Arcade Scripting

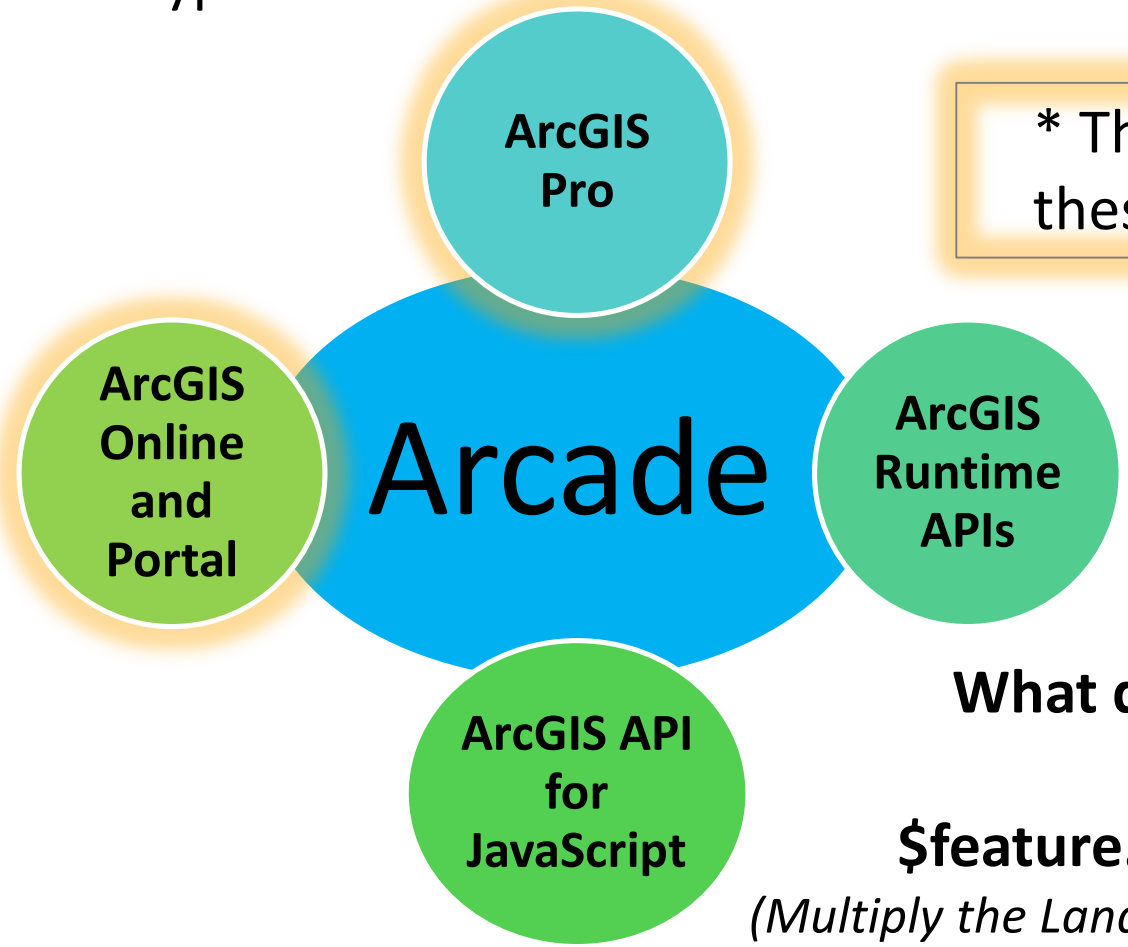
The Arcade Scripting Language

- Why ANOTHER Language?
- Basic Syntax
- Arcade Operators and Functions
- Custom Symbology with Arcade
- Conditional Statements
- Arcade for Labeling

Why ANOTHER Language?

What is Arcade?

- Arcade is a lightweight, yet powerful, expression language used securely across the entire **ArcGIS platform** and on many different device types



* This talk will focus on these two uses of Arcade

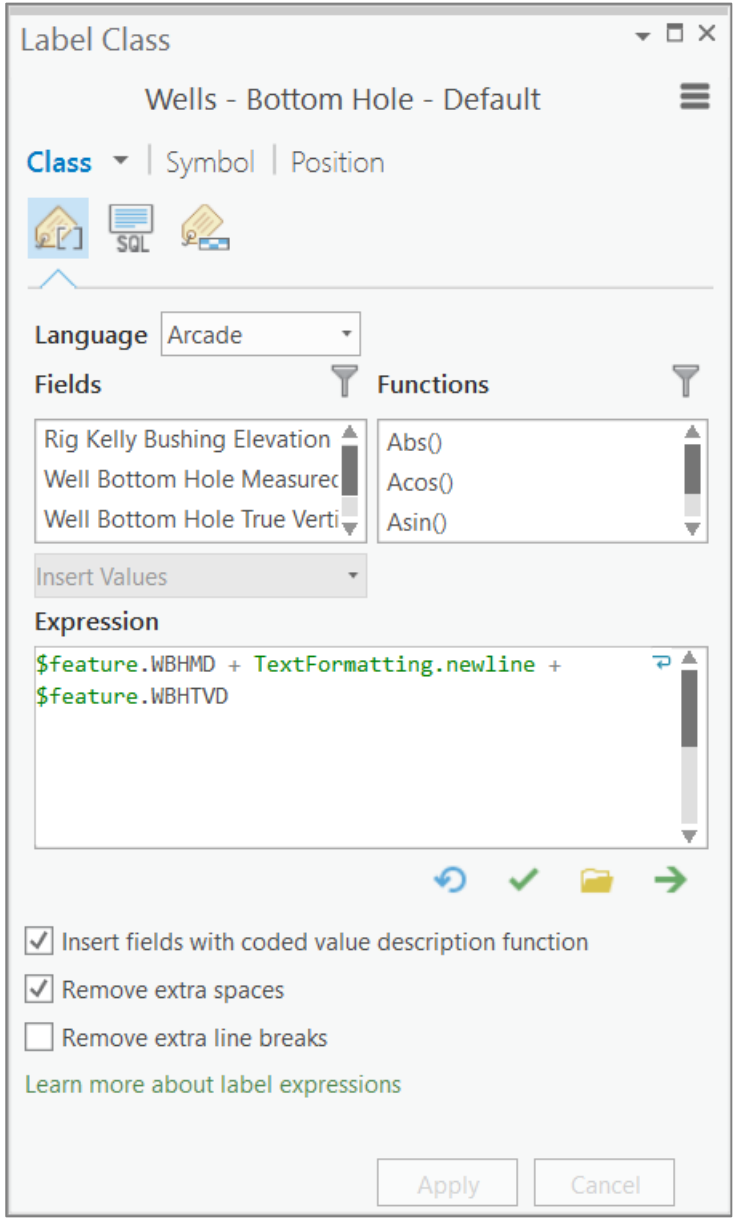
What does it look like?

$feature.landAcreage * .01

(Multiply the LandAcreage attribute by .01 and return the result.)

Why Arcade?

- Labeling, field calculations, symbology, pop-ups will work the same
- Use across windows, Android devices, and iOS devices
- Small and uncomplicated
- Syntax similar to JavaScript and Python



Where Is Arcade Used?

