

PHASE TWO PARTS TOLERANCE

C

Parts Tolerance determination is a very important part of the manufacturing process. Those parts which are not in tolerance should be referred to the Quality Control Inspector for review.

This phase incorporates the math skills from the first phase and the student must use those computation skills to establish the low and high number tolerance range.

ALWAYS compute the low number (subtraction) on the left side of the problem, and the high number (add) on the right side.

EXAMPLE: The **BASE NUMBER** is .789 and the tolerance is .005.

$$\begin{array}{r} .789 \\ -.005 \\ \hline .784 \text{ low} \end{array} \qquad \begin{array}{r} .789 \\ +.005 \\ \hline .794 \text{ high} \end{array}$$

The numbers of measurements which are acceptable include those numbers and all numbers in between.

.784 .785 .786 .787 .788 .789 .790 .791 .792 .793 .794

NOTE: A part that is measured in this range is considered acceptable **IF** it complies with the rest of the specification.

The student will compute the high and low tolerance numbers and select those numbers from each problem that comply with the parts tolerance range of measurement.

EXAMPLES OF PARTS TOLERANCE COMPUTATIONS

The BASE NUMBER is .789 and the tolerance is .005.

$$\begin{array}{r} .789 \\ - .005 \\ \hline .784 \text{ low} \end{array} \qquad \begin{array}{r} .789 \\ + .005 \\ \hline .794 \text{ high} \end{array}$$

Each number is listed in order of succession from lowest to highest, but in the real world of manufacturing these numbers will come in any order.

ACCEPTABLE MEASUREMENTS

.784 .785 .786 .787 .788 .789 .790 .791 .792 .793 .794

Given the following numbers, which would you select that are in tolerance ?

.783 .786 .876 .794 .790 .788 .781 .795 .793 .786 .787

Those in tolerance are:

.786 .794 .790 .788 .793 .786 .787

The BASE NUMBER (Check) is .575 - and + .015

$$\begin{array}{r} .575 \\ - .015 \\ \hline .560 \end{array} \qquad \begin{array}{r} .575 \\ + .015 \\ \hline .590 \end{array}$$

Any number from .560 up to .590 would be acceptable. Select those in tolerance.

.562 .573 .592 .567 .657 .589 .569 .570 .581 .586 .578

Those in tolerance are:

.562 .573 .567 .589 .569 .570 .581 .586 .578

1. Write the numbers which are correct if the base number is .835 and the tolerance is + and - .005

.818 .800 .815 .835 .855 .852 .885 .850

2. Check 1.78 + and - .01 Write the numbers which are in tolerance.

1.765 1.875 1.77 1.780 1.79 2.758 1.799 1.79

3. Check 2.476 + and - .015 Write the numbers in tolerance.

2.461 2.450 2.445 2.491 2.476 2.493 2.376 2.479

4. Check .91 + and - .015 Write the numbers which are in tolerance.

.925 .930 .910 .905 .899 .895 .89 .926 .9

5. Check 1.963 + and - .010 Write the numbers which are in tolerance.

1.958 1.947 1.975 1.973 1.954 1.969 1.949 1.971

6. Check .99 + and - .015 Write the numbers which are in tolerance.

.98 .895 .995 .393 .99 .001 .005 .099 1.001 1.100

7. Check 3.355 + and - .010 Write the numbers which are in tolerance.

3.345 3.535 3.555 3.365 3.355 3.35 3.360 3.340

8. Check .879 + and - .005 Write the numbers which are in tolerance.

.881 .874 .889 .897 .879 .987 .877 .884 .88 .883

1. Write the numbers which are correct if the base number is .358 and the tolerance is + and - .005

.360 .358 .36 .353 .359 .355 .352 .385 .350

2. Check 1.855 + and - .015 Write the numbers which are in tolerance.

1.865 1.875 1.877 1.840 1.87 1.858 1.859 1.869

3. Check 3.764 + and - .010 Write the numbers in tolerance.

3.754 3.750 3.765 3.774 3.776 3.746 3.76 3.762

4. Check .812 + and - .005 Write the numbers which are in tolerance.

.815 .830 .817 .807 .809 .805 .819 .816 .811

5. Check 2.997 + and - .015 Write the numbers which are in tolerance.

2.988 3.012 2.982 2.993 2.994 2.989 2.986 2.991 3.0

6. Check .775 + and - .005 Write the numbers which are in tolerance.

.777 .771 .779 .772 .77 .781 .775 .769 .778 .785

7. Check 1.553 + and - .015 Write the numbers which are in tolerance.

1.538 1.559 1.565 1.555 1.549 1.558 1.553 1.568

8. Check .798 + and - .015 Write the numbers which are in tolerance.

.81 .814 .789 .797 .779 .787 .783 .784 .788 .793

1. Write the numbers which are correct if the base number is .357 and the tolerance is + and - .015

.347 .362 .342 .355 .365 .352 .375 .372 .37

2. Check 2.544 + and - .005 Write the numbers which are in tolerance.

2.539 2.550 2.549 2.542 2.524 2.561 2.544 2.54

3. Check 1.761 + and - .010 Write the numbers in tolerance.

1.771 1.775 1.764 1.751 1.760 1.773 1.769 1.796

4. Check .78 + and - .005 Write the numbers which are in tolerance.

.782 .783 .780 .870 .79 .785 .779 .775 .777

5. Check 3.637 + and - .015 Write the numbers which are in tolerance.

3.662 3.622 3.633 3.643 3.651 3.626 3.649 3.631

6. Check .93 + and - .010 Write the numbers which are in tolerance.

.940 .950 .936 .931 .929 .904 .921 .936 .911 .942

7. Check 1.544 + and - .015 Write the numbers which are in tolerance.

1.454 1.535 1.555 1.655 1.55 1.559 1.529 1.540

8. Check .789 + and - .015 Write the numbers which are in tolerance.

.801 .804 .800 .787 .793 .798 .777 .774 .776 .783

1. Write the numbers which are correct if the base number is .576 and the tolerance is + and - .015

.476 .626 .562 .565 .569 .590 .582 .572 .571

2. Check 3.449 + and - .010 Write the numbers which are in tolerance.

3.439 3.450 3.454 3.442 3.439 3.456 2.445 2.441

3. Check 3.613 + and - .015 Write the numbers in tolerance.

3.618 3.598 3.624 3.61 3.60 3.623 3.609 3.625

4. Check .499 + and - .010 Write the numbers which are in tolerance.

.509 .409 .489 .507 .519 .491 .494 .405 .504

5. Check 2.372 + and - .005 Write the numbers which are in tolerance.

2.362 3.367 2.333 2.369 2.367 2.37 2.377 2.375

6. Check .82 + and - .015 Write the numbers which are in tolerance.

.840 .830 .836 .831 .829 .804 .821 .806 .811 .842

7. Check 3.441 + and - .010 Write the numbers which are in tolerance.

3.451 3.445 3.455 3.45 3.431 3.459 3.339 3.340

8. Check .896 + and - .005 Write the numbers which are in tolerance.

.891 .894 .900 .897 .893 .898 .888 .89 .901 .983

1. Write the numbers which are correct if the base number is .769 and the tolerance is + and - .010

.760 .766 .762 .765 .769 .790 .782 .772 .757

2. Check 2.497 + and - .015 Write the numbers which are in tolerance.

2.493 2.490 2.484 2.494 2.49 2.481 2.482 2.511

3. Check 2.138 + and - .010 Write the numbers in tolerance.

2.128 2.119 2.134 2.14 2.146 2.139 2.133 2.138

4. Check .991 + and - .015 Write the numbers which are in tolerance.

.999 .987 .989 1.007 .981 .976 .994 .988 .979

5. Check 1.725 + and - .015 Write the numbers which are in tolerance.

1.712 1.717 1.733 1.769 1.767 1.727 1.737 1.735

6. Check .251 + and - .010 Write the numbers which are in tolerance.

.231 .241 .251 .245 .255 .265 .256 .261 .247 .242

7. Check 2.417 + and - .005 Write the numbers which are in tolerance.

2.415 2.425 2.405 2.422 2.421 2.419 2.433 2.420

8. Check .964 + and - .015 Write the numbers which are in tolerance.

.961 .969 .949 .977 .973 .978 .981 .95 .951 .973

1. Write the numbers which are correct if the base number is .693 and the tolerance is + and - .015

.703 .686 .676 .679 .769 .690 .69 .678 .687

2. Check 1.97 + and - .005 Write the numbers which are in tolerance.

1.973 1.970 1.974 1.965 1.976 1.971 1.982 1.961

3. Check 1.383 + and - .010 Write the numbers in tolerance.

1.380 1.393 1.384 1.394 1.373 1.390 1.386 1.391

4. Check .918 + and - .005 Write the numbers which are in tolerance.

.919 .917 .913 .907 .921 .914 .92 .922 .932

5. Check 3.257 + and - .010 Write the numbers which are in tolerance.

3.247 3.266 3.253 3.269 3.267 3.627 2.337 3.250

6. Check .514 + and - .015 Write the numbers which are in tolerance.

.523 .524 .505 .504 .515 .521 .525 .526 .524 .529

7. Check 1.174 + and - .015 Write the numbers which are in tolerance.

1.158 1.274 1.159 1.172 1.174 1.189 1.163 1.152

8. Check .642 + and - .010 Write the numbers which are in tolerance.

.641 .659 .649 .637 .633 .647 .639 .652 .651 .643

1. Write the numbers which are correct if the base number is .935 and the tolerance is + and - .010

.931 .926 .934 .939 .929 .930 .926 .938 .927

2. Check 3.970 + and - .015 Write the numbers which are in tolerance.

3.973 3.970 3.974 2.965 3.976 3.971 3.982 2.961

3. Check 1.835 + and - .015 Write the numbers in tolerance.

1.830 1.839 1.849 1.841 1.820 1.825 1.836 1.839

4. Check .183 + and - .015 Write the numbers which are in tolerance.

.19 .17 .193 .178 .182 .189 .192 .198 .195

5. Check 2.571 + and - .010 Write the numbers which are in tolerance.

2.57 2.566 2.573 3.569 2.567 2.570 2.579 2.58

6. Check .314 + and - .010 Write the numbers which are in tolerance.

.323 .324 .305 .304 .315 .321 .325 .326 .324 .329

7. Check 3.745 + and - .005 Write the numbers which are in tolerance.

3.748 3.742 3.749 3.752 2.745 3.751 3.563 3.742

8. Check .429 + and - .015 Write the numbers which are in tolerance.

.415 .459 .491 .437 .433 .427 .439 .442 .411 .443

1. Write the numbers which are correct if the base number is .355 and the tolerance is + and - .015

.341 .369 .34 .339 .350 .360 .345 .358 .367

2. Check 2.705 + and - .010 Write the numbers which are in tolerance.

2.713 2.701 2.696 2.699 2.706 2.711 2.714 2.691

3. Check 3.358 + and - .005 Write the numbers in tolerance.

3.355 3.359 3.349 3.361 3.363 3.552 3.660 3.449

4. Check .834 + and - .010 Write the numbers which are in tolerance.

.829 .842 .839 .848 .826 .833 .835 .841 .846

5. Check 1.719 + and - .015 Write the numbers which are in tolerance.

1.72 1.706 1.734 1.723 1.738 1.704 1.729 1.732

6. Check .125 + and - .005 Write the numbers which are in tolerance.

.123 .124 .130 .104 .115 .121 .125 .126 .124 .129

7. Check 2.451 + and - .015 Write the numbers which are in tolerance.

2.468 2.442 2.439 2.541 2.455 2.451 2.463 2.437

8. Check .290 + and - .010 Write the numbers which are in tolerance.

.295 .259 .291 .297 .283 .287 .299 .281 .301 .300

1. Write the numbers which are correct if the base number is .556 and the tolerance is + and - .010

.546 .569 .564 .549 .560 .550 .545 .558 .566

2. Check 1.053 + and - .015 Write the numbers which are in tolerance.

1.063 1.041 1.056 1.069 1.066 1.071 1.044 1.071

3. Check 2.587 + and - .010 Write the numbers in tolerance.

2.575 2.595 2.589 2.581 3.363 2.572 2.576 2.59

4. Check .346 + and - .005 Write the numbers which are in tolerance.

.351 .342 .339 .348 .326 .343 .345 .351 .346

5. Check 3.192 + and - .010 Write the numbers which are in tolerance.

3.202 3.196 3.194 3.197 3.183 3.187 3.189 3.2

6. Check .250 + and - .015 Write the numbers which are in tolerance.

.230 .240 .235 .247 .265 .257 .251 .26 .241 .254

7. Check 1.519 + and - .010 Write the numbers which are in tolerance.

1.518 1.522 1.529 1.531 1.526 1.510 1.513 1.537

8. Check .903 + and - .015 Write the numbers which are in tolerance.

.907 .897 .894 .917 .923 .916 .919 .893 .901 .900

1. Write the numbers which are correct if the base number is .563 and the tolerance is + and - .015

.566 .568 .554 .548 .550 .570 .555 .557 .567

2. Check .539 + and - .015 Write the numbers which are in tolerance.

.533 .541 .556 .549 .536 .521 .524 .531 .545

3. Check 1.587 + and - .005 Write the numbers in tolerance.

1.575 1.592 1.589 1.581 1.583 1.587 1.586 1.59

4. Check .461 + and - .015 Write the numbers which are in tolerance.

.463 .476 .449 .448 .452 .453 .545 .451 .546

5. Check 2.019 + and - .010 Write the numbers which are in tolerance.

2.029 2.019 2.014 2.009 2.013 2.017 2.009 2.008

6. Check .506 + and - .010 Write the numbers which are in tolerance.

.501 .514 .515 .495 .505 .507 .513 .496 .511 .504

7. Check 3.319 + and - .010 Write the numbers which are in tolerance.

3.318 3.322 3.329 3.331 3.326 3.310 3.313 3.370

8. Check .450 + and - .005 Write the numbers which are in tolerance.

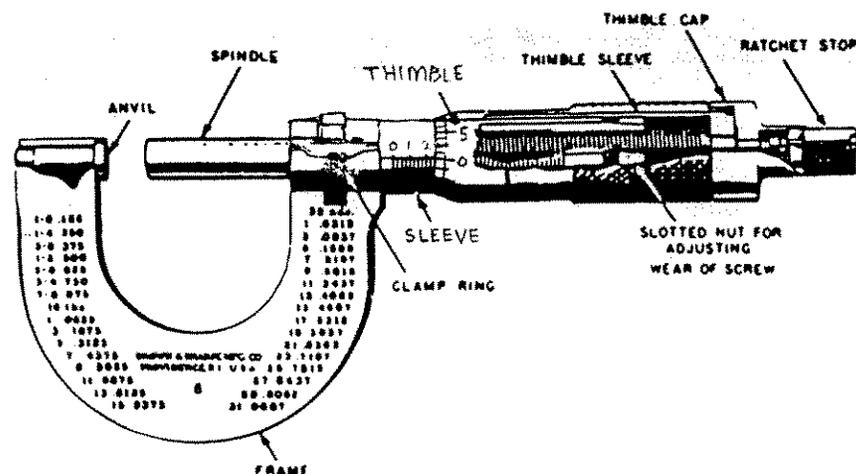
.455 .435 .449 .445 .452 .456 .438 .451 .448 .454

PHASE THREE MEASURING EQUIPMENT

The MICROMETER is one of the primary measuring tools used to Determine if a part is in tolerance. During phase three, the student has demonstrated computation skills and must transfer that skill to use hands on training with equipment.

