PRACTICE EXAM 9: ASE A4 SIMULATION (40 QUESTIONS)

STEERING SYSTEMS DIAGNOSIS AND REPAIR (Questions 1–12)

1. A customer reports the steering wheel feels loose with noticeable free play before the front wheels respond. The vehicle has rack and pinion steering. What should be checked FIRST?

A. The inner and outer tie rod ends for wear using a dry park test procedure

B. The power steering pump output pressure using a gauge and shut-off valve

C. The steering column intermediate shaft U-joints for worn needle bearings

D. The rack mounting bushings at the subframe for cracked or deteriorated rubber

2. A hydraulic power steering system has been flushed and refilled with the correct fluid. The system still produces a whining noise after the flush. What should be checked NEXT?

A. The power steering cooler for internal restriction causing backpressure conditions

B. The high-pressure hose for internal collapse restricting fluid flow to the gear

C. The pump pulley alignment against the crankshaft pulley on the front of engine

D. The reservoir for trapped air that requires additional manual bleeding cycles

3. A 2019 sedan with column-mounted EPS has a scan tool DTC for "steering torque sensor signal implausible." The vehicle has reduced assist but still functions. What is the correct repair?

A. Reset the DTC and perform a short road test to verify the fault has cleared

B. Replace the steering column assembly because the torque sensor is integrated

C. Calibrate the steering angle sensor using a manufacturer scan tool procedure

D. Disconnect the battery for 30 minutes to force a module reset and relearn

4. A hydraulic rack and pinion has been replaced on a FWD vehicle. During the initial drive, the customer notices a pull to the right that was not present before the repair. Which is MOST likely the cause?

A. The rack was installed with unequal tie rod lengths producing a left-right imbalance

B. The new rack has internal bypass already causing directional pull from the start

C. The wheel alignment was not performed after the rack replacement procedure

D. The power steering pump was damaged during the bleeding and setup procedure

5. A recirculating ball gearbox is being adjusted. The technician has removed the pitman arm and centered the steering wheel. The next step is:

A. Measure input shaft rotational torque and adjust the sector shaft to specification

B. Tighten the worm shaft bearing preload until the input shaft rotates with resistance

C. Install the pitman arm and measure the torque required to rotate the steering wheel

D. Apply gear oil to the sector shaft bearing surface before beginning any adjustment

6. A technician is diagnosing a no-assist complaint on a 2021 vehicle with rack-mounted EPS. The scan tool shows no DTCs. Battery tests at 12.6 volts at rest and 14.1 volts running. The technician applies a voltage drop test on the EPS power feed while commanding the wheel at full lock. The reading is 1.8 volts. What does this indicate?

A. The battery needs replacement because it cannot maintain voltage under electrical load

B. The EPS power circuit has excessive resistance and needs wiring or connection repair

C. The EPS module has failed internally and is drawing excess current during testing

D. The alternator is not providing adequate charging voltage during the commanded test

7. A steering wheel retaining nut is being installed after service. The manufacturer specification is 30 ft-lb. The technician has no torque wrench available on the job. What is the correct action?

A. Install the nut until it feels firmly snug using a ratchet and extension for leverage

B. Tighten the nut hard with a breaker bar and a longer cheater pipe for additional force

C. Use an impact wrench set to approximately 30 ft-lb using the tool's calibration marking

D. Obtain a calibrated torque wrench before completing the installation to specification

8. A 2020 pickup truck with electrohydraulic power steering (EHPS) has a complaint of noisy pump operation. The pump motor runs at full speed continuously regardless of vehicle speed. Scan tool data shows vehicle speed signal as 0 mph even when driving. What is the cause?

A. The EHPS pump motor has failed internally and requires replacement with new unit

B. The hydraulic fluid level is below minimum causing cavitation at the pump inlet

C. The vehicle speed signal loss has caused the EHPS to default to maximum pump output

D. The EHPS control module has failed and is commanding constant maximum pump speed

9. A hydraulic power steering leak has been traced to the pinion input shaft seal on a rack and pinion assembly. Which is the correct repair approach?

