

PRACTICE EXAM 18: ASE A4 SIMULATION

(40 QUESTIONS)

STEERING SYSTEMS DIAGNOSIS AND REPAIR (Questions 1–12)

1. A 2022 sedan arrives with no power steering assist. Scan tool shows DTC U0100 "Lost communication with ECM/PCM" and reduced EPS assist. The vehicle cranks and starts normally. What is the MOST likely cause?

- A. The EPS control module has an internal fault and requires immediate replacement now
- B. A communication network fault between the ECM/PCM and EPS module — check network wiring
- C. The battery voltage is low affecting the EPS module communication with other modules today
- D. The steering angle sensor has failed causing loss of network communication to the EPS system

2. A 2021 truck has a DTC for "EPS motor position sensor invalid." Live data shows motor position at 0° while the steering wheel is clearly rotated 90° from center. The wiring tests good. What is the correct repair?

- A. Reset the motor position sensor using a scan tool command to match the current wheel position
- B. Replace only the motor position sensor as a separately serviceable component of the steering rack
- C. Replace the steering angle sensor because it provides the reference for the motor position
- D. Replace the rack assembly — the motor position sensor is integrated and not individually serviceable

3. A vehicle has a DTC for "torque sensor signal mismatch" with live data showing Channel A at 2.5 V and Channel B at 2.4 V at rest. The steering has reduced assist. What does this indicate?

- A. The readings are within normal tolerance and the DTC is stored from a previous condition
- B. The torque sensor wiring has a shorted circuit causing the two channels to read similar voltages

C. The torque sensor has failed internally — the mismatch indicates sensor drift requiring rack replacement

D. The EPS module has failed and is generating the mismatch error as part of module internal failure

4. A customer complains that their 2023 vehicle's EPS system delays response when first turning the steering wheel after the vehicle sits for 8+ hours. After 30 seconds of operation, the delay disappears. What is MOST likely the cause?

A. Normal EPS module wake-up sequence — the module requires a brief initialization after extended sleep

B. The EPS motor coupling has worn and requires replacement to eliminate the delay during startup

C. The power steering fluid has separated during the extended sit affecting assist during startup

D. The steering angle sensor requires calibration because it drifts during extended vehicle sitting time

5. A 2024 vehicle with rack-mounted EPS shows a scan tool DTC "P0562 System voltage low" during cold morning starts only. Battery voltage measures 12.6 V at rest and 14.2 V running. What should be checked NEXT?

A. The battery condition — cold cranking amps may be inadequate despite acceptable resting voltage

B. The EPS control module for internal failure requiring scan tool diagnostic verification procedure

C. The steering angle sensor calibration using manufacturer scan tool calibration procedure steps

D. The serpentine belt tension during cold operation to verify adequate belt drive to alternator

6. A hydraulic power steering pump produces a squealing noise only during turning at parking speeds. The fluid is at specification and clear. Which is MOST likely the cause?

A. Worn internal pump components requiring complete pump replacement during this service visit

B. Contaminated fluid affecting the pump's ability to produce adequate pressure at the gear inlet

C. The high-pressure hose is restricted internally causing backpressure during the steering operation

D. A glazed or slipping serpentine belt loading the pump during high-demand steering operation

7. A clockspring has been replaced on a 2022 vehicle. After installation, the SRS warning light remains illuminated. The scan tool DTC reads "Driver airbag circuit resistance high." What is the MOST likely cause?

- A. The SRS module has failed during the installation and requires replacement with programming
- B. The airbag module itself has a defect causing the resistance value to read above specification
- C. The clockspring was not properly centered during installation or the ribbon cable was damaged
- D. The battery voltage dropped too low during the installation causing SRS module memory loss

8. A 2020 vehicle with lane-keep assist has had a steering angle sensor replaced. After calibration, the lane-keep assist activates at random times during straight driving even without lane marker detection. What is MOST likely the cause?

- A. The forward camera also requires calibration after the SAS replacement to restore proper function
- B. The lane-keep assist module has failed during the SAS replacement and requires complete replacement
- C. The new SAS is defective and is reporting incorrect steering position to the lane-keep module
- D. The lane-keep assist requires a software update after any sensor replacement to restore function

9. A recirculating ball gearbox is being adjusted. The technician has removed the pitman arm and centered the steering wheel. Input shaft rotational torque reads 4 in-lb. Specification is 6–10 in-lb. What is the correct action?

