

# The American Registry of Radiologic Technologists®

Education + Ethics + Examination = The ARRT Equation for Excellence

## The Magic Number: A Look at What Goes Into an ARRT Scaled Score of 75

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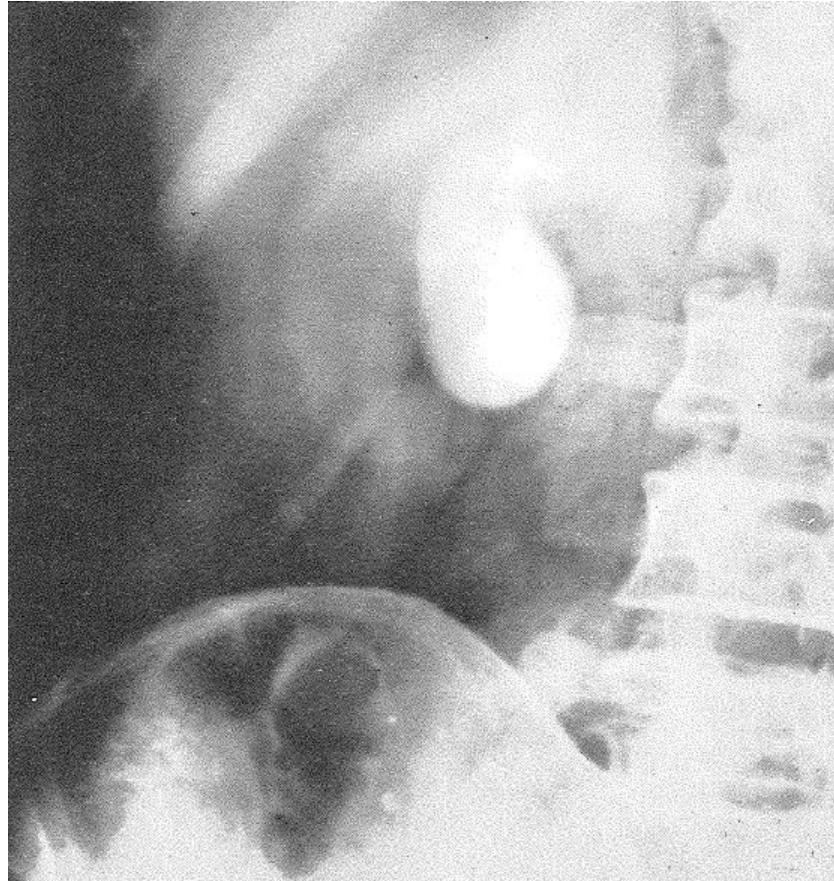
Where Can I Find This Presentation?

[www.arrrt.org/research](http://www.arrrt.org/research)

# Where Are We Going?


1. Practice analysis
2. Exam construction
3. Exam scoring / scaling
4. After the test

Do You Do This Study Anymore?



