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THREE-DIMENSIONAL ANALYSIS OF ROOT SURFACE AREA USING CBCT

by

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Submitted in partial fulfillment of the requirements for the degree of Master of Science in Dentistry

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THREE-DIMENSIONAL ANALYSIS OF ROOT SURFACE AREA USING CBCT

Abstract

by

BOYD D. MARTIN, III

The objectives of this study were to evaluate root morphology, including root surface area, root length, and percentage root surface area, using cone beam computed tomography. The Hitachi CB MercuRay™ was used to scan the selected patients during "records week" at the Case School of Dental Medicine, as part of the routine diagnostic records. Thirty subjects were randomly selected and 240 teeth studied. The CBCT images were measured using commercially available software (CyberMed's Accurex v.1.1). The reconstructed data was analyzed slice-by-slice using a modification of root planimetry, in which the root surface area for each slice is summated into the whole, based off the perimeter of the root in each slice. In addition, the total number of slices was converted to the root length, using the known height of each slice (0.28 mm). The teeth analyzed were

the maxillary right central incisor, maxillary right lateral incisor, maxillary right first bicuspid, maxillary right first molar, mandibular right central incisor, mandibular right canine, mandibular right first bicuspid, and mandibular right first molar. Measurements were repeated on twenty-four randomly selected teeth; twelve single rooted teeth and twelve multirooted teeth. The surface area was also determined using a simpler mathematical cone model and compared to the slice by slice average using paired t-tests. The root surface area of the teeth was analyzed in relationship to the length, to determine the percentage of coronal root length that contained 50% of the total root surface area.

Average root surface area ranged from 109.78 mm^2 for the mandibular central incisor to 330.74 mm^2 for the maxillary first molar. The average root lengths ranged from 10.18 mm for the mandibular central incisor to 12.85 mm for the mandibular canine. Results were normalized between gender for root surface area ($r > 0.99$) and length and ($r > 0.91$). Intraoperator analysis for CBCT measurements showed good correlation for both single rooted and multirooted teeth ($r > 0.97$ and $r > 0.98$ respectively). A statistically significant difference was

found between root surface area using root planimetry and the root surface area derived from the cone model. The percentage of the coronal root that contained 50% of the total root surface area was found to vary between 37% on the maxillary central incisor to 40% on the mandibular first molar.

DEDICATION

This thesis is dedicated to:

My parents, Boyd and Jeanne, I appreciate your unwavering support. For all the sacrifices you have made for both Catherine and I; believing that we could indeed be anything we wanted in life.

To my sister, Catherine, I hope that I have led by example. Our relationship is as close as any brother and sister could be. I have enjoyed watching you come into your own; as a successful and accomplished woman.

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LITERATURE REVIEW

Root length and root surface area are topics well studied in restorative, periodontal, and orthodontic literature, and is of clinical importance (Hujoel 1994) in daily practice. There have been many studies categorizing the morphology and variation of the individual teeth ranging from the use of traditional radiography to other investigative and experimental methods.

Rationale and Clinical Implications

In order to create a tooth-type standard, Wheeler selected a sample of ideal teeth and reported average length, circumference and morphology (Ash 2003). Further studies incorporated the estimation of root surface area. In restorative dentistry, the amount of surface area is related to the crown to root ratio of abutment teeth in fixed prostheses (Luthra et al. 1974; Mowry et al. 2002, Pan et al. 2004). The ratio of supported to unsupported root structure (Chen et al. 2002) has been attributed the prognosis of a tooth. In addition, the surface area has been related to the amount of stress that a tooth can

withstand (Klock et al. 1993; Levy, Wright 1978; Nicholls et al. 1974). These factors can affect the prognosis of any individual tooth in the eyes of a clinician.

In periodontal literature, the emphasis on prognosis of a tooth is dependent on the remaining bone available for attachment. This has been studied using a single tooth type, such as a maxillary or mandibular first molar (Mowry et al. 2002; Dunlap, Gher 1985; Gher, Dunlap 1985). A key factor in retaining a tooth is the ratio of supported root structure (Chen et al. 2005; Klock et al. 1993; Levy, Wright 1978; Yamamoto et al. 2006). In fact, the functional root consists only of the root that is supported by bone (Despeignes 1970). Traditionally, linear probing measurements have been used to estimate the amount of attachment using periapical radiographs (Jeffcoat, Williams 1984) or lateral cephalograms (Phillips 1955). The cross section of teeth, however, vary greatly along their root (Chen et al. 2002), and the morphology (Gher, Vernino 1980) of multirooted teeth make it more difficult to use linear measurements (Klock et al. 1993). Linear measurements may overestimate (Chen et al. 2004; 2005) or underestimate (Klock et al. 1993) the

surface area and do not take into account the root shape (Jeffcoat, Williams 1984). Jeffcoat stated that cross-sectional surface area provides a clearer idea of the periodontal support of the tooth versus a linear measurement. Length estimates of amount of attachment remaining have been shown to underestimate the true amount of attachment (Hujoel, Bollen 1989; Jeffcoat, Williams 1984; Klock et al. 1993) because they do not adequately reflect the curvature of the root or the tapering nature of the root.

The importance of coronal attachment is also critical in teeth with furcation involvement (Gher, Dunlap 1985). Several studies have discussed the root surface area between separate roots in molar teeth (Dunlap, Gher 1985; Gher, Dunlap 1985; Gher, Vernino 1980; Hermann et al. 1985) with regard to periodontal prognosis after hemisection, following fucation involvement.

In both restorative and periodontal literature, there is an emphasis placed on assessing the attachment on the coronal end of the tooth. There is a greater percentage of periodontal attachment in the crestal two-

thirds and the crestal one-third has been shown to be more important in altering the crown to root ratio (Lupi et al. 1996). The number of Sharpey's fibers has been shown to be decreased in the apical third (Brown 1982).

Orthodontic inquiries into root surface area involve both the effect of orthodontically induced apical root resorption and the surface area for anchorage considerations (Crabb, Wilson 1974; Luthra et al. 1974). There are more resorptive cells in the apical third (El-Bialy et al. 2004) and the cementum is less dense in this region (Malek et al. 2001), making it more likely that root resorption will occur there. Cementum is usually more resistant to resorption than alvelolar bone (Brezniak, Wasserstein 1993) but as the cross-sectional area decreases, there is more force per unit area during orthodontic tooth movement (Beck, Harris 1994). The apical portion of the root has been shown to have little effect on the overall attachment apparatus of the tooth (Kalkwarf et al. 1986) because there is less area to be lost as the root tapers to the apex (Chen et al. 2002; Hujoel, Bollen 1989; Jeffcoat, Williams 1984; Klock et al. 1993). Commonly with orthodontic mechanics, there is

some blunting of the roots. In some cases, there is severe root resorption, and there has been an increase in malpractice claims against orthodontists due to root resorption (Brezniak, Wasserstein 1993; El-Bialy et al. 2004). Maxillary incisors were shown by some studies to be the most frequently affected teeth (Beck, Harris 1994; Dermaut, DeMunck 1986; Lupi et al. 1996; Phillips 1955; Remington et al. 1989; Sameshima, Asgarifar 2001) and in cases of severe resorption, the most severely affected (Lupi et al. 1996).

Based on the above clinical implications across multiple dental specialties, it is important for the clinician to be able to accurately assess root surface area using a non-invasive yet accurate measurement.

Previous studies have been completed using a variety of techniques to measure surface area. In addition, a meta-analysis of surface area measurements was published in 1994 by Hujoel. In the period 1950-1992, taking into account 4,730 measurements from twenty-two studies (Hujoel 1994), norms for surface area were reported. The methods used consist solely of the membrane method, weight conversion, and division planimetry. The meta-

analysis reports the number of teeth measured. Sixty percent of the measurements come from one Russian study, so all result are reported with and without that study (Hujoel 1994). The studies all had different inclusion and exclusion criteria, and more modern techniques including digital radiography, direct contact methods, or computer-aided methods were not included.

Measuring Root Surface Area

Membrane Method

Surface area measurements using the membrane method have been studied since 1950. By using a thin membrane over the root surface, and then transferring this membrane to a measurement grid, an estimation of the three dimensional root surface area can be obtained. Membrane materials ranged from latex (Crabb, Wilson 1974), tin foil (Crabb, Wilson 1974, Phillips 1955), vinyl acetate and α-cyanoacrylate (Yamamoto et al. 2006), or thin paper (Mowry et al. 2002).

Phillips (1955) measured root surface area of eight teeth using tin foil to cover the root. Tin foil was placed up to the cementoenamel junction on all surfaces, then transferred to a planimeter. Averages were not

reported, however, after systematically reducing the root length in 2 mm increments, the surface area of the root was re-measured. The first 2 mm was estimated to hold 5-10% of the total root surface area, while 6 mm of apical root structure contained 30-40% of the root surface area. However, Phillips only measured this in maxillary and mandibular central and lateral incisors (two each).

Crabb and Wilson (1974) used a similar technique using tin foil to measure the surface area of 120 maxillary canines. Exclusion criteria were stated, and the sample was from teeth extracted due to crowding. The sample however, included teeth with incomplete apical development (age range 9-28 years). Averages were reported for males and females separately: the average for males was 2.61 cm^2 and the average for females was 2.28 cm^2. There was no difference between right and left maxillary canines. Reliability was reported to be good, however the technique was reported to be time consuming and very technique sensitive.

As recently as 2006, Yamamoto et al. used a computer-aided membrane technique to determine remaining attachment level of teeth of 420 extracted teeth. This

sample included thirty of each tooth type including second molars. This was the only study using this method that included multi-rooted teeth in the sample. The study used both a coating of vinyl acetate and α-cyanoacrylate as the membrane material. An image of the membrane was captured using a video camera, and enlarged on a computer screen for measurement. Lines were hand drawn on the root in 2 mm increments for measurement purposes. Averages were reported by Yamamoto for both the surface area and the root length (measured by caliper in a separate procedure). The largest surface area was found in the maxillary first molar, while the smallest was found in the mandibular central incisor.

The percent of total root surface area loss after removing increments of 2 mm to model attachment loss was reported. Four different mathematical models were also used to estimate the slope of the percentage surface area loss - linear, quadratic, cubic, and exponential. This study found the linear measurements to be the most reliable is estimation of surface area, supporting traditional probing methods is assessing surface area, however the slope of the line varied by tooth type.

Longer teeth had a gentler slope, and the loss of surface area per mm was less. The lines drawn in 2 mm increments mimicked the curvature of the CEJ, however there may be error in hand-drawn lines.

Other errors from the membrane method may include distortion of the measurement material (Despeignes 1970; Crabb, Wilson 1974) and the inability of the material in concavities to lie flat on the measurement grid (Mowry et al. 2002; Nicholls et al. 1974).

Weight Conversion Method

The weight conversion method coats a model of the tooth with heavy metals, which were later weighed to determine the weight change (Klock et al. 1993). The layer used was an even coat of benzene (Luthra et al 1970), silver plate (Despeignes 1970), or other heavy metals (Klock et al 1993). Some used actual teeth, while others used plaster models (Luthra et al. 1974) of the teeth. The weight conversion before and after was then used to estimate the surface area of the root.

In 1974, Luthra et al. used twenty plaster models of a maxillary central incisor which absorbed benzene vapor on its surface. The method was first applied to models

of known geometric shapes to test for reliability. The conversion in weight using the known weight of benzene was used to determine the surface area of the maxillary central incisor root. The average surface area was reported to be 2.18 cm^2 for all twenty maxillary central incisor root models.

Klock et al. used a similar procedure in 1993 using Cu and Co metal ions in a sample of 280 extracted teeth. Area measurements were made using weight conversion of a coating of heavy metals, either cupric chloride ($CuCl_2$) or cobalt chloride ($CoCl_2$). Repeat measurements were made for reliability. Linear measurements were also made using a series of measurements made to represent a periodontal probing depth (to the coronal aspect of the attachment). Averages for six tooth-types were reported for both surface area and root length. The central and lateral incisors were combined into one average. The smallest surface area ranged from 1.7 cm^2 for the maxillary second biscuspid to 4.4 cm^2 for the maxillary first molar. A comparison was made between the linear loss of attachment and the surface area lost. In teeth with mild to moderate attachment loss, there was a

correlation between linear and area loss of 0.62. In teeth with more than 50% attachment loss, there was a lower correlation (0.25) between the area loss and the linear loss of attachment. This was attributed to root morphology, and the decrease in cross-sectional perimeter of the root. The conclusion was that linear measurements may underestimate the overall attachment loss, when compared to area measurements.

The method of weight conversion using a plaster model was time consuming and adds an additional step which may introduce error (Mowry et al. 2002) into the study. The weight conversion method has been shown to produce a higher surface area than other methods (Hujoel 1994) and is impractical in the clinical setting. The coefficient of variation in these studies has been shown to be variable (Yamamoto et al. 2006) and the results may not be as reliable as other methods.

Division Planimetry

A series of studies from 1982-1985 was completed under the direction of the Naval Research Center (Hermann et al 1982; Dunlap, Gher 1985; Gher, Dunlap 1985) to investigate root surface area in maxillary and mandibular

first molars. Using sections of 1-2 mm slices (Kalkwarf et al. 1986; Levy, Wright 1978; Mowry et al. 2002), the surface area of each slice is used to summate into a whole.

Hermann et al. (1982) focused on the relationship of the surface area of twenty maxillary first molar roots to one another and to the total root surface area. The teeth were embedded in acrylic and sectioned in 1 mm sections. A photograph of each slice was produced and enlarged in order to measure the slice perimeter. There were two separate measurements per slice, one apical and one coronal, which were averaged. The total root surface area was found to be 476.43 mm^2 with a range of 360-582 mm^2. Length was determined by adding the number of 1 mm slices along the length of the root. In addition, the distobuccal root was found to have the least amount of root surface area, compared to the mesiobuccal or palatal roots.

In 1985, Dunlap and Gher as well as Gher and Dunlap measured root surface area in both the maxillary and mandibular first molars. In Dunlap and Gher, twenty mandibular first molars were embedded in acrylic and

sectioned in 1 mm increments. Root circumference was measured and converted into slice surface area. The mean surface area was reported as well as the percentage of surface area contained in each millimeter. The average surface area was reported to be 436.8 mm ± 63.7 mm^2. Nearly 50% of the surface area was contained within the coronal 6mm of root length. In addition, the mesial root was shown to contain more of the total root surface area than the distal root.

The same study was carried out on twenty maxillary molars as well (Gher, Dunlap 1985). The average surface area was reported to be 477.0 mm^2 with a range of 336.4-584.0 mm^2. Approximately 50% of the root surface area was contained within the coronal 6 mm of root length, or about one-half the root length. This study reported a "ballooning" of surface area in the furcation area (similar to Levy, Wright 1978) with the largest surface area per millimeter in this area.

The inability of the division planimetry method to follow the curvature of the CEJ (Mowry et al. 2002) has been cited as an error in the estimation of root surface area (Yamamoto et al. 2006). These studies had

relatively small sample sizes and were specific to one particular tooth-type.

Computer Aided Methods

There were a number of studies that used digitzed surface area of cross-sections of the tooth (Kalkarf et al. 1986; Levy, Wright 1978; Nicholls et al. 1974) using a modification of root planimetry.

The first investigator to use a digital computer was Nicholls et al. in 1974. Teeth were mounted into leucite blocks and then sectioned into 2 mm increments. The perimeter of each slice was analyzed reassembled by computer into a three dimensional model from which root surface area could be determined. Three teeth were measured and averages were reported. The amount of root length that contained 50% of the root surface area was also reported, which varied between 36.1-38.5% of the coronal root.

Levy et al. (1978) used nine extracted mandibular first bicuspids embedded into plastic and analyzed in 1 mm segements similar to the method used by Nicholls et al. The slices were photographed and the perimeter of the slice recorded digitally using 28 points. This data

was fed into a computer to reassemble the root in three-dimensions. The average surface area and length were reported to be 258.7 mm^2 and the 14.5 mm. It was also reported that 50% of the attachment was contained in the coronal 38.5% of the root length.

The above methods (Levy, Wright 1978; Nicholls et al. 1974) use a computer-aided modification of root planimetry, and the same problem of measuring the true CEJ as a straight line applies. This could affect the overall estimate of the surface area. Later methods take this into account through digital imaging not requiring the sectioning of the tooth.

Kalkwarf et al. (1986) measured the surface area of a single maxillary right central incisor using a computed generated image. Images were recorded for each 30° around the tooth. The surface area was not reported, however the percent surface area was reported as decreasing from 100% for each millimeter of vertical root resorption (from the apex). Fifty percent of the attachment area was contained in the coronal 6 mm of root length. This study equated 3 mm of root resorption to 1 mm crestal bone loss.

As recently as 2002, a similar method was used to measure the surface area of mandibular canines and bicuspids (Mowry et al. 2002). The sample consisted of fifty each of the three extracted tooth-types. Lines were drawn on the root surface in 2 mm increments. Video images of the teeth were obtained for all four surfaces. Length measurements were obtained by hand, using a Boley gauge. Surface area averages were reported to be 275.88 mm^2, 251.45 mm^2, and 271.81 mm^2 for the mandibular canine, first bicuspid and second bicuspid respectively. In addition, surface area for the 2 mm increments was also reported decreasing from 100% at the CEJ to simulate periodontal disease. Fifty percent of the root surface area was contained in the coronal 6 mm for both the canine and first bicuspid, and in the coronal 8 mm for the mandibular second bicuspid. This study also included the root surface up to the CEJ, unlike other methods (Levy, Wright 1978; Nicholls et al. 1974).

However, methods using video imaging require precise tooth positioning (Mowry et al. 2002) because the machinery is highly sensitive. Also, these studies use a convenient sample of extracted and exclude teeth with

fused roots or other damage from the extraction procedure.

Radiography

Early studies investigating root surface area, morphology, and root resorption used traditional dental radiography to examine the root structure. In essence, a radiograph is a one dimensional representation of a 3-D object (Chen et al. 2002). In addition, traditional periapical and panoramic radiographs have a magnification between 5-20% (Sameshima, Asgarifar 2001). Methods using traditional radiography require precise paralleling techniques (Remington et al. 1989) to avoid distortion of overlying anatomic structures (Misch et al. 2006). The angulation of radiographs must be standardized or corrected to make an accurate assessment. Digital dental radiographs can also be used to estimate root surface area. Using the density of the pixel after attenuation of the beam, the thickness of the material can be determined (Beers' Law), and therefore the surface area.

Chen et al. (2002) used digital radiographs to determine root surface area using single projection data of a single extracted tooth. A three-dimensional surface

area measurement was then estimated of the root parallel to the central ray as an ellipse. When the central ray was not perpendicular to the tooth, the surface area was underestimated.

Pan et al. (2004) also used Beers' Law to estimate root surface area from the attenuation of the beam in digital radiographs. Eight extracted teeth were placed next to a wedge of known thickness. The pixel values were then transformed into thickness data. The circumference of the root slice and half the thickness (radius) were used to determine the surface area. The results were compared to two other methods which will be discussed later (a direct contact CMM method and a stereolithographic method).

Errors of using digital radiography may include the algorithm used to estimate the surface area from projection data (Chen et al. 2002). In addition, the assumption of symmetry in cross-section (Pan et al. 2004) or the use of an ellipse to represent the cross-section may not be accurate when estimating surface area (Chen et al. 2002). In addition, radiographic studies cannot assess buccal and lingual root structure (Dermaut,

DuMunck 1986) unless using a three-dimensional approach (Jeffcoat, Williams 1984; Sameshima, Asgarifar 2001). Attachment has been shown be better related to surface area measurements, rather than linear measurement (Hujoel et al. 1989) as the amount of surface area for attachment may very greatly with the same linear loss in different tooth types (Hujoel et al. 1992).

Direct Measurement Techniques

The use of direct measurements on extracted teeth came from the error introduced into radiographic studies by the measurement technique. By using extracted teeth, the radiographic error could be avoided, however clinical use proved to be difficult. These studies measured the extracted teeth directly, using a unique computer and probing system.

Chen et al. (2004,2005) and Pan et al. (2004) went a step farther and used computed generated images of extracted teeth to examine root surface area using CAD/CAM technology. Eight extracted teeth were analyzed using a coordinate measurement system (CMM), which digitizes points using a probe that actually contacts the tooth surface. The tooth root was embedded into wax and

the digital probe circumscribed the tooth. The CMM technique requires specific machinery and takes more time than a "non-contact method" such as digital scanning or optical laser scanning. In addition, the probe is unable to accurately assess multi-rooted tooth. In 2004 and 2005, Pan et al. and Chen et al. compared the "true" surface area from CMM data to the previously discusses digital radiographic data of eight extracted teeth. Thickness data were collected in two ways. The first extrapolated data from a stereolithography format to estimate surface area, which was similar to the "true" surface area. The second used a step wedge of known thickness to estimate thickness using digital dental radiography. A stereolithographic model (Chen et al. 2004) of a tooth was created and surface area was calculated based on a 0.7 mm pixel height. Chen used a digital probe and CAD/CAM technology to create a 3-D model of the tooth, which could be used to determine root surface area (CMM). The tooth root was embedded into wax and the digital probe circumscribed the tooth. The root surface area was then determined in a sequentially modeled loss of periodontal attachment loss (Chen et al.

2004). Chen showed that length-based estimates (1-D) of surface area are less accurate than those based on thickness (2-D) or surface area (3-D). In both studies, thickness data was only available from extracted teeth. There was less error when using the thickness estimates from the stereolithographic model (< 5%), however data from the digital images were found to be easier to use and within an acceptable error range (20%).

Surface area was not reported as an average, however Chen et al. (2004) reported percentage surface area decreasing from 100% from the coronal end of the root. The eight teeth are all of different lengths, and the percentages are reported separately for each tooth. Errors of the direct contact method includes inability of the probe to enter the furcation (Chen et al. 2005), which may alter the surface area estimate.

Three Dimensional Surface Area Estimation

The analysis of the root in three dimensions has been postulated in the literature as the future in assessing root surface area (Jeffcoat, Williams 1984; Sameshima, Asgarifar 2001). In previous attempts to assess three dimensional surface areas, the root has been

modeled as a right circular cone (Luthra et al. 1970; Jeffcoat, Williams 1984; Chen et al. 2004). However the natural root morphology is not an exact match. Attachment is multidimensional (Jeffcoat, Williams 1984) and cross-sectionally, a tooth root is not a perfect circle, so a cone model does not take into account concavities or variations along the root length. The advent of the Cone Beam CT scanner made possible the analysis of teeth in three dimensions. Three-dimensional information allows for better root surface estimation (Chen et al. 2004, Pan et al. 2004) and overcomes traditional radiographic errors (Misch et al .2006).

The Cone Beam CT scanner (CBCT) uses a cone of radiation to create a three-dimensional image using a single scan. CBCT provides good tissue contrast, eliminates overlapping of adjacent teeth, and provides orthogonal views eliminating problems with projection effects (Elefteriadis et al. 1996). In 2001, Sameshima and Asgarifar stated that cross-sectional tomography may be the method of choice for optimum visualization, except that the cost and radiation exposure make it unpractical for routine use. Studies have been published on the

accuracy and reliabililty of CBCT measurements using different machines than the CB MercuRay™.

LaScala et al. (2004) used the NewTom® 9000 CBCT in analyzing eight dry skulls in linear skeletal measurements. They found linear measurements reliable except for those in the cranial base. The CBCT data underestimated the actual length, but the difference was not significant. Hilgers et al. (2005) performed a similar experiment on twenty-five dry skulls using the iCAT™ CBCT in analyzing images in three planes of space in the temporomandibular joint (TMJ) region using eleven anatomic landmarks. All CBCT measurements were found to be accurate in the TMJ region, unlike those from traditional cephalometry, which were all larger (Hilgers et al. 2005).

In 2006, Misch et al. reported on the use of CBCT measurements in periodontal defects. Using two dry skulls and gutta percha cones as a reference, the horizontal bone loss was measured. The CBCT allowed measurement of all four sides of the tooth, including buccal and lingual, making it a "superior technique" (Micsh et al. 2006). There were no statistically

significant differences between the actual measurement and those measured from the CBCT data. However, the use of dry skulls and gutta percha enhanced detection of the defects.

STATEMENT OF THESIS

The objective of this study was to evaluate root morphology, root surface area and root length of teeth in thirty randomly selected subjects, using cone beam computed tomography data and reconstruction software. A series of slice-by-slice images were used to compute the root surface area, length of the root of each tooth type and the percentage of root length containing one-half and one-third of the root surface area.

The method used is a modification of root planimetry, which will be compared to a simpler mathematical cone model using the length and perimeter at the coronal end of the root. It is hypothesized that there is no difference between the two methods of determining root surface area. If rejected, there would be a difference between the root planimetry and cone methods.

MATERIALS AND METHODS

The Case Western Reserve University Institutional Review Board (IRB) approved the experimental protocol. Subjects were selected randomly from a sample of patients presenting to the dental school for comprehensive orthodontic treatment in the graduate clinic. All initial records include an existing cone-beam computed tomography (CBCT) scan from the CB MercuRay™ (Hitachi Medical Systems America Co., Twinsburg, OH). The CBCT has user controlled variables designed to be used in different clinical situations, which may affect image quality. These settings include mA, kVp, and field of view. All initial records were standardized to 2 mA, 120 kVp and a 9 inch field of view. The measurement technique is a modification of root planimetry, in which the root is arbitrarily sectioned. Each slice in the constructed CBCT image has a standard voxel height of 0.28 mm, which is the predetermined slice thickness. The surface area of each slice is compiled into a total surface area estimation of the entire root.

All records used in this study were taken during the "records week" in April 2006. A 5% level of significance and an 80% power were used to calculate a minimum sample size of 25 per group. Thirty records were randomly selected out of 185 records.

Eight representative permanent tooth types were chosen to investigate, including the maxillary central incisor, maxillary lateral incisor, maxillary first bicuspid, maxillary first molar, mandibular central incisor, mandibular canine, mandibular first bicuspid, and mandibular first molar. Tooth types were chosen to represent others with similar root morphology and all teeth selected for investigation were on the right, as a matter of convention. The exclusion criteria were as follows: 1) absence of any of the investigated tooth-types, 2) incomplete apical development of any of the teeth investigated, 3) presence of movement artifact or unclear images and 4) teeth showing evidence of previous root resorption.

The Accurex software (Cybermed Inc., Seoul, Korea) was used to reconstruct the data from the CBCT. Each of the eight teeth was located along the long axis in three

planes of space; axial, coronal, and sagittal. The constructed cemetoenamel junction (CEJ) was located on the sagittal image where the buccal and lingual enamel ended along the root. The perimeter of the root in the axial slice was measured using a tool included in the software used along the long axis of the tooth. The perimeter of each slice was measured by a single investigator (BDM) and entered into an Excel 2003 spreadsheet (Microsoft® Corp., Redmond, WA). Moving apically slice by slice, the perimeter of each slice was collected until the end of the root (Figure 5). In multirooted teeth, the measurements were repeated for each root on one slice; two for the permanent mandibular first molar and permanent maxillary first bicuspid teeth and three for the permanent maxillary first molar teeth. In areas of the root trunk on multirooted teeth, the perimeter for two or three connected roots was measured as a unit until a clear delineation between the separate roots was observed. The complete number of slices was also recorded to be used to determine the length of the root (using the known slice height of 0.28 mm.) The last slice containing root surface was counted as 0.28 mm

Descriptive statistics were calculated using an Excel spreadsheet. Sample size was calculated using previously published means and standard deviations. Data were entered into SPSS 14.0 (SPSS Inc., Chicago, IL) for further data analysis. Using SPSS, a histogram was created for each tooth type to determine normal distribution. The surface areas were normally distributed for each tooth type across the thirty subjects. The mean root surface area averages were reported, including standard deviation and range. To determine if there was a gender interaction, an independent t-test between male and female averages were compared for both root length and total root surface area using Excel.

A reliability study was completed two weeks after the initial measurements. Twenty-four teeth were randomly selected for repeat measurements; twelve single rooted teeth, and twelve multirooted teeth. The data were entered in SPSS 14.0 to determine intraclass correlation values for single and multirooted teeth.

Two methods were chosen to estimate root surface area; a modification of root planimetry and a cone model

method. Root planimetry uses the perimeter and length of each slice to summate the total root surface area. The cone model method only uses the most coronal perimeter (circumference) and the length to determine surface area. Only the length of the root and the perimeter of the root at the CEJ are needed. The surface area results between the two methods were compared. A independent t-test was used to detect significant differences between the two methods while a correlation was used to determine if the two results showed a similar trend.

During data analysis, the perimeter of each slice was converted into slice surface area by multiplying the perimeter and the slice thickness. Using the separate slice thicknesses and total root surface area, it was determined the number of slices per tooth that contained one-half or one-third the total root surface area. This number of slices was converted to two figures; in millimeter and percent of the total root length. In order to compare the percentage of total root surface area in the coronal or apical end of the tooth, data was reported in three ways; in millimeters from the coronal or apical end of the root containing fifty percent of the

total root surface area, as a percentage of the root length containing one-half or one-third the total root surface area, and as a percentage of the root length containing one-half or one-third of the total root surface area.

THREE DIMENSIONAL ANALYSIS OF ROOT SURFACE AREA USING CBCT

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Objectives: To evaluate teeth morphology using cone beam computed tomography, including root length, surface area, and percentage surface area. **Methods:** The sample consisted of 15 male and 15 female patients, with an average age of 12.99+/-1.57 years. The teeth analyzed were the maxillary central incisor, maxillary lateral incisor, maxillary 1st bicuspid, maxillary 1st molar, mandibular central incisor, mandibular canine, mandibular 1st bicuspid, and mandibular 1st molar. The reconstructed data was analyzed using a root planimetry modification. The surface area was also determined using a simpler mathematical cone model and compared to the CBCT method. In addition, the total number of slices was converted to the root length. The root surface area was analyzed in relationship to the length, to determine the coronal and apical root length (in mm) and percentage root length (%) that contained 50% of the total root surface area. **Results:** The average root surface area ranged from 109.78mm^2 (mandibular central incisor) to 330.74mm^2 (maxillary 1st molar). The average root lengths ranged from 10.18mm (mandibular central incisor) to 12.85mm (mandibular canine). Results were normalized between gender for root surface area ($r>0.99$) and length and ($r>0.91$). Interexaminer analysis showed good reproducibility ($r>0.97$). A statistically significant difference was found between the CBCT Method and the cone model. The percentage of the coronal root that contained 50% of the total root surface area was found to vary between 37% on the maxillary central incisor to 40% on the mandibular 1st molar. **Conclusions:** On average, the coronal 39% of the root contained 50 % of the total root surface area for attachment for all tooth-types investigated. The cone model was inaccurate when compared to the CBCT Method.

INTRODUCTION

Root length and root surface area measurements have been well studied in dental literature. The surface area of the root is directly related to the amount of attachment of the periodontal ligament. In turn, the amount of periodontal attachment is important in the prognosis of a tooth, and is of clinical significance [1]. In restorative dentistry, the amount of surface area is important for the crown to root ratio of abutment teeth [2,3] or the amount of stress a tooth can withstand [4,5,6]. Finally in orthodontics, the surface area of the tooth is directly related to anchorage during tooth movement [2,7] and the force needed to move teeth. For these reasons, it is important for the clinician [1] to be able to accurately assess root surface area using a non-invasive yet accurate measurement.

The relationship between surface area for periodontal attachment and attachment level has been studied by single tooth type [3,8,9]. Linear measurements have been used to estimate remaining attachment [10], however a three dimensional method may be more accurate [10,11] as teeth vary greatly in cross section along the root [12]. Linear measurements have been shown to overestimate [13, 14] or underestimate [4] surface area for attachment. Conversely, linear measurements have also been shown to be dependent upon the amount of attachment loss [10] to adequately assess surface area. This may be especially true in multirooted teeth [4] due to the more complicated root anatomy.

