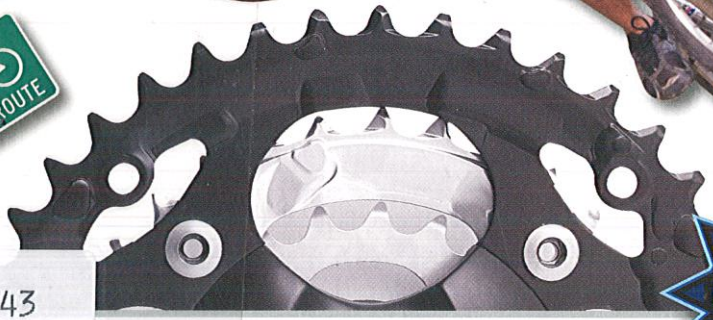
MERIT BADGE SERIES

CYCLING



BOY SCOUTS OF AMERICA®

STEM-Based

Requirements

1. Do the following:
   a. Explain to your counselor the most likely hazards you may encounter while participating in cycling activities and what you should do to anticipate, help prevent, mitigate, and respond to these hazards.
   b. Show that you know first aid for injuries or illnesses that could occur while cycling, including cuts, scratches, blisters, sunburn, heat exhaustion, heatstroke, hypothermia, frostbite, dehydration, insect stings, tick bites, and snakebite. Explain to your counselor why you should be able to identify the poisonous plants and poisonous animals that are found in your area.
   c. Explain the importance of wearing a properly sized and fitted helmet while cycling, and of wearing the right clothing for the weather. Know the BSA Bike Safety Guidelines.
2. Clean and adjust a bicycle. Prepare it for inspection using a bicycle safety checklist. Be sure the bicycle meets local laws.
3. Show your bicycle to your counselor for inspection. Point out the adjustments or repairs you have made. Do the following:
   a. Show all points that need regular lubrication.
   b. Show points that should be checked regularly to make sure the bicycle is safe to ride.
   c. Show how to adjust brakes, seat level and height, and steering tube.

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4. Describe how to brake safely with foot brakes and with hand brakes.
5. Show how to repair a flat by removing the tire, replacing or patching the tube, and remounting the tire.
6. Describe your state and local traffic laws for bicycles. Compare them with motor-vehicle laws.
7.* Using the BSA buddy system, complete all of the requirements for ONE of the following options: road biking OR mountain biking.

Option A: Road Biking

   a. Take a road test with your counselor and demonstrate the following:
      (1) Properly mount, pedal, and brake, including emergency stops.
      (2) On an urban street with light traffic, properly execute a left turn from the center of the street; also demonstrate an alternate left-turn technique used during periods of heavy traffic.
      (3) Properly execute a right turn.
      (4) Demonstrate appropriate actions at a right-turn-only lane when you are continuing straight.
      (5) Show proper curbside and road-edge riding. Show how to ride safely along a row of parked cars.
      (6) Cross railroad tracks properly.
   b. Avoiding main highways, take two rides of 10 miles each, two rides of 15 miles each, and two rides of 25 miles each. You must make a report of the rides taken. List dates for the routes traveled, and interesting things seen.
   c. After completing requirement b for the road biking option, do ONE of the following:
      (1) Lay out on a road map a 50-mile trip. Stay away from main highways. Using your map, make this ride in eight hours.

*The bicycle used for fulfilling these requirements must have all required safety features and must be registered as required by your local traffic laws.

(2) Participate in an organized bike tour of at least 50 miles. Make this ride in eight hours. Afterward, use the tour's cue sheet to make a map of the ride.

Option B: Mountain Biking

a. Take a trail ride with your counselor and demonstrate the following:

(1) Properly mount, pedal, and brake, including emergency stops.

(2) Show shifting skills as applicable to climbs and obstacles.

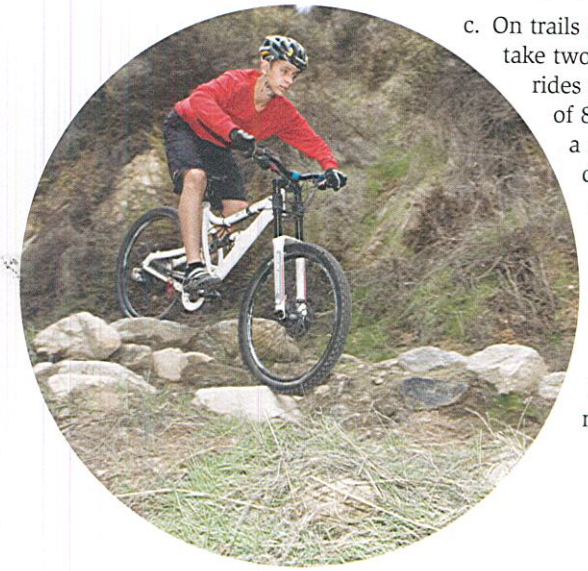
(3) Show proper trail etiquette to hikers and other cyclists, including when to yield the right-of-way.

(4) Show proper technique for riding up and down hills.

(5) Demonstrate how to correctly cross an obstacle by either going over the obstacle on your bike or dismounting your bike and crossing over or around the obstacle.

(6) Cross rocks, gravel, and roots properly.

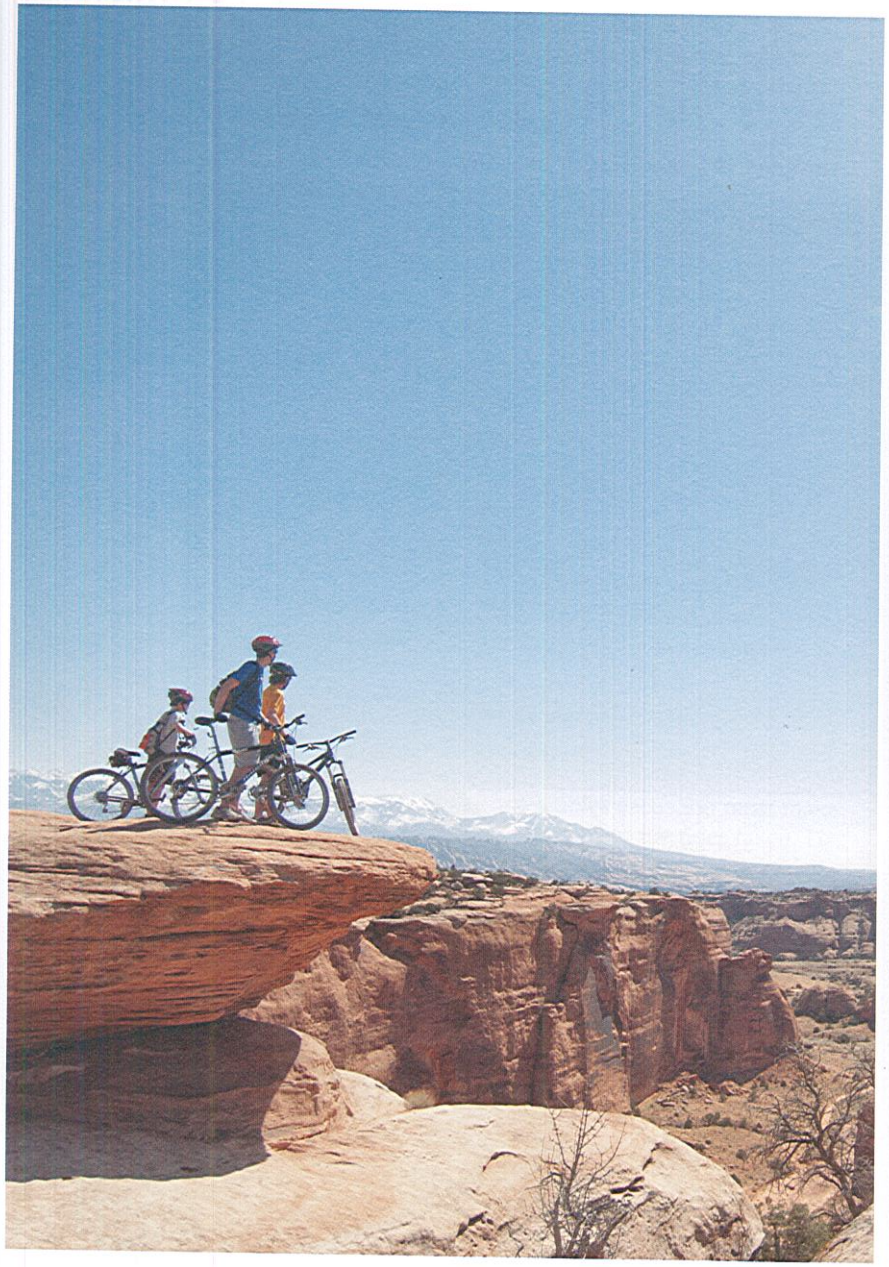
b. Describe the rules of trail riding, including how to know when a trail is unsuitable for riding.



c. On trails approved by your counselor, take two rides of 2 miles each, two rides of 5 miles each, and two rides of 8 miles each. You must make a report of the rides taken. List dates for the routes traveled, and interesting things seen.

d. After fulfilling the previous requirement, lay out on a trail map a 22-mile trip. You may include multiple trail systems, if needed. Stay away from main highways. Using your map, make this ride in six hours.

Contents



Introduction

A messenger weaves his way through a traffic jam in midtown Manhattan. A lawyer commutes to her office in Topeka, Kansas. A Scout zips down the street to hang out with a friend. All these people are united by the bicycle, an amazing invention that has been around for more than a century and is likely here to stay.

The bike is the most efficient human-powered vehicle ever invented. With the energy it takes to walk a few miles per hour, you can ride four or five times that fast. With a little more energy, you can travel 50, 75, or even 100 miles in a single day. How far and how fast you ride is really up to you. As long as you understand how to keep yourself safe and keep your bike in good condition, your bike can launch you on a lifetime of adventure on roads and trails in your neighborhood—and all over the world.

In these pages, you will learn the basics of bicycle types, repairs, maintenance, equipment, riding skills, safety, and touring and mountain biking—information you will need to fulfill the merit badge requirements.

So what are you waiting for? Grab your bike, put on your helmet, and let the adventure begin.

Types, Parts, and Fit

The basics of bicycle design haven't changed much since the first chain-driven models appeared around 1885. Most bikes today include the same main parts as those early models: a diamond **frame,** two **wheels,** a **chain** that connects the **pedals** to the rear wheel, **handlebars** that let the rider turn the front wheel, and a seat (also called a **saddle**).

However, the comparisons end there. Modern bikes use all sorts of innovations such as **front** and **rear derailleurs,** index shifting, and carbon-fiber components that make them lighter, faster, and easier to use. Modern bikes also come in a variety of styles, each designed for a different purpose.

The major classes of bicycles you will probably see are mountain bikes (MTB), road bikes, hybrid bikes, comfort bikes, and BMX bikes. Each class has its own strengths and weaknesses.

The diagrams in the appendix will help you identify the bike parts described (and set in bold) in this section.

Mountain Bicycles

Mountain bikes, or MTBs, are intended for use on trails and in the mountains. They are built for power and maneuverability. Among their features:

- Sturdy construction—a more compact frame than a road bike, high pedals for greater ground clearance, flat handlebars that make handling easier
- Versatile **gearing**—one to 30 widely ranging gears and rear and front derailleurs that allow for riding on many kinds of terrain
- Fat, knobby tires for greater traction on trails
- Hand **brakes** that allow quick, controlled braking

See the chapter on mountain biking for more information about these versatile bikes.

The features that make MTBs ideal for rugged ground also make them less suitable for longer trips on paved roads.

Most mountain bikes have suspension systems that offer a smoother and more efficient ride. Many even have hydraulic disc brakes.

Road Bicycles

Road bikes are built for paved surfaces, both for long-distance rides and racing. Among their features:

- Dropped handlebars that permit a choice of riding positions: higher for slow riding, hilly terrain, visibility in traffic, and comfortable posture; lower when speed, flat terrain, and reduced wind resistance are considerations.
- Narrow, high-pressure tires that are lightweight, can withstand damage, and reduce rolling resistance
- Front and rear derailleurs that produce 10 to 30 different gear combinations. The shifting controls are usually integrated into the handlebar brake levers.
- A smooth, narrow saddle that puts the cyclist's weight over the pedals, the best position for generating power and for long periods of riding

The road-bike class includes racing and time-trial bikes, which are built for speed, and track bikes, which are raced on tracks and have a single fixed gear and no brakes.

Road bikes are designed to reduce rolling resistance and wind resistance.

Hybrid Bicycles

Hybrid and commuter bikes combine features of road bikes and mountain bikes. They typically have the larger wheels and frame of a road bike and the upright riding position and straight handlebars of a mountain bike.

Comfort, Cruiser, and Utility Bicycles

Comfort and cruiser bicycles are intended for short trips on flat surfaces. Utility bicycles are typically used for running errands and feature baskets, racks, or panniers (saddlebags). Some have medium-width tires and a single speed, while others feature three to seven speeds with a rear derailleur. A few have front and rear derailleurs for 10 to 20 different speed combinations. The pedals are basic models with rubber or metal **treads,** and the handlebars usually are raised for comfort. These bikes may have **coaster brakes** or hand brakes.

BMX Bicycles

These durable bikes are made for trick riding—track and vert (or "vertical," in reference to the tops of stunt ramps) riding, jumping, flipping, spinning, and other stunts. The small frames are strong, stiff, lightweight, maneuverable, and built to absorb intense shocks. Some BMX (*bi*cycle *moto*cross) bikes have a rotor attached to the stem, which lets the rider spin the handlebars 360 degrees without tangling the brake **cables.** The wheels are small (20-inch), and the handlebars are slightly upright for greater maneuverability and stability.

BMX bikes, made for jumping and stunt riding, are small-wheeled and highly maneuverable.

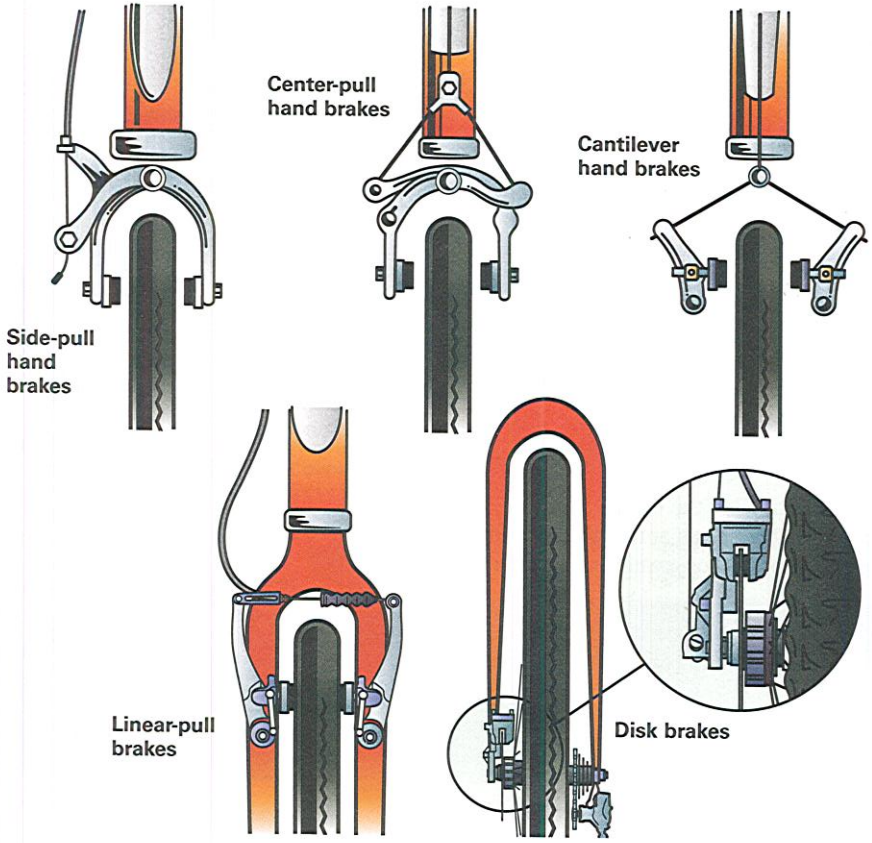
You may occasionally see a few other types of bikes. Tandem bikes carry two riders. Recumbent bikes place the rider in a reclined position with his legs pointing straight ahead rather than down. Folding bikes can be folded up and carried onto a bus or train.

Parts

Being familiar with and knowledgeable about how your bike is equipped makes maintaining it more manageable.

Brakes

Most bicycles have either coaster brakes or hand brakes (also called caliper or rim brakes). Coaster brakes are housed in the hub of the rear wheel; you apply them by pedaling backward. While the hub protects them from the weather, coaster brakes have several disadvantages. They take slightly longer to apply than hand brakes and affect only the rear wheel. Plus, you must have the pedals in position for pedaling backward to apply them.



Levers mounted on the handlebars control hand brakes. Normally, the brakes on the front wheel and the rear wheel are controlled by separate handlebar levers. Operating through flexible cables, these levers cause rubber **brake pads** to press against the **rims** of the wheels.

While hand brakes generally provide more effective braking than hub brakes, they require frequent adjustment. Cables must be checked often and occasionally replaced to prevent sudden snapping. Moisture and dirt on the wheel rims can greatly affect braking response.

When hand-brake levers are fully squeezed, there should be at least an inch of clearance between the levers and handlebars. If not, the brakes need to be tightened.

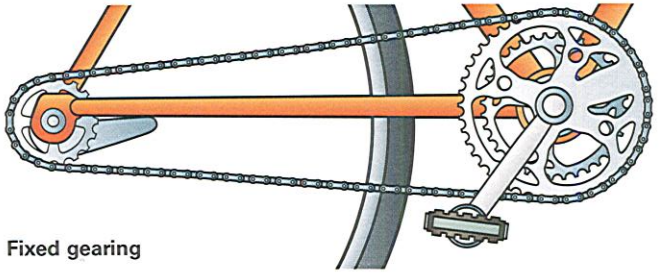
Higher-end mountain bikes are usually equipped with disc brakes. Disc brakes are popular because they are more dependable in wet or muddy conditions, provide braking modulation, and give the rider more stability on slippery surfaces. They are also relatively low maintenance, because the brake system is sealed. You can learn more about other types of braking systems by visiting a reputable bike shop.

Gearing

Gearing lets you adjust the bike's efficiency—that is, the effort required to move the gears—based on speed and terrain. When you shift to a low gear as you are climbing a big hill, the wheels won't move very far on each pedal stroke, but you also won't have to work very hard. When you shift to a high gear when you are moving quickly, each pedal stroke will move the wheel a greater distance.

There are three main types of gearing: fixed gearing, multispeed internal gearing, and derailleur gearing.

FIXED GEARING



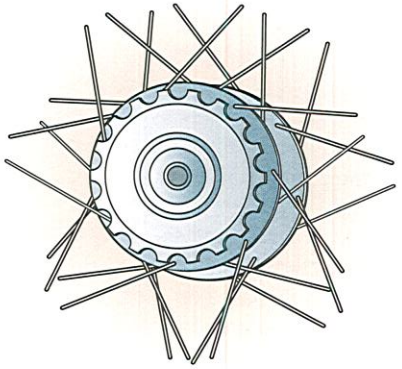
Fixed gearing

A fixed-gear bike has only one gear, which may be high, low, or in between. In this gearing system, the pedals always move with the wheel. Fixed gearing is mostly found on utility bikes and track bikes, although some elite riders actually prefer "fixies," as they are called, to multispeed bikes.

MULTISPEED INTERNAL GEARING

Multispeed internal gearing operates in the hub of the rear wheel and is connected by cable to a control lever on the handlebar.

Bikes with multispeed internal gearing usually have three or five speeds. The lowest-numbered gear is for pedaling uphill or against strong winds. The highest-numbered gear is for traveling at a higher speed downhill or with a tailwind. This system's benefits include weather resistance and easier cleaning and maintenance.



