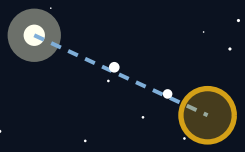
Star Hop Finder Charts

Practical mini-maps for finding 15 famous deep-sky targets.

Naked-eye reference → intermediate stars → target in the eyepiece.



Why star-hop?

Star hopping is the traditional skill of navigating from a bright naked-eye reference star to a faint deep-sky target by hopping through intermediate stars visible in your finder or low-power eyepiece. It's how astronomers found things for centuries before GoTo. **Even with a GoTo mount, knowing how to star-hop teaches the sky in a way no automated system can.**

Each chart in this guide shows the path from a naked-eye-bright reference star (Vega, Sirius, Polaris, etc.) to a specific famous deep-sky target. The blue dotted line is your route. Numbered circles mark intermediate stars worth pausing at to verify you're on track. The gold circle is your destination.

> **How to use these charts**
>
> **(1)** Find the starting bright star with your naked eye — Vega, Sirius, Polaris, etc. **(2)** Center it in your finderscope or low-power eyepiece (a Telrad reflex finder is ideal). **(3)** Move your scope along the hop path — usually by recognizing star patterns through the finder. **(4)** At each numbered waypoint, verify you see the expected pattern. **(5)** When you arrive at the target, switch to higher magnification to study it. Beginners: practice in the daytime with a terrestrial target to learn how your finder works before attempting at night.

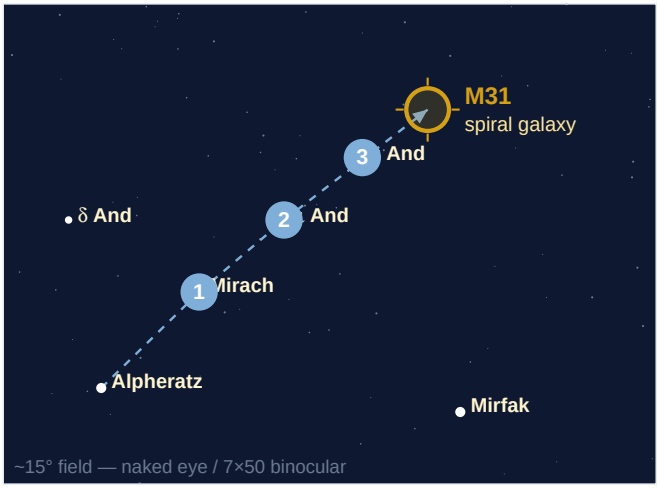
The fifteen charts

Star-hops to famous targets, by season

M31 — Andromeda Galaxy

Spiral Galaxy · Andromeda · mag 3.4

Start: Pegasus Square (Alpheratz, NE corner) **Season:** Fall / Winter (Aug–Feb) **Difficulty:** Easy — naked-eye in dark skies



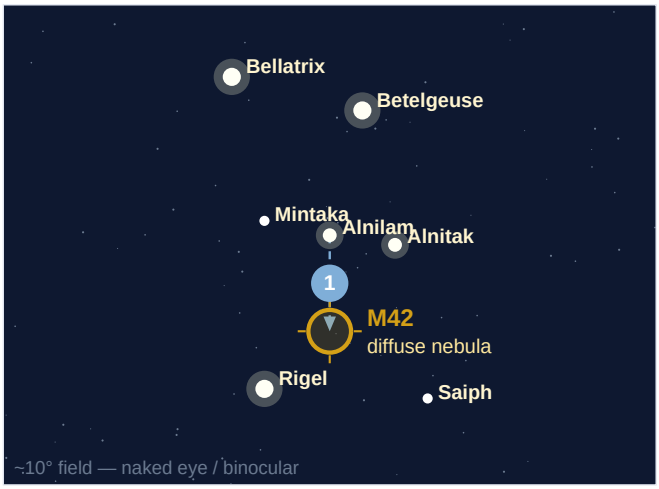
1. Find the Great Square of Pegasus. Alpheratz is its NE corner — also the start of Andromeda.
2. From Alpheratz, hop east-northeast to Mirach (mag 2.1, another bright orange star).
3. From Mirach, look 90° to your right and find μ And (a fainter star).
4. Continue past ν And and you'll see M31 as an obvious oval glow even to the naked eye.
5. Binoculars confirm — large oval with bright core, surrounded by companion galaxies M32 and M110.