- A. Leave the setting as measured because 4 in-lb is below the maximum specification value
- B. Replace the gearbox because the sector teeth cannot produce proper preload at this setting
- C. Loosen the sector shaft adjuster until the reading drops further to a minimum setting
- D. Tighten the sector shaft adjuster until the input shaft rotational torque reaches 6–10 in-lb

10. A power steering hose has developed a pinhole leak at a crimped metal fitting. The leak produces a fine spray during steering operation. What is the correct repair?

- A. Apply thread sealant to the fitting and retorque to specification to stop the leak during service
- B. Replace the complete hose assembly because crimped fittings cannot be resealed during service
- C. Install a new sealing washer between the fitting and the pump to stop the pinhole leak at crimp
- D. Overtighten the fitting until the leak stops completely during the repair of the pinhole leak

11. A 2023 vehicle has the following scan tool data: Battery voltage 13.8 V, EPS motor current 75 A at full lock, Torque sensor channels 2.5 V and 2.6 V (within 0.1 V tolerance). The customer reports normal steering operation. Which statement is correct?

- A. The readings are all within normal specifications and confirm proper EPS system operation
- B. The motor current is too high and indicates excessive mechanical load from a binding rack
- C. The torque sensor readings are too close together indicating an internal sensor short circuit
- D. The battery voltage is too low for proper EPS operation at the commanded motor current

12. A 2022 pickup with column-mounted EPS has had its battery replaced. The steering has reduced assist and the EPS warning light is illuminated. The scan tool shows no stored DTCs. What is the correct action?

- A. Replace the EPS control module because the voltage loss damaged internal components
- B. Disconnect the battery for 30 minutes to force the EPS module to reset to factory default
- C. Perform the manufacturer-specified EPS initialization procedure after battery replacement
- D. Check battery voltage under load — the new battery may be defective from the factory

SUSPENSION SYSTEMS DIAGNOSIS AND REPAIR (Questions 13–24)

13. A 2020 SUV with air suspension has DTCs for "Ride height sensor left rear out of range" and the affected corner is dropped. The ride height sensor wiring tests good. What is the correct repair?

- A. Replace the suspension control module because the sensor signal is being misinterpreted
- B. Replace the ride height sensor and inspect the linkage arm for breakage during installation

- C. Reset the suspension control module to calibrate the sensor to the current ride height value
- D. Adjust the ride height at the affected corner using the adjuster on the sensor during service

14. An adaptive damping system has DTCs for "damper current low" on the rear right damper. Live data shows commanded current of 2.0 A and actual current of 0.1 A. Wiring tests good with proper continuity. What is the correct repair?

- A. Reset the suspension control module to force relearn of the damper electrical characteristics
- B. Replace only the rear right damper because it is the confirmed failed component from testing
- C. Replace the suspension control module because the output driver is failing to deliver current
- D. Replace both rear dampers as a matched pair to maintain balanced damping across the rear axle

15. A MagneRide damper has been replaced during collision repair. After installation, the damper does not respond to scan tool commands. Wiring tests good. Live data shows the damper as "not recognized." What is the MOST likely cause?

- A. The new damper requires a programming procedure specific to the vehicle control module system
- B. The MR fluid in the new damper requires magnetic field conditioning before normal operation
- C. The damper is defective from the manufacturer and requires replacement with another unit
- D. The suspension control module has a programming fault causing it to not recognize the new part

16. A vehicle sits low on one corner after hitting a large pothole. Visual inspection reveals no broken spring but the ride height at that corner is 2 inches below specification. What is MOST likely the cause?

- A. The strut mount has torn internally from the impact and allowed the strut to shift downward
- B. The shock absorber is leaking fluid internally but does not show external evidence of the leak
- C. The coil spring has collapsed internally — visible cracks aren't always present in fractured springs
- D. The ball joint is worn excessively from the impact and has allowed the wheel to sag downward

17. A pickup truck with torsion bar front suspension has developed ride height below specification on one side only after 75,000 miles. The adjuster is functional. What is the correct repair?

