

Star Cartography Club

Draw the sky, build depth models, and think like a mapmaker.



20 activities | Ages 7-10 with support

GATHER

Pencil, crayons, child-safe scissors, glue or tape, and this pack. Scrap card is optional.
An adult helps with cutting.

EXPLORE

Maps: 1-6. Depth: 7-9.
Our viewpoint: 10-15.
Tools and missions: 16-20.
Try 2-4 activities at a time.

Print single-sided. Every task works indoors on paper.

Cover patterns are decorative. No page is an observing chart. No devices or Sun viewing are needed; never look at the Sun through optics.

Read a sky-map key

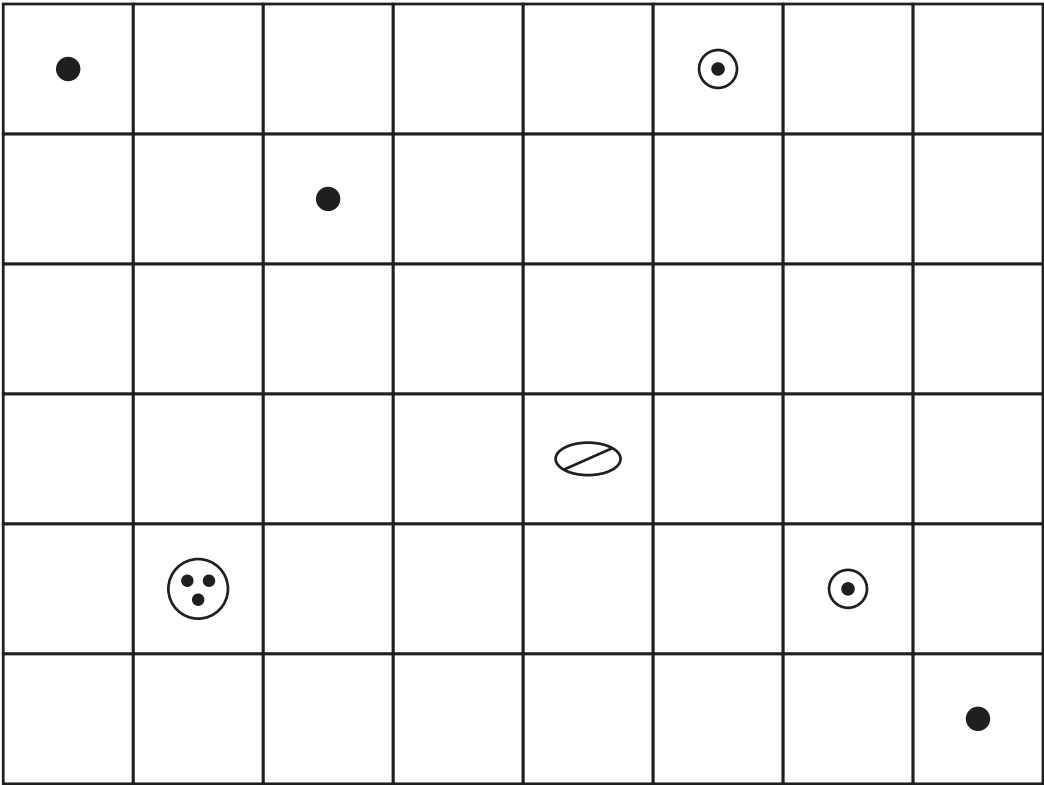
Use this practice map's symbols. Count each kind of object.


STAR


PLANET


CLUSTER


GALAXY



Stars	Planets	Clusters	Galaxies

Invented practice map. Symbols represent categories, not actual shapes or sizes. Different real charts may use different keys.

Plot the Lantern

Put one star in each listed square. Join them in order, then return to the first star.

A4 > B2 > C1 > D2 > E4 > D6 > C7 > B6 > A4

Read letter first (column), then number (row).

	A	B	C	D	E	F	G	H
1								
2								
3								
4								
5								
6								
7								
8								

How many different stars make this invented pattern?

These coordinates are a paper-grid system. Astronomers use other coordinate systems for real objects in the sky.

Repair the star copy

One star is missing and one has been added. Circle both changed places on the copy.

REFERENCE

	A	B	C	D	E	F
1				●		
2	●					●
3			●			
4					●	
5		●				
6				●		

COPY

	A	B	C	D	E	F
1				●		
2	●					●
3						
4					●	
5		●				
6				●	●	

Missing star address:

Extra star address:

Check positions, not just totals: both drawings have the same number of stars. This is an invented map-copying puzzle.

One sky, two pictures

Use the same stars to invent two different patterns. Name both.

PICTURE 1

	A	B	C	D	E	F
1				●		
2	●					●
3			●			
4					●	
5		●				
6				●		

PICTURE 2

	A	B	C	D	E	F
1				●		
2	●					●
3			●			
4					●	
5		●				
6				●		

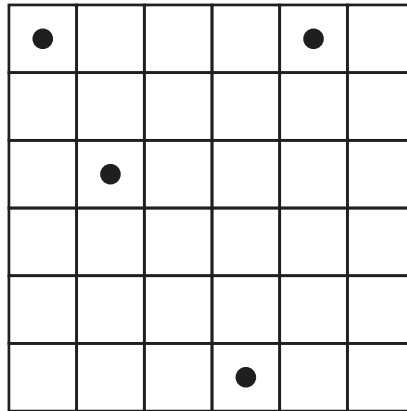
People in different cultures have seen and named different patterns in the stars. Your two new pictures are your own inventions.

Pattern lines are imaginary connections. They are not strings joining stars in space. This page does not represent any culture's traditional star map.

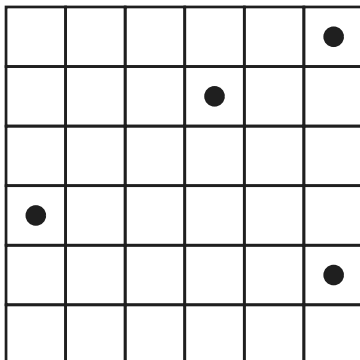
Turn the map

Which candidate is the reference turned around? Turning is allowed; flipping is not.

