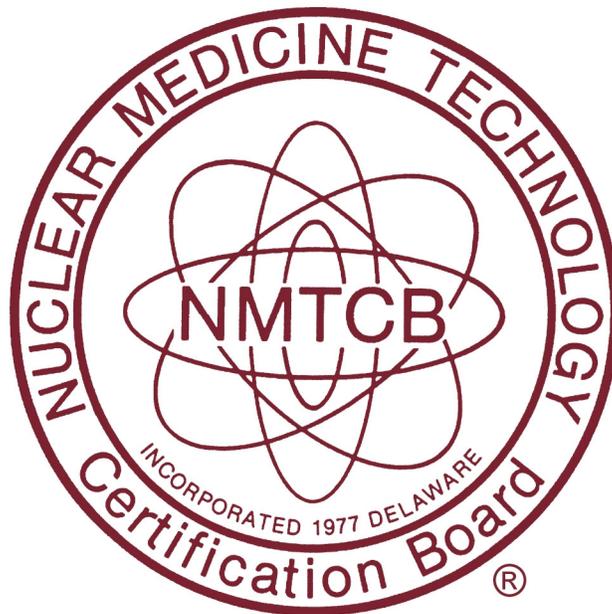


**THE NUCLEAR MEDICINE TECHNOLOGY  
CERTIFICATION BOARD, INC.**

# **N M T C B**

**ANNUAL  
EXAMINATION  
REPORT  
2009**



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## 2009 Statistics At-A-Glance

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### All Examinees

|                    |      |       |
|--------------------|------|-------|
| Total Number:      | 1466 |       |
| Total Number Pass: | 1319 | 89.9% |
| Total Number Fail: | 147  | 10.1% |

#### Performance breakdown:

#### Summary Statistics:

|                                |     |       |  |                    |          |
|--------------------------------|-----|-------|--|--------------------|----------|
| Pass:                          | 867 | 59.1% |  | Range of Scores    | 66 to 99 |
| Pass with Distinction:         | 285 | 19.4% |  | Average Score      | 79.61    |
| Pass with Highest Distinction: | 167 | 11.4% |  | Standard Deviation | 4.218    |
| Fail:                          | 147 | 10.1% |  | Median Score       | 80       |

---

### First-Time Examinees (Nuclear Medicine Program Graduates)

|                    |      |       |
|--------------------|------|-------|
| Total Number:      | 1286 |       |
| Total Number Pass: | 1213 | 94.3% |
| Total Number Fail: | 73   | 05.7% |

#### Performance breakdown:

#### Summary Statistics:

|                                |     |       |  |                    |          |
|--------------------------------|-----|-------|--|--------------------|----------|
| Pass:                          | 771 | 60.0% |  | Range of Scores    | 66 to 99 |
| Pass with Distinction:         | 280 | 21.7% |  | Average Score      | 80.21    |
| Pass with Highest Distinction: | 162 | 12.6% |  | Standard Deviation | 3.923    |
| Fail:                          | 73  | 05.7% |  | Median Score       | 80       |

---

### Repeat Examinees

|                    |    |       |
|--------------------|----|-------|
| Total Number:      | 94 |       |
| Total Number Pass: | 42 | 44.7% |
| Total Number Fail: | 52 | 55.3% |

#### Performance breakdown:

#### Summary Statistics:

|                                |    |       |  |                    |          |
|--------------------------------|----|-------|--|--------------------|----------|
| Pass:                          | 41 | 43.6% |  | Range of Scores    | 67 to 82 |
| Pass with Distinction:         | 1  | 1.1%  |  | Average Score      | 74.01    |
| Pass with Highest Distinction: | 0  | 0%    |  | Standard Deviation | 2.525    |
| Fail:                          | 52 | 55.3% |  | Median Score       | 74       |

---

### Alternate Eligibility Examinees

|                    |    |       |
|--------------------|----|-------|
| Total Number:      | 86 |       |
| Total Number Pass: | 64 | 74.4% |
| Total Number Fail: | 22 | 25.6% |

