

## Tutorials for Mountaineer's Basic Experience Climbs

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These annotated tutorials are designed to promote field instruction in key mountaineering skills. Climb leaders and rope leaders are encouraged to use them, adding their own knowledge to reinforce the skills.

If you have comments about these tutorials or would like to offer additional information for them, please contact Don Schaechtel (e-mail: [don.safety@att.net](mailto:don.safety@att.net)).

## **Tutorial: Ascending Steep Hard Snow**

### **A. Preparation**

1. Put ski poles away  
*Ski poles are not adequate for self-belay or self-arrest.*
2. Get out ice ax  
*The ice ax won't do any good if it is attached to your pack.*
  - Uncover pick and adze  
*Some students may still have a taped adze from their field trips; it should be uncovered in case the adze is needed for chopping a step. Protectors should be off both the pick and adze.*
  - Attach leash to wrist  
*The leash will keep the ice ax from sliding down a slope if you lose your grip on it.*
3. Put on gloves to protect hands from abrasion on snow  
*If you slip, abrasive snow will cut exposed knuckles, which may make you lose your grip on the ice ax.*
4. Put on crampons before they are needed on steep terrain  
*It is a lot easier to put on crampons on a flat rock than it is on a steep slope.*
  - Assure proper fit and secure attachment  
*Crampons should fit snugly without straps.*

### **B. Footwork with and without crampons**

1. Kick steps if possible  
*Steps are the most secure means of ascending snow, and can be kicked with or without crampons.*
2. Look for natural footholds in snow  
*In harder snow, sun-cups and rocks will make natural footholds.*
3. Chop steps and handholds if necessary  
*Chopping steps is useful for short sections of hard snow. Chop from heel to toe.*

### **C. Footwork when flat-footing with crampons**

1. Keep all points in contact with snow  
*This may not feel natural at first, but is an essential flat-footing technique. Note: students may have no experience in hard snow.*
2. Stay in balance – don't lean in  
*This positions the body so it is easier to keep the feet flat on the snow.*
3. Let ankles flex  
*Flexing the ankles helps keep all crampon points on the snow.*
4. Exaggerate knee bend  
*Bending the knees helps you stay balanced on steep terrain with ankles flexed.*

### **D. Ice ax technique**

1. Self-belay  
*This is the critical safeguard when ascending snow. The cane and stake positions, with the spike well-driven into the snow, are the most secure.*
2. Transition ice ax technique as conditions change  
*These transitions should create secure self-belays as the slope increases or the snow hardens.*
  - Cane position  
*You may have to push several times to get good penetration. Use an existing ice ax hole if one is available.*
  - Stake position  
*Excellent on steep snow – very secure. Note: students only learn the cane and stake positions on field trips.*
  - Low dagger position  
*Excellent for steeper slopes – will hold body weight if feet slip.*
  - Anchor position  
*Useful for short and steep sections, such as at the top of a couloir.*

## **E. Self-arrest**

1. Arrest immediately – before speed increases  
*Note: In field trips, students allow themselves to build up speed before self-arresting. On hard snow you must self-arrest the instant you slip, otherwise speed may increase too fast to arrest.*
2. Keep crampon points off snow  
*This is contrary to self-arrest without crampons, but if a crampon point catches the snow it may flip you over or break your ankle.*

