PRACTICE EXAM 20: ASE A4 SIMULATION (40 QUESTIONS)

STEERING SYSTEMS DIAGNOSIS AND REPAIR (Questions 1–12)

1. Technician A says a removed airbag module must be stored face-up on a flat surface. Technician B says yellow SRS connectors contain internal shorting bars that automatically short the squib leads when unplugged. Who is correct?

A. Technician A only

B. Technician B only

C. Neither Technician A nor B

D. Both Technicians A and B

2. Each of the following can cause power steering pump whine EXCEPT:

A. A low fluid level in the pump reservoir during normal operation of the vehicle today

B. An over-tightened serpentine belt tensioner causing excessive belt loading during the service

C. Air trapped in the hydraulic circuit during or after service of the power steering components

D. A restricted return line back to the reservoir during normal operation of the steering system

3. A hydraulic power steering pump produces adequate pressure at the pump but the rack cannot reach relief pressure at full lock. What is the MOST likely cause?

A. Internal bypass in the rack and pinion — fluid is leaking past the rack piston seal internally

B. The power steering pump is worn and cannot maintain pressure during the full-lock condition

C. The return line is restricted preventing pressure buildup in the rack during the test condition

D. The relief valve is stuck open at the pump preventing pressure from reaching the specification

4. A 2021 vehicle has had its battery replaced. The EPS warning light is illuminated with reduced assist. The scan tool shows no stored DTCs. What is the correct action?

A. Replace the EPS control module because the battery service damaged internal components

B. Disconnect the battery for an additional 30 minutes to force the EPS module to reset completely

C. Perform the manufacturer-specified EPS initialization procedure after battery service for restoration

D. Verify battery voltage meets specification under load before attempting additional EPS diagnosis

5. A clockspring has been installed on a vehicle. The technician installed the steering wheel with the road wheels turned 45° to the right. What is the MOST likely consequence?

A. The horn circuit will function intermittently during normal driving conditions on the vehicle

B. The clockspring ribbon cable may break during the first full steering cycle after installation

C. The airbag SRS warning light will illuminate immediately after installation of the steering wheel

D. The steering wheel will be rotationally off-center during straight driving on level roads today

6. Each of the following is correct SRS service practice EXCEPT:

A. Disconnecting the negative battery cable before any airbag service is performed on the vehicle

B. Waiting the specified capacitor discharge time after battery disconnect before proceeding with service

C. Storing a removed airbag face-up on a flat surface during the service event on the vehicle

D. Testing the airbag squib circuit continuity with a conventional 12-volt digital multimeter in use

7. A recirculating ball gearbox is being adjusted. The technician has removed the pitman arm, centered the steering wheel, and measured input shaft rotational torque at 12 in-lb. Specification is 6–10 in-lb. What is the correct action?

A. Loosen the sector shaft adjuster until the input shaft rotational torque reaches 6–10 in-lb spec

B. Leave the setting as measured because 12 in-lb exceeds the minimum specification of 6 in-lb

C. Replace the gearbox because the sector teeth cannot produce proper preload at this reading

D. Install the pitman arm and remeasure the rotational torque at the steering wheel location

8. A power steering fluid shows a dark brown color with visible metallic particles. What is the correct action?

A. Top off the fluid with fresh manufacturer-specified fluid and return to service without flushing

B. Add a power steering additive to dissolve the particles and restore normal fluid condition during service

C. Flush the system, identify the source of the metal contamination, and repair the source of the wear

D. Drive the vehicle for 500 miles to allow the fluid to circulate and clear the metal particles during use

9. An intermediate shaft between the column and the gear has developed a notchy feel when rotated by hand. What is the MOST likely cause?

A. The steering column upper bearing has worn beyond specification and requires replacement with new

B. Worn U-joint needle bearings in the intermediate shaft require replacement to restore smooth rotation

C. The rack pressure spring has backed off requiring adjustment to restore smooth wheel rotation during service

D. The power steering fluid is contaminated causing the rotational resistance through the intermediate shaft

10. A steering damper is being inspected on a pickup truck. The damper has an active wet stripe with oil drips forming at the bottom. What is the correct action?