- Arcade manipulates data on the fly for:

Labeling

```
$feature.TYPE + "\n" + $feature.STATUS;
```

Symbology

```
if ($feature.OilProduction > 0){
  return "Oil Producer"}
else {
  return "Other"}
```

Pop-Ups

```
$feature.GasProductionMCF \ 5800;
```

Field Calculations

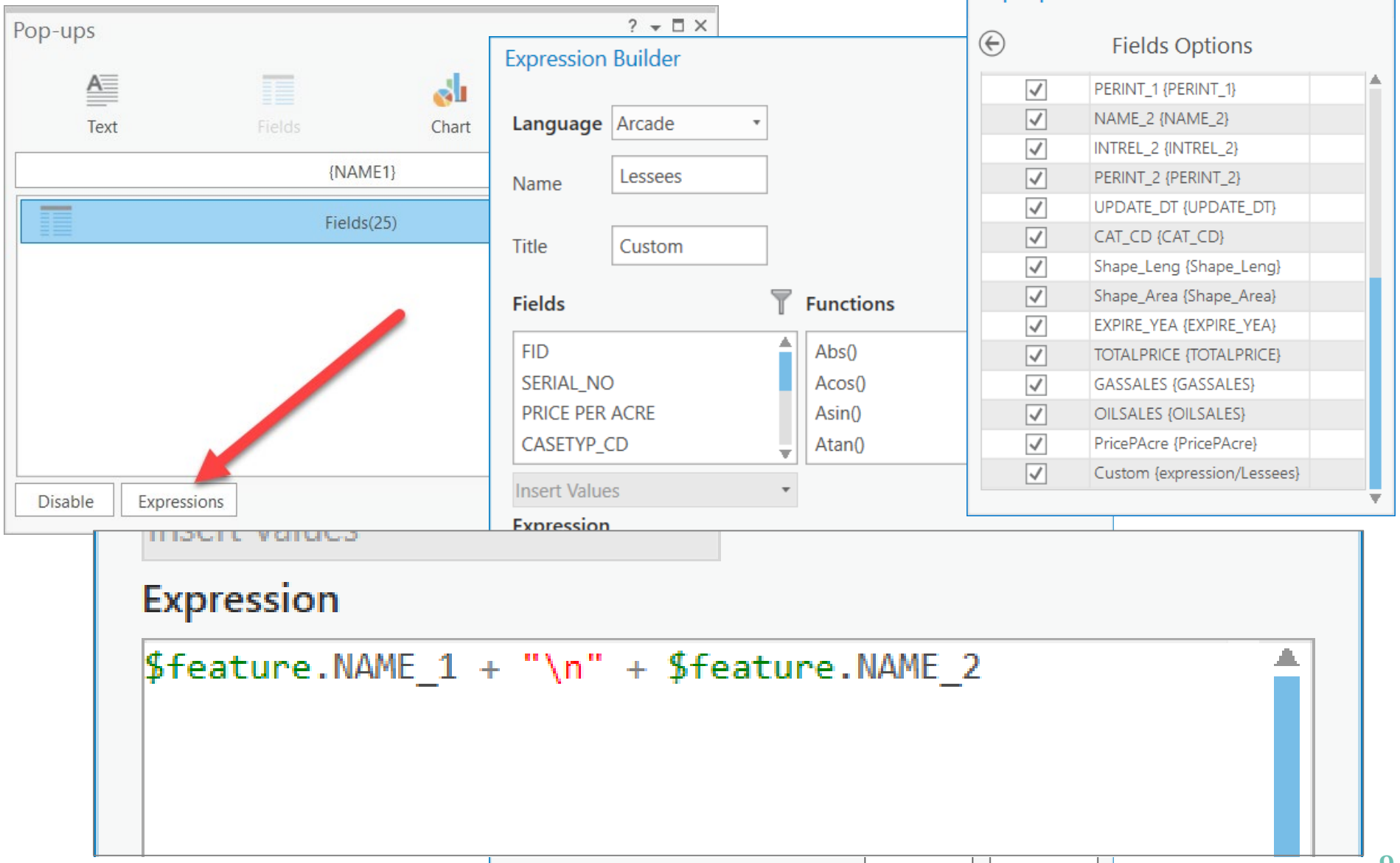
```
$feature.Shape_Length \ 5280;
```

Arcade Profiles

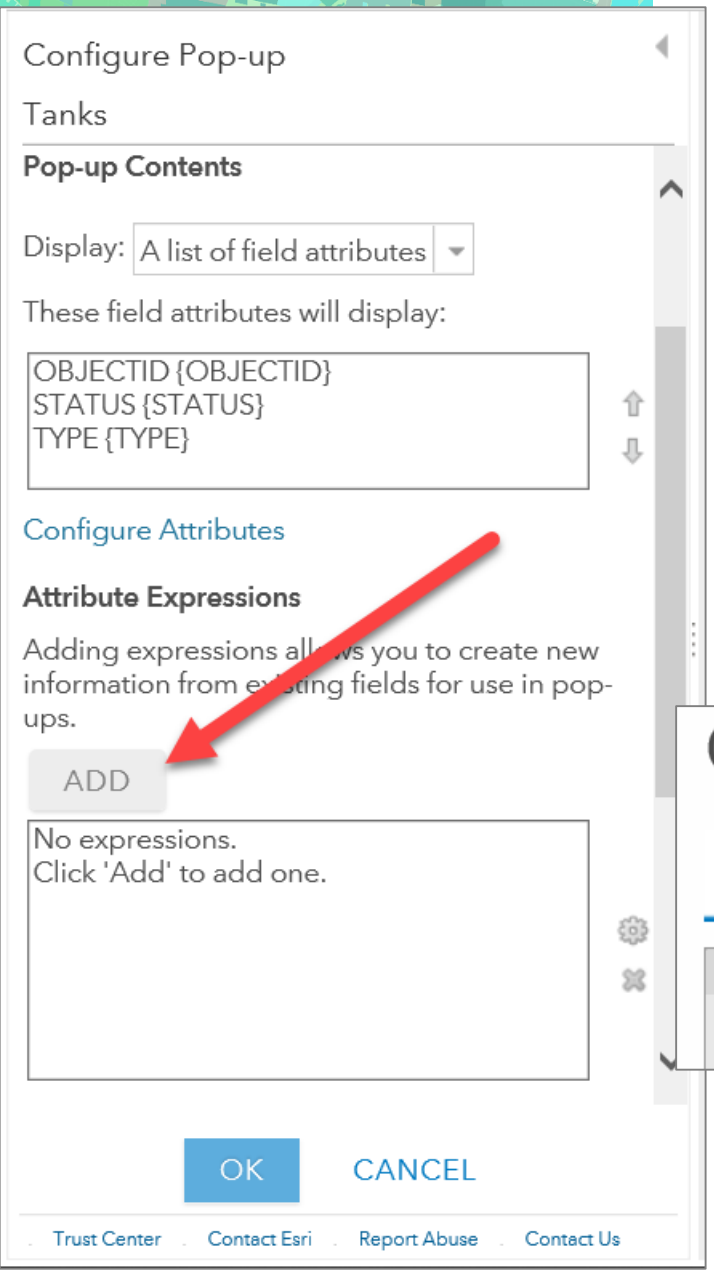
- Profiles – Arcade has slightly different capabilities depending on where in the ArcGIS world you are using them
  - **Field Calculation**
  - **Labeling**
  - **Pop-Ups**
  - **Visualization**
  - **There are others**
- Profiles define which parameters are available as global variables
  - In the Arcade interface, you see only those that are used by that profile

