wR‡iv: `¨ ev‡qvMÖvwd Ae A¨v W¨vÄvivm AvBwWqv

g~j: Pvj©m wmd

Abyev`: Avãyj¨vn Avw`j gvngy`

DrmM©

m~wPcÎ

**Aa¨vq k~b¨: bvj A¨vÛ f‡qW**

**Aa¨vq GK: wKQyB bv Kivi Mí**

k~‡b¨i m~Pbv

k~b¨wenxb Rxeb

k~‡b¨i Rb¥

k~‡b¨i fqvbK ˆewkó¨

**Aa¨vq `yB: k~b¨Zv †\_‡K ïay k~b¨ZvB †g‡j**

cvðv‡Z¨ k~‡b¨i cÖZ¨vL¨vb

wMÖK msL¨v-`k©‡bi DrcwË

Amxg, k~b¨Zv I cvðvZ¨

AÜ Awfmvi

k~b¨Zg msL¨v

wekvj k~b¨Zv

**Aa¨vq wZb: k~‡b¨i eiY**

cÖv‡P¨ k~‡b¨i AvMgb

k~‡b¨i cybRb¥

Aviwe msL¨v

Avwg hv ZvB: k~b¨

k~‡b¨i weRq

**Aa¨vq Pvi: k~‡b¨i ag©ZË¡**

Lyjj iæ×Øvi

k~b¨ Ges f‡qW

Ck¦i wb‡q evwR

**Aa¨vq cuvP: Amxg k~b¨**

k~b¨ I ˆeÁvwbK wecøe

k~b¨ I giwg K¨vjKzjvm

giwgev‡`i BwZ

**Aa¨vq Qq: Amx‡gi hgR**

k~‡b¨i Amxg ˆewkó¨

KvíwbK msL¨v

we›`y I cÖwZwe›`y

Amxg k~b¨

**Aa¨vq mvZ: cig k~b¨**

k~‡b¨i †fŠZ ˆewkó¨

k~b¨ Zvc

†Kvqv›Uvg k~b¨: Amxg kw³

Av‡cw¶Kxq k~b¨: eø¨vK‡nvj

webv cyuwR‡Z jvf?

**Aa¨vq AvU: MÖvDÛ wR‡ivi k~b¨Zg NÈv**

¯’vb-Kv‡ji mxgvbvq k~b¨

k~‡b¨i wbe©vmb: w÷ªs ZË¡

k~b¨Zg NÈv: weM e¨vs

**Aa¨vq bq: †kl mgq**

†kl mgq

Amxg I Zvi Icv‡i

**cwiwkó**

cÖvYx, mewR, bvwK gš¿x?

†mvbvwj AbycvZ

AšÍi‡Ki AvaywbK msÁv

g~j` msL¨vi MYbvq K¨v›Ui

Iqvg©‡nvj UvBg †gwkb evbv‡bvi Dcvq

k~‡b¨i Ak~b¨ BwZnvm

k~b¨Zg Aa¨vq

bvj A¨vÛ f‡qW

BDGmGm BqK©UvDb Rvnv‡R k~‡b¨i AvNvZUv U‡c©‡Wvi g‡ZvB n‡jv|

1997 mv‡ji 21 †m‡Þ¤^i| RvnvRwU fvwR©wbqv DcK‚j †\_‡K cÖ‡gv`åg‡Y †ei nq| kZ †KvwU Wjv‡ii wgmvBj µyRviwU nVvr Kuvc‡Z Kuvc‡Z †\_‡g hvq| BqK©UvDb Rvnv‡Ri mjxj mgvwa ILv‡bB|

hy×RvnvR¸‡jv evbv‡bvB nq U‡c©‡Wv ev we‡ùvi‡Ki AvNv‡Zi cÖwZ mnbxq K‡i| BqK©UvDb RvnvR‡K me ai‡bi A¯¿ †\_‡K euvPv‡bvi e¨e¯’v Kiv n‡qwQj| wKš‘ k~b¨ †\_‡K euvPv‡bvi K\_v †KD fv‡ewb| gvivZ¥K GK fyj|

gvÎB BqK©UvD‡bi Kw¤úDUv‡i bZyb GK mdUIq¨vi BÝUj Kiv n‡q‡Q| GwUB wbqš¿Y Ki‡Q Rvnv‡Ri BwÄb| wKš‘ †Kv‡Wi g‡a¨ †h GKwU UvBg †evgv jywK‡q Av‡Q Zv †Lqvj K‡iwb| mdUIq¨vi BÝUj Kivi mgq k~b¨Uvi w`‡K cÖ‡KŠkjx‡`i bRi †`Iqv DwPZ wQj| wKš‘ Kx Kvi‡Y †K Rv‡b—k~b¨Uvi w`‡K †KD ZvwK‡q †`‡Lwb| d‡j †mwU jywK‡q \_vKj †Kv‡Wi wf‡o| hZ¶Y bv mdUIq¨vi k~b¨Uv‡K †g‡gvwi‡Z wb‡q Avmj| Avi Zv‡ZB me †kl|

BqK©UvD‡bi Kw¤úDUvi k~b¨ w`‡q fvM Kivi †Póv K‡iwQj| mv‡\_ mv‡\_ 80 nvRvi nm©cvIqv‡ii hvb A‡K‡Rv n‡q †Mj| BwÄb‡K Riæwi wbqš¿Y e¨e¯’vq Avb‡Z cÖvq wZb NÈv mgq †j‡M wM‡qwQj| c‡i †Kv‡bviK‡g Zx‡i wfo‡Z m¶g nq| k~b¨ †\_‡K gyw³ cvIqv, BwÄb †givgZ Kiv I BqK©UvDb‡K cybivq mPj Ki‡Z †j‡M †Mj `yB w`b mgq|

Ab¨ †Kv‡bv msL¨vi Øviv Ggb ¶wZ Kiv m¤¢e bq| BqK©UvD‡b NUv Kw¤úDUv‡ii ÎæwU k~‡b¨i ¶gZvi Lye †QvÆ GK bgybv| wewfbœ ms¯‹„wZi gvbyl k~‡b¨i weiæ‡× iæ‡L `uvwo‡qwQj| k~‡b¨i gy‡LvgywL n‡j `vk©wbK‡`i we‡`¨eyw× †jvc †cZ| KviY k~b¨ Ab¨ msL¨v †\_‡K G‡Kev‡iB Avjv`v| AeY©bxq I Amx‡gi GK †QvÆ ewntcÖKvk| G Kvi‡YB gvbyl G‡K fq †c‡q‡Q| N„Yv K‡i‡Q| wbwl× K‡i‡Q|

G eBUv k~‡b¨i Mí| cÖvPxbKv‡j Gi R‡b¥i K\_v| cÖv‡P¨ Gi mv`‡i M„nxZ nevi K\_v| BD‡iv‡c ¯^xK…wZ cvIqvi msMÖvg| Avi AvaywbK c`v\_©we`¨vq Gi wbZ¨bZyb ûgwKi K\_v| GLv‡b ejv n‡q‡Q †mBme cwÐZ, giwgev`x, weÁvbx I cv`ªx‡`i K\_v hviv GB msL¨vwUi A\_© wb‡q jovB K‡i‡Qb| cÖ‡Z¨‡KB eyS‡Z †P‡q‡Qb| cÖv‡P¨i aviYv¸‡jv †\_‡K wb‡R‡`i‡K AcÖ‡qvRbxqfv‡e (KLbI KLbI mwnsm Dcv‡q) gy³ ivLvi cvð¨v‡Zi GKwU e¨\_© †PóviI BwZnvm GwU| GQvovI GKwU mij-`k©b msL¨v †\_‡K m„ó wewfbœ c¨vivW‡·iI BwZnvm GwU| eZ©gvb kZvãxi †miv eyw×i gvbyl¸‡jvI †c‡i DV‡Qb bv Gi mv‡\_| ˆeÁvwbK wPšÍvi cy‡iv AeKvVv‡gv‡K nqZ GB msL¨vwUB cwi®‹vi Ki‡e|

k~‡b¨i A‡bK ¶gZvi KviY GwU Amx‡gi hgR| Giv mgvb Ges wecixZ| G‡Ki g‡a¨ `yB| weåvwšÍi Rb¥ I Kó †`Iqvi †¶‡Î `y‡UviB Ae`vb mgvb| weÁvb I a‡g©i eo eo cÖkœ¸‡jv Kiv nq k~b¨Zv I wPišÍZv wb‡q| k~b¨Zv I AmxgZv wb‡q| k~b¨ I Amxg wb‡q| k~b¨ wb‡q msNwUZ hy× `k©b, weÁvb, MwYZ I a‡g©i wfwË‡Z Av‡jvob Zy‡jwQj| me wecø‡ei †cQ‡b KvR K‡i‡Q k~b¨| mv‡\_ wQj Amxg|

cÖvP¨ I cvð¨v‡Zi msNv‡Zi g~‡j wQj k~b¨| L„óag© I weÁv‡bi msMÖv‡gi †K‡›`ª wQj k~b¨| k~b¨ cwiYZ n‡jv cÖK…wZi fvlvq| n‡q †Mj MwY‡Zi me‡P‡q ¸iæZ¡c~Y© nvwZqvi| c`v\_©weÁv‡bi me‡P‡q e¨vcK mgm¨v¸‡jvi mgvav‡b †gvKv‡ejv Ki‡Z nq k~b¨‡K| †nvK †m eø¨vK‡nv‡ji AÜKvi †K›`ª wKsev weM e¨vs‡qi D¾¡j SjK|

wKš‘ BwZnv‡m cvZv ej‡Q, evwRgvZ memgq K‡i‡Q k~b¨B| cÖZ¨vL¨vb, wbe©vmb me †gvKv‡ejv K‡i k~b¨ memgq cÖwZc¶‡K nvwi‡q w`‡q‡Q| gvbyl KL‡bvB k~b¨‡K `k©‡b AšÍf©~³ n‡Z eva¨ Ki‡Z cv‡iwb| eis gnvwek¦ I Ck¦‡ii aviYv †c‡Z k~‡b¨i Kv‡QB †h‡Z n‡q‡Q gvbyl‡K|

cÖ\_g Aa¨vq

wKQyB bv Kivi Mí

[k~‡b¨i m~Pbv]

*ZLb Aw¯ÍZ¡ ev Abw¯ÍZ¡ †Kv‡bvUvB wQj bv| wQj bv ¯’v‡bi RMr, Avi bv wQj Zvi evB‡ii AvKvk| †K RvMvj? †Kv\_vq RvMvj?*

-F‡M¦`

k~‡b¨i Mí Lye cyi‡bv| MwY‡Zi R‡b¥i mg‡qB Gi Rb¥ nq| †m AvR †\_‡K nvRvi nvRvi eQi Av‡Mi †Kv\_v| ZLbI cÖ\_g mf¨ZviI Rb¥ nqwb| gvby‡li wjL‡Z-co‡Z cviviI eû Av‡Mi K\_v| k~b¨‡K AvR Avgv‡`i Kv‡Q Lye ¯^vfvweK g‡b nq| wKš‘ cÖvPxbKv‡ji gvby‡li Kv‡Q msL¨vwU‡K ewnivMZ g‡b nZ| g‡b nZ fxwZKi|

aviYvwUi Rb¥ cÖv‡P¨i dvU©vBj wµ‡m›U1 ev De©i P›`ªKjv AÂ‡j| wLª‡÷i R‡b¥i K‡qK k eQi Av‡M| GB k~b¨ ïay Avw`g k~b¨Zvi cÖwZ”QweB bq| Gi wQj fqvbK MvwYwZK ag©I| k~‡b¨i g‡a¨ i‡q‡Q hyw³i wfwË‡K ¸uwo‡q †`Iqvi kw³|

‡fov ¸b‡Z gvby‡li g‡a¨ MvwYwZK wPšÍvi m~Pbv N‡U| GQvovI m¤ú‡`i wnmve ivL‡Z I mgq gvc‡Z MwYZ jvMZ| G¸‡jvi †Kv‡bvUv‡ZB k~b¨‡K `iKvi nqwb| k~‡b¨i Avwe®‹v‡ii Av‡MI nvRvi eQi a‡i mf¨Zv wVKVvK KvR KiwQj| k~‡b¨i cÖwZ N„Yv KvR Kivq wKQy wKQy ms¯‹„wZi gvbyl msL¨vwU‡K ev` w`‡qB euvP‡Z †P‡qwQj|

k~b¨wenxb Rxeb

Avgv‡`i ˆ`bw›`b Rxe‡b k~b¨‡K cÖ‡qvRb nq bv| †KDB k~b¨wU gvQ wKb‡Z hvq bv| GK w`K †\_‡K me A¼evPK msL¨vi g‡a¨ GwU me‡P‡q mf¨| wPšÍvi cwikxwjZ iƒcB Avgv‡`i‡K msL¨vwU e¨envi Ki‡Z eva¨ K‡i‡Q|

