

PRACTICE EXAM 6: T5 SIMULATION

(50 QUESTIONS)

1. A truck is brought in with a complaint of intermittent hard steering during right-hand turns only. Power steering fluid level is correct and clean, the belt is in good condition with proper tension, and pump pressure tests within the OEM specification range. What should the technician check next in the diagnostic sequence?

- A. Replace the high-pressure hose because intermittent hard steering points to internal hose collapse
- B. Inspect the steering gear poppet relief valves and check for spool valve sticking on right-turn input
- C. Replace the power steering pump because intermittent hard steering always traces to pump output
- D. Adjust the over-center setting on the steering gear to compensate for the right-turn assist loss

2. After removing a steering gear from a heavy-duty tractor for shop bench testing, the technician notices fluid weeping from the input shaft seal area when the input shaft is rotated by hand. Pump pressure on the truck tested correctly before the gear was removed. What is the most likely cause of the weep observed on the bench?

- A. The steering gear was damaged during removal and the housing has cracked at the input shaft area
- B. The pump pressure test on the truck did not reach actual relief pressure during the test sequence
- C. The input shaft seal was already failing before removal and bench rotation revealed the leak
- D. The input shaft seal is failing and shop-floor rotation is causing fluid to bypass the seal lips

3. A driver complains of a popping noise heard from the steering column area during slow turning maneuvers. The noise occurs only when the steering wheel passes through a specific angular range. The first inspection point in the diagnostic sequence should be:

- A. Inspect the intermediate shaft U-joints and slip yoke splines for wear or lack of lubrication
- B. Replace the steering wheel because popping noise originates from the steering wheel hub
- C. Inspect the steering gear input shaft for damage at the spool valve assembly internal area
- D. Replace the steering column assembly because intermediate shaft failures are not serviceable

4. A technician is performing a power steering system pressure test. With the engine at idle and the wheel held at full lock, the gauge reads 1,400 psi. The OEM specification calls for relief at 2,150 psi. Fluid level is correct and the belt is tight. The next diagnostic step is:

- A. Replace the pump immediately because pressure is well below the relief specification value
- B. Replace the steering gear because the relief valve is opening at too low a pressure setting
- C. Verify the gauge connection and check the gauge accuracy with a known good pressure source
- D. Replace the high-pressure hose because hose collapse can prevent reaching relief pressure

5. When a heavy truck driver reports that the steering wheel feels "loose" or has excessive free play but the truck still steers and tracks acceptably under power, the FIRST diagnostic step is to:

- A. Replace the steering gear assembly because the spool valve dead band has worn beyond service
- B. Perform a dry-park steering test with the engine off to identify the exact source of mechanical lash
- C. Replace all kingpin assemblies because excessive free play traces to kingpin wear in most cases
- D. Adjust the steering gear over-center setting because all free play originates inside the gear

6. A heavy-duty truck steering system has a known leak at the high-pressure hose between the pump and gear. After replacing the hose and topping off fluid, the system is bled. The driver returns the next day reporting moaning noise during turns. What is the most likely cause of the new noise complaint?

- A. Trapped air remaining in the system from incomplete bleeding after the hose replacement service
- B. The new high-pressure hose has incorrect fittings creating a restriction at the gear connection point
- C. The pump was damaged during the original leak event and is now showing internal wear noise
- D. The steering gear poppet relief valves have failed and are creating fluid noise during turns

7. A truck pulls hard to one side only when the engine is started and assist is available. With the engine off and assist absent, the truck steers heavy but tracks straight. Tech A says the spool valve in the integral gear has shifted off-center. Tech B says one wheel-end has excessive bearing preload causing one-sided drag. Who is correct?

- A. Tech A only
- B. Tech B only
- C. Both Tech A and Tech B
- D. Neither Tech A nor Tech B

8. A technician finds the worm shaft thrust bearing preload is below specification on a TRW integral steering gear. The next service decision should be:

- A. The condition is acceptable because thrust bearing preload reduces over time and is self-adjusting
- B. Adjust the worm shaft thrust bearing preload to specification by replacing the adjuster shim stack
- C. Replace the steering gear assembly because internal thrust bearing service is not field-serviceable
- D. Tighten the input shaft retaining nut to add preload to the thrust bearing without disassembly

9. A driver complains that the steering effort is heavy in both directions and that the heavy effort persists at all engine speeds. Pump pressure tests confirm 2,100 psi at relief, within the 2,000 to 2,200 psi specification. The next diagnostic step is:

- A. Replace the pump regardless of test results because heavy steering at all speeds traces to the pump
- B. Inspect the steering linkage and front axle pivots for binding or excessive friction in the pivots
- C. Replace the steering gear because heavy steering with adequate pump pressure must come from gear wear
- D. Adjust the steering gear over-center setting tighter to reduce steering effort during operation

10. A heavy truck steering gear shows internal leakage during a bench test, with fluid bypassing the spool valve to the return circuit. The technician's next decision should be:

- A. Reseat the spool valve by tapping it gently with a soft mallet to restore the centered position
- B. Adjust the over-center setting to compensate for the internal leakage observed during testing
- C. Replace the steering gear assembly because spool valve internal leakage is not field-serviceable
- D. Top off the fluid level and return the gear to service because minor internal leakage is acceptable

11. After a steering gear replacement on a Class 8 tractor, the driver returns with a complaint of off-center steering wheel after highway driving. Toe-and-thrust alignment is within specification and the steering wheel was centered before delivery. The next inspection point should be:

- A. Verify pitman arm installation on the master spline of the new gear sector shaft alignment position
- B. Replace the steering wheel because off-center conditions trace to steering wheel installation alone
- C. Adjust the drag link length to recenter the steering wheel during normal driving operation
- D. Replace the new steering gear because off-center conditions indicate a defective replacement unit

12. A power steering pump on a heavy truck is producing a high-pitched whine at idle that decreases as engine speed increases. Fluid is correct level, clean, and free of foam. The next diagnostic step is:

- A. Replace the pump because all pump-related noise traces to internal vane and ring wear
- B. Replace the high-pressure hose because hose collapse causes whine at low engine speeds only
- C. Inspect the suction-side hose and clamps for an air leak that draws air into the pump inlet
- D. Add fluid until the system is overfilled to compensate for air entering the suction line

13. A heavy-duty truck tractor uses a Sheppard M100 integral steering gear. After 600,000 miles of service, the driver reports a slight increase in steering wheel free play. Pre-service inspection of linkage shows tight pivots and good drag link condition. The most appropriate next action is:

- A. Adjust the over-center adjusting screw on the steering gear to remove sector-to-rack lash within spec
- B. Replace the steering gear assembly because Sheppard gears are not adjustable in field service
- C. Replace the kingpin assemblies because high-mileage trucks always need kingpin replacement at this point
- D. Adjust the worm shaft thrust bearing preload by tightening the input shaft nut to specification value

14. A heavy-duty truck has had a power steering pump replaced. After the repair, the driver reports a "growl" noise from the pump under heavy steering load only. Fluid is correct level and clean, and bleeding has been performed. The next diagnostic step is:

- A. Replace the new pump because pump replacements that growl indicate defective new units from the factory
- B. Top off the fluid above the maximum mark to flood the suction port and reduce the growl noise
- C. Re-bleed the system because growl under load indicates trapped air in the steering circuit
- D. Verify pump rotation direction and pulley alignment with the engine drive belt at proper tension

15. The recommended sequence for diagnosing a heavy-truck power steering complaint is:

- A. Replace the gear first, then the pump, then the linkage in order of cost descending
- B. Verify fluid level and condition first, then verify belt and pulley, then test pump pressure, then evaluate gear
- C. Replace the pump first because pump issues account for most steering complaints
- D. Test the gear first because the gear is the largest steering component and most likely cause

16. A technician finds 1/8 inch of vertical play at the cross tube tie rod end on the curb side of a tractor. The other tie rod end on the road side shows no measurable play. The next service action should be:

- A. Replace both tie rod ends as a pair to maintain balanced linkage geometry on the steering axle
- B. Tighten the castellated nut at the worn end and install a new cotter pin to remove the play
- C. Replace only the worn tie rod end because individual replacement is acceptable on a heavy truck
- D. Lubricate the worn tie rod end through the zerk fitting until the vertical play is eliminated

17. A driver reports that the steering wheel will not return to center after a turn at any speed and that effort during turns feels normal. Toe and caster are within specification. The next diagnostic step is:

- A. Inspect the steering linkage and kingpin pivots for binding or restricted motion at the front axle
- B. Replace the steering gear because failure to return is always a gear spool valve centering issue
- C. Replace the steering pump because failure to return indicates pump pressure decay during turns
- D. Adjust the toe to a higher toe-in setting to force the front wheels to return after each turn

18. A heavy-duty truck pulls slightly to the right on a level highway with no crown. After a steering gear replacement the pull persists. Pump pressure and gear test results are normal. The next diagnostic step is to:

- A. Replace the pump because residual pull after gear replacement always traces to pump output bias

- B. Replace the steering wheel because pull on a level road originates from the steering wheel position
- C. Replace the new gear with a different unit because the replacement gear is causing the persistent pull
- D. Verify alignment specifications including caster split, camber split, thrust angle, and tire conicity

19. A driver reports a clunk from the rear suspension over road expansion joints on a tractor with air ride. Initial inspection finds normal ride height and proper air bag pressure. The next inspection point should be:

- A. Replace the air bags because clunking at expansion joints traces to air bag bottoming under load
- B. Inspect shock absorbers, shock mounts, and trailing arm bushings for wear or fractured brackets
- C. Replace the height control valve because clunking indicates valve cycling under road input loads
- D. Adjust the height control valve to a lower ride height to reduce the suspension travel and clunking

20. A heavy-duty truck with multi-leaf rear springs shows visible spring leaf separation at the center bolt area. Tech A says this can be caused by loose U-bolts allowing the leaf stack to spread apart under load. Tech B says leaf separation is normally caused by overload damage from a single event during operation. Who is correct?