Notes M31 is the easiest galaxy to find — once you've done it, you'll know exactly where the Andromeda constellation pattern lives. Visible naked-eye from Bortle 4 or darker.

M42 — Orion Nebula

Diffuse Nebula · Orion · mag 4.0

Start: Orion's Belt (Alnitak, Alnilam, Mintaka) **Season:** Winter (Dec–Mar) **Difficulty:** Easy — naked-eye fuzzy 'star'



1. Find Orion — three bright stars in a line form the belt (Mintaka, Alnilam, Alnitak).
2. Below the belt, three fainter stars in a line form 'Orion's Sword'.
3. The middle 'star' of the sword is actually M42 — visibly fuzzy even to the naked eye.
4. Binoculars or low-power eyepiece show the fan-shaped nebulosity clearly.
5. 4-inch+ telescope at moderate magnification reveals the four Trapezium stars at the heart.

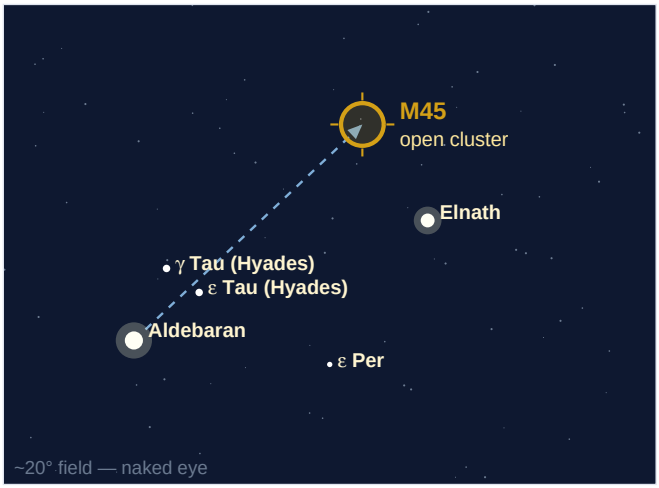
Notes M42 is the brightest emission nebula in the sky and the easiest deep-sky target after the Moon. Visible naked-eye from any sky condition. Often the first deep-sky object a beginner identifies.

M45 — Pleiades

Open Cluster · Taurus · mag 1.6

Start: Naked-eye recognition (no hop needed)

Season: Fall / Winter (Oct–Mar) **Difficulty:** Trivial — naked-eye obvious



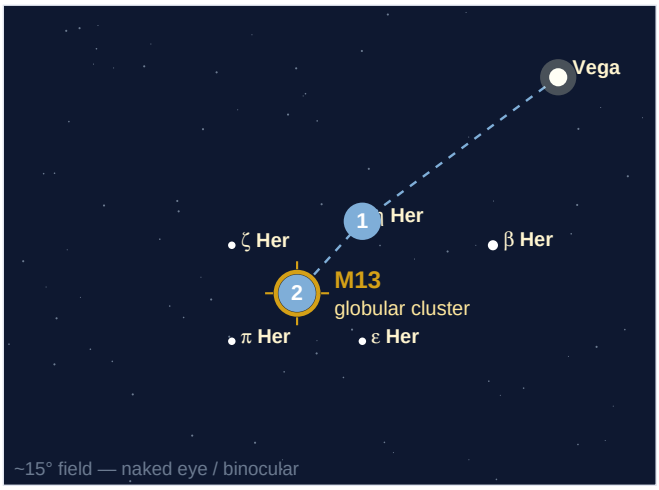
1. Find Aldebaran (orange-red, mag 0.85) — the 'eye of Taurus'.
2. From Aldebaran, look northwest (above and to the right in the evening sky).
3. About 15° away you'll see a small cluster of 6-7 stars in a tight 'dipper' shape — that's the Pleiades.
4. Even in light-polluted skies, the Pleiades are obviously a cluster — they look like a tiny Big Dipper.
5. Binoculars reveal 50+ stars; long exposures show faint blue reflection nebulosity around the brightest.