- A. Adjust the preload on the affected side at curb weight on level ground to restore ride height
- B. Replace both torsion bars because unilateral sag indicates the bars have reached end of service life
- C. Swap the torsion bars from left to right to equalize the preload between the two sides of vehicle
- D. Lift the vehicle and adjust the preload with wheels hanging free for better access to the adjuster

18. A multi-link rear suspension has rear camber 1.5° more negative than specification on one side only. The camber adjustment eccentric cam has been fully rotated through its adjustment range. What is the MOST likely cause?

- A. The rear shock absorber has failed causing the camber shift during dynamic load conditions
- B. The tires are mismatched in size between the two rear wheels affecting apparent camber readings
- C. The alignment equipment requires recalibration for the vehicle model and its adjustment range
- D. A worn or damaged suspension link or bushing has shifted the suspension from its design position

19. A stabilizer bar end link is being replaced. The ball stud at one end has 0.150 inch of axial play when tested by hand. Specification is 0.030 inches maximum. What is the correct action?

- A. Tighten the ball stud retaining nut to reduce the axial play to within the specified tolerance limit
- B. Replace the end link assembly — the ball stud wear exceeds specification by a wide margin
- C. Apply thread locker to the ball stud threads and retorque to eliminate the axial play in use
- D. Replace the ball stud seal to restore the original retention of the ball stud in the socket assembly

20. An air suspension vehicle has been lifted on a two-post hoist without disabling the air suspension. The compressor has run for 3 minutes continuously after the vehicle was lifted. What is the consequence?

- A. The compressor will not be damaged because modern air suspension compressors are rated for continuous duty

- B. The air springs will inflate to excessive pressure causing eventual damage to the rolling lobe bellows
- C. The ride height sensors may report extreme droop causing the system to inflate beyond safe pressure
- D. The air suspension control module will detect the abnormal condition and shut down the compressor

21. A leaf spring U-bolt has come loose 1,000 miles after initial service. The U-bolt is torque-to-yield. What is the correct repair?

- A. Retorque the existing U-bolt to the original specification value and release to the customer
- B. Apply thread locker to the existing U-bolt and retorque to compensate for future loosening
- C. Overtorque the U-bolt beyond specification by 25% to ensure it does not loosen again during service
- D. Replace the U-bolt with a new torque-to-yield unit and torque to specification per manufacturer

22. A ball joint inspection reveals the grease fitting projects 1/4 inch above the housing surface at curb height on a load-carrying ball joint. Specification states the fitting should be at or above the housing surface. What does this indicate?

- A. The joint has exceeded its wear limit and requires immediate replacement with a new ball joint
- B. The joint is within acceptable wear limits and does not require replacement during this service
- C. The wear indicator is defective and the joint must be inspected using alternate methods for wear
- D. The joint requires additional grease to extend its service life before any replacement is needed

23. A coil spring has been compressed with a spring compressor. The strut mount retaining nut has been removed. The spring remains captured by the compressor without expansion. What does this indicate?

- A. The spring compressor is properly engaged — proceed with the upper strut mount removal procedure
- B. The spring compressor is not engaged deeply enough — re-engage for better capture of the spring
- C. The spring has aged beyond acceptable service and requires replacement at this repair interval
- D. The strut shaft is damaged and the service must be halted before additional disassembly continues

24. A vehicle with a solid rear axle has leaf springs. A customer complains of rear clunking on bumps and direction changes. Inspection reveals worn rear shackle bushings. What is the correct repair?

- A. Replace only the side with the visibly worn bushings to minimize cost during the repair visit
- B. Replace the complete leaf spring assembly because shackle bushings are not separately serviceable
- C. Replace the shackle bushings on both sides of the vehicle as a matched pair for the service
- D. Replace only the shackles themselves while retaining the existing bushings for continued service

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

25. A vehicle has had its alignment completed. The thrust angle reads $+0.45^\circ$ with total rear toe within specification. Which condition exists?