The surface area of the root has been measured by time-consuming surface measurement techniques [2, 15] such as membrane coating or weight conversion. In

the "membrane method", the root is covered by a membrane, which is placed on a measured grid to measure surface area. Membrane materials range from latex, thin paper [3], tin foil [7], to vinyl acetate [15]. Error from this method may include distortion of the measurement material [3,6]. In the "weight conversion method", a model of the tooth is coated with heavy metals, which is later weighed to determine the weight change [4], which can be converted into surface area. Commonly used materials include benzene, silver plate, or heavy metals [4]. The models of the teeth were made of different materials, including dental plaster [2] which adds an additional step to the process [3]. These methods use extracted teeth and are impractical in a clinical setting,

Later studies used computer assisted methods [5,6,16] which often measure the perimeter of root slices in a method called "division planimetry". Using extracted teeth arbitrarily sectioned into slices of 1-2mm [3,5,8,9,16] slices, the surface area of each slice is used to summate into a whole. This method has a drawback in that the process is unable to account for the curvature of the CEJ on the teeth [6]. This method uses a mathematical formula to derive a surface area measurement from perimeter measurements using a known slice thickness.

Information from digital radiographs has been used to extrapolate root surface area in the clinical setting [17] by converting pixel density into surface area [12]. Estimation of the surface area in three dimensions has also been accomplished using extracted teeth and computer-aided design and manufacturing (CAD/CAM) [13,14,17] however, these methods are not available for clinical use. Later

modifications of this method do not actually section the teeth, but reconstruct captured data in three dimensional form via video imaging [3]. Computer-aided design and computer-aided manufacturing (CAD/CAM) have also been applied to surface area investigations [13,14,17].

The simplest three-dimensional model is the right-circular cone. Studies have compared root morphology to a cone model [10,13] and used geometry to determine root surface area. However, true three-dimensional analysis of the root in three dimensions has been postulated in the literature as the future in assessing root surface area including the use of computed tomography [10,11]. Three-dimensional information allows for better root surface estimation [12,13,17] and overcomes traditional radiographic errors [18]. Cone-beam data has been shown to be accurate as well [19,20].

MATERIALS AND METHODS

The Case Western Reserve University Institutional Review Board (IRB) approved the experimental protocol. Subjects were selected randomly from a sample of patients presenting to the dental school for comprehensive orthodontic treatment in the graduate clinic. All initial records include an existing cone-beam computed tomography (CBCT) scan from the CB MercuRay™ (Hitachi Medical Systems America Co. – Twinsburg, OH) The CBCT has user controlled variables designed to be used in different clinical situations, and may affect image quality. These settings include mA, kVp, and field of view. All initial records were standardized to 2 mA,

120 kVp and a 9 inch field of view. The measurement technique is a modification of root planimetry, in which the root is arbitrarily sectioned. Each slice in the constructed CBCT image has a standard voxel height of 0.28mm, which is the predetermined slice thickness. The surface area of each slice is compiled into a total surface area estimation of the entire root.

All records used in this study were taken during the "records week" in April 2006. A 5% level of significance and an 80% power were used to calculate a minimum sample size of 25 per group. Thirty records (N = 30) were randomly selected out of 185 records.

Eight representative tooth-types were chosen to investigate, including the maxillary central incisor, maxillary lateral incisor, maxillary 1st bicuspid, maxillary 1st molar, mandibular central incisor, mandibular canine, mandibular 1st bicuspid, and mandibular 1st molar. Tooth-types were chosen to represent others with similar root morphology and all teeth selected for investigation were on the right, as a matter of convention. The exclusion criteria were as follows: 1) absence of any of the investigated tooth-types, 2) incomplete apical development of any of the teeth investigated, 3) presence of movement artifact or unclear images and 4) teeth showing evidence of previous root resorption.

The CB Works 2.0 software (Cybermed Inc. – Seoul, Korea) was used to reconstruct the data from the CBCT. Each of the eight teeth was located along the long axis in three planes of space – axial, coronal, and sagittal (Figures 1, 2, 3). The constructed cemetoenamel junction (CEJ) was located on the sagittal image where the

buccal and lingual enamel ended along the root. The perimeter of the root in the axial slice was measured using a tool included in the software used (Figure 4) along the long axis of the tooth [12,14]. The perimeter of each slice was measured by a single investigator (BDM) and entered into an Excel 2003 (Microsoft Co. – Redmond, WA) spreadsheet. Moving apically slice by slice, the perimeter of each slice was collected until the end of the root (Figure 5). In multirooted teeth, the measurements were repeated for each root on one slice (2 for the mandibular 1st molar and maxillary 1st bicuspid, 3 for the maxillary 1st molar.) In areas of the root trunk on multirooted teeth, the perimeter for two or three connected roots was measured as a unit until a clear delineation between the separate roots was observed. The complete number of slices was also recorded to be used to determine the length of the root (using the known slice height of 0.28mm.)

DATA ANALYSIS AND STATISTICAL METHODS

Descriptive statistics were calculated using an Excel 2003 (Microsoft Co. – Redmond, WA) spreadsheet. Sample size was calculated using previously published means and standard deviations. Averages for both length and surface area by tooth-type, including standard deviation and range were reported. Analysis of variance (ANOVA) was calculated to determine variation among specific tooth-types across subjects. To determine if there was a gender interaction, a correlation between male and female averages were compared for both root length and total root surface area

Two methods were chosen to estimate root surface area. The first method – the "CBCT method" summated the surface area of each slice into a whole. The

second method – the "cone method" used a mathematical formula for determining surface area of a right-circular cone. Only the length of the root and the perimeter of the root at the CEJ are needed. The surface area results between the CBCT Method and the Cone Model were compared. A 2-tailed t-test was used to detect significant differences between the two methods while a correlation was used to determine if the two results showed a similar trend.

During data analysis, the perimeter of each slice was converted into slice surface area by multiplying the perimeter and the slice thickness. Using the separate slice thicknesses and total root surface area, it was determined the number of slices per tooth that contained 50% of the total root surface area. This number of slices was converted to two figures: 1) in mm and 2) percent (%) of the total root length. To compare the percentage of total root surface area in the coronal or apical end of the tooth, data was reported in two ways: 1) in millimeters from the coronal or apical end of the root containing 50% of the total root surface area and 2) in percentage of the root length (%) containing 50 % of the total root surface area.

RESULTS

Demographics

The sample consisted of 30 subjects, 15 male subjects and 15 female subjects. The average age of the male subjects was 13.06±1.33 years. The average age for the female subjects was 12.92±1.92 years. The average compiled age for all subjects was 12.99±1.57 years, with a range from 11.00 – 16.58 years.

All measurement were collected by a single operator (BDM). A reliability study was completed 2 weeks after the initial measurements. Twenty-four teeth were randomly selected for repeat measurements; twelve single rooted teeth, and twelve multirooted teeth. The average correlation values for single and multirooted teeth were 0.97 and 0.98 respectively. This showed a high correlation and reproducibility of the method in determining an estimate of total root surface area.

Variation Among Tooth Types

The tooth-type averages were compiled from 30 teeth; one from each subject. To test for differences among tooth-type between subjects, an analysis of variance was used with significance set at $p<.05$. The variation within tooth-types averaged to be $6.12x10^{-11}$, with a P-value of 1. The average F_{crit} for each group averaged to be 1.48. The analysis of variance did not show statistically significant differences among teeth in each tooth-type group.

Root Surface Area

The average root surface area by tooth type is presented in Table 1. Data is presented with male and female averages combined. Two-tailed t-tests compared the surface area averages by tooth-type, which were not statistically significant between male and female subjects. The surface area of the maxillary central incisor was $152.44\pm29.27mm^2$ with a range of $81.24\text{-}213.72mm^2$. The surface area of the maxillary lateral incisor was $130.33\pm24.18mm^2$ with a range of $75.32\text{-}189.98mm^2$. The surface area of the maxillary 1st bicuspid was $175.69\pm78.39mm^2$ with a range of $78.39\text{-}253.97mm^2$. The surface area of the maxillary 1st molar was

330.74±57.53mm^2 with a range of 209.81-453.78mm^2. The surface area of the mandibular central incisor was 109.78±20.00mm^2 with a range of 65.25-147.23mm^2. The surface area of the mandibular canine was 186.62±38.93mm^2 with a range of 112.28-276.65mm^2. The surface area of the mandibular 1st bicuspid was 158.20±28.74mm^2 with a range of 95.33-224.11mm^2. The surface area of the mandibular 1st molar was 330.60±65.22mm^2 with a range of 231.19-493.82mm^2. The maxillary 1st molar had the largest root surface area followed closely by the mandibular 1st molar. The mandibular canine had the 3rd largest surface area followed by the maxillary 1st bicuspid, the mandibular 1st bicuspid, the maxillary central incisor, the maxillary lateral incisor, and the mandibular central incisor (Table 5).

Root Length

The average root length by tooth type is presented in Table 1. Data is presented with male and female averages combined. Two-tailed t-tests compared the root length averages by tooth-type, which were all not statistically significant between male and female subjects. The length of the maxillary central incisor was 11.41±1.76mm^2 with a range of 6.72-14.00mm^2. The length of the maxillary lateral incisor was 10.99±1.55mm^2 with a range of 6.72-13.44mm^2. The length of the maxillary 1st bicuspid was 10.48±1.55mm^2 with a range of 7.00-13.72mm^2. The length of the maxillary 1st molar was 11.49±1.71mm^2 with a range of 8.12-15.40mm^2. The length of the mandibular central incisor was 10.18±1.44mm^2 with a range of 7.00-12.88mm^2. The length of the mandibular canine was 12.85±2.00mm^2 with a

range of 8.40-16.52mm^2. The length of the mandibular 1st bicuspid was 11.64±1.66mm^2 with a range of 8.68-15.40mm^2. The length of the mandibular 1st molar was 12.04±1.73mm^2 with a range of 9.52-14.56mm^2. The manduibular canine had the longest root length followed by the mandibular 1st molar. The mandibular 1st bicuspid had the 3rd largest surface area followed by the maxillary 1st molar, the maxillary central incisor, the maxillary lateral incisor, the maxillary 1st bicuspid , and the mandibular central incisor (Table 5).

Comparison to the Cone Model

The total surface area was also calculated using a geometric formula for a right-circular cone: $\pi r\sqrt{(r^2+h^2)}$, in which "r" is the radius of the base and "h" is the height. In our model, the radius (r) was determined using the perimeter data of the most coronal slice and the fact that perimeter is equal to πr^2. The total root length was used for the cone height (h). For each tooth-type, the average measurement of the perimeter of the first slice at the constructed cementoenamel junction was used, as well as the average length for that tooth type. Figure 3 shows the different values for the cone model compared to the CBCT Method. The general trend had showed that the cone model data estimated lower values than those from the CBCT Method. These differences were statistically significant ($p<0.05$), however the two were highly correlated with $P = 0.96$. The rank order of the largest to the smallest total surface areas were the same, with the largest surface area exhibited by the maxillary 1st molar and the smallest exhibited by the mandibular central incisor.

Percentage Root Surface Area per Unit Length and Percent Length

Figure 4 shows the actual length (mm) of the roots (Figure 4) containing 50 % of the root surface area from both the coronal and apical ends of the tooth. Figure 5 shows the same data converted into percentage of the total root length (%). Data is shown with male and female data combined. Fifty percent of the total surface area was contained on average in the coronal 39% of the total root length. In this sample, this ranged from 4.01mm in the mandibular central incisor to 4.91mm in the mandibular 1st molar. Conversely, 50% of the total root surface area was also contained the apical 61% of the root, which in this sample ranged from 6.17mm in the mandibular central incisor to 8.02mm in the mandibular canine.

DISCUSSION

Early methods used to determine surface area often used cumbersome [23,24] techniques and were shown to be an estimate [10,25,26] of actual root surface area. Studies based off of radiographs required precise paralleling techniques [27] to avoid distortion or other overlying anatomic structures [18]. A radiograph is a two-dimensional version of a 3D structure [12]. Many studies had smaller sample sizes, from 1 tooth [16], 3 teeth [6], to 8 teeth [14,17]. These methods are not available to the clinician, in which the teeth are still in the mouth. In addition, x-ray based studies cannot assess buccal and lingual root structure [28] unless using a three-dimensional approach [10,11].

In this study, each of the 8 tooth-types contained 30 individual teeth, which were not significantly different among those in the tooth-type category. Gender differences were not significant either in this study, although some studies have

shown gender differences for root surface area [7]. Referring to Table 1, the surface area and length averages of each tooth-type are shown. The values found in this study are smaller than some previously reported surface area averages [2,3,5,9,15,29], however other studies [4,6] reported surface area averages at or below our surface area averages for the maxillary central incisor, maxillary 1st molar, mandibular canine, mandibular 1st bicuspid and mandiblar 1st molar. In the 1994 Hujoel [1] meta-analysis, the averages in this study fall outside of the 95% confidence interval except two teeth; 1) the mandibular canine and 2) the mandibular 1st molar. Even so, many of the studies in the meta-analysis contained varying inclusion criteria and the study reports some bias in sample selection. In addition, 60% of the data is from one study alone and some even included teeth with incompletely formed apices. The inability to measure the area of the root above the constructed CEJ may explain the discrepancy between the surface area averages between this and other techniques [15] although root surface averages has been shown to vary between techniques used [1].

The cone model may have been a simpler method in determining surface area, however the values were much smaller and outside of the standard deviations of the studies [1,2,3,5,9,15,29]. Although the trends were identical in between the two methods, it was not shown to be as accurate in assessing root surface area.

The surface area measurements in previous studies have been reported as percentage of remaining attachment in regard to root length or bone height remaining in millimeters [3,13,16]. This is possible on a single tooth basis [16], but in studies looking at multiple teeth, it is difficult to compare teeth with differing lengths. For this

reason, we looked at the average root length or percentage of root length containing a fixed percentage of root surface area – fifty percent (50%). In looking at the data comparing the percentage of the root length containing 50% of the total root surface area, there was approximately a 40:60 ratio when combining all tooth-types. Attachment has been shown be better related to surface area measurements, rather than linear measurement [25] as the amount of surface area for attachment may very greatly with the same linear loss in different tooth types [26]. In this study however, the linear length (in mm) and the percentage length (%) were relatively similar (4.01mm-4.91mm; 37%-40%) for the 50% root surface area loss. So, although, the tooth-types vary in their morphology, there was a relatively similar result; that with approximately 4.43mm or 39% of coronal attachment length there is 50% loss of surface area of attachment. Other studies have reported 50% root surface area contained in the coronal 36% [5,9], 37-38% [6], or 46-50% [9] of total root length.

The importance of coronal attachment is critical in periodontally compromised teeth with furcation involvement [24]. Several studies have discussed the root surface are between separate roots in molar teeth [8,9,24,29] with regard to periodontal prognosis after hemisection. Also important to the prognosis of a periodontally involved tooth is the ratio of supported to unsupported root structure [12] and the presence or absence of furcation involvement. In this study, the average furcation on the maxillary 1st molar began 3.16mm from the constructed CEJ. Considering that the coronal 4.12mm contains 50% of the total root surface area, it is important to note that we are less than 1mm from that point with the beginning of

furcal involvement with periodontal disease. In the mandibular 1st molar, the average furcation began 2.78mm from the constructed CEJ. In the average mandibular 1st molar from this sample, 50% of the total root surface area was contained in the coronal 4.91mm, which is 2.12mm from the average furcation entrance. With furcal involvement, the potential prognosis of a tooth may be much more guarded in the maxillary versus the mandibular 1st molar, considering the amount of attachment loss.

Within orthodontics, it is important to note the amount of surface area contained in the apical portion of the tooth. Commonly with orthodontic mechanics, there is some blunting of the roots. In some cases, there is severe root resorption, and there has been an increase in malpractice claims against orthodontists due to root resorption [30,31]. Maxillary incisors were shown by some studies to be the most frequently affected teeth [11,27,28,32,33,34] and in cases of severe resorption, the most severely affected [32].

Many studies support that fact that root resorption with concomitant crestal bone loss [32] is more detrimental, due to the fact that there is a greater percentage of periodontal attachment in the crestal 2/3rds. The crestal 1/3 has been shown to be more important in altering the crown to root ratio [32]. The number of Sharpey's fibers decreases in the apical 1/3 [23] and there are more resorptive cells in the apical 1/3 [30], making it more likely that root resorption will occur there. Cementum is usually more resistant to resorption than alvelolar bone [31] but as the cross-sectional area decreased, there is more force pre unit area during orthodontic tooth movement [34]. In addition, the apical portion of the root has been shown to have little effect on the

overall attachment apparatus of the tooth [16] because there is less area to be lost as the root tapers to the apex [4,10,12,25]. Loss of coronal attachment length is more detrimental than the equivalent loss of root structure length from root resorption [31]. Studies have equated loss of coronal attachment to loss of apical root structure in ratios; 1mm coronal:3mm apical [16], while others equate millimeters into percentage root surface area. One study [5] showed that 1mm of coronal root surface was equal to 19.3% of the total root surface area, while 1mm of apical structure equated to only 8.6%.

Although no study in the literature reports tooth loss due to root resorption, some show increased mobility [27], although case-reports discuss long-term maintenance of these teeth [27,35]. Some articles have categorized the loss of apical tooth structure as clinically insignificant [36], with the benefits of treatment outweighing the risk [37]. Root resorption, even up to 1/4 [38] or 1/3 [32] of the root has been shown to not increase tooth mobility or tooth loss, and severe resorption has been not been shown to have an adverse effect on the maintenance of the teeth [27,38].

CONCLUSION

Our results indicate that the method of using CBCT data and collecting perimeter data per slice can provide a relatively accurate assessment of root surface area. The benefit of using three-dimensional data is that surface irregularity can be accounted for, as well as providing a non-invasive technique for in vivo use. The comparison of the root to a geometric cone did not prove to be as accurate in determining root surface area. In regard to periodontal prognosis, the clinician must

be aware of the amount of surface already lost once furcation involvement has begun, especially in the maxillary 1st molar.

With regard to orthodontists concerns about root resorption and loss of attachment surface area, it appears that the coronal attachment is of much more importance to the overall periodontal attachment. This study showed an approximately 2:3 ratio in percent of coronal to apical root length containing half of the root surface area. In other words, half of the root surface area is located on average in the coronal 39% of the root length. With the presence of root resorption, it is important to monitor the remaining coronal periodontal attachment.

Table 1. -- Root Surface Area and Root Length Averages (Males and Females)

	Root Surface Area (mm^2)			**Root Length (mm)**		
	x	*SD*	*Range*	*x*	*SD*	*Range*
UR1	152.44	29.27	81.24-213.72	11.41	1.76	6.72-14.00
UR2	130.33	24.18	75.32-189.98	10.99	1.55	6.72-13.44
UR4	175.69	34.08	78.39-253.97	10.48	1.69	7.00-13.72
UR6	330.74	57.53	209.81-453.78	11.49	1.71	8.12-15.40
LR1	109.78	20.00	65.25-147.23	10.18	1.44	7.00-12.88
LR3	186.62	38.93	112.28-276.65	12.85	2.00	8.40-16.52
LR4	158.20	27.74	95.33-224.11	11.64	1.66	8.68-15.40
LR6	330.60	65.22	231.19-493.82	12.04	1.73	9.52-14.56

Table 2. -- CBCT Measured Root Surface Area vs. Cone Model*		
	CBCT	**Cone**
UR1	152.44	120.32
UR2	130.33	99.54
UR4	175.69	130.38
UR6	330.74	210.68
LR1	109.78	77.06
LR3	186.62	135.93
LR4	158.20	121.81
LR6	330.60	205.27
* $p<.05$		

Table 3. --Root Length (mm) containing 50% Root Surface Area (RSA) from the coronal and apical ends of the tooth (average)

	All Subjects		**Males Only**		**Females Only**	
	Coronal	**Apical**	**Coronal**	**Apical**	**Coronal**	**Apical**
UR1	4.19	7.21	4.41	7.41	3.98	7.02
UR2	4.21	6.79	4.37	7.056	4.05	6.51
UR4	4.12	6.37	4.29	6.67	3.94	6.07
UR6	4.65	6.84	4.82	7.21	4.48	6.48
LR1	4.01	6.17	4.07	6.20	3.96	6.14
LR3	4.83	8.02	4.91	8.16	4.76	7.88
LR4	4.89	7.15	4.52	7.13	4.46	7.17
LR6	4.91	7.13	5.06	7.34	4.76	6.93
Mean	4.26	6.96	4.55	7.14	4.30	6.77

Table 4. -- Root Length Percentage (%) containing 50 Root Surface Area (RSA) from the coronal and apical ends of the tooth (average)

	All Subjects		Males Only		Females Only	
	Coronal	**Apical**	**Coronal**	**Apical**	**Coronal**	**Apical**
UR1	36.74	63.26	37.28	62.72	36.16	63.84
UR2	38.29	61.71	38.24	61.76	38.34	61.66
UR4	39.27	60.73	39.18	60.82	39.37	60.63
UR6	40.45	59.55	40.06	59.94	40.89	59.11
LR1	39.41	60.59	39.64	60.36	39.19	60.81
LR3	37.62	62.38	37.57	62.42	37.67	62.33
LR4	38.57	61.42	38.78	61.22	38.36	61.63
LR6	40.78	59.22	40.81	59.19	40.73	59.27
Mean	38.89	61.11	38.95	61.05	38.84	61.16

Table 5. -- Teeth Ranked in Order of Root Surface Area and Root Length (Largest to Smallest)

RANK	**Root Surface Area**	**Root Length**
Largest	Maxillary 1st molar	Mandibular Canine
	Mandibular 1st Molar	Mandibular 1st Molar
	Mandibular Canine	Mandibular 1st bicuspid
	Maxillary 1st Bicuspid	Maxillary 1st molar
	Mandibular 1st bicuspid	Maxillary Central Incisor
	Maxillary Central Incisor	Maxillary Lateral Incisor
	Maxillary Lateral Incisor	Maxillary 1st Bicuspid
Smallest	Mandibular Central Incisor	Mandibular Central Incisor