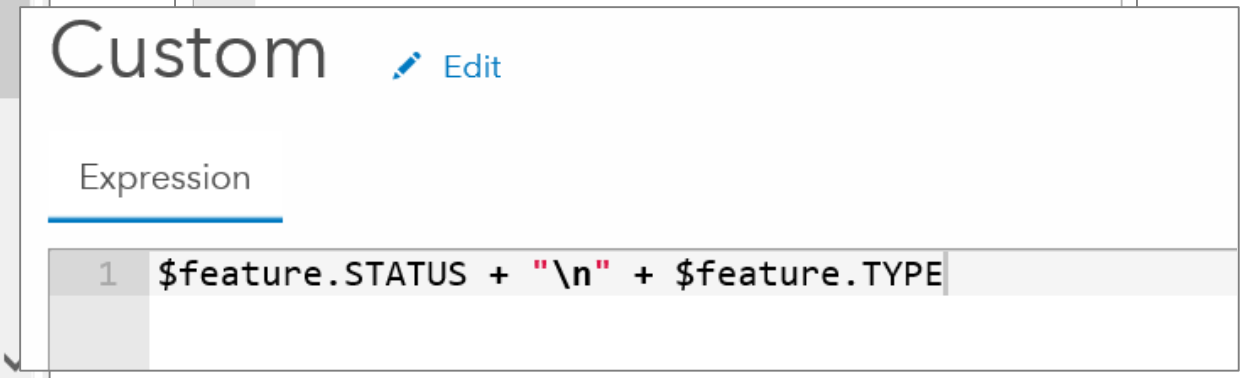
An Example: Pop-Ups in Pro

Custom Pop-Ups in ArcGIS Pro



An Example: Pop-Ups in Web Maps





Basic Syntax

Basic Syntax

- Similar to Python and to JavaScript
  - But NOT case sensitive

```
$feature.API or $FEATURE.api
```

- Arcade scripts execute and return a value. That's all they do. They cannot alter their environment. With multi-line scripts, use `Return` to return the value (but this can be omitted).

```
return $feature.Shape_Length / 5280
```

Basic Syntax

- Lines should end with a ; (but this can be omitted on single line code or when it's obviously the end of the line)

```
return left($feature.API,2);
```

- Comments start with // or /*

```
/*
  This code concatenates lease
  acreage with expiration date
*/
//This is a single line comment
```

Basic Syntax

- Concatenate strings using a `+`

```
$feature.API + "-" + $feature.Operator;
```

- Arcade makes smart assumptions (implicit type casting) about the data type to determine whether the + should concatenate or do math
- What about the Python `"\n"` or Visual Basic `vbNewLine` equivalent?

```
"\n"
TextFormatting.NewLine
```

It doesn't work in ArcGIS Online yet. It should be available later in 2019. It works in Pro, though.

Other TextFormatting: `.BackwardSlash`, `.DoubleQuote`….

Example: Field Calculations

- ArcGIS Pro Field Calculations
- Calculate the total cost of a lease, given that you have the following columns:
  - Price Per Acre (as a text string)
  - Shape_Area (in square meters)

1. Convert the price per acre field to a number
2. Convert the Shape_Area to acres
3. Multiply the price per acre times the area, in acres

```
($feature.Shape_Area * 0.000247105)
    * Number($feature.PRICE)
```

Arcade Operators and Functions

Operators You Are Familiar With

- Mathematical Operators

  +, −, /, *, %(modulus), ++, many others

- Boolean/Logical Operators (for comparisons)

Description	Operator
Equals	==
Not Equal	!=
AND	&&
OR	||

Functions That Look Familiar

- String Functions:

  `Upper`, `Lower`, `Mid`, `Left`, `Right`, many others

- Numeric Functions:

  `Mean`, `Min`, `Max`, `Round`, many others (work on feature sets, using $layer.<field_name>)

- Date Functions:

  `Today`, `DateDiff`, `Day`, `Month`, `Year`, many others

- These things allow us to do what we have been doing for years in ArcMap, but there are also Data Functions and Geometry Functions, for more advanced Arcade scripts (not covered in this workshop)

Arcade Global Variables

- $feature is a global variable that represents the feature that is being processed (for example, the feature that you clicked on when you get a pop-up)
- Use $feature before field names to reference the field values. You can think of $feature like a pointer to the current record:

```
$feature.API + "\n" + $feature.Operator;
```

- Use $map and $layer to get access to features from multiple layers all at once (to find min/max, for example).
  - There are functions that know how to work with $map and $layer
  - Mathematical functions, geometry functions, many other types

Data Functions

- Console
- Count
- Dictionary
- Distinct
- DomainCode
- DomainName
- Feature
- First
- Guid
- HasKey
- IndexOf
- NextSequenceValue
- Number
- Reverse
- Sort
- Text
- Top
- TypeOf

Date Functions

- Date
- DateAdd
- DateDiff
- Millisecond
- Second
- Minute
- Hour
- Month
- Weekday
- Year
- Day
- Now
- Today
- Timestamp
- ToLocal
- ToUTC

Logical Functions

- IsEmpty
- DefaultValue
- When
- Decode
- Iif
- Boolean

Text Functions

- Concatenate
- Find
- Lower
- Left
- Mid
- Proper
- Replace
- Right
- Split
- Trim
- Upper

Mathematical Functions

- Abs
- Acos
- Asin
- Atan
- Atan2
- Average
- Ceil
- Constrain
- Cos
- Exp
- Floor
- Log
- Mean
- Min
- Max
- Pow
- Random
- Round
- Sin
- Sqrt
- Stdev
- Sum
- Tan
- Variance

Geometry Functions

- Area
- AreaGeodetic
- Buffer
- BufferGeodetic
- Centroid
- Clip
- Contains
- Crosses
- Cut
- Difference
- Disjoint
- Distance
- Equals
- Extent
- Geometry
- Intersection
- Intersects
- Length
- LengthGeodetic
- MultiPartToSinglePart
- Multipoint
- Overlaps
- Point
- Polyline
- Polygon
- Relate

Create a Custom Pop-Up

- Consider this pop-up customization that will report the number of wells in a lease that is clicked-on

```
// get the count for all wells in the Lease

var well_layer = FeatureSetByName($map,"Piceance_Wells")

var well_count = Count(Intersects(well_layer,$feature))

return well_count
```