## Tutorial: Descending Steep Snow

### A. Plan the descent

1. Consider:
  - Snow conditions  
*Try to anticipate the snow and route conditions. In late spring and early summer the snow is usually good for plunge stepping. In mid-summer the snow may have soft and hard layers. By late summer, the snow may be so hard that plunge stepping is difficult.*
  - Slope, aspect, and time of day  
*Expect hard snow in the morning or on shadowed or north-facing slopes. Expect softer snow in the afternoon or on sunlit or south-facing slopes.*
  - Run-out  
*Use extra caution if rocks or cliffs are below or if you can't see what is below. Consider setting up a belay if the party desires one.*
  - Route  
*Traversing may avoid hazards or steep sections of a descent.*
2. Decide if crampons needed  
*Balance the security crampons will provide with the risk of snow balling up under them. Snow conditions will dictate this decision. Remember: never glissade while wearing crampons.*
3. Choose facing in or facing out  
*Facing in will provide greater security, but travel may be slower. Facing in is useful on short, steep sections, exposed areas with no run-out, and when visibility is poor. Facing out is faster, but the potential to lose control on steeper slopes is greater.*
4. Put on gloves  
*Protect your hands – this will help you hold onto the ice ax during a self-arrest.*

### B. Plunge stepping

1. Step aggressively  
*You have to kick into the slope to make a secure step in harder snow.*
2. Lean forward on slightly bent knees  
*If you lean back your feet may slip out from under you. Keeping a slightly bent knee improves balance and reduces the risk of knee injury if you should break through soft snow.*
3. Lead with the heel; toe up  
*Plunge the heel into the snow.*
4. Sense snow conditions and anticipate trouble  
*Feel for sub layers and anticipate your foot sliding out from under you if you hit a hard sub layer. Try to find better snow conditions to either side.*
5. Be prepared to self arrest  
*Some climbers hold the ice ax in a cross-body position so they can immediately self-arrest.*

### **C. Self-belay facing out**

1. Plunge step with well-bent knees  
*Move deliberately, bending the knees more as the slope gets steeper.*
2. Place ice ax low for self-belay  
*Plant the ice ax firmly and low so you can move past it while staying in balance. Note that if you slip and cannot self-belay, the ice ax shaft may end up pointing uphill, which will require reaching up to grab it for self arrest.*

### **D. Self-belay facing in**

1. Plant ice ax firmly  
*Drive in the spike for an effective self-belay. Sometimes this takes a couple of tries. If you slip, grab the shaft at the snow line with one hand while holding onto the head with the other. Most of the weight is applied at the snow line; the hand on the head prevents the ice ax from levering out by putting weight on the head and pushing down.*
  - Use existing holes to save energy  
*Each person can improve the holes by driving them deeper.*
  - Use stake position if possible  
*The stake position allows you to hold onto the ax with both hands. Alternatively, you can descend with one hand on the ax while the other hand grabs steps for handholds.*
  - Use pick if spike won't drive into the snow  
*This is useful on short, sections of hard snow, especially with crampons.*
2. Use existing steps for greater security  
*Each person should improve the steps as the party descends. More experienced climbers should descend first to build a good set of steps.*

### **E. Self-arrest**

1. Arrest immediately – before speed increases  
*On hard snow you must self-arrest the instant you slip, otherwise speed may increase too fast to arrest.*
2. Keep trying to arrest – don't give up  
*Attempts at self-arresting will slow you down, increasing your chances of self-arresting successfully.*
3. Keep crampon points off snow  
*If a crampon point catches the snow it may flip you over or break your ankle. This differs from self-arrest technique without crampons, where you want to dig your toes into the snow.*

## **Tutorial: Glissading**

### **A. Assess the slope**

1. Run-out  
*Adequate run-out is the first prerequisite for a safe glissade.*
2. Visible route  
*Make sure you can see the entire glissade path; an unseen portion could hide a moat or other hazard.*
3. Steepness and snow conditions  
*Everyone who is glissading should be comfortable with the slope, with consideration to how snow conditions will affect speed. Do not try to glissade steep, icy slopes.*
4. Snow stability  
*Plan an alternate route if avalanche potential is moderate to high.*
5. Rocks, moats, and other hazards  
*Consider how obstacles can be avoided. If they can't, don't try to glissade.*

