ASTRIS ASTRONOMY CLUB

The Club Kit Guide

Real astronomy, built from things at home.

All 18 hands-on builds across the club's three-year cycle: what each one teaches, what to bring from home, what Astris supplies, and how each grade band takes it further.

A YEAR A
Earth, Moon and Sun
6 builds

B YEAR B
Planets and spaceflight
6 builds

C YEAR C
Stars and the Universe
6 builds

01 — HOW THE KITS WORK

Real science from everyday things

Each cycle year has six builds, one roughly every five weeks. Four go home with the member and two stay in class. Every build is the same activity for the whole club, but each grade band takes it to its own depth.

01
Home first

Every build starts with things most homes already have: boxes, bottles, old CDs, a phone torch.

02
Low cost by design

Market parts are simple and cheap. The most a year's kit costs per student is about Rs 262.

03
Safe by design

No sharp tools for young members, no chemicals, and never a direct look at the Sun.

WHAT ASTRIS SUPPLIES

Every part that is hard to find at home: lenses, printed cards, fasteners, balloons and the shared launcher. It comes in a labelled kit pouch for each build and is included in the club fee.

Rs 262	Rs 105	Rs 75
Year A kit	Year B kit	Year C kit

Approximate cost per student at bulk prices.

START SAVING AT HOME

- Empty 2-litre soda bottles
- Cereal and shoe boxes
- Old CDs or DVDs
- Toilet-paper rolls
- Paper cups and straws
- Aluminium foil
- Marbles and pebbles
- An old dupatta or bedsheet

Five safety rules for every build

- Never look at the Sun directly, or through any lens, binoculars or telescope.
- Solar viewing happens only with certified filters or by projection, under an educator.
- Cutting with blades is done by educators; members use scissors.
- Rocket launches and lander drops are run only by Astris educators.
- Food items used in builds are not eaten.

02 — YEAR A KIT

A Earth, Moon and Sun

Six builds that follow the Year A themes. 4 go home with every member; the rest are done together in class.

#	BUILD	FROM HOME	IN THE ASTRIS KIT	RS
01	**Planisphere star finder** Week 3 · Take home	Scissors, Glue stick	Star wheel printed on 300 gsm card, Split-pin fastener	**15**
02	**Moon-phase and eclipse model** Week 9 · In class	Desk lamp or torch, Pencil	Two polystyrene balls, Wooden skewers, Printed phase chart	**15**
03	**DIY refracting telescope** Week 12 · Take home	Cardboard poster tube or two chart-paper rolls, Tape	Objective lens (50 mm, f = 500 mm), Eyepiece lens (f = 25–50 mm), Two sliding cardboard tubes	**200**
04	**Pinhole solar projector** Week 17 · Take home	Long shoebox or cereal box, Aluminium foil, White paper, Tape and a pin	Printed template sheet	**2**
05	**Sundial** Week 19 · Take home	Compass app on a phone, Ruler and protractor	Printed sundial dial and gnomon on 300 gsm card	**10**
06	**Moon crater experiment** Week 28 · In class	Baking tray or old box lid, Marbles and pebbles of different sizes	Flour and cocoa powder (class supply), Ruler	**20**
Approximate Astris kit cost per student for Year A				**262**

EXPLORERS · 4–6
Build it, use it, describe what they see.

NAVIGATORS · 7–9
Change one thing, measure, and record the result.

ASTRONOMERS · 10–12
Apply the equation from their syllabus to the data.

01 Planisphere star finder

Year A · Week 3

TAKE HOME

≈ Rs 15 / student

A rotating star map that shows which stars are up at any date and time.

FROM HOME

- Scissors
- Glue stick

IN THE ASTRIS KIT

- Star wheel printed on 300 gsm card
- Split-pin fastener

HOW TO BUILD

1. Cut out the star disc and the holder
2. Join them at the Pole Star with the split pin
3. Turn the dial to today's date and the time
4. Hold it overhead and match the stars

EXPLORERS
Find Orion and the Big Dipper with the date-and-time dial.

NAVIGATORS
Predict when a constellation rises and sets tonight.

ASTRONOMERS
Show why the Pole Star sits about 28.6° up from Delhi: its altitude equals your latitude.