- A. The front toe is causing the thrust angle and requires readjustment to reduce it to zero
- B. The alignment equipment requires recalibration before accurate thrust angle can be measured
- C. The rear alignment is correct because total rear toe is within specification as specified
- D. The left and right rear toe settings are asymmetric creating the non-zero thrust angle reading

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

- A. The alignment is out of specification and requires adjustment to eliminate the pull direction change
- B. A tire has conicity causing the pull to reverse when the tire is moved to the opposite side of vehicle
- C. A dragging brake caliper on one side is causing the directional pull despite the tire swap test done
- D. The steering gear has internal bypass producing direction-dependent pull regardless of tire position

27. A vehicle has front camber readings of Left $+0.4^\circ$ and Right -0.3° . Camber specification is $0^\circ \pm 0.75^\circ$. The vehicle pulls to the left at highway speed. What is the cause?

- A. Cross-camber of 0.7° with the left side more positive produces a leftward pull direction

- B. The right side is more negative than the left producing a pull toward the right direction
- C. The absolute camber values are too small and producing no effect on the pull direction
- D. Normal road crown compensation causing the pull during straight driving is normal service

28. A caster reading shows Left $+3.0^\circ$ and Right $+4.5^\circ$. Camber is within specification on both sides. The vehicle pulls at highway speed. In which direction?

- A. Toward the right — the right has more caster than the left producing pull in that direction
- B. No pull occurs because caster imbalance does not affect pull direction during normal driving
- C. Toward the left — caster pulls toward the less-caster side of the vehicle during highway driving
- D. The pull direction depends on cross-camber not shown in the readings during this alignment

29. A FWD vehicle with torsion beam rear suspension has one rear toe reading 0.30° out of specification. The other side reads within spec. Torsion beam suspensions have no rear toe adjustment. What is the correct repair?

- A. Install aftermarket adjustable torsion beam mounts to provide rear toe adjustment capability
- B. Rotate the tires to equalize the wear pattern caused by the out-of-specification rear toe condition
- C. Adjust the front toe to compensate for the rear asymmetry and document on the printout
- D. Inspect the torsion beam and trailing arm for bent or damaged condition — replace as needed

30. A vehicle with lane-keep assist has had an alignment completed. The steering wheel was re-centered during toe adjustment. The forward camera was not physically moved. Which calibration is required?

- A. Only the tire pressure monitoring system requires reset after the alignment service is completed
- B. The steering angle sensor and typically the ADAS forward camera require calibration procedures
- C. Only the electronic stability control module requires a relearn during road test at highway speed
- D. No calibration is needed because the forward camera was not physically disturbed during the service

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

- A. Wheel runout compensation on each wheel to correct for clamping device offset errors
- B. A complete road test to evaluate the steering feel before any alignment service is performed
- C. A caster sweep to record initial caster values before any other alignment angle is measured
- D. Front toe adjustment to approximately zero to establish a measurement baseline reference

32. A vehicle has included angle readings of Left 12.5° and Right 13.9° . Camber is within specification on both sides at -0.2° . Specification for SAI is $13.0^\circ \pm 0.5^\circ$. What does this indicate?

- A. The alignment equipment requires recalibration before continuing alignment service procedures
- B. The tire pressures differ between the two sides causing the apparent included angle difference
- C. A steering knuckle is likely bent — the included angle difference exceeds specification tolerance
- D. The ride height varies between the two sides causing the included angle measurement to shift

33. A vehicle has had its alignment completed. The steering wheel sits 5° off-center during straight driving. The vehicle tracks straight without pulling. What is the correct action?

- A. Remove the steering wheel and reindex it on the splined shaft to correct the off-center condition
- B. Split the front toe adjustment unequally between the two tie rods to re-center the steering wheel
- C. Adjust the rear toe to create a thrust angle offset that compensates for the wheel offset
- D. Accept the off-center condition because the vehicle tracks straight — cosmetic offset only

34. Excessive negative camber at both front wheels will produce which tire wear pattern?

- A. Outside-edge wear with feathering across the tread from inside toward the outside edge surface
- B. Center tread wear with minimal shoulder wear on either edge of the tire tread surface during service
- C. Cupped or scalloped wear around the tire circumference from worn shock absorbers causing tire
- D. Inside-edge wear with a smooth feel across the tread — no feathering pattern present on tire

35. A vehicle has SAI readings of Left 13.4° and Right 12.6° . Camber is within specification on both sides at -0.1° . Specification is $13.0^\circ \pm 0.5^\circ$. What does the SAI comparison indicate?

