

FIND YOUR BEARINGS

01 | Where does the sky begin?

If a star is inside the circle, will you be able to see it?

The chart rim is a level, geometric horizon. A ridge or tree can hide a star above that line. Air also bends light near the horizon; this model leaves that effect out. An above-horizon position is only one part of an actual sighting.

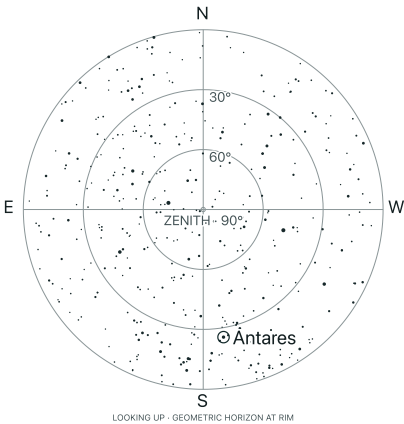
Try it. Find Antares in the reading table. Imagine a ridge higher than its altitude. Sketch where that ridge would hide the star.

The circle is not a survey of the skyline at Sunset Point.

Sources [15] [2] [3] · Paired activity 3

Calculated target readings

Object	Altitude	Bearing
Antares	25.3°	189.0° S



July 15, 2026 at 11:00 PM MDT
2026-07-16T05:00:00Z
Astronomical night
Moon 4.7% illuminated

FIND YOUR BEARINGS

02 | How high is that star?

Which direction takes you toward 90 degrees?

Altitude measures an angle above a level horizon, not a distance from Earth. Zero degrees is at the rim; 90 degrees is directly overhead, at the zenith. On this chart the 30-degree and 60-degree rings help you read the climb toward the center.

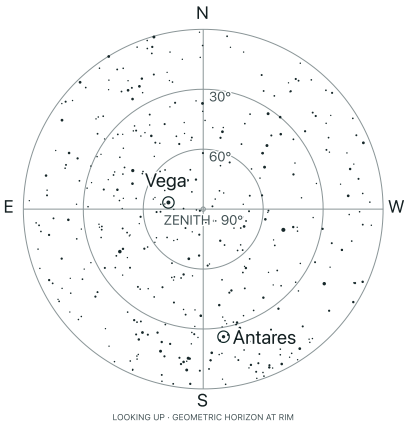
Try it. Compare Vega with Antares. Point to the higher star on the chart before reading their altitudes.

A star plotted nearer the center is higher in the sky, not physically nearer to you.

Sources [15] [1] · Paired activity 1

Calculated target readings

Object	Altitude	Bearing
Vega	72.3°	79.2° E
Antares	25.3°	189.0° S



July 15, 2026 at 11:00 PM MDT
2026-07-16T05:00:00Z
Astronomical night
Moon 4.7% illuminated

FIND YOUR BEARINGS

03 | Turn the page, not the sky.

Why is east on the left of a north-up sky chart?

This view looks upward. With north at the top, east belongs on the left. The direction you choose to face moves to the bottom, nearest you. Rotating the drawing changes its orientation while every object's altitude and true-north bearing stay the same.

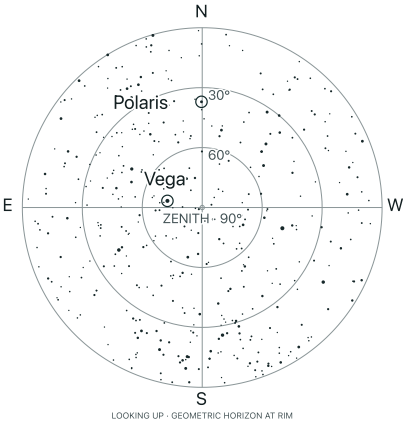
Try it. Change Face from south to north. Watch Polaris move on the page, then check that its two angles did not change.

Azimuth runs clockwise from true north: N 0, E 90, S 180, W 270 degrees. It is not a magnetic compass reading.

Sources [15] [7] · Paired activity 4

Calculated target readings

Object	Altitude	Bearing
Polaris	37.1°	0.4° N
Vega	72.3°	79.2° E



July 15, 2026 at 11:00 PM MDT
2026-07-16T05:00:00Z
Astronomical night
Moon 4.7% illuminated

FIND YOUR BEARINGS

04 | A nearly steady north.