Notes The Pleiades are too big for most telescopes (110' across — twice the Moon's width). Binoculars or wide-field photographic lens are the optimal viewing tools.

M13 — Great Hercules Cluster

Globular Cluster · Hercules · mag 5.8

Start: Vega (brightest summer star) **Season:** Summer (May–Sep) **Difficulty:** Easy in binoculars



1. Find Vega (mag 0.03) — by far the brightest star in the summer sky.
2. From Vega, find the 'Keystone' of Hercules: four stars (η, ζ, ε, π Her) forming a slightly squished trapezoid.
3. M13 sits on the western edge of the keystone, about 1/3 of the way from η Her to ζ Her.
4. Binoculars show M13 as an obvious fuzzy 'star' (it's brighter than the surrounding background stars).
5. Through a 6"+ telescope, M13 resolves into a glittering sphere of hundreds of individual stars.

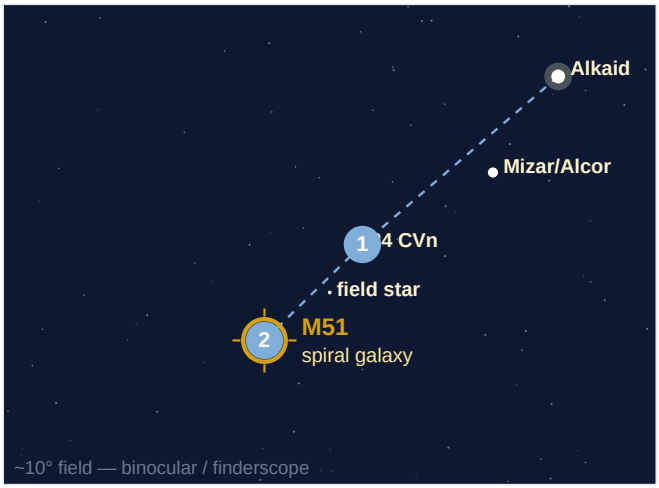
Notes M13 is the northern hemisphere's showpiece globular cluster — the best of its kind visible from northern latitudes. Look for the 'propeller' — three dark lanes that bisect the cluster, visible in 10"+ scopes.

M51 — Whirlpool Galaxy

Spiral Galaxy · Canes Ven. · mag 8.4

Start: Alkaid (end of Big Dipper's handle)**Season:** Spring (Mar–Jun)

Difficulty: Moderate — needs dark sky for arms



1. Find Alkaid — the star at the very end of the Big Dipper's handle.
2. M51 lies about 3.5° southwest of Alkaid (toward Cor Caroli in Canes Venatici).
3. Through a finder, look for a small mag-5 'star' that's not really a star — that's M51's bright core.
4. Center it. In a 4" scope you'll see two fuzzy 'stars' (M51 plus its companion NGC 5195).
5. In an 8"+ scope from a dark site, the famous spiral arms become visible — the most striking galaxy in the sky outside Andromeda.

Notes M51 is the textbook face-on spiral. The spiral arms need Bortle 4 or darker to see visually — but they show clearly in any imaging exposure of 5+ minutes.

