

2

Measurement Process

Avgiv BwZgta`B tRtbnQ th, weirfbæc`t`Âi ifc, c`kuz I m`ut`Kp eY`v I e`vL`vi Rb` Z`_`imk msL`vi AvKv`ti c`kukZ nq, hv cwi msL`vb bvtg cwi`PZ| wKš` GB msL`v,`tj vtK wbgZwšK Dcvtq chfe`Yy bv Kitj Zv GKw``tK thgb c`ZubwaZ`kij nq bv, Ab`w``tK, tm,`tj vtK tZgb e`vL`v Kivl hvq bv| cwi msL`vb ifc cwi`PZ msL`v,`tj vtK A_`en Kti Z`z`z` ntj Ges Zwi`EK KvVrtgvi Astk cwiYZ KitZ ntj tm,`tj vtK KZ,`tjv cL``tqi gva`tg msÁmqZ KitZ nq| msL`vtK cwi msL`v`tb cwiYZ Kiv Ges cL``tqi mvt_ m`ú`mKZ Kivi weÁvbm`sz c`x`uz ntjv cwi gvc c`l`uqv| GB cwi gvc c`l`uqv Avt`ivn Ges Aet`ivn c`x`uz`z` Kivh`Ki nq| Awf`ÁZij ä chfe`Yy`tK cwi gvc Kti cL``qMZ Avt`b cwiYZ Kiv ev cL``qMZ Avt`K Awf`ÁZij ä chfe`Yy`tY cwiYZ Kivi weirfbæc`x`uz I gv`v itqtQ| tmB c`x`uz,`tjv m`ú`t`K`Avgt``i m`y`ú`o aviYv tbqv c`l`qvRb| GB BDwb`tU tm mKj c`x`uz I gv`v,`tj vtK Avtj`vPbv Kiv ntqtQ|

GB BDwb`tU Avgiv th c`v,`tjv Aa`qb Kitev tm,`tjv ntjv:

- ◆ c`v - 1 : cL``tqi A_`q cwi gvc
- ◆ c`v - 2 : cwi gvt`ci gv`v: bvgmPK I μgmPK
- ◆ c`v - 3 : cwi gvt`ci gv`v: e`v`w`B`gj-K I Ab`v`vZ`gj-K

cL`tqi A_9 cui gvc Meaning & Measurement of Concept

GB cW tkfI hv Rvbr hvte —

- msL`v, cui msL`vb I cui gvtci gta` m`uK®
- Ávb AR`bi wfiÉ
- Avfi vnx I Aeti vnx c`uZ
- avi Yv I cL`tqi gta` cv`R`
- cL`qMZ-ZÉjMZ msÁv I Kvhrí-AwFÁZij ä msÁv
- cui gvc c`uqv

msL`v, cui msL`vb I cui gvtci gta` m`uK®(Relationship between Number, Statistics and Measurement)

cui msL`vbMZ c`uZi mKj KgRvU ntjv msL`vb fP| Gi`iæng msL`v w`tq Ges Gi tkfI nq msL`v w`tq| tek wQyZ`_tK (hv msL`vi AvKvti cKvkZ) msw`BKi`Yi gva`tg hLb GKvU cui msL`vb i`fc cKvk Kiv nq ZLb tmU| GKvU msL`v`e Ab` wQybq| Avgvt`i gj`j`n` ntjv, GB msL`v`_tjvtK e`eniv I e`vL`v Kiv Ges e`w`3 I tMv`x m`u`K`GB msL`v`_tjv wKfite Z`_tK Avgvt`i KvQ t`c`f`Q t`q tmU tevSvi tPov Kiv| Gi Rb` Avgvt`i e`S`f`Z nte th, cL`w`gK msL`v`_tjvi cKvZ` wK Ges wK Kti G`_tjv cui msL`vbMZ w`tkd`i`Yi gta` c`ek Kti |

†Kvb GKvU w`v`e` w`l`tqi Dci m`M`p`v`Z th tKvb Z`_` ntjv DcvÉ| cui msL`vb hv` h`_`vh`_` DcvÉ t`_`tK Avvii Z`_` bv ntq`_`v`K, Zte Zv`K m`w`K`f`v`te e`v`L`v Kiv hvte bv| cui msL`vbMZ w`tkd`i`Yi e`eniv`thv`M` DcvÉ n`Z` ntj th tKvb Z`_`_`v`w`k`K` `Q`U kZ`c`i`Y Ki`Z` nte| cL`g`Zt, DcvÉ`K Aek`B GK ev GKv`a`K Pj`†Ki Dci w`b`q`g`Z`w`S`K Dcv`t`q cui Pw`j`Z ch`f`e`Y`i`Yi cL`Z`v`w`a`Z`k`j` n`Z` nte| w`Z`i`q`Z`t, DcvÉ`K Aek`B msL`v`m`PK i`fc cKvk Kivi c`u`q`v`U cui gvc c`u`Zi m`v`_` m`u`K`w`Y`| Avi GB cui gvc c`u`Zi gva`tgB cL`w`gK msL`v`_`tjv cui msL`vbMZ w`tkd`i`Yi gta` c`ek Kti |

Ávb AR`bi wfiÉ (Basis of Knowledge)

Avgiv Rmb th, mh`ce`w`r` tK D`†V Ges c`w`g` w`tK A`_`l`hvq; c`u`_`ex m`†h`P Pw`i`w` tK c`w`w`Y`Y` Kti; Ges P`†i`i` w`R`^` tKvb Avtjv tbB| Avgiv GI Rmb th, gvb`j`i` e`w`3`Z`i` w`e`K`v`†k` m`g`v`w`RK I m`v`_`w`Z`K cui`t`ek GKvU`_`_`i`æ`Z`c`v`e`f`v`g`Kv` c`j`b` Kti`_`v`†K| c`k`e`n`t`j`v, Avgiv wKfite G me Rmb? Avgiv G me Rmb, KviY, tKD bv tKD Avgvt`i G me etj`†Ob Ges Avgiv tKvb c`k`e`bv KtiB tm me w`e`k`j`m` Ktiw`Q| GB t`†KD bv tKD`U`-Giv n`†`Ob, nq GKRB w`K`†K, GKRB M`†e`IK, ev GKRB w`e`Á`v`b`| G`†`i` w`e`l`q`_`tjvi Dci GK a`i`†Yi KZ`Z`i` ev Awa`Kw`i`Z`i` (authority) i`†q`†Q| Avi Zv`_`v`K`†j` Avgiv tZv`_`Z`v`†i` K`_`v` w`e`k`j`m` Ki`Z`i`g` bv| Ab`_`K`_`v`q, Avgvt`i` Awa`K`i`sk` Á`v`†`bi` w`fi`É` ntjv, HKgZ`_` I w`e`k`j`m`| Avi GmKj`_` HKgZ`_` I w`e`k`j`m`i` Drc`w`É` nq Hw`Z`n`_` I KZ`Z`i` (tradition and authority) t`_`tK|

Avgiv Avtiv GKfite Ávb AR[®] Kti _mK| tmiU ntjv, cLZ`ŋ AwfÁZv ev chfeŋtYi
gva`tg| Avgiv`i cwi cmkRZiq Avgiv cLZv`b j`ŋ` Kwi th, gvby euÁZ nt`Q, migvRK
ghPvi cwieZB NUtQ, wefbaAcivagj-K KgRvU msNwUZ nt`Q, brix wbfZb nt`Q,
MYZwŠK cLjvqi cLZómbKxKiY nt`Q, BZ`vri | G mKj wclq m=útk[®]Avgiv`i Avtbi
wfiEwU nt`Q m=úYŋfite e`w³MZ AwfÁZv I Awm[®]vi | A_vP, Avgiv cKZcŋŋ`ŋU ev`bZvi
gta` evm Kwi – HKgZ` I wekŋtmi ev`bZv Ges AwfÁZvi ev`bZv|

cLZv`b wefbaelq Avgiv`i `wóŋMvPti Avtm Ges GKB wclq eú chfeŋtYi aiv cto| GB
chfeŋtYi,tjvi gta` Aŋk tŋŋt` wKQymKQymgij LjR cvlqv hvq etj tmB wgj LjR cvlqv
%wko` ,tjv GKwU mvariY iŋc cKwKZ nq| GB mvariY iŋcU GK chŋq Avšb[®]K
thwMthwM cLZóv ev fitei Av`vb cLvtbi Rb` tek DcŋwMx ntq cto| Avgiv ZLb GB
mvariY iŋcUŋK GKwU bŋg bŋgqZ Kti _mK| Avi GB bŋg,tjvB GK GKwU c` (term) ev
cLZ`q (concept) wnmŋte cwiwPZ nq| GB bŋg,tjv e`enŋti i gva`tg hLb Avgiv tKvb
mvariY cLZ`qŋK tevSŋZ tPón Kwi ZLb Avgiv fvetZ`i iáKwi th, cLZ`q,tjv ntjv Ggb
wKQyhw miz` miz`B ev`te we`gib| Avi hLb GB fievwU`vqx ntZ`_vK ZLbB gŋbi gta`
cKwRŋM th, wbi`ŋ chfeŋtYi,tjv wK mswkó cLZ`ŋqi h_vh` wbt`RK? chfeŋtYi I cLZ`ŋqi
gta` GB`ŋZ m=úK[®]Ávb AR[®]ŋbi` ŋU c×wZŋK wbt`R Kti – Avtiwvx c×wZ I Aetiwvx
c×wZ|