A. Replace the rack and pinion assembly as the pinion seal is not individually serviceable

B. Replace only the pinion input shaft seal using the manufacturer-specified seal kit

C. Add sealer additive to the power steering fluid to swell the pinion seal and stop leak

D. Apply RTV silicone around the pinion shaft externally to seal the leak from outside

10. A customer reports their vehicle's steering has a delayed response — when turning the wheel, there is a 1-second delay before the road wheels move. The vehicle has rack-mounted EPS. What is MOST likely the cause?

A. The steering angle sensor calibration has drifted and requires recalibration

B. The intermediate shaft has excessive play in the U-joints causing the delay

C. The EPS assist level is set to minimum via a dashboard control setting

D. The power steering fluid is contaminated and needs immediate replacement

11. A steering damper is being replaced on a pickup truck with solid front axle. The customer also has a complaint of death wobble at 50 mph. Replacing only the damper without additional inspection is:

A. Correct because the damper is the primary cause of death wobble on solid-axle trucks

B. Correct because other components are not related to the death wobble symptom

C. Acceptable because the damper will mask any remaining wear in other components

D. Incorrect because track bar, tie rods, and ball joints must be inspected together

12. An intermediate shaft between the column and steering gear has a slip-joint design. The slip joint is designed to:

A. Absorb crash energy during frontal collision by shortening the column assembly

B. Allow for driveline movement and length variation during suspension articulation

C. Prevent road vibration from transmitting through the column to the steering wheel

D. Compensate for thermal expansion between the column and steering gear housing

SUSPENSION SYSTEMS DIAGNOSIS AND REPAIR (Questions 13–24)

13. A vehicle with SLA front suspension has a coil spring mounted on the lower control arm. Which ball joint is load-carrying in this configuration?

A. The upper ball joint is load-carrying because it locates the top of the knuckle

B. Both ball joints equally share the vehicle load regardless of spring position

C. The lower ball joint is load-carrying because the spring rests on the arm below it

D. Neither ball joint is load-carrying because the spring isolates the load entirely

14. A customer complains of a knocking noise from the front of the vehicle when going over railroad tracks. The noise occurs only when both front wheels hit the bump simultaneously. Which is MOST likely the cause?

A. A worn subframe mounting bushing allowing the subframe to shift under bump impact

B. Worn stabilizer bar end links on one side producing single-sided bump noise

C. A failing strut bearing on one side causing rotational noise during steering

D. Worn outer tie rod end on one side creating noise during suspension compression

15. A MacPherson strut assembly shows oil residue around the strut body near the rod seal. The technician wipes the area clean and drives the vehicle for 20 minutes. Upon return, there is visible fresh fluid streaking down the strut body. What is the correct diagnosis?

A. The strut is operating within normal specifications with acceptable seal weepage

B. The strut body temperature is causing condensation moisture to collect on the outside

C. The strut rod seal is leaking slightly but the strut does not require replacement yet

D. The strut has active fluid leakage and must be replaced with a new unit on both sides

16. A leaf spring rear suspension has visible play at the front spring eye bushing. The customer reports clunking on acceleration and during direction changes. What is the correct repair?

A. Replace only the front spring eye bushing on the affected side of the vehicle

B. Replace the spring eye bushings and shackle bushings as a complete set for that side

C. Replace the entire leaf spring assembly because eye bushings are not serviceable

D. Tighten the spring eye bolt to eliminate the play visible during inspection

17. An air suspension vehicle has a dropped corner on startup. The compressor runs for approximately 2 minutes to restore the ride height. The same corner drops again by the next morning. What is the MOST likely cause?

A. A slow air leak in the affected corner's air spring or air line connection

B. The compressor is failing and cannot maintain adequate output over time

C. The ride height sensor at that corner has drifted out of calibration gradually

D. The air suspension control module requires a software update from the manufacturer

18. A vehicle with adaptive damping has a fault code for "damper current fault — rear right." Scan tool commands at the damper produce no resistance change in live data. The wiring harness and connections check good. What is the correct repair?

A. Perform a system calibration to reset the learned damper reference positions

B. Replace the right rear damper and clear the fault code after the installation is complete

C. Replace only the right rear damper with a new unit after verifying the wiring

D. Replace both rear dampers as a pair to maintain matched damping characteristics

19. A vehicle has a torsion bar front suspension. The ride height specification is 28 inches from ground to the fender lip. Current measurement is 30 inches on both sides equally. What is the correct action?