02 Moon-phase and eclipse model

Year A · Week 9

IN CLASS

≈ Rs 15 / student

A working Sun–Earth–Moon model that recreates every phase and both kinds of eclipse.

FROM HOME

- Desk lamp or torch
- Pencil

IN THE ASTRIS KIT

- Two polystyrene balls
- Wooden skewers
- Printed phase chart

HOW TO BUILD

1. Push the Moon ball onto a skewer
2. Stand in a dark room with the lamp as the Sun
3. Turn slowly and watch the lit half change
4. Line up lamp, head and ball for an eclipse

EXPLORERS
Act out the eight phases and name each one.

NAVIGATORS
Tilt the Moon's path 5° and see why eclipses are rare.

ASTRONOMERS
Explain total solar eclipses: the Sun is about 400 times wider and 400 times farther away.

03 DIY refracting telescope

Year A · Week 12

TAKE HOME
≈ Rs 200 / student

A real two-lens telescope that shows craters on the Moon.

FROM HOME

- Cardboard poster tube or two chart-paper rolls
- Tape

IN THE ASTRIS KIT

- Objective lens (50 mm, f = 500 mm)
- Eyepiece lens (f = 25–50 mm)
- Two sliding cardboard tubes

HOW TO BUILD

1. Fix the big lens in the wide tube
2. Fix the small lens in the narrow tube
3. Slide to focus on a far tree
4. Rest it on a wall and find the Moon

EXPLORERS
Spot craters and dark 'seas' on the Moon.

NAVIGATORS
Work out magnification: 500 mm ÷ 50 mm = 10×.

ASTRONOMERS
Draw the ray diagram and explain why the image is upside down.

⚠ **Safety:** Never point any telescope at the Sun. It can blind you in an instant.

04 Pinhole solar projector

Year A · Week 17

TAKE HOME
≈ Rs 2 / student

A box that projects a safe image of the Sun, sunspots included.

FROM HOME

- Long shoebox or cereal box
- Aluminium foil
- White paper
- Tape and a pin

IN THE ASTRIS KIT

- Printed template sheet

HOW TO BUILD

1. Tape white paper inside one end
2. Cover a window at the other end with foil
3. Make one clean pinhole in the foil
4. Turn your back to the Sun; watch the screen

EXPLORERS
See the Sun's image safely, without looking at it.

NAVIGATORS
Measure how the image grows with a longer box.

ASTRONOMERS
Use similar triangles to calculate the Sun's diameter from its image.

⚠ **Safety:** Look only at the paper screen, never through the pinhole at the Sun.

05 Sundial

Year A · Week 19

TAKE HOME

≈ Rs 10 / student

A pocket sundial that tells time from the Sun's shadow.

FROM HOME

- Compass app on a phone
- Ruler and protractor

IN THE ASTRIS KIT

- Printed sundial dial and gnomon on 300 gsm card

HOW TO BUILD

1. Fold the gnomon and glue it on the dial
2. Set the gnomon's angle using the scale on the card
3. Point it north using the compass app
4. Read the time where the shadow falls

EXPLORERS
Tell the time by the shadow at three points in the day.

NAVIGATORS
Find out why a Delhi sundial runs about 20 minutes behind IST.

ASTRONOMERS
Set the gnomon to 28.6° and correct for the equation of time.

06 Moon crater experiment

Year A · Week 28

IN CLASS

≈ Rs 20 / student

A tray of 'Moon dust' that shows how craters and rays form.

FROM HOME

- Baking tray or old box lid
- Marbles and pebbles of different sizes

IN THE ASTRIS KIT

- Flour and cocoa powder (class supply)
- Ruler

HOW TO BUILD

1. Fill the tray with 3 cm of flour
2. Dust a thin layer of cocoa on top
3. Drop pebbles from different heights
4. Measure each crater and its rays

EXPLORERS
Make craters and spot their bright rays.

NAVIGATORS
Graph crater width against drop height.

ASTRONOMERS
Link impact energy (mgh) to crater size on a log scale.

03 — YEAR B KIT

B Planets and spaceflight

Six builds that follow the Year B themes. 4 go home with every member; the rest are done together in class.