- A. The alignment equipment requires recalibration before continuing the alignment service procedures
- B. The tire pressures differ between sides affecting the apparent SAI measurement at each side
- C. The SAI values indicate a bent steering knuckle — the difference of 0.8° exceeds the tolerance
- D. The ride height varies between the two sides causing the SAI measurement difference on rack

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

36. A vehicle has radial runout of 0.080 inch on one front wheel-and-tire assembly. Specification is 0.060 inch maximum. What is the correct repair approach?

- A. Match-mount the tire to the wheel — rotate the tire on the rim to reduce the combined runout
- B. Balance the assembly with additional weights to compensate for the excess runout measurement
- C. Replace the wheel because the rim is distorted and causing the runout above specification
- D. Drive the vehicle for 500 miles to break in the tire and reduce the runout measurement

37. A direct TPMS sensor has stopped reporting data. The scan tool shows the sensor as "not communicating." The tire pressure measures correct with a handheld gauge. The vehicle is 7 years old. What is MOST likely the cause?

- A. The TPMS module has lost programming and requires reprogramming with the vehicle VIN
- B. The wheel speed sensor at the corner is affecting the TPMS direct sensor communication
- C. The tire pressure is at a threshold value causing the sensor to deactivate during operation
- D. The TPMS sensor battery has reached end of life — typical life is 5–10 years on direct sensors

38. A tire puncture in the tread area is $3/16$ inch in diameter. The industry-standard maximum repairable diameter is $1/4$ inch. The tire has $7/32$ inch tread remaining. What is the correct repair?

- A. Replace the tire because any puncture requires tire replacement for safety reasons during service
- B. Repair the puncture using a combination plug/patch from inside the tire after dismount and inspection
- C. Install an external string plug since the puncture is smaller than the maximum repairable size
- D. Install an interior patch only without plugging the puncture since the size is below the maximum

39. A wheel hub assembly is being installed with a torque-to-yield axle nut. The specification is "260 ft-lb + 45°." The technician torques to 260 ft-lb and skips the 45° rotation step. What is the likely consequence?

- A. The wheel bearing will have insufficient preload causing excessive play and premature failure
- B. The wheel bearing will have excessive preload from the initial torque causing immediate overheating
- C. The axle nut will loosen during driving from vibration at highway operating speeds and conditions
- D. The brake rotor will develop excessive runout from improper hub seating during initial installation

40. A wheel-and-tire assembly on a balancer shows weights of 0.5 oz inner and 0.5 oz outer at 180° apart. What does this indicate?

- A. The assembly has radial runout requiring match-mounting to reduce the combined runout measurement
- B. The assembly has only static imbalance that can be corrected at a single plane position as weight
- C. The assembly has dynamic imbalance requiring weights at both rim edges for proper correction service
- D. The assembly is within acceptable residual balance tolerance and no additional correction is needed

Practice Exam 18: Answer Key and Explanations

1. B — U-code DTCs (starting with "U") indicate network communication faults, not hardware failures. U0100 "Lost communication with ECM/PCM" points to a CAN bus or wiring issue between the ECM/PCM and the EPS module. Check network wiring, terminating resistors, and connector integrity before condemning any module. Modern EPS depends on network communication for normal operation.

2. D — On modern rack-mounted EPS systems, the motor position sensor is integrated into the rack assembly and is not individually serviceable. When the sensor produces invalid readings despite good wiring, rack replacement is the correct repair. Reset commands don't restore failed sensor hardware; separate sensor replacement isn't available on integrated designs.

3. C — Torque sensor channels at 2.5 V and 2.4 V are only 0.1 V apart, which is technically within tolerance at rest. However, the DTC for mismatch indicates the sensor drifts under load or has internal degradation beyond the resting-measurement view. Torque sensors are integrated into modern racks — rack replacement is the required repair when the DTC indicates sensor failure.

4. A — Modern EPS modules enter a sleep state after extended vehicle inactivity to conserve battery. Upon first steering input, the module must wake up, verify sensor states, and re-establish motor control — a brief delay of a few seconds is normal. This wake-up delay on the first input after extended sitting is expected behavior, not a fault.

