Front End Alignment Toe-In / Toe-Out

Lesson 13

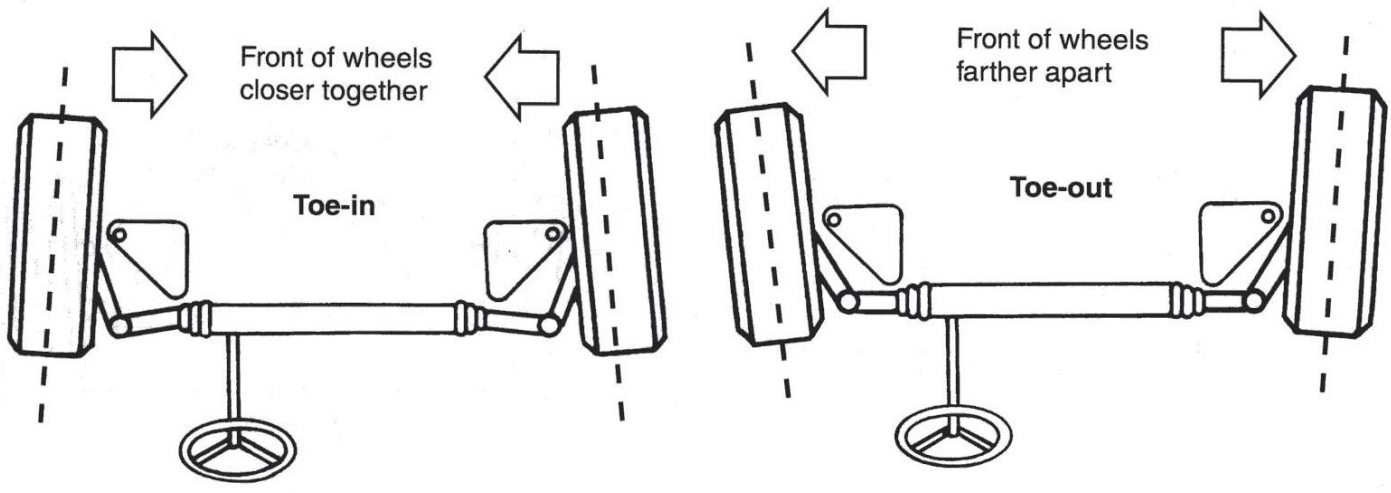
Remember:
Pretty **P**lease **M**y **D**ear **A**unt **S**ally
(From left to right; **P**arentheses; **P**ower; **M**ultiply; **D**ivide; **A**dd, **S**ubtract)

Today, we're just going to move from camber and caster to toe-in and toe-out adjustments. Camber, caster, toe-in/toe-out and angles of a circle, are measurements taken and adjusted during a front wheel alignment. These measurements are critical to tire wear and steerability. Some of the background math skills needed before you can learn how to make front end alignment, how these adjustments affect the front end steering adjustments for toe-in and toe-out are:

1. Converting linear measurements
2. Basic principles of Euclidean geometry regarding parallel lines

What can you tell me about changing tolerances and angle measurements?

Do you remember how to convert inches to millimeters, and visa versa?



Toe-In and Toe-Out

1. You're working on a Toyota Camry, and you're Toe-in and Toe-out readings are as follows:

L +.15º R +.78º

Manufacture specifications for this vehicle are as follows:

L + 3 mm + 3 mm R + 3 mm + 3 mmTotal toe = 3 mm + 3 mm

An adjustment of 1/8 of an inch is equal to .125º

Is an adjustment necessary, if so what kind of adjustment.

2. Find the Toe-in in inches if the front measurement is 140.97 cm and rear measurement is 141.605 cm.

3. Find the Toe-in the measurement at the front of the tires is 541/4 in. and the measurement at the rear of the tires is 54 9/16 in.

4. One side of a crank shaft measures 2.030 inches and the opposite side measures 2.045 inches. The original manufacturers specification was 2.050. The maximum undersize shim is .025 inches.

Can this crankshaft be reground?

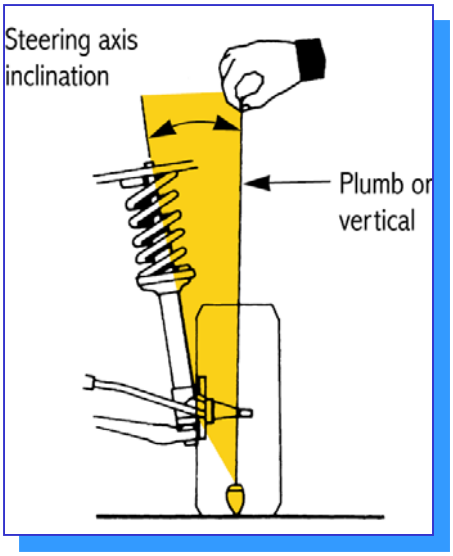
What is the amount of metal that can be removed from this crankshaft if in spec?