- A. Tech A only
- B. Tech B only
- C. Both Tech A and Tech B
- D. Neither Tech A nor Tech B

21. A heavy-duty rear air suspension on a tandem-axle tractor will not equalize air bag pressure between the two drive axles. The forward axle shows 90 psi and the rear axle shows 60 psi at level rolling weight. The next diagnostic step is:

- A. Replace both air bags because pressure imbalance always traces to internal air bag damage on one side
- B. Replace the height control valves on both axles because pressure imbalance points to valve calibration

- C. Inspect the air supply line, equalizing line, and valves between the two axles for restriction or leak
- D. Add air pressure manually to the rear axle until pressures match the forward axle reading observed

22. A heavy truck with Hendrickson PrimaaxEX air suspension has been in service for 800,000 miles. The driver reports increased rear-end noise over rough pavement that was not present before. The first inspection point in the diagnostic sequence should be:

- A. Replace the trailing arms because all PrimaaxEX trailing arms require replacement at 800,000 miles
- B. Inspect trailing arm bushings, shock absorbers, and air bags for wear consistent with high mileage
- C. Replace the entire suspension assembly because Hendrickson does not service individual components
- D. Adjust the height control valve to raise ride height and reduce suspension travel and noise from the system

23. A driver reports that a tractor with leaf spring rear suspension is "leaning" to one side under load. The lean is observed only when the truck is loaded and disappears when the truck is empty. The first inspection point in the diagnostic sequence should be:

- A. Replace both leaf spring stacks because lean under load indicates fatigue across the spring assembly
- B. Replace the leaf spring on the leaning side because lean under load always traces to one spring set
- C. Adjust the loaded ride height by adding spacer blocks between the spring and axle saddle on the low side
- D. Inspect the leaf spring stack on the leaning side for broken main leaves, fatigue, or shifted leaf alignment

24. After a heavy-duty truck has had a U-bolt replacement on the rear leaf springs, the recommended re-torque interval is:

- A. After approximately 500 miles or one to two days of service following the U-bolt installation
- B. After 5,000 miles or one month of operation following the U-bolt installation in the shop
- C. Re-torque is not required because the U-bolts are torqued to yield once during installation

D. After 50,000 miles or as part of the next scheduled preventive maintenance service interval

25. The most likely cause of a "saw-tooth" or jagged wear pattern on the inside of leaf spring main leaves is:

A. Normal wear from spring travel during operation that does not require corrective service action

B. Excessive U-bolt torque applied during installation that has crushed the spring leaves at the saddle

C. Lubricant inside the spring stack from the previous service that has worn the leaves prematurely

D. Loose U-bolts allowing relative motion between leaves and producing wear from inter-leaf rubbing

26. A trailer with air suspension shows excessive rear ride height (approximately 2 inches above specification) only on the right side. The left side is at correct ride height. The next diagnostic step is:

A. Replace both height control valves because right-side high height indicates valve calibration drift on both sides

B. Replace the right-side air bag because excessive ride height traces to air bag overpressure conditions

C. Inspect the right-side height control valve linkage for adjustment, damage, or improper assembly

D. Adjust the right-side air bag pressure manually to match the left side ride height after correction

27. A heavy-duty truck with equalizer beam (walking beam) suspension shows uneven wear between the two drive axles, with the rear axle tires wearing faster than the forward axle tires. The first inspection point should be:

A. Replace the rear axle tires immediately because faster tire wear traces to a defective tire batch

B. Inspect the equalizer beam center bushing, end caps, and saddle bushings for wear that affects load sharing

C. Adjust rear axle alignment to a different thrust angle to compensate for the differential tire wear

D. Replace the rear axle suspension assembly because uneven tire wear always indicates suspension failure

28. A heavy-duty truck with air ride suspension produces a continuous air leak that the technician traces to the air bag piston (lower mounting plate) area. The next service action should be:

- A. Remove the air bag, inspect the piston and mounting hardware, and replace the bag with new fasteners
- B. Apply sealing compound to the air bag piston mounting bolts to seal the leak without removing the bag
- C. Tighten the air bag piston mounting bolts to a higher torque than specification to seal the leak observed
- D. Replace the air supply line because piston-area leaks always trace to supply line damage near the bag

29. A driver complains of a harsh ride after a new shock absorber installation on the rear suspension. Inspection confirms the shocks were installed at the correct mounting positions and torque values. The most likely cause is:

- A. The new shocks are defective from the factory and must be replaced with another set of new shocks
- B. The shock mounting brackets are bent and must be straightened to restore proper damping characteristics
- C. The truck has not been driven enough miles for the new shocks to break in to a normal damping rate
- D. The new shocks may have a different damping rate than specified or required for the application

30. The function of a "jounce" bumper (also called bump stop) on a heavy-duty rear air suspension is to:

- A. Provide additional vertical load capacity beyond the air bag during normal operating conditions
- B. Limit suspension upward travel and prevent metal-to-metal contact during severe compression events
- C. Damp suspension oscillations during normal road inputs as a secondary system to the shock absorber
- D. Position the axle housing fore-aft during heavy braking applications to prevent axle wrap conditions

