MERIT BADGE SERIES

CYCLING

Scouting America

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"Enhancing our youths' competitive edge through merit badges"

Scouting America

Requirements

Always check scouting.org for the latest 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, concussions, blisters, sunburn, heat exhaustion, heat-stroke, 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.
2. Describe your state and local laws concerning bicycles. Discuss what is the same and what is different from laws applying to motor vehicles. Explain where and how you should ride on roads and streets to include lane position, changing lanes, making left and right turns, and riding through intersections.
3. Explain the importance of wearing the right clothing and gear while cycling, including a properly sized and fitted helmet. Know the Scouting America Bike Safety Guidelines.
4. Using a bicycle safety checklist, clean and adjust a bicycle and present it to your counselor for inspection. Do the following:
   (a) Show points that should be checked regularly to make sure the bicycle is safe to ride.

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(b) Show how to adjust the saddle and handlebars for a proper fit.

(c) Show how to adjust brakes and gear shifting (derailleurs).

(d) Show all points that need regular lubrication.

(e) Show how to repair a flat by removing the tire, replacing or patching the tube, and remounting the tire.

(f) Show that the bicycle meets local laws.

5. Demonstrate basic bicycle handling skills to your counselor, to include how to properly mount your bicycle, starting and stopping (to include emergency stops), riding in a straight line, turning, shifting gears, scanning, and signaling.

6. Using the Scouting America buddy system, complete all of the requirements for ONE of the following options: Road Biking OR Trail or Mixed Surface Biking. These requirements may be completed using a road bike, mountain bike or other properly equipped, manually-powered cycle such as a gravel bike, tandem bike, hand-powered bike, recumbent bike, adult tricycle, or adaptive cycle. If a tandem bike is used, the Scout must actively power the cycle in concert with the other rider.

Option A: Road Biking

(a) Take a road safety test with your counselor and demonstrate the following:

(1) 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.

(2) Properly execute a right turn.

(3) Demonstrate appropriate actions at a right-turn-only lane when you are continuing straight.

(4) Show proper curbside and road-edge riding. Show how to ride safely along a row of parked cars.

(5) 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.

(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: Trail or Mixed Surface Biking

(a) Demonstrate the following mountain bike handling skills to your counselor:

(1) Neutral position, ready position, bike body separation (side to side, and forward and back), and body positioning for cornering

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

(3) Show proper technique for riding up (seated, crouched, and standing) and down hills.

(b) Take a trail safety test with your counselor and demonstrate the following:

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

(2) 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.

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

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

(d) On mountain biking or multi-use 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.

(e) 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, complete this ride in one day.

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

In choosing a bike, ask yourself: 1) what kind of riding will I be doing? and 2) where will I be riding? Prices also vary widely. As price increases, so does the overall quality of workmanship, materials, and components.

The three primary types of bikes you will see are road bikes, mountain bikes, and hybrid bikes.

Road Bikes

Road bikes are built for riding quickly and efficiently on paved surfaces. They often have dropped handlebars that allow for a variety of riding positions while providing less wind resistance. They will generally have narrower tires to reduce rolling resistance and front and rear derailleurs that can produce from 3 to 30 different gear combinations, with shifters integrated into the handlebar brake levers. Road bikes have narrower saddles for more efficient pedaling over long periods. The family of road bikes includes touring bikes for riding long distances with pan-

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

niers (packs) and gravel bikes, which excel at riding on both paved and unpaved roads and paths.

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

Mountain Bikes

Mountain bikes (MTBs) are ideal for riding on unpaved terrain. They have a more heads-up riding position, larger, lower-pressure tires for better traction, and a wide range of gears. MTBs have sturdy, compact frames and flat handlebars for quick handling. Most MTBs have front suspension forks to absorb bumps, and many now have rear suspensions for even more comfort and control. Most modern MTBs have efficient disc brakes, and some even have hydraulic disc brakes.

Hybrid Bikes

If you are going to be riding in the city or on multi-use trails, hybrid bikes, also called fitness bikes, are a blend of road and mountain bikes. They typically have a more upright riding position than a road bike and narrower tires than a mountain bike. These bikes are generally more comfortable than road bikes but aren't as efficient, and, while they can be ridden on unpaved surfaces, they aren't as capable of handling off-road conditions as a mountain bike. Hybrid bikes are a good choice for commuting.

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

Other Bikes

Other types of bicycles include:

- Comfort and cruiser bikes; with heavier frames and wider tires, they are suited for short trips on flat terrain.
- BMX bikes are made for racing on bicycle motocross courses and trick riding. Their small wheels and lack of gears make them inefficient for road and trail riding.
- Tandem bikes carry two riders, and are therefore, suitable for recreation or for some adaptive uses.
- Recumbent bikes place the rider in a reclined position with the legs extending ahead rather than down to pedal.
- Folding bikes can be folded up and carried onto a bus or train.
- E-bikes with batteries and electric motors to assist the rider in pedaling are gaining in popularity. Road bikes, mountain bikes and hybrid bikes can all now be found as e-bikes. Because they can allow a bike rider to go at speeds faster than they can control, e-bikes are generally not appropriate for beginning riders. *E-bikes are not appropriate for the requirements of this merit badge.*

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

A recumbent bicycle or tricycle may be easier for a physically challenged person to power. Some are adapted so that they can be pedaled with the hands rather than the feet.

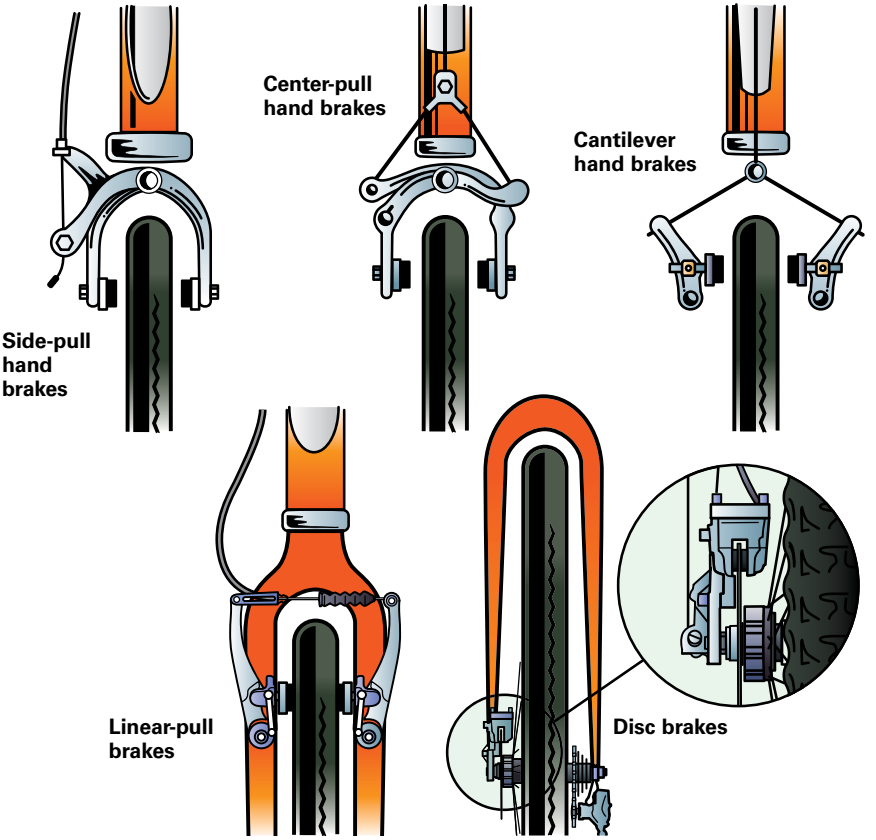
A tandem bicycle pay give a visually impaired person the ability to ride. Both riders must work in a coordinated way to steer and power the bike safely.