#### Performance breakdown:

#### Summary Statistics:

|                                |    |       |  |                    |          |
|--------------------------------|----|-------|--|--------------------|----------|
| Pass:                          | 55 | 63.9% |  | Range of Scores    | 66 to 91 |
| Pass with Distinction:         | 4  | 04.7% |  | Average Score      | 76.66    |
| Pass with Highest Distinction: | 5  | 05.8% |  | Standard Deviation | 4.304    |
| Fail:                          | 22 | 25.6% |  | Median Score       | 76       |

# NMTCB Annual Examination Overview 2009



## **Introduction**

This summary report is intended to provide detailed information about the 2009 certification examination. The primary purpose of this report is to serve the needs of program directors and administrators. It contains a description of computer adaptive test (CAT) for classification, and provides detailed information about scaled scores and examination performance. The performance section includes a summary of examination data sorted by different groups of examinees as well as visual aids for the year 2009.

## **Computer Adaptive Test (CAT) for Classification.**

In July 1996, the NMTCB began offering a computer adaptive test (CAT) for classification in association with ACT, Inc., The CAT for classification is designed to render a pass/fail decision. That is, in a CAT of this type, examinees are NOT rank-ordered along a score scale according to measured ability; rather, the emphasis is on providing an accurate classification relative to a set pass/fail criterion. In order to administer a CAT for classification, the items themselves are ranked at the decision point on the score scale according to their ability to classify accurately and quickly. Each item in the item pool is associated with information on its difficulty (the proportion of examinees answering an item correctly) and discrimination (the ability of an item to distinguish between passing and failing individuals) levels. An item that has a difficulty level at or near the passing score and has good discrimination will be a better item for decision-making than another item that is too difficult or too easy or has little ability to discriminate between those examinees who should pass and those who should fail. All items in the pool were classified based on the statistics obtained from the Item Response Theory (IRT) by the psychometric staff at ACT, Inc.

A "classification" CAT is still adaptive in that those examinees whose abilities are far from the passing score (in either direction) will require fewer test items for classification than those whose ability is at or near the passing score. The test will adapt by test length rather than by item difficulty. For the classification CAT, the items that are administered to each and every candidate are the same type: there are no "difficult items for better examinees" or "easier items for poorer examinees." Each examinee answers a total of 80 to 90 items, and the items are different for each examinee.

Items for the classification CAT are selected in the following approximate proportions for each of four content domains of nuclear medicine technology. I. Radiation safety (15%), II. Instrumentation (20%), III. Clinical procedures (45%), and IV. Radiopharmacy (20%).

Decisions for pass/fail were based on the passing score from the benchmark examination administered in September 1993. The September 1993 examination was the first test developed under the current test blueprint. The algorithm used in the classification CAT adjusts for differences in test form difficulty. For example, examinees that receive a CAT that is easier relative to the benchmark exam must answer more items correctly to receive a passing score. Conversely, if a candidate receives a set of items that is more difficult, he/she would be required to answer fewer questions correctly to pass the exam. In essence, each CAT administered is equated so the passing level is appropriate for the set of items selected for administration to each examinee.

The CAT for classification, while providing a high degree of confidence in the pass/fail decision, does not allow the same analysis of individual performance and subgroup performance obtained with the paper and pencil exam. In the past, because all examinees that sat at the same administration of a test took the same test, comparative information was obtained. Because the primary purpose of the CAT exam is to classify examinees as pass or fail, CAT for classification selects items that are optimal for minimizing errors in

classification, a critical consideration in occupation certification programs. Examinees whose ability estimates are close to the passing score require more items to make a pass/fail decision; whereas, those that are clearly significantly above the pass/fail mark need fewer items. Examinees are required to answer every item presented; however, they are permitted to review and change their responses.

### **Scaled Score Information:**

Examination results are reported in terms of the scaled score, the mean scaled score, and a measure of the variability of the scaled score distribution -- the standard deviation.