31. After installation of a new air bag on a heavy-duty rear suspension, the technician must verify:

- A. Ride height adjustment to specification and proper bag inflation through the height control valve operation

- B. Shock absorber bushing tightness because new bags shift mounting position and stress the shock mount
- C. Wheel alignment specifications because new bags change axle position and require alignment correction
- D. Trailing arm bushing torque because new bags affect the loading on the front trailing arm pivot bushings

32. A heavy-duty truck with a Hendrickson Haulmaax mechanical rubber suspension shows premature wear of the rubber spring elements at 200,000 miles. The most likely cause is:

- A. Rubber spring elements have an OEM service life limit of 200,000 miles and routine replacement is required
- B. The trucks has been operated at higher than specified GVW causing accelerated rubber spring degradation
- C. Contamination from oil, fuel, or hydraulic fluid leaks has degraded the rubber spring element compound
- D. The truck has been operated in cold climates causing the rubber spring compound to lose elasticity prematurely

33. After a steer-axle alignment on a Class 8 tractor, the truck pulls left on a level road with no crown. Caster reads +4.0 left and +4.5 right; camber reads +0.25 both sides; toe is at +1/16 inch toe-in. The next diagnostic step is:

- A. Increase right caster to match left caster because cross-caster split causes the left pull
- B. Verify rear-axle thrust angle and check for thrust angle deviation that affects steer axle pull
- C. Replace the steer tires because tire conicity always causes pull when alignment is within specification
- D. Adjust toe to zero or slight toe-out to eliminate the pull caused by toe-in setting on the front axle

34. A heavy-duty truck shows uneven tire wear on the steer axle with the right tire wearing on the outside edge and the left tire wearing evenly. Alignment angles measure within OEM specification. The next inspection point should be:

- A. Replace both steer tires because outside-edge wear on one side indicates a defective tire batch

- B. Adjust right-side caster to a higher value because outside-edge wear traces to caster deviation
- C. Verify load distribution on the steer axle and check for chassis lean or sagged springs causing offset loading
- D. Adjust right-side camber to a negative value to compensate for the outside-edge wear pattern observed

35. A tractor has been in a frame collision and shows a thrust angle reading of 0.5 degrees right after repair. The next service decision should be:

- A. The thrust angle of 0.5 degrees right is within typical specification and no further service is required
- B. Adjust steer axle toe to compensate for the thrust angle deviation and return the truck to service
- C. Replace the entire rear suspension assembly because thrust angle deviation traces to suspension damage
- D. Verify frame and suspension component alignment because thrust angle deviation indicates ongoing chassis damage

36. A heavy-duty truck shows a kingpin inclination (KPI) reading of 7 degrees on the left and 9 degrees on the right. The OEM specification calls for KPI of 8 degrees with a maximum left-right split of 0.5 degrees. The next diagnostic step is:

- A. Adjust right-side KPI to 7 degrees by shimming the steering knuckle to match the left side
- B. Inspect the front axle beam, kingpin bores, and steering knuckles for damage indicating bent components
- C. Replace both kingpin assemblies because KPI deviation indicates kingpin wear in both pivots
- D. Adjust caster on both sides to compensate for the KPI split and return the truck to service

37. The recommended sequence for a heavy-duty truck steer axle alignment is:

- A. Pre-alignment inspection (kingpins, linkage, tire pressures), then caster, then camber, then toe
- B. Toe first because toe affects all other alignment angles and must be set before measurement begins
- C. Camber first because camber affects caster measurement and must be corrected before reading caster

D. Caster, toe, camber, then thrust angle in that order regardless of pre-alignment inspection condition

38. A heavy-duty truck with caster within specification on both sides still pulls to one side on a level road. Camber, toe, and thrust angle are also within specification. The next inspection step should be:

- A. Adjust caster on the side opposite the pull direction by adding 0.5 degrees of additional caster
- B. Replace the steer axle tires because tire conicity always causes residual pull at level road conditions
- C. Swap steer tires side-to-side to evaluate for tire conicity as the residual cause of the pull condition
- D. Adjust toe by 1/16 inch toward the side opposite the pull to compensate for the residual pull

39. A heavy-duty truck with a steer axle alignment showing equal positive caster, equal positive camber, and proper toe still has a complaint of poor steering feel and lack of return. The next diagnostic step is:

- A. Verify kingpin bushing condition and steering linkage pivot freedom that may bind despite alignment
- B. Replace the steering gear because lack of return always traces to spool valve centering issues
- C. Replace the steer tires because lack of return at proper alignment indicates tire defect causing drag
- D. Increase positive caster on both sides to higher than specification to force return after turns

40. A truck has been involved in a curb strike that damaged the right front wheel. After wheel replacement, the truck pulls hard right. Caster shows +4 degrees left and +4 degrees right; camber shows +0.25 left and -1.0 right; toe is at +1/16 inch toe-in. The most likely cause of the pull is:

- A. Toe setting at +1/16 inch toe-in is creating the right pull and toe should be set to zero
- B. Caster is matched at +4 degrees on both sides and is contributing to the pull condition observed
- C. Camber readings are within typical specification range and are not contributing to the pull complaint
- D. Right-side camber at -1.0 degrees is significantly different from left and indicates bent component

41. A heavy-duty truck has a rear-axle thrust angle of 0.3 degrees left. The vehicle has been involved in a previous frame repair. The driver complains of dog-tracking and offset steering wheel position to compensate. The next service decision should be:

- A. The thrust angle is within typical specification range and no further service is needed for this complaint
- B. Inspect the rear suspension for shifted spring center bolts, bent torque rods, or damaged trailing arms
- C. Adjust the steer axle toe to compensate for the thrust angle deviation and return the truck to service
- D. Replace the rear axle assembly because thrust angle deviation indicates rear axle housing damage

42. The "Ackerman angle" on a heavy-duty truck steer axle refers to:

- A. The geometric relationship between inside and outside steer wheel angles during a turn for proper tracking
- B. The angle between the kingpin axis and vertical when measured from the rear of the steer axle
- C. The angle between the rear-axle direction of travel and the longitudinal centerline of the chassis
- D. The amount of caster offset between left and right kingpins to compensate for road crown effects

43. After installing new disc wheels with a hub-piloted mounting system, the technician must verify:

- A. Lug nut tapered seats engage the wheel disc properly to center the wheel on the hub flange
- B. The wheel studs extend at least three threads beyond the lug nut after final torque application
- C. The wheel pilot bore engages the hub pilot pads with no gap between the wheel and hub flange
- D. The wheel and hub mating surfaces are clean and free of debris before mounting and final torque

44. A heavy-duty truck shows a vibration that increases with road speed and is felt only in the steering wheel. The next diagnostic step in sequence is:

- A. Inspect steer tires for radial runout, lateral runout, and balance condition before further diagnosis

- B. Replace the steer tires because steering wheel vibration always indicates tire belt separation or defect
- C. Replace both steer wheel-end bearings because vibration in the steering wheel traces to bearing wear
- D. Adjust the steer axle alignment to a different specification to reduce the vibration in the steering wheel

45. A wheel-end seal on a steer axle is leaking. Before replacing the seal, the technician should:

- A. Verify the wheel bearing preload because loose preload causes seal failure under operating conditions
- B. Replace the wheel bearing because seal failure indicates bearing damage causing excessive heat at the seal
- C. Inspect the spindle journal sealing surface for wear, scoring, or damage requiring repair before installation
- D. Verify the seal part number is correct for the application before ordering and installing the new seal

46. A trailer with two-axle leaf spring suspension shows tire wear on the rear trailer axle in a "feathered" pattern on the inside edge of both tires. The forward trailer axle tires show even wear. The most likely cause is:

- A. Excessive caster split on the rear trailer axle relative to the forward trailer axle assembly position
- B. Rear trailer axle is misaligned with toe-out condition relative to the trailer centerline reference
- C. Worn shock absorbers on the rear trailer axle causing tire bounce and irregular wear at resonant speed
- D. Excessive tire pressure on the rear trailer axle causing reduced contact patch and edge wear pattern

47. The most common cause of a "wheel-off" event on a heavy-duty truck is:

- A. Wheel bearing failure from inadequate lubrication during the prior service interval before the event
- B. Spindle nut failure from over-tightening during prior wheel service before the wheel-off event
- C. Wheel stud fatigue from cyclical loading during normal operation over millions of miles of service
- D. Improper wheel installation procedure including incorrect torque, dirty mating surfaces, or no re-torque

48. After a wheel-end service, the recommended interval for re-torque verification of the lug nuts is:

- A. Re-torque is not required because lug nuts are tightened to specification once during installation
- B. Re-torque after 50,000 miles or as part of the next scheduled preventive maintenance service
- C. Re-torque after approximately 50 to 100 miles of operation following the wheel installation service
- D. Re-torque after 5,000 miles or one month of service following the wheel installation in the shop

49. A driver reports a "growling" noise from the right front wheel-end that increases with road speed and changes pitch slightly during cornering. The most likely cause is:

- A. Failed or damaged wheel bearing on the right front wheel-end requiring bearing replacement service
- B. Worn brake pads on the right front wheel making contact with the rotor at intermittent intervals
- C. Tire defect on the right front wheel causing road noise that varies with cornering load applications
- D. Wheel imbalance on the right front wheel producing the growl noise during high-speed operation

50. A heavy-duty truck has had recent wheel-end service. The driver returns the next day reporting a wheel "shimmy" at highway speeds that was not present before service. The next diagnostic step is:

- A. Replace the wheel-end bearings because shimmy after wheel service indicates bearing damage during installation
- B. Verify wheel-and-tire balance, check for proper mounting on hub pilots, and inspect for damaged lug nuts
- C. Replace the steer tires because wheel shimmy after service traces to tire belt separation from mounting
- D. Adjust the steering gear over-center setting to compensate for the new shimmy condition observed