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 brake levers that control rim brakes or disc brakes. Coaster brakes are housed in the hub of the rear wheel, and are applied by pedaling backward. While the hub protects them from the weather, coaster brakes have several disadvantages. They take longer to apply than hand brakes, they affect only the rear wheel, and you must have the pedals in position for pedaling backward to apply them.



Levers mounted on the handlebars control rim brakes and disc brakes. Stopping force is created by friction. In a rim brake, that friction is from the **brake pads** pushing on the sides, or "**rims**," of the wheel; for a disc brake, the friction comes from pistons in a brake caliper pushing brake pads against a disc rotor attached to the wheel, like in a car. The brakes work through either a flexible cable pulling the brake pads against the wheel rim or disc rotor, or, for hydraulic disc brakes, a fluid that pushes pistons into the brake pads and against the rotor.

Hand-operated brakes provide for more stopping power and control than coaster brakes. However, hand-operated brakes may need more frequent adjustment. Cables need to be checked and occasionally replaced to prevent snapping; brake pads wear down and need to be replaced.

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.

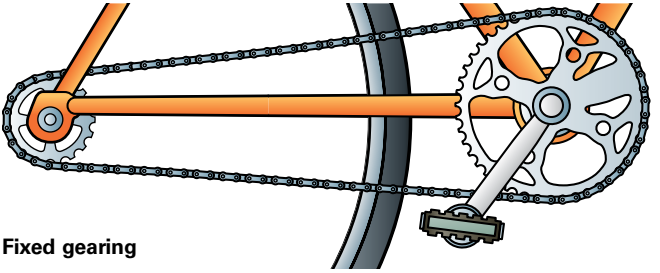
More bikes now have disc brakes. Disc brakes are popular because they are more dependable in wet or muddy conditions, provide better braking modulation, and give the rider more control on slippery surfaces. Moisture and dirt on wheel rims can greatly affect rim brakes. Hydraulic disc brakes are low-maintenance because the brake system is sealed and there are no cables to fray or stretch. You can learn more about bicycle brakes on-line or by visiting a bike shop.

Gearing

Gearing lets you adjust the bike's efficiency—the effort required to move the gears—based on speed and terrain. When you shift to a low gear as you are climbing a hill, the wheels won't move as far on each pedal stroke, but you also won't have to work as 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



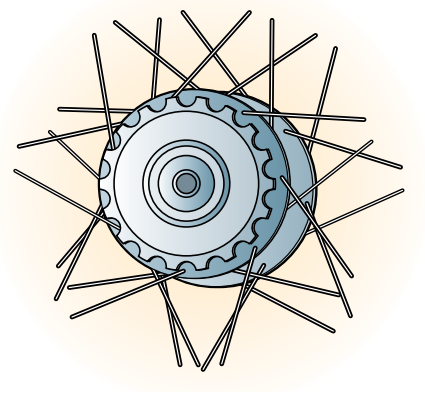
Fixed gearing

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 or the bottom bracket and is connected by a 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

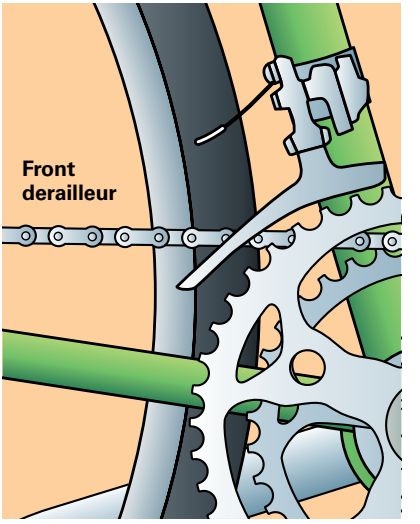
A derailleur moves the **chain** (literally derails it) from a sprocket or **chainring** of one size to a sprocket or chainring of another size, changing the bike's gearing. The chain passes through a guide, or cage, that moves it to the various sprockets or chainrings as needed. This cage is connected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

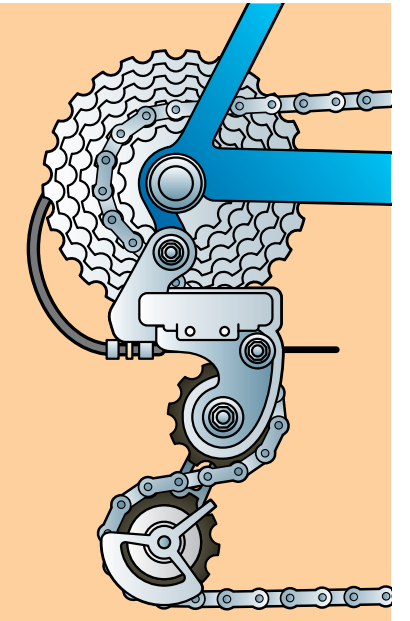
Determine the number of possible gear combinations by multiplying the number of sprockets (cogs) on the rear cluster by the number of chainrings at the pedals. For example, a bike with seven rear cogs and three chainrings (front sprockets) has 21 gear combinations. Gearing available today ranges from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

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.

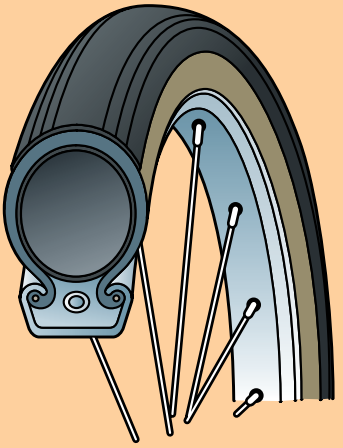



Rear derailleur

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 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.
- 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, 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.



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.

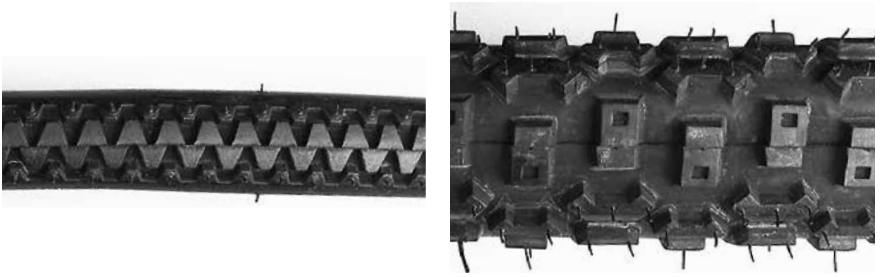
- *Rim construction* can vary, but virtually all rim-and-tire combinations on bikes (other than ultrahigh performance bikes) have "clincher" rims.