Figure 1. Location of the tooth in the sagittal plane

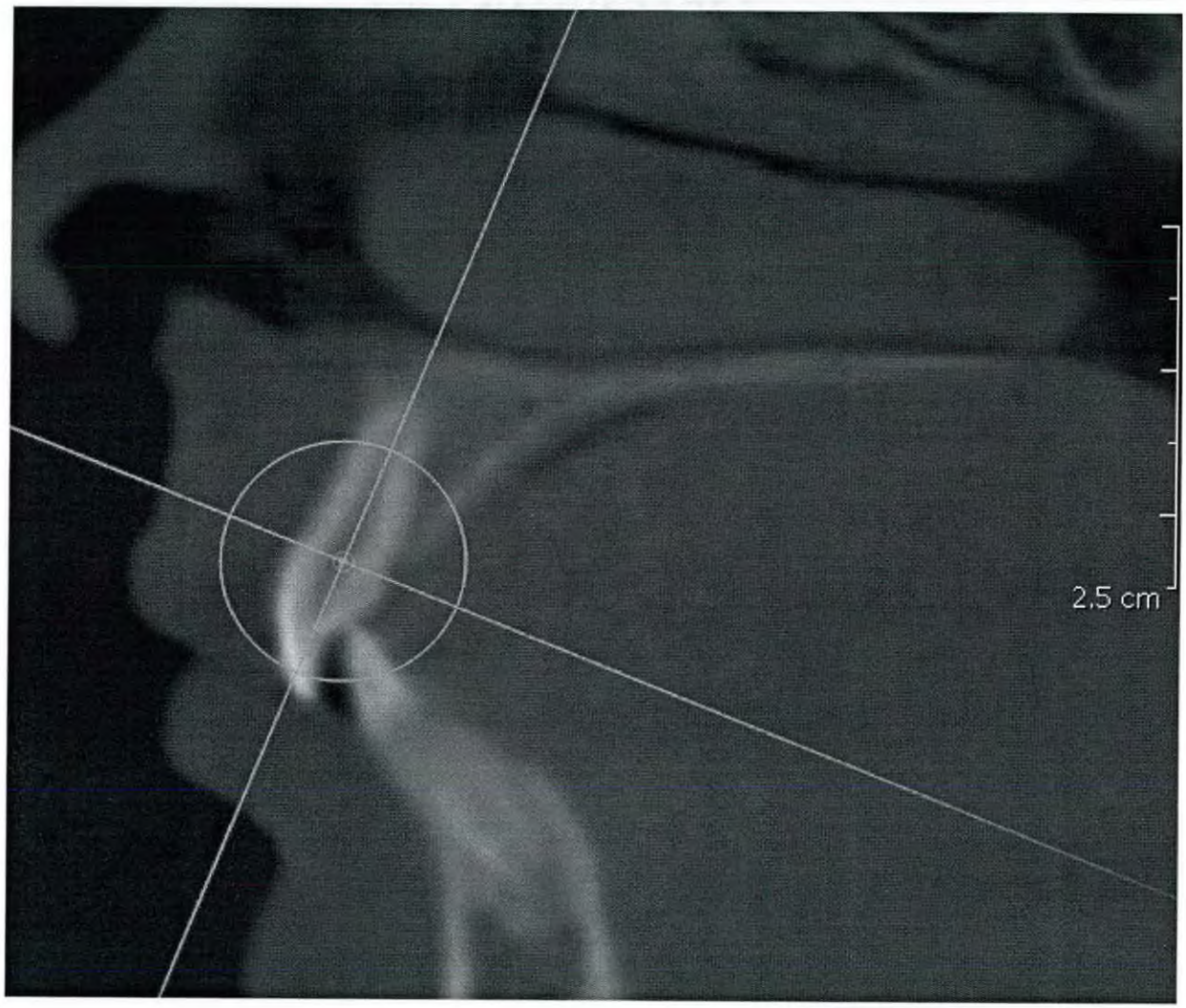


Figure 2. Location of the tooth in the coronal plane

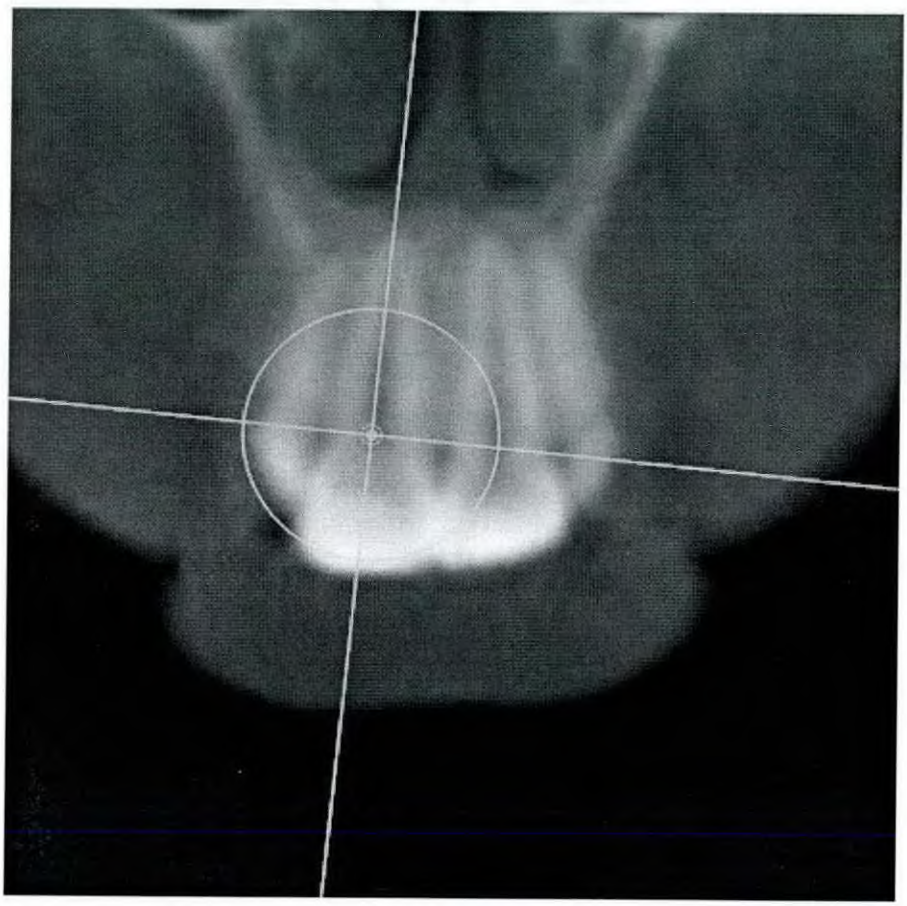


Figure 3. Location of the tooth in the axial plane

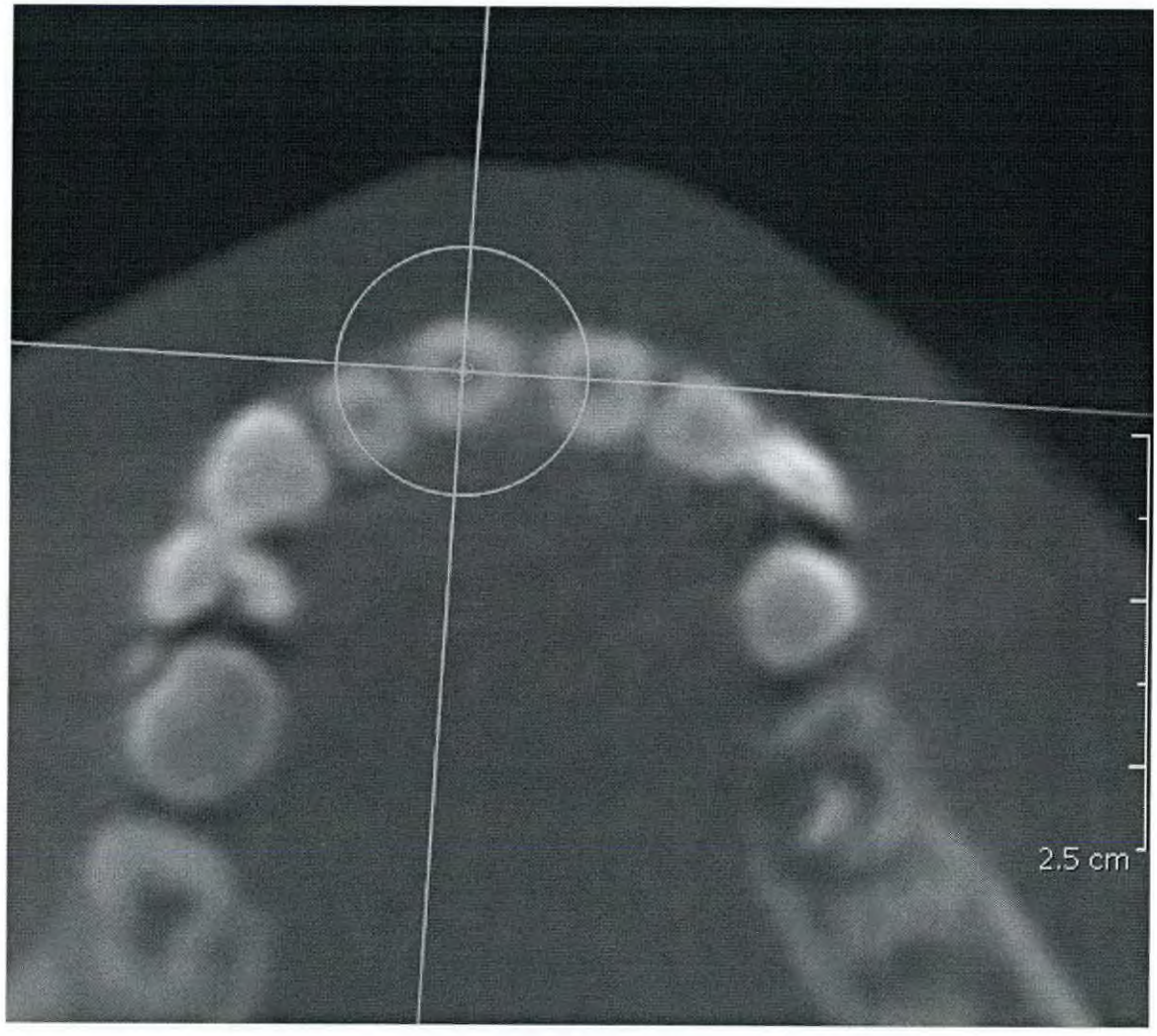


Figure 4. Perimeter of the most coronal slice – the "constructed" CEJ

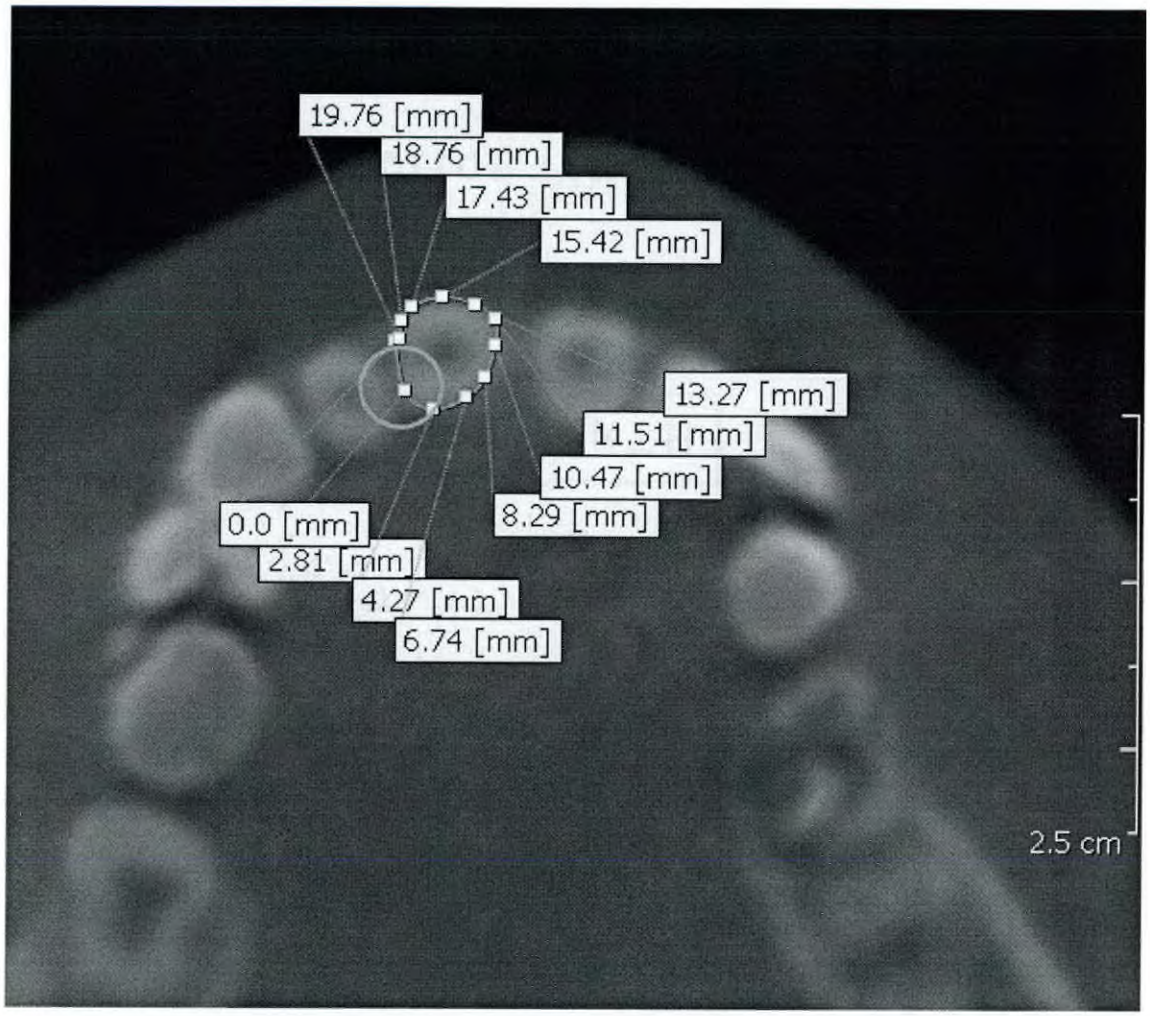
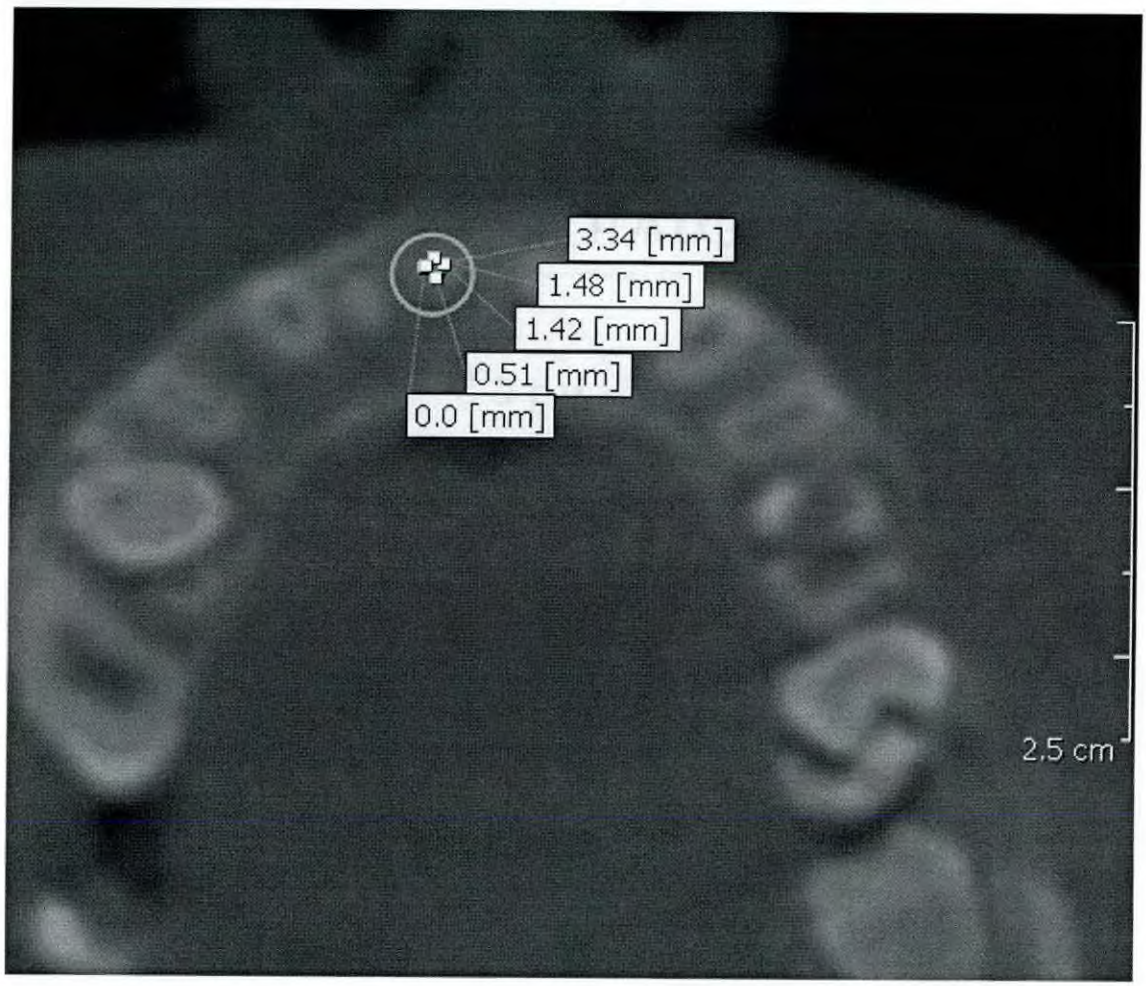


Figure 5. Perimeter of the most apical slice



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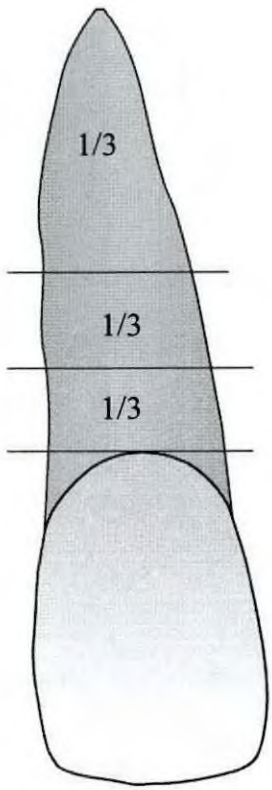
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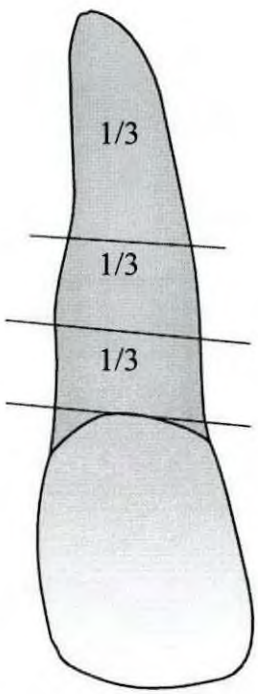
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Figure 6: Maxillary Central Incisor: One-Third Root Surface Area as a Function of Root Length



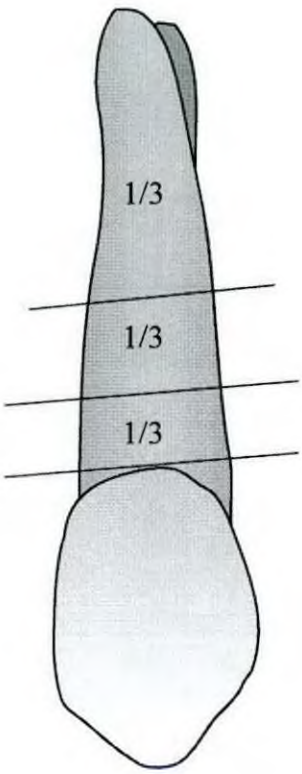
1/3	**5.39mm**	**47.20%**
1/3	**3.40mm**	**29.82%**
1/3	**2.62mm**	**22.99%**

Figure 7: Maxillary Lateral Incisor: One-Third Root Surface Area as a Function of Root Length



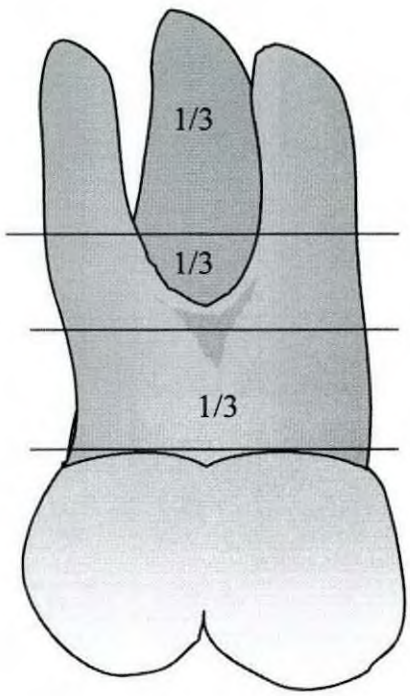
1/3	**4.95mm**	**45.01%**
1/3	**3.41mm**	**31.04%**
1/3	**2.63mm**	**23.95%**

Figure 8: Maxillary First Bicuspid: One-Third Root Surface Area as a Function of Root Length



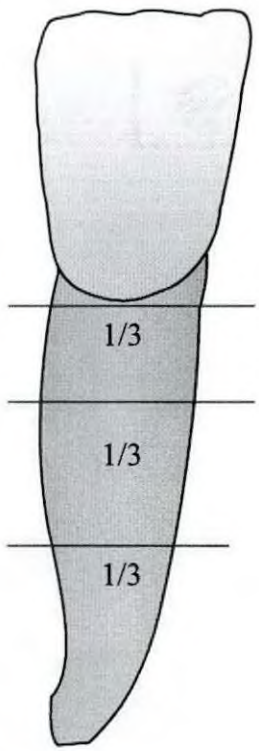
	4.63mm	**44.17%**
	3.23mm	**30.80%**
	2.62mm	**25.03%**

Figure 9: Maxillary First Molar: One-Third Root Surface Area as a Function of Root Length



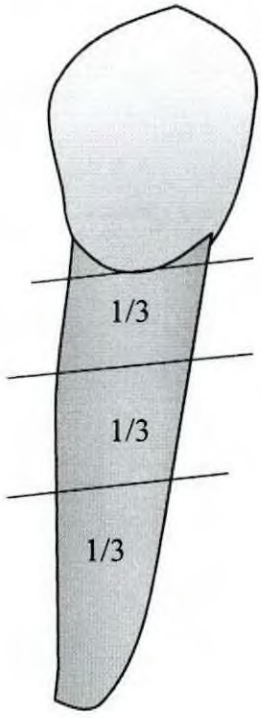
5.23mm	**45.49%**
2.96mm	**25.76%**
3.30mm	**28.76%**

Figure 10: Mandibular Cental Incisor: One-Third Root Surface Area as a Function of Root Length



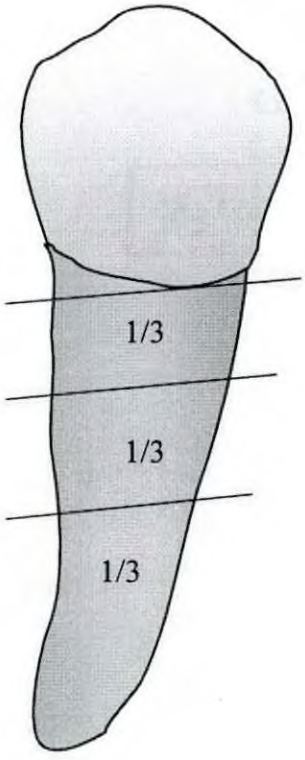
1/3	**2.55mm**	**22.18%**
1/3	**4.62mm**	**40.21%**
1/3	**4.32mm**	**37.61%**

Figure 11: Mandibular Canine: One-Third Root Surface Area as a Function of Root Length



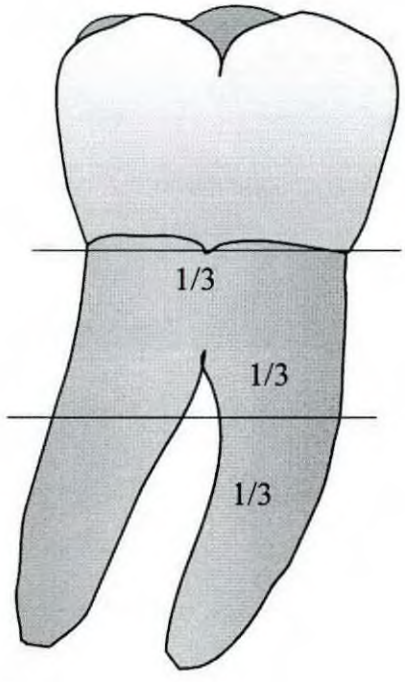
	3.11mm	**24.19%**
	3.83mm	**29.84%**
	5.91mm	**45.98%**

Figure 12: Mandibular First Bicuspid: One-Third Root Surface Area as a Function of Root Length



1/3	**2.82mm**	**24.22%**
1/3	**3.58mm**	**30.72%**
1/3	**5.25mm**	**45.06%**

Figure 13: Mandibular First Molar: One-Third Root Surface Area as a Function of Root Length



3.35mm	**27.83%**
3.30mm	**27.44%**
5.39mm	**44.73%**

APPENDIX 1

IRB Approval

Case Western Reserve University
Institutional Review Board

NOTICE OF EXEMPTION (#2)

Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures,

interview procedures or observation of public behavior

If this protocol changes,

the RI and/or CI must fully complete and submit an addendum request.

Other than age, gender, and tooth measurements, no other patient identifiers can be kept.

Responsible Investigator: **J. Martin Palomo**
Department: **Dentistry - General**
IRB Protocol Number: **20070203**
Title: ***Three Dimensional Analysis of Root Surface Area Using CBCT***
Co-Investigator: **Boyd D. Martin**

Exemption Date: February 22, 2007

The Institutional Review Board (IRB) has deemed the above protocol EXEMPT under 45 Code of Federal Regulations (CFR) part 46.101(b)(2). The IRB will not conduct subsequent reviews of this protocol.

Any changes to the protocol that put it under the purview of the IRB would require a formal application to, and approval of, the IRB prior to implementation of the change IRB applications are available at the CWRU IRB Pages, or from the Office of Research Compliance (ORC) at Sears Library Building, #657.

APPENDIX 2

Raw Data: Perimeter data for Subjects A-DD

TABLE 1.--Subject A: Perimeter Data

Subject A	UR1	UR2	UR4	UR6 MB	UR6 DB	UR6 P	LR1	LR3	LR4	LR6 M	LR6 D
	18.71	16.21	22.41	32.66			14.92	17.18	17.96	28.82	
	17.08	15.77	22.37	31.5			14.46	17.2	17.49	28.16	
	17.26	15.22	20.4	31.22			14.35	17.1	17.31	27.84	
	16.65	13.85	19.36	30.72			14.12	17.02	17.52	27.76	
	15.57	15.1	19.25	28.97			13.41	16.65	17.01	27.56	
	15.67	13	18.15	27.69			12.93	16.36	16.87	27.86	
	14.52	12.76	18.84	27.65			12.97	16.27	16.11	27.46	
	13.98	13.08	17.35	26.27			12.98	16.87	15.79	27.3	
	13.15	12.41	16.59	26.31			12.72	15.8	15.76	28.18	
	13.56	12.5	16.91	26.69			12.08	16.29	15.28	20.02	17.31
	14.81	12.24	17.43	26.74			11.8	15.03	14.76	19.3	16.98
	13.42	11.14	17.06	28.05			11.56	14.78	14.48	19.26	15.95
	11.76	11.15	16.25	27.72			12.32	14.49	14.07	19.26	16.38
	11.95	10.29	16.46	14.95	13.38	13.07	11.17	13.99	14.18	19.04	14.78
	12.31	10.45	16.14	14.63	11.99	13.28	10.67	13.57	13.69	17.95	14.02
	11.51	11.54	16.58	13.02	10.7	13.35	10.41	12.84	13.14	18.65	14.17
	10.97	10.48	15.92	10.39	10.16	12.06	10.92	13.44	13	16.76	13.98
	11.07	10.7	15.98	11.28	9.49	10.87	9.97	12.79	13.72	17.79	15.95
	10.03	9.82	16.33	10.88	9.48	10.78	10.18	12.17	11.76	15.55	11.96
	7.78	8.38	16.31	12.38	9.15	8.91	9.01	12.47	12.23	15.22	8.79
	6.56	7.95	15.59	13.73	9.42	9.32	8.47	11.42	12.22	14.72	10.32
	6.05	5.57	12.57	13.22	10.09	9.18	7.29	10.94	11.31	14.66	8.33
	3.87	5.82	11.31	12.75	9.5	9.75	7.43	10.47	11.41	13.73	7.43
	1.9	3.57	9.78	14.14	8.96	9.2	5.15	10.18	11.56	14.52	9.17
			6.54	10.69	9.68	8.27	4.34	10.45	11.87	13.92	6.92
				9.99	7.47	8.35		10.3	10.57	12.72	6.85
				6.14	6.55	7.78		9.72	11.25	13.58	7.21
				3.24	3.33	7.25		8.68	10.32	14.99	5.12
						5.68		9.47	10.07	15.18	5.65
								7.06	8.37	7.96	
									5.93	8.86	
										4.33	
										5.06	
										4.44	

TABLE 2.--Subject B: Perimeter Data

Subject B	UR1	UR2	UR4 B	UR4 L	UR6 MB	URD B	UR6 P	LR1	LR3	LR4	LR6 M	LR6 D
	21.56	20.64	26.14		37.89			16.23	23.45	22.45	35.74	
	21.88	21.6	26.51		37.15			16.05	22.4	22	36.19	
	22.1	20.22	25.28		37.67			16.45	22.3	20.18	35.4	
	21.05	19.53	24.55		37.23			16.23	21.15	20.19	34.59	
	20.44	19.77	24.57		37.12			16.01	22.7	20.29	35.71	
	20.39	19.26	24.73		36.1			15.64	21.08	20.45	35.1	
	19.22	18.8	25.3		35.41			14.77	21.73	20.11	37.92	
	19.46	17.38	24.57		37.52			15.71	21.74	20.4	24.23	23.27
	21.57	16.77	24.2		36.12			14.62	21.38	19.46	25.89	23.96
	20.32	17.68	24.12		36.69			15.82	21.46	19.44	23.95	22.25
	19.38	16.46	24.66		40.01			14.67	21.86	18.65	23.91	19.8
	19.44	16.06	22.53		20.09	29.94		13.61	19.62	18.47	23.54	19.18
	19.34	16.1	23.47		20.77	34.09		14.28	20.94	17.65	23.72	20.49
	19.7	15.57	23.01		19.04	16.22	19.63	15.29	21.04	17.39	23.73	21.86
	18.02	15.73	23.43		19.74	15.89	17.72	14.82	20.76	17.56	22.36	21.74
	18.24	14.79	12.02	12.42	20.14	15.17	17.3	14.6	20.44	16.08	22.16	20.97
	17.18	14.45	12.41	12.22	18.17	14.19	16.21	14.26	20.54	16.55	21.09	18.78
	16.22	14.6	11.7	11.59	17.89	13.41	16.04	13.52	20.4	17.2	19.84	17.17
	16.79	14.58	10.31	11.36	16.3	13.6	16.54	12.6	20.09	15.98	19.59	17.82
	16.35	13.49	10.41	11.35	15.45	12.96	16.06	11.9	19.01	14.9	19.18	17.76
	16.29	13.64	10.96	11.4	14.61	12.64	15.65	12.16	18.94	14.14	18.44	18.15
	16.17	13.59	11.32	9.34	15.19	10.98	14.61	10.62	18.88	15.26	18.76	17.71
	15.03	12.93	10.34	5.49	14.56	11.59	14.52	11.7	18.77	15.43	16.78	16.59
	14.66	12.41	8.62	4.37	13.96	9.56	13.2	9.84	18.72	15.01	17.84	17.08
	13.3	12.45	9.62		11.98	8.91	12.3	9.88	17.77	14.91	17.07	13.7
	14.4	12.11	7.56		8.79	8.57	12.38	9.17	15.81	13.33	16.87	12.68
	12.04	12.65	5.88		8.2	8.18	10.68	8.29	15.26	10.75	15.99	12.28
	11.23	11.58	5.65		7.42	7.75	11.62	8.86	14.34	9.66	15.04	13.57
	11.38	10.72	4.93		6.45	3.54	12.39	7.79	12.72	9.98	14.64	14.08
	9.46	11.14			8.81		10.96	6.75	13.36	8.5	14.04	11.33
	7.02	9.78			8.33		11.03	5.03	12.8	6.13	11.71	10.31
	5.28	9.95			7.3		8.39	4.38	13.37	4.12	10.8	9.31
		8.52			7.31		8.7		12.69	3.89	8.16	6.8
		6.31			5.41		6.66		9.71		6.88	5.53
		5.59					7.03		8.59		6.17	5.97
							6.49		8.12		4.86	5.2
							5.69		5.99		3.81	5.45
							5.42					

TABLE 3.--Subject C: Perimeter Data

Subject C	UR1	UR2	UR4B	UR4L	UR6MB	URDB	UR6P	LR1	LR3	LR4	LR6M	LR6D
	20.49	16.78	24.54		34.07			14.33	21.03	19.84	32.25	
	19.67	15.9	24.1		33.35			13.51	19.3	18.96	31.93	
	18.71	15.38	23.59		32.58			13.04	18.99	17.48	30.84	
	18.63	14.71	22.12		31.59			13	18.8	17.55	30.55	
	18.3	13.98	21.83		31.04			13.02	18.81	16.93	30.49	
	17.89	14.21	20.8		30.57			12.55	18.76	16.4	30.26	
	17.15	13.53	20.34		30.04			12.13	17.68	16.17	30.33	
	16.78	13.86	20.54		31.19			12.61	17.77	16	29.28	
	16.45	14.08	20.82		31.08			12.46	16.81	15.66	28.58	
	17.03	13.8	21.01		19.23	24.64		12.74	16.15	15.68	20.66	19.31
	17.08	13.36	14.19	11.08	18.74	25.47		12.34	16.57	15.62	20.21	18.3
	16.32	13.29	14.2	10.13	17.94	25.67		12.51	16.73	15.08	19.66	18.6
	16.47	12.99	14.21	9.67	17.04	25.58		12.4	16.2	14.9	19.36	18.91
	16.69	12.92	14.14	8.86	15.71	24.23		11.5	16.29	14.88	19.41	18.57
	16.37	11.52	14.72	8.4	15.03	10.13	13.93	11	15.76	14.79	20	17.84
	16.09	11.57	13.99	8.34	14.67	9.91	12.83	10.47	15.37	14.35	18.93	15.66
	15.92	11.92	13.85	8.22	13.97	9.79	12.17	10.15	15.66	13.57	18.09	15.48
	14.08	11.75	11.43	8.99	14.22	9.07	12.03	10.1	16.6	14.61	17.99	16.77
	14.26	10.97	11.5	8.74	13.24	10.03	12.25	10.09	16.15	14.22	17.63	15.99
	14.14	11.64	11.52	8.27	11.4	10.08	12.35	10.41	15.81	13.55	17.25	15.32
	13.58	11.2	11.11	8.83	10.76	9.57	11.87	10.45	15.52	13.47	17.24	14.76
	13.49	10.39	10.29	7.96	9.75	8.93	11.76	10.06	15.01	13.31	17.03	14.71
	14.09	10.03	9.3	8.41	9.67	8.15	11.9	9.72	14.81	12.84	17	17
	14.04	9.67	9.59	7.73	9.94	7.26	11.81	9.75	14.21	11.56	16.95	16.69
	13.57	9.56	8.72	7.7	8.76	7.22	10.67	9.65	13.62	11.55	16.37	16.7
	12.2	8.9	8.23	7.65	8.34	6.94	9.74	8.94	14.33	11.42	16.26	14.9
	12.58	8.88	8.31	5.3	8.06	7.4	9.48	7.6	14.11	10.9	15.75	14.15
	11.6	8.34	7.26	5.24	7.96	7.57	9.13	7.81	13.7	11.41	15.1	13.45
	10.97	8.28	7.1	4.96	6.57	6.36	9.34	7.17	12.86	10.98	15.2	12.9
	10.81	7.6	6.91	5.01	5	6.36	9.24	6.66	12.54	10	15.31	12.76
	10.48	7.57	6.27	4.63		4.89	8.75	6.61	12.47	9.9	15.16	11.99
	10.23	7.21	5.9	3.94		5.02	8.24	5.81	12.28	9.69	14.79	11.55
	10.04	6.28	4.67	4.3			8.57	3.78	12.19	8.84	13.51	11
	10.01	5.66	4.25				8.71	3.64	11.77	8.74	12.87	10.27
	9.97	3.99	3.78				7.94		11.07	7.63	11.89	9.28
	8.49	3.94					7.25		10.67	6.82	10.56	8.67
	7.34						8.01		10.5	5.17	9.57	8.39
	6.7						8.1		10.03	4.49	8.48	7.96
	6.25						7.66		9.67	3.47	7.26	6.48
	5.18						7.4		9.48		5.32	5.89
	3.66						5.84		9.1		5.12	6.01
	3.66						5.9		9.14			3.78
	2.99						4.29		8.78			
							3.91		8.22			
									7.52			
									7			
									5.64			
									4.02			

TABLE 4.--Subject D: Perimeter Data

Subject D	UR1	UR2	UR4B	UR4L	UR6MB	URDB	UR6P	LR1	LR3	LR4	LR6M	LR6D
	21.57	18.72	25.13		34.91			15.49	19.28	21.4	35.02	
	21.24	18.68	24.82		34.63			15.45	19.24	21.42	34.63	
	20.91	17.58	23.6		33.58			15.31	19.14	21.35	33.48	
	19.87	16.7	22.91		32.79			14.81	19.3	20.6	33.91	
	19.66	15.9	22.24		33.87			14.31	19.2	20.33	33.97	
	19.75	15.45	22.03		33.26			15.21	18.15	19.82	32.26	
	19.44	15.87	21.67		33.5			15.12	18.62	18.98	31.1	
	19.28	15.7	21.29		33.25			14.17	18.74	18.47	31.48	
	20.04	16.02	21.57		33.14			14.26	18.52	18.48	31.85	
	19.81	15.33	21.44		33.24			13.96	18.6	17.96	32.29	
	18.59	15.87	20.28		33.14			14.8	18.3	17.59	33.08	
	19.79	16	19.81		32.23			14.31	18.19	17.56	32.84	
	18.86	15.78	19.48		17.35	26.65		13.78	17.78	17.62	20.93	19.3
	18.08	14.47	20.47		16.81	26.95		13.67	18.21	17.56	20.46	19.6
	17.48	15.27	20.55		14.72	14.72	15.76	13.57	18.01	16.93	20.18	19.79
	16.89	15.12	21.06		15.84	14.85	14.87	13.87	18.75	16.68	20.41	19.75
	15.97	14.18	21.11		16.28	14.09	14.51	13.96	18.88	16.6	19.62	19.93
	15.7	15.09	20.47		15.75	13.57	15.57	13.57	18.42	16.24	19.26	18.84
	15.39	14.68	20.12		15.11	13.05	15.73	13.77	18.37	16.11	19.29	18.07
	14.88	14.33	19.99		15.94	12.89	14.44	13.5	17.91	15.7	19.08	17.62
	14.49	14.2	12.43	10.31	15.44	12.49	13.15	13.24	17.82	15.58	18.73	17.27
	13.7	13.45	11.72	11.07	14.99	11.32	12.89	12.87	16.09	15.2	18.06	16.61
	13.56	13.57	11.6	10.91	13.87	10.87	13.2	12.27	15.81	14.86	17.92	15.75
	12.69	13.33	11.64	9.98	12.09	10.63	13.01	11.97	15.69	14.68	17.9	16.24
	12.39	13.6	10.91	10.74	10.14	9.97	12.61	11.81	16.57	15.06	17.82	16.01
	11.12	13.19	9.65	10.58	7.37	9.76	12.07	11.57	16.17	15.19	16.27	15.56
	11.3	12.57	10.91	10.83	9.58	8.87	11.8	11.34	16.88	15.8	15.79	15.05
	11.26	12.47	9.81	10.21	8.24	8.15	10.9	10.68	16.25	15.72	15.76	14.81
	11.08	11.8	9.14	9.48	7.66	7.02	10.78	10.65	15.32	15.44	15.13	13.66
	10.65	10.29	8.17	8.76	7.24	6.37	10.22	9.94	15.29	14.86	14.59	14.96
	10.54	8.61	8.55	8.97	6.1	6.11	10.64	9.84	14.76	14.31	13.98	13.33
	10.03	7.81	8.64	8.19	5.22	5.87	10.24	8.97	14.49	14.86	12.8	12.78
	9.67	7.64	8.8	7.31	4.08	4.96	9.48	9.12	14.45	15.08	11.1	11.68
	8.57	6.97	8.26	7.28		4.39	8.57	8.58	13.64	14.85	11.47	9.57
	6.24	5.84	7.98	6.29		3.87	8.27	8.44	13.6	14.7	11.62	8.7
	5.99	5.23	7.29	5.78			7.08	7.37	12.59	14.23	10.6	7.96
	5.36	4.02	6.27	4.87			5.65	6.25	12.06	14.05	9.97	7.15
	4.76		5.5	4.61			5.65	6.07	12.54	14	8.6	6.12
	3.91		4.37	3.07			4.23	5.2	12.1	13.94	8.21	6.08
							2.88	3.28	11.63	13.08	7.26	5.91
									11.18	13.07	7.07	5.2
									11.08	10.5	5.22	4.87
									10.26	7.63	5.02	4.01
									9.91	6.23		
									8.7	6.2		
									8.62	4.07		
									7.96			
									5.69			
									5.21			
									4.36			
									3.57			