PRACTICE EXAM 6: ANSWER KEY AND EXPLANATIONS

1. B — Inspect the steering gear poppet relief valves and check for spool valve sticking on right-turn input. With pump output verified within specification, intermittent hard steering on one side specifically points to internal steering gear function — a sticking spool valve or poppet that fails to direct full assist when commanded right. Replacing the pump or hose without confirming gear behavior is wasted parts and labor.
2. D — Input shaft seal is failing and shop-floor rotation is causing fluid to bypass the seal lips. A fluid-filled steering gear naturally weeps at a worn input shaft seal when the shaft is rotated, since rotation pushes fluid past the failed lip. Truck-side pump pressure tests do not stress the input shaft seal directly, so the failure can pass an on-vehicle test but reveal itself on the bench.
3. A — Inspect the intermediate shaft U-joints and slip yoke splines for wear or lack of lubrication. Popping noise that occurs only at specific steering angles is the classic signature of a worn U-joint or dry slip yoke spline binding and releasing as it rotates through that angle. The intermediate shaft is the easiest and most common source to inspect first.
4. C — Verify the gauge connection and check the gauge accuracy with a known good pressure source. A 700 psi shortfall from specification is a large discrepancy, and the diagnostic discipline is to verify the test instrument before condemning components — gauge error, leaking tee fitting, or incorrect connection point will produce false low readings. Confirming the gauge is the cheapest first step.
5. B — Perform a dry-park steering test with the engine off to identify the exact source of mechanical lash. A dry-park test with the engine off applies steering input through the linkage at low speed without hydraulic assist, isolating mechanical play to specific components by direct observation. This identifies the source before any parts are replaced.
6. A — Trapped air remaining in the system from incomplete bleeding after the hose replacement service. A new noise complaint immediately following service points to the service work itself, and the most common post-service issue is incomplete bleeding leaving air in the steering circuit, which produces moan during turns. Re-bleed is the first corrective step.
7. A — Tech A only. A pull that appears only with assist is a hydraulic effect, and a shifted spool valve directs continuous assist toward one side as soon as the pump pressurizes the system. Wheel-end bearing drag would produce mechanical pull regardless of assist condition, so Tech B's mechanism does not match the symptom pattern.

8. C — Replace the steering gear assembly because internal thrust bearing service is not field-serviceable. The worm shaft thrust bearing is internal to the gear and is not adjusted or replaced as a serviceable assembly in the field — manufacturers specify gear replacement when internal preload is out of specification. Field "adjustments" on internal preload risk catastrophic gear failure.
9. B — Inspect the steering linkage and front axle pivots for binding or excessive friction in the pivots. With pump pressure confirmed within specification, the next failure path for heavy steering is mechanical resistance in the linkage or kingpins, which adds load that the hydraulic assist must overcome. Linkage and pivot inspection is the next logical step before considering the gear.
10. C — Replace the steering gear assembly because spool valve internal leakage is not field-serviceable. Internal leakage at the spool valve indicates worn precision-machined surfaces inside the gear that cannot be repaired in the field, and OEM service procedures specify gear replacement. Top-off and adjustment do not address the underlying internal wear.
11. A — Verify pitman arm installation on the master spline of the new gear sector shaft alignment. Off-center steering wheel after gear replacement most commonly traces to incorrect pitman arm indexing on the master spline of the new gear, which shifts steering wheel position relative to straight-ahead. The other answers do not address the gear-side mechanical relationship that establishes centered position.
12. C — Inspect the suction-side hose and clamps for an air leak that draws air into the pump inlet. Whine at idle that decreases with speed is the signature of a suction-side air leak, where ingested air cavitates in the pump and produces high-frequency noise that diminishes as pump speed exceeds the air ingestion rate. Pump replacement before checking suction is wasteful.
13. A — Adjust the over-center adjusting screw on the steering gear to remove sector-to-rack lash within spec. Sheppard integral gears include an external over-center adjusting screw that can be set to remove sector-to-rack lash within OEM specification, and a slight increase in free play after high mileage is a routine adjustment point. Field adjustment is the correct first action before considering replacement.
14. D — Verify pump rotation direction and pulley alignment with the engine drive belt at proper tension. Growl on a newly installed pump can result from incorrect rotation direction or pulley misalignment, both of which produce loaded-condition noise. Verifying installation parameters comes before condemning the new component as defective.
15. B — Verify fluid level and condition first, then verify belt and pulley, then test pump pressure, then evaluate gear. Diagnostic discipline starts with the cheapest, easiest-to-inspect items — fluid and belt — and progresses to more complex tests, with component replacement as the last resort. Skipping to replacement bypasses the diagnostic process.