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.

Many bikes, particularly mountain bikes, use "tubeless" tires and wheels, where a liquid sealant is used inside the tire rather than an inner tube. The sealant plugs minor punctures to prevent air escaping, and, because there is no inner tube, pinch punctures are eliminated and the tire can be operated at lower pressures. Both the tire and the wheel must be designed to work tubeless. You will also need to add or replace sealant periodically after it has dissipated or dried out.

Three types of hubs and axles are used for wheels. Some bikes have solid axles with hex nuts on their ends to keep them tight on the forks or dropouts. Quick-release hubs have a hollow axle through which a rod passes, permitting the rapid installation and removal of a wheel. Many bikes now use thru axles where a large bolt passes through the hub and screws into one side of the fork or dropout; the bolt is loosened or tightened with an attached lever or with a hex wrench.



Road bikes have narrower tires (left), which usually require higher inflation pressure than the wider tires (right) on mountain bikes.

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.

Check the fit by straddling the top tube and lifting the handlebars until the top tube reaches your crotch. On a road bike with a horizontal top tube, there should be 1 inch of clearance; for a road bike with a sloping top tube, look for 2 or more inches of clearance. For a mountain bike, there should be 2 to 4 inches of clearance.

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, control and comfort. Different types of bikes are sized differently. Road bikes come in both standard (S, M, L) and numerical sizes. Mountain bikes come in standard sizes (S, M, L). Bike manufacturers usually have recommendations as to the correct size based on your height and inseam length. Because frame size is one aspect of the bike that cannot be adjusted, work with your local bike shop to select the right frame.

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. After adjusting the seat height, make sure the saddle is level, not tilted up or down.

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,

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.

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.

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.

You may be able to make small adjustments to the height of your handlebars. If your bike has a quill-type (threaded) handlebar stem, loosen the stem expander bolt at the top of the

stem to raise or lower the stem, making sure you do not extend the stem beyond the marked limit. For a threadless headset, you might be able to place spacers under the stem if the steerer tube is long enough or replace the stem with one that raises or lowers the handlebars. Consult your local bike shop for advice.

As you ride more miles, you might find that minor adjustments will sometimes lead to large gains in comfort and efficiency.

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

There might be times when repairs are easier with the bike upside down. Avoid scuffing or damaging the handlebars, shifters, grips, or head unit. Be careful to not to damage hydraulic disk brakes or other sensitive components.

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 skilled in bike maintenance and repair, have a bike mechanic inspect and service your bike once a year. This can include cleaning and replacing bearings (bottom bracket, headset, and **wheel bearings**), replacing worn cables and housings, replacing brake pads, replacing the chain if worn beyond limits, checking the suspension (for mountain bikes), and replacing tires. If you ride long distances or in adverse conditions, your bike might need servicing more often. There are on-line resources with detailed instructions and videos on how to perform many bike repairs.

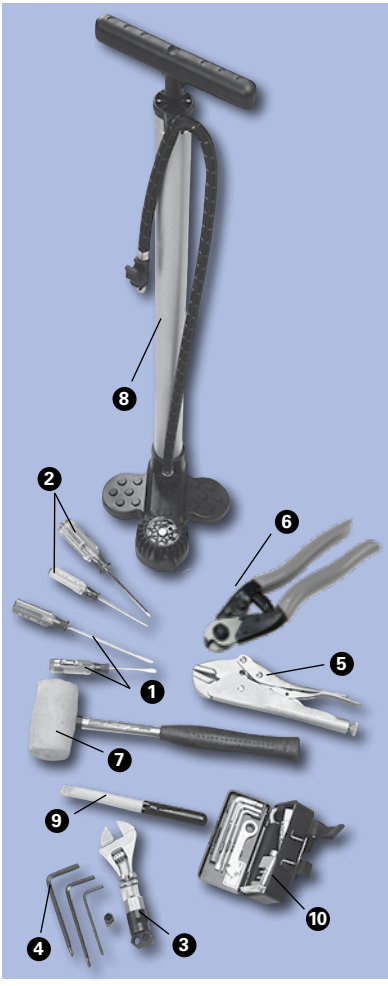
Just as important as annual servicing is preventive maintenance. Before every ride, remember your ABCs:

- **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 or thru axles 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. **Cable and housing cutters; used to cut cables and cable housings**
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 Schrader 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.

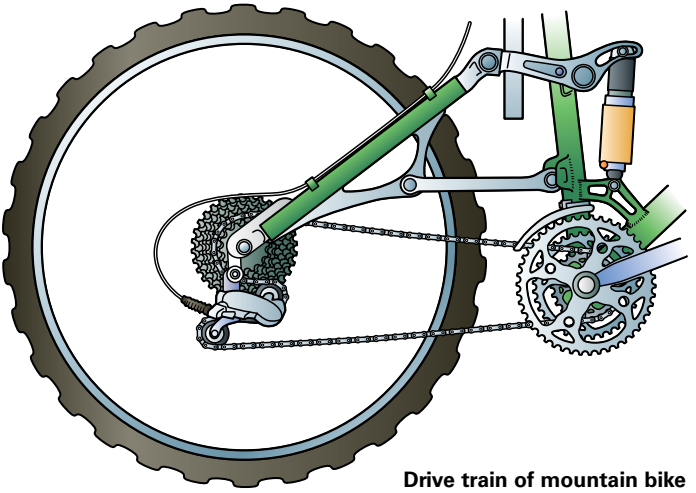
All painted parts of the bicycle can benefit from an application of car wax, which makes cleaning easier the next time. Take great care that the wax doesn't get into the drivetrain or on braking surfaces. The film of oil and dirt should be removed from the rims of the wheels or brake discs so that the 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 the drive train of the bike (chain, chain rings, cassette, and derailleurs) may be a little messier and is best done outside. A bike-specific degreaser or grease-cutting dishwashing liquid works well to clean the drive train; avoid automotive degreasers, which generally are too harsh. Begin by cleaning the rear cassette with a brush; an old toothbrush can work. Then clean the front chain rings. To clean the chain, a chain scrubber with degreaser will remove the grit trapped in the chain's rollers. If you do not have a chain scrubber, an old toothbrush can work here too. After cleaning the drive train components, wipe them dry and inspect them for wear. Worn chains, chain rings, and cassettes can cause poor shifting.

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 disc rotors. If it does get on any brake parts, it is nearly impossible to remove and may require replacing brake pads and cleaning rims or disc rotors with alcohol.

Lubricating

Like any machine, your bike needs proper lubrication to work best. The lubricant you use depends on the part you are lubricating. A good rule: "Less is best." Always wipe away excess lubricant, and prevent lubricant from getting on other parts, such as holding a cloth behind the part when using spray lubricant.

Chain Lube: The part you will lubricate most often is the chain. Always start with a clean chain. Applying new lube on top of old leaves the grit and dirt in the old lube that will grind down your drive train. There are two common types of chain lube: "wet" lube, which is designed for wet conditions and does not wash off easily; and "dry" lube, which is designed for dry conditions and does not attract as much dirt and grit. Apply chain lube weekly or after riding in wet conditions.