A. The damper is operating normally — slight seepage is typical for in-service steering dampers today

B. Clean the damper body and wait to see if the drips continue during normal operation of the vehicle

C. Replace only the damper seal to restore sealing without complete damper replacement during service

D. Replace the damper — active external leakage with drips indicates seal failure requiring replacement

11. A 2023 vehicle with rack-mounted EPS has a DTC for "torque sensor signal invalid." Live data shows the two torque sensor channels reading 2.5 V and 2.4 V at rest — within the 0.1 V tolerance. The vehicle has reduced assist. What is the correct repair?

A. Clear the DTC and road test — the torque sensor readings are within normal tolerance at rest conditions

B. Replace the steering angle sensor because it affects the torque sensor reference during normal operation

C. Replace the rack and pinion — the torque sensor is integrated with the rack assembly as one unit

D. Disconnect the battery for 30 minutes to reset the EPS module and clear the torque sensor DTC

12. A pickup truck with solid-axle front suspension exhibits death wobble at 50 mph after hitting a pothole. The steering damper is new — installed 2 weeks ago. What is the MOST likely underlying cause?

A. Track bar bushings, tie rod ends, and front ball joints have cumulative wear producing the death wobble

B. The new steering damper is defective and requires immediate replacement with another new unit

C. The power steering pump is below specification and contributing to the death wobble condition

D. The front shock absorbers have failed causing excessive wheel motion producing the wobble symptom

SUSPENSION SYSTEMS DIAGNOSIS AND REPAIR (Questions 13–24)

13. Each of the following is a function of a suspension bushing EXCEPT:

A. Allowing controlled pivoting of the control arm through its travel range during suspension movement

B. Isolating road vibration from transmitting into the vehicle chassis during normal driving conditions

C. Locating the control arm precisely at the pivot point under load during dynamic operation conditions

D. Carrying the primary vertical weight load of the vehicle body during normal driving conditions today

14. A MacPherson strut is being replaced. Technician A says the strut mount should be replaced along with the strut. Technician B says the strut bearing is integrated with the upper mount on most modern designs. Who is correct?

A. Technician A only

B. Both Technicians A and B

C. Technician B only

D. Neither Technician A nor B

15. A load-carrying ball joint is being inspected on a vehicle with SLA front suspension and the coil spring on the lower control arm. The vehicle is on a two-post lift with wheels hanging free. What is the correct inspection method?

A. Grab the tire at 12 and 6 o'clock positions and rock it firmly to detect any vertical play in the joint

B. Grab the tire at 3 and 9 o'clock positions and rock it firmly to detect any horizontal play in the joint

C. Place a pry bar between the lower control arm and the frame to unload the joint during the inspection

D. Remove the ball joint from the knuckle to inspect for internal wear directly during the service procedure

16. A customer complains of clunking from the front suspension at highway speed during straight-line driving over expansion joints. The clunking disappears below 40 mph. What is MOST likely the cause?

A. Worn strut dampers unable to control high-frequency bump input at highway speed conditions only

B. Worn outer tie rod ends producing noise during suspension deflection at highway speed conditions

C. Worn upper strut bearings producing noise during steering wheel rotation at any speed condition

D. Worn lower ball joints producing noise during suspension travel at any speed regardless of bumps

17. A vehicle with four-corner air suspension has all four corners dropped overnight. The compressor runs for 8 minutes to restore height. What is MOST likely the cause?

A. The compressor has failed internally and cannot produce adequate pressure for the system operation

B. The suspension control module has a software fault requiring reprogramming from the manufacturer

C. The ride height sensors have simultaneously failed at all four corners of the vehicle during service

D. Multiple slow leaks across all four air springs from aging rubber affecting the bilateral operation

18. A stabilizer bar end link is being replaced. The new link has rubber bushings at each end. The correct torque practice is:

A. Torque the fasteners while the vehicle is on a two-post lift with wheels hanging freely during the service

B. Torque the fasteners at ride height with the suspension loaded to the vehicle curb weight specification

C. Torque the fasteners with the vehicle supported on jack stands under the frame rails during the service

D. Leave the fasteners hand-tight to allow the link to self-position during driving on the vehicle operation

19. A pickup truck with torsion bar front suspension has ride height below specification on both sides equally. What is the correct action?