Custom Symbology with Arcade

Arcade for Symbology

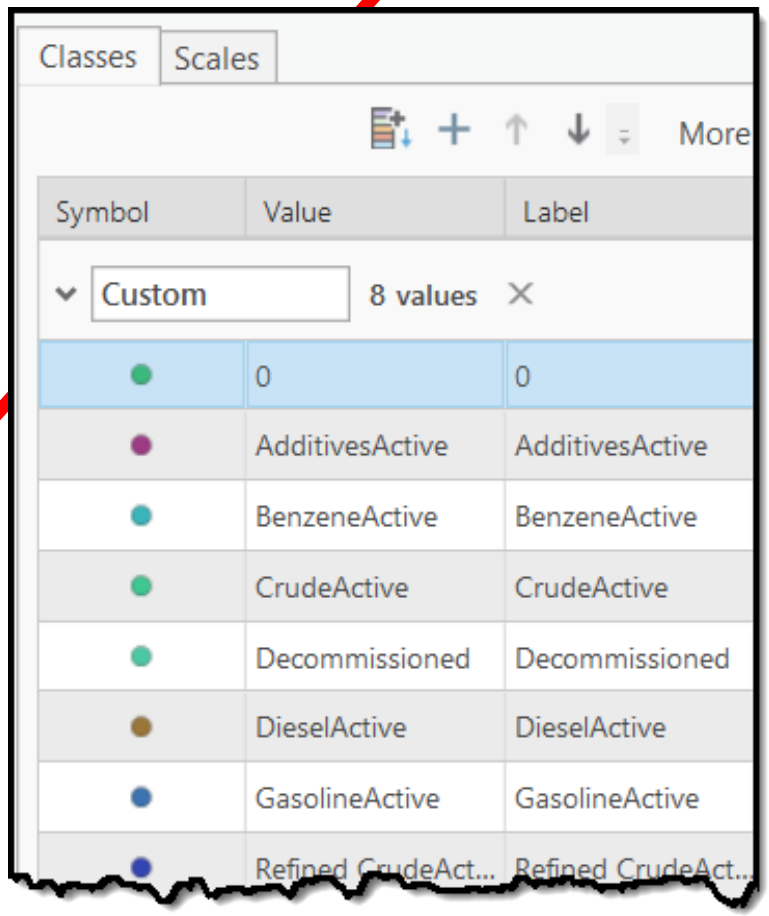
- Using Arcade, you can manipulate data on the fly to symbolize on a calculated field
  - You have production in MCF, but you want to symbolize based on OEB
  - You are length in feet, but you want to symbolize based on length in miles
  - You have oil and gas production values, but you want to symbolize based on whether the well is an oil or a gas producer:

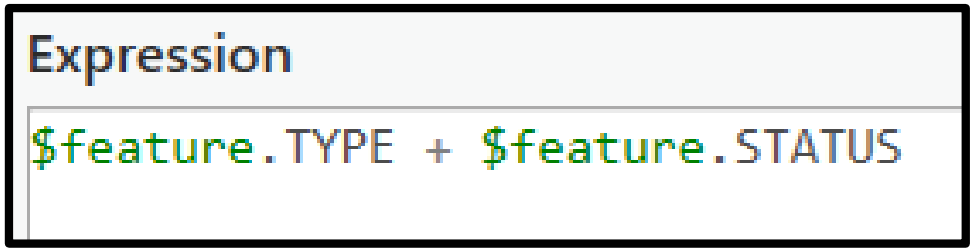
    "if the oil production is greater than zero and the gas production is zero, symbolize this as an oil well…"

Symbology Expressions?

- In ArcPro…

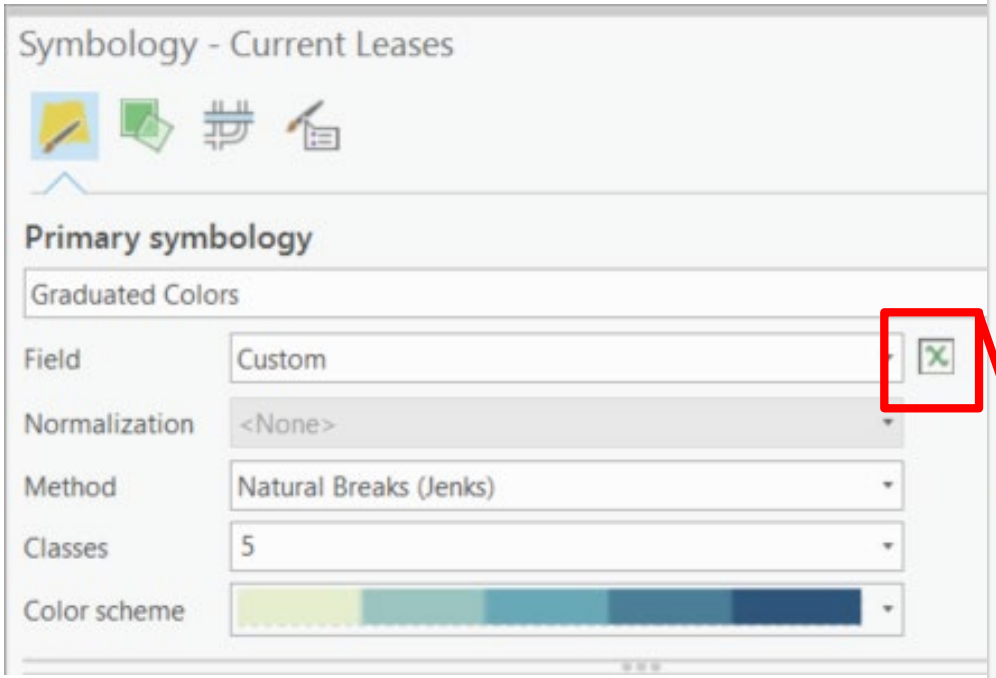
Appearance Tab → Symbology Pane → Pick Symbology Type → Click the Expression Icon