16. C — Replace only the worn tie rod end because individual replacement is acceptable on a heavy truck. Heavy truck tie rod ends are individually serviceable, and there is no requirement to replace both ends simultaneously when only one is worn. Tightening or lubricating a worn ball-and-socket end does not restore lost clearance.
17. A — Inspect the steering linkage and kingpin pivots for binding or restricted motion at the front axle. Failure to return with normal effort during turns points to mechanical drag in the linkage or kingpins that prevents the wheels from being pulled back to center by caster torque. Component replacement before inspection is premature.
18. D — Verify alignment specifications including caster split, camber split, thrust angle, and tire conicity. Persistent pull after gear replacement when the gear and pump test correctly indicates the cause is outside the steering hydraulic system, and alignment plus tire conicity are the remaining causes. Verifying these specifications is the next diagnostic step.
19. B — Inspect shock absorbers, shock mounts, and trailing arm bushings for wear or fractured brackets. Clunk over expansion joints is a mechanical-impact signature, most commonly from worn shocks that bottom out, fractured shock mounts, or worn trailing arm bushings that allow axle shift. These are the first items to inspect before considering air bag or valve issues.
20. A — Tech A only. Loose U-bolts allow the leaf stack to spread apart at the saddle area, exposing the center bolt to forces it is not designed to resist and producing leaf separation. Single-event overload typically fractures springs at high-stress points rather than causing leaf separation at the center bolt area.
21. C — Inspect the air supply line, equalizing line, and valves between the two axles for restriction or leak. Pressure imbalance between two axles fed from common air supply points to a flow restriction, partial blockage, or leak in the supply or equalizing lines, not simultaneous failure of both bags or both valves. Inspection isolates the cause before component replacement.
22. B — Inspect trailing arm bushings, shock absorbers, and air bags for wear consistent with high mileage. At 800,000 miles, normal wear items (bushings, shocks, bags) are within their expected service life range and inspection identifies the specific component requiring replacement. Wholesale assembly replacement is not the engineered service path for these suspensions.
23. D — Inspect the leaf spring stack on the leaning side for broken main leaves, fatigue, or shifted leaf alignment. Lean appearing only under load points to lost spring rate on one side, most commonly from a fractured main leaf or leaves, and visual inspection of the spring stack identifies the failure directly. Spacer blocks do not address the underlying spring failure.
24. A — After approximately 500 miles or one to two days of service following the U-bolt installation. New U-bolts must be re-torqued shortly after installation because initial seating of the leaf stack and residual hardware relaxation reduce the original clamp load — the OEM-recommended re-

torque interval is typically 500 miles or one to two days. Skipping re-torque is a known cause of repeat U-bolt failure.

25. D — Loose U-bolts allowing relative motion between leaves and producing wear from inter-leaf rubbing. Saw-tooth wear on inner leaf surfaces is the classic signature of relative motion between leaves caused by inadequate U-bolt clamp force, which permits the leaves to slide against each other under load cycling. Properly torqued U-bolts prevent this wear pattern.
26. C — Inspect the right-side height control valve linkage for adjustment, damage, or improper assembly. One-sided high ride height points directly to the height control valve on that side, with linkage adjustment being the most common cause and the easiest first inspection point. Bag replacement before checking valve linkage is premature.
27. B — Inspect the equalizer beam center bushing, end caps, and saddle bushings for wear that affects load sharing. Walking beam suspensions distribute load between axles through the equalizer beam and its bushings, and wear at any of these points shifts load balance toward one axle, accelerating tire wear at the overloaded position. Bushing inspection is the diagnostic starting point.
28. A — Remove the air bag, inspect the piston and mounting hardware, and replace the bag with new fasteners. Piston-area air leaks require bag removal to inspect mounting surface condition, fastener integrity, and piston damage, with bag replacement being standard practice once removed. Sealants and over-torqued fasteners are not acceptable repair methods.
29. D — The new shocks may have a different damping rate than specified or required for the application. Aftermarket and substitute shocks frequently have damping rates different from OEM specification, producing harsh ride even when installed correctly. Verifying part number matches OEM specification is the logical next step before condemning the shocks as defective.
30. B — Limit suspension upward travel and prevent metal-to-metal contact during severe compression events. Jounce bumpers (bump stops) are compressible elements positioned to engage during severe compression events, limiting suspension travel and preventing damaging metal-to-metal contact. They do not carry normal vertical load or damp normal road inputs.
31. A — Ride height adjustment to specification and proper bag inflation through the height control valve operation. A new air bag changes effective ride height and bag inflation behavior, so verification of ride height to OEM specification is the required post-installation step. Other suspension components are not directly affected by bag replacement.
32. C — Contamination from oil, fuel, or hydraulic fluid leaks has degraded the rubber spring element compound. Rubber spring elements have a normal service life of 1,000,000 miles or more under clean operating conditions, and premature wear at 200,000 miles points to chemical contamination from a fluid leak that degrades the rubber compound. The other answers do not match the early-failure pattern.