A. Adjust both torsion bar preload bolts at curb weight on level ground to raise ride height to spec

B. Replace both torsion bars because the preload adjustment range is exhausted from aging in service

C. Lift the vehicle on a two-post lift and adjust both torsion bar preloads with wheels hanging freely

D. Swap the torsion bars left-to-right to equalize the ride height between the two sides of vehicle

20. A coil spring is being installed during strut assembly. The spring shows a painted directional marking on one end indicating the top. The technician installs the spring with the marking at the bottom. What is the likely consequence?

A. The spring will function normally because the marking is for assembly reference only during the service

B. The spring isolator will wear faster than normal from the reversed installation orientation during use

C. The spring rate will be incorrect causing ride height error and potentially compromised handling

D. The spring will fracture within the first 1000 miles of service from reversed stress pattern during operation

21. An adaptive damping system has a DTC for "damper current out of range — rear right." Wiring and connector inspection shows no issues. What is the correct repair?

A. Reset the fault code and road test the vehicle to verify if the condition returns during normal driving

B. Replace both rear dampers as a matched pair to maintain balanced damping across the rear axle

C. Replace the suspension control module because the output driver has failed for that circuit only

D. Replace only the rear right damper since the fault is isolated to that specific corner of the vehicle

22. A multi-link rear suspension has rear toe that cannot be brought within specification despite full adjustment range at the eccentric cam. The suspension links appear intact on visual inspection. What is MOST likely the cause?

A. The rear tires are mismatched in size between the two sides affecting the toe measurements taken

B. The alignment equipment requires recalibration for the specific vehicle model being aligned currently

C. The rear shock absorbers are worn and causing dynamic shift during alignment measurement process

D. The rear subframe has shifted and requires centering with manufacturer pins to restore design position

23. A wear-indicator ball joint is inspected at curb height. The grease fitting projects 1/4 inch above the housing surface. What does this indicate?

A. The ball joint is within acceptable wear limits and does not require replacement during this visit

B. The ball joint has reached its wear limit and requires immediate replacement before additional service

C. The wear indicator is defective and the joint must be inspected using alternate methods during service

D. The joint requires additional grease injection to extend its service life before any replacement is needed

24. A leaf spring U-bolt has come loose 500 miles after initial torque. The U-bolt is torque-to-yield. What is the correct action?

A. Retorque the existing U-bolt to specification and release the vehicle to the customer after verification

B. Apply thread locker to the existing U-bolt and retorque to prevent future loosening during service

C. Replace the U-bolt with a new torque-to-yield unit and torque to specification per manufacturer

D. Overtorque the U-bolt 25% beyond specification to ensure it does not loosen again in service

WHEEL ALIGNMENT DIAGNOSIS, ADJUSTMENT, AND REPAIR (Questions 25–35)