DERAILLEUR GEARING

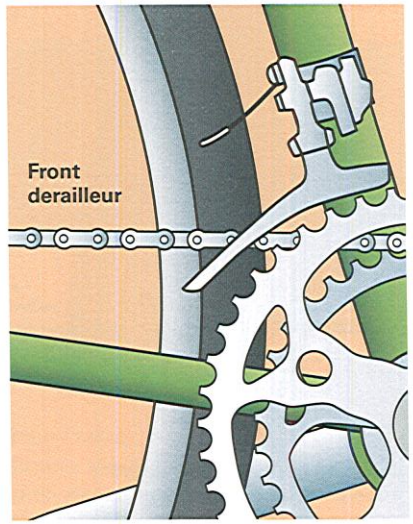
A derailleur is a device that moves the **chain** (literally derails it) from a sprocket or **chainring** of one size to a sprocket or chainring of another size, thus changing the bike's gearing. The chain passes through a guide, or cage, that moves it to the various sprockets or chainrings as needed. This cage is connected by a flexible cable to a control mechanism near the rider's hands. Some bikes have a derailleur on just the rear wheel, but most bikes have front and rear derailleurs.

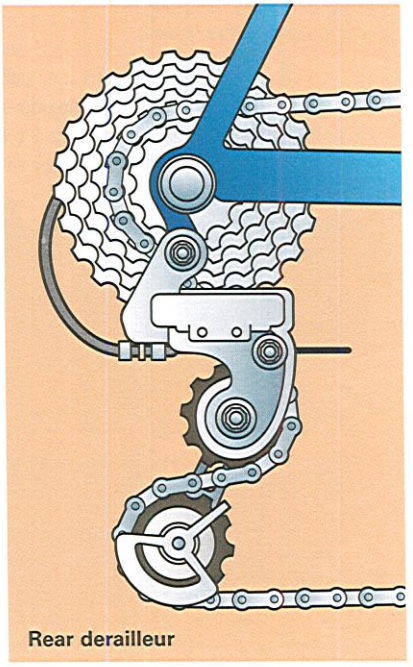
You can determine the number of possible gear combinations by multiplying the number of sprockets (cogs) on the rear cluster by the number of chainrings at the pedals. For example, a bike with seven rear cogs and three chainrings (front sprockets) has 21 gear combinations. Gearing available today ranges from five to 30 speeds.

Devices that control the derailleur come in a variety of styles. They can be:

- Ergonomic **shifters** that work in conjunction with brake levers
- Levers mounted on the down tube
- Levers mounted on dropped handlebars
- Thumb-shifters mounted on straight bars
- Twist-grip shifters that work through the **handlebar grips**

The shifters can work in two modes: indexed or friction. A "click stop" in the indexed system precisely controls the shifting of the derailleur. Each click of the shifter moves the derailleur one position. The friction-style shifter has an infinite range of movement. To shift gears, you move the lever until the gears change, then adjust the lever to fine-tune the mechanism so that the gears produce as little noise as possible. Front-derailleur shifters may be either friction or indexed, especially in integrated brand-brake systems.

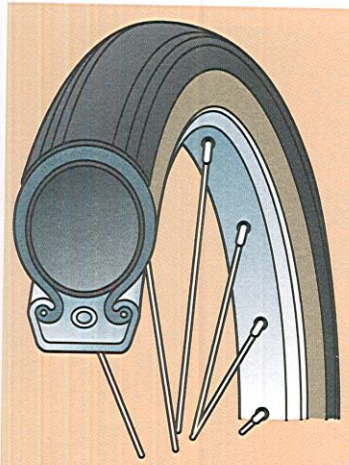




Wheels and Tires

Wheels can be described several ways:

- *Diameter* is measured in either millimeters or inches. Note that even though the two dimensions might be roughly the same size, they are not usually interchangeable.
- The *number of* **spokes** varies according to the bike's intended use and rider. In general, a wheel will have more and thicker spokes if it is designed for rougher conditions or heavier loads. For example, a road bike may have 28, 32, or 36 spokes per wheel, while a tandem bicycle may have 48 spokes for the same size wheel.

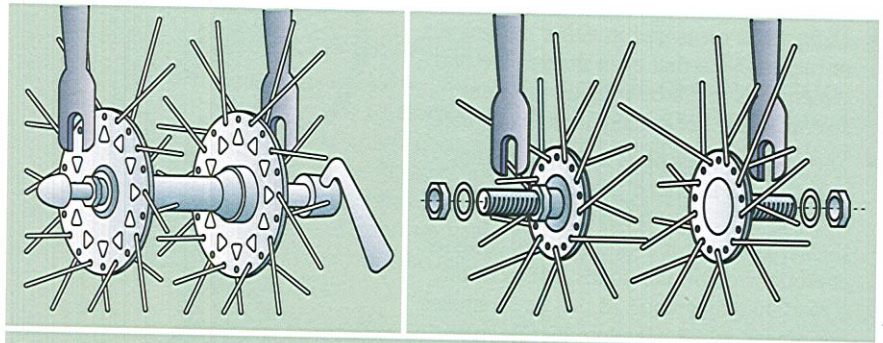


In a clincher tire, the inflated tube presses the wire-embedded edge, or bead, of the tire casing outward, holding it secure against the wheel.

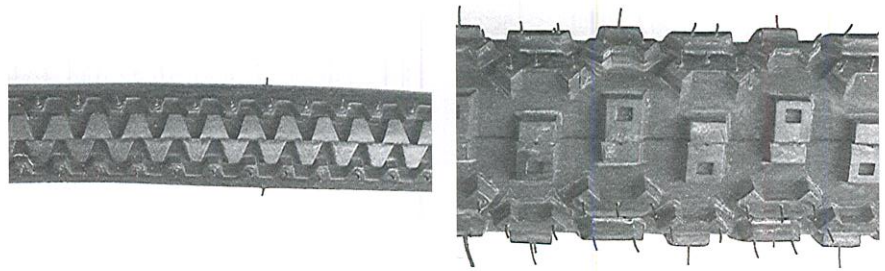
- Bike wheels generally are made from one of three *materials:* steel, anodized aluminum, or carbon. Steel wheels are found on less costly bikes, are slightly heavier than aluminum wheels, and don't work as well in wet conditions as aluminum with hand-operated brakes do. Carbon wheels, suited for both paved surfaces and mountain terrain, are found most often on high-end racing bikes.
- *Rim construction* can vary, but virtually all rim-and-tire combinations on bikes (other than ultrahigh performance bikes) have "clincher" rims.

Like wheels, tires are sized in inches or millimeters. To find the size of a tire, look on the label of the tire or on its sidewall. The first number is the wheel diameter; the second is the width of the tire.

Tubes are the rubber bladders that hold air and expand inside the tire. They come sized to fit a range of tires, which in turn must match the size of the rims. A 27 × 1 to 1¼ tube would fit a 27-inch tire measuring 1 to 1¼ inches; a 700 × 25 to 32 tube would fit a 700-millimeter tire measuring 25 to 32 millimeters.

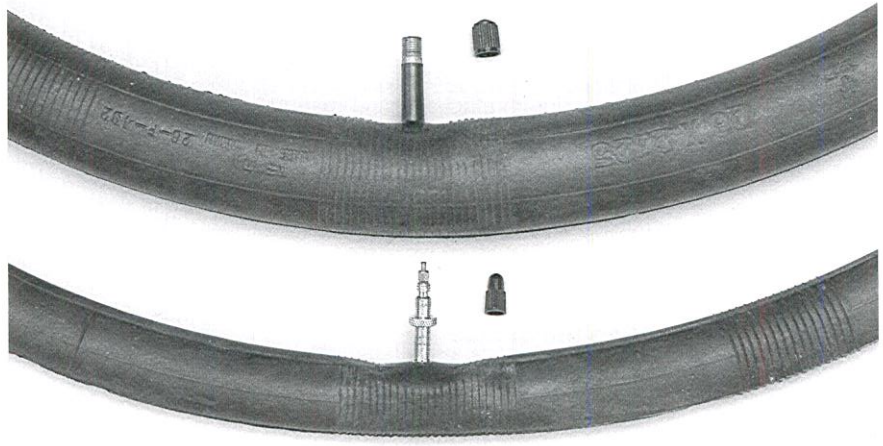


Two types of hubs are used for wheels. Some, *right,* have solid axles with hex nuts on their ends to keep them tight on the forks, or dropouts, of the bicycle. The quick-release hub, *left,* has a hollow axle through which a rod passes, permitting the rapid installation and removal of a wheel from the bicycle. Some mountain bikes use a third type of axle assembly (not shown) that has a solid-fork bottom and a large bolt that goes through the axle and into a receiver fitted with quick-releases.



Road bikes use narrow tires that are not much wider than the rims they are mounted on. A narrow tire, *left,* must be inflated to a higher pressure—at least 70 psi, or pounds per square inch. In contrast, a mountain bike tire, *right,* is wider and requires less inflation pressure.

Two types of air **valves,** the Schrader and the Presta, are used in tubes. Schrader valves are the same as those used in car tires. You push in a pin to release the air, while a spring shuts the valve to retain air pressure. Presta valves have a narrow, all-metal tip with a locknut on the end that can be partially unscrewed. The valve floats freely once the locknut is unscrewed; air pressure inside the tube pushes out on the valve to retain the air. Once the Presta tube is brought to operating pressure, the locknut is screwed tight.



The Presta valve tube, bottom, is most often used on narrow rims because it requires a smaller valve opening, which is the rim's weakest point.

To check the fit of a bicycle, straddle the top tube and lift the handlebars until the top tube reaches your crotch level. If the road bike fits you, there should be about an inch or two of space between the front tire and the ground, which allows you to dismount safely and ride with maximum efficiency. For a mountain bike, there should be 2 to 4 inches of space.

Fit

Fitting a bike means adjusting it to fit your body's dimensions. The easiest parts to adjust are the saddle and the handlebars; in extreme cases, you may need to replace parts such as the stem or crank arms. When a bike fits you just right, you should enjoy maximum efficiency and minimal discomfort.

Sizing

Choosing the correctly sized frame will help you ride with greater efficiency and comfort. This is the one aspect of the bike that cannot be adjusted, so work with your local bike shop to select the right frame for your body.

Fitting the Saddle

The most important adjustment is setting the saddle height. When the saddle is too low, you put too much stress on your knees. When the saddle is too high, you lose leverage and can't use the cranks efficiently. The saddle should be positioned so that your knee is slightly bent when you are seated and have the ball of your foot on the pedal in the 6 o'clock position.

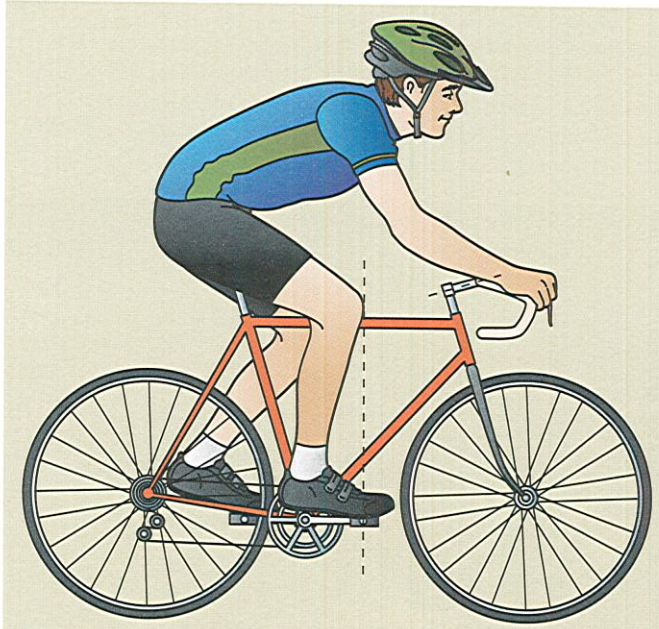
To test the saddle's height, put on your helmet, mount the bike close to a wall, and lean one shoulder against the wall. Place the ball of your foot directly over the axle of the pedal, then pedal backward and check your motion. As you spin the crank, your leg should almost—but not completely—straighten out and your hips shouldn't rock.

Some saddles can be adjusted forward or backward. If your saddle has this feature, do the following: Put the right pedal in the 3 o'clock position and center the ball of your right foot on the pedal axle. Hang a weighted string next to the bottom of your right kneecap. The string should pass through the center of the pedal axle. If the string is behind the axle, move the saddle forward. If it is in front, move the saddle backward. Next, make sure the saddle is level and not tilted up or down.

Fitting the Handlebars

As a general rule, the top of the handlebars should be about an inch below the height of the saddle, so your weight is balanced between the saddle and the handlebars. (This guideline does not apply to bicycles like utility-style bikes for which a more upright position is usually preferred.) Your body proportions, flexibility, and riding style will help you determine the most comfortable, efficient handlebar placement. Your local bike shop can help you fine-tune this adjustment.

These are the basic, beginning adjustments to your bike. As you ride more miles, you may find that minor adjustments will lead to large gains in comfort and efficiency.



On a road bike, the handlebar ends should be tilted up or down so they are parallel to the ground. If the handlebars are in the correct position, your back should be at a 45-degree angle when you are riding. (This angle is a suggested guideline; your personal preference may vary.) If not, you may have to change to a different size handlebar stem or adjust the height of the bars.

A line etched on the handlebar stem shows the maximum recommended extension. Check your bike's specifications to make sure you do not exceed the safe, suggested limit.

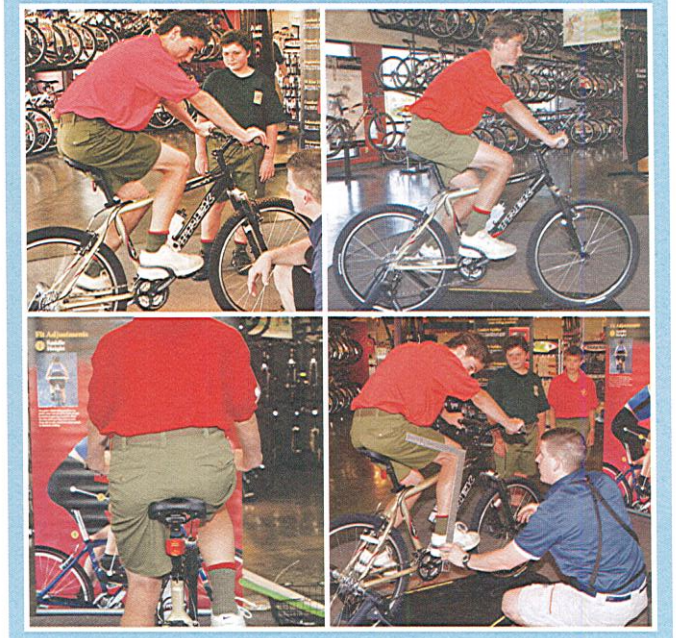
To test the saddle's fit, put on your helmet, mount the bike close to a wall, and lean one shoulder against the wall. Place the ball of your foot directly over the axle of the pedal, then pedal backward and check your motion. As you spin the crank, your leg should be almost— but not completely—straight and there should be no rocking of the hips. After adjusting the height of the seat, make sure the saddle is level and not tilted up or down.

Fitting the Handlebars

The top of the handlebars should be about an inch below the height of the saddle. (This guideline does not apply to bicycles like a utility-style bike.)

On the handlebar stem is a line showing maximum extension. Make sure at least 2½ inches of the stem remains inside the steering tube.

These are the basic, beginning adjustments to your bike. As you ride more miles, you may find that minor adjustments will sometimes lead to large gains in comfort and efficiency.



For a proper mountain bike fit, your arms should be slightly bent to help absorb shock. Due to your height and handlebar design, you may need to adjust your handlebar placement to accommodate your riding style and for comfort.

Maintenance

The bicycle is a very simple machine. As long as you take care of it, it will give you many miles of riding pleasure. The information in this chapter will help you get started. As you read, keep in mind requirements 2, 3, and 5, as well as the Bicycle Safety Checklist in the appendix.

How much maintenance should you do? That depends on you. If you are mechanically inclined and have a good set of tools, you can service most parts of your bike. If you do not have a clear idea of what you are doing, you should leave everything but routine maintenance to an experienced mechanic.

Unless you are an expert, you should have a trained mechanic give your bike a thorough servicing once a year. This includes cleaning and repacking bottom-bracket, headset, and **wheel bearings** (unless they are sealed), and replacing worn cables, brake pads, and tires. If you ride long distances or in very adverse conditions, your bike should be serviced more often.

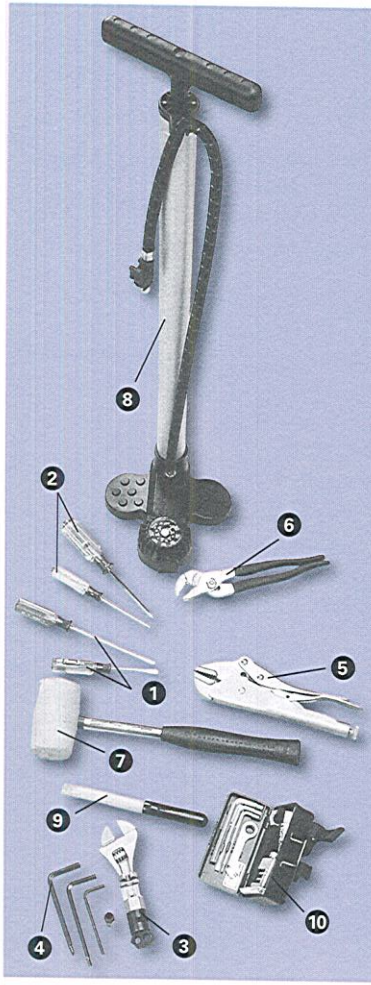
Just as important as annual servicing is preventive maintenance. Before every ride, remember your ABCs:

- **A:** Check the **air** pressure in your tires and inspect the tires for cracks and cuts from glass. Remove anything stuck in the tires. Debris, thorns, or other objects may eventually pierce the tube if they haven't already.
- **B:** Make sure your **brakes** are working properly. The pads should be in adjustment and not too worn, the cables should be taut and not frayed at the ends, and any quick-release mechanisms should be fastened correctly.
- **C:** Make sure the **chain** is clean and well lubricated. If you have ridden in the rain, clean and lubricate the chain immediately.

You can find helpful bike maintenance books at your local library, bookstore, online, or at a bike shop.

Tools

Most bikes have metric-sized nuts and bolts, and it is important to use the correct tools to remove and tighten them. Except in an emergency, do not use adjustable tools to turn nuts and bolts, because these tools tend to strip or round the corners of the fasteners. Instead, use the correct size of box, open-end, or Allen wrench. Special wrenches called cone wrenches work well when open-end wrenches are too thick.



SCREWDRIVERS

1. Standard (slotted), ⅛ inch and ¾ inch
2. Phillips, small and medium heads; used on derailleur-adjustment screws and accessory-mounting screws

WRENCHES

3. Box or open-end wrenches, 8 to 17 millimeters (1-millimeter increments); used for various nuts and bolts
   - 6-inch and 12-inch adjustable wrenches; used for adjusting brake toe-in and headset-bearing work
4. Allen wrenches, standard 4 to 8 millimeters

PLIERS/CUTTERS

5. Vise grip–type pliers, locking 6-inch; used for grabbing bolts rounded by adjustable wrenches
6. Diagonal cutters, 6-inch; used for cutting cable, cable housing, and toe straps
7. MALLET—1-pound wooden or rubber mallet; used for loosening handlebar expander bolt (usually found on older bikes)
8. FLOOR PUMP—high-pressure (150 psi) pump with built-in air gauge; used for underinflated tires; should work with Presta and Schader valves
9. TIRE TOOLS—set of plastic tire levers; used to remove clincher tires
10. CHAIN TOOL—metal tool that removes pins from chains; used to break and rejoin chains

Except for the floor pump, tire tools, and chain tool, which can be purchased at bike shops, the tools pictured usually can be found around the house or purchased at a local hardware store. Many bike shops sell tool kits that include the most commonly used tools.

