

# PRACTICE EXAM 22: ASE A4 SIMULATION

## (40 QUESTIONS)

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### STEERING SYSTEMS DIAGNOSIS AND REPAIR (Questions 1–12)

1. A 2020 vehicle arrives with multiple complaints: reduced power steering assist, an illuminated SRS warning light, and a horn that does not function. Which complaint should be diagnosed FIRST?
- A. Reduced power steering assist because it affects the vehicle's drivability during operation today
  - B. The horn because it is the simplest system to diagnose and can be addressed quickly during visit
  - C. The SRS warning light because it may indicate a safety issue with multiple related electrical circuits
  - D. All three complaints equally since they are not related to each other in any way during operation
2. A vehicle has both a power steering fluid leak and a whining noise from the pump. Scan tool shows no DTCs. Which repair should be performed FIRST?
- A. Identify and repair the external fluid leak before attempting to address the whining noise from the pump
  - B. Top off the fluid and perform a bleeding procedure to address the whining first during service visit
  - C. Replace the power steering pump because the whining indicates the pump is the primary failure point
  - D. Flush the system and replace the fluid because degraded fluid can cause both leaks and whining today
3. A customer reports their vehicle has heavy steering effort AND an occasional popping noise from the steering column during turning. The scan tool shows EPS DTCs. Which complaint indicates the MORE likely primary fault?
- A. The heavy steering effort indicates the EPS system has failed — focus diagnosis on the EPS motor and module

B. The popping noise indicates the intermediate shaft U-joints have failed — focus diagnosis on the shaft components

C. Both complaints are independent and should be addressed separately during two different service visits today

D. The EPS DTCs direct the primary diagnosis — the popping noise may be secondary to the EPS fault condition

4. A 2022 vehicle has multiple DTCs: "EPS motor circuit fault," "Steering angle sensor not calibrated," and "Vehicle speed sensor invalid." The technician should:

A. Replace the EPS control module because multiple DTCs typically indicate module failure during operation

B. Start with the vehicle speed sensor fault — the VSS signal affects both SAS calibration and EPS operation

C. Start with the steering angle sensor calibration — this is the simplest fault to address quickly today

D. Disconnect the battery for 30 minutes to clear all DTCs and see which faults return during road test

5. A rack and pinion is being replaced due to internal leakage. The technician also notices the intermediate shaft has worn U-joints producing a notchy feel. Which components should be replaced?

A. Both the rack and pinion AND the intermediate shaft — both are worn beyond service limits during this visit

B. Only the rack and pinion — the intermediate shaft can be serviced at a later visit to reduce cost today

C. Only the intermediate shaft — the rack can be rebuilt to save cost and labor during this service visit

D. Only the rack and pinion — the intermediate shaft's notchy feel is within acceptable service tolerance

6. A vehicle has a power steering pump that produces a whining noise AND the fluid shows contamination with metallic particles. Which condition is the primary concern?

A. The whining noise indicates the pump is failing and requires immediate replacement during this service

B. The fluid color is a secondary concern and can be addressed at a later service visit after the pump

C. The metallic particles indicate internal wear that will destroy any new pump installed without full flushing

D. Both conditions are equally concerning and can be addressed with a simple fluid change during this service

7. A vehicle has a torn rack bellows boot on one side AND a leaking power steering pump shaft seal. Which repair is more urgent?

A. Both repairs are equally urgent and must be performed during the same service visit for vehicle safety

B. The torn bellows boot — contamination ingress will damage the inner tie rod socket and internal rack within weeks

C. The pump shaft seal — fluid loss affects the entire system and must be addressed before bellows repair today

D. Neither repair is urgent — both can be deferred until the next service interval when other work is needed

8. An intermediate shaft replacement has been completed. The vehicle is returned to the customer. The next morning, the customer reports the SRS warning light came on after starting the vehicle. What is MOST likely the cause?