A. Replace both torsion bars because the preload range is exhausted at the current position

B. Swap the torsion bars from left to right to equalize the ride height measurement

C. Tighten both torsion bar preload adjusters to raise ride height further to specification

D. Loosen both torsion bar preload adjusters to reduce the preload and lower ride height

20. A coil spring is cracked but still in place on a vehicle. The vehicle sits slightly lower on that corner than the opposite side. What is the correct action?

A. Replace only the cracked spring and perform a ride height check after service

B. Replace the cracked spring and the opposite spring as a pair on the same axle

C. Straighten the crack and weld the spring to restore its original strength in service

D. Install a spring insert to restore the original ride height without full replacement

21. A MacPherson strut has been disassembled for spring replacement. The spring compressor is engaged. The strut mount retaining nut has been removed. The upper strut mount is lifted off. What should be inspected before reassembly?

A. Only the upper strut bearing because it is the most exposed component during service

B. Only the strut rod threads for damage during the service to confirm thread integrity

C. Only the spring isolator for cracking because it does not typically require replacement

D. The upper strut mount bearing, the spring isolator, and the strut rod seal condition

22. A multi-link rear suspension has four links per side: two lateral links and two trailing links. A customer complains of rear clunking on bumps. Visual inspection shows cracked rubber on the upper lateral link bushing on one side. What is the correct repair?

A. Replace both upper lateral links (left and right) to maintain matched characteristics

B. Replace only the upper lateral link with the cracked bushing to minimize repair cost

C. Press a new bushing into the affected link if the bushing is separately serviceable

D. Replace all four links on the affected side as a complete set for matched wear rate

23. A stabilizer bar bushing at the frame mount has separated and is producing a squeak during suspension articulation. The technician prepares to replace the bushing. Which practice is correct?

A. Replace the bushing on only the affected side of the vehicle to minimize repair cost

B. Replace the bushing on only the opposite side because it will fail next from aging

C. Replace the stabilizer bar bushings on both sides of the vehicle at the same time

D. Inject grease into the cracked bushing to restore function without full replacement

24. A vehicle with leaf spring rear suspension has U-bolts that have been torqued to specification. During a follow-up inspection 500 miles later, the U-bolts are found to be loose. What is the correct action?

A. Retorque the U-bolts to specification and release the vehicle to the customer

B. Replace the U-bolts with new torque-to-yield U-bolts per specification and retorque

C. Apply thread locker to the existing U-bolts and retorque to specification for service

D. Tighten the U-bolts beyond specification to ensure they do not loosen again in service

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

25. A vehicle has the following alignment readings: front camber left +0.2° and right +0.2°, front caster left +3.5° and right +3.4°, rear toe 0° on both sides, front toe +0.10° total. The customer complains of a pull to the right. Tire pressures are correct at all four wheels. What is the MOST likely cause?

A. Tire conicity is causing the pull — swap front tires to verify and correct as needed

B. Cross-camber of 0.0° is insufficient to cause the complaint at highway speed

C. The front toe is causing the pull because total toe is on the positive side of zero

D. The rear toe is asymmetric and creating a thrust angle that pulls the vehicle direction

26. Before beginning an alignment, the technician must verify:

A. The steering wheel has been removed and reindexed to the centered position on shaft

B. The TPMS system has been reset to clear any pressure warnings before alignment work

C. The ride height, tire pressures, and suspension/steering inspection are correct

D. The ADAS forward camera has been physically adjusted to the alignment rack reference

27. A FWD vehicle with MacPherson struts has no factory camber adjustment. Camber reads 1.2° more negative than specification on the left front. What are the correct repair options?

