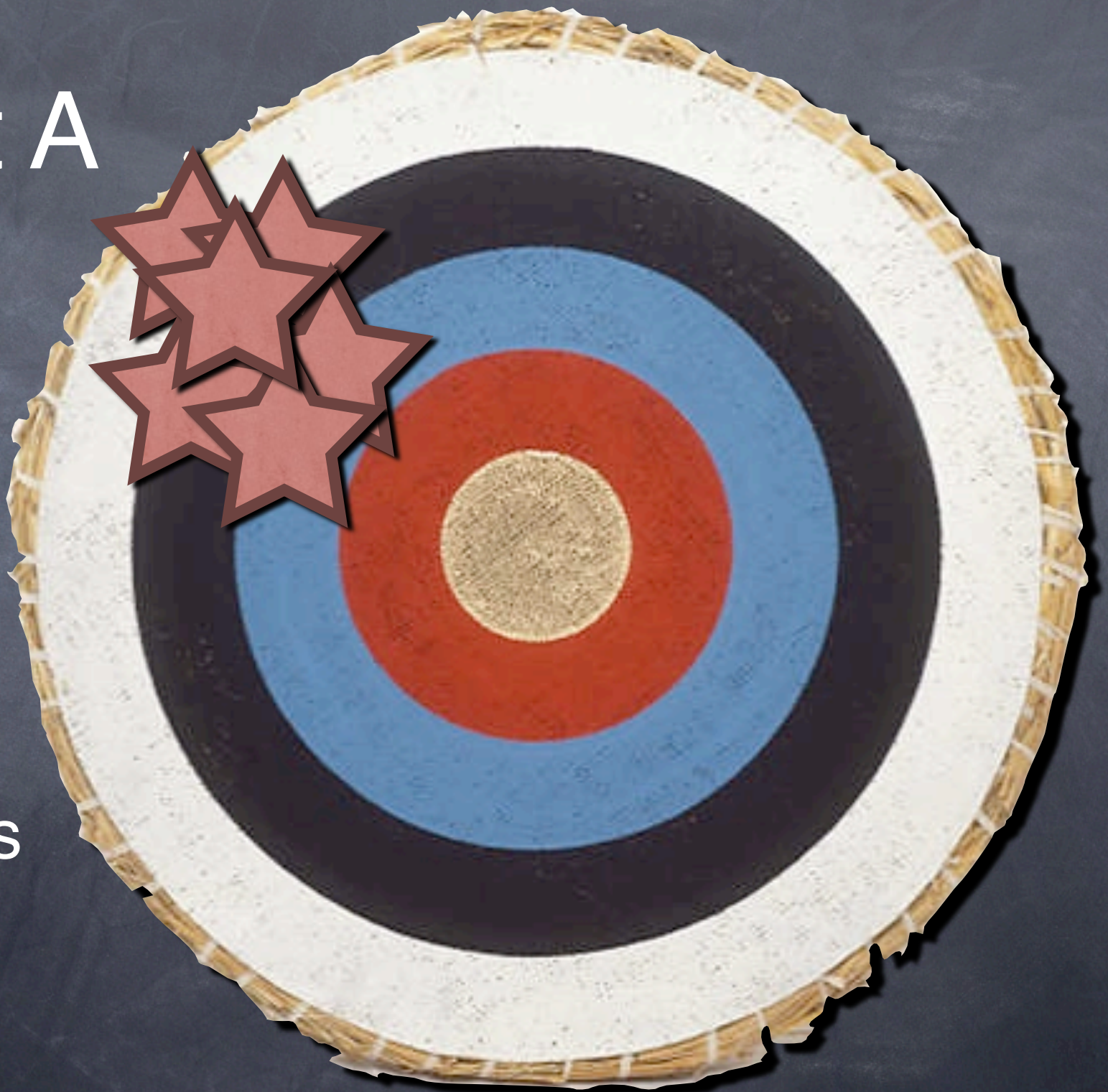
The Accuracy and Precision of Numbers

Physics 2013-2014

Student A



- Six shots at the target

Student B

- Six shots at the target

Which one did “better”?

Student B demonstrated ACCURACY

- Accuracy means that the average is nearly correct.
- How close to correct should be discussed.

Student A demonstrated PRECISION

- Precision shows consistency.
- Good technique leads to precision

Accurate or Precise?