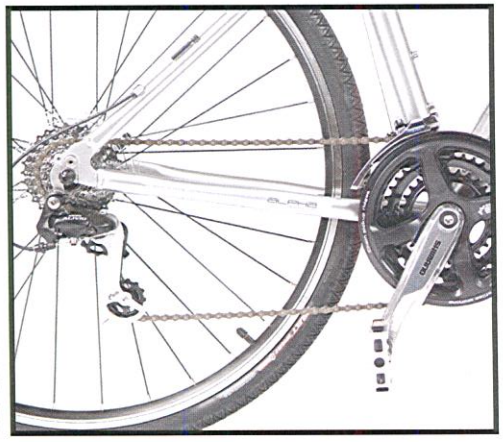
Cleaning and Lubricating

You should spend some time each week inspecting, cleaning, and lubricating your bicycle. If you ride fairly often, check the condition of your bike more frequently. By finding potential trouble spots early, you can avoid breakdowns on the road.

The parts of the bike that are not lubricated can be cleaned with a soft brush, a rag, and a mild detergent solution. These parts include the spokes, wheel rims, and tires. After washing, rinse and dry everything well.

All painted parts of the bicycle can benefit from an application of car wax, which makes cleaning easier the next time. Take great care that the wax doesn't get into the drivetrain or on braking surfaces. The film of oil and dirt should be removed from the rims of the wheels so that the brakes will work smoothly and effectively. After washing the wheels with soap and water, wipe the rims with a clean, dry rag.

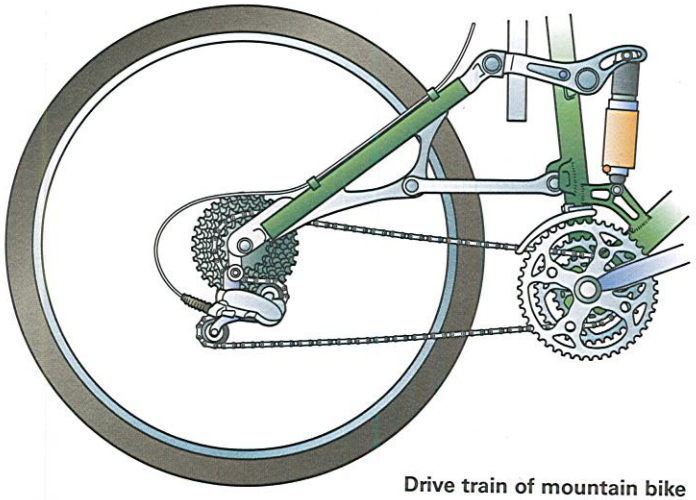
Never wash your bike with high-pressure water (like in a drive-through car wash) because water will be forced into bearings, causing rust.



A good time to inspect the drive train and the rest of the bike for worn or broken parts is right after it has been cleaned.

Cleaning lubricated components is a little messier. Spread plenty of newspapers to protect the surface below the bicycle. Use an old toothbrush with a little bit of lubricating oil or degreaser to brush off any accumulated dirt and lubricant from the rear cogs, the derailleur pulleys, the crankset, and the chain. Wipe the parts with a rag to remove most of the remaining dirt from the components. Then carefully clean each component by wiping it with a rag that has been dampened with lubricant. All the grime should be removed with this step. A final pass with a clean rag will remove any lubricant used in cleaning and leave the parts dry and ready for the next step—inspection.

Inspect the frame for bulges or cracks in the metal or paint, especially at the joints. Look at the wheels for cracks in the rim, broken spokes and spoke holes, and irregularities. Scan the whole drivetrain for worn, bent, or cracked parts. Make sure that every bolt and screw on the bike is tight, taking care not to overtighten or strip screws or parts, and check the tires for anything unusual. Damaged tires must be replaced immediately.



Drive train of mountain bike

Be careful not to let lubricant drip in brake pads, rims, or disk rotors. If it does get on any brake parts, it is nearly impossible to move and may require replacing brake pads and cleaning rims or disc rotors with alcohol.

Lubricating

Remembering what needs lubrication on a bike is easy: "Less is best." Chains and cables are the primary components that require lubrication. Always wipe away excess lubricant, and prevent overspray by holding a cloth behind the part you are lubricating.

High-quality lubricants specifically formulated for bikes can be used for lubrication of all closed (contained) components, such as the wheel bearings, the headset (the bearing assembly that connects the **front fork** to the frame), and the **bottom-bracket bearings.** For open (exposed) components, high-quality, water-resistant lubricants containing silicone are recommended. Do not use common household oils or products such as WD-40®. Their sticky composition traps dirt, which adds to unwanted abrasion between the moving parts. A bike shop can recommend appropriate lubricants.

The following chart lists bike components by the recommended frequency of lubrication.

Component	Lubricant	How to Lubricate	When to Lubricate
Chain	Silicone-based	Use a drop of lubricant and wipe.	When dry, after rain, weekly
Derailleur pulleys	Silicone-based	Use a drop of lubricant and wipe. Don't add lubricant where the pulleys come into contact with the chain.	When dry, after rain, weekly
Derailleurs	Silicone-based	Use a drop of lubricant (only on locations that pivot, not on springs) and wipe.	Monthly
Cable ends	Silicone-based	Wipe with lubricant-dampened rag.	Monthly
Brake calipers	Silicone-based	Use a drop of lubricant and wipe.	Only when the pivot squeaks or is especially dirty.
Brake levers	Silicone-based	Use a drop of lubricant.	Every six months
Handlebar stem and seatpost	Grease	(See text)	Annually (see text)

The handlebar stem and seatpost are two parts that do not move but must be lubricated nonetheless to prevent them from corroding and jamming in their tubes. First, find and mark the height of each one (you could wrap masking tape around the stem and post). Remove each part. Clean and lubricate the tube in which it was mounted; clean and grease the seatpost or stem; reinsert each part at its previous height. Do not overtighten the clamping bolts on these components. The seatpost bolt only has to keep the seat from sliding down. Tighten the stem bolt enough to hold the handlebars against usual cycling forces. Use torque wrenches and follow your bike's torque specifications for best results.

Brakes

Brakes are the most important components on a bicycle because they stop a bicycle in motion or help control its speed on a descent. They should function at maximum efficiency all the time. Coaster brakes should be adjusted and serviced only by a bicycle repair specialist, but you can adjust hand brakes with a little effort.

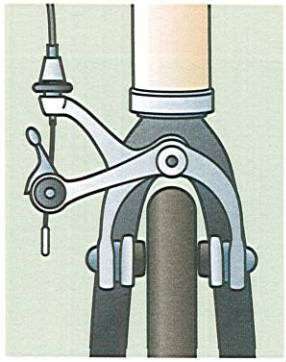
For the remaining adjustments, be sure your wheels are true, or laterally aligned. To check, spin the wheel. If it has a noticeable side-to-side wobble or up-and-down "hop," it's not true. Bike shops are well equipped to true wheels.

Keeping hand brakes in good working order and maintaining air pressure in your tires are the maintenance tasks you will perform most frequently.

Brake Pads

First, check the brake pads for wear. If there is less than ⅛ inch of rubber outside the brake pad base, or if the pads are glazed and hard, replace both brake pads on that assembly. To make sure you get the correct replacements, take the old pads to a bike shop as examples. Worn brake pads can be shaped with a file or sandpaper to remove any "shelves" formed by the pads riding below the wheel rim. The file also will remove any glazing from the surfaces of pads.

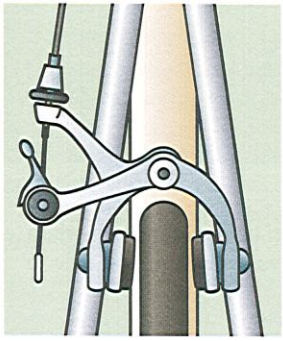
After pulling the main brake cable taut through the anchor bolt, tighten the bolt. Now squeeze the brake lever hard several times to make sure nothing slips. After releasing the brake pads from contact with the rim, turn the barrel adjuster to move the brake pads so they just clear the rim as you spin the wheel.



Loosen the main anchor bolt. On side-pull brakes, this bolt is on the arm. On center-pull brakes, this bolt is on the bridge-wire hook. The main brake cable is now free to move, and you can adjust the brake pads so that they are aligned with the side of the rim when moved against the rim.

Disc brakes should only be adjusted by a trained mechanic. Make sure never to compress a disc break lever with a wheel dismounted.

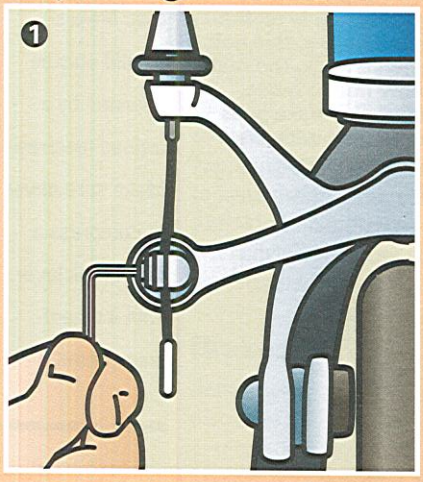
The brake blocks should not ride above the rim on the tire, nor should they extend below the side of the rim.

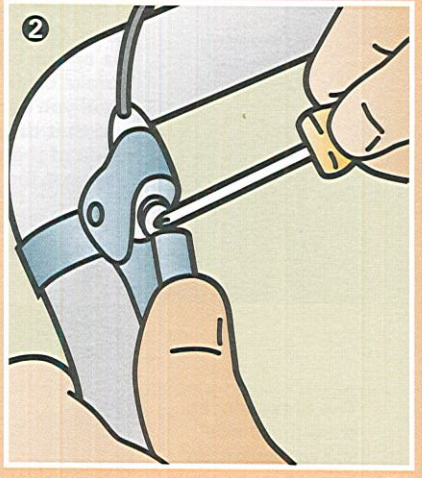


The front edge of the brake pad should be "toed in" so it contacts the rim slightly before the rear edge. To make this adjustment, gently bend the flat surfaces of side-pull brake arms, or adjust the shaped washers on center-pull brakes. Once the brakes are aligned with the rim, have a friend hold the brake pads (or use a tool or a piece of string), then tighten their mounting bolts to secure them. You also can follow this procedure to remedy squeaky brakes.

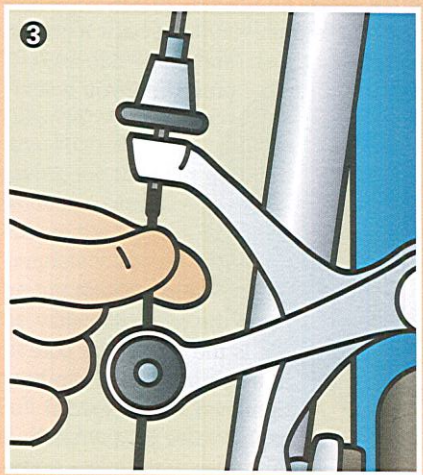
Now center the brakes on both sides of the rim. Side-pull brakes can be rotated after their mounting bolts are loosened. Center-pull brakes are adjusted by regulating the spring tension on each arm at the pivot point.

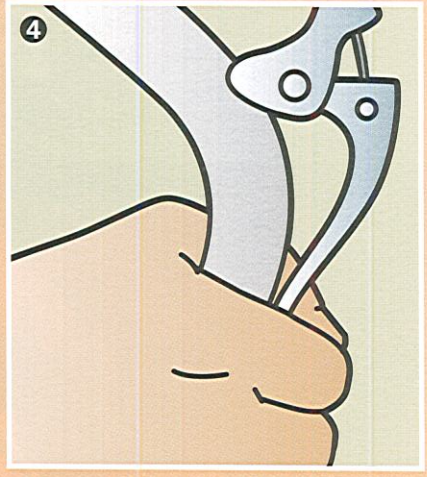
Adjusting Brake Cables





1. To adjust your brake cables, loosen the anchor belt.
2. Squeeze the brake lever. Unscrew the barrel adjuster. This frees the cable for loosening or tightening to increase or decrease cable tension. If you need to use pliers, do so carefully to avoid causing the cable to fray. Holding the cable in place, screw in the barrel adjuster.





3. Tighten the anchor bolt. Then check the tension and readjust, if necessary.
4. After the brakes are centered, check the whole brake system by squeezing the lever several times to see that the parts work promptly, nothing slips, and everything returns to a natural position when the levers are released.

Cantilever and linear-pull brakes used on mountain bikes are mounted differently from side-pull and center-pull hand brakes. However, the same kinds of adjustments are necessary: rim clearance, pad alignment, and toe-in.

Brake Cables

If your brake cables are too tight, your bike might lurch when you try to stop. If they are too loose, you might not be able to brake effectively.

Inspect the brake cables and housings. If a cable housing has any kinks or crimps, replace it. The brake cable also should be replaced if there are signs of wear, loose strands, or rust on the outside. If you have any doubt about your brake cables and housings, replace them. Your brakes are critical to your safety.

Before performing any cable adjustments, make sure the cable-adjusting barrel, or barrel adjuster, is screwed all the way in, less one turn. If your bike has quick-release devices, make sure they are in the closed position.

Tires

Improperly inflated tires probably cause greater maintenance expense than any other part. Underinflated tires result in preventable cuts and damage to tires, tubes, and rims.

Use only a frame pump or floor pump (or a CO_2 cartridge) to inflate your tires. Service station air pumps can blow out tires.

Check your tires frequently for breaks, cracks, and worn treads. Replace tires that are suspect in any way.

Keep tires inflated to within 10 psi of the maximum pressure recommended by the manufacturer without exceeding it. This pressure is stamped on the side of each tire.

Fixing a Flat

Removing a flat tire from the wheel completely makes it easier to find the cause of the flat and to put everything back together without damaging the tube. Do not rush, and don't skip any steps. By being patient and following the procedure, you will be less likely to have recurring flats.

Step 1—First, check to see if the reason for the flat is the valve. The core in a Schrader stem can be tightened with a special cap or valve core wrench, but tubes with Presta stems must be replaced.

Step 2—If the flat is on the rear wheel, turn the crank by hand and shift to the smallest cog on both the rear sprockets and the chainring. Deflate the tire completely, release the brakes if possible, and remove the wheel from the bike.

Step 3—Slip a tire lever between the rim and the tire on the side of the wheel facing you. Slide the tool around the rim until the tire is loose on that side. Then, starting at a point opposite the valve stem and leaving the tube inside the casing, remove the tire completely. Lay the tire on top of the wheel exactly the way it was before you removed it. Pull the tube from the tire, maintaining the relative positions of the casing and tube.

Step 4—Inflate the problem tube with enough air that you can find any holes by feeling or hearing the air escape. Dunking the tube in water may help detect holes that are otherwise difficult to locate. Check the corresponding section of the tire for a sharp object that might have caused the flat. Be absolutely sure the object is gone before you continue.

Step 5—Replace with a new tube and/or tire, if necessary, or follow the procedures below to fix the flat.

a. *Using a "boot."* If the hole in the tire casing is bigger than the head of a straight pin, you should repair the tire to prevent the tube from squeezing through the hole and bursting. A boot can be made from duct tape, a scrap of denim, a quarter-sized piece of a plastic milk jug, a tire patch, or even a folded dollar bill. Place the boot over the hole inside the tire before installing the tube.

When changing or patching tubes, most riders do not completely remove the tire. Instead, removing only one side is recommended.

b. *Patching a tube.* Deflate the tube completely and dry it, if necessary. Clean an area around the hole that is just a little bigger than the patch you will use, then apply the patch, making sure it adheres tightly to the tube. This patch should suffice until you can get home and replace the tube.

The easiest patches to use are self-adhesive and don't require glue. If the patches in your repair kit require glue, carefully follow these instructions: Roughen the tube surface with sandpaper or the metal roughener included in patch kits. Apply one thin coat of glue. While waiting for it to dry, raise the protective backing at one corner of a patch so that the backing will be easy to remove when you are ready for it. Apply a second coat of glue and let it dry until the glue loses its shine.

Peel the backing off the patch, being careful not to let anything touch its clean surface, and center it over the hole. The patch should stick immediately; hold it down if it does not, and make sure the edges of the patch are well sealed.

Step 6—To make remounting the tire easier, use talcum powder to coat the inside of the tire, the bead of the casing, and the tube.

Next, inflate the repaired or replacement tube with enough air to give it a soft shape, and insert the tube into the tire so that the valve stem is aligned with the label on the tire. Working with the tire and tube as a unit, insert the valve stem into the hole in the wheel, and work one end of the tire onto the wheel. The powder should allow you to do this using only your hands. If you must use a tool to flip the tire onto the rim, be very careful not to cut the tube.

Adjust the tube so that it is not pinched between the casing and the rim and so that the valve stem is perpendicular to the rim. Starting at a point opposite the valve stem, mount the other side of the tire onto the wheel. (It may help to release a small amount of air from the tube.) Check again to make sure the tube is inside the tire.

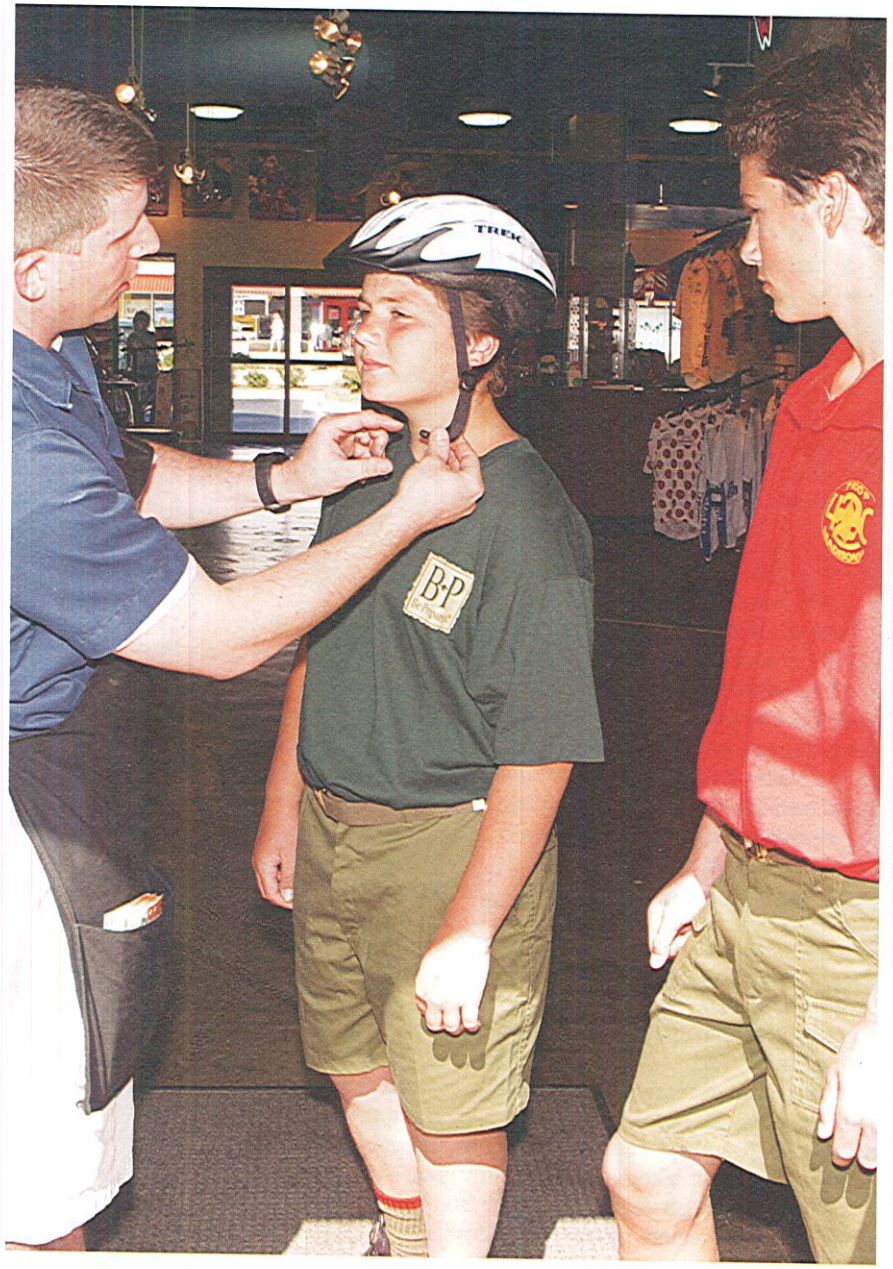
The best place to patch a tube is at home. The best way to fix a flat along the road is to use the spare tube you have carried for just that purpose, but you should always carry a patch kit in the event you get two flats on a ride.