Grease: A quality bicycle grease is used on closed components, such as headset bearings, wheel bearings, and bottom bracket bearings. You should regrease those components at least annually; bikes with sealed cartridge bearings may not require as frequent lubrication or may not be able to be re-greased at all.

Light Oils: Lighter oils containing PTFE are best for lubricating pivot points on derailleurs, jockey wheels, brake levers, and rim brake calipers. Take care when lubricating brake calipers not to get lubricant on brake pads, wheel rims, or disk rotors.

Besides lubricants, there are a few other products you may use on your bike.

- Thread lock is an adhesive applied to the threads of screws, nuts and bolts to prevent loosening and corrosion. Generally, use "blue" medium-strength thread lock on bikes. Thread lock must be applied to a clean surface. Thread lock may be used on handlebar stem bolts, brake caliper bolts, chain ring bolts, dropout hangers, or any place where vibration could cause a fastener to work loose.
- Anti-seize compound is a lubricant that reduces friction in threaded and press-fit connections for easy assembly and disassembly as with bottom brackets, pedal threads, pressed headset cups, seat posts, and quill stems. It is used where two metals come into contact, to prevent them from reacting and becoming stuck.
- Carbon-fiber paste is used on carbon-fiber seat posts, handlebars and stems to reduce slippage without having to use too much torque on clamps and bolts.

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

If your bike has a quill (threaded) stem, clean the stem regularly, applying a thin coat of grease. Headset bearings need to be properly lubricated for the steerer fork to turn freely. For threadless headsets with cartridge bearings, you may not be able to lubricate the bearings, but they should be replaced when they start to bind or stick. Some headsets allow for the bearings to be re-greased, but pitted and corroded bearings should be replaced. These may be jobs best left to your local bike shop. Seat posts should be cleaned to prevent them from becoming corroded and wedded to the seat tube. For alloy seat posts in an alloy frame, a thin coat of grease should be applied. For carbon posts and frames, use a carbon fiber paste to prevent the seat post from slipping.

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.

Front linear pull brake

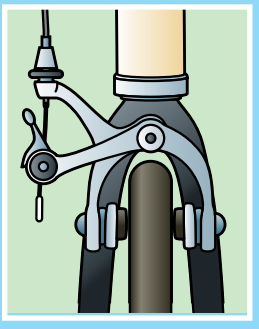
Front hydraulic disc brake

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.

Brake Pads

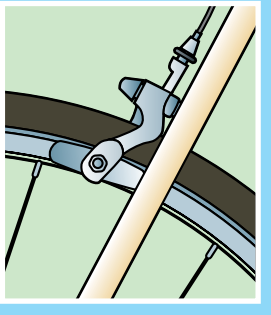
If your bike has caliper brakes, center-pull brakes, or linear-pull ("V") brakes, you will need to check the brake pads that push against the wheel rim for wear. If there is less than ¼ inch of rubber outside the brake pad base, or if the pads are glazed and hard, replace both brake pads on that assembly. 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.

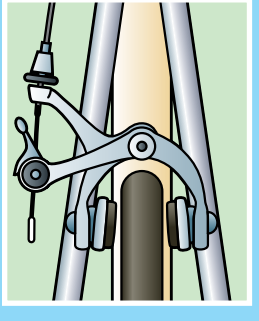
Adjusting Caliper-Rim Brakes



Loosen the anchor bolt or quick release (shown here). 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.

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. Gently bend the flat surfaces of side-pull brake arms, or adjust the 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 bolts to secure them. You also do this to fix squeaky brakes.

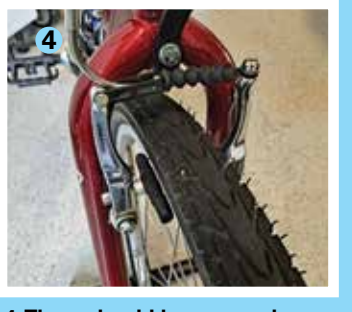
Adjusting Linear-Pull Brakes

Adjust brake pads by loosening the mounting nut and aligning the pad with the rim of the wheel. Pull the brake arm toward the rim to hold the pad in position when retightening the mounting nut. Add a little toe-in so that front of the pad contacts the rim first.

1. Align the brake pads and loosen the mounting bolt.

2. If the brake lever moves more than halfway toward the handlebar, add tension to the brake cable. If pads engage immediately when you pull the lever, the cable is too tight. Back out the barrel adjuster at the brake lever to allow for later adjustment.

3. Loosen the cable pinch bolt. Pull the cable to move the brake arms together until the pads are almost touching the rim. Tighten the pinch bolt.



4. There should be an equal space between the rim and pads on each side.

5. Use the barrel adjuster to fine tune cable tension. If the brakes are not centered, adjust the screws on the brake arms using a screwdriver or hex wrench until the brake pads are an equal distance from the rim, then If not already there, place an end cap on the cable and tuck the cable end down along the brake arm.

Disc Brake Pads

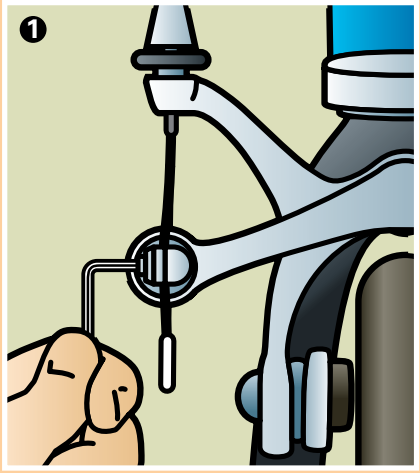
If your bike has disc brakes, replace the pads when they wear down to 3 millimeters thick or less. Inspect your disc brake pads at least monthly and check the disc rotor to make sure it is not warped or bent. Hydraulic brakes require much less maintenance than rim brakes and are self-centering as the brake pads wear down. For mechanical brakes, you may need to adjust the tension of the brake cable as well as adjust the centering of the brake pads in the caliper. Check the manufacturer's instructions for your brakes to see how to do these tasks. If your disc brake pads have become contaminated, clean the pads with isopropyl alcohol, which can also be used to clean the rotors. You can also lightly sand the surface of the pads. Do not use any solvent other than isopropyl alcohol to clean pads.