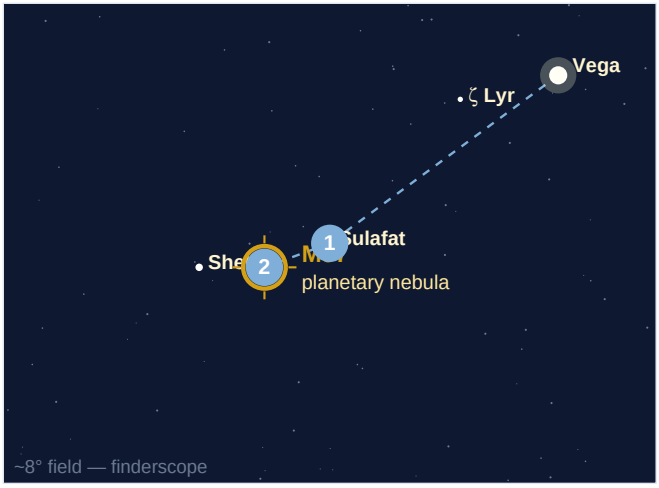
M57 — Ring Nebula

Planetary Nebula · Lyra · mag 8.8

Start: Vega (brightest summer star)

Season: Summer (May–Sep)

Difficulty: Easy — among the easiest planetaries



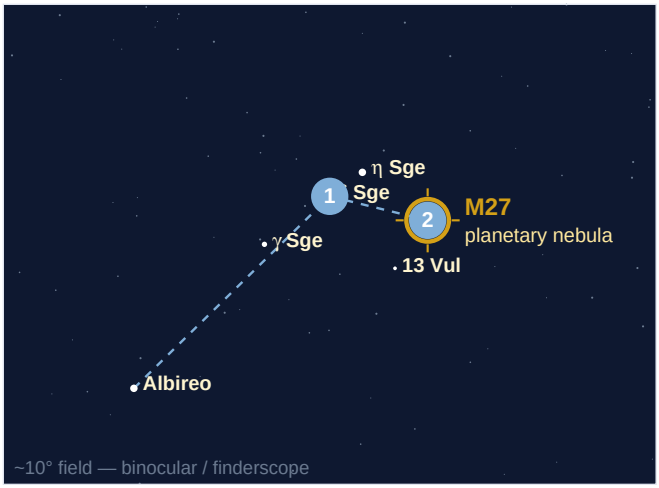
1. Find Vega. Lyra is a small constellation just southeast — a parallelogram of four stars.
2. Find the southern edge of the parallelogram: Sheliak (β Lyr) and Sulafat (γ Lyr).
3. M57 sits exactly halfway between these two stars.
4. Through a finder, it's a faint 'star'. Center on it and switch to medium magnification.
5. Even small scopes (3"+) show the obvious smoke-ring shape — there's no mistaking it for a star.

Notes The Ring Nebula is the best beginner planetary nebula target. Use high magnification (150×+) for a more impressive view. An OIII filter dramatically improves contrast from light-polluted sites.

M27 — Dumbbell Nebula

Planetary Nebula · Vulpecula · mag 7.4

Start: Albireo (β Cyg, head of Cygnus) **Season:** Summer (Jun–Sep) **Difficulty:** Easy — bright, large



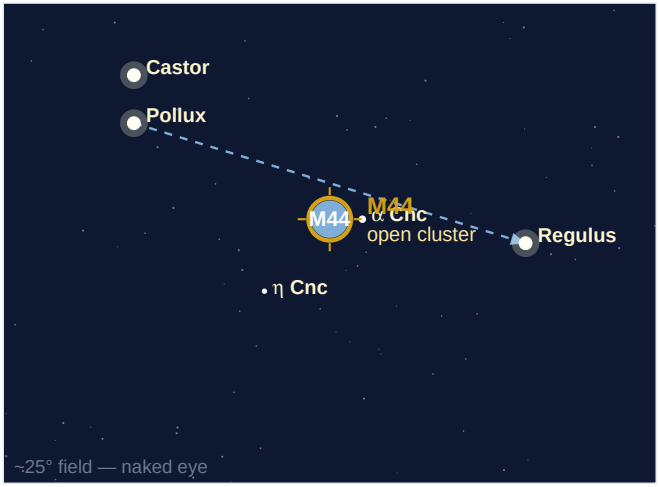
1. Find the small arrow-shape of Sagitta just north of Aquila — γ Sge, δ Sge, η Sge form a kite.
2. From η Sge (the point of the arrow), hop 3° north into Vulpecula.
3. M27 appears as a bright 'star' in any finder — much larger and brighter than most planetaries.
4. Through a 4" scope at 80-100×, the famous dumbbell shape (two bright lobes) is unmistakable.
5. Through an 8"+ scope with an OIII filter, fainter outer halo extensions become visible.

