

Knot Tying — Workbook

This workbook gives you the hands-on practice structure, field reference tools, and planning frameworks to move from watching knot tutorials to tying reliably from memory in the field. Work through each section alongside the corresponding course module, completing the exercises before the next lesson rather than after — muscle memory builds faster when repetition is spaced across days. Bring this workbook on your first camping or climbing trip to use the templates in real conditions.

The Mechanics of Knots — How and Why They Hold

Apply the physics framework from Module 1 to analyse real ropes, calculate safe working loads, and build a personal inspection baseline.

Exercise: Load Direction Analysis — Trace the Force Path

Select three rigging scenarios from the list below (or use real scenarios from your own planned trip). For each, sketch the anchor, the rope path, and the load vector. Label the standing part, working end, and tail. Identify which knot family is correct and explain why, citing the load-direction principle from Lesson 1.

- Scenario A: suspend a 12 kg pack 4 m off the ground vertically from a tree branch — what is the load direction at the anchor knot? What load direction at the bag attachment?
- Scenario B: secure a canoe crosswise on a roof rack — how many load directions does the rope experience during highway driving? Which knot must handle multi-directional load?
- Scenario C: rig a tarp ridge line between two trees 5 m apart in a location where wind gusts to 60 km/h overnight — what additional force does wind add to the static tarp weight, and how does that change your safety factor calculation?
- For one of your scenarios, calculate the effective safe working load using a real rope specification (check the label on your rope for breaking strength in kN) and the appropriate knot efficiency and safety factor.

Worksheet: Rope Inventory and Safety Factor Calculator

Complete one row for each rope you own or plan to purchase. Use the knot efficiency and safety factor figures from Lesson 3. Leave the SWL columns blank until you have filled in BS, knot efficiency, and safety factor — then calculate SWL by hand.

Rope ID / label

Material (nylon / polyester / UHMWPE / other)

Construction (kernmantle static / kernmantle dynamic / laid)

Diameter (mm)

Length (m)

Rated breaking strength (kN) — from label or manufacturer spec sheet

Intended primary knot

Knot efficiency for that knot (%)

Planned application (camping / climbing / rigging / other)

Required safety factor for that application

Effective safe working load (kN) — calculate yourself

First-use date

Retirement date (first-use + recommended service life)

Checklist: Pre-Trip Rope Readiness Checklist

- Visual inspection completed — no sheath cuts, glazing, or bleaching
- Tactile inspection completed — no soft spots or hard flat spots felt
- Flex test on any suspicious sections — no crackle or uneven bend
- First-use date marked and retirement date checked
- Rope has been washed and dried since last muddy or wet use
- Rope stored away from petroleum products and UV for the off-season
- Diameter and material confirmed appropriate for planned application
- Safe working load calculated and confirmed above planned load with correct safety factor
- Backup rope or redundant anchor system packed for life-safety applications

The Five Essential Knots — Technique and Muscle Memory

Build reliable muscle memory for all five knots through timed repetition logging, partner feedback, and failure-mode identification drills.

Exercise: Timed Repetition Log — 10-Day Practice Program

Each day, tie all five knots (bowline, figure-8 loop, clove hitch, sheet bend, trucker's hitch) five times each. Record your time and note any step where you hesitated or made an error. Aim to reduce hesitation time by 20% per five-session block. After session 10, tie each knot blindfolded (or with eyes closed) five times — this is the true test of muscle memory.

- On Day 1, describe in your own words — without looking at the instructions — the hand sequence for the bowline from memory. Then check your description against the course notes. What step did you miss or mis-sequence?
 - On Day 3, have a partner or record a video of yourself tying the figure-8 loop and critique the dressing step: are all strands parallel and un-crossed before you seat the knot?
 - On Day 7, tie the trucker's hitch to tension a cord between two chairs 2 m apart. Measure the cord deflection at the midpoint before and after tensioning. Is the result under 5 cm at 2 m span?
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- On Day 10, write a one-paragraph coaching note you would give to a beginner who has the most common error you personally made during this practice block.