#	BUILD	FROM HOME	IN THE ASTRIS KIT	RS
07	**Scale Solar System walk** Week 3 · Take home	A toilet-paper roll or long strip of paper, Markers	Planet scale cards and stickers	10
08	**Gravity-well orbit model** Week 9 · In class	Old dupatta or stretchy bedsheet, A bucket or hoop to stretch it over, A heavy ball, such as a cricket ball	Set of marbles (class supply)	10
09	**Pins-and-string orbit tracer** Week 12 · Take home	Cardboard sheet, Paper and a pencil	Two push pins, Loop of string	5
10	**Mars lander drop challenge** Week 17 · In class	Paper cups, straws and rubber bands, Cotton and newspaper, A raw egg, or a small tomato as the passenger	Balloon, Plastic parachute sheet	10
11	**Water rocket** Week 19 · Take home	Empty 2-litre soda bottle, Cardboard for fins, Tape	Rubber cork with valve adapter, Fin and nose-cone sheet, Club launcher (brought by Astris)	50
12	**Paper Mangalyaan model** Week 28 · Take home	Scissors, Glue	Printed die-cut model sheet	20
Approximate Astris kit cost per student for Year B				105

EXPLORERS · 4–6
Build it, use it, describe what they see.

NAVIGATORS · 7–9
Change one thing, measure, and record the result.

ASTRONOMERS · 10–12
Apply the equation from their syllabus to the data.

07 Scale Solar System walk

Year B · Week 3

TAKE HOME

≈ Rs 10 / student

A paper strip that turns the Solar System's distances into a walk.

FROM HOME

- A toilet-paper roll or long strip of paper
- Markers

IN THE ASTRIS KIT

- Planet scale cards and stickers

HOW TO BUILD

1. Mark the Sun at one end
2. Measure out each planet's scaled distance
3. Stick the planet card at each point
4. Walk the strip and feel the empty space

EXPLORERS
Place all eight planets in order along the strip.

NAVIGATORS
Calculate each distance at 1 m for every 150 million km.

ASTRONOMERS
Show why sizes and distances can't fit one scale, and add light-travel times.

08 Gravity-well orbit model

Year B · Week 9

IN CLASS

≈ Rs 10 / student

A stretched sheet that shows how gravity bends paths into orbits.

FROM HOME

- Old dupatta or stretchy bedsheet
- A bucket or hoop to stretch it over
- A heavy ball, such as a cricket ball

IN THE ASTRIS KIT

- Set of marbles (class supply)

HOW TO BUILD

1. Stretch the cloth tightly over the hoop
2. Place the heavy ball in the centre as the Sun
3. Roll marbles sideways around it
4. Watch which marbles orbit and which escape

EXPLORERS
Watch marbles circle the 'Sun' like planets.

NAVIGATORS
Show that marbles closer in move faster.

ASTRONOMERS
Connect orbital speed to distance, and explain the spiral with friction.

09 Pins-and-string orbit tracer

Year B · Week 12

TAKE HOME

≈ Rs 5 / student

Two pins and a loop of string that draw a true planetary orbit.

FROM HOME

- Cardboard sheet
- Paper and a pencil

IN THE ASTRIS KIT

- Two push pins
- Loop of string

HOW TO BUILD

1. Push two pins into the card a few centimetres apart
2. Loop the string around both pins
3. Pull the loop tight with a pencil
4. Trace all the way round

EXPLORERS
Draw a circle, then an ellipse, and compare them.

NAVIGATORS
Move the pins apart and see the orbit stretch.

ASTRONOMERS
Measure eccentricity and compare Mars (0.09) with Halley's Comet (0.97).

10 Mars lander drop challenge

Year B · Week 17

IN CLASS

≈ Rs 10 / student

Design a lander that keeps its 'astronaut' safe from a two-storey drop.

FROM HOME

- Paper cups, straws and rubber bands
- Cotton and newspaper
- A raw egg, or a small tomato as the passenger

IN THE ASTRIS KIT

- Balloon
- Plastic parachute sheet

HOW TO BUILD

1. Sketch a design with a shock absorber
2. Build it around the passenger
3. Drop it from a marked height
4. Check the passenger and improve the design

EXPLORERS
Build a lander and keep the passenger safe.