Notes M27 is the largest planetary nebula visible in the sky (about 8 arc-minutes) and one of the brightest. An excellent first planetary nebula target.

M44 — Beehive Cluster

Open Cluster · Cancer · mag 3.7

Start: Between Pollux (Gemini) and Regulus (Leo) **Season:** Winter / Spring (Feb–May) **Difficulty:** Trivial — naked-eye fuzz



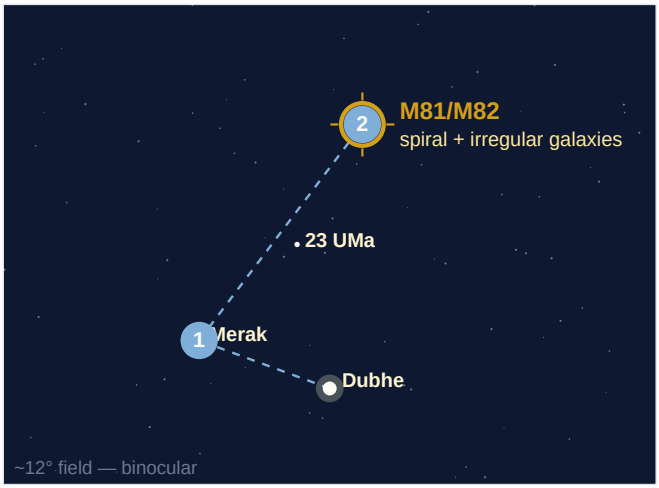
1. Find Pollux (the brighter twin in Gemini) and Regulus (the heart of Leo).
2. M44 sits roughly halfway between them, slightly north of the line.
3. From a Bortle 4 or darker site, M44 is naked-eye visible as a small fuzzy patch.
4. Binoculars resolve it into a swarm of dozens of stars in a beehive-like pattern.
5. Through a telescope at low power, the cluster fills the field. Don't use high magnification — it's too big.

Notes The Beehive is best in binoculars. Even modest 7×50s show 30+ stars; 10×50s show 50+. A wide-field eyepiece (32mm or longer) is needed to fit the whole cluster in a telescope view.

M81 & M82 — Bode's and Cigar

Galaxy Pair · Ursa Major · mag 6.9 / 8.4

Start: Big Dipper bowl (Dubhe, Merak) **Season:** Spring (Mar–Jun, circumpolar) **Difficulty:** Easy — bright, well-known



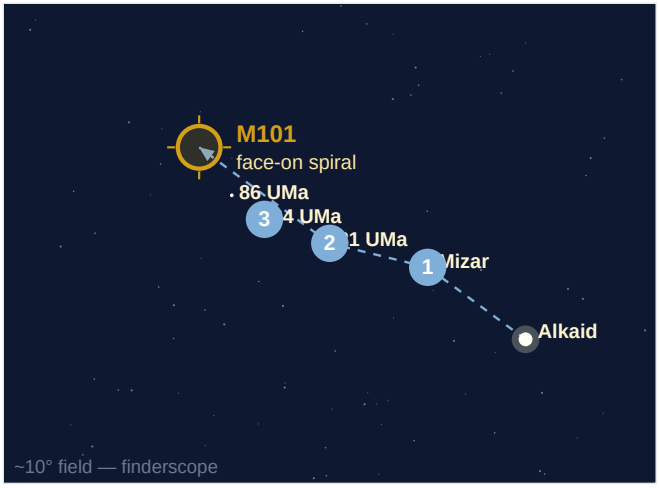
1. Find Dubhe and Merak — the two stars forming the front of the Big Dipper's bowl.
2. Draw an imaginary line from Merak through Dubhe and continue the same distance again.
3. You'll land in the area of M81 and M82 — about 10° from Dubhe.
4. Binoculars show both galaxies in the same field as small fuzzy 'stars'.
5. Through a 4" telescope, M81 is a bright oval; M82 is an elongated 'cigar' just north. Pair them in a single field at low power.