25. Camber pull direction goes toward the:

A. Rear of the vehicle because camber affects rear toe adjustment during normal driving operation today

B. More-positive side — the side with more positive camber produces the pull direction at highway speed

C. Less-positive side — the side with less positive camber produces the pull during straight driving

D. Front of the vehicle because camber affects the front toe setting during the normal service procedures

26. Caster pull direction goes toward the:

A. More-caster side — the side with more positive caster produces the pull at highway speed conditions

B. Rear of the vehicle because caster affects the rear alignment during the normal service procedures

C. Side with more negative camber because caster and camber interact during normal driving conditions

D. Less-caster side — the side with less positive caster produces the pull at highway speed conditions

27. Each of the following is a primary alignment angle EXCEPT:

A. Camber at the front wheels of the vehicle during the alignment service procedure on the rack

B. Toe at both the front and rear wheels of the vehicle during alignment service on the rack procedure

C. Steering axis inclination at the front wheels of the vehicle during the alignment service procedure

D. Caster at the front wheels of the vehicle during the alignment service procedure on the rack

28. Included angle (SAI + Camber) is used to diagnose:

A. Bent steering knuckles — matching included angles side-to-side confirm the knuckles are straight

B. Tire wear patterns from excessive camber at the front wheels during highway driving conditions

C. Rear toe asymmetry creating a thrust angle affecting the vehicle during normal driving conditions today

D. Excessive caster imbalance between the left and right front wheels during alignment service procedures

29. The correct modern alignment sequence is:

A. Front toe first to center the steering wheel, then front camber, front caster, and rear toe last

B. Rear toe first to center the thrust line, then front caster, front camber, and front toe last for service

C. Rear camber first, then rear toe, then front toe, front caster, and front camber last in the sequence

D. Front caster and camber first, then front toe, then rear toe and rear camber last in the service sequence

30. Setback is:

A. The angle between the rear axle thrust line and the vehicle geometric centerline measurement during service

B. The side-to-side camber difference between the left and right front wheels during alignment service on rack

C. The angle between the steering axis and vertical viewed from the front during alignment service on rack

D. The fore-aft offset between the two wheels on the same axle measurement during alignment service on rack

31. Before beginning any alignment measurements, the technician must perform:

A. Wheel runout compensation on each wheel to correct for clamp offset errors before any measurement

B. A caster sweep to record initial caster values before any other alignment angle is measured during service

C. A road test to evaluate steering feel before beginning the alignment procedure at the service location

D. Front toe adjustment to approximately zero to establish a measurement baseline reference point

32. A vehicle has had its alignment completed. The steering wheel was re-centered during front toe adjustment. The vehicle has lane-keep assist. Which calibration is typically required?

A. Only the tire pressure monitoring system requires reset after the alignment service is completed today

B. Only the electronic stability control module requires a relearn during road test at highway speed

C. Only the forward camera requires calibration because the SAS is isolated from alignment service procedures

D. The steering angle sensor and typically the ADAS forward camera require calibration after alignment

33. A FWD vehicle with torsion beam rear suspension has rear toe reading 0.35° out of specification on one side only. The torsion beam typically has no rear toe adjustment. What is the correct repair?

A. Install aftermarket adjustable torsion beam mounts to provide rear toe adjustment capability during service

B. Inspect the torsion beam and trailing arm for bent or damaged condition — replace the damaged component

C. Adjust the front toe to compensate for the rear asymmetry and document the condition on the printout

D. Rotate the tires front-to-rear to equalize wear patterns caused by the out-of-specification rear toe condition

34. A vehicle has SAI readings of Left 12.5° and Right 14.1°. Camber is within specification on both sides at -0.2°. Specification is 13.0° ± 0.5°. What does the SAI difference indicate?

A. The alignment equipment requires recalibration before continuing the alignment service procedures today

B. The tire pressures differ between sides causing the apparent SAI measurement on the alignment rack

C. A steering knuckle is bent — the SAI difference of 1.6° exceeds tolerance and camber was adjusted

D. The ride height varies between the two sides producing the apparent SAI measurement difference on rack

35. A vehicle pulls to the left at highway speed. Tire pressures are correct. After swapping the front tires side-to-side, the pull direction changes to the right. What is the correct diagnosis?

A. A tire has conicity — the pull direction reversed when the tire was moved to the opposite side of vehicle

B. The alignment is out of specification and requires adjustment to eliminate the pull after the tire swap

C. A dragging brake caliper is causing the pull — the tire swap is not a reliable diagnostic test for brake drag

D. The steering gear has internal bypass producing direction-dependent pull regardless of tire position change

WHEEL AND TIRE DIAGNOSIS AND SERVICE (Questions 36–40)

36. A direct TPMS sensor has stopped reporting data to the vehicle. The scan tool shows the sensor as "not communicating." The tire pressure measures correct with a handheld gauge. The vehicle is 8 years old. What is MOST likely the cause?

A. The TPMS module has lost programming and requires reprogramming with the vehicle VIN identifier

B. The wheel speed sensor at that corner is affecting the TPMS direct sensor communication during service

C. The tire pressure is at a threshold value causing the sensor to deactivate during the current service

D. The TPMS sensor battery has reached end of life — typical life is 5–10 years on direct TPMS sensors

37. A wheel-and-tire assembly on a balancer shows weights of 2.0 oz inner and 1.8 oz outer at 180° apart. What does this indicate?

A. The assembly has only static imbalance that can be corrected at a single plane position during service

B. The assembly has dynamic imbalance requiring weights at both rim edges for correction service during balance

C. The assembly has radial runout requiring match-mounting to reduce the combined runout during service today

D. The assembly is within acceptable residual balance tolerance and no additional correction is needed now

38. A wheel hub assembly is being installed with a torque-to-yield axle nut. The specification is "240 ft-lb + 60°." The technician torques to 240 ft-lb and skips the 60° rotation. What is the likely consequence?

A. The axle nut will loosen during driving from vibration at highway speed operation during the service use

B. The wheel bearing will have excessive preload from 240 ft-lb alone causing overheating during service operation

C. The brake rotor will develop excessive runout from improper hub seating during the initial installation procedure

D. The wheel bearing will have insufficient preload causing excessive play and premature failure during service

39. A tire puncture in the tread area measures 1/4 inch in diameter — exactly at the industry-standard maximum repairable size. The tire has 6/32 inch tread remaining. What is the correct service action?

A. Replace the tire because 1/4 inch is too large to repair safely even at the industry-standard size limit

B. Install an external string plug since the puncture is at the size limit and in the tread area of the tire

C. Repair using a combination plug/patch from inside the tire — 1/4 inch is the maximum repairable size

D. Install an interior patch only without plugging the puncture channel through the tread to the surface

40. A tire sidewall reads "P235/55R18 104W." The "W" represents:

A. The tire's maximum speed rating — W = 168 mph sustained speed rating during operation conditions

B. The tire's wheel diameter in inches that the tire is designed to fit during mounting and service operations

C. The tire's load index specifying maximum load at the rated inflation pressure during normal service use

D. The tire's aspect ratio expressed as a percentage of the section width in millimeters during service use

Practice Exam 20: Answer Key and Explanations

1. D — Both technicians are correct. Removed airbag modules must be stored face-up on a flat surface so any accidental deployment rockets away from personnel rather than into them. Yellow SRS connectors contain internal shorting bars that automatically short the squib leads when the connector is unplugged, preventing accidental deployment during service.

2. B — An over-tightened serpentine belt tensioner will not cause pump whine — it may cause belt noise, bearing damage, or premature pump wear, but the pump itself receives adequate drive. Whine originates from air in the system, low fluid, or restricted return flow that starves the pump. Tensioner condition is inspected for slipping, not over-tension.

3. A — When the pump can build specification pressure at its outlet but the rack cannot reach relief pressure at full lock, fluid is bypassing internally within the rack. The pump is proven healthy; the rack has failed seals allowing fluid to leak past the piston internally. Rack replacement is indicated — not pump replacement.

4. C — After battery replacement, many EPS-equipped vehicles require the manufacturer-specified initialization procedure to restore full assist. The system loses certain learned values during power loss and operates in reduced-assist mode until the procedure is performed. Skipping this is one of the most common causes of post-battery-service EPS warnings.

5. B — When the clockspring is installed with the road wheels turned 45° right (uncentered), the internal ribbon cable is positioned near one of its travel limits rather than the middle of its range. The first full steering cycle pushes the cable beyond that limit and breaks it. Clocksprings must be centered with wheels straight before steering wheel installation.

6. D — Conventional digital multimeters source enough current to potentially trigger airbag deployment. Only manufacturer-approved scan tools or certified airbag testers can safely probe SRS circuits. Battery disconnect, capacitor wait time, and face-up storage are all correct SRS practices — only the DMM test is prohibited.

7. A — When over-center preload reads above specification (12 in-lb vs. 6–10 in-lb spec), the sector shaft adjuster must be loosened to bring the reading within the 6–10 in-lb range. Over-tight preload causes binding, hard steering, and accelerated gear wear. Always bring preload within spec — never higher, even when the excess seems "safe."

8. C — Dark fluid with metallic particles indicates internal component wear — typically a failing pump or rack. The correct action is flushing the system, identifying the source of the metal contamination, and repairing the source. Additives, top-offs, and driving to "circulate" the fluid all miss the underlying wear cause and spread contamination.

9. B — A notchy feel during intermediate shaft rotation is the classic signature of worn U-joint needle bearings. The joint cannot rotate smoothly and catches at specific angles. Column bearing wear, rack pressure spring issues, and fluid contamination produce different symptoms — the notchy rotation specifically identifies intermediate shaft U-joint wear.

10. D — Active external leakage with visible oil drips down the damper body confirms seal failure and internal fluid loss. The damper can no longer generate consistent damping force. Slight dampness is normal weepage; active drips require replacement. Seal replacement is not a manufacturer-approved repair for most modern dampers.

11. C — On modern rack-mounted EPS systems, the torque sensor is integrated into the rack assembly as a non-serviceable component. When the sensor produces invalid signals and the vehicle has reduced assist despite readings within resting tolerance, rack replacement is required. The sensor drifts under load even when resting values appear normal.

12. A — Death wobble on solid-axle vehicles is almost always caused by combined wear in track bar bushings, tie rod ends, and front ball joints. Replacing only the damper treats the symptom temporarily; the underlying wear causes the new damper to wear out within weeks. All related components must be inspected and repaired together.

13. D — Bushings allow pivoting, isolate vibration, and locate control arms precisely — but they do NOT carry the vehicle's vertical weight load. That function is handled by the springs (coil, leaf, torsion, air). Bushings see cornering and braking loads through the pivot, not the sprung weight of the vehicle body.

14. B — Both technicians are correct. Strut mounts and their integrated bearings should always be replaced during strut service — reusing aged mounts on new struts typically causes complaints within months. The strut bearing is integrated with the upper mount on most modern MacPherson designs, so replacing the mount automatically replaces the bearing.

15. C — A load-carrying lower ball joint (SLA with spring on lower arm) must be unloaded before inspection. Placing a pry bar between the lower control arm and the frame supports the arm and unloads the joint, revealing the play accurately. Wheels-hanging inspection without unloading keeps the spring loading the joint and hides the play.

16. A — Worn strut dampers lose high-frequency response before losing low-frequency response. At highway speed over expansion joints, the damper cannot control rapid rebound, producing a clunk. At lower speeds, the inputs are slower and the damper can still manage them. This speed-dependent clunking pattern specifically identifies worn struts.

17. D — Multiple slow leaks across all four air springs is a common aging pattern on air-suspension vehicles. All four corners dropping overnight with an 8-minute recovery time indicates small, bilateral leaks that the running system can compensate for. Compressor, module, and simultaneous sensor failures produce different symptom patterns.

18. B — Stabilizer end link fasteners with rubber bushings must be torqued at ride height with the suspension loaded to the vehicle curb weight. Torqueing on a lift with wheels hanging preloads the bushings in a twisted position, accelerating wear. The ride-height torque rule applies to any suspension fastener passing through a rubber bushing.

19. A — Torsion bar ride height adjustment must always be performed at curb weight on level ground to position the suspension in its normal loaded state. Adjustment on a lift with wheels hanging produces incorrect preload settings. Replacement is unnecessary unless adjustment range is exhausted; swapping bars causes eventual fracture.

20. C — Coil springs with directional markings must be installed with the marking oriented correctly. Installation upside-down typically produces incorrect spring rate characteristics because the coil design incorporates variable pitch or directional loading. The result is incorrect ride height and compromised handling. Always install per the manufacturer's marking.

21. B — Adaptive dampers must be replaced in pairs on the same axle regardless of which side shows the fault. Asymmetric damping characteristics between a new damper and an older one cannot be compensated by the control module and produce unpredictable handling. Pair replacement is standard industry practice for all electronically controlled damping systems.

22. D — When rear toe cannot be brought within specification despite full adjustment range, the rear subframe has shifted from its design position. Modern rear subframes require centering procedures using manufacturer-specified pins; once shifted, eccentric adjusters cannot reach spec. Shocks, equipment calibration, and mismatched tires are less common causes.

23. A — When the wear indicator (grease fitting) on a load-carrying ball joint projects above the housing surface at curb height, the joint is within acceptable wear limits. The joint needs replacement only when the indicator recedes flush with or below the housing. A projecting indicator means the joint is healthy and no service is needed.

24. C — Torque-to-yield U-bolts are single-use and must be replaced with new units whenever they are disturbed or loose. Once loosened or released, a TTY U-bolt cannot maintain proper clamping force even when retorqued. Retorqueing old U-bolts, thread locker, and overtorque are all unsafe practices. New U-bolts and proper retorque is the only acceptable repair.

25. B — Camber pull direction goes toward the MORE-positive side. The side with more positive camber causes the tire to roll more on its outside edge, creating a pulling force in that direction. This is the opposite of caster pull direction. Memorize the rule: camber → more-positive side; caster → less-caster side.