Worksheet: Knot Practice Session Log

Fill in one row per knot per practice session. Track your time, error type (if any), and self-assessed confidence. Use the notes column to write the specific step you are drilling next session.

Date

Knot name

Session number (1–10)

Time to tie (seconds)

Dressing correct? (Y/N)

Seating correct? (Y/N)

Error type (slip / capsize / geometry / dressing / other)

Error at which step

Confidence level (1 = still need notes / 3 = from memory / 5 = blindfolded)

Focus for next session

Checklist: Five-Knot Competency Sign-Off Checklist

- Bowline: tied correctly from memory in under 30 seconds, 10 consecutive times
- Bowline: untied cleanly after loading with 20 kg for 10 minutes
- Figure-8 loop (bight method): tied correctly in under 30 seconds, 10 consecutive times
- Figure-8 loop (retrace method): traced correctly through a harness tie-in or ring, 5 consecutive times
- Clove hitch: tied on a post and on a biner, correctly, in under 20 seconds each
- Clove hitch: backed up with a half-hitch on tail and confirmed it does not slip under lateral tug
- Sheet bend: joined two ropes of different diameter (both thin-to-thick and thick-to-thin attempted)
- Sheet bend: both tails confirmed exiting the same side of the knot
- Trucker's hitch: tensioned a cord between two anchor points and locked off with two half-hitches
- All five knots tied successfully with light gloves on

Knot Selection — Matching the Knot to the Job

Build and test your personal knot selection decision framework through scenario analysis, material adaptation drills, and cold-weather practice planning.

Exercise: Knot Selection Decision Drills

For each scenario below, write down: (1) the knot you would choose, (2) the reason based on load type, material, and release requirement, and (3) any backup knot or redundancy you would add. Compare your answers with the selection framework in Module 3.

• You need to hang a rain tarp over your tent in heavy rain using 8 mm nylon cord between two trees 4 m apart. You will need to adjust the ridge line tension twice during the night as the rain changes the tarp sag. Which knot for the ridge line? Which for the anchor? Why?

• You are joining a 9 mm polyester rope to an 11 mm nylon rope to extend your bear hang system — you do not have a spare carabiner. Which joining knot do you use and which rope forms the bight? What tail length do you leave?

• You are setting up a top-rope anchor in December. Temperature is -8°C. You have 5 mm thick mountaineering gloves. You need to tie two anchor loops and clip them to a master point. Which loop knot do you choose and why? What specific modification do you make for the cold conditions?

• Your climbing partner has dropped a 30 m static rope and you need to retrieve it by extending your 25 m dynamic rope. The combined line will bear body weight for rappel. Which joining knot is safe for this application? Which is specifically unsafe and why?

Worksheet: Personal Knot Selection Reference Card

Complete this table to create your laminated field reference card. One row per knot. Fill in each column based on what you have learned and practised. Leave the Last Tested column blank to fill in from your practice log.

Knot name

Primary purpose (loop / hitch / bend / tensioning system)

Load types it handles (static / dynamic / shock)

Material limitations (e.g. not for UHMWPE, not for webbing)

Release difficulty after load (easy / moderate / hard / jam-risk)

Minimum tail length (mm)

Knot efficiency (% of rope BS)

Common failure mode to watch for

Glove-compatible? (Y / partial / N)

Situations where I personally use this knot

Last tested (date from practice log)

Checklist: Field Scenario Planning Checklist

- Load type identified (static / dynamic / shock) before choosing any knot for the trip
- Load direction mapped for each anchor point before tying
- Material of every rope confirmed and matched to knot list
- Release requirement assessed — any knot that must release after loading has been practised under that load in training
- Cold-weather or glove constraints planned for and practised with actual gloves
- Personal knot selection card printed, laminated, and packed
- Redundancy added to every life-safety application
- SERENE-A criteria checked for any anchor built on a climbing trip

Rope Care, Inspection, and Field Applications

Formalise your inspection protocol, document your rope inventory maintenance schedule, and plan your first complete real-world rigging scenario using all five knots.