Notes M81 and M82 are circumpolar from latitudes 40°N and higher — visible year-round. M82 is one of the most famous starburst galaxies, with central activity visible in Hα.

M101 — Pinwheel Galaxy

Spiral Galaxy · Ursa Major · mag 7.9

Start: Big Dipper handle (Alkaid, Mizar) **Season:** Spring / Summer (Mar–Aug) **Difficulty:** Challenging — low surface brightness



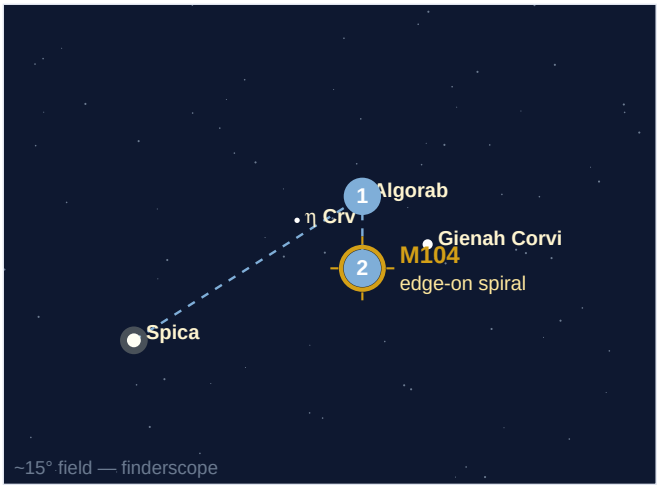
1. Find Mizar (the bend in the Big Dipper's handle).
2. From Mizar, hop east-northeast through 81 UMa.
3. Continue to 84 UMa, then 86 UMa — both naked-eye in dark skies, easily seen in any finder.
4. M101 sits just past 86 UMa. It's faint visually but obvious in long-exposure imaging.
5. From a Bortle 4 site through an 8" scope, the spiral arms hint visible with averted vision.

Notes M101 is large (28' wide) but has very low surface brightness — it's deceptively hard to see despite the bright integrated magnitude. Dark skies essential. Among the most photogenic galaxies for imaging.

M104 — Sombrero Galaxy

Spiral Galaxy · Virgo · mag 8.0

Start: Spica (brightest Virgo star) **Season:** Spring (Mar–Jun) **Difficulty:** Moderate — small but bright



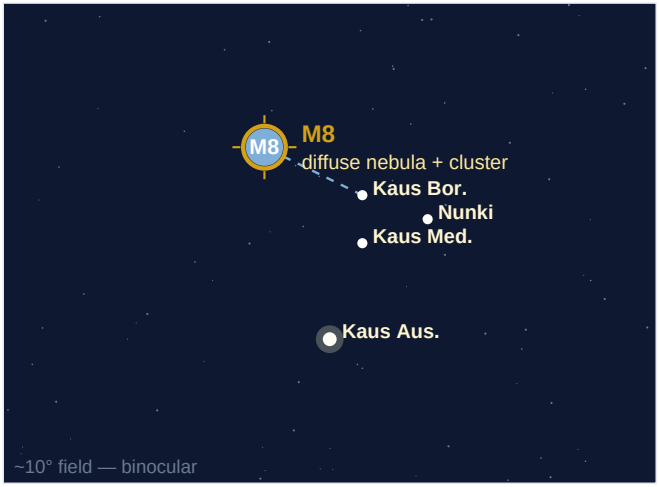
1. Find Spica (bright blue-white star). About 15° to the west you'll find the box of Corvus.
2. Algorab (δ Crv) is the NW corner of Corvus's box.
3. M104 lies just 5° NE of Algorab.
4. Through a 4" scope, M104 appears as a bright elongated oval with a hint of darkness in the middle.
5. Through an 8"+ scope, the dramatic dust lane bisecting the bulge becomes visible — the source of the 'sombrero hat' nickname.