As noted above, the main objective of the NMTCB CAT is to obtain a pass/fail decision with a high degree of precision. However it was recognized that there are occasions when there is a need to know whether an examinee's performance is close to the passing score or a distance from it. Consequently, scaled scores were developed and reported beginning midway through the 1997 testing cycle and subgroup performance in rank order was made available at this time, also. The scaled score is a transformation of the IRT value that is calculated based on the examinee's responses to the items presented during the examination. The scaled passing score was set to 75. That is, the ability estimate obtained from IRT required to pass the examination was "anchored" at 75. It is very important to note that the scaled score value is not a percentage value. Classifications of passing were set up as "Pass" for a scaled value of 75 through 81, "Pass with Distinction" for a scaled value of 82 through 84 and "Pass with Highest Distinction" for a scaled value of 85 or better.

## Overall Examinee Performance:

Please refer to Table 1 for a general overview of the examination. This table presents the number of examinees who took the test, their average scaled score and the pass rate for fourteen years beginning 1996, the year CAT was started, to 2009.

**Table 1.** 1996 - 2009 NMTCB CAT Examinees

|      | Number of Examinees | Mean Scaled Score | Overall Pass Rate | Pass Rate for NMT Program Graduates |
|------|---------------------|-------------------|-------------------|-------------------------------------|
| 1996 | 671                 | 78.9              | 88.1%             | 94.4%                               |
| 1997 | 757                 | 78.8              | 85.6%             | 92.4%                               |
| 1998 | 664                 | 78.4              | 83.8%             | 92.9%                               |
| 1999 | 696                 | 78.3              | 83.9%             | 93.0%                               |
| 2000 | 792                 | 78.2              | 81.0%             | 90.4%                               |
| 2001 | 879                 | 77.9              | 81.9%             | 90.1%                               |
| 2002 | 1072                | 78.02             | 78.6%             | 88.4%                               |
| 2003 | 1327                | 77.99             | 79.9%             | 87.1%                               |
| 2004 | 1459                | 78.35             | 82.6%             | 91.6%                               |
| 2005 | 1652                | 78.74             | 84.1%             | 90.0%                               |
| 2006 | 1590                | 79.05             | 87.9%             | 93.7%                               |
| 2007 | 1694                | 79.19             | 86.7%             | 91.7%                               |
| 2008 | 1712                | 79.30             | 86.3%             | 91.7%                               |
| 2009 | 1466                | 80.00             | 89.9%             | 94.3%                               |

From Table 1, it can be seen that the number of examinees taking the test ranged from a low candidate volume of 664 in 1998 to a high candidate volume of 1712 in 2008. Since the beginning of the CAT, the average scaled scores of examinees have been steadily constant around 78.

**Table 2.** 2009 Overall Examinee Performance

|                       | Total Number | Total Number Pass | Pass Percentage for Each Group | Total Number Fail | Fail Percentage for Each Group |
|-----------------------|--------------|-------------------|--------------------------------|-------------------|--------------------------------|
| Program Graduates     | 1286         | 1213              | 94.3%                          | 73                | 05.7%                          |
| Repeat Examinees      | 94           | 42                | 44.7%                          | 52                | 55.3%                          |
| Alternate Eligibility | 86           | 64                | 74.4%                          | 22                | 25.6%                          |
| <b>All Examinees</b>  | 1466         | 1319              | 89.9%                          | 147               | 10.1%                          |

**Program Performance 2009:** Table 3 (below) provides a percentile rank of the average score for each program for 2009. It provides each school’s average score and the percentile rank for each score. For example, if the average scaled score of students graduating from a program is 85.00, the program is ranked to the 98<sup>th</sup> percentile on the scale.

