Dealing with distances

- Tools: Spatial Analyst Tools - Distance
- Two types of distance measured in ArcGIS:
  - **Euclidean** (straight line) distance
  - **Cost** distance
  - (Related: Allocation and direction info rasters)
- Euclidean (straight line distance) only based on points (here: stars) or line segments (i.e. many points)
- each cell: contains: a euclidian (real space) distance (float) to the closest point (where ever that point is!)
- it’s NOT known, which (ID) of the 3 points is that closest point
- traversal cost would be 1 for each cell
- Allocation raster: Which point is the closest? (space partition)
- Thought experiment (for later):
  - imagine the distance as elevation raster (point have 0 elevation)
  - Which path would a drop of water at the circled location take?
  - (related to direction info)

Real cost to traverse a cell

- Traversal cost raster encodes a abstract “cost” that influences the creation of a path
- Rule: to traverse this cell, you need to pay X
- Here X can be 1 - 10 (10: most expensive)
- land use (1 - 10):
  - roads (city) cost 1 (green)
  - fields cost 6 (yellow)
  - water cost 10 (red)
- black lines: roads layer - ignore triangles: schools (points)
**Cost distance raster**: How much to pay from here to get to the closest school?
Unit of cost is same as traversal cost raster (here: abstract, based on 1-10 scheme)
Shows the **accumulated** cost, NOT simply a “concentric” increase!

Also create the Cost backlink (distance) raster

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**Cost Back Link Raster**
- Encodes directions
- “On current cell, which direction do I need to go to get the shortest way back to the source?”
- 8 possible directions
- (0 means: you’re back on the source
- Needed later for shortest path operation
- Here: grey pixel is the only source (not roads!)
- Repeat until source is hit

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**Cost path tool**
- “destination” data: my location
- Destination field: gives the value for path raster? (not sure...)
- Needs: Cost distance raster, cost backlink direction raster
- Both rasters contain indirect information about source points (schools)
- Result: shortest (cheapest) line to go from start to any source point(s)

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**Shortest Path**
- Raster of optimal (shortest, cheapest) path (rest: Nodata cells)
- PATHCOST: total cost along this path
- Convert path raster to line feature (didn’t work for me :(}
HW 5 - shortest path based on slope cost

- 1) create euclidian distance around schools
  (the rest will deal with cost distances only)
- 2) reclass the slope raster into to 1 - 10, equal intervals and use it as traversal cost raster
- 3) Create cost distance and cost backlink rasters
- 4) create cost path my location to nearest school
- 5) compare to landuse cost based path