TABLE 5.--Subject E: Perimeter Data

Subject E	UR1	UR2	UR4 B	UR4 L	UR6 MB	UR6 DB	UR6 P	LR1	LR3	LR4	LR6 M	LR6 D
	20.68	18.54	23.01		29.6			13.36	19.43	20.41	29.11	
	19.57	17.58	22.51		29.34			12.9	19.58	19.67	28.26	
	19.43	17.14	22.19		29.08			12.66	19.59	19.26	27.37	
	18.59	16.59	21.72		28.59			11.87	19.47	19.23	27.26	
	17.07	15.59	21.65		27.41			11.6	19.53	19.57	26.54	
	17.26	15.02	21.33		26.75			11	18.63	17.69	27.12	
	17.37	14.57	21.57		25.71			11.03	18.42	18.25	26.58	
	17.64	14.95	20.13		26.17			11.07	18.3	16.93	26.79	
	17.43	14.72	19.68		26.7			10.98	18.19	16.2	27.21	
	16.58	14.31	19.44		14.6	22.86		10.77	18.26	16.49	25.87	
	16.26	13.76	20.15		15.58	23.28		10.74	18.03	16.29	20.26	
	15.86	13.08	20.22		15.88	24.21		10.54	17.65	16.75	19.22	16.48
	15.34	12.78	18.98		15.63	23.84		10.4	17.51	16.85	19.56	15.63
	15.78	12.74	17.71		15.25	23.6		10.56	16.94	16.23	18.15	15.04
	15.25	13.25	17.5		14.26	22.97		10.29	16.79	16.13	18.59	14.8
	15.02	14.06	10.12	8.34	13.52	12.42	11.82	10.57	16.78	15.72	17.63	14.32
	14.09	13.24	9.91	7.15	14.27	10.26	11.65	10.47	16.47	15.93	18.26	13.59
	14.23	12.41	8.33	7.81	14.21	9.04	11.61	9.58	15.69	15.68	18.05	13.48
	13.31	12.4	8.75	7.7	14.09	9.81	10.68	9.3	15.93	15.13	17.96	13.74
	12.84	12.38	8.3	7.61	13.58	9.45	10.3	9.78	15	15.28	17.89	12.95
	11.99	12.29	7.89	7.56	12.61	8.63	9.63	10.26	15.02	15.39	17.26	12.69
	11.96	11.45	7.83	7.2	11.27	8.41	9.05	9.54	14.48	14.69	16.3	12.5
	11.63	11.75	7.6	6.93	11.03	8.67	9.56	9.35	14.23	14.74	15.23	12.47
	11.64	11.55	7.46	6.76	10.27	8.46	9.36	10.02	13.78	14.82	14.93	12
	11.35	10.38	7.56	5.56	9.63	7.96	9.78	9.97	13.87	14.27	14.86	12.36
	10.97	9.9	7.23	5.45	8.69	7.96	9.16	8.85	13.82	14.26	14.95	11.65
	10.85	10.24	6.25	4.96	9.08	6.25	9.91	8.2	14.02	14.58	14.07	11.15
	9.9	10.61	6.28	4.75	9.21	5.96	8.97	8.78	14.21	15.2	13.73	10.15
	9.72	9.64	5.12	4.85	9.11	5.96	8.78	7.62	13.4	13.2	12.63	10.36
	8.18	9.2	5.25	5.02	8.36	6.01	8.09	7.26	13.54	12.97	12.01	9.69
	7.83	6.45	4.32	5.12	7.63	6.11	8.63	7.2	12.87	12.63	12.12	8.99
	8.15	9.51	4.32	4.78	7.2	5.98	8.38	6.59	12.85	12	11.56	8.76
	8.18	8.68	5.01	4.75	6.36	4.89	7.36	4.34	12.34	11.29	11.5	7.5
	7.26	7.75	5.11	3.99	5.29	5.22	7.12	3.78	12.2	10.64	11.07	7.06
	6.93	7.56	4.59	4.25	5.87	4.69	6.98		11.52	9.37	10.23	6.69
	6.54	6.58	4.86		4.33	4.02	5.69		10.67	8.85	10.01	6.57
	5.69	5.23			4.06	3.87	5.69		10.45	8.69	9.63	5.12
	5.45	5.23					4.82		9.76	8.26	9.48	4.49
	4.23	4.8					4.21		9.29	7.22	7.56	4.56
	4.08	4.03							9.36	6.94	7.23	5.02
	3.29								8.89	5.36	5.23	5.13
									7.9	4.36	4.03	4
									7.93	5.08	3.58	4.12
									5.69	4.11		4.21
									6.07			
									5.23			
									5.12			
									5.02			
									4.06			

TABLE 6.--Subject F: Perimeter Data

Subject F	UR1	UR2	UR4	UR6 MB	UR6 DB	UR6 P	LR1	LR3	LR4	LR6 M	LR6 D
	20.3	17.45	23.27	31.5			15.42	21.32	18.78	29.64	
	19.93	17.06	22.97	31.34			14.89	20.29	18.88	28.15	
	19.93	16.41	21.48	31.33			15.47	19.78	17.73	28.47	
	19.63	16.38	21.67	30.33			14.14	20.2	16.78	28.52	
	18.88	15.84	21.48	30.15			14.66	19.44	16.2	28.5	
	19.07	16	20.44	29.73			13.66	19.85	16.15	28.4	
	17.23	16.9	20.88	29.45			14.54	19.6	16.11	27.91	
	18.54	16.05	19.52	28.95			14.04	19.24	15.42	28.35	
	18.23	16.07	19.27	29.75			14.72	19.69	15.01	28.2	
	18.21	15.71	19.14	30.16			15.09	19.46	14.63	28.79	
	17.21	15.45	19.99	30.66			14.8	19.1	14.61	20.85	18.26
	16.2	15.08	18.9	30.04			14.31	19.3	14.4	20.52	17.92
	16.63	13.83	17.92	17.31	24.76		14.29	18.94	13.48	20.68	18.35
	15.85	14.91	19.99	17.3	24.47		14.08	18.48	13.48	20.68	17.97
	15.93	14.35	19.59	16.13	10.68	15.19	14.27	18.28	12.94	19.49	17.99
	15.84	15.39	18.64	15.99	10.8	13.94	14.12	18.4	13.15	19.05	16.89
	16.04	15.21	18.55	16.97	11.65	13.66	13.2	17.92	12.61	18.77	15.3
	15.73	14.08	17.6	16.61	10.05	13.54	12.8	17.24	12.77	18.98	14.96
	16.12	13.58	17.87	16.62	11.42	13.57	12.99	17.37	12.03	17.32	15.23
	14.79	12.72	16.72	14.38	10.69	13.67	12.85	17.09	12.44	17.67	14.13
	15.11	13.08	16.71	14.44	10.59	14	12.07	16.78	12.89	17.36	13.72
	14.86	12.83	15.84	15.52	10.39	14.12	12.61	15.6	12.55	17.33	13.55
	14.57	13.28	15.43	15.98	10.06	13.33	11.03	16.14	11.62	17.52	12.99
	13.89	12.3	16.54	13.96	10.28	13.35	11.17	15.21	11.33	16.15	12.76
	14.12	12.14	14.77	8.84	9.32	13.02	10.25	14.29	11.39	15.98	12.41
	13.56	12.09	14.11	9.94	8.91	11.97	10.49	14.28	11.69	14.45	11.18
	13.35	11.22	13.55	9.27	8.99	12.74	10.27	13.22	10.47	15.1	10.97
	13.18	11.26	12.81	10.23	7.94	11.93	10.43	12.61	10.76	15.42	10.85
	12.71	10.24	12.97	10.91	7.26	11.81	8.89	11.94	9.74	13.97	10.22
	12.89	9.58	12.54	7.35	7.03	10.75	8.85	11.75	9.53	13.21	10.18
	12.68	9.01	12.77	8.54	5.74	10.76	8.36	9.94	9.2	10.71	10.04
	12.55	8.24	12.6	7.74	5.76	10.74	7.72	10.82	9.28	11.93	8.81
	11.8	9.22	12.32	6.5	4.55	9.11	6.98	8.44	7.94	12.51	8.79
	10.9	8.51	11.8	4.95	6.23	9.46	6.82	9.85	7.58	12.64	9.32
	10.6	5.71	10.84	4.38	6.26	8.94	5.05	8.82	8.22	10.97	9.39
	10.55	6.72	10.37	6.14	5.71	7.67	3.51	8.09	6.77	11.27	7.48
	9.48	6.63	9.97	3.92	4.35	8		8.13	5.92	10.74	6.8
	9.44	7.16	5.09		4.88	7.46		7.03	5.83	11.71	7.23
	8.97	5.66				7.71		7.13	5.23	8.42	5.33
	8.35	5.11				6.68		6.45	4.16	6.44	4.16
	7.82	4.68				6.04		5.16		6.74	3.75
	6.87	4.41				4.84		5.65		5.41	
	7.27	4.07				4.39		3.94		4.26	
	5.53							3.41		4.1	
	4.67									3.74	
	4.16										
	4.28										
	2.66										

TABLE 7.--Subject G: Perimeter Data

Subject G	UR1	UR2	UR4B	UR4L	UR6MB	URDB	UR6P	LR1	LR3	LR4	LR6M	LR6D
	22.51	18.4	24.91		36.47			15.66	23.61	20.94	33.3	
	21.77	18.62	25.15		35.93			15.19	23.47	20.46	33.03	
	21.06	18.13	24.13		34.48			14.32	22.65	19.91	32.24	
	20.99	18.07	23.47		32.53			13.82	22.82	19.71	31.74	
	20.5	17.94	23.04		30.34			13.93	23.24	18.59	31.4	
	21.06	17.73	22.56		32.42			13.19	22.8	18.36	31.03	
	20.43	17.26	22.58		34.07			13.64	22.2	17.98	31.79	
	20.36	17.15	22.18		32.93			13.29	21.93	18.67	20.91	20.15
	19.83	16.19	22.02		34.33			13.61	21.21	18.04	21.88	19.57
	20.33	16.31	22.2		16.86	27.78		13.81	22.23	18.2	21.72	20.19
	19.07	16.7	21.24		16.42	29.17		13.01	20.85	17.79	21.57	19.05
	19.46	16.87	21.53		16.76	31.46		14.01	20.26	17.02	20.77	18.6
	18.73	17.04	21.36		17.01	14.62	16.48	13.18	20.52	16.32	21.22	18.96
	18.76	16.49	21.64		16.2	14.64	17.19	13.36	19.66	16.97	20.7	19.26
	19.33	16.65	13.36	10.45	16.15	14.24	15.46	13.69	20.49	16.9	21.26	18.05
	19.06	15.74	12.43	10.27	15.84	14.11	16.51	13.24	20.42	17.36	21.5	18.42
	18.29	15.27	11.56	9.6	14.85	13.79	15.98	12.87	20.68	17.62	20.23	16.89
	17.86	14.8	12.51	9.06	15.09	14.07	15.24	12.19	19.25	17.91	20.5	16.61
	17.89	14.76	10.72	7.88	14.92	12.99	14.95	12.09	18.85	17.45	18.47	16.39
	17.35	14.98	10.76	7.89	14.52	12.57	13.78	12.16	18.53	18.19	18.43	16.25
	17.27	14.52	10.49	8.67	13.21	12.58	14.25	12.35	19.11	17.56	18.16	16.14
	15.86	14.53	10.89	8.48	13.61	11.32	13.31	11.01	19.08	16.98	18.25	15.56
	15.1	14.1	9.88	7.51	14.13	11.46	13.88	10.2	18.56	17.86	17.65	14.87
	15.2	13.44	8.85	6.82	12.86	10.54	13.46	10.47	18.2	18.18	17.31	15.79
	14.15	13.26	8.69	7.01	12.62	9.55	12.87	10.57	18.12	15.91	17.89	16.45
	13.94	12.57	6.99	5.53	13.12	9.39	12.85	9.89	17.57	14.36	16.99	14.59
	13.6	11.86	7.27		13.58	9.22	12.87	9.52	17.27	15.28	16.42	13.57
	12.89	11.85	5.93		12.4	9.53	12.93	8.82	17.94	14.72	16.28	12.97
	11.48	10.83	5.35		12.03	9.59	12.31	8.21	17.68	13.18	14.9	11.75
	10.55	9.48			12.61	9.21	11.45	7.42	17.37	11.32	15.01	10.57
	10.98	9.18			11.77	8.97	10.99	6.51	16.46	9.89	13.26	9.4
	11	7.5			11.01	8.63	10.29	4.68	16.7	7.56	12.38	8.9
	9.33	6.27			9.53	8.15	10.4	3.48	16.62	6.63	10.06	7.04
	8.44	4.23			6.93	5.6	10.09		14.98		9.42	7.2
	8	2.91			6.09	5.07	9.3		14.96		8.75	5.86
	6.99				4.56	6.17	8.86		14.56		7.09	3.56
	6.69					4.42	7.57		12.3		6.75	4.47
	5.52						6.35		11.27		5.83	
	4.05						4.75		11.09			
	3.64						4.09		10.71			
									11.04			
									7.56			
									6.49			

TABLE 8.--Subject H: Perimeter Data

Subject H	UR1	UR2	UR4 B	UR4 L	UR6 MB	UR6 DB	UR6 P	LR1	LR3	LR4	LR6 M	LR6 D
	24.33	19.5	24.71		34.14			15.26	20.85	20.89	34.52	
	24.12	19.61	23.24		32.85			14.8	20.25	20.23	33.28	
	23.44	19.62	22.75		21.16			14.32	20.78	19.52	33.76	
	22.58	18.8	22.69		30.98			13.77	20.75	19.63	32.23	
	22.02	18.62	22.91		31.34			13.72	19.39	19.65	31.74	
	22.04	18.53	22.26		31.09			13.61	19.36	18.98	30.07	
	21.73	18.25	22.22		31.15			14.03	19.35	18.75	30.87	
	21.9	18.15	21.94		29.35			14.31	19.46	18.26	30.77	
	21.39	17.75	21.46		30.25			14.01	19.57	18.43	30.67	
	20.84	17.04	21		30.98			13.68	20.08	18.25	30.58	
	20.46	16.8	20.92		16.67	26.88		13.66	20.1	17.75	31.7	
	19.85	16.69	20.13		16.55	27		13.17	19.64	18.23	29.97	
	19.62	15.63	19.83		16.68	27.98		13.14	19.21	18.32	20.28	21.24
	16.23	15.79	19.34		17.02	27.82		13.26	19.65	17.25	20.58	20.85
	18.99	15.47	19.34		17.03	28.28		13.34	19.92	16.78	20.89	20.83
	18.75	15.15	19.22		16.68	27.26		12.8	18.98	17.1	20.46	20.45
	18.29	15.03	18.82		15.82	12.79	15.41	12.37	18.27	17.21	20.48	20.24
	18.62	14.81	18.54		14.52	12.26	14.88	12.24	18.32	16.89	20.84	20.67
	18.22	14.78	18.35		13.82	11.51	14.08	12.02	18.3	16.61	20.98	19.06
	17.26	14.8	17.79		13.25	11.3	13.58	11.19	17.87	16.84	20.46	19.68
	16.69	14.26	17.29		13.01	11.09	13.61	10.83	17.32	17.01	20.17	18.13
	16.4	14.38	17.8		12.99	11.12	13.68	10.67	17.56	16.54	19.69	17.75
	16.16	14.1	17.84		12.8	10.04	13.65	10.84	17.07	16.22	18.23	17.03
	15.91	13.85	17.36		12.05	10.8	12.26	10.75	15.86	15.02	18.47	16.58
	15.76	13.57	17.21		11.38	9.55	12.18	10.16	16.52	14.41	18.17	16.2
	14.23	13.49	17.06		11.58	9.68	12.01	10.08	15.9	14.26	17.45	16.72
	12.88	13.45	16.04		11.26	8.03	11.55	9.62	15.87	14.24	16.35	16.9
	12.03	12.48	15.59		10.97	7.62	11.23	9.95	15.65	13.84	16.02	16.67
	11.08	11.9	14.96		10.79	7.35	10.6	9.24	15.39	13.42	15.83	16.19
	11.02	10.9	13.26		10.89	7.4	10.03	9.61	15.21	12.9	15.57	16.51
	10.34	10.36	9.72	7.23	10.46	7.15	9.89	7.71	15.11	12.81	14.61	15.59
	9.91	10.26	9.24	7.02	10.23	6.84	9.61	6.67	15.23	12.24	14.83	15.57
	8.9	10	8.12	6.25	9.93	6.3	9.2	6.21	15.22	11.98	14.75	14.65
	8.4	9.57	7.75	6.11	9.51	5.23	8.96	4.29	14.84	12.18	13.27	14.88
	8.2	8.21	7.08	4.09	9.19	3.96	9.01	4.35	14.04	12.25	12.94	14.27
	7.86	7.86	6.51	3.84	8.89	3.21	8.99	4.3	13.31	11.82	12.85	13.81
	7.29	7.66	6.07		7.18		9.03		12.85	10.32	12.68	13.3
	6.88	6.9	5.04		6.69		8.02		12.68	11.13	12.14	13
	6.38	6.21	4.11		5.51		6.48		11.79	10.08	11.91	12.9
	5.26	5.69			4.49		4.9		11.16	10.36	11.41	11.48
	5.02	5.58			4.06		4.52		10.65	9.45	10.78	10.71
	4.28	4.12			3.48		3.36		9.91	9.21	9.58	9.56
	3.24	3.05					3.02		9.67	8.12	9.08	8.66
	2.99						2.87		9.76	6.28	7.64	6.23
									10.47	4.9	5.12	5.57
									9.62	4.17	5	4.62
									8.34			4.75
									7.94			
									7.91			
									6.36			
									5.26			
									4.2			

TABLE 9.--Subject I: Perimeter Data

Subject I	UR1	UR2	UR4 B	UR4 L	UR6 MB	UR6 DB	UR6 P	LR1	LR3	LR4	LR6 M	LR6 D
	20.71	17.31	24.63		32.6			14.89	19.26	22.66	29.75	
	19.37	17.74	24.43		32.34			13.96	19.01	21.71	29.06	
	19.53	17.07	23.34		31.76			13.67	18.56	20.02	28.52	
	19.75	15.13	22.29		31.01			14.2	18.22	19.29	27.91	
	19.64	15.12	22.46		30.6			13.96	17.11	19.63	28.36	
	19.52	15.27	21.61		30.28			14.18	17.92	19.58	27.27	
	19.45	15.92	21.6		30.33			14.35	18.06	17.96	26.97	
	19.57	14.01	20.93		29.7			14.28	17.66	17.11	27.44	
	18.21	14.18	20.96		29.27			13.72	17.71	17.49	18.44	17.51
	18.63	13.42	20.28		29.2			14.23	18.15	17.04	18.07	16.94
	17.82	13.3	20.15		29.77			14.15	17.16	17.1	18.19	16.8
	16.91	12.96	19.24		31.21			14.11	17.53	16.99	18.79	16.85
	16.49	13.33	19.94		16.06	25.08		13.83	15.94	16.28	19.13	16.76
	16.17	13.55	19.28		15.31	24.86		13.51	16.59	15.43	18.83	16.98
	16.04	13.24	18.58		16.27	11.5	16.41	13.56	16.1	16.29	18.68	16.31
	15.79	13.43	18.35		16.33	10.63	15.19	13.18	16.42	16.36	17.43	16.32
	14.66	13.32	17.75		15.6	11.33	15.77	13.07	15.28	15.84	18.26	15.72
	14.8	11.63	17.25		13.73	10.59	15.01	12.66	15.2	16.06	17.21	14.47
	14.23	11.53	16.98		14.04	10.1	14.4	12.7	15.05	14.64	17.5	14.64
	13.34	10.94	16.71		13.03	9.7	14.78	13.16	14.51	14.13	17.64	13.84
	12.81	10.95	16.65		12.27	9.95	14.41	11.95	13.35	14.14	16.6	13.67
	11.61	11.26	15.49		12.76	9.61	13.19	11.91	11.89	13.56	15.48	13.25
	12	10.6	7.98	8.24	11.79	9.94	13.19	9.81	12.18	13.15	15.96	13.14
	11.35	10.97	7.08	8.64	11.37	7.74	12.6	9.54	11.85	12.82	14.61	12.04
	11.85	10.41	5.93	7.55	11.59	8.49	12.49	8.3	12.2	12.88	14.14	11.24
	10.27	9.99	5.68	7.21	12.06	6.44	11.57	7.32	10.99	12.9	13.88	10.55
	9.87	9.09	6.1	7.02	10.78	4.44	10.71	6.72	9.81	12.25	12.75	9.95
	8.74	7.92	5.6	6.63	9.16	5.42	10.8	5.66	9.96	11.53	12.68	9.36
	6.92	8.67	4.78	6.06	8.35	3.95	10.41	5.42	8.34	11.53	11.6	8.95
	6.51	6.9	3.57	6.18	7.65	3.88	9.82	3.54	7.78	10.81	10.87	7.52
	5.56	7.32		4.35	5.68	3.56	10.16		6.37	9.72	9.73	6.35
	5.63	4.93			3.95		8.76		5.6	8.94	9.73	6.95
	3.98	4.17			3.35		7.61		5.2	7.51	8.17	5.72
	3.82						7.08			5.12	5.66	5.21
							5.56					3.95

TABLE 10.--Subject J: Perimeter Data

Subject J	UR1	UR2	UR4B	UR4L	UR6MB	URDB	UR6P	LR1	LR3	LR4	LR6M	LR6D
	22	20.26	25.36		31.82			16.3	22.69	20.89	33.68	
	21.79	20.6	24.98		32.1			15.58	22.69	19.98	33.37	
	21.43	19.52	24.38		31.86			15.25	22.48	20.11	32.61	
	21.65	19.44	23.78		32.59			14.87	23.46	20.34	32.85	
	20.42	19.28	22.86		33.88			15.27	23.62	20.79	32.9	
	20.43	19.06	23.47		34.38			15.59	23.87	20.23	31.42	
	20.15	18.19	23.43		34.37			16	23.76	20.38	31.9	
	20.2	18.2	22.78		34.29			15.79	22.96	20	33.33	
	20.25	18.49	24.64		36.23			15.48	23.8	20.99	32.82	
	20.64	18.55	24.58		20.24	28.47		15.89	22.79	20.41	32.79	
	20.25	17.58	24.25		19.87	29.12		15.3	23.08	19.98	33.92	
	20.5	17.91	24.04		19.62	28.59		16.4	23.12	19.66	34.38	
	20	17.31	24.26		18.09	29.22		15.77	23.23	19.27	37.25	
	19.03	16.95	25.7		19.24	30.58		15.69	21.99	18.49	23.82	21.73
	19.1	17.19	25.31		18.87	31.26		16.05	22.06	18.67	25.08	23.14
	18.84	16.28	27.26		19.06	13.66	15.9	15.34	22	17.33	24.81	22.84
	19.41	16.69	27.62		16.66	14.08	16.16	14.54	22.18	19.11	25.32	22.58
	17.2	15.57	26.18		16.84	14.18	15.16	14.43	22.18	18.86	25.16	21.6
	17.5	15.56	14.12	12.8	16.85	13.44	14.66	14.21	20.89	19.16	25.47	21.94
	16.69	15.11	12.58	11.93	16.8	12.4	14.83	13.71	21.76	18.1	24.4	22.28
	17.28	16.17	11.51	12.61	16.43	11.77	13.32	13.55	20.44	18.45	24.24	21.8
	17.33	15.57	11.56	13.06	14.56	11.28	12.49	14.03	20	17.66	22.94	21.22
	16.6	15.22	12.94	12.45	14.79	11.11	13.05	13.64	20.08	17.65	24.29	21.82
	16.74	15.83	11.9	12.08	14.23	10.88	12.97	12.87	19.56	17.88	23.6	20.03
	16.96	15.08	11.45	12.41	14.47	10.42	13.62	12.74	18.96	17.31	22.87	19.56
	15.64	15.26	10.2	10.94	13	9	11.55	12.61	19.47	17.34	22.43	20.6
	16.28	14.83	10.35	11.11	11.31	9.44	11.58	12.96	18.98	17.39	22.07	19.81
	16.93	14.41	9.92	10.79	10.49	9.06	11.66	12.79	19.3	17.41	20.88	18.86
	15.76	13.52	10.32	11.24	9.43	8.17	11.51	12.85	18.81	17.14	21.55	19.98
	14.81	13.28	10.12	11.91	8.09	8.02	10.96	11.82	18.15	17.61	21.06	19.26
	15.32	13.33	10.65	10.65	8.03	4.26	10.07	12.01	17.5	17.81	20.68	19.72
	14.48	13.38	9.08	11.07	6.86	5.04	10.52	10.04	17.78	16.38	20.29	19.42
	13.57	13.54	8.75	10.24	6.59	4.36	10.04	10.23	17.11	17.66	20.08	18.3
	13.56	14.62	9.27	10.26	5.63	3.93	10.3	9.78	17.06	15.37	19.68	17.71
	13.22	13	9.09	8.88	3.95	3.89	9.54	10.41	15.96	16.37	19.46	15.87
	12.44	12.67	8.54	9.02	2.64	3.99	9.21	9.15	15.52	14.15	17.94	16.4
	12.23	11.25	7.95	9.18		4.21	8.41	9.25	15.65	12.92	17.64	15.74
	12.31	10.99	7.12	8.09		3.53	7.13	8.68	14.89	14.06	17.33	15.69
	11.51	9.91	5.47	7.16			7.08	4.55	15.02	13.14	17.26	15.39
	9.98	8.47	5.52	7.59			7.51	4.41	14.99	8.18	14.82	14.01
	10.38	8.57	4.63	7.56			6.36		13.39	6.68	15.19	13.83
	9.81	9.21		5.15			5.89		13.38		15.68	12.71
	8.43	9.12		4.75			4.19		13.29		14.11	12.66
	8.64	7.17					4.07		12.21		14.29	12.51
	8.16	6.06							11.57		12.03	11.16
	6.95	4.07							11.94		9.88	9.68
	7.28	3.57							11.47		9.92	7.62
	4.88	2.66							11.4		9.16	6.46
	4.89								10.69		7.48	5.32
	3.45								10.36		5.63	3.88
									9.82			5.21
									9.53			3.54
									8.2			
									6.74			
									5.81			
									5.62			
									4.58			
									4.21			
									3.99			

TABLE 11.--Subject K: Perimeter Data

Subject K	UR1	UR2	UR4B	UR4L	UR6MB	URDB	UR6P	LR1	LR3	LR4	LR6M	LR6D
	19.98	17.46	21.63		32.55			14.32	20.18	19.48	30.48	
	19.72	17.68	21.69		31.06			13.92	19.64	20.03	30.4	
	19.09	16.99	21.14		30.2			14.16	19.74	18.65	29.84	
	17.99	16.4	19.85		29.78			13.91	18.5	17.7	29.67	
	18.37	16.86	19.65		29.93			13.54	18.8	17.65	28.61	
	18.11	15.96	18.65		29.51			12.65	18.71	16.97	29.33	
	18.05	15.36	19.01		30.44			13.81	18.34	15.69	28.98	
	18	14.89	19.04		28.3			13.28	18.92	16.16	28.86	
	17.8	15.87	18.96		28.39			13.54	19.15	16.22	29.03	
	16.85	14.94	18.73		28.74			13.5	19.26	16.38	29.5	
	17.03	14.64	17.91		29.07			13.11	19.38	15.59	27.83	
	16.69	14.23	17.97		29.57			12.63	17.81	16.03	29.06	
	16.25	13.92	17.87		16.99	14.42	16.36	12.55	18.43	15.74	18.16	17.53
	16.46	14.1	17.77		16.63	13.6	14.63	13.08	18.71	15.89	18.93	17.87
	14.98	13.52	17.01		16.07	12.65	15.55	13.54	17.77	14.21	18.37	15.56
	15.89	13.07	10.75	8.03	16.77	14.43	15	12.67	17.67	13.91	18.5	15.18
	15.14	13.05	9.26	7.47	16.31	13.29	15.14	11.17	18.34	12.47	18.18	14.96
	14.22	12.53	9.04	7.91	15.91	12.3	14.08	10.9	16.78	12.54	16.65	13.69
	13.9	12.81	8.34	7.5	14.59	11.09	13.35	10.1	15.43	13.36	16.75	13.54
	14.02	12.96	8.64	7.61	13.76	10.36	12.98	10.88	15.05	12.07	12.18	14.5
	13.22	12.75	8.3	7.37	14.28	11.13	13.94	10.28	15.38	11.94	9.54	14.52
	13.29	11.67	7.54	7.17	14.05	10.9	12.56	11.02	15.83	11.24	10.47	13.88
	12.99	12.17	7.96	7.76	13.15	10.06	11.86	10.05	15.93	9.62	8.5	13.23
	13	11.53	7.86	7.05	12.39	8.99	11.71	9.84	14.12	9.1	8.8	12.73
	12.36	11.27	7.92	6.64	12.17	9.01	11.32	9.82	14.95	10.24	7.09	12.13
	12.5	10.97	7.46	6.96	11.36	8.43	10.88	8.82	13.41	10.2	5.68	11.47
	12.58	9.74	8.12	6.16	10.64	8.2	11.38	7.74	11.49	10.83	5.57	10.73
	12.98	10.2	7.12	6.37	10.8	6.62	10.64	8.25	11.6	9.3	5.21	11.25
	12.72	11.59	6.54	5.72	9.66	5.65	9.65	7.67	11.2	9.21	5.55	11.24
	11.37	11.48	4.56	5.66	8.03	5.48	9.76	6.37	12.05	7.7	4.58	10.37
	11.77	10.79		5.42	8.72	5.99	8.51	6.67	11.64	7.33	3.84	9.97
	10.85	10.97		4.65	8.1	6.2	8.12	5.3	11.09	6.87	3.49	10.15
	10.01	10.02		4.12	7.65	5.25	7.56	5.79	10.13	7.01	4.21	9.86
	8.89	9.52			6.54	5.12	7.65	5.03	10.75	6.96		8.9
	8.28	8.93			4.25	4.26	6.25	4	8.81	5.43		8.8
	7.25	8.64			3.96	3.88	4.63	4.89	8.81	4.45		6.84
	7.23	8.42					4.22	3.78	9.14	4.12		5.54
	6.7	6.47					4.1	3.54	7.91	3.89		4.58
	6.31	6.41							6.84			
	6.23	6.19							6.5			
	5.56	5.46							5.68			
	4.74	5.12							4.44			
	4.77								4.22			