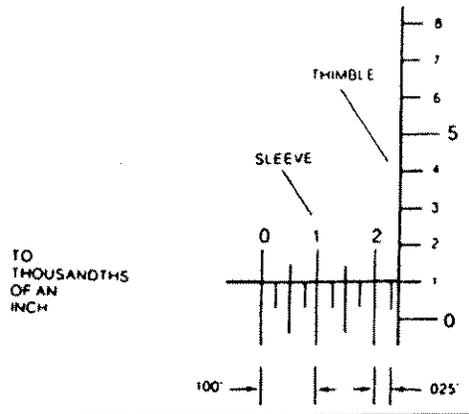
The Micrometer has several features, but three key parts to retain and use are:

1. The measurement conversion scale in decimals usually located on the "C" frame.
2. The sleeve, which has a vertical scale of forty lines for measuring in units of .025 of an inch. Each fourth line is longer and is marked 1 through 9 representing .100 to .900 of an inch.
3. The thimble, which has a horizontal scale of twenty-five lines for measuring in units of .001 of an inch.



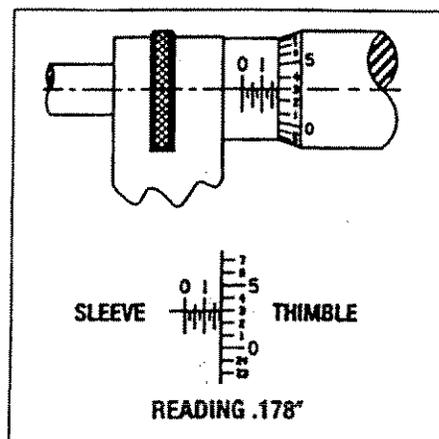
The thimble and sleeve combine to give accurate measurements to one thousandth of an inch (.001).

CAUTION: Care must be used to ensure the correct number is dialed on the two measuring line areas.



1. The thimble is past the 2 and before the 3 on the sleeve. This means the number is between .200 and .300.
2. One full line is showing on the sleeve which has a value of .025.
3. The thimble is showing 1, and has a value of .001.
4. The reading is $.200 + .025 + .001 = .226$

EXAMPLE:
 The "1" line on sleeve is visible,
 representing100"
 There are 3 additional lines visible,
 each representing .025"
 $3 \times .025'' = .075''$
 Line "3" on the thimble coincides
 with the reading line on the sleeve,
 each line representing .001"
 $3 \times .001'' = .003''$
 The micrometer reading is178"



1. The sleeve reading is .900
There are three lines showing.
The thimble line shows 23
MEASUREMENT
2. The sleeve reading is .500
There are two lines showing.
The thimble line shows 5
MEASUREMENT
3. The sleeve reading is .800
There are three lines showing.
The thimble line shows 4
MEASUREMENT
4. The sleeve reading is .700
There is no line showing.
The thimble line shows 11
MEASUREMENT
5. The sleeve reading is .200
There are two lines showing.
The thimble line shows 18
MEASUREMENT
6. The sleeve reading is .600
There is one line showing.
The thimble line shows 8
MEASUREMENT
7. The sleeve reading is .500
There are three lines showing.
The thimble line shows 4
MEASUREMENT
8. The sleeve reading is .400
There are two lines showing.
The thimble line shows 14
MEASUREMENT
9. The sleeve reading is .100
There are three lines showing.
The thimble line shows 15
MEASUREMENT
10. The sleeve reading is .300
There is one line showing.
The thimble line shows 12
MEASUREMENT
11. The sleeve reading is .900
There are two lines showing.
The thimble line shows 19
MEASUREMENT
12. The sleeve reading is .400
There is one line showing.
The thimble line shows 20
MEASUREMENT
13. The sleeve reading is .100
There are three lines showing.
The thimble line shows 7
MEASUREMENT
14. The sleeve reading is .800
There are two lines showing.
The thimble line shows 13
MEASUREMENT

1. The sleeve reading is .000
There are three lines showing.
The thimble line shows 16
MEASUREMENT
2. The sleeve reading is .300
There are three lines showing.
The thimble line shows 12
MEASUREMENT
3. The sleeve reading is .400
There are three lines showing.
The thimble line shows 18
MEASUREMENT
4. The sleeve reading is .500
There is no line showing.
The thimble line shows 17
MEASUREMENT
5. The sleeve reading is .700
There are two lines showing.
The thimble line shows 14
MEASUREMENT
6. The sleeve reading is .200
There is one line showing.
The thimble line shows 6
MEASUREMENT
7. The sleeve reading is .100
There are three lines showing.
The thimble line shows 8
MEASUREMENT
8. The sleeve reading is .200
There are two lines showing.
The thimble line shows 4
MEASUREMENT
9. The sleeve reading is .600
There are two lines showing.
The thimble line shows 5
MEASUREMENT
10. The sleeve reading is .800
There is no line showing.
The thimble line shows 13
MEASUREMENT
11. The sleeve reading is .300
There are two lines showing.
The thimble line shows 19
MEASUREMENT
12. The sleeve reading is .900
There is one line showing.
The thimble line shows 21
MEASUREMENT
13. The sleeve reading is .600
There are three lines showing.
The thimble line shows 9
MEASUREMENT
14. The sleeve reading is .800
There are two lines showing.
The thimble line shows 11
MEASUREMENT

1. The sleeve reading is .700
There are three lines showing.
The thimble line shows 6
MEASUREMENT
2. The sleeve reading is .900
There are three lines showing.
The thimble line shows 15
MEASUREMENT
3. The sleeve reading is .300
There are three lines showing.
The thimble line shows 17
MEASUREMENT
4. The sleeve reading is .100
There is no line showing.
The thimble line shows 12
MEASUREMENT
5. The sleeve reading is .400
There are two lines showing.
The thimble line shows 2
MEASUREMENT
6. The sleeve reading is .200
There is one line showing.
The thimble line shows 18
MEASUREMENT
7. The sleeve reading is .600
There are three lines showing.
The thimble line shows 14
MEASUREMENT
8. The sleeve reading is .500
There are two lines showing.
The thimble line shows 14
MEASUREMENT
9. The sleeve reading is .200
There are two lines showing.
The thimble line shows 13
MEASUREMENT
10. The sleeve reading is .800
There is no line showing.
The thimble line shows 23
MEASUREMENT
11. The sleeve reading is .600
There are two lines showing.
The thimble line shows 9
MEASUREMENT
12. The sleeve reading is .900
There is one line showing.
The thimble line shows 19
MEASUREMENT
13. The sleeve reading is .000
There are three lines showing.
The thimble line shows 24
MEASUREMENT
14. The sleeve reading is .800
There are two lines showing.
The thimble line shows 10
MEASUREMENT

1. The sleeve reading is .900
There are three lines showing.
The thimble line shows 12
MEASUREMENT
2. The sleeve reading is .300
There are three lines showing.
The thimble line shows 8
MEASUREMENT
3. The sleeve reading is .700
There are three lines showing.
The thimble line shows 11
MEASUREMENT
4. The sleeve reading is .400
There is no line showing.
The thimble line shows 7
MEASUREMENT
5. The sleeve reading is .200
There are two lines showing.
The thimble line shows 17
MEASUREMENT
6. The sleeve reading is .800
There is one line showing.
The thimble line shows 13
MEASUREMENT
7. The sleeve reading is .300
There are three lines showing.
The thimble line shows 23
MEASUREMENT
8. The sleeve reading is .200
There are two lines showing.
The thimble line shows 4
MEASUREMENT
9. The sleeve reading is .600
There are two lines showing.
The thimble line shows 5
MEASUREMENT
10. The sleeve reading is .800
There is no line showing.
The thimble line shows 13
MEASUREMENT
11. The sleeve reading is .900
There are two lines showing.
The thimble line shows 24
MEASUREMENT
12. The sleeve reading is .500
There is one line showing.
The thimble line shows 11
MEASUREMENT
13. The sleeve reading is .100
There are three lines showing.
The thimble line shows 14
MEASUREMENT
14. The sleeve reading is .500
There are two lines showing.
The thimble line shows 16
MEASUREMENT