Awtinx I Aetiwx c×wZ (Inductive and Deductive Methods)

Avtiwvx c×wZ ntjv tKvb wbi`ŋ chfeŋtYi t_ŋK mvariY Dcmsnŋti DcbxZ nI qv| Avtiwvx
c×wZi thšw³KZwU tevSŋbvi Rb` th D`vniYwU eúj cŋŋj Z tmiU ntjv – Kwi g mŋne
giYkij, thŋZyKwi g mŋne GKRB gvby, KvŋRB cL`exi mKj gvbyB giYkij | GKRB
MŋelK memgq mvariY wbgvejxi cLZB AvMh cKvk Ktib, tKvb weŋkl Nubvi cLZ`bq|
Zte GwU gŋb ivLv cLqvRb th, mvariY wbgvejxi weŋkl chfeŋtYi mgwó| thgb, GKwU
RbŋMvóxi Rbŋvŋti i gvŋv I cwi eZŋbi wclq tKvb Dcmsnŋti tcsŋtZ ntj GKRB MŋelKŋK
Aŋk,tjv`ZŠ;ev weŋkl chfeŋtYi gva`tgB tmB mvariY Dcmsnŋti tcsŋtZ nq| GKRB
MŋelK Rŋbb th, cLZwU`ZŠ;e`w³i mšŋb tbevi mgq, mSL`v I KviY wfbwŋtq`_vK| GB
cLZwU wfbwŋtZ wZwb AvMhx bb| Zte cLZwU`ZŠ;cw evŋti i mšŋb Rbŋ`vŋbi mgq, mSL`v I
KviY weŋklŋtYi gva`tgB wZwb Rbŋvŋti i gZ GKwU cwi mSL`vbMZ cwi gŋtc tcsŋtB| thgb,
Kwi g mŋne weŋqi`ŋeQi ci cLg mšŋb wbtqŋB| Gi wK`ŋeQi Qggw ci wZxq mšŋb
wbtqŋB Ges Gici Avi tKvb mšŋb tbbw| i wng mŋne weŋqi cLg eQŋti i gv_vq mšŋb
wbtqŋB Ges weŋqi`k eQŋti tgvU cŋŋU mšŋtbi RbK ntqŋB| dwi` mŋne weŋqi wZb
eQi ci cLg mšŋb wbtqŋB Ges eZŋvŋb Zvi mšŋb mSL`v wZwU| Gi Kg Avtiv chfeŋtYi
ci MŋelK GKwU mvariY wbgq t`LjZ tctj b th, ersj vt`ŋki gvby cwi evi Mvŋbi`ŋeQŋti i
gv_vq mšŋb tbq Ges cLZwU cwi evŋti Mto mšŋb mSL`v nt`Q 3.3 Rb| weŋkl weŋkl chfeŋtYi
t_ŋK mvariY ŋKŋtYi tcsŋtŋvii GB c×wZwU ntjv Ávb AR[®]ŋbi Avtiwvx c×wZ| Avtiwvx c×wZ
eYŋvj-K MŋelYvi tŋŋt` e`eüZ ntq`_vK|

Avtiwvx c×wZ ntjv tKvb
wbi`ŋ chfeŋtYi t_ŋK mvariY
Dcmsnŋti DcbxZ nI qv|

Ab`w`ŋK, Aetiwx c×wZ ntjv mvariY Dcmsnvi t_ŋK weŋkl chfeŋtYi tcsŋtŋv| Avevi I
Avgiv eúj cŋŋj Z D`vniYwU e`enŋti KiŋZ cwi| thgb, cL`exi mKj gvby giYkij,
thŋZzKwi g mŋne GKRB gvby, tmŋZzKwi g mŋnel giYkij| Aetiwx c×wZi gva`tg
GKwU ZÉ;ev ZÉ;ŋ GKvŋtki cŋŋwMKZv ev h_v`Zv cixŋv Kti t`Lv nq| GKwU ZÉ;ŋ gta`
mvariY Zt`ŋ ev ZtZwaK cLZ`ŋqi gta`Kvi m=úK[®]e`vL`v Kiv ntq`_vK| tmB cLZ`q,tjv
wefbaPj K ev mPŋKi gva`tg chfeŋtYi thwM` Kti tZvj vi ci KZ,tjv Abŋŋi cixŋvi gva`tg

Aetiwx c×wZ ntjv mvariY
Dcmsnvi t_ŋK weŋkl
chfeŋtYi tcsŋtŋv|

tmB m=úK⁹ tjtK ev⁻ tēi mvt₁ wgvj t₁ t⁻ Lv nq| GKu D⁻ vi Y w⁻ t₁ w l q u t K Av t v⁻ úo Kti tZjv hvK| cix⁹lvq QvT-QvT⁻ i mdj Zv AR⁹bi Kih⁹Kvi Y w⁻ t₁ t⁻ Y A t b K₁ t j v c ũ l e b v i g t a⁻ GKu n t Z c v t i t h, ũ A a⁻ q b B n t j v c i x⁹lvq m v d t j⁻ i P w e K u w ũ | G B c ũ l e b v i h₁ v₁ Z v c i x⁹lv K t i t⁻ L t Z n t j c ũ l e b v q e w⁻ Z m = ú K⁹ t j v t h m K j c ũ l⁻ q w b t q M w Z c ũ t g t m₁ t j v t K w P w y Z K i t Z n t e l Z v i c i c ũ l⁻ q₁ t j v t K c h f e⁹ Y t h w M⁻ P j K e v m P t K i g v a⁻ t g A b j r i c i x⁹lv c i B t K e j g v⁻ GB c ũ l e b v i h₁ v₁ Z v c ũ y Y K i v h v t e l t h g b, c ũ l e b w U i g t a⁻ ` ũ U c a i v b c ũ l⁻ q j⁻ q⁻ K i v h v t⁻ Q, G K u n t j v ũ A a⁻ q b ũ G e s A b⁻ u n t j v, ũ c i x⁹lv m v d j⁻ ũ | G B ` ũ U c ũ l⁻ q t K c h f e⁹ Y t h w M⁻ K t i Z z t Z n t j t h m P K ` ũ U e⁻ e n v i K i v h v q Z v n t j v ũ G K R b Q v T - Q v T x i ` w b K A a⁻ q t b i m g q ũ, G e s ũ c i x⁹lv c ũ B b a⁻ t ũ | G B ` ũ U m P K w⁻ t g c i x⁹lv t h w M⁻ A b j r i u G g b n t Z c v t i t h, G K R b Q v T - Q v T x ` w b K h Z N s U v t e k x A a⁻ q b K i t e t m B Q v T - Q v T x c i x⁹lv Z Z t e k x b a⁻ t c v t e l M t e l K A t b K₁ t j v c h f e⁹ t Y i g v a⁻ t g t⁻ L t e b A b j r i u c u i m s L⁻ v b M Z f i t e Z v r c h e⁹ Y K b v l h w⁻ Z v r c h e⁹ Y n q, Z t e w Z u b w n x i s l t b t e b t h, c ũ l e b w U i h₁ v₁ Z v c ũ y w Y Z n t q t Q | A b⁻ v q, c ũ l e b w U w₁ v₁ c ũ y w Y Z n t e l A e t i v n x c x w Z c i x⁹lv g j - K e v e⁻ v L⁻ v g j - K M t e l Y v i t⁻ q⁻ t⁻ e⁻ e ũ Z n t q⁻ v t K |

avi Yv I c ũ l⁻ q (Conception and Concept)

th tKvb w l q m = ú t K⁹
Avgv⁻ i g t b t h g v b w m K
c ũ Z⁻ Q u e t f t m D t v t m m K j
g v b w m K c ũ Z⁻ Q u e t K a v i Y v
e j v n q |