Notes The Sombrero is among the most distinctive galaxies in the sky — its near-edge-on orientation and dramatic dust lane are unmistakable. One of the standout galaxy targets of spring.

M8 — Lagoon Nebula

Diffuse Nebula · Sagittarius · mag 6.0

Start: Sagittarius 'Teapot' asterism **Season:** Summer (Jun–Aug) **Difficulty:** Easy — visible naked-eye from dark sky



1. Find the 'Teapot' asterism in Sagittarius — south sky in summer.
2. Kaus Borealis (the top of the teapot) is your anchor.
3. From Kaus Borealis, hop ~5° northwest. M8 will be obvious — much brighter than the surrounding starfield.
4. Through binoculars, M8 looks like a small bright cloud with an embedded star cluster.
5. Through a 4"+ telescope, the dark dust lane bisecting the nebula (the 'Lagoon') becomes visible.

Notes M8 is the brightest diffuse nebula in the southern half of the sky and a centerpiece of summer observing. From Bortle 4 skies, M8 is naked-eye visible. Best paired with M20 (Trifid Nebula) just 1.5° to the north.

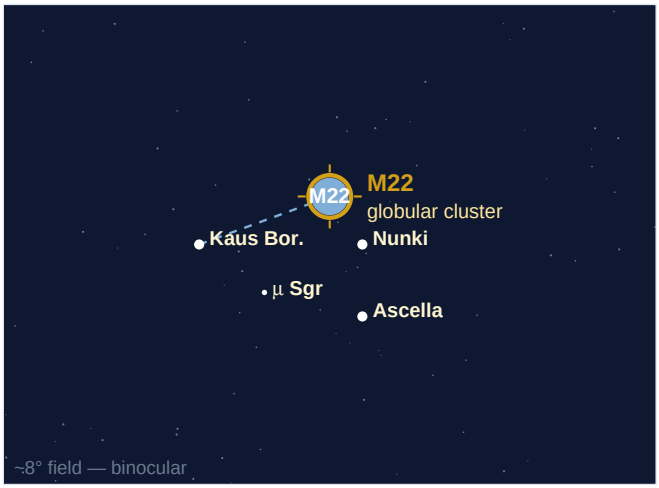
M22 — Sagittarius Cluster

Globular Cluster · Sgr · mag 5.1

Start: Lambda Sgr (Kaus Borealis)

Season: Summer (Jun–Aug)

Difficulty: Easy — among brightest globulars



1. Find Kaus Borealis (λ Sgr, top of Teapot).
2. M22 lies just 2.5° NE of Kaus Borealis.
3. Through binoculars, M22 is obviously fuzzy — much brighter than a star at the same position.
4. Through a 4"+ telescope, M22 begins to resolve into individual stars.
5. Through a 6"+ scope, the cluster fully resolves into hundreds of pinpoint stars.

Notes M22 is the brightest globular cluster visible to northern observers, often considered superior to M13 if you can get reasonable altitude. From Canadian latitudes it stays low (peaks around 20°), making seeing-quality variable.

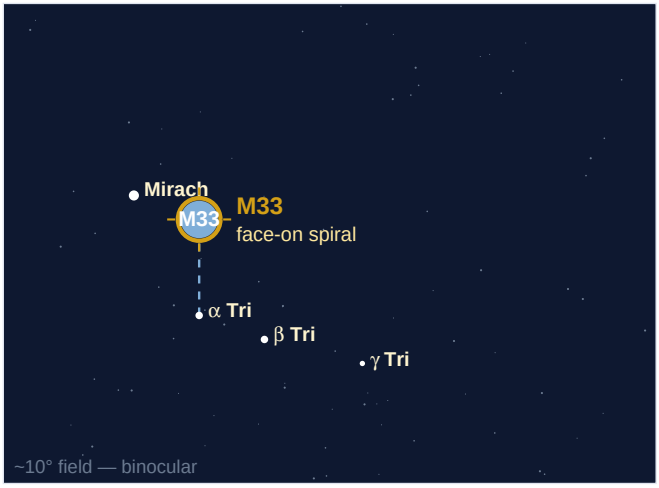
M33 — Triangulum Galaxy

Spiral Galaxy · Triangulum · mag 5.7

Start: Triangulum constellation

Season: Fall / Winter (Oct–Feb)

