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MAKE THESE EASY PATIO CHAIRS!

12 TIME-SAVING
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**IS YOUR HOUSE
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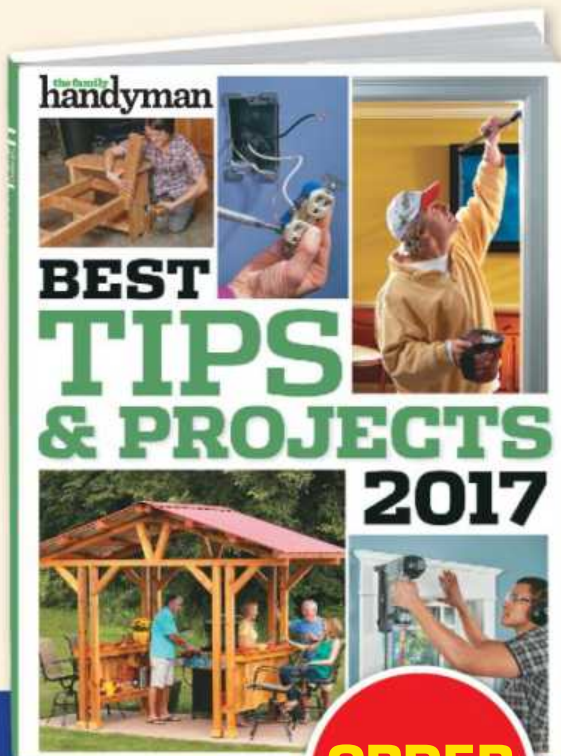
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Build our easy Adirondack chairs and then sit back, relax and enjoy the view!
Photographed by Tom Fenenga

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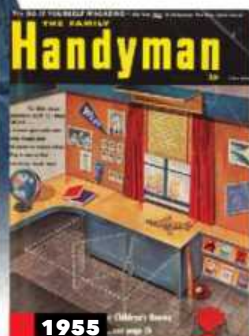
A remodeled magazine

Like many an old house, this old magazine has undergone several remodels over the years. You're looking at the latest retooling right now. If you liked the old version, don't worry—we've packed the following pages with the same useful, expert advice we've been delivering since 1951. I'd be interested in your reactions—good or bad. Shoot me a note at feedback@familyhandyman.com.

— GARY WENTZ, EDITOR-IN-CHIEF

P.S. MY FAVORITE DIY TOOL!

As an editor at *The Family Handyman*, I'm supposed to know everything about houses. But here's a confession: Before I launch into any project, I search our website. It contains far more expertise than my brain can hold. You should give it a try too. Go to familyhandyman.com and search on any DIY topic. You'll get tips and advice from true hands-on experts.



Shopping for a chain saw?

Associate editor Jeff Gorton has been up to his ankles in sawdust at The International Chain Saw Testing Institute, located in our parking lot. He's been slicing up logs with battery-powered rechargeable saws. After more than 1,000 cuts, Jeff has advice and recommendations for you.

See p. 53 for more.



Our simplest patio chair ever

For years, Ken Collier, our former editor-in-chief, has been perfecting a patio chair design. The result is finally unveiled in this issue. It's attractive, sturdy, comfortable and—above all—easy to build. See Ken's masterpiece on p. 32.

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Stuff We Love

Our favorite DIY tools, materials + gear. By Mark Petersen

WORTH THE SPLURGE

An outdoor light that can save the day

One night last year I was wandering around my yard in the dark and seriously wrecked my shin by walking into a retaining wall. That prompted me to replace the wimpy 60-watt outdoor light fixture with the Eaton All-Pro Revolve LED Triple Head Security Light. I absolutely love this thing! It's motion activated, and the three LED bulbs blast my driveway with 2,400 lumens of brilliant white light. It's so bright that I can unload cars or cook burgers on the grill, almost as if I were working in daylight.

It mounts on the eave and the lights are independently adjustable, so you can light up whatever you wish. The only downside is that now my neighbors can see what I'm up to, too. It's a bit pricy, but the bulbs will last for 50,000 hours! I bought my Revolve light for about \$100 at The Home Depot.

TRAVIS LARSON, SENIOR EDITOR



MUST-HAVE

People-safe, pet-safe mosquito killer

Do the West Nile and Zika viruses have you dressing like an Eskimo in the summertime? Here's an all-natural pesticide to help control the mosquito population in your backyard. Terminix AllClear Mosquito BAIT & KILL is made from nothing but sugar and garlic. The sugar attracts the pesky bloodsuckers, and the garlic oil kills them. (If it doesn't solve your mosquito problem, at least you won't have to worry about a vampire infestation.) The manufacturer claims that one 30-oz. twin pack can eliminate more than 90 percent of the mosquitoes in up to a 5,000-sq.-ft. area in two to three weeks. Terminix AllClear Mosquito BAIT & KILL is available online for \$13.



GREAT GADGET

Crankless spreader

A while ago, I needed to spread some fertilizer but couldn't find my spreader. (I'm pretty sure I lent it to someone who never returned it.) But my loss also turned out to be my gain because I stumbled upon the Scotts Wizz spreader. Unlike my old one, which has a hand crank, this one runs on four "AA" batteries.

It works great at spreading seed, weed killer, fertilizer and even ice melt compound. Thanks to its EdgeGuard sliding shield, the spreader can be set to broadcast only straight ahead and to the right, which helps keep product off driveways and sidewalks.

I like the one-handed operation best of all. On windy days, I can hold the spreader close to the ground without nasty chemicals being blown back in my face. The Scotts Wizz spreader is available at home centers and hardware stores for about \$20, batteries included.

MARK PETERSEN, ASSOCIATE EDITOR



MONEY SAVER

A color-renewing clear coat

Just like millions of others, I saw the commercials for Rust-Oleum ReColor by Wipe New. It's not paint—it's a clear coating and sealant formulated to restore and protect the original color of faded, weather-beaten items. I decided to give it a try on a couple pieces of plastic yard furniture. The chair and footstool looked brand new—the green color came alive and the white faded streaks were gone. The furniture still looks good, but it has not yet spent an entire summer outside.

The 2-oz. bottle was just enough to finish the two pieces. I started working on the furniture in my garage but had to move the operation outside because of the strong odor. Be sure to thoroughly clean and dry the surface or the dirt, grime or stains may be permanently sealed in place.

ReColor by Wipe New can be used for many applications, including vinyl, plastic, stone and metal. It's available for less than \$20 at discount stores and many other retailers.

TRAVIS LARSON, SENIOR EDITOR



HANDY HELPER

SMART HOSE ATTACHMENT

I gave the Black & Decker Snake Wand a workout all last summer. I discovered that its flexible neck does a great job of watering hanging plants and spraying off the very top and underside of my truck. And it lets me fill buckets from a distance to avoid getting splashed. The flexible neck is still leak-free and holds its shape like it did when it was new. The wand has a comfortable grip and a nozzle with nine spray patterns. My kids love it too—they like to spray me with the soaker setting. It's available for about \$35 online, and at some hardware stores, home centers and discount stores.

JOSH RISBERG,
TFH LEAD CARPENTER



TIME SAVER

Flower planting helper

Last summer I decided to turn our raised vegetable garden into a flower garden. I started to have second thoughts when I figured out it would take 170 plants to fill the space—that's a lot of holes to dig! My husband suggested I use the auger he had bought to tunnel a hole under the sidewalk to install a sprinkler system. I just hooked it into our cordless drill and zipped along—the auger made perfect-size holes in just a few seconds each. It saved me a lot of time on my hands and knees. The 30-in. x 1-3/4-in. Yard Butler Garden Auger is about \$17 online.

ROSANNE PETERSEN, FIELD EDITOR



SMART CHOICE

LED BULB FOR GARAGE DOOR OPENERS

Vibrations created from a garage door opening and closing are hard on the filaments in incandescent bulbs. That's why until recently "rough service" incandescent bulbs were the best choice for your garage door opener. LED bulbs weren't an option because they could interfere with your opener's remote control, reducing its range to just a few feet!

Now Genie has developed an LED specifically for garage door openers. The bulb's electronics are shielded to prevent receiver interference. It's built to withstand vibration and low temperatures down to minus 22 degrees F, and it's rated for damp locations (most LEDs aren't). Genie claims a 25,000-hour life span, which equals about 17 years of use! Genie LED garage door opener bulbs are available online for about \$10.

RICK MUSCOPLAT, CONTRIBUTING EDITOR



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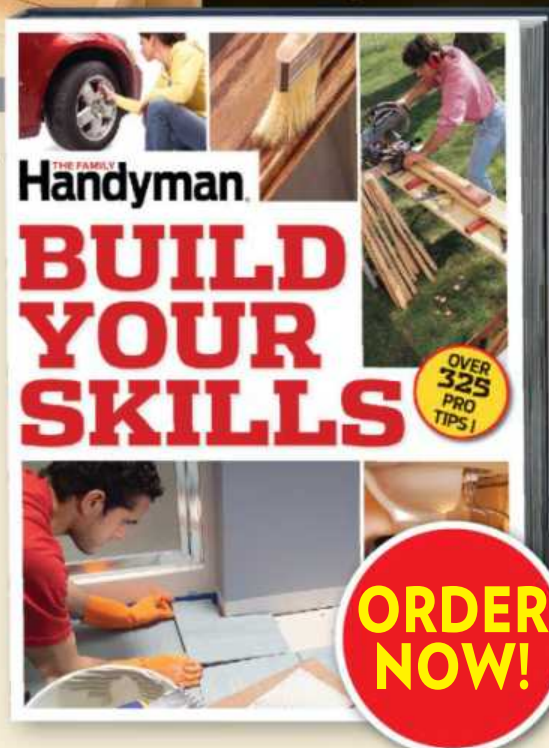
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LADDER-BARROW

The older I get, the heavier my extension ladder gets. Instead of lugging it around, I just strap it to my wheelbarrow! A rubber mat on the front lip of the wheelbarrow and a ratcheting cargo strap around the handles keep it from sliding as I wheel the ladder around the yard. – **KEN APACKI**



RECIPROCATING SAW BLADE BINDER

I used to keep all my reciprocating saw blades inside my saw's case, but they were a mess and it was hard to find just the right one. So I found a binder ring at an office supply store to keep the blades together.

– **ANDREW WOLF**



TRASH BAG HOOP

Putting stuff in a trash bag can be tough when the wind keeps blowing the bag closed. To hold the bag open, I "borrowed" one of my wife's 14-in. wooden embroidery hoops. It's just the right size for a 13-gallon kitchen trash bag. You can find embroidery hoops at hobby and craft stores for about \$4. – **GUY MARSHALL**

HANDY HINTS



Foil
Duct Tape

FOIL-TAPE PAINT SAVER

After paint cans have been opened and closed over a couple of years, the lids and rims get all bent and gooped up, making it hard to get an airtight seal. I now wrap foil duct tape around the upper part of the can. Works great! – **JOHN VAN DER LINDEN**



GUTTER SHELVES

Vinyl rain gutters are fairly inexpensive and great for storing small items. They come in 10-ft.-long sections, so you can cut them up with a power miter saw or hacksaw and make several shelves out of them. I just snap an end cap on each end, drill a couple of holes and attach them to my cabinets with wood screws and finish washers. For heavier stuff, I attach them with fascia gutter brackets, which you'll find at the home center right next to the gutters. – **DAVID OJALA**



Sawtooth
Picture Hanger

PICTURE HANGER TAPE HOLDER

I use my tape measure a lot in the workshop, so I like knowing where it is at all times. Sick of digging through piles of stuff to find it, I screwed a "sawtooth" picture hanger on the edge of my workbench, and that's where the tape measure lives—always! – **RYAN SORENSEN**

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Paul Fredrick

DIY Essentials

Our best tips for getting your project done right. By Jeff Gorton

Tips for Buying a Walk-Behind Lawn Mower

Whether you're buying your first mower or replacing an old one, navigating the maze of models and features can be daunting. Here are some tips to help you narrow your choices.

1. DON'T FORGET ELECTRIC MOWERS

If you don't have a huge lawn, a battery-powered mower may be perfect. Cordless mowers are quieter, require less maintenance, and of course, run without gas or oil. But best of all, you'll never have to start a gas engine—you just push a button or lever and you're mowing.

As lithium-ion battery technology has improved, most manufacturers have included cordless mowers in their lineup, so you'll have plenty of choices. Many of these mowers can cut an average suburban yard (about one-fifth of an acre) on a single charge. Prices for battery-powered mowers are similar to those of their gas-powered rivals, and you'll find most of the same features, too.



DIY ESSENTIALS

2. MATCH THE DRIVE SYSTEM TO YOUR TERRAIN AND YARD SIZE

If your lawn is relatively flat and not huge, chances are you'll be perfectly happy with a push mower—that is, a mower that's not self-propelled. In addition to being cheaper, mowers without power to the wheels are lighter, have fewer mechanical parts to wear out, and are usually easier to maneuver.

If you have hills or a large yard, a self-propelled mower is a better choice. Front wheel drive mowers pull the mower along but may lose traction on hills, where you tend to push down on the handle. And if you bag your grass, the weight of the bag will reduce the traction on the front wheels, making the drive wheels less effective. In most cases, rear-wheel drive is the best option since it works great on hills and with a bag. All-wheel drive is needed only for severely sloping terrain.

If you buy a self-propelled mower, consider upgrading to variable speed for more flexibility in matching your mowing speed to the lawn conditions and your walking speed.

3. SPENDING MORE UP FRONT MAY SAVE YOU IN THE LONG RUN

Residential, walk-behind lawn mowers range in price from less than \$200 to well over \$600. And you may be wondering if it's worth spending top dollar on a mower. In addition to the extra features available on more expensive mowers, high-end mowers have better-quality components. You'll find easy-rolling ball bearing wheels, long-lasting composite or aluminum decks, and top-quality engines. And most high-end mowers include a longer warranty, too. This adds up to a mower that will last longer and need fewer repairs. So you may save money by not having to replace or repair your old mower.

4. CHECK ONLINE REVIEWS TO AVOID BUYING A LEMON

Even a top-brand mower will occasionally have a quirky problem. One good way to discover whether the mower you're considering has a hidden flaw is to check online reviews. You'll find user reviews on manufacturer websites, Amazon and other websites where lawn mowers are sold. But keep in mind that there will always be a few users who have had a bad experience. Multiple complaints about the same problem should be a red flag, though.

5. DON'T FORGET YOUR LOCAL DEALER

You may be able to save a little money by purchasing a lawn mower from a department store or home center. But buying from a local servicing dealer has advantages that might outweigh any cost savings. First, you're more likely to get better purchasing advice from the more knowledgeable staff at a dealer showroom. And when it comes time for a tune-up or warranty repairs, you'll know right where to go for convenient, personal service. Most dealers have at least two or three top-quality brands to choose from and will display the most popular models on the showroom floor.



MEET THE EXPERT

Bob Tacke has been in the outdoor power equipment industry for more than five decades, managing stores, selling equipment and consulting with customers.



TOP: HUSQVARNA BOTTOM: SNAPPER



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DIY ESSENTIALS



6. GET ELECTRIC START AND STOP PULLING

If pulling a starter rope is difficult for you or anyone else who will be using the mower, look for a mower with an electric start. A built-in battery and starter motor eliminate the need to pull-start your mower. This is great for people with shoulder or strength problems. The electric start feature is also handy when you need to stop to empty the grass-catcher bag or pick up a stick that's in the way. Just turn off the engine. Restarting is a button-push away. Honda even makes a mower that charges the battery while you mow, so you don't ever have to plug in the mower to recharge the battery. You'll spend about \$100 more for the electric start feature.

7. GET A GOOD MULCHER

If you mulch your grass, look for features like special mulching blades or an aluminum or composite deck that resists grass buildup on the underside better than steel. If you prefer to bag your grass, make sure the bag is easy to remove and reinstall. And for the greatest versatility, look for a mower that also has a side discharge chute for times when you've let your grass grow too long for mulching or bagging.

Some mowers have features like Toro's "Bag On Demand" that simplify the change-over from bagging to mulching. Honda makes a mower with a feature called Versamow that allows you to mulch and bag at the same time, and adjust the percentage of clippings that go into the bag.



8. STOP WITHOUT RESTARTING If you collect your clippings and need to empty the bag frequently, or if you have to stop often to pick up sticks or move toys out of the way, you know what a hassle it can be to restart the lawn mower every time. You can avoid this problem by shopping for a mower with a blade brake clutch (BBC) or Toro's Blade Override System (BOS). Mowers with either feature allow you to stop the blade but leave the engine running. Expect to pay about \$100 more.



9. MAKE SURE IT'S EASY TO ADJUST THE CUTTING HEIGHT Try out the height adjusters on the mower you intend to buy to make sure they work smoothly and easily. On some mowers, a single lever adjusts a pair of wheels or even all four wheels at once.

TOP PHOTO: TORO

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Best Pro Tips

Expert advice from the job site. By Mark Petersen

Avoid Framing Mistakes

Minor framing mistakes can lead to wavy walls and squeaky floors. More serious mistakes can leave a house vulnerable to high winds, heavy snow loads and earthquakes. We wanted to know which mistakes were the most common and how to avoid them. So who better to talk to than a building inspector? He shared his experiences, his insight and a few horror stories. We walked away with some great tips on how to build a rock-solid house, build it code compliant and build it right the first time.



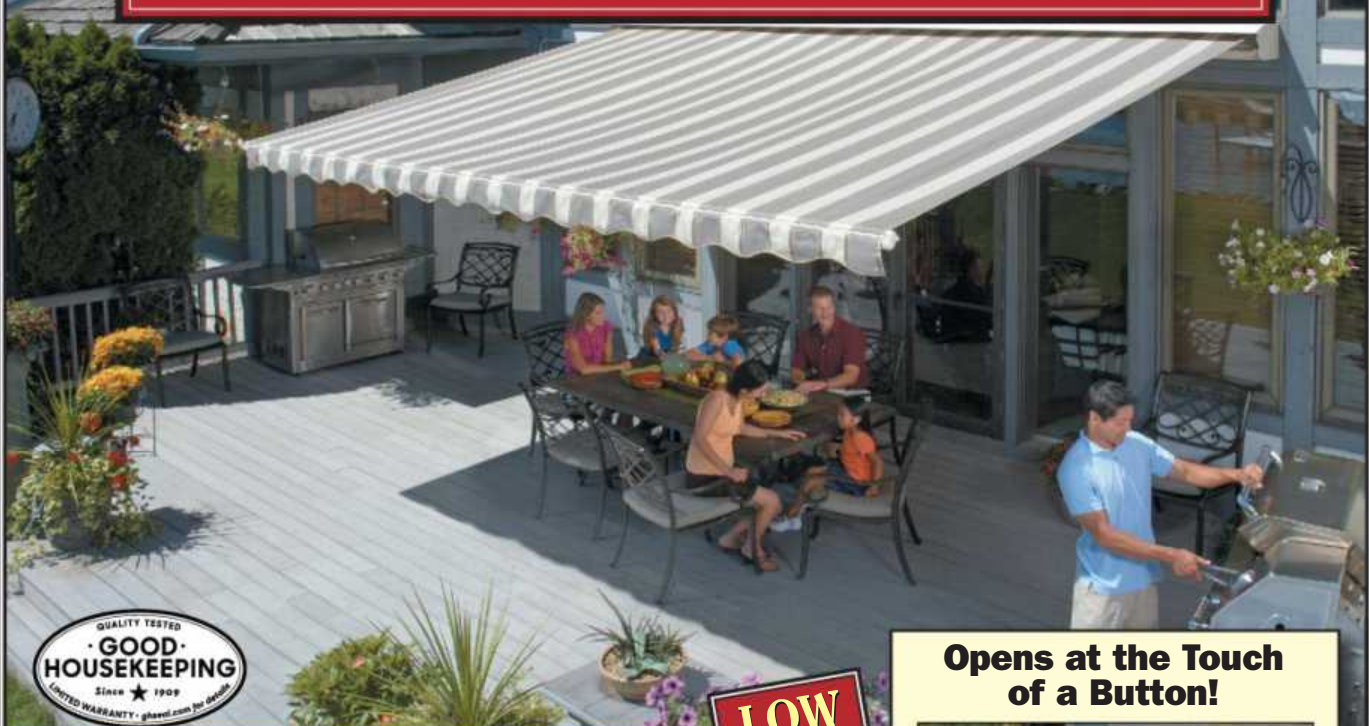
MEET THE EXPERT

Don Sivigny saw a few framing mistakes and code violations in the 13 years he spent as a construction manager and general contractor, and the 21 years he

worked as a building inspector. Today Don is a construction code representative in the Construction Codes and Licensing Division for the State of Minnesota. He also represents the state when new building codes are being drafted.



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BEST PRO TIPS



Stagger the joints in the top plates

It's best to have one continuous top and tie plate, but that's not possible on longer walls. When multiple plates are necessary, keep top plate end joints a minimum of 24 in. away from tie plate end joints. And keep end joints at least 24 in. from the end of the wall as well. If the two end joints are not kept apart, they create a hinge point, which weakens the wall. But 24 in. is a bare minimum; most conscientious framers prefer at least twice that distance.



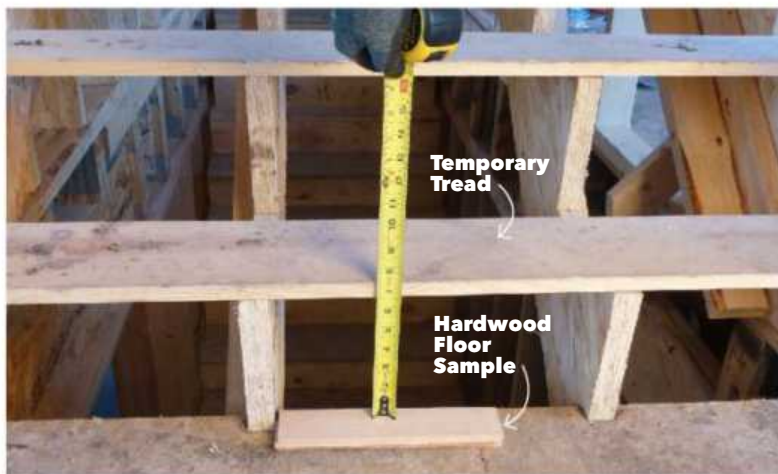
Nail to the framing

When you're securing the bottom plates of walls to the floor, nail into the floor joists/trusses below. Nailing through the plywood keeps the wall from moving side to side, but expansion and contraction of the roof system could cause the wall to lift if it's not also nailed to the floor joists/trusses. Plus, the nails will be out of the way when contractors need to cut holes in the plates for pipes, ducts and wires. For the same reason, nail top plates to overlying floor joists or roof trusses near studs whenever possible.



Don't forget the connectors

Structural connectors are designed to hold framing members to the foundation and to one another. They help a building withstand heavy loads, strong winds and earthquakes. Building codes that require structural connectors have been changing as connector technology improves, so make sure to review your local codes and contact your local building department if you still have questions. The foundation straps shown here prevent high winds from blowing these small garage walls off the foundation.



Include finished flooring when laying out stairs

The highest riser (step) height cannot be more than $\frac{3}{8}$ in. higher than the shortest riser height throughout the entire flight of stairs. Those measurements include finished floor heights. So mock up and plan for the absolute finished floor heights, top and bottom, before you begin doing the math and laying out the stair stringers.

Installing $\frac{3}{4}$ -in.-thick hardwood floors on a $\frac{1}{4}$ -in. subfloor will raise a floor height 1 in. Some carpet, vinyl and laminate flooring options are less than $\frac{3}{8}$ in. thick. If you don't account for those height differences, you could fail your inspection, and ripping out stairs is an expensive callback.



Use approved nails on treated lumber

Today, treated lumber intended for residential construction is protected with a copper-based preservative system called alkaline copper quaternary (ACQ).

Whenever you're working with ACQ lumber, be sure to use only ACQ-approved nails. ACQ treated wood is extremely corrosive to standard framing nails; they will actually dissolve when in direct contact with ACQ lumber. And if there are no nails holding wall studs to a treated bottom plate, foundation bolts/anchors are ineffective. It's also important to use ACQ nails to secure the sheathing to a treated bottom plate.



Double up jack studs

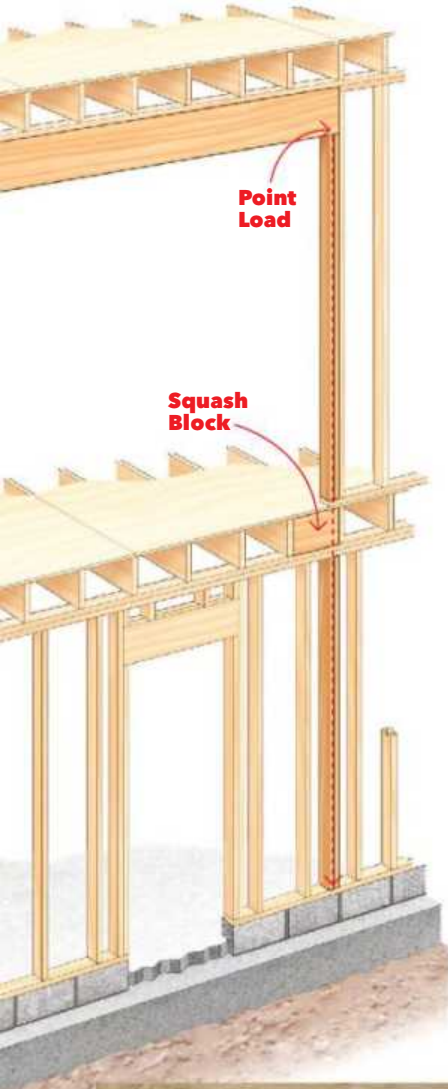
Jack studs, or "trimmers," are the framing members that support headers. The number of jack studs needed depends on the length (and sometimes the width) of the header. If the blueprints don't specify, a good rule of thumb is to install two on each side if the opening is wider than 6 ft., the typical patio door size.



Check for crowns in the studs

This may seem like a "duh!" tip, but some carpenters don't take the time to check the crown (bow) in every stud before assembling a wall. No one will notice if two studs with a 1/4-in. crown are aligned the same way. But if those same studs are installed on opposite sides of the wall, that 1/2-in. difference will be noticeable on both sides of the wall. Also, the studs may continue to warp as they dry, making the wave even more prominent. When you're assembling walls on the ground, keep the crown side up. If the crowns face down, the studs behave like a rocking chair and make it harder to assemble the wall. Some builders use engineered lumber on walls where cabinets will be located because it's super straight and stable.

BEST PRO TIPS



Add squash blocks to carry loads

When a heavy load-bearing beam sits atop a wall, extra studs are needed to help carry that “point load” down to the bottom of the wall. But the story doesn’t end there; that load has to be carried all the way down to the foundation. Squash blocks are often required to bridge the gap between a beam-supporting wall and the wall beneath it. Either vertical blocks (photo above) or horizontal blocks (illustration at left) could work.



Don't forget drywall backing

Most framing assemblies require extra backers to secure the drywall. Even if you’re conscious of installing drywall backers as you build, it’s easy to forget a section now and again. Don’t treat missing backers lightly; they can be a lot more difficult to install if there are wires, pipes or ducts in the way. Also, a grumpy drywall guy may have to rip off moisture barrier, pull out fiberglass insulation or chip out spray foam in order to hang the drywall. To make sure all the backing is there, one simple trick is to walk from room to room and scan every single wall and ceiling intersection with the thought of hanging drywall. And don’t forget the closets.

AVOID HEADACHES!

Don't install joists under toilets

ALL BLUEPRINTS SHOULD INDICATE THE SIZE AND SPACING of floor joists/trusses, but many don't spell out their exact locations. Avoid installing floor joists/trusses directly in the path of large drainpipes and mechanical chases. Toilet locations usually cannot be moved, which means the plumber will have to cut into a joist/truss, which can mean hiring an engineer to design a repair, which takes time and costs money.



Reinforce doorway walls

A wall that supports a door takes a lot of abuse. Some solid-core doors weigh more than 100 lbs. Add an emotional, door-slaming teenager, and you have a door frame that needs to withstand a lot of force. It's important to add extra support to doorway walls, both on the hinge and on the latch side. Do that by applying construction adhesive under the bottom plate on each side of the opening and by adding a couple of 3-in. toe screws.



Talk to the masons about anchor locations

Meet with the masons before they build the foundation. They should know that anchor bolts are required to secure wall plates every 6 ft. on center and within 12 in. from the ends and each side of joints. But sometimes anchors end up where they don't belong, like in door openings or under jack studs. A short meeting to discuss locations of openings and splices could spare you from cutting out misplaced anchors and installing new ones.



Shelter your materials

A little moisture isn't going to hurt most building materials, but if a project is delayed or you know you're in for a long run of wet weather, cover your materials with a tarp. Long exposure to wet conditions can promote mold as well as cause engineered lumber to delaminate and framing lumber to warp and twist. Plus, no one wants to work with wet lumber! Keep the tarp a little loose at the bottom for air circulation.

MORE PRO TIPS

Build Your Skills is packed with pro tips to get the job done right, whether you're a DIY veteran or just getting started. Get your copy today at familyhandyman.com/BuildSkill.



PERFECT PATIO CHAIRS

A classic design, reinvented
for comfort and easy building

BY KEN COLLIER





This chair is hard to beat for comfort, economy and ease of building. The design is based on a couple chairs I've had at the family cabin for more than a decade. Being a fiddle-with-it kind of guy, I modified the originals over the years, built others and eventually chose this design.

I think it's about as close to perfect as you can get: It's comfortable to sit in for hours at a time, the arms are wide enough to hold a drink, and you're reclined enough for relaxation, but not so much that you'll groan every time you get up (unlike with most Adirondack chairs). It will accept a common type of outdoor chair cushion, available at any home center, but doesn't require one. It's light enough to move around easily, and you can fit it through a doorway without contortions. Plus, it's inexpensive and easy to build.

Skills, tools & lumber

This is a beginner to intermediate level project. If you have just a little experience with tools, you can do it. You'll need an orbital or a random-orbit sander, a 7/16-in. wrench, six clamps and a drill. You can cut parts with a circular saw and drive nails with a hammer, but you'll get faster, nicer results with a miter saw, an air compressor and an 18-gauge brad nailer.

I've built this design from both pine and cedar. Each pine chair will cost you about \$60, cedar about \$90. Cedar is a better choice if your chairs are going to spend much time out in the rain. You may find it hard to buy 1x3 cedar, so you may have to rip a 1x6 in half. Also note that rough cedar is usually thicker than 3/4 in., while pine boards come in the standard 3/4-in. thickness. When you're building the seat and back, keep those different thicknesses in mind **(see Photos 2 and 3).**

MEET THE BUILDER
Ken Collier, former editor-in-chief of *The Family Handyman* and a longtime cabinet-maker, likes nothing better than sitting in a comfortable chair looking out over his favorite river.



Figure A Exploded View

OVERALL DIMENSIONS:
35-1/4" tall x 27" wide
x 33-1/4" deep

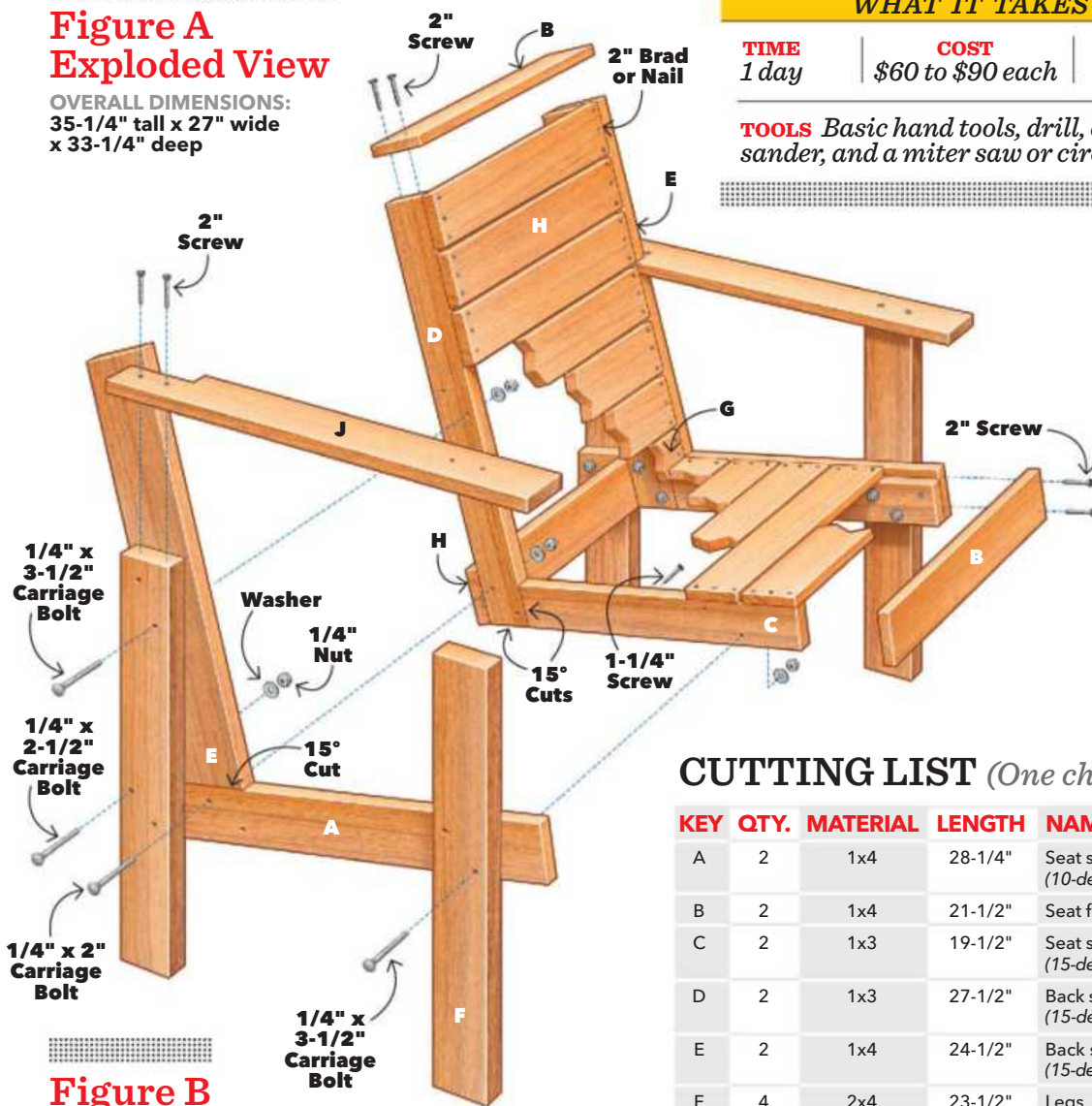
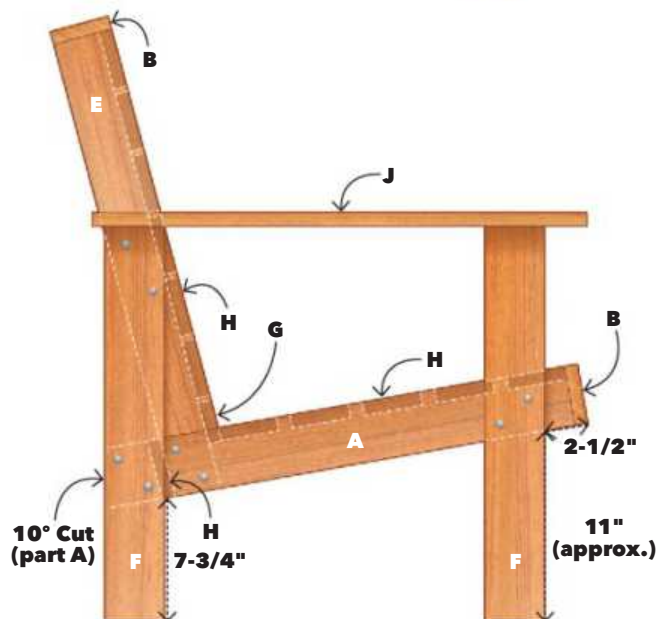


Figure B



WHAT IT TAKES

TIME 1 day | **COST** \$60 to \$90 each | **SKILL LEVEL** Beginner

TOOLS Basic hand tools, drill, clamps, sander, and a miter saw or circular saw

CUTTING LIST (One chair)

KEY	QTY.	MATERIAL	LENGTH	NAME
A	2	1x4	28-1/4"	Seat sides (10-degree cut one end)*
B	2	1x4	21-1/2"	Seat front, back top
C	2	1x3	19-1/2"	Seat supports (15-degree cut one end)*
D	2	1x3	27-1/2"	Back supports (15-degree cut one end)*
E	2	1x4	24-1/2"	Back sides (15-degree cut one end)*
F	4	2x4	23-1/2"	Legs
G	1	1x3	19-3/4"	Bottom back slat (cut to fit)
H	12	1x4	19-3/4"	Slats, back brace (cut to fit)
J	2	1x4	29-1/4"	Arms

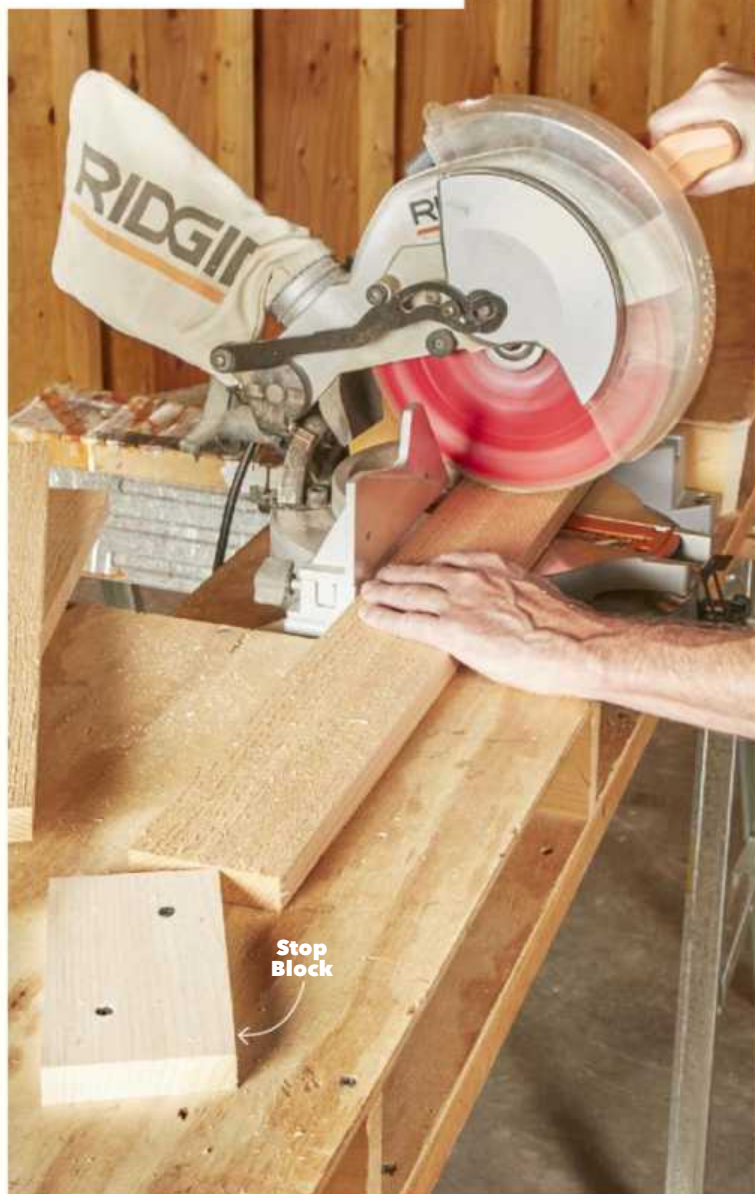
* Measure to **long** point on all angled parts

MATERIALS LIST (One chair)

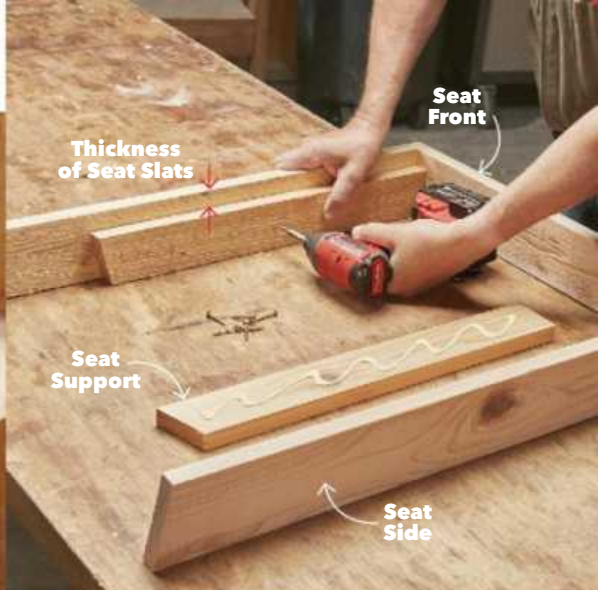
QTY.	ITEM
1	8' 2x4
5	8' 1x4
2	8' 1x3
4	1/4" x 2" galv. carriage bolts
4	1/4" x 2-1/2" galv carriage bolts
8	1/4" x 3-1/2" galv carriage bolts
16	1/4" galv. washers
16	1/4" galv. nuts
1 lb.	2" deck screws
1 lb.	1-1/4" deck screws
	18-gauge galv. 2" brads or 4d galv. finish nails
	Exterior glue and finish



1 Cut the parts
Making more than one chair means cutting a lot of pieces to the same length. A stop block lets you cut a bunch without measuring and marking each board.



Stop Block



2 Assemble the seat base
Screw the front to the sides, then glue and screw the seat supports to the sides. If needed, raise or lower the seat supports slightly so that the space above them matches the thickness of the slats.



3 Build up the back supports
Screw and glue the back supports to the back sides. Position the back supports to match the thickness of the back slats.

Build a prototype

Over decades of chair building, I've learned this: Every chair is a compromise, and no chair is right for everyone. This chair, for example, is mid-sized and may not be comfortable for large people. So I strongly recommend that you build a prototype before you settle on this or any other design. Use pine or plywood scrap, and don't bother sanding the parts.

The biggest advantage to a prototype is that you and your family can

test it for comfort. You can also shop for cushions and actually try them out on the chair. Thicker cushions change the feel of a chair significantly. A prototype is also a building lesson: Once you've built one chair, you can churn out others faster, better and without mistakes.

First, cut and sand the parts

Begin by cutting all the parts except G

and H (**Photo 1**). If you're using cedar that's rough on one side, you need to cut each part so that the smooth side will face out. That means you'll have left and right sides to parts A, D and E. In other words, for each pair of parts, make sure the angled cut goes one direction on one part, the other direction on the other. This will allow you to assemble the chair with the smooth face of the cedar facing out.

As you're cutting, label the parts with masking tape. Parts G and H are



4 Bolt on the back
Attach the back to the seat side with galvanized carriage bolts. Then screw the back brace to the back side supports.



TEST THE BOLTS
A heavy buildup of zinc coating on galvanized bolts can make it nearly impossible to thread on the nut. So try a nut on each bolt first. Better to discover a stubborn bolt before you pound it into the hole.



5 Attach the legs
On a flat, level surface, clamp the legs to the seat and back. Check the legs for plumb and the seat for level, then bolt on the legs.



6 Nail on the slats
For both the seat and the back, position the end slats first. Then space the others between them (typically 3/8 in. apart).



HIDE THE UGLY BOARDS
If the seat and back will get covered by cushions, use up knotty or odd-colored stock for the slats. But check the slats before you use them: Big, loose knots can create a weak spot that will crack under stress.

cut after the chair is assembled so you can get them to fit perfectly. In cedar, the length is likely to be about 19-3/4 in. instead of 20 in. Once pieces are cut, sand them. Generally, you don't need to sand finer than 120 grit. For cedar parts, sand only the smooth face.

Build the frame

For pieces that are screwed together, you should drill a pilot hole. In pine, you should countersink a little so the screw head doesn't splinter the wood; cedar is so soft that it's better not to.

Build the seat frame on a flat surface so it stays flat (**Photo 2**). Begin by screwing the front (B) to the sides (A), then screw and glue the seat support (C) to the inside surface of A. Now glue and screw the back supports (D) to the back sides (E), keeping the square ends flush (**Photo 3**). The angles at the ends should be parallel. Put the sides in position and tack them on with one screw each at the bottom into the seat sides (A). Screw the back top (B) to the top of the back sides (E). With the back lightly screwed in place, drill two

bolt holes each through the seat sides and the back supports (**see Figure A**). Install galvanized carriage bolts and tighten the nuts firmly (**Photo 4**).

Attach the legs

Mark two legs (F) at 7-3/4 in. from the end and mark the other two legs at 11 in. Turn the chair assembly on its side and clamp two legs into place (**Figure B**) so one leg is flush to the angled cut on the seat sides (A) and the other is 2-1/2 in. from the front edge of the seat. After



7 Mark the arm for a notch

Hold the arm in position and mark the angle of the back onto its edge.



8 Cut the notch with a handsaw
When you reach the end of the long cut, angle the saw to match the angled cut. Any handsaw will do, but smaller is better.



9 Mount the arms

Screw on the arms. Round over corners and sharp edges with a file or sandpaper. Give everything a final sanding and you're ready for finish!



SOAK THE LEGS

If the chair will sit on a wet patio or deck, the legs will wick up moisture and rot. To prevent that, soak each leg in a pan of finish for a few minutes. Set the leg on a nut or washer to expose the end of the leg. The finish will penetrate deep and lock out moisture.

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clamping the legs to the seat sides and back, turn the chair over and clamp on the other two legs. Turn the chair right side up to adjust the legs (**Photo 5**).

Tweak the position of the chair seat so all four legs are on the work surface, the legs are plumb and the seat is level (assuming your work surface is too). Don't worry if the chair seat is not quite on the leg marks you made earlier. When all is well, drill the bolt holes and attach the bolts. Be careful drilling; your holes must go through the back and seat supports (C and D), well away from the edges where the slats will rest.

Seat slats and arms

Measure the inside width of the chair seat and cut a test slat. If it's a good fit, drill the ends and screw it to the bottom edge of the seat supports, in back (**see Figure A**). Cut part G and the rest of the slats (H).

Divide your slats into good and better, and use the better ones on the back, where they're more visible. Nail on the top slats of the back, the front slat of the seat, and the bottom back slat (G). Then space the other slats out and nail them on (**Photo 6**). It helps to tip the chair over to do the

back slats. Follow **Photos 7 - 9** to install the arms.

Sand and finish

Gently round the corners of the arms with a file or sandpaper. Then file a small round-over on all exposed edges, especially on the undersides of the arms, to prevent splinters.

You can cover the screw heads with exterior-grade wood filler or leave them exposed. Lightly sand the entire chair to 120 grit and it'll be ready for finish. I finished our chairs with transparent deck stain.

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READERS' FAVORITES

12 Top Spring Storage Tips

Ingenious ideas to help you prep for a no-clutter summer



By Mary Flanagan

1. GARDEN TOOL HIDEAWAY

A mailbox hidden behind shrubs near your garden provides a convenient home for tools. A small mailbox like this one costs less than \$20 at hardware stores and home centers. King-size models cost about \$35. – **LYNN SAMPLES**



3. PVC TOOL HOLDER

Build this rack to store your tools on the wall. Use a jigsaw to cut a 1-1/4-in.-wide notch the length of a 2-in.-diameter PVC pipe. Cut several 3-1/2-in.-long, 1/8-in.-wide holes behind the notch. Use 1-1/4-in. drywall screws to attach these pieces to a 2x4 screwed to the wall. —**JOHN SCHORLING**



Wood Block

2. GARAGE STORAGE

Cardboard concrete-forming tubes are inexpensive (\$10 at any home center) and provide a great place to store baseball bats, long-handled tools and rolls of just about anything. Rest the tubes on a piece of 2x4 to keep them high and dry. Secure each tube to a garage stud with a plumbing strap.

—**DAVID S. MALLINAK**



4. TOOL BUCKET

A 5-gallon bucket comes in handy out in the garden—and not just for collecting weeds. You can load it up with all your gardening tools and carry them easily from place to place. If it starts to rain, protect the tools with the lid. But here's the best part—it doubles as a portable stool when you need to rest or do some pruning. The only problem is that the lid can be hard to pry off. Solve that by cutting off all but two of the plastic tabs. The lid will go on and off in a snap.

—**JULIE ABBOTT**

5. HANG-IT-HIGH HELPER

With this extension pole, you can hang objects in high, hard-to-reach areas. Attach a spring clamp to the end of an ABS or PVC drainpipe, and use the end of the clamp as a hook to lift items on or off a hook or nail.

—**JOSEPH AND DEBRA WRONKOWSKI**





6. HANG-IT-ALL HOOKS

Those plastic hooks that plumbers use to support pipes make convenient hangers for just about anything. They're strong and cheap and they come in a range of sizes. Find them in the plumbing aisle at home centers and hardware stores.

— LORI CALLISTER



8. GARDEN GEAR CADDY

An old golf bag, especially one on a cart, is perfect for storing and hauling garden tools. Get them all to the garden in one trip and park them in the caddy shack when you're done. Fore!

— RANDY ROUSH

7. SAVE YOUR LAWN PRODUCTS

Leave a bag of fertilizer or weed killer open for long and it'll soak up moisture from the air and won't go through a spreader. Even grass seed could use an extra layer of protection from a moisture-wicking concrete floor. Place opened bags of lawn products in large resealable plastic bags (\$1 at discount stores). The products will be free of clumps or pests when you need them.

— JAMES A. HANNA



Make hinge installation an open-and-shut case



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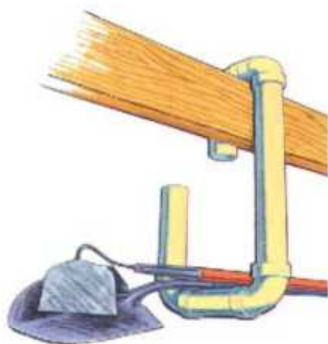


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9. SIMPLE SPIRAL HOSE STORAGE

Here's a handy tip for storing your spiral hoses so they don't end up tangled. Just wrap them around the handle of a rake or shovel. The long-handled tool does double duty! – **BILL ALOI**



10. STORAGE HOOKS

Get ladders, tree pruners, kids' bikes and other unwieldy items off your garage floor with these inexpensive PVC hooks. For heavy items, you could make the hook out of steel pipe. – **FRED KENDLE**

12. WHEELBARROW RACK

Hang up your wheelbarrow to free up floor space. Center a 2-ft. 1x4 across two studs, 2 ft. above the floor. Tack it into place, then drive 3-in. screws through metal mending plates and the 1x4 and into the studs. Leave about 3/4 in. of the plate above the 1x4 to catch the rim. Rest the wheelbarrow on the 1x4 as shown, and mark the studs 1 in. above the wheelbarrow bucket. Drill pilot holes and screw ceiling hooks into the studs. Twist the hooks so they catch on the wheelbarrow lip and hold it in place. – **BRYAN TURNBO**



Mending Plate



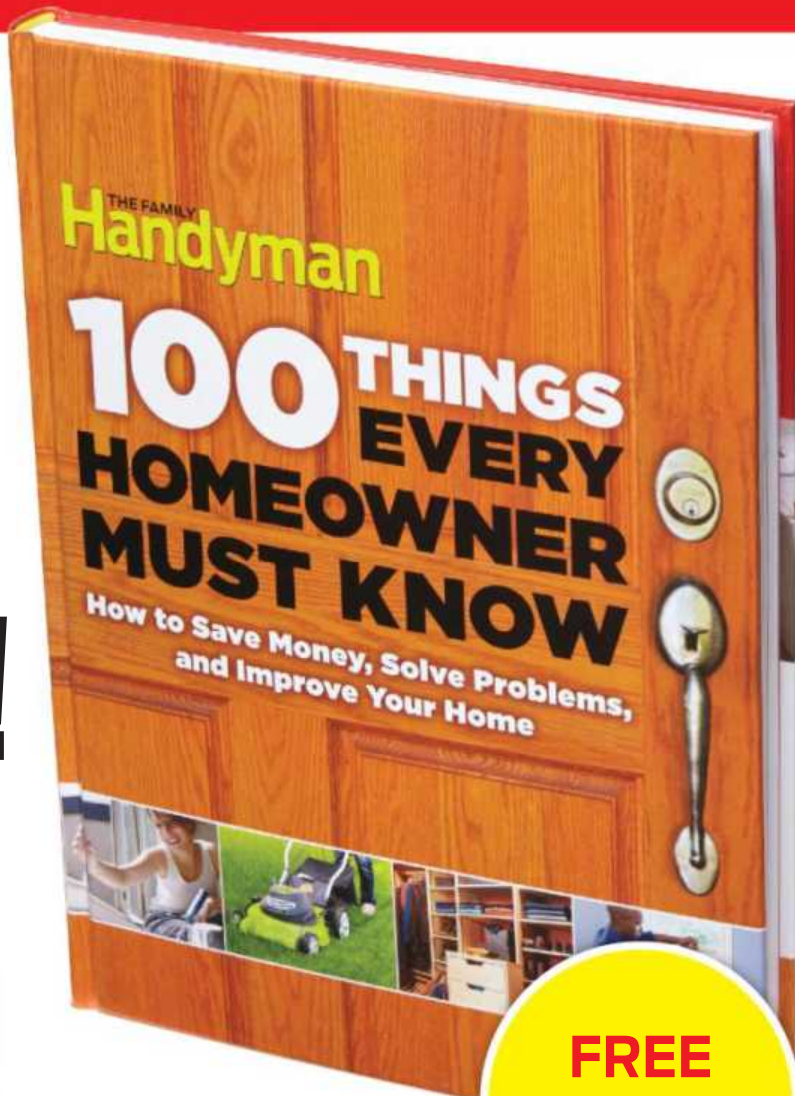
Ceiling Hook



11. YARD TOOL ORGANIZER

Create a simple long-handled tool hanger out of two 1x4s. On the first one, drill a series of 2-in. holes along the edge of the board. The trick is to center each hole about 1 in. from the edge. That leaves a 1-1/2-in. slot in the front that you can slip the handles through. Space the holes to accommodate whatever it is you're hanging. Screw that board to another 1x4 for the back and add 45-degree brackets to keep it from sagging. If you wish, pound nails into the vertical board to hang even more stuff. No more tripping over the shovels to get to the rakes! – **ROBERT JOHNSON**

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DIY RADON REDUCTION

**You can save \$1,000 in a weekend!
Here's what you need to know before
you begin. By Jason White**

If you've tested for radon and found you've got a problem, your next question is probably "Can I fix it myself?" This story will help you answer that question. And if you decide to go for it, we've got some great tips from professional installers to help you get it done.

In most cases, pros charge about \$1,500 to install a radon mitigation system, but you can do it yourself for only about \$500 in materials. So if you're fairly handy and have some carpentry, plumbing and electrical skills, you can install your own system in a weekend and save yourself a thousand bucks!

WHAT IS RADON?

Radon is an invisible, odorless radioactive gas that seeps out of the soil and into the atmosphere. It's almost everywhere. In fact, you're probably breathing in tiny traces of it right now. But when it's trapped inside a home and reaches high levels, radon can cause lung cancer. Your house can have high levels of radon even if your house is new and your neighbor's house doesn't have any. The highest levels are normally found in basements, but it's possible for radon to reach other parts of your house too.

Seal holes and cracks first

If the radon levels in your home are only slightly elevated, try sealing holes and cracks in concrete walls and floors and test again. In most cases, sealing doesn't solve the problem. But you'll have to seal before you install a mitigation system anyway, so it's worth a try. Sealing is usually simple; caulk small openings and fill larger gaps with expanding foam or hydraulic cement.



HOW A RADON REDUCTION SYSTEM WORKS

A fan pulls radon gas from beneath the floor and exhausts it outside. In cold climates, it's better to run the pipe inside the house rather than outside as shown here.



TEST FOR RADON

It's important to fix the radon problem in your house if a test shows a concentration of 4 picoCuries per liter (pCi/L) or higher, so buy a test kit. You can get one at a home center for about \$10—plus a \$40 lab fee—and perform the test yourself. You just let the tester sit in your house for a few days and then mail it to a lab for analysis. Electronic radon monitors that monitor continuously for radon are available online for about \$130 and don't require a lab.

PVC Pipe

Shallow Pit

PLANNING YOUR SYSTEM: 7 QUESTIONS TO ANSWER

More than most projects, a radon mitigation system requires detailed planning. The planning process will also help you decide whether you're willing and able to tackle the job yourself. Here are seven questions you must answer before you charge ahead:

1. What does your building inspector require?

Make a quick phone call to your town's building department to ask about local code requirements, permits and inspections. In some areas, only licensed pros are allowed to install systems.

2. Where will the pipe begin?

In most cases, you'll want to locate the PVC pipe that sucks radon from under your concrete floor near an exterior wall so it's out of the way and easy to route outside. This is also where sump pump basins and footing drainpipes (aka "drain tile") are located in some homes—perfect places from which to suck radon. If you don't have a sump basin, you'll have digging to do (see p. 47). If you use the sump basin as your suction point, be sure to seal around any pipe and wire penetrations in the lid. Special supplies for dealing with sump basin lids are available online at indoor-air-health-advisor.com, or do an online search for "radon sump lid."

3. Run the pipe indoors or out?

It's much easier to route the pipe outside the house, but that can cause a problem in cold climates. Condensation can form inside, causing ice to build up and stop the fan from working.

4. What's the pipe path?

If you'll be routing your pipe outdoors, it's no big deal. Just run it up along an exterior wall. But running pipe indoors can be a real nightmare. Most professional installers in cold-weather areas try to avoid condensation problems by routing the pipe up through a closet or finished garage and to a fan in the attic that blows the radon out above the roof. Be ready for a big, dusty mess if you have to route your pipe indoors. Also keep in mind that the pipe has to terminate 12 in. above the roof and be at least 10 in. away (horizontally) from any dormer windows. Ask your city's building department about any additional requirements.



5. Where will you put the fan?

If you'll be mounting the fan outside, put it in a place where you can get electricity to it easily. If it's indoors, the fan *must* be located in an unfinished attic. Never install the fan in your basement or any living space because, if there's ever a leak, the fan could pump highly concentrated radon right into your home.

6. How will you get power to the fan?

The toughest part of any electrical job is getting cable from point A to point B. If there's a junction box nearby that you can extend the circuit from, you're golden. If not, you might be spending lots of time fishing cable to where you need it. Fans draw very little power—usually less than 100 watts—so you can tap any nearby circuit. You can also hardwire a fan or plug it into an outlet. In an attic, it's best to install an outlet because it makes replacing the fan easier. Outside, it's best to hardwire the fan using water-tight conduit.



TIPS FOR INSTALLING YOUR SYSTEM

Find the footing

If you'll be installing your PVC pipe close to a basement wall, drill a test hole in the floor and feel around for the foundation's footing. Concrete slabs are typically about 4 in. thick, so use a masonry bit that's a couple of inches longer than the thickness of the floor (our installers use a 12-in. one) to see if the footing under the foundation walls will be in the pipe's way. If you do hit the footing, try again a couple inches farther from the wall. You can patch the test holes later with patching cement.

**Help for
Cutting &
Gluing Pipe**

Cutting and gluing PVC pipe for a radon system is done the same way as for any regular plumbing job. For tips, go to tfhmag.com/joinplasticpipe



7. What's under the slab?

You may not know what kind of base material you have under your concrete slab until you punch a hole in the floor. (See "Make a Big Hole with Several Small Ones," below.) Soil conditions affect how readily radon flows underneath the slab, so don't buy a fan until you know what you're dealing with. You'll need to provide this information when you buy a fan. (See "Buy Your Fan from an Expert" at right.)

BUY YOUR FAN FROM AN EXPERT

Radon fans cost \$140 to \$250, depending mostly on size. Some radon mitigation systems require a big, powerful fan. Others work fine with a smaller model. Sizing a fan requires expertise, so we strongly recommend that you buy from an expert who will ask questions and supply you with the best fan for your situation, as well as exchange the fan for a bigger one if the smaller one doesn't fix your radon problem. One such expert is Val Riedman, a professional radon system installer who runs a website where you can get more DIY information and buy supplies. *The Family Handyman* editors have purchased fans from him. Visit <http://www.indoor-air-health-advisor.com/radon.html> for more information. Val also contributed to this article.



Make a big hole with several small ones

You'll need a hole in the basement floor a little bigger than the PVC pipe to give you some wiggle room and make it easier to remove soil and gravel. You could rent a large rotary hammer drill and coring bit from the home center, but save yourself some money and try this trick instead: Just draw a 6-in. circle where the pipe will be installed. Then, using a 3/16-in. masonry bit, drill several holes close together. Now just whack the center of the large hole with a hammer to break through.

Make a suction pit

Creating a shallow pit underneath the hole gives the radon a place to collect before getting sucked up the pipe. You'll need to remove several gallons of whatever base material is under your slab. The tighter the soil, the more material you'll have to remove so the radon fan can do its job. For loose gravel, you need to remove only about 5 gallons. For tighter soils like sand, dirt or clay, plan to remove 15 gallons or more. A shop vacuum helps suck up the loose stuff. For tighter soil, you'll probably need to do a combination of hand digging and vacuuming.



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Dry-fit all the piping

Doing a “dry fit” before gluing the PVC pipe and fittings ensures that everything will fit together properly after you apply the glue. Once you commit to gluing, you only have seconds to push and twist everything together before they’re permanently fused.



Install fire-stop collars in garages

If you route part of your radon piping through a garage, then you must install fire-stop pipe collars (also called fire barriers) wherever pipe goes through a finished wall or ceiling. The collars seal around the pipe, preventing—or at least slowing down—fire from spreading to other parts of the house. You can buy fire-stop collars for \$40 to \$50 online.



MEET THE EXPERTS

Gary and Jake Vaness are professional radon system installers. They run Radon Reduction Inc., in Minnetonka, Minnesota, and let us tag along on one of their installations for this article.



Exit through the rim joist

If you'll be running pipe directly outside from the basement or out through an attached garage, you'll need to cut a nice, clean hole in the rim joist. A hole saw (\$25 to \$40 at home centers) is the perfect tool for this job. Buy the cheapest one you can find since you'll probably use it only once or twice in your lifetime. The installers we worked with use a 4-1/2-in.-diameter hole saw, which matches the outside diameter of 4-in. PVC pipe, giving it a very snug fit. Drill a locator hole from inside the basement first, then use the hole saw to cut the hole from outside.



Seal around the pipe with patching cement

After you've installed all the pipe, stuff some foam backer rod into the gap between the pipe and the concrete and apply fast-setting concrete patching cement. Trowel the cement flush with the top of the concrete floor.



Install a manometer

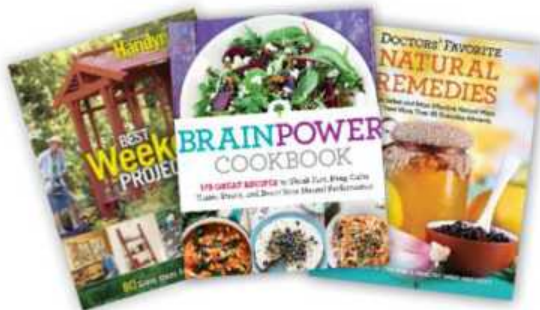
Radon fans don't run forever (typically 7 to 10 years), so you need a warning device to tell you when it stops working. One option is a liquid-filled manometer (\$10 to \$30 online) mounted on the PVC pipe. When the liquid level drops, the system isn't working. Electronic monitors that measure radon in the air are another option. The Safety Siren Radon Detector, for example, sounds an alarm when radon levels become dangerous (\$130 online).

Do another radon test

After installing your radon system, do another test. If that test shows you still have high levels of radon, contact the company you bought the fan from. Chances are, you'll need to install a more powerful fan. But in some cases, a second suction point (where pipe enters the floor) is the solution. (See "Buy Your Fan from an Expert" on p. 47.)

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2017 *BEST IN DIY*

CORDLESS CHAIN SAWS

**Surprise!
Some battery-
powered saws
perform like
gas models**

BY JEFF GORTON

A few years ago, I would have scoffed at the idea of a battery-powered chain saw that can rival its gas-powered cousin. But today, improvements in lithium-ion battery and motor technology allow production of batteries that can run everything from cordless trimmers to lawn mowers. So it's only natural that chain saw makers, and even power tool manufacturers, have jumped on the bandwagon.

WHAT WE DISCOVERED

If you're wondering how battery-powered chain saws compare with gas-powered versions, or whether this type of chain saw is right for you, we can help. For this review, we chose 10 chain saws ranging in price from about \$177 to \$540. We'll show you what separates the most and least expensive saws, and walk you through features you should consider if you decide to buy a cordless chain saw.

There was a noticeable improvement in performance from the two lower-priced saws to the more expensive models, but after that the differences were more subtle. The DeWalt, Echo and EGO saws were at the top of the class for cutting speed and endurance. The saws with higher amp-hour batteries tended to cut more logs before running out of juice. Also, we found that with battery-powered chain saws, it was especially important to let the saw do the work. Most of the saws will stop abruptly if you overload them by applying too much pressure. Check the comments on individual saws for more details.

Picking a favorite was difficult. In the end, we chose two saws with high amp-hour batteries that also included all our favorite features. But there were several close seconds.

THE 3 HOWs

HOW MANY
cuts can you
make through
an 8-in. log?

HOW LONG
does it take to
deplete the
battery?

HOW FAST
do each of the
saws cut?

TO FIND OUT, we repeatedly cut through an 8-in.-diameter log with each saw until the battery went dead.

Chain Saw Performance

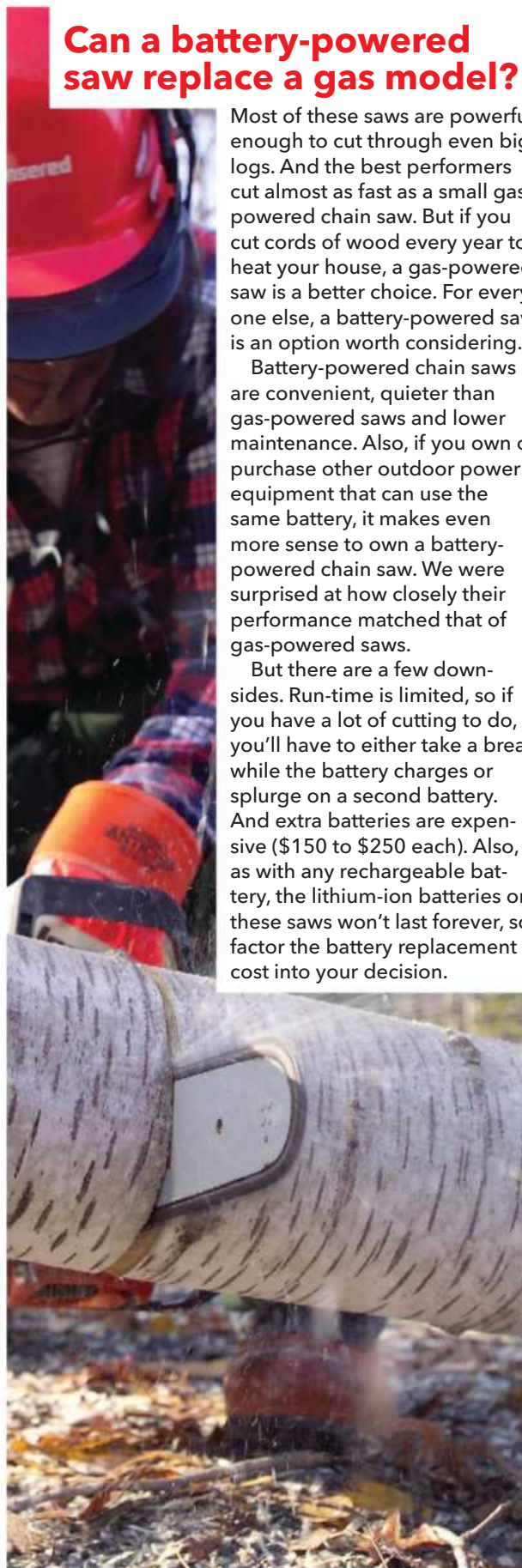
Brand	Cuts Per Battery Charge	Minutes Per Battery Charge	Average Seconds Per Cut
Echo	66	9	8.2
DeWalt	65	12	11.1
EGO	63	9	8.6
Stihl	57	9	9.5
Husqvarna	57	12	12.6
Greenworks	35	6	10.3
Oregon	34	9	15.9
Kobalt	33	6	10.9
Ryobi	14	2	8.6
B&D	10	7	42.0

Can a battery-powered saw replace a gas model?

Most of these saws are powerful enough to cut through even big logs. And the best performers cut almost as fast as a small gas-powered chain saw. But if you cut cords of wood every year to heat your house, a gas-powered saw is a better choice. For everyone else, a battery-powered saw is an option worth considering.

Battery-powered chain saws are convenient, quieter than gas-powered saws and lower maintenance. Also, if you own or purchase other outdoor power equipment that can use the same battery, it makes even more sense to own a battery-powered chain saw. We were surprised at how closely their performance matched that of gas-powered saws.

But there are a few downsides. Run-time is limited, so if you have a lot of cutting to do, you'll have to either take a break while the battery charges or splurge on a second battery. And extra batteries are expensive (\$150 to \$250 each). Also, as with any rechargeable battery, the lithium-ion batteries on these saws won't last forever, so factor the battery replacement cost into your decision.



Gas vs. Electric Race

We wanted to see, side by side, which cut faster: a gas-powered or an electric saw. The results were surprising. See for yourself at tfhmag.com/chainsawrace

BATTERIES & CHARGERS

Batteries for the saws we tested ranged from 36 to 80 volts, and from 1.5 to 6 amp-hours. If you're curious what these numbers mean, think of voltage as horsepower and amp-hours as the amount of fuel in the tank. Using this analogy, you would expect the 80-volt, 2-amp-hour battery on the Kobalt and Greenworks saws to provide tons of power but run out of juice sooner than the 36-volt, 6-amp-hour battery on the Stihl saw. And that's consistent with our test results.

All of the saws include smart chargers that sense when the battery is too hot or too cold to charge properly, and delay charging until the battery is at the ideal temperature. Listed charging times range from 30 minutes to 3-1/2 hours, but these can fluctuate a lot depending on the temperature and battery condition.

Even though the chargers are designed to prevent battery damage, be sure to read the use and care instructions for your saw's battery and follow them carefully to make sure your battery lasts as long as possible.

2 Amp-Hour

5 Amp-Hour

FEATURES WE LIKE

Some features, like tool-free chain tensioning, are available on several of the saws we reviewed. Others, like Oregon's built-in blade sharpener, are exclusive to a brand. Here are some of our favorite features on the saws we reviewed.

Convenient bar-oil filling



Filling your saw with bar oil isn't a maintenance task—it's something essential just to keep cutting, just like adding gas to your car. So it's important that adding oil be as simple and convenient as possible. We liked the caps on the DeWalt and Stihl saws with flip-up handles and quarter-turn action. We also liked the oil reservoir on the Greenworks and Kobalt saws. Since you fill them with the saw upright, you can see the oil level through the translucent window as you're filling.

Tool-free chain tensioning

Keeping the chain on your saw tensioned correctly is crucial for safety and preventing damage to your bar and chain. The tool-free feature found on many of these saws allows you to easily adjust the chain tension without a wrench or screwdriver. The mechanism varies somewhat from saw to saw, but in general, the bar nuts have been replaced with a large knob that you turn to loosen or tighten the bar. There's another knob to adjust the chain tension. We think it's worthwhile to look for this handy feature.



Variable speed

All but three of these saws run at full speed when you pull the trigger. Usually this is fine, but sometimes it's nice to have more control over the chain speed. That's when the variable-speed feature found on the Ryobi, Echo and DeWalt saws is preferable. As you depress the trigger further, the motor and blade speeds increase.

FEATURES WE LIKE

(continued)



Bar length

Bar lengths on the saws we tested ranged from 12 to 18 in. Some of the saws, like the Stihl, are available with different bar sizes, so you can choose the size you want.

A longer bar allows you to cut bigger logs, of course, but it also requires more power. The saws we tested generally had the power to match their bar length.

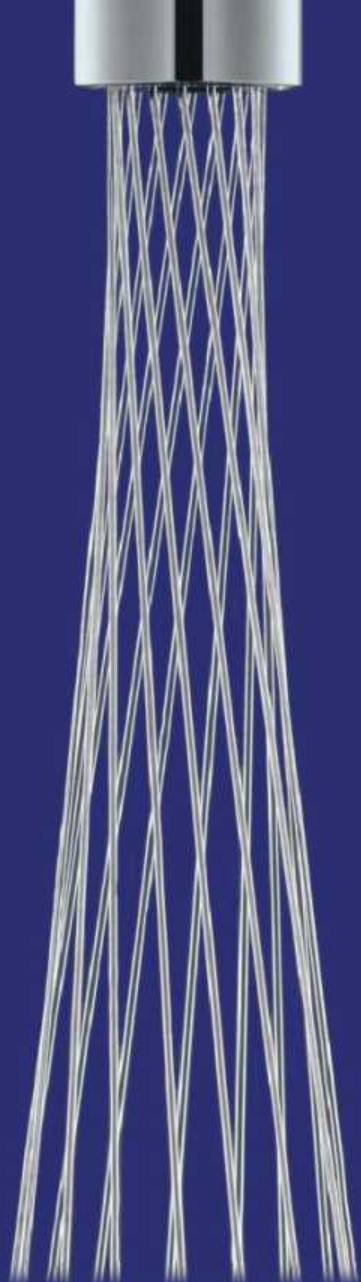
"On" switch

You must press a button on the handle to turn on the Greenworks, Kobalt and Husqvarna saws. The Greenworks and Husqvarna saws turn off after about 60 seconds. The Kobalt saw remains on for only about 20 seconds. This feature ensures that you don't grab the saw and accidentally start the blade spinning. We found this additional step a little annoying but not a deal breaker if you otherwise like the saw.



Room for gloves

Some saws provide more clearance between the handle and the hand guard. If you'll be using your saw in a cold climate with heavy gloves, more space is better.



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Models We Tested



Ryobi RY40511

The small battery provided far fewer cuts than other saws, but the cutting speed was as fast as that of much more expensive models. The variable speed trigger provided good control. This saw is a good choice if you don't need to cut large quantities of wood at a time, and you don't mind not having tool-free chain tensioning or a blade brake.

EDITORS' CHOICE 2017
BEST VALUE



EGO CS1604

This EGO saw was a top performer. EGO claims that its unique battery design keeps the battery cooler during use and charging for a longer-lasting battery. The large battery is mounted transversely, creating a wide-bodied saw. If this isn't an issue for you, then this saw should be on the top of your list. Our only criticism is the filter basket on the bar oil reservoir makes it difficult to fill, but fortunately it's removable.

EDITORS' CHOICE 2017
TIED FOR BEST PERFORMANCE



Echo CCS-58V4AH

This saw practically tied EGO for top speed and number of cuts on a single charge, and was one of our favorites. The only feature missing is the tool-free chain tensioner. But the wrench required to loosen and tighten the bar nuts is securely attached in a convenient pocket on the underside of the handle.

Chain Saw Specs

	Bar Length	Battery Volts	Amp-Hours	Charge Time (Hours)	Tool-Free Chain Tensioning	Variable Speed	Brushless Motor	Chain Brake
Black & Decker LCS1240; \$177	12	40	2	1.5	✓			
Ryobi RY40511; \$199	14	40	1.5	1		✓	✓	
Greenworks GCS80420; \$279	18	80	2	0.5			✓	✓
Echo CCS-58V4AH; \$299	16	58	4	1		✓	✓	✓
EGO CS1604; \$299	16	56	5	1.5	✓		✓	✓
Kobalt KCS 180B-06; \$300	18	80	2	0.5			✓	✓
Husqvarna 136Li; \$350	12	36	4	0.8	✓			✓
DeWalt DCCS690H1; \$369	16	40	6	1.5	✓	✓	✓	✓
Oregon CS300-A6; \$381	16	40	4	4	✓		✓	✓
Stihl MSA 160 C-BQ; \$540	12	36	6	1.2	✓		✓	✓

MODELS WE TESTED

(continued)



Black & Decker LCS1240

This saw is acceptable for trimming branches and cutting small trees, but it's noticeably less powerful than the other saws we tested. Since the chain speed is slow, inexperienced lumberjacks may find this saw less threatening. It's one of two in our test that does not have a chain brake.



DeWalt DCCS690H1

This saw, along with the Stihl, has the highest amp-hour battery of the group. The design of the tool-free chain tensioner is top notch, and we liked the quarter-turn oil reservoir cap and wide oil-filling opening. It's one of a few saws that have variable speed. Our only criticism is that the space between the hand guard and the handle is a little tight.



Husqvarna 136Li

This is another nice saw from a respected chain saw brand. The battery voltage and amp-hours are average, and the performance on tests was about what you would expect considering the battery is less powerful than some. The saw includes all the features we like except variable speed. This model is being discontinued and replaced by a similar saw (Model No. 120Li) that includes an improved brushless motor and a lower price (\$299).



Oregon CS300-A6

This is the only saw with a built-in chain sharpener. And because of that, it's the only saw with a different chain design. After cutting with the other saws, we found that this saw took some getting used to. The chain seemed more aggressive and required us to let up and simply let the saw work. If you tend to dull your chains quickly or simply want a more convenient way to sharpen your chain, this saw is a good fit.



Greenworks GCS80420

One of the most powerful saws in the group, the Greenworks cut fast without bogging down. The 2-amp-hour battery provided only about half as many cuts as saws with 4- to 6-amp-hour batteries. We liked that the oil reservoir level was easy to see. This helps prevent messy overfilling. If you're looking for a powerful saw with a long bar and don't mind the shorter run-time and the absence of a tool-free chain tensioner, this is a good choice.



Kobalt KCS 180B-06

The Kobalt saw appears to be identical to the Greenworks saw except for the color. And the two saws performed similarly, with plenty of power to cut even 10-in.-diameter logs. The batteries are not interchangeable, though. The 80-volt battery provided plenty of power but didn't last as long as batteries with a higher amp-hour capacity. This saw is a great choice if you need to cut big logs and want a cordless tool that can rival the power of a gas chain saw.



Stihl MSA 160 C-BQ, AP 300 battery, AL 100 charger

This saw comes fitted with a unique thin-kerf, 1/4-in.-pitch chain. It was one of the fastest and most powerful saws we tested and was one of our favorites. The saw felt great and had every feature you could want, except variable speed. Unlike any of the other saws, it can cut brush and small limbs like butter because of its unique chain. The downside is the cost. The saw, charger and battery are sold separately, which drives up the price. If you don't mind spending more for a Stihl saw, or you own other Stihl tools that can use the same battery, this saw would be a great choice.



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HomeCare+Repair

Fix it, maintain it, improve it. By Jason White and Rick Muscoplat

Prevent Fires and Cut Your Energy Bill!

On any top 10 list of home fire causes, you'll find "clothes dryer." But it would be more accurate to categorize these disasters as "lint fires." Lint buildup, plus the heating system inside a dryer, is a recipe for fire.

One cause of lint buildup is neglect. A dryer and its vent need to be cleaned out regularly (experts recommend cleaning every year). Another cause of lint buildup is a bad vent. A good vent allows the dryer's exhaust (and lint!) to flow outside easily. A bad vent traps lint. A bad vent also costs you time and money. By restricting airflow, it slows down drying, forces the dryer to work harder and drives up your energy bill. This article will help you recognize and correct problems with your dryer vent. In most situations, the materials cost for a completely new vent system is about \$60.

WARNING!
When lint catches fire, vinyl duct burns—and this is the result.



FLEXIBLE VINYL

If you have this type of duct, replace it. The ridges inside impede airflow and trap lint. Worst of all, vinyl is flammable. Some vinyl ducts have a silver coating to imitate metal foil. Don't be fooled.



FLEXIBLE FOIL

Like vinyl ducts, these ducts impede airflow and trap lint. Aluminum foil won't burn, of course, but it will quickly disintegrate in a fire. Dryer manufacturers don't recommend foil ducts and neither do we.



SEMI-RIGID METAL

If you need flexible duct, this is the best choice. It has smaller ridges inside for better airflow and less lint buildup. It also withstands fire better than other flexible duct.



RIGID METAL

With its smooth, straight walls, "pipe" provides maximum airflow and minimal lint traps. Most pros prefer aluminum; it's easier to cut and never rusts. It also has a smoother surface that catches less lint, according to some experts. But some pros prefer galvanized steel because it's stiffer and available in longer sections at some stores.



On the Web

For more on dryer vents, including complete how-to instructions, go to tfhmag.com/dryervent

TIPS FOR A BETTER DRYER VENT



Clamp

NEVER USE SCREWS

Join sections of duct with clamps or tape—never screws. Screw tips poking into the duct catch lint.



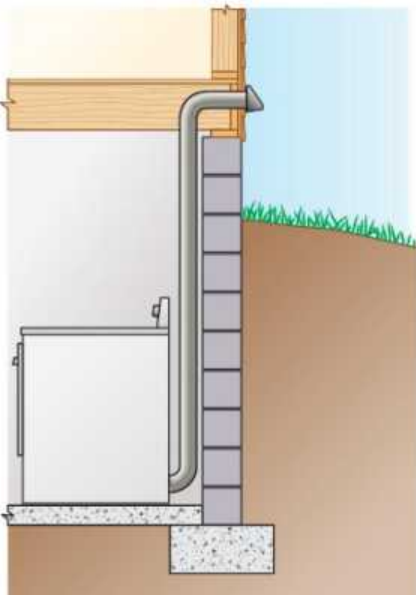
Foil Tape

FOIL TAPE IS BEST

Duct tape often falls off after months or years. Aluminum foil tape seals perfectly and stays put forever.

KEEP "FLEX" RUNS SHORT

Even the best flexible vent material reduces airflow and catches lint. So use rigid metal wherever you can and keep flex lengths to a minimum. Some inspectors and dryer manufacturers allow up to 8 ft. of flex—some less.



CHECK THE DUCT LENGTH

Longer ducts means more resistance to airflow, and most dryer manufacturers call for a total length of 35 ft. or less (check the owner's manual). But remember this: Each 90-degree elbow counts as 5 ft. So if you need two elbows, for example, the rest of the duct can total only 25 ft. If you need to go longer, install a special dryer booster fan (available online, starting at about \$150).



Seam

PUT SEAMS AT THE TOP

When you start up your dryer, moisture condensation forms inside the cool duct. If the seam on rigid duct faces down, that water will leak out and drip onto whatever is below. But if the seam faces up, the water will stay in the duct and evaporate as the duct heats up.



Crimped End

Airflow

CRIMPED ENDS GO WITH THE AIRFLOW

When you're building your duct system, make sure the crimped ends point toward the airflow direction and the uncrimped ends toward the dryer. If you get this backward, lint is more likely to build up at joints.

EXPERT ADVICE

A wooden basement? Are you kidding me?

A reader wrote us asking about using pressure-treated wood instead of concrete for a basement or crawl space. Senior Editor Travis Larson built homes with wood foundations for many years and had this to say:

"I live in a house that I built 35 years ago with a wood foundation and in my days as a contractor have built dozens of them for customers, and I've never heard a single complaint. They're fast and easy to build, energy efficient and easy to finish, and adding windows or doors is a snap. There is no downside. In fact, it has always puzzled me that wood foundations aren't the choice for all new homes."

You'll find lots more information about wood foundations online at southernpine.com/applications/permanent-wood-foundations/



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The Doctor Recommended TV•EARS® headset has helped millions of people hear television dialog clearly while eliminating concerns about loud volume or the need to buy expensive hearing aids. Put on your TV•Ears headset and turn it up as loud as you want while others listen to the television at a comfortable volume. You can even put the TV on mute and listen through the headset only. Others in the room won't hear a thing, but we guarantee you will. Imagine watching television with your family again without fighting over the TV volume or listening in private while a loved one sleeps or reads. As thousands of our customers have said, "TV•Ears has changed our lives!"

Voice Clarifying Circuitry®

The TV•Ears headset contains proprietary Voice Clarifying Circuitry that automatically adjusts the audio curve to increase the clarity of television dialog while decreasing the volume of background sounds such as music and sound effects.

The words seem to jump out of the audio track, making even whispers and accents understandable.

Fast, Safe and Simple. TV•Ears transmitters use Speed of Light Infrared Technology™ (SoLIT) to send the television's audio to the headset. Unlike slower Bluetooth or Radio Frequency, SoLIT does not need to be paired or adjusted, is completely safe with pacemakers, and will not interfere with your telephone.

Twice the Power with 120 decibels. The TV•Ears headsets are classified as "Assistive Listening Devices" for hearing-impaired individuals. This special designation permits the TV•Ears headset to have twice the maximum volume compared to all other wireless headsets.

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Over 2 million satisfied users since 1998

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PROBLEM SOLVER

SCREW EXTRACTOR

Backing out a screw with a stripped head can be tough. That's why it's a good idea to keep a set of different-size screw extractors on hand. The one shown here is made by Grabit. You just chuck the appropriate-size extractor in your drill, burnish the screw head, flip the extractor end for end and then back out the screw. You'll wonder how you ever got along without them!



LEARN FROM THE PROS

Strip wire the safe way

When stripping insulation from wiring, you might be tempted to use the cutting jaws on lineman's pliers, needle-nose pliers or even diagonal cutters. Don't do it! The sharp cutters on those jaws can create a score line around the copper wire, making a weak point where the wire can snap off.

Spend a few extra bucks and get a wire stripper—they cost \$10 to \$25 at home centers.

Multipurpose lineman's pliers with built-in strippers are also available for \$20 to \$45. Just match the gauge of the stripper jaws with the gauge of the wire you're stripping, close the jaws and strip away.



QUICK FIX

Trim screws tighten a wobbly chair

Got a chair with a wobbly leg? This usually happens because the glue holding the legs and "stretchers" together no longer holds. The best fix is to take the chair apart and glue it back together, but that's a lot of work.

If it's an old chair and there's nothing particularly special about it, you can fix it with trim head screws. Just drill pilot holes and "toe-screw" into the loose joints. Be sure to drive the screws in from the bottom so you won't see them when the chair is upright. If a joint is really loose, you might need to force some epoxy into it to fill the gaps and make the joint stronger.





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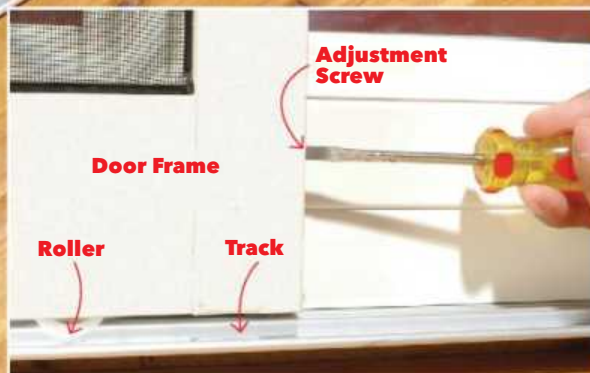
5
MINUTE
FIX

ADJUST A STICKING PATIO SCREEN DOOR

Badly aligned rollers inside the bottom of a patio screen door will cause the door to bind or stick when opening or closing. This stresses the corners of the door, and if the corner joints become loose, the door will eventually fall apart. But you can adjust the door to glide smoothly with just a screwdriver. You'll find two adjustment screws at the bottom of the door, one at each end, that raise or lower separate rollers. Adjust them as shown here.

1. Lower the door Turn the adjustment screw counterclockwise and lower the door until it rests on the track. Do the same at the other end of the door.

2. Then raise it Raise one roller until it lifts the door about 1/4 in. off the track. Slowly raise the other roller until there's an even gap between the door and the track.



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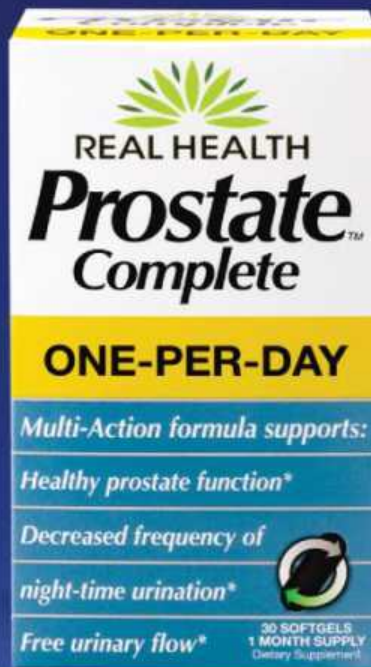
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HOME SMARTS

Vacuuming is good for your carpet

Dirt—even dirt you can't see—is abrasive. So when you walk across a dirty carpet, dirt particles grind away at the fibers. The result is carpet that looks dull, stains easier and soon becomes matted down. That's why regular vacuuming is the best way to maximize the life of your carpet and delay the heavy cost of replacement.



Vacuum smarts

- **Vacuum often.** Vacuum entrance areas and high-traffic areas twice a week and the rest of the carpeting at least weekly.
- **Set the height right.** Raise the vacuum to its highest setting, turn it on and lower it until you can feel the vacuum trying to tug itself forward.
- **Slow down.** It's OK to make one quick pass over low-traffic areas, but make two slow passes over high-traffic areas to get as much grit as possible.
- **Use clean filters and bags.** A dirty bag or filter reduces your vacuum's cleaning power. Replace filters on bagless vacuums every three months. Replace vacuum bags when they're three-quarters full.

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New solutions for today's home. By Rick Muscoplat

BLUETOOTH WIRELESS SPEAKERS

Smartphone and tablet speakers are just too small and tinny-sounding to produce good output. But crummy sound isn't limited to your smart devices; the cheap speakers in your flat panel TV aren't that good either. However, you can get great sound for your smart devices and TV, simply and inexpensively, with Bluetooth speakers.

Battery-powered Bluetooth speakers are fine if you need portability. But if you largely enjoy your smart device entertainment in one area, or plan to upgrade your TV audio, choose AC-powered units. You'll eliminate battery-charging hassles and get much better sound. Prices start at about \$100 for bookshelf-size speakers and go up in price based on size, power rating and transmission technology. We'll give you some buying advice and show you

how to make Bluetooth wireless speakers work with other devices, such as your TV and old stereo equipment.

Quick primer on AC-powered wireless speakers

Wireless speakers receive sound wirelessly through Bluetooth, but they do have wires. Every pair has an "active" unit that plugs into an AC receptacle and a cable that connects the active to the passive speaker. The active unit houses the wireless receiver, amplifier, volume and tone knobs. Many active speakers also have a stereo jack and speaker terminals that allow you to connect directly to your smart device or TV using a cable. Bluetooth technology is supposed to work up to 33 ft., but don't count on that—it's really more like 10 to 15 ft. In fact, plan on being within line-of-sight with

your Bluetooth speakers because the signal doesn't travel well through walls. There are significant sound-quality differences among brands, so it's best to shop for wireless speakers at a retail store where you can compare sound quality rather than blindly ordering online.

Teach old dogs new tricks with Bluetooth add-ons

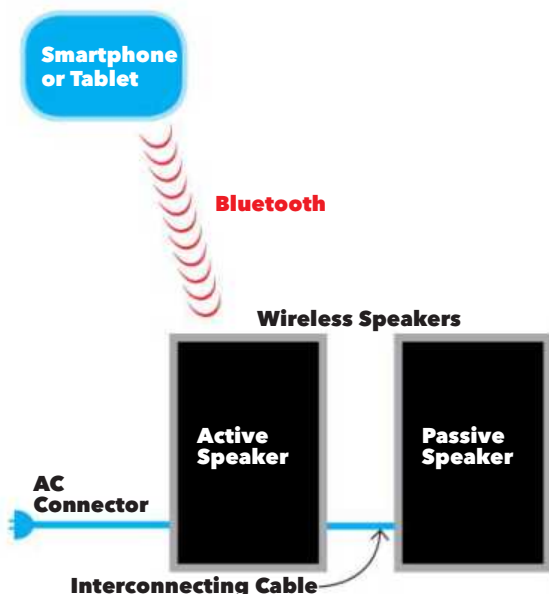
You can easily retrofit your TV, computer or old stereo to work with Bluetooth. Just plug a Bluetooth transmitter (one example is the TaoTronics No. TT-BA07; \$30 at taotronics.com) into the external speaker or headphone jack on your TV or computer and pair it to your speakers. To retrofit your old receiver, just add a Bluetooth receiver (such as the BrightPlay Home HD; \$30 at brighttechshop.com).



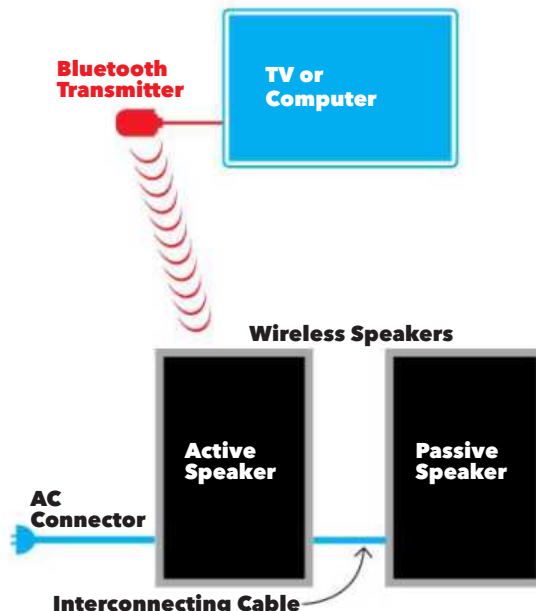
BEST USES FOR BLUETOOTH WIRELESS SPEAKERS

Play directly from your smart devices or computer using Bluetooth.

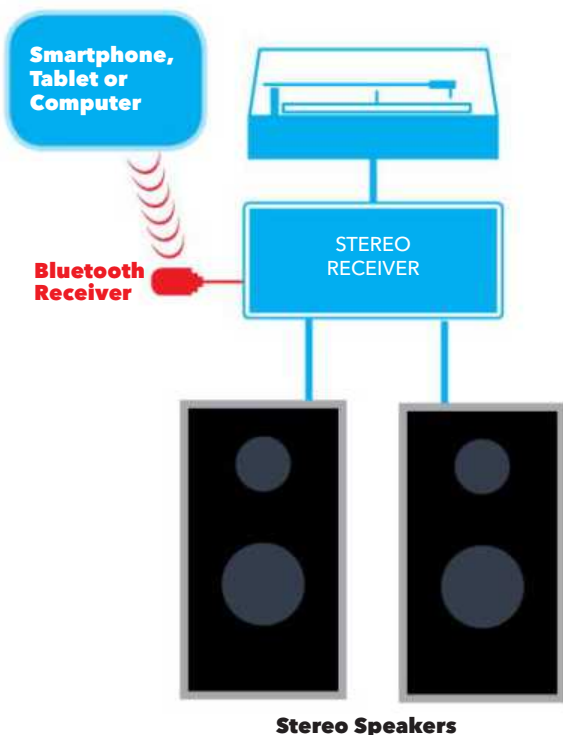
Broadcast sound from your smartphone or tablet



Broadcast sound from your desktop, laptop or TV



Broadcast sound from your smartphone, tablet or computer to your stereo system



What you'll need:



WHAT IS BLUETOOTH?

Bluetooth is a wireless transmission technology that's used for device-to-device connections, for example, between your phone, tablet or laptop and Bluetooth-equipped speakers or headphones. Bluetooth can also be used to transmit data between two devices.

In perfect conditions, Bluetooth can transmit up to about 100 ft. But in your home, you'll find it's closer to 10 to 15 ft. Bluetooth doesn't transmit well through walls or around corners. Setting up a Bluetooth connection between two devices requires a special "pairing" procedure. Pairing has to be done only once—the devices remember each other after they're paired.

Car + Garage

Expert advice on repair, maintenance and gear. By Rick Muscoplat



10 Things to Know About Car Leasing

Leasing can be a great way to get a new car or truck every two or three years and never have to worry about repair bills. The down payment and monthly payments are lower than buying, making leasing initially more affordable. In addition to the joy of driving a new car, the lower payments allow you to drive a car or truck you couldn't otherwise afford. As long as you take care of the car and don't drive more than 12,000 miles per year, you can walk away at the end of the lease and try a different make and model next time. Over the long run, leasing always costs more than buying. But if you follow the tips we list here, you can avoid the most common leasing mistakes and even beat the deals you find in the leasing ads.

1. Choose models for reliability and resale

Lease a make and model with a reputation for reliability and high resale value to get a lower monthly payment. Rare or trendy cars depreciate quickly, and you pay for all that depreciation. Go online and check resale values before choosing a vehicle.

2. Negotiate the "cap" cost

The "capitalization cost" is the price of the vehicle minus its estimated value when you return it. Negotiate the vehicle price as if you were actually buying it. Go to edmunds.com and truecar.com, enter the vehicle information and see what buyers in your area are paying for the same vehicle. Print that out and hand it to the dealer to begin the negotiations.

3. Be careful with mileage

Be realistic about how many miles you drive. Most leases allow 12,000 miles per year, but the "average" driver puts on 13,500. If you return with just 5,000 extra miles, you'll have to cough up \$750 more at the end of the lease.

4. Bargain for the best interest

You can negotiate the annual percentage interest rate (APR). But first you have to unpack it from the "money factor" shown on the leasing agreement. If the money factor is shown as a decimal, such as .0042, multiply it by 2,400 and you'll see the interest rate is really 10.08 percent APR. If it's listed as a whole number, such as 3.1, multiply by 2.4 to learn the real interest rate. Once you know the actual APR, you can bargain for a lower rate.

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CAR + GARAGE

5. Treat it like a newborn baby

Take care of the vehicle or you'll pay dearly. The leasing company allows for normal wear and tear but will charge big bucks if it's returned with dents, scuffed wheels, paint chips, scrapes or stained upholstery.

6. Don't ignore maintenance

You're responsible for maintaining the vehicle according to the carmaker's schedule. Maintenance costs and repairs that aren't covered by the new-car warranty are your responsibility. Keep the receipts to prove the work was done.

7. GAP insurance is smart

Lease cars from a leasing agency or dealer, but buy GAP insurance from your insurance agent. If the car is totaled in an accident, GAP insurance covers the difference between the vehicle's actual value at the time of a total loss and what you still owe the leasing company. Your current insurance agent can usually save you money on GAP insurance.

8. Lease cars near the end of the year

That's when dealers are anxious to get rid of inventory and you'll get the best lease deals. In addition to rebates and promotional pricing, the dealer may also be willing to negotiate or remove some fees.

9. A closed-end lease is best for most drivers

A closed-end lease means you don't owe money at lease end as long as you don't exceed the mileage limit and you return the vehicle in good condition. An open-end lease can result in a rebate if the vehicle brings more at auction than its estimated value, but you'll have to pay the difference if it sells for less. If you're willing to pay a bit more and avoid all risk at lease end, choose a closed-end lease.

10. Leasing is never cheaper than buying

If instead of buying a particular vehicle outright, you sign two three-year leases for it, leasing will cost you about \$2,000 more than buying.



Roll-around stool keeps tools at your fingertips

I really like my trusty rolling mechanic's stool because it saves my knees when I work on cars and small engines. But I'm going to give it up for this new rolling Sidekick stool/tool chest from Mychanic (\$100 from mychanic.us) because it has all the features my current stool lacks.

I love the two large drawers with the ball-bearing slides—they hold all my most-used tools and spray cans. The handy tool rack provides quick access to screwdrivers and pliers and keeps them off the floor while I roll around. I especially like the two flip-down magnetic side trays that hold the nuts and bolts I remove. The 3-in. rubber wheels don't get stuck in cracks like the wheels on my old stool, and the thick seat cushion, well, you know. The Sidekick stool is perfect for garage and home use.

QUICK FIX

Free up a sticking hood latch

If your hood doesn't latch and unlatch easily, chances are it's just rusty and dry. You can fix the problem in about 10 minutes with spray rust penetrant and spray lithium grease. Pop the hood and saturate the entire latch mechanism with rust penetrant. Latch and unlatch

the hood several times until the mechanism works smoothly. The rust penetrant won't last long, so you'll have to apply a better lube. Open the hood and spray all the moving parts with white lithium grease. Latch and unlatch the hood several more times and you're good to go.



DIY Quiz

Test what you know—learn what you don't. By Jeff Gorton

Put on your thinking cap and take this month's quiz to see just how smart you are when it comes to DIY. Here's how it works:

- There are easy, intermediate and really tough questions all mixed together.
- There may be more than one correct answer!
- Get the answers and your DIY rating on pp. 77 and 87.

Find
**THE
DIY QUIZ
ANSWERS**
ON PAGES 77,87

1. True or False? It's safe to put a 100-watt-equivalent compact fluorescent or LED bulb in a fixture rated for 60 watts.

2. What is this piece of hardware used for?

- A. Punching a hole in a plumbing pipe.
- B. Connecting a ground wire to a copper stake.
- C. Installing a crimping wire connector.
- D. Cracking a rusty nut.



3. Your car starter clicks but won't start the car when you turn the key. Which of the following should you try before calling for help?

- A. Shake the battery to mix up the acid inside.
- B. Bang the battery terminals with your shoe.
- C. Turn on the car lights.
- D. Rap the starter motor with a tire iron.

4. How can you tell when it's time to replace a serpentine belt?

- A. The belt has started to slip.
- B. When you test the belt with a belt wear gauge, the gauge sits flush with the top of the ribs.
- C. The belt has stretched and turned gray.
- D. A belt tension gauge shows increased brittleness.



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DIY QUIZ

5. What is the name of the plumbing part shown with the arrow pointing to it?

- A. ABS trap adapter
- B. AAV (air admittance valve)
- C. PVC hub connector
- D. OAV (open air vent)



6. True or False?

You shouldn't install a receptacle rated for 15 amps on a 20-amp circuit.

7. In most jurisdictions, how deep must you bury underground feeder cable that is protected by a GFCI?

- A. 6 in.
- B. 12 in.
- C. 18 in.
- D. 24 in.

8. Experts recommend installing a bath fan that can provide a complete air change about eight times per hour. The cfm rating on fans tells you how many cubic feet per minute the fan will exhaust. If your bathroom is 8 ft. wide, 10 ft. long and has an 8-ft. ceiling, what is the closest size fan that would provide the recommended amount of ventilation?

- A. 60 cfm
- B. 100 cfm
- C. 150 cfm
- D. 200 cfm

9. True or False? It's safe to drive on tires when the depth gauge shows 1/16 in. of tread remaining.



10. Which of the following describes the chain in the photo at left?

- A. The tension is correct.
- B. The chain is too tight.
- C. The chain is too loose.
- D. The chain is too long.



1. True. Compact fluorescent and LED bulbs are more efficient than incandescent bulbs and require less energy to produce an equivalent amount of light. They also give off less heat. That's why you can safely install a 100-watt-equivalent fluorescent or LED bulb in a fixture rated for a maximum of 60 watts.



2. (D) The tool shown is a nut splitter. It's used to remove nuts that are too corroded to turn with a wrench. You place the tool over the nut, aligning the chisel-shaped end of the breaker with a flat spot on the frozen nut. Turning the splitter bolt with a wrench forces the chisel into the corroded nut and eventually cracks it, allowing the nut to be removed without damaging the bolt it's threaded to.



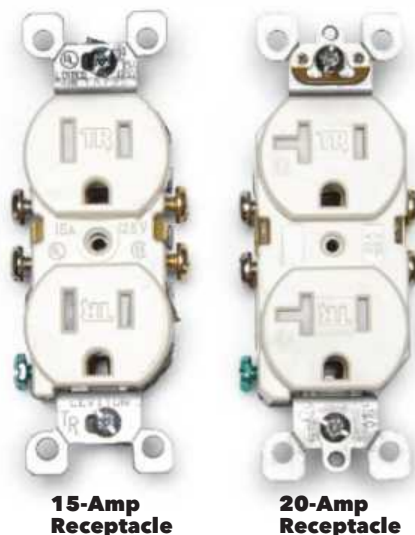
3. (B & D) Rotating the battery cable connector slightly by banging it with your shoe could reestablish a corroded connection. If it works, be sure to remove the cables and clean the connections when you get back to your garage. Also, rapping on the starter motor with a tire iron can jar loose a stuck electrical contact.

4. (B) When you test your serpentine belt with a belt wear gauge, lay the gauge in the ribs on the belt and run your fingers across them. If the gauge sits flush with the top of the ribs, the belt is worn out.



5. (B) Plumbing codes require drainpipes from plumbing fixtures to be connected to a vent pipe within a specified distance from the fixture trap. Vent pipes typically exit through the roof of your house and allow air to enter the drainpipe as the water is leaving, preventing a vacuum or siphoning effect that could pull water out of the fixture trap.

In situations where it's difficult to connect to a vent pipe, some jurisdictions permit the use of an air admittance valve (AAV) to satisfy the venting requirement. The AAV is a one-way valve that allows air to enter the pipe but doesn't allow potentially hazardous sewer gas to leave.



6. False. The National Electrical Code allows 15-amp-rated receptacles to be installed on 20-amp circuits in some cases. The requirements for using a 20-amp-rated receptacle are too complex to summarize here. Check with your electrical inspector before installing receptacles to make sure you use the correct one.

Continued on p. 87

HARBOR FREIGHT

QUALITY TOOLS AT RIDICULOUSLY LOW PRICES

SCISSOR SUPER COUPON

10" PNEUMATIC TIRE
ITEM 60385/62388/62409
62698/30900 shown

SAVE 73% **SUPER COUPON**
\$3.99

Customer Rating **★★★★**

Not for highway use. comp at **\$14.99**

41424452

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SCISSOR SUPER COUPON

20% OFF

ANY SINGLE ITEM

LIMIT 1 coupon per customer per day. Save 20% on any 1 item purchased. *Cannot be used with other discount, coupon or any of the following items or brands: Inside Track Club membership, Extended Service Plan, gift card, open box item, 3 day Parking Lot Sale item, compressors, floor jacks, saw mills, storage cabinets, chests or carts, trailers, trenchers, welders, Admiral, Bantam, CoverPro, Dayton, Earthquake, Hercules, Jupiter, Lynco, Poulton, Predator, ShowCat, Taligator, Viking, Vulcan. Not valid on prior purchases. Non-transferable. Original coupon must be presented. Valid through 5/31/17.

41386850

CHICAGO ELECTRIC POWER TOOLS **SCISSOR SUPER COUPON**

10" SLIDING COMPOUND MITER SAW
ITEM 61971/61972
96199 shown

Customer Rating **★★★★**

SUPER COUPON
\$84.99

comp at **\$119.99**
comp at **\$179**

SAVE \$94

41424791

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CENTRAL MACHINERY **SCISSOR SUPER COUPON**

UNIVERSAL TOOL STAND
Customer Rating **★★★★**
500 lb. capacity

SUPER COUPON
\$29.99

ITEM 60805

SAVE 63%
\$39.99 comp at **\$81.39**

41336976

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CHICAGO ELECTRIC WELDING **SCISSOR SUPER COUPON**

MIG-FLUX WELDING CART
ITEM 60340 shown
60790/61316

Customer Rating **★★★★**

SUPER COUPON
\$34.99

~~\$44.99~~ comp at **\$57.99**

SAVE 39%
\$79.99

Welder and accessories sold separately.

41427286

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CENTRAL MACHINERY **SCISSOR SUPER COUPON**

8" 5 SPEED BENCHTOP DRILL PRESS
ITEM 62520
60238 shown

SAVE \$75

SUPER COUPON
\$49.99

~~\$64.99~~ comp at **\$125.13**

Customer Rating **★★★★**

41372863

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PITTSBURGH **SCISSOR SUPER COUPON**

50" CLAMP AND CUT EDGE GUIDE
PITTSBURGH
ITEM 66581

Customer Rating **★★★★**

SUPER COUPON
\$14.99

~~\$22.99~~ comp at **\$49.99**

41433311

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CENTRAL PNEUMATIC **SCISSOR SUPER COUPON**

RETRACTABLE AIR HOSE REEL WITH 3/8" x 50 FT. HOSE
Customer Rating **★★★★**

SAVE \$138 **SUPER COUPON**
\$59.99

~~\$79.99~~ comp at **\$198.45**

41414015

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CHICAGO ELECTRIC WELDING **SCISSOR SUPER COUPON**

ADJUSTABLE SHADE AUTO-DARKENING WELDING HELMET
ITEM 61611
46092 shown

Customer Rating **★★★★**

SUPER COUPON
\$39.99

~~\$49.99~~ comp at **\$79.99**

SAVE 50%

41423503

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drill master **SCISSOR SUPER COUPON**

4-1/2" ANGLE GRINDER
ITEM 69645
60625 shown

SAVE 50%

SUPER COUPON
\$9.99

~~\$14.99~~ comp at **\$20.13**

Customer Rating **★★★★**

41423573

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CENTRAL PNEUMATIC **SCISSOR SUPER COUPON**

2 HP, 8 GALLON, 125 PSI PORTABLE AIR COMPRESSOR
ITEM 59667
68740 shown

Customer Rating **★★★★**

SUPER COUPON
\$99.99

~~\$119.99~~ comp at **\$159**

SAVE \$59

41423246

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Lifetime CARBIDE **SCISSOR SUPER COUPON**

ALUMINUM OXIDE SANDING SPONGES - PACK OF 10
COARSE ITEM 46751
MEDIUM ITEM 46752
FINE ITEM 46753

SAVE 59% **SUPER COUPON**
\$3.99

~~\$4.99~~ comp at **\$9.95**

Customer Rating **★★★★**

41373867

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CENTRAL MACHINERY **SCISSOR SUPER COUPON**

4" x 36" BELT/6" DISC SANDER
Customer Rating **★★★★**
ITEM 82502
97181 shown

SAVE \$64 **SUPER COUPON**
\$59.99

~~\$79.99~~ comp at **\$124.51**

41411061

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CENTECH **SCISSOR SUPER COUPON**

AUTOMATIC BATTERY FLOAT CHARGER
ITEM 69594
69955
42292 shown

SAVE 85% **SUPER COUPON**
\$4.99

~~\$8.99~~ comp at **\$34.99**

Customer Rating **★★★★**

41387752

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BADLAND **SCISSOR SUPER COUPON**

2500 LB. ELECTRIC WINCH WITH WIRELESS REMOTE CONTROL
ITEM 61258 shown
81840/68146/61297/63476

Customer Rating **★★★★**

SUPER COUPON
\$49.99

~~\$89.99~~ comp at **\$119.99**

41399969

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HYDROSTAR **SCISSOR SUPER COUPON**

50 FT. ELECTRIC DRAIN CLEANER
Customer Rating **★★★★**
ITEM 60285
61856 shown

SAVE \$199 **SUPER COUPON**
\$199.99

~~\$249.99~~ comp at **\$399**

41398333

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US GENERAL SUPER COUPON



SAVE \$269

26", 4 DRAWER TOOL CART
ITEM 95659 shown
61634/61952

Customer Rating
★★★★★
• 580 lb. capacity

SUPER COUPON
\$99.99

~~\$149.99~~
comp of \$369.32



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SUPER COUPON FREE

WITH ANY PURCHASE
3-1/2" SUPER BRIGHT NINE LED ALUMINUM FLASHLIGHT



\$4.97 VALUE

ITEM 69052 shown
69111/62522/62573

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CENTRAL PNEUMATIC SUPER COUPON



18 GAUGE BRAD NAILER
ITEM 63157 shown
68021 shown

SAVE 80%

SUPER COUPON
\$14.99

Customer Rating
★★★★★

~~\$109.99~~
comp of \$74.99

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HaulMaster SUPER COUPON



HEAVY DUTY HAND TRUCK
ITEM 95081/62275/62776/62973 shown

• 660 lb. capacity

SUPER COUPON
\$29.99

~~\$49.99~~
comp of \$59.99

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PREDATOR GENERATORS SUPER COUPON

4000 HP/3200 RUNNING WATTS 6.5 HP (212 CC) GAS GENERATORS
ITEM 69729/63080/69676/63079 shown
ITEM 69675/69728/63090/63089 CALIFORNIA ONLY



70 dB Noise Level

SAVE \$149

SUPER COUPON
\$289.99

~~\$439.99~~
comp of \$439

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HARDY SUPER COUPON

POWDER-FREE NITRILE GLOVES PACK OF 100

SIZE	ITEM
MED	68496/61363
LG	68497/61368
X-LG	68498/61369

Customer Rating
★★★★★
• 5 mil thickness

YOUR CHOICE
\$5.99

~~\$7.99~~
comp of \$15.99

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PITTSBURGH SUPER COUPON

RAPID PUMP® 3 TON HEAVY DUTY STEEL FLOOR JACK
ITEM 69227/62116 shown
62584/68048 shown

• Weighs 74 lbs.

SAVE \$66

SUPER COUPON
\$149.99

~~\$215.99~~
comp of \$141.88

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PITTSBURGH SUPER COUPON



• SAE and metric

6" DIGITAL CALIPER
ITEM 61585 shown
62387 shown

SUPER COUPON
\$9.99

~~\$17.99~~
comp of \$29.99

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PITTSBURGH SUPER COUPON

16 OZ. HAMMERS WITH FIBERGLASS HANDLE
ITEM 69006 shown
60715/60714

YOUR CHOICE
\$3.99

~~\$4.99~~
comp of \$17.99

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CHICAGO ELECTRIC WELDING SUPER COUPON

120 AMP FLUX WIRE WELDER
ITEM 61849 shown
62719 shown
68887 shown

SAVE \$50

SUPER COUPON
\$89.99

~~\$139.99~~
comp of \$149.99

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HaulMaster SUPER COUPON

MOVER'S DOLLY
ITEM 68497 shown
61999/62399 shown
63095/63096 shown
63098/63097 shown
93888 shown

• 1000 lb. capacity

SAVE 59%

SUPER COUPON
\$7.99

~~\$19.97~~
comp of \$19.97

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CENTECH SUPER COUPON

12 VOLT, 10/2/50 AMP BATTERY CHARGER/ENGINE STARTER

SAVE 57%

SUPER COUPON
\$29.99

~~\$49.99~~
comp of \$69.99

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CHICAGO ELECTRIC POWER TOOLS SUPER COUPON

4" BISCUIT PLATE JOINER
ITEM 68987

SUPER COUPON
\$44.99

~~\$64.99~~
comp of \$179

SAVE \$134

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HaulMaster SUPER COUPON

1000 LB. CAPACITY SWING-BACK TRAILER JACK
ITEM 69700/41005 shown

SAVE 54%

SUPER COUPON
\$17.99

~~\$24.99~~
comp of \$39.94

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CENTRAL MACHINERY SUPER COUPON

14" OSCILLATING SPINDLE SANDER
ITEM 95088/62146 shown
69257 shown

SAVE \$53

SUPER COUPON
\$9.99

~~\$14.99~~
comp of \$152.99

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SUPER COUPON

7 FT. 4" x 9 FT. 6" ALL PURPOSE WEATHER RESISTANT TARP
ITEM 68249/69115/69137 shown
69129/69121/877 shown

SAVE 64%

SUPER COUPON
\$2.99

~~\$4.99~~
comp of \$8.48

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105

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TOOLS

107

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MISCELLANEOUS

108

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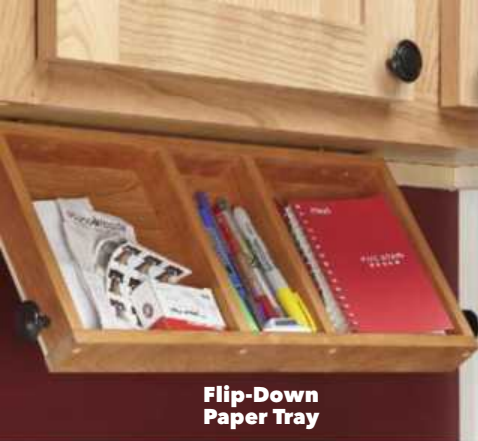
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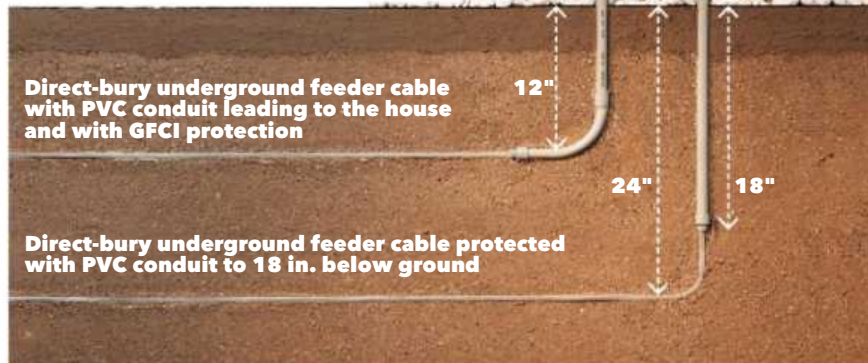
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7. (B) According to the National Electrical Code, direct-bury underground feeder (UF) cable can be buried as shallow as 12 in. if it's protected by a ground fault circuit interrupter (GFCI) and the portion of the cable that runs from the house to 12 in. below ground is inside a PVC conduit (see photo). Unprotected UF cable must be buried at least 24 in. deep.



8. (B) To calculate the answer, first find the volume of the bathroom in cubic feet by multiplying the width (8 ft.) by the length (10 ft.) by the height (8 ft.), which in this case equals 640 cu. ft. This volume of air must be replaced eight times in an hour, so multiply 640 by 8 to get 5,120 cu. ft., the total volume of air replaced in an hour. To get the cubic feet per minute, divide by 60 (the number of minutes in an hour), which equals 85.33. You'd need a fan that moves at least 85 cu. ft. per minute, so the closest answer is (B) 100 cfm.



9. False. Tests conducted by consumer testing organizations show that tires with 1/16-in. tread required twice the stopping distance as tires with 1/8 in. And if you see cracks in the tread or sidewalls, you should replace your tires regardless of the tread depth.

WHAT'S YOUR LEVEL OF EXPERTISE?

BEGINNER
0-3 Correct

INTERMEDIATE
4-7 Correct

DIY GURU
8-10 Correct

10. (C) The chain is too loose. The tension is correct when you can't lift the chain drivers free of the bar groove, but you can still drag the chain easily around the bar with a gloved hand.



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Laughs and lessons from our readers. By Jason White



Paint mix-up

I had part of my living room ceiling patched and retextured, and took on the job of repainting the entire ceiling myself. The popcorn ceiling was soaking up more paint than I expected, so I bought a second can of ceiling white (or so I thought). When I finished painting, I pulled off all the masking tape and painter's plastic, folded up the drop cloths and poured myself a cold one.

However, a few hours into a "Godfather" binge-watching session, I glanced up and half the ceiling still looked wet. In a cold sweat, I checked the label on the second can and discovered that instead of flat ceiling paint, I had bought glossy enamel. And because of its shiny appearance, it always looks wet. So I was forced to repaint the entire ceiling. Next time, I'll double-check the paint can label before I leave the store.

— RICK MUSCOPLAT

Quick on the thaw!

It was time to defrost the workshop refrigerator before winter set in. We had already received a dose of cold weather, so my kerosene "bullet" heater was up and running.

In a moment of genius, I decided to speed up the thawing process. I was in a hurry to meet my father-in-law (who had purchased the refrigerator as a gift for me a few years ago), so I moved the heater closer to the refrigerator and continued to tidy up the garage.

Well, the bullet heater sure did the job. When I returned just a few minutes later, it had not only thawed all the ice clinging to the fridge but also melted the plastic liner and shelving!

I know my father-in-law won't let me forget it for years to come.

— ROB WEISBARTH



HARD-OF-HEARING HANDYMAN

I was using my router outside when my wife brought me the phone. My friend Jack was calling for advice on a house project. The connection was so bad that I struggled to hear.

Taking the phone back into the house, I complained to my wife about the bad connection. She just grinned and suggested that next time I take out my earplugs when I answer the phone!

— JOHN J. CEAMAN

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