Now inflate the tire to about 30 psi and check to see that the tire is concentric (centered) on the wheel: The "witness line" molded onto the tire should be an equal distance from the rim all the way around. Make adjustments using your hands. Pump the tire to the maximum recommended pressure shown on the sidewall. With the help of the powder, the tire should align itself straight on the wheel. Install the wheel on the bike and reconnect the brakes if necessary.

Carry your spare tube, along with a tablespoon of talcum powder, in doubled resealable bags. This way, the tube will already be coated, and the leftover powder can be used on the tire.

Wet-Weather Maintenance

Generally, you will have to perform more frequent maintenance on your bike when you ride in wet or rainy conditions. If your bike has chromed-steel rims, you can benefit from switching to specially coated aluminum rims. Hand brakes work much better with aluminum rims. The drivetrain will need to be cleaned and lubricated after every ride through cold, wet weather. Brake pads wear down faster when there is water and grit on the rims of the wheels. Bearings can get contaminated and dirty sooner. Some parts of your bike—such as the drivetrain—can become inoperative if they get coated with water and freeze. These parts, especially, require preventive lubrication.



Equipment

Many accessories are available to make cycling safer and more fun, comfortable, and secure. The accessories you choose will depend on where and how you ride. Some of the essential and more popular equipment is described here.

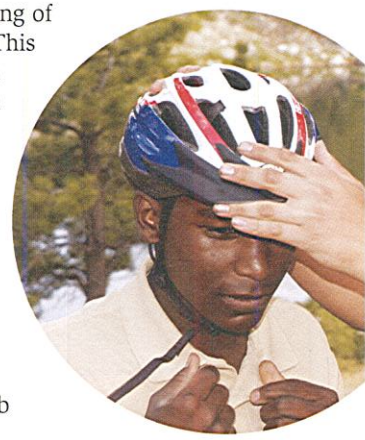
Rider's Equipment

Helmets

About 75 percent of deaths and permanent disabilities resulting from cycling accidents involve brain injuries. *A helmet is the most important piece of equipment a cyclist can own and use.* In fact, the National Highway Traffic Safety Administration says bicycle helmets can reduce head injuries by 85 percent. So, even if your state doesn't require helmet use, you should always wear a properly fitted helmet when riding your bike.

To protect your head, a helmet must do two things:

1. Gradually slow the momentum of the skull and act as a shock absorber. A good helmet should have a lining of rigid, crushable foam at least half an inch thick. This lining reduces the severity of damage to the brain when it bangs against the skull as the head hits a hard surface.
2. Prevent sharp items from reaching your head. To do this, a helmet should have a rigid shell covering the foam layer. The shell distributes the impact of a sharp or hard object over a larger surface, reducing the chance of penetration. Helmets with fabric covers do not provide the protection of shell-covered helmets. Shell-covered helmets can slide along the road surface in an accident, while fabric-covered versions tend to grab on the surface and could twist the rider's neck.



Too far back

Too far forward

Correctly positioned

Select a shell-covered helmet that closely matches the size of your head and is comfortable. Most helmets come with a selection of replaceable pads of various thicknesses that you can use to fit the helmet to your head.

The helmet should have four fully adjustable ear straps. Wear your helmet so that it covers your forehead to just above the eyebrows. Adjust the straps so that the helmet stays in this position on your head. The chin strap should be easy to fasten and unfasten.

To increase visibility, select a helmet color that is bright and reflective. You can apply reflective tape or stickers to the helmet to help other vehicle operators see you. Also, a light-colored helmet will help keep you cool in the hot sun, as will one with large vents.

Even if it shows no damage, a helmet must be replaced if it has been worn in an accident, because the foam protecting the head will have been crushed. The helmet should also be replaced when any of its parts show wear, or if it has been used for more than three years. In terms of your safety, a helmet is a very inexpensive precaution.

The rule to remember is: If you are on a bicycle—even straddling it without moving—your helmet should be properly fastened on your head.

Gloves

Gloves serve several purposes. They cushion the shocks transmitted through the handlebars from the wheel, and they reduce damage to your hands if you fall. Most gloves have padded palms for cushioning. Warm-weather gloves are fingerless, but their temperature range can be increased by wearing a wool or synthetic liner under them. Cold-weather gloves cover the whole hand.

Shoes

You can pedal in any comfortable shoes. However, shoes intended for cycling have special features. Usually lightweight, they have very stiff soles to protect your feet and reduce fatigue. Most cycling shoes have cleats to lock onto clipless pedals. Shoes designed for road biking typically have little or no tread, while mountain-biking shoes have the sort of tread you would find on hiking boots. This tread comes in handy when you have to walk your bike over obstacles or on a muddy trail.

If you wear ordinary shoes when cycling, tuck your shoelaces inside your shoes. Otherwise, the laces could get tangled in the chain or the chainrings, causing you to crash.

Eye Protection

Because your eyes are so exposed on rides, they can be stressed and damaged if they are not protected from the effects of sun, wind, and flying particles or insects. It's a good idea to wear high-quality, polarized sunglasses when you ride. When you don't need sun protection, clear or amber riding glasses or goggles are useful.

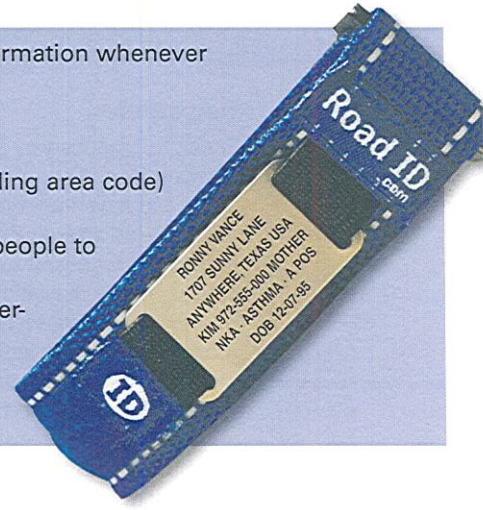
Identification

Every rider should carry some form of identification when cycling. In case of an accident, authorities can use this information to reach the people who should be notified of your situation.

ID information can be neatly recorded on a card and glued inside your helmet or stamped into metal dog tags you can purchase. Whatever the form, the information should be carried where it can be found easily by someone trying to help. Keep it on you, not on your bike, which can get separated from you after an accident.

You should carry the following information whenever you are riding:

- Full name
- Home address
- Home telephone number (including area code)
- Date of birth
- Names and phone numbers of people to contact in an emergency
- Special medical information emergency personnel should know, including any medications you may be taking



Roadside and Repair Kit

Be prepared for roadside emergencies by carrying a kit containing the items shown here.

Registration

Traffic regulations vary by state and locality, but all states consider bicycles the same as other vehicles. Bicyclists are granted the same rights and have the same responsibilities as operators of motor vehicles—an awesome set of obligations.

Check with your local police department or bike shop to find out the bicycle regulations in your community. Many municipalities have ordinances regulating bicycle registration, inspection, and usage. Many require residents to register their bicycles with the local police and to show a registration sticker. Others require riders to pass a bicycle inspection and rider examination to obtain registration. During the registration process, the police typically record a complete description of your bicycle, including its serial number. If your bike is stolen and later recovered, this information may enable police to return it to you.

Money

You should carry emergency money on every ride to buy food or drinks when necessary. On many trips you will want to bring spending money, but it is always nice to know that your emergency cash is in reserve.

Clothing

You can ride in just about any clothing that is comfortable and doesn't restrict your range of motion. However, many garments have been designed specifically for cycling.

Jerseys. A cyclist's jersey is a tight-fitting, short- or long-sleeved shirt made of fabric that wicks away moisture. Jerseys are long enough to cover your waist in the normal riding position and usually have pockets sewn onto the back where you can carry food or other small items while cycling. Bright-colored jerseys help other drivers see you easily.

Shorts. Cycling shorts protect your skin where it comes in contact with the saddle. These shorts are made from a stretchable synthetic material and have legs long enough to extend below the edge of the seat. A special material is sewn into the crotch of the shorts to provide padding and wick away moisture. Cycling shorts come in many colors, but black is the most popular because it does not show stains from dirty hands, chains, saddles, or tires.

Jackets. Like jerseys, cycling jackets have long tails and usually have back pockets. They typically have a breathable back panel to let excess heat escape; some feature armpit zippers and removable sleeves.

For maximum safety, attach retroreflective strips to your jersey.

Weather-Appropriate Gear

With the right gear, cycling can be enjoyed year-round. In hot weather, it is important to wear clothing that allows the flow of air to cool your body. Riding in wet or cold weather requires more specialized gear.

RAINWEAR AND LAYERS

Rain clothing, such as high-tech, breathable-fabric rain jackets or simple nylon windbreakers, should shed the rain and allow air to flow around your body, keeping it at a comfortable temperature. Rainwear should be a bright color such as yellow or lime green and have retroreflective strips to help other drivers see you despite poor visibility.

Your body controls its temperature by perspiring, so trying to stay dry in clothing that cannot breathe will cause your body to overheat and can lead to *hyperthermia*. Riding unprotected from the rain can cause your body to cool too much and create a serious condition known as *hypothermia*. (See the chapter on riding skills for more information on this topic.)

Do not rely on cotton clothing to keep you warm while cycling. Cotton absorbs and retains moisture, actually making you colder as you ride.

You can maintain a comfortable body temperature over a wide range of cool to cold conditions by dressing in layers. Experienced riders will often put on warmer clothing—long-sleeved jerseys or cycling tights—when the temperatures start to fall into the high 50s. To stay warm on cool or cold days, use multiple thin layers of material that wick moisture away from the body and keep you warm even if you get wet. Wool and polypropylene are two such materials. Thin, closed-cell, neoprene-rubber foam is often found in gloves, shoe covers, and face masks.

All clothing works better when you can prevent wind from penetrating it and carrying off the body heat you are trying to conserve. Windproof yourself by wearing a nylon shell, windproof warm-up pants, and wind-resistant gloves and shoe covers.

PROTECTION FOR THE BODY'S EXTREMITIES

Because your legs are doing most of the work, they will stay the warmest and need the least protection from the cold. Your hands, feet, and ears will be the coldest because they can't generate or maintain heat well. Headbands or ear covers, full-fingered gloves, and shoe covers or booties (overshoes) help protect these parts of your body.

To warm up, your body needs to transfer heat from warm areas to cool ones by circulating blood. The clothing you wear—especially gloves and socks—should be loose enough to allow good circulation but tight enough to insulate against the cold. Gloves and socks that are too tight can actually make your hands and feet colder.

Your eyes and lungs need protection from the cold, too. Clear or amber-tinted goggles or close-fitting ski-style sunglasses protect your eyes from cold and wind. When temperatures drop below 25 degrees Fahrenheit, wear a mask, balaclava, or even an inexpensive carpenter's dust mask over your mouth and nose to prevent the cold, dry air you are breathing from damaging your lungs.

Special Gear for Mountain Biking

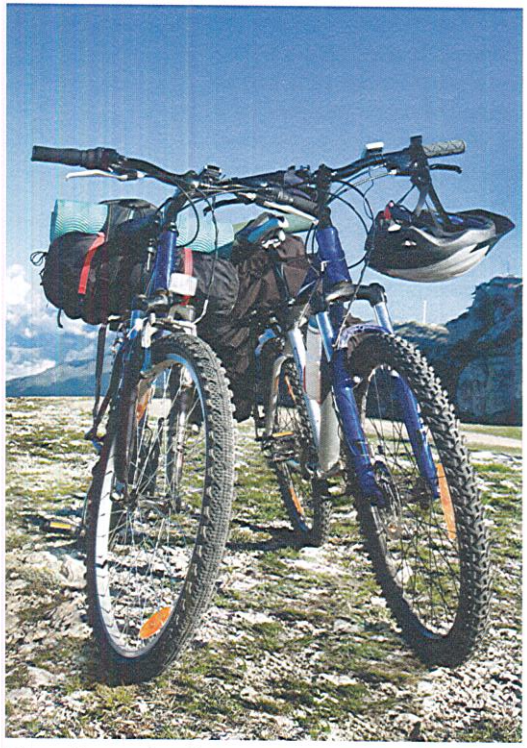
If you ride on challenging mountain trails, you may want to consider wearing gear that protects your body more than ordinary cycling gear does. Some mountain bikers prefer to wear BMX helmets, for example, which cover the ears and jaw and have smaller vents. Others wear sleeves or pads on their elbows and knees and even upper-body "armor" that looks like something a knight might wear.

While such gear protects your body, it also decreases comfort and increases weight. Whatever gear you are wearing, you can still get seriously hurt if you ride beyond your capabilities or don't use common sense.

Bicycle Equipment

Racks

Racks are metal or plastic frames attached to the bicycle to help transport objects. They allow you to secure all kinds of gear to the bicycle while keeping the gear away from the working parts of the bike and off your back, where it could interfere with your balance.



The safest and easiest way for a cyclist to carry extra equipment is to let the bike haul it.

Among the racks available are ones that are mounted on the handlebars, over the front wheel or on the front fork, or over the rear wheel. Note that the higher a rack is installed on a bicycle, the less weight it should carry. One frame in particular, the low-rider rack, allows the cyclist to carry a bag on either side of the front wheel, keeping the weight low on the bike and the bike in balance.

Bags

The best way to carry gear while cycling is in bags specifically designed for bikes. Most are constructed to hold gear securely and can be mounted on a rack. Most bicycle bags have hardware that firmly attaches them to the frames, but bags containing small items or bulky things can also be secured to frames with bungee cords and straps. Many bags have lightweight internal frames that give them shape and keep the bags from sagging into moving parts of the bicycle, interfering with its safe operation. Quick-release fasteners let you remove the bags with ease.

Handlebar bags are great for holding items you need quick access to, like cameras and cell phones, but such bags should carry as little weight as possible because they are so high on the bike. Seat bags that attach behind and below the saddle are the best place to carry repair gear (see photo). Rack trunks or rear duffel bags are rectangular-shaped bags that attach to a bike's rear rack. These are useful for carrying supplies for day trips. Panniers are the bags that hang vertically on front or rear racks on either side of the wheels. These are used to carry more gear for multiday rides and tours. Frame bags are thin, triangular bags that fasten between the top tube and seat tube of the bicycle; they can substitute for a seat bag.

Water Bottles and Cages

You can conveniently carry plastic bottles of fluids on the bicycle in water bottle cages that hold 20- to 25-ounce bottles of liquid. The cages are usually clamped to the seat tube or down tube or attached with screws to special threaded sections of the frame. Backpack-style hydration packs are popular for mountain biking and can hold as much as 100 ounces of liquid.

Locking Devices

All riders should have some means of preventing bicycle theft. A padlock on a coiled cable is one of the simplest solutions. Locks specifically designed for bicycles are also available. The cable should be long enough to pass through both the front and rear wheels. Always secure your bike to a sturdy parking rack or some other immovable object like a tree, pole, or lamppost in a way that doesn't interfere with other people's movements around your bike. If you ride by yourself, you will need your own locking equipment. Group riders often can share locking devices.

Locking devices

Pumps

A pump is a necessity when you have a flat tire. The long pumps available for road use are mounted directly under the bike's top tube. Minipumps and tire inflators are stored on the bike in their own or carried in a seat bag.

Before you need to use the pump on a ride, be sure it can inflate the tires of your bike and that the inflation head is compatible with the type of valve used on your tires.

In addition to using lights and reflectors, you should also apply reflective tape wherever practical on the bicycle, your clothing, and your helmet. This helps other vehicle operators see you in low-light conditions, especially at dawn and dusk.

Lights and Reflectors

Common sense tells us not to ride at night. If you must ride in the dark, you need **lights** and **reflectors** for people to see you—and for you to see the roadway. Even if you are cycling in an area with streetlights, you still need lights to ride in the dark. Lights and reflectors should be aimed in at the ground some distance in front of you to be most effective. Remember to carry spare lightbulbs and batteries in your gear bag.

All cyclists in all states are required to use a white front light on their bicycles from sunset to sunrise. Some states may also require a red rear taillight or a red rear reflector, or white or amber side reflectors. Check your state laws for requirements for lights and reflectors. A bike shop can help you select these components.

For cycling in low light or darkness, you can select from four main types of lights:

1. **Small battery-powered lights** work well for riding in areas with streetlights and can be used with rechargeable batteries, keeping operating costs low.
2. **Generator systems** emit enough brightness even on dark roads, and they go dark when you stop riding.

3. **High-powered battery lights** work well in all conditions but have heavy battery packs, cost more, and need more frequent recharging than other types of lights.
4. **High-intensity/high-efficiency front lights with rear strobe lights** can be fastened with Velcro to helmets or clothing.

Mirrors

The cyclist's rearview mirror alerts the rider to vehicles approaching from behind.

Remember, however, that using a mirror is no substitute for scanning by turning your head and making visual contact with everything around you.

Mirrors can be mounted several ways on the handlebars. Several styles of small mirrors attach to glasses or helmets. Although small, these mirrors provide a wide field of view.

Cycle Computers

Cycle computers, also known as cyclometers or cyclocomputers, are handlebar-mounted devices that track your speed (current, average, and maximum), distance traveled (per trip and cumulative), riding time, and current time. Some models measure cadence (pedal speed), altitude, elevation gain, and heart rate; high-end models work like the GPS units found in some cars.

Riding Skills

You may have learned how to ride a bike when you were a little kid, but you can still learn to ride more safely and efficiently.

Mounting and Dismounting

To mount the bicycle, engage the brakes to prevent the bike from rolling. Swing either leg up and over the bike and straddle the top tube. Now put one of your feet on the pedal. Use your foot to turn the crank backward until it reaches the 10 o'clock position.

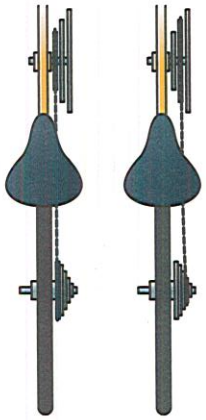
Release the brakes and push down on the pedal. As your body moves up and the bike moves forward, the saddle will move under you. When the opposite pedal reaches the 12 o'clock position, make a second pedal stroke.

To dismount, place the left pedal straight down and stand on it like a step. As the bike is about to come to a stop, lean a little to the right and put your right foot on the ground. As soon as you can, position the left pedal to the 10 o'clock position in preparation for starting again. That way, you are ready for a quick start with minimal effort.

When the pedal is around the 10 o'clock position as shown in the photo below, you are ready to start pedaling. Remember, the forward motion of the bicycle will provide the momentum needed to keep the bike (and you) in the upright position.

Braking

To brake efficiently, you must keep your brakes in good operating condition. About 80 percent of the stopping force of a bicycle comes from applying the brakes to the front wheel (except on a bike with coaster brakes, which are stopped by pressure on the rear wheel only). When a bicycle is stopping, the rider's body weight and the weight of the bicycle shift forward to the front wheel, reducing the weight over the rear wheel.



In a pronounced change of terrain, you may need to shift the front derailleur as well as the rear. Move the chain, using the front shifter, onto a smaller ring for a lower gear (one in which it's easier to pedal), and, using the rear shifter, onto a larger ring for a higher gear (one that enables pedaling as you go downhill).

If you apply the front brake too forcefully, you could go over the handlebars. If you use the rear brake too forcefully, it will skid and wear out your rear tire. The trick is to use both brakes together in the most efficient combination.

Apply both brake levers at the same time. If the rear wheel starts to skid, release the rear brake a little bit until the skidding stops, and then reapply the rear brake. If you follow this technique, your stops will be safe and efficient.

Shifting Gears

When you ride, you should try to maintain a consistent cadence (the number of times per minute the cranks rotate). Shifting gears lets you do this.

When climbing hills or riding into a headwind, you change to progressively lower gears to reduce your effort. Going downhill or riding with a tailwind, you change to higher gears to increase your leg effort and maintain your pedaling speed. The more tired you get, the more you should shift to lower gears. When you think you need to shift to a lower gear, do so as soon as possible. This keeps your cadence consistent and preserves your momentum.