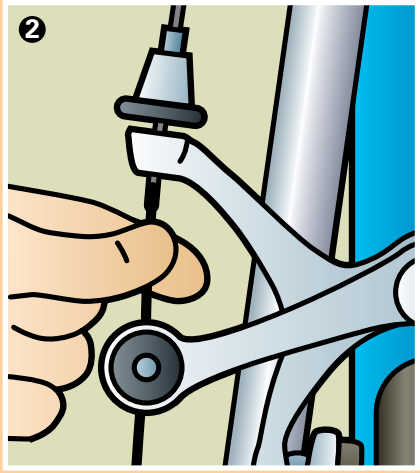
Disc brake pads and pin

Barrel adjuster on cable disc brake

Barrel adjusters on brake and shift levers

Adjusting Brake Cables





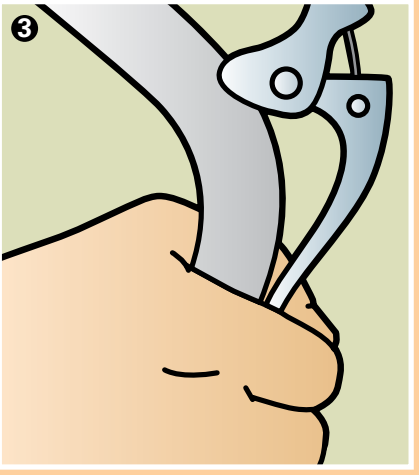
1. **To adjust your brake cable, loosen the main anchor bolt. Squeeze the brake lever; unscrew the barrel adjuster. This frees the cable for loosening or tightening to decrease or increase cable tension.**
2. **After pulling the main brake cable taut through the anchor bolt, screw in the barrel adjuster and tighten the bolt. If you need to use pliers, do so carefully to avoid causing the cable to fray. Check the tension and readjust if necessary.**

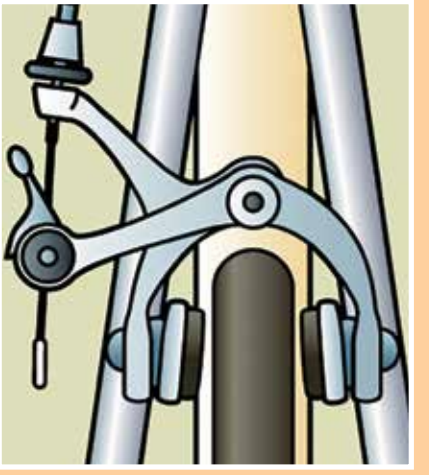
Brake Cables

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/down position.





3. 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.

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. Overinflated tires result in poor handling, an uncomfortable ride, and increased wear

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 within the range recommended by the manufacturer. This range 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 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.

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 Make sure your helmet meets standards for bike helmets set by the Consumer Product Safety Commission.

To protect your head, a helmet must:

1. Gradually slow the momentum of the skull and act as a shock absorber. A good helmet will 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.

Helmet technology aims to reduce rotational force, which correlates to how much the brain moves inside the skull during an impact. The two most common are Multidirectional Impact Protection System (MIPS) and WaveCel. A MIPS helmet has an inner liner that absorbs rotational forces while the foam outer layer absorbs impacts.

Too far back

Too far forward

Correctly positioned

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.

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.

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.

What To Carry on a Ride

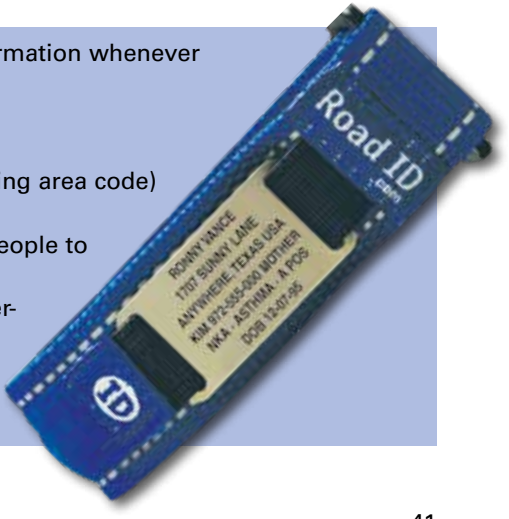
Identification

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 label inside your helmet or on dog tags or bracelets. 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 are 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.

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. Some jerseys have reflective material sewn into the fabric.

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. Shorts, add a sentence at the end: Most cycling shorts are designed to be worn without underwear, which can bunch up and cause discomfort.

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, always wear reflective clothing.

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 might 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 cellphones, 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.

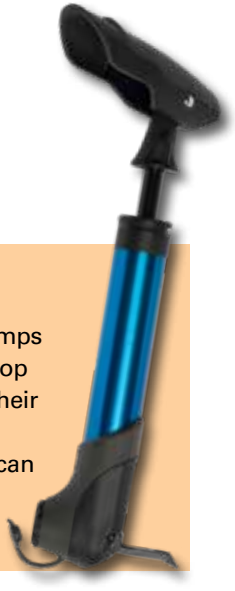
Locking Devices

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.

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.



Lights and Reflectors

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.

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.

Some cycle computers now have GPS and maps.

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.

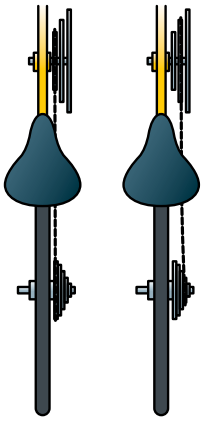
Release the brakes and push down on the pedal. As your body moves up and the bike moves forward, the saddle will move under you. When the opposite pedal reaches the 12 o'clock position, make a second pedal stroke.

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. To compensate, extend your arms and move your weight back on the bike, even off the rear of the saddle if necessary.



When approaching a hill, shift the front derailleur to a smaller ring (in which it is easier to pedal) and shift the rear derailleur to a larger gear. For downhill, shift the front derailleur to a larger ring and the rear derailleur to a smaller gear. Avoid cross-chaining; that is, selecting a large ring in the front and a large gear in the back or a small ring in the front and small gear in the back.

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, ease up slightly on the front brake. Slide your body as far back as possible on the saddle. 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

If your bike is equipped with derailleurs, you can shift only while pedaling forward. 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 for Riding

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.

League of American Bicyclists (LAB) Rules for the Road

- **Follow the Law:** You have the same rights and responsibilities as drivers. Obey traffic signals and stop signs. Ride with traffic; use the rightmost lane headed in the direction you are going.
- **Be Predictable:** Make your intentions clear. Ride in a straight line and don't swerve between parked cars. Signal turns, and check behind you well before turning or changing lanes.
- **Be Conspicuous:** Ride where people can see you and wear bright clothing. Use a front white light, red rear light and reflectors. Make eye contact with others. Don't ride on sidewalks.
- **Think Ahead:** Anticipate what drivers, pedestrians, and others on bikes will do. Watch for turning vehicles and ride outside the door zone of parked cars. Look out for debris, potholes, and other road hazards. Cross railroad tracks at right angles.
- **Ride Ready:** Check your tires are sufficiently inflated, brakes are working, chain runs smoothly, and quick release levers are closed. Carry tools and supplies appropriate for your ride. Wear a helmet.

Mirrors are good for keeping track of vehicle traffic behind you, but the only way you can keep tabs on 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

Learn how to observe traffic and make your intentions clear to other drivers by scanning and signaling. *Scanning* means being aware of traffic around you, including behind you. In one sense, scanning is simply looking over your shoulder. While scanning lets you know what other road users are doing, *signaling* tells other road users what you intend to do. Practice scanning so you can keep the bike moving in a straight line

Left-turn signal

Right-turn signal

Stop or slow down

when you are looking behind you. One way to keep from swerving is to take one hand off the handlebar and place it along your side or even on the back of your saddle as you scan. With practice, looking over your shoulder will become easy.

Communicating your intentions not only makes you safer, it is also required by law. Always signal to let others know when you are turning, changing lanes, or stopping. Before changing lanes, scan behind you. Signaling is usually done 100 feet before your turn and held for 2-3 seconds. Signal in advance of the turn in order to prepare other drivers and so both your hands can be on the handlebar during the turn for maximum control.