-Avj‡d«W b\_© DB\_‡nW

GKRb AvaywbK gvbyl k~b¨wenxb Rxe‡bi K\_v fve‡ZI cv‡ib bv| wVK †hgwb 7 ev 31 msL¨v¸‡jv Qvov Rxeb Pjv Am¤¢e| wKš‘ GK mgq k~b¨ ej‡Z †Kv‡bv msL¨v wQj bv| wVK †hfv‡e wQj bv 7 ev 31| †mUv cÖv‰MwZnvwmK Kv‡ji K\_v| ZvB Rxevk¥we`iv cv\_i I nv‡oi UyK‡iv †\_‡K Z\_¨ msMÖn K‡i MwY‡Zi Rb¥Kvwnwb †ei K‡i‡Qb| Gme †\_‡K M‡elKiv †R‡b‡Qb, cÖ¯Íi hy‡Mi MwYZwe`iv GLbKvi MwYZwe`‡`i †P‡q AgvwR©Z wQ‡jb| eø¨vK‡ev‡W©i e`‡j Zviv e¨envi Ki‡Zb †bK‡o|

1930-Gi `k‡K cÖ¯Íi hy‡Mi MwYZwe`‡`i m¤ú‡K© eo GKwU Z\_¨ cvIqv hvq| cÖZœZË¡we` Kvj© A¨v‡eøvmg †P‡Kv‡¯øvfvwKqvi gvwU wb‡q cix¶v KiwQ‡jb| wZwb G mgq 30 nvRvi eQ‡ii cyi‡bv GKwU †bK‡oi nvo Lyu‡R cvb| Zv‡Z i‡q‡Q A‡bK¸‡jv LuvR KvUv| †KD Rv‡b bv, R‰bK ¸nvgvbe MM GB nvo w`‡q Zvi wkKvi Kiv nwiY, AuvKv Qwe ev Zvi †Mvmj bv Kiv w`b¸‡jv ¸‡bwQj wK bv| Z‡e GUv wbwðZ, cÖvPxb gvby‡liv wKQy bv wKQy ¸‡bwQj|

cÖ¯Íi hy‡M †bK‡oi GKwU nvoB eZ©gvb mg‡qi GKwU mycviKw¤úDUvi| M‡Mi Avw`cyiæliv †Zv `yB ch©š‘I ¸b‡Z cviZ bv| †mLv‡b k~‡b¨i `iKvi nIqvi †Zv cÖkœB I‡V bv| g‡b n‡”Q MwY‡Zi G‡Kev‡i ïiæi w`‡K gvbyl ïay GK I eûi cv\_©K¨ eySZ| GKRb ¸nvgvb‡ei ek©v nq GKUv \_vKZ, bvnq eû| wZwb nq GKwU wUKwUwK †L‡Zb, bvnq eû| GK ev eû Qvov Ab¨ ivwk‡K †evSv‡bvi g‡Zv wKQyi Aw¯ÍZ¡ wQj bv| ax‡i ax‡i cÖvPxb fvlv¸‡jv weKwkZ n‡jv| GK, `yB I eûi g‡a¨ cv\_©K¨ cvIqv †Mj| †kl ch©šÍ GK, `yB, wZb I eûi cv\_©K¨I Rvbv †Mj| wKš‘ AviI eo msL¨vi †Kv‡bv bvg wQj bv| GB mgm¨v GLbI wKQy wKQy fvlvq †`Lv hvq| ewjwfqvi wmwiqbv BwÛqvb ev eªvwR‡ji Bqv‡bvqvgv‡`i K\_vB aiæb| Zv‡`i fvlvq wZ‡bi †ewk msL¨v‡K cÖKvk Kivi Rb¨ †bB †Kv‡bv kã| †Zgb `iKvi n‡j Zviv e‡jb ÒA‡bKÓ ev ÒcÖPyi|Ó

wKš‘ msL¨vi GKwU `viæY ˆewk‡ó¨i Kvi‡Y msL¨vc×wZ †mLv‡bB †\_‡g hvqwb| msL¨v‡`i‡K †hvM K‡i bZyb bZyb msL¨v cvIqv hvq| ZvB wKQyw`b c‡iB eyw×gvb gvbyl¸‡jv msL¨v-kã¸‡jv‡K wewfbœ mvwi‡Z mvRv‡Z jvMj| eZ©gvb eªvwR‡ji evKvBwi I †ev‡iv‡iv RvwZi gvby‡li e¨eüZ fvlvq GB KvRwU Kiv n‡q‡Q| Zv‡`i msL¨v¸‡jv G iKg: GK, `yB, `yB I GK, `yB I `yB, `yB I `yB Ges GK BZ¨vw`| Zviv `yB‡qi gva¨‡g wnmve K‡i| MwYZwe`iv G‡K e‡jb evBbvwi ev wØwgK (binary) c×wZ|

evKvBwi ev †ev‡iv‡iv‡`i g‡Zv K‡i †Zgb †KD MYbv K‡ib bv| cÖvPxb †bK‡oi nvoB cÖvPxbKv‡ji MYbvc×wZi Av`k© D`vniY| M‡Mi †bK‡oi nv‡o 55wU LuvR wQj| cÖwZ MÖæ‡c wQj 5wU K‡i LuvR| cÖ\_g 25wU `v‡Mi c‡i wØZxq AviI GKwU LuvR wQj| g‡b n‡”Q, MM nqZ 5 w`‡q wnmve KiwQ‡jb| Ges MÖæc¸‡jv‡K 5 w`‡q ¸”Qe× KiwQ‡jb| GUv Kiv LyeB A\_©en| `vM¸‡jv‡K GKwU GKwU K‡i MYbv Kivi †P‡q MÖæ‡c MÖæ‡c mvwR‡q wb‡j A‡bK `ªæZ KvR Kiv hvq| AvaywbK MwYZwe`iv ej‡eb †Lv`vB wkíx MM cuvPwfwËK (quinary) MYbv c×wZ e¨envi K‡iwQ‡jb|

wKš‘ †Kb cuvP-B? Mfx‡i wM‡q wPšÍv Ki‡j †evSv hv‡e Avm‡j †h‡Kv‡bv GKwU msL¨v wb‡jB PjZ| MM PviwU wb‡q ¸”Q K‡i `vM Uvb‡j Ges Pvi I †lv‡jv Gi ¸”Q evbv‡jI Zvi msL¨vc×wZ wVKB KvR KiZ| GKBfv‡e KvR KiZ Qq I QwÎ‡ki ¸”QI| KqUv wb‡q ¸”Q Kiv n‡jv †mUvi Ici nv‡oi Ici `v‡Mi msL¨v wbf©i K‡i bv| wKš‘ MM Pv‡ii e`‡j 5wU wb‡q ¸”Q K‡i‡Qb| c„w\_exi me gvbylB M‡Mi ˆewkó¨Uv †c‡q‡Q| gvby‡li cÖwZ nv‡Z cuvPwU K‡i Av½yj Av‡Q| d‡j wewfbœ ms¯‹„wZi msL¨vc×wZi wfwË wn‡m‡e 5-‡K RbwcÖq n‡Z †`Lv †Mj| †hgb, cÖv\_wgK hy‡Mi wMÖKiv U¨vwj wPý AuvKv‡K ejZ 'dvBwfs'|

GgbwK `w¶Y Av‡gwiKvi wØwgK MYbv c×wZ‡ZI fvlvwe`iv cuvPwfwËK msL¨vc×wZi m~Pbv †`‡L‡Qb| †ev‡iv‡iv fvlvq Ò`yB I `yB Ges GKÓ ejvi Av‡iKwU Dcvq n‡jv, ÒGUv n‡jv Avgvi GB cy‡iv nv‡Zi mgvb|Ó †evSvB hv‡”Q, cÖvPxb Avg‡ji gvbyl kix‡ii A½-cÖZ¨½ w`‡q MYbv Ki‡Z PvBZ| cuvP (GK nvZ), `k (Dfq nvZ) Ges wek (Dfq nvZ I Dfq cv) wQj Lye cQ›`bxq wPý| Bs‡iwR fvlvi B‡j‡fb (GMv‡iv) I Uy‡qjf (ev‡iv) kã `ywU m¤¢eZ ÒIqvb Ifvi †UbÓ I ÒUy Ifvi †UbÓ †\_‡K G‡m‡Q| Avi †Zi (\_vwU©b), †PŠÏ (‡dvwU©b), c‡bi (wddwUb) BZ¨vw` n‡jv h\_vµ‡g Òw\_ª A¨vÛ †UbÓ, Ò‡dvi A¨vÛ †UbÓ Ges ÒdvBf A¨vÛ †UbÓ-Gi msw¶ß iƒc| G Kvi‡Y fvlvwe`iv g‡b Ki‡Qb, †h Rvg©vbxq Avw`fvlvmg~n †\_‡K Bs‡iwR fvlv G‡m‡Q †m¸‡jv‡Z `k wQj †gŠwjK GKK| G Kvi‡Y †mB fvlv¸‡jvi gvbylivI 10-wfwËK msL¨vc×wZ e¨envi Ki‡Zb| Ab¨ w`‡K divwm fvlvq Avwk-‡K e‡j †Kvqv‡Î wfsZ (PviwU wek)| Avi beŸB‡K e‡j †Kvqv‡Î wfsZ w` (PviwU wek I GKwU `k)| nqZ GLbKvi d«v‡Ý †h gvbyl¸‡jv evm Ki‡Zb Zviv 20-wfwËK ev wf‡Rwmbvj (vigesimal) msL¨vc×wZ e¨envi Ki‡Zb| mvZ I 31-Gi g‡Zv msL¨v¸‡jv GB me¸‡jv msL¨vc×wZ‡ZB wQj| †nvK †mUv 5-wfwËK, 10-wfwËK, wKsev 20-wfwËK| wKš‘ G¸‡jvi †Kv‡bvwU‡ZB wQj bv k~‡b¨i R‡b¨ †Kv‡bv bvg| GB aviYvUviB Aw¯ÍZ¡ wQj bv|

k~b¨wU †fovi hZœ †Zv KLbI wb‡Z nq bv| wKsev ïb¨msL¨K mšÍv‡bi wnmve ivLvi `iKvi nq bv| ÒAvgvi Kv‡Q k~b¨wU Kjv Av‡QÓ bv e‡j †`vKvbx e‡jb, ÒAvgvi Kv‡Q †Kv‡bv Kjv †bB|Ó †Kv‡bv wKQyi Afve †evSv‡bvi R‡b¨ Avcbvi msL¨vi cÖ‡qvRb nq bv| Avi †Kv‡bv e¯‘i Afve‡K cÖZxK w`‡q cÖKvk Kivi welqwUI KviI gv\_vq Av‡mwb| G Kvi‡YB k~b¨ QvovB gvbyl GZ¸‡jv mgq cvi K‡i w`‡q‡Q| k~‡b¨i `iKviB c‡owb| k~‡b¨i D`qI ZvB N‡Uwb|

mwZ¨ ej‡Z, cÖv‰MwZnvwmK Kv‡j msL¨vi Ávb wQj eo GK ¸Y| ¸b‡Z cviv wQj `viæY †gavi cwiPvqK| G‡K Rv`yg‡š¿i g‡ZvB AZxw›`ªq I ¸ß g‡b Kiv nZ| wgkixq eB eyK Ae †WW-G Av‡Kb bv‡g GK †bŠKvi gvwS we‡`nx AvZ¥v‡K b`x cvi K‡i bi‡K †cuŠ‡Q †`q| wZwb GKevi GKwU g„Z AvZ¥vi gy‡LvgywL nb| G mgq wZwb ÒZvi Av½y‡ji msL¨v Rv‡b bvÓ Ggb KvD‡K †bŠKvq wb‡Z A¯^xKvi K‡ib| gvwS‡K mš‘ó Ki‡Z ZLb AvZ¥v‡K Av½y‡ji msL¨v †ei Ki‡Z GKwU MYbvi Qov AvIov‡Z nq| (Aek¨ wMÖK M‡í gvwS PvBZ UvKv, hv g„Z e¨w³i wRnŸvi wb‡P euvav \_vKZ)|

cÖvPxb c„w\_ex‡Z ¸b‡Z cviZ nv‡Z †Mvbv wKQy gvbyl| Z‡e msL¨v I MYbvi †gŠwjK aviYv¸‡jv memgq gvbyl AvqË K‡i wjL‡Z-co‡Z cvivi Av‡MB| Av‡MKvi hy‡Mi mf¨Zvi gvbyl hLb LvMov w`‡q gvwUi wjwc‡Z wjL‡Z, cv\_‡i †Lv`vB K‡i Qwe AuvK‡Z I cïPg© I c¨vcvBiv‡m Kvwj w`‡q wjL‡Z ïiæ K‡i, ZZ w`‡b msL¨vc×wZ mycÖwZwôZ n‡q †M‡Q| †gŠwLK msL¨vc×wZ‡K wjwLZ AvKv‡i Dc¯’vcb RwUj wKQy wQj bv| `iKvi ïay GKwU mv‡¼wZK c×wZ| hvi gva¨‡g †jLKiv msL¨v‡K AviI ¯’vqx iƒc w`‡Z cv‡i| (wKQy wKQy mgv‡Ri gvbyl †Zv †jLv‡jwL †kLvi Av‡MB GB KvRwU K‡i †d‡j‡Q| †hgb wbi¶i BbKviv KzBcy bv‡g GKwU c×wZ e¨envi KiZ| GUv wQj wnmve Kivi Rb¨ evbv‡bv GKwU iwOb I wMuU euvav `wo|)