How to Shift Gears

You can only change gears while you are pedaling forward if your bike is equipped with derailleurs. The forward motion shifts the chain to different cogs or rings with the derailleur. Just as you move the shifter, slightly reduce the pressure on the pedal until the next gear is fully engaged. This allows for easier shifting with no hard changes that can damage drivetrain parts. For safety, don't shift the front and rear derailleurs at the same time.

If your bike has three chainrings in the front, you will do most of your riding with the chain on the middle ring. This means that you usually have to shift only the rear derailleur to find a comfortable gear. Keep pedaling and use the shifter on the right side of the handlebar or down tube to move the chain.

For bikes with a hub gear, shifting can be done at any time, whether the bike is in motion or stationary.

As you become a more experienced rider, you will learn to shift by feel, reducing the need to look away from the road or the trail as you adjust your gears. The cyclists' adage, "shift early, shift often" is also important, as it serves as a reminder that shifting before your terrain changes is more efficient for you and less stressful on your bike's drivetrain.

Rules of the Road

Cyclists are subject to the same laws as the drivers of motor vehicles, and they are safest when treated just like motorists. That means you need to follow the same rules of the road as motorists do—and use a few special techniques that apply only to cyclists.

Mirrors are good for keeping track of vehicle traffic behind you, but the only way you can keep tabs traffic beside you is to look. Do not rely upon your hearing; cars can be very quiet in motion, as can bikes.

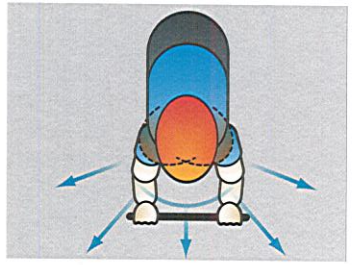
Scanning and Signaling

A key part of following the rules of the road is learning how to observe traffic and making your intentions clear to other drivers by scanning and signaling. Scanning means taking measures to be aware of traffic that's around you in all directions. Signaling is like asking the question, "May I move from where I am now?"

When you signal, a driver should respond in some way—by slowing down to let you into the lane, changing lanes to open a lane for you, or actually giving you a signal, as if to say, "Yes, you may move." You must receive the driver's response before changing your riding position on the road.

Your signal alone does not make it safe for you to change position on the road. One reason is that the vehicles in the other lane have the right of way. You must wait for an opening to move into a new lane. If possible, plan your changes early enough to deal with two drivers. If the first driver does not permit your action, the second one most likely will.

Left-turn signal



When cyclists turn their head to scan, they often turn the handlebars in the same direction. Practice scanning in an empty parking lot to develop the skill of riding straight without swerving as you turn your head to look.

Although you should signal with your left arm, in heavy traffic a turn of your head can suffice as the only signal in cases where you must keep both hands on the handlebars, ready to brake if necessary.

Right-turn signal

Stop or slow-down signal

Where to Ride

The first rule of the road is: *Ride on the right side of the road, with the flow of all other vehicular traffic.* One of the most frequent causes of car-and-bike accidents is cyclists riding on the left, pedestrian style, facing the flow of traffic. Riding on the right lets you approach drivers on side streets and pedestrians on sidewalks from the direction they expect, the one from which traffic normally comes. When you ride on the right side of the road, drivers also have more time to react to you and just have to slow down to avoid or pass you.

You should not ride on sidewalks. Not only do you interfere with pedestrians on sidewalks, but you also actually put yourself at more risk than when you are on the road because drivers at intersections and driveways are less likely to see you. (This restriction does not apply to established bike paths.)

The standard vehicle code for all road users states, "All persons have an equal right to use the highways for purposes of travel by proper means, and with due regard for the corresponding rights of others." The second rule of the road, then, is: *Slower traffic keeps to the right, and faster traffic passes on the left.* A cyclist should ride to the right as far as is safe—which does not mean you should ride at the very edge of the road. In fact, you should typically ride about 3 feet away from the pavement's edge, as well as from parked cars, hedges, and other obstructions. If you ride any closer to the edge, you may encounter road debris, crumbling pavement, or a car door that suddenly opens in your path.

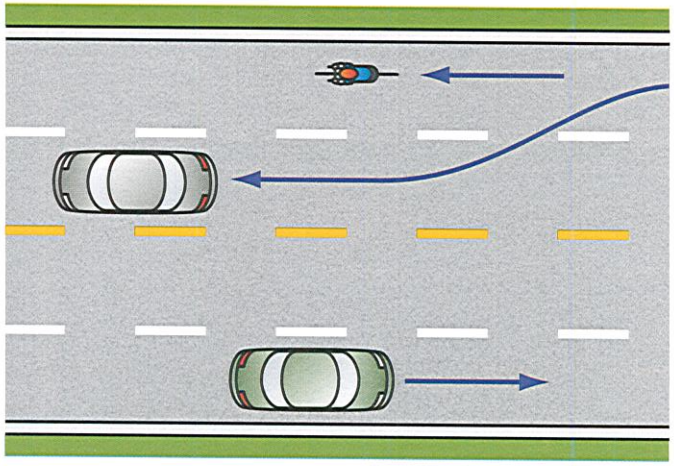
If cars to the rear are trying to pass you, you can move to the edge of the road while they do so. This allows them to pass you without moving too far into the other lane.

Many country roads and city streets are so narrow that cars can't pass you without moving partway into the next lane. When cars are approaching you from both directions, and on blind curves where there might be oncoming traffic, take the middle of the lane to discourage drivers from unsafe passing. Look and signal before you move.

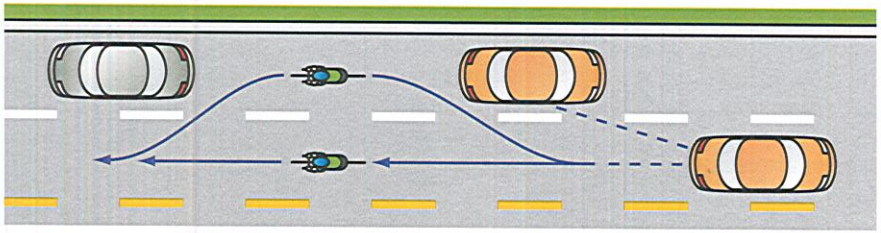
Do not forget that you have the same right to use the road as a motorist. Make motorists slow down for you if safety warrants it. Be courteous and give a "slow" signal to tell the driver behind you that it is unsafe for him or her to pass. When motorists approach from the rear, they are required to slow down and follow if they cannot safely pass. However, you should not delay faster drivers unnecessarily.

If you are going the same speed as other vehicles, pull into line with them. If you must pass slower vehicles, look back for a safe interval in traffic and signal before moving left into the passing lane. (Do not pass on the right; drivers expect faster vehicles to pass on the left.) Make sure you are visible to the driver at this point. Don't ride too close to the vehicle you are passing. After you pass, return to the right lane as soon as is convenient.

If your lane is clear, you may move toward the center of the road to avoid debris, sand, gravel, or other hazards.

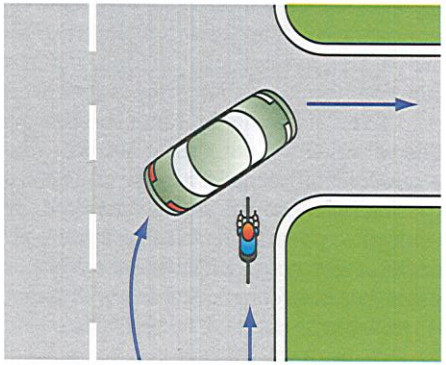


On roadways that have two narrow lanes for each direction, ride in the middle of the right lane at all times. Drivers need to get the idea that they must move into the passing lane if they want to pass you.

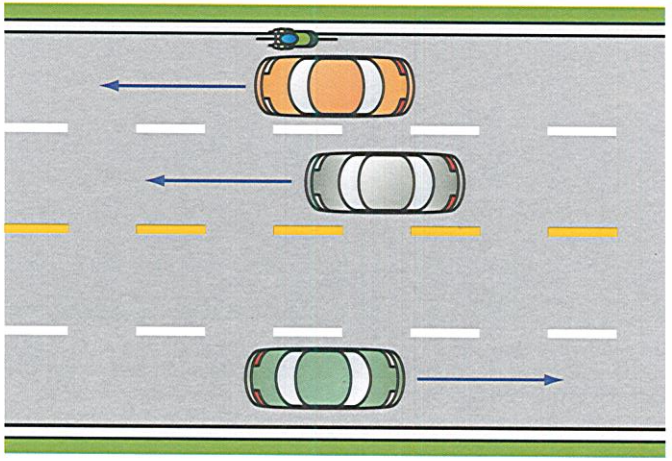


Do not weave among parked cars. You become invisible to drivers and will have to swerve back into traffic when you reach the next parked car.

If the roadway has a usable paved shoulder or an extra-wide right lane, you may ride in a line that is consistent from the left side of the right lane and about 3 feet to the right of where the cars are traveling. This lets motorists see you and helps prevent you being cut off by a driver turning right, as in this illustration.



If the vehicle you are passing speeds up while you are beside it, wait until you have fallen behind, look back to the right for traffic and merge back to the right when it is safe to do so.



In narrow-lane conditions, riding all the way to the right invites a car to try passing you in the same lane, possibly forcing you off the road.

Handling Intersections

An intersection is any point, including a driveway, where the paths of two vehicles can cross. There are ways to get through an intersection as easily and safely as possible.

First, always move to the lane position that will allow you to ride through most efficiently. To turn right, get to the right side; to go straight, stay near the middle; to turn left, move just to the right of the center of the roadway or into the left-turn lane.

The cyclist's turning-lane rules are as follows:

- Select the rightmost lane that goes to your destination (the left, middle or right lane).
- Ride on the side nearest your destination if one lane goes in two directions, such as left and straight-through center lanes.

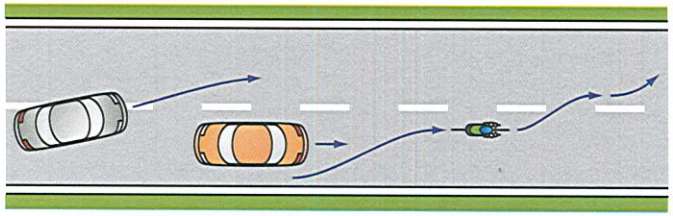
Right Turns. Right turns are the easiest turns. From the right side of the right lane, look both ways for oncoming traffic, signal, and go around the corner. At an intersection with a stop sign or where right turns at a red light are allowed, you must stop and yield the right-of-way to traffic already in the intersection. You also must yield to pedestrians in the crosswalks. A right-turn signal is necessary to let drivers know your intentions.

Left Turns. Left turns are the most complex traffic maneuvers a cyclist can make. In areas where traffic is light enough to permit it, you should execute left turns from the center of the roadway, meaning the lane from which no cars on your left will go straight ahead. Turning left from this position puts all the traffic you might have to deal with in front of you. It allows through traffic to pass on your right, and it doesn't require you to look back when turning.

If the traffic at an intersection is too heavy for you to ride through safely, it's OK to make the left turn as a pedestrian. Ride to the far right corner of the intersection, come to a complete stop, dismount from your bike, and look for traffic in all four directions. Now, wait like a pedestrian until traffic clears, then walk your bicycle safely across the street.

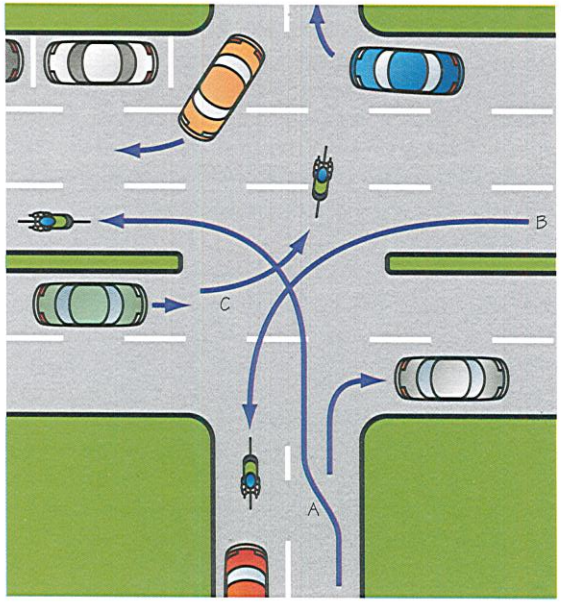
On one-way streets with two or more lanes, you may ride on either side of the road. The easiest way to make a left turn from a one-way street onto another one-way street is to ride around the corner on the left, then change lanes to the right as soon as you are certain the roadway is clear and operators of vehicles behind you are aware of your intentions.

Never pass the last in a series of cars stopped and waiting at an intersection. You do not know which way the car will go, or whether it is hiding a pedestrian or other hazard.



When moving into position within a lane, look back for traffic clearance first. When changing lanes to get into position, look back to let a driver make room for you, make a left-turn signal, cross to the other side of the lane, look back again to let a driver make room for you, and cross the line into the new lane. To cross multiple lanes, repeat the process as needed.

Going Straight. When going through an intersection, make sure traffic turning right passes you on your right. Ride to the left side of dual-destination lanes (lanes from which vehicles can go straight or turn right) and stay completely out of right-turn-only lanes.



Where in the lane should you be to prepare to make your left turn? If the lane is also for through traffic, ride on its left side (A). If the lane is a left-turn-only lane, ride on its right side (B). You must yield to other traffic in the intersection—both vehicular and pedestrian. Pass oncoming left-turning vehicles right side to right side (C). When you are turning left from the left side of the lane, don't let left-turning cars behind you pass on the right. While waiting to turn left, move to the middle of the lane and make a slow signal with your left hand to inform the motorists behind you.

The simplest-looking yet most difficult intersection to ride through is one on a small, two-lane street, where the traffic in the right lane can go left, straight, or right. To discourage drivers from passing you on the left and then turning right, ride a little farther into the lane as you approach the intersection. Position yourself far enough from the curb to allow drivers to make legal right turns on a red light if you are going straight. You might need to gesture to such drivers that it is OK for them to turn between you and the curb.

Handling Hazards

Motor Vehicles in General

Getting hit from behind on a bicycle happens infrequently and usually occurs when a driver loses control of a vehicle. Because you can do little to recognize or prevent this situation, heads-up riding is the only survival strategy you can use. You *can* do something about drivers underestimating your speed and cutting you off as they overtake you. While you look ahead, keep track of the passing vehicle out of the corner of your eye. If the car merges too soon, slow down to give it space, or, if necessary, take a safe route off the road to avoid it, especially if it is a long vehicle like a bus, a tractor-trailer rig, or a truck pulling a trailer.

When a string of cars is coming toward you on a rural road, watch for one of the trailing cars to pull out and pass the lead vehicle. Give it space if necessary. A head-on collision could occur if there's not enough room for the passing car to get back into its lane before it reaches you. Since this type of accident occurs partly because the motorist cannot see the cyclist ahead, it is a good idea to wear a conspicuous helmet and bright clothing to increase your visibility.

Emergency Vehicles

Emergency vehicles always have the right-of-way. Bicyclists should take this rule one step further. As soon as you hear the siren or see the lights of emergency vehicles, pull off the roadway as quickly and safely as you can. Drivers of vehicles are trained to look for the emergency vehicles and clear the way for them. During this process, their ability to deal with a bicycle on the road is reduced. The best thing to do is get off the road and wait until the emergency vehicle passes.

The general rule in the presence of police cruisers, fire department equipment, or ambulances is "Sirens or lights, drive right."

Although motorists demand much of your attention when you are riding, you should also keep an eye on—and cooperate with—other cyclists. We'll discuss this topic in the chapter on touring.

Because hand brakes do not work as well in the rain, squeeze the brakes lightly and regularly to help keep the rims dry so that you can stop quickly when necessary. Allow extra room for stopping.

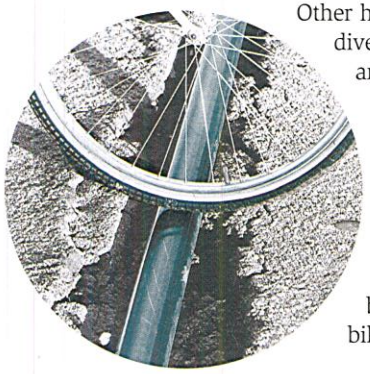
Weather

Motor-vehicle drivers—and cyclists—can have a hard time seeing in poor weather conditions. Therefore, ride where you can easily be seen, and do everything else you can to increase your visibility. Remember that rainwear may make it uncomfortable to turn your head to scan, while glasses will become rain-spotted and steamy.

Everything gets slippery when wet. The roadway loses some traction just by having water on it—especially if it hasn't rained in a while. Anything made of metal (such as manhole covers, gratings, and steel bridges), painted or wooden surfaces, road markings, and areas on the road where vehicles drip oil become very slippery. Be especially careful of painted striping and markings on the road. Not only is your ability to brake reduced, your ability to accelerate or pedal may also be affected. The rear wheel may spin out from under you if you try to pedal hard, so take it a little easier with the pedals. In wet and cold conditions, watch out for shaded areas on the roadway, where water trends to freeze.

Don't ride far away from civilization when a storm is approaching. At the first sign of lightning, find shelter and wait for the storm to pass. If you are riding in cool or cold conditions, plan to take breaks and end your ride at a place where you can get warm and change into dry clothing. Staying in wet clothes could lead to hypothermia.

Other Hazards



Other hazards include sharp edges or bumps in the road, diversions, slippery conditions, immovable objects, and moving obstructions. A hazard can fall into more than one category. For example, a wet diagonal railroad crossing could have a sharp edge, a parallel diversion, and a slippery surface. Always cross railroad tracks perpendicular to the rails.

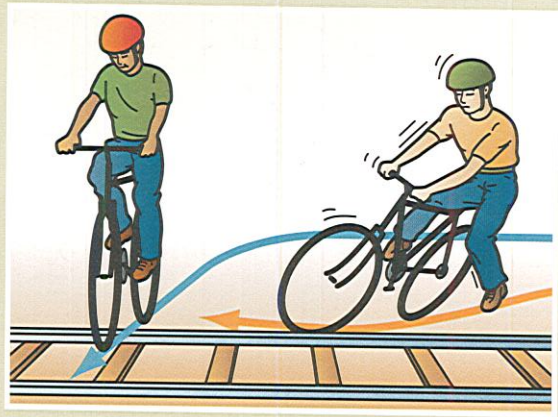
Sharp edges or bumps in the road can cause flats, fold a wheel, or throw you from the bike. The front wheel is more vulnerable to edges because of the weight transfer that occurs when the bike is slowed for any reason. If you cannot dodge this hazard, try to get the bike to "climb" over it. (Never "climb" curbs.) Cross these hazards at their most level or lowest point. Slowing down gives the wheels more time to climb over without compressing the tire and deforming the rim. (See the "Mountain Biking" chapter for more details.)

On a bicycle, you have a limited amount of traction, which is divided between accelerating or decelerating and steering. Slippery conditions reduce traction, so straighten up and steer straight, delaying your braking until better traction is available. *Cross slippery surfaces at right angles, if possible.*

Immovable objects such as concrete barriers are intended to control motor traffic. The only way to handle these hazards, which can cause serious injury to cyclists, is to watch for them and steer clear.

Steer your bike carefully to keep moving objects—toys, balls, etc.—and animals and children from getting under your front wheel. If you see a ball, watch out for a child, too. Most animals will get out of your way, but a loose dog may chase you. If this occurs, steer clear of the dog and keep both hands on the handlebars for control. Get the dog behind you, and try to frighten it off by shouting aggressively until you get past. Shifting to a lower gear and sprinting also is effective. If a dog starts to attack you, get off the bicycle and keep it between you and the dog.

Almost all immovable road hazards appear in front of you. Avoid them by being observant and anticipating problems. If you cannot avoid a hazard but can stop safely, get off the bike and walk around the hazard.



A diversion is any hazard that causes the front wheel to move sideways or out from under the rider *(right).* Cross this type of hazard at a right angle *(left).* If this is not possible and you cannot stop, make the front wheel "climb" over the hazard. The rear wheel may move sideways as a result, but you can get the bike back under you and in control by steering with the front wheel. This works especially well on uneven road edges.