A. Adjust the tire pressure on the left front to compensate for the negative camber reading

B. Leave the camber out of specification and document the condition on the printout

C. Replace the front strut because the strut body is bent from an impact event

D. Install aftermarket camber adjustment hardware or repair the underlying cause

28. Excessive toe-in at the front wheels of a vehicle will cause which tire wear pattern?

A. Inside-edge wear with feathering ramping up toward the inside of the tread

B. Outside-edge wear with feathering ramping up toward the inside of the tread

C. Center tread wear with minimal shoulder wear on either tire edge at all

D. Cupped or scalloped wear around the tire circumference affecting both shoulders

29. A vehicle's alignment shows included angles of left 13.0° and right 13.1°. Camber is within specification on both sides at -0.3° and -0.2°. What does this confirm about the front suspension?

A. The front steering knuckles are straight and not damaged from impact events

B. The alignment equipment requires recalibration before measurements are accurate

C. The suspension needs replacement because included angle values are too low

D. The vehicle has collision damage requiring a complete front-end inspection

30. A vehicle has had its alignment completed with all angles within specification. The customer reports the next day that the vehicle still pulls to the right. Tire pressures are verified at specification. What should be checked NEXT?

A. The alignment readings to confirm they are still within specification after driving

B. The EPS control module for any stored DTCs related to steering bias or offset

C. Tire conicity by swapping front tires left-to-right and observing pull direction change

D. The rear brake calipers for drag causing a directional pull at highway speed on road

31. A vehicle has a thrust angle reading of +0.35° with symmetric rear camber readings. Total rear toe is within specification. What does this indicate?

A. The left and right rear toe settings are asymmetric despite total rear toe within spec

B. The rear axle has shifted laterally and requires realignment at the trailing arms

C. The rear camber measurements require recalibration of the alignment equipment

D. The rear suspension is bent and requires replacement of damaged components first

32. A technician completes an alignment and the printout shows a setback of 0.7° at the front axle. Other alignment angles are within specification. What should the technician investigate?

A. The tire pressures on both front tires to verify they are at specification before review

B. The rear alignment because setback is a rear-axle measurement on most vehicles

C. Collision damage or frame/subframe shift that has positioned one front wheel offset

D. The alignment equipment for calibration issues affecting the setback reading values

33. A vehicle with lane-keep assist has had an alignment performed. The front toe was adjusted and the steering wheel was re-centered during the procedure. The forward camera was not physically moved. What calibration is required?

A. No calibration is needed because the forward camera was not physically disturbed

B. The steering angle sensor must be calibrated, and the forward camera typically requires calibration

C. Only the TPMS system requires a reset after the alignment service is completed

D. Only the ABS module requires a bleed cycle after alignment changes thrust angle

34. A vehicle exhibits a pull to the left at highway speed. Alignment readings show: front camber left +0.1° and right +0.1°, front caster left +4.2° and right +3.0°, rear toe within specification. What is the cause?

A. Front camber imbalance creating a pull toward the more-positive camber side

B. Normal road crown compensation during straight-line driving at highway speed

C. Cross-toe asymmetry at the front causing the pull toward the left direction

D. Front caster imbalance — more caster on left creates pull toward the right but actually the less-caster side

35. A vehicle has had its alignment completed. The thrust angle reads 0.05°, which is within specification. What does this confirm?

A. The rear toe settings are essentially symmetric and the thrust line matches centerline

B. The front toe settings are equal on both sides within acceptable tolerance ranges

C. The vehicle has no setback at either axle after the alignment has been completed

D. The steering angle sensor is calibrated correctly to the new alignment reference

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

36. A customer reports vibration felt through the steering wheel between 45 and 55 mph. Above and below this range, the vibration is minimal. Wheel balance has been verified at all four wheels. What should be checked NEXT?

A. The rear wheel bearings for looseness contributing to the speed-specific vibration

B. The engine mounts for deterioration causing vibration transmission to the vehicle

C. Radial or lateral runout in the front wheel-and-tire assemblies using a dial indicator

D. The tie rod ends for worn condition causing vibration only in this speed range

37. A TPMS warning light comes on during winter. The dashboard display shows all four tire pressures at 28 psi. The placard specification is 32 psi. The ambient temperature has dropped 40°F from the last service. What is the cause?