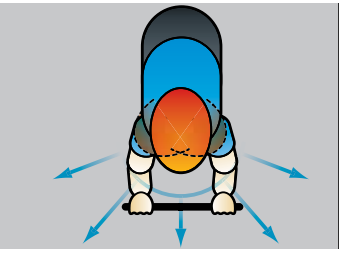
To let others know that you are going to turn left, fully extend your left arm out to the side. To signal a right turn, fully extend your right arm out to the side or bend your left arm up at a right angle with your hand flat. Signal that you are slowing down or stopping by extending your left arm out at a downward angle.

When changing lanes, yield to traffic that is already in the lane you are trying to enter. Scan to make certain there is a sufficient gap in traffic. Moving to the left side of your travel lane can also indicate to other drivers you are planning to change lanes.

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



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.

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.)

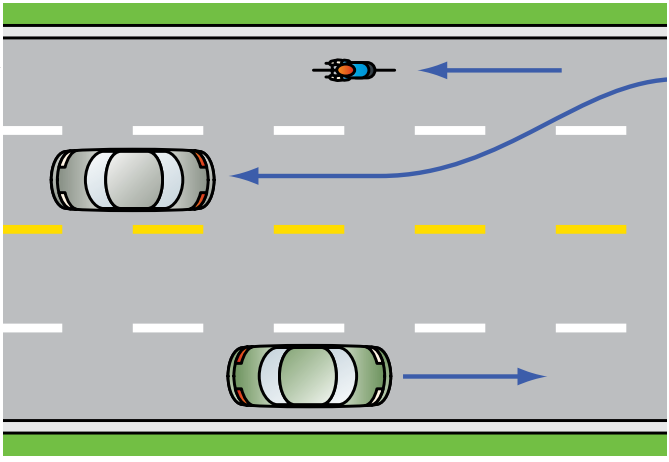
The standard vehicle code for all road users states, "All persons have an equal right to use the highways for purposes of travel by proper means, and with due regard for the corresponding rights of others." The second rule of the road, then, is: *Slower traffic keeps to the right, and faster traffic 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 your lane is clear, you may move toward the center of the road to avoid debris, sand, gravel, or other hazards.

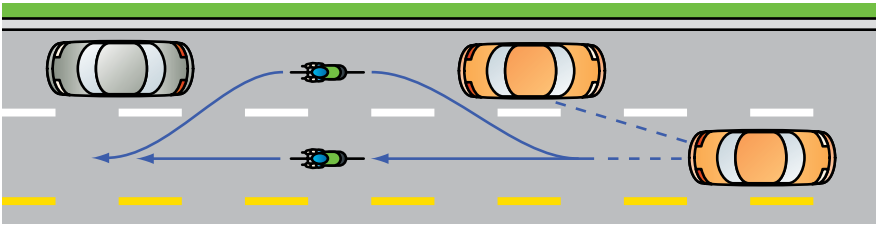
If cars to the rear are trying to pass you, you can move to the edge of the road while they do so. This allows them to pass you without moving too far into the other lane.

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

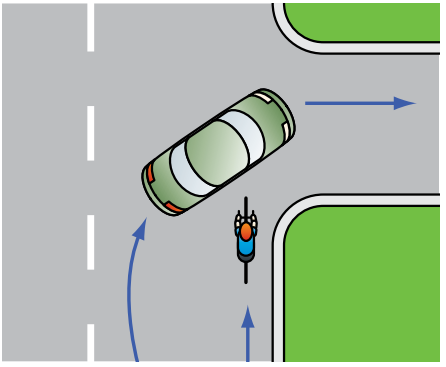


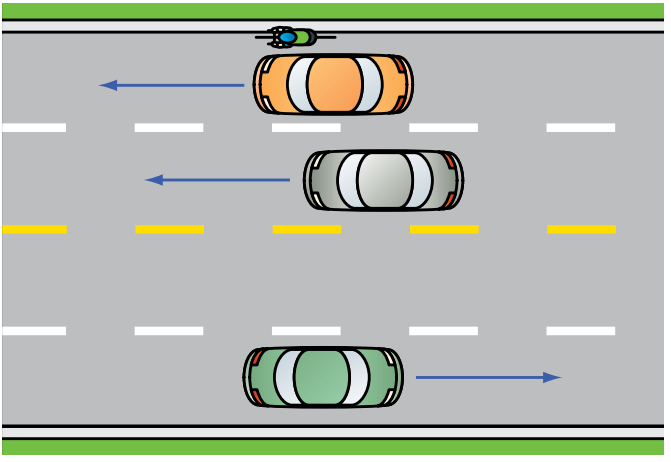
On roadways that have two narrow lanes in each direction, ride in the middle of the right lane. Drivers need to get the idea that they must move into the passing lane if they want to pass you.



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.





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.

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 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.

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.

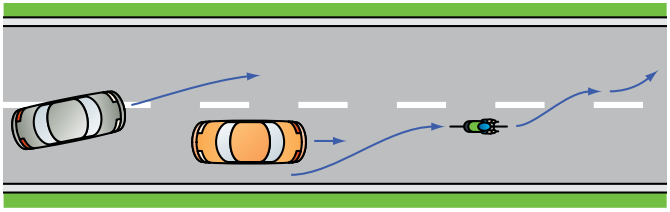
The cyclist's turning-lane rules are as follows:

- 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. From the right side of the right lane, look both ways for 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, 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. Particularly when making left turns, be aware that a vehicle may

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.



You may need to cross more than one lane to get in position for a turn or move. Ideally, a gap will extend across more than one lane and you can move across multiple lanes to your destination. If that is not possible, you may need to change lanes one at a time, following the same scan-and-signal routine for each change.

sometimes be hidden in the "traffic shadow" of a larger vehicle. Allow sufficient time after a truck or van passes to make sure there are no other vehicles before beginning your turn.

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.

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.

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.

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.

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

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.

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.

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.

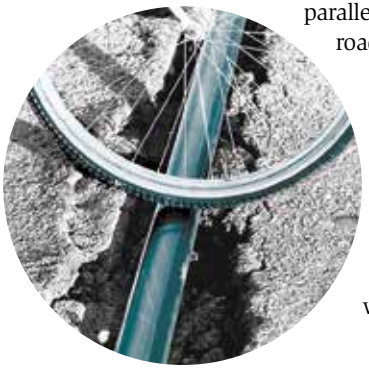
Because hand brakes do not work as well in the rain, squeeze the brakes lightly and regularly to help keep the rims dry so that you can stop quickly when necessary. Allow extra room for stopping.

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.

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

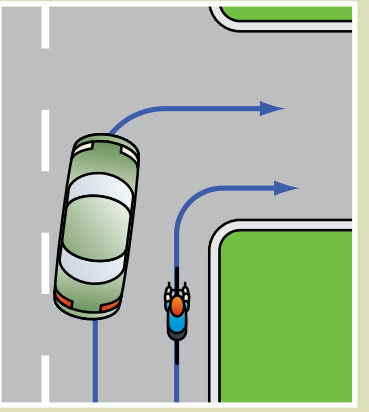
Just before you reach a rock or other obstacle, steer the handlebars left without leaning over first. Just as the front wheel goes around the rock, quickly turn the handlebars right to correct your balance and straighten out. This technique works because your body doesn't have a chance to follow the 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 Quick Stop

The quick 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 Scouts BSA 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 or guardian's permission) on the USGS website at 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 (mapmyride.com) let you create accurate cue sheets on a computer.