The rock dodge makes your wheels weave around a rock or small pothole while you are riding in a straight line. Use the rock dodge when you cannot swerve too far either way because of traffic or the road edge.

Emergency Maneuvers

The emergency maneuvers described here can be used to handle hazards that occur too quickly for you to use any other measures. Practice these techniques in a safe environment like an empty parking lot or a school **playground**. These skills don't feel natural at first; they should be learned and practiced until they come easily so that if you must use them, you will be prepared to do so.

The Rock Dodge

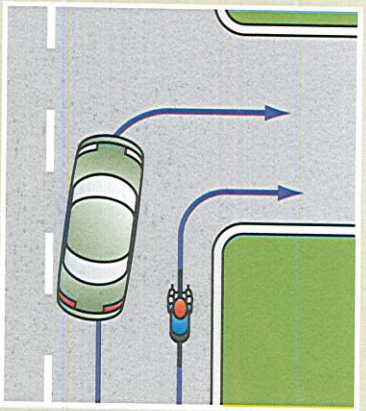
Just before you reach a rock or other obstacle, steer the handlebars left without leaning over first. Just as the front wheel goes around the rock, quickly turn the handlebars right to correct your balance and straighten out. This technique works because your body doesn't have a chance to follow the bike's weaving and you haven't strayed very far from the line you were originally following.

To practice this technique, place a sponge in the path of your bike and practice missing it. This "practice rock" won't hurt you if you hit it. Start slowly, then increase your speed until you can dodge the "rock" at normal speeds.

The Panic Stop

The panic stop is nothing more than a maximum-effort stop without skidding either wheel. You get a gain in braking efficiency when you shift your hips back on the saddle, or even slide off the saddle and place your stomach on the seat. This transfers more of your body weight to the rear wheel and increases its traction.

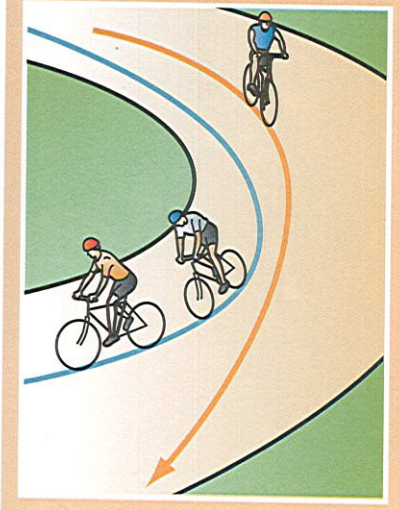
The Instant Turn



Picture this: You are approaching an intersection when the car on your left suddenly begins to turn right. You need to turn right, quickly.

You know that to turn on a bicycle, you lean and then steer the handlebars. How do you get the bike into a quick lean so you can turn in a hurry?

The instant turn is like the rock dodge, except that you do not straighten up at once but let the bike stay in the deeper turn. Steer the bike out from under you to the left for an instant. You will momentarily steer toward the car you want to avoid. Now the bike is leaning right and turning. Raise the leg on the inside of the turn and point your knee outward. This will help you deepen the turn. Then, once you are around the corner, bring yourself back up to a vertical position. Practice the instant turn using a sponge. Start cautiously and increase your speed as you learn.



A variation on the instant turn can help if you are going around a downhill curve too fast. Instead of doing what feels right—braking and steering straight—do not brake. Momentarily straighten the handlebars. This should put you into a deeper lean on the bike and let you get around the curve. If you skid out, you will land on your side and skid to a stop. If you are in danger of going over a cliff or hitting a wall, it may be wise to skid on purpose by hitting the brakes after leaning into the turn.

Touring

Planning the Trip

Touring simply means taking a long bike ride while being more or less self-sufficient. Many bike clubs offer organized tours complete with rest stops, food, and support vehicles. However, you can plan your own tours as well.

Participating in an Organized Tour

Tours offered by bike clubs or other organizations are a great way to take long rides. Some rides raise money for charity; others are strictly for fun.

Organized tours typically offer support and gear (SAG) stops where you can refill water bottles and get a snack, roving SAG vehicles that can help with breakdowns, entertainment, souvenir T-shirts, and more. Some offer a variety of route options, up to a century route (100 miles). Even on a long route, you will be riding with hundreds of other riders, so you won't have to worry about getting lost, bored, or stranded. Local bike shops can tell you about upcoming rides in your area.

Planning a Trip

If you want to plan your own long ride, you should consider these factors:

- Purpose
- Route
- Distance
- Terrain
- Suitability of roadways
- Traffic conditions
- Weather
- Points of interest
- Starting location and time
- Solo or group ride
- Experience, skill, and condition of riders
- Pace and cadence
- Rest stops
- Eating and drinking

You can avoid getting lost by learning to use a map. The *Boy Scout Handbook* explains how to orient a map, locate yourself on it, read the map's symbols, and translate the scale so you know how to gauge map distances on the ground.

The Route: Maps and Cue Sheets

Maps. When we travel by car, we look for the quickest route, which usually means following interstate highways or other multilane roads. Cyclists, however, seek out little-traveled secondary roads. The twists and turns on these back roads discourage automobile traffic and provide cyclists with diversion and scenic splendor.

Since back roads don't always appear on ordinary road maps, you will need to rely on maps from other sources. Topographic maps, obtained by writing to the U.S. Geological Survey in Washington, D.C., are among the best. Digital files of topographic maps are also available for download (with your parent's permission) on the USGS website at www.usgs.gov. Similar maps are available from your state's department of conservation or department of public works.

County engineer offices stock up-to-date maps of all county roads. Many veteran cyclists consider these the most helpful and readily available. You also can get maps from local bicycle clubs, chambers of commerce, tourism agencies, and nature or conservation groups. Local bookstores and outdoor stores are another good source of county maps, atlases, and gazetteers useful for planning rides.

In mapping out your ride, try to plan a return route that's easier than the outgoing route, since you are likely to be less energetic on the return trip. Biking into the prevailing wind going out might give you a tailwind coming back. Hills also seem easier early in the route.

Cue Sheets. Because it's not practical to carry large maps or atlases on a bike, cyclists usually carry cue sheets instead. A cue sheet tells how to follow a planned route. Four kinds of information make useful cues:

- Mileage—the cumulative distance to the nearest tenth of a mile and/or the distance to the next cue
- Signals—traffic-control devices, for example:
  - —TL (traffic light)
  - —SS (stop sign)
  - —Y (yield sign)
- Directions/Actions—which way to go:
  - —L/BL (left/bear left)
  - —R/BR (right/bear right)
  - —X/CR (cross)
  - —S (straight)
  - —TRO (to remain on)
  - —RL or R/L (right, then immediate left [jog right])
  - —LR or L/R (left, then immediate right [jog left])
- Description—name of the roadway and other useful information

For planning purposes, estimate mileage and indicate signals to the best of your knowledge; mapping websites can be helpful. On the ride, modify the cue sheet with actual signals and mileage from a cycle computer, if available. If you are the leader of a group of cyclists, you should ride the route ahead of time to make the cue sheet as accurate as possible. This advance ride will also let you change the route to handle unexpected difficulties such as roadway construction or closed roads or bridges.

Websites like MapMyRide (www.mapmyride.com) let you create accurate cue sheets on a computer.

Solo or Group Riding

Riders should know that biking with a buddy is best, and that solo riders should always tell someone their route, schedule, and destination before departing.

You can ride alone or with a group of other cyclists. Individual riders have more freedom in selecting the distance, pace, time, and route for a ride. However, solo riders must be self-sufficient and have the knowledge, skills, and equipment to take care of themselves on rides. Riding solo also requires extra effort to be visible to other vehicular traffic; brightly colored, conspicuous clothing helps.

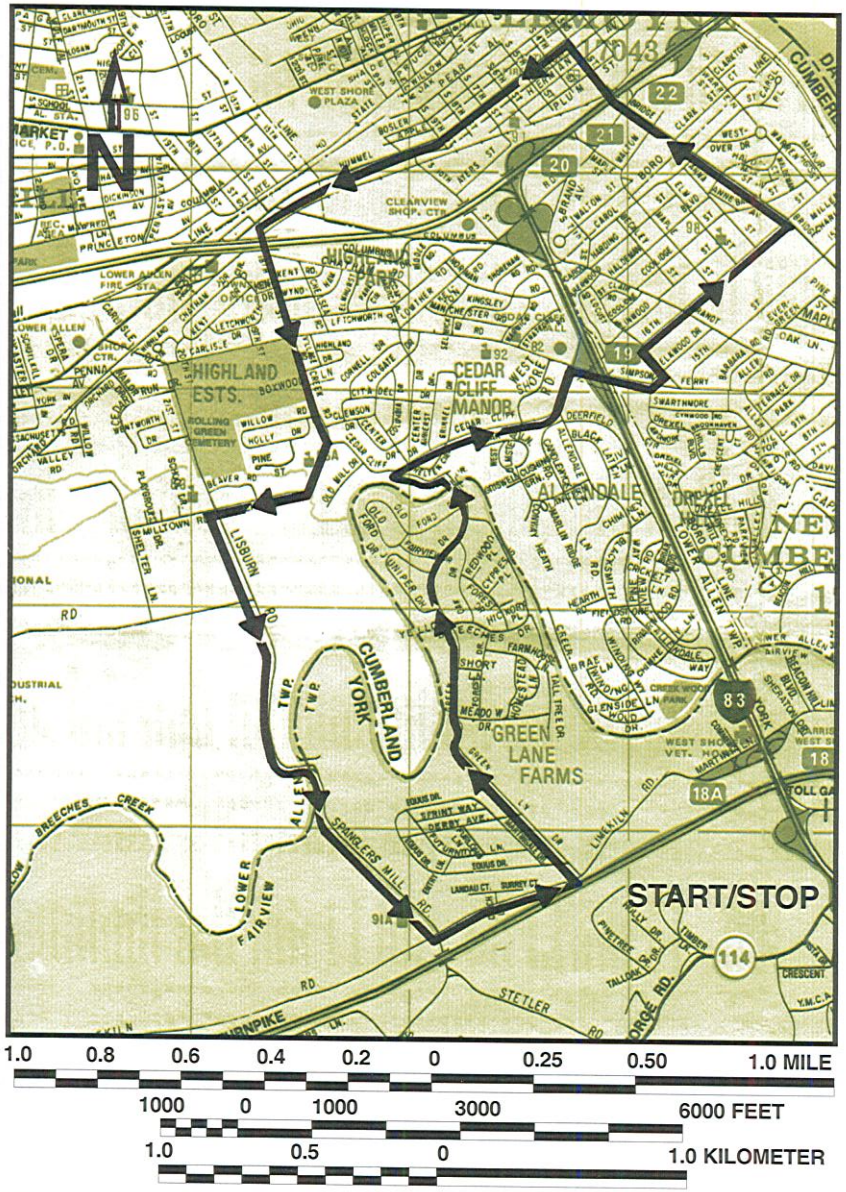
Riding with friends makes the miles fly by because it is simply more fun. In a group, you can gain the confidence to go farther. Because individuals want to finish a ride with their friends, they tend to complete the whole ride and not quit early. Group members don't have to be so self-sufficient because the resources of all riders—both equipment and experience—can be pooled. Plus each person can take a turn at the front blocking the wind, allowing the others to draft behind the lead rider.

Group riding has disadvantages, too. The individual riders must follow the same route and maintain the same pace as everyone else. To an extent, you are responsible for everyone else's safety. All the riders must strive to keep a "safety cocoon" of space—3 feet on level ground and even more on downhill runs—around their bikes.

Sample Cue Sheet

Distance	Signal	Action	Description
0.0		L	Locust Street
0.2	SS	R	Sixteenth Street
3.0	TL	L	Bridge Street (becomes Third Street)
2.1	TL	X	Lowther Street
2.5	TL	L	Humel Avenue
4.1	TL	L	Eighteenth Street (becomes Creek Road)
5.7		BL	Lisburn Road (becomes Spangler's Mill Road)
6.7			Caution: metal deck bridge
7.6		L	Limekin Road
8.4		L	Green Lane Drive
10.3	SS	R	Cedar Cliff Drive
11.5	TL	R	Simpson Ferry Road
11.9		L	Elkwood Street
12.0	SS	L	Locust Street
12.0		L	Home

Legend: SS = Stop Sign; L = Left; R = Right; TL = Traffic Light; X = Cross; BL = Bear Left; BR = Bear Right



When you are on the same road for a long distance, include a cue that indicates a landmark (for example, a crossroads), which will help confirm that you are on the correct route and reduces the chances of taking wrong turns.

Other safety rules for group riding include:

- Never pass another rider on the right side (your left).
- Never ride two abreast on a winding (curving) or hilly road.
- Never "drop" (leave behind) slower riders off the back of the group.

Safe group riding requires a lot of communication among riders. The standard hand signals (right turn, left turn, stop) tell riders about changes in direction or speed. Pointing at road hazards is one way to warn others about them. Many verbal signals also are commonly used for warning others of situations.

Verbal Signals for Warning Others

"On your left!"—I am about to pass you on your left side.

"Stopping (Slowing)!"—I am stopping or slowing down.

"Right (left) turn!"—We are making a turn to the right (left).

"Coming on!" or "Coming off!"—I'm entering (or leaving) the roadway or trail.

"Gravel!"—There is loose material ahead on the roadway.

"Glass!"—There is glass ahead on the roadway.

"Rumbles!"—There are rumble strips (textured strips) on the shoulder of the road.

"Tracks up!"—There are railroad tracks ahead.

"Grate!"—There is a storm grate ahead. (Storm-drain grates can catch wheels and cause falls.)

"Car left (right)!"—A car is approaching from the left (right).

"Car back!"—A vehicle is approaching from the rear. Form a single line as quickly and safely as possible.

"Car up!"—A car is approaching from the front.

"On your wheel!"—I am directly behind you.

"Roadkill!"—There is a dead animal ahead in the roadway.

"Thank you!"—OK/I heard you.

Cadence and Pace

A monitor on a cycle computer can tell you things like your pace, distance you have ridden, and when you have reached the desired rpm.

You will have more fun on a bike trip if you understand the importance of moderation and common sense in setting the pace.

Experience has shown that the best cadence (pedal speed) for riding long distances is 75 to 95 revolutions per minute (rpm). This cadence may feel strange and uncomfortable to you in the beginning; however, practice riding at this cadence and you will find that you can go longer distances with ease. Pedaling at a low cadence will increase your fatigue. Experienced cyclists frequently pedal at cadence levels between 95 and 105 rpm or higher.

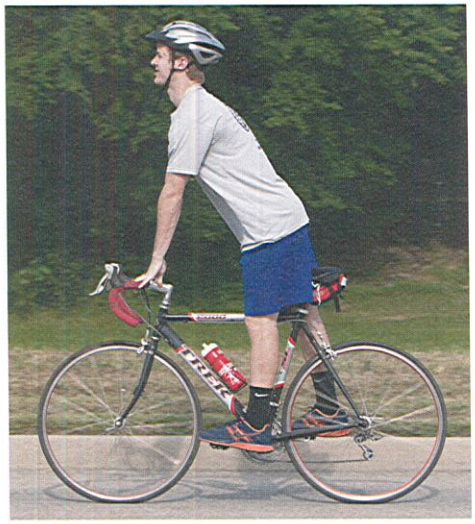
Automobiles measure their speed in miles per hour. Cyclists frequently do the same. If you have a cycle computer, it is tempting to begin your ride at a faster pace than advised—you are fresh, you have lots of energy, and it feels good. However, remember how many miles you expect to travel that day or on that trip. Determine a pace that is comfortable for you—perhaps 10 to 12 miles per hour—and maintain that average for the entire trip. Remember, you will climb hills at a slower pace and go downhill at a faster one. Realize also that riding into the wind, even on flat land, can be at least as difficult as pedaling up a long, steep hill. (Strong winds blowing across the road could throw an unsuspecting cyclist off balance.)

The best part of cycling is the opportunity to see the world around you. When you are in an automobile, the scenery rushes by. Traveling by bike lets you experience things you might otherwise not notice. So set a realistic pace, take rest stops when you feel like it, and enjoy the scenery and your riding companions.

Other Considerations

Staying Comfortable

To ease muscle aches from being in the same position on your bike for several hours, vary your riding position. Move your hands to different places on the handlebars. Remember to keep your elbows flexed. Stiff, rigid elbows will cause fatigue in your hands, shoulders, and back.



Stretch while riding. Every 30 minutes, stand on the pedals, arch your back, and stretch your legs. To prevent upper-body stiffness, do slow neck rolls and shoulder shrugs. When you are out riding, practice stretching so that you will be able to do so effectively on longer rides.

Stops

There are lots of reasons to stop on a ride: to eat and drink; to take pictures or view points of interest; to allow stacked-up motorists to pass on narrow roads; to fix mechanical problems like flat tires; to rest; and to let slower riders rejoin the group. In this last situation, do not resume the ride as soon as the slower riders catch up. The cyclists who just rejoined the group should determine when to resume the ride.

The best place to stop is where all riders can get a safe distance off the roadway and where you are visible to motorists for a long distance. Do not stop in places that interfere with the movement of other vehicles or pedestrians. It is more enjoyable to start down a hill after a rest, so try not to stop at the bottom or in the middle of a hill. Again, do not remain on the roadway while stopped.

Try not to stop for more than 10 minutes at a time during your ride. Longer rest stops can make you stiff and zap your motivation.

Nutrition

Food provides the energy necessary for cycling. From the foods you eat, your body gets the nutrients it needs, including carbohydrates, fats, and protein. Carbohydrates are the primary energy source for recreational cycling. Fats, also an energy source, are more important in endurance sporting events (such as track-and-field events or marathon running). Proteins maintain and repair cells throughout the body.

Carbohydrates come in simple and complex forms. Simple carbs, also called sugars, are found in fruits and vegetables. They provide quick energy and are not stored by the body to maintain energy. Complex carbs, also called starches, are found in pasta, breads, and cereals. They provide the long-term energy you need for a long bicycle ride. Eating a dinner of pasta the day before a big ride and a breakfast of cereal and a bagel or an English muffin the day of the ride will provide a good energy foundation.

The basic rule of refueling while cycling is: *Eat before you are hungry and drink before you are thirsty.*

Oils, fats, and sweets are not considered a food group. Try to limit your intake of fats and sweets, which are high in calories and difficult for the body to digest.

Proteins are important to the body's maintenance and repair of cells. You should eat foods containing proteins—such as meats, cheese, nuts, and peanut butter—in moderate amounts to keep a nutritional balance in your body.

Fig bars, granola bars, and dried fruits (raisins, apricots, pineapple, etc.) are excellent natural sources of the carbohydrates that will keep you going during your ride. They are also a good substitute for satisfying your sweet tooth. Plan to refuel every 20 minutes or at least every 10 miles.

Bananas are a cyclist's mainstay. They provide carbs as well as other vitamins and nutrients that the body uses in large amounts while cycling.

Water

You will perspire more heavily than usual while cycling, but you may not notice since the wind quickly dries your sweat. Dehydration is a serious condition that you should work to prevent. The day before your ride, drink more water than usual to "superhydrate" your body in preparation for the exertion of the ride. Plan to drink one bottle (about 20 ounces) of water per hour or every 10 to 12 miles of your ride. If the weather is exceptionally hot and humid, increase the amount and frequency of your drinking.

You may want to take along sports drinks, some of which contain carbs, vitamins, and other nutrients to keep you going. However, many of these drinks contain a lot of sugar and sodium, so read the labels and choose carefully. Avoid soft drinks, which have lots of sugar and no nutrients.

For an enjoyable ride, eat and drink at a slow, steady pace. Your route should include rest stops at regular intervals. If you plan when and what you will eat, your body will enjoy the ride as much as the rest of you will.

If you find yourself feeling light-headed and ill on a very hot day, you may be experiencing the early signals of dehydration. Get off your bike and get help to rehydrate before continuing your ride.

Mountain Biking

Just as cycling on the road requires you to master certain skills and maneuvers, so, too, does trail riding. To get started on the right path to mountain biking, start by choosing the right bike for you.

The Right Bike for the Right Use

There are three basic types of mountain bikes.