A	B	C	D
2’ 5”	5’ 9.8”	1’ 10”	2’ 10”
5’ 10”	5’ 10.1”	1’ 9.5”	8’ 10”
9’ 4”	5’ 10.0”	1’ 10”	4’ 10”
32’ 0.1”	5’ 10.1”	1’ 10.5”	6’ 10”

Assume the correct answer is 5’10”

Significant Digits

- “sig digs” or “sig figs”
- Follow these rules for all measured values.
- That includes lab experiments: of course.
- Unless stated not for; tests, quizzes, homework, or online assignments

Zeros at the Front

File:James Bond at Madame Tussauds, London.jpg

- Bond - Agent 007
- Important to HIM!
- still just the 7th agent
- Not important, Not ever.

Zeros in the middle

- 101 Dalmations?
- Of COURSE!!
  - missing 90 dogs?
- Zeros in the middle are always significant

Zeros at the end

- The rule you need to think about
- 5400
- 3.00
- 0.00650
- With a decimal point expressed, YES
- Without a decimal point, NO
- 0053.20070

Do not change sig figs when using scientific notation

- 5400
- 5.4×10^{3}
- 3.00
- leave it alone, or 3.00×10^{0}
- 0.00650
- 6.50×10^{-3}

Sig-Figs tell someone where you guessed or rounded

- 50 was rounded to the nearest ten and has a possible range of 45 to 54.
- 50.0 was rounded to the nearest tenth and has a range of 49.95 to 50.04.

Math with sig figs

- **When multiplying or dividing**
- **Keep the lowest amount of sig figs**

3	3	3	3	3
x 2	x 3	x 4	x 6	x 10
6	9	10	20	30

Do these results seem odd?

What is the area of a 3 x 4 rectangle?

Math teachers say 12, but it is 10.

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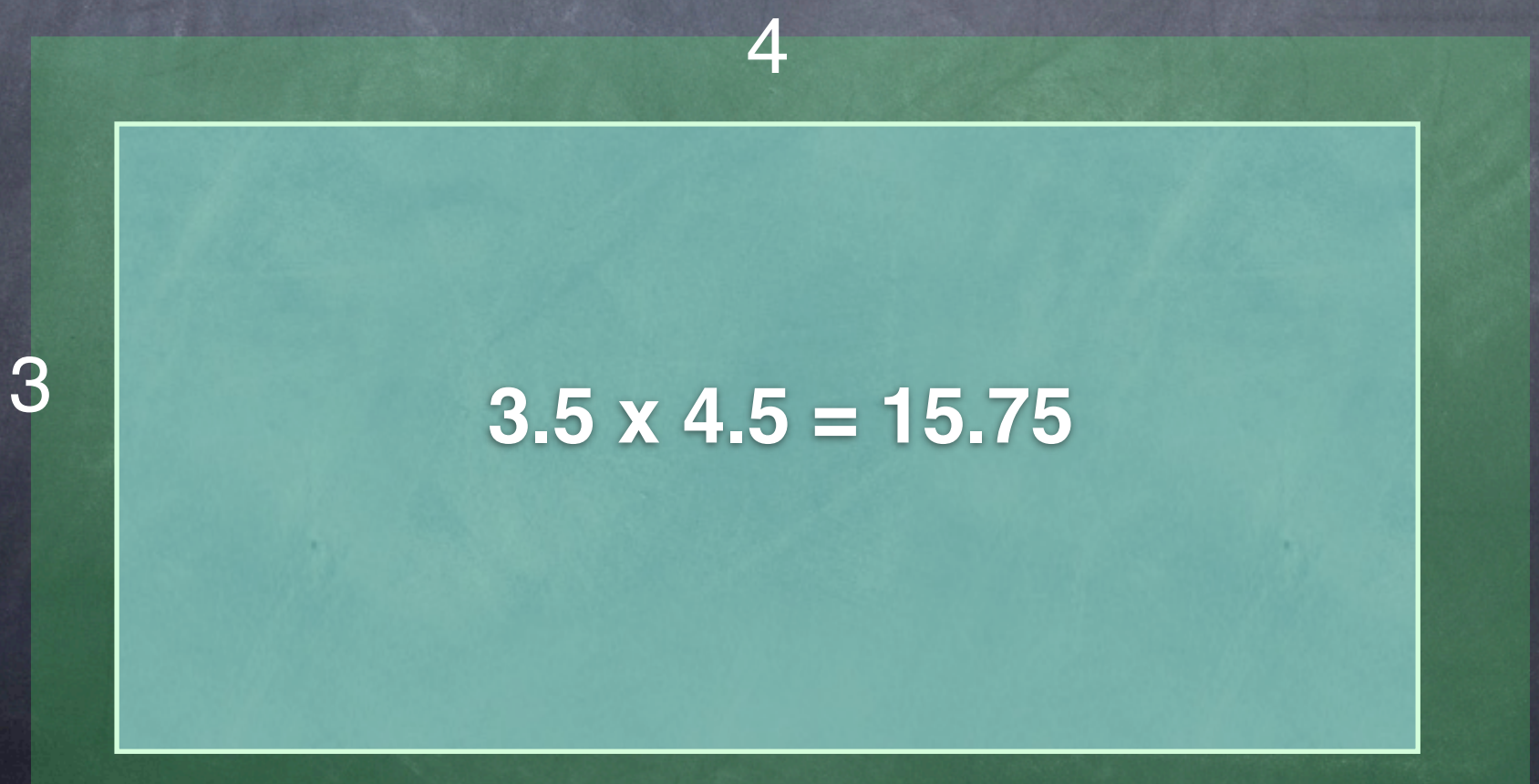

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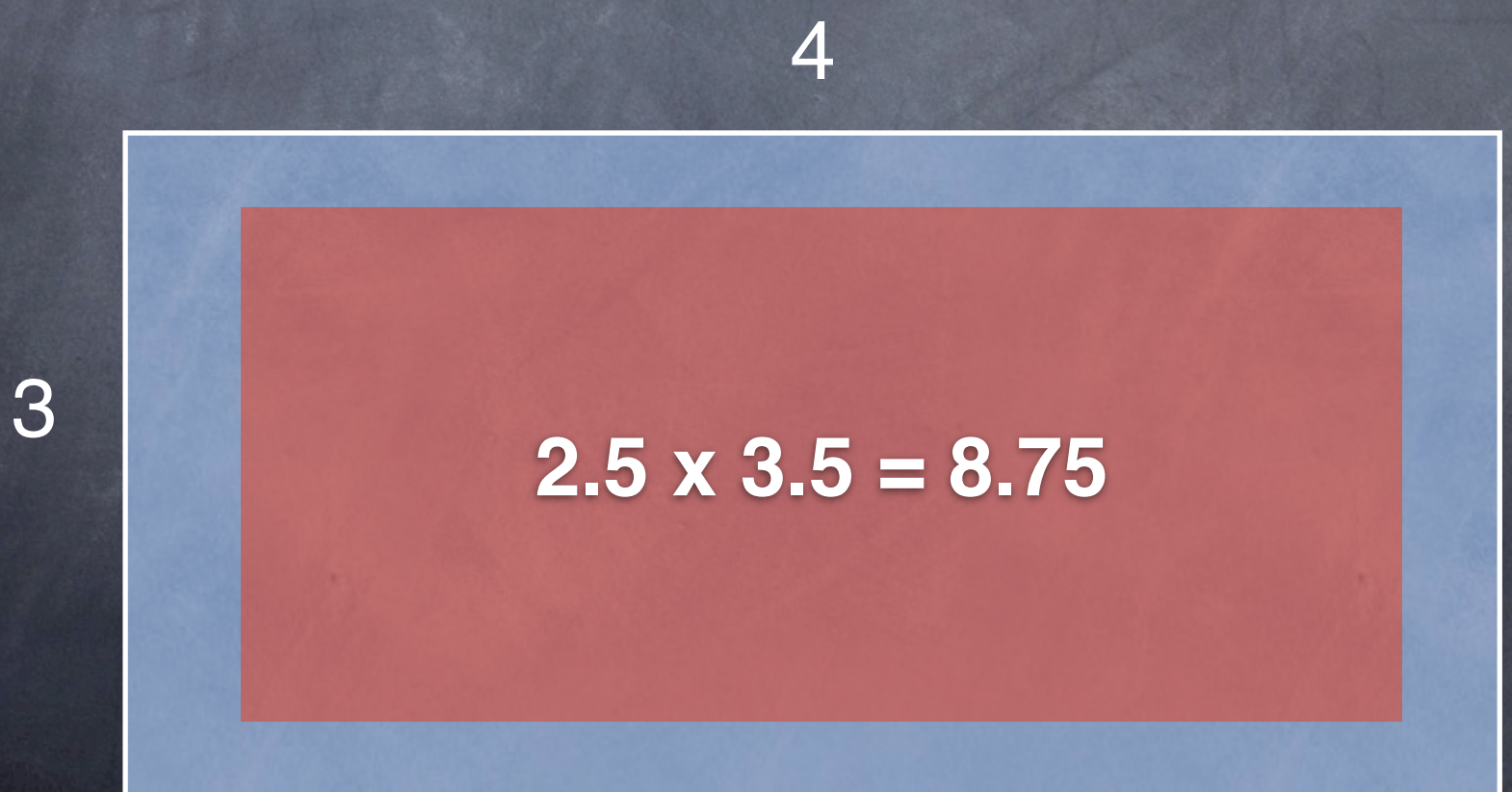

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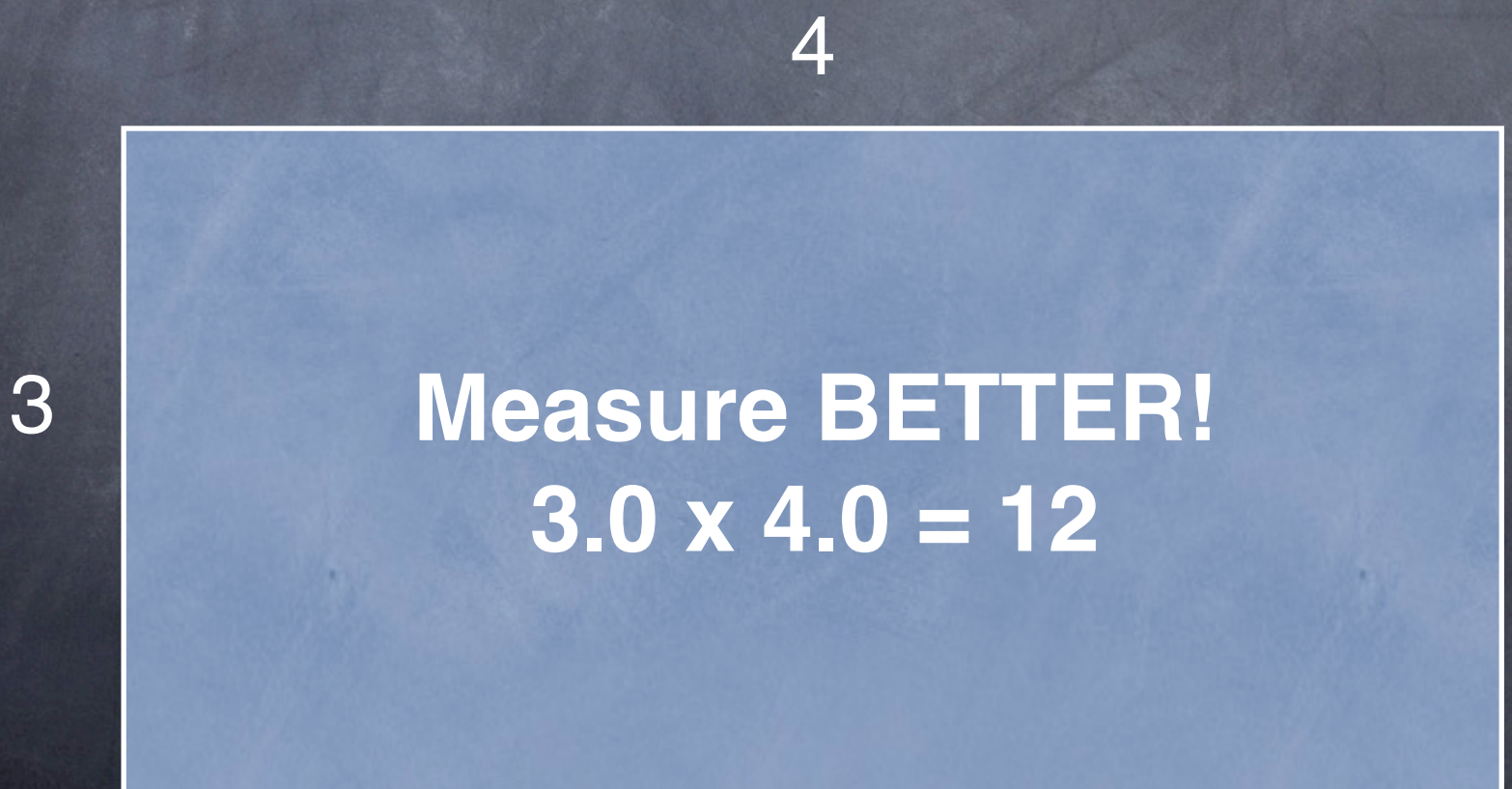
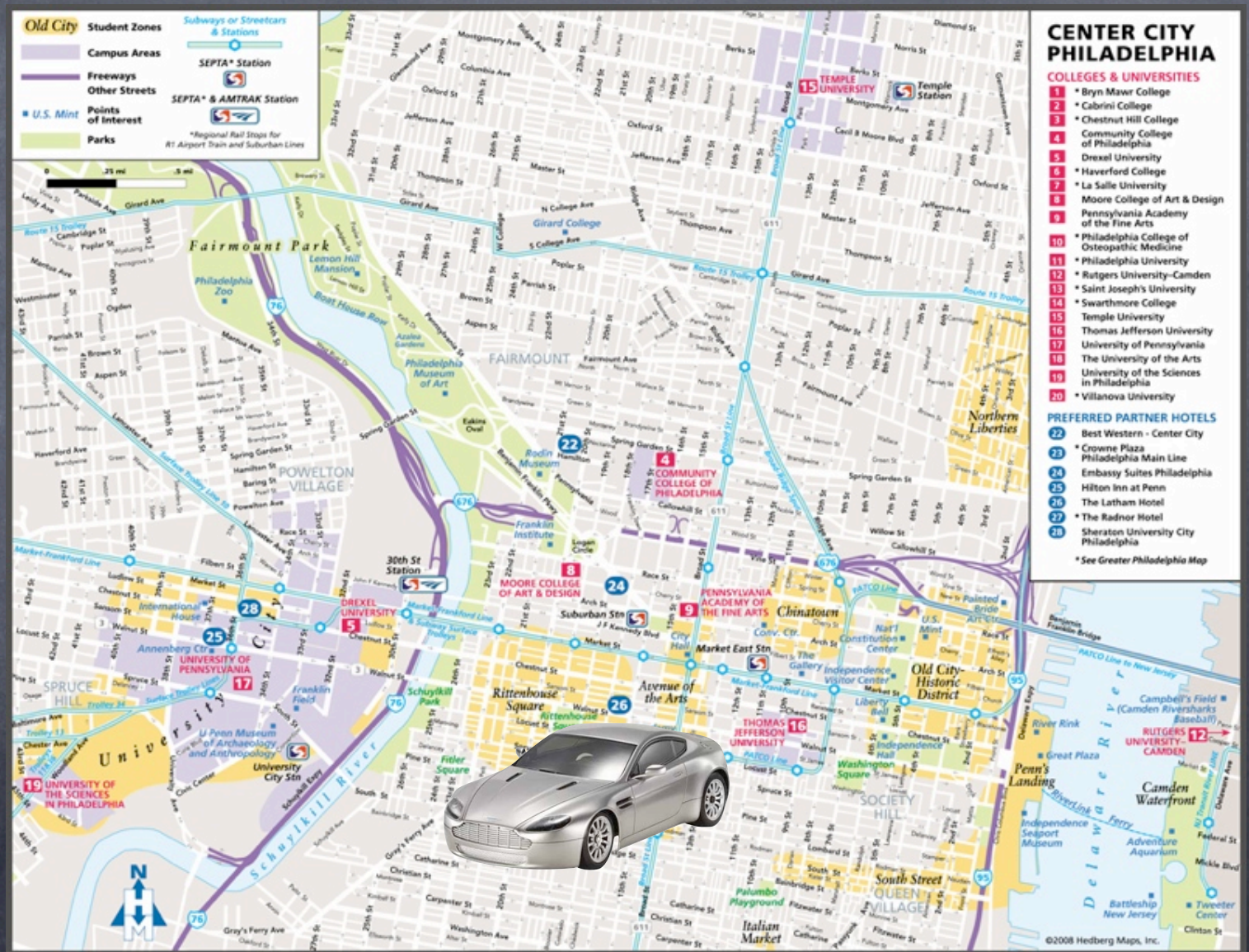


Adding or Subtracting

- 4.2 km
- 1.5 km
- 0.2 km
- 250 m
- 4.58 m
- 0.2 m



Answer matches the **Least Precise** measurement

- 4.2 km
- 1.5 km
- 0.2 km
- 250 m
- 4.58 m
- 0.2 m

$$
\begin{array}{r}
4200 \\
1500 \\
200 \\
250 \\
4.58 \\
+\quad 0.2 \\
\hline
6154.78
\end{array}
$$

6200m or 6.2 km