### **B. Positioning yourself for a sitting glissade**

1. Dress properly
  - No crampons  
*You will likely break an ankle if you glissade with crampons.*
  - Gloves to protect your hands  
*Abrasive snow will cut exposed knuckles, which may cause you to lose your grip on your ice ax.*
  - Rain pants – pros and cons  
*Rain pants will keep you dry and will make your glissade faster. Sometimes you want to be faster and sometimes you don't.*
2. Hold the ice ax properly
  - Shaft to one side and parallel with the direction of travel
  - Spike trailing as a brake
  - Pick pointed away from your body  
*This position offers the best safety by providing a brake and pointing the pick away from your legs. Note that your arm holding the ice ax head is across your body, with the hand palm up.*
3. Leg positions
  - Knees bent with feet flat for most control
  - Knees straight for speed in soft conditions  
*Straightening the legs increases the surface area in contact with the snow for more buoyancy, which can lengthen a glissade on soft snow or a gentle slope.*

### **C. Controlling speed**

1. Put pressure on the spike to slow down  
*The harder you push on the spike the slower you will go. You shouldn't need any pressure if you are happy with your speed and you are not accelerating.*

2. Stop by braking with the spike, then dig in your heels  
*Get up carefully if you are carrying a heavy pack.*
3. Self arrest if you can't control speed with the spike
  - Roll away from the spike  
*If you roll toward the spike you could get flipped over, causing a tumble down the slope.*
4. To avoid obstacles, stop, move over, and continue your glissade  
*You don't have a lot of steering control with a sitting glissade. Plan your path before you start.*

## **Tutorial: Avalanche!**

### **A. Before the trip**

1. Know the weather/weather history  
*Be alert to weather patterns that may have created weak layers in the weather.*
2. Check the current weather forecast  
*Watch for storm forecasts and warming trends.*
3. Check the current avalanche forecast (if available)  
*Make alternate plans if the avalanche hazard is high.*
4. Consider the avalanche hazard before leaving home  
*Be ready to apply the historical information and forecast to your field assessment.*

### **B. Assessing snow stability**

1. Hazard is greatest on:
  - Wind-loaded slopes (especially leeward)
  - Convex slopes
  - 30-45° slopes
  - Open slopes, especially slide paths  
*Assess each factor. Dig a pit if necessary.*
2. Hazard increases in these weather conditions:
  - Storms  
*A high percentage of avalanches occur before, during, and after storms.*
  - Rain or snow greater than 1 inch per hour  
*New rain or snow can overload weak layers and cause them to slide.*
  - Wind greater than 15 mph  
*Wind can transport dry snow onto leeward slopes even in good weather.*
  - Increasing temperature  
*While melt-freeze cycles consolidate snow, rapid warming may allow melt water to lubricate a weak layer and cause a slide.*
3. Look and listen for signs of avalanches
  - Fresh avalanche debris or avalanche paths
  - Snow sluffs
  - Hollow sound when stepping on snow (whomp!)
  - Slides while you watch  
*Seeing an avalanche occur is the surest sign that the snow is unstable. In these cases it is time make other plans.*

### **C. Routefinding**

1. Ridges are safest  
*You want to travel out of the path of a potential avalanche.*
2. Traveling on windward slopes and in trees reduces risk  
*Trees provide an anchor for the snow. Rocks offer some anchoring. The windward side will generally have more stable snow than the leeward side.*

3. Avoid cornices  
*Fracture lines may develop well below a cornice.*
4. Move quickly across suspect terrain
  - Put on warmer clothes  
*Increase your chances of survival if you are caught in an avalanche.*
  - Travel up or down – do not traverse  
*Most people caught in avalanches trigger them; a traverse is the most likely way to release a slide.*
  - Move one at a time  
*If one person is caught in a slide the other party members can respond with a rescue.*
  - Post a lookout  
*Everyone should watch for the last position of anyone caught in an avalanche.*

#### **D. If you are caught in an avalanche**

1. Fight to stay on top – “swim”  
*Your chances of surviving are much greater if you stay on top of the snow.*
2. Grab trees or brush  
*You may be able to hold onto something and let the snow pass by you.*
3. Get a hand above the surface and a hand in front of your face  
*Anything above the surface will help rescuers find you. A speedy extraction is the key to survival. A hand in front of your face will aid breathing.*
4. Remain calm