Rigid mountain bikes have no front or rear suspension (shock absorbers). These bikes are great for riders with beginner to intermediate abilities because the lack of cushioning makes you feel every bump on the trail, encouraging you to take the smoothest line of approach. Mountain bikes are also usually reasonably priced and easier to maintain than other types.

Hardtail mountain bikes have shock-absorbing suspension for the front wheel but no suspension for the back wheel. Front shocks allow the steering wheel to stay planted on the ground while riding over small bumps and improve overall handling and control. Hardtail bikes are designed for all abilities, tend to cost more than rigid bikes, and require good mechanical ability to service. Hardtails are best suited for intermediate to rough trail conditions.

Full-suspension mountain bikes use shock-absorbing suspension technology for the front and rear wheels. Shocks on both wheels improve handling and control at higher speeds by helping to smooth out rough terrain. Full-suspension bikes are designed for riders with intermediate to advanced abilities. They are more costly than rigid and hard-tail mountain bikes and are usually the heaviest of the three types. Full-suspension bikes require the most maintenance to keep all their moving parts working correctly.

Because there are many types of mountain bike frames and accessories, it is important to work with a knowledgeable bike shop to find the combination that is right for you. The best way to tell if a new bike, frame, or accessory is right for you is to try it where you like to ride, the way you like to ride.

Sharing the Path

Perhaps the most important thing you can learn about riding on a public mixed-use path is proper trail courtesy. Respect other trail users, such as walkers, joggers, people on horseback, and in-line skaters. Yield to slower users, and let others know you are approaching. And consider this: when a speeding cyclist hits someone or something, the bicycle rider is usually the more seriously injured party.

Sometimes cyclists like to venture beyond the easy trails that also are used by walkers or casual cyclists. The narrow mountain trails that crisscross the wilderness are called singletrack. Riding singletrack involves more skill and training than riding flat, wide, mixed-use paths. Some of the most important skills for singletrack riding are navigating rough terrain, climbing, and descending steep hills.

Preserving the Path

Like many recreational activities, mountain biking can damage the environment if riders are careless. To minimize your impact, follow these guidelines:

- Ride only on established, open trails. Check park maps or trail signposts.
- Do not ride on wet trails.
- Do not skid or spin out.
- Preserve switchbacks by slowing down on corners. Never take shortcuts on switchbacks.
- Preserve water bars by riding directly over them or dismounting and walking across. Never ride around them.

Riding Rough Terrain

Manipulating a mountain bike over rocks, roots, logs, and other trail hazards is a skill. Find the path of least resistance with your front wheel and look where you want to go. Keep your weight back and off the saddle, and your arms bent at the elbow. To maintain control, don't lock up the wheels by braking too hard.

Keep your grip firm, and your elbows, knees, ankles, and shoulders relaxed. Your arm muscles should be as relaxed as possible, too, while still controlling large movements of the front wheel from side to side and up and down. Your leg muscles must also remain relaxed while still providing the necessary power to the pedals. This allows your body to act as a shock-absorbing system.

Rules of the Trail

You should always follow these rules of the trail, formulated by the National Off-Road Bicycle Association:

- Yield the right-of-way to other nonmotorized recreationists.
- Use caution when overtaking another rider and make your presence known well in advance.
- Maintain control of your speed at all times.
- Stay on designated trails.
- Do not disturb wildlife or livestock.
- Do not litter.
- Respect public and private property.
- Be self-sufficient.
- Do not travel solo when bike-packing in remote areas.
- Observe the practice of minimum-impact bicycling.
- Always wear a helmet when you ride.

Take more weight off the front wheel when riding over obstacles. The trick is to maintain directional control while flowing over any and all obstacles.

Crossing Obstacles

Mountain trails offer a variety of obstacles—from branches to boulders. Not all obstacles are safe to cross on a bike, especially if you are just getting started. Do not feel bad about dismounting and walking your bike around or over an obstacle.

If you come upon an obstacle about 6 to 10 inches high, you can try to cross it using this technique:

Step 1—As you approach the obstacle, stand up on your pedals with your weight shifted back a bit, keeping your knees and elbows relaxed. Make sure you are in a relatively easy gear.

Step 2—When your front wheel gets close to the obstacle, pull up sharply on the handlebars to let the front wheel climb onto the obstacle. Do not use your brakes. Lean back a little, but not so far that you tip over backward.

Step 3—Once your front wheel is on the obstacle, push forward on the handlebars and move your hips forward. If you have clipless pedals, lift with your feet. These actions plus your momentum should pull the back wheel up onto the obstacle.

Step 4—Continue pushing with your arms until you are over the obstacle. Keep your body and knees compressed.

The Bunny Hop

For small obstacles, try the bunny hop. First gain some momentum. Then, just before reaching the obstacle, crouch on the bike, pushing your weight forward on the handlebars and downward as much as possible. At the last moment, pull up on the handlebars and pedals, stand up, and spring over the obstacle. This is a sharp, quick burst of energy. Do not sit in the saddle until you have "landed." Performing effective bunny hops takes practice—and lots of it.

Other Skills

That is just the tip of the mountain when it comes to single-track. Other types of off-road cycling may intrigue you, too, such as free riding, cross-country cycling, and downhill racing, as well as wheelies and other special maneuvers that make every mountain biking experience unique.

The best way to find out more about any form of off-road riding is to find experienced groups in your area. To learn more about any of these off-road sports, visit the websites for the cycling organizations listed in the resources section of this pamphlet.

It's difficult for novice mountain bikers to know how to choose trails that are right for their skill level. You don't want to pick ones that are too tricky or dangerous; that will just leave you feeling frustrated, defeated—and possibly injured. Instead, select trails that offer just the right amount of challenge, excitement, and adventure. That will allow you to enjoy your newfound hobby and build your level of skill. Ask your merit badge counselor for advice.

Four Tips to Improve Steep Climbs

Having the right strengths and, more importantly, the right skills for climbing a steep hill separates the advanced mountain biker from the beginner. Any hill can be a challenge depending upon your experience, your bike, how tired you are, and the kind of surface you are riding. Steep hills expose the limits of your equipment, technique, and fitness level.

You can work on your technique more easily when climbing, because you are moving more slowly. Maintaining your balance becomes very important at slower speeds. Since the wheels are no longer spinning quickly, you do not have the gyroscopic effect to help keep you upright.

1. Shift Weight Forward. When entering a steep climb, shift your weight forward just a bit. This helps improve control and keeps the front wheel on the ground, but leaning too far forward reduces rear wheel traction, which can cause you to spin out. Shifting to one of the lowest gears prior to starting the climb makes the effort easier on you and your bike.

2. Lower Your Center of Gravity. When climbing a steep hill, move forward onto the tip of the saddle, bend your elbows down, and lean toward the handlebars. Relax your upper body and keep a firm grip on the handlebars. This will lower your center of gravity, stabilize your balance, and improve traction to the rear wheel, making climbing much easier. Do not stand up on the pedals during steep climbs. Standing will shift your weight too far forward and you will lose rear wheel traction. Staying seated is the best position for steep climbs.

3. Pull Down and Back Against the Handlebars. Drop your wrists and bend your elbows. Pull down and back against the handlebars. Timing the pull of your hand against the push of the pedal stroke helps improve traction.

4. Stay Smooth. Do not rock your upper body from side to side; keep your hips steady on the seat. Leaning to one side reduces traction. Do not waste your energy. Keep your breathing steady.

Four Tips for Steep Descents

One of the great joys of mountain biking is the exhilaration of riding downhill, particularly a steep hill. Singletrack skills must be practiced many times before they become second nature.

Never ride down a steep hill or trail without knowing if the trail is open to bikes and whether other trail users such as hikers, horseback riders, hunters, or all-terrain vehicles are allowed to use the same trail. Never ride on trails closed to mountain bikes, no matter how tempting that may be.

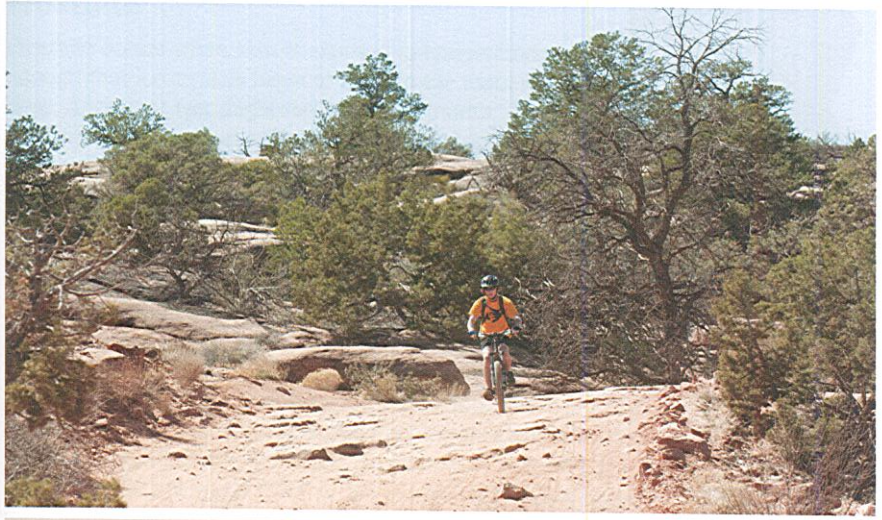
Steep slopes (20 percent grade or more) will erode and change when exposed to rain, wind, and trail users. Bicycling professionals would not think of riding a new section of downhill singletrack without first inspecting the trail. Never be afraid to walk down a hill that is inappropriate for you because of unusual weather, the wrong equipment, or the need for more practice. Always have a place to make an emergency stop on a new hill.

1. Be Ready at the Start of the Hill. Put your bike in the highest gear of your chainrings and in the middle gear of your rear sprockets. Keep your cranks horizontal to minimize contact between the pedals and rocks or logs. When the terrain permits, pedal to increase downhill speed if desired, returning quickly to the parallel-to-the-ground position.

A tough hill calls for secure handholds on the handlebars with just a finger holding the brake levers. Remember that bent elbows and relaxed arm and leg muscles act as shock absorbers, reducing wear and tear on the body.

2. Start Slowly. The steeper the descent, the slower you should start your ride. Once you have started downhill in earnest, you may find it very difficult to slow down. Using too much braking power on steep descents, especially on loose rocks, gravel, or dirt, can cause loss of traction, so balancing speed with control is the key to a safe downhill ride.

Avoid grooves caused by water runoff or previous riders. If you find yourself in a groove, try not to brake suddenly; that won't help you slow down but will only make the groove worse. Weave from side to side until you find firmer ground.



The faster you are traveling, the farther you should look to anticipate avoiding or riding over tree limbs, rocks, and other obstacles. Part of the art of downhill riding is picking the best "line," or most enjoyable ride.

3. Keep Your Weight Back on the Bike. Slide back on the bicycle. Sometimes you may end up with your arms fully extended and your rear over the back wheel, just as in the emergency stop on the road described in the chapter on riding skills. Do not move your weight back that far, however, unless you are on a steep hill, and do not move too fast even then, or you will lose control over the front wheel.

4. Avoid Skids. Do not brake too hard with the rear brake or you will lock the rear wheel, causing it to slide along the surface and damage the trail. If your rear wheel starts to skid, let up on the rear brake.

Under extreme conditions, even the front wheel may skid. The same trick for stopping the rear wheel from skidding works here, too—just let go of the front brake a bit. The front brake is doing most of the stopping, however, so be prepared to reapply the front brake almost immediately. If you still skid, turn in the direction of the skid so that you do not fall.

Cycling and First Aid

While cyclists can prepare for their rides by keeping their bodies and bikes fit and by planning their routes, first-aid situations will sometimes arise. All riders should be prepared to take action.

Hypothermia

Hypothermia occurs when a person's body is losing more heat than it can generate. Exposure to the cold and dehydration are contributing factors. Wind, rain, hunger, and exhaustion can further compound the danger. Temperatures do not need to be below freezing. A cyclist caught out in a cold, windy rainsquall without proper raingear can be at great risk.

A hypothermia victim may experience numbness, fatigue, irritability, slurred speech, uncontrollable shivering, poor judgment or decision making, and loss of consciousness. After calling for help, use any or all of the following methods to help rewarm the person.

- If the person is fully conscious and able to swallow, have him or her drink warm liquids, such as soup, fruit juices, or water, but no caffeine or alcohol.
- Move the person to a shelter. Replace wet clothing with dry, warm clothes or wrap the person in anything handy like jackets or a sleeping bag.
- Wrap towels around water bottles filled with warm fluid, then position the bottles in the person's armpit and groin areas.

Monitor a hypothermia victim closely for any change in condition. Do not rewarm the person too quickly (for instance, by immersing the person in warm water); doing so can be dangerous to the heart.

Frostbite

Frostbite occurs when skin is exposed to temperatures cold enough that ice crystals begin to form in the tissues. The ears, nose, fingers, or feet might feel painful or numb, though the person may not notice any such sensation. Grayish-white patches on the skin signal the first stage of frostbite, or frostnip.

To treat frostnip, move the victim into a tent or building, then warm the injured area. To rewarm an ear or cheek, remove a glove and cover the area with the palm of your hand. Slip a frostnipped hand under your clothing and tuck it beneath an armpit. Treat frostnipped toes by putting the victim's bare feet against the warm skin of your belly.

To treat frostbite, remove wet clothing and wrap the injured area in a dry blanket. Get the victim under the care of a physician as soon as possible. Do not massage the area or rub it with snow. **Rewarm the area only if there is no chance of refreezing.** Expose the area to warm (100° to 105° F) water until normal color returns and the skin feels warm. Bandage the area loosely with dry, sterile gauze between fingers and toes.

Dehydration

When we lose more water than we take in, we become dehydrated. Symptoms of mild dehydration include increased thirst, dry lips, and dark yellow urine. Symptoms of moderate to severe dehydration include severe thirst, dry mouth with little saliva, dry skin, weakness, dizziness, confusion, nausea, cramping, loss of appetite, decreased sweating (even with exertion), decreased urine production, and dark brown urine.

For mild dehydration, have the victim drink a quart or two of water or a sports drink *over two to four hours.* The person should rest for 24 hours and continue drinking fluids. See a physician for moderate to severe dehydration, which requires emergency care; the victim will need intravenous fluids.

Dehydration increases the danger of frostbite, so be just as diligent about drinking fluids in cold weather as you are when the weather is hot. Drink before you feel thirsty—thirst is an indication you are already becoming dehydrated.

Heat Exhaustion

Heat exhaustion happens when the body becomes overheated. Symptoms include a severe lack of energy, general weakness, headache, nausea, faintness, heavy sweating, pale and clammy skin, and muscle cramps.

To treat heat exhaustion, get the person into a shady, cool spot. Encourage him to drink small amounts of fluids, such as cool water or a sports drink. Apply water to his skin and clothing and fan him. Raising the legs may help prevent a feeling of faintness. Usually after two or three hours of rest and fluids, the victim will feel better but should rest for the remainder of the day and be extra careful about staying hydrated.

Heatstroke

In heatstroke, the body's cooling system fails and the person's core temperature rises to life-threatening levels (above 105 degrees). Dehydration and overexertion in hot weather, especially in high humidity, can lead to heatstroke. Symptoms can include hot, red skin that can be either dry or damp with sweat, confusion, disorientation, a rapid pulse, and in severe cases, unconsciousness.

If you suspect someone is suffering from heatstroke, seek immediate medical assistance. Work quickly to lower the victim's temperature. Move the person to a shady, cool area. Loosen tight clothing, fan the victim, and apply wet towels. If you have cold packs, wrap them in a thin barrier (such as a T-shirt) and place them under the person's armpits and against the neck and groin. If the person is able to drink, give small amounts of cool water.

Cuts and Scratches

Wash cuts, scratches, and scrapes with soap and water. Allow to air dry. Apply antiseptic to help prevent infection. Keep the wound clean with an adhesive bandage. Clean and rebandage small wounds daily. Cover larger wounds with a sterile gauze pad or a clean cloth folded into a pad. Hold the pad in position with tape or a bandage.

Sunburn can cause lasting skin damage and the potential for skin cancer. Cover up to prevent sunburn, and use plenty of sunscreen with a sun protection factor (SPF) of at least 15. Reapply frequently, even on cloudy days. To ease the pain of a mild sunburn, apply cool, wet cloths to the affected area. A soothing lotion containing chamomile or aloe vera may provide relief.

Blisters

Blisters are pockets of fluid that form when the skin is irritated by friction. A hot spot—the tender area as a blister starts to form—is a signal to stop and take preventive action. To help prevent foot blisters, wear shoes or boots that fit, change socks if they become sweaty or wet, and pay attention to how your feet feel. To help prevent blisters on the hands, wear gloves for protection and pay attention to how your hands feel.

To treat a hot spot, cover the pinkish, tender area with a piece of moleskin or molefoam slightly larger than the spot. Use several layers if necessary. If you must drain a blister, wash the skin with soap and water, then sterilize a pin in the flame of a match. Prick the blister near its lower edge and press out the fluid. Change bandages every day to help keep wounds clean and avoid infection.

Bites and Stings

Ticks. To avoid tick bites, wear long pants and a long sleeves whenever you are in tick-infested woodlands and fields. Ticks bury their heads beneath the skin of their victims. To remove a tick, with gloved hands, grasp it with tweezers close to the skin and gently pull until it comes loose. Do not squeeze, twist, or jerk the tick, as doing so could leave its mouthparts still buried in the skin and may cause the tick to release more of any disease-carrying bacteria. Wash the wound with soap and water and apply antiseptic. Thoroughly wash your hands after handling a tick.

Fire ants. The sting of a fire ant can be extremely painful, and it's also possible to have an allergic reaction to a sting. (See the text box on anaphylactic shock.) Be careful not to break the tiny blisters that form. Wash the area well using antiseptic or soap and water. Cover with a sterile bandage. For relief, try a paste made of baking soda and water, and take a mild nonaspirin pain reliever.

Bee, wasp, or hornet stings. If you are stung by a bee, wasp, or hornet but are not allergic to their stings, remove the stinger by scraping it out with a knife blade. Do not try to squeeze the stinger out. Doing so will force more venom into the skin from the sac attached to the stinger. Use a cold pack to help reduce pain and swelling.

For people who are allergic to bee or wasp venom or fire ant stings, a life-threatening reaction called *anaphylactic shock (anaphylaxis)* can occur. Symptoms can include a swelling of throat tissues or tongue that makes breathing difficult or even impossible. Any Scout who has an allergy that could cause anaphylactic shock should share that information with his unit leaders and let them know where anaphylaxis medications are kept so that they can be made available at a moment's notice.

Scorpion stings. The stings of common scorpions can cause severe pain, swelling, and itching. Wash the wound with soap and water and remove jewelry. Apply a cold pack or cool compresses. Do not cut into the wound or apply suction. Acetaminophen or an over-the-counter antihistamine may provide relief; avoid aspirin and ibuprofen. More rare, and far more dangerous, are the stings of certain desert scorpions that live in the border country of Arizona, New Mexico, and California. In the case of a venomous sting, treat for shock and immediately seek medical help.

Snakebites. The nonvenomous snakebite causes minor puncture wounds and can be treated as such. Scrub the bite with soap and water, apply an antiseptic, and cover with a sterile bandage. However, the bite of a venomous snakebite requires special care.

Step 1—Get the victim under medical care as soon as possible so that physicians can neutralize the venom.