cÖ\_gw`‡Ki †jLK‡`i †jLv msL¨v¸‡jvi mv‡\_ Zv‡`i msL¨vc×wZi wgj \_vKZ| Avi AbywgZfv‡eB Zviv †mUv h\_vm¤¢e msw¶ß Dcv‡q wjLZ| M‡Mi mg‡qi c‡i mgvR Rxe‡b DbœwZ mvwaZ n‡q‡Q| G‡Ki ci GK †QvU †QvU `v‡Mi ¸”Q bv evwb‡q †jLKiv cÖwZwU ¸‡”Qi R‡b¨ cÖZxK ˆZwi Kij| cuvP-wfwËK msL¨vc×wZ‡Z †jLK GK †jLvi R‡b¨ nqZ GKwU `vM †`‡eb| cuvP-Gi GKwU ¸”Q †evSv‡Z Avjv`v Av‡iKwU wPý e¨envi Ki‡eb| 25-Gi ¸”Q †evSv‡Z e¨envi Ki‡eb Ab¨ Av‡iKwU `vM| Gfv‡eB Pj‡e|

wgkixqiv wVK GB KvRwUB K‡i‡Q| 5 nvRvi eQ‡iiI Av‡M, wcivwgWI ˆZwii Av‡MB wgkixqiv Zv‡`i `kwgK c×wZ‡K †jLvq iƒc †`Iqvi GKwU wbqg ˆZwi K‡i| †mLv‡b Zviv Qwe w`‡q msL¨v †evSvZ| GKwU Lvov `vM w`‡q GK GKK †evSv‡bv nZ| Avevi †Mvovwji GKwU nvo w`‡q †evSv‡bv nZ 10, GKwU †gvPov‡bv `wo wQj 100 BZ¨vw`| Gfv‡e msL¨v wj‡L hvIqvi R‡b¨ Zv‡`i‡K ïay GB cÖZxK¸‡jvi ¸”Q †iKW© Ki‡Z nZ| GK k †ZBk †evSv‡bvi R‡b¨ 123wU `vM †`Iqvi e`‡j †jLKiv QqwU cÖZxK wjLZ| GKwU iwk, `ywU †Mvovwj I wZbwU Lvov `vM| cÖvPxbKv‡jB g~jZ Gfv‡eB MvwYwZK KvR nZ| Avi Ab¨ A‡bK mf¨Zvi g‡ZvB wgk‡iI k~b¨ wQj bv| ev ejv hvq, cÖ‡qvRb nqwb|

ZeyI cÖvPxb wgkixqiv MwY‡Z fv‡jvB nvZ cvwK‡qwQj| †R¨vwZwe©`¨v I mgq MYbvq Zviv Kvwikgv †`wL‡qwQj| Zvi gv‡b Zv‡`i‡K DbœZ MwYZ e¨envi Ki‡Z n‡qwQj| KviY cwÄKvi cvZv Lye `ªæZ e`‡j hvq|

‡ewkifvM cÖvPxb gvby‡li Kv‡QB GKwU w¯’wZkxj cwÄKv evbv‡bv wQj eo GK mgm¨vi KvR| Gi KviY wQj Zviv mvaviYZ Pv›`ª cwÄKv w`‡q KvR ïiæ Ki‡Zb| cici `ywU c~wY©gvi gv‡Si mgqUyKz wQj GK gvm| Gfv‡e MYbv KivB wQj mnRvZ Af¨vm| AvKv‡k Puv‡`i eo-‡QvU nIqv mn‡RB mevi bRi Kv‡o| Avi mg‡qi Pµ wnmve Kivi R‡b¨ GLvb †\_‡K myweavRbK GKwU DcvqI Lyu‡R cvIqv hvq| wKš‘ Pv›`ª gv‡mi ˆ`N¨© nq 29 †\_‡K 30 w`‡bi gvSvgvwS| 12wU gvm †hvM K‡i me wgwj‡q 354 w`‡bi †ewk cvIqv hvq bv| hv †mŠi eQ‡ii †P‡q 11 w`b Kg| Pv›`ª gvm †ZiwU wb‡j Avevi 19 w`b †ewk n‡q hvq| Iw`‡K Avevi Pvlvev` wbf©i K‡i †mŠi eQ‡ii Ici, Pv›`ª eQi bq| Ams‡kvwaZ Pv›`ª gvm w`‡q wnmve Ki‡j FZyi gvm¸‡jv‡K e`‡j †h‡Z †`Lv hvq|

Pv›`ª gvm‡K ms‡kvab KivI Av‡iK gykwK‡ji KvR| AvaywbK mg‡qI †mŠw` Avie I Bmiv‡qjmn A‡bK¸‡jv †`k GLbI cwigvwR©Z Pv›`ª cwÄKv e¨envi K‡i| wKš‘ 6 nvRvi eQi Av‡M wgkixqiv AviI fvj GKwU mgvavb †c‡q hvq| Zv‡`i w`‡bi wnmve ivLvi c×wZwU wQj LyeB mij| †mB cwÄKv FZyi mv‡\_ wgj †i‡L PjZ A‡bK w`b ch©šÍ| mg‡qi wnmve ivL‡Z Zviv Puv‡`i e`‡j m~‡h©i avi¯’ nq| †hgbUv eZ©gv‡b †ewkifvM RvwZ K‡ib|

Pv›`ª cwÄKvi g‡ZvB Zv‡`i gvm wQj 12wU| wKš‘ cÖwZwU gvm wQj 30 w`‡bi| (10-wfwËK msL¨v e¨envi Kivq Zv‡`i GK mßv‡ni ˆ`N¨© wQj 10 w`b| eQi †kl n‡j AviI evowZ cuvPwU w`b †hvM Kiv nZ| G‡Z K‡i me wgwj‡q 365 w`b n‡q †hZ| GB cwÄKvB Avgv‡`i eZ©gvb K¨v‡jÛv‡ii Avw`iƒc| wgkixq‡`i GB c×wZ wMÖK I c‡i †ivgvbiv MÖnY K‡i| †ivgvbiv G‡K cwigvR©b K‡i Awael© †hvM K‡i| GUvB c‡i cvðv‡Z¨ Av`k© cwÄKv wn‡m‡e AvZ¥cÖKvk K‡i| Z‡e wgkixq, wMÖK I †ivgvb‡`i Kv‡Q k~‡b¨i e¨envi bv \_vKvq cwðgv cwÄKvqI †bB k~b¨| GB Ag‡bvhMB mnmª eQi c‡i mgm¨vi KviY n‡q `uvovq|

wgkixq‡`i †mŠi cwÄKvi D™¢veb wQj `viæY GK AMÖMwZ| Z‡e BwZnv‡mi cvZvq Zviv AviI ¸iZ¡c~Y© GKwU Ae`v‡bi ¯^v¶iI iv‡L| R¨vwgwZi Ávb| k~b¨ QvovB wgkixq Aí mg‡qi g‡a¨B MwY‡Zi we‡klÁ n‡q I‡V| cv‡kB GKwU DËvj b`xi Dcw¯’wZ‡Z Avm‡j bv n‡qI Dcvq wQj bv| cÖwZ eQi bxj b‡`i cvwb Dc‡P c‡o Gi K‚j fvwm‡q w`Z| eØx‡c †b‡g AvmZ eb¨v| GKwU fvj w`KI wQj Gi| DbœZ cwj G‡m RgZ K…wl Rwg‡Z| Gi d‡j cÖvPxb c„w\_ex‡Z bxj eØxc n‡q D‡VwQj me‡P‡q De©i K…wlRwg| Lvivc w`‡Ki g‡a¨ wQj mxgvbvi `vM nvwi‡q hvIqv| K…lKiv eyS‡Z cvi‡Zb bv †KvbUv Kvi Avevw` Rwg| wgk‡i gvwjKvbv‡K Lye ¸iZ¡ †`Iqv nZ| wgkixq eB eyK Ae †WW co‡j †`Lv hvq, GKRb g„Z gvbyl‡K Ck¦‡ii Kv‡Q kc\_ K‡i ej‡Z nq †h †m cÖZviYv K‡i Zvi cÖwZ‡ekxi Rwg `Lj K‡iwb| GB cv‡ci kvw¯Í wQj GK fqvbK f¶K cÖvYx‡K cvcxi ü`wcÐ †L‡Z †`Iqv| wgk‡i Pywi Kiv wQj kc\_ fvOv, KvD‡K nZ¨v Kiv ev gw›`‡ii †fZ‡i ¯^‰g\_y‡bi g‡ZvB KwVb Aciva|

cÖvPxb †divDbiv ¶q¶wZ cwigvc I bZyb K‡i mxgvbv wb‡`©kK ¯’vcb Kivi Rb¨ Rwic-Avwgb wb‡qvM w`Z| Avi Gfv‡eB Rb¥ nq R¨vwgwZi| GB Rwic-Avwgb ev `wo cÖmviKiv (G bvg †`Iqi KviY Zviv cwigv‡ci hš¿ I wMuU euvav iwk w`‡q mg‡KvY evbvZ) †kl ch©šÍ Rwg‡K AvqZ‡¶Î I wÎfy‡R wef³ K‡i †¶Îdj †ei Kivi Kvq`v †ei K‡i| GQvov wgkixqiv wcivwg‡Wi g‡Zv wewfbœ e¯‘i AvqZb gvcvi †KŠkjI AvqË K‡i| cy‡iv f~ga¨mvMi GjvKvq wgkixq MwYZ L¨vwZ AR©b K‡iwQj| Ges m¤¢eZ cÖv\_wgK hy‡Mi wMÖK MwYZwe`iv, we‡kl K‡i \_¨vwjm I wc\_v‡Mviv‡mi g‡Zv R¨vwgwZwe`iv wgk‡i cov‡kvbv K‡iwQ‡jb| wKš‘ wgkixq‡`i GZme `viæY R¨vwgwZK Kg© m‡Ë¡I wgk‡ii †Kv\_vI k~‡b¨i Aw¯ÍZ¡ wQj bv|

Gi eo KviY, wgkixqv wQj Kov ev¯Íeev`x| AvqZb Ges w`b I NÈv cwigv‡ci †ewk wKQy Zviv Ki‡Z cv‡iwb| cÖ‡qvM †bB Ggb †Kv‡bv wKQy‡Z MwYZ Zviv Kv‡R jvMvZ bv| e¨wZµg n‡jv †R¨vwZlwe`¨v (astrology)2| G Kvi‡Y wgk‡ii †miv MYwZwe`ivI ev¯Íe RM‡Zi mv‡\_ Am¤úwK©Z †Kv‡bv MvwYwZK mgm¨vq R¨vwgwZi g~jbxwZ‡K Kv‡R jvMv‡Z cvi‡Zb bv| Zviv Zv‡`i MvwYwZK e¨e¯’v‡K weg~Z© hyw³i KvVv‡gv‡Z iƒc w`‡Z cv‡iwb| MwYZ‡K `k©‡b ¯’vb w`‡ZI Zv‡`i †Kv‡bv D‡`¨vM wQj bv| wMÖKiv Avevi Ggb wQj bv| weg~Z© I `vk©wbK hyw³‡K Zviv mv`‡i MÖnY K‡iwQ‡jb| cÖvPxb MwYZ‡K ZvivB m‡e©v”P D”PZvq wb‡q wM‡qwQj| ZeyI Zviv k~b¨ Avwe®‹vi Ki‡Z cv‡iwb| k~‡b¨ G‡m‡Q cÖvP¨ †\_‡K| cvðvZ¨ †\_‡K bq| ///////////

k~‡b¨i Rb¥

*ms¯‹„wZi BwZnv‡m k~‡b¨i Avwe®‹vi gvby‡li Ab¨Zg eo AR©b wn‡m‡e memgq ¯^Y©v¶‡i †jLv \_vK‡e|*