## Tutorial: Quick Belays

### A. When should you use a quick belay?

*Quick belays may be needed before a party has roped up, such as on an approach scramble, or when traveling in coils. "Quick" implies that the belay is adequate for the job, but not as solid as a bombproof SRENE system. A quick belay is not a substitute for belaying a lead climber on rock.*

1. When requested by a party member  
*Quick belays make it easier to honor these requests. Belayers may only need to uncoil a portion of the rope to provide the belay.*
2. Short sections of steep snow or ice  
*Belays can be set up quickly since the anchors are constructed with the ice ax.*
3. Marginal snow bridges  
*A quick belay can add security for a rope team if a snow bridge is suspect.*

### B. Quick belays on rock

*Quick belays can be needed on mixed third and fourth-class terrain where fixed belays are not normally used. These points apply to belaying a follower from above. These techniques are not appropriate for belaying a leader, as the potential fall forces are too great.*

1. Tie into the rope (both belayer and climber)
  - Use harness or bowline around waist  
*If wearing a harness, tie in with a Figure-8 knot or clip a Figure-8 knot to the harness carabiner. Or use a bowline-on-a-bight around the waist unless a fall could leave you in a hanging position.*
2. Set up a quick anchor
  - Anchor to a rock, horn, or tree  
*You can use the rope itself to tie into natural protection, rather than using slings or webbing. Make sure vegetable belays are solid. A natural chockstone is also a suitable anchor.*
  - Set up a strong stance; braced against a rock or tree if possible  
*Sitting with feet braced against rock is a strong stance.*
3. Use a quick belay method with no slack  
*By keeping slack out of the rope, the climber will have tension immediately upon slipping; this may be enough tension to prevent a fall. It also requires less effort from the belayer when compared to absorbing the energy of a fall with built-up and momentum.*
  - Provide tension  
*Tension will aid the follower's confidence.*
  - Hip belay  
*Rope can be brought in quickly; set up with brake hand opposite anchor tie-in.*
  - Friction around a rock horn  
*Friction on a rock feature can hold a top-roped fall.*
4. Running belays may speed progress

- Rock protection is best
- Weaving around natural features may work  
*Running belays add some protection for simul-climbing on moderate terrain.*

### C. Quick belays on snow

*Quick belays on snow may have to be established by anyone on a rope, therefore these quick belays may be useful to leaders or followers. These belays can occur on steeper snow, when crossing moats and bergschrunds, or when crossing snow bridges.*

1. Tie into the rope (both belayer and climber)
  - Use harness or bowline around waist  
*If wearing a harness, tie in with a Figure-8 knot or clip a Figure-8 knot to the harness carabiner. Or use a bowline-on-a-bight around the waist unless a fall could leave you in a hanging position.*
2. Set up a quick anchor
  - Ice ax or picket  
*A half-length or shorter runner works best for a carabiner/ice ax belay. Drive pickets in all of the way; otherwise attach runner at snow level.*
  - Sit in a moat  
*Sitting with feet braced on the snow provides a strong stance.*
3. Use a quick belay method:
  - Boot/ax belay  
*Orient the stance for the direction of fall (a leader may slide below the belayer). Chop a step in harder snow.*
  - Carabiner/Ice Ax belay  
*This technique is more reliable than the boot/ax belay and almost as fast (have the carabiner and short runner set up in advance). This provides a dynamic belay when used with a hip belay.*
  - Hip belay  
*This is useful in a moat, where the belayer's center of gravity can remain low.*

### D. Consider simul-climbing moderate terrain

*Simul-climbing enables fast progress, but requires a good mutual understanding between rope team members. Since the technique is simple, a good tutorial discussion is "When is this appropriate and when is it not?"*