**OF COURSE YOU DON'T!**

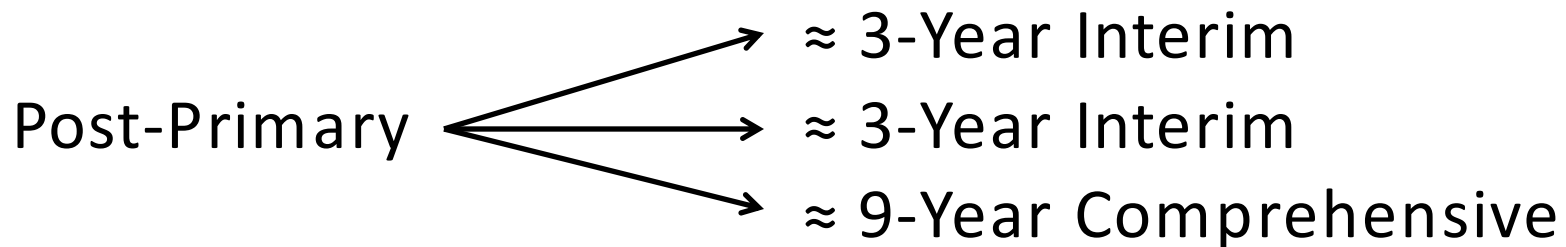
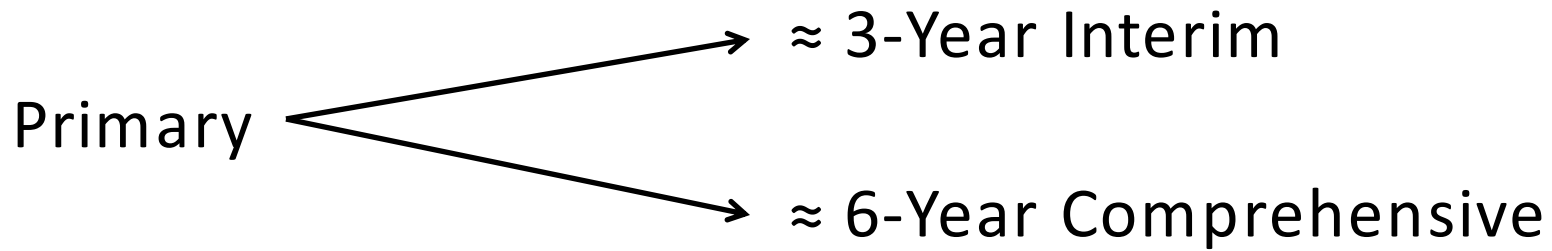
# Practice Analysis

- Helps ARRT keep up with modern medical imaging
- Goal 1: Create an inventory of “typical” R.T. tasks
- Goal 2:  
Task Inventory 

```
graph LR; A[Task Inventory] --> B[Exam Content Specifications]; A --> C[Clinical Requirements]
```
- How does ARRT decide on the tasks?  
PA Advisory Committee + Survey Data

# PA Surveys: Who, and How Often?

- Task survey primarily targets entry-level R.T.s.
  - Primary: 1-3 years experience
  - Post-Primary: 1-5 years experience