th tKvb w l q (thgb, awg⁹RZv, D⁻ vi Zv, ms⁻ vi, BZ⁻ w⁻) m = ú t K⁹ Avgv⁻ i g t b t h g v b w m K c ũ Z⁻ Q u e t f t m D t v t m m K j g v b w m K c ũ Z⁻ Q u e t K a v i Y v (conception) e j v n q | G B a v i Y v, t j v t K A v g i v w e i r f b a e⁻ w⁻ t g t e v S v t b v i t P o v K t i⁻ w m K | w K S⁻ G m K j c t⁻ i g v a⁻ t g A v g i v h v t e v S v t Z P v B Z v g v b y m n t R e s t Z c v t i b v | K v i Y, G m K j a v i Y v G t K K R t b i g t b G t K K f i t e c ũ Z⁻ w e w Z n t q⁻ v t K | G m K j a v i Y v i w K Q y n q e v⁻ b m a⁻ Z G e s A b⁻ t j v b q | G B a v i Y v, t j v A⁻ Q G e s ũ t⁻ ũ c u i c Y⁹ d t j G K R t b i g t b i a v i Y v A t b⁻ i g t b m i v m i Q v c t d t j b v | Z t e G m K j a v i Y v i g t a⁻ w K Q y m K Q y A s t k i w g j⁻ v t K | A v g i v G B w g j c v l q v A s k₁ t j v w b t q G K u c⁻ t K t e v S v t b v i R b⁻ K i h R i H K g t Z⁻ i (working agreement) g v a⁻ t g G K u M h Y t h w M⁻ A⁻ A v t i v c K t i⁻ w m K | G K u c t⁻ i A⁻ w K n t Z c v t i Z v i K i h R i H K g Z⁻ c ũ Z ũ v i c ũ l⁻ q v t K a v i Y v q b e v c ũ l⁻ w q K i Y (conceptualization) e t j |

M t e l Y v i m t₁ m = ú m K⁹
f i l v i A b⁻ Z g Z v r c h e⁹ Y⁹
c ũ l⁻ K u n t j v ũ c ũ l⁻ q ũ |

A v g i v A v g v⁻ i w P s l i t h s⁻ K Z v u c ũ v k K u i f i l v i g v a⁻ t g | A v i G f i l v n t j v A v s b⁻ K t h w M t h w M c ũ Z ũ v e v f i t e i A v v b c ũ v t b i G K u c ũ l⁻ q v, h v K Z₁ t j v c ũ l⁻ x K G e s t m B c ũ l⁻ x₁ t j v i e ũ g w t K m s i g k Y m a⁻ Z e⁻ e n i v t i i w e w a m a⁻ Z w b g g v e j x i m g a⁻ t q M w Z | M t e l Y v i m t₁ m = ú m K⁹ f i l v i A b⁻ Z g Z v r c h e⁹ Y⁹ c ũ l⁻ x K u n t j v ũ c ũ l⁻ q ũ | A v i F A Z i j ä c u⁻ e t K e Y ũ v i R b⁻ c ũ l⁻ q M v t b i g v a⁻ t g w e A v b v i v M t e l Y v c ũ l⁻ q v i i a⁻ K t i b | A t b K₁ t j v N U b v t K G K u m v a v i Y w k t i v b v t g i A a t b D c⁻ v t c t b i g v a⁻ t g w P s l i c ũ l⁻ q v t K m n R K i v B G i D t i k⁻ | c ũ Z u w w e A v t b i w R⁻ w K Q y c ũ l⁻ q i t q t Q | G₁ t j v w e A v b v t⁻ i t c k v M Z f i l v M v b K t i G e s Z v t⁻ i Z⁻ t K e n b I t c ũ t Y i K i t R e⁻ e ũ Z n q | m i g w i R K g h⁹ v, q⁻ l g Z v, A v g i v Z S₁ e y x g E v, c ũ l⁻ q⁻ Y, w K⁻ Y, P w n⁻ v, m i e i v n, B Z⁻ w⁻ n t j v m i g w i R K w e A v t b e⁻ e ũ Z c ũ l⁻ q m g t n i w K Q y D⁻ v i Y |

w K Q y c ũ l⁻ q i t q t Q t h₁ t j v c ũ Z u b v a Z K v i x e⁻ e v Z t⁻ i L y K i v i K u w n q | t h g b, ũ g v b y ũ c ũ l⁻ q u w w⁻ t g G K R b g v b y t K t⁻ L v t b v e v t e v S v t b v L y m n R n q | t K b b v, g v b y b v t g i ` k⁻ g v b e⁻ w m n t R B t⁻ L v h v q | g v b y l i t h⁻ e n k o⁻ t j v w⁻ t g G B c ũ l⁻ q u w w b g v⁹ K i v n t q t Q Z v m n t R B c h f e⁹ Y t h w M⁻ | w K S⁻ w K Q y c ũ l⁻ q i t q t Q h v L y m n t R B t e v S v t b v e v t⁻ L v t b v m a⁻ e n t q D t v b v | t h g b, i v R⁻ w Z K w o f z x, w n s m v, w e t ũ l, M Y Z S₁ t k Y x ũ ũ, B Z⁻ w⁻ n t j v G a i t Y i w K Q y c ũ l⁻ q | Z t e G u g t b i v L v c ũ l⁻ q R b t h, c ũ l⁻ q c ũ Z c t⁻ q A v i F A Z i j ä c ũ A w n t m t e A v⁻ Z g v b b q, t m₁ t j v e i s e v⁻ t e ` k⁻ g v b c ũ t A i c ũ l⁻ x | A b⁻ K₁ v q, c ũ l⁻ q G K u w e g Z⁻

avi Yv, hv GKIU e`i; ev tmB e`i tKvb `enkó, ev tKvb AvPi YMZ cĕtĀi (phenomenon) cĕZibwaZkxj ijc| GKIU cĕZ`q ntjv KZ, tjv avi Yvi cwi evi | GK GKIU cĕZ`q ntjv GK GKIU mbgŲ, hv KLtĕvB cĕZ`Ų ev cĕivŲfite t`Lv hvq bv| Kvi Y, tm, tjvi Aw`Zi; tĕB, Avgiv tm, tj vtK `Zix Kwi | thgb, ōtkYxĕ cĕZ`quUi tKvb `k`gvb Aw`Zi; tĕB, Avgiv tkYx KivtgrĕK weibgŲ Kwi |

cĕZ`q GKIU megZ`avi Yv, hv GKIU e`i; ev tmB e`i tKvb `enkó, ev tKvb AvPi YMZ cĕtĀi cĕZibwaZkxj ijc|

GB cĕZ`q, tjvi mĕt_ chĕŲŲthM` `enkó`i `i-Z; hZ evote, cĕZ`q, tjv mĕutKŲjy tevSvi AeKvk ZZ evote| cikvcmk, G, tjvi AmZK`e`envti i gvĕv ZZ eŲx cvte| tm Kvi tY, ZZtekr cĕqvRb cote mĕVK cwi gĕtci | Avi GB mĕVK cwi gĕtci Rb` cĕqvRb GKIU cĕZ`qtK mĕVKfite msĀwqZ Kivi | hw` cĕZ`qtK AvšĕŲK thvMthvM `vcb ev fitei Av`vb cĕvb, AwfĀZvi tkYxexKiY, mĕvavi YvKiY Ges ZĒ; MVtĕi gZ Kvh`mĕuv`b Ki tZ nq, Zte cĕZ`qtK ntZ nte `úó, m² Ges MĕhYthvM`| tmB Rb` cĕZ`tqi e`envti m²Zv I `úóZv ARĕ Ki tZ ntj GKRb weĀvbtK `ŲaitYi msĀv cĕqvM Ki tZ nq – cĕZ`qMZ-ZĒMZ (conceptual-theoretical) Ges KvhRi -AwfĀZij ä (operational-empirical) |

cĕZ`qMZ-ZĒMZ msĀv (Conceptual – Theoretical Definitions)

