FIGURE 7.1 Most early vehicles used single straight axles.

FIGURE 7.2 Typical kingpin used with a solid axle.
FIGURE 7.3 Twin I-beam front suspension. Rubber bushings are used to support the I-beams to the frame and help isolate road noise.

FIGURE 7.4 The rubber radius rod bushing absorbs road shocks and helps isolate road noise.

FIGURE 7.5 The upper control arm is shorter than the lower control arm on a short/long-arm (SLA) suspension.
FIGURE 7.6 A typical SLA-front suspension using coil springs.

FIGURE 7.7 An SLA-type suspension with the coil spring placed on top of the upper control arm.

FIGURE 7.8 A torsion bar SLA suspension can use either the lower or the upper control arm.
FIGURE 7.9 An SLA-type suspension that uses a coil-over-shock assembly.

FIGURE 7.10 A typical MacPherson strut showing all of the components of the assembly. A strut includes the shock and the spring in one structural assembly.

FIGURE 7.11 The modified strut front suspension is similar to a MacPherson strut suspension except that the coil spring is seated on the lower control arm and is not part of the strut assembly.
FIGURE 7.12 The HiPer Strut compared to the traditional MacPherson strut.

FIGURE 7.13 Multilink front suspension design varies depending on the vehicle manufacturer.

FIGURE 7.14 A leaking strut. Either a cartridge insert or the entire strut will require replacement. If a light film of oil is seen, this is to be considered normal. If oil is dripping, then this means that the rod seal has failed.
FIGURE 7.15 This front coil spring looks as if it has been heated with a torch in an attempt to lower the ride height of the vehicle. Both front springs will require replacement.

FIGURE 7.16 It is easy to see that this worn control arm bushing need to be replaced. The new bushing is shown next to the original.

FIGURE 7.17 Grease fitting projecting down from the surrounding area of a ball joint. The ball joint should be replaced when the area around the grease fitting is flush or recessed.
FIGURE 7.18 Indicator ball joints should be checked with the weight of the vehicle on the ground.

FIGURE 7.19 Typical dial indicator used to measure the suspension component movement.

FIGURE 7.20 If the spring is attached to the lower control arm as in this SLA suspension, the jack should be placed under the lower control arm as shown.
FIGURE 7.21 The jack should be placed under the lower control arm of this modified MacPherson-type suspension.

FIGURE 7.22 If the spring is attached to the upper control arm, the jack should be placed under the frame to check for ball joint wear.

FIGURE 7.23 A special tool or a block of wood should be inserted between the frame and the upper control arm before lifting the vehicle off the ground.
FIGURE 7.24 The jacking point is under the frame for checking the play of a lower ball joint used with a MacPherson strut.

FIGURE 7.25 This worn and rusty ball joint was found by moving the wheel and looking for movement in the joint.

FIGURE 7.26 Taper breaker tool being used to separate the upper ball joint from the steering knuckle. This is especially important for vehicles equipped with aluminum alloy control arms.
FIGURE 7.27 A pinch bolt attaches the steering knuckle to the ball joint. Remove the pinch bolt by turning the nut, not the bolt.

FIGURE 7.28 If the pinch bolt is overtightened, the steering knuckle can be deformed.

FIGURE 7.29 By drilling into the rivet, the holding force is released.
FIGURE 7.30 The head of the rivet can be removed by using a large-diameter drill bit as shown.

FIGURE 7.31 A punch and a hammer being used to remove a rivet after the head has been removed.

FIGURE 7.32 Press-in ball joints are best removed using a large C-clamp press, as shown.
FIGURE 7.33 Typical kingpin assembly.

FIGURE 7.34 Driving a kingpin out with a hammer.

FIGURE 7.35 A kingpin being removed showing the worn bushing.
FIGURE 7.36 Most shock absorbers used on the front suspension can be removed from underneath the vehicle after removing the attaching bolts or nuts.

FIGURE 7.37 Removing the upper strut mounting bolts. Some experts recommend leaving one of the upper strut mount nuts loosely attached to prevent the strut from falling when the lower attaching bolts are removed.