1. Running belays may speed progress
  - Use rock (best) or snow protection
  - Weaving around natural features may work  
*Running belays offer limited security, but they allow fast travel on moderate terrain.*
2. Fixed lines for big parties or short sections  
*A fixed line may save time since only one belay is needed to set it up. Followers connect to the fixed line with a Prusik knot and slide it along for security.*

## **Tutorial: Loose Rock**

### **A. Group travel**

1. Wear helmets  
*A helmet will protect your head from impact the of small rocks.*
2. Yell “Rock!” if a loose rock is dislodged  
*Take cover if you hear “Rock!” If no protection is available, point your pack uphill as protection.*
3. Avoid the fall line of others  
*Try not to travel directly above another person or directly below another person. You can spread out or wait until they move to a better position.*
4. Travel one at a time, others stay in a protected area  
*For areas that are short and loose, such as a rotten gully, party members can wait behind the safety of a buttress or other feature while members move one at a time. If a rock is dislodged, it can fall out of the way of the other climbers.*
5. Or, travel as a tight bunch  
*When traveling as a bunch, party members can trap dislodged rocks before they gain momentum downhill. They can also communicate about which rocks pose the most danger.*

### **B. Route finding**

1. When possible, avoid the loosest areas  
*In some gullies, one side may be relatively solid while the other is loose.*
2. Assess stability of rock in general area  
*Rock structure may offer clues to the hazard. Lots of loose rock in a gully suggests an immediate hazard. Loose holds suggest that party inflicted rockfall is possible.*
3. Avoid areas with natural stone fall  
*Especially in areas where snow is melting, be alert for spontaneous rockfall.*
4. Watch out for rock fall from other parties  
*On popular routes it may be advisable to wait for other parties to clear out before entering areas with loose rock.*

### **C. Step carefully**

1. Plan where you will step to avoid loose rocks  
*Climb with your eyes to avoid obvious and suspect rocks.*
2. Test rocks and holds that may be suspect  
*Before committing to a suspect hold, test it with light hand or foot pressure.*
3. Step onto suspect rocks with light pressure, applied into the slope rather than downslope  
*Friction holds loose rocks in place. If you don't apply more than the frictional force, the rock should stay in place.*
4. Avoid kicking rocks when lifting your feet  
*Exercise the same care when moving your feet as you do when placing them.*

#### **D. Use your hands**

1. Test handholds by thumping or pushing  
*Evaluate a hold before committing pressure to it.*
2. Pull gently on suspect holds – down-pressure may be effective  
*A marginal hold may work as long as you don't put much pressure on it. Don't pull hard on holds in loose areas.*
3. Carefully move loose rocks that come off in your hand  
*If you pull a rock off, try to find a secure place to put it.*

## **Tutorial: Using Personal Anchors**

### **A. Making a personal anchor**

1. Double runner or daisy chain  
*Using a double runner means no additional gear is needed; some climbers prefer a daisy chain for its versatility.*
2. Girth hitch to harness  
*Wrap the girth hitch through the same points on your harness as the climbing rope.*
3. Locking carabiner  
*A locking carabiner offers the most security.*
4. Wrap around waist or clip in middle while climbing  
*Connect the anchor so it does not restrict leg movement or hang up. As an alternative to wrapping a double runner around your waist, you can tie an overhand knot in the middle of it and clip the carabiner in the inner loop and then to your harness.*

### **B. At rappel stations**

1. Connect to anchor:
  - when you are waiting to rappel (if exposed)  
*Anyone positioned at an exposed area should be anchored, either to the rappel anchor or a separate anchor.*
  - while you are rigging your rappel set-up  
*The personal anchor allows you to concentrate on properly constructing your rappel set-up, when it is possible to lose your balance.*
2. Disconnect after rappel set-up is complete  
*Removing the personal anchor is the last step before beginning the rappel.*