th mKj msĀv GKIU cĕZ`qtK Ab` cĕZ`q e`envti i gva`tg msĀwqZ Kti `vtK ZvtK cĕZ`qMZ-ZĒMZ msĀv etj | thgb, ōŲgZvĕ cĕZ`quUtK msĀwqZ Kiv hvq Gfite th, ōŲgZv nj Ggb GKIU `ŲZv hv w`tq th tKvb KgRvŲtK ev`emqZ Kiv hvqŲ| ŲgZvi GB msĀvq ō`ŲZvĕ ōKgRvŲŲ-Gi gZ Avtĕv `ŲU cĕZ`q e`envi Kiv ntqtŲ| `ŲZv I KgRvŲ-Gi A_ĕ GtKKRtĕi KvtŲ GtKK iKg ntZ cvti | KvtRB G `ŲU cĕZ`qtKI mŲúófite msĀwqZ Kivi cĕqvRb itqtŲ| msĀvqtĕi GB cĕqvvi GK chĕŲ t`Lv hvte th, cĕZ`qtK Avi Ab` tKvb cĕZ`q ev c` w`tq msĀwqZ Kiv hv`ŲQ bv| GB c`_tj vtK Aw`g c` (primitive term) etj | thgb, GKIU wĕfR ntjv wZbvU mij tiLv thvMdj Ges mij tiLv nj KZ, tjv we`jy thvMdj | wKŠ`we`jK Avi tKvb c` ev cĕZ`q w`tq msĀwqZ Kiv hvq bv, tKej gvĕ we`jy Aw`Zi; eYŲv Kiv hvq| GB ōwe`Ųc`wU ntjv ōAvi`gŲ c` Ges ōmij tiLvŲ ntjv ōAviwi Z c`Ų (derived term)| Avi I GKIU D`vniY t`qv thtZ cvti | thgb, mgvRtK msĀwqZ Kiv hvq KZ, tjv mĕgvRK tMvxi mg`tq MvZ GKIU GKK wntĕe| Avevi mĕgvRK tMvxi ntjv KZ, tjv e`w³i ci`úvi K w_Ųqvvi gva`tg MvZ GKIU RbmguŲ| G tŲtĕ, e`w³ ntjv Aw`g c` Ges mĕgvRK tMvxi ntjv Aviwi Z c`| A_Ų, cĕZ`qMZ msĀvq `ŲaitYi c` e`eüZ nq, GKIU ntjv Aw`g c` Ges Ab`wU ntjv Aviwi Z c` |

th mKj msĀv GKIU cĕZ`qtK Ab` cĕZ`q e`envti i gva`tg msĀwqZ Kti `vtK ZvtK cĕZ`qMZ-ZĒMZ msĀv etj |

KvhRi-AwfĀZij ä msĀv (Operational – Empirical Definitions)

Avgiv Rmb th, cĕZ`qtK cĕZibwaZkxj Kti Ggb AwfĀZij ä `enkó` ev NUbv cĕqkt cĕZ`Ųfite chĕŲŲY Kiv hvq bv| gj`teva, eŲxgĒy, mšĕó, `Ųofwš, BZ`w` ntjv Ggb wKŲycĕZ`q| Gme tŲtĕ GKIU cĕZ`tqi ev`ĕ Aw`ZtK cĕivŲfite Abgvb (infer) Ki tZ nq KvhRi ev AwfĀZij ä msĀvqtĕi gva`tg| GKIU cĕtĀi ev`em`Z Aw`Zi; ev Aw`tZi; gvĕv cĕkĕbi Rb` th mKj cĕqvRbxj KgRvŲ mĕuv`b Ki tZ nq KvhRi msĀv tmB mKj KgRvŲŲi mbgvejtK mb`R Kti | KvhRi msĀv cĕZ`tqi A_ŲK AbŲŲthvM` Kti tZvtj | cĕZ`tqi A_ŲK Avgv`i AwfĀZii Avl Zvq Avb`Z wĕtq wK Ki tZ nte Ges wK chĕŲŲY Ki tZ nte KvhRi msĀv Avgv`i Zv etj t`q| thgb, RbKxj Zv (fertility) GKIU cĕZ`q| RbKxj Zv cĕZ`quUtK ev`ĕ wKfite cwi gĕc Kiv hvq KvhRi msĀv Avgv`i Zv etj t`te| A_Ų, GKRb bvix Zvi cĕjv cĕRbb eqtm KZwU mšĕb Rb` t`q Zvi tgvU mšĕv wYŲ Kivi c`wZwB KvhRi msĀv eYŲv Kti `vtK| GB eYŲvi gva`tg RbKxj Zv cĕZ`quU ev`ĕ

mvi vsk

cwi msL`vbMZ c×iZi mKj KgRvŪ ntjv msL`vibfP| Gi`i iæ nq msL`v i`tq Ges Gi tkl I
nq msL`v i`tq| cwi gvc c×iZi gva`tgB msL`v,tjv cwi msL`vbMZ weikl`tYi gta` cŕek
Kti | cŕZw`b weifbæelq Avgv`i` i`p`MvPti Avtm Ges GKB weiq eü chfe`ŕY aiv cto|
ibw`ŕ chfe`ŕY,tjv iK msikŕ cŕZ`tqi h_vh_`ib`Rk? chfe`ŕY I cŕZ`tqi gta` GB`ŕZ
m`úK`Ávb ARŕbi` ŷU c×iZ`tK`ib`R`Kti – Avtivnx c×iZ I Aeti vnx c×iZ| Avtivnx
c×iZ ntjv tKvb`ibw`ŕ chfe`ŕY t`tK mvari Y Dcmsrvti DcbxZ nI qv| Ab`i`tK, Aeti vnx
c×iZ ntjv, mvari Y t`tK weikl` chfe`ŕY tcŕŕtbi| Avgiv Avgv`i` i`Pšri thš`KZmU
cKvk Kwi fvlvi gva`tg| Avi GB fvlv ntjv Avšb`K thvM`thvM cŕZŕv ev fitei Av`vb
cŕv`tbi GKiu cŕp`qv, hv KZ,tjv cŕZ`K Ges tmB cŕZ`K,tjvi eügw`K msigk`Ym`Z
e`envti i` weiam`Z`ibqgejxi mg`tq MvZ|

civwEi gj'iqb

bePK cke

mivK DEti i civk iUK (v) iPy w`b -

1| Avti vnx cxiZ Mtel Yvi tTtT e`euZ ntq _vtK|

- K. e`vL`vgj-K
- L. chfeTYgj-K
- M. eYbgj-K
- N. cixTYgj-K

2| hLb tKvb cL`qtK Ab` tKvb cL`q ev c` w`tq msAviqZ Kiv hvq bv ZLb ZvtK:

- K. Avni Z c` etj
- L. bZb c` etj
- M. %AvnbK c` etj
- N. Av`g c` etj

3| GKiu cL`qtK Ab` cL`q e`envti i gva`tg msAviqZ KivtK Mtel Yvi fivq:

- K. cL`qMZ-ZEMZ msAv etj
- L. KvhRi-AwfAZvj ä msAv etj
- M. cL`qMZ- AwfAZvj ä msAv etj
- N. KvhRi-ZEMZ msAv etj

msvTB cke

1| Avtj vPbv Ki ab:

- K. cL`qMZ-ZEMZ msAv
- L. KvhRi-AwfAZvj ä msAv

2| mgvR Mtel Yvq cwi msL`vtbi e`envi Avtj vPbv Ki ab|

iPbgj-K cke

1| mgvR Mtel Yvq Avti vnx I Aeti vnx cxiZi figKv D`vni Ymn Avtj vPbv Ki ab|

2| Ucwigvc cxiZi gva`tg cL`qMZ-ZEMZ Ges AwfAvZvj ä-chfeTYthvM` RMtZi gta` GKiu tmZEU`vcb KtiU- Avtj vPbv Ki ab|

cW - 2

cwi gvtci gvĭv: bvgmPK I μgmPK
Levels of Measurement: Nominal and Ordinal

GB cW tkĭtI hv Rĭbv hĭte —

- cwi gvtci gvĭv
- bvgmPK I μgmPK gvĭvi `eikó` I cv_Ŕ`

cwi gvtci gvĭv (Levels of Measurement)

cĭZ`tqi chĕŕYthvM` `eikó` ev mPK cwi gvtci Rb` meÁvĭvĭv meŕfbægvĭv e`envi Kĭi
 _vtKb| ĩKbbv, chĕŕYthvM` mKj `eikó`ĭK GKB gvĭvq cwi gvc Kiv hvq bv| `eikó`i
 cĭZ AvĭimcZ cĭZxK, tĭvi (hv, YMZ ev cwi gvYMZ DfqB ntZ citi) gĭa` GKĭU Kĭvĭtĭvi
 mgaiŕZv (similarity of structure) _vKĭZ nq etĭ cwi gvtci gvĭv meŕfbæntq _vtK|
 cwi gvc cĭLqvĭ tĭŕĭĭ G meLqvĭ LqB, ĭazcYŕ Avgvĭ` i memgq j ŕĭ` ĭvLĭZ nĕ th, GKĭU
 cĭZ`q cwi gvc Kivi Rb` th msL`vmPK cĭLqvĭU (numerical system) e`envi Kiv nq tmĭU
 tmB cĭZ`tqi Kĭvĭtĭvi mĭ_ mgagŕĭKbv| cwi gvtci PviU cĭvb gvĭv ĭtĭŕŕŒ – bvgmPK,
 μgmPK, e`mBĭj-K I AbĭvZĭj-K| GB cĭv Avgiv cĭg` ŕĭU cwi gvtci gvĭv ĭbĭq
 AvĭjvPbv Kĭĭev – bvgmPK I μgmPK|