FIGURE 7.38 A brake hydraulic hose is often attached to the strut housing. Sometimes all that is required to separate the line from the strut is to remove a spring clip.
FIGURE 7.39 Use a strut spring compressor fixture to compress the spring on a MacPherson strut before removing the strut retaining nut.

FIGURE 7.40 Removing the strut rod nut. The strut shaft is being helped with one wrench while the nut is being removed with the other wrench. Notice that the spring is compressed before the nut is removed.

FIGURE 7.41 Typical MacPherson strut showing the various components.
FIGURE 7.42 After installing the replacement strut cartridge, reinstall the spring and upper bearing assembly after compressing the spring. Notice that the strut is being held in a strut spring compressor fixture.

FIGURE 7.43 Before final assembly, make sure the marks you made are aligned. Some struts are manufactured with marks to ensure proper reassembly.

FIGURE 7.44 The strut on a modified MacPherson strut assembly can be replaced by removing the upper mounting nuts.
FIGURE 7.45 Stabilizer bar links should be replaced as a pair.

FIGURE 7.46 A strut rod as viewed from the front of the vehicle.

FIGURE 7.47 Typical strut rod bushing with rubber on both sides of the frame to help isolate noise, vibration, and harshness from being transferred to the passengers.
FIGURE 7.48 Notice that if the front coil springs are sagging, the resulting angle of the lower control arm causes the wheels to move from side to side as the suspension moves up and down.

FIGURE 7.49 Spring compressing tool in place to hold the spring as the ball joint is separated. Note that the stabilizer bar links have been removed to allow the lower control arm to move downward enough to remove the coil spring.

FIGURE 7.50 The steering knuckle has been disconnected from the lower ball joint. The lower control arm and the coil spring are being held up by a floor jack.
FIGURE 7.51 A rubber mallet is being used to support the upper control arm as the lower control is being lowered using a floor jack.

FIGURE 7.52 Spring insulators are installed between the spring seat and the coil spring to reduce noise.

FIGURE 7.53 The holes in the lower arm are not only used to allow water to drain from the spring seat, but also used as a gauge to show the service technician that the coil spring is correctly seated.
FIGURE 7.54 By rotating the adjusting bolt, the vehicle can be raised or lowered.

FIGURE 7.55 An adapter and a press or large clamp are used to remove the old bushing from the control arm and to install a new bushing.

The tools needed to replace a front strut assembly include several sockets and a ball-peen hammer, plus a strut compressor.
After safely hoisting the vehicle to elbow height and removing the wheel covers, remove the front tire/wheel assembly.

Remove the two strut retaining nuts.

Before using a hammer to drive the retaining bolts from the steering knuckle, thread the nut into the bolt backwards to prevent causing damage to the threads.
Remove the retaining bolts and separate the strut from the steering knuckle.

Lower the vehicle and remove the upper strut retaining fasteners.

Hold the strut while removing the last upper retaining nut and then remove the strut assembly.
After the strut has been removed from the vehicle, install the assembly into a strut-compressor.

Position the jaws of the compressor under the bearing assembly as per the vehicle manufacturer’s instructions.

Turn the compressor wheel until all tension of the spring has been relieved from the upper bearing assembly.
Remove the strut retaining nut.

Remove the strut assembly.

Before installing the replacement strut, check the upper bearing by exerting a downward force on the bearing while rotating and check for roughness. Replace if necessary.
Install the strut from underneath the spring compressor fixture.

Install the strut retaining nut. Most vehicle manufacturers specify that the strut retaining nut be replaced and the old one discarded.

Before loosening the tension, check that the coil spring is correctly located at both the top and the bottom, then release the tension on the spring.
Remove the strut assembly from the compressor and back of the vehicle and install the upper fasteners. Do not torque to specifications until the lower fasteners have been installed.

Attach the lower strut to the steering knuckle using the original hardened bolts and nuts.

Using a torque wrench, torque all fasteners to factory specifications.
Install the tire/wheel assembly, lower the vehicle, and torque the lug nuts to factory specifications. Align the vehicle before returning it to the customer.