-‡Uvweqvm W¨vbwRM , bv¤^vi: `¨ j¨vs¸‡qR Ae mv‡qÝ

wgkixq‡`i †P‡q wMÖKiv MwYZUv fvj eySZ| wk‡LwQj wKš‘ wgkixq‡`i Kv‡QB| Z‡e Aí w`‡bi gv\_vqB wMÖKiv ¸iæ‡`i‡K Qvwo‡q hvq| ïiæ‡Z wMÖK‡`i msL¨vc×wZ wgkixq‡`i g‡ZvB wQj| wMÖK‡`i GKwU 10-wfwËK MYbvc×wZI wQj| `yB ms¯‹„wZi msL¨v †jLvi c×wZ‡ZI cv\_©K¨ wQj Lye mvgvb¨| msL¨v †evSv‡Z wgkixq‡`i g‡Zv Qwe e¨envi bv K‡i wMÖKiv e¨envi Kij A¶i| H (BUv)3 gv‡b †nKvUb ev 100| M (wgD) gv‡b wgwiIwi ev 10,000| Bs‡iwR‡Z hv‡K e‡j wgwiqvW (myriad)| wMÖK c×wZ‡Z GUvB wQj me‡P‡q eo ¸”Q| cuv‡Pi R‡b¨I Zv‡`i GKwU cÖZxK wQj| hv †\_‡K †evSv hv‡”Q, Zv‡`i c×wZwU wQj cuvP I `k-wfwËK c×wZi wgkªY| wKš‘ mvwe©Kfv‡e †ek wKQy w`b ch©šÍ wgkixq I wMÖK‡`i †jLvi Kvq`v wQj cÖvq GKB| Z‡e wgkixqiv GKB RvqMvq †\_‡K †M‡jI wMÖKiv Avw`g GB c×wZi DbœwZ K‡i AviI AvaywbK †KŠkj Avwe®‹vi K‡i|

wgkixq‡`i g‡Zv `ywU AuvPo w`‡q 2 ev wZbUv H wj‡L 300 bv eywS‡q bZyb c×wZ‡Z wMÖKiv 2, 3 , 300 I AviI eû msL¨vi Rb¨ (wPÎ 1) Avjv`v Avjv`v A¶i e¨envi Kij| G c×wZi cÖeZ©b N‡U L„óc~e© 500 mv‡ji Av‡M| G †KŠk‡ji gva¨‡g A¶‡ii cybive„wË †VKv‡bv †Mj| †hgb, 87 wjL‡Z n‡j wgkixq c×wZ‡Z 15wU cÖZxK jvMZ| AvUwU †Mvovwj I mvZwU Lvov `vM| wMÖK‡`i bZyb c×wZ‡Z †mLv‡b †j‡M‡Q gvÎ `ywU cÖZxK| 80 Gi Rb¨ Π Ges 7 Gi Rb¨ ζ| (‡ivgvb c×wZ G‡m wMÖK c×wZ‡K AcmviY K‡i| wKš‘ †ivgvb‡`i c×wZ GK avc †cQ‡b wM‡q wgkixq‡`i AbybœZ c×wZB MÖnY K‡i| †ivgvb 87, LXXXVIIwjL‡Z n‡j mvZwU cÖZxK jv‡M| A‡bK¸‡jv cÖZxKB GKvwaKevi G‡m‡Q|)

wMÖK‡`i c×wZ wgkixq‡`i †P‡q DbœZ n‡jI GwU cÖvPxbKv‡j †jLv‡jwLi me‡P‡q DbœZ †KŠkj bq| G gh©v`v cv‡e cÖv‡P¨i Av‡iKwU D™¢veb| MYbvi e¨vwejbxq †KŠkj| Avi Zv‡`i c×wZi Kvi‡YB †kl ch©šÍ cÖv‡P¨ k~‡b¨i D`q N‡U| eZ©gvb Biv‡Ki dvU©vBj wµ‡m›U AÂ‡j|

cÖ\_‡g †`‡L e¨vwejbxq c×wZ‡K G‡jv‡g‡jv g‡b n‡e| cÖ\_gZ, GUv n‡jv 60-wfwËK c×wZ| †`L‡Z-ïb‡Z LyeB A™¢yZ †V‡K| KviY †ewkifvM mgv‡RB †Zv 5, 10 ev 20 wQj wfwË msL¨v| GQvov e¨vwejbxqiv Zv‡`i msL¨v¸‡jv cÖKvk Ki‡Z gvÎ `ywU `vM e¨envi KiZ| GKwU KxjK w`‡q 1 I GKwU Wvej KxjK w`‡q 10| GB `vM `ywU‡K ¸”Q ¸”Q K‡i mvRv‡bv nZ| †hvMdj nZ 59 ev Zvi Kg| GB ¸”Q¸‡jvB wQj MYbvi †gŠwjK cÖZxK| wVK †hfv‡e wMÖK‡`i wQj A¶i Avi wgkixq‡`i wQj Qwe| wKš‘ e¨vwejbxq c×wZi A™¢yZ w`K GwU bq| wgkixq I wMÖK‡`i †hLv‡b cÖwZwU cÖZxK w`‡q Avjv`v Avjv`v msL¨v †evSv‡bv nZ, †mLv‡b e¨vwejbxq‡`i cÖwZwU cÖZxK w`‡q A‡bK¸‡jv Avjv`v Avjv`v msL¨v †evSv‡bv †hZ| GKwUgvÎ KxjK w`‡q 1, 60, 3600 ev Ab¨ AviI AMwYZ msL¨v cÖKvk Kiv nZ|

wPÎ 1: wewfbœ ms¯‹„wZi msL¨v

AvaywbK †PvL GUv †`‡L AevK n‡jI cÖvPxb gvby‡li Kv‡Q GwU wQj LyeB A\_©en| G‡K †eªvÄ hy‡Mi Kw¤úDUvi †KvW ejv P‡j| Ab¨ A‡bK ms¯‹„wZi g‡ZvB e¨vwejbxqivI MYbvi Kv‡R mnvqZv Kiv hš¿ Avwe®‹vi K‡iwQj| Gi g‡a¨ me‡P‡q weL¨vZ hš¿ n‡jv A¨vevKvm| hš¿Uv Rvcv‡b m‡ivevb, Px‡b myqvb-cvb, ivwkqvq ¯‹wU, Zyi‡¯‹ Kzjev, Av‡g©wbqvq †Kv‡je Ges Ab¨vb¨ ms¯‹„wZ AviI bvbvb bv‡g cwiwPZ wQj| A¨vevKv‡m wcQjv‡bv cv\_i e¨envi K‡i msL¨vi cwigv‡Yi wnmve ivLv nZ| (K¨vjKz‡jU ev wnmve Kiv, K¨vjKzjvm I K¨vjwmqvg me¸‡jv kãB bywo k‡ãi j¨vwUb iƒc K¨vjKzjvm †\_‡K Avmv| )

cv\_i‡K Dc‡i-bx‡P bovPov K‡iB †hvM K‡i †djv †hZ A¨vevKv‡m| wfbœ ¯Í‡¤¢i (Kjvg) cv\_‡ii mvswL¨K gvb wQj wfbœ| G¸‡jv‡K bvwo‡q `¶ e¨enviKvix eo eo msL¨v Lye `ªæZ †hvM K‡i †dj‡Zb| wnmve †kl n‡j e¨enviKvix‡K ïay cv\_‡ii me©‡kl Ae¯’v‡bi w`‡K ZvKv‡Z nZ| Gevi †m¸‡jv‡K msL¨vq iƒcvšÍi K‡i wb‡jB †Kjøvd‡Z! ///////

e¨vwejbxq‡`i msL¨v wb‡q KvR Kivi c×wZwU gvwUi dj‡K A¨vevKvm‡K cÖZxK w`‡q wj‡L †djvi g‡Zv| cÖZx‡Ki cÖwZwU ¸”Q w`‡q †h wbw`©ómsL¨K cv\_i A¨vevKv‡m bvov‡bv n‡q‡Q Zv †evSv‡bv nZ| Avi A¨vevKv‡mi cÖwZwU Kjv‡gi g‡ZvB Ae¯’v‡bi Ici wbf©i K‡i cÖwZwU ¸‡”Qi Avjv`v Avjv`v mvswL¨K gvb wQj| GB w`K †\_‡K Avgiv GLb †h c×wZ e¨envi Kwi, e¨vwejbxq c×wZ A‡bKUv GKBiKg wQj| 111 Gi cÖwZwU 1-Gi gvb wfbœ| Wvb †\_‡K Zv‡`i gvb h\_vµ‡g GK, `k I GKk (111 = 100 + 10 + 1)| GKBfv‡e 𒁹𒁹𒁹 Gi wZbwU Avjv`v Ae¯’v‡b 𒁹 Gi gv‡b h\_vµ‡g GK, lvU I QwÎk k (3600)| GKwU mgm¨v ev` w`‡j GUvI wVK A¨vevKv‡mi g‡ZvB wQj| e¨vwejbxqiv 60 wjLZ Kxfv‡e? 1 †jLv †Zv mnR| GKwU KxjK (𒁹)| `~f©v‡M¨i e¨vcvi n‡jv 60-I †jLv nZ Gfv‡eB| GKgvÎ cv\_©K¨ n‡jv cÖ\_g Ae¯’v‡bi e`‡j 𒁹 \_vKZ wØZxq Ae¯’v‡b| A¨vevKvm w`‡q †evSv †hZ †Kvb msL¨vwU †evSv‡bv n‡”Q| GKwUgvÎ cv\_i cÖ\_g Kjv‡g Av‡Q bv wØZxq Kjvg Av‡Q Zv †Zv †`‡L mn‡RB †evSvB hvq| wKš‘ wjL‡Z †M‡j? GKwU wjwLZ cÖZxK †Kvb Kjv‡g wQj Zv wj‡L †evSv‡bvi R‡b¨ e¨vwejbxq‡`i †Kv‡bv c×wZ wQj bv| 𒁹-Gi A\_© n‡Z cviZ 1, 60 ev 3600| msL¨v¸‡jv wgwkªZ n‡j e¨vcviUv AviI Lvivc n‡q `uvovq| 𒁹𒁹 Gi A\_© n‡Z cv‡i 61, 3601 ev 3660 ev AviI eo wKQy|

wPÎ 1.2: 60-wfwËK e¨vwejbxq msL¨v

G mgm¨vi mgvavb n‡jv k~b¨| L„óc~e© cÖvq 300 mv‡ji w`‡K e¨vwejbxqiv A¨vevKv‡mi Lvwj Kjvg ev duvKv ¯’vb †evSv‡Z `ywU euvKv‡bv KxjK, 𒀺𒀺, e¨envi Ki‡Z ïiæ K‡i| Gi gva¨‡g †evSv †hZ GKwU cÖZxK †Kvb Ae¯’v‡b Av‡Q| k~b¨ Avmvi Av‡M 𒁹𒁹- †K 61-I ejv †hZ, 3601-I ejv †hZ| wKš‘ k~b¨ Avmvi c‡i 𒁹𒁹 w`‡q †evSvj 61 Avi 3601 †jLv nZ 𒁹𒀺𒀺𒁹|(wPÎ 2)| e¨vwejbxq A‡¼i wbw`©ó µg‡K Abb¨ I ¯’vqx A\_© cÖ`vb Ki‡Z k~‡b¨i Rb¥ nq| k~b¨ `viæY Kv‡R Avmj| wKš‘ Gi wQj ïayB ¯’vbxq Ae¯’vb| A¨vevKv‡mi duvKv ¯’vb e¨envi Kivi Rb¨B ïay G‡K e¨envi Kiv n‡jv| A¨vevKv‡mi †h Kjv‡g me¸‡jv cv\_i bx‡P c‡o \_vKZ †m Kjv‡gi R‡b¨| Ab¨ A¼¸‡jv‡K mwVK RvqMvq emv‡bv wbwðZ Kivi †P‡q †Zgb †ewk †Kv‡bv wQj bv k~‡b¨i| Gi wbR¯^ †Kv‡bv mvswL¨K gvb wQj bv| Avi hvB †nvK, 00,00,21,48 Avi 2148 †Zv GKB msL¨vB| GK ¸”Q A‡¼i g‡a¨ k~‡b¨i euv‡q †Kv‡bv A¼ \_vK‡j Z‡eB k~b¨ A\_©en nq| Gi wbR¯^ ej‡Z Av‡Q ... k~b¨| k~b¨ wQj GKwU A¼, msL¨v bq| Gi †Kv‡bv gvb wQj bv| ////////

wPÎ 2: wKQy e¨vwejbxq msL¨v

GKwU msL¨vi gvb cvIqv hvq msL¨v‡iLvq (number line) Gi Ae¯’vb †\_‡K| Ab¨ msL¨v‡`i mv‡c‡¶ Gi Ae¯’vb Zyjbv K‡i| †hgb, 2 msL¨vwU Av‡m 3 Gi Av‡M Ges 1 Gi c‡i| Ab¨ †Kv\_vI G‡K ivLvi †Kv‡bv hyw³ †bB| wKš‘ msL¨v‡iLvq k~b¨wU `v‡Mi Rb¨ ïiæ‡Z †Kv‡bv Ae¯’vb wQj bv| GUv wQj ïay GKwU cÖZxK| msL¨v‡`i µgweb¨v‡m Gi R‡b¨ †Kv‡bv ¯’vb wQj bv| GgbwK GLbI Avgiv k~b¨‡K A‡bKmgq AmsL¨v (nonnumber) wn‡m‡e we‡ePbv Kwi| hw`I Avgiv mevB Rvwb, k~‡b¨i Av‡Q GKwU mvswL¨K gvbI| k~‡b¨i mvswL¨K gvb bv eywS‡qI G‡K ¯’vb wb‡`©kK wn‡m‡e e¨envi Kwi| †Uwj‡dvb ev Kw¤úDUvi wK‡ev‡W©i w`‡KB ZvwK‡q †`Lyb bv| 0 Av‡Q 9 Gi c‡i| 1 Gi Av‡M bq, †hLv‡b Gi \_vKvi K\_v| ¯’vb wb‡`©kK 0 †Kv\_vq emj Zv‡Z wKQy Av‡m hvq bv| msL¨vi µgweb¨v‡m GwU †h‡Kv‡bv RvqMvqB em‡Z cv‡i| wKš‘ GLb mevB Rv‡b, k~b¨‡K Avm‡j msL¨v‡iLvi †h‡Kv‡bv GK RvqMvq emv‡j n‡e bv| KviY Gi wbR¯^ GKwU wbw`©ó mvswL¨K gvb Av‡Q| GwUB abvZ¥K I FYvZ¥K msL¨vi g‡a¨ cv\_©K¨ K‡i| GwU GKwU †Rvo msL¨v| Avi GwU 1 Gi Av‡Mi c~Y© msL¨v| msL¨v‡iLvq k~b¨‡K Gi Dchy³ RvqMvq ¯’vb w`‡Z n‡e| (+1)- Gi Av‡M Ges (-1)- Gi c‡i| Ab¨ †Kv\_vI msL¨vwU A\_©c~Y© nq bv| ZeyI Kw¤úDUv‡i k~‡b¨i Ae¯’vb mevi †k‡l| Avi †Uwj‡dv‡b mevi bx‡P| KviY Avgiv ¸b‡Z ïiæ Kwi 1 †\_‡K|