bvgmPK gvĭv (Nominal Level)

cwi gvtci meĭŕtq mij gvĭvU ntĭv bvgmPK gvĭv| GB chĕŕq, msL`v ev Ab`vb` cĭZxKĭK
 e`envi Kiv nq chĕŕY, tĭvtK KZ, tĭv tĭMvŕĭZ (categories) tkYxĕ Kivi Rb`|
 tkYxĕKiY th tĭvb meÁvĭbi tgŕĭj K I cĭLĭgK KĭR| Avgiv GB tkYxĕ tĭMvŕ, tĭvtK
 KZ, tĭv mĕĕavRbK bvg ĭtq _mK| thgb, msL`vmPK cĭZxK 1 I 2 ĭtq Avgiv GKĭU
 RbĭMvŕĭK bviĭ I cĭĭd GB ŕĭU tĭMvŕĭZ mef³ KĭZ cwi bviĭ meĭĭĭZ 1 I cĭĭdĭ
 meĭĭĭZ 2 msL`vmPK cĭZxK Avĭvĭtci gva`tg| GKB RbĭMvŕĭK Avei atĭŕĭ ĭŕĭĭĭZĭ
 tĭMvŕĭx Kiv hvq gĭmĭj g, ĭn`yLŕvb, I teŕx agŕĕj`ĭĭ i h_vĭtĭg 1, 2, 3, I 4 msL`vmPK
 cĭZxK Avĭvĭc Kĭi| bvgmPK cwi gvtci gva`tg Avgiv GKĭU tĭMvŕ ĭ_ĭK AvĭĭKĭU tĭMvŕĭ
 cv_Ŕ` ĭbaŕĭY Kĭi _mK| thgb, bviĭ I cĭĭdĭ gĭa` cv_Ŕ`| RĭZĭqZv, `eemNk ghĭv,
 Avĭĭj KZv, ĭvŕŕŕwZK `j, BZ`ĭĭ` ntĭv bvgmPK gvĭvq cwi gvcKZ.Pj ĭKi ĭKQyD`vniY|

bvgmPK cwi gvtci gva`tg
 Avgiv GKĭU tĭMvŕ ĭ_ĭK
 AvĭĭKĭU tĭMvŕĭ cv_Ŕ`
 ĭbaŕĭY Kĭi _mK|

cwi msL`vbMZ tĭKŕĭj cĭLqvĭMi Rb` tkYxĕ tĭMvŕ, tĭvtK bĭbZĭcĭŕĭĭ ŕĭU kZ`cĭY Kiv
 cĭLqvĭRb| GKĭU ntĭv, cĭLvbĭZv (exhaustiveness) Ges Ab`ĭU ntĭv meĭkŕZv
 (exclusiveness)| A_ŕ, GKĭU tĭMvŕĭK cĭLvbĭZv ntZ ntĭ tmB tĭMvŕĭ GKB `eikó`m`ubĕ
 mKj e`; Nubv ev chĕŕĭYi m`uY`Aŕŕĭŕĭ KĭY ntZ nĕ| A_ŕ, tĭvb chĕŕĭYĭKB MYbv
 ĭ_ĭK ev` ĭ`qv hĭte bv| Avi meĭkŕZv ntĭv, tĭvb chĕŕĭYĭKB GKĭU tĭMvŕĭ AmZĭi³
 Ab` tĭvb tĭMvŕĭZ Aŕŕĭŕĭ bv Kiv| A_ŕ, hĭcŕfĭte GKĭU Nubv, e`ev chĕŕĭYĭK GĭKi
 AmK tĭMvŕĭZ Aŕŕĭŕĭ Kiv hĭte bv| Ab` K_vq, ŕĭU `eikó`ĭK GKB cĭZĭK ĭPvĭZ Kiv hĭte
 bv| thgb, cĭĭd ĭK cĭĭd tĭMvŕĭZ Ges bviĭĭK bviĭ tĭMvŕĭZB ĭ`agvĭ Aŕŕĭŕĭ Kiv hĭte|

cwi msL`vbMZ tĭKŕĭj
 cĭLqvĭMi Rb` tkYxĕ
 tĭMvŕ, tĭvtK bĭbZĭcĭŕĭĭ
 ŕĭU kZ`cĭY Kiv cĭLqvĭRb|
 GKĭU ntĭv, cĭLvbĭZv
 Ges Ab`ĭU ntĭv meĭkŕZv|

Gm Gm GBP Gj

bigmPK gvīvi `gU MmYiZK %enkó" itqtQ| GKiu ntjv cūZmvg"Zv (symmetry) Ges Ab'iu ntjv mKgRZv (transitivity)| cūZmvg"Zv ej tZ Avgiv eyS th, hw` K I L-Gi gta" m=úK@ mZ" nq, Zte tmB m=úK@ L I K-Gi gta" I mZ" nte| A_@,

$$hw` K = L nq, Zte L = K nte|$$

GKiu D`vni Y t`qv hvK| Kwig I iung cūZmg| KviY, `@RbB cjad | th mKj `enkto"i wfiEtZ bviX I cjad I gta" cv_R" i uPZ ntqtQ Ges Kwig I iungtK cjad ejv ntqtQ tmB `enkto"i wfiEtZB GB cūZmvg"Zv `Zix ntqtQ| thgb, Kwig GKRB cjad, iungl GKRB cjad | KvTRB,

$$Kwig = iung, Ges iung = Kwig|$$

Zte GmU gtb ivLtZ nte th, GLvrb cūZmvg"ZmU `Zix ntqtQ i agvī wj %xq `enkto"i wfiEtZ, Ab` tKvb `enkto"i wfiEtZ bq| mKgRZv ej tZ Avgiv eyS th,

$$hw` K = L Ges L = M nq, Zte K = M nte|$$

Averi I Avgiv cteP D`vni YmU e`envi Ki tZ cmi |

$$hw` Kwig = iung Ges iung = dmi` nq, Zte Kwig = dmi`, ev dmi` = Kwig nte|$$

bigmPK gvīvi gva`tg Avgiv tKej gvī tkYxe×KiY ev tMvōxe×KiY Ki tZ cmi | GB gvīvq wewfbaetMvōxi gta" Avgiv tKej gvī wfbzv wbfjcy Ki tZ cmi, wKS` tKvb , YMZ (fvtjv/gv`) ce`avi Yv Abgvb Ki tZ cmi bv| tMvōx, tj vi gta" fvtjv-gv` ev Kg-tekx GB RvZxq tKvb , Yv, Y wPvi Ki tZ ntj Avgv` i , YevPK cwi gv tci gvīv e`envi Ki tZ nte|

μgmPK gvīv (Ordinal Level)

mvgmRK MtelK Ggb AtbK PjK e`envi Ktib th, tjv tkYxe×KiYi ckvvcmk wKQy m=úK@ c@k@ Kti | mPivPi t`Lv hvq Ggb m=úK@tjv ntjv, epEi-@Zzi, D"Pzi-wb=zi, BZ`w | GB m=úK@tjv 0>0 I 0<0 c@zxK `gU w` t`Lv tbr ntq _vtK| thgb, tkYx KvVtgvq D"P tkYx, ga" tkYx I wbaetkYx GKiu μgavi vi m=úK@c@k@ Kti | G t@t@, D"P tkYx ga" tkYxi Zj`bvq Ges ga" tkYx wbaetkYxi Zj`bvq AwakZi mvgmRK ghP v tfvM Kti | A_@,

$$D"P tkYx > ga" tkYx > wbaetkYx|$$

A_er,

$$wbaetkYx < ga" tkYx < D"P tkYx|$$

μgmPK gvīvi wZbu
MmYiZK `enkó" itqtQ|
cūZmU ntjv AbvZlevPKZv,
wZxquU ntjv AcūZmvg"Zv,
Ges ZZxquU ntjv mKgRZv|

bigmPK gvīvi gZ μgmPK gvīvq cylvbsylZv I wewkōZvi `enkó" `gU KvRi _vtK| A_@, tkYxe×KiY ev tMvōxe×KiY cūZmU NubvtK AšfP Ki tZ nte Ges GKiu NubvtK tKej gvī GKiu tkYx ev tMvōxtZB AšfP Kiv hvte, Ab'iu tZ bq| μgmPK gvīvi wZbu MmYiZK `enkó" itqtQ| cūZmU ntjv AbvZlevPKZv (irreflexivity), wZxquU ntjv AcūZmvg"Zv (asymmetry), Ges ZZxquU ntjv mKgRZv (transitivity)| AbvZlevPKZv ntjv m=úK@ gta" GKiu thšw³K `enkó", hv th tKvb GKiu e`ev e`w³ i t@t@ mZ" ntj tmB e`w³ ev e`KLbl tmB GKB e`w³ ev e`i tPtq D"Pzi ev wbaet i ntZ cvti bv| thgb,