26. D — Caster pull direction goes toward the LESS-caster side. The side with less caster has weaker self-centering force, causing the vehicle to pull toward that side. This is opposite to camber pull direction, which is why the two are commonly confused. Memorize: caster → less-caster side.

27. C — Steering axis inclination (SAI) is a secondary (diagnostic) alignment angle, not a primary adjustable angle. The three primary angles are camber, caster, and toe. SAI is built into the knuckle and

is used diagnostically via included angle comparison to identify bent components, not adjusted during alignment.

28. A — Included angle (SAI + Camber) is used to diagnose bent steering knuckles. Matching included angles side-to-side confirm the knuckles are straight. When included angles differ by more than 0.5°, a knuckle is typically bent. SAI is built into the knuckle casting and cannot be adjusted, making this a reliable diagnostic measurement.

29. B — The correct modern alignment sequence is rear toe first (to center the thrust line), then front caster, then front camber, then front toe with the steering wheel centered. This order exists because front toe is set relative to the thrust line — setting it before rear toe would require redoing it. Industry-standard sequence.

30. D — Setback is the fore-aft offset between the two wheels on the same axle. Significant setback typically indicates collision damage that has shifted a subframe or bent a control arm. Setback is different from thrust angle (rear axle direction), camber difference, or SAI (front viewed angle). Fore-aft wheel offset is the specific definition.

31. A — Wheel runout compensation is the mandatory first step before any alignment measurement. Without compensation, every reading is offset by a fraction of a degree due to the clamp's offset from the wheel's rotation axis. Skipping this step invalidates the entire alignment; it must be done before initial measurements or adjustments.

32. D — When the steering wheel is re-centered during alignment, the SAS's learned zero-point is invalidated. On lane-keep-assist-equipped vehicles, the forward camera also typically requires calibration because the system depends on accurate vehicle geometry references. Both the SAS and ADAS camera typically require calibration after this type of service.

33. B — Torsion beam rear suspensions typically have no rear toe adjustment. When one side reads out of spec, the beam or trailing arm is bent — requiring component replacement, not adjustment. Installing aftermarket adjustment, compensating at the front, or tire rotation all miss the actual problem. The bent component is the underlying cause.

34. C — Side-to-side SAI difference of 1.6° exceeds the typical 0.5° tolerance by a significant margin — the classic signature of a bent steering knuckle. Camber may still be within spec because it was

adjusted around the damage, but the underlying SAI variation indicates the knuckle itself is bent from impact.

35. A — When a tire swap reverses the pull direction, the pull is caused by tire conicity — an inherent lead direction from manufacturing. Alignment, brake drag, and steering gear issues produce pulls that stay in the same direction regardless of tire position. The swap test is the definitive tire-vs-alignment diagnostic test.

36. D — Direct TPMS sensor batteries have a typical service life of 5–10 years. On an 8-year-old vehicle with a sensor reporting "not communicating" despite correct actual tire pressure, battery failure is the most likely cause. Replacement and relearn restore function. Module programming, wheel speed sensors, and pressure thresholds are less common causes.

37. B — Weights at both inner and outer rim edges 180° apart is the classic signature of dynamic (two-plane) imbalance. The offset mass distribution along the wheel's axis creates a wobbling force couple that modern balancers correct with weights at each rim edge simultaneously. Static imbalance alone requires only single-plane correction.

38. D — Torque-plus-angle specifications must be completed in full. Torquing to 240 ft-lb without the additional 60° rotation leaves the bearing under-preloaded — the nut has not stretched to its final preload. Excessive play develops, leading to premature bearing failure. Always complete both stages of the specification for correct preload.

39. C — A 1/4-inch puncture in the tread area is at the industry-standard maximum repairable size and is repairable. The correct repair is a combination plug/patch from inside the tire after dismount. The plug seals the puncture channel; the patch seals the inner liner. External string plugs are temporary; interior patches without plugging leave the channel exposed.

40. A — The letter "W" in a tire sidewall code is the speed rating — 168 mph maximum sustained speed. Speed ratings are not interchangeable — always replace tires with at least the same speed rating as OE, never lower. The aspect ratio, load index, and wheel diameter are separate elements of the tire code and cannot be confused with the speed rating.