‡`‡L g‡b nq MYbv ïiæi R‡b¨ GK (1)-B mwVK msL¨v| wKš‘ †mUv Ki‡j k~b¨ P‡j hv‡”Q A¯^vfvweK GK RvqMvq| †gw·‡Kv I ga¨ Av‡gwiKvi gvqvb RvwZmn wewfbœ ms¯‹„wZ‡Z GK w`‡q ïiæ Kiv‡K ¯^vfvweK g‡b Kiv nZ bv| gvqvb‡`iI GKwU msL¨vc×wZ I cwÄKv wQj| †mwU Avgv‡`i c×wZi †P‡qI †ewk A\_©en wQj| e¨vwejbxq‡`i g‡ZvB gvqvb‡`i wQj A¼ I ¯’v‡bi ¯’vbxq gvb c×wZ| GKgvÎ cv\_©K¨ n‡jv, †hLv‡b e¨vwejbxq‡`i msL¨vi wfwË wQj 60, gvqvb‡`i †mLv‡b wfwË wQj 20| ZviI Av‡M cÖPwjZ 10-wfwËK msL¨vc×wZi aviYv G‡Z Kv‡R jvMv‡bv n‡qwQj| e¨vwejbxq‡`i g‡ZvB Zv‡`iI cÖZxwU A‡¼i A\_© †Lqvj ivLvi R‡b¨ GKwU k~‡b¨i `iKvi c‡owQj| AviI gRvi e¨vcvi n‡jv, gvqvb‡`i `yB ai‡bi A¼ wQj| mij iƒ‡c wQj ïay we›`y Avi †iLv| Avi RwUj iƒcwU evbv‡bv n‡qwQj A™¢yZ`k©b gyLveq‡ei wM­d (glyph)w`‡q| AvaywbK †Pv‡L Avcbvi Kv‡Q gvqvb‡`i wjwLZ wM­d‡K wfbMÖ‡ni cÖvYxi gy‡Li g‡ZvB g‡b n‡e (wPÎ 3)|

wgkixq‡`i g‡Zv gvqvb‡`iI `viæY GKwU †mŠi cwÄKv wQj| MYbvc×wZ 20-wfwËK nIqv‡Z ¯^vfvweKfv‡eB Zviv eQi‡K 20 w`b †gqv‡`i 18wU gv‡m wef³ K‡iwQj| †hvM Ki‡j hv nq 360 w`b| eQi †k‡l Dqv‡qe bv‡g we‡kl cuvPwU w`b †hvM K‡i 365 evbv‡bv nZ| wKš‘ wgkixq‡`i bv \_vK‡jI gvqvb‡`i MYbvc×wZ‡Z GKwU k~b¨ wQj| d‡j Zviv hv Kivi ZvB Kij| w`‡bi wnmve Kiv ïiæ Kij k~b¨ †\_‡K| wRc gv‡mi cÖ\_g w`b‡K ejv nZ wR‡ci BÝU‡jkb ev ms¯’vcb| c‡ii w`b‡K ejv nZ 1 wRc| Zvi c‡i 2 wRc| Gfv‡eB PjZ 19 wRc ch©šÍ| c‡ii w`b‡K ejv nZ Rrh ev 0 Rr‡hi ms¯’vcb| Gi c‡i AvmZ 1 Rrh, 2 Rrh BZ¨vw`| cÖwZ gv‡m wQj 20wU w`b| hv‡`i‡K 0 †\_‡K 19 ch©šÍ m~wPZ Kiv nZ| GLb Avgiv †hfv‡e wjwL †Zgb 1 †\_‡K 20 bq| (gvqvb cwÄKv we¯§qKi iKg RwUj wQj| GB †mŠi cwÄKvi mv‡\_ GKwU Abyôvbag©x cwÄKvI wQj| G‡Z wQj 20wU mßvn| cÖwZ mßv‡n 13 w`b| †mŠi eQ‡ii mv‡\_ mgwš^Zfv‡e GB cwÄKvwU GKwU Pµ ˆZwi K‡i| 52-eQi `xN© GB P‡µi cwZ w`‡bi R‡b¨ wQj Avjv`v Avjv`v bvg|)

wPÎ 3: gvqvb msL¨v

eZ©gvb cvðvZ¨ e¨e¯’vi †P‡q gvqvb c×wZ †ewk A\_©c~Y© wQj| cvð¨v‡Z¨ cwÄKv ˆZwii mgq k~b¨ wQj bv| G Kvi‡Y Avgiv k~b¨ w`b ev k~b¨ eQi †`wL bv| AvcvZ`„wó‡Z k~b¨‡K ev` †`Iqvi †Kv‡bv D‡jøL‡hvM¨ cÖwZwµqv Av‡Q e‡j g‡b Kiv nq bv| A\_P Gi d‡jB wKš‘ A‡bK mgm¨v n‡q‡Q| k~b¨ bv \_vKvi Kvi‡Y mnmªv‡ãi m~Pbv wb‡q weZK© euv‡a| GKwesk kZ‡Ki cÖ\_g eQi wK 2000 bvwK 2001 Zv wb‡q gvqvb‡`i weZK© Kiv jvMZ bv| wKš‘ Avgv‡`i cwÄKvi m~Pbv gvqvbiv K‡iwb| K‡i‡Q wgkixqiv I c‡i †ivgvbiv| G Kvi‡Y Avgiv mgm¨vgq k~b¨wenxb cwÄKvq AvU‡K AvwQ|

wgkixq mf¨Zvq k~b¨ bv \_vKvi e¨vcviUv cwÄKv I fwel¨r cvðvZ¨ MwY‡Zi Rb¨ Lvivc dj e‡q Av‡b| Avm‡j MwY‡Zi R‡b¨ wgkixq mf¨Zv GKvwaK Kvi‡Y †bwZevPK dj e‡q Av‡b| ïay k~‡b¨i AfveB fwel¨‡Zi R‡b¨ mgm¨v ˆZwi K‡iwb| fMœvsk wb‡qI KvR Kivi fvj †Kv‡bv Dcvq Zviv †ei Ki‡Z cv‡iwb| GLb Avgiv 3/4 †K †hgb Pvifv‡Mi wZb fvM g‡b Kwi Zviv †mfv‡e †`LZ bv| Zviv G‡K wbQK 1/2 I 1/4 Gi †hvMdj wn‡m‡e †`LZ| 2/3 Qvov me fMœvsk‡K wgk‡i 1/n AvKv‡i msL¨vi †hvMdj AvKv‡i †jLv nZ| (‡hLv‡b n GKwU MYbvmsL¨v ev ¯^vfvweK msL¨v, gv‡b 1, 2, 3, ... BZ¨vw`)| 1/n †K ejv nZ Z\_vKw\_Z GKK fMœvsk| GB GKK fMœvsk‡`i wekvj mvwii Kvi‡Y wgkixq (I wMÖK) msL¨vc×wZ‡Z AbycvZ wb‡q KvR Kiv wQj `viæY KwVb GK KvR|

k~‡b¨i Avwef©ve G Amyweav `~i Kij| e¨vwejbxq c×wZ‡Z k~b¨ wQj| d‡j fMœvsk †jLv mnR n‡q †Mj| Avgiv 1/2 †K wVK †hfv‡e 0.5 wjL‡Z cvwi ev 3/4 †K 0.75, GKBfv‡e e¨vwejbxqiv 1/2‡K wjLZ 0;30, 3/4‡K wjLZ 0;45| (Avm‡j fMœvsk wb‡q KvR Ki‡Z e¨vwejbxq‡`i 60-wfwËK c×wZ Avgv‡`i AvaywbK 10-wfwËK c×wZi †P‡q †ewk myweavRbK|)

`~f©v‡M¨i welq n‡jv, †ivgvb I wMÖKiv k~b¨‡K N„Yv KiZ| †m N„Yvi cwigvY GZ †ewk wQj †h Zviv e¨vwejbxq‡`i c×wZ‡Z bv wM‡q wgkixq‡`i cÖZxK wb‡q c‡o iBj| A\_P e¨vwejbxq c×wZ wQj mnR| †R¨vwZwe©`¨vi mviwY evbv‡bvmn bvbvb Kv‡R RwUj wn‡me-wb‡Kk Kiv `iKvi nq| wMÖK c×wZ GZB RwUj wQj †h MwYZwe`iv GKK fMœvsk¸‡jv‡K e¨vwejbxq 60-wfwËK msL¨vq iƒcvšÍi KiZ| Zvici wn‡me †kl K‡i cÖvß msL¨v‡K Avevi wMÖK iƒc `vb KiZ| PvB‡jB Zviv A‡bK mgq euvPv‡Z cviZ| (fMœvMk‡K evievi iƒcvšÍi Ki‡Z †Kgb gRv Zv mevB Rvwb) wKš‘ wMÖKiv k~b¨‡K GZB N„Yv Ki‡Z †h Zviv G‡K Zv‡`i msL¨vc×wZ‡Z ¯’vb w`‡Z A¯^xKvi K‡i| hw`I myweav m¤ú‡K© RvbZ| KviY k~b¨‡K Zviv g‡b KiZ fq¼i|

k~‡b¨i fqvbK ˆewkó¨

*me‡P‡q cÖvPxb mg‡q evm KiZ Bwgi| wQj bv Rj ev ¯’j| ev †Kv‡bv †bvbv Zi½| wQj bv b‡fvgÐj ev f~gÐj| wQj ïay nuv K‡i \_vKv k~b¨Zv| †Kv\_vI wQj bv mey‡Ri we¯Ívi|*

-`¨ GjWvi GWv

msL¨v‡K Avevi gvbyl fq! GUv Kíbv KivI KwVb| ZeyI k~b¨Zv ev Abw¯Í‡Z¡i mv‡\_ k~b¨‡K †Rvi K‡i Rwo‡q †djv n‡qwQj| k~b¨Zv I wek„•Ljv wQj f‡qi eo GKwU KviY| k~b¨ wb‡qI wQj fq|

‡ewkifvM cÖvPxb gvbyl g‡b KiZ, gnvwe‡k¦i R‡b¥i Av‡M wQj ïay k~b¨Zv I wek„•Ljv| wMÖKiv ejZ, ïiæ‡Z AÜKvi wQj mewKQyi RbK| AÜKvi †\_‡K Gj wek„•Ljv| AÜKvi I wek„•Ljv †\_‡K Rb¥ nq evwK me m„wói| wneªæ m„wó cyiv‡Y Av‡Q, Ck¦i Av‡jv I ˆewkó¨ cÖ`vb Kivi Av‡M c„w\_ex wQj wek„•Lj I duvKv| (wneªæ K\_vwU n‡jv †Zvû f eû| ievU© †MÖf‡mi g‡Z GB †Zvû k‡ãi mv‡\_ †ZngZ kãwU RwoZ| †ZngZ n‡jv GKwU †m‡gUxq WªvMb, hv gnvwe‡k¦i R‡b¥i mgq Dcw¯’Z wQj| Gi †`n †\_‡K Av‡m c„w\_ex I AvKvk| Avi eûi mv‡\_ m¤úK© wQj †engZ-Gi, hv n‡jv wneªæ iƒcK\_vi weL¨vZ `vbe|) cÖvPxb wn›`y HwZ‡n¨ GKRb mªóvi K\_v ejv nq, whwb wek„•Ljvi gvLb‡K gš’b K‡i c„w\_ex m„wó K‡ib| bm© cyiv‡Y Av‡Q GKwU Db¥y³ k~b¨Zvi K\_v, hv eid w`‡q Ave„Z nq| Avi Av¸b I ei‡di wgkªY †\_‡K m„ó wek„•Ljv †\_‡K Rb¥ nq Avw` `vb‡ei| gnvwe‡k¦i Avw`g I mnRvZ Ae¯’v wQj k~b¨ I wek„•Lj| mg‡qi mgvwß‡Z k~b¨Zv I wek„•Ljv Avevi wd‡i Avmvi fq memgq Zvov K‡i wdiZ| k~b¨ wQj †mB k~b¨ZviB cÖwZ”Qwe| /////////

wKš‘ k~‡b¨i fq k~b¨Zv wb‡q A¯^w¯Í‡KI Qvwo‡q †Mj| cÖvPxb gvby‡li Kv‡Q k~‡b¨i MvwYwZK ˆewkó¨¸‡jv wQj e¨vL¨vZxZ| †hgwbfv‡e in‡m¨i Pv`‡i XvKv wQj gnvwe‡k¦i Rb¥ | Gi KviY k~b¨ Ab¨ msL¨v †\_‡K Avjv`v| e¨vwejbxq c×wZi Ab¨ msL¨vi g‡Zv k~‡b¨i KLbI wbR¯^ gh©v`v wQj bv| Gi KviYUvI h\_vh\_ wQj| wbtm½ k~‡b¨i AvPiY fvj bq| Kg K‡i ej‡jI, GwU Ab¨ msL¨vi g‡Zv AvPiY K‡i bv|