μgmPK gvīv bvgmPK gvīvi tPtq mKQyv Dbz| KviY, bvgmPK gvīvq ubw̄θ %enktōi
w̄fūĒtZ i'agvī tkYxex Kiv hvq, mKŠ' tKvb , YMZ gvb Avtīvc Kiv hvq bv| A_ŕ, cjad I
brix i'enktōi w̄fūĒtZ `ŕU tMvōxK Avj v̄v Kiv tMj I brix Atcŕlv cjad tkč mKbv Zv
w̄baŕY Kiv hvq bv| mKŠ' μgmPK gvīvq Avgiv ubw̄θ `enktōi w̄fūĒtZ tKej tkYxex ev
tMvōxexB KitZ cwi bv, Avgiv Gi , Yv, YI Avtīvc KitZ cwi | thgb, cixŕlvq cūB bŕii
w̄fūĒtZ Avgiv Qvī-Qvīx̄t`i cūg, w̄Zxq I ZZxq tkYx̄tZ w̄f³ KitZ cwi, Ges GI ej tZ
cwi th, cūg tkYx cūB Qvī-Qvīx̄t' w̄Zxq tkYx Ges w̄Zxq tkYx cūB Qvī-Qvīx̄t' ZZxq tkYx
cūB Qvī-Qvīx̄t`i tPtq AtcŕlvKZ.fitj v gvtbi |

μgmPK gvīvi
m̄xgve×Zvū n̄tj v th,
GB gvīvq cwi gvcKZ.
Pj tKi Ašifŕ w̄w̄fba
Dcv`v̄tbi gta`
cv_ŕK`i e`earb ev
e`w̄Bvū w̄bYŕ Kiv m̄æ
nq bv|

Zte μgmPK gvīvi m̄xgve×Zvū n̄tj v th, GB gvīvq cwi gvcKZ.Pj tKi Ašifŕ w̄w̄fba
Dcv`v̄tbi gta` cv_ŕK`i e`earb ev e`w̄Bvū w̄bYŕ Kiv m̄æ nq bv| A_ŕ, GKū Dcv`v̄b Ab`
GKū Dcv`v̄b t_ŕK KZUkzep̄Ēi ev tkōZi Zv cwi gvc Kiv m̄æ bq| thgb, Avgiv i'ay
Rv̄tZ cwi th, K L Atcŕlv ep̄Ēi | mKŠ' Avgiv ej tZ cwi bv KZUkzep̄Ēi | Avgiv GI
ej tZ cwi bv th, K I L-Gi gta`Kvi cv_ŕK`ū M I N-Gi gta`Kvi cv_ŕK`ūI tPtq Kg ev
tekr| Gū w̄bYŕ KitZ n̄tj Avgv̄t`i e`w̄Bvj-K gvīvi m̄v̄v` w̄tZ n̄tj

mvi isk

cwi gvtci Pviū cāvb gvīv i'q̄tQ – bvgmPK, μgmPK, e`w̄Bvj-K I AbzvZgj-K| cwi gvtci
m̄etPtq mij gvīwū n̄tj v bvgmPK gvīv| bvgmPK cwi gvtci gva`tg Avgiv GKū tMvōx t_ŕK
Av̄tīKū tMvōxi cv_ŕK` w̄baŕY Kti _mK| thgb, brix I cjad I gta` cv_ŕK`| bvgmPK
gvīvi gva`tg Avgiv tKej gvī tkYxexKiY ev tMvōxexKiY KitZ cwi, mKŠ' tKvb , YMZ
(fitj v/gv)` ce`avi Yv Abgvb KitZ cwi bv| μgmPK gvīv bvgmPK gvīvi tPtq mKQyv
Dbz| KviY, bvgmPK gvīvq ubw̄θ %enktōi w̄fūĒtZ i'agvī tkYxex Kiv hvq, mKŠ' tKvb
, YMZ gvb Avtīvc Kiv hvq bv| mKŠ' μgmPK gvīvq Avgiv ubw̄θ `enktōi w̄fūĒtZ tKej
tkYxex ev tMvōxexB KitZ cwi bv, Avgiv Gi , Yv, YI Avtīvc KitZ cwi | μgmPK gvīvi
m̄xgve×Zvū n̄tj v th, GB gvīvq cwi gvcKZ.Pj tKi Ašifŕ w̄w̄fbaDcv`v̄tbi gta` cv_ŕK`i
e`earb ev e`w̄Bvū w̄bYŕ Kiv m̄æ nq bv|

civvEi gj`iqb

bePK ckae

mivK DEti i civk iUK (v) iPy ir` b –

1| civi gvrci cãvb gvT v i tqfQ|

- K. GKiu
- L. `gu
- M. iZbiu
- N. Pvi u

2| gvT vi gva`tg tKej gvT tkYe×Ki Y Ki tZ civi |

- K. bigmPK
- L. µgmPK
- M. e`mBgi-K
- N. AbgvZgj-K

3| cãZmvg`Zv Ges mKgRZv GB `gu`ewkó` Avgi v civi gvrc t`L tZ civ|

- K. bigmPK
- L. µgmPK
- M. e`mBgi-K
- N. AbgvZgj-K

msvTB ckae

1| msAv ir` b Ges`ewkó` Avtj vPbv Ki ab:

- K. bigmPK civi gvc
- L. µgmPK civi gvc

iPbvj-K ckae

1| bigmPK I µgmPK civi gvrci gvT v `gu D`vni Ymn Avtj vPbv Ki ab|

2| Zx`bvj-K Z` Dc`vcibi gva`tg t`Lvb th civi gvrci me tPiq mij gvT iU njv bigmPK gvT v|

cwi gvtci gviv: e'wbgj-K I AbgvZgj-K
Levels of Measurement: Interval and Ratio

GB cw tkfI hv Rvbr hrte —

- e'wbgj-K I AbgvZgj-K gvivi 'enkó' I cv_R
- cwi gvtci Piiw gvivi gta' Zjbv

e'wbgj-K gviv (Interval Level)

tkYe×KiY Ges , YMZ
 μgavi vi m=úR 'ictbi
 cikvcwK GKU chfe'Y
 t_tK Avti KuU chfe'Y wK
 KZ GKtKi e'earfb Ae'vb
 Kti e'wbgj-K gviv Avgt' i
 Zv wYq Ki tZ mngZv
 Kti |

cw 2-G Avgiv tRtbw th, bvgmPK gviv chfe'Y tK tKej gviv tkYe× Kti Ges μgmPK gviv Avgt' i Avti K avc GmMtg wbtg tkYe×Ki tYi cikvcwK chfe'Y mgtai gta' , YMZ μgavi vi GKU m=úK' vcb Kti | wKs' Avgiv GI Rmb th, μgmPK gvivi cwi gvtci gva'tg m=úK' GB chfe'Y , tji vi gta' e'earfb gviv wba' Y Kiv hvq bv | hv Avgiv cZwU chfe'Y gta' Kvi cKZ. e'earbw RvbtZ cwi , Zte Avgiv cwi gvtci e'wbgj-K gviv ARB Ki tZ m'lg nB | A'fr, tkYe×KiY Ges , YMZ μgavi vi m=úR 'ictbi cikvcwK GKU chfe'Y t_tK Avti KuU chfe'Y wK KZ GKtKi e'earfb Ae'vb Kti Zv e'wbgj-K gvivi gva'tg wYq Kiv m=é | thgb, e'wbgj-K gvivi cwi gvtci gva'tg Avgiv i agv' GUKB ej tZ cwi bv th, Kwi g m'ne i wng m'ntei t'p'q tekx Avq Kti b, Avgiv GI ej tZ m'lg nB th, Kwi g m'ne i wng m'ntei t'p'q 5000 UvKv tekx Avq Kti b | GB cwi gv YMZ ZjbwU Ki tZ ntj Avgt' i Aek' B GKU cwi gvtci m= GKK _vKtZ nte Ges chfe'Y i cZwU GKtKi gta' Kvi e'earbw mgvb n'tZ nte |

e'wbgj-K gvivi MwywZK 'enkó' , tji v ntj v:

- **Abb'Zv (uniqueness):** hv` K I L `ju cKZ. msL'vi cZwU wZj Kti , Zte K+L I K×L GKU Ges GKgv' GKU cKZ. msL'v'K cZwU wZj Kti |
- **cZwmg'Zv (symmetry):** hv` K=L nq, Zte L=K nte |
- **wbgq'th'w'Zv (commutation):** hv` K I L cKZ. msL'v'K wbt' R Kti , Zte K+L=L+K I KL=LK nte |
- **cZK'bv (substitution):** hv` K=L I K+M=N nq, Zte L+M=N; Ges hv` K=L I KM=N nq, Zte LM=N nte |
- **msm'Zv (association):** hv` K, L I M cKZ. msL'v'K wbt' R Kti , Zte (K+L)+M=K+(L+M) I (KL)M=K(LM) nte |

e'wbgj-K gvivi m' bvgmPK I μgmPK gvivi c'v' cv_R'wU ntjv e'wbgj-K gviv cwi gvcKZ. Pj K, tji vi gta' cwi gvtci GKU cwi wZ GKK (standard unit) i t'q'Q Ges GKU GKK t_tK Ab' GKtKi mgvb `i-Zj_v'K |

w'v' e'wbgj-K gviv cwi gvcKZ. GKU Pj K | w'v'wZ th'w'Zvi w'v'Z Avgiv w'v' e'w'K w'v'wZ w'v'Z w'v' K i tZ cwi Ges tmB th'w'Z, tji GKU , YMZ m=úK' μgavi v'Zix Kti | thgb, cAg tkYx ch'w'v' mgvB Kij Avgiv GKRB e'w'K c'w'K w'v'v'

ukwġZ etj _mK, `kg tkYx mguB Kitj Avgiv gva'ugK, evtiv eQi mguB Kitj D'P gva'ugK, Kgctġ tPŠġ eQi mguB Kitj ũZK Ges tlvj eQi mguB Kitj ũZtKvĒi ukwġvq ukwġZ etj AwfinZ Kwġ | G tġġġ ukwġMZ thM'Zvi wfiĒtZ weifbebvigKitYi gva'tg bvqmPK gvġvi Kvġw m'úw Z ntqġQ|

thġnZzcġ ugK ukwġvi Zġbvq gva'ugK ukwġv D'Pzi | gva'ugK ukwġvi Zġbvq D'P gva'ugK ukwġv D'Pzi, Ges ũZK ukwġvi Zġbvq ũZtKvĒi ukwġv D'Pzi, tmġnZzkwġvi GB tkYx,tjv GKw m'útKġ µgaviv `vcġbi ga` w'tq cwi gvtci µgmPK gvġvi Kvġw m'úw b Kitġ| th weiqw GLvtb j ġ'Yxq tmw ntjv, cġg tkYx t_ġK ũZtKvĒi tkYx chŠġ mguB KitġZ GKRB Qvġ/QvġġK cġZw tkYxġZ GK eQi mgqKvj AwZµg Kġi GKw ewl R cixġlvq DĒYġntZ ntqġQ| A_ġ, GLvtb GKw cwi ugZ GKġKi cwi gvc Abġi Y Kiv ntqġQ| cġZw tkYxġK GK GKw GKK wntmte weġPbv Kitġ t`Lv hvq th, cġZw tkYxi gġa` e'eaib ntjv GK eQġi | GB GK eQġi e'eaibw cġZw tkYxi Rb` mguB I Acwi eZġvq| Avq, eyxgĒv, tġvU vtB mġg RbtMvòx, Rbtġvi, BZ`w` ntjv e`wBġj-K gvġvq cwi gvcKZ.yġġKi ukQyD`vni Y|

e`wBġj-K gvġvi mxgve×ZwU ntjv, GB gvġvq cwi gvcKZ.Pj K,tjvi mġw Ĳ tKvb mPbv`j ev DrcwĒ`j (definite origin) tbB, hv GKw `rfweK ũbi%k kb` Ae`vb (absolute natural zero point) w'tq wPwYZ Kiv nq| GB mPbv`j w Rvb bv_vKġj GB gvġvq cġB cwi mSL`vbMZ DcġĒ,tjv D'Pzi cwi mSL`vbMZ weġkġġY mgm`v`Zix Kġi |

AbġvZġj-K gvġv (Ratio Level)

th me PġġKi `rfweK ũbi%k kb` Ae`vb we`yġġQ ev ũwġ Ĳ GKw DrcwĒ`j iġġQ, tm me PġġKġ AbġvZġj-K gvġvq cwi gvc Kiv qvq| I Rb, mgq, eqm, Zvcgvġv, ``N°BZ`w` ntjv AbġvZġj-K gvġvq cwi gvc thM` PġġKi ukQyD`vni Y| e`wBġj-K I AbġvZġj-K gvġv GKb aiġYi | th ũbgvejx Abġi Y Kġi PġġKmgġni cġZ mSL`v Avġvc Kiv nq tm,tjv GKb iKg, i'ayGkw e'wZµg Qvov| tmB e'wZµgU ntjv th, AbġvZġj-K gvġvi tġġġ me aiġYi MwYwZK ev cwi mSL`wbK KgRvU`i i'æng GKw ũbi%k kb` Ae`vb we`yġġK| Ab` w'ġK, e`wBġj-K gvġvi tġġġ tm mKj KgRvU`i i'æng GKw t`wġj-K mPbv`j t_ġK|

eqm PġġKwġK GKw D`vni Y wntmte aiv thġZ cvġi | GKw ũkġi Rġbġ ci t_ġK GK eQi cYġv nI qv chŠġ Zvi eqm aiv nq kb` eQi | A_ġ, GKRB e'wġi eqm MYbv`i i'æng kb` eQi t_ġK| Ab` K_vq, eqm PġġKwġi `rfweK DrcwĒ`j nj Rġbġ mgqU| GB DrcwĒ`j w cġKwZKfvġB mġ, Kwġgfvġb q| ũKŠ, e`wBġj-K gvġvq th tKvb `vb t_ġK MYbv`i i'æntZ cvġi | thgb, mŠġb Rbġvtb mġg bvġġ i eqm MYbv`m mskw mKj cġvi MwYwZK KgRvU`i i'æng 15 eQi eqm t_ġK Ges tkI Kiv nq 49 eQġi | Kvi Y, GB PġġKwġK GfvġB msÁwqZ Kiv ntqġQ| tġvU vtB mġg e'wġġ i MYbv Kiv nq 18 eQi eqm t_ġK| Kvi Y, 18 eQi eqmġK cġBġq`Zvi gvb`Ū wntmte wPwYZ Kiv ntqġQ Ges GB cġBġq`ZvB tġvU vtbi thM`ZvtK ũbi'cy Kġi |

Zvcgvġv ntjv AbġvZġj-K gvġvq cwi gvcKZ.Ggb Avġi Kw PġġK, hv GKw cġKwZK I ũwġ Ĳ kb` DrcwĒ`j iġġQ| Kvi Y, cwb kb` ZvcgvġvZB eiġd cwi YZ nq| ũKŠ hLb GKRB wPwKrmK GKRB e'wġi kiġi Rġi Zvcgvġv cwi gvc Kġib ZLb ũZwb t`ġLb th, Zvcgvġv 98.6 mwmġ dvġibnġBU AwZµg KġiġQ ũKbv| hv` tmB e'wġi kiġi Zvcgvġv 98.6 mwmġ dvġibnġBġUi Dġi nq, Zġe ũZwb tmB e'wġi Rġi ntqġQ etj wPwYZ Kġib | G tġġġ Zvcgvġv PġġKw AbġvZġj-K`eikó` nmiġq e`wBġj-K-G cwi YZ nq| GKw PġġKġ

e`wBġj-K gvġvi mxgve×ZwU ntjv, GB gvġvq cwi gvcKZ.Pj K,tjvi mġw Ĳ tKvb mPbv`j ev DrcwĒ`j tbB, hv GKw ũbi%k cġKwZK kb` Ae`vb w'tq wPwYZ Kiv nq|

th me PġġKi `rfweK ũbi%k kb` Ae`vb we`yġġQ ev ũwġ Ĳ GKw DrcwĒ`j iġġQ, tm me PġġKġ AbġvZġj-K gvġvq cwi gvc Kiv qvq| I Rb, mgq, eqm, Zvcgvġv, ``N°BZ`w` ntjv AbġvZġj-K gvġvq cwi gvc thM` PġġKi ukQyD`vni Y|