A. The intermediate shaft replacement disturbed the steering angle sensor wiring producing the SRS warning

B. The battery was disconnected too long during the intermediate shaft service causing SRS memory loss

C. The clockspring was disturbed during the intermediate shaft replacement — it may need to be recentered now

D. The SRS module has failed during the intermediate shaft replacement procedure requiring complete replacement

9. A 2023 vehicle has had its rack and pinion replaced. The customer returns 1 week later complaining of heavy steering effort. Scan tool shows no DTCs. Alignment readings are within specification. Which was MOST likely missed during the original repair?

- A. The EPS initialization procedure — required after any rack replacement to restore normal EPS operation
- B. The front wheel alignment — required after rack replacement to restore proper toe setting during service
- C. The steering angle sensor calibration — required after any EPS-related component service visit today
- D. The power steering fluid was not bled properly — residual air causes heavy effort during normal operation

10. A clockspring has been replaced AND the steering angle sensor has been replaced during the same service visit. The vehicle has reduced EPS assist and DTCs for SAS calibration and clockspring continuity after the repairs. What should be addressed FIRST?

- A. Re-verify the clockspring installation — uncentered clockspring can cause the described symptoms regardless of SAS
- B. Perform the SAS calibration procedure using a scan tool — the calibration procedure will also re-establish EPS operation
- C. Perform the clockspring centering procedure first, then proceed with the SAS calibration after verification today
- D. Replace both the clockspring and SAS with new units because one or both may be defective during the service

11. A hydraulic power steering pump is being replaced. During inspection, the technician notices the high-pressure hose shows external rubber cracks along the outer cover. What is the correct action?

- A. Replace the hose along with the pump — aged hose is likely to fail shortly if only the pump is replaced
- B. Replace only the pump — the hose damage is superficial and does not indicate imminent hose failure today
- C. Replace the hose in 6 months at the next service interval to space out the repair costs for the customer
- D. Apply sealant to the hose to prevent further deterioration before returning the vehicle to the customer

12. A vehicle has a DTC for "EPS supply voltage low" and a DTC for "Low battery voltage" active during cold starts. Battery tests good at room temperature. What is the correct repair sequence?

- A. Replace the battery first because the battery is likely the root cause of both DTCs during cold operation
- B. Clear the DTCs and road test to see which faults return during the normal driving conditions today
- C. Replace the EPS module first because the EPS fault is the more significant system fault during service
- D. Test the battery using a load test that simulates cold cranking conditions before any repair decisions

#### SUSPENSION SYSTEMS DIAGNOSIS AND REPAIR (Questions 13–24)

13. A vehicle has two suspension complaints: a harsh ride over bumps AND clunking during direction changes. The shocks test fine on bounce test. What should be addressed FIRST?

- A. The harsh ride — this is more noticeable to the customer and should be the primary focus during service
- B. The clunking — clunking typically indicates loose components that are a safety concern during driving today
- C. Both complaints equally — they are likely related to the same worn component in the suspension system
- D. The shocks should be replaced first because they are the most common cause of both types of complaints

14. A vehicle has had both stabilizer bar end links and upper strut mounts replaced during the same service visit. After release, the customer returns complaining of persistent clunking. What should be checked FIRST?

- A. The stabilizer bar end link torque — may have been tightened at the wrong suspension position during service
- B. The upper strut mount installation — may have been seated incorrectly during the service procedure today
- C. The shock absorbers — they may require replacement along with the mounts that were replaced during service
- D. The torque specifications — one or both installations may have been torqued at the wrong suspension position

15. A MacPherson strut assembly has been disassembled for spring replacement. The technician discovers the upper strut bearing is rough and the strut rod seal is weeping slightly. What should be replaced during the service?