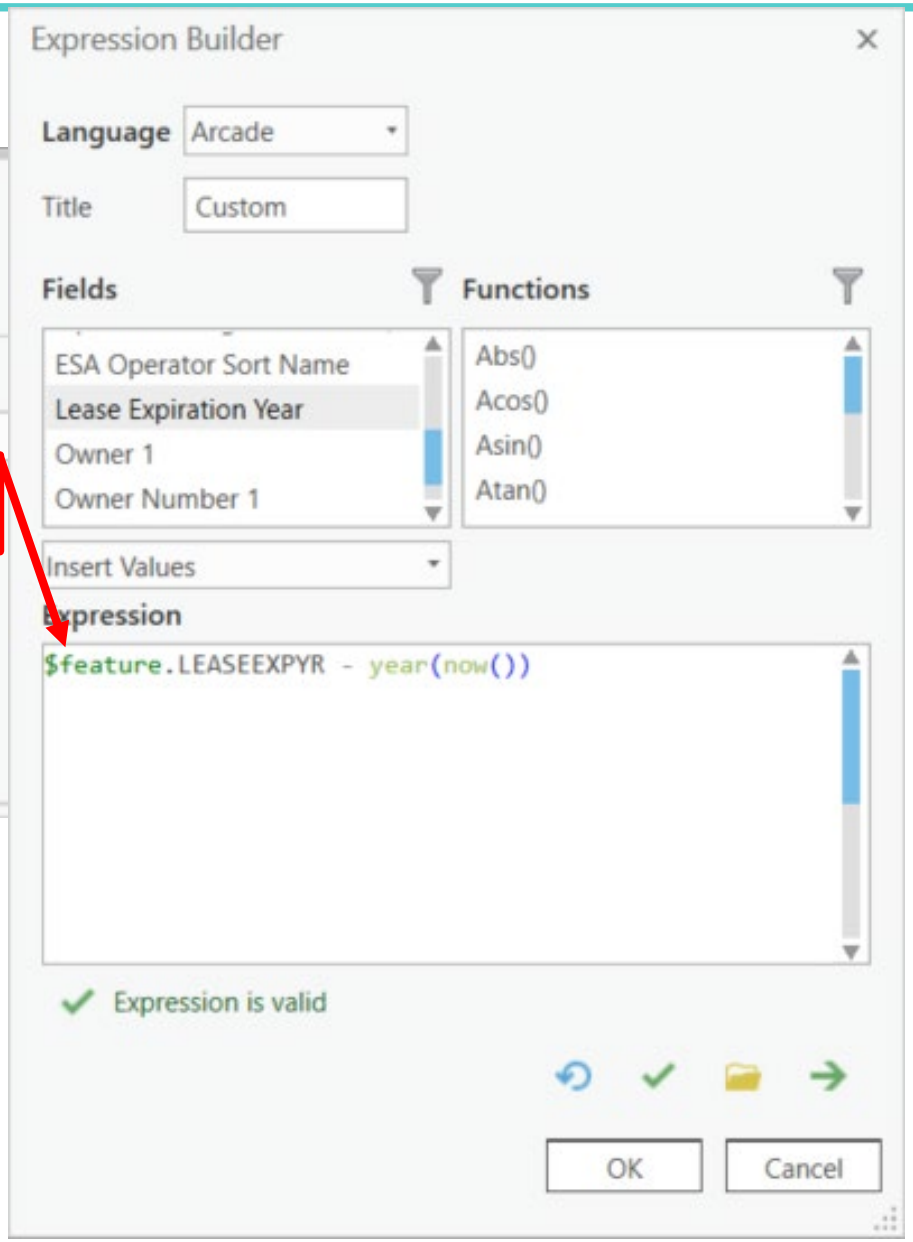




Example: Symbology

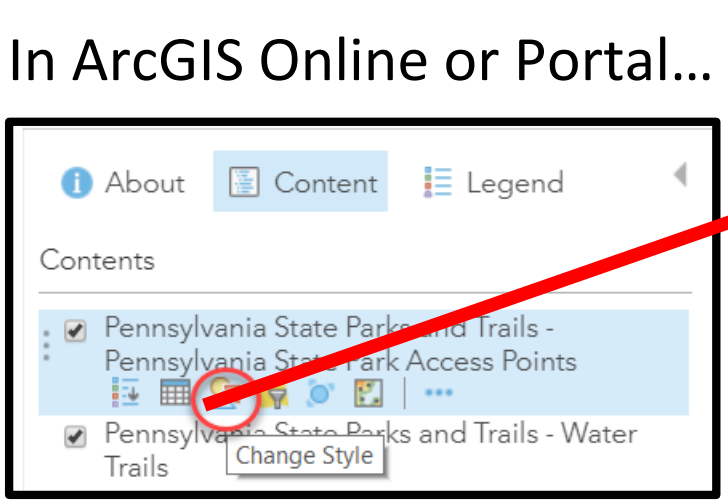
- Symbology in Pro

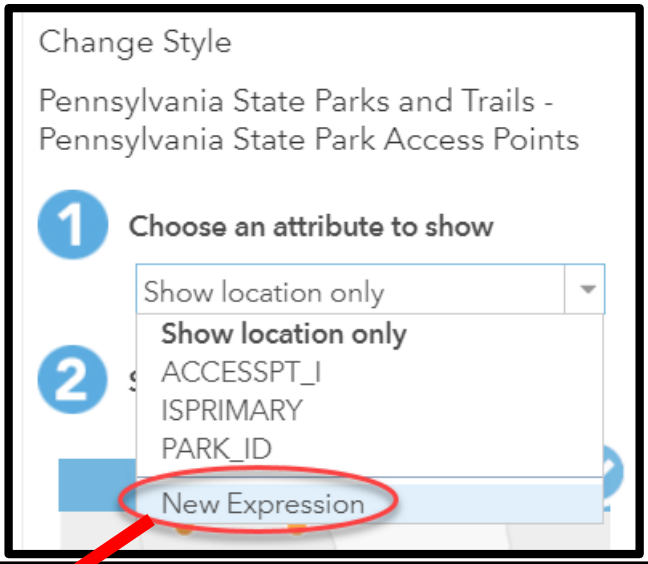


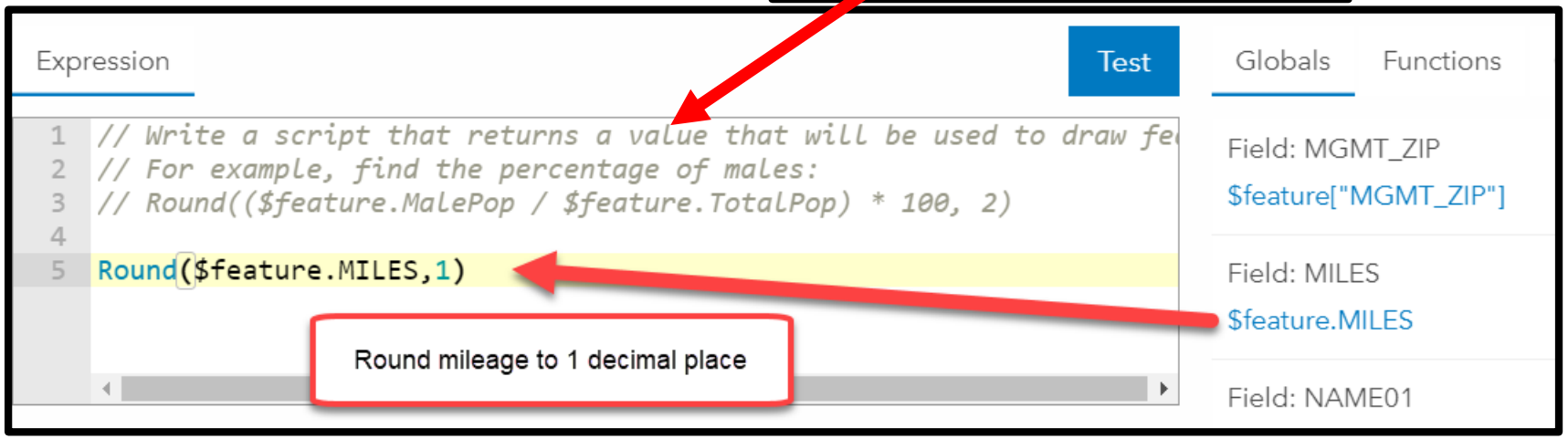


Symbology Expressions

- In ArcGIS Online or Portal…







Change Style Button → **Attribute to Show** drop-down → Scroll to the bottom of the list → Create New Expression

An Example: Symbology

- Suppose you want to symbolize your leases based on how long until they expire. BUT…suppose the only relevant column that you have in your leases table is the Expiration date, and it is stored as a date field.

```
Round(DateDiff(Date($feature.EXPIRE_DT), now(), 'days'))
```

