Elastic Multiplication Notes

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### Phase 1: Fraction as action (operator)

Pull equally: observe midpoint as being fixed.

Relax equally: observe midpoint as being fixed.

Invariance in the midst of change

Use elastic to find mid points of various lengths;

Use elastic to find doubles

Doing & Undoing

Use elastic to find 1/3 points; to find 2/3 points; to find triples; to find 3/2’s.

Doing & Undoing

Opportunity to generalise

Fraction as operator

### Phase 2: Determining scale factor

Mark mid-point; stretch so mid-point is where old unit point was (other end fixed). What scale factor? Where does one-third-point go? Four-fifths-point? Cloud’th-point? Shrink so unit point is where old mid-point was. What scale factor?

Mark one-third-point; stretch so one-third-point is where old two-third-point was. What scale factor? Shrink so unit-point is where old one-third-point was. What scale factor?

Invariance in the midst of change

Doing & Undoing

Opportunity to generalise

Start again and stretch so one-third-point is where old unit-point was. What scale factor? Shrink so unit-point is where old one-third-point was. What scale factor?

### Phase 3

Mark one third point and one-half point.

Stretch until one-third-point is where old one-half-point was. What is scale factor?

Approach 1: stretch one-third-point to old unit point (factor of 3); then shrink to old one-half-point (factor of ½) overall scale factor is 3/2.

Approach 2: Undoing, shrinks one-half-point to old one-third-point so unit point shrinks to old two-thirds-point, so scale factor is 2/3 and hence stretch has scale factor 3/2.

Approach 3: distance from 0 to ½ has had half of itself added to it, so 1 ½ or 3/2 scale factor.