1. The sleeve reading is .200
There are three lines showing.
The thimble line shows 6
MEASUREMENT
2. The sleeve reading is .800
There are three lines showing.
The thimble line shows 9
MEASUREMENT
3. The sleeve reading is .700
There are three lines showing.
The thimble line shows 19
MEASUREMENT
4. The sleeve reading is .900
There is no line showing.
The thimble line shows 12
MEASUREMENT
5. The sleeve reading is .300
There are two lines showing.
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MEASUREMENT
6. The sleeve reading is .200
There is one line showing.
The thimble line shows 6
MEASUREMENT
7. The sleeve reading is .400
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The thimble line shows 14
MEASUREMENT
8. The sleeve reading is .300
There are two lines showing.
The thimble line shows 9
MEASUREMENT
9. The sleeve reading is .400
There are two lines showing.
The thimble line shows 10
MEASUREMENT
10. The sleeve reading is .600
There is no line showing.
The thimble line shows 18
MEASUREMENT
11. The sleeve reading is .100
There are two lines showing.
The thimble line shows 5
MEASUREMENT
12. The sleeve reading is .400
There is one line showing.
The thimble line shows 16
MEASUREMENT
13. The sleeve reading is .700
There are two lines showing.
The thimble line shows 19
MEASUREMENT
14. The sleeve reading is .900
There are two lines showing.
The thimble line shows 21
MEASUREMENT

1. The sleeve reading is .100
There are three lines showing.
The thimble line shows 11
MEASUREMENT
2. The sleeve reading is .600
There are three lines showing.
The thimble line shows 18
MEASUREMENT
3. The sleeve reading is .300
There are three lines showing.
The thimble line shows 21
MEASUREMENT
4. The sleeve reading is .700
There is no line showing.
The thimble line shows 9
MEASUREMENT
5. The sleeve reading is .500
There are two lines showing.
The thimble line shows 22
MEASUREMENT
6. The sleeve reading is .400
There is one line showing.
The thimble line shows 17
MEASUREMENT
7. The sleeve reading is .700
There are three lines showing.
The thimble line shows 12
MEASUREMENT
8. The sleeve reading is .200
There are two lines showing.
The thimble line shows 13
MEASUREMENT
9. The sleeve reading is .700
There are two lines showing.
The thimble line shows 20
MEASUREMENT
10. The sleeve reading is .800
There is no line showing.
The thimble line shows 23
MEASUREMENT
11. The sleeve reading is .200
There are two lines showing.
The thimble line shows 15
MEASUREMENT
12. The sleeve reading is .100
There is one line showing.
The thimble line shows 14
MEASUREMENT
13. The sleeve reading is .600
There are three lines showing.
The thimble line shows 9
MEASUREMENT
14. The sleeve reading is .900
There is one line showing.
The thimble line shows 21
MEASUREMENT

1. The sleeve reading is .500
There are three lines showing.
The thimble line shows 16
MEASUREMENT
2. The sleeve reading is .900
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7. The sleeve reading is .600
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MEASUREMENT
8. The sleeve reading is .800
There are two lines showing.
The thimble line shows 15
MEASUREMENT
9. The sleeve reading is .300
There are two lines showing.
The thimble line shows 22
MEASUREMENT
10. The sleeve reading is .600
There is no line showing.
The thimble line shows 3
MEASUREMENT
11. The sleeve reading is .200
There are two lines showing.
The thimble line shows 20
MEASUREMENT
12. The sleeve reading is .800
There is one line showing.
The thimble line shows 18
MEASUREMENT
13. The sleeve reading is .000
There are three lines showing.
The thimble line shows 19
MEASUREMENT
14. The sleeve reading is .400
There are two lines showing.
The thimble line shows 24
MEASUREMENT

1. The sleeve reading is .400
There are three lines showing.
The thimble line shows 4
MEASUREMENT
2. The sleeve reading is .200
There are three lines showing.
The thimble line shows 13
MEASUREMENT
3. The sleeve reading is .600
There are three lines showing.
The thimble line shows 18
MEASUREMENT
4. The sleeve reading is .000
There is no line showing.
The thimble line shows 17
MEASUREMENT
5. The sleeve reading is .300
There are two lines showing.
The thimble line shows 2
MEASUREMENT
6. The sleeve reading is .500
There is one line showing.
The thimble line shows 13
MEASUREMENT
7. The sleeve reading is .900
There are three lines showing.
The thimble line shows 19
MEASUREMENT
8. The sleeve reading is .900
There are two lines showing.
The thimble line shows 23
MEASUREMENT
9. The sleeve reading is .100
There are two lines showing.
The thimble line shows 21
MEASUREMENT
10. The sleeve reading is .300
There is no line showing.
The thimble line shows 13
MEASUREMENT
11. The sleeve reading is .100
There are two lines showing.
The thimble line shows 12
MEASUREMENT
12. The sleeve reading is .900
There is one line showing.
The thimble line shows 16
MEASUREMENT
13. The sleeve reading is .200
There are three lines showing.
The thimble line shows 17
MEASUREMENT
14. The sleeve reading is .400
There are two lines showing.
The thimble line shows 7
MEASUREMENT

1. The sleeve reading is .800
There are three lines showing.
The thimble line shows 10
MEASUREMENT
2. The sleeve reading is .100
There are three lines showing.
The thimble line shows 12
MEASUREMENT
3. The sleeve reading is .600
There are three lines showing.
The thimble line shows 14
MEASUREMENT
4. The sleeve reading is .300
There is no line showing.
The thimble line shows 16
MEASUREMENT
5. The sleeve reading is .400
There are two lines showing.
The thimble line shows 18
MEASUREMENT
6. The sleeve reading is .700
There is one line showing.
The thimble line shows 13
MEASUREMENT
7. The sleeve reading is .200
There are three lines showing.
The thimble line shows 22
MEASUREMENT
8. The sleeve reading is .300
There are two lines showing.
The thimble line shows 1
MEASUREMENT
9. The sleeve reading is .700
There are two lines showing.
The thimble line shows 19
MEASUREMENT
10. The sleeve reading is .500
There is no line showing.
The thimble line shows 7
MEASUREMENT
11. The sleeve reading is .900
There are two lines showing.
The thimble line shows 19
MEASUREMENT
12. The sleeve reading is .200
There is one line showing.
The thimble line shows 6
MEASUREMENT
13. The sleeve reading is .100
There are three lines showing.
The thimble line shows 17
MEASUREMENT
14. The sleeve reading is .600
There are two lines showing.
The thimble line shows 12
MEASUREMENT

1. The sleeve reading is .700
There are three lines showing.
The thimble line shows 24
MEASUREMENT
2. The sleeve reading is .200
There are three lines showing.
The thimble line shows 3
MEASUREMENT
3. The sleeve reading is .500
There are three lines showing.
The thimble line shows 6
MEASUREMENT
4. The sleeve reading is .300
There is no line showing.
The thimble line shows 12
MEASUREMENT
5. The sleeve reading is .900
There are two lines showing.
The thimble line shows 18
MEASUREMENT
6. The sleeve reading is .400
There is one line showing.
The thimble line shows 23
MEASUREMENT
7. The sleeve reading is .100
There are three lines showing.
The thimble line shows 11
MEASUREMENT
8. The sleeve reading is .400
There are two lines showing.
The thimble line shows 19
MEASUREMENT
9. The sleeve reading is .300
There are two lines showing.
The thimble line shows 11
MEASUREMENT
10. The sleeve reading is .700
There is no line showing.
The thimble line shows 17
MEASUREMENT
11. The sleeve reading is .100
There are two lines showing.
The thimble line shows 13
MEASUREMENT
12. The sleeve reading is .600
There is one line showing.
The thimble line shows 9
MEASUREMENT
13. The sleeve reading is .000
There are three lines showing.
The thimble line shows 7
MEASUREMENT
14. The sleeve reading is .500
There are two lines showing.
The thimble line shows 12
MEASUREMENT

Mathematics Review

The purpose of this review is to determine individual computation skills necessary to spot check parts.