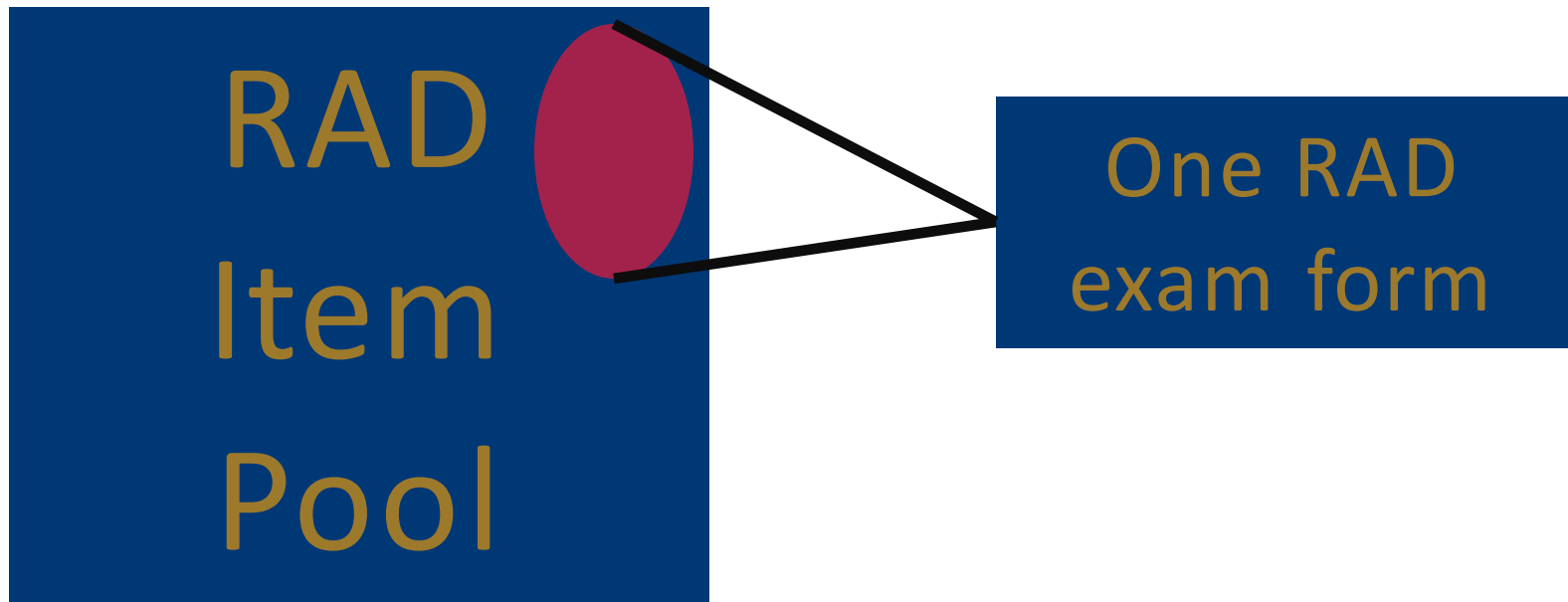


# PA Data and the PA Committee Notes

- PA Advisory Committee = R.T.s, educators, physicians, and physicists
- $\geq 40\%$  responsible tasks make the task inventory
- Committee may include infrequent but critical tasks
- The R.T. community comments on the draft content specifications and clinical requirements ([arrt.org](http://arrt.org))
- The ARRT Board of Trustees has the final approval

# Next Step: Compiling the Exam

- Exams come from a large pool of questions (items)



- Item writers: ARRT-trained R.T.s who write questions
- Only “tried and true” items compose the score



# What Does the Exam Look Like?

- Exam content closely follows the content specifications from the PA.

# What Does the Exam Look Like?

CONTENT CATEGORY	PERCENT OF TEST	NUMBER OF QUESTIONS <sup>2</sup>
A. Radiation Protection	22.5%	45
B. Equipment Operation and Quality Control	11.0%	22
C. Image Acquisition and Evaluation	22.5%	45
D. Imaging Procedures	29.0%	58
E. Patient Care and Education	<u>15.0%</u>	<u>30</u>
	100%	200

# What Does the Exam Look Like?

## B. EQUIPMENT OPERATION AND QUALITY CONTROL (22)

### 1. Principles of Radiation Physics (9)

#### A. X-Ray Production

1. source of free electrons (e.g., thermionic emission)
2. acceleration of electrons
3. focusing of electrons
4. deceleration of electrons

#### B. Target Interactions

1. bremsstrahlung
2. characteristic

#### C. X-Ray Beam

1. frequency and wavelength
2. beam characteristics
  - a. quality
  - b. quantity
  - c. primary versus remnant (exit)
3. inverse square law
4. fundamental properties (e.g., travel in straight lines, ionize matter)

#### D. Components of Digital Imaging (CR and DR)

1. PSP - photo-stimulable phosphor
2. flat panel detectors - direct and indirect
3. start up and shut down
4. CR plate erasure
5. equipment cleanliness (imaging plates, CR plates)

#### E. Types of Units

1. dedicated chest unit
2. tomography unit

#### F. Accessories

1. stationary grids
2. Bucky assembly
3. image receptors

### 3. Quality Control of Imaging Equipment and Accessories (4)

#### A. Beam Restriction

1. light field to radiation field alignment
2. central axis alignment

# What Does the Exam Look Like?

- Exam content closely follows the content specifications from the PA
- Why is this important? **VALIDITY!**
- ARRT staff maintains comparable exam difficulty from year to year
- ARRT launches “fresh” new exam forms often

# Pop Quiz!

How many items compose a Radiography Exam score?

- A. 100
- B. 120
- C. 200
- D. 220

# Pop Quiz!

How many items compose a Radiography Exam score?