A. Only the coil spring — the original service request does not include additional components during the visit

B. The coil spring and strut rod seal — the bearing can be serviced at the next visit to minimize cost today

C. The coil spring, upper strut bearing, and strut rod seal — perform all related repairs during the same labor

D. The complete strut assembly including all components — the most expensive but most comprehensive service

16. A pickup truck has both a broken leaf spring AND worn shackle bushings on the same side. Which should be replaced?

A. Both the broken leaf spring AND the shackle bushings — related wear patterns on the same side of the vehicle

B. Only the broken leaf spring — the bushings can be addressed at the next service interval to minimize cost today

C. Only the shackle bushings — the leaf spring may still be within service tolerance despite the visible break

D. Replace the complete leaf spring assembly on both sides of the vehicle to maintain matched service life today

17. A vehicle with air suspension has one dropped corner AND a DTC for a failed ride height sensor at the same corner. Which should be addressed FIRST?

A. Inflate the corner manually and release the vehicle — the sensor can be replaced at a later service visit today

B. Replace the compressor — the dropped corner indicates the compressor is the primary fault during the service

C. Replace the air spring — the dropped corner indicates the air spring has failed during the extended parking

D. Replace the ride height sensor first — the sensor fault is likely causing the module to release air at that corner

18. A ball joint and its control arm pivot bushing on the same side are both worn. What is the correct repair approach?

A. Replace only the ball joint — it is the primary load-bearing component during normal driving operation today

B. Replace both the ball joint and the control arm with bushings — they wear at similar rates and fail together

C. Replace only the bushing — the ball joint may still be within service tolerance despite visible wear during test

D. Replace the control arm on both sides of the vehicle to maintain matched service life during the visit today

19. A multi-link rear suspension has rear toe out of specification AND a visibly cracked rubber bushing on one of the rear lateral links. Which should be addressed FIRST?

A. Adjust the rear toe to specification first, then monitor the bushing during future service intervals for wear

B. Replace the cracked bushing first, then perform the rear toe adjustment after the installation is complete

C. Replace the lateral link — the cracked bushing is causing the toe issue and must be repaired first

D. Adjust the toe and replace the bushing separately since they are not related to each other during service

20. A shock absorber has been replaced on one corner. The customer returns 1 month later complaining of the vehicle pulling toward the opposite side. Alignment readings are within specification. What is MOST likely the cause?

- A. The opposite shock needs replacement — mismatched damping produces the pull during normal driving today
- B. The replaced shock is defective and requires warranty replacement during this service visit to correct
- C. The alignment has shifted since the original service despite current readings within specification today
- D. The tire pressure is different between the two sides causing the pull despite the alignment being correct

21. A pickup truck has both a torsion bar that won't adjust AND a ride height below specification. Which indicates the primary failure?

- A. The torsion bar has seized in its mounts — lubrication will restore normal adjustment operation today
- B. The adjuster bolt threads are stripped — thread repair will restore ride height adjustment capability
- C. The torsion bar anchor has broken — the bar rotates without applying preload to the suspension during service
- D. The torsion bar has lost spring rate — replacement is required regardless of which secondary symptom appears first

22. An adaptive damping system has fault codes for all four dampers simultaneously. What should be checked FIRST?

- A. Each damper individually for internal failure — the individual dampers may have all failed during the service
- B. A common power or ground to all four damper circuits — shared circuit failure affects all simultaneously
- C. The suspension control module — all four output drivers have failed at the same time during service today
- D. The individual wiring harnesses to each damper — all four harnesses may have failed simultaneously today

23. A vehicle has had both a MagneRide damper replaced AND subframe bushings replaced during the same service. Upon return, the customer reports the vehicle's ride has changed significantly. What is the MOST likely cause?

- A. The MagneRide damper and subframe bushings work together — both changes affect ride quality together
- B. The subframe bushings have not settled into their normal position yet — wait 500 miles before evaluating
- C. The wheel alignment was not performed after the subframe bushing replacement disturbed suspension geometry
- D. The MagneRide damper programming was not completed after the installation during the service procedure

24. A wheel bearing replacement has been completed using a torque-to-yield axle nut. The technician torqued to the torque specification but did not complete the additional angle rotation. What is the MOST likely consequence?

- A. The axle nut will loosen during driving from vibration at highway operating speeds during normal service use
- B. The wheel bearing will have excessive preload from the torque alone causing overheating during operation today
- C. The wheel bearing will have insufficient preload causing excessive play and premature bearing failure eventually
- D. The brake rotor will develop excessive runout from improper hub seating during the installation procedure today

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

25. A vehicle has multiple alignment complaints: a pull to the left, rapid inside-edge tire wear on the right front tire, and the steering wheel sitting off-center by 8°. Which should be addressed FIRST during alignment?

- A. The steering wheel off-center — this is the most visible issue to the customer and should be fixed first today
- B. The underlying causes — pull, wear pattern, and off-center wheel all stem from incorrect alignment angles

C. The tire wear — the tire may need replacement before the alignment can be completed properly during visit

D. The pull direction — the pull is the primary complaint from the customer and should be addressed first

26. A vehicle has alignment readings showing both cross-camber AND cross-caster out of specification. The vehicle has a significant pull. Which is MOST likely contributing more to the pull?

A. Cross-camber because it produces stronger pull force per degree than cross-caster at highway speed conditions

B. Cross-caster because it has more influence on the vehicle's directional behavior than camber during service

C. Both equally because they are similar in magnitude of effect on vehicle pull direction during normal driving today

D. Neither — the pull is likely caused by tire conicity rather than the alignment readings during the test drive

27. A vehicle's alignment shows: rear toe asymmetric, front camber within spec, front caster within spec. The customer reports a pull AND the steering wheel sitting off-center. Which should be corrected FIRST?

A. The front toe — the pull and off-center wheel will both improve after front toe adjustment during service

B. The front camber — although in spec, small adjustments can correct the pull direction during alignment

C. The front caster — although in spec, small adjustments can correct the pull direction during service today

D. The rear toe — the thrust angle affects both the pull and the front toe setting during the alignment service

28. A vehicle with MacPherson struts has no factory camber adjustment. The left front camber reads  $1.5^\circ$  more negative than spec. The vehicle also has evidence of prior collision damage to the left front fender. Which is MOST likely the cause?

- A. The left front strut assembly is bent from a previous impact — replace the strut to restore correct camber today
- B. The left front subframe has shifted from prior impact damage requiring centering during the service visit today
- C. The left front knuckle is bent from prior impact damage — SAI and included angle measurements will confirm
- D. Worn suspension bushings have allowed the camber to drift — visible signs of bushing wear should be inspected

29. A FWD vehicle with torsion beam rear suspension has rear toe out of spec on one side. The vehicle has been involved in a rear impact based on body shop repair records. Which is the correct repair?

- A. Inspect the torsion beam and trailing arm for bent or damaged condition — replace damaged components as found
- B. Install aftermarket adjustable mounts to provide rear toe adjustment capability during the service visit today
- C. Accept the out-of-specification toe condition — torsion beam suspensions cannot be adjusted at the rear
- D. Rotate the tires to equalize wear patterns caused by the out-of-specification toe condition during service

30. A vehicle has an alignment performed. The customer returns 2 weeks later complaining of a pull. The alignment is rechecked — all angles still within specification. The tire pressures are verified correct. What should be checked NEXT?

- A. The alignment equipment calibration — it may have drifted since the original alignment during the service visit
- B. Tire conicity by swapping the front tires left-to-right — the pull will reverse if conicity is the cause of pull
- C. The suspension components for wear — worn bushings can cause dynamic alignment shift during driving today
- D. The wheel bearings on both front wheels — they may be loose and causing the pull during straight driving today

31. A vehicle has SAI readings of Left  $13.0^\circ$  and Right  $12.3^\circ$ . Camber is within specification on both sides at  $0.0^\circ$ . Specification is  $13.0^\circ \pm 0.5^\circ$ . What does this 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 difference during service
- C. The right front steering knuckle is bent — SAI difference of  $0.7^\circ$  exceeds tolerance despite camber being adjusted
- D. The ride height varies between the two sides producing the apparent SAI measurement difference on rack

32. A vehicle has had an alignment performed. The steering wheel was re-centered during front toe adjustment. The vehicle has both lane-keep assist AND adaptive cruise control. Which calibrations are typically required?

- A. The steering angle sensor AND the forward camera — both systems depend on accurate geometry references after alignment
- B. Only the steering angle sensor — the lane-keep and adaptive cruise modules are independent of alignment changes
- C. Only the forward camera — the SAS does not require recalibration unless it was physically disturbed during service
- D. Neither calibration is required — the SAS and camera self-calibrate after the alignment during normal driving

33. A vehicle has both a non-zero thrust angle AND setback at the front axle. Which is MORE likely to indicate collision damage?

- A. The thrust angle — asymmetric rear toe always indicates collision damage requiring frame inspection today
- B. Both equally because they are similar in magnitude of collision damage indication during service visit today

C. The setback only if it exceeds  $1.0^\circ$  — smaller setback values are normal for vehicles during service visit

D. The setback — fore-aft wheel offset on the same axle specifically indicates collision damage or frame shift

34. A vehicle has front cross-caster of  $1.0^\circ$  with the left side more positive. The vehicle should pull:

A. Toward the left side — caster pulls toward the more-positive side during straight driving at highway speed

B. Toward the right side — caster pulls toward the less-caster (right) side during straight driving at highway speed

C. No pull direction — cross-caster of  $1.0^\circ$  is within normal tolerance and does not produce pull direction effects

D. The pull direction depends on cross-camber readings not shown — cross-caster alone cannot determine pull

35. A vehicle has had a front strut replaced. Alignment must be performed. The technician should perform the alignment:

A. 24 hours after the strut replacement — suspension components require time to settle before accurate alignment

B. 500 miles after the strut replacement — the new strut requires break-in before the alignment is valid service

C. Only if the alignment was already out of specification before the strut replacement — otherwise skip the service

D. Immediately after strut replacement — strut replacement disturbs suspension geometry regardless of settling period

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

36. A vehicle has both a TPMS warning light AND a tire with visible damage — a bulge in the sidewall. Which should be addressed FIRST?

- A. The damaged tire — sidewall damage indicates imminent tire failure that is a safety concern during driving today
- B. The TPMS warning light — it may indicate the tire pressure is low and needs adjustment to clear the warning now
- C. Both equally because both indicate safety concerns that require immediate attention during the service visit today
- D. The TPMS light first — it may have triggered from normal pressure variation and can be quickly cleared during service

37. A wheel-and-tire assembly has both imbalance AND radial runout. Which should be addressed FIRST?

- A. The imbalance — it is easier to correct using the balancer than the runout which requires additional equipment today
- B. Both equally because they will produce the same vibration characteristics during highway driving at road speed today
- C. The runout first — match-mounting the tire can reduce combined runout and improve the balance correction after
- D. Imbalance is the primary problem and runout is secondary — address the imbalance and re-evaluate the runout later

38. A direct TPMS system has had all four sensors replaced with universal aftermarket sensors. Which steps are required?

- A. Drive the vehicle at highway speed for 30 minutes to allow automatic sensor recognition by the module
- B. Programming the sensors with vehicle-specific data AND performing the TPMS relearn procedure for each wheel
- C. Only the TPMS relearn procedure since universal sensors come pre-programmed from the manufacturer today
- D. Only the programming procedure since the sensors will learn their positions during the first drive cycle today

39. A tire has a puncture AND a tread wear indicator flush with the surrounding tread (at the 2/32 inch legal minimum). Which should be addressed FIRST?

- A. Repair the puncture using a combination plug/patch — the tire still has acceptable service life during driving today
- B. Monitor the tread depth and defer the puncture repair until the tire is replaced at the next service interval today
- C. Balance the tire first to ensure the repair is effective during normal driving after the repair service visit today
- D. Replace the tire — the tire is at the legal tread minimum and should be replaced regardless of puncture repair

40. A wheel hub assembly has been replaced. The customer returns 1 week later complaining of a growling noise during highway driving. The noise is constant regardless of cornering direction. What is MOST likely the cause?