TABLE 12.--Subject L: Perimeter Data

Subject L	UR1	UR2	UR4 B	UR4 L	UR6 MB	UR6 DB	UR6 P	LR1	LR3	LR4	LR6 M	LR6 D
	19.47	16.31	22.95		32.66			14.51	21.01	20.25	30.7	
	18.86	16.63	22.85		32.71			13.77	19.96	20.04	31.05	
	18.42	15.88	23.32		32.37			13.67	20.54	19.59	30.43	
	18.02	15.57	23.02		31.76			13.55	19.58	18.65	30.81	
	17.48	15.11	23.04		31.12			13.88	19.24	18.7	30.51	
	16.59	15.05	22.76		30.77			12.65	19.63	18.37	30.61	
	16.9	14.73	22.98		29.95			12.94	19.91	18.13	31.07	
	17.2	13.75	22.14		31.82			12.93	19.77	17.48	29.95	
	16.96	13.72	20.93		32.77			13.23	20.41	16.82	29.98	
	17.13	12.91	21.05		31.78			12.68	20.58	17.41	32.78	
	16.22	12.62	19.47		29.65			12.36	20.58	17.18	19.06	20.37
	16.79	12.77	20.81		32.19			13.52	19.66	16.41	19.54	18.5
	15.53	12.9	19.58		32.76			13.14	20.17	16.68	20.17	18.14
	16	13.31	19.27		15.99	26.03		11.76	19.21	16.52	18.47	16.93
	15.93	13.51	19.71		15.38	25.25		12.16	18.26	15.91	18.06	17.01
	16.46	13.37	19.42		14.33	13.57	14.27	11.68	18.43	16.31	18.21	17.05
	15.5	12.47	18.96		14.98	12.43	15.35	12.36	19.59	16.1	18.16	16.87
	15.21	11.93	18.77		14.14	12.25	14.3	11.76	19.73	15.83	19.1	15.66
	15.41	12.76	19.83		13.39	12.18	14.27	11.58	18.93	16.61	18.32	15.95
	14.16	12.35	19.01		13.39	11.61	14.47	11.22	17.76	16.32	18.47	15.58
	14.88	11.01	19.25		13.79	12.05	12.38	11.25	17.48	14.29	16.87	16.1
	14.68	11.15	18.93		13.49	11.58	12.07	11.54	17.35	14.35	17.1	13.89
	13.85	10.84	18.24		11.41	9.86	12.18	9.93	17.33	15.23	16.27	14.25
	12.83	10.63	17.14		11.43	9.63	11.96	10.71	16.54	14.57	16.63	14.62
	13.54	10.9	8.44	9.48	10.99	9.07	11.64	10.62	16.14	15.42	16.59	15.34
	13.23	10.5	7.85	8.95	10.87	8.69	9.75	10.45	17.14	13.24	17.56	13.69
	12.79	10.01	8	7.81	10.3	8.74	9.99	10.13	16.91	12.85	15.95	12.68
	12.78	9.69	7.12	7.78	10.14	8.45	8.74	10.36	15.17	13.8	16.53	13.91
	12.43	9.18	7.65	8.28	11.41	8.45	8.36	9.48	15.98	13.51	16.95	13.07
	12.31	8.98	6.68	7.98	10.69	7.23	9	9.57	15.67	12.87	16.29	13
	11.54	8.15	6.55	8.12	10.91	7.25	8.65	8.76	14.76	12.33	16.99	12.76
	10.92	8.84	6.22	8.01	9.69	7.46	8.59	8.53	12.91	11.71	17.03	13.26
	10.54	7.82	5.85	7.65	8.05	8.13	8.34	8.13	12.16	10.9	15.54	12.72
	10.4	8.33	5.34	6.58	9.68	7.8	7.8	7.37	10.83	10.46	14.63	12.09
	9.36	8.17	5.96	6.65	10.7	7.27	7.76	6.74	11.79	11.8	13.02	11.29
	9.53	9.08	5.16	6.16	10.9	7.12	7.05	5.87	11.04	10.9	13.73	11.26
	9.41	8.24	5.7	6.05	11.18	7.8	7.05	5.68	11.34	10.58	13	10.4
	9.4	8.4	5.62	6.01	10.12	6.51	6.67	4.57	10.37	10.06	12.8	10.16
	9.15	8.3	5.15	5.98	9.33	7.12	6.62	4.25	9.89	10.1	12.28	9.58
	8.94	7.94	4.35	5.72	9.84	6.41	5.48	3.89	7.34	9.3	11.49	8.98
	8.74	6.52	4.12	5.13	9.43	6.72	6.37		7.49	8.02	11.45	9.85
	7.21	5.64	2.5	4.87	5.3	4.01	6.33		6.37	8.19	10.35	8.15
	6.85	5.58		4.25		3.84	6.42		5.94	7.3	10.06	7.63
	5.69	4.96		4.12			6.41		4.95	6.46	10.86	7.18
	3.25	5.01		3.98			5.4		6.99	6.43	9.68	7.01
	3.44						3.87		4.66	5.58	8.45	6.98
									4.78	4.65	4.59	6.28
									4.37	4.22		5.17
									4.22	3.87		3.75

TABLE 13.--Subject M: Perimeter Data

Subject M	UR1	UR2	UR4	UR6MB	URDB+P	LR1	LR3	LR4	LR6M	LR6D
	16.67	15.98	22	29.66		13.07	18.34	18.75	29.12	
	15.8	15.53	21.25	29.3		12.8	17.75	18.52	29.22	
	15.64	15.01	20.26	28.89		12.65	17.35	18.44	29.35	
	15.23	14.42	20.47	28.25		12.85	16.8	17.46	28.79	
	15.37	13.97	19.48	27.38		12.9	16.26	16.48	28.75	
	14.42	12.26	18.62	27.14		12.47	16.45	16	28.47	
	13.57	11.67	18	26		12.83	16.89	15.75	28	
	13.8	12.05	17.45	26.25		12.46	16.64	15.84	28.63	
	13.69	12.04	16.69	26.71		12.23	16.41	15.82	28.51	
	13.26	12.1	16.8	27.23		12.21	16.02	15.24	27.79	
	13.16	12.05	16.71	28.37		12.02	15.99	14.72	17.81	17.39
	12.99	12.12	16.45	14.11	23	12.03	15.75	14.35	17.64	17
	12.65	11.78	16.38	13.35	22.86	12	15.68	14.15	17.18	16.67
	12.5	11.8	16.85	12.58	22.6	12.12	15.96	14.41	17.41	16.25
	12.28	11.82	16.9	12.61	25.47	11.89	15.92	13.99	17.61	15.68
	11.82	11.26	16.34	12.13	25.51	11.84	14.9	13.84	16.9	15.84
	11.37	10.82	16.3	12.24	24.86	11.9	14.83	13.56	16.83	16.67
	11.62	10.78	16.84	12.04	24.54	11.61	14.87	14.24	16.48	15.96
	12.23	10.35	16.45	11.13	23.21	11.32	14.78	13.23	16.42	15.31
	11.12	10.68	15.76	10.35	22.86	11.42	14.96	13.23	16.84	15.79
	10.52	10.69	15.02	10.26	21.16	11.22	14.9	12.58	16.98	15.7
	10.34	10.25	15.45	10.09	20.85	11.14	15.24	12.47	16.54	14.85
	10.29	10.08	15.35	9.63	21.59	10.46	15.15	12.17	16.45	14.15
	9.81	9.68	14.9	9.99	21.56	9.94	15	12.23	15.14	14.32
	9.23	9.93	14.83	8.84	21.24	9.81	14.69	11.48	14.81	14.04
	9.22	9.48	13.57	8.5	20.87	8.84	13.84	10.05	14.9	13.24
	9.11	9.14	12.96	7.74	20.05	8.15	13.3	9.9	15.59	12.98
	8.57	8.52	13.04	7.61	20.52	7.45	13.14	10.21	14.68	12.04
	7.86	8.04	12.97	7.96	20.47	6.68	13.06	10.4	14.56	11.84
	7.92	8.23	12.45	8.57	19.71	6.75	12.68	9.84	14.6	11.53
	8.34	7.91	12.01	8.46	19.57	6.5	12.53	9.55	14.4	11.07
	7.62	8.02	12.18	8.14	18.79	5.85	11.47	9.48	13.26	10.95
	7.04	8	11.05	8.12	17.78	5.31	10.45	9.43	12.53	10.19
	6.67	8.09	10.6	8.15	17.76	5.02	10.38	9.26	11.24	9.87
	6.22	8.1	10.14	7.76	16.56	4.41	10.28	9.16	10.45	9.27
	6.01	7.62	9.87	6.32	15.6	4.01	9.68	8.47	10.35	8.89
	5.34	7.15	8.1	6.56	15.47		9.36	8.46	10.13	8.77
	5.69	6.69	8.46	5.44	15.23		8.84	7.25	10.26	8.26
	4.58	6.25	8.65	5.48	14.48		8.28	7.06	10.03	8
	4.12	5.12	7.4	5.46	13.99		7.94	6.82	9.84	7.79
	3.67	4.48	7.02	4.42	10.26		6.9	6.65	8.71	7.11
	3.21	4.2	6.87	4.12	6.19		6.84	6.25	8.62	5.36
		3.66	6.2	3.94	5.1		6.51	6.01	7.4	4.9
			5.78		3.49		5.96	5.64	7.23	4.27
			5.34				5.47	4.4	6.84	4.01
			4.42				4.21	4.12	5.69	3.94
			3.67				4.12	3.99	4.12	
									3.74	

TABLE 14.--Subject N: Perimeter Data

Subject N	UR1	UR2	UR4	UR6 MB	UR6 DB	UR6 P	LR1	LR3	LR4	LR6 M	LR6 D
	21.2	16.25	23.5	32.59			16.18	21.09	20.87	32.33	
	20.94	16.08	22.52	32.66			14.92	20.73	19.4	31.43	
	20.89	15.74	22.49	31.49			14.53	21.14	19.14	30.43	
	20.3	15.53	22.19	31.37			14.71	20.49	18.6	31.34	
	20.75	15.15	21.92	30.39			14.17	20.77	18.92	31.51	
	19.39	15.24	22.16	30.32			14.34	20.31	18.11	30.9	
	19.36	15.6	22.33	30.31			13.58	20.64	17.68	31.17	
	19.02	15.26	21.07	31.33			13.3	20.43	17.93	31.48	
	19.18	14.9	20.47	30.66			13.75	19.86	17.56	31.98	
	19.73	14.65	20.86	32.06			14.1	20.33	18.43	31.57	
	19.99	15.15	20.57	34.58			14.09	19.92	17.56	22.08	20.49
	19.6	14	20.29	34.1			14.89	20.22	17.94	21.21	20.21
	19.49	14.58	19.73	35.88			14.2	20.17	17.79	21.25	20.27
	17.78	13.52	20.89	16.87	14.81	14.79	13.74	19.53	16.91	21.23	19.9
	17.85	13.05	20.1	17.57	15.01	15.9	13.7	19.8	16.97	20.56	19.78
	17.24	12.6	19.74	16.61	13.1	15.59	13.51	19.73	17.02	20.25	19.34
	17.51	13.32	19.34	15.73	12.93	15.83	13.26	18.74	16.01	20.5	19.33
	16.97	13.17	18.92	16.81	11.42	15.33	13.95	19.43	15.83	19.58	17.62
	17.29	14.04	18.32	16.06	11.94	14.85	13.91	17.98	15.66	20.91	18.1
	16.6	12.65	18.7	15.54	11.36	13.93	13.25	17.96	16.21	19.55	19.26
	15.98	12.24	18.38	14.97	11.04	13.83	13.79	17.73	16.74	20.32	18.66
	16.39	13.45	18.35	14.28	11.09	14.13	13.18	17.45	15.84	20.46	18.49
	15.47	12.62	18.34	13.65	11.31	13.81	13.36	18.49	16.31	19.02	18.46
	15.2	12.43	17.28	13.1	10.87	12.34	12.06	17.85	15.05	18.84	17.87
	14.82	11.98	16.98	14.1	9.84	12.03	11.39	17.25	14.98	18.21	18.37
	14.73	11.63	15.77	12.73	9.58	12.76	11.95	16.38	15.54	18.9	17.76
	14.36	11.71	16.28	12.95	8.63	12.54	11.12	15.74	15.27	19.11	16.95
	14.66	11.7	15.74	12.93	8.81	11.83	11	15.18	15.28	19.14	17.05
	14.1	11.29	16.28	12.39	8.78	12.4	9.95	15.5	15.59	19.25	17.3
	13.4	10.69	15.16	12.18	7.66	12.36	9.69	14.19	14.9	18.73	17.33
	13.75	10.59	14.8	12.15	7.46	11.72	9.82	14.17	13.46	18.62	16.82
	12.16	10.12	14.24	11.63	7.58	11.62	9.34	14.77	13.44	18.6	16.11
	11.73	10.59	14.48	11.94	6.55	10.63	8.85	13.19	13.88	17.75	16.3
	11.26	9.78	12.94	11.36	7.38	10.93	8.89	13.08	14.01	17.62	14.97
	10.54	9.75	12.57	11.65	7.03	10.28	8.56	12.17	13	16.75	14.31
	10.17	9.14	12.01	10.93	6.1	9.71	8.34	12.63	13.18	15.09	14.03
	10.64	8.4	11.64	10.79	5.66	10.45	7.66	12.41	12.44	16.05	14.79
	9.36	8.13	10.31	10.27	6.13	10.31	7.18	10.58	11.5	15.25	13.12
	9.18	7.32	10.15	10.52	6.07	9.2	6.72	10.97	11.52	15.83	12.72
	8.79	6.61	8.5	10.01	6.66	9.62	5.92	10.05	11.52	16.19	13.06
	8.18	6.38	7.47	8.85	5.6	8.93	5.05	8.41	10.11	15.42	12.89
	7.58	5.36	6.75	9.78	4.94	9.32	4.82	8.33	9.53	13.88	11.57
	7.25	4.75	5.46	7.51	3.84	8.94	4.96	7.81	9.11	13.36	10.16
	6.17	4.68	4.29	7.01		7.75	4.23	7.33	7.28	12.74	9.8
	5.73	3.05		5.82		6.89		5.87	5.29	11.7	9.18
	4.08			3.91		6.47		4.89		9.98	6.79
	3.35					5.35		4.58		10.11	
						4.37		5.24		9.85	
						3.68		3.01		4.82	
										3.95	

TABLE 15.--Subject O: Perimeter Data

Subject O	UR1	UR2	UR4B	UR4L	UR6MB	URDB	UR6P	LR1	LR3	LR4	LR6M	LR6D
	18.94	15.88	22.63		30.12			13.98	17.99	17.57	28.37	
	17.18	15.09	22.25		29.71			14.29	17.78	17.9	28.52	
	17.14	14.8	22.19		29.31			13.21	17.69	17.4	28.2	
	16.65	14.73	21.36		28.44			12.57	16.99	17.47	28.46	
	17.05	13.97	21.04		28.92			13.41	16.66	15.59	27.82	
	16.32	14.42	20.7		28.46			12.88	17.04	15.43	28.82	
	17	14.16	19.57		28.94			12.69	16.16	15.68	26.88	
	16.78	13.71	20.08		28.56			12.75	15.17	16.18	27.51	
	16.91	13.15	18.35		29.48			11.99	15.37	16.65	28.11	
	16.67	14.58	18.96		17.04	23.92		12.46	15.89	16.05	29.32	
	16.75	14.27	16.91		16.32	25.04		11.5	15.08	14.44	17.87	17.67
	16.93	13.35	18.82		15.23	23.52		11.28	15.6	15.18	18.67	17.66
	16.53	13.09	18		14.77	23.64		11.77	14.11	15.47	17.97	16.35
	15.7	12.65	18.37		15.23	10.2	12.3	11.34	14.31	15	17.8	16.6
	15.22	12.76	18.27		14.81	10.52	13.67	11.19	14.08	14.59	17.99	16.27
	14.71	12.68	9.66	8.8	13.26	10.05	13.92	10.95	13.97	14.05	18.13	16.48
	14.58	12.68	9.65	8.8	12.16	9.21	13.94	10.97	14.78	14.78	18.99	14.83
	15.96	12.48	9.14	8.84	13.39	9.5	14.59	10.65	14.66	14.15	17.69	14.99
	15.68	10.86	8.98	8.63	11.55	8.73	12.55	10.12	12.87	14.15	16.65	15.31
	15.33	11.23	8.72	8.33	11.72	8.87	13.05	10.75	12.94	13.08	17.19	15.51
	14.66	10.75	7.62	8.71	10.9	8.01	11.62	9.86	12.93	13.67	15.97	14.72
	13.84	10.69	7.95	8.23	10.29	8.04	10.47	9.67	12.34	13.6	13.28	13.02
	13.94	10.23	7.62	8.26	10.75	9.34	12.1	9.25	11.91	13.57	14.72	13.47
	13.03	10.17	6.65	7.72	10.54	7.67	11.5	8.76	12.57	13.42	14.19	13.23
	11.56	8.82	6.95	7.25	11	6.95	11.42	8.91	11.38	13.31	13.49	12.39
	10.52	9.41	6.67	6.81	9.54	6.14	10.04	9.36	11.56	12.66	11.96	12.35
	10.25	9.86	6.1	6.94	9.09	6.59	9.8	8.7	11.55	12.56	12.92	11.42
	10.62	7.82	6.7	6.25	8.39	5.72	8.61	8.98	11.57	11.88	11.19	11.37
	10.45	7.93	6.63	6.16	7.31	5.35	9.26	8.02	11.27	12.01	11.29	11.06
	9.84	7.93	5	5.81	6.08	4.82	9.43	7.37	9.34	11.6	12.14	10.33
	7.94	8.42	4.85	5.98	5.89	5.53	9.19	7.76	10.4	11.2	11.74	9.55
	7.6	8.5	4.68	5.64	6.23		7.72	7.22	9.96	11.5	10.77	9.54
	7.15	7.69	4.26	5.12	6.69		7.18	7.34	9.07	10.9	10.21	9.06
	7.66	6.24	3.85	4.01	6.97		6.2	6.35	9.93	11.31	10.92	8.24
	8.18	5.19		4.62	4.85		4.68	5.98	8.99	10.85	10.94	7.16
	6.91	4.63		4.21			4.23	5.01	7.62	10.42	7.42	6.81
	7.55						3.91	5.26	6.68	8.56	8.27	6.46
	6.67							4.23	6.54	8.27	6.99	5.24
	5.77							3.68	6.24	7.01	5.92	5.73
	4.77								5.89	7.63	5.68	4.29
	4.52								3.01	6.4	6.39	4.25
									5.68	6.54	5.67	4.68
									4.21	5.54	4.82	
										4.23		

TABLE 16.--Subject P: Perimeter Data

Subject P	UR1	UR2	UR4B	UR4L	UR6MB	URDB	UR6P	LR1	LR3	LR4	LR6M	LR6D
	22.59	19.46	26.15		38.03			15.61	23.82	21.62	35.85	
	21.19	19.37	24.64		37.42			14.5	24.13	21.08	35.38	
	20.42	18.38	24.79		36.23			14.97	22.91	20.86	35.49	
	18.57	17.89	24.24		35.63			14.75	23.04	20.48	34.34	
	19.08	17.38	23.61		34.77			13.77	23.1	19.86	35.13	
	18.66	17.51	23.29		36.99			14.27	22.24	19.05	36.79	
	17.11	17.13	22.97		38.98			13.78	21.73	19.77	38.59	
	17.12	15.95	22.44		16.2	31.75		13.64	22.13	18.66	22.09	20.1
	17.38	16.27	22.43		16.44	32.92		12.78	21.23	19.03	21.38	19.81
	17.52	15.77	20.9		15.35	31.72		12.74	21.75	18.64	19.54	20.3
	16.71	15.78	21.19		14.32	31.35		13.34	20.67	18.94	21.06	19.35
	17.09	16	21.15		13.76	31.75		13.59	20.66	19.23	20.93	19.26
	16.74	16.08	21.64		13.93	13.24	16.71	12.45	20.8	18.3	21.24	18.47
	14.86	14.53	13.42	11.39	13.22	12.77	16.86	11.44	20.98	18.29	20.15	17.35
	15.5	14.81	12.45	11.61	12.83	13.12	15.71	11.36	20.21	18.01	19.02	17.24
	14.34	14.27	13.49	11.27	12.17	11.73	13.68	10.56	21.01	17.07	19.79	16.98
	14.66	14.52	13.42	10.94	11.73	11.13	14.44	11.01	20.21	18.68	17.91	16.42
	14.54	13.03	12.11	9.81	11.56	10.97	13.72	10.15	19.73	17.88	18.18	17.62
	14.45	12.01	13.43	9.86	12.24	10.32	13.19	9.45	19.77	20.41	18.49	15.87
	13.92	12.09	12.84	10.02	11.08	9.38	13.74	8.57	18.7	19.29	18	15.38
	12.59	11.35	10.06	11.13	12.01	9.14	13.04	8.1	18.61	19.19	16.28	15.2
	12.5	11.21	10.4	10.63	11.17	8.64	12.61	6.87	17.39	21.09	15.5	13.81
	10.7	10.77	10.88	10.53	10.47	9.21	12.32	5.71	18.21	20.53	15.77	13.7
	9.93	9.34	9.76	9.28	11.21	8.44	12.2	5.97	17.8	20.19	15.14	12.95
	10.08	8.49	8.17	9.15	9.72	8.41	11.69	5.65	16.82	19.83	14.53	12.46
	8.82	7.52	7.65	8.83	8.42	6.65	11.28	4.22	16.71	15.68	14.39	12.3
	8.72	6.55	7.15	7.99	9.18	7.13	10.89	4.68	16.36	13.53	13.45	10.71
	8.8	6.03	5.67	8.18	6.69	6.75	11.14	4.25	14.63	12.35	12.96	10.92
	7.9	5.87	4.77	8.16	6.12	6.32	10.66		14.47	10.46	11.73	9.06
	6.06	3.96	3.86	8.02	5.9	5.15	9.13		13.07	7.11	9.58	8.28
	5.14		3.56	8.73	5.54	4.85	9.64		13.1	5.26	8.69	8.21
	4.85		3.02	7.5	5.32	4.21	8.13		13.01		7.56	7.31
				7.43	4.23		8.48		11.82		6.53	5.35
				7.17			7.52		12.21		3.98	4
				7.49			6.77		12.07			5.33
				6.72			6		11.37			4.3
							5.27		9.6			
							4.99		8.43			
									7.94			
									7.25			
									6.36			
									6.58			
									5.56			
									5.21			

TABLE 17.--Subject Q: Perimeter Data

Subject Q	UR1	UR2	UR4 B	UR4 L	UR6 MB	UR6 DB	UR6 P	LR1	LR3	LR4	LR6 M	LR6 D
	19.77	19.52	22.17		33.22			13.37	18.91	21.07	31.03	
	18.77	18.56	21.96		31.79			12.81	18.6	19.79	30.14	
	18.12	18.06	21.53		31.18			13.04	18.5	19.46	30.17	
	17.73	17.51	21.87		30.5			12.6	18.51	18.17	29.53	
	17.86	16.3	20.47		29.82			11.89	18.31	17.34	28.94	
	17.24	16.29	20.88		30.7			12.52	18.44	17.43	29.23	
	16.76	15.68	20.34		29.88			12.63	18.11	16.81	29.54	
	16.53	16.39	21.31		30.48			11.96	17.69	15.94	27.42	
	16.14	15.89	19.73		30.5			11.38	16.4	16.44	28.93	
	15.9	14.57	19.57		31.03			11.14	15.94	16.36	28.4	
	15.22	13.1	20.19		32.33			11.36	16.32	16.56	29.33	
	14.51	12.82	19.94		17.63	25.89		12.04	15.72	16.39	19.45	15.66
	14.74	13.36	19.5		15.69	26.68		12.17	15.83	15.91	17.64	16.37
	14.27	12.86	19.64		15.44	12.99	14.6	12.26	15.31	13.95	20.17	16.33
	13.76	11.99	12.24	8.52	16.04	11.82	12.96	11.38	14.01	14.52	18.75	15.18
	13.71	11.28	10.62	9.02	15.2	9.25	12.21	11.12	15.1	14.61	19.14	14.42
	13.05	10.9	11.1	8.43	14.34	10.15	12.03	10.56	14.36	13.19	19.58	14.68
	13.83	11.02	11.5	8.7	14.12	9.82	11.25	10.62	15.02	13.38	17.67	13.83
	13.15	11.16	10.29	8.36	15.45	9.51	9.16	10.74	14.47	12.82	16.54	13.86
	13.51	10.57	10.37	8.87	13.57	5.7	9.55	9.5	14	13.1	14.14	12.14
	12.6	10.67	10.66	8.42	12.53	5.64	9.37	9.18	13.49	13.33	14.38	12.94
	11.73	10.21	10.03	7.15	10.65	6.74	10.15	8.83	12.68	12.68	12.54	12.04
	11.56	9.76	10.54	7.78	11.01	5.79	10.61	8.13	11.79	11.51	13.07	9.6
	10.88	9.34	9.28	8.15	9.22	4.74	7.72	7.6	11.64	11.21	13.29	10.07
	10.79	8.74	7.41	6.62	7.95	6.61	7.79	7.5	11.96	11.35	13.67	9.47
	10.85	8.66	8.33	6.06	9.44	5.56	7.72	7.26	11.1	11.93	12.27	8.93
	10.82	8.72	7.88	7.31	10.31	6.59	6.32	6.88	11.25	11.34	12.86	8.8
	9.83	10.32	8.36	5.76	9.56	6.56	5.68	4.42	10.01	10.59	11.06	8.48
	9.17	10.6	6.02	5.33	7.35	5.86	5.29	4.01	8.2	10.69	11.74	8.79
	9.2	9.12	6.59	5.28	8.21	4.68		3.85	7.58	10.6	10.39	8.49
	6.86	9.34	6.95	5.16	6.59	5		3.65	7.06	10.93	10.07	6.91
	6.93	8.55	5.21	4.98	4.73	4.33			6.3	8.38	9.72	6.71
	5.89	6.83	5.01	4.35		4.2			6.54	8.69	8.96	6.22
	5.32	6.65		4.45					3.99	6.56	7.61	4.39
	4.68	5.85		3.89					4.45	6.77	6.91	3.76
		5.23		3.72					4.26	6.45	6.26	
		4.41								5.89	4.56	
										4.71		
										3.93		

TABLE 18.--Subject R: Perimeter Data

Subject R	UR1	UR2	UR4	UR6MB	URDB	UR6P	LR1	LR3B	LR3L	LR4	LR6M	LR6D
	20.59	17.04	25.26	33.84			15.51	22.55		22.05	32.89	
	20.16	16.94	24.79	33.59			14.43	22.61		21.92	32.33	
	20.08	16.98	24.33	33.52			15.17	22.07		21.61	32.22	
	19.59	17.81	24.91	33.33			14.02	23.17		20.89	32.23	
	19.95	16.63	24.34	32.61			14.46	21.93		21.43	31.71	
	19.9	16.35	24.37	30.9			15.13	22.68		21.8	31.83	
	18.81	15.76	24.23	30.89			14.15	23.11		20.61	31.98	
	19.04	14.7	24.09	31.09			13.9	23.07		20.25	31.43	
	19.16	14.16	23.7	32.46			15.21	23.2		20.8	31.12	
	19.79	15.94	23.35	31.78			14.84	23.23		20.19	29.79	
	18.79	15.26	23.79	31.9			14.18	23.3		19.86	30.3	
	20.04	15.12	24.12	31.5			13.75	23.39		20.45	31.26	
	18.9	14.47	23.46	31.3			14.14	22.76		20.78	31.24	
	18.78	15.21	23.64	31.37			12.91	13.62	12.12	19.36	30.82	
	18.56	14.51	21.76	31.47			13.73	12.59	11.89	18.97	33.34	
	17.88	13.3	22.16	32.11			14.02	12.52	11.82	18.78	19.75	19.46
	17.19	14.18	21.76	33.23			13.15	12.56	11.07	18.48	20.61	18.37
	18.07	12.92	21.76	33.82			13.31	11.55	10.75	17.32	20.08	18.81
	17.51	13.78	21.08	15.84	12.66	17.52	12.67	12.29	10.94	17.87	19.08	18.27
	16.88	12.32	21.05	14.83	11.98	17.12	11.68	11	9.46	16.05	19.27	16.24
	16.93	13.05	20.49	12.25	9.72	17.28	10.82	10.16	9.15	16.95	21.37	16.32
	16.09	12.59	19.76	13.08	9.74	15.63	11.43	10.58	9.89	16.81	20.75	16.35
	16.67	12.07	17.13	12.21	9.48	14.68	12.17	10.11	10.44	16.26	20.27	15.45
	16.61	12.54	16.53	12.41	9.27	14.96	11.57	10.67	9.46	15.59	20.39	14.93
	14.81	10.76	15.65	12.5	9.1	14.68	10.16	9.51	9.51	15.32	18.98	15.72
	15.81	11.7	16.76	12.82	8.35	13.68	11.11	10.07	10.15	15.31	19.08	16.56
	16.13	10.76	15.46	12.08	8.68	13.67	10.31	9.61	9.36	15.57	18.68	15.49
	15.79	10.73	15.11	11.25	8.83	13.04	10.06	8.5	8.98	14.02	17.87	14.61
	14.26	11	13.71	11.36	8.67	12.17	9.94	8.38	8.32	14.41	16.25	13.38
	14.58	9.65	13.5	11.58	9.85	11.9	10.32	8.15	7.88	13.44	15.9	12.18
	13.69	9.51	14.04	12.16	7.59	11.33	10.17	7.86	7.22	13.66	16	12.57
	14.08	8.58	12.8	12.59	7.68	12.34	8.87	7.87	7.58	14.03	16.13	12.26
	12.22	8.33	11.59	13.48	8.98	11.69	9.35	14.41		13.93	17.18	11.64
	11.98	7.89	12.47	10.81	9.15	12.29	9.23	14.43		12.24	17.88	12.95
	11.09	8.24	13.63	11.72	8.73	10.09	8.49	13.33		12.97	16.42	12.98
	10.84	7.95	12.44	11.56	8.79	10.72	8.14	12.82		12.12	14.75	10.27
	10.12	7.91	11.61	11.11	8.43	11.13	7.44	13.24		12.75	14.83	11.47
	9.4	7.87	12.2	8.02	8.32	11.74	7.44	12.58		10.69	14.7	10.92
	7.76	8.87	11.54	8.05	7.39	11.6	6.48	5.6	5.7	10.7	15	10.84
	8.13	7.95	9.49	8	7.36	11.38	5.98	5.63	5.21	11.28	14.54	12.09
	8.27	7.32	9.61	7.44	6.75	10.31	6.45	6.01	4.68	11.24	12.31	11.58
	8.19	6.91	10.15	7.2	7.25	10.79	5.87	4.72	3.99	10.95	12.88	10.65
	7.92	5.32	8.72	7.02	7.05	10.06	5.34	3.67	4.11	9.54	13.18	11.18
	7.03	5.84	9.16	7.49	5.33	9.39	4.98	3.78	4	8.95	13.65	10.76
	6.78	4.53	8.98	8.59	6.2	8.43	4.32			9	13.72	9.67
	6.07		9.61	8.22	4.91	9.92	3.76			8.84	13.7	9.88
	4.79		8.91	7.32	3.76	8.86				8.35	13.45	9.64
	5.33		6.73	4.99	3.97	7.36				8.24	11.37	8.05
	5.12		5.18	3.57	4.62	6.51				7.96	11.34	8.42
	5.01					8.9				7.84	10.95	7.08
						7.94				9.5	9.87	7.42
						4.62				7.23	10.52	7.24
						6.25				6.21	10.9	6.92
						5.23				4.78	10.15	5.23
						4.96				4.26	9.94	
											8.01	
											7.68	
											5.69	
											4.98	
											4.65	