### **C. At belay stations (optional)**

1. Connect to belay anchor if following (then you are “off belay”)  
*Using the personal anchor allows the climber to get off belay quickly, so the belayer can sort gear or break down the anchors while a new one is constructed. It allows the climber to be secure while figuring out the best way to connect the climbing rope to the anchor.*
2. Connect the climbing rope to the main anchor (Don’t belay off the personal anchor).  
*The climbing rope, attached the anchor with a figure 8 knot or clove hitch, is the most secure anchor for belaying.*

## **Tutorial: Crevasse Rescue**

### **A. Rope management on glaciers**

1. Keep rope extended (but not clothesline tight)  
*Too much slack and the victim will fall deeper into the crevasse; too little slack and the team may be pulled off balance and have trouble arresting the fall.*
2. Remain spread out at stops  
*Do not automatically bunch up at rest breaks unless it is obviously safe.*
3. Belay climbers across weak/suspect snow bridges  
*If a snow bridge looks suspect, especially later in the day, use a quick belay.*

### **B. Immediate action if someone falls in a crevasse**

1. Team arrest!  
*Survival depends on an efficient team arrest.*
2. Establish communication topside; alert other teams  
*Good communication is the key to ensuring that the rope and everyone attached to it are safely guarded at all times, especially during weight transfers. Alerting other rope teams promptly will get help on the scene by the time the anchors are set.*
3. Transfer weight to middle person  
*Once the weight is transferred you want to get the initial anchor installed as quickly as possible to get the middle person off of the snow. Take time, however, to use a Prusik self-belay on the rope.*
4. End person sets up initial anchor  
*Use a picket or ice ax. Back up the hero loop with a figure 8 knot in the rope*
5. Transfer weight to initial anchor; end person guards  
*Put your foot on top of the picket or ice ax.*
6. Middle person constructs main anchor  
*Take time to do it right the first time; measure to properly place the deadpan anchor.*

### **C. Approaching the crevasse**

1. Use Prusik for self-belay  
*Attach the hero loop to a personal anchor on your harness to ease mobility.*
2. Take equipment to crevasse lip
  - Pully
  - Hero loop
  - Ice ax and anchor for crevasse lip*Pool gear with other party members.*
3. Establish voice communication with fallen climber  
*The condition of the fallen climber may dictate how the rescue is performed.*

### **D. If you are in the crevasse**

1. Stay calm

- Remember that you have successfully gotten out of a crevasse in practice.*
2. Hang on to your ice ax  
*You may need your ice ax to get over the crevasse lip.*
  3. Clip everything into the rope  
*Anything dropped is lost forever; you will need your gear when you get out.*
  4. Remove pack and hang it from the rope  
*Connect your pack to the rope with a carabiner and single runner attached to the haul loop before removing the straps.*
  5. Pull hood over head; add clothes if possible  
*A crevasse is cold and often wet. Dress to stay warm in a cold rain and be ready to be hit with snow dislodged by the rescue.*

## **E. Carry out the rescue**

1. Engage the brain  
*Few crevasse rescue situations will proceed according to a textbook scenario. The rescue solution is an exercise in applied problem solving, which first requires everybody to use their heads to sort out the options.*
2. Implement a rescue method  
*A useful exercise is to have students lead a tutorial demonstration themselves. They can also rank rescue methods according to various criteria, such as simplicity, speed, ease of execution, hauling power, etc.*
  - Walk or climb out if possible  
*Sometimes a sunken snow bridge may allow you to walk out the end of the crevasse. This takes communication and coordinated rope management between the person in the crevasse and those topside.*
  - Prusik up rope once anchors are set  
*This is the easiest and quickest way out; and it will help you stay warm.*
  - Direct pull  
*This is the fastest way if you have four or more rescuers or if the victim is not in very far. Pull carefully when the victim is near the crevasse lip to prevent crushing him or her.*
  - “C” pulley  
*This requires a conscious victim but is fast and efficient. Mechanical advantage is 2:1. It may be used in combination with a “Z” pulley to get the victim over the crevasse lip.*
  - “Z” pulley  
*This gives you a 3:1 mechanical advantage and can be used with an injured victim.*