Exercise: Rope Inspection Lab — Identify and Document Damage

Perform a full hand-over-hand inspection of every rope you own using the protocol from Lesson 10. For each rope, complete the inspection record below. If you find any damage indicator, photograph it and note the location in metres from one end.

- After completing your inspection, rank your ropes from best to worst condition. Which rope, if any, should be retired from life-safety use immediately? Which should be monitored?

- Pick the rope in best condition. How many years of service life remain based on the first-use date and UIAA retirement criteria? How many pitches or load cycles does that represent at your expected use rate?

- Describe a rope storage system you could implement at home using the storage requirements from Lesson 11 — specify the container, location, and any changes needed to your current storage.

- Write the inspection protocol as a three-sentence verbal checklist you could recite to a beginner before they start their own inspection.

Worksheet: Rope Maintenance and Inspection Log

Record every inspection, wash, and condition change for each rope. One row per inspection event. This log is your documentation that you applied reasonable care — important for any equipment used in a supervised or guided context.

Rope ID / label

Date of inspection

Inspector (self / partner)

Visual result (pass / advisory / fail)

Tactile result (pass / advisory / fail)

Flex test result (pass / fail / not performed)

Damage found (location in metres from end, description)

Action taken (continue use / monitor / downgrade / retire)

Washed this session? (Y/N)

Storage condition after inspection

Next inspection due (date)

Checklist: First Real-World Rigging Trip Planning Checklist

- Trip scenario chosen and written down (tarp camp / bear hang / top-rope anchor / canoe lash / other)
- All five knots rehearsed at home in the exact configuration planned for the trip
- Rope lengths calculated for each rigging task (minimum 4x span for trucker's hitch)
- Rope materials confirmed appropriate for planned knots
- Inspection completed on all ropes to be used — pass confirmed
- Redundant anchor backup planned for any life-safety application
- Knot selection card packed
- Gloves or cold-weather gear considered and knots rehearsed with them if applicable
- After the trip: fill in Knot Practice Log with real-world performance notes
- After the trip: identify one knot or scenario to improve before the next outing

Exercise: Post-Trip Debrief — What Worked and What Did Not

Complete this reflection within 48 hours of returning from your first real-world rigging trip while the experience is fresh. Be specific — vague reflections do not build skill.

- Which of the five knots did you tie most confidently in the field? Which took the most time or required a reference? What made the difference?

- Describe one situation where you had to choose between two knots or adapt a knot for a material or anchor that was not ideal. What did you choose and what would you do differently?

- Were there any knots that you tied incorrectly in the field that you had tied correctly in practice? What changed in the field — cold, fatigue, time pressure, unfamiliar rope?

- Name one specific skill (a knot, an inspection step, a selection decision) you will deliberately practise before your next trip, and describe exactly how you will practise it.

Your Action Plan

1. Buy or locate a 10 m length of 8–9 mm polyester or nylon rope for dedicated daily knot practice — cut it from a longer length if needed; it costs under \$10.
2. Complete Sessions 1–3 of the Timed Repetition Log in the first week, focusing only on the bowline and figure-8 until both are under 30 seconds from memory.
3. Fill in the Rope Inventory and Safety Factor Calculator for every rope you own before your next outdoor trip.
4. Perform a full hand-over-hand inspection on each rope using the Lesson 10 protocol and record results in the Rope Maintenance and Inspection Log.
5. Complete the Knot Selection Reference Card table and have it printed and laminated as your

field pocket guide.

6. Practise the trucker's hitch between two chairs or trees in your yard until you can tension a 2 m span to under 5 cm deflection consistently.
7. Add a cold-weather practice session by putting on your actual winter gloves and tying all five knots — note which knots need modification and update your selection card.
8. Plan a one-night camping or day-hike trip specifically to use all five knots in real rigging scenarios (tarp, bear hang, lashing).
9. After the trip, complete the Post-Trip Debrief worksheet within 48 hours and identify your weakest knot for the next practice block.
10. Revisit the Rope Inspection Log and check retirement dates; schedule a reminder six months before each rope's retirement date so you can plan a replacement.