ḡU gvĭvq cwi gvc Kiv m^æ eĭj AþK mgq e^ımBġj-K | AbġvZġj-K cwi gvtci gvĭv GKB Aþ_^æeüZ nġq_ıþK | ıKŠ'Zv c^ııZMZ fıte mıvK bq |

AbġvZġj-K gvĭvi cwi gvc AıRZ nq ZLbB, hLb PııU ^ıewkó'B GKıU Pj þKi gta^ı_ıþK | ^ıewkó' , tġv nġjv: mgv_ŘZv, epĒi-ġġZi, th þKıv ḡU e^ıearþbi ÁvZ ^ıi-Z; Ges GKıU mız'Kvi kb^ı'j ev DrcıĒ'j |

AbġvZġj-K gvĭvi cwi gvc (hv mıvıYZt cÖKıZK weÁvþbi þġıþB tekı cÖqıM Kiv nġq_ıþK) AıRZ nq ZLbB, hLb PııU ^ıewkó'B GKıU Pj þKi gta^ı_ıþK | ^ıewkó' , tġv nġjv: (K) mgv_ŘZv (equivalence), (L) epĒi-ġġZi, (greater than-less than), (M) th þKıv ḡU e^ıearþbi ÁvZ ^ıi-Z; (known distance of any two intervals), Ges (N) GKıU mız'Kvi kb^ı'j ev DrcıĒ'j (a true zero point or origin) | Zte GıU mZ^ı th, mKj ^ıewkó'B kb^ı' t_þK cwi gvc Kiv hıq bv, thġb, kb^ı' mıvıRK tkYı þKıv A_Ēn cĹ'q nġZ cıþi bv | Ab^ı'ıþK, kb^ı' ıKġıMZ thıM'Zv Avġvı'ı ^ıúo aviYv t`q th, GKRB e^ıı^ıi þKıv cÖZömbK ıKġıv tbB |

cwi gvtci gvĭv, tġvi gta^ı Zġbv (Comparison between the Levels of Measurement)

cwi gvc c^ııZi cĀıv PıııU gvĭvi gta^ı Zġbvġj-K Avġı vPbvq mıvıB fıte ej v hıq th,

- bıgmPK gvĭvq Avġıv tKej mgv_ŘZv ^ııcb KiþZ cwiı |
- μgmPK gvĭvq mgv_ŘZvi cıkvııK epĒi-ġġZi , YMZ μgavıvi m^ıúK^ıımcZ nq |
- e^ımBġj-K gvĭvq mgv_ŘZv | , YMZ μgavıvi m^ıúK^ı mıþ_ GKıU GKK t_þK Ab^ı GKþKi gta^ı e^ıearþbi ^ıi-ZıU ıbarPY Kiv hıq, hv memġq mgıv ^ıi-Zıi nġq_ıþK |
- AbġvZġj-K gvĭvq mgv_ŘZv, , YMZ μgavıvi m^ıúK^ıı GKKmgþıi gta^ıKvi e^ıearþbi ÁvZ ^ıi-Z; Qıvıv GKıU mıvıv^ıĒ, ^ııfıweK | ıbi ^ık DrcıĒ'j ıvYġ m^ıæ, hvi MYbv kb^ı' t_þK i^ıæ nq |

ıbtai mıvıYıU chġeġıY Kiþj PıııU gvĭvi Zġbv Avġıv ^ıúo nġq DVġe |

cwi gvtci gvĭv	chġeġıYi Zġbvq Dcıq	D`niY
bıgmPK	• chġeġıY, tġv ıK ıfbĒ	^ı æenıK ghıv ^ı
μgmPK	• chġeġıY, tġv ıK ıfbĒ • þKıv chġeġıYıU epĒi?	mıvıRK tkYı
e ^ı mBġj-K	• chġeġıY, tġv ıK ıfbĒ • þKıv chġeġıYıU epĒi? • KZUKzepĒi?	eqm
AbġvZġj-K	• chġeġıY, tġv ıK ıfbĒ • þKıv chġeġıYıU epĒi? • KZUKzepĒi ? • chġeġıYıUı ıK GKıU mıvıv ^ı Ē/ ıbi ^ı k kb ^ı ' DrcıĒ'j i ^ı qıQ?	Zıvcġıv

Comment [AKH1]

meþkþı ej v hıq th, cwi gvtci gvĭvıU ıbarıı Z nq Pj þKi cÖKıZi Dcı | AZGe, cwi gvtci cĀıvq ıbarPY Kivi cġePj þKi cÖKıZıK mıvıv fıte eġZ nte |

mvi usk

tkYie×KiY Ges ,YMZ μgavivi m=úR `vc†bi cvkvcmk GKiu chfeŋY t_†K Av†i KiU
chfeŋY WK KZ GK†Ki e`ear†b Ae`vb K†i Zv e`mBgf-K gv†vi gva`tg mbYq Kiv m=é/
e`mBgf-K gv†vi MmYmZK `ewkó` ,†jv n†jv Abb`Zv, cūZmvg`Zv, neibgq†hM`Zv, cūZKí bv
I msmMZv/ e`mBgf-K gv†vi m†_ bvgmPK I μgmPK gv†vi cāvb cv_R`u n†jv th,
e`mBgf-K gv†vq cwi gvcKZ. Pj K, †jvi g†a` cwi g†c†i GKiu cwi ugZ GKK i†q†Q Ges
GKiu GKK t_†K Ab` GK†Ki mgvb `†Zj_†K/ AbxvZgf-K gv†vq e`mBgf-K gv†vi `ewkó`
QrovI GKiu m†v`θ, `†fmeK I mbi ¼k DrcwE`j i†q†Q hvi MYbv kb` t_†K i iænq/

c#WÈi gj`iqb

`be⁹³K c⁸kæ

m¹MK DÈti i c¹t¹k ¹UK (√) ¹Py ¹ir b –

1| ðh c¹ii g¹vc ðk¹Y¹e×K¹i ð¹Y¹i c¹ik¹vc¹mk ¹YMZ µg¹avi i G¹K¹U m¹u¹K¹vc¹b K¹ti Z¹vt¹K:

- K. b¹vg¹m¹PK c¹ii g¹vc e¹t¹j
- L. µ¹g¹m¹PK c¹ii g¹vc e¹t¹j
- M. e¹ˆ¹m¹B¹g¹j-K c¹ii g¹vc e¹t¹j
- N. Ab¹g¹vZ¹g¹j-K c¹ii g¹vc e¹t¹j

2| ðh me P¹j ð¹K¹i ¹mbi ¹¼¹k k¹bˆ Ae¹ˆ¹vb i ð¹qt¹Q Z¹vt¹K:

- K. b¹vg¹m¹PK c¹ii g¹vc e¹t¹j
- L. µ¹g¹m¹PK c¹ii g¹vc e¹t¹j
- M. e¹ˆ¹m¹B¹g¹j-K c¹ii g¹vc e¹t¹j
- N. Ab¹g¹vZ¹g¹j-K c¹ii g¹vc e¹t¹j

3| Ab¹g¹vZ¹g¹j-K g¹v¹ˆ¹iq c¹ii g¹vc h¹_v¹ˆ¹ng Z¹L¹b¹B, h¹L¹b %e¹mk¹óˆˆ G¹K¹U P¹j ð¹K¹i g¹taˆˆ¹v¹t¹K|

- K. 1¹U
- L. 2¹U
- M. 3¹U
- N. 4¹U

ms¹u¹ˆ¹B c¹kæ

1| ms¹Á¹v ¹ir b I ¹e¹mk¹óˆˆ Av¹t¹j v¹P¹b¹v Ki¹ab:

- K. e¹ˆ¹m¹B¹g¹j-K g¹v¹ˆ¹v
- L. Ab¹g¹vZ¹g¹j-K g¹v¹ˆ¹v

i¹P¹b¹g¹j-K c¹kæ

1| e¹ˆ¹m¹B¹g¹j-K I Ab¹g¹vZ¹g¹j-K g¹v¹ˆ¹vi ¹e¹mk¹óˆˆ I c¹v¹_R¹ˆˆ Av¹t¹j v¹P¹b¹v Ki¹ab|

2| mg¹v¹R M¹te¹l Y¹iq e¹ˆ¹m¹B¹g¹j-K I Ab¹g¹vZ¹g¹j-K c¹ii g¹v¹t¹c¹i c¹ˆ¹qv¹R¹b¹iq¹Z¹v D¹ˆ¹vni Y¹mn Av¹t¹j v¹P¹b¹v Ki¹ab|