Does the North Star stand exactly still?

Polaris lies close to the north celestial pole, but not precisely on it. Its small daily circle makes it a useful northward landmark. At this reference latitude, the pole itself is about 37.6 degrees above the level northern horizon.

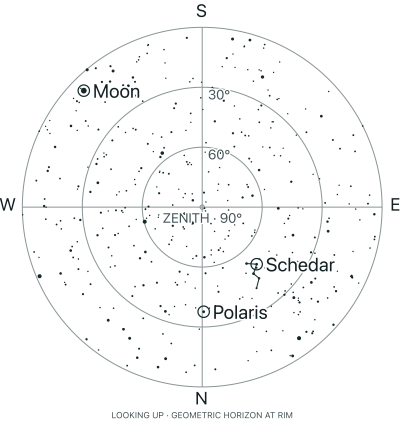
Try it. Step forward an hour four times. Compare Polaris with Schedar: which changes altitude less over those steps?

Polaris is a direction clue, not the brightest star. The pole's height follows from the observer's latitude.

Sources [7] [15] [2] · Paired activity 4

Calculated target readings

Object	Altitude	Bearing
Polaris	37.6°	0.8° N
Schedar	50.5°	43.6° NE



October 15, 2026 at 9:00 PM MDT
2026-10-16T03:00:00Z
Astronomical night
Moon 26.9% illuminated

FOLLOW A PATTERN

05 | One pattern, two hours.

Will the triangle change its shape or its place?

Earth's rotation carries a familiar star pattern across your local sky. The stars' arrangement is effectively unchanged over an evening, even while their altitude and bearing change. A flat chart projection can stretch the apparent drawing as it approaches the rim.

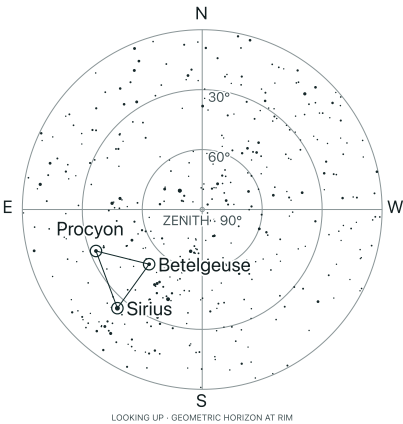
Try it. Load the winter exercise. Compare Sirius at 9 p.m. and 11 p.m.; describe the change using both altitude and bearing.

This is apparent daily motion. The two-hour jump is a teaching comparison, not a moving live view.

Sources [7] [8] [1] · Paired activity 1

Calculated target readings

Object	Altitude	Bearing
Sirius	24.9°	139.3° SE
Betelgeuse	51.9°	135.9° SE
Procyon	32.9°	111.3° E



January 15, 2026 at 9:00 PM MST
2026-01-16T04:00:00Z
Astronomical night
Moon 6.9% illuminated

FOLLOW A PATTERN

06 | The same hour, a month later.

Does keeping the clock fixed keep the stars fixed?

As Earth travels around the Sun, its night side faces different directions in space. A star therefore occupies a different place at the same clock time on another date. The spring pair keeps Denver's daylight-saving offset the same on both dates, making that comparison easier to read.

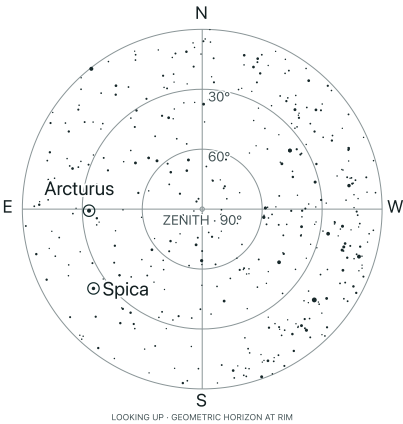
Try it. Compare Arcturus on April 15 and May 15 at 10 p.m. Predict which position is higher, then open the pair.

A seasonal name does not mean a pattern appears only in that season; the hour matters too.