Example: Check $2.234 +$ and $- .015$

$$\begin{array}{r} 2.234 \quad 2.234 \\ - .015 \quad + .015 \\ \hline 2.219 \quad 2.249 \end{array}$$

1. Check $.264 +$ and $- .005$
2. Check $.558 +$ and $- .010$
3. Check $1.435 +$ and $- .015$
4. Check $.855 +$ and $- .015$
5. Check $2.550 +$ and $- .005$
6. Check $4.055 +$ and $- .015$
7. Check $1.805 +$ and $- .010$
8. Check $.205 +$ and $- .005$
9. Check $.570 +$ and $- .005$
10. Check $2.578 +$ and $- .015$
11. Check $.757 +$ and $- .010$
12. Check $.655 +$ and $- .005$

This portion of the review measures addition and subtraction skills.

1. There are 73 parts in the parts basket and the specification requires 250 per basket.

How many more parts are needed ?

2. The basket holds 280 parts and you have put 111 into the basket.

How many more parts do you need to put in ?

3. There are 104 parts in the basket and the specification sheet says there should be 200.

How many more parts do you need ?

4. The basket holds 250 parts and you have put 213 into the basket.

How many more parts do you need ?

5. There are 276 parts in the basket and the sheet says it should hold 250.

How many more will you put in the basket ?

6. The basket holds 250 parts and you have put 159 in already.

How many more parts are needed ?

7. There are 83 parts in the basket and the sheet calls for 200 total.

How many more parts do you need to put in ?

8. The basket holds 280 parts and you have put 59 into the basket.

How many more are required ?

The parts tolerance portion of this test is designed to simulate the inspection of parts to ensure they meet manufacturing specifications.

1. Write the numbers which are correct if the Base Number is .835 and the tolerance is + and - .015

.820 .818 .800 .815 .835 .855 .852 .885

2. Check 1.780 + and - .010 and write the numbers which are in tolerance.

1.765 1.875 1.77 1.780 1.79 2.758 1.799

3. Check 2.461 + and - .015 and write the numbers which are in tolerance.

2.461 2.450 2.445 2.491 2.476 2.493 2.376

4. Check .91 + and - .015 and write the numbers which are in tolerance.

.925 .930 .910 .905 .899 .895 .89 .926 .9

5. Check 1.963 + and - .010 and write the numbers which are in tolerance.

1.958 1.947 1.975 1.973 1.954 1.969 1.971

6. Check .99 + and - .015 and write the numbers which are in tolerance.

.98 .895 .995 .393 .99 .001 1.005 .099 1.0

The micrometer caliper portion of this review is designed to simulate measurement readings.

1. The sleeve reading is .200
There are two lines showing.
The thimble line shows 22
MEASUREMENT

2. The sleeve reading is .700
There are two lines showing.
The thimble line shows 17
MEASUREMENT

3. The sleeve reading is .000
There are three lines showing.
The thimble lines shows 23
MEASUREMENT

4. The sleeve reading is .600
There is no line showing.
The thimble line shows 8
MEASUREMENT

5. The sleeve reading is .900
There are two lines showing.
The thimble line shows 7
MEASUREMENT

6. The sleeve reading is .300
There is no line showing.
The thimble line shows 3
MEASUREMENT

7. The sleeve reading is .400
There are two lines showing.
The thimble line shows 14
MEASUREMENT

8. The sleeve reading is .600
There is one line showing.
The thimble line shows 10
MEASUREMENT

9. The sleeve reading is .200
There are three lines showing.
The thimble line shows 5
MEASUREMENT

10. The sleeve reading is .500
There are two lines showing.
The thimble line shows 18
MEASUREMENT

11. The sleeve reading is .300
There are no lines showing.
The thimble line shows 23
MEASUREMENT

12. The sleeve reading is .800
There are three lines showing.
The thimble line shows 14
MEASUREMENT

13. The sleeve reading is .400
There is one line showing.
The thimble line shows 9
MEASUREMENT

Mathematics Final Examination

The purpose of this final is to determine individual computation skills necessary to spot check parts.

Example: Check 2.234 + and - .015

$$\begin{array}{r} 2.234 \\ - .015 \\ \hline 2.219 \end{array} \quad \begin{array}{r} 2.234 \\ + .015 \\ \hline 2.249 \end{array}$$

1. Check .648 + and - .015
2. Check .585 + and - .005
3. Check 3.355 + and - .005
4. Check .550 + and - .010
5. Check 7.505 + and - .015
6. Check 2.730 + and - .010
7. Check 2.054 + and - .015
8. Check 1.642 + and - .010
9. Check .701 + and - .007
10. Check 5.788 + and - .010
11. Check .745 + and - .005
12. Check .565 + and - .015

**This portion of the final exam measures addition
And subtraction skills.**

**1. There are 69 parts in the parts basket and the
specification requires 200 per basket.**

How many more parts are needed ?

**2. The basket holds 250 parts and you have put
136 into the basket.**

How many more parts do you need to put in ?

**3. There are 182 parts in the basket and the
specification sheet says there should be 280.**

How many more parts do you need ?

**4. The basket holds 200 parts and you have put
207 into the basket.**

How many more parts do you need ?

**5. There are 166 parts in the basket and the sheet
says it should hold 200.**

How many more will you put in the basket ?

**6. The basket holds 280 parts and you have put
259 in already.**

How many more parts are needed ?

**7. There are 74 parts in the basket and the sheet
calls for 280 total.**

How many more parts do you need to put in ?

**8. The basket holds 200 parts and you have put 37
into the basket.**

How many more are needed ?

The parts tolerance portion of the final exam is designed to simulate the inspection of parts to ensure they meet manufacturing specifications.

1. Write the numbers which are correct if the Base Number is .565 and the tolerance is + and - .010

.555 .55 .535 .552 .656 .556 .560 .575

2. Check 2.4 + and - .015 and write the numbers which are in tolerance.

2.415 2.451 1.455 2.413 2.415 2.395 2.51

3. Check 1.115 + and - .015 and write the numbers which are in tolerance.

1.13 1.123 1.149 1.125 1.129 1.127 1.130

4. Check .820 + and - .010 and write the numbers which are in tolerance.

.82 .830 .810 .805 .799 .895 .825 .826 .80

5. Check 1.963 + and - .005 and write the numbers which are in tolerance.

1.958 1.963 1.964 1.959 1.961 1.960 1.968

6. Check .78 + and - .015 and write the numbers which are in tolerance.

.789 .785 .795 .783 .798 .701 .775 .79 .90

The micrometer caliper portion of this final is designed to simulate measurement readings.

1. The sleeve reading is .100
There are three lines showing.
The thimble line shows 12
MEASUREMENT

2. The sleeve reading is .600
There are three lines showing.
The thimble line shows 7
MEASUREMENT

3. The sleeve reading is .400
There are two lines showing.
The thimble lines shows 17
MEASUREMENT

4. The sleeve reading is .300
There is one line showing.
The thimble line shows 18
MEASUREMENT

5. The sleeve reading is .700
There are three lines showing.
The thimble line shows 11
MEASUREMENT

6. The sleeve reading is .200
There is one line showing.
The thimble line shows 18
MEASUREMENT

7. The sleeve reading is .500
There are three lines showing.
The thimble line shows 4
MEASUREMENT

8. The sleeve reading is .900
There is no line showing.
The thimble line shows 12
MEASUREMENT

9. The sleeve reading is .100
There are two lines showing.
The thimble line shows 15
MEASUREMENT

10. The sleeve reading is .600
There are three lines showing.
The thimble line shows 8
MEASUREMENT

11. The sleeve reading is .000
There is one line showing.
The thimble line shows 5
MEASUREMENT

12. The sleeve reading is .100
There are two lines showing.
The thimble line shows 19
MEASUREMENT

13. The sleeve reading is .400
There are three lines showing.
The thimble line shows 11
MEASUREMENT

APPENDIX A PRETEST ANSWER KEY

Page One Decimal Computation Skills

1. 1.114 1.138 2. 3.440 3.460 3. .425 .445
4. .980 .990 5. .535 .565 6. 8.895 8.915
7. .786 .814 8. 5.190 5.220

Page Two Addition and Subtraction Skills

1. 177 parts 2. remove 11 3. 166 parts
4. 167 parts 5. 204 parts 6. 166 parts
7. 137 parts 8. 91 parts

Page Three Parts Tolerance Skills

1. .250 .255 .235 .265 .260 .242
2. 1.515 1.485 1.510
3. 3.345 3.34 3.349 3.347 3.339 3.350
4. .92 .920 .905 .90
5. 1.947 1.957 1.943
6. .89 .875 .89

Page Four Micrometer Caliper Skills

1. .327
2. .486
3. .165
4. .243
5. .595

APPENDIX B SPECIFICATIONS WORKSHEET ANSWER KEY

Page Seven

1. .911 .941 2. .805 .825 3. .699 .709 4. .678 .708
5. .572 .592 6. .466 .476 7. .345 .375 8. .249 .269
9. .143 .153 10. .032 .042 11. .881 .911 12. .775 .795
13. .726 .746 14. .620 .630 15. .499 .529 16. .393 .413
17. .387 .397 18. .266 .296 19. .160 .180 20. .064 .074
21. .943 .973 22. .837 .857 23. .758 .768 24. .637 .667

Page Eight

1. .816 .836 2. .710 .720 3. .589 .619 4. .583 .603
5. .477 .487 6. .356 .386 7. .250 .270 8. .154 .164
9. .043 .053 10. .922 .952 11. .855 .875 12. .753 .763
13. .631 .641 14. .510 .540 15. .404 .424 16. .298 .308
17. .277 .307 18. .171 .191 19. .065 .075 20. .959 .979
21. .848 .868 22. .742 .752 23. .648 .678 24. .542 .562

Page Nine

1. .881 .891 2. .770 .800 3. .684 .704 4. .568 .578
5. .417 .447 6. .351 .371 7. .285 .295 8. .124 .154
9. .063 .093 10. .907 .927 11. .870 .880 12. .763 .793
13. .661 .691 14. .555 .575 15. .469 .479 16. .338 .368
17. .232 .252 18. .126 .136 19. .045 .075 20. .944 .954
21. .823 .833 22. .742 .772 23. .603 .623 24. .567 .577

Page Ten

1. .760 .790 2. .664 .684 3. .578 .588 4. .447 .477
5. .311 .331 6. .245 .255 7. .174 .204 8. .018 .038
9. .957 .977 10. .801 .811 11. .754 .774 12. .657 .677

Page Ten continued

13. .555 .575 14. .449 .459 15. .348 .378 16. .222 .242
17. .419 .429 18. .298 .328 19. .596 .616 20. .479 .509
21. .267 .297 22. .565 .585 23. .497 .507 24. .446 .476

Page Eleven

1. .654 .674 2. .558 .568 3. .457 .487 4. .341 .361
5. .205 .215 6. .134 .164 7. .068 .088 8. .912 .922
9. .851 .861 10. .690 .720 11. .648 .658 12. .551 .561
13. .651 .661 14. .328 .358 15. .242 .262 16. .116 .126
17. .303 .323 18. .192 .212 19. .954 .964 20. .373 .393
21. .161 .181 22. .459 .469 23. .476 .506 24. .340 .360

Page Twelve

1. .441 .451 2. .351 .381 3. .267 .287 4. .150 .160
5. .206 .236 6. .934 .954 7. .872 .882 8. .696 .726
9. .650 .660 10. .490 .510 11. .340 .370 12. .867 .897
13. .551 .581 14. .334 .354 15. .250 .260 16. .107 .137
17. .306 .316 18. .195 .205 19. .940 .970 20. .383 .393
21. .172 .182 22. .451 .481 23. .189 .209 24. .090 .100

Page Thirteen

1. .518 .548 2. .640 .670 3. .717 .727 4. .929 .959
5. .430 .460 6. .334 .344 7. .213 .243 8. .606 .626
9. .717 .747 10. .295 .305 11. .451 .471 12. .168 .198
13. .512 .532 14. .450 .460 15. .818 .848 16. .201 .221
17. .758 .788 18. .372 .402 19. .105 .125 20. .833 .863
21. .921 .951 22. .549 .569 23. .198 .228 24. .674 .704

Page Fourteen

1. .984 1.014 2. .762 .792 3. .550 .560 4. .318 .348
5. .106 .116 6. .795 .805 7. .585 .615 8. .390 .410
9. .185 .215 10. .982 .992 11. .755 .775 12. .533 .553
13. .878 .898 14. .661 .671 15. .429 .459 16. .212 .232
17. .885 .915 18. .685 .715 19. .490 .510 20. .285 .315
21. .095 .105 22. .866 .886 23. .639 .669 24. .417 .447

Page Fifteen

1. .988 1.008 2. .764 .784 3. .537 .567 4. .329 .349
5. .496 .526 6. .826 .856 7. .661 .681 8. .457 .467
9. .207 .227 10. .912 .942 11. .738 .748 12. .509 .519
13. .882 .892 14. .648 .678 15. .431 .451 16. .223 .233
17. .931 .951 18. .741 .761 19. .533 .543 20. .369 .389
21. .168 .198 22. .844 .854 23. .658 .688 24. .441 .471

Page Sixteen

1. .084 .094 2. .292 .302 3. .452 .472 4. .630 .640
5. .798 .818 6. .119 .139 7. .414 .424 8. .558 .588
9. .238 .268 10. .632 .642 11. .802 .832 12. .906 .926
13. .141 .171 14. .364 .384 15. .538 .548 16. .706 .726
17. .905 .915 18. .574 .584 19. .834 .864 20. .888 .898
21. .913 .933 22. .232 .262 23. .162 .172 24. .836 .846

APPENDIX C PARTS TOLERANCE WORKSHEET ANSWER KEY

Page Nineteen

1.				.835					
2.		1.875	1.77	1.780	1.79				1.79
3.	2.461			2.491	2.476				2.479
4.	.925		.910	.905	.899	.895			.9
5.	1.958			1.973	1.954	1.969			1.971
6.	.98		.995		.99				1.001
7.	3.345			3.365	3.355	3.35	3.360		
8.	.881	.874			.879		.877	.884	.88 .883

Page Twenty

1.	.360	.358	.36	.353	.359	.355			
2.	1.865				1.840	1.87		1.859	1.869
3.	3.754			3.765	3.774		3.746	3.76	3.762
4.	.815		.817	.807	.809			.816	.811
5.	2.988	3.012	2.982	2.993	2.994	2.989	2.986	2.991	3.0
6.	.777	.771	.779	.772	.77		.775		.778
7.	1.538	1.559	1.565	1.555	1.549	1.558	1.553	1.568	
8.	.81		.789	.797		.787	.783	.784	.788 .793

Page Twenty One

1.	.347	.362	.342	.355	.365	.352		.372	.37
2.	2.539		2.549	2.542				2.544	2.54
3.	1.771		1.764	1.751	1.760			1.769	
4.	.782	.783	.780			.785	.779	.775	.777
5.		3.622	3.633	3.643	3.651	3.626	3.649	3.631	
6.	.940		.936	.931	.929		.921	.936	
7.		1.535	1.555		1.55	1.559	1.529	1.540	
8.	.801	.804	.800	.787	.793	.798	.777	.774	.776 .783

