1) All coordinates in a CNC program (positions through which a cutting tool will move) will have a polarity. An *origin* (zero point) will be designated for each motion direction (axis). Any position on one side of this origin point will be positive. Any position on the other side of the origin point will be negative.

2) Adjustments made to keep a cutting tool machining correctly will also have a polarity. If more material must be removed from a workpiece surface in order to make it on size, the adjustment polarity will probably be negative. If less material must be removed, the adjustment will probably be positive.

Summary of shop math

As you've seen, the only arithmetic you'll be doing on a regular basis– as a CNC operator or setup person – is addition, subtraction, multiplication, and division. It's not overly difficult. The trick is in knowing the appropriate formula to apply for your particular problem/s. We'll be discussing each formula as it's needed. If you'll be programming CNC machining centers, there may be the additional need to learn *right angle trigonometry*. We do include some trigonometry discussions in our CNC Machining Center Programming manual (sold separately).

Shop Math Quiz

1) All that is required of an electronic calculator for most CNC operators is addition, subtraction, multiplication and division.

   ✍ True ✍ False

2) Which of these has the highest priority (must be done first) in an arithmetic expression?

   ✍ a. Addition and subtraction
   ✍ b. Multiplication and division
   ✍ c. Anything in parentheses
   ✍ d. equality

3) Provide answers for the following expressions:

   a. (3 + 4) X 5 = _____
   b. 3.82 X 300 / 2.5 = _____
   c. 4 X 0.002 X 500 = _____
   d. 1.0 / 2 + 4.5 = _____

4) Round these values to four places:

   a. 0.234375 _____
   b. 0.296875 _____
   c. 0.71875 _____
   d. 0.140625 _____

5) Given the formulae below, provide answers to the questions that follow:

   rpm = 3.82 X sfm / tool diameter
   inches = millimeters / 25.4
   millimeters = inches X 25.4

   a. You look in the tooling manufacturer's manual, and they say to run a 0.75 diameter drill at 80 sfm for the material you must machine. What will the required rpm be?

   _____

   b. Convert 300.0 mm to inches.

   _____

   c. Convert 4.5 inches to millimeters.

   _____

6) Convert these fractions to decimal format:

   a. 3/16 = _____
   b. 21/64 = _____
   c. 15/16 = _____
   d. 1/2 = _____

Answers: 1: True, 2: c, 3a: 35, 3b: 458.4, 3c: 4.0, 3d: 5.0, 4a: 0.2344, 4b: 0.2969, 4c: 0.7187, 4d: 0.1406, 5a: 407 rpm, 5b: 11.8110 inches, 5c: 114.3 millimeters, 6a: 0.1875, 6b: 0.328125, 6c: 0.9375, 6d: 0.5