Sources [9] [15] [1] · Paired activity 2

Calculated target readings

Object	Altitude	Bearing
Arcturus	33.4°	90.8° E
Spica	22.6°	126.1° SE



April 15, 2026 at 10:00 PM MDT
2026-04-16T04:00:00Z
Astronomical night
Moon 2.5% illuminated

FOLLOW A PATTERN

07 | Three stars, one memory aid.

Is the Summer Triangle a constellation?

Vega, Deneb and Altair form an asterism: a recognizable pattern. They belong to Lyra, Cygnus and Aquila respectively. Our line segments help you connect the names; they are neither physical links between stars nor official constellation boundaries.

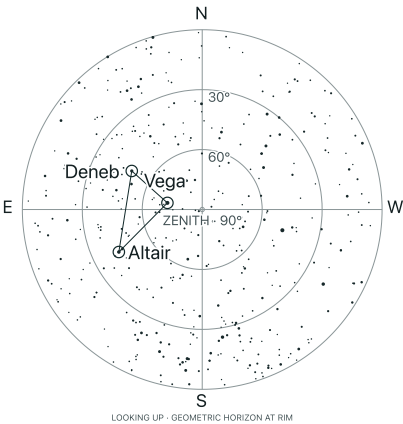
Try it. Find all three corners. Switch the pattern lines off, then try identifying the corners again from their labels and bearings.

These modern finding aids represent only a small part of the many ways people understand the sky.

Sources [8] [1] · Paired activity 3

Calculated target readings

Object	Altitude	Bearing
Vega	72.3°	79.2° E
Deneb	49.8°	61.3° NE
Altair	43.2°	117.0° SE



July 15, 2026 at 11:00 PM MDT
2026-07-16T05:00:00Z
Astronomical night
Moon 4.7% illuminated

FOLLOW A PATTERN

08 | A smaller number can shine brighter.

What does a larger star dot actually mean?

Apparent visual magnitude ranks how bright a star appears from Earth: lower numbers mean brighter stars. The catalogue gives Sirius a lower magnitude than Procyon. Point sizes here suggest that ranking; they do not show stellar size, and they do not simulate tonight's visibility.

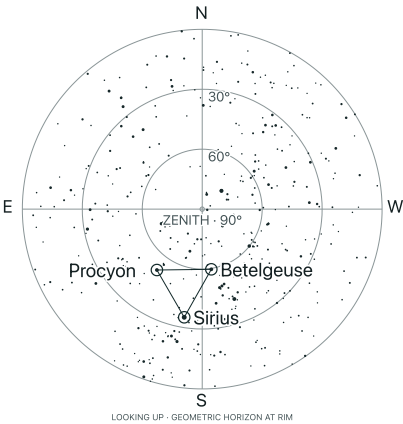
Try it. Read the catalogue magnitudes for Sirius, Betelgeuse and Procyon. Rank them from brightest to faintest before comparing their dots.

Catalogue brightness is a reference value. Variable stars and local observing conditions are not animated.

Sources [1] [18] · Paired activity 1

Calculated target readings

Object	Altitude	Bearing
Sirius (mag -1.44)	35.1°	170.6° S
Betelgeuse (mag 0.45)	59.5°	188.6° S
Procyon (mag 0.40)	52.0°	143.4° SE



January 15, 2026 at 11:00 PM MST
2026-01-16T06:00:00Z
Astronomical night
Moon 6.5% illuminated

09

READ THE LIGHT

Darkness has a scale.

Is every moment after sunset equally dark?

Civil, nautical and astronomical twilight are defined using the Sun's center at 6, 12 and 18 degrees below the horizon. These thresholds describe geometry. They do not tell you exactly when a particular star becomes visible.

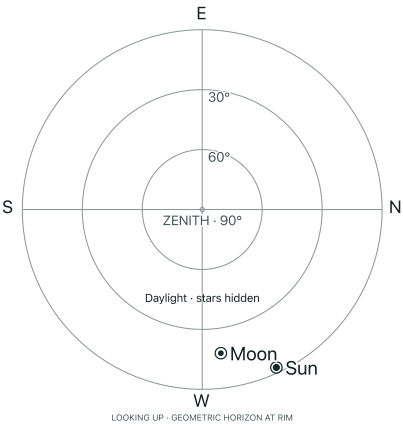
Try it. Open the summer pair. Compare the Sun's altitude and the twilight label at 8:30 p.m. and 10:30 p.m.

