

[Table Of Contents](#)

**Acknowledgments**

**Foreword by Jim McFarland**

**Introduction**

**Chapter 1: Basic Math and Science**

Core Principles

**Chapter 2: Engine Displacement**

Cylinder Bore Diameter

Stroke Length

Calculating Displacement

Calculating Overbore Displacement

Calculating Bore and Stroke Relationships

Bore/Stroke and Rod/Stroke Ratios

Metric Conversions

Equivalent Displacement

What is Bore Spacing?

Sonic Checking

Practie Calculations

Displacement Formulas at a Glance

**Chapter 3: Compression Ratio**

Factors Affecting Compression Ratio

Finding V2

Displacement Ratio

Cranking Compression

Compression Ratio Formulas at a Glance

**Chapter 4: Piston Speed**

Maximum Piston Speed

Piston Acceleration

Calculating RPM Limits

Engine Balancing and Overbalancing

Calculating Piston Position

Piston Speed Formulas at a Glance

## **Chapter 5: Brake Horsepower and Torque**

Calculating Horsepower from Torque

How to Read a Dyno Sheet, Part 1

Horsepower and Torque Ratings

Indicated Horsepower

Indicated Torque

Brake Mean Effective Pressure

Mechanical Efficiency

Torque and HP Formulas at a Glance

## **Chapter 6: Induction Math**

Engine Air Capacity

Volumetric Efficiency

Intake Manifolds

Street Carburetor vs Race Carburetor

Choosing Throttle Body Size

Calculating Turbocharger Carburetor Size

Sizing a Turbocharger

Boost and Supercharger Drive Ratios

Wave Tuning

Ram Effects and Inlet Cooling

How to Calculate Runner Cross Section

Induction Formulas at a Glance

## **Chapter 7: Cylinder Head Math**

Converting Combustion Chamber Sizes

Evaluating Port Volumes

Calculating Valve Curtain Area  
Calculating Optimum Port Area from Valve Size  
Calculating Minimum Port Area  
Calculating Port Velocity  
Estimating Peak Engine Speed from Airflow  
Predicting Horsepower from Airflow  
Looking at Valve-Lift-to-Diameter Ratios  
Comparing Flow at Different Test Pressures  
Understanding Exhaust-to-Intake Ratio  
Cylinder Head Formulas at a Glance

### **Chapter 8: Exhaust System Math**

PipeMax Exhaust System Calculations  
Calculating Primary Tube Cross Section  
Calculating Primary Tube Length  
Calculating Collector Diameter and Length  
Food for Thought  
Exhaust System Wave Dynamics  
Exhaust System Formulas at a Glance

### **Chapter 9: Fuel System Math**

Understanding BSFC  
How to Read a Dyno Sheet, Part 2  
Fuel System Calculations  
Fuel System Formulas at a Glance

### **Chapter 10: Atmospheric and Combustion Math**

Atmospheric Effects on Engine Performance  
Density Altitude  
Performance Weather Stations  
Lambda and Air/Fuel Ratios  
Dynamometer Correction Factors

Atmospheric/Combustion Formulas at a Glance

### **Chapter 11: Camshaft Math**

Lobe Centers

Understanding Cam Specs

Calculating Valve Lift

Finding TDC

Degreeing the Cam

Calculating Valve Overlap

Camshaft Formulas at a Glance

### **Chapter 12: Tools and Equipment**

Measurement Tools, Standards and Accuracy

### **Chapter 13: How To Build an Engine Math Spreadsheet**

Finding Displacement

Finding Piston Speed

Finding Stroke Length

Other Calculators

Engine Build/Content Sheet

Engine Assembly Sheet

### **Chapter 14: Engine Simulation and Modeling Software**

Performance Trends

Racing Systems Analysis

Comp Cams/ProRacing Sim

Motion Software

Support Programs

### **Appendix A: Abbreviations and Acronyms**

### **Appendix B: Handy Conversion Factors**

### **Appendix C: Glossary**

### **Source Guide**