33. B — Verify rear-axle thrust angle and check for thrust angle deviation that affects steer axle pull. With caster split within typical limits (0.5 degrees), camber matched, and toe within specification, the next variable to check is thrust angle, which can produce vehicle pull as the chassis tracks at an angle to direction of travel. Thrust angle is part of any complete heavy-truck alignment.
34. C — Verify load distribution on the steer axle and check for chassis lean or sagged springs causing offset loading. One-sided edge wear with alignment angles within specification points to dynamic loading factors — chassis lean, sagged spring on one side, or asymmetric axle loading — which alter effective contact patch geometry during operation. The static alignment is correct but the dynamic behavior is not.
35. D — Verify frame and suspension component alignment because thrust angle deviation indicates ongoing chassis damage. A 0.5-degree thrust angle deviation after frame collision repair is significant and points to incomplete repair of the chassis or suspension components. The vehicle should not be returned to service until the underlying chassis condition is corrected.
36. B — Inspect the front axle beam, kingpin bores, and steering knuckles for damage indicating bent components. A 2-degree KPI split far exceeds the 0.5-degree specification and is too large to attribute to wear, indicating bent components in the axle beam or knuckle area. Adjustment by shimming is not an acceptable repair for bent structural components.
37. A — Pre-alignment inspection (kingpins, linkage, tire pressures), then caster, then camber, then toe. Heavy-truck alignment procedure begins with mechanical inspection because worn or loose components produce false alignment readings, and adjustments proceed from the angles that affect others (caster, camber) to those that depend on them being set first (toe). The pre-alignment step is non-negotiable.
38. C — Swap steer tires side-to-side to evaluate for tire conicity as the residual cause of the pull condition. After alignment specifications are confirmed, residual pull is most commonly tire conicity, and the standard diagnostic is to swap the steer tires side to side — if the pull direction reverses, conicity is confirmed. This is faster and cheaper than tire replacement.
39. A — Verify kingpin bushing condition and steering linkage pivot freedom that may bind despite alignment. Lack of return with proper alignment angles points to mechanical drag in pivots, where kingpin bushings or linkage joints may bind and prevent caster torque from returning the wheels. This is the next diagnostic step before further alignment changes.
40. D — Right-side camber at -1.0 degrees is significantly different from left and indicates bent component. A 1.25-degree camber split following a curb strike on the affected side is too large to attribute to wear and indicates physical damage to the steering knuckle, axle beam, or related component. The damaged side requires physical inspection and component replacement.
41. B — Inspect the rear suspension for shifted spring center bolts, bent torque rods, or damaged trailing arms. Thrust angle deviation traces to rear suspension geometry — the components that

locate the rear axle relative to the chassis frame — and post-repair thrust deviation indicates incomplete or incorrect suspension repair. The rear suspension components must be inspected before any steer axle compensation.

42. A — Geometric relationship between inside and outside steer wheel angles during a turn for proper tracking. Ackerman geometry refers to the steering linkage design that produces different left and right wheel angles during a turn so each tire follows its own arc without scrubbing. The other definitions describe unrelated alignment parameters.
43. D — Wheel and hub mating surfaces are clean and free of debris before mounting and final torque. Hub-piloted wheel installations require clean, debris-free mating surfaces because rust, scale, or paint between the wheel and hub causes the joint to settle in service, losing clamp load and producing wheel-off events. This is the most critical pre-mounting verification.
44. A — Inspect steer tires for radial runout, lateral runout, and balance condition before further diagnosis. Steering wheel vibration that increases with road speed is the classic signature of steer tire imbalance, runout, or belt separation, and inspection of these conditions is the first diagnostic step. Bearing or alignment causes are addressed only after tire condition is confirmed.
45. C — Inspect the spindle journal sealing surface for wear, scoring, or damage requiring repair before installation. Wheel-end seal failures most commonly trace to a damaged sealing surface on the spindle journal, and installing a new seal on a worn surface guarantees another failure. Surface inspection and reconditioning are required before seal replacement.
46. B — Rear trailer axle is misaligned with toe-out condition relative to the trailer centerline. Inside-edge feathering on both tires of a single axle is the toe-out wear signature, and a difference between forward and rear trailer axles indicates the rear axle has shifted from its proper alignment relative to the trailer centerline. Misalignment is corrected through suspension or axle stop adjustment.
47. D — Improper wheel installation procedure including incorrect torque, dirty mating surfaces, or no re-torque. Wheel-off investigations consistently identify installation procedure as the leading root cause — incorrect torque, contaminated mating surfaces, or missed re-torque after mileage break-in account for the majority of events. Bearing and stud failures are less common causes by comparison.
48. C — Re-torque after approximately 50 to 100 miles of operation following the wheel installation service. Initial seating of the wheel against the hub and gasket relaxation reduce clamp load shortly after installation, requiring a verification re-torque within the first 50 to 100 miles to restore specification clamp load. Skipping this step is a known cause of wheel-off events.
49. A — Failed or damaged wheel bearing on the right front wheel-end requiring bearing replacement service. A growling noise that increases with road speed and changes with cornering load is the classic wheel bearing failure pattern, where load shift during cornering changes contact pressure on the damaged bearing. The other items would not produce this specific noise behavior.

50. B — Verify wheel-and-tire balance, check for proper mounting on hub pilots, and inspect for damaged lug nuts. Shimmy after recent service points to the service work, and balance, mounting, and hardware are the items most likely affected. These verifications are faster and cheaper than condemning components for replacement.