- A. 100
- B. 120
- C. 200
- D. 220

There are 220 total items, but 20 are unscored, untried pilot test items designated before the exam launch.

***The pilot items do not influence an individual's score in any way!***

# Why Have Pilot Items?

Make sure items have good stats before they “count”

- Too easy / too difficult?
- High scorers answer the item correctly?

Examinees may comment on items before they “count”

- Non-statistical check of item functioning
- Exam committees review all relevant comments

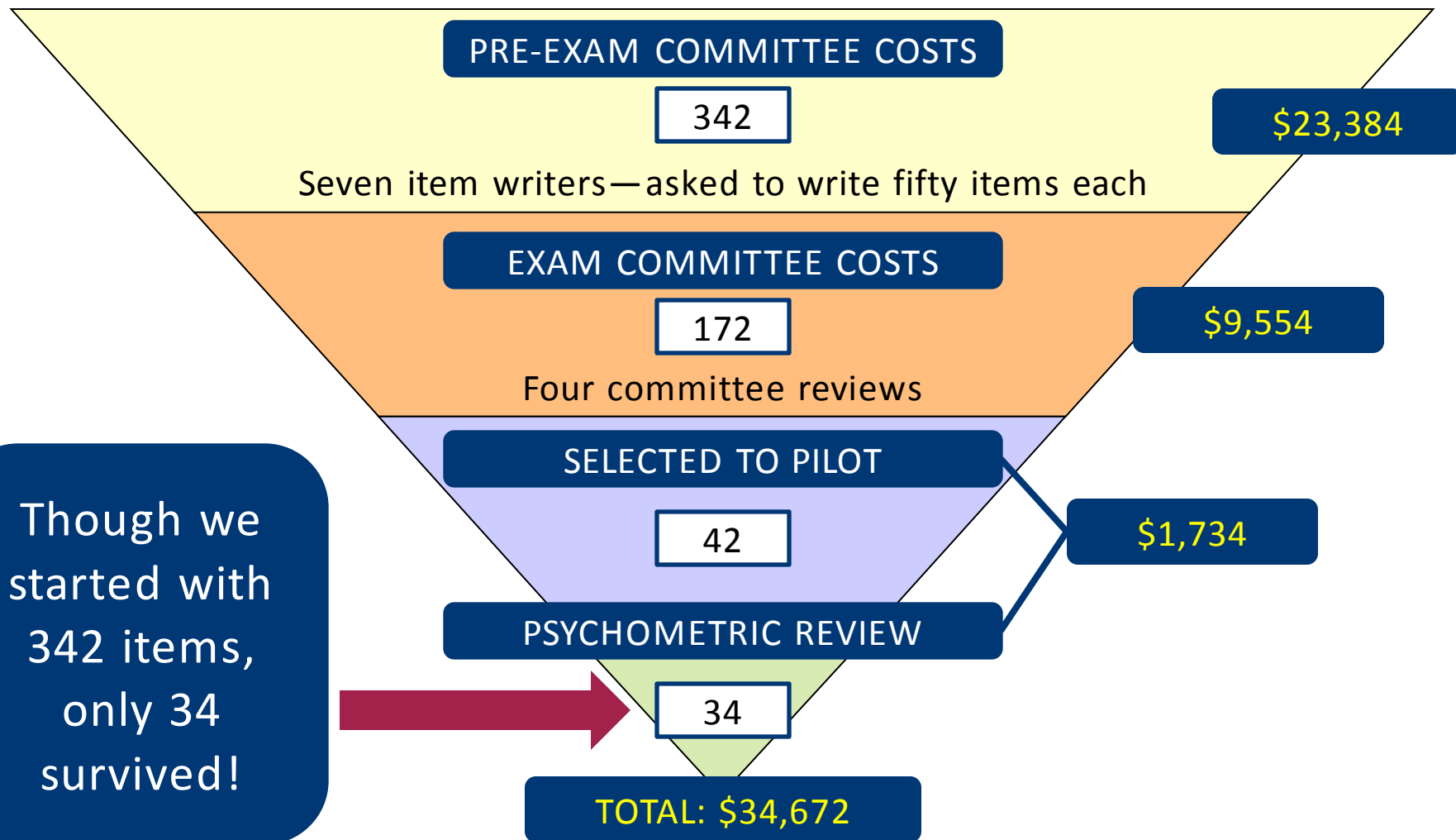
# Who Looks at the Exams?