GKwU msL¨v‡K wb‡Ri mv‡\_ †hvM Kiæb| GwU cv‡ë hv‡e| G‡Ki mv‡\_ GK †hvM Ki‡j GK nq bv| nq `yB| `yB‡qi mv‡\_ `yB †hvM Ki‡j nq Pvi| wKš‘ k~‡b¨i mv‡\_ k~b¨ †hvM Ki‡j k~b¨B \_v‡K| GwU AvwK©wgwW‡mi Dccv`¨ †g‡b P‡j bv, hv msL¨vi †gŠwjK GKwU bxwZgvjv| Dccv`¨wU ej‡Q, †Kv‡bv wKQy‡K h‡\_ómsL¨K evi wb‡Ri mv‡\_ †hvM Ki‡j GwU gv‡bi w`K w`‡q mKj msL¨vi †P‡q eo n‡q hv‡e| (AvwK©wgwW‡mi Dccv`¨‡K cÖKvk Kiv n‡qwQj †¶Îd‡ji gva¨‡g| `y‡Uv Amgvb †¶Îd‡ji cv\_©K¨‡K GKwU msL¨v g‡b Kiv nZ) wKš‘ k~b¨ †Zv KLbI eo nq bv| GwU Ab¨ msL¨v‡KI eo Ki‡Z cv‡i bv| `yB I k~b¨ †hvM Ki‡j k~b¨B \_v‡K| †hb Avcwb msL¨vi †hvM Kiv‡KB †\_vovB †Kqvi Ki‡Qb| we‡qvM Ki‡jI N‡U GKB KvÐ| `yB †\_‡K k~b¨ we‡qvM Ki‡jI `yB-B cv‡”Qb| k~‡b¨i †hb †Kv‡bv `vgB †bB| Zey GB `vgnxb msL¨vB ¸Y I fv‡Mi g‡Zv MwY‡Zi me‡P‡q mij KvR¸‡jv‡K A\_©nxb K‡i w`‡Z Pvq|

msL¨vi RM‡Z ¸Y n‡jv GK ai‡bi cÖmviY| Av¶wiK A‡\_©B ejwQ| g‡b Kiæb, msL¨v‡iLv n‡jv GKwU iev‡ii wdZv| hvi Mv‡q wewfbœ `vM †`Iqv Av‡Q| (wPÎ 4) `yB w`‡q ¸Y Kiv gv‡b wdZv‡K `yB ¸Y cÖmvwiZ Kiv| Av‡M †h `vMwU GK wQj, GLb †mwU `yB| Av‡M †h `vMwU wZb b¤^i Ae¯’v‡b wQj, GLb Zvi Ae¯’vb Q‡q| GKBfv‡e G‡Ki A‡a©K w`‡q ¸Y Kiv gv‡b wdZvUv‡K GKUy wkw\_j Kiv| Av‡M †h `vMwU wQj `yB bs Ae¯’v‡b, GLb †mwU Av‡Q GK bs Ae¯’v‡b| Av‡M †h `vMwU wQj wZ‡b, GLb †mwU Av‡Q †`‡o| wKš‘ k~b¨ w`‡q ¸Y Ki‡j Kx n‡e?

wPÎ 4: iev‡ii ¸‡Yi wdZv

‡h‡Kv‡bv wKQy‡K k~b¨ w`‡q ¸Y Ki‡j k~b¨ nq| d‡j me¸‡jv `vM P‡j Av‡m k~b¨‡Z|

iev‡ii wdZv †kl| cy‡iv msL¨v‡iLvB †kl|

`~f©v‡M¨i e¨vcvi n‡jv, GB AwcÖq mZ¨‡K Gov‡bvi †Kv‡bv Dcvq †bB| †h‡Kv‡bv wKQy‡K k~b¨ w`‡q ¸Y Ki‡j k~b¨B nq| GUv Avgv‡`i msL¨vc×wZi GKwU wbqg| ˆ`bw›`b msL¨v¸‡jv‡K A\_©en n‡Z n‡j Zvi eÈb ˆewkó¨ \_vK‡Z n‡e| GKUv D`vniY wPšÍv Kiæb| aiæb, GKwU †Ljbvi †`vKv‡b ej wewµ Kiv nq `ywU K‡i Avi BU wewµ Kiv nq wZbwU K‡i| cv‡ki †Ljbvi †`vKv‡b wewµ nq `ywU ej I wZbwU B‡Ui wgwkªZ c¨vK| GK e¨vM ej I GK e¨vM BU wg‡j hv nq, cv‡ki †`vKvbwUi GKwU wgkªY c¨vKI ZvB nq| e¨vcviUv wVK \_vK‡e hw` GK †`vKv‡bi mvZ e¨vM ej I mvZ e¨vM BU cv‡ki †`vKvb †\_‡K †Kbv wgkªY c¨v‡Ki mvZwUi mgvb nq| GUvB eÈb ag©| MvwYwZKfv‡e Avgiv ewj, 7 × 2 + 7 × 3 = 7 × (2+3)| mewKQy wVK Av‡Q|

GB ˆewkó¨ k~‡b¨i †¶‡Î cÖ‡qvM Ki‡Z †M‡j A™¢yZ dj wgj‡e| Avgiv Rvwb, 0 + 0 = 0| Zvn‡j GKwU msL¨v‡K 0 w`‡q ¸Y Kiv Avi (0 +0) w`‡q ¸Y Kiv GKB n‡e| D`vniY †`Lv hvK| 2 × 0 = 2 (0 + 0)| wKš‘ eÈb ag© ej‡Q, 2 (0 + 0) Avi 2 × 0 + 2 × 0 GKB wRwbm| wKš‘ Gi A\_© n‡e 2 × 0 = 2 × 0 + 2 × 0| 2 × 0 Gi gvb hvB †nvK, G‡K Gi mv‡\_ †hvM Ki‡j Av‡Mi gvbB \_v‡K| G‡K A‡bKUv k~‡b¨i g‡ZvB g‡b nq| Avm‡jB GwU ZvB| mgxKi‡Yi `yB cvk †\_‡K 2 × 0 we‡qvM Ki‡j Avgiv †`wL 0 = 2 × 0| AZGe, Avcwb hvB K‡ib bv †Kb, GKwU msL¨v‡K k~b¨ w`‡q ¸Y Ki‡j k~b¨B wgj‡e| GB weiw³Ki msL¨vUv msL¨v‡iLv‡K `yg‡o-gyP‡o we›`y evwb‡q †`q| Z‡e GB ˆewkó¨ weiw³Ki n‡jI k~‡b¨i Avmj ¶gZv †Ui cvIqv hvq ¸‡Yi e`‡j fvM w`‡Z †M‡j|

wVK †hfv‡e ¸Y msL¨v‡iLv‡K cÖmvwiZ K‡i, †Zgwb fvM K‡i m¼ywPZ| `yB w`‡q ¸Y Ki‡j msL¨v‡iLv `yB ¸Y cÖmvwiZ n‡e| `yB w`‡q fvM Ki‡j msL¨v‡iLvi iev‡ii wdZv `yB ¸Y wkw\_j n‡e| ¸‡Yi cÖfve evwZj n‡q hv‡e| fvM Ki‡jB ¸‡Yi cÖfve P‡j hvq| msL¨v‡iLvq cÖmvwiZ nIqv `vM P‡j Avm‡e Gi Av‡Mi RvqMvq| (2 × 3 = 6 n‡j 6 ÷ 2 = 3 ev 6 ÷ 3 = 2 n‡e| ¸Y I fvM cwic~iK wn‡m‡e KvR K‡i|)

k~b¨ w`‡q ¸Y Ki‡j Kx n‡Z cv‡i Zv Avgiv †`‡LwQ| msL¨v‡iLvi wejywß N‡U| k~b¨ w`‡q fvM nIqv DwPZ k~b¨ w`‡q ¸‡Yi wecixZ| aŸsm nIqv msL¨v‡iLv‡K Gi wdwi‡q Avbv DwPZ| wKš‘ `~f©vM¨RbKfv‡e †mUv nq bv|

Av‡Mi D`vni‡Y Avgiv †`Ljvg, 2 × 0 Gi gvb 0| AZGe, Av‡Mi Ae¯’vq †h‡Z n‡j Avgv‡`i‡K a‡i wb‡Z n‡e, (2 × 0)‡K 0 w`‡q fvM w`‡j 2 †diZ cvIqv hv‡e| GKBfv‡e (3 × 0) †K 0 w`‡q fvM w`‡j 3 cvIqvi K\_v| (4 × 0) †K 0 w`‡q fvM w`‡j 4 cvIqvi K\_v| wKš‘ Avgvi †Zv †`LjvgB, 2 × 0, 3 × 0 I 4 × 0 Gi cÖwZwUi gvb 0| AZGe, (2 × 0) ÷ 0 Gi gvb 0 ÷ 0, (3 × 0) ÷ 0 Gi gvbI 0 ÷ 0| GKB gvb (4 × 0)-GiI| wKš‘ nvq! Gi gv‡b `uvovq, 0 ÷ 0 n‡jv 2 Gi mgvb| ïay ZvB bq, GUv 3-GiI mgvb| 4-GiI| Gi †Kv‡bv A\_©B nq bv| ////////

1 ÷ 0 Gi w`‡K GKwU wfbœfv‡e ZvKv‡jI A™¢yZ wRwb‡mi †`Lv †g‡j| ¸Y Ki‡j fv‡Mi cÖfve `~i nIqvi K\_v| d‡j 1 ÷ 0 Gi gvb nIqvi K\_v 1| wKš‘ Avgiv †Zv †`LjvgB, †h‡Kv‡bv wKQy‡K k~b¨ w`‡q ¸Y Ki‡j k~b¨B cvIqv hvq| Ggb †Kv‡bv msL¨v †bB, hv‡K k~b¨ w`‡q ¸Y Ki‡j 1 n‡e| AšÍZ Avgiv GLb ch©šÍ Ggb †Kv‡bv msL¨v †`wLwb|

me‡P‡q fq¼i K\_v n‡jv, †Rvi K‡i k~b¨ w`‡q fvM w`‡Z †M‡j hyw³ I MwY‡Zi cy‡iv wfwËB aŸsm n‡q hv‡e| k~b¨ w`‡q GKevi, gvÎ GKevi, fvM w`‡qB Avcwb gnvwe‡k¦i mewKQy MvwYwZKfv‡e cÖgvY Ki‡Z cvi‡eb| Avcwb cÖgvY Ki‡Z cvi‡eb 1 + 1 = 42| GUv †\_‡K Avcwb cÖgvY Ki‡Z cvi‡eb Gikv` wQ‡jb wfbMÖ‡ni GKRb evwm›`v, KvwR bRiæj Bmjvg R‡b¥wQ‡jb DR‡ewK¯Ív‡b| A\_ev AvKvkUv †Mvj †Mvj bKkv w`‡q mvRv‡bv| (DBb÷b PvwP©j †h GKwU MvRi wQj Zv †`L‡Z cwiwkó K coyb|)

k~b¨ w`‡q ¸‡Y aŸsm nq msL¨v‡iLv| wKš‘ k~b¨ w`‡q fvM w`‡j aŸsm nq cy‡iv MvYwZK KvVv‡gv|

GB GKwU mij msL¨vi A‡bK ¶gZv| MwY‡Z msL¨vwU me‡P‡q ¸iæZ¡c~Y© A¯¿ nIqvi K\_v wQj| wKš‘ k~‡b¨i A™¢yZ MvwYwZK I `vk©wbK ˆewk‡ó¨i Kvi‡Y cvð¨v‡Z¨i †gŠwjK `k©b G‡K MÖnY K‡iwb|