- A. The new hub assembly has failed — a defective or damaged replacement during shipping or installation today
- B. The axle nut was not torqued to the final specification — insufficient preload has allowed the bearing to fail today
- C. The brake rotor was not cleaned on the hub mating surface producing the growling noise during normal driving today
- D. The CV joint on the same side was damaged during the hub replacement procedure causing the growling noise

## Practice Exam 22: Answer Key and Explanations

1. C — The SRS warning light indicates a safety-critical system fault. All three symptoms (reduced EPS, horn inoperative, SRS warning) share the steering column as a common point and are likely related to a single underlying cause — often a clockspring or SRS-related fault. Addressing the SRS first guides diagnosis of the shared root cause rather than chasing each symptom separately.

2. A — External fluid leaks must be identified and repaired before addressing the whining noise. Fluid loss is the root cause; whining is the symptom that appears when fluid drops below minimum. Topping

off and bleeding without finding the leak only temporarily masks the symptom — the fluid will leak out again, and the whining returns. Always repair the leak first.

3. D — When EPS DTCs are present, those codes direct the primary diagnosis. The popping noise and heavy effort may both stem from a single EPS-related root cause — for example, a failing motor coupling can produce both symptoms simultaneously. Following the DTC-directed diagnostic path is efficient and often resolves multiple symptoms through a single repair.

4. B — The vehicle speed sensor (VSS) signal is a foundational input — the SAS calibration depends on it, and the EPS uses it for variable assist. When VSS is invalid, the SAS and EPS operation are both affected. Fixing the VSS first may resolve the SAS calibration error and the EPS fault simultaneously. Always repair the most foundational input before chasing downstream faults.

5. A — Both the rack and the intermediate shaft are worn beyond service limits. Replacing only the rack leaves the notchy intermediate shaft, which will likely require return service within weeks. Replacing both during the same visit is more efficient and ensures the repair addresses all identified wear. The intermediate shaft's notchy feel is not within acceptable tolerance.

6. C — Metallic particles in the fluid indicate internal wear from failing components — pump, rack, or gear internals. Installing a new pump without flushing the contaminated fluid and identifying the wear source will rapidly destroy the new pump. The metallic contamination must be thoroughly flushed and the source identified and repaired before installing any new components.

7. B — A torn rack bellows boot allows water, grit, and road debris to enter the inner tie rod socket and rack end. This contamination causes progressive damage to expensive components within weeks. The pump shaft seal leak is slower to cause downstream damage. The bellows boot is the more urgent repair because contamination actively damages the rack.

8. C — The clockspring is positioned within the column assembly. Intermediate shaft service often requires removing or disturbing the column assembly, which can affect the clockspring. The SRS warning light appearing after the repair points specifically to the clockspring — it may have been disturbed, rotated off-center, or damaged during the service. Recentering is typically the fix.

9. A — After rack replacement on an EPS-equipped vehicle, the manufacturer-specified EPS initialization procedure is typically required to restore normal operation. Without initialization, the

system operates in reduced-assist mode even without setting DTCs. Alignment, SAS calibration, and bleeding are separate concerns — initialization is the most commonly missed post-repair step.

10. C — When both the clockspring and SAS have been replaced during the same visit, the clockspring centering must be verified first, because an uncentered clockspring can produce the exact symptoms described (SRS warning, clockspring DTC, reduced assist). After the clockspring is verified centered and correctly installed, the SAS calibration procedure follows. Proper sequence is: clockspring first, then SAS.

11. A — During pump replacement, the high-pressure hose is accessible and the labor cost of replacing both components together is much less than two separate visits. Cracked outer rubber indicates compromised hose integrity; replacement now avoids imminent hose failure. Replacing both during the same service event is efficient and addresses identified wear.

12. D — Before replacing components, test the battery using a load test that simulates cold cranking conditions. The DTCs suggest a battery capacity issue (insufficient CCA) even though the battery tests good at room temperature. Load testing under cold-simulated conditions identifies the actual problem. Replacing components without proper diagnosis wastes time and cost.