5. A — Cold cranking amps (CCA) can be inadequate even when resting voltage is acceptable. A weak battery can sag below the EPS module's minimum operating voltage during cold starts when high cranking current is drawn. Battery load testing — not just voltage measurement — is the correct diagnostic. This cold-weather-only pattern is a classic CCA-inadequate symptom.

6. D — A squealing noise specifically during parking-speed turning is the classic signature of a glazed or slipping serpentine belt. The pump requires more power during steering input, which loads the belt; a healthy belt doesn't squeal, but a glazed or loose belt slips under load. Belt inspection and tension check is the correct diagnostic.

7. C — "Driver airbag circuit resistance high" DTC after clockspring replacement most commonly points back to the clockspring — either improperly centered during installation or ribbon cable damage during installation. Before replacing the SRS module or airbag, verify correct clockspring centering and inspect the ribbon cable for damage. This is the most frequent cause of this specific post-installation DTC.

8. A — Lane-keep assist depends on both the SAS and the forward camera for proper operation. When the SAS is replaced and calibrated, the forward camera also typically requires calibration because the system's lane reference depends on integrated geometry data. Random activation points to a system miscalibration, most commonly the forward camera requiring post-service recalibration.

9. D — When over-center preload reads BELOW specification (4 in-lb vs. 6–10 in-lb spec), the sector shaft adjuster must be tightened to bring the reading within the 6–10 in-lb range. Insufficient preload causes steering wheel free play and loose feel at center. Always bring the reading within spec through adjustment — not by replacement or loosening further.

10. B — Crimped metal fittings on power steering hoses cannot be resealed by tightening, thread sealant, or additional washers. A pinhole leak at the crimp indicates the crimp itself has failed. The complete hose assembly must be replaced — attempts to reseat at the crimp risk sudden rupture under operating pressure.

11. A — All three readings are within normal EPS operating parameters: battery voltage 13.8 V (normal), motor current 75 A at full lock (within 60–90 A range), torque sensor channels within 0.1 V tolerance (meets spec). Recognizing normal scan tool readings is a core skill — the customer reports normal operation because the system IS operating normally.

12. 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.

13. B — A "ride height sensor out of range" DTC with good wiring indicates sensor failure. Ride height sensors commonly fail from broken plastic linkage arms (especially on aging luxury vehicles). Replace the sensor AND inspect the linkage arm for breakage before installation — the arm is often the actual failure point, and a new sensor with a broken arm won't solve the problem.

14. B — Commanded current of 2.0 A with actual current of 0.1 A, combined with good wiring, indicates the damper itself has failed internally (open coil or damper mechanism failure). Replace only the rear right damper — the fault is specifically identified at that corner. Module replacement is unnecessary when the output command is correct but the damper doesn't respond.

15. A — After replacing a MagneRide damper, the new unit typically requires a programming procedure specific to the vehicle and its control module. Without this programming, the module doesn't recognize the new damper as a valid component and shows "not recognized." This is a standard post-service step for most vehicle-specific electronic dampers.

16. C — Coil springs can collapse internally from hard impacts without showing obvious external cracks. The spring's internal coil structure may shift, causing the spring to lose its designed height. A 2-inch drop at one corner after impact points directly to spring failure. Strut mounts, shocks, and ball joints produce different symptom patterns and different ride height changes.

17. A — Torsion bar ride height adjustment must be performed at curb weight on level ground to position the suspension in its normal loaded state. Lifting the vehicle produces incorrect preload settings. For unilateral sag with a functional adjuster, adjusting the preload at the correct vehicle position is the repair. Replacement and side-swapping are unnecessary when the adjuster still functions.

18. D — When camber cannot be brought within specification despite full adjustment range, a worn or damaged suspension link or bushing has shifted the suspension from its design position. The adjustment range is being exceeded because the underlying geometry has changed. Visual inspection of lateral links, trailing arms, and related bushings is the diagnostic next step.

19. B — Ball stud axial play of 0.150 inch exceeds the 0.030-inch specification by 5x. The stud is severely worn and the end link must be replaced. Tightening the retaining nut, thread locker, and seal replacement cannot restore the worn ball-socket interface — the internal wear cannot be corrected externally.

