

Exeter Density

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Calibration Data

| length | pixelLength | weight | pixelVolume |
|--------|-------------|--------|-------------|
| 463 | 181 | 100 | 5637083 |
| 525 | 193 | 116 | 6031855 |
| 650 | 198 | 120 | 6335393 |
| 600 | 222 | 118 | 6716032 |
| 600 | 222 | 122 | 7034454 |
| 425 | 266 | 131 | 7480873 |
| 575 | 332 | 164 | 8853113 |
| 550 | 346 | 175 | 9449946 |
| 550 | 346 | 190 | 10855547 |
| 700 | 383 | 190 | 10855547 |
| 650 | 392 | 237 | 12538366 |

length in inches x 100 and weight in ounces x 10

Calculating Density

Multiplying length by 0.0254 to get lengthCm (0.0254cm per 100th of an inch)

| length | lengthCm |
|--------|----------|
| 463 | 11.7602 |
| 525 | 13.3350 |
| 650 | 16.5100 |
| 600 | 15.2400 |
| 600 | 15.2400 |
| 425 | 10.7950 |
| 575 | 14.6050 |
| 550 | 13.9700 |
| 550 | 13.9700 |
| 700 | 17.7800 |
| 650 | 16.5100 |

Dividing pixelLength by lengthCm to get pixels/cm estimates

| pixelLength | lengthCm | pixelsPerCm |
|-------------|----------|-------------|
| 181 | 11.7602 | 15.39089 |
| 193 | 13.3350 | 14.47319 |

| pixelLength | lengthCm | pixelsPerCm |
|-------------|----------|-------------|
| 198 | 16.5100 | 11.99273 |
| 222 | 15.2400 | 14.56693 |
| 222 | 15.2400 | 14.56693 |
| 266 | 10.7950 | 24.64104 |
| 332 | 14.6050 | 22.73194 |
| 346 | 13.9700 | 24.76736 |
| 346 | 13.9700 | 24.76736 |
| 383 | 17.7800 | 21.54106 |
| 392 | 16.5100 | 23.74319 |

Calculating mean number of pixels/cm, then raising to power of three to get cubic pixels/cubic cm

```
meanPixelsPerCm = mean(cdata$pixelsPerCm)
cubedPixelsPerCmCubed = meanPixelsPerCm ^ 3
```

Dividing pixelVolume by cubic pixels/cubic cm to get volume in cubic cm

| pixelVolume | cmCubed |
|-------------|-----------|
| 5637083 | 774.4210 |
| 6031855 | 828.6547 |
| 6335393 | 870.3547 |
| 6716032 | 922.6468 |
| 7034454 | 966.3915 |
| 7480873 | 1027.7204 |
| 8853113 | 1216.2384 |
| 9449946 | 1298.2312 |
| 10855547 | 1491.3323 |
| 10855547 | 1491.3323 |
| 12538366 | 1722.5175 |

Multiplying weight by 2.83495 to get weight in grams (2.83495 g per 10th of an oz)

| weight | weightGrams |
|--------|-------------|
| 100 | 283.4950 |
| 116 | 328.8542 |
| 120 | 340.1940 |
| 118 | 334.5241 |
| 122 | 345.8639 |
| 131 | 371.3784 |
| 164 | 464.9318 |
| 175 | 496.1162 |
| 190 | 538.6405 |
| 190 | 538.6405 |
| 237 | 671.8832 |

Dividing weight in grams by volume in cubic cms to get density estimates, then calculating mean density

| cmCubed | weightGrams | densityCmCubed |
|-----------|-------------|----------------|
| 774.4210 | 283.4950 | 0.3660735 |
| 828.6547 | 328.8542 | 0.3968531 |
| 870.3547 | 340.1940 | 0.3908682 |
| 922.6468 | 334.5241 | 0.3625701 |
| 966.3915 | 345.8639 | 0.3578921 |
| 1027.7204 | 371.3784 | 0.3613614 |
| 1216.2384 | 464.9318 | 0.3822703 |
| 1298.2312 | 496.1162 | 0.3821479 |
| 1491.3323 | 538.6405 | 0.3611807 |
| 1491.3323 | 538.6405 | 0.3611807 |
| 1722.5175 | 671.8832 | 0.3900588 |

```
meanDensityCmCubed= mean(cdata$densityCmCubed)
meanDensityCmCubed
```

```
## [1] 0.3738597
```