TABLE 19.--Subject S: Perimeter Data

Subject S	UR1	UR2	UR4B	UR4L	UR6MB	URDB	UR6P	LR1	LR3	LR4	LR6M	LR6D
	16.6	14.58	22.58		30.83			12.59	18.48	17.67	28.35	
	16.22	14.3	21.49		30.34			11.63	18.14	17.71	28.33	
	16.18	13.79	20.99		29.84			11.35	17.34	17.59	27.63	
	16.57	13.57	20.51		28.89			11.82	17.99	15.98	27.9	
	15.99	12.84	20.03		29.15			11.28	17.77	15.32	27.33	
	15.82	12.63	20.05		28.92			11.54	17.74	14.9	28.24	
	16.47	13.12	20.13		28.55			11.22	17.57	15.41	27.44	
	15.67	12.06	19.4		27.97			11.76	17.85	14.65	27.06	
	14.85	12.81	19.84		28.26			11.02	17.79	14.51	26.78	
	14.99	12.53	18.99		29.04			10.39	18.04	15.38	27.45	
	15.16	11.86	20.12		29.25			10.78	18.29	14.44	26.52	
	14.99	12.31	20.09		28.77			10.95	17.94	14.36	27.19	
	13.6	11.47	19.65		29.85			11.33	17.88	14.81	27.12	
	14.12	10.99	19.64		30.98			10.72	16.64	14.68	27.92	
	13.21	11.1	18.67		16.28	11.12	14.3	10.95	16.91	13.8	19.03	15.88
	13.36	10.75	18.46		13.31	11.35	14.74	10.66	16.01	13.47	18.4	16.06
	12.32	10.64	17.91		12.71	10.95	14.07	10.41	15.43	14.39	17.53	14.98
	12.34	10.26	18.61		13.57	9.83	14.35	10.2	14.66	13.82	16.14	16.03
	11.47	9.98	18.19		12.98	23.15		9.68	14.15	12.94	17.08	16.14
	10.63	9.1	18.29		12.1	22.52		7.51	13.83	12.66	17.41	15.29
	9.96	9.35	17.01		10.86	22.41		8.7	15.03	12.37	16.7	15.04
	10.68	9.13	16.9		11.22	19.84		8.93	13.33	11.9	16.87	13.77
	10.26	9.82	8.74	8.45	8.85	22.01		8.93	13.23	11.49	16.06	13.03
	9.29	9.41	8.04	7.73	10.16	9.09	13.43	7.93	13.34	11.29	16.64	13.64
	8.61	7.68	15.68		10.18	7.43	12.4	8.15	11.94	10.36	15.36	11.87
	8.87	7.69	14.37		8.46	18.56		8.3	11.69	10.31	14.8	11.84
	8.22	7.56	14.79		7.72	18.88		7.82	11.49	9.59	14.11	8.89
	7.32	7.32	13.58		6.91	18.52		6.02	11.13	10.22	13.46	10.12
	7.16	7.22	12.54		7.11	8.43	10.16	4.91	10.23	9	14.32	9.17
	6.38	6.94	12.49		4.51	8.85	10.73	4.26	10.55	8.61	11.66	9.34
	6	5.98	5.04	5.74	4.45	16.48		3.98	9.79	8.94	12.17	10.59
	6.85	5.77	5.55	6.07	5.15	16.49		3.67	9.15	8.7	11.85	9.52
	6.14	5.23	4.99	5.95	4.9	16.45		3.99	8.55	7.83	11.64	9.94
	5.8	3.98	5.64	5.22	4.7	15.98			8.97	7.45	10.59	8.65
	4.3	4.01	4.27	4.73	4.95	14.65			10.33	7.22	8.99	7.35
	3.24	3	2.97	3.2	4.68	14.26			10.75	6.44	9.1	7.16
					3.24	13.8			9.31	6.32	8.76	6.84
						2.99	8.34		8.84	4.21	7.62	6.41
							7.77		7.59	6.89	6.48	6.62
							6.54		8.11	5.6	5.48	5.49
							5.65		7.68	6.4	6.8	5.94
							4.52		6.24	7.64	6.87	5.88
							4.65		5.52	6.66	5.26	5.93
							3.8		4.68	5.98	5.22	5.87
									4.9	5.21	4.68	4.68
									3.56	4.26	3.94	3.25
									3.33	4.01	3.84	2.99

TABLE 20.--Subject T: Perimeter Data

Subject T	UR1	UR2	UR4	UR6MB	URDB	UR6P	LR1	LR3	LR4	LR6M	LR6D
	20.64	17.16	22.65	35.47			15.98	20.71	20.44	33.01	
	19.63	16.97	22.54	35.6			14.58	20.7	19.49	32.77	
	19.5	16.69	22	35.12			14.34	20.64	19.06	32.67	
	18.89	17.43	21.25	34.62			14.24	20.04	18.74	31.93	
	19.78	16.44	21.86	34.11			13.88	19.77	18.48	31.9	
	18.87	15.82	21.28	33.24			13.97	20.31	18.2	31.5	
	18.33	16.11	20.86	33.13			13.32	19.78	17.96	31.56	
	17.99	15.91	21.18	32.65			13.15	20.28	17.3	32.05	
	17.97	15.57	20.16	33.34			13.68	20.31	17.75	32.26	
	16.75	14.78	19.55	32.79			13.18	20.38	17.49	32.14	
	17.26	15.61	19.21	32.23			12.83	19.96	17.5	34	
	16.52	15.47	19.6	32.09			12.53	18.81	17.35	33.6	
	17.55	15.18	19.22	32.46			13.36	19.31	17.78	33.42	
	16.81	14.71	18.65	32.47			12.87	19.1	16.89	21.46	20.1
	16.45	14.6	18.81	33.01			12.71	19.03	16.46	22.43	20.11
	16.71	14.22	18.05	33.6			11.95	18.9	15.48	22	20.87
	15.28	13.56	18.21	32.82			12.05	18.91	15.75	22.12	19.64
	15.99	13.88	17.92	34.11			12.2	18.26	15.66	22.23	18.07
	15.34	13.17	18.03	17.87	26.84		12.52	17.82	15.29	22.33	19.23
	15.84	12.98	17.04	18.35	28.58		11.69	17.45	15.1	22.08	19.96
	15.53	13.79	15.91	18.73	28.64		11.38	17.46	14.88	22.69	18.83
	14.56	11.92	15.58	17.37	16.27	16.13	10.66	17.47	14.73	20.18	17.67
	14.7	11.82	16.12	17.05	15.49	16.35	10.24	17.35	14.05	19.73	17.04
	14.74	11.93	14.55	15.43	14.63	15.96	10.37	17.3	13.92	20.88	16.61
	14.98	11.27	14.5	16.78	13.26	15.84	10.53	17.16	13.46	20	16.37
	14.35	11.6	13.6	17.09	12.66	14.92	10.34	16.73	13.05	19.81	15.74
	14.17	11.11	14.24	17.93	12.63	14.24	10.76	16.55	11.23	19.62	15.11
	12.47	10.51	14.67	15.61	12.19	12.8	10	16.4	11.06	18.34	15.09
	11.35	9.73	13.14	15.82	10.79	13.04	9.91	15.53	11.01	17.67	15.05
	10.14	9.15	12.03	14.47	12.31	12.57	8.95	14.94	11.07	16.83	15.01
	10.86	9.65	11.2	15.27	11.99	12.44	8.77	14.73	11.18	16.8	14.47
	9.79	10.26	11.67	16.07	11.91	12.28	8.38	14.85	9.7	16.44	13.05
	10.07	10.12	11.56	13.94	10.2	12.3	8.09	14.65	10.22	15.37	12.19
	9.61	9.5	11.84	11.18	8.48	11.04	7.11	14.26	10.31	14.61	11.87
	8.56	8.69	11.33	11.96	9.81	10.71	7.02	13.92	9.76	15.87	12.19
	8.27	7.44	11.1	9.7	7.36	11	6.3	13.35	9.23	14.97	11.87
	7.88	7.67	10.18	8.46	6.35	10.52	6.79	12.67	8.37	14.39	10.91
	7.26	7.53	8.42	12.8	7.14	9.01	6.71	11.98	7.89	14.57	10.71
	6.89	7.23	8.4	12.25	6.17	8.53	6.08	11.2	7	14.3	8.99
	5.78	6.54	7.29	7.22	5.98	7.79	5.12	10.9	6.91	13.79	8.95
	5.63	4.81	5.67	6.35	4.65	7.77	6.19	9.69	6.37	14.51	7.97
	4.67	4.3	5.3	5.95		8.08	5.84	8.5	5.51	13.8	7.61
	3.49	3.66	4.26	4.69		7.36	4.99	8.24	4.88	13.27	7.26
	3.21	3.49	4.01	4		7.21	4.51	7.94	4.91	12.75	6.9
	3.06	2.79		3.9		7.05	3.94	7.16	3.67	11.92	6.1
						7.1		6.54	3.48	13.7	5.91
						6.51		5.91		12.13	4.37
						4.31		4.26		11.09	4.95
								4.06		8.95	3.84
										6.39	
										4.91	
										4	

TABLE 21.--Subject U: Perimeter Data

Subject U	UR1	UR2	UR4B	UR4L	UR6MB	URDB	UR6P	LR1	LR3B	LR4	LR6M	LR6D
	20.23	18.18	23.84		32.11			15.62	22.22	19.9	30.01	
	19.11	17.49	22.36		32.11			15.57	21.69	19.34	28.87	
	18.02	16.71	22.17		31.72			15.38	21.22	19.23	27.84	
	20.04	16.51	21.77		30.59			14.07	21.29	18.47	27.92	
	19.07	15.25	20.96		30.14			14.48	20.58	18.25	27.49	
	18.67	16.09	20.8		30.05			13.56	20.3	17.6	27.34	
	17.97	15.86	20.51		28.87			13.84	19.59	16.59	26.92	
	18.34	14.51	20.13		29.06			14.2	19.6	16.36	28.17	
	17.95	15.7	18.65		27.83			13.96	19.12	16.19	28.2	
	17.31	14.15	20.41		28.36			14.14	18.84	15.37	28.43	
	17.28	14.25	18.63		28.47			14.23	18.08	16.02	17.98	15.79
	17.98	14.23	19.61		27.78			13.45	17.65	16.11	18.86	15.92
	17.53	13.18	20.27		28.17			14.15	18.83	15.5	18.54	15.33
	16.87	12.78	19.32		31.23			13.87	18.11	13.78	18.61	14.85
	15.4	12.89	18.71		15.11	12.17	14.65	12.9	18.52	13.29	17.87	13.46
	15.26	12.06	20		15.5	11.8	14.33	12.5	19.1	13.66	17.89	13.78
	16.66	12.26	11.41	8.87	14.09	12.32	13.8	12.25	18.86	13.87	17.05	14.75
	15.95	12.18	10.19	8.51	14.13	11.88	14.78	11.59	18.62	14.06	16.48	14.44
	16.28	12.32	10.12	8.28	14.89	11.12	14.6	12.32	18.45	13.3	17.48	14.21
	16.04	12.16	9.37	8.21	14.27	10.88	12.84	11.15	17.9	13.58	17.38	13.55
	15.07	11.29	9.29	7.98	14.89	10.19	11.64	11.2	17.35	13.24	17.4	13.59
	14.03	11.57	8.5	8.18	14.82	11.08	11.09	10.93	17.24	13.49	17.54	13.46
	14.23	11.89	7.94	7.67	14.05	11.15	11.18	10.66	17.43	13.62	16.99	12.91
	12.78	11.77	8.62	7.36	13.48	9.62	10.27	10.13	17.03	13.1	16.72	11.82
	12.29	11.93	9.03	7.39	11.75	9.18	9.79	9.62	16.67	12.4	15.7	12.27
	12.81	11.68	8.79	7.22	12.2	9.36	9.9	10	16.8	11.89	15.5	12.56
	13.24	10.83	7.99	7.19	12.19	9.04	9.82	10.43	16.49	12.25	13.31	12.25
	13.19	11.12	7.36	7.17	11.81	9.72	9.38	9.57	15.6	12.02	13.86	11.73
	12.7	10.15	7.11	7.15	11.73	8.4	9.67	9.03	14.89	11.81	13.7	11.11
	12.26	9.95	7.26	7.01	12.11	8.02	8.43	8.94	14.36	11.56	13.01	10.51
	11.41	9.98	7.08	6.66	12.17	7.3	8.97	8.74	13.55	10.72	12	10.12
	11.61	9.88	5.92	6.66	11.5	7.29	9	8.68	13.44	9.07	12.37	9.14
	10.77	9.88	6.51	5.84	10.82	6.21	8.42	9.46	12.63	9.48	12.65	7.88
	10.9	9.18	5.12	5.6	9.44	6	7.42	9.66	12.81	9.22	13.07	9.76
	9.76	8.55	3.84	4.91	9.67	5.9	7.62	9.14	13.2	8.93	12.25	8.7
	9.74	8.62	3.66	4.2	9.12	5.26	8.01	8.62	13.57	9.65	11.34	7.37
	9.23	5.34	4.52	5	8.17	4.94	8.3	7.76	13.77	8.91	11.24	7.29
	8.64	8.16	4.12	5.16	8.1	4.39	7.61	7.14	12.45	7.91	10.89	7.44
	8.71	7.32	3.7	4.7	7.61	4.4	6.27	7.4	11.64	8	10.91	7.51
	8.27	8.3		3.84	6.91		5.29	5.06	11.79	8.67	11.06	6.08
	8.23	6.53			6.24		5.6	4.83	11.73	6.78	9.57	5.29
	7.44	5.58			5.19		4.37	4.82	11.43	4.91	8.36	4.57
	7.32	4.67			4.44		4.28	4.1	10.93	3.37	7.59	4.29
	6.37	4			3.21		4.29		10.28		6.41	4.11
	5.32	3.91							9.65		5.07	
	4.67								9.94			
	4.02								10.18			
									9.67			
									8.61			
									8.46			
									8.23			
									7.67			
									7.49			
									6.27			
									5.49			
									5.55			
									4.91			
									4.23			

TABLE 22.--Subject V: Perimeter Data

Subject V	UR1	UR2	UR4B	UR4L	UR6MB	URDB	UR6P	LR1	LR3	LR4	LR6M	LR6D
	20.48	17.88	23.48		31.72			14.74	19.1	20.02	29.4	
	19.97	17.08	23.35		30.73			13.89	18	18.61	28.53	
	18.95	15.92	22.99		28.83			14.19	17.73	18.49	28.54	
	18.56	16.42	22.61		28.45			13.51	17.7	18.24	27.42	
	18.54	15.75	21.37		28.22			12.45	17.72	17.7	27.87	
	18.05	15.26	19.82		28.47			12.4	18	16.74	27.66	
	18.52	14.67	19.7		27.44			12.33	17.59	16.15	28.65	
	18.77	13.8	19.1		26.9			12.7	17.08	16.34	19.69	17.87
	18.68	13.56	18.38		27.16			11.63	16.99	16.36	19.46	17.6
	18.88	13.1	18.19		26.91			12.2	16.49	16	18.79	16.07
	16.98	13.58	18.55		12.72	21.14		12.49	15.75	15.91	18.68	16.19
	17.38	13.13	18.62		13.2	21.28		12.01	15.55	15.7	18.55	16.28
	17.02	13.51	18.63		13.76	6.35	16.72	11.45	15.74	15.55	18.46	16.67
	16.99	12.77	17.63		13.69	6.98	15.57	11.2	14.9	16.33	19.06	16.49
	16.53	12.98	16.94		12.6	6.68	14.28	11.2	14.36	16.21	17.92	15.4
	15.91	12.88	16.66		12.73	7.69	14.36	11.43	13.99	15.21	17.99	14.69
	15.48	13.13	17.05		12.72	10.8	13.84	10.44	13.7	13.59	18.29	14.78
	14.94	12.6	18.35		11.61	9.42	13.26	11.47	12.5	13.82	17.83	14.4
	15.1	12.89	17.48		11.54	9.53	13.31	1.09	13.55	13.25	17.05	13.84
	15.1	11.7	17.4		8.9	8.79	12.33	10.88	13.48	13.7	17.07	14.52
	15.28	11.73	16.34		9.12	9.01	12.33	11.01	13.49	13.97	16.72	14.1
	14.47	11.82	16.3		10.24	9.86	12.32	10.85	12.68	14.14	16.51	13.57
	13.81	11.9	15.54		10.07	9.27	11.72	8.98	13.01	13.8	15.98	12.82
	14.2	12.13	14.83		9.36	8.65	11.8	9.36	13.07	13.64	16.31	12.39
	13.68	11.34	14.36		8.77	8.26	12.74	8.57	13.09	12.85	16.15	12.29
	13.07	11.42	14.47		8.88	7.95	10.8	8.55	12.78	12.61	16.7	11.85
	12.94	11.28	14.3		9.19	7.68	9.31	8.54	11.43	12.24	15.03	11.15
	12.41	10.59	13.95		6.55	7.69	8.47	8.61	11.39	11.77	15.04	9.99
	11.76	10.6	14.34		6.77	7.37	8.24	8.88	11.25	11.2	15.83	10.89
	11.48	10.43	14.06		7.34	7.28	8.11	7.52	11.24	10.35	14.34	9.96
	10.7	10.08	13.97		7.22	6.91	8.59	7.78	11.2	10.81	14.4	10.02
	10.56	9.27	13.55		7.1	6.42	9.22	7.06	10.01	10.56	14.65	9.9
	9.46	8.86	13.7		6.24	6.24	7.23	6.9	9.8	11.36	13.03	9.27
	8.93	8.61	8.37	6.18	7.09	6.55	7.1	5.98	9.69	10.1	13.13	8.26
	8.26	8.11	6.88	5.48	7.23	4.04	7.44	4.96	8.97	9.51	12.19	8.79
	7.76	7.77	4.91	3.99	5.26	3.99	6.51	4.2	8.79	9.61	12.65	7.95
	7.91	7.16	4.25	3.87	4.22		5.12		8.66	8.86	12.36	7.34
	6.18	6.39			3.92		6.22		7.58	8.4	11.9	6.7
	5.97	5.77					6.32		7.41	8.08	11.68	5.95
	4.99	5.25					6.09		6.91	7.87	9.72	4.88
	5.24	4.91					6.07		5.14	5.91	8.1	
	5.8	4.1					5.12		4.11	4.18	5.69	
	4.09						5.5			3.78		

TABLE 23.--Subject W: Perimeter Data

Subject W	UR1	UR2	UR4B	UR4L	UR6MB	URDB	UR6P	LR1	LR3	LR4	LR6M	LR6D
	20.38	17.52	23.68		33.44			14.26	19.75	19.82	29	
	19.08	17.23	23.34		32.45			14.26	19.67	19.7	28.91	
	18.03	16.34	23.88		31.38			13.88	18.91	19.6	28.72	
	17.38	16.5	22.05		30.72			13.57	18.15	19.56	28.11	
	17.3	16.75	22.15		31.17			13.94	18.81	18.56	28.73	
	17.3	16.17	20.72		28.97			13.67	17.66	18.49	29.28	
	17.66	16.22	21		29.87			14.24	17.92	18.32	29.01	
	17.79	15.58	20.78		30.27			13.96	17.81	18.2	28.83	
	17.2	14.47	20.86		31.82			14.18	18.06	17.83	20.43	17.7
	17.15	14.11	20.98		31.49			14.35	18.16	17.47	19.61	18.29
	16.91	13.79	20.15		16.43	25.57		14.56	17.92	16.79	18.53	18.79
	16.01	14.22	19.97		15.67	24.06		13.72	18.25	16.65	19.34	18.16
	15.33	14.28	20.02		15.86	24.51		14.12	18.73	16.87	18.55	18.22
	15.78	14.5	19.81		15.81	24.12		14.06	18.29	16.46	19.2	17.78
	14.49	13.76	19.36		16.48	25.39		13.97	18.62	16.59	19.39	17.34
	13.57	13.99	11.82	10.47	16.82	24.91		14.04	18.35	16.24	18.97	16.31
	14.37	13.19	11.73	11.18	15.64	24.37		14.15	18.93	15.81	18.32	15.95
	15.52	12.9	11.01	11.11	14.91	25.48		14.11	18.75	14.79	18.6	16.19
	14.35	12.21	11.32	9.36	13.61	24.33		13.83	18.33	14.49	18.62	16.17
	13.76	11.15	10.21	9.91	14.91	10.27	13.59	13.26	17.58	14.52	19.02	16.14
	13.39	12.67	9.97	9.07	15.43	9.61	14.31	13.15	16.9	14.17	17.06	15.01
	13.01	12.21	9.01	9.2	15.69	8.99	12.95	13.18	16.72	13.9	16.1	14.58
	12.75	11.9	8.76	9.17	13.76	8.29	11.82	13.3	15.29	13.57	15.94	14.05
	12.03	11.89	8.72	8.43	12.41	8.18	10.87	12.66	15	12.92	15.6	13.55
	12.06	10.97	8.27	8.09	12.4	8.58	10.69	12.7	15.06	13.62	14.6	12.93
	11.8	10.86	8.81	7.81	11.13	8.7	11.02	13.16	15.19	12.73	14.06	12.71
	11.4	10.28	8.6	7.87	10.57	7.9	10.81	11.95	15.21	12.67	12.57	12.27
	11.56	10.22	9.01	6.44	10.21	6.7	9.65	10.91	15.09	12.01	13.8	11.15
	11.46	10.04	8.54	6.78	10.16	5.28	9.95	9.81	14.29	11.83	14.08	10.73
	9.17	10	7.81	6.77	9.27	4	9.67	9.54	14.06	11.3	14.16	10.04
	9.58	9.82	8.07	6.38	6.14	4.11	9.02	8.31	13.85	11.78	13.28	9.22
	9.2	7.91	7.6	6.34	5.29		8.46	7.32	12.7	10.59	13.6	7.75
	8.75	6.81	6.06	6.19	2.97		7.71	6.27	12.43	9.79	13.14	6.45
	9.2	5.91	5.78	6.71			6.92	5.19	11.9	8.96	12.47	6.18
	7.55	4.25	5.9	5.24			6.52	5.24	11.83	9.02	10.92	5.76
	7.26	4.01	4.76	5.02			5.21	5.24	12.2	8.95	8.64	5.29
	7.34		3.99	5.01			4.19	3.91	11.92	8.46	7.2	5.62
	6.66								10.67	8.09	5.37	5.24
	5.24								9.76	7.58	4.45	4.29
	4.9								9.1	7.24		3.98
	4.7								8.62	7.3		
	3.2								8.14	6.33		
									7.26	5.61		
									5.97	4.21		
									5.02			
									4.26			
									4.01			
									3.91			

TABLE 24.--Subject X: Perimeter Data

Subject X	UR1	UR2	UR4	UR6MB	URDB	UR6P	LR1	LR3	LR4	LR6M	LR6D
	20.28	18.34	23.74	36.47			14.86	20.99	22.34	33.33	
	20.24	18.27	23.45	36.21			14.63	20.7	21.17	33.25	
	20.17	17.91	22.64	35.45			14.24	20.66	19.67	33.5	
	19.8	17.76	22.75	35.24			14.25	20.82	20.14	32.12	
	19.37	17.44	22.74	34.1			14.08	20.71	19.17	31.01	
	18.26	16.75	21.56	33.75			13.85	21.01	19.26	32.47	
	18.16	16.73	21.53	32.61			13.55	21.61	18.88	34.2	
	18.24	16.91	21.86	32.9			14.36	21.62	19.7	34.01	
	18.06	17.13	21.46	32.28			14.35	20.21	19.22	33.41	
	17.86	16.27	20.99	32.58			13.48	20.16	19.25	33.23	
	17.6	15.56	21.35	33.13			13.45	19.83	19.5	32.98	
	17.15	15.67	20.17	32.47			13.56	19.96	18.77	31.16	
	16.57	15.7	19.87	33.69			13.1	19.75	18.17	20.82	19.99
	16.87	15.77	19.36	33.08			12.48	19.11	18.2	20.12	19.96
	16.91	15.71	19.7	33			12.08	18.71	17.08	19.71	19.81
	16	15.42	19.63	32.27			12.63	18.75	17.03	20.46	18.47
	15.94	15.37	20.24	17.05	28.97		12.11	18.47	16.88	20.19	18.45
	15.81	15.07	19.25	16.58	28		12.47	18.69	16.87	20.33	18.6
	15.74	14.28	19.17	16.06	27.95		12.22	19.35	17.31	19.55	18.61
	16.03	14.48	19.17	16.75	27.96		12.09	17.25	16.58	16.6	18.37
	16.07	14.38	18.98	16.68	27.6		12.12	16.86	16.41	19.52	18.84
	15.12	14.3	18.79	15.27	27.39		11.9	17.34	16.03	18.74	19.24
	14.4	14.27	18.67	14.93	27.63		11.47	17.5	15.92	18.37	19.17
	14.71	13.5	17.76	14.22	26.91		11.45	16.91	15.57	16.54	19.03
	13.51	13.75	16.64	13.29	26.25		11.19	17.01	14.85	19.74	19.08
	13.8	13.42	16.63	14.06	26.57		10.72	16.84	14.09	16.91	19.22
	13.61	13.28	15.96	14.34	27.27		9.94	16.49	13.98	17.3	19.3
	12.66	12.88	15.47	12.24	27.01		10.46	16.45	14.16	16.78	17.56
	12.5	12.3	15.12	11.5	26.67		10.63	16.41	13.96	16.93	16.91
	12.06	12.47	15.91	11.19	27.18		9.67	16.97	13.6	16.37	17.24
	11.96	12.38	16.07	10.24	27		9.43	16.99	13.36	16.72	17.11
	11.45	11.6	15.03	11.17	16.69		9.48	16.34	13.02	15.9	16.94
	11.4	11.32	14.62	11.63	26.19		9.44	16.4	12.93	15.65	16.8
	10.69	10.13	14.85	10.23	24.15		8.91	16.28	13.57	14.43	15.87
	10.51	10.12	14.67	9.79	23.71		8.23	16.39	13.81	13.15	15.47
	9.68	9.99	13.47	8.81	23.34		7.76	16	12.7	12.18	14.46
	9.06	8.68	13.23	7.63	23.82		6.87	15.8	12.61	11.97	14.19
	8.89	8.48	12.9	7.59	22.48		6.23	15.37	12.47	11.44	13.34
	8.16	8.07	12.48	7.72	21.65		5.47	14.63	12.37	11.61	12.11
	7.36	6.57	12.47	6.9	21.09		5.31	14.18	12.31	11.3	12.7
	6.22	6.46	12.34	6.62	21.06		4.23	13.31	12.06	11.07	12.04
	6.31	5.7	11.12	5.84	19.23		3.67	13.24	11.8	10.26	10.06
	5.89	4.69	10.55	5.23	18.72			12.62	10.49	9.28	9.95
	5.26	4.03	10.05	4.11	17.25			12.4	10.21	8.14	9.41
	4.42		9.59	4.03	17.03			12.2	9.58	7.47	8.68
	4.12		8.85		16.67			11.67	8	6.67	7.26
			7.67			8.74		9.56	7.23	5.04	5
			5			7.28		9.26	5.27	4.02	3.96
			4.99			5.99		9.24	4.21		
						5.48		8.88			
						4.9		7.53			
						3.87		6.77			
								5.36			
								4.33			
								3.94			

TABLE 25.--Subject Y: Perimeter Data

Subject Y	UR1	UR2	UR4B	UR4L	UR6MB	URDB	UR6P	LR1	LR3	LR4	LR6M	LR6D
	18.65	15.06	22.72		32.94			13.9	20.24	18.57	31.03	
	18.46	15.27	22.19		32.27			13.66	19.43	18.37	30.79	
	18.33	14.6	21.92		31.94			13.54	19.5	17.69	30.23	
	18.1	14.25	21.28		31.49			13.01	19.41	17.72	29.97	
	16.62	13.83	20.47		30.8			12.94	20	17.07	29.76	
	16.8	13.25	19.9		30.26			12.88	19.76	16.58	29.9	
	17.27	12.97	18.83		30.12			12.72	19.67	16.07	29.93	
	16.77	11.76	18.99		31.22			13.02	19.85	16.26	29.94	
	16.48	11.99	18.92		29.81			12.8	18.9	16	28.81	
	16.26	12.63	18.47		29.19			12.7	18.63	14.54	20.57	18.32
	16.11	12.56	18.23		18.24			12.44	18.43	14.6	21.22	18.56
	16	12.54	18.24		16.44	25.04		11.97	18.77	14.64	20.15	17.92
	15.95	12.14	17.21		16.5	26.2		11.82	18.99	14.41	18.96	16.95
	15.22	12.7	16.75		15.8	26.93		12.06	18.76	14.38	18.76	15.56
	14.59	11.76	16.16		15.53	11.87	14.67	11.9	18.6	14.27	18.6	16.24
	13.59	10.65	17.69		13.99	10.7	13.88	11.83	18.25	14.98	18.58	16.36
	13.46	10.8	16.81		13.79	10.41	13.83	10.87	18.15	13.81	18.67	16.25
	13.09	10.57	15.77		12.26	11.09	12.7	10.33	17.81	13.55	17.77	15.62
	12.93	10.05	13.6		12.12	9.91	12.72	10.3	17.13	12.37	17.34	14.64
	13.86	10.19	13.82		11.48	9.7	12.14	10.25	17.56	12.4	17.23	13.74
	12.91	9.79	13.23		11.32	9.73	11.45	10.46	17.3	12.18	16.47	13.8
	12.57	9.34	13.55		11	8.28	12.05	9.77	16.88	12.27	16.39	13.86
	11.92	9.48	13.5		11.08	7.78	11.27	9.17	16.15	12.22	16.46	13.57
	12.88	8.78	13.12		10.01	7.51	10.26	9.16	15.49	12.01	15.34	12.84
	13.01	8.49	12.32		9.89	7.49	10.06	8.84	14.88	11.5	15.11	12.3
	12.24	8.71	12.8		9.35	6.68	9.23	8.41	14.41	11.49	13.74	11.3
	11.11	6.19	13.01		8.13	6.05	9.74	8.76	14.4	11.07	12.75	11.01
	10.12	6.78	10.54		8.57	5.69	9.04	8.37	13.56	11.14	12.07	10.23
	9	6.59	9.91		8.07	5.02	8.39	8.45	13.01	10.64	11.2	10.36
	8.93	6.15	7.11	5.27	7.01	5.17	8.1	8.06	13.27	9.7	10.85	9.97
	8.82	6.84	7.02	4.48	6.35	5	6.84	7.61	13.2	9.21	9.84	9.15
	8.82	7.29	9.57	4.08	6.87	4.97	6.44	7.58	13.06	3.12	10.04	8.59
	7.88	6.75	5.48	3.76	6.21	4.84	5.37	7.36	13.05	9.13	9.67	8.85
	7.54	6.73	5.23		5.15	3.97	5.78	7.4	13.01	7.8	9.25	9.02
	7.46	6.38	4		5.24	4.02	4.97	7.38	13.35	7.74	9.13	8.89
	6.73	5.78			4.91	3.77	4.79	6.79	12.64	7.35	8.87	8.79
	6.38	5.4			4.29		3.25	6.81	11.95	6.94	7.62	7.62
	5.84	5			4.29		2.99	5.49	10.46	6.24	7.25	6.25
	3.89	4.29						4.25	10.07	5.76	7.01	6.45
	4.2	3.79						3.14	9.99	5.33	5.92	4.67
		2.99							8.89	4	5.75	4.36
									8.78	3.75	4.95	3.78
									8.84	2.79	4.66	
									6.93			
									5.91			
									5.76			
									4.87			
									4.5			
									4.11			