20. C — Air suspension systems must be disabled before lifting. When lifted without disabling, the ride height sensors report extreme droop (wheels hanging), and the system may command excessive air inflation to "restore" height. This can overinflate the air springs beyond safe pressure. The correct procedure is always to disable the system first per manufacturer specification.

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

22. B — 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. The projecting indicator at 1/4 inch above the surface means the joint is healthy and no service is needed.

23. A — When a properly engaged spring compressor is in place, the compressed spring stays fully captured when the strut mount nut is removed — no expansion. This is the whole purpose of the compressor: to fully capture spring energy. The service can safely proceed with upper mount removal. Any visible expansion would indicate inadequate compression and require stopping the job.

24. C — Shackle bushings on leaf-spring suspensions should be replaced in pairs on the same axle to maintain matched wear rates. Replacing only one side leaves the other side about to fail, producing a repeat service visit within months. Complete spring assembly replacement is unnecessary; shackle bushings are typically serviceable components separately from the springs.

25. D — Thrust angle of $+0.45^\circ$ with total rear toe within spec means the left and right rear toe readings are asymmetric — one rear wheel toes in more than the other, creating the thrust offset. Total toe being in spec does not guarantee symmetry. The rear toe must be symmetric, not just within total tolerance, to produce zero thrust angle.

26. B — 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.

27. A — Cross-camber (side-to-side camber difference) is $+0.4^\circ$ minus $(-0.3^\circ) = 0.7^\circ$. A 0.7° cross-camber produces a pull toward the more-positive side (the left in this case). The individual values may be within tolerance, but cross-camber drives pull behavior. Camber pull goes to the more-positive side; caster pull goes to the less-caster side.

28. C — Caster pull direction goes toward the LESS-caster side. With left caster at 3.0° and right at 4.5° , the left has less caster, so the pull goes to the left. The side with less caster has weaker self-centering force, producing pull toward that side. This is the opposite of camber pull direction, which is commonly confused.

29. D — 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 and must be repaired.

30. B — 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.

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 clamping device'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. C — Side-to-side included angle difference of 1.4° exceeds the typical 0.5° tolerance — the signature of a bent steering knuckle. Camber may still be within spec because it was adjusted around the damage, but the underlying included angle variation indicates the knuckle casting itself is bent. The knuckle must be replaced before valid alignment is possible.

33. B — When the steering wheel sits off-center after alignment, splitting the front toe adjustment unequally between left and right tie rods recenters the wheel while maintaining correct total toe. This is standard alignment procedure. Reindexing the wheel on splines is a last resort; adjusting rear toe creates new thrust angle problems; accepting the offset creates customer complaints.

34. D — Excessive negative camber causes the inside edge of the tire to carry more load than the outside, producing smooth (flat) inside-edge wear. No feathering occurs because the tire doesn't scrub — it only leans. Feathered sawtooth patterns are the signature of toe issues; smooth edge wear is specifically a camber signature.

35. C — Side-to-side SAI difference of 0.8° exceeds the typical 0.5° tolerance — the classic signature of a bent steering knuckle. Camber may be within spec because it was adjusted around the damage, but the underlying SAI variation indicates the knuckle is bent. The knuckle must be replaced before valid alignment is possible.

36. A — When assembly runout exceeds specification, match-mounting the tire to the wheel (aligning the tire's high spot with the wheel's low spot) is the first correction — it can reduce combined runout by 25–40%. Balancing cannot correct runout (mass vs. dimensional issue). Replacing the wheel or tire is the next step only if match-mounting doesn't resolve the issue.

37. D — Direct TPMS sensor batteries have a typical service life of 5–10 years. On a 7-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.

38. B — A 3/16-inch puncture in the tread area is within the 1/4-inch maximum repairable size limit. The correct repair is a combination plug/patch applied from inside the tire after dismount. The plug seals the puncture channel; the patch seals the inner liner. External string plugs are temporary only; interior patches without plugging leave the channel exposed to contamination.

39. A — Torque-plus-angle axle nut specifications must be completed in full. Torquing to 260 ft-lb without the additional 45° 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.

40. C — 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; this pattern is specifically dynamic.