NAVIGATORS
Time the fall on a phone and compare parachute sizes.

ASTRONOMERS
Estimate impact speed and deceleration, and link them to Chandrayaan-3's landing legs.

⚠ **Safety:** Drops are done by the educator from a safe, fenced spot.

11 Water rocket

Year B · Week 19

TAKE HOME
≈ Rs 50 / student

A soda-bottle rocket that flies 30 metres or more on water and air.

FROM HOME
- Empty 2-litre soda bottle
- Cardboard for fins
- Tape

IN THE ASTRIS KIT
- Rubber cork with valve adapter
- Fin and nose-cone sheet
- Club launcher (brought by Astris)

HOW TO BUILD
1. Tape on three fins and a nose cone
2. Fill the bottle one-third with water
3. Fit the cork and place it on the launcher
4. Stand back while the educator launches

EXPLORERS
Build and launch a rocket, and cheer it up.

NAVIGATORS
Change the water level and measure the height reached.

ASTRONOMERS
Apply Newton's third law and momentum to explain the best water fill.

⚠ **Safety:** Only Astris educators pressurise and launch. Everyone stands at least 5 m back.

12 Paper Mangalyaan model

Year B · Week 28

TAKE HOME
≈ Rs 20 / student

A fold-up model of India's Mars Orbiter, with every part labelled.

FROM HOME
- Scissors
- Glue

IN THE ASTRIS KIT
- Printed die-cut model sheet

HOW TO BUILD
1. Cut out and fold the body
2. Attach the solar panel and dish antenna
3. Label each part
4. Display it with its mission card

EXPLORERS
Assemble the model and name each part.

NAVIGATORS
Explain why the panel faces the Sun and the dish faces Earth.

ASTRONOMERS
Estimate the panel's power from its area and sunlight at Mars.

04 — YEAR C KIT

C Stars and the Universe

Six builds that follow the Year C themes. 4 go home with every member; the rest are done together in class.

#	BUILD	FROM HOME	IN THE ASTRIS KIT	RS
13	**Constellation viewer** Week 3 · Take home	Toilet-roll tube, Phone torch, Pushpin	Set of 12 printed constellation cards	15
14	**CD spectroscope** Week 9 · Take home	Old CD or DVD, Cereal box, Black paper and tape	Diffraction grating slide, in case there is no CD	15
15	**Parallax rangefinder** Week 12 · Take home	Ruler, Pencil, Measuring tape	Printed angle-sight card	10
16	**Star life-cycle wheel** Week 17 · Take home	Scissors, Glue	Printed two-layer wheel, Split-pin fastener	12
17	**Expanding-universe balloon** Week 19 · In class	Nothing needed from home	Round balloon, Dot stickers, Measuring tape (class supply)	8
18	**Exoplanet transit detector** Week 28 · In class	Smartphone with a free light-meter app, Table lamp	Polystyrene planet balls, Skewers and modelling clay	15
Approximate Astris kit cost per student for Year C				75

EXPLORERS · 4–6
Build it, use it, describe what they see.

NAVIGATORS · 7–9
Change one thing, measure, and record the result.

ASTRONOMERS · 10–12
Apply the equation from their syllabus to the data.

13 Constellation viewer

Year C · Week 3

TAKE HOME
≈ Rs 15 / student

A tube that projects constellations onto a wall or ceiling.

FROM HOME
- Toilet-roll tube
- Phone torch
- Pushpin

IN THE ASTRIS KIT
- Set of 12 printed constellation cards

HOW TO BUILD
1. Pick a constellation card
2. Prick a hole at every star
3. Fix the card over the end of the tube
4. Shine the torch through in a dark room

EXPLORERS
Project and name constellations on the ceiling.

NAVIGATORS
Match each one to its Indian nakshatra and season.

ASTRONOMERS
Make bigger holes for brighter stars to model the magnitude scale.

14 CD spectroscope

Year C · Week 9

TAKE HOME
≈ Rs 15 / student

An old CD and a cereal box that split light into a rainbow spectrum.