No sunrise or sunset time is calculated. The real skyline, refraction, clouds and artificial light are absent.

Sources [12] [15] · Paired activity 3

Calculated target readings

Object	Altitude	Bearing
Sun	2.7°	295.1° NW
Vega	43.6°	69.0° E



July 15, 2026 at 8:30 PM MDT
2026-07-16T02:30:00Z
Daylight
Moon 4.2% illuminated

10

READ THE LIGHT

A fraction of a sunlit disk.

Does 50 percent illuminated mean half as bright?

The illuminated fraction describes the sunlit part of the Moon's apparent disk, not a fraction of its maximum brightness. Ordinary phases come from the changing Sun-Earth-Moon geometry, rather than Earth's shadow falling across the Moon.

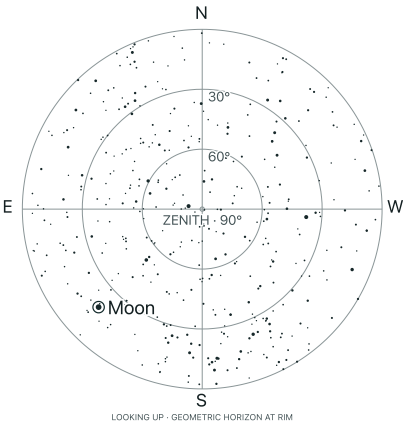
Try it. Compare the July 15 and July 29 readings. Write down the fraction and broad phase label for each night.

The circular Moon marker shows position only. It does not depict the lunar disk's shape, orientation or true angular diameter.

Sources [11] [3] [15] · Paired activity 5

Calculated target readings

Object	Altitude	Bearing
Moon	18.6°	133.4° SE



July 29, 2026 at 11:00 PM MDT
2026-07-30T05:00:00Z
Astronomical night
Moon 99.6% illuminated

11

READ THE LIGHT

Phase is only half the question.

Can you tell where the Moon is from its phase alone?

A phase reading and a direction reading answer different questions. Check the Moon's altitude as well as its illuminated fraction. A negative altitude places its modeled center below the geometric horizon at this location and instant.

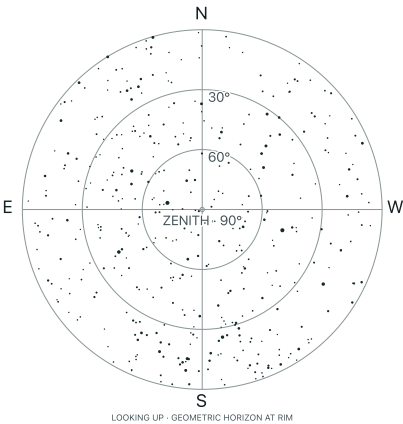
Try it. Start on July 15 at 11 p.m. Find the Moon in the table even if it has no marker inside the chart. Then load the other July night.

An above-horizon Moon still does not establish a clear view. No moonlight brightness or skyglow forecast is supplied.

Sources [11] [15] [3] · Paired activity 5

Calculated target readings

Object	Altitude	Bearing
Moon	-10.0°	298.7° NW



July 15, 2026 at 11:00 PM MDT
2026-07-16T05:00:00Z
Astronomical night
Moon 4.7% illuminated

12

READ THE LIGHT

A line through our galaxy.

What can a guide line tell you about the Milky Way?

We view the Milky Way's disk from inside it. The dashed line marks the calculated Galactic equator, giving a direction reference across the sky. Its width, dashes and color are drawing choices; they cannot describe dust lanes or how bright the Milky Way will appear.

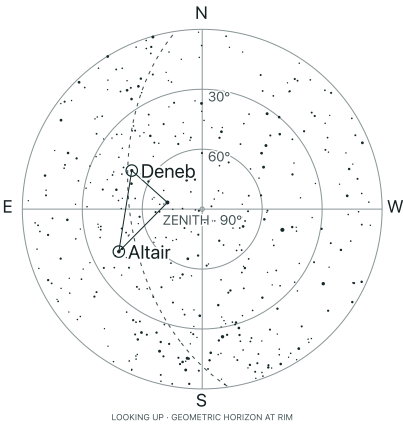
Try it. Trace the dashed guide across the summer scene. Toggle it off and compare it with the Summer Triangle's straight finding lines.