- Staff R.T.s and psychometricians compile the initial exam forms
- Exam committees of R.T.s, educators, physicians, and physicists review every item on every exam... EVERY TIME!
- Staff R.T.s and psychometricians QC all final forms
- ARRT's exam security team monitors the exams to protect those valuable items

**1 operational item ≈ \$1,000**



# The Cost of Operational Items



Though we started with 342 items, only 34 survived!

# Exam Scoring and Scaling

- ARRT must determine the minimum number of correct responses required to pass
- Standard setting: experts rate items to determine the minimum passing score

**Infrequent, but occasionally necessary**

- Equating: making statistical adjustments to keep test scores equitable over time

**Frequent**

# Raw Scores to Scaled Scores

- Scale: a numbering system
- Raw Score: total number correct
- Scaled Score: a raw score placed on a numbering system that is consistent over time

# Tea Time!

Sir Isaac Newton:

“My water is 36 degrees Newton.”



Lord William Thomson, 1st Baron Kelvin:

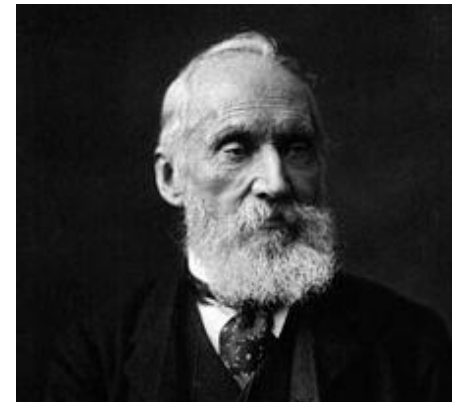
“My water is 366 Kelvin.”

Whose water, if any, is boiling?

Let's SCALE the measurements to °C.

$36\text{ }^{\circ}\text{N} \approx 109\text{ }^{\circ}\text{C}$

$366\text{ K} \approx 93\text{ }^{\circ}\text{C}$



# Raw Scores to Scaled Scores

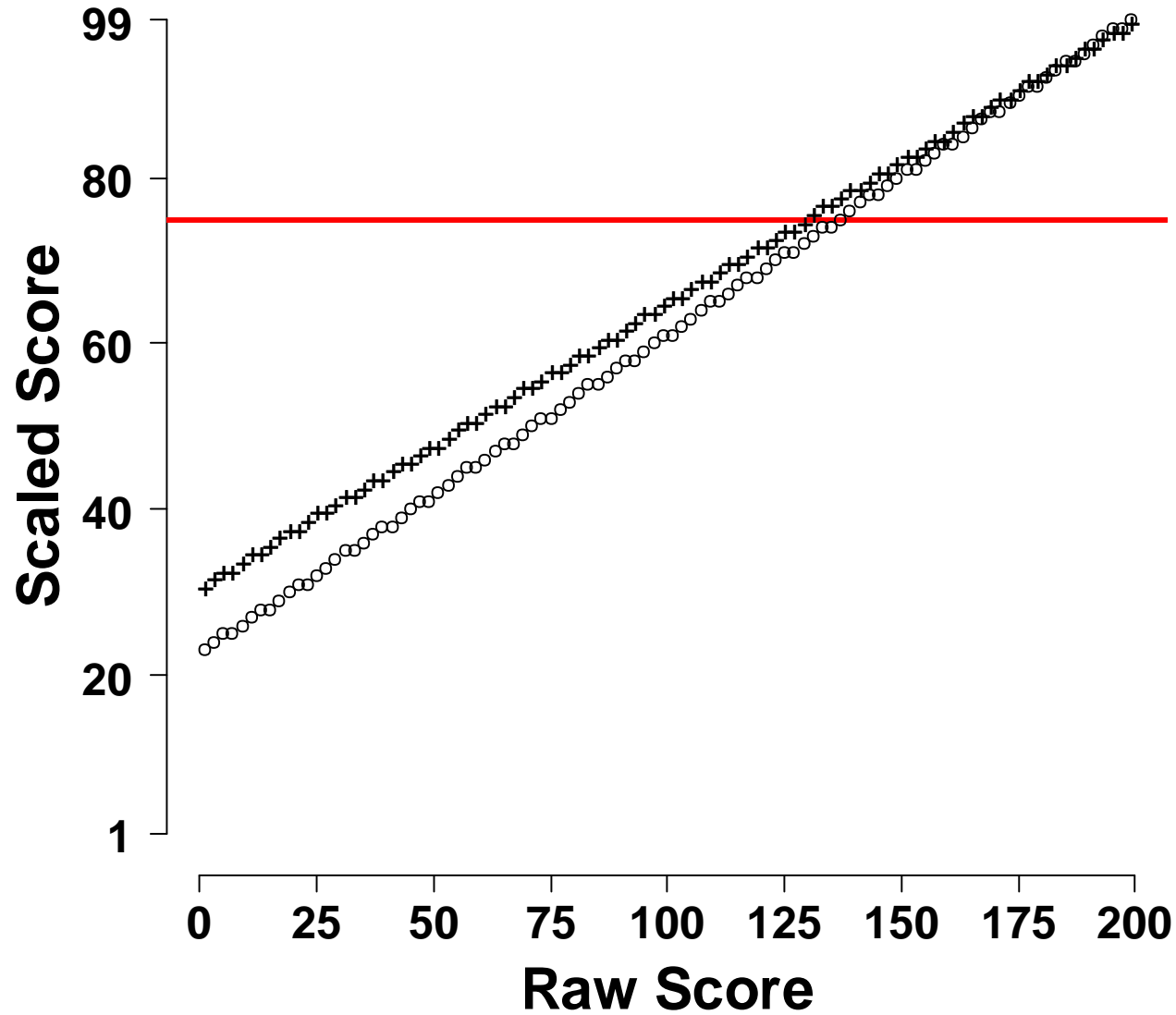
- Scale: a numbering system
- Raw Score: total number correct
- Scaled Score: a raw score placed on a numbering system that is consistent over time
- Why does ARRT use scaled scores?  
Scaled scores → *fair scores among different forms*

1 = minimum, **75 = passing**, 99 = maximum

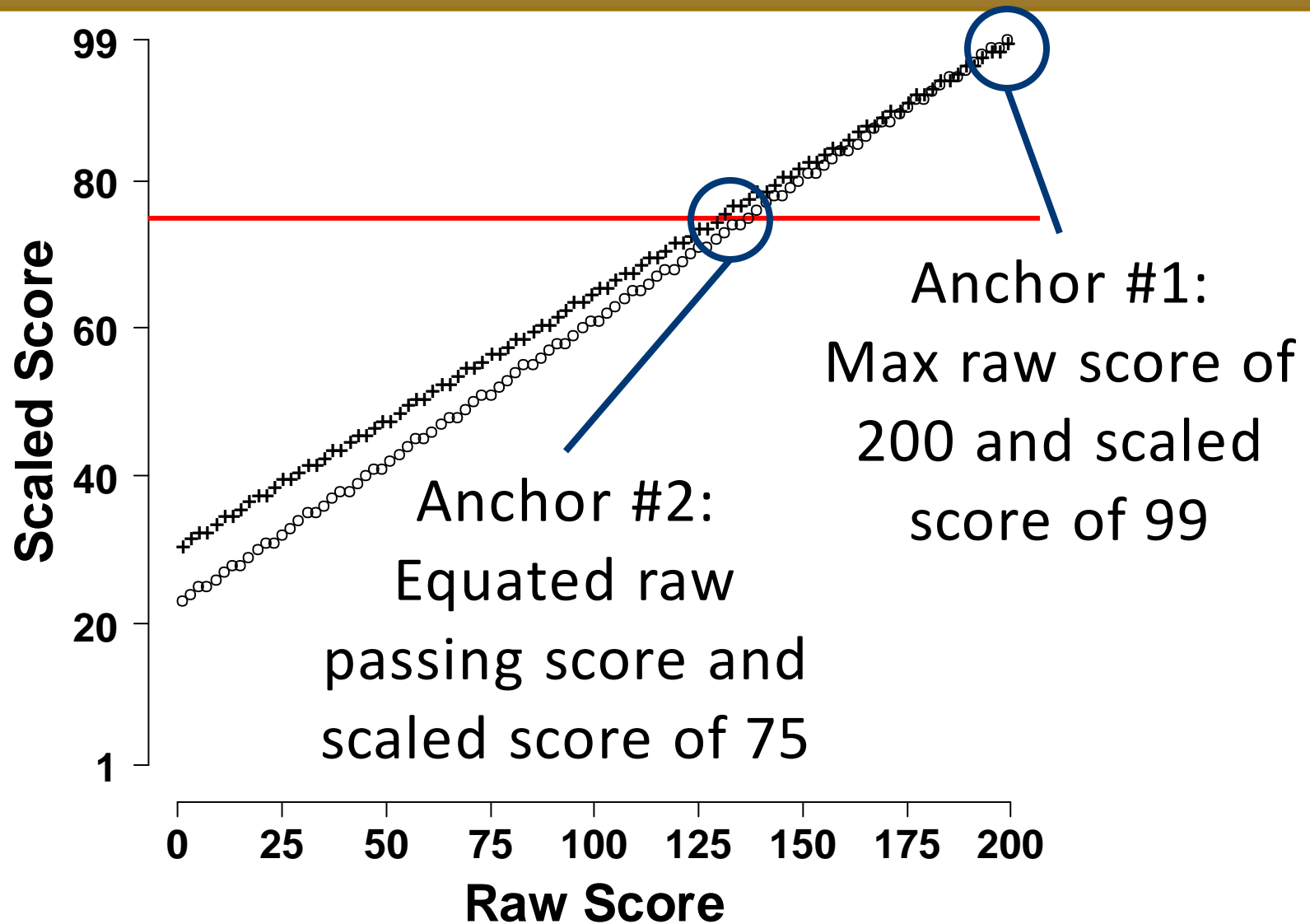
# Raw Scores to Scaled Scores

A scaled score of 75  
is NOT 75% correct!!!!