Page Twenty Two

1. .562 .565 .569 .590 .582 .572 .571
2. 3.439 3.450 3.454 3.442 3.439 3.456
3. 3.618 3.598 3.624 3.61 3.60 3.623 3.609 3.625
4. .509 .489 .507 .491 .494 .504
5. 2.369 2.367 2.37 2.377 2.375
6. .830 .831 .829 .821 .806 .811
7. 3.451 3.445 3.45 3.431
8. .891 .894 .900 .897 .893 .898 .901

Page Twenty Three

1. .760 .766 .762 .765 .769 .772
2. 2.493 2.490 2.484 2.494 2.49 2.482 2.511
3. 2.128 2.134 2.14 2.146 2.139 2.133 2.138
4. .999 .987 .989 .981 .976 .994 .988 .979
5. 1.712 1.717 1.733 1.727 1.737 1.735
6. .241 .251 .245 .255 .256 .261 .247 .242
7. 2.415 2.422 2.421 2.419 2.420
8. .961 .969 .949 .977 .973 .978 .95 .951 .973

Page Twenty Four

1. .703 .686 .679 .690 .69 .678 .687
2. 1.973 1.970 1.974 1.965 1.971
3. 1.380 1.393 1.384 1.394 1.373 1.390 1.386 1.391
4. .919 .917 .913 .921 .914 .92 .922
5. 3.247 3.266 3.253 3.267 3.250
6. .523 .524 .505 .504 .515 .521 .525 .526 .524 .529
7. 1.159 1.172 1.174 1.189 1.163 1.152
8. .641 .649 .637 .633 .647 .639 .652 .651 .643

Page Twenty Five

1.	.931	.926	.934	.939	.929	.930	.926	.938	.927
2.	3.973	3.970	3.974		3.976	3.971	3.982		
3.	1.830	1.839	1.849	1.841	1.820	1.825	1.836	1.839	
4.	.19	.17	.193	.178	.182	.189	.192	.198	.195
5.	2.57	2.566	2.573		2.567	2.570	2.579	2.58	
6.	.323	.324	.305	.304	.315	.321		.324	
7.	3.748	3.742	3.749					3.742	
8.	.415		.437	.433	.427	.439	.442		.443

Page Twenty Six

1.	.341	.369	.34		.350	.360	.345	.358	.367
2.	2.713	2.701	2.696	2.699	2.706	2.711	2.714	2.691	
3.	3.355	3.359		3.361	3.363				
4.	.829	.842	.839		.826	.833	.835	.841	
5.	1.72	1.706	1.734	1.723		1.704	1.729	1.732	
6.	.123	.124	.130		.121	.125	.126	.124	.129
7.		2.442	2.439		2.455	2.451	2.463	2.437	
8.	.295		.291	.297	.283	.287	.299	.281	.300

Page Twenty Seven

1.	.546		.564	.549	.560	.550		.558	.566	
2.	1.063	1.041	1.056		1.066			1.044		
3.		2.595	2.589	2.581				2.59		
4.	.351	.342		.348		.343	.345	.351	.346	
5.	3.202	3.196	3.194	3.197	3.183	3.187	3.189	3.2		
6.		.240	.235	.247	.265	.257	.251	.26	.241	.254
7.	1.518	1.522	1.529		1.526	1.510	1.513			
8.	.907	.897	.894	.917		.916		.893	.901	.900

Page Twenty Eight

1.	.566	.568	.554	.548	.550	.570	.555	.557	.567
2.	.533	.541		.549	.536		.524	.531	.545
3.		1.592	1.589		1.583	1.587	1.586	1.59	
4.	.463	.476	.449	.448	.452	.453		.451	
5.	2.029	2.019	2.014	2.009	2.013	2.017	2.009		
6.	.501	.514	.515		.505	.507	.513	.496	.511 .504
7.	3.318	3.322	3.329		3.326	3.310	3.313		
8.	.455		.449	.445	.452		.451	.448	.454

APPENDIX D MEASURING EQUIPMENT WORKSHEET ANSWER KEY

Page Thirty One

1. .998 2. .555 3. .879 4. .711 5. .268
6. .633 7. .579 8. .464 9. .190 10. .337
11. .969 12. .445 13. .182 14. .863

Page Thirty Two

1. .091 2. .387 3. .493 4. .517 5. .764
6. .231 7. .183 8. .254 9. .655 10. .813
11. .369 12. .946 13. .684 14. .861

Page Thirty Three

1. .781 2. .990 3. .392 4. .112 5. .452
6. .243 7. .689 8. .564 9. .263 10. .823
11. .659 12. .944 13. .099 14. .860

Page Thirty Four

1. .987 2. .383 3. .786 4. .407 5. .267
6. .838 7. .398 8. .254 9. .655 10. .813
11. .974 12. .536 13. .189 14. .566

Page Thirty Five

1. .281 2. .874 3. .794 4. .912 5. .366
6. .206 7. .489 8. .359 9. .460 10. .618
11. .155 12. .441 13. .769 14. .971

Page Thirty Six

1. .186 2. .693 3. .396 4. .709 5. .572
6. .442 7. .787 8. .263 9. .770 10. .823
11. .265 12. .142 13. .684 14. .946

Page Thirty Seven

1. .591 2. .994 3. .789 4. .507 5. .174
6. .347 7. .686 8. .865 9. .372 10. .603
11. .270 12. .843 13. .094 14. .474

Page Thirty Eight

1. .479 2. .288 3. .693 4. .017 5. .352
6. .538 7. .994 8. .973 9. .171 10. .313
11. .162 12. .941 13. .292 14. .457

Page Thirty Nine

1. .885 2. .187 3. .689 4. .316 5. .468
6. .738 7. .297 8. .351 9. .769 10. .507
11. .969 12. .231 13. .192 14. .667

Page Forty

1. .799 2. .278 3. .581 4. .312 5. .968
6. .448 7. .186 8. .469 9. .361 10. .717
11. .163 12. .634 13. .082 14. .562

APPENDIX E REVIEW EXAMINATION ANSWER KEY

Page Forty One Decimal Computation Skills

- | | | | | | |
|-----------|-------|----------|-------|----------|-------|
| 1. .259 | .269 | 2. .548 | .568 | 3. 1.420 | 1.450 |
| 4. .840 | .870 | 5. 2.545 | 2.555 | 6. 4.040 | 4.070 |
| 7. 1.795 | 1.815 | 8. .200 | .210 | 9. .565 | .575 |
| 10. 2.563 | 2.593 | 11. .747 | .767 | 12. .650 | .660 |

Page Forty Two Addition and Subtraction Skills

- | | | |
|--------------|--------------|-------------|
| 1. 177 parts | 2. 169 parts | 3. 96 parts |
| 4. 37 parts | 5. Remove 26 | 6. 91 parts |
| 7. 117 parts | 8. 221 parts | |

Page Forty Three Parts Tolerance Skills

- | | | | | | | | |
|----------|-------|-------|-------|-------|-------|-------|-----|
| 1. .820 | | | | .835 | | | |
| 2. | 1.77 | 1.780 | 1.79 | | | | |
| 3. 2.461 | 2.450 | | | 2.476 | | | |
| 4. .925 | .910 | .905 | .899 | .895 | | | .9 |
| 5. 1.958 | | | 1.973 | 1.954 | 1.969 | 1.971 | |
| 6. .98 | .995 | .99 | | 1.005 | | | 1.0 |

Page Forty Four Micrometer Caliper Skills

- | | |
|---------|----------|
| 1. .272 | 8. .635 |
| 2. .767 | 9. .280 |
| 3. .098 | 10. .568 |
| 4. .608 | 11. .323 |
| 5. .957 | 12. .889 |
| 6. .303 | 13. .434 |
| 7. .464 | |