5. Find the range of values represented by the following specifications:

A. 5.675 +/- .125

B. 4.355 +/- .375

C. 4 5/16 +/- 1/16



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Lesson 13 Worksheet – Front Alignment: Toe-In / Toe-Out

Name: _____ AM-1: _____ PM _____ Date: _____

1. You're working on a Toyota Tercel, and you're Toe-in and Toe-out readings are as follows:

L +.25º R +.68º

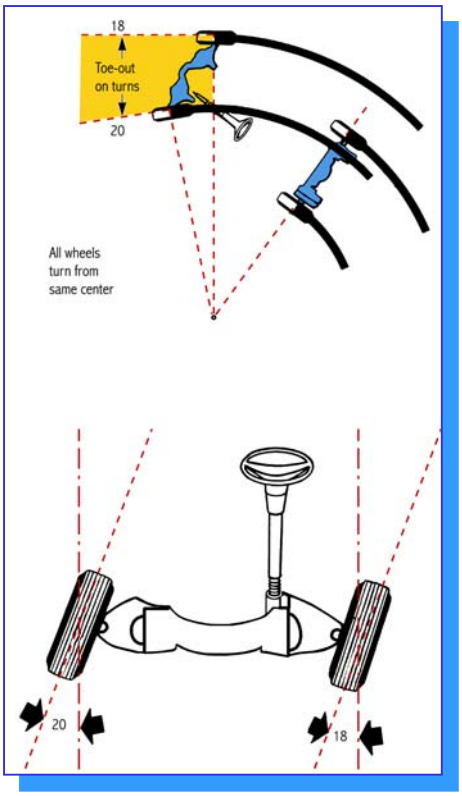
Manufacture specifications for this vehicle are as follows:

L + 2 mm + 2 mm, R + 2 mm + 2 mm, Total toe = 2 mm +/- 2 mm

An adjustment of 1/8 of an inch is equal to .125º

Is an adjustment necessary, if so what kind of adjustment?

2. Find the toe-in in inches if the front measurement is 153.65 cm and rear measurement is 129.60 cm.



3. Checking Toe-out on turns, the left front wheel is at 20º.

The right front wheel is 23.5º . Specifications are 20º + 2º.

Is this vehicle within spec?

4. Using a full contact shim, we need to increase

the left rear wheel toe-in .125º. What size shim do we need?

5. Using full contact shims, we need to decrease

the right rear wheel toe out by .0625º.

What size shim do we need?

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Lesson 13 Homework – Front Alignment: Toe-In / Toe-Out

Name: _____ AM-1: _____ PM _____ Date: _____

1. You're working on a 2002 Pontiac GranAm. The customer states that the front tires are wearing unevenly on the inside tread area. You road test the vehicle and observe that the steering wheel is off-center. After taking the following readings, what should you do?

Manufactures specification: Front and Rear Camber/Caster are not adjustable. The rear Toe specs are:

Rear toe: 1º P + .5º Total toe: .25º+ .5º

Front toe: 0º + .5º Total toe: 0º + .5º

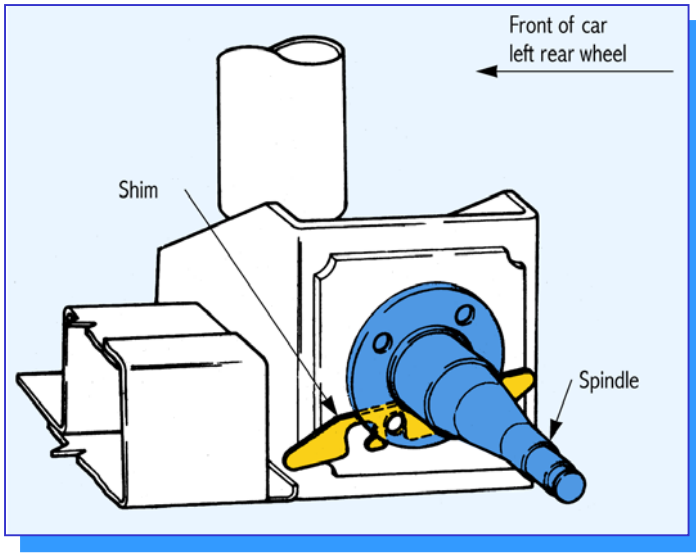
You're readings are: L/R .75º P R/R .25º N

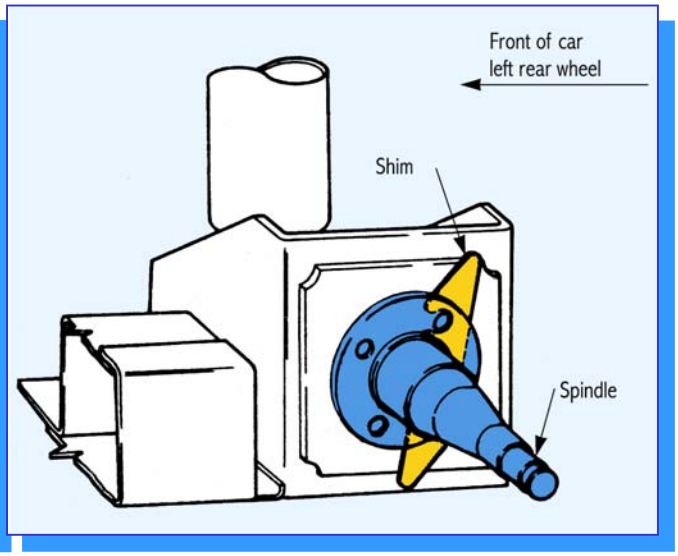
L/F .5º P R/F .5º N

What is the rear total toe? What is the front total toe?

Is the vehicle within manufacturers total toe specs?

Using 1/8" full contact shim(s) in the rear, what size shim(s) will be needed to bring the vehicle in to spec?





2. Find the range of values represented by the following specifications:

A. 6.837 + 1.246 _____

B. .698 + .103 _____

C. 3 3/8 + 7/8 _____

3. The thickness specification on a crankshaft key lock is 0.050. The minimum thickness is .035. The key lock on the engine you're working is worn 0.010 at one end. Can the key lock be ground and reused? Can this crank shaft be reground? What is the amount of metal that can be removed from the key lock and still have it be in spec?

4. The diameter of a hollow cylinder is 11.375 inches. There is a score on the cylinder wall that measures 0.009 inches deep. The maximum diameter of the cylinder can be machined to 11.390 inches. Can this cylinder be machined?