

Myth or Fact

Tires are arguably the most important component on your vehicle. They are, however, among the least understood features.

1. The tire-pressure monitoring system (TPMS) in my new car makes sure my tires are adequately inflated.

The truth: TPMS isn't required to issue a warning until pressure is 25 percent below the vehicle manufacturer's recommendation. That's "well below the pressure required for safe driving," according to AAA and "barely adequate to carry the vehicle's maximum load," says the Rubber Manufacturers' Association. TPMS is intended as a last-minute warning before imminent tire failure, not as a monitor to make sure your tires are properly inflated.

Buy a quality tire gauge and set your tire pressure to at least the vehicle manufacturer's recommendation, which is found on the driver's door jamb. I'd rather you set your tires 3 or even 5 psi high rather than 1 low. Tire-pressure gauges can be inaccurate, and tires leak as much as 1 psi per month. Higher pressure improves hydroplaning resistance and, if you're like many folks, you may not bother to check your tires again for six months.

2. When replacing only two tires, the new ones go on the front.

The truth: Rear tires provide stability, and without stability, steering or braking on a wet or even damp surface might cause a spin. If you have new tires up front, they will easily disperse water while the half-worn rears will go surfing: The water will literally lift the worn rear tires off the road. If you're in a slight corner or on a crowned road, the car will spin out so fast you won't be able to say, "Oh, fudge!"

There is no "even if" to this one. Whether you own a front-, rear- or all-wheel-drive car, truck, or SUV, the tires with the most tread go on the rear.

3. A tire is in danger of bursting if pressure exceeds the "max press" number on the sidewall.

The truth: The "max press" number has nothing to do with a tire's burst pressure. The "max press" and "max load" numbers indicate the pressure at which the tire will carry the maximum amount of weight. A new, quality tire will not pop at an even multiple of the "max press." I'm sworn to secrecy about the exact burst pressure, but I wouldn't hesitate to double the "max press" of any new passenger-

vehicle tire on a new wheel. But hitting a big pothole at super-high pressures may cause a failure.

4. The "max press" is where the tire offers its maximum cornering grip.

The truth: If you didn't read the previous point, do so now. Many law enforcement officers cling rigidly to the misconception that the "max press" is secret code for maximum at-the-limit traction. It's a coincidence that many low-bidder tires offer increased grip at 40 or more psi. But that's all it is: a coincidence. If I were going to race a stock ex-cop Ford Crown Victoria on street tires on a road-racing circuit, 45 psi front, 35 psi rear wouldn't be a bad place to start. (The tail would be, in Nascar lingo, too loose for safe street driving.)

5. Low-profile tires fitted on large-diameter wheels improve handling.

The truth: The short sidewalls of low-profile tires enhance the tires' response when the driver first turns the steering wheel. That gives the driver the (often false) feeling the tire has tons of grip. But after that initial movement, it's the tread compound—the stickiness of the rubber—that determines how well the tire grips the road. Also, the combination of a large-diameter wheel and low-profile tire is usually heavier than the original equipment. This means the suspension may not be able to keep the tire in touch with the pavement.

6. All tires with the same designation are exactly the same size.

The truth: Think all 225/35R19s (or whatever tire size) are exactly 225 millimeters wide and their sidewalls are exactly 35 percent as tall as the tire is wide? Not exactly. And unlike what's commonly believe, these designations are *not* about production tolerances.

All the tires of a specific part number or stock keeping unit (SKU) can be can be slightly wider or narrower than the nominal width and their profile can be slightly taller or shorter than the stated percentage. Why? A wider, taller tire puts more rubber on the ground, which is good for a performance tire. A shorter, narrower tire uses less material, thus reducing costs in a business where profit margins almost never break into double digits. So tire makers might scrimp a bit here and there. It's a bit like how a 2 x 4 is not, in fact, 2 by 4.

Myth or Fact

Choose whether the statement listed is a myth or a fact.
Provide your thinking or evidence to support your choice.

Tires are arguably the most important component on your vehicle. They are, however, among the least understood features.

1. The tire-pressure monitoring system (TPMS) in my new car makes sure my tires are adequately inflated.

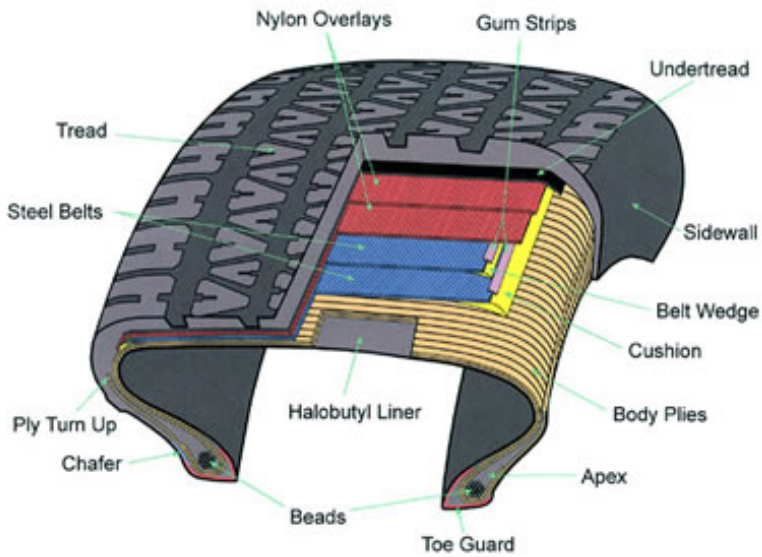
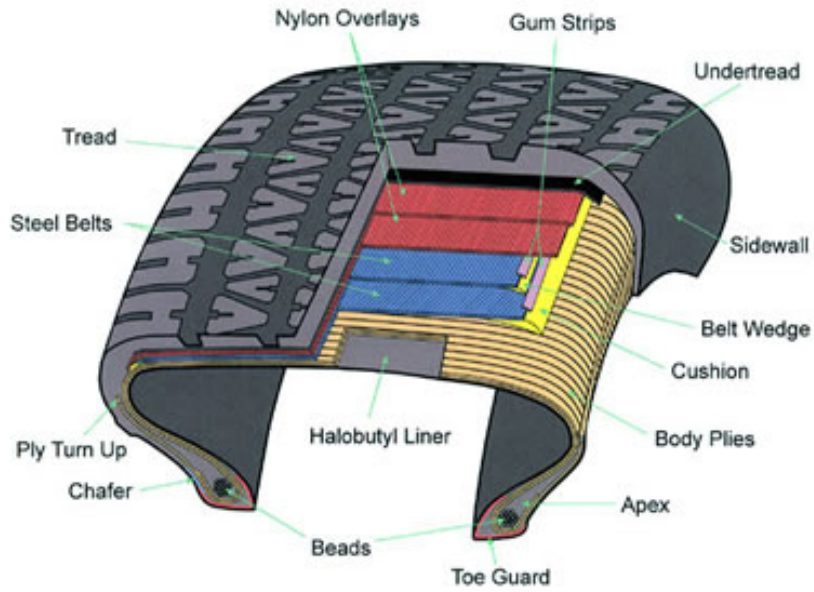
2. When replacing only two tires, the new ones go on the front.

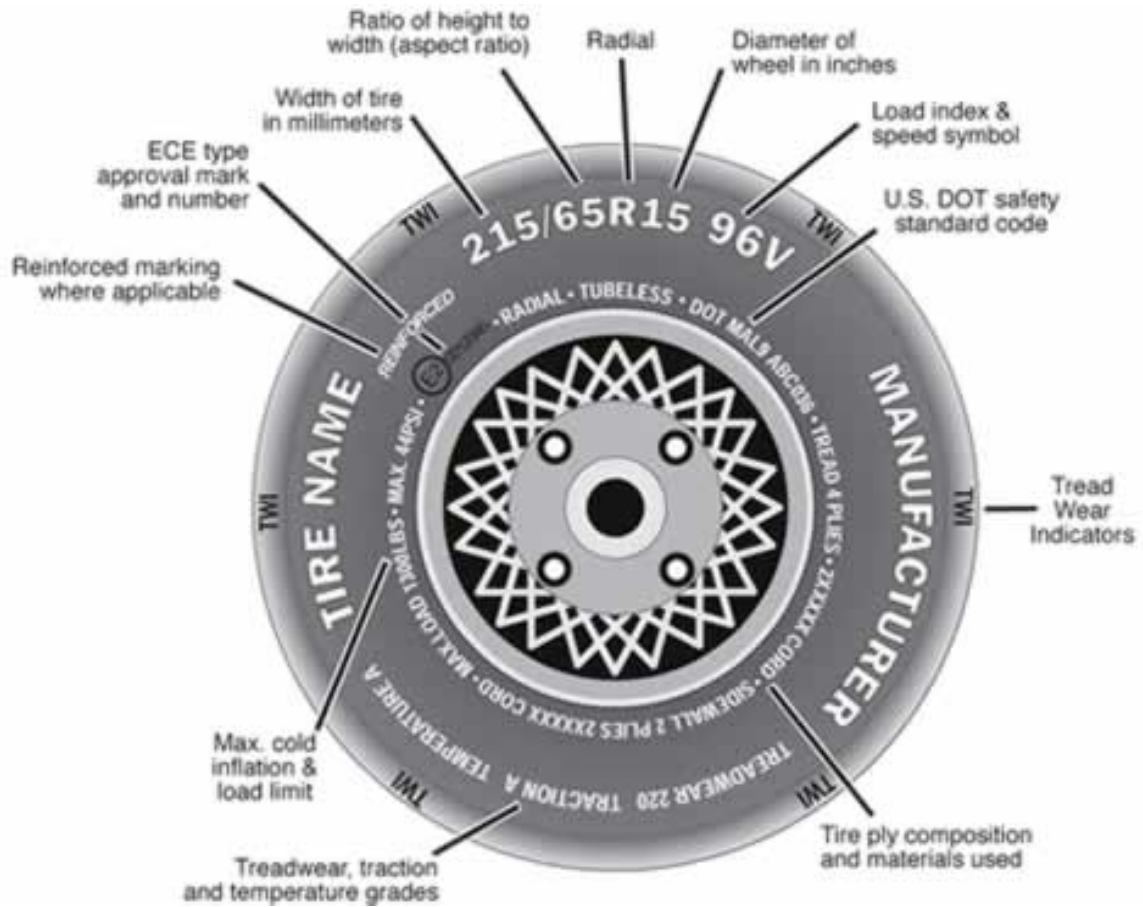
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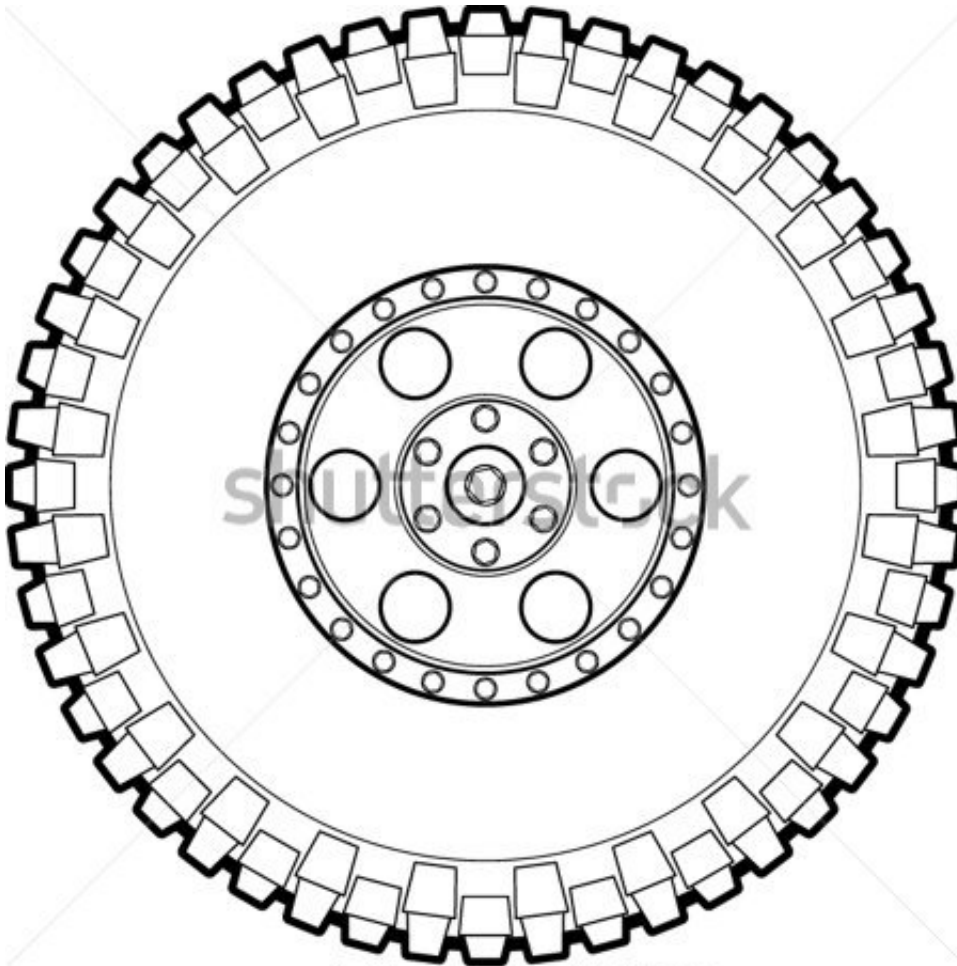
Testing your skills-
Who will be the last one standing?

Challenge #1

Describe to the person next to you when you would refer to these 3 images--



Challenge #2



What's wrong with each tire?

1. _____



2. _____



3. _____



4. _____



5. _____



6. _____



What's wrong with each tire? (Answer Key)

1. _____



2. _____



3. _____



4. _____



5. _____



6. _____



Put the following steps of tire change process on the flow chart:

- mark the offending spot
- remove old weights and mark rim-to-tire location
- remove valve cap and core
- unseat beads
- clamp wheel and set arm adjustments
- lube the upper bead area
- remove upper bead from wheel
- remove lower bead from wheel
- clean rim and tire
- valve stem R & R

Concentricity:

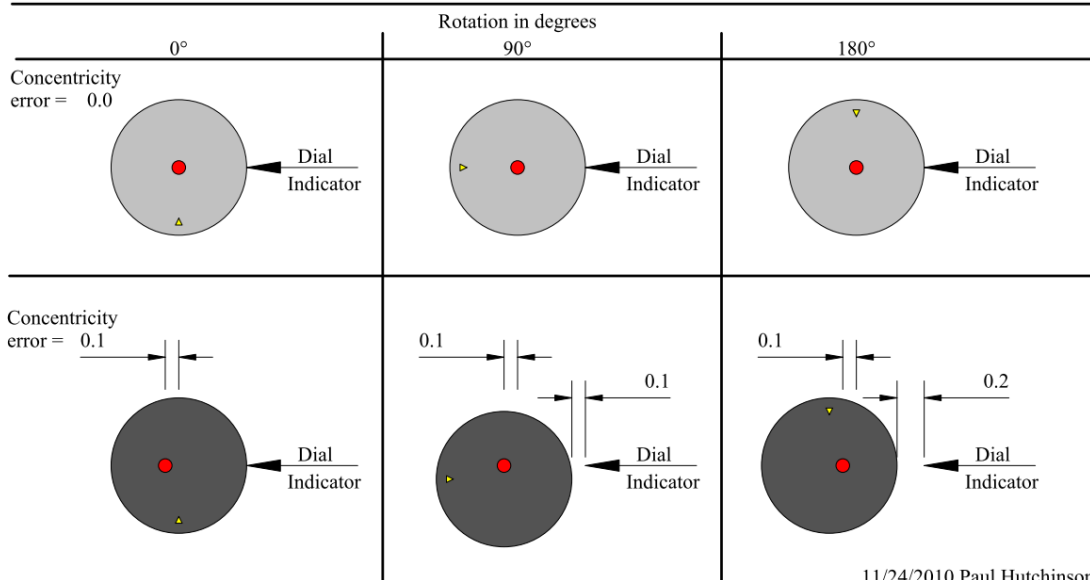
With diagnosing wheel bearing problems, it is very important to understand the term concentricity. Examine the images below and predict what you think concentricity means: _____.

_____.

Concentricity - the quality of having the same center (as circles inside one another) source - TheFreeDictionary.com

Two assemblies, one with no concentricity error (light gray disc) and one with 0.1 concentricity error (dark gray disc), shaft is red color. The pointer arrows represents a dial indicator zeroed out at the 0° rotation.

When rotated through 180°, the unit with no error shows no indicator change while the 0.1 error unit shows 0.2 TIR at 180°.



Wheel Bearing Basics Anticipation Guide

1. _____ Wheel bearings are meant for lubricant to the wheel and don't actually support any of the vehicle's weight. (F)
Where's the evidence in the text to support your choice?
2. _____ A wheel bearing must maintain a perfect alignment with the axle. (T)
Where's the evidence in the text to support your choice?
3. _____ There are generally no special safety precautions to be followed when installing wheel bearings. (F)
Where's the evidence in the text to support your choice?
4. _____ New wheel bearings should always be installed with new seals too. (T)
Where's the evidence in the text to support your choice?
5. _____ Worn wheel bearings can often be detected by rocking the vehicle from side to side at low speeds with the steering wheel. (T)
Where's the evidence in the text to support your choice?
6. _____ There are really no specifications on the type of grease a mechanic uses to repack new or used wheel bearings. (F)
7. *Where's the evidence in the text to support your choice?*

A picture may be worth a 1000 words

1.



What sound would my client describe if the wheel bearing damage looks like image 1?

If I am the mechanic, how would diagnose the problem with this?

2.



What sound would my client describe if the wheel bearing damage looks like image 2?

If I am the mechanic, how would diagnose the problem with this?

3. Draw an illustration of a wheel bearing problem...Describe the problem you are illustrating.

4. Draw an illustration of a tire problem...Describe the problem you are illustrating.

Chapter 74—Need to Know Vocab

Steps...

1. Quickly check the terms you are confident you know.
2. Write or illustrate/draw what you think of with the terms you do know.
3. Check with you partner—compare what you have with each other. We will get together to clarify anyone who is off-track.
4. Use the highlighter to highlight the vocab we need to learn.
5. Dig into Chapter 74...Use the context to create a visual or description of each highlighted terms.

Pneumatic	Tubeless tire	Tread
Sidewall	Bead	Body Plies
Liner	Resistance	Rolling Resistance
Tread wear	Tire Traction	Wear Bars
Valve stem	Valve cores lug nuts	Lug studs

Lug bolts	Wheel bearing	Rim
Spider	Safety Rim	Blowout
Air chuck	Lug Nuts	Lug Studs
Wheel weights	Outer Race	Inner Race
Inner	Rollers	Spindle
Grease Seal	Safety Washer	Driving vs. Nondriving Hub

In class Scenario Challenge:

Problem #1: A customer comes to you and with a problem in his rear wheel bearings and your shop has to replace them. A question comes up when Technician A & Technician B disagree on a key point...Who is RIGHT?

Technician A #1	Technician B #1
You say that if rear wheel bearings are dry and noisy when turned by hand, they should be replaced.	You say that the fasteners on the rear wheel bearing and assembly should exceed the vehicle's recommended torque to prevent bolts from coming loose.

Using the Argumentation Frame

“There has been a lot of attention in the news lately about America’s addiction to sugar. It is costly, hazardous to health, but is it a public or private matter. Should we have guidelines to limit our sugar set by the government?”

Here is our argument!

We should / should not have guidelines set on our sugar intake.

Here are the steps we are going to follow today.

Step 1---Speak your “hook” or the introduction piece to the class (establish your Learning Target).

Step 2---Demonstrate what annotation looks like.

Give 6-7 minutes absolute quiet time to allow students to read the article and annotate it by themselves.

Step 3---Student groups of 2-3 will collaborate on the content of the article.

Choose an Argumentation Frame to work through as a group
Figure out together what information goes on the frame to support your argument.

Step 4---After a set time (10-13 mins) to work to complete the frame, student pairs will share/post their evidence and opinions with whole group for discussion.

- Depending on the article and content, as students discuss, technical vocabulary could be identified for students.

Envelope label:

Be a wise consumer!

“6 Questions on Tire Features”

Your situation: You drive a _____ which is used largely for _____. When you are buying new tires, create 4-5 questions you would want to ask before buying the tires to show you are a wise consumer!

Place each question on a separate post-it note and post on the correct chart paper on the wall.

Chapter 75

Technician A versus Technician B

Situation 1: A car equipped with disc brakes is brought into the shop with worn front wheel bearings. Technician A replaces the bearings and packs the new bearings with all-purpose bearing grease. Technician B replaces the bearings and packs the new bearings with high-temperature wheel-bearing grease.

Use one of the 2 frames or create your own to demonstrate who is right. Remember, they can also either be both right or both wrong also.

Situation 2: Technician A says front wheel bearings on a driving hub and ball-type wheel bearing assembly are serviced during a brake job. Technician B says this type of wheel bearing assembly is not normally serviced.

Use one of the 2 frames or create your own to demonstrate who is right. Remember, they can also either be both right or both wrong.

Situation 3: A customer wants his car's front wheel bearings greased. Technician A tells the customer that some automotive wheel bearings can be cleaned, packed with grease, and reinstalled. Technician B tells the customer that certain types of wheel bearings are sealed and must simply be removed and replaced.

Use one of the 2 frames or create your own to demonstrate who is right. Remember, they can also either be both right or both wrong.

Situation 4: An automobile is brought into the shop with damaged lug studs on the left wheel hub assembly. Technician A removes the damaged studs with a hammer and punch. Technician B uses a hydraulic press to remove the damaged studs.

Use one of the 2 frames or create your own to demonstrate who is right. Remember, they can also either be both right or both wrong.

Situation 5: Bulges are discovered on an automobile's front tires. Technician A immediately replaces the tires. Technician B is not going to replace the tires until after determining the cause of the tire damage.

Use one of the 2 frames or create your own to demonstrate who is right. Remember, they can also either be both right or both wrong.

TEACHER GUIDE

Anticipation Guide Chapter 76: Suspension System Technology

1. _____ The suspension system allows the tires and wheels to move up, down, and absorb bumps in the road. (T)
2. _____ Chassis stiffness will cause a vehicle to run loudly with a lot of rough movements. (F)
3. _____ Both independent and non-independent suspensions will be attached to one solid axle. (F)
4. _____ A control arm does just as its name implies: it holds the axle in place as the wheel moves up and down. (T)
5. _____ Within the suspension system, the limited rotation is provided by the ball joints. (T)
6. _____ Without shock absorbers, a vehicle would not be able to experience a smooth ride. (T)
7. _____ A sway bar is given its name because it allows the car to lean sharply in quick turns. (F)
8. _____ Even though there are different types of suspension systems, they all use only one control arm and a strut assembly as support. (F)
9. _____ A traditional suspension system typically uses conventional springs and shock absorbers to control movement and allow for a smooth ride. (T)
10. _____ Since hydra means water, a hydraulic ram would rely on water as a stabilizer. (?)

Anticipation Guide
Chapter 76: Suspension System Technology

1. ____ The suspension system allows the tires and wheels to move up, down, and absorb bumps in the road.
Evidence (where you found it?):

2. ____ Chassis stiffness will cause a vehicle to run loudly with a lot of rough movements.
Evidence (where you found it?):

3. ____ Both independent and non-independent suspensions will be attached to one solid axle.
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Evidence (where you found it?):

5. ____ Within the suspension system, the limited rotation is provided by the ball joints.
Evidence (where you found it?):

6. ____ Without shock absorbers, a vehicle would not be able to experience a smooth ride.
Evidence (where you found it?):

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Evidence (where you found it?):

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Evidence (where you found it?):

10. _____ Since hydra means water, a hydraulic ram would rely on water as a stabilizer.
Evidence (where you found it?):

Evaluating the Features of a Suspension System

IDENTIFY KEY FEATURES OF EACH SUSPENSION SYSTEM BELOW	WELL SUITED FOR SPORTS CAR	WELL SUITED FOR A PICK-UP TRUCK			
INDEPENDENT SUSPENSION FEATURES <table border="1" data-bbox="332 680 938 1167"><tr><td data-bbox="332 680 938 831"></td></tr><tr><td data-bbox="332 831 938 982"></td></tr><tr><td data-bbox="332 982 938 1167"></td></tr></table>					
DEPENDENT SUSPENSION FEATURES <table border="1" data-bbox="332 1247 938 1801"><tr><td data-bbox="332 1247 938 1432"></td></tr><tr><td data-bbox="332 1432 938 1617"></td></tr><tr><td data-bbox="332 1617 938 1801"></td></tr></table>					

Chapter 76

Evaluating the Features of a Suspension System

TEACHER DIRECTIONS:

Have students go to the beginning of Chapter 76. After you identify the major parts of a suspension system and discuss the basic function of each suspension system feature, challenge the students to complete the evaluation chart above.

You may want to do this as a Think-Pair-Share activity.

Chapter 76

Vocabulary approach

Take the stack of vocabulary terms (printed out) and reserve the last 15-20 minutes of each day as the vocabulary highlight time.

For each day, pull the papers (one with each term) of terms covered that day. Hand 1-3 (depending on the number of kids) to each student to write their definition or example with an illustration of the term.

Students then could take a turn explaining how they used that term today and then post it on the wall under the sign Suspension System Technology.

****Once all of the terms have been discussed, play the “Connect the Terms” game on last day you are covering Chapter 76.**

CONNECT THE TERMS, VOCAB GAME

DIRECTIONS:

Have students line up in two lines, facing each other (like you would see in a game of Red-rover). Have each student walk over to the stack of vocab cards (lieing face down) and pull 2 cards. They will need to have access to whiteboards and markers (sitting around the room on desks).

Once students are standing face to face in the 2 lines, say “go”. Students will have 2 mins. to write a sentence connecting as many of the terms together as they have, 2-3-or-4 terms. Take a few minutes to share the connections they wrote on the whiteboards.

Clear up misconceptions. Unused cards can be returned to the pile or have students hold on to them.

Continue to play by having students pull 2 more cards and face off with a new partner.

Play until you either run out of time or cover each of the terms.

Chapter 76 Vocab.

Acceleration Sensor	Active suspension system
Adjustable shock absorbers	Air shocks
Air Spring	Automatic suspension leveling systems
Ball joints	Body dive
Body Roll	Body Squat
Brake sensor	Chassis Hertz

Chassis stiffness	Coil Spring
Compressor assembly	Control arm
Control arm bushings	Curb Height
Damper unit	Dead axle
Dust shield	Electronic control module
Electronic height control system	Electronic suspension system
Gas-charged shock absorbers	Height Sensor

Independent suspension	Insulators
Jounce	Jounce bumpers
Lateral acceleration	Lateral control rod
Leaf spring	Leaf spring windup
Long-short arm suspension	Lower spring seat
MacPherson strut suspension	Manual suspension leveling system
Mode switch	Modified strut suspension

Neutral Steering	Non-independent Suspension
Oscillators	Oversteer
Pressure lines	Rebound
Rubber bumpers	Rubber isolators
Self-leveling shock absorber	Semi-independent suspension
Sensor link	Shackle
Shock absorber	Shock actuators

Skidpad	Solenoid valve
Spring rate	Sprung weight
Stabilize bar	Steering sensor
Strut assembly	Strut bearing
Strut rod	Strut rod nut
Strut shock absorber	Suspension control module
Suspension leveling system	Suspension system

Suspension system springs	Sway bar
Sway bar links	Torsion bar
Torsion bar suspension	Track rod
Travel	Understeer
Unsprung weight	Upper spring seat
Upper strut retainer	

Chapter 77

SUSPENSION SYSTEM DIAGNOSIS

Chunking with Problem Solving

- **Using the Problem-solving template (attached), after you cover the 6 areas listed below in class, stop and write the condition (problem) on the whiteboard. Give each student a Problem-solving template to complete.**
- **I would run this as a Think-Pair-Share.**

Once students have completed the template working alone, have them pair with a partner to compare and discuss what each of them wrote. Then have the students discuss as a whole group, while you write all of their possible causes on the whiteboard.

*** You will want to consult pages 1614-1615 in the textbook to add to the list of possible causes they may not think about.**

Suspension System Diagnosis

8 Problems to chunk:

- 1. Front end whines on turns**
- 2. Front end growl or grinding on turns**
- 3. Front end clunk or snap on turns**
- 4. Front end whine with vehicle going straight at a constant speed**
- 5. Front end growl with vehicle going straight at a constant speed**
- 6. Road wander**
- 7. Lateral pull**
- 8. Excessive steering effort**

Chapter 77

Technician A & Technician B

Situation 1: A car is brought into the shop with a “steering wheel pull” problem. Technician A checks the condition of the sway arm bushings. Technician B inspects the front control arm components.

Use one of the 2 frames or create your own to demonstrate who is right. Remember, they can also either be both right or both wrong.

Situation 2: A car’s wheel alignment angles are not within specifications. Technician A checks the condition of the ball joints. Technician B looks for worn control arms bushings.

Use one of the 2 frames or create your own to demonstrate who is right. Remember, they can also either be both right or both wrong also.

Situation 3: A customer brings an automobile into the shop with a rough ride complaint. Technician A looks for worn strut shock absorbers. Technician B checks the condition of the strut mounting nuts.

Use one of the 2 frames or create your own to demonstrate who is right. Remember, they can also either be both right or both wrong also.

Situation 4: A vehicle's body bounces five times after a "shock bounce test" is performed. Technician A says this indicates that the shocks are in good condition. Technician B says the results of this test indicate bad shock absorbers.

Use one of the 2 frames or create your own to demonstrate who is right. Remember, they can also either be both right or both wrong also.

Situation 5: A small pickup truck is brought into the shop with a leaking shock absorber. Technician A says that the shock's oil seal must be replaced. Technician B says that the leaking shock must be replaced.

Use one of the 2 frames or create your own to demonstrate who is right. Remember, they can also either be both right or both wrong also.

Situation 6: A car's strut shock absorbers are being replaced. During the procedure, Technician A says jack stands must be placed under the vehicle's strut assemblies. Technician B says jack stands should be placed under the axles.

Use one of the 2 frames or create your own to demonstrate who is right. Remember, they can also either be both right or both wrong also.

Situation 7: A customer wants to know why his car's wheels are out of alignment. Technician A says the weak suspension system springs can affect an automobile's wheel alignment. Technician B says weak suspension system springs do not affect an automobile's wheel alignment.

Use one of the 2 frames or create your own to demonstrate who is right. Remember, they can also either be both right or both wrong also.

Situation 8: A car's curb weight is being measured. Technician A checks curb weight with the automobiles' gas tank empty. Technician B checks curb weight with the automobile's gas tank full.

Use one of the 2 frames or create your own to demonstrate who is right. Remember, they can also either be both right or both wrong.

Situation 9: An automobile's coil springs are being replaced. During this procedure, Technician A unbolts the ball joint before compressing the coil spring. Technician B compresses the coil spring before unbolting the ball joint.

Use one of the 2 frames or create your own to demonstrate who is right. Remember, they can also either be both right or both wrong.

Situation 10: An automobile's ball joints have been replaced. After performing this procedure, Technician A says the vehicle should be road tested before further adjustments are made. Technician B says the vehicle's wheel alignment should be checked before the vehicle is road tested.

Use one of the 2 frames or create your own to demonstrate who is right. Remember, they can also either be both right or both wrong.

Connected Categories

Imagine it is getting down to the wire with test preparation and you fear that many of your students are still not able to correctly use many of your technical vocabulary terms.

What do you do to help them make the connections stick?

What can you do with vocabulary words that will be different than the strategies you've already used time and again?

The Answer:

You can engage your students in a challenging round of "Connected Categories."

Here's how it works:

Step 1. Group your students, 4 or 6 per group, around a table with a flat surface. Instruct students that they will want to bring their notebook with pen in case they get a good connection during the game they want to record. (You want an even number of team members whenever possible.)

Step 2. Once students are all positioned, with paper & pen nearby, give them a copy of the instructions (attached) as you read through them together.

Step 3. Pass out the list of vocabulary terms that you want your students to know for the EOY assessment or upcoming test. I always start with a list of 50 terms. (Scaffolding Note: We are emphasizing the *definition* of the terms so you may want to include the definitions on the list of vocabulary words, or to make students have more conversations, you can make them discuss the definitions as they go through the list of terms.)

Step 4. Pass out the envelope of cut categories and instruct them to put the pile face down in the center of the table.

Step 5. Model for students how it is played. You read vocabulary term #1 from the list, randomly pull a category and make a fun connection within the 30-second time.

- Have students respond to your connection attempt with a thumbs-up or a thumbs-down gesture....majority of up or down determine if you get the point.
- Make sure someone at the table is the scorekeeper.
- Make sure someone at the table is the timekeeper.

Step 6. Begin Play☺

Connected Categories! Instructions

Objective: You want to make the most peer-accepted connections between the vocabulary word list you have been given and the random categories you select cards from. Much like “Apples to Apples,” whether the connection you create is accepted is determined by majority of thumb-ups you get from your teammates.

STEPS:

1. Youngest player goes first. Move clockwise around the table until time is called or you get through then entire list of 50, whichever you complete first.
2. You **MUST** go through the list of vocabulary in order, from beginning to end.
3. You randomly pull a category card, discuss the definition of the term, and make a clever connection between the definition of the term and the category.
4. Team members all give a thumbs-up or thumbs-down. If majority of responses are thumbs-up, you get the point. If not, you move on to the next player.
5. Be sure you have a timekeeper and a scorekeeper at your table.

The trick: It is NOT about connecting the word itself to the category...It IS about connecting the definition of the term correctly to the category. Being clever is required much of the time, so put your creative brain in overdrive and BEGIN!

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Step 6. Begin Play☺

Follow the same format for Vocabulary as in Chapter 76 (if it went well☺)

Chapter 78 **Vocabulary approach**

Take the stack of vocabulary terms (printed out) and reserve the last 15-20 minutes of each day as the vocabulary highlight time.

For each day, pull the papers (one with each term) of terms covered that day. Hand 1-3 (depending on the number of kids) to each student to write their definition or example with an illustration of the term.

Students then could take a turn explaining how they used that term today and then post it on the wall under the sign Suspension System Technology.

****Once all of the terms have been discussed, play the “Connected Categories” game on last day you are covering Chapter 78**

Connected Categories! Instructions

Objective: You want to make the most peer-accepted connections between the vocabulary word list you have been given and the random categories you select cards from. Much like “Apples to Apples,” whether the connection you create is accepted is determined by majority of thumb-ups you get from your teammates.

STEPS:

6. Youngest player goes first. Move clockwise around the table until time is called or you get through then entire list of 50, whichever you complete first.
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The trick: It is NOT about connecting the word itself to the category...It IS about connecting the definition of the term correctly to the category. Being clever is required much of the time, so put your creative brain in overdrive and BEGIN!

Chapter 78-Vocabulary term list:

1. Adjusting nut	2. Adjusting Screw
3. Ball Guides	4. Ball nut
5. Ball sockets	6. Center link
7. Collapsible steering column	8. Constant-ratio gearbox
9. Control valve	10. Electronic steering assist
11. end cover	12. External cylinder power steering system
13. Flexible coupling	14. Gear housing
15. Gearbox ratio	16. Hydraulic Lines
17. Hydraulic 4-wheel steering system	18. Idler arm
19. Ignition lock mechanism	20. Ignition switch
21. Integral-piston power steering system	22. Linkage steering systems
23. Locking steering wheel	24. manual tilt column
25. Mechanical 4-wheel steering system	26. Memory tilt wheels
27. Parallelogram steering linkage	28. Pitman arm
29. Power cylinder	30. Power Piston
31. Power-rack-&-pinion steering	32. Power steering fluid reservoir
33. Power steering hoses	34. Power steering oil cooler
35. Power steering pump	36. Power tilt column
37. pressure-relief valve	38. Proportional rack-&-pinion power steering gear
39. Rack-&-pinion steering gear	40. Rack-&-pinion steering systems
41. recirculating-ball	42. relay rod
43. Road feel	44. Rotary control valve
45. Rotary valve	46. Rubber dust boots

47. Sector Shaft	48. Speed-sensitive power steering
49. Spool control valve	50. Spool valve
51. Steering Column	52. Steering Column assembly
53. Steering Damper	54. Steering gear reduction
55. Steering Gearbox	56. Steering linkage
57. Steering pinion gear	58. Steering ratio
59. Steering Shaft	60. Steering wheel
61. Thrust spring	62. Tie-rod assemblies
63. Tie-rods	64. Tilt steering column
65. Toe adjustment sleeve	66. Universal joint
67. Variable-ratio gearbox	68. Worm Shaft
69. Worm-&-roller steering gearbox	

Chapter 79— Chunking with Problem Solving

- **Using the Problem-solving template (attached), after you cover the 6 areas listed below in class, stop and write the condition (problem) on the whiteboard. Give each student a Problem-solving template to complete.**
- **I would run this as a Think-Pair-Share.**

Once students have completed the template working alone, have them pair with a partner to compare and discuss what each of them wrote. Then have the students discuss as a whole group, while you write all of their possible causes on the whiteboard.

*** You will want to consult pages 1614-1615 in the textbook to add to the list of possible causes they may not think about.**

Manual & Power Steering Systems Diagnosis

6 Problems to chunk:

- 1. Steering pump pressure low**
- 2. Steering pump noise**
- 3. Steering gear dull rattle or chuckle**
- 4. Hissing sound in gear**
- 5. Tire squeal on turns**
- 6. External fluid leaks**

Chapter 79—

The Technician A-Technician B Challenge!

Teacher Direction to Students: “You have worked throughout the 9-weeks on Technician A/B questions with problem solving. Now we are going to bump it up a notch and see how you can analyze and create problems for other students.

I am going to give you each cards with some information/details on it. You are going to take your cards and work with a partner to write a couple of good, challenging, Technician A/B type questions.

I will give you 10 minutes to write your 2 questions. They need to be worded in the analyzing the problem way that you have practiced.

Your objective is to challenge 2 other students in the room to see if they can correctly solve your challenge—so you will need to know who is right! A, B, neither or both.”

“Does everyone understand the objective? Take out 2 pieces of paper, one for each of the 2 questions you will write. “

- **Hand each of the students a couple of cards (attached below) and begin. After 10-15 minutes, however long it takes, have them swap cards and work on a different group’s challenge.**
- **Once they have answered, go around the room, listening to the Tech A/B descriptions, and how each group answered. Ask the original writing group if they are correct and how they know.**

Chapter 79

Tech A/B Card Challenge:

Alignment problems/possible difficulties	Potential problems with alignment equipment software
Potential difficulties or problems with alignment heads	Potential difficulties or problems with camber
Potential difficulties or problems with caster	Potential difficulties or problems with caster-camber gauge
Potential difficulties or problems with console	Potential difficulties or problems with dog tracking

Potential difficulties or problems with feathered edge	Potential difficulties or problems with incorrect camber
Potential difficulties or problems with incorrect toe	Potential difficulties or problems with negative camber
Potential difficulties or problems with negative caster	Potential difficulties or problems with positive camber
Potential difficulties or problems with positive caster	Potential difficulties or problems with rack

Potential difficulties or problems with reading tires	Potential difficulties or problems with road crown
Potential difficulties or problems with road crown pull	Potential difficulties or problems with setback
Potential difficulties or problems with steering axis inclination	Potential difficulties or problems with toe-out on turns
Potential difficulties or problems with tracking	Potential difficulties or problems with tram gauge
Potential difficulties or problems with turning radius	Potential difficulties or problems with vehicle cradle

#76

Active suspension system

Air shocks

**Automatic
suspension
leveling
systems**

Body dive

Body Squat

Chassis Hertz

Coil Spring

Control arm

Curb Height

Dead axle

Electronic control module

Electronic suspension system

Height Sensor

Insulators

Jounce bumpers

Lateral control rod

Leaf spring windup

Lower spring seat

**Manual
suspension
leveling
system**

Modified strut suspension

Non- independent Suspension

Oversteer

Rebound

Rubber isolators

Semi- independent suspension

Shackle

Shock actuators

Solenoid valve

Sprung weight

Steering sensor

Strut bearing

Strut rod nut

Suspension control module

Suspension system

Sway bar

Torsion bar

Track rod

Acceleration Sensor

Adjustable shock absorbers

Air Spring

Ball joints

Body Roll

Brake sensor

Chassis stiffness

Compressor assembly

Control arm bushings

Damper unit

Dust shield

Electronic height control system

Gas-charged shock absorbers

Independent suspension

Jounce

Lateral acceleration

Leaf spring

Long-short arm suspension

MacPherson strut suspension

Mode switch

Neutral Steering

Oscillators

Pressure lines

Rubber bumpers

Self-leveling shock absorber

Sensor link

Shock absorber

Skidpad

Spring rate

Stabilize bar

Strut assembly

Strut rod

Strut shock absorber

Suspension leveling system

Suspension system springs

Sway bar links

Torsion bar suspension