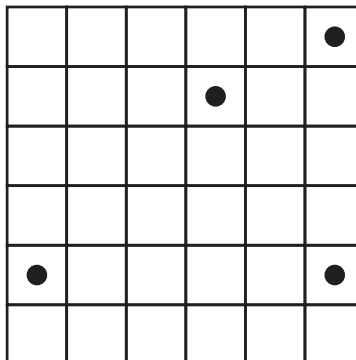
REFERENCE



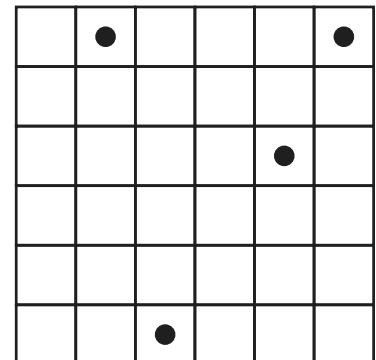
A



B



C



My matching candidate is:

Only one drawing matches by rotation. Stars keep their relative pattern when we rotate a paper map; the paper itself has moved.

Bright does not mean big

Here a bigger dot means brighter as seen by the observer. It does not show physical size.

KEY: small = faint / medium = middle / large = bright



A



B



C



D

Two stars tie for brightest in this map. Which?

Which star appears faintest?

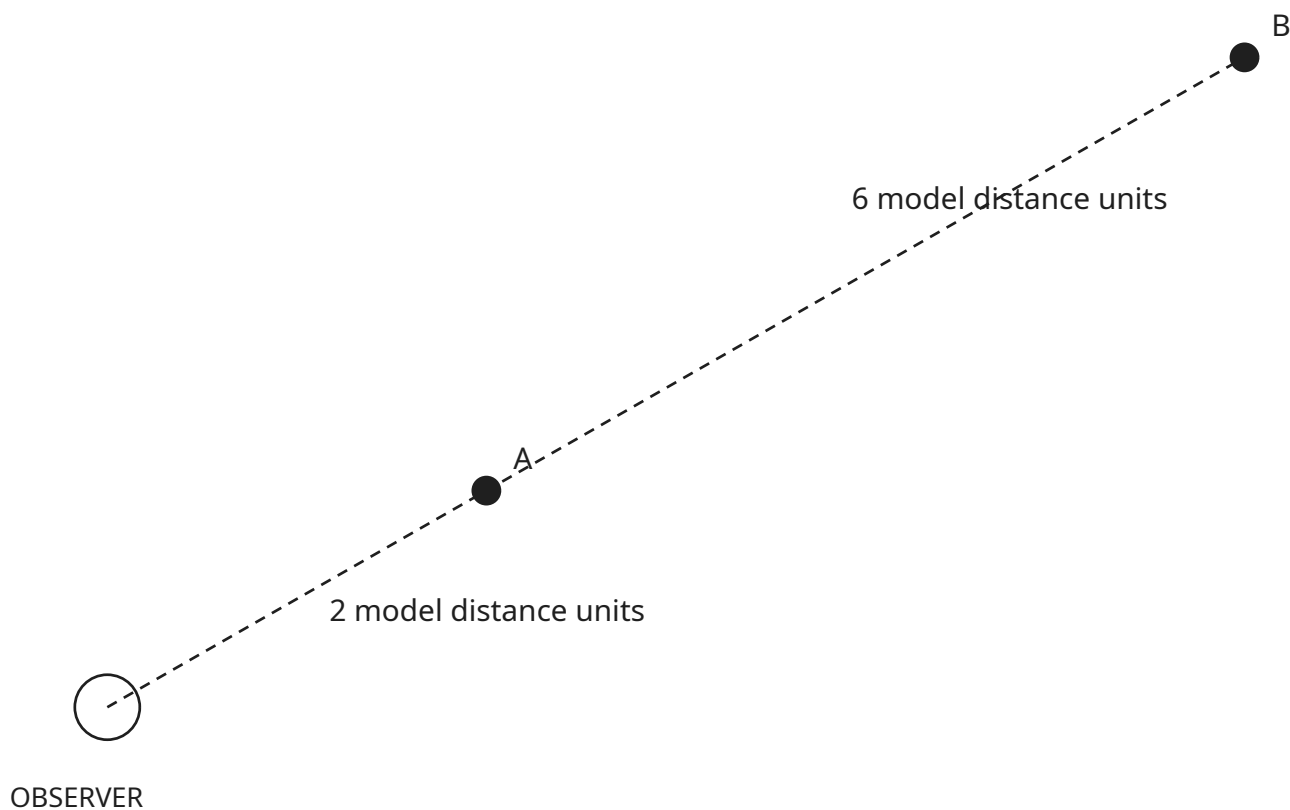
Can this map alone tell which star is physically largest?

Circle: YES / NO

Apparent brightness depends on distance and how much light an object sends out, among other factors. Dot size alone cannot reveal a star's diameter.

Same direction, different depth

Follow the sight line. A and B lie in the same direction from this imaginary observer.