APPENDIX F FINAL EXAMINATION ANSWER KEY

Page Forty Six Decimal Computation Skills

1. .633 .663
2. .580 .590
3. 3.350 3.360
4. .540 .560
5. 7.490 7.520
6. 2.720 2.740
7. 2.039 2.069
8. 1.632 1.652
9. .694 .708
10. 5.778 5.798
11. .740 .750
12. .550 .580

Page Forty Seven Addition and Subtraction Skills

1. 131 parts
2. 119 parts
3. 98 parts
4. Remove 7
5. 34 parts
6. 21 parts
7. 206 parts
8. 163 parts

Page Forty Eight Parts Tolerance Skills

1. .555 .55 .556 .560 .575
2. 2.415 2.413 2.415 2.395 2.51
3. 1.13 1.123 1.149 1.125 1.129 1.127 1.130
4. .82 .830 .810 .825 .826
5. 1.958 1.963 1.964 1.959 1.961 1.960 1.968
6. .789 .785 .795 .783 .775 .79

Page Forty Nine and Fifty Micrometer Caliper Skills

1. .187
2. .682
3. .467
4. .343
5. .786
6. .243
7. .579
8. .912
9. .165
10. .683
11. .030
12. .169
13. .486

Chairpersons Burke, Gard, and members of the committee, I want to thank you for the opportunity to speak with you today. My name is Joe Northwood and in addition to being a full time student at UW La Crosse, I work three part-time jobs.

I am here today to speak in opposition to two related topics, the proposed increase in the UW System budget at student's expense and a program known as Tuition flexibility.

While the students, faculty, staff, and administrators at this university are glad to see that there is an increase in the amount of money that the Governor has proposed to a lot to the University system, many of us are concerned with how that money will be coming into the system.

During the last budget process, the state of Wisconsin was fortunate enough to be faced with a budget surplus of sufficient size that the UW System was given enough GPR dollars so that tuition did not have to be raised. As you know, that is not the case this year. The Governor has limited the amount of GPR dollars that are going to the UW system and instead told the UW schools that if they want an increase for their budgets, get it from tuition money.

Over the past twenty-five years, tuition for four year comprehensive universities went from \$468 in 1974 to \$2594, a 454% increase. As a comparison, consumer price index (CPI) over the same twenty-five year period has only increased 235%. Also, during that time, the split between GPR dollars and program revenue rose from a 75/25% split to a 63/37% split. If tuition were to continue to increase at the same rate for the next twenty-five years, then when the children of today's students wanted to attend UW schools, they would be paying roughly \$12,000 per year. The cost of attending one of Wisconsin's fine public universities would quickly out pace what the Wisconsin public could afford.

According to a study done by the UW system last year, students today are graduating from UW schools with undergraduate degrees and an average debt load of sixteen thousand dollars. By simple averages, for every student that graduates without a debt due to tuition and fees, there is a student that graduates with around thirty-two thousand dollars in debt. However, that is only for undergraduates. If you start counting in students that have gone on to graduate school and/or on to earn a doctorate, the debt load is even higher.

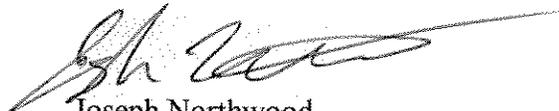
With all the discussion about the 'brain drain' of Wisconsin graduates, the thought occurs to that maybe all of these students that are going to the twin cities in Minnesota or larger cities in Illinois such as Chicago are not doing so by choice. It is possible that for a large number of those students, while they would rather return to the cities and communities that they lived in previously, they can not afford to because they would not be able to obtain a job that would pay enough for them to establish a comfortable living style while being able to pay off their debts.

The second item that I would like to discuss with you is a program known as tuition flexibility. By allowing the Board of Regents to have this program, the legislature would

be giving up their power of oversight with regard to the cost of tuition at UW schools. You would be handing complete control over to an appointed board, that while it claims to be acting in the best interest of the UW system, seems at times to operating only in its best interest at a cost to its customers, the UW students and Wisconsin taxpayers.

In Wisconsin, we like to consider ourselves to be progressive, so much so that we included it in our state motto, emblem, and flag. We also like to say that we are dedicated to educating our residents and while a little over one third of our state budget goes to help support education, more and more of the residents of Wisconsin are finding that they cannot afford to attend Wisconsin's institutions of higher education. If we want to continue our state traditions, we must find ways to keep UW system school affordable.

Thank you for your time today and have a safe journey.



Joseph Northwood

University of Wisconsin – La Crosse

Christine J. Clair
128 So. 29th St.
La Crosse, WI 54601

Testimony before Joint Finance: April 3, 2001

My name is Christine Clair. I have lived in Wisconsin for 22 years and in La Crosse County for 12 years. I have been a homeowner and taxpayer during my entire Wisconsin residency. I am married with 2 young children. Marianna Clair is in 4th grade and attends 1 of La Crosse School District's Charter Schools - SOTA, School of Technology and Arts. Alea Clair will be a student next fall of the La Crosse School District's 4-year-old program. I am a former pre-school teacher. I am an elected board member and Treasurer of the Criminal Law Section of the State Bar. I am an elected member of the La Crosse School Board. I am an active member in my professional and personal communities.

I am a 12-year employee of the Wisconsin State Public Defender, working 10 years as a staff attorney and 2 years as the Private Bar Liaison for the Western District of Wisconsin, which covers all counties west of a line from Florence to Walworth Counties. My current administrative position is with the Assigned Counsel Division, a division of the State Public Defender that oversees all private bar appointments and payments to private bar attorneys that accept State Public Defender appointments.

I am taking vacation time to express my concerns with the Governor's proposed budget, specifically on 2 issues. One being the proposed budget cut to the State Public Defender and the second to the proposed budget cut to the SAGE program in the Public Schools.

1. The proposed 3.2 million-dollar cut to the State Public Defender could result in laying off of approximately 50 staff attorneys. This will result in the caseload of those attorneys being shifted to the private bar who have been certified to accept State Public Defender appointments. If this were to take place, the cost for appointment of counsel through the private bar has been estimated to be 5.8 million-dollars each year. This would be a 2.6 million-dollar increase to State of Wisconsin taxpayers for providing constitutionally mandated representation to individuals who are guaranteed legal representation in various judicial proceedings, primarily criminal. This is fiscally irresponsible and illogical.

But the fact of the matter is that the pool of private bar attorneys who are willing to accept State Public Defender appointments has dropped by 1/3 over the last several years because of the compensation rate currently paid, \$40 per hour. If the proposed budget cut to the State Public Defender occurs and that caseload is

shifted to the Assigned Counsel Division, there will not be enough certified private bar attorneys to accept those appointments. As the appointment of counsel process is delayed, court proceedings will be postponed, which will effect all judicial proceedings and Clerk of Court transactions. County jails will house non-convicted, but accused individuals longer while efforts to obtain counsel are being initiated. And, the reality could well be that the Courts will have to appoint counsel at county expense because there will not be enough State Public Defender certified private bar attorneys willing to accept the cases. The impact to individual county budgets will be devastating and be passed on to local property taxpayers.

This impact to county budgets is already being felt due to the current State Public Defender eligibility standards. I have been approached by judges and clerk of courts throughout the Western District, who have expressed their concern regarding the growing amount of individuals that are clearly indigent by W-2 standards but are not eligible for State Public Defender representation. Courts are appointing counsel, which is constitutionally mandated, but at costs that numerous counties are fiscally unable to burden.

Therefore, we need to restore full funding to the State Public Defender, raise the private bar compensation rate from \$40 to the Supreme Court rate, and raise the State Public Defender eligibility standards to W-2 standards.

2. The proposed budget cuts to the SAGE program is unbelievable. As a former pre-school teacher, I know the benefit the SAGE program has for children. It is a wonderful program that has reflected Wisconsin's proactive commitment to Wisconsin's children's education. To cut this program is to cut off the one of the best and undisputed opportunities children have for future success in their education and life long contribution to society. My colleagues from the La Crosse School Board and La Crosse School District Administration will detail my position at a later presentation.