**Z\_¨wb‡`©k**

1| dvU©vBj wµ‡m›U AÂjwU ga¨cÖv‡P¨i AšÍM©Z BivK, wmwiqv, Bmiv‡qj, wdwjw¯Íb, R`©vb, wgk‡ii bxjb` GjvKv I DËi-c~e© AÂj, Zyi‡¯‹i `w¶Y-c~e© GjvKv I Biv‡bi cwðgvsk‡K GK‡Î dvU©vBj wµ‡m›U e‡j| g¨v‡c G‡K †`L‡Z Aa©P‡›`ªi g‡Zv jv‡M|

2| †R¨vwZlwe`¨v n‡jv MÖn-b¶Î †`‡L c„w\_exi NUbvi c~e©vfvm ejvi cÖ‡Póvi bvg, hvi †Kv‡bv ˆeÁvwbK wfwË †bB| G‡K gvbyl A‡bK mgq †R¨vwZwe©`¨vi (astronomy) mv‡\_ ¸wj‡q †d‡jb, hv weÁv‡bi GKwU kvLv|

3| G¸‡jv wMÖK fvlvi eo nv‡Zi A¶i| Avgiv mvaviYZ †QvU nv‡Zi A¶i †`wL| †QvU nv‡Zi BUv n‡jv η Ges wgD n‡jv μ|

wØZxq Aa¨vq

k~b¨Zv †\_‡K ïay k~b¨ZvB †g‡j

[cvðv‡Z¨ k~‡b¨i cÖZ¨vL¨vb]

*k~b¨Zv †\_‡K †Kv‡bv wKQyi m„wó m¤¢e bq|* — jy‡µwkqvm, †` †iiæg bvZyiv

cvðvZ¨ `k©‡bi †gŠwjK GKwU aviYvi mv‡\_ k~‡b¨i Ø›Ø †`Lv †`q| †mB aviYvwUi g~‡j wQj wc\_v‡Mviv‡mi msL¨vi `k©b| †R‡bvi1 c¨vivW·¸‡jvi gva¨‡g aviYvwU ¸iæZ¡c~Y© n‡q I‡V| cy‡iv wMÖK mgv‡Ri g~j aviYvB wQj: f‡qW ev k~b¨Zv (void) ej‡Z wKQy †bB|

wMÖK mf¨Zvi cZ‡bi A‡bK w`b c‡iI wc\_v‡Mvivm, A¨vwi÷Uj I U‡jwg‡`i Mov wMÖK mgvR wU‡K wQj| †mB mgv‡R k~b¨Zv ej‡Z wKQy wQj bv| wQj bv k~b¨| G Kvi‡Y cvðvZ¨ cÖvq `yB nvRvi eQi ch©šÍ k~b¨‡K †g‡b wb‡Z cv‡iwb| Gi dj n‡jv A‡bK Lvivc| k~‡b¨i Afv‡e MwY‡Zi AMÖMwZ \_g‡K \_v‡K| weÁv‡b bZyb bZyb wPšÍvi Øvi \_v‡K iæ×| GQvovI NUbvµ‡g cwÄKvq MÐ‡Mvj ˆZwi K‡i| k~b¨‡K MÖnY Ki‡Z n‡j cvðv‡Z¨i `vwk©wbK‡`i‡K Zv‡`i mvgvwRK KvVv‡gv asm Ki‡Z nZ|

wMÖK msL¨v-`k©‡bi DrcwË

*Avw`‡Z wQj AbycvZ, AbycvZ wQj Ck¦‡ii mv‡\_, Avi AbycvZB wQj Ck¦i|2*

- †hvnb 1:1

R¨vwgwZi Avwe®‹viK wgkixiqv MwYZ wb‡q Lye †ewk wPšÍv-fvebv K‡iwb| Zv‡`i Kv‡Q GUv wQj w`b MYbv I f~wgi wewfbœ As‡ki i¶Yv‡e¶‡Yi GKwU nvwZqvi| Z‡e wMÖK‡`i wPšÍvaviv wQj Avjv`v| Zviv g‡b KiZ, msL¨v I `k©b‡K Avjv`v Kiv m¤¢e bq| `y‡Uv‡KB Zviv Lye ¸iæ‡Z¡i mv‡\_ wb‡qwQj| Avm‡j msL¨v wb‡q wMÖKiv ev¯ÍweK A‡\_©B LyeB Drmvnx wQj|

‡gUvcbUv‡gi wncvmvm Rvnv‡Ri †W‡K D‡V `uvov‡jb| wb‡jb givi cÖ¯‘wZ| Pvicvk wN‡i i‡q‡Q GKwU †Mvcb fvZ„m‡•Ni m`m¨iv| hv‡`i wek¦vm bó K‡i‡Qb wZwb| wncvmvm Ggb GKwU †Mvcb wRwbm cÖKvk K‡i‡Qb hv wMÖK‡`i wPšÍvi †KŠk‡ji R‡b¨ cÖvYNvZx wQj| H fvZ„m•N †h `k©b `uvo Kiv‡Z †P‡qwQj Zv‡K aŸsm Kivi g‡Zv GKwU †Mvcbxq wRwbm wQj †mwU| †mB †Mvcb wRwbm cÖKv‡ki `v‡q gnvb wc\_v‡Mvivm wb‡R wncvmvm‡K cvwb‡Z Wywe‡q g„Z¨`Ð †`b| msL¨v-`k©b‡K euvPv‡Z H m•N LybI KiZ| wKš‘ wncvmvm †h †Mvcb wRwbm duvm K‡iwQ‡jb, †mUv k~‡b¨i Zyjbvq †Zgb fq¼i wKQy bq|

H m‡•Ni †bZv wQ‡jb cÖvPxbKv‡ji cÖMwZev`x wc\_v‡Mvivm| †ewkifvM eY©bv Abymv‡i Zyi‡¯‹i wbKUeZ©x wMÖK Øxc mv‡gv‡m L„óc~e© lô mv‡j Zuvi Rb¥| ØxcUv †niv †`exi gw›`i I Lye DbœZ g‡`i R‡b¨ weL¨vZ| cÖvPxb wMÖK‡`i g‡a¨ h‡\_ó Kzms¯‹vi cÖPwjZ wQj| wKš‘ wc\_v‡Mviv‡mi a¨vbaviYv¸‡jv nvi gvbvq †m Kzms¯‹vi‡KI| Zuvi `„p wek¦vm wQj, wZwb †UªvRvb exi BDdiev‡mi beRb¥cÖvß iƒc| G Kvi‡Y wc\_v‡Mvivm †Rviv‡jvfv‡e g‡b Ki‡Zb, g„Zy¨i c‡i cÖvYx‡`imn mKj AvZ¥v bZyb †`‡n ¯’vbvšÍwiZ nq| G Kvi‡Y wZwb wQ‡jb K‡Vvi wbivwgl‡fvRx| Z‡e wmg †L‡Zb bv, KviY G‡Z †cU dz‡j hvq| †`L‡ZI jv‡M j¾v¯’v‡bi g‡Zv|

nqZ wc\_v‡Mvivm cÖvPxbKv‡ji GKRb cÖMwZev`x wPšÍvwe` n‡q \_vK‡eb| Z‡e wZwb wQ‡jb Ruv`‡ij e³v| cÖL¨vZ cwÐZ| Avi Rv`yKix GKRb wk¶K| Kw\_Z Av‡Q, wZwb BZvwj‡Z emevmiZ wMÖK‡`i R‡b¨ msweavb iPbv K‡iwQ‡jb| QvÎiv `‡j `‡j Ro nZ Zuvi Kv‡Q| Aí w`‡bi gv\_vqB wZwb GK`j D”Pc`¯’ I DrmyK wkl¨ †c‡q †M‡jb|

wc\_v‡Mvixqiv †bZvi Abykvmb †g‡b PjZ| Zv‡`i wek¦v‡mi g‡a¨ Ab¨Zg wQj, gwnjv‡`i mv‡\_ GKv‡šÍ mgq KvUv‡bv DwPZ kxZKv‡j| MÖx®§Kv‡j GUv Kiv hv‡e bv| Zv‡`i g‡Z, Lvevi wVK g‡Zv nRg bv nIqvB me †iv‡Mi g~j KviY, LvIqv DwPZ ïay KuvPv Lvevi, cvwb Qvov Ab¨ wKQy cvb Kiv wVK bq Ges ckwg Kvco †Kv‡bvg‡ZB civ hv‡e bv|

wMÖKiv Zv‡`i msL¨v¸‡jv cvq wgkixq R¨vwgwZK‡`i KvQ †\_‡K| G Kvi‡Y wMÖK MwY‡Z AvK…wZ I msL¨vi g‡a¨ we‡kl †Kv‡bv cv\_©K¨ wQj bv| wMÖK MwYZ I `vk©KwbK‡`i Kv‡Q G `y‡Uv wRwbm wQj GKB| (Zv‡`i cÖfv‡ei Kvi‡Y GgbwK AvRI Avgiv eM© msL¨v I wÎfyR msL¨v †`L‡Z cvB) [wPÎ 5] †m Kv‡j MvwYwZK Dccv`¨ cÖgvY Kiv my›`i GKwU Qwe AuvKvi g‡ZvB mnR wQj| cÖvPxb wMÖK MwYZwe`iv †cwÝj I KvM‡Ri e`‡j e¨envi KiZ K¤úvm I iæjvi| Avi wMÖK‡`i Kv‡Q AvK…wZ I msL¨vi m¤úK© wQj Lye Mfxi I M~p Zvrch©c~Y©| cÖwZwU msL¨v-AvK…wZi (number-shape) wQj GKwU K‡i †Mvcb A\_©| Avi me‡P‡q my›`i msL¨v-AvK…wZ¸‡jv‡K cweÎ g‡b Kiv nZ|

¯^vfvweKfv‡eB wc\_v‡Mvixq‡`i Ava¨vwZ¥K cÖZxKI wQj GKwU msL¨v-AvK…wZ: †c›UvMÖvg ev cuvP‡KvYv Zviv (pentagram)| GB †QvU QwewUB Amx‡gi GKwU †QvÆ bgybv| Zvivi †iLv¸‡jv‡K Rwo‡q Av‡Q cÂfyRwU (pentagon)| cÂfy‡Ri †KvYv¸‡jv‡K †iLvi mv‡\_ †hvM Ki‡j GKwU †QvU I Dëv‡bv (IciUv bx‡P, bxPUv Ic‡i) cuvP‡KvYv Zviv cvIqv hvq| hv Abycv‡Zi w`K †\_‡K wVK Av‡Mi ZvivwUi g‡ZvB| G‡ZI Avevi AviI †QvU GKwU cÂfyR Av‡Q| hv‡Z Av‡Q AviI †QvU GKwU Zviv I †QvU GKwU cÂfyR| Gfv‡e Pj‡ZB \_v‡K (6 bs wPÎ †`Lyb)| Z‡e gRvi e¨vcvi n‡jv, GB ¯^-cybive„wË wKš‘ wc\_v‡Mvixq‡`i Kv‡Q †c›UvMÖv‡gi me‡P‡q ¸iæZ¡c~Y© ˆewkó¨ wQj bv| †mUv jyKv‡bv wQj Zvivi †iLvi g‡a¨| G¸‡jvi g‡a¨ wQj GKwU msL¨v-AvK…wZ, wc\_v‡Mvixq‡`i Kv‡Q hv wQj gnvwe‡k¦i P~ovšÍ cÖZxK| Zvi bvg †mvbvjx AbycvZ (Golden ratio)|

wPÎ 5: eM© I wÎfyR msL¨v

wPÎ 6: †c›UvMÖvg

‡mvbvjx AbycvZ ¸iæZ¡I †c‡q‡Q GKwU wc\_v‡Mvixq Avwe®‹vi †\_‡K| hw`I GLb †mUv wb‡q Lye GKUv Av‡jvPbv nq bv| AvaywbK ¯‹yj¸‡jv‡Z wkïiv wc\_v‡Mviv‡mi bvg †kv‡b Zuvi weL¨vZ Dccv`¨wUi R‡b¨B: mg‡KvYx wÎfy‡Ri AwZfy‡Ri eM© Aci `yB evûi e‡M©i mgwói mgvb| Z‡e GUv Avm‡j AviI cÖvPxb Avwe®‹vi| wc\_v‡Mviv‡mi R‡b¥i 1,000 eQ‡iiI †ewk mgq Av‡M GUv gvbyl RvbZ| cÖvPxb wMÖ‡m gvbyl wc\_v‡Mvivm‡K wPbZ Ab¨ GKwU Avwe®‹v‡ii R‡b¨| †mUv n‡jv m½xZ MÖvg|