This is derived geometry, not a night photograph. Whether the Milky Way is visible must be observed in the field.

Sources [4] [10] [5] · Paired activity 3

Calculated target readings

Object	Altitude	Bearing
Deneb	49.8°	61.3° NE
Altair	43.2°	117.0° SE



July 15, 2026 at 11:00 PM MDT
2026-07-16T05:00:00Z
Astronomical night
Moon 4.7% illuminated

KEEP GOOD TIME

13 | One clock reading, two skies.

When can 1:30 a.m. happen twice?

When Denver leaves daylight saving time, the repeated hour has two different UTC instants. The sky keeps moving while the clock repeats. This deck requires an occurrence choice instead of silently choosing one. In spring, a skipped clock time has no matching instant.

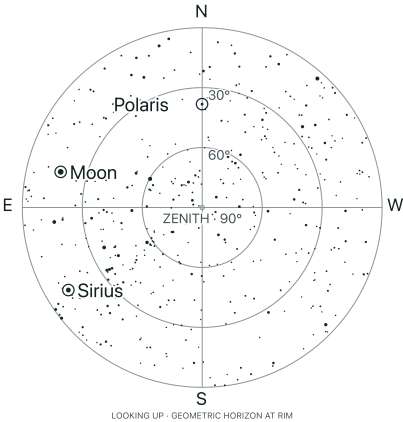
Try it. Load the November repeated-hour activity. Compare the MDT and MST choices and read the UTC label for each.

The location always uses America/Denver, even if your device is elsewhere. Future time-zone rules may change.

Sources [16] [15] · Paired activity 8

Calculated target readings

Object	Altitude	Bearing
Polaris	38.2°	0.1° N
Sirius	11.3°	121.7° SE



November 1, 2026 at 1:30 AM MDT
2026-11-01T07:30:00Z
Astronomical night
Moon 56.2% illuminated

KEEP GOOD TIME

14 | Give the date its full name.

Is February 29 a valid date every year?

A date needs a year as well as a month and day. The date controls accept February 29 in 2028 and reject it in 2026. They also reject dates outside the supported local years, 2020 through 2035, rather than extending the classroom's stated range.

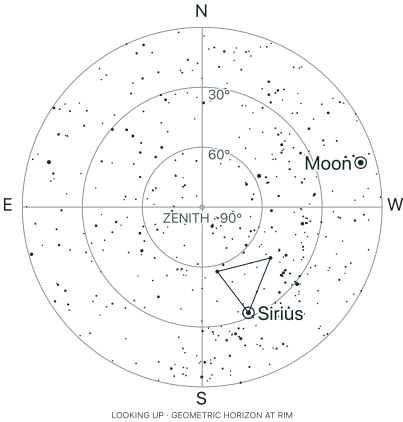
Try it. Use the leap-day pair, then enter 2026-02-29 in a text-capable date control. An invalid request must leave the last valid sky intact.

A UTC date can differ from the Denver date. Both are shown so that another person can reproduce the same instant.

Sources [15] [17] · Paired activity 6

Calculated target readings

Object	Altitude	Bearing
Sirius	32.2°	203.7° SW



February 29, 2028 at 10:00 PM MST
2028-03-01T05:00:00Z
Astronomical night
Moon 19.8% illuminated

KEEP GOOD TIME

15 | Let your eyes catch up.

What changes when the screen turns red?

NPS stargazing guidance suggests allowing roughly 20 to 30 minutes for dark adaptation and keeping lights restrained. The red-display option changes this page's palette. It does not dim your hardware, other apps or the real sky.

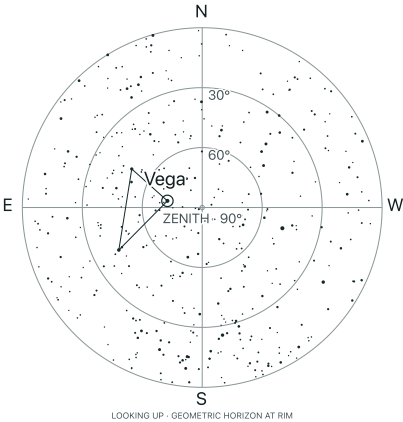
Try it. Switch between night, high contrast and red display. Check that the astronomical readings stay identical. Choose a readable setting and lower device brightness yourself when appropriate.