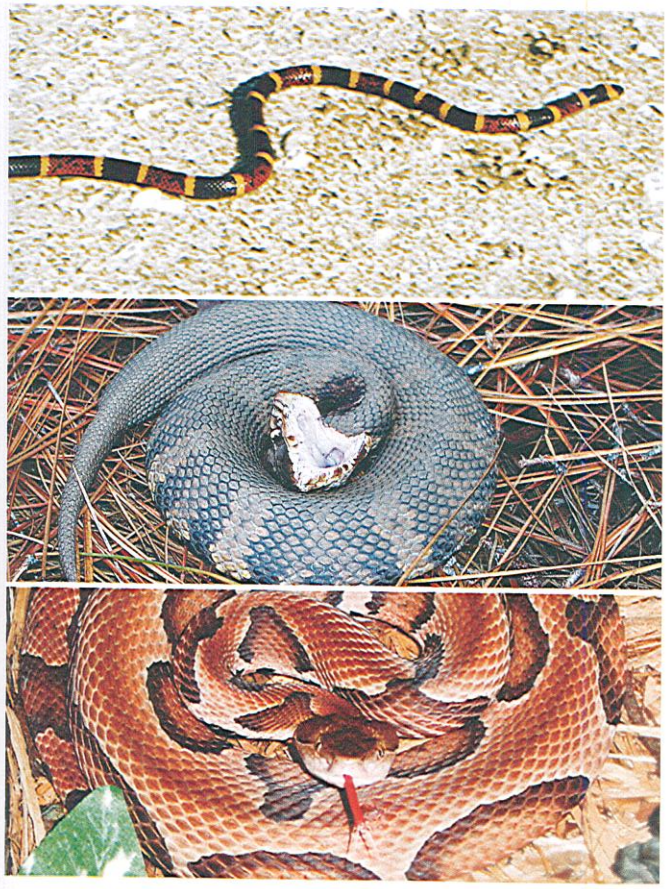
Step 2—Remove rings and other jewelry that might cause problems should the bite area swell.

Step 3—If the victim must wait for medical attention to arrive, wash the wound. For a coral snakebite, wrap the area snugly (but comfortably) with an elastic roller bandage.

Step 4—Have the victim lie down and position the bitten part lower than the rest of his body. Keep him calm and assure him that he is being cared for.

Step 5—Treat for shock.

For more information about snakebites, see the *First Aid* merit badge pamphlet.



Coral snake

Cottonmouth moccasin

Copperhead

The venom of a coral snake works on the nervous system. Signals of a coral snakebite include slowed physical and mental reactions, sleepiness, nausea, shortness of breath, convulsions, shock, and coma. Pit vipers include rattlesnakes, copperheads, and cottonmouths. These snakes have triangular-shaped heads with pits on each side in front of their eyes. Their venom affects the circulatory system. Signals of a pit viper bite include puncture marks, pain and swelling (perhaps extreme), skin discoloration, nausea and vomiting, shallow breathing, blurred vision, and shock.

Improving as a Cyclist

The Cycling Journal

A cycling journal is essential to improving your riding. Keeping a journal will enable you to gauge your progress, help you to recognize why on certain days riding felt exceptionally good, and let you build on the unique experiences you have. It also will give you material for the reports you need to write to fulfill requirement 7 of the Cycling merit badge.

Mileage and Experience

Keep a steady record of the mileage you complete each time you go for a ride. You may find that 10 miles is long for a beginning ride. Start your journal, however, with the first ride you take, regardless of the length. Then, ride five miles one day and five miles another day in the same week. You need not take a trip to accomplish this. Do you know the length of your street? Ride up and down your street continuously until you have completed five miles. The next week, repeat the process, except this time, ride seven miles at a time.

In your journal, record also what you eat and drink every day, especially what you eat and drink while riding. As your mileage per ride increases, you will find that certain foods and drinks will fuel you more comfortably for a long ride. Your journal will help you clarify what you enjoyed about each ride and help you isolate things that you would like to do differently on your next ride.

Sample Journal Entry

Date:_____ Hours slept:_____

Nutrition: (Record what you ate for each meal and snacks.)

Breakfast: _____

_____

Lunch:_____

_____

Dinner: _____

_____

Snacks: _____

_____

Distance ridden today: _____

Route and type of terrain:_____

_____

_____

Weather: _____

Remarks: _____

_____

_____

_____

_____

_____

_____

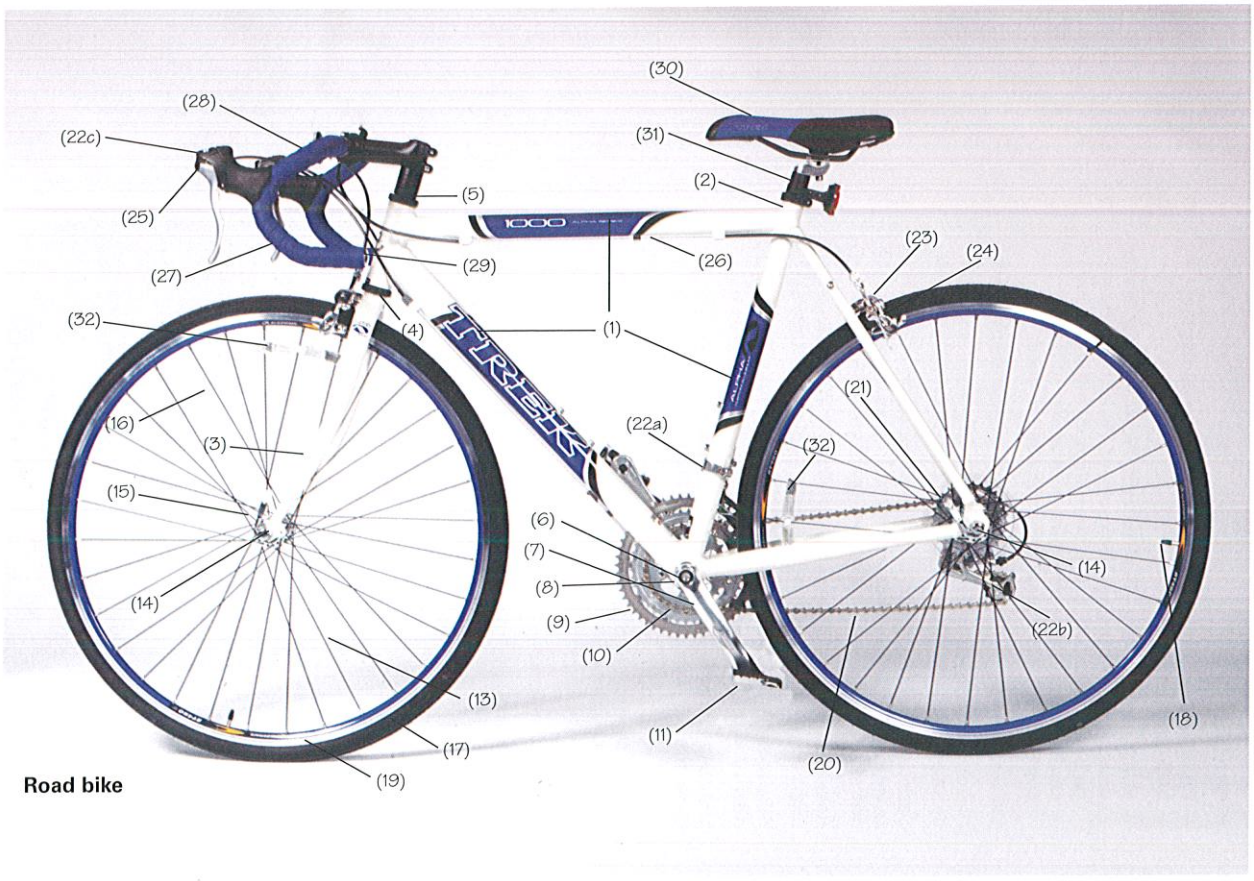
Use your journal as notes for the reports you write for requirement 7.

Appendix

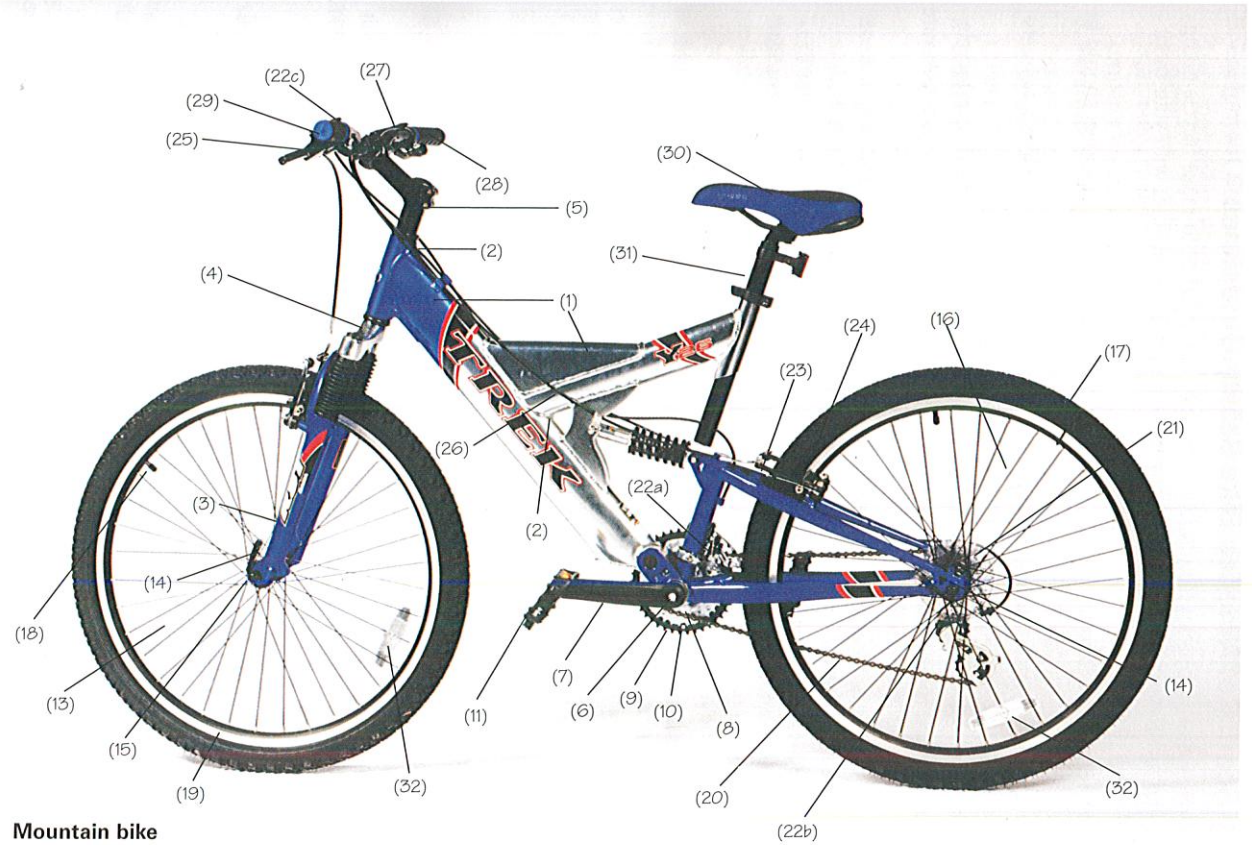
Bicycle Safety Checklist

Use this list, or another provided by your counselor, to be sure your bike is ready for inspection—and the road or trail.

- ☐ Frame (1)—Clean and not bent out of shape. No cracks at frame joints (2).
- ☐ Front fork (3)—Clean and not bent out of shape. No cracks at fork joints (4).
- ☐ Headset bearing (5)—Well lubricated; turns freely with no binding. No perceptible play in the assembly.
- ☐ Bottom-bracket bearing (6)—Turns freely with no more than barely perceptible play in the bearing.
- ☐ Crank arms (7)—Clean and not bent out of shape. Tightened securely on the crankset axle (8).
- ☐ Chainrings (9)—Clean, not worn, and not bent out of shape. Chainring bolts (10) tightened securely to hold chainrings to crank arms.
- ☐ Pedals (11)—Tightly screwed into crank arm. Flat bearings well-lubricated; turn freely with no perceptible play in the bearing. (12) or clipless pedals functional.
- ☐ Wheels (13)—Run true and round. Centered in fork or frame members. Wheel nuts tight. Closed and tight quick-releases (14).
- ☐ Wheel bearings (15) in hubs—Well lubricated and properly adjusted to move freely with no more than barely perceptible play.
- ☐ Spokes (16)—None broken or bent. Tightened to a uniform tension.
- ☐ Tires—Good tread (17). Valves (18) completely airtight. Properly inflated to recommended pressure.
- ☐ Rims (19)—Clean of oil and grime. Free of dents or kinks.
- ☐ Chain (20)—Proper tension, allowing ½ inch of play. No stiff links. Clean, lubricated, and wiped of excess lubrication.
- ☐ Gearing (21)—Clean and oiled. Three-speed gears adjusted to eliminate all slipping. Front (22a) and rear (22b) derailleurs adjusted for proper shifting with shifters (22c).
- ☐ Brakes (23)
  - — Coaster: even braking. Operate within a 20-degree back-pedaling motion.
  - — Hand: even braking. All nuts tight. Front and rear brakes work without binding. Minimum of 3/16 inch of rubber on brake pads (24). Brake pads aligned with rims and contact rims with a minimum movement of hand controls (25). No squeal when brakes are used.
- ☐ Cables (26)—No frayed ends. No broken strands. All taut.
- ☐ Handlebars (27)—Tightened securely. Grips (28) not worn; fit snugly. Adjusted to comfort of rider. Ends (29) plugged.
- ☐ Saddle (30)—Height, tilt, and fore/aft position adjusted to rider. All adjustments securely tightened. Seatpost (31) not extended beyond maximum mark on post.
- ☐ Rear red reflectors/lights (32)—Visible for 300 feet. Lights/blinkers functional with generator or batteries.
- ☐ Bike registration—If required by local law, must be displayed on frame.
- ☐ Lights (optional)—Front light visible for 500 feet. Generator or battery in good operating condition.
- ☐ Bell or horn (optional)—In good operating condition. All accessories well-tightened and securely fastened. No broken frames or fasteners.



Road bike



Mountain bike

Boy Scouts of America Bike Safety Guidelines

The Boy Scouts of America Bike Safety Guidelines are designed to make bicycle riding safer and more enjoyable for you and others. Review these guidelines with your merit badge counselor.

Sweet 16 of BSA Safety. As with all Scouting activities, these principles should be applied in your cycling event.

Wear a properly fitted helmet. Protect your brain; save your life! Bicycle helmets can reduce head injuries by 85 percent, according to the NHTSA.

Adjust your bicycle to fit. Make sure you can stand over the top tube of your bicycle.

Assure bicycle readiness. Make sure all parts are secure and working well. Assure that tires are fully inflated and brakes are working properly.

See and be seen. Wear clothing that makes you more visible, such as bright neon or fluorescent colors. Wear reflective clothing or tape. Avoid riding at night.

Watch for and avoid road hazards. Stay alert at all times. Be on the lookout for hazards, such as potholes, broken glass, gravel, puddles, leaves, animals, or anything that could cause you to crash. If you are riding with friends and you are in the lead, call out and point to the hazard to alert the riders behind you.

Follow the rules of the road. Check and obey all local traffic laws. Always ride on the right side of the road in the same direction as other vehicles. Go with the flow— not against it! Yield to traffic and watch for parked cars.

For more information on bicycle safety, visit the National Highway Traffic Safety Administration (NHTSA) website at www.nhtsa.dot.gov.

The Sweet Sixteen of BSA Safety

These 16 safety points, which embody good judgment and common sense, are applicable to all activities:

1. **Qualified Supervision.** The activity should be supervised by a conscientious adult who understands and knowingly accepts responsibility for the well-being and safety of the children and youth in his or her care.
2. **Physical Fitness.** For youth participants in any potentially strenuous activity, the supervisor should receive a complete health history from a health-care professional, parent, or guardian. The supervisor should adjust all supervision, discipline, and protection to anticipate potential risks associated with individual health conditions.
3. **Buddy System.** The long history of the buddy system in Scouting has shown that it is always best to have at least one other person with you and aware at all times of your circumstances and what you are doing while cycling.
4. **Safe Area or Course.** A key part of the supervisors' responsibility is to know the area or course for the activity and to determine that it is well-suited and free of hazards.

5. **Equipment Selection and Maintenance.** Most activity requires some specialized equipment selected to suit the participant and the activity and to include appropriate safety and program features. The supervisor should also check equipment to determine whether it is in good condition for the activity and is properly maintained while in use.
6. **Personal Safety Equipment.** The supervisor must ensure that every participant has and uses the appropriate personal safety equipment. For example, cycling requires a helmet properly worn by each participant. Everyone should be dressed for warmth and utility depending on the circumstances.
7. **Safety Procedures and Policies.** Common-sense procedures and standards can greatly reduce risk. These should be known and appreciated by all participants, and the supervisor must ensure compliance.
8. **Skill Level Limits.** The supervisor must identify and recognize the minimum skill level for the activity and be sure that no participants are put at risk by attempting an activity beyond their ability.
9. **Weather Check.** The risk factors in many outdoor activities vary substantially with weather conditions. These variables and the appropriate response should be understood and anticipated.
10. **Planning.** Safe activity minimizes risks and follows a plan that has been conscientiously developed by the experienced supervisor or other competent source.
11. **Communications.** The supervisor needs to be able to communicate effectively with participants as needed during the activity. Emergency communications also need to be considered in advance.
12. **Permits and Notices.** BSA tour and activity plans, council office registration, government or landowner authorization, and any similar formalities are the supervisor's responsibility when such are required.
13. **First-Aid Resources.** The supervisor should determine what first-aid supplies to include among the activity equipment. The level of first-aid training and skill appropriate for the activity should also be considered.
14. **Applicable Laws.** BSA safety policies generally parallel or go beyond legal mandates, but the supervisor should confirm and assure compliance with all applicable regulations or statutes.
15. **CPR Resource.** Any strenuous activity or remote trek could present a cardiac emergency. The BSA strongly recommends that a CPR-trained person (preferably an adult) be part of the leadership for any BSA program.
16. **Discipline.** No supervisor is effective if he or she cannot control the activity and individual participants. Youth must respect their leader and follow his or her direction.

For the full Sweet Sixteen safety procedures, go to www.scouting.org/HealthandSafety/Sweet16.aspx.

Cycling Resources

Scouting Literature

Fieldbook; Deck of First Aid; Emergency First Aid pocket guide; *First Aid* merit badge pamphlet

Visit the Boy Scouts of America's official retail website (with your parent's permission) at http://www.scoutstuff.org for a complete listing of all merit badge pamphlets and other helpful Scouting materials and supplies.

Books

Baker, Arnie. *Smart Cycling: Successful Training and Racing for Riders of All Levels.* Fireside, 1997.

Burke, Edmund R., and Ed Pavelka. *The Complete Book of Long-Distance Cycling: Build the Strength, Skills, and Confidence to Ride as Far as You Want.* Rodale Press, 2000.

Clark, Nancy, and Jenny Hegmann. *The Cyclist's Food Guide,* 2nd ed. Sports Nutrition Publishers, 2011.

Downs, Todd. *The Bicycling Guide to Complete Bicycle Maintenance and Repair: For Road and Mountain Bikes,* 6th ed. Rodale Press, 2010.

Forester, John. *Effective Cycling,* 7th ed. MIT Press, 2012.

Friel, Joe. *The Cyclist's Training Bible,* 4th ed. VeloPress, 2009.

———. *The Mountain Biker's Training Bible.* VeloPress, 2000.

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Hewitt, Ben. *Bicycling Magazine's New Cyclist Handbook,* revised ed. Rodale Press, 2005.

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Zinn, Lennard. *Zinn & the Art of Mountain Bike Maintenance,* 5th ed. VeloPress, 2010.

———. *Zinn & the Art of Road Bike Maintenance,* 3rd ed. VeloPress, 2009.

Magazines

Bicycling
400 South 10th Street
Emmaus, PA 18098
Website: http://www.bicycling.com

BMX Plus!
25233 Anza Drive
Valencia, CA 91355
Website: http://www.bmxplusmag.com

Mountain Bike
Website: http://www.mountainbike.com

Organizations and Websites

Adventure Cycling Association
Toll-free telephone: 800-755-2453
Website: http://www. www.adventure-cycling.org

American Bicycle Association
Telephone: 480-961-1903
Website: http:// www.usabmx.com

International Mountain Bicycling Association
Toll-free telephone: 888-442-4622
Website: http://www.imba.com

League of American Bicyclists
Website: http://www.bikeleague.org

National Highway Traffic Safety Administration
Website: http://www.nhtsa.dot.gov

National Off-Road Bicycle Association (NORBA)
Telephone: 719-866-4581
Website: http://www.usacycling.org/mtb

USA Cycling
210 USA Cycling Point, Suite 100
Colorado Springs, CO 80919
Telephone: 719-434-4200
Website: http://www.usacycling.org

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