TABLE 26.--Subject Z: Perimeter Data

Subject Z	UR1	UR2	UR4 B	UR4 L	UR6 MB	UR6 DB	UR6 P	LR1	LR3	LR4	LR6 M	LR6 D
	20.37	18.63	22.25		34.46			15.01	21.48	20.59	32.28	
	19.1	17.77	22.54		33.36			14.31	22.18	20.42	32.3	
	19.21	17.31	22.78		32.93			14.29	22.01	19.46	31.67	
	19.12	17.86	21.24		33.95			14.33	21.97	19.3	31.56	
	18.74	16.6	22.31		34.02			14.1	21.8	19.17	32.32	
	18.65	16.58	22.58		34.61			14.2	22.01	19.28	32.45	
	18.45	17.14	21.75		34.64			14.11	21.7	19.33	32.17	
	18.1	16.57	22.81		33.75			14.03	20.83	19.48	31.97	
	17.77	15.98	23.5		19.45	28.86		14.17	21.31	18.55	22.58	20.73
	17.31	16.14	22.7		18.42	28.19		14.16	21	18.38	23.01	19.89
	16.93	15.83	22.61		17.82	28.51		14.47	21.08	17.86	23.34	19.67
	16.7	15.2	22.56		17.17	28.66		13.8	20.67	17.6	22.57	19.7
	16.13	15.08	23.7		16.16	29.13		13.12	20.69	18.21	20.81	18.75
	16.23	15.2	22.81		15.65	12.81	14.78	12.86	21.01	18.32	20.94	18.66
	16.27	15.17	13.1	10.2	14.68	12.21	14.6	12.98	19.37	18.07	20.99	18.52
	16.55	14.25	13.15	9.09	13.66	11.27	14.33	13.42	19.79	17.58	19.67	18.23
	16.12	14.56	12.7	9.19	13.95	11.56	13.11	13.16	19	17.63	19.66	18.31
	13.01	15.03	10.89	9.87	13.6	11.15	13.29	12.67	20.41	17.72	19.85	17.86
	15.93	14.59	10.94	9.56	13.8	10.72	13.16	12.31	19.34	16.53	19.57	16.99
	15.22	15.8	11.02	10.42	14.54	11.14	13.03	11.76	19.09	16.27	16.45	16.49
	15.33	14.72	11.31	10.17	14.4	11	13.56	11.5	18.99	15.96	19.54	16.11
	15.29	15.1	11.32	7.98	14.35	10.97	14.12	11.12	18.9	16.03	19.37	16
	15.68	14.67	10.83	7.9	14.15	9.07	13.9	11.55	18.46	16.06	19	15.48
	15.24	14.35	10.17	7.97	13.8	8.85	12.68	10.78	17.53	15.07	19.28	14.96
	14.22	13.03	9.92	8.22	13.05	8.19	12.04	9.96	16.83	14.82	19.09	14.48
	13.36	12.57	8.63	8.11	11.62	8.07	10.83	9.94	16.57	13.66	18.34	13.87
	13.27	11.87	8.52	7.51	10.89	7.96	10.24	9.67	16.85	13.58	17.02	13.7
	13.1	11.61	7.39	7.55	10.23	6.56	9.83	9.8	16.53	12.47	16.84	13.81
	12.79	11.63	7.36	6.81	10.11	5.59	9.48	9.23	15.73	11.5	16.41	13.75
	12.2	11.61	8.36	6.72	9.36	4.83	9.6	9.24	15.43	11.62	16.18	12.9
	11.26	11.76	7.56	6.59	8.71	3.94	10.19	9.15	15.25	11.49	15.16	11.86
	10.89	11.74	7.32	5.99	6.59		9.42	9.73	15.3	11.62	14.26	10.23
	10.3	11.48	6.2	5.79	4.58		8.76	8.92	14.42	11.8	13.99	10.07
	9.6	10.57	6.31	4.61	3.57		9.16	8.34	15.24	11.33	13.97	9.35
	10.32	10.63	5.91	4.62	3.44		8.98	7.74	15.01	10.89	12.04	8.47
	9.97	10.82	4.16	3.81			9.38	6.75	14.39	10.87	12.22	7.7
	9.47	10.14	4.02				8.12	5.7	13.52	9.76	11.08	6.24
	9.26	9.58					7.98	5.03	12.2	9.24	9.67	5.15
	8.84	8.64					7.09	3.79	11.75	8.96	8.14	4.02
	8.41	8.46					6.24		11.44	7.48	6.78	
	6.47	8.2					4.95		11.6	6.87	5.78	
	6.34	7.84					3.28		11.73	5.87	4.61	
	6.16	6.46							11.32	4.63		
	5.76	5.62							11.28	4.12		
	5.21	4.8							10.7	3.24		
	4.87	3.99							10.56			
	4.55	3.97							3.67			
	4.25								9.41			
									8.51			
									7.18			
									7.1			
									6.34			
									5.48			
									4.5			
									3.33			

TABLE 27.--Subject AA: Perimeter Data

Subject AA	UR1	UR2	UR4	UR6MB	URDB	UR6P	LR1	LR3	LR4	LR6M	LR6D
	20.93	18.71	24.4	35.72			15.53	22.42	20.25	33.16	
	19.36	17.95	23.69	35.25			14.58	21.8	18.45	32.76	
	18.26	16.56	22.37	34.28			14.04	21.77	16.75	30.84	
	18.26	16.52	22.24	33.35			14.09	20.16	15.68	31.02	
	17.74	16.42	20.07	33.27			13.05	20.03	15.1	30.37	
	17.25	16.8	20.25	33.24			13.1	20.13	15.29	31.59	
	16.66	16.53	20.38	33.65			13.09	20.23	15.37	32.52	
	16.91	15.9	19.85	32.22			13.27	20.02	15.6	19.31	18.8
	17.02	15.56	19.73	14.87	25.91		13.07	20.57	15.68	18.91	17.8
	16.78	15.84	18.85	15.02	25.61		12.59	19.82	16.06	18.9	17.67
	16.53	15.61	18.89	15.33	26.85		12.09	19.56	16	18.76	17.26
	15.26	15.23	18.59	15.23	25.55		12.27	19.57	15.27	18.73	16.77
	14.86	14.61	18.19	15.15	11.85	15.04	11.49	18.57	15.27	18.35	16.25
	15.85	14.3	17.89	14.26	10.9	14.03	11.2	17.83	14.3	17.95	16.51
	15.51	14.27	17.72	13.97	10.35	13.4	10.8	17.96	14.92	18.3	15.57
	14.89	14.27	17.65	14.81	9.84	13.22	10.66	16.82	13.53	18.15	14.51
	14.7	13.67	17.58	14.14	8.88	12.89	10.5	17.19	13.65	17.58	14.68
	14.68	13.23	17.53	13.76	8.25	12.87	10.2	17.17	12.46	16.84	14.56
	14.8	12.12	17.08	12.55	8.96	12.93	9.52	17.02	12.86	15.8	14.35
	13.25	12.57	16.29	12.2	9.15	12.58	9.64	16.23	11.65	15.28	14.31
	12.91	12.03	15.67	11.22	9.08	12.68	9.56	16.32	13.33	15.45	13.26
	12.8	12.36	16.27	11.18	7.26	11.17	9.74	16	12.95	14.36	12.99
	12.63	11.42	16.13	10.2	5.69	10.95	9.3	15.29	12.2	13.8	11.18
	11.28	10.99	14.58	9.61	4.24	10.02	8.5	14.36	11.75	13.23	11.62
	10.29	10.92	13.61	8.48	4.26	9.97	7.37	14.26	10	12.64	11.75
	9.81	11.57	12.37	7.55		8.97	6.58	13.79	9.47	12.12	11.48
	8.1	11.16	11.18	5.31		8.91	6.27	12.81	8.63	11.88	10.37
	7.56	10.05	10.23	4.39		8.26	5.95	11.52	8.1	10.49	9.95
	6.19	9.55	8.59			8.3	5.48	11.76	7.26	9.67	9.5
	5.26	9.63	8.14			7.26	5.04	11.36	6.25	9.45	9.02
	5.2	9.27	6.26			6.28	4.28	9.97	6.21	8.26	8.89
	4.61	8.25	4.6			4.26	3.99	10.22	5.88	7.26	7.84
	4.23	7.5	4.51			4.26		9.25	4.6	5.36	6.3
		7.15				4.27		8.99	4.51	4.36	4.21
		5.3						7.56		5.02	3.84
		5.07						6.09		4.26	
		4.03						5.55			
								4.26			

TABLE 28.--Subject BB: Perimeter Data

Subject BB	UR1	UR2	UR4B	UR6MB	URDB	UR6P	LR1	LR3	LR4	LR6M	LR6D
	18.32	15.24	17.66	29.29			13	17.71	16.65	29.35	
	18.26	14.49	17.2	28.85			12.63	17.63	15.57	28.16	
	18.06	13.4	16.88	27.5			12.14	17.58	14.41	27	
	16.23	13.42	15.42	27.54			11.47	16.58	14.63	27.25	
	15.98	12.75	13.86	25.76			11.01	16.28	14.5	27.12	
	14.8	12.57	13.64	25.77			10.45	15.79	13.28	26.84	
	14.22	12.41	13.97	25.71			9.96	15.22	13.08	26.26	
	14.96	12.21	12.84	25.76			10.23	15.14	13.24	26.35	
	15.25	11.45	12.15	25.87			10.52	15	13.37	26.74	
	13.78	11.87	11.79	24.94			9.84	15.23	12.68	25.97	
	13.87	11.65	11.23	13.64	22.27		9.23	15.08	12.3	17.94	16.52
	13.52	11.34	10.8	10.45	23.09		9.12	14.84	12.48	16.87	15.8
	13.62	11.11	10.66	9.81	9.73	11.92	8.91	14.05	12.25	15.35	15.56
	12.72	11.45	9.76	10.15	9.58	12.21	8.88	13.57	12.09	16.05	15.43
	11.22	11.06	9.07	10.74	9.08	12.61	8.73	12.91	12.02	16.21	15.29
	11.34	10.27	9.21	9.96	8.15	11.8	7.94	12.61	11.14	14.49	14.16
	11.21	9.83	9.37	9.69	7.65	11.11	7.81	12.42	10.04	13.78	13.04
	10.06	9.63	9.01	8.78	7.44	10.16	6.78	11.8	10.34	13.59	12.84
	9.61	9.29	8.41	8.44	7.11	9.47	6.46	11.26	10.51	13.15	12.23
	9.67	9.24	8.26	8.3	6.67	6.78	5.75	11.23	9.87	11.47	12.03
	9.6	9.07	7.35	8.18	6.5	9.51	5.36	11.25	8.6	10.82	11.05
	8.91	8.75	6.29	7.75	6.64	9.46	4.91	11.75	8.45	10.28	11.12
	8.74	8.46	5.85	6.44	6.7	9.23	4.84	12.26	8.23	9.69	11.01
	7.75	8.16	5.26	7.23	5.58	7.47	5.12	10.74	7.76	9.56	10.56
	7.16	8.06	5.12	7.2	4.58	6.84	5.02	10.19	6.36	9.74	10.03
	6.66	7.75	4.84	6.26	4.48	6.02	4.68	9.84	5.87	9.87	9.87
	6.22	6.83	4.06	5.99	4.01	5.79	4.42	9.6	5.76	10.25	9.51
	5.87	6.2		5.12	3.94	5.2	4.02	8.48	4.97	9.78	8.76
	5.32	5.58		4.47	3.88	4.78	3.79	7.69	4.8	8.09	8.43
	4.49	4.99		4.12		4.32		6.45	4.76	8.06	8.24
	5.02	4.7				3.97		5.81	4.23	8.19	8.18
	4.27	4.15				3.89		5.12	4.28	7.67	7.78
	3.28							4.94	4.32	6.58	6.96
								4.78	3.86	5.47	5.42
								4.21	3.76	4.41	4.18
								4.09		3.87	4.12
								3.68			

TABLE 29.--Subject CC: Perimeter Data

Subject CC	UR1	UR2	UR4	UR6 MB	UR6 DB	UR6 P	LR1	LR3	LR4	LR6 M	LR6 D
	19.48	16.98	23.02	34.05			14.63	19.69	20.33	31.63	
	19.32	16.25	22.15	33.26			14.23	18.6	19.36	31.26	
	19.09	15.98	21.5	32.37			13.57	18.59	18.98	31.97	
	19.12	15.93	20.47	32.15			13.24	17.32	18.75	30.56	
	18.88	15.31	20.73	31.5			12.96	17.83	18.25	30	
	17.45	15.47	20.15	30.18			12.8	17.56	18.23	29.96	
	17.14	14.57	19.42	28.52			12.76	18.19	18.03	29.45	
	16.91	13.58	19.74	30.48			13.24	17.22	17.88	30.84	
	16.81	13.73	19.62	30.4			13.34	17.51	17.22	30.96	
	16.7	13.36	19.64	29.36			12.84	16.81	16.64	19.01	18.22
	16.55	13.39	19.36	29.37			12.62	16.88	16.09	18.78	17.38
	16.62	13.42	18.65	28.47			12.24	17.45	15.84	18.45	17.55
	16.53	13.11	18.55	12.15	25.89		12.63	16.7	15.11	18.85	17.88
	15.24	12.82	17.57	12.04	25.15		12.36	16.32	15.2	18.65	17.3
	14.75	12.33	17.15	11.66	25.64		12.75	16.18	14.96	18.55	17.31
	14.83	12.38	16.25	12.34	25.47		12.14	16.47	14.21	17.47	16.28
	14.41	12.81	15.6	12.52	25.39		11.94	15.59	13.63	16.23	15.78
	14.81	12.78	15.14	12.24	25.32		11.87	15.58	13.51	16.54	15.46
	14.59	12.67	14.43	11.78	25.99		11.75	15.32	13.35	16.35	15.87
	13.51	11.56	13.26	12.31	24.71		11.84	15.22	12.84	16.23	15.03
	13.64	11.07	12.82	12.43	24.31		11.94	15.52	12.16	15.99	14.97
	13.74	10.9	12.47	11.15	23.34		10.27	14.19	12.57	15.47	15.48
	13.98	10.83	13.54	10.64	11.73	10.75	10.27	13.17	12.27	15.66	14.55
	12.26	10.2	13	11.09	11.64	10.4	10.06	13.36	12.51	15.63	13.99
	11.97	9.92	13.27	11.16	11.26	9.93	9.59	12.76	11.53	15.38	12.92
	11.37	9.82	13.25	10.82	11.06	8.96	9.87	11.57	12.26	15.12	12.84
	11.61	9.73	13.38	10.2	8.51	8.86	10.32	11.52	12.02	14.47	12.72
	11.27	9.64	13.07	10.7	7.54	7.94	9.86	11.48	11.15	13.7	10.6
	11.25	9.62	13.03	9.11	8.01	8.34	9.38	11.4	10.46	13.28	9.82
	9.27	8.48	12.05	8.87	6.23	7.62	8.87	11.22	10.06	12.26	9.36
	8.97	7.08	10.99	6.74	4.77	6.23	7.23	11.1	9.38	11.58	8.33
	7.62	7.15	9.54	5.23	3.79	5.11	6.24	11.05	8.01	11.7	8.11
	6.51	6.37	9.33	4.32		4.21	5.1	11.15	7.05	11.65	7.88
	5.12	5.8	8.74				3.78	11.32	7.13	7.33	6.02
	5.03	5.47	7.65				3.48	11.04	6.85	6.31	5.72
	4.12	4.23	6.69					10.38	5.12	4.31	4.29
		4.2	6.2					9.82	4.48		
			4.53					8.84	3.9		
			3.91					7.13	3.48		
								6.21			
								5.3			
								4.26			

TABLE 30.--Subject DD: Perimeter Data

Subject DD	UR1	UR2	UR4	UR6MB	URDB	UR6P	LR1	LR3	LR4	LR6M	LR6D
	20.58	16.5	22.72	34.21			13.92	20.31	20.88	31.29	
	19.96	16.45	21.59	33.29			13.5	19.47	19.6	30.79	
	19.47	16.03	20.28	32.75			13.24	19.14	18.3	29.14	
	19.54	15.57	20.16	32.66			13.26	18.83	17.64	29.22	
	19.86	14.68	18.92	32.67			13.11	18.64	17.4	29.41	
	19.6	14.23	18.85	32			13.87	17.8	17.64	28.87	
	19.31	14.07	18.75	31.39			14.22	17.73	17.91	30.17	
	18.76	13.61	19.02	31.28			13.67	17.56	17.83	30.51	
	18.49	13.57	19.19	18.38	25.61		14.04	17.29	17.71	19.81	19.43
	18.33	15.6	18.82	18.49	25.8		13.27	16.57	17.26	19.7	18.76
	18.01	13.67	17.96	18.87	26.14		12.18	16.28	16.95	19.68	18.4
	17.81	13.57	17.56	17.59	26.24		12.84	16.24	16.76	18.86	17.49
	17.83	13.51	17.02	16.69	26.7		12.51	16.64	16.5	18.29	17.51
	17.56	13.57	16.67	16.2	25.97		11.8	16.75	16.53	17.56	17.56
	16.35	12.98	16.66	14.98	13.13	14.7	11.74	17.2	16.5	17.35	17.57
	16.37	12.63	16.84	14.26	10.29	14.55	11.63	16.82	15.79	17.67	16.81
	16.75	12.12	16.81	13.11	9.15	14.21	11.06	16.27	15.4	18.1	16.78
	15.57	11.9	16.57	12.8	10.24	13.79	10.9	16.47	15.3	17.56	16.34
	15.38	11.77	16.38	12.76	10.7	13.72	10.68	16.44	15.23	16.85	15.69
	14.85	11.57	16.39	13.23	9.84	13.62	10.62	16.2	14.75	16.58	14.85
	14.41	11.4	16.46	13.05	9.95	13.52	10.07	15.99	14.62	17.05	14.29
	13.37	10.82	15.25	12.26	8.91	12.53	9.57	15.74	14.63	16.91	14.26
	12.73	10.32	14.96	11.34	8.34	12.15	8.72	15.26	14.25	16.88	14.28
	12.29	10.65	14.15	10.56	8.25	11.75	8.75	14.88	14.06	15.26	14.06
	11.73	10.6	15.11	9.82	8.15	11.45	8.49	14.12	13	15.09	13.84
	11.75	9.81	14.57	9.61	7.96	10.22	8.34	13.51	13.25	15.09	12.34
	10.23	9.17	14	9.01	7.81	10.78	8.43	11.89	13.05	15.23	11.52
	10.11	8.67	12.5	9.27	7.84	10.81	8.52	12.25	12.25	14.26	11.46
	10.03	8.32	10.82	9.3	8.23	10.7	8.71	12.45	11.5	13.23	11.18
	9.86	7.9	10.7	8.54	7.65	9.94	7.57	12.4	11.63	12	11.12
	8.63	7.58	10.17	6.84	5.95	8.63	6.82	12.34	11	11.5	11.38
	8.48	6.84	9.85	5.59	5.86	8.67	6.59	11.26	11.26	10.9	10.57
	8.01	6.63	9.61	5.57	6.01	8.78	6.96	10.58	11.24	10.81	9.51
	7.9	5.97	8.76	4.86	5.12	7.34	6.7	9.57	10.8	9.81	8.86
	7.81	6.01	7.92	4.23	4.68	7.25	6.01	8.98	10.11	9.71	8.32
	6.81	5.78	6.94	4.3	4.58	4.6	5.67	9.24	9.94	8.65	7.19
	6.77	4.87	6.59	4.01	5.11	7.52	4.12	9.31	8.69	7.57	6.67
	5.26	4.63	5.17		4.96	6.27	2.97	8.19	7.59	6.87	6.67
	5.12	3.91	4.03		4.75	5.54		7.53	6.64	7.01	6.5
	4.99				4.23	5.8		6.67	6.25	5.96	6.48
	4.73					5.24		5.67	5.7	5.26	5.31
	4.2					5.16		5.23	4.96	4.26	5.15
						4.96		4.85	4.23	4.05	4.67
						4.82		4.12	3.91	3.69	4.02
						4.33		3.69		3.45	
						3.99		3.24			
						4.07					
						3.88					

APPENDIX 3

Raw Data: By Tooth Type

TABLE 31.--Maxillary Central Incisor: Subjects A-DD

UR1															
	A 13.3 F	D 11.9 F	E 12.2 F	H 11.8 F	I 12.2 F	K 12.10 F	N 12.2 F	O 12.9 F	S 12.10 F	U 12.9 F	W 12.2 F	Y 15.1 F	BB 16.6 F	CC 14.4 F	DD 13.6 F
Raw RSA	290.14	560.51	505.42	647.79	471.55	564.14	680.11	521.46	409.64	626.97	531.57	500.79	359.99	490.47	555.60
RSA	***81.24***	*156.94*	*141.52*	*181.38*	*132.03*	*157.96*	***190.43***	*146.01*	*114.70*	*175.55*	*148.84*	*140.22*	*100.80*	*137.33*	*155.57*
Raw L	24.00	39.00	41.00	44.00	34.00	43.00	47.00	41.00	36.00	47.00	42.00	40.00	33.00	36.00	42.00
L	***6.72***	*10.92*	*11.48*	*12.32*	*9.52*	*12.04*	***13.16***	*11.48*	*10.08*	***13.16***	*11.76*	*11.20*	*9.24*	*10.08*	*11.76*
	B 12.2 M	C 13.0 M	F 11.7 M	G 12.9 M	J 11.0 M	L 16.11 M	M 13.7 M	P 13.4 M	Q 16.7 M	R 12.10 M	T 13.1 M	V 10.2 M	X 13.2 M	Z 11.8 M	AA 11.11 M
	534.91	560.45	637.11	609.32	763.30	601.93	430.57	448.54	451.68	711.17	594.12	579.78	624.88	628.32	440.37
	149.77	*156.93*	*178.39*	*170.61*	***213.72***	*168.54*	***120.56***	*125.59*	*126.47*	*199.13*	*166.35*	*162.34*	*174.97*	*175.93*	*123.30*
	32.00	43.00	48.00	40.00	50.00	46.00	42.00	32.00	35.00	50.00	45.00	43.00	46.00	48.00	33.00
	8.96	*12.04*	*13.44*	*11.20*	***14.00***	*12.88*	*11.76*	***8.96***	*9.80*	***14.00***	*12.60*	*12.04*	*12.88*	*13.44*	*9.24*

TABLE 32.--Maxillary Lateral Incisor: Subjects A-DD

UR2															
	A 13.3 F	D 11.9 F	E 12.2 F	H 11.8 F	I 12.2 F	K 12.10 F	N 12.2 F	O 12.9 F	S 12.10 F	U 12.9 F	W 12.2 F	Y 15.1 F	BB 16.6 F	CC 14.4 F	DD 13.6 F
Raw RSA	269.00	491.33	461.94	568.67	395.58	507.55	524.87	404.82	350.78	510.84	444.63	391.11	317.38	418.94	427.48
RSA	***75.32***	*137.57*	*129.34*	***159.23***	*110.76*	*142.11*	*146.96*	*113.35*	*98.22*	*143.04*	*124.50*	*109.51*	*88.87*	*117.30*	*119.69*
Raw L	24.00	37.00	40.00	43.00	33.00	42.00	45.00	36.00	36.00	45.00	36.00	41.00	32.00	37.00	39.00
L	***6.72***	*10.36*	*11.20*	*12.04*	*9.24*	*11.76*	***12.60***	*10.08*	*10.08*	***12.60***	*10.08*	*11.48*	*8.96*	*10.36*	*10.92*
	B 12.2 M	C 13.0 M	F 11.7 M	G 12.9 M	J 11.0 M	L 16.11 M	M 13.7 M	P 13.4 M	Q 16.7 M	R 12.10 M	T 13.1 M	V 10.2 M	X 13.2 M	Z 11.8 M	AA 11.11 M
	506.85	365.66	511.62	491.63	678.50	491.52	427.82	399.32	430.83	531.25	522.77	482.13	579.31	597.15	462.92
	141.92	***102.38***	*143.25*	*137.66*	***189.98***	*137.63*	*119.79*	*111.81*	*120.63*	*148.75*	*146.38*	*135.00*	*162.21*	*167.20*	*129.62*
	35.00	36.00	43.00	35.00	48.00	45.00	43.00	30.00	37.00	45.00	45.00	42.00	44.00	47.00	37.00
	9.80	*10.08*	*12.04*	*9.80*	***13.44***	*12.60*	*12.04*	***8.40***	*10.36*	*12.60*	*12.60*	*11.76*	*12.32*	*13.16*	*10.36*

TABLE 33.--Maxillary First Bicuspid: Subjects A-DD

UR4															
	A 13.3 F	D 11.9 F	E 12.2 F	H 11.8 F	I 12.2 F	K 12.10 F	N 12.2 F	O 12.9 F	S 12.10 F	U 12.9 F	W 12.2 F	Y 15.1 F	BB 16.6 F	CC 14.4 F	DD 13.6 F
Raw RSA	411.88	760.92	570.42	680.05	547.50	526.86	730.28	574.30	603.33	642.59	676.95	535.95	279.96	569.86	574.72
RSA	*115.33*	***213.06***	*159.72*	*190.41*	*153.30*	*147.52*	*204.48*	*160.80*	*168.93*	*179.93*	*189.55*	*150.07*	***78.39***	*159.56*	*160.92*
Raw L	25.00	39.00	36.00	39.00	31.00	33.00	44.00	36.00	36.00	40.00	37.00	35.00	27.00	39.00	39.00
L	***7.00***	*10.92*	*10.08*	*10.92*	*8.68*	*9.24*	***12.32***	*10.08*	*10.08*	*11.20*	*10.36*	*9.80*	*7.56*	*10.92*	*10.92*
	B 12.2 M	C 13.0 M	F 11.7 M	G 12.9 M	J 11.0 M	L 16.11 M	M 13.7 M	P 13.4 M	Q 16.7 M	R 12.10 M	T 13.1 M	V 10.2 M	X 13.2 M	Z 11.8 M	AA 11.11 M
	588.34	637.49	626.92	562.86	907.02	741.25	634.30	687.39	602.73	830.91	664.64	619.94	810.51	691.91	531.88
	164.74	*178.50*	*175.54*	*157.60*	***253.97***	*207.55*	*177.60*	*192.47*	*168.76*	*232.65*	*186.10*	*173.58*	*226.94*	*193.73*	***148.93***
	29.00	35.00	38.00	29.00	43.00	45.00	47.00	36.00	36.00	49.00	44.00	37.00	49.00	37.00	33.00
	8.12	*9.80*	*10.64*	***8.12***	*12.04*	*12.60*	*13.16*	*10.08*	*10.08*	***13.72***	*12.32*	*10.36*	***13.72***	*10.36*	*9.24*

TABLE 34.--Maxillary First Molar: Subjects A-DD

UR6															
	A 13.3 F	D 11.9 F	E 12.2 F	H 11.8 F	I 12.2 F	K 12.10 F	N 12.2 F	O 12.9 F	S 12.10 F	U 12.9 F	W 12.2 F	Y 15.1 F	BB 16.6 F	CC 14.4 F	DD 13.6 F
Raw RSA	840.07	1192.98	1058.24	1283.73	1046.33	1139.46	1489.94	1020.68	1109.13	1245.34	1089.86	1051.71	749.33	1013.71	1245.21
RSA	*235.22*	*334.03*	*296.31*	***359.44***	*292.97*	*319.05*	*417.18*	*285.79*	*310.56*	*348.70*	*305.16*	*294.48*	***209.81***	*283.84*	*348.66*
Raw L	29.00	40.00	39.00	44.00	35.00	38.00	49.00	37.00	44.00	44.00	37.00	38.00	32.00	33.00	48.00
L	***8.12***	*11.20*	*10.92*	*12.32*	*9.80*	*10.64*	***13.72***	*10.36*	*12.32*	*12.32*	*10.36*	*10.64*	*8.96*	*9.24*	*13.44*
	B 12.2 M	C 13.0 M	F 11.7 M	G 12.9 M	J 11.0 M	L 16.11 M	M 13.7 M	P 13.4 M	Q 16.7 M	R 12.10 M	T 13.1 M	V 10.2 M	X 13.2 M	Z 11.8 M	AA 11.11 M
	1269.23	1092.85	1214.47	1345.48	1351.26	1325.61	1200.48	1165.72	933.09	1562.03	1535.29	1074.74	1620.63	1224.84	945.36
	355.38	*306.00*	*340.05*	*376.73*	*378.35*	*371.17*	*336.13*	*326.40*	***261.27***	*437.37*	*429.88*	*300.93*	***453.78***	*342.96*	*264.70*
	38.00	44.00	43.00	40.00	44.00	46.00	44.00	38.00	33.00	55.00	48.00	43.00	52.00	42.00	34.00
	10.64	*12.32*	*12.04*	*11.20*	*12.32*	*12.88*	*12.32*	*10.64*	***9.24***	***15.40***	*13.44*	*12.04*	*14.56*	*11.76*	*9.52*

TABLE 35.--Mandibular Central Incisor: Subjects A-DD

LR1															
	A 13.3 F	D 11.9 F	E 12.2 F	H 11.8 F	I 12.2 F	K 12.10 F	N 12.2 F	O 12.9 F	U 12.9 F	W 12.2 F	Y 15.1 F	S 12.10 F	BB 16.6 F	CC 14.4 F	DD 13.6 F
Raw RSA	275.63	476.35	331.23	403.98	355.54	386.12	499.91	382.46	469.15	441.97	398.20	303.38	233.02	382.01	385.07
RSA	*77.18*	*133.38*	*92.74*	*113.11*	*99.55*	*108.11*	***139.97***	*107.09*	*131.36*	*123.75*	*111.50*	*84.95*	***65.25***	*106.96*	*107.82*
Raw L	25.00	40.00	34.00	36.00	30.00	38.00	44.00	39.00	43.00	37.00	40.00	33.00	29.00	35.00	38.00
L	***7.00***	*11.20*	*9.52*	*10.08*	*8.40*	*10.64*	***12.32***	*10.92*	*12.04*	*10.36*	*11.20*	*9.24*	*8.12*	*9.80*	*10.64*
	B 12.2 M	C 13.0 M	F 11.7 M	G 12.9 M	J 11.0 M	L 16.11 M	M 13.7 M	P 13.4 M	Q 16.7 M	R 12.10 M	T 13.1 M	V 10.2 M	X 13.2 M	Z 11.8 M	AA 11.11 M
	401.55	348.01	428.84	383.39	525.83	423.18	366.16	298.18	306.40	500.56	464.01	361.45	462.42	441.20	326.84
	112.43	*97.44*	*120.08*	*107.35*	***147.23***	*118.49*	*102.52*	***83.49***	*85.79*	*140.16*	*129.92*	*101.21*	*129.48*	*123.54*	*91.52*
	32.00	34.00	36.00	33.00	40.00	40.00	36.00	28.00	31.00	46.00	45.00	36.00	42.00	39.00	32.00
	8.96	*9.52*	*10.08*	*9.24*	*11.20*	*11.20*	*10.08*	***7.84***	*8.68*	***12.88***	*12.60*	*10.08*	*11.76*	*10.92*	*8.96*

TABLE 36.--Mandibular Canine: Subjects A-DD

LR3															
	A 13.3 F	D 11.9 F	E 12.2 F	H 11.8 F	I 12.2 F	K 12.10 F	N 12.2 F	O 12.9 F	S 12.10 F	U 12.9 F	W 12.2 F	Y 15.1 F	BB 16.6 F	CC 14.4 F	DD 13.6 F
Raw RSA	401.00	751.90	663.78	788.77	466.96	608.53	744.52	519.78	589.71	832.00	685.01	706.56	422.81	574.82	607.61
RSA	***112.28***	*210.53*	*185.86*	*220.86*	*130.75*	*170.39*	*208.47*	*145.54*	*165.12*	***232.96***	*191.80*	*197.84*	*118.39*	*160.95*	*170.13*
Raw L	30.00	51.00	49.00	52.00	33.00	43.00	49.00	43.00	47.00	58.00	48.00	49.00	37.00	42.00	46.00
L	***8.40***	*14.28*	*13.72*	*14.56*	*9.24*	*12.04*	*13.72*	*12.04*	*13.16*	***16.24***	*13.44*	*13.72*	*10.36*	*11.76*	*12.88*
	B 12.2 M	C 13.0 M	F 11.7 M	G 12.9 M	J 11.0 M	L 16.11 M	M 13.7 M	P 13.4 M	Q 16.7 M	R 12.10 M	T 13.1 M	V 10.2 M	X 13.2 M	Z 11.8 M	AA 11.11 M
	659.93	655.50	625.67	771.31	988.04	720.86	602.77	723.40	471.85	818.57	752.17	541.62	865.83	849.79	584.23
	184.78	*183.54*	*175.19*	*215.97*	***276.65***	*201.84*	*168.78*	*202.55*	***132.12***	*229.20*	*210.61*	*151.65*	*242.43*	*237.94*	*163.58*
	37.00	48.00	54.00	43.00	59.00	49.00	47.00	44.00	36.00	44.00	49.00	42.00	55.00	55.00	38.00
	10.36	*13.44*	*15.12*	*12.04*	***16.52***	*13.72*	*13.16*	*12.32*	***10.08***	*12.32*	*13.72*	*11.76*	*15.40*	*15.40*	*10.64*