Screen color is not a guarantee of preserved night vision. Consider other observers and keep lights out of their eyes.

Sources [13] · Paired activity 3

Calculated target readings

Object	Altitude	Bearing
Vega	72.3°	79.2° E



July 15, 2026 at 11:00 PM MDT
2026-07-16T05:00:00Z
Astronomical night
Moon 4.7% illuminated

KEEP GOOD TIME

16 | Make a note the model cannot.

Which part of an observing log has to come from you?

A calculation can supply a date, direction and modeled altitude. It cannot report what you actually saw. On paper, separate the calculated reading from your own description of clouds, obstructions and detected objects. Leave unobserved details blank.

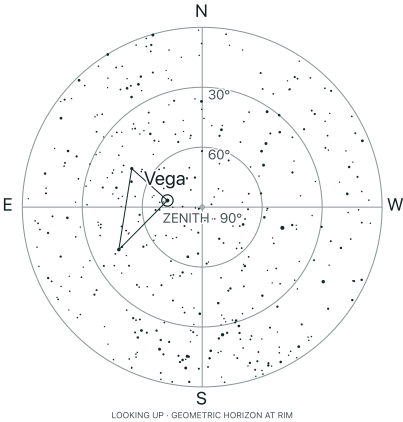
Try it. Use the print deck's blank log. Record a model value in one column and a real observation in the other only after observing.

These are learning examples, not forecasts, telescope instructions, access advice or a park program schedule.

Sources [15] [6] [14] · Paired activity 2

Calculated target readings

Object	Altitude	Bearing
Vega	72.3°	79.2° E
Moon	-10.0°	298.7° NW



July 15, 2026 at 11:00 PM MDT
2026-07-16T05:00:00Z
Astronomical night
Moon 4.7% illuminated

ACTIVITY 01 · WINTER

Follow a winter triangle

Over two hours, will Sirius move higher or lower above the horizon?

1. Read the first scene at 9 p.m. on January 15.
2. Predict the change, then load the 11 p.m. scene.
3. Compare the three stars' altitudes and bearings. Describe motion relative to the horizon.

Scene A · 2026-01-15 21:00

January 15, 2026 at 9:00 PM MST
2026-01-16T04:00:00Z · Astronomical night
Moon: 6.9% illuminated

Calculated target readings

Object	Altitude	Bearing
Sirius	24.9°	139.3° SE
Betelgeuse	51.9°	135.9° SE
Procyon	32.9°	111.3° E

Scene B · 2026-01-15 23:00

January 15, 2026 at 11:00 PM MST
2026-01-16T06:00:00Z · Astronomical night
Moon: 6.5% illuminated

Calculated target readings

Object	Altitude	Bearing
Sirius	35.1°	170.6° S
Betelgeuse	59.5°	188.6° S
Procyon	52.0°	143.4° SE

Compare. The calculated readings show Sirius higher at 11 p.m. Compare the whole triangle rather than treating a single dot's movement as a change in the pattern itself.

Sources [1] [7] [8]

ACTIVITY 02 · SPRING

Keep the hour, change the month

Will Arcturus occupy the same place at 10 p.m. one month later?

1. Start on April 15 at 10 p.m.
2. Keep the same clock time and move to May 15.
3. Compare Arcturus and Spica. Both dates use MDT; the clock offset has not changed.

Scene A · 2026-04-15 22:00

April 15, 2026 at 10:00 PM MDT
2026-04-16T04:00:00Z · Astronomical night
Moon: 2.5% illuminated

Calculated target readings

Object	Altitude	Bearing
Arcturus	33.4°	90.8° E
Spica	22.6°	126.1° SE

Scene B · 2026-05-15 22:00

May 15, 2026 at 10:00 PM MDT
2026-05-16T04:00:00Z · Astronomical twilight
Moon: 0.9% illuminated

Calculated target readings

Object	Altitude	Bearing
Arcturus	56.2°	114.2° SE
Spica	37.6°	155.0° SE

Compare. Arcturus is higher in the May scene. This is a comparison of two dates at the same local clock time, not a claim that a star is unique to a season.

Sources [9] [1] [15]

ACTIVITY 03 · SUMMER

Wait for the Sun to move lower

Which light category will the model show two hours later?

1. Load July 15 at 8:30 p.m. and read the Sun's altitude.
2. Load 10:30 p.m. and compare the category.
3. Try red display. Confirm that changing color does not change the modeled Sun.

Scene A · 2026-07-15 20:30

July 15, 2026 at 8:30 PM MDT
2026-07-16T02:30:00Z · Daylight
Moon: 4.2% illuminated

Calculated target readings

Object	Altitude	Bearing
Sun	2.7°	295.1° NW
Vega	43.6°	69.0° E

Scene B · 2026-07-15 22:30

July 15, 2026 at 10:30 PM MDT
2026-07-16T04:30:00Z · Astronomical twilight
Moon: 4.6% illuminated

Calculated target readings

Object	Altitude	Bearing
Sun	-16.8°	315.4° NW
Vega	66.4°	77.8° E

Compare. The later scene is still astronomical twilight: the Sun's center is about 16.8 degrees below the horizon. Step forward one more hour to reach the model's night category. Neither category establishes weather or visibility.

Sources [12] [15] [13]

ACTIVITY 04 · AUTUMN

Carry a pattern across midnight

Will Polaris and Schedar change altitude by the same amount?

1. Start at 9 p.m. on October 15, facing north.
2. Load 1 a.m. on October 16. Notice the calendar day change.
3. Compare both stars. Separately rotate the chart to see why turning the page is a different action.

Scene A · 2026-10-15 21:00

October 15, 2026 at 9:00 PM MDT
2026-10-16T03:00:00Z · Astronomical night
Moon: 26.9% illuminated

Calculated target readings

Object	Altitude	Bearing
Polaris	37.6°	0.8° N
Schedar	50.5°	43.6° NE

Scene B · 2026-10-16 01:00

October 16, 2026 at 1:00 AM MDT
2026-10-16T07:00:00Z · Astronomical night
Moon: 28.3% illuminated

Calculated target readings

Object	Altitude	Bearing
Polaris	38.2°	0.4° N
Schedar	70.4°	348.3° N

Compare. Over this pair, Schedar's altitude changes more than Polaris's. Polaris lies much closer to the rotation pole. The date must advance when the comparison crosses midnight.

Sources [7] [1] [15]

ACTIVITY 05 · MOON & DATE

Ask two questions about the Moon

What can change if the local clock stays at 11 p.m. for both nights?

1. Record the Moon's altitude and illuminated fraction on July 15.
2. Repeat for July 29 at the same local hour.
3. Explain why a percentage alone cannot tell you whether the Moon is above the horizon.

Scene A · 2026-07-15 23:00

July 15, 2026 at 11:00 PM MDT
2026-07-16T05:00:00Z · Astronomical night
Moon: 4.7% illuminated

Calculated target readings

Object	Altitude	Bearing
Moon	-10.0°	298.7° NW

Scene B · 2026-07-29 23:00

July 29, 2026 at 11:00 PM MDT
2026-07-30T05:00:00Z · Astronomical night
Moon: 99.6% illuminated

Calculated target readings

Object	Altitude	Bearing
Moon	18.6°	133.4° SE

Compare. The Moon is below the geometric horizon in the first scene and above it in the second, with a much larger illuminated fraction. The fraction measures disk area, not brightness.

Sources [11] [3] [15]

ACTIVITY 06 · CALENDAR

Make room for February 29

Will the same star return to exactly the same position after one solar day?

1. Compare February 28 and February 29, 2028, both at 10 p.m.
2. Look for the small change in Sirius's altitude and bearing.
3. Try an unsupported year in the date controls. The previous valid scene must remain labeled and unchanged.

Scene A · 2028-02-28 22:00

February 28, 2028 at 10:00 PM MST
2028-02-29T05:00:00Z · Astronomical night
Moon: 12.6% illuminated

Calculated target readings

Object	Altitude	Bearing
Sirius	32.5°	202.6° SW

Scene B · 2028-02-29 22:00

February 29, 2028 at 10:00 PM MST
2028-03-01T05:00:00Z · Astronomical night
Moon: 19.8% illuminated

Calculated target readings

Object	Altitude	Bearing
Sirius	32.2°	203.7° SW

Compare. Both dates are valid in leap year 2028. The positions differ slightly after 24 hours because a solar day and a stellar rotation cycle are not identical.