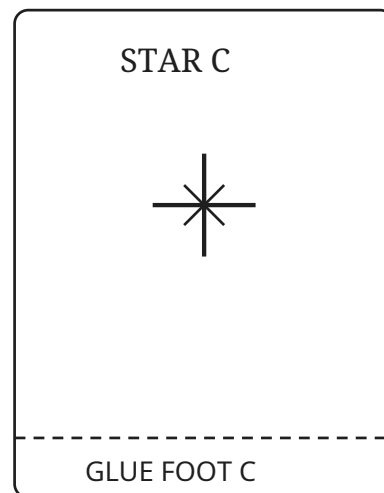
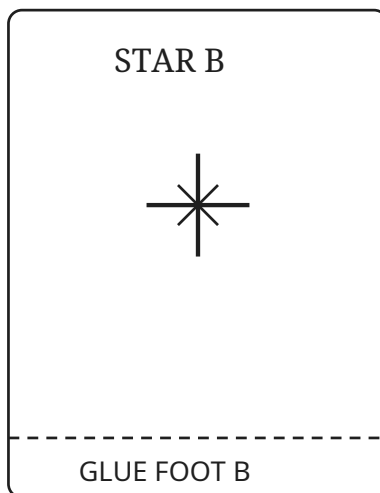
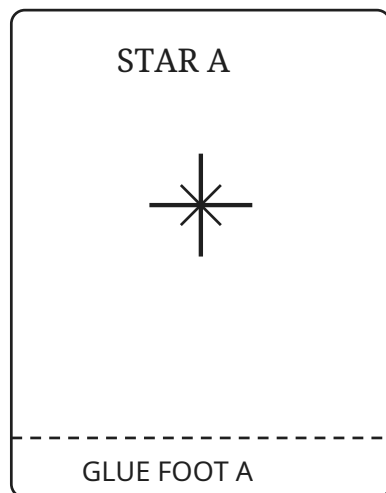
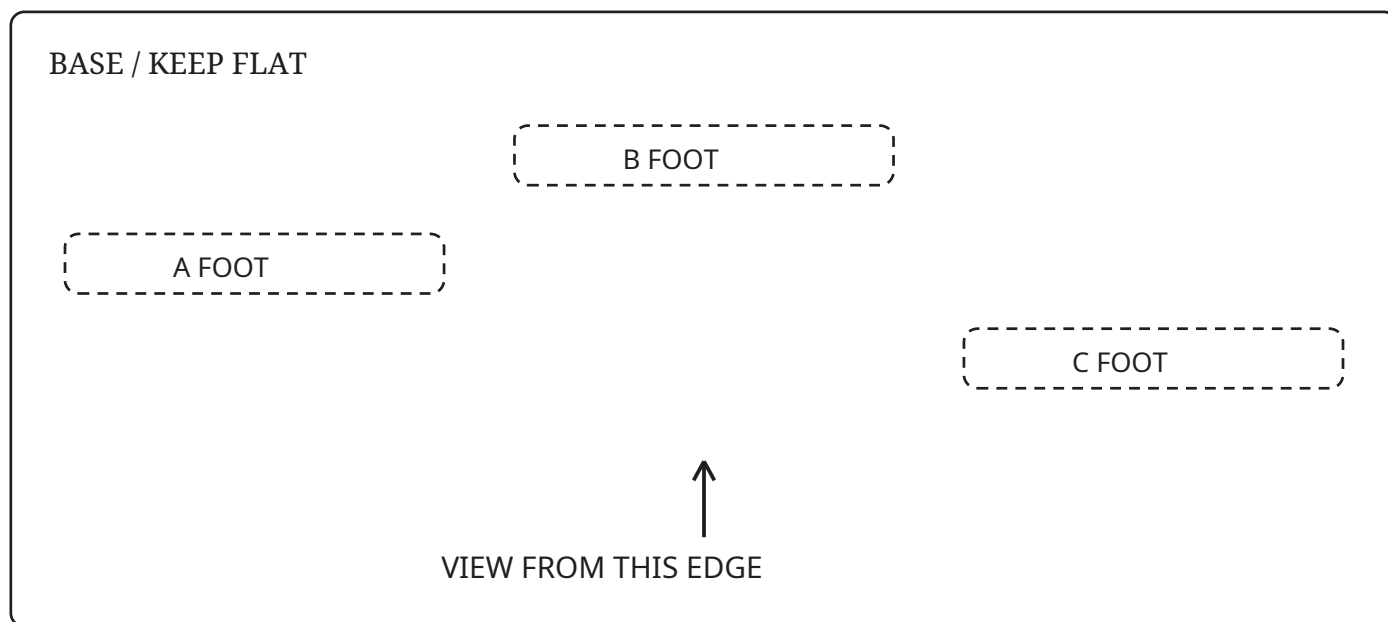
A flat map records direction. This side view also shows depth: one star is much farther along the same sight line.

Which star is nearer to the observer?

Schematic, not to scale with real stars. The stars could overlap in the observer's view even though they are far apart in space.

Build a depth display

Cut the base and three cards. Fold each card's foot backward and glue it onto its matching place.



Face all printed stars toward VIEW. The folded edge faces VIEW; feet point away. Let the glue dry.

Adult help with cutting. Optional: attach the cards to scrap card first. This deliberately tiny model cannot reproduce real interstellar distances.

Move the viewpoint

Look from the marked edge, then move toward a front corner. Keep all star faces visible and leave the cards still.

VIEW 1 / FROM THE MARKED EDGE

Draw the apparent positions of A, B and C.

VIEW 2 / FROM A FRONT CORNER

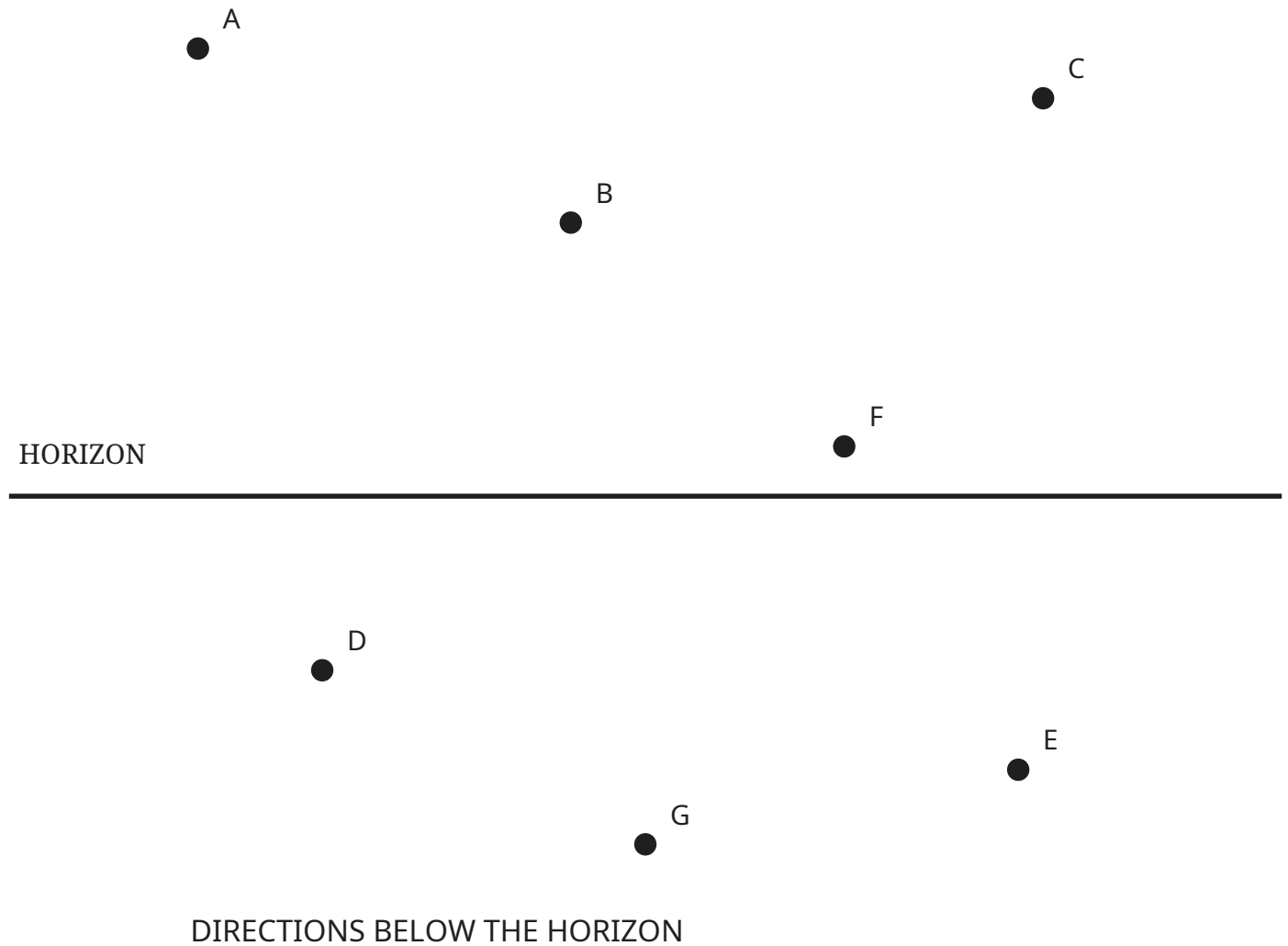
Keep all three star faces visible. Draw their apparent positions again.

Did the cards have to move for your view to change? YES / NO

Changing the observer's position can change the apparent arrangement. Astronomers measure tiny shifts against background stars to help determine distance.

Above the horizon

Circle every labeled star above the horizontal horizon line in this schematic sky.

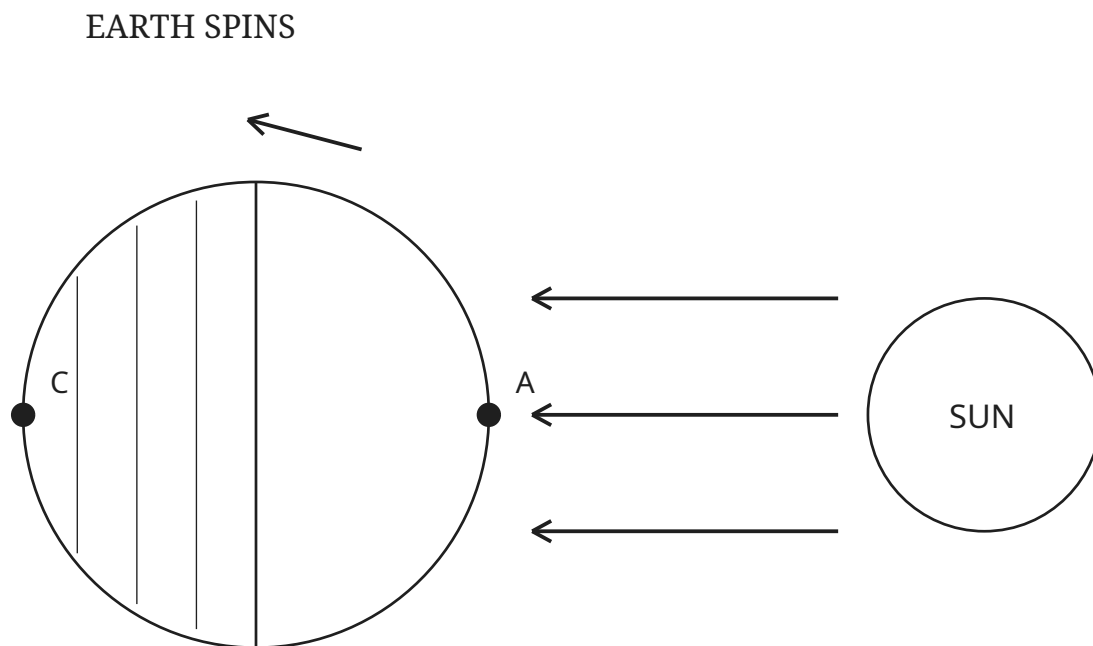


Above-horizon star letters:

Answer only for this drawing. The lower half represents directions blocked by Earth; the stars are not inside the ground. Invented practice view.

A turning Earth

This diagram looks down from above Earth's North Pole. Follow the light arrows.



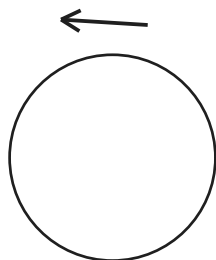
Which marked place faces the Sun: A or C?

After half a turn, is that place in day or night?

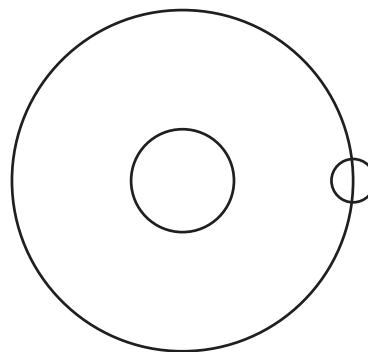
The shaded half is night. This simplified top view omits Earth's tilt. Study only the paper diagram; never look at the Sun through optics.

Spin or orbit?

Put each card number into the matching motion box. Read the whole clue.