TABLE 37.--Mandibular First Bicuspid: Subjects A-DD

LR4															
	A 13.3 F	D 11.9 F	E 12.2 F	H 11.8 F	I 12.2 F	K 12.10 F	N 12.2 F	O 12.9 F	S 12.10 F	U 12.9 F	W 12.2 F	Y 15.1 F	BB 16.6 F	CC 14.4 F	DD 13.6 F
Raw RSA	417.01	710.59	602.61	670.73	508.47	462.18	679.31	559.45	513.39	551.47	589.39	501.66	340.46	500.80	586.44
RSA	*116.76*	***198.97***	*168.73*	*187.80*	*142.37*	*129.41*	*190.21*	*156.65*	*143.75*	*154.41*	*165.03*	*140.46*	***95.33***	*140.22*	*164.20*
Raw L	31.00	46.00	44.00	46.00	34.00	38.00	45.00	44.00	47.00	43.00	44.00	43.00	35.00	39.00	44.00
L	***8.68***	*12.88*	*12.32*	*12.88*	*9.52*	*10.64*	*12.60*	*12.32*	***13.16***	*12.04*	*12.32*	*12.04*	*9.80*	*10.92*	*12.32*
	B 12.2 M	C 13.0 M	F 11.7 M	G 12.9 M	J 11.0 M	L 16.11 M	M 13.7 M	P 13.4 M	Q 16.7 M	R 12.10 M	T 13.1 M	V 10.2 M	X 13.2 M	Z 11.8 M	AA 11.11 M
	516.51	498.43	479.70	543.82	721.31	652.30	541.35	550.37	500.78	800.41	596.02	559.52	731.36	638.69	425.28
	144.62	*139.56*	*134.32*	*152.27*	*201.97*	*182.64*	*151.58*	*154.10*	*140.22*	***224.11***	*166.89*	*156.67*	*204.78*	*178.83*	***119.08***
	33.00	39.00	40.00	33.00	41.00	49.00	47.00	31.00	39.00	55.00	46.00	43.00	49.00	45.00	34.00
	9.24	*10.92*	*11.20*	*9.24*	*11.48*	***13.72***	*13.16*	***8.68***	*10.92*	***15.40***	*12.88*	*12.04*	*13.72*	*12.60*	*9.52*

TABLE 38.--Mandibular First Molar: Subjects A-DD

LR6															
	A 13.3 F	D 11.9 F	E 12.2 F	H 11.8 F	I 12.2 F	K 12.10 F	N 12.2 F	O 12.9 F	S 12.10 F	U 12.9 F	W 12.2 F	Y 15.1 F	BB 16.6 F	CC 14.4 F	DD 13.6 F
Raw RSA	825.68	1258.21	1044.15	1410.92	946.30	880.86	1555.96	1064.89	1094.32	1135.68	1080.05	1104.36	830.39	1033.24	1154.75
RSA	***231.19***	*352.30*	*292.36*	*395.06*	*264.96*	*246.64*	***435.67***	*298.17*	*306.41*	*317.99*	*302.41*	*309.22*	*232.51*	*289.31*	*323.33*
Raw L	34.00	43.00	44.00	47.00	35.00	38.00	50.00	43.00	47.00	45.00	40.00	43.00	36.00	36.00	45.00
L	***9.52***	*12.04*	*12.32*	*13.16*	*9.80*	*10.64*	***14.00***	*12.04*	*13.16*	*12.60*	*11.20*	*12.04*	*10.08*	*10.08*	*12.60*
	B 12.2 M	C 13.0 M	F 11.7 M	G 12.9 M	J 11.0 M	L 16.11 M	M 13.7 M	P 13.4 M	Q 16.7 M	R 12.10 M	T 13.1 M	V 10.2 M	X 13.2 M	Z 11.8 M	AA 11.11 M
	1221.49	1200.48	1133.95	1163.18	1763.64	1345.25	1213.74	1063.48	923.17	1613.04	1522.35	1137.89	1479.15	1256.43	963.97
	342.02	*336.13*	*317.51*	*325.69*	***493.82***	*376.67*	*339.85*	*297.77*	***258.49***	*451.65*	*426.26*	*318.61*	*414.16*	*351.80*	*269.91*
	37.00	42.00	45.00	38.00	52.00	49.00	48.00	36.00	37.00	60.00	52.00	42.00	48.00	42.00	36.00
	10.36	*11.76*	*12.60*	*10.64*	***14.56***	*13.72*	*13.44*	***10.08***	*10.36*	*16.80*	***14.56***	*11.76*	*13.44*	*11.76*	***10.08***

APPENDIX 4

Raw Data: Cone Model

TABLE 39.--CBCT Method versus the Cone Model

	CBCT Model (in mm^2)	Cone Model (in mm^2)
Maxillary Central Incisor	152.44	120.32*§
Maxillary Lateral Incisor	130.33	99.54*§
Maxillary First Bicuspid	175.69	130.38*§
Maxillary First Molar	330.74	210.68*§
Mandibular Central Incisor	109.78	77.06*§
Mandibular Canine	186.62	135.93*§
Mandibular First Bicuspid	158.20	121.81*§
Mandibular First Molar	330.60	205.27*§
* Statistically Significant $p < 0.05$		
§ Correlation $p > 0.97$		

APPENDIX 5

Raw Data: Percentage Root Surface Area

TABLE 40.--Percentage Root Surface Area: by Tooth-type (including male versus female)

		ALL			Female only			Male only		
UR1		*0.50*	*Total mm*	*0.50*	*50% mm*	*Total mm*	*50% mm*	*50% mm*	*Total mm*	*50% mm*
	mm	4.19	11.41	7.21	3.98	10.99	7.02	4.41	11.82	7.41
	%	0.37		0.63	0.36		0.64	0.37		0.63
		Coronal		*Apical*	*Coronal*		*Apical*	*Coronal*		*Apical*
UR2		*0.50*	*Total mm*	*0.50*	*50% mm*	*Total mm*	*50% mm*	*50% mm*	*Total mm*	*50% mm*
	mm	4.22	10.99	6.78	4.05	10.57	6.51	4.37	11.42	7.06
	%	0.38		0.62	0.38		0.62	0.38		0.62
		Coronal		*Apical*	*Coronal*		*Apical*	*Coronal*		*Apical*
UR4		*0.50*	*Total mm*	*0.50*	*50% mm*	*Total mm*	*50% mm*	*50% mm*	*Total mm*	*50% mm*
	mm	4.12	10.48	6.37	3.94	10.01	6.07	4.29	10.96	6.66
	%	0.39		0.61	0.39		0.61	0.39		0.61
		Coronal		*Apical*	*Coronal*		*Apical*	*Coronal*		*Apical*
UR6		*0.50*	*Total mm*	*0.50*	*50% mm*	*Total mm*	*50% mm*	*50% mm*	*Total mm*	*50% mm*
	mm	4.65	11.49	6.84	4.48	10.96	6.48	4.82	12.02	7.21
	%	*0.40*		*0.60*	0.41		0.59	*0.40*		*0.60*
		Coronal		*Apical*	*Coronal*		*Apical*	*Coronal*		*Apical*
LR1		*0.50*	*Total mm*	*0.50*	*50% mm*	*Total mm*	*50% mm*	*50% mm*	*Total mm*	*50% mm*
	mm	4.01	10.18	*6.17*	3.96	10.10	6.14	4.07	10.27	6.20
	%	0.39		0.61	0.39		0.61	0.40		0.60
		Coronal		*Apical*	*Coronal*		*Apical*	*Coronal*		*Apical*
LR3		*0.50*	*Total mm*	*0.50*	*50% mm*	*Total mm*	*50% mm*	*50% mm*	*Total mm*	*50% mm*
	mm	4.83	12.85	*8.02*	4.76	12.64	7.88	4.91	13.07	8.16
	%	0.38		0.62	0.38		0.62	0.38		0.62
		Coronal		*Apical*	*Coronal*		*Apical*	*Coronal*		*Apical*
LR4		*0.50*	*Total mm*	*0.50*	*50% mm*	*Total mm*	*50% mm*	*50% mm*	*Total mm*	*50% mm*
	mm	4.49	11.64	*7.15*	4.46	11.63	7.17	4.52	11.65	7.13
	%	0.39		0.61	0.38		0.62	0.39		0.61
		Coronal		*Apical*	*Coronal*		*Apical*	*Coronal*		*Apical*
LR6		*0.50*	*Total mm*	*0.50*	*50% mm*	*Total mm*	*50% mm*	*50% mm*	*Total mm*	*50% mm*
	mm	4.91	12.04	*7.13*	4.76	11.69	6.93	5.06	12.39	7.34
	%	0.41		0.59	0.41		0.59	0.41		0.59
		Coronal		*Apical*	*Coronal*		*Apical*	*Coronal*		*Apical*
Avg	**mm**	4.43		6.96	4.30		6.77	4.55		7.14
	%	38.89		61.11	38.84		61.16	38.95		61.05

APPENDIX 6

Raw Data: Male versus Female

TABLE 41.--t-tests for Root Length and Root Surface Area: Male versus Female ($p < 0.05$)

MAXILLARY CENTRAL INCISOR		MANDIBULAR CENTRAL INCISOR	
ROOT SURFACE AREA	0.13	ROOT SURFACE AREA	0.50
ROOT LENGTH	0.16	ROOT LENGTH	0.77
MAXILLARY LATERAL INCISOR		MANDIBULAR CANINE	
ROOT SURFACE AREA	0.06	ROOT SURFACE AREA	0.15
ROOT LENGTH	0.11	ROOT LENGTH	0.61
MAXILLARY FIRST BICUSPID		MANDIBULAR FIRST BICUSPID	
ROOT SURFACE AREA	0.06	ROOT SURFACE AREA	0.42
ROOT LENGTH	0.13	ROOT LENGTH	0.98
MAXILLARY FIRST MOLAR		MANDIBULAR FIRST MOLAR	
ROOT SURFACE AREA	0.08	ROOT SURFACE AREA	0.08
ROOT LENGTH	0.13	ROOT LENGTH	0.31

APPENDIX 7

Raw Data: Distribution

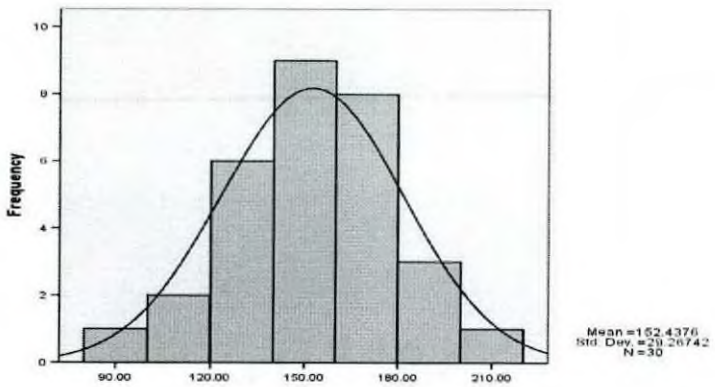


Figure 14. Maxillary right central incisor surface area distribution plot

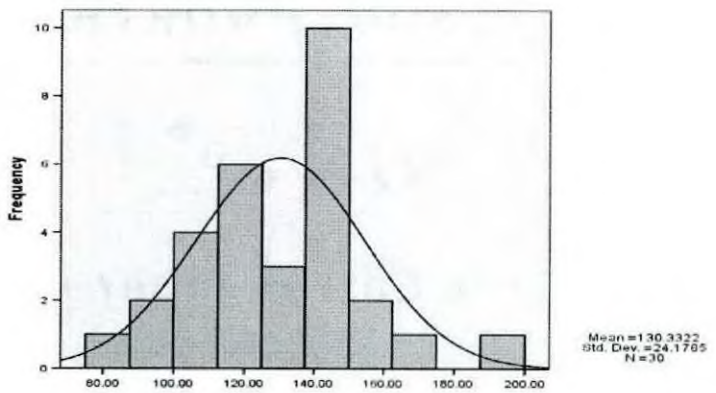


Figure 15. Maxillary right lateral incisor surface area distribution plot

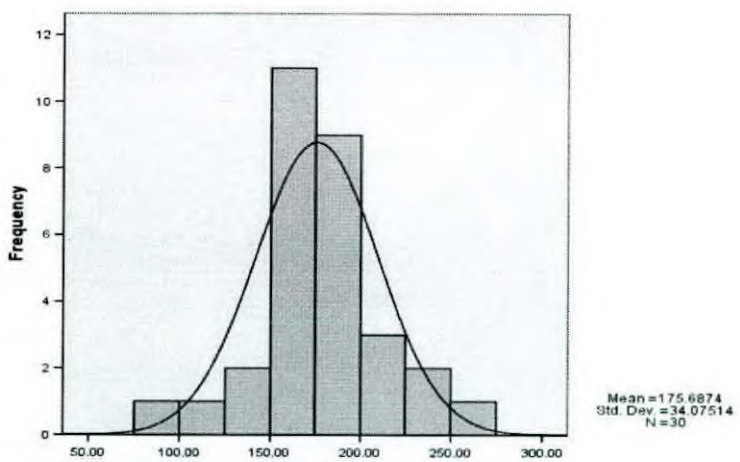


Figure 16. Maxillary right first bicuspid surface area distribution plot

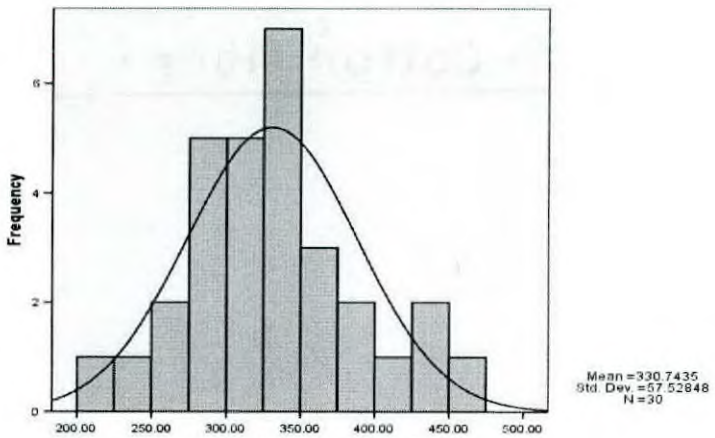


Figure 17. Maxillary right first molar surface area distribution plot

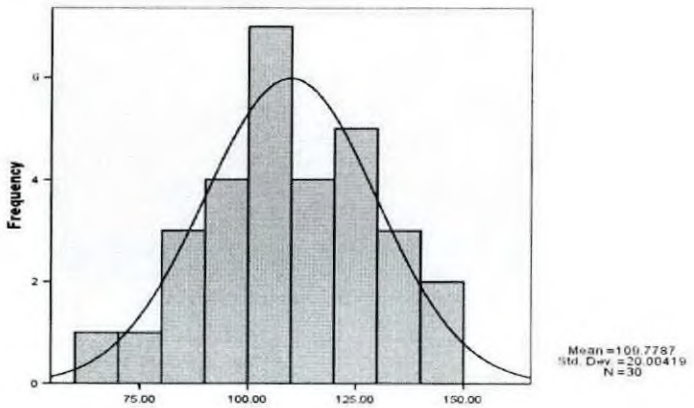


Figure 18. Mandibular right central incisor surface area distribution plot

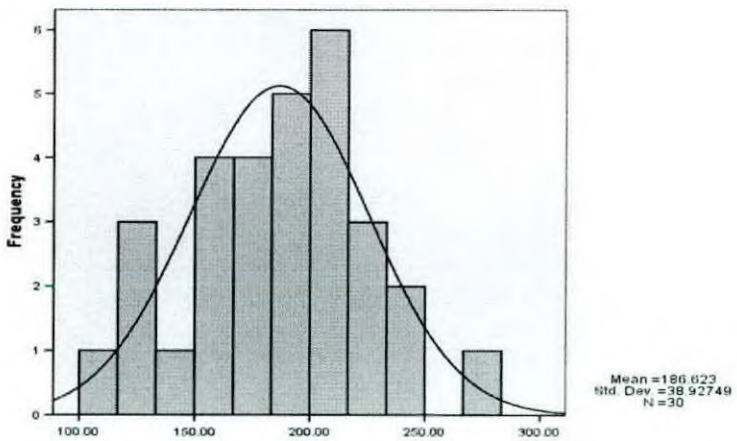


Figure 19. Mandibular right canine surface area distribution plot

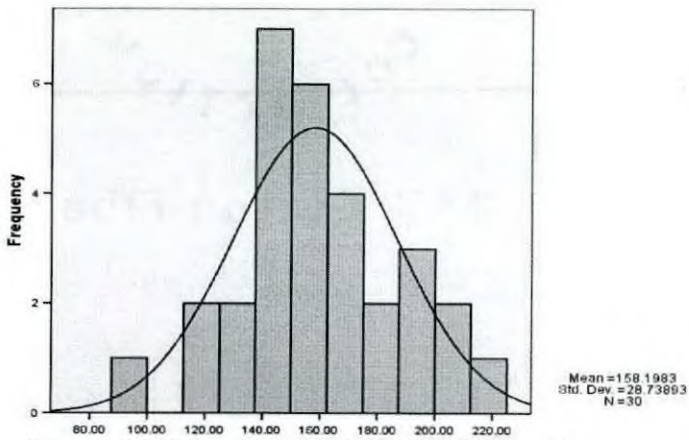


Figure 20: Mandibular right first bicuspid surface area distribution plot

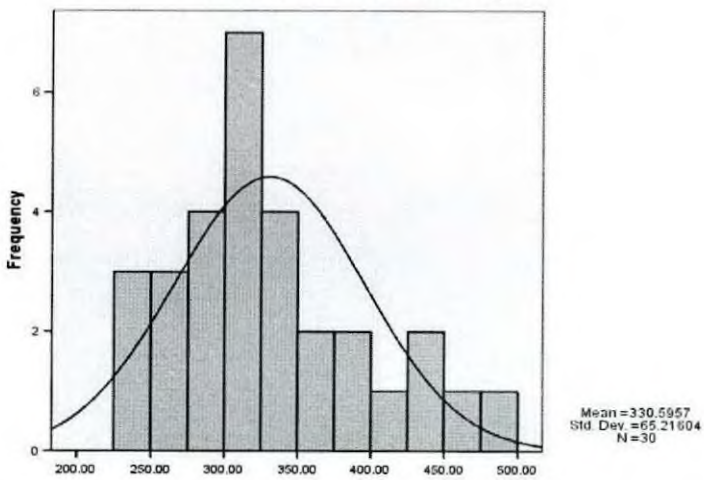


Figure 21: Mandibular right first molar surface area distribution plot

APPENDIX 8

Raw Data: Interexaminer Reliablity

Table 42.--Error Study: Perimeter of Twenty-Four Randomly Selected Teeth

A LR4	B LR6M	B LR6D	C UR4B	C UR4L	F UR2	G UR4B	G UR4L	H LR1	H UR6MB	H UR6DB	H UR6P	I UR2	I LR6M	I LR6D	J UR2	J UR4B	J UR4L
18.06	33.46		22.57		16.63	24.1		15.69	34.57			17.34	29.79		21.16	26.01	
17.23	33.61		21.56		15.82	23.23		15.43	33.36			16.8	28.12		19.02	25.53	
16.35	33.64		21.27		15.24	22.7		15.22	32.45			16.38	27.97		18.85	24.18	
15.96	33.25		21.14		14.96	21.14		15.12	31.87			15.52	27.67		18.59	24.1	
15.81	33.54		20.16		14.79	20.97		14.48	31.75			14.17	28.08		17.68	23.19	
15.24	33.78		19.97		15.24	21.06		14.23	31.26			14.12	17.56		17.57	22.76	
14.71	34.78		19.9		15.42	21.55		13.95	31.3			14.04	27		17.4	22.36	
14.83	34.25		19.46		14.48	20.78		12.09	30.8			14.15	26.87		17.11	22.81	
14.91	22.07	21.59	19.48		14.47	20.18		14.1	30.69			14.03	19.33	18.7	17.23	23.35	
14.26	23.05	20.26	20.01		13.24	20.65		14.23	29.96			13.36	19.23	17.76	17.05	23.51	
14	23.08	19.8	20.56		12.95	20.58		14.22	15.64	27.91		12.66	18.83	16.03	17.12	23.16	
13.24	21.15	18.9	19.84	10.16	12.24	20.89		14.27	16.02	27.42		12.57	18.85	16.38	16.74	23.16	
12.94	20.38	18.78	19.66	9.63	11.96	21.04		14.21	16.25	27.8		12.38	17.27	16.58	16.35	23.14	
12.56	20.47	17.54	18.48	9.25	12.57	20.67		13.42	15.75	27.46		12.26	17.45	15.86	15.59	23.85	
12.38	20.1	17.13	18.11	8.12	12.39	11.61	10.42	12.99	15.25	27.6		12.41	17.25	15.36	15.12	24.77	
12.24	21.46	17.23	17.76	7.47	12.03	11.02	10.25	12.62	15.86	26.76		12.57	17.4	14.8	15.45	24.56	
11.66	22.46	17.57	16.97	7.98	11.77	10.85	10.24	12.62	15.88	12.5	15.57	12.62	17.36	14.67	15.59	25.04	
11.56	20.24	17.45	16.45	7.72	12.24	10.58	9.78	12.4	15.74	12.21	14.8	12.11	17.56	14	15.03	24.63	
11.48	19.96	17.02	11.71	7.72	12.05	11.27	9.19	12.34	15.75	11.72	14.24	11.59	17.76	13.53	14.94	12.76	12.38
10.04	20.14	16.99	10.16	7.48	11.84	10.35	8.87	12.75	14.43	10.94	13.23	11.53	16.8	12.29	15.21	12.2	12.26
9.95	12.6	16.25	9.58	8.57	11.37	10.7	8.67	12.76	13.25	10.56	12.89	11.02	16.56	11.67	15.2	11.75	12.07
9.84	19.95	15.94	9.48	7.26	11.24	9.68	8.45	11.85	12.79	10.43	12.68	10.52	15.27	12.01	15.11	12.24	12.57
9.38	19.21	15.7	8.73	7.74	10.35	9.25	7.24	11.35	12.49	9.52	13.19	9.78	14.95	11.94	14.92	12.02	12.73
9.21	18.02	15.69	8.34	7.12	10.76	9.24	7.13	10.42	12.12	9.37	12.57	9.56	14.6	10.8	14.6	11.16	12.06
8.96	17.75	14.45	8.27	7.04	10.75	9.21	6.97	10.04	11.94	9.29	12.07	10.04	14.45	9.81	14.41	10.52	11.94
8.86	16.89	14.35	7.6	6.95	10.35	8.7	6.64	10.24	12.56	9.76	12.06	9.23	13.52	8.96	14.08	10.57	11.64
8.81	16.23	13.23	7.46	5.23	9.94	8.36	6.43	10.45	13.26	10.16	12.01	8.91	13.28	8.85	13.39	10.41	10.69
8.24	15.43	12.63	6.47	4.12	9.74	7.86	6.78	10.24	12.46	9.81	11.15	8.82	12.27	8.45	13.26	10.32	10.63
8.15	15.79	12.47	6.46	4.01	8	7.71	6.89	10.04	12.85	8.87	10.85	8.54	11.84	8.06	13.19	10.24	10.1
7.65	15.66	12.26	5.98	4.12	7.46	6.58	5.25	9.56	11.9	8.21	10.61	7.36	10.39	7.37	12.96	9.58	9.86
5.63	15.08	12.06	5.87	3.98	7.73	5.59	4.42	9.07	11.89	8.05	10.09	5.62	9.99	6.66	12.89	9.37	9.67
4.23	14.83	12.18	5.12	4.25	7.63	4.42	4.12	8.52	11.77	7.73	9.86	5.89	8.25	5.12	12.6	8.9	8.76
	14.14	11.89	5.12	3.78	8.04	3.52		6.48	11.61	6.47	9.36	4.98	6.34	4.36	12.54	8.75	8.79
	13.32	12.64	4.89	3.77	7.96			5.25	10.42	6.41	8.97	4.34	4.15	3.97	11.87	8.61	7.91
	9.25	9.58	4.23		7.82			4.86	9.7	5.29	8.71	3.24	4.12		11.61	8.37	7.8
	8.87	8.63			8.1			4.33	10.26	5.15	7.79				11.24	7	7.69
	7.21	7.25			8.05			4.2	10.39	5.13	7.67				10.39	6.83	7.82
	7.71	7.07			7.02				9.87	5.02	6.88				9.59	6.26	6.75
	5.25	6.25			6.58				9.87	5.06	6.83				8.86	5.87	6.17
	4.94	4.03			5.12				8.87	4.22	5.84				8.78	5.75	5.94
	4.12	4.25			4.88				8.31		5.34				8.73	4.43	5.3
	3.78	4.05			4.02				6.48		5.23				7.75	3.45	4.76
		3.99							5.2		5.11				6.44		4.3
									4.3		4.81				6.28		
											3.78				6.1		
															5.78		
															5.45		
															4.77		
															4.2		

Table 43.--Error Study: Perimeter of Twenty-Four Randomly Selected Teeth

M UR6MB	M UR6DB	O UR1	O UR4B	O UR4L	P LR4	R UR1	U UR1	U LR6M	U LR6D	V LR6M	V LR6D	X LR1	X UR4	Z UR1	Z LR6M	Z LR6D	BB LR3
30.3		18.63	23.03		22.66	21.66	21.29	31.41		28.84		14.8	23.62	19.01	31.94		17.55
29.63		17.75	22.57		21.26	21.26	20.24	30.25		28.52		14.92	22.85	18.66	31.56		17.23
28.27		17.08	22.05		20.54	20.41	18.5	29.03		28.53		13.44	22.15	18.57	31.43		16.78
27.9		16.35	21.15		20.22	20.21	18.68	28.48		27.84		13.72	22.24	17.95	32.49		16.6
27.73		16.18	20.43		20.07	19.54	18.71	27.47		27.43		13.61	21.94	17.68	31.64		16.53
27.63		16.23	20.24		19.63	19.65	18.42	27.45		27.34		14.04	21.38	17.54	31.78		15.87
27.57		16.47	20.12		18.99	19.83	17.91	27.66		27.97		13.75	21.22	17.57	32.65		15.57
27.12		15.87	20.3		18.6	19.26	17.89	27.6		26.99		13.86	21.47	17.23	31.55		14.98
26.92		15.22	19.36		18.43	19.1	17.78	27.89		18.67	16.6	13.64	20.91	17.13	21.72	20.07	14.6
26.9		14.85	18.58		18.55	18.57	17.54	26.97		18.75	15.86	13.77	20.16	17.11	21.2	19.96	14.53
27.96		14.2	17.74		18.62	17.36	17.29	18.18	17.13	18.6	15.11	13.24	19.95	16.55	20.93	19.56	14.34
13.06	24	14.48	17.67		17.9	16.66	16.9	18.54	16.23	17.8	15.27	13.51	20.45	16.35	20.75	19.27	13.8
13.26	23.84	15.47	17.96		16.93	15.64	16.83	18.65	15.09	17.61	15.41	12.9	20.52	16.27	19.99	19.02	13.23
13.36	23.84	15.2	17.96		16.48	15.9	16.54	18.26	15.24	17.68	15.6	12.82	19.87	16.22	19.89	19.1	12.81
12.89	24.43	15.11	18.17		16.36	16.6	16.4	17.95	15.11	17.71	15.47	12.84	19.69	15.89	20.38	19.06	12.6
12.47	25.22	14.8	17.45		17.2	15.78	15.36	18.05	15.47	17.25	14.86	13.14	20.34	15.74	19.87	18.67	11.37
12.87	24.86	14.23	17.33		17.55	15.89	15.63	18.2	15.38	17.09	14.15	12.6	20.85	15.82	19.77	18.54	10.82
13.09	24.62	13.56	10.21	9.62	16.49	15.4	15.47	17.45	14.8	16.37	13.37	12.54	19.21	16.23	19.57	17.77	10.91
12.26	23.37	13.12	9.53	9.18	16.26	15.01	15.44	17.13	14.33	16.27	12.96	12.88	18.79	15.84	19.52	16.1	10.87
11.01	22.28	13.26	9.23	8.85	15.97	15.46	14.25	17.47	13.86	17.01	12.58	13.17	18.77	15.24	19.75	15.98	10.4
10.24	22.24	13.69	8.47	7.83	15.77	15.97	14.54	16.82	13.89	16.95	12.71	12.3	19.64	14.78	19.47	15.77	10.12
9.59	21.42	12.84	8.12	8.14	16.23	15.46	14	16.58	13.24	15.69	12.69	12.29	18.63	14.89	18.52	15.64	9.6
9.65	21.68	12.57	7.97	8.14	15.4	15.68	13.92	16.59	13.41	15.56	12.45	12.14	18.28	14.57	17.91	15.42	9.14
9.99	21.52	11.67	8.24	8.2	14.53	15.4	13.25	16.34	12.27	15.24	11.66	12.09	17.5	13.34	17.66	15.25	8.88
8.75	21.96	11	8.21	7.83	14.22	15.36	12.94	16.51	11.94	14.09	11.46	11.46	16.41	12.94	17.49	14.76	8.66
8.48	21.93	10.27	7.57	7.24	13.97	15.24	12.87	15.82	11.5	14.47	11.3	10.39	15.49	12.26	17.5	14.87	7.63
7.69	20.57	9.85	6.55	7.61	12	15.03	12.81	15.59	11.3	13.94	11.02	10.74	14.9	12.16	17.57	15.18	7.44
7.61	19.94	9.8	6.45	7.16	10.56	13.54	12.45	15.24	10.73	14.3	10.74	10.58	15.7	12	16.37	14.46	7
7.59	19.65	9.77	6.38	6.36	8.36	11.28	12.04	15.41	10.55	14.22	9.86	10.33	15.45	11.46	15.11	13.63	6.92
8.19	19.8	8.64	6.28	6.45	7.45	10.8	11.8	13.24	10.2	13.58	9.35	10.21	14.88	10.7	14.47	13.37	6.23
8.42	19.36	8.43	6.73	6.41	5.68	10.24	11.64	12.85	9.87	13.46	9.14	9.57	14.65	10.16	13.61	12.54	6.12
8.46	18.92	8.12	5.57	5.9	4.23	9.54	11.42	13.4	9.63	12.72	8.77	9.32	14.7	9.96	12.23	12.27	5.57
7.96	17.53	7.65	5.41	5.83		9.02	11.02	13.05	9.59	11.86	8.15	9.3	14.71	8.87	11.88	10.66	5.22
7.89	16.83	7.49	5.78	5.24		8.64	10.81	12.29	8.75	11.96	7.63	9.21	15.2	9.25	12.21	9.98	4.98
6.26	16.84	7.79	5.8	4.8		8.43	10.63	11.21	8.65	10.78	6.69	9	15.19	9.12	12.85	8.86	4.23
5.29	16.89	6.94	4.96	4.26		8.44	10.24	11.26	7.75	10.88	7.01	8.72	14.85	8.48	11.16	7.75	4.36
6.24	16.23	6.89	4.24			8.32	9.72	10.14	6.69	10.67	6.35	7.24	13.74	8.83	10.4	7.12	4.12
6.38	15.59	6.27				7.43	9.25	9.6	6.5	9.84	5.59	7.14	12.28	7.23	8.56	6.58	
5.86	14.8	5.97				7.3	9.15	8.41	5.12	9.04	5.42	6.25	11.13	6.34	7.36	6.58	
5.53	13.84	5.45				6.87	9.24	8.24	4.89	8.47	4.45	6.25	11.6	6.21	4.56	5.23	
4.87	12.26	4.3				6.59	8.91	7.46	4.89	5.24	4.22	5.41	11.54	5.1	3.99	4.2	
4.3	10.35	3.45				6.91	8.15	4.35	4.02	4.89	3.57	5.03	10.57	4.98			
4.36	7.26					6.78	7.23	3.84		4.12		4.02	10.33	4.69			
3.84	5.24					6.47	6.26						9.68	4.33			
	4.23					6.23	5.6						9.51	4			
	3.27					5.77	4.33						8.58	3.48			
						5.12	3.87						7.85	3.55			
						4.23							6.22				
						4.06							5.01				

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