**Table 3.** Percentiles by school average

| Average Score | Percentile |
|---------------|------------|
| 89.33         | 100        |
| 85.33         | 99         |
| 85.00         | 98         |
| 84.83         | 96         |
| 84.67         | 96         |
| 84.46         | 95         |
| 84.43         | 94         |
| 84.33         | 93         |
| 84.00         | 92         |
| 83.60         | 90         |
| 83.38         | 89         |
| 83.33         | 89         |
| 83.29         | 88         |
| 83.23         | 87         |
| 83.00         | 86         |
| 82.71         | 86         |
| 82.67         | 85         |
| 82.50         | 84         |
| 82.44         | 83         |
| 82.43         | 82         |
| 82.30         | 81         |
| 82.25         | 80         |
| 82.20         | 79         |
| 82.13         | 79         |
| 82.11         | 78         |
| 82.00         | 77         |
| 81.97         | 76         |
| 81.92         | 75         |
| 81.88         | 75         |
| 81.86         | 74         |
| 81.71         | 73         |
| 81.50         | 71         |
| 81.44         | 71         |
| 81.40         | 70         |
| 81.33         | 69         |
| 81.17         | 68         |
| 81.15         | 67         |
| 81.14         | 66         |
| 80.88         | 65         |
| 80.77         | 64         |
| 80.75         | 64         |
| 80.71         | 63         |
| 80.63         | 62         |
| 80.60         | 61         |
| 80.50         | 60         |
| 80.43         | 59         |

| Average Score | Percentile |
|---------------|------------|
| 80.40         | 57         |
| 80.38         | 56         |
| 80.33         | 55         |
| 80.25         | 54         |
| 80.24         | 52         |
| 80.19         | 51         |
| 80.17         | 50         |
| 80.14         | 49         |
| 80.00         | 45         |
| 79.90         | 42         |
| 79.85         | 41         |
| 79.83         | 40         |
| 79.76         | 39         |
| 79.75         | 39         |
| 79.71         | 38         |
| 79.70         | 37         |
| 79.67         | 36         |
| 79.63         | 36         |
| 79.50         | 34         |
| 79.44         | 32         |
| 79.42         | 32         |
| 79.38         | 31         |
| 79.33         | 30         |
| 79.23         | 28         |
| 79.21         | 27         |
| 79.07         | 26         |
| 79.00         | 25         |
| 78.83         | 24         |
| 78.71         | 23         |
| 78.67         | 22         |
| 78.66         | 21         |
| 78.60         | 20         |
| 78.55         | 19         |
| 78.40         | 18         |
| 78.33         | 18         |
| 78.27         | 17         |
| 78.25         | 16         |
| 78.00         | 15         |
| 77.91         | 14         |
| 77.90         | 13         |
| 77.57         | 12         |
| 77.33         | 11         |
| 77.30         | 10         |
| 77.27         | 9          |
| 77.00         | 8          |
| 76.80         | 7          |

| Average Score | Percentile |
|---------------|------------|
| 76.75         | 6          |
| 76.38         | 5          |
| 76.00         | 4          |
| 75.60         | 3          |
| 75.56         | 2          |
| 74.33         | 1          |
| 73.00         | 0          |

# Group Performance 2009

## All Examinees:

A total of 1319 out of 1466 examinees, who attempted, passed the NMTCB certification examination in 2009 (Table 4). Out of those who attempted, 167 examinees (11.4 percent) passed the examination with highest distinction, and 285 examinees (19.4 percent) passed the examination with distinction. A total of 147 examinees failed the examination in 2009. A frequency distribution of all examinees' scaled scores is also presented below (Graph 1).

**Table 4.** All 2009 Examinees

|                    |      |         |
|--------------------|------|---------|
| Total Number:      | 1466 |         |
| Total Number Pass: | 1319 | (89.9%) |
| Total Number Fail: | 147  | (10.1%) |