ROTATION / SPIN



ORBIT / TRAVEL AROUND

1. Earth turns once in about a day.
2. Earth travels around the Sun in about a year.
3. Stars appear to shift during one night as Earth turns.
4. Our night side faces different space directions across a year.
5. A place on Earth turns into daylight and then into night.
6. Earth returns to about the same place along its yearly path.

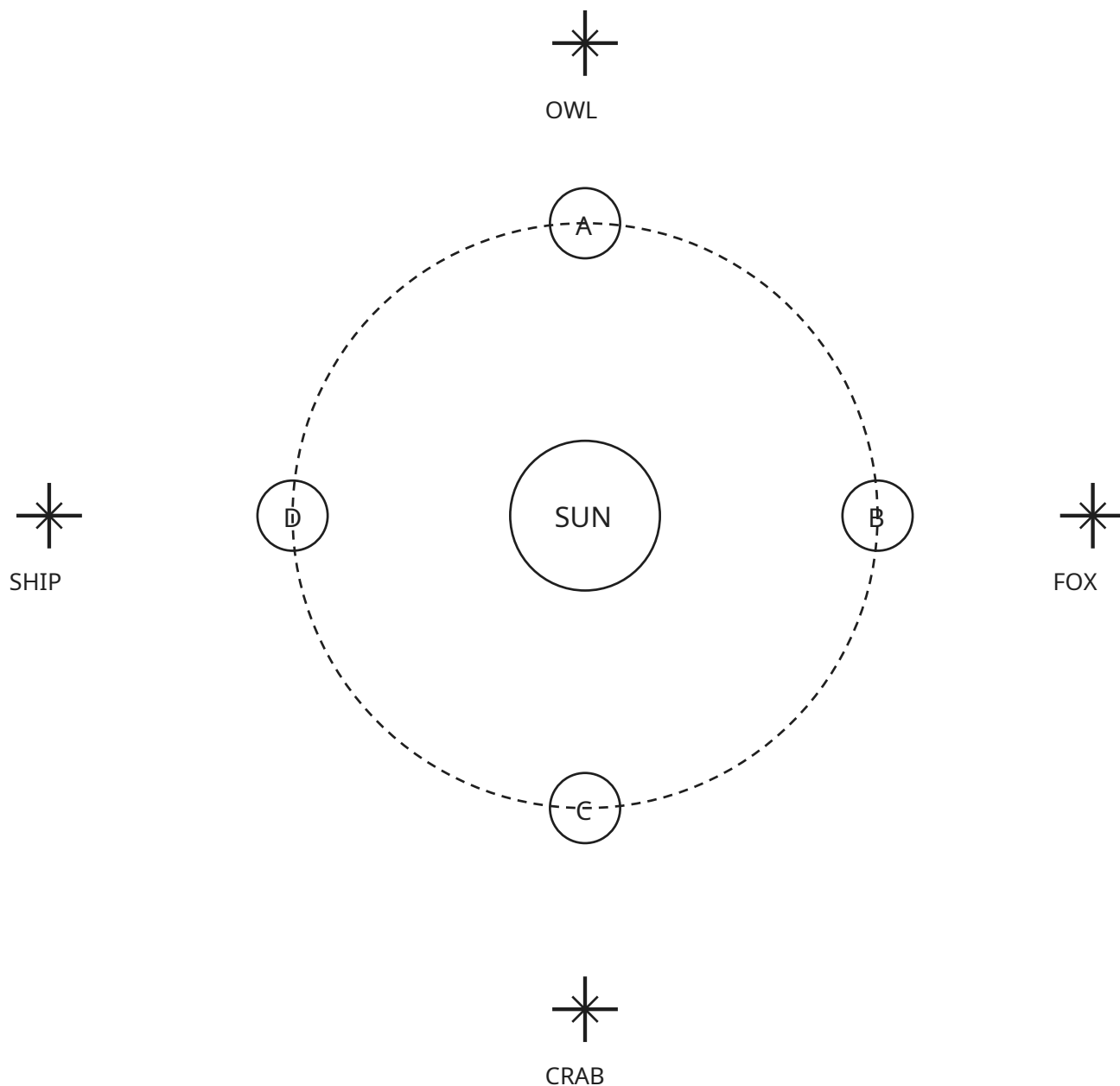
SPIN: _____

ORBIT: _____

Both motions happen together. This sorting task separates their effects so we can explain them clearly.

The year's night directions

Draw an arrow from each Earth away from the Sun. Which invented star group lies that way?



A: _____ B: _____ C: _____ D: _____

Not a seasonal star chart. The orbit changes our night-facing direction. Earth's tilt causes the seasons; northern and southern seasons differ.

Choose the right chart

These are practice chart labels. Match all three details: latitude, date, and local time.

CHART A

41 N / 15 April / 21:00

CHART B

41 S / 15 April / 21:00

CHART C

41 N / 15 October / 21:00

CHART D

41 N / 15 October / 03:00

MISSION 1: 41 N / 15 October / 21:00

Choose chart: _____

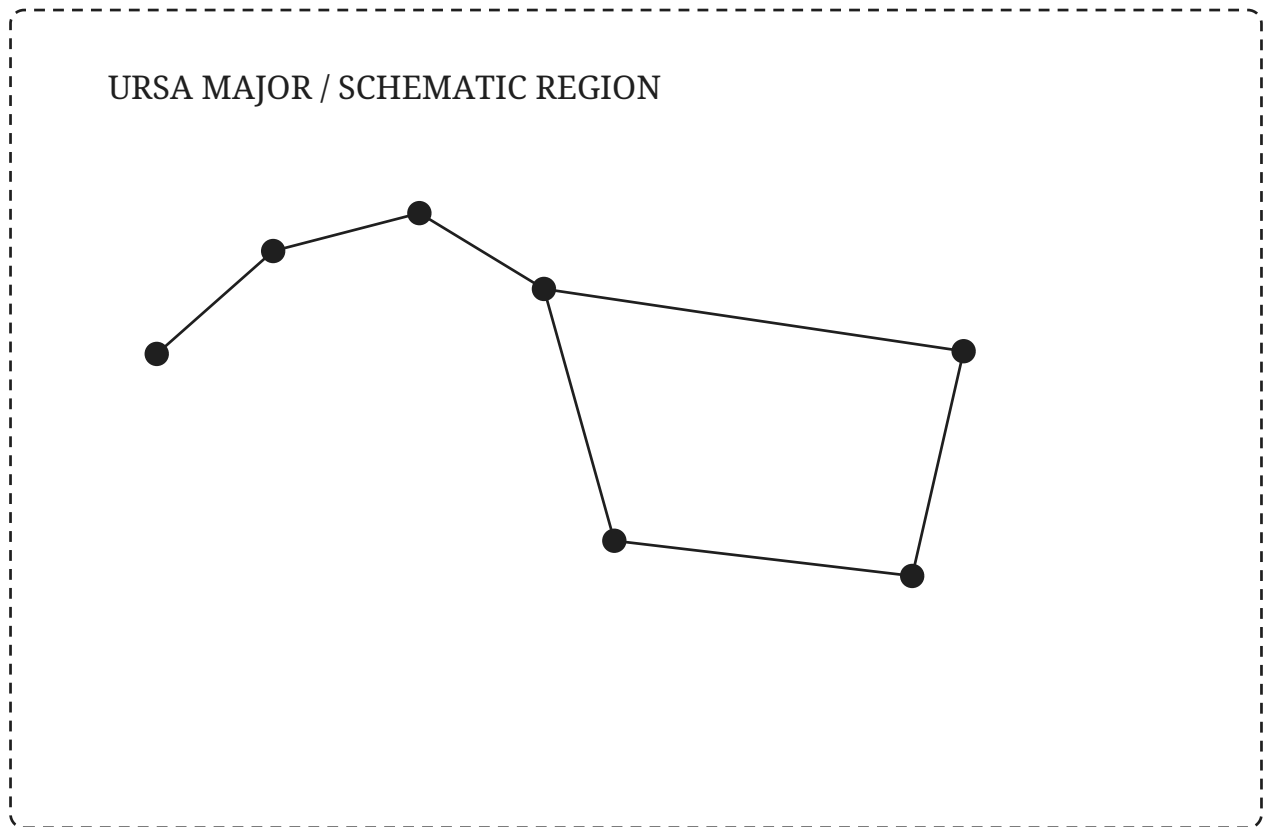
MISSION 2: 41 S / 15 April / 21:00

Choose chart: _____

N and S mean degrees north or south of the equator. Real chart times must also handle the stated time zone and daylight-saving convention.

Pattern or sky region?

Trace the seven-star Big Dipper pattern. Then name the pattern and its larger sky region.



An asterism is a recognizable star pattern.

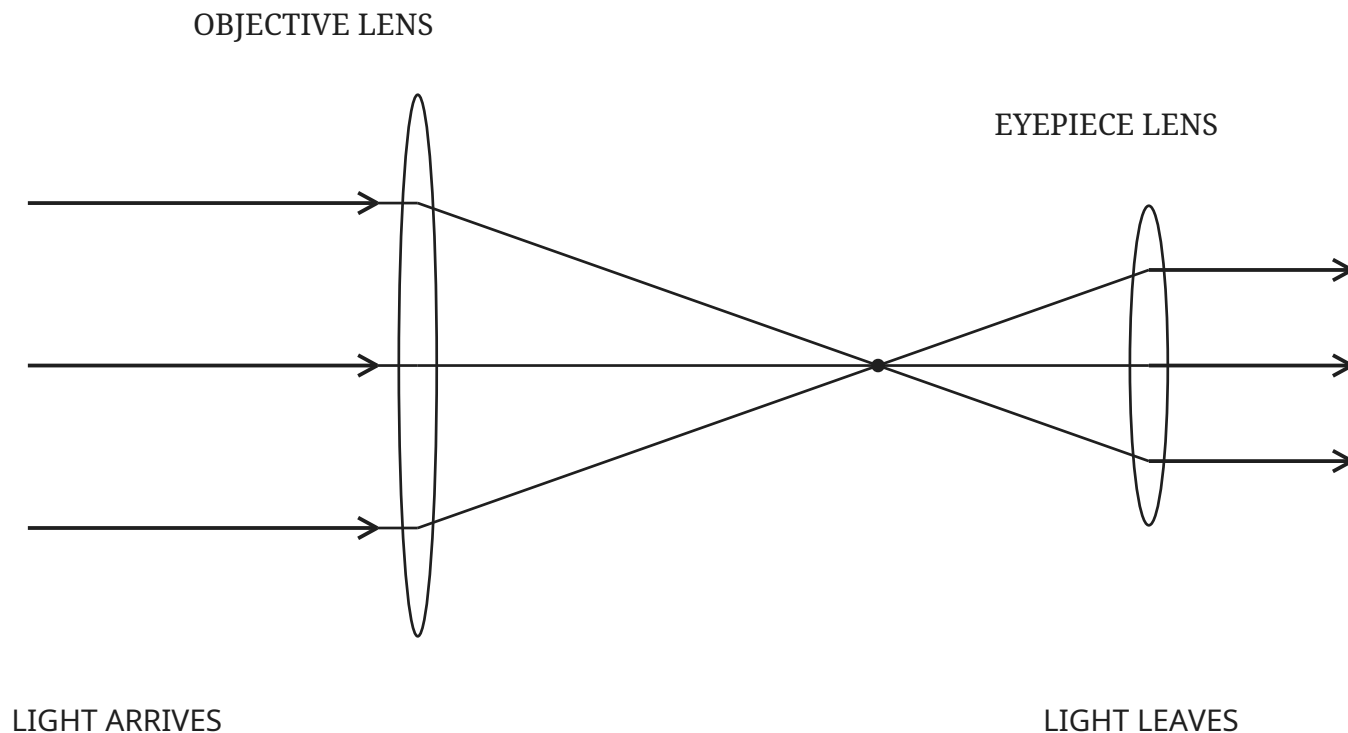
A constellation is also an officially defined sky region.

Pattern: _____ Region: _____

Big Dipper = an asterism within Ursa Major. This recognizable sketch is not an accurate chart or boundary map. Constellation traditions vary across cultures.

Follow the telescope light

Trace the three rays from left to right. Circle where the first lens brings them together.



Does this telescope gather light or create starlight?

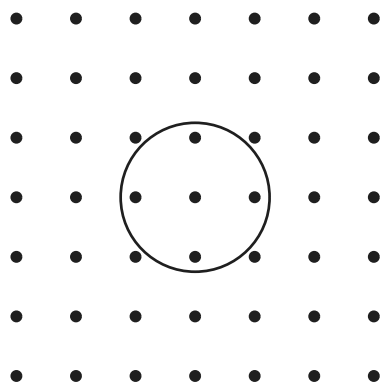
This is a simplified two-lens refracting telescope. Many other telescopes use mirrors instead.

Ray diagram, not a build plan or a scale drawing. No real lenses are needed. Never aim any telescope or binoculars at the Sun.

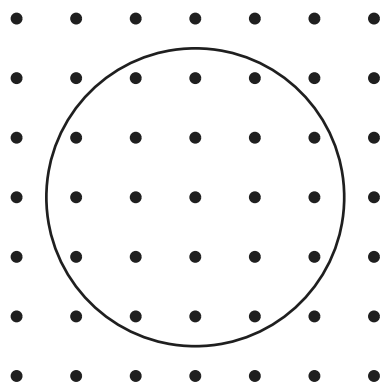
A bigger light collector

Every tiny dot stands for a light ray. Count the dots inside each circular opening.

A / SMALL



B / LARGE



Opening	Light dots inside
A	
B	

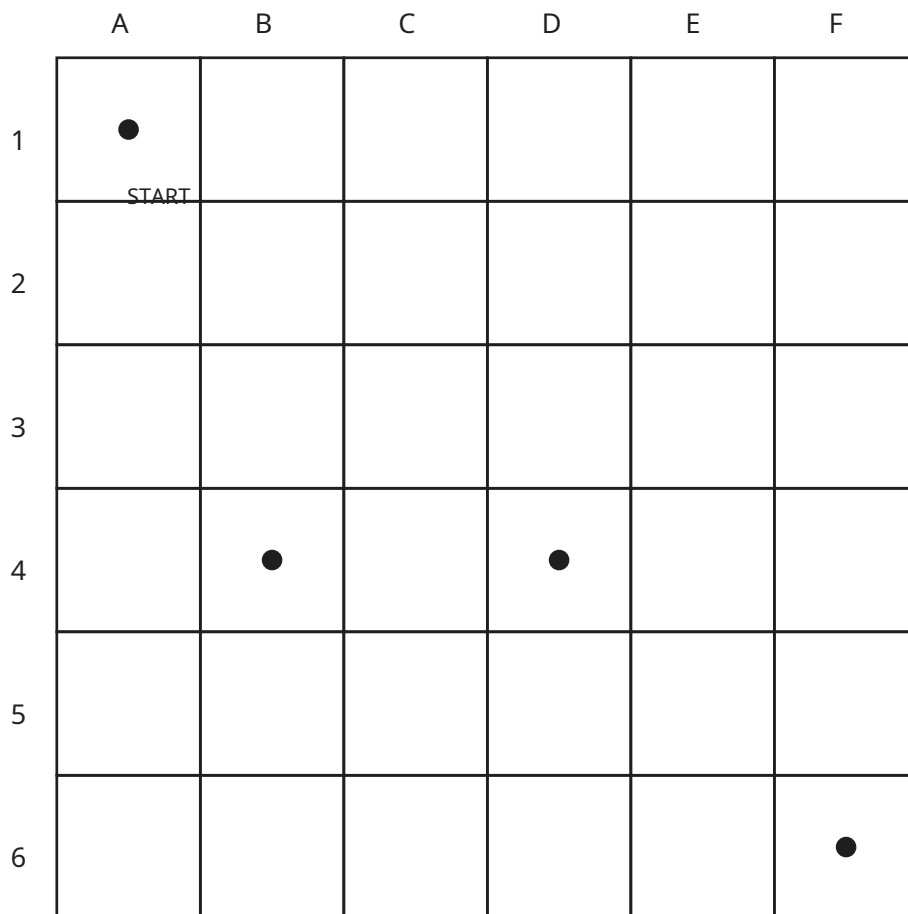
Which opening gathers more of these rays? A / B

A bigger telescope opening can gather more light. These sampled paper dots illustrate the idea; their totals are not precise brightness predictions.

Plan a paper sky survey

Start at A1. Visit B4, D4 and F6. Find a route using only 10 square-to-square moves.

PAPER RULE: move up, down, left or right. No diagonal moves.



Target visit order:

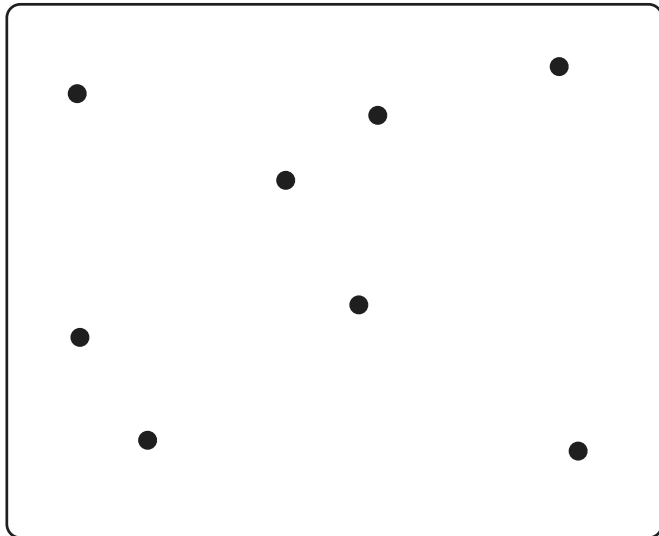
Moves used: _____ Check your route with a finger.

Imagine pointing a telescope, not travelling between stars. Grid moves are game units, not degrees, travel distances or light-years.

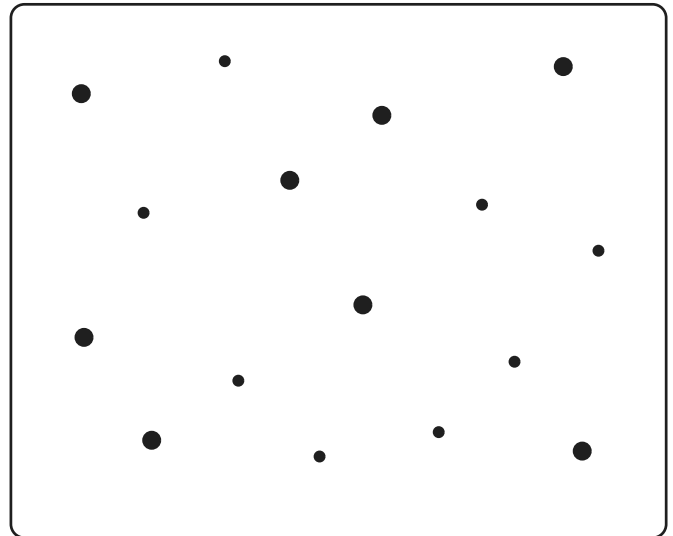
Read the observing record

These fictional views share a place, time and clear weather. Only nearby lighting changes.

A / BRIGHT LIGHTING



B / DARKER LIGHTING



Record A count	Record B count	Difference

Circle the supported explanation:

1. Darker conditions revealed more stars in this record.
2. Extra stars were born when the lights changed.

Invented evidence for practice. Visibility also depends on clouds, the Moon, eyesight and other conditions; a count is not a census of all stars.

Fold a pocket star atlas

Complete each panel. Cut the outside rectangle and fold the dotted lines like a fan.

MY STAR ATLAS	MY MAP KEY	MY INVENTED MAP	MAP NOTES
Draw a cover. Give your club a name.	● Star ⊙ Planet Add one more symbol and its meaning.	Place 8 stars. Join a pattern. Name it below. _____	This map is INVENTED. It is not an observing chart. Symbols are not to scale.

Share one thing your map shows and one thing it cannot tell a reader. Use your own words.

Adult help with cutting. Leave the four panels connected. Real sky maps need location and time information as well as a legend.

For the grown-up

The mapmaking is real practice. The supplied star fields are deliberately fictional.

Prepare the paper models

Print single-sided. Pencil, crayons, scissors and glue or tape are enough. Activity 8 uses three 140-wide feet and matching bases; activity 20 folds into four panels. Scrap card can stiffen the star stands.

Maps are not the objects

A chart flattens directions onto paper. Symbol sizes can encode apparent brightness without showing physical diameters. Stars close together on a map can be far apart in depth.

Name the viewpoint

Daily rotation changes the sky during a night. Earth's orbit changes the directions our night side faces during the year. Actual visibility depends on latitude, date, time and horizon; northern and southern seasons differ.

Respect pattern traditions

The invented patterns are creative exercises. The Big Dipper is an asterism in Ursa Major; its sketch is not a chart. Other cultures have other star traditions, and should be represented with specific attributed sources.

Use the evidence carefully

The counts and grid routes describe supplied drawings only. The depth stand exaggerates perspective changes; real stellar parallax is tiny. The telescope diagram omits a housing and many optical details.

Support and extend

Read aloud or accept oral answers. Ask which extra information a real observer would need. This editorial prototype still needs a family playtest to validate age fit and session length. No outdoor or Sun observation is part of the pack.

Safety: never look directly at the Sun through a telescope, binoculars or other optics. All activities here are completed on paper.

Answers: activities 1-10

For drawings and observations, reward a clear explanation rather than one artistic result.

- 1 3 star symbols, 2 planet symbols, 1 cluster, 1 galaxy. Count the entire cluster symbol as one object.
- 2 Eight different stars; A4 is repeated only to close the pattern. Rows increase downward and columns run A-H.
- 3 Missing: C3. Extra: E6. Both pictures have seven stars, so equal totals do not prove that positions match.
- 4 Any two distinct patterns using the supplied points. Names are invented; do not present them as traditional cultural constellations.
- 5 A is the rotated match. B changes one star's position. C is mirrored, not simply rotated.
- 6 B and D tie for brightest; A appears faintest. NO: this map alone cannot determine physical stellar diameters.
- 7 A is nearer: 2 model units versus 6. The two stars are aligned with the observer, so direction alone does not reveal their separation.
- 8 Three cards should stand at different depths on their labeled positions. Their 140-wide feet exactly match the printed places.
- 9 The drawings can differ even though the cards stay still. NO: only the observer needs to move. Record what the child actually sees.
- 10 A, B, C and F lie above the horizon line. D, E and G lie below it in this diagram.

Activity 8's model is a viewing demonstration, not a model of actual star distances or the precise geometry of any real constellation.

More answers and sources

Activities 11-20. The references support science, not endorsement of this workbook.

- 11-12 11: A faces the Sun; after half a turn it is on the night side. 12: spin 1,3,5; orbit 2,4,6.
- 13-14 13: A Owl, B Fox, C Crab, D Ship. These names are fictional. 14: mission 1 chart C; mission 2 chart B.
- 15-16 15: Big Dipper pattern; Ursa Major sky region. 16: rays meet at the marked point between the lenses. Telescopes gather light.
- 17-18 17: A catches 5 dots; B catches 21. B gathers more. 18: visit B4, D4, F6 in that order. A route of 10 orthogonal moves is possible.
- 19-20 19: A 8 stars, B 16, difference 8; explanation 1. 20: eight plotted stars, an understandable key, an invented pattern and honest map notes.

SCIENCE REFERENCES

NASA Space Place: spaceplace.nasa.gov/constellations/en/

NASA Skywatching FAQ: science.nasa.gov/skywatching/faq/

NASA Telescope optics: spaceplace.nasa.gov/telescopes/en/

NASA Seasons: spaceplace.nasa.gov/seasons/en/

NASA Hubble glossary: science.nasa.gov/mission/hubble/multimedia/hubble-glossary/

ESA Parallax: esa.int/content/view/full/416412

NASA Asterisms: science.nasa.gov/solar-system/what-are-asterisms/

References checked October 2026. Original layouts and fictional maps. Real constellations and instruments require fuller descriptions than these paper models.