Difficulty: Moderate — dark sky required



1. Find the small triangle of Triangulum just east of the Andromeda constellation.
2. α Tri (mag 3.4) is the southernmost vertex of the triangle.
3. M33 lies 4° WSW of α Tri — toward Mirach in Andromeda.
4. From a Bortle 3-4 site with averted vision, M33 is naked-eye visible.
5. Binoculars show it as a large pale glow. Telescopes at low power show a face-on spiral — but the surface brightness is so low that high magnification dims it more.

Notes M33 is famously hard to see despite its bright integrated magnitude because of its extremely low surface brightness. Bortle 4 darker is essential. Spectacular when imaged with 300-500mm focal length and 2+ hour integration.

Double Cluster — NGC 869/884

Open Cluster Pair · Perseus · mag 4.3

Start: Cassiopeia 'W' or Mirfak (α Per) **Season:** Fall / Winter (Sep–Mar) **Difficulty:** Easy — naked-eye in dark skies

1. Find the 'W' (or 'M') of Cassiopeia high in the autumn northern sky.
2. Ruchbah (δ Cas, eastern bend of the W) is your anchor.
3. From Ruchbah, look toward Mirfak (α Per) — about 12° to the southeast.
4. The Double Cluster sits about halfway between, visible naked-eye in Bortle 5 skies as a faint patch.
5. Through binoculars or low-power eyepiece, two distinct rich star clusters sit side-by-side in the same field — one of the most rewarding visual targets in the entire sky.

Notes The Double Cluster (Caldwell 14) is one of the spectacular naked-eye treasures of the northern sky. Both NGC 869 and NGC 884 are visible together in any low-power eyepiece. Best appreciated visually — photographs don't capture the depth.

Star-hopping tips

Practical advice that makes hops succeed

Use a Telrad

A Telrad reflex finder ($45) projects a non-magnifying red bullseye onto the sky. It shows three concentric circles at 0.5°, 2°, and 4° — exactly the scales you need for star-hopping. Once you've used one, going back to a traditional optical finderscope feels primitive.

Recognize patterns, not individual stars

Don't try to memorize each waypoint star. Memorize the patterns they form — triangles, chains, parallelograms. The brain is far better at pattern recognition than star identification.

Print these charts and bring them outside

Reading them on a glowing phone screen ruins dark adaptation. Print on paper. A red flashlight illuminates them without affecting your eyes.

Practice in moonlight first

Bright moonlight kills deep-sky observing but is perfect for practicing star-hopping — most of the dimmer waypoint stars are visible enough to learn the routes, without the visual distraction of deep-sky targets.

Confirm orientation

Different telescopes flip the image differently — refractors with a diagonal flip left-right, Newtonians flip top-bottom, naked-eye/binoculars don't flip. Note which your scope does and orient the chart accordingly.

Slow down at each waypoint

Don't blast through the hop. At each intermediate star, verify you see the expected pattern in the surrounding starfield. A 30-second pause to confirm beats 5 minutes searching after a wrong turn.

If you can't find it, try a wider field

When you're 'lost,' switch to the lowest-power eyepiece you have — more sky in view, easier to relocate. Once oriented, return to the magnification you wanted.

> **The bigger picture**
>
> Star-hopping is a craft. The first ten hops are slow and frustrating; the hundredth is intuitive and satisfying. You'll find yourself looking at the sky and recognizing 'oh, the Pleiades are up, which means Aldebaran is over there, which means the Crab Nebula must be roughly...' — and you'll have located something specific from a vague memory. That kind of intuitive map of the sky is what differentiates an experienced amateur from a beginner with a GoTo scope. Worth developing.