FROM HOME
- Old CD or DVD
- Cereal box
- Black paper and tape

IN THE ASTRIS KIT
- Diffraction grating slide, in case there is no CD

HOW TO BUILD
1. Cut a thin slit in one end of the box
2. Fix the CD at an angle at the other end
3. Cut a viewing hole above the CD
4. Point the slit at a tube light

EXPLORERS
See the rainbow hidden inside white light.

NAVIGATORS
Compare LED, tube-light and street-lamp spectra.

ASTRONOMERS
Use line spectra as element fingerprints and the grating equation $d \sin\theta = n\lambda$.

⚠ **Safety:** Point it at lamps or a bright white wall, never at the Sun.

15 Parallax rangefinder

Year C · Week 12

TAKE HOME
≈ Rs 10 / student

A card sight that measures distance the way astronomers measure stars.

FROM HOME
- Ruler
- Pencil
- Measuring tape

IN THE ASTRIS KIT
- Printed angle-sight card

HOW TO BUILD
1. Try the thumb-jump test with one eye closed
2. Mark a baseline a few metres long
3. Sight a far tree from each end
4. Read the angles and work out the distance

EXPLORERS
See your thumb 'jump' and explain why.

NAVIGATORS
Measure the distance to a tree using a baseline.

ASTRONOMERS
Use distance = baseline ÷ tan(p) and link it to the parsec.

16 Star life-cycle wheel

Year C · Week 17

TAKE HOME
≈ Rs 12 / student

A two-layer wheel that follows a star from birth to its end.

FROM HOME
- Scissors
- Glue

IN THE ASTRIS KIT
- Printed two-layer wheel
- Split-pin fastener

HOW TO BUILD
1. Cut out both wheel layers
2. Join them with the split pin
3. Turn the wheel stage by stage
4. Read the facts at each window

EXPLORERS
Follow a star like the Sun from nebula to white dwarf.

NAVIGATORS
Compare the paths of low-mass and high-mass stars.

ASTRONOMERS
Place each stage on the HR diagram and name the fusion step.

17 Expanding-universe balloon

Year C · Week 19

IN CLASS
≈ Rs 8 / student

A balloon covered in 'galaxies' that shows the Universe stretching.

FROM HOME

- Nothing needed from home

IN THE ASTRIS KIT

- Round balloon
- Dot stickers
- Measuring tape (class supply)

HOW TO BUILD

1. Half-inflate the balloon and add dot stickers
2. Measure the gaps between dots
3. Inflate it fully
4. Measure the gaps again

EXPLORERS
Watch every dot move away from every other.

NAVIGATORS
Show that no dot is the centre.

ASTRONOMERS
Show that farther dots separate faster, as in Hubble's law, $v = H_o d$.

18 Exoplanet transit detector

Year C · Week 28

IN CLASS
≈ Rs 15 / student

A lamp, a ball and a phone light-meter that find a 'planet' the way NASA does.

FROM HOME

- Smartphone with a free light-meter app
- Table lamp

IN THE ASTRIS KIT

- Polystyrene planet balls
- Skewers and modelling clay

HOW TO BUILD

1. Place the phone's sensor facing the lamp
2. Move a planet ball slowly across the lamp
3. Record the light reading
4. Repeat with a bigger planet

EXPLORERS
See the light dip as the 'planet' passes.

NAVIGATORS
Show that a bigger planet makes a bigger dip.

ASTRONOMERS
Use dip = $(Rp/Rs)^2$ to estimate the planet's size.

05 — IN EVERY MEMBER'S BAG

Three things every member receives each year

Kit

Build pouches

One labelled pouch for each of the year's six builds, handed out in the session it is needed.

Textbook

A simple guide

One short, picture-led page per theme, written for the member's own grade band and cycle year.

Logbook

Their own record

Observation sheets, build records and the level checklist, kept all year and shown at the showcase.

Astris Space

Want to see a build in action?

We bring a live demonstration to every school assembly before the club starts: a telescope, a spectroscope and a water-rocket launch.

PHONE AND WHATSAPP
+91 7581821834

EMAIL
astriseducation@gmail.com

WEBSITE
astriseducation.in