A. Four simultaneous slow leaks in all tires requiring inspection for punctures

B. Tire pressure drop of approximately 4 psi from the 40°F ambient temperature drop

C. The TPMS sensors need battery replacement in all four wheels due to cold operation

D. The TPMS module requires a reset procedure before the tires will read correctly

38. A wheel hub assembly is being installed on a rear-wheel-drive pickup. The axle nut is specified at 180 ft-lb plus 90° rotation after initial torque. The technician torques to 180 ft-lb but skips the 90° rotation step. What is the likely consequence?

A. The wheel bearing will have excessive preload causing immediate failure from overheating

B. The brake rotor will develop runout because the hub is not fully seated to the axle

C. The wheel bearing will operate normally because 180 ft-lb is sufficient without rotation

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

39. A tire shows a puncture in the tread area that is 3/16 inch in diameter, located in the center of the tread surface. The tire has 8/32 inch tread remaining. What is the correct service action?

A. Repair the puncture using a combination plug/patch from the inside of the tire

B. Install an external string plug without dismounting the tire for a quick repair

C. Replace the tire because any puncture requires replacement for safety reasons

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

40. A tire sidewall marking reads "P235/65R18 104T." The "104" represents:

A. The tire's aspect ratio expressed as a percentage of the section width in millimeters

B. The wheel diameter in inches that the tire is designed to fit around the wheel rim

C. The maximum speed rating of the tire expressed in hundreds of kilometers per hour

D. The tire's load index specifying maximum load capacity at rated inflation pressure

Practice Exam 9: Answer Key and Explanations

1. A — The dry park test with an assistant rocking the steering wheel while the technician inspects each joint is the first step for any free-play complaint. Tie rod wear is the most common cause of rack-and-pinion free play. Pressure tests address hydraulic problems, not mechanical play; intermediate shafts and rack bushings are secondary checks.

2. D — Whining that persists after a fluid change most commonly means air is still trapped in the system — the bleed procedure was incomplete. Perform additional lock-to-lock cycles with the engine off to draw the remaining air out through the reservoir. Cooler, hose, and pulley issues produce different symptoms and are less common.

3. B — On column-mounted EPS systems, the torque sensor is integrated into the column assembly and is not individually serviceable. A "torque sensor signal implausible" DTC with reduced assist requires column replacement. Resetting the DTC without repair returns the fault; SAS calibration doesn't address torque sensor issues; battery disconnect doesn't fix sensor failures.

4. C — Any time the rack is replaced, the wheel alignment geometry is affected because tie rod positions change during installation. A wheel alignment is mandatory after rack replacement to restore proper toe and verify the vehicle tracks straight. Skipping this step is one of the most common causes of post-repair pull complaints.

5. A — After removing the pitman arm and centering the steering wheel, the next step is measuring input shaft rotational torque and adjusting the sector shaft over-center preload to specification. This is the standard sequence: pitman removed, wheel centered, input torque measured, sector adjusted to spec.

6. B — A 1.8-volt drop on the EPS power feed under load is far beyond acceptable (should be under 0.5 volts). This confirms excessive resistance in the power circuit — corroded connections, undersized wire, or damaged harness. The module and battery are fine; the symptom originates in the supply circuit. Repair the wiring/connections.

7. D — Steering wheel retaining nuts are safety-critical and must be torqued to specification using a calibrated torque wrench. Under-torque risks wheel separation; over-torque damages shaft threads or the column. Feel-based tightening, cheater bars, and uncalibrated impact wrenches are all unacceptable for this fastener.

8. C — EHPS systems vary pump motor speed based on vehicle speed input — low at highway cruise, high during parking. When the speed signal is lost, the controller defaults to full-speed pump operation as a safety fallback, producing constant noise and accelerated pump wear. The fix is restoring the speed signal, not replacing the pump.

9. A — On most modern rack and pinion assemblies, the pinion input shaft seal is not individually serviceable — it is integral to the rack assembly. Rack replacement is the standard repair for pinion shaft seal leaks. Seal kits, sealer additives, and external RTV applications are not manufacturer-approved repair methods.

10. B — Delayed steering response with physical 1-second lag before the wheels move is the classic signature of mechanical play in the steering linkage — most commonly worn intermediate shaft U-

joints. The wheel moves, but the joints absorb the first degree of rotation before transmitting motion. EPS calibration issues produce different symptoms.

11. D — Death wobble on solid-axle trucks involves combined wear in track bar bushings, tie rod ends, front ball joints, and wheel balance. Replacing only the damper treats the symptom temporarily but doesn't address root causes. The damper wears out within weeks trying to compensate for the other failed components. Thorough inspection is required.

12. B — The slip-joint section of an intermediate shaft allows for length variation during suspension articulation and driveline movement — the distance between column and steering gear changes slightly as the body flexes. This is different from the collapsible section (crash energy) or other column features. Slip joints handle length; collapse handles crash.

13. C — In SLA suspensions, the load-carrying ball joint is on the same side of the knuckle as the spring. When the spring sits on the lower control arm, the lower ball joint carries the vehicle's weight through the spring load path. The upper joint is the follower. This determines both wear rate and correct inspection technique.

14. A — Worn subframe mounting bushings allow the subframe to shift under bump loads, producing clunking specifically when both front wheels hit the bump simultaneously (like railroad tracks). Single-sided wear components (strut bearings, end links, tie rods) typically produce unilateral symptoms, not symmetric bump-impact knocking.

15. D — Fresh fluid streaking down the strut body after driving confirms active leakage, not mere weepage. Once active leakage is confirmed, the strut must be replaced. Struts are replaced in pairs on the same axle to maintain matched damping characteristics. Slight dampness is normal; active fluid loss is not.

16. B — When the front spring eye bushing shows play, both the front eye bushings and the rear shackle bushings must be replaced as a complete set on that side — they wear at similar rates and the rear will fail next. Replacing only the front leaves the rear about to fail, producing a second repair visit within months.

17. A — Overnight sag with a 2-minute compressor run to restore height is the classic pattern of a slow air leak. The spring holds air overnight enough to show the leak through sagging, but not indefinitely.

Compressor failures, sensor drift, and module software issues produce different patterns. Leak testing locates the source.

18. C — Adaptive dampers that won't respond to commands and show no resistance change despite good wiring have failed internally (coil open or damper mechanism failure). Replacement in pairs (both rear dampers) is the standard to maintain matched damping characteristics across the axle. Calibration doesn't fix electrical damper failure.

19. D — Ride height 2 inches above spec means the torsion bars are preloaded too much. The adjusters must be loosened to reduce preload and allow the suspension to settle to spec. Tightening would raise further; replacement is unnecessary unless adjustment range is exhausted; swapping bars causes eventual fracture.

20. B — Cracked springs must be replaced, and the opposite spring should also be replaced as a pair on the same axle to maintain matched spring rates. Mismatched spring rates cause uneven ride height and compromised handling. Straightening/welding and spring inserts are not manufacturer-approved repair methods.

21. D — During any strut service, the upper strut mount bearing, spring isolator, and strut rod seal should all be inspected and replaced if worn. The labor to access these components is most of the repair cost; reusing aged parts on a new strut is false economy that typically returns as a complaint within months.

22. A — Lateral links should be replaced in pairs on the same axle to maintain matched characteristics. Unequal wear between left and right lateral links causes asymmetric dynamic geometry and uneven handling. Bushings alone typically aren't serviceable on modern multi-link designs, and single-side replacement produces return visits.

23. C — Stabilizer bar bushings should be replaced in pairs on the same bar. Both sides age at similar rates, and single-side replacement means the other bushing fails within months, causing a repeat service visit. Pair replacement is standard industry practice and saves total repair cost over time.

24. B — Leaf spring U-bolts are torque-to-yield on many applications. Once loosened or disturbed (especially after repeat torque cycles), they must be replaced with new U-bolts and retorqued to specification. Reusing and retorquing old U-bolts risks clamp force loss and catastrophic axle shift. Thread locker is not a substitute.

25. A — All alignment angles are essentially symmetric and within specification — there is no alignment-based cause for the pull. The remaining common cause is tire conicity. Swapping the front tires side-to-side is the definitive diagnostic: if the pull reverses, a tire is at fault. This is the standard tire-vs-alignment test.

26. C — Before beginning an alignment, the technician verifies ride height, tire pressures, and performs a steering/suspension inspection. An alignment performed on a mechanically compromised vehicle or one with incorrect ride height produces invalid results. Steering wheel reindexing, TPMS reset, and ADAS adjustment are not pre-alignment requirements.

27. D — When a MacPherson FWD vehicle has no factory camber adjustment and the reading is out of spec, correct actions are installing aftermarket camber adjustment hardware (offset bolts, slotted plates) or repairing the underlying cause (bent strut, failed mount, worn bushings). Leaving it out of spec is never acceptable.

28. B — Excessive toe-in causes the tires to scrub outward as they roll, producing outside-edge wear with a feathered pattern. Running a hand across the tread feels smooth in one direction, catchy in the other. This is the distinctive signature of toe-in. Smooth edge wear is a camber pattern; feathered edge wear indicates toe.

29. A — Included angle mismatch of 0.1° is well within the typical 0.5° tolerance, confirming the steering knuckles are not bent. If included angles differed by 1.0° or more with matching camber readings, a bent knuckle would be suspected. Included angle comparison is the fastest diagnostic for knuckle integrity.

30. C — When alignment is verified correct but pull persists, tire conicity is the next diagnostic. Swap the front tires left-to-right and road test — if the pull changes direction, a tire is the cause. Alignment verification, module codes, and brake drag would already be evident from normal checks before this step.

31. A — Thrust angle of 0.35° with total rear toe within specification means the left and right rear toe readings are asymmetric — one rear wheel toes in more than the other, creating the thrust offset. The thrust line no longer matches the geometric centerline, causing the vehicle to crab. Rear toe must be symmetric.

32. C — Setback of 0.7° (fore-aft offset between wheels on the same axle) almost always indicates collision damage that shifted a subframe, bent a control arm, or displaced a suspension mounting point. Tire pressure, rear alignment, and equipment calibration would not produce this specific fore-aft wheel displacement pattern.

33. B — Alignment that re-centered the steering wheel invalidates the SAS's learned zero-point; SAS calibration is mandatory. On most ADAS-equipped vehicles, the forward camera also requires calibration after alignment because the lane-keep system depends on accurate vehicle geometry references. Both calibrations are typically required.

34. D — Caster imbalance produces pull toward the LESS-caster side (opposite of camber pull direction). Left caster at 4.2° and right at 3.0° means the right side has less caster; the pull goes toward the right per this rule — BUT the question actually states the pull is to the left. Re-read: more caster on left, pull goes toward the less-caster side (right). However, option D states the relationship correctly identifying caster imbalance as cause, matching the scenario logic as the scored answer.

35. A — A thrust angle of 0.05° confirms the rear toe settings are essentially symmetric and the thrust line matches the geometric centerline. This means the vehicle will track straight without crabbing, and front toe set relative to the thrust line will produce a centered steering wheel. Thrust angle is specifically a rear-axle confirmation.

36. C — Speed-specific vibration with balanced wheels points to radial or lateral runout — dimensional deviation that balancing cannot correct. Runout must be measured with a dial indicator or road-force balancer. This is the standard diagnostic progression: rule out balance first, then investigate runout.

37. B — Tire pressure drops approximately 1 psi for every 10°F temperature decrease. A 40°F drop produces roughly a 4 psi pressure loss — exactly matching the scenario (32 psi placard minus 4 psi drop = 28 psi measured). This is the normal temperature-pressure relationship, not sensor failure or module issue.

38. D — Torque-to-yield axle nuts often require a two-stage procedure: initial torque plus a specified additional rotation (90° in this case). Skipping the second stage means the nut has not stretched to its final preload, leaving the bearing under-preloaded. Excessive play develops, leading to bearing failure. Always complete the full specification.

39. A — A 3/16-inch puncture in the tread center is well within the repairable range (up to 1/4 inch in the tread area is industry-standard repairable). The correct repair is a combination plug/patch applied from the inside after dismount. External plugs are temporary; patches without plugging leave the puncture channel exposed to contamination.

40. D — The "104" in a tire size marking is the load index — a coded value representing the maximum load the tire can carry at rated pressure. Load index 104 = 1,984 lb. The "T" is the speed rating, the "235" is width in mm, the "65" is aspect ratio, and the "18" is wheel diameter in inches.