Sources [17] [15] [9]

ACTIVITY 07 · CLOCK CHANGE

Meet the missing hour

What should a chart do with a local time that never occurs?

1. Try March 8, 2026, at 2:30 a.m. in Denver.
2. Read the rejection; no new sky should replace the last valid scene.
3. Load 3:30 a.m. and compare its local and UTC labels.

Scene A · 2026-03-08 02:30

No matching instant. This Denver clock time is skipped. Keep the previous valid scene.

Scene B · 2026-03-08 03:30

March 8, 2026 at 3:30 AM MDT
2026-03-08T09:30:00Z · Astronomical night
Moon: 77.1% illuminated

Calculated target readings

Object	Altitude	Bearing
Polaris	37.1°	359.6° N
Sirius	-13.9°	259.4° W

Compare. The first request has no UTC match under the current Denver rules. The valid second request is 09:30 UTC. A silent one-hour correction would hide an important difference.

Sources [16] [15]

ACTIVITY 08 · CLOCK CHANGE

Give the repeated hour a name

How can two 1:30 a.m. readings be an hour apart?

1. Load the first November 1, 2026, 1:30 a.m. occurrence: MDT.
2. Load the second occurrence: MST.
3. Compare the UTC times and star readings. The clock repeats; Earth's rotation continues.

Scene A · 2026-11-01 01:30 · first

November 1, 2026 at 1:30 AM MDT
2026-11-01T07:30:00Z · Astronomical night
Moon: 56.2% illuminated

Calculated target readings

Object	Altitude	Bearing
Polaris	38.2°	0.1° N
Sirius	11.3°	121.7° SE

Scene B · 2026-11-01 01:30 · second

November 1, 2026 at 1:30 AM MST
2026-11-01T08:30:00Z · Astronomical night
Moon: 55.7% illuminated

Calculated target readings

Object	Altitude	Bearing
Polaris	38.2°	359.9° N
Sirius	20.8°	133.0° SE

Compare. The first occurrence is 07:30 UTC and the second is 08:30 UTC. Choosing an occurrence resolves the ambiguity; it does not change the fixed Bryce location.

Sources [16] [15]

A pocketful of questions.

Choose a card. Make a prediction. Compare it with a dated model reading. A second person can read the prompt while you point to the chart. Cut the first eight sheets across the dotted middle line if you want separate cards.

Read the drawing

The chart looks up. Its center is the zenith, 90 degrees above a level horizon. The rim is altitude zero; the rings mark 30 and 60 degrees. North is geographic north. With north at the top, east is on the left. The facing direction sits at the bottom. Ringed points identify target objects. Solid finding lines and dashed Galactic guide lines are illustrations built on calculated positions.

Keep the model and the field separate

The fixed reference is Sunset Point, 37.622568° N, 112.165988° W, using America/Denver clock rules. Source coordinate accuracy is unknown. The Moon calculation assumes zero ellipsoid height, not Bryce's actual elevation. No terrain, refraction, clouds, haze or local lighting is modeled. Daylight hides chart stars. A marker above the horizon does not promise a sighting.

Moon percentages describe sunlit disk area, not brightness. Markers do not depict actual angular sizes or lunar orientation. The catalogue is HYG v4.1; plots retain stars through magnitude 4.5. No planet positions or precise rise/set events are provided.

Your observing log

Leave field entries blank until you have actually observed. The model cannot fill them for you.

Calculated reading	Observed in the field
Date, Denver time, zone, UTC:	Actual observing time and location:
Object, altitude and bearing:	Detected object or not detected:
Moon fraction / geometric light category:	Clouds, obstructions, nearby light:

Use NPS for current park conditions and programs. This independent educational deck is not NPS-endorsed and supplies no forecast, observing guarantee or telescope-pointing instructions.

Sources & rights

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David Nash / Astronexus. Version 4.1; repository pinned by commit. CC BY-SA 4.0; runtime subset and catalogue-derived charts retain the same license and attribution.

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<https://science.nasa.gov/solar-system/what-are-asterisms/>

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Sources & rights · continued

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