# Raw to Scaled: The Hinge

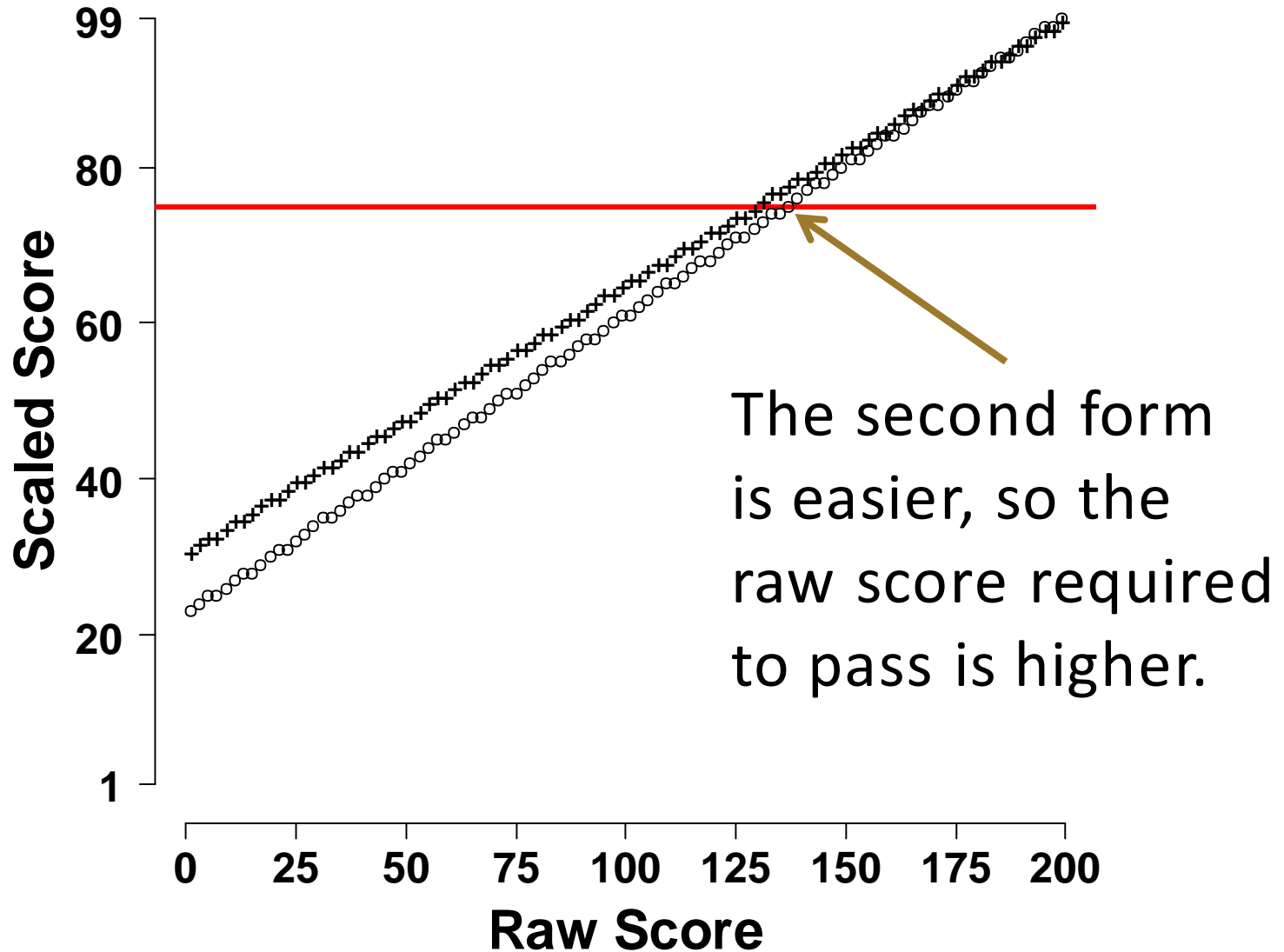


# Raw to Scaled: The Hinge





# Raw to Scaled: The Hinge



# After the Test Site

- Weekly score QC
  - Pearson VUE and ARRT independently score every testing event
  - Scores at the test site are *preliminary*. Why?
- Review of exam and item comments
- Review of item statistics
- Annual statistical reports

# What Does This Mean For Me, an R.T.?

- Use the content specifications to guide study efforts for ARRT exams.
- You will properly interpret what scaled scores mean.
  - ☺ Your score  $\geq 75$
  - ☹ Your score  $< 75$

Scaled scores are NOT percentage correct scores!

# What Does This Mean For Me, an R.T.?

## **WE NEED R.T. PARTICIPATION!!!**

- PAs: Fill out and return PA surveys, comment on the draft documents, volunteer for the committee
- Examination: volunteer to be an item writer, volunteer to be an exam committee member, create an environment of exam ethics
- Standard setting: requires a large number of R.T. volunteers to set or re-set a new base standard

# Some Useful Websites

<https://www.arrrt.org/Content-Specifications>

<https://www.arrrt.org/Publications/Brochures>

<https://www.arrrt.org/Practice-Analysis/>

<https://www.arrrt.org/Examination/Statistics>

<https://www.arrrt.org/Examination/Volunteers>

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**Questions?  
Thank You!**

