLES: Mintaka Meissa Mizar Menkib Theta-1 Oriens	EXAMPLES: Markab Bellatrix Spica Fugulus Electra Alwano	EXAMPLES: Sirius Vega Altair Mizar Zosma Denebola	EXAMPLES: Proxima Eta Corvi Deneb Procyon Talitha Beta Virginis	EXAMPLES: Sol (our Sun) Al Botic A Alpha Centauri A Kappa-1 Ceti Achard A Ciu-1 Orionis	EXAMPLES: alpha centauri B epsilon Indi 70 Ophiuchi A Algorab B 61 Cygni A 61 Cygni B	EXAMPLES: Proxima Centauri Wolf 359 Barnard's Star Kruger 601 Gliese 581 Lalande 21185
<b>NOTE:</b> The small M-class stars are by far the Milky Way's most common stars (80%). However, they are not visible to the human eye!							
<b>Sun DIAMETERS</b>	(25-12) 18	(12-4) 8	(4-15) 3	(15-11) 1.2	(11-08) 1.0	(08-06) 0.7	(06-01) 0.3
<b>Sun MASSES</b>	40 (30-20)	12 (20-4)	3 (4-2)	1.5 (2-1.1)	1.0 (1.1-0.8)	0.7 (0.8-0.5)	0.3 (0.5-0.1)