Piston Displacement Lesson 3 Worksheet **Name** Key

Solve the following using the cubic inch displacement formula and the convert to the indicated unit. Show work and use appropriate units.

1. A V-6 engine block has a bore of 3 inches, a stroke of 4 inches. Calculate the cubic inch displacement in cubic inches. If the engine is modified with a .75 increase in the stroke, what is the increase in the CID.

$CID = .7854 \times 3^2 \times 4 \times 6$

$CID = 170$ cubic inches

New Stroke $= 4 + .75 = 4.75$ inches

Modified $CID = .7854 \times 3^2 \times 4.75 \times 6$

Modified $CID = 201$ cubic inches

CID increase $= 201 - 170$

CID increase $= 31$ cubic inches

2. A V-6 engine block has a bore of 3.25 inches, a stroke of 3 inches. Calculate the cubic inch displacement in Liters. If the engine's bore is increased to 3.5 inches, what is the change in the CID in Liters?

$CID = .7854 \times 3.25^2 \times 3 \times 6$

$CID = 149$ cubic inches

$149\ in^3 \cdot \frac{16.39\ cc}{1\ in^3} \cdot \frac{1\ L}{1000\ cc} = 2.4\ L$

New Bore $= 3.5$ in

New $CID = .7854 \times 3.5^2 \times 3 \times 6$

NEW $CID = 173$ cubic inches

$173\ in^3 \cdot \frac{16.39\ cc}{1\ in^3} \cdot \frac{1\ L}{1000\ cc} = 2.8L$

change in CID $= 2.8 - 2.4$

.4 L

3. A 4-cylinder engine block has a bore of 4.05 inches, a stroke of 3.25 inches. Calculate the cubic inch displacement in cubic centimeters. If the bore is increased to 4.15 inches and the stroke is increased to 3.5 inches, what is the increase in the CID in cubic centimeters?

$CID = .7854 \times 4.05^2 \times 3.25 \times 4$

$CID = 167$ cubic inches

$167\ in^3 \cdot \frac{16.39\ cc}{1\ in} = 2737\ cc$

New Bore $= 4.15$ in

New Stroke $= 3.5$ in

New $CID = .7854 \times 4.15^2 \times 3.5 \times 4$

New $CID = 189$ cubic inches

$189\ in^3 \cdot \frac{16.39\ cc}{1\ in^3} = 3098\ cc$

CID increase $= 3098 - 2737$

361 cc

4. A V-6 engine block has a bore of 4.03 inches, a stroke of 3.125 inches. Calculate the cubic inch displacement in Liters. If the bore is increased by .05 inches, calculate the new CID in Liters.

$CID = .7854 \times 4.03^2 \times 3.125 \times 6$

$CID = 239$ cubic inches

$239\ in^3 \cdot \frac{16.39\ cc}{1\ in^3} \cdot \frac{1\ L}{1000\ cc} = 3.9L$

New Bore $= 4.03 + .05 = 4.08$ in

New $CID = .7854 \times 4.08^2 \times 3.125 \times 6$

New $CID = 245$ cubic Inches

$245\ in^3 \cdot \frac{16.39\ cc}{1\ in^3} \cdot \frac{1\ L}{1000\ cc} = 4$

4 L

5. An 8-cylinder engine block has a bore of 3.75 inches, a stroke of 3.5 inches. Calculate the cubic inch displacement in Liters. If the engine is modified to a bore of 4 inches, what is the increase in the CID in Liters?

$CID = .7854 \times 3.75^2 \times 3.5 \times 8$

$CID = 309$ cubic inches

$309\ in^3 \cdot \frac{16.39cc}{1\ in^3} \cdot \frac{1L}{1000cc} = 5.1L$

New Bore = 4 in

$New\ CID = .7854 \times 4^2 \times 3.5 \times 8$

$New\ CID = 352$ cubic inches

$352\ in^3 \cdot \frac{16.39cc}{1\ in^3} \cdot \frac{1L}{1000cc} = 5.8L$

$CID\ increase = 5.8L - 5.1L = \boxed{.7L}$

6. A 6-cylinder engine block has a bore of 4 inches, a stroke of $3\frac{3}{8}$ inches. Calculate the cubic inch displacement in Liters. If the stroke is increased by $\frac{1}{4}$ inch, what is the increase in the CID in Liters?

$CID = .7854 \times 4^2 \times 3\frac{3}{8} \times 6$

$CID = .7854 \times 16 \times 3.375 \times 6$

$CID = 254$ cubic inches

$254\ in^3 \cdot \frac{16.39cc}{1\ in^3} \cdot \frac{1L}{1000cc} = 4.2L$

$New\ Stroke = 3\frac{3}{8} + \frac{1}{4} = \frac{27}{8} + \frac{2}{8} = \frac{29}{8}$ or $3\frac{5}{8}$

$New\ CID = .7854 \times 4^2 \times 3\frac{5}{8} \times 6$

$New\ CID = .7854 \times 16 \times 3.625 \times 6$

$New\ CID = 273$ cubic inches

$273\ in^3 \cdot \frac{16.39cc}{1\ in^3} \cdot \frac{1L}{1000cc} = 4.5L$

$CID\ increase = 4.5 - 4.2$

$\boxed{.3L}$

7. A V-8 engine block has a bore of 4.5 inches, a stroke of $3\frac{1}{2}$ inches. Calculate the cubic inch displacement in cubic inches. If the stroke is increase by ½ inch and the bore is increased by .125 inches, what is the increase in the CID in cubic inches?

$CID = .7854 \times 4.5^2 \times 3.5 \times 8$

$CID = 445$ cubic inches

$New\ Stroke = 3\frac{1}{2} + \frac{1}{2} = 4$ in

$New\ Bore = 4.5 + .125 = 4.625$ in

$New\ CID = .7854 \times 4.625^2 \times 4 \times 8$

$New\ CID = 538$ cubic inches

$CID\ increase = 538 - 445$

$\boxed{93\ cubic\ inches}$

8. A 5.0 Liter V-8 engine is bored from 3.5 to 3.75 inches. The stroke is unchanged. What is the increase in the CID in Liters?

$5.0L \cdot \frac{1000cc}{1L} \cdot \frac{1\ in^3}{16.39cc} = 305\ in^3$ (CID)

$305 = .7854 \times 3.5^2 \times Stroke \times 8$

$\frac{305}{76.9692} = \frac{76.9692 \times Stroke}{76.9692}$

Stroke = 4.0 inches

New Bore = 3.75 inches

$New\ CID = .7854 \times 3.75^2 \times 4 \times 8$

$New\ CID = 353$ cubic inches

$353\ in^3 \cdot \frac{16.39cc}{1\ in^3} \cdot \frac{1L}{1000cc} =$

$New\ CID = 5.8L$

$CID\ increase = 5.8 - 5.0$

$\boxed{.8L}$