Solo or Group Riding

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.

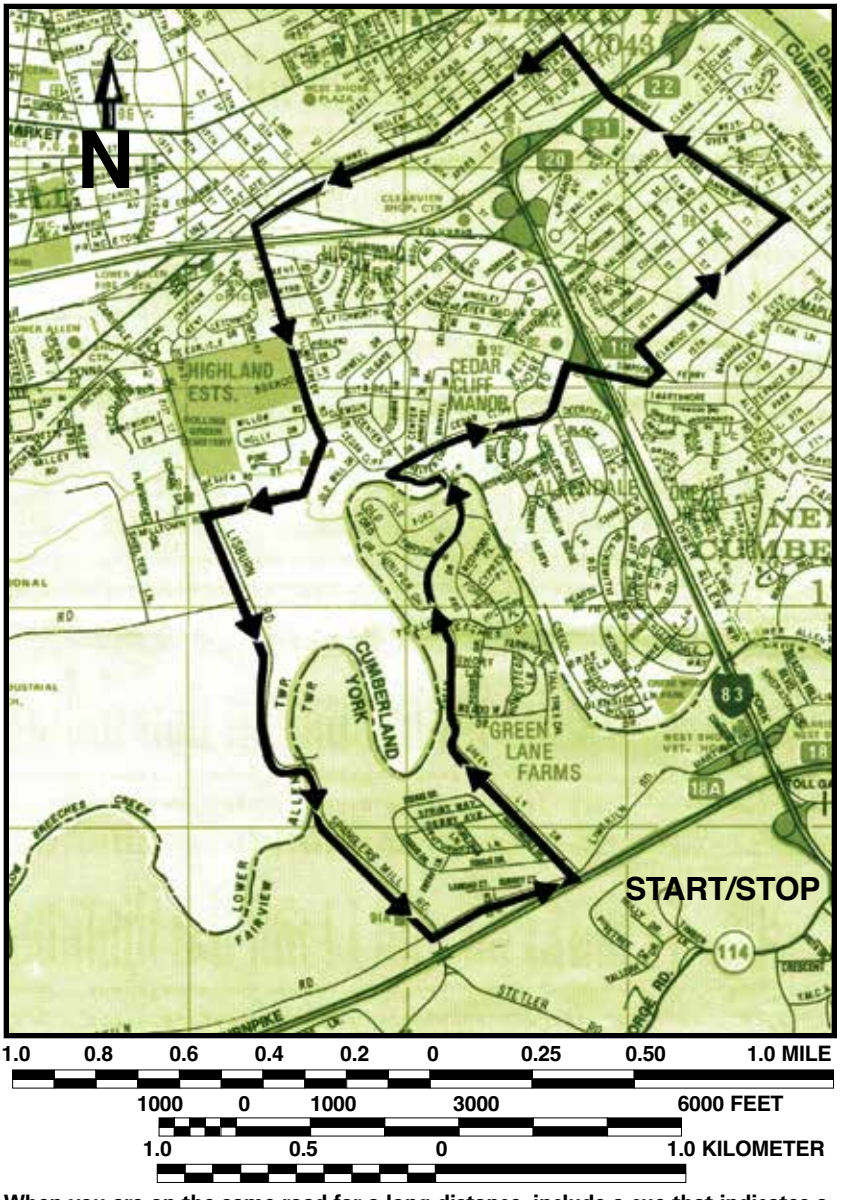
Group riding has disadvantages, too. The individual riders must follow the same route and maintain the same pace as everyone else. To an extent, you are responsible for everyone else's safety. All the riders must strive to keep a "safety cocoon" of space—3 feet on level ground and even more on downhill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

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.

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 (or right)!"—A car is approaching from the left (or the 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. Rigid 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. On the trail, everyone should yield to horses; bicycles should yield to horses and pedestrians; and downhill bicycles should yield to bikes going uphill.

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 ride on wet trails. Ride dirt, not mud. If your tires leave a track, it is too wet to ride.
- 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.

Basic Skills: Neutral and Ready Positions

Mountain biking requires riders to quickly shift their weight to traverse tight turns, steep descents, and other obstacles found on trails. The neutral position is the default position the mountain biker uses. It consists of being relaxed and tall, knees slightly bent, elbows slightly bent, and one finger on each brake lever.

Rules of the Trail

The Rules of the Trail for the International Mountain Biking Association (IMBA) were developed to promote responsible and courteous conduct on shared-use trails.

1. Ride on Open Trails Only. Respect trail and road closures—ask a land manager for clarification if you are uncertain about the status of a trail. Do not trespass on private land. Obtain permits or other authorization as may be required. Be aware that bicycles are not permitted in areas protected as state or federal wilderness.

2. Leave No Trace. Be sensitive to the dirt beneath you. Wet and muddy trails are more vulnerable to damage than dry ones. When the trail is soft, consider other riding options. This also means staying on existing trails and not creating new ones. Don't cut switchbacks. Be sure to pack out at least as much as you pack in.

3. Control Your Bicycle. Inattention for even a moment could put yourself and others at risk. Obey all bicycle speed regulations and recommendations, and ride within your limits.

4. Yield to Others. Do your utmost to let your fellow trail users know you're coming—a friendly greeting or bell ring are good methods. Try to anticipate other trail users as you ride around corners. Bicyclists should yield to all other trail users, unless the trail is clearly labeled for bike-only travel. Bicyclists traveling downhill should yield to ones headed uphill, unless the trail is clearly labeled for one-way or downhill-only traffic. Strive to make each pass a safe and courteous one.

5. Never Scare Animals. Animals are easily startled by an unannounced approach, a sudden movement or a loud noise. Give animals enough room and time to adjust to you. When passing horses, use special care and follow directions from the horseback riders (ask if uncertain). Running cattle and disturbing wildlife are serious offenses.

6. Plan Ahead. Know your equipment, your ability and the area in which you are riding and prepare accordingly. Strive to be self-sufficient: keep your equipment in good repair and carry necessary supplies for changes in weather or other conditions. Wear a helmet and appropriate safety gear.

The ready position is the position to get in when a technical challenge is coming up. It consists of being off the saddle, level pedals (3 and 9 o'clock positions), bent knees, bent elbows, one finger on each brake lever, torso down, and head up. From this position you are ready to move your body weight to navigate the technical obstacles coming up.

Cornering on Trails

Using side-to-side bike/body separation, you can control your bike through many tight turns on trails. Practice this skill on a relatively flat space with some markers (cones, half tennis balls, or rocks and sticks) and mark out a 90-degree turn and a 180-degree turn. Practice riding through the turns several times, increasing your speed, off the saddle and with level pedals. Push your bike into the turn, keep your head up and look at your exit point, one finger on each brake lever.