‡jvKKvwnbx Abymv‡i GKw`b wc\_v‡Mvivm GKwU GKZviv wb‡q †LjwQ‡jb| hv GKwU e· I GKwU Zvi w`‡q ˆZwi (wPÎ 7)| GKwU †mvqvwo‡K GKZvivi Dc‡i-bx‡P bvwg‡q wc\_v‡Mvivm Zuvi h‡š¿i myi cwieZ©b Ki‡Zb| GKUy c‡iB wZwb eyS‡Z cvi‡jb, Zv‡ii GKwU A™¢yZ wKš‘ Aby‡gq AvPiY j¶¨Yxq| †mvqvwo Qvov Zvi‡K Uvb w`‡j GKwU cwi®‹vi myi cvIqv hvq| Gi bvg †gŠwjK myi| †mvqvwo‡K GKZvivq †i‡L Zv‡ii mv‡\_ ¯úk© Kiv‡j evR‡Z \_vKv myi cv‡ë hvq| †mvqvwo‡K GKZvivi I Zv‡ii wVK gvSLv‡b ivL‡j Zv‡ii `yB As‡kB GKB myi ev‡R| GB myi nq Zv‡ii †gŠwjK my‡ii †P‡q cy‡ivcywi GK AóK †ewk| †mvqvwo‡K GKUy miv‡j nqZ GK As‡k Zv‡ii wZb cÂgvsk I Aci As‡k `yB cÂgvsk \_vKj| wc\_v‡Mvivm †`L‡jb, Zv‡ii Ask¸‡jv‡K a‡i Uvb w`‡j `ywU wbLyuZ cÂK myi ˆZwi nq| G‡KB me‡P‡q kw³kvjx I ¯§„wZ-RvMvwbqv m½xZ wgkªY ejv n‡q \_v‡K| wfbœ wfbœ Abycv‡Z cvIqv hvq wfbœ myi| †mUv Avb›``vqKI n‡Z cv‡i, weiw³KiI n‡Z cv‡i| (‡hgb, †emy‡iv wÎmyi‡K (tritone) ejv nq m½x‡Zi †cÖZ| ga¨hy‡Mi m½xZ wekvi`iv GB myi MÖnY K‡ibwb| A™¢yZ e¨vcvi n‡jv, wc\_v‡Mvivm hLb †mvqvwo‡K Zv‡ii Ggb RvqMvq ivL‡jb †hLv‡b Zvi mij Abycv‡Z wef³ nq bv, ZLb m„ó myi fvj nq bv| Drcbœ kã nZ †emy‡iv| gv‡Sgv‡S nZ A‡bK Lvivc| gv‡Sg‡a¨ †Zv myi cvM‡ji g‡Zv DVv-bvgv KiZ|

wc\_v‡Mviv‡mi Kv‡Q m½xZ wQj GKwU MvwYwZK PP©v| eM© I wÎfy‡Ri g‡ZvB †iLvivI wQj msL¨v-AvK…wZ| AZGe, GKwU Zvi‡K `yB fvM Kiv Avi `yB msL¨vi GKwU AbycvZ wb‡q KvR Kiv GKB K\_v| GKZvivi HKZvb Avm‡j MwY‡ZiB HKZvb| Ges cÖKvivšÍ‡i gnvwe‡k¦‡iB HKZvb| wc\_v‡Mvivm a‡i wb‡jb, ïay m½xZ‡KB bq, AbycvZ mKj †mŠ›`h©‡KB wbqš¿Y K‡i | wc\_v‡Mvixqiv g‡b Ki‡Zb, AbycvZ m½xZ I †fŠZ †mŠ›`‡h©i Ges MvwYwZK †mŠ›`‡h©i wbqšÍv| cÖK…wZ‡K †evSv Abycv‡Zi MvwYwZK wewa †evSvi g‡ZvB mij KvR|

wPÎ 7: giwg GKZviv

m½xZ, MwYZ I cÖK…wZi ci¯úi cwieZ©bxqZvi GB `k©‡bi Ici wbf©i K‡iB wc\_v‡Mvixq‡`i cÖv\_wgK MÖng‡Wj ˆZwi nq| wc\_v‡Mvivm ej‡jb, c„w\_ex Av‡Q gnvwe‡k¦i †K‡›`ª| Avi m~h©, P›`ª, MÖn I b¶Îiv Nyi‡Q c„w\_ex‡K †K›`ª K‡i| hvi cÖwZwU Av‡Q wbR wbR †Mvj‡K (wPÎ 8)| †MvjK¸‡jvi mvB‡Ri AbycvZ wQj my›`i I myweb¨¯Í| †Mvj‡Ki Pj‡bi Zv‡j Zv‡j ˆZwi nZ m½xZ| me‡P‡q evB‡ii MÖn e„n¯úwZ I kwb3 NyiZ me‡P‡q †Rv‡i| d‡j G‡`i ¯^iMÖv‡gi myi nq me‡P‡q †ewk| Puv‡`i g‡Zv me‡P‡q †fZ‡ii w`‡Ki e¯‘¸‡jvi myi wQj nvjKv| mewgwj‡q Pjgvb MÖû¸‡jv †Mvj‡Ki g‡a¨ GKwU HKZvb ˆZwi K‡iwQj| Avi gnvKv‡k evR‡Z \_v‡K my›`i my›`i me MvwYwZK MxZ| 'mewKQyB msL¨v' e‡j wc\_v‡Mvivm GUvB eywS‡qwQ‡jb|

wPÎ 8: wMÖK gnvwek¦

cÖK…wZ‡K Rvbvi g~j gva¨g wQj AbycvZ| G Kvi‡Y wc\_v‡Mvixq Ges Zv‡`i c‡i wMÖK MwYZwe`iv Abycv‡Zi ˆewkó¨ Rvbvi cÖ‡Póv Pvwj‡qB †ewkifvM mgq cvi K‡i‡Qb| †kl ch©šÍ Zviv AbycvZ‡K 10wU Avjv`v fv‡M wef³ K‡ib| Gi g‡a¨ GKwU bvg n‡jv Zi½ Mo (harmonic mean)| Ggb GKwU MoB we‡k¦i me‡P‡q my›`i4 msL¨v ˆZwi K‡i‡Q| GUv n‡jv †mvbvjx AbycvZ|

‡gvnbxq GB MowU †c‡Z n‡j GKwU †iLv‡K we‡kl Dcv‡q wef³ Ki‡Z n‡e| G‡K Ggbfv‡e fvM Ki‡Z n‡e hv‡Z †QvU I eo As‡ki AbycvZ eo Ask I cy‡iv As‡ki Abycv‡Zi mgvb nq (‡`Lyb cwiwkó L)| Gfv‡e ej‡j wRwbmUv‡K †Zgb wKQy g‡b nq bv| wKš‘ GB AbycvZ †\_‡K cvIqv Qwe¸‡jv‡K me‡P‡q my›`i wRwbm g‡b nq| GgbwK AvR‡Ki w`‡bI ¯’cwZiv mnRvZfv‡eB Rv‡bb, ˆ`N¨© I cÖ‡¯’i GB AbycvZ †g‡b evbv‡bv ¯’vcbv me‡P‡q bv›`wbK nq| G Kvi‡YB wkí I ¯’vc‡Z¨i eû RvqMvq GB Abycv‡Zi e¨envi †`Lv hvq| wKQy wKQy BwZnvm I MwYZwe‡`i g‡Z cv\_©vbb bv‡gi ivRKxq A¨v‡\_bxq gw›`i Ggbfv‡e evbv‡bv n‡qwQj hv‡Z Gi cÖwZwU w`‡KB †mvbvjx AbycvZ `„k¨gvb nq| GgbwK cÖK…wZi m„wó‡KŠk‡jI †`Lv hvq †mvbvjx Abycv‡Zi Dcw¯’wZ| kvgyKRvZxq cÖvYx‡`i cici `ywU cÖ‡Kv‡ôi AvKv‡ii AbycvZ Zyjbv Kiæb| A\_ev Avbvi‡mi WvbveZ©x I evgveZ©x LuvR¸‡jvi AbycvZ †`Lyb| †`Lv hv‡e GB AbycvZ †mvbvjx Abycv‡Zi Lye KvQvKvwQ|

‡c›UvMÖvg n‡q I‡V wc\_v‡Mvixq åvZ„m‡•Ni me‡P‡q cweÎ cÖZxK| Gi KviY n‡jv †c›UvMÖv‡gi †iLv¸‡jvI GB we‡kl Dcv‡q MwVZ| †mvbvjx AbycvZ w`‡q cwic~Y©| Avi wc\_v‡Mvivm g‡b Ki‡Zb †mvbvjx AbycvZ n‡jv me msL¨vi ivRv| wkíx I cÖK…wZi Kv‡Q †mvbvjx AbycvZ mgv‡b fvjevmv cvq| G †hb wc\_v‡Mviv‡mi K\_viB cÖwZaŸwb: m½xZ, †mŠ›`h©, ¯’vcZ¨ I gnvwe‡k¦iB MVb G‡K Ac‡ii mv‡\_ m¤úwK©Z I Awe‡”Q`¨| wc\_v‡Mvixq‡`i g‡Z AbycvZB gnvwe‡k¦i wbqšÍv| Avi GKmgq hv ïay fveZ wc\_v‡Mvixqiv, Aíw`‡bi gv\_vqB Zv cy‡iv cvðvZ¨ we‡k¦iB fvebv n‡q `uvovj| bv›`wbKZv, AbycvZ I gnvwe‡k¦i AwZcÖvK…Z m¤úK© cvðvZ¨ mf¨Zvi GKwU cÖavb I `xN©¯’vqx wek¦v‡m cwiYZ n‡jv| †k·wcq‡ii mgq ch©š‘I weÁvbxiv wewfbœ Abycv‡Zi K¶c‡\_i cÖ`w¶Y wb‡q K\_v ej‡Zb| ej‡Zb cy‡iv gnvwe‡k¦ cÖengvb ¯^M©xq Mx‡Zi K\_v|

wPÎ 9: cv\_©vbb, kvgy‡Ki †Lvjm I †mvbvjx AbycvZ

wc\_v‡Mvixq ms¯‹„wZ‡Z k~‡b¨i †Kv‡bv ¯’vb wQj bv| msL¨v I AvK…wZi mgZyj¨Zv cÖvPxb wMÖK‡`i‡K R¨vwgwZi bvqK evwb‡qwQj| wKš‘ G‡Z wQj GK wekvj Amyweav| G aviYvi Kvi‡Y k~b¨‡K msL¨v we‡ePbvi K\_vwU KviI gv\_vq Av‡mwb| k~‡b¨i Avevi wK‡mi AvK…wZ \_vK‡e?

`yB GKK ˆ`N¨© I `yB GKK cÖ‡¯’i GKwU eM© Kíbv Kiv Lye mnR| wKš‘ k~b¨ ˆ`N¨© I cÖ‡¯’i GKwU eM© †Kgb n‡e? ˆ`N¨© I cÖ¯’ †bB, †bB †Kv‡bv Dcv`vbI- Ggb wKQy‡K eM© wn‡m‡e Kíbv Kiv KwVb GKwU KvR| d‡j k~b¨ w`‡q ¸Y KivI wQj A\_©nxb KvR| `ywU msL¨v‡K ¸Y Kiv gv‡bB GKwU AvqZ‡¶‡Îi †¶Îdj cvIqv| wKš‘ k~b¨ ˆ`N¨© I cÖ‡¯’i GKwU Avq‡Zi †¶Îdj KZ n‡Z cv‡i?

eZ©gv‡b MwY‡Zi eo eo AgxgvswmZ mgm¨v¸‡jv‡K Dc¯’vcb Kiv nq MwYZwe`‡`i c‡¶ mgvav‡bi A‡hvM¨ Abygvb (conjecture) AvKv‡i| Z‡e cÖvPxb wMÖ‡m msL¨v-AvK…wZ¸‡jv wfbœ GKwU wPšÍvi Dcvq Ly‡j w`‡qwQj| †m mg‡qi me‡P‡q weL¨vZ AgxgvswmZ mgm¨vwU wQj R¨vwgwZi| ïay K¤úvm I iæjvi w`‡q Avcwb wK Ggb GKwU eM© AuvK‡Z cvi‡eb, hvi †¶Îdj GKwU e„‡Ëi †¶Îd‡ji mgvb? GB hš¿¸‡jv w`‡q Avcwb wK GKwU †KvY‡K wZb fvM Ki‡Z cvi‡eb? R¨vwgwZK MVb I AvK…wZ wQj GKB wRwbm| g‡b Kiv nZ, k~b¨ Ggb GKwU msL¨v hvi †Kv‡bv iKg R¨vwgwZK A\_© \_vK‡Z cv‡i bv| Zvi gv‡b k~b¨‡K VuvB w`‡Z n‡j wMÖK‡`i‡K cy‡iv MvwYwZK Kv‡Ri c×wZB cv‡ë †dj‡Z nZ| Zviv †mUv bv Kij bv|

wMÖK c×wZ‡Z k~b¨ hw` †\_‡KI \_vKZ, ZeyI k~b¨‡K w`‡q AbycvZ evbv‡bv‡K cÖK…wZweiæ× g‡b nZ| `ywU e¯‘i m¤úK©‡K Avi AbycvZ AