# Measurement Errors and Their Effects - Assignment

Complete this assignment prior to the presentation.
Have fun.

**True or False**

| | | | |
|---|---|---|---|
| T | F | 1. | Random errors can be completely eliminated from a measurement. |
| T | F | 2. | Standard deviation is a precision indicator. |
| T | F | 3. | It is possible to have a measurement set that is accurate but not precise. |
| T | F | 4. | You can measure an angle twice as accurately using a total station with a 2” manufacturer’s stated angle accuracy than using one with a 4” stated accuracy. |
| T | F | 5. | Determining a point elevation by differential leveling is an example of a direct measurement. |
| T | F | 6. | It’s not really possible to state a measurement-based result to a 100% confidence level. |
| T | F | 7. | A least squares adjustment can adjust random and systematic errors. |
| T | F | 8. | A discrepancy is the difference between the same quantity measured by two different field crews. |

**Choice** For each of the following errors indicate the source and type

| ***Source*** | | ***Type*** | |
|---|---|---|---|
| E | Environment | M | Mistake |
| I | Instrumental | S | Systematic |
| P | Personal | R | Random |

| ***Source*** | ***Type*** | ***Error*** |
|---|---|---|
| E I P | M S R | Sticking compensator on automatic level. |
| E I P | M S R | Incorrect reflector offset in total station. |
| E I P | M S R | Manufacturer’s stated angle accuracy for a total station. |
| E I P | M S R | Heat waves when sighting across pavement. |
| E I P | M S R | GPS multipath. |
| E I P | M S R | The crosshairs in a total station are slightly rotated and off center. |
| E I P | M S R | Magnetic declination |

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**Question (1)** What is a *degree of freedom*?

**Question (2)** Why would a minimally constrained adjustment be performed?

**Question (3)** What are *a priori* errors and what are they used for?

**Question (4)** Your new survey tech got to run the manual total station on a lot survey for the first time. You checked the total of her measured angles on the loop traverse that was run through the six property corners and came up with 720°00’36”. What was her measurement random error per angle?

**Question (5)** Why balance foresight and backsight distances in differential leveling?

**Question (6)** This one could require a little bit of digging. For a horizontal network:

> **Part (a)** does your primary survey adjustment software have an option to check ALTA/ACSM adherence?
>
> **Part (b)** How does your software determine the size of the 95% confidence interval error ellipse?

**Extra credit**

To re-establish the lost E1/4 corner of Section 20 a base receiver is set up over the existing NE corner and a roving unit on a 2 meter rod is used to measure a distance of 5283.44 ft to the existing SE corner. What is the expected distance error between the NE and E1/4 corner location after it is re-set with the rover? Assume the base receiver set up height is 5.58 ft, its centering error is 0.005 ft, and the NE corner elevation is 1455 (scaled). It is 75°F, 29.95” Hg barometric pressure, 70% relative humidity, with wind gusting to 20 mph. The rover antenna centering error is 0.10 ft at both the SE and E1/4 corners. Both receivers have a manufacturer’s stated horizontal accuracy of 8mm + 1 ppm and vertical accuracy of 15 mm + 1.5 ppm.