13. B — The clunking is the more urgent complaint because clunking typically indicates loose components that can progress to catastrophic failure. Harsh ride is uncomfortable but not a safety issue. Addressing the cause of clunking (loose end links, worn bushings, failed mounts) is the priority. The harsh ride may resolve once the loose component is fixed.

14. D — Both the stabilizer end links and upper strut mounts are fasteners that pass through rubber bushings — they must be torqued at ride height with the suspension loaded. If either installation was torqued at the wrong suspension position (e.g., full droop on a lift), the bushings are preloaded incorrectly and produce noise. Verify torque specs were applied at the correct position.

15. C — When a strut is disassembled and both the upper bearing (rough) and rod seal (weeping) are found defective, they should all be replaced during the same labor. The labor to access these components is most of the service cost; reusing aged parts is false economy that typically returns as a complaint within weeks.

16. A — Both the broken leaf spring and the shackle bushings on the same side should be replaced during the same service. They represent related wear patterns that have developed together. Replacing

only the spring leaves worn shackle bushings; replacing only the bushings leaves a broken spring. Full side repair addresses all identified wear.

17. D — When the ride height sensor has failed, the module receives incorrect data and may release air at that corner, producing the dropped corner symptom. The sensor fault is the primary issue. Replacing the sensor may resolve the dropped corner without needing to replace the air spring. Always address the sensor failure first — it may be the root cause.

18. B — The ball joint and control arm pivot bushing on the same side wear at similar rates. Replacing only the ball joint leaves the worn bushing about to fail; replacing only the bushing leaves a worn ball joint. Both should be replaced together — the control arm with bushings is typically the correct repair unit for modern vehicles.

19. C — The cracked rubber bushing on the lateral link is causing the rear toe to be out of specification. The link has shifted from its design position because the bushing no longer holds it properly. Simply adjusting toe without replacing the damaged bushing means the toe will drift again. Replacing the failed link (and its bushing) is the root-cause repair.

20. A — Shock absorbers must be replaced in pairs on the same axle to maintain matched damping characteristics. A new shock paired with the old opposite shock produces asymmetric damping that causes the pull described. Alignment within spec doesn't compensate for asymmetric damping. The opposite shock must be replaced to restore balanced handling.

21. D — When the torsion bar preload adjuster turns freely but ride height doesn't respond, the bar has lost its spring rate. This is the root cause; all other symptoms (stripped threads, broken anchor, seized mounts) are less common and produce different specific failure patterns. Bar replacement is required regardless of secondary symptoms.

22. B — When all four dampers show fault codes simultaneously, a common power or ground to the damper circuits is the most likely cause. Four simultaneous damper failures or four output driver failures are statistically unlikely. Check the shared electrical supply first — a blown fuse, loose connector, or damaged harness to the damper circuits is the most common cause.

23. A — Both the MagneRide damper and the subframe bushings directly affect ride quality, and both were replaced during the same service. The change in ride is due to the combined effect of the two

repairs. This is expected and not a fault. Wait and assess if the changed ride is acceptable to the customer before concluding additional repairs are needed.

24. C — Torque-to-yield axle nuts require completion of the full torque-plus-angle specification. Torquing to the first-stage torque without the additional angle rotation leaves the bearing under-preloaded — excessive play develops, leading to premature bearing failure. Always complete both stages of the specification for correct preload.

25. B — The pull, rapid wear pattern, and off-center wheel all stem from incorrect alignment angles. Addressing the underlying cause (alignment) fixes all three complaints simultaneously. Addressing only one surface symptom without correcting the alignment is incomplete service. The alignment is the root cause, and all three symptoms will resolve when alignment is corrected.

26. A — Cross-camber ( $0.8^\circ$  or more difference side-to-side) produces stronger pull force per degree than cross-caster, though both contribute. When both are out of spec, camber is more likely the primary contributor to pull magnitude. Addressing cross-camber first may eliminate the pull completely; cross-caster is typically a secondary contributor to feel.

27. D — When rear toe is asymmetric (non-zero thrust angle) and the customer reports both a pull and off-center steering wheel, rear toe correction must happen first. Setting front toe before fixing rear toe is wasted work — the front will need redoing after rear toe is corrected. The modern alignment sequence (rear toe first) directly addresses this scenario.

28. C — Prior collision damage combined with camber significantly out of specification ( $1.5^\circ$  negative) is the signature of a bent steering knuckle. SAI and included angle measurements will confirm this — mismatched included angles are the diagnostic test. Bent knuckles cannot be adjusted; camber can only be adjusted around the damage. The knuckle must be replaced.

29. A — When documented rear collision damage combined with out-of-spec rear toe on a torsion beam suspension, the beam or trailing arm is likely bent. Replacement is required — torsion beam designs typically have no rear toe adjustment. Inspection for bent components is the correct first step after reviewing the collision history.

30. B — When alignment verifies correct and tire pressures are correct, tire conicity is the next diagnostic. Swap the front tires side-to-side and observe whether the pull direction changes. If the pull

reverses, a tire is at fault. This is the definitive tire-vs-alignment diagnostic and should be performed before further investigation.

31. C — Side-to-side SAI difference of  $0.7^\circ$  exceeds the typical  $0.5^\circ$  tolerance, and camber has been adjusted to remain within spec on both sides. When camber is adjusted but SAI is mismatched, the knuckle is bent — camber compensation is working around the underlying damage. The knuckle must be replaced to restore proper geometry.

32. A — On vehicles with both lane-keep assist and adaptive cruise control, both the steering angle sensor AND the forward camera typically require calibration after alignment that re-centers the steering wheel. Both systems depend on accurate geometry references; both must be calibrated to function correctly. Skipping either calibration can cause unpredictable system behavior.

33. D — Setback (fore-aft wheel offset on the same axle) is a specific indicator of collision damage that shifted a subframe or bent a control arm. Thrust angle has multiple causes (worn bushings, tire pressure, rear axle damage), while setback almost always indicates structural shift. Setback is the more direct collision indicator.

34. B — Caster pull direction goes toward the LESS-caster side. With left caster more positive, the right side has less caster, and the vehicle pulls to the right. Caster pulls toward the less-caster side because the side with less caster has weaker self-centering force. This is opposite to camber pull direction.

35. D — After front strut replacement, wheel alignment must be performed immediately to verify the suspension geometry is correct after the service. Strut replacement disturbs suspension geometry regardless of how carefully the installation was performed. Waiting 24 hours or 500 miles delays customer receipt of a correctly aligned vehicle and is unnecessary on OE-spec components.

36. A — A sidewall bulge indicates imminent tire failure — the internal reinforcement has separated, and the tire can rupture at any time at road speed. This is a catastrophic safety issue. The TPMS warning light is secondary to the visible sidewall damage. Address the damaged tire first, then the TPMS light (which may resolve once the damaged tire is replaced).

37. C — When both imbalance and radial runout are present, match-mounting the tire to the wheel is the first step. Match-mounting can reduce combined runout by 25–40%, which simultaneously reduces the weight required for balancing. Correcting runout first, then balancing, is the standard sequence. Addressing imbalance alone without fixing runout means the vibration persists.

38. B — Universal aftermarket TPMS sensors require both programming (with vehicle-specific data) AND performing the TPMS relearn procedure. Programming establishes the sensor's identity; relearn teaches the vehicle which sensor is at which wheel position. Both steps are required — programming alone doesn't tell the vehicle where each sensor is located.

39. D — When a tire is at the legal tread minimum (2/32 inch), it should be replaced regardless of whether it has a puncture. Repairing a punctured tire that's already at end of life is false economy — the tire needs to be replaced anyway. The customer gets a new tire that requires no repair, which is the more appropriate service recommendation.

40. A — The new hub assembly has likely failed within 1 week of installation — indicating either a defective unit from the manufacturer or damage during shipping/installation. Constant growling regardless of cornering direction points to severe bearing failure. Warranty replacement is the correct action. The torque was properly applied; the component itself is defective.