Climbing

On steep climbs a rider may choose one of three positions: seated, crouched, or standing. In the seated position, the rider's shoulders move forward and the rider may move forward on the saddle. As the terrain becomes steeper, a rider may need to move into a crouched position similar to a ready position. This position provides more power, bike/body separation, and better traction control. A standing position provides the most power and can be used when traction is good to rest from other positions and for acceleration. Practice each of the three climbing positions in a relatively flat space keeping one finger on each brake lever.

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.

Four Tips to Improve Steep Climbs

Having the right strengths and 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 creating the gyroscopic effect to help keep you upright.

1. Shift Weight Forward. When entering a 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. 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.

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 counselor for advice.

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 might 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 riding, 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 remove the person to shelter and replace wet clothing with dry, warm items. If the victim is conscious, have him or her swallow warm water, soup, or juice.

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.

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.**

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.

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 the person to drink small amounts of fluids, such as cool water or a sports drink. Apply water to the skin and clothing and fan the person. Raising the legs may help prevent a feeling of faintness.

Heatstroke

In heatstroke, the body's cooling system fails and the person's core temperature rises to life-threatening levels (above 105 degrees). 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.

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.

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.

Concussion

A concussion is a brain injury, caused by a blow to the head or by a sudden change in motion of the head, in which the brain bounces rapidly back and forth inside the skull. A person does not need to be knocked out to have a concussion. Some symptoms are disorientation, slurred speech, nausea, sensitivity to light or noise, and sleepiness. Someone with a suspected concussion should be assessed promptly by a medical professional.

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.

Bites and Stings

Ticks. To avoid tick bites, wear long pants and 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. Wash the wound with soap

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. Scouts who have allergies that could cause anaphylactic shock should share that information with their unit leaders and let them know where anaphylaxis medications are kept so that they can be made available at a moment's notice.

and water and apply antiseptic. Thoroughly wash your hands after handling a tick.

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. Use a cold pack to help reduce pain and swelling.

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.

Summon medical help immediately. Wash the wound if possible, and remove any restrictive clothing or jewelry in case of swelling. Have the victim lie down with the bitten part below the rest of the body. Watch for and treat any signs of shock.

Poisonous Plants

The oily sap from the leaves, stem, and roots of poison ivy, poison oak, and poison sumac irritates the skin of most people. Once the sap gets on skin, it can spread to other parts of the body and cause a rash with redness, blisters, swelling, itching, burning, fever, and headache. Immediately stop to wash the exposed area well with soap and water. Wipe with rubbing alcohol and apply calamine or other soothing skin treatment.

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/dropouts. Wheel securely attached by either nuts, quick releases, or thru axles. (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, screws and bolts tight. Front and rear brakes work without binding. Minimum of 3/16 inch of rub on rim brake pads (24) or 3 millimeters of thickness on disc brake pads. Brake pads properly aligned with rims or discs and contact with a minimum movement of brake levers (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.**


(30)
(28)
(31)
(22c)
(2)
(5)
(25)
(23)
(24)
(27)
(29)
(26)
(32)
(4)
(1)
(21)
(16)
(22a)
(3)
(32)
(15)
(6)
(7)
(14)
(8)
(14)
(9)
(22b)
(10)
(13)
(18)
(17)
(11)
(20)
(19)

Road bike

Mountain bike

Scouting America Bike Safety Guidelines

The Scouting 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.

Scouting America SAFE Checklist. 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 nhtsa.dot.gov

Scouting America SAFE Checklist

Scouts and their parents or guardians expect all Scouting America activities to be conducted safely. To ensure the safety of participants, Scouting America expects leaders to use the four points of SAFE when delivering the Scouting program:

1. **Supervision.** Youth are supervised by qualified and trustworthy adults who set the example for safety.
   - Accepting responsibility for the well-being and safety of youth under their care.
   - Ensuring that adults are adequately trained, experienced, and skilled to lead the activity, including the ability to prevent and respond to likely problems and potential emergencies.
   - Knowing and delivering the program of Scouting America with integrity.
   - Using qualified instructors, guides, or safety personnel as needed to provide additional guidance.
   - Maintaining engagement with participants during activities to ensure compliance with established rules and procedures.

2. **Assessment.** Activities are assessed for risks during planning. Leaders have reviewed applicable program guidance or standards and have verified the activity is not prohibited. Risk avoidance or mitigation is incorporated into the activity.
   - Predetermining what guidance and standards are typically applied to the activity, including those specific to the Scouting America program.
   - Planning for safe travel to and from the activity site.
   - Validating the activity is age appropriate for the Scouting America program level.
   - Determining whether the unit has sufficient training, resources, and experience to meet the identified standards, and if not, modifying the activity accordingly.
   - Developing contingency plans for changes in weather and environment and arranging for communication with participants, parents or guardians, and emergency services.
3. **Fitness and Skill.** Annual Health and Medical Records are reviewed, and leaders have confirmed that prerequisite fitness and skill levels exist for participants to take part safely.
   - Confirming the activity is right for the age, maturity, and physical abilities of participants.
   - Considering as risk factors temporary or chronic health conditions of participants.
   - Validating minimum skill requirements identified during planning and ensuring participants stay within the limits of their abilities.
   - Providing training to participants with limited skills and assessing their skills before they attempt more advanced skills.
4. **Equipment and Environment.** Safe and appropriately sized equipment, courses, camps, campsites, trails, or playing fields are used properly. Leaders periodically check gear use and the environment for changing conditions that could affect safety.
   - Confirming participants' clothing is appropriate for expected temperatures, sun exposure, weather events, and terrain.
   - Providing equipment that is appropriately sized for participants, is in good repair, and is used properly.
   - Ensuring personal and group safety equipment is available, properly fitted, and used consistently and in accordance with training.
   - Reviewing the activity area for suitability during planning and immediately before use, and monitoring the area during the activity through supervision.
   - Adjusting the activity for changing conditions or ending it if safety cannot be maintained.

Full details of the SAFE checklist at scouting.org/health-and-safety/safe

Cycling Resources

Scouting Literature

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

With your parent or guardian's permission, visit Scouting America's official retail site, **scoutshop.org**, for a complete list of merit badge pamphlets and other helpful Scouting materials and supplies.

Books

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———. *Zinn & the Art of Road Bike Maintenance,* 5th ed. VeloPress, 2016.

Magazines

Bicycling
400 S. 10th St.
Emmaus, PA 18098
bicycling.com

Ride BMX
2052 Corte Del Nogal, Suite 100
Carlsbad, CA 92011
bmx.transworld.net

Mountain Bike
mountainbike.com

Organizations and Websites

Adaptive Adventures
Resources to adapt equipment and activities for individuals with special needs
adaptiveadventures.org

Bikepacking.com
bikepacking.com

Adventure Cycling Association
Toll-free telephone: 800-755-2453
adventurecycling.org

International Mountain Bicycling Association
Toll-free telephone: 888-442-4622
imba.com

International Special Olympics
Resources related to cycling for individuals with special needs
specialolympics.org

League of American Bicyclists
bikeleague.org

National Highway Traffic Safety Administration
nhtsa.dot.gov

National Interscholastic Cycling Association (NICA)
nationalmtb.org

Park Tool (bike repair videos)
parktool.com

REI
rei.com/learn/c/cycling

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

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