Conditional Statements

Basic Syntax

- Conditional statements (if/then/else):

```
if ( left($feature.API,2) == "17"){
return "Louisiana"}
else {
return "Somewhere without good food"}
```

- Other single-line conditional statements:

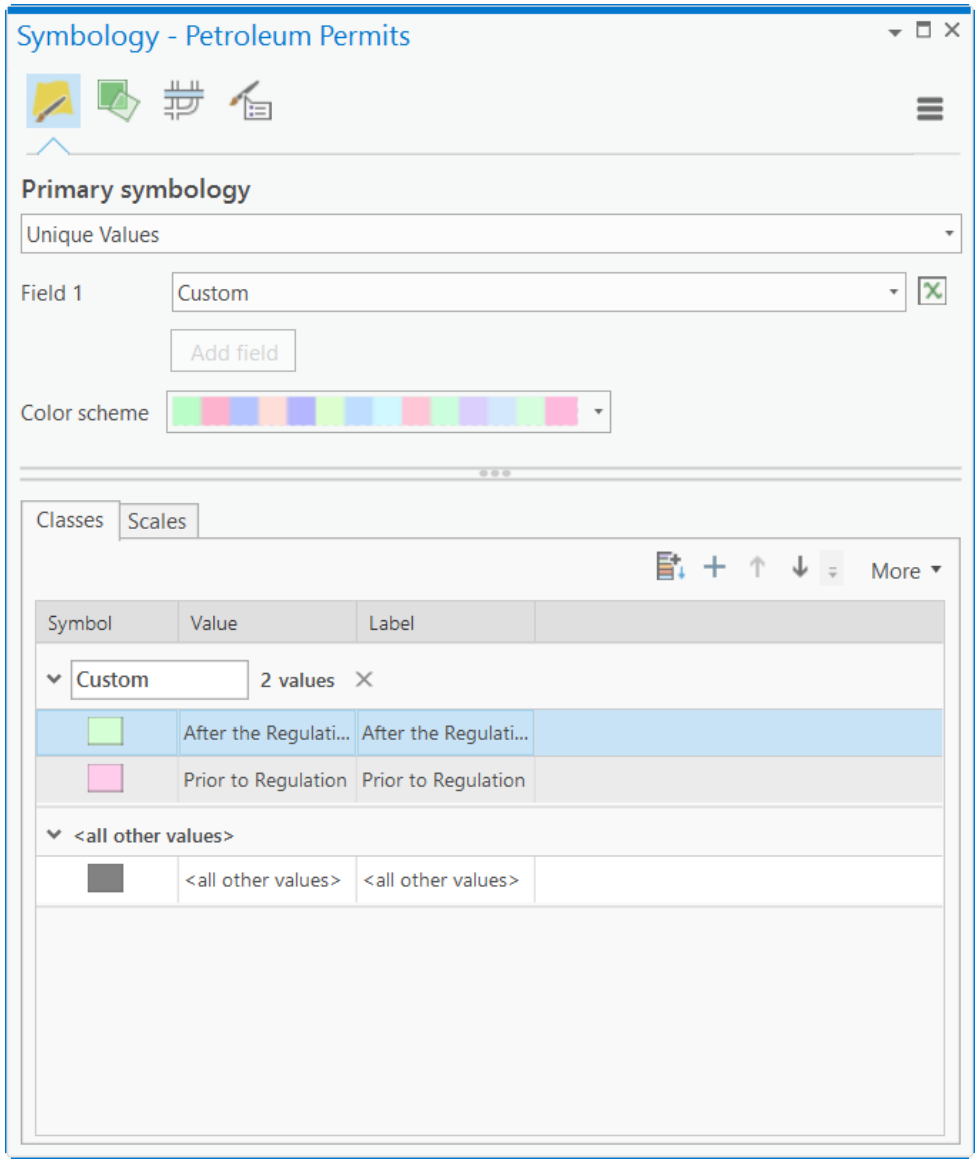
  IIF, Decode, When

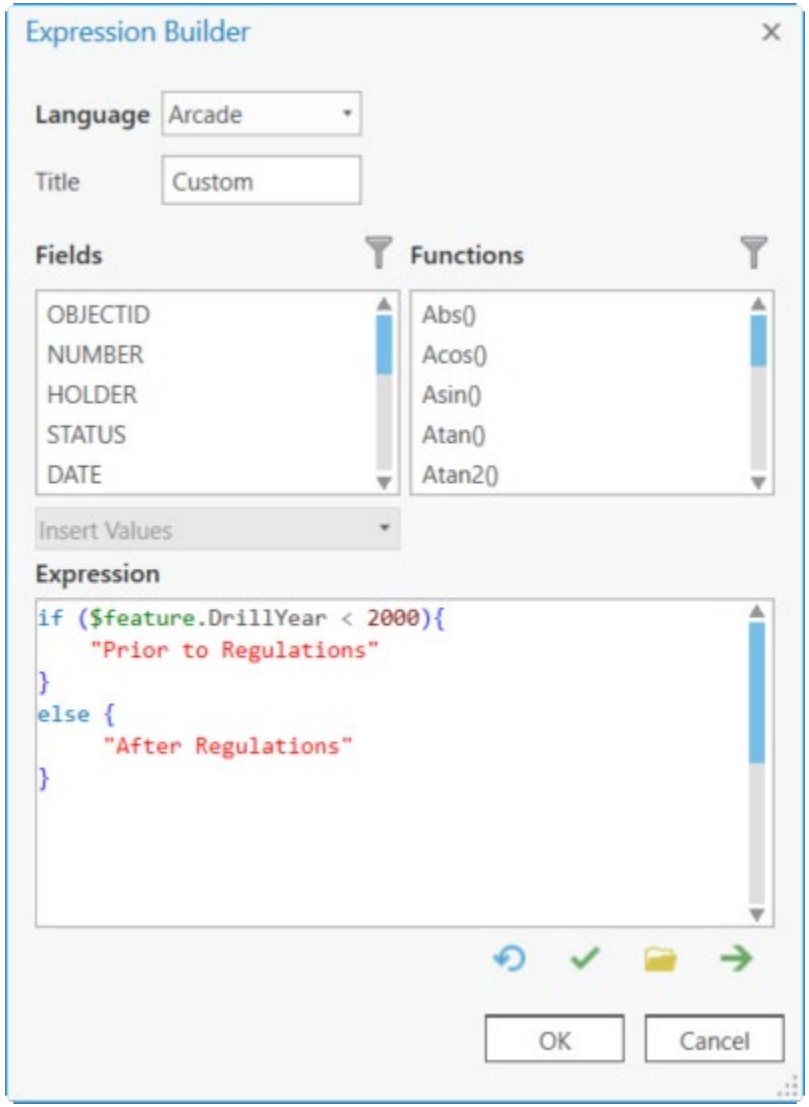
- A reminder about operators:

Description	Operator
Equals	==
Not Equal	!=
AND	&&
OR	||

Example: Symbology

- Create symbology based on a conditional statement

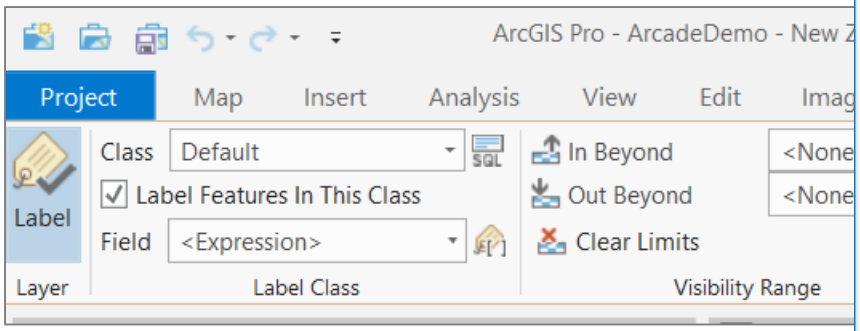


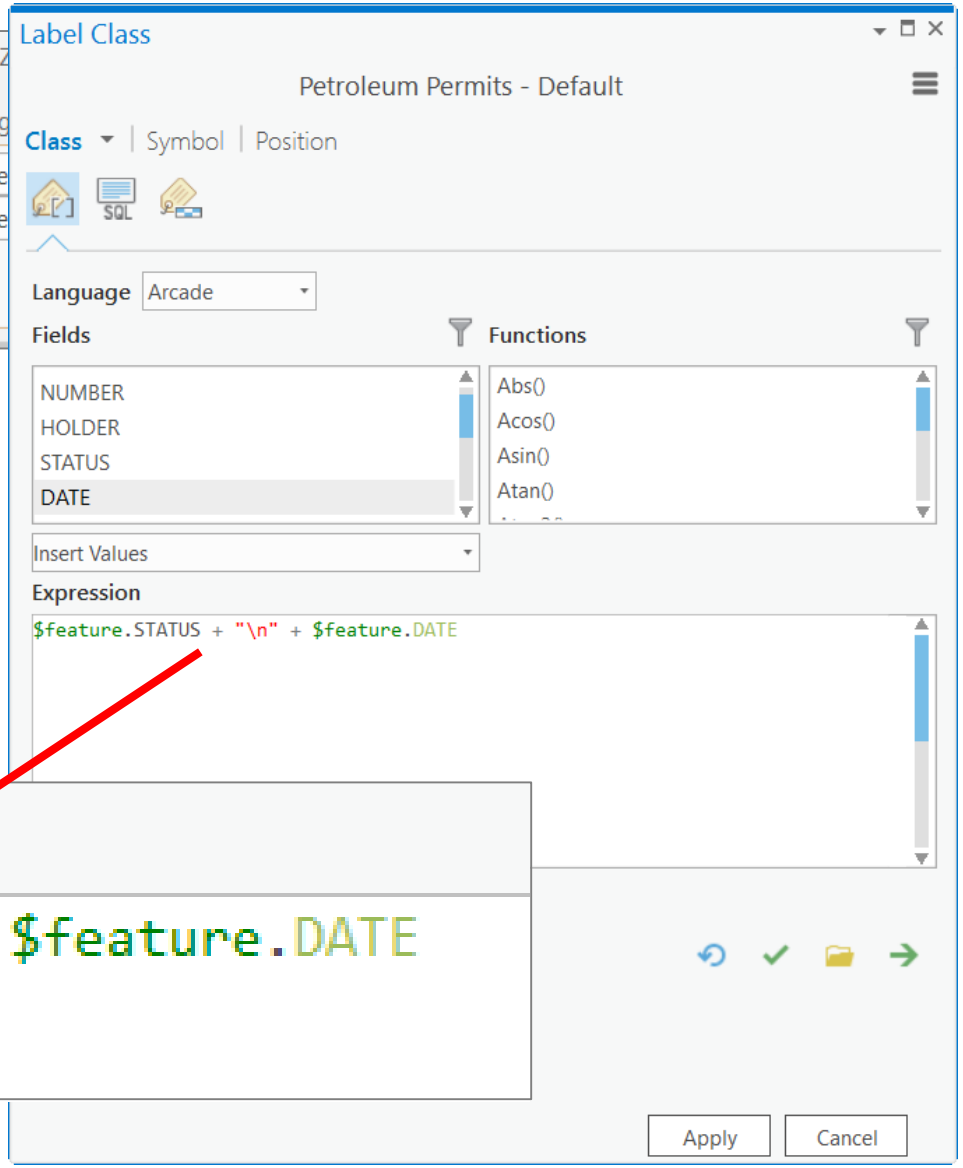


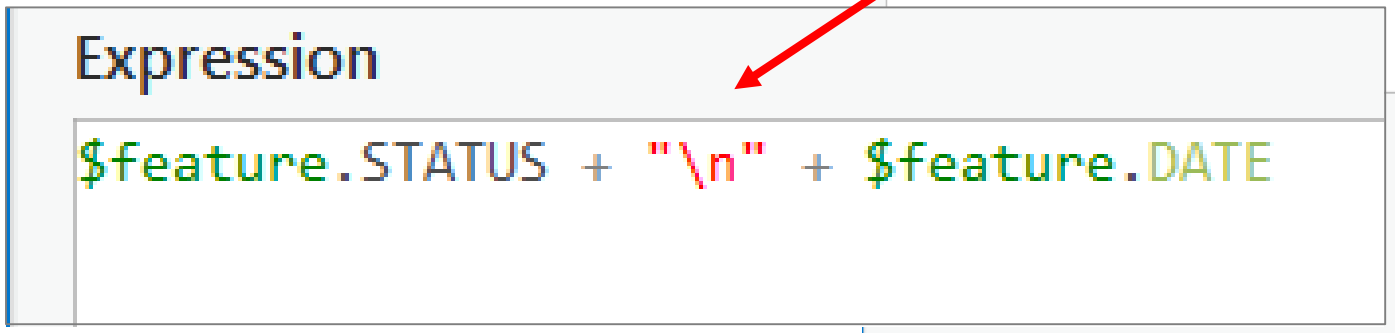
Arcade for Labeling

Label Expressions

Create Custom Label Expressions

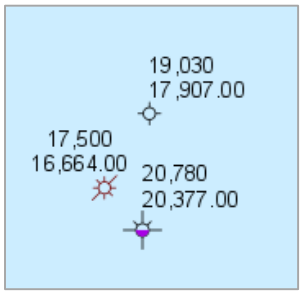


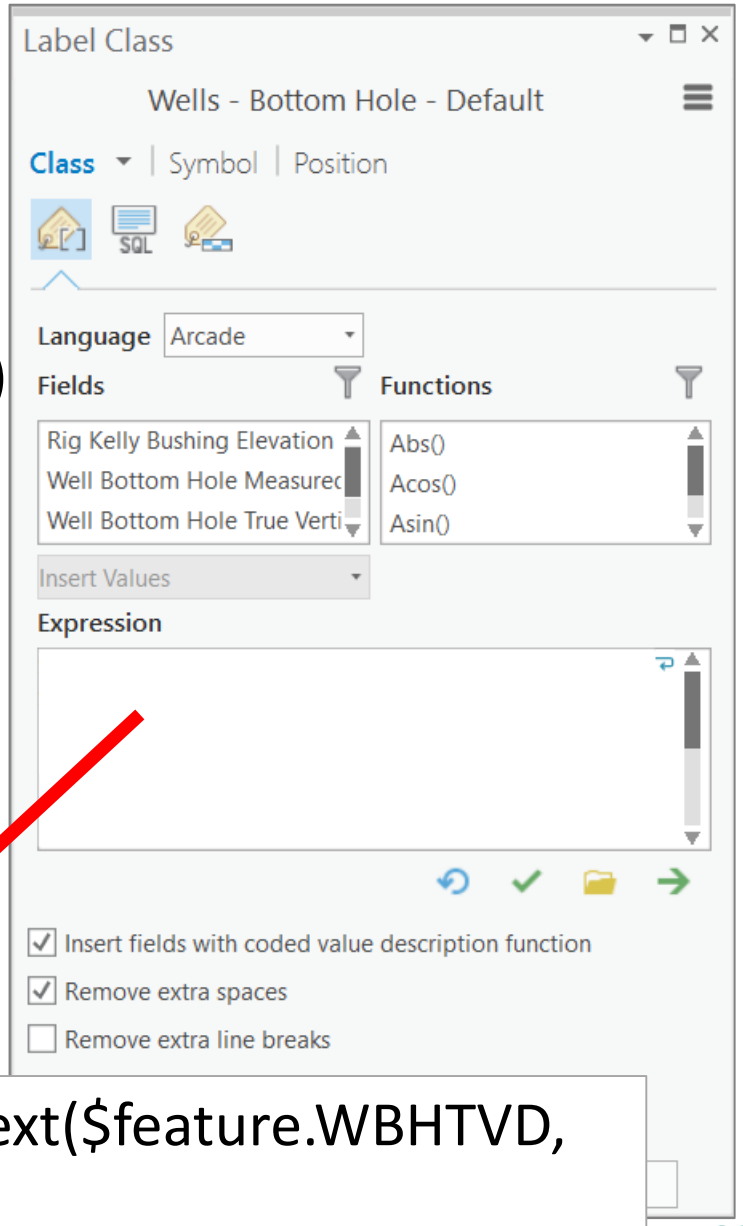




ArcGIS Pro Label Expressions

- Want it to look better?
  - Format the output with the `Text` function
  - ##,### (group by thousands)
  - ##,###.00 (round to 2 decimal places)
  - # is a placeholder for any digit, but it omits leading or trailing zeros
  - 0 is a placeholder for any digit (puts a zero if nothing is there)

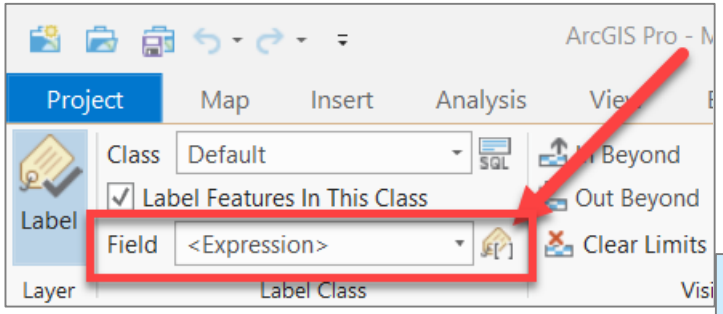


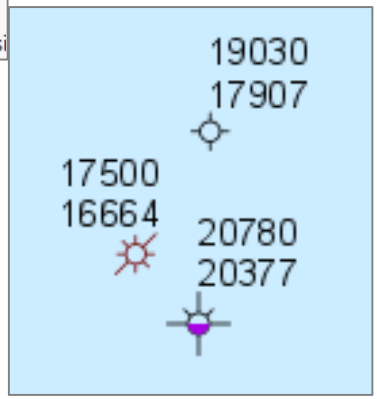


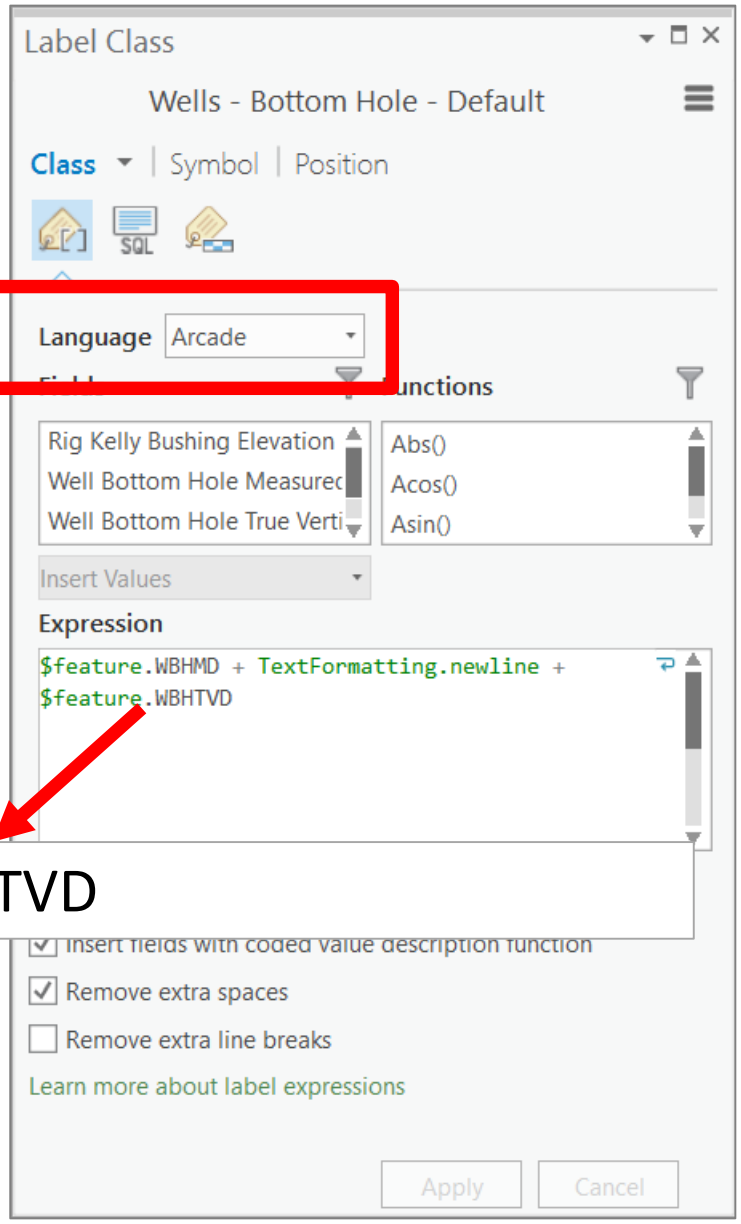

```
text($feature.WBHMD,"##,###") + “\n” +  text($feature.WBHTVD, "##,###.00")
```

Example: Labeling

- An example: Labeling in ArcGIS Pro:
  - Label wells with MD and TVD







$feature.WBHMD + "\n" + $feature.WBHTVD

- What would this have returned?

$feature.WBHMD + $feature.WBHTVD

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Thanks for Attending!

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