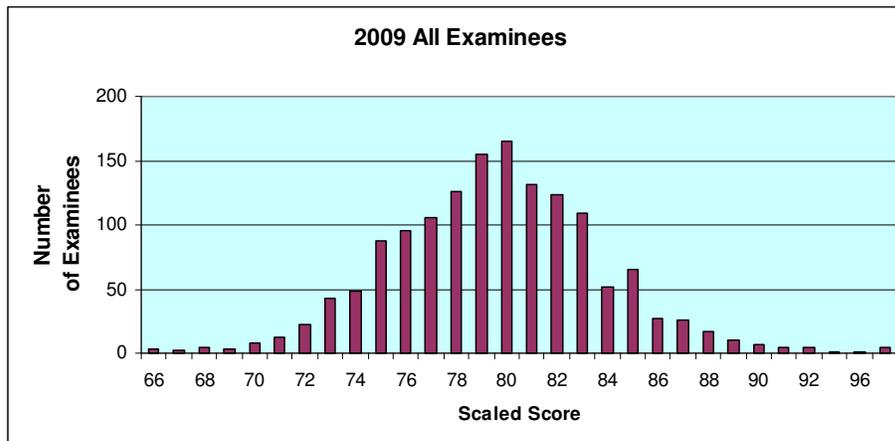
**Performance breakdown**

|                                |     |         |
|--------------------------------|-----|---------|
| Pass:                          | 867 | (59.1%) |
| Pass with Distinction:         | 285 | (19.4%) |
| Pass with Highest Distinction: | 167 | (11.4%) |
| Fail:                          | 147 | (10.1%) |

|                      |               |
|----------------------|---------------|
| Range of scores:     | 66 through 99 |
| Average score:       | 79.61         |
| Standard Deviation:  | 4.218         |
| Median scaled score: | 80            |

**Graph 1.** All 2009 Examinees



**Repeat Examinees:**

Ninety-four (94) examinees were repeat examinees in 2009 (Table 5). A total of 42 out of 94 examinees (44.7 percent) passed the examination. No one passed with highest distinction and one person in this group passed the examination with distinction. A frequency distribution of these repeat examinees scaled scores is also presented below (Graph 2).

**Table 5:** 2009 Repeat Examinees

|                    |    |         |
|--------------------|----|---------|
| Total Number:      | 94 |         |
| Total Number Pass: | 42 | (44.7%) |
| Total Number Fail: | 52 | (55.3%) |

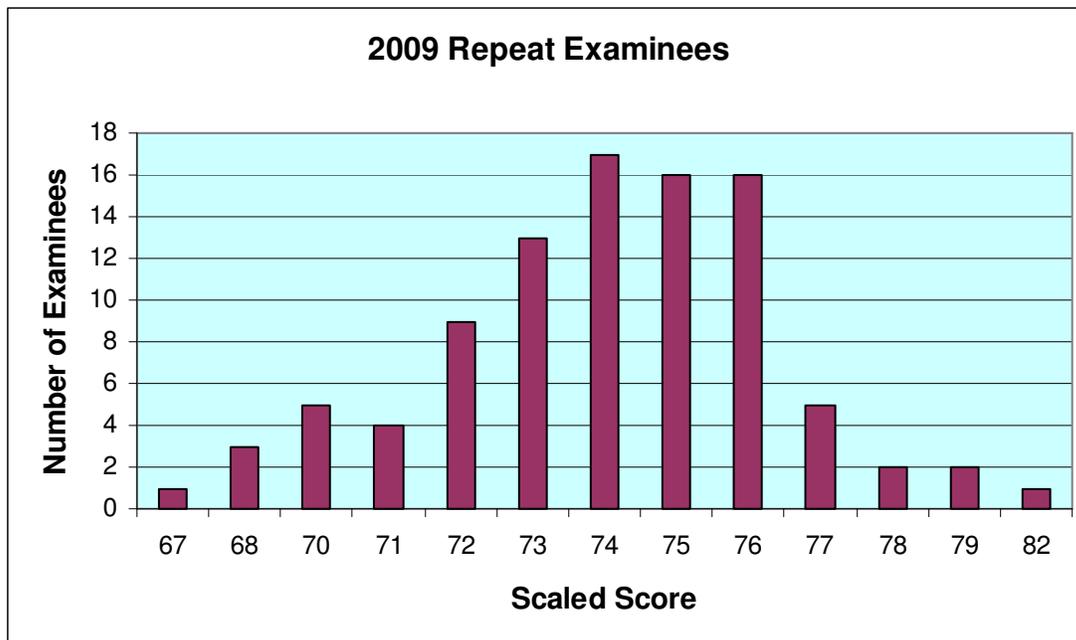
  

|                                |    |         |
|--------------------------------|----|---------|
| <b>Performance Breakdown</b>   |    |         |
| Pass:                          | 41 | (43.6%) |
| Pass with Distinction:         | 1  | (1.1%)  |
| Pass with Highest Distinction: | 0  | (0%)    |
| Fail:                          | 52 | (55.3%) |

|                      |               |
|----------------------|---------------|
| Range of scores:     | 67 through 82 |
| Average score:       | 74.01         |
| Standard Deviation:  | 2.525         |
| Median scaled score: | 74            |

**Graph 2.** 2009 Repeat Examinees



**Alternate Eligibility:**

Eighty-six (86) examinees qualified to sit for the examination through the Alternate Eligibility Pathway in 2009 (Table 6). A total of 64 out of 86 examinees (74.4 percent) passed the examination. Five candidates passed the examination with highest distinction, four examinees passed with distinction. A frequency distribution of the alternate eligibility examinees is presented below (Graph 3).

**Table 6:** 2009 Alternate Eligibility Examinees

|                    |    |         |
|--------------------|----|---------|
| Total Number:      | 86 |         |
| Total Number Pass: | 64 | (74.4%) |
| Total Number Fail: | 22 | (25.6%) |

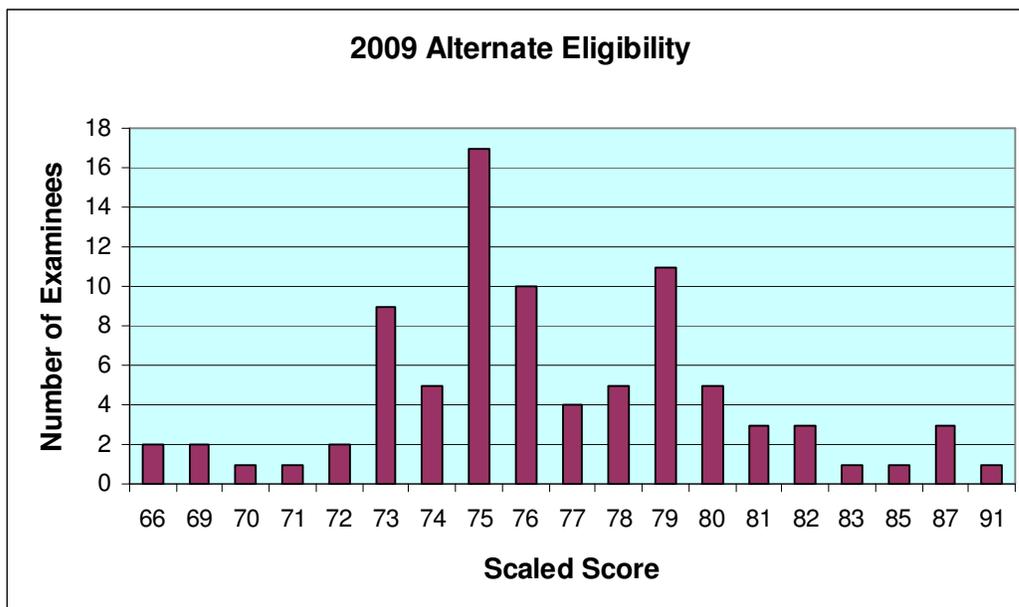
**Performance Breakdown**

|                                |    |         |
|--------------------------------|----|---------|
| Pass:                          | 55 | (63.9%) |
| Pass with Distinction:         | 4  | 04.7%   |
| Pass with Highest Distinction: | 5  | (05.8%) |
| Fail:                          | 22 | (25.6%) |

|                      |          |
|----------------------|----------|
| Range of scores:     | 66 to 91 |
| Average score:       | 76.66    |
| Standard Deviation:  | 4.304    |
| Median scaled score: | 76       |

**Graph 3.** Alternate Eligibility Examinees



**NMT Program Graduates - First Time Examinees:**

A total of 1286 out of 1466 examinees (87.7 percent) were graduates of nuclear medicine technology training programs who took the examination for the first time (Table 7). A total of 1213 out of 1286 first-time examinees (94.3 percent) passed the examination in 2009. Of those, 162 examinees (12.6 percent) passed the examination with highest distinction and 280 examinees (21.7 percent) passed the examination with distinction. Only 73 program graduate first-time examinees (5.7 percent) did not pass the examination in 2009. A frequency distribution of these first-time examinees is provided below (Graph 4).

**Table 7.** First Time Examinees (Nuclear Medicine Program Graduates)

|                    |      |         |
|--------------------|------|---------|
| Total Number:      | 1286 |         |
| Total Number Pass: | 1213 | (94.3%) |
| Total Number Fail: | 73   | (05.7%) |

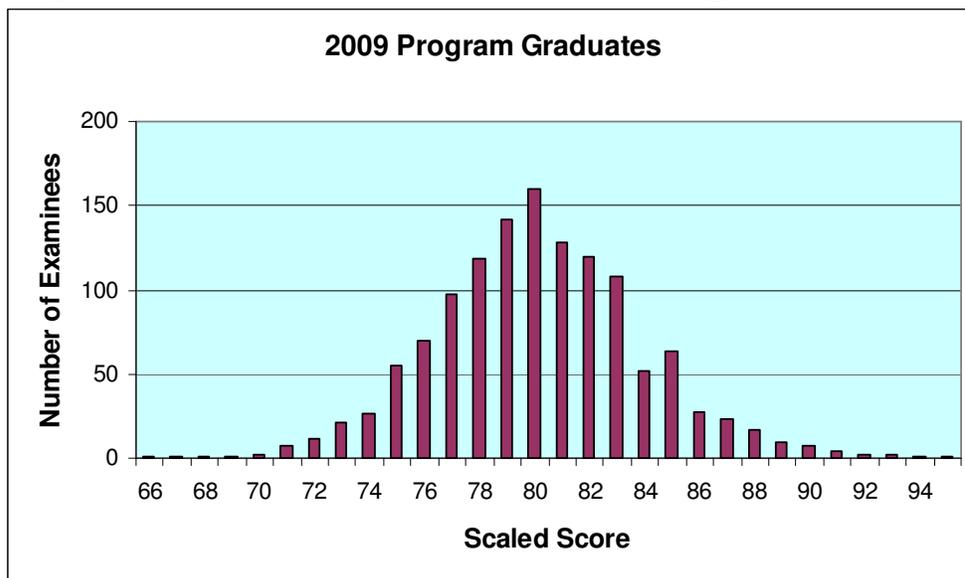
**Performance Breakdown**

|                                |     |         |
|--------------------------------|-----|---------|
| Pass:                          | 771 | (60.0%) |
| Pass with Distinction:         | 280 | (21.7%) |
| Pass with Highest Distinction: | 162 | (12.6%) |
| Fail:                          | 73  | (05.7%) |

|                      |          |
|----------------------|----------|
| Range of scores:     | 66 to 99 |
| Average score:       | 80.21    |
| Standard Deviation:  | 3.923    |
| Median scaled score: | 80       |

**Graph 4.** First Time Examinees (Nuclear Medicine Program Graduates)



## **Summary**

Overall, the year 2009 was a successful year for both program directors and students of nuclear medicine technology programs. Almost 95 percent of the 1286 examinees who graduated from nuclear medicine technology training programs passed the examination in 2009. Among those examinees who passed the examination in their first attempt, about one out of three (34.3 percent) passed the examination with distinction or highest distinction.

As always, the NMTCB remains sensitive to the needs of the program directors and their students. The Board is committed to offering the premier certification program for nuclear medicine technologists. Please let us know if there is anything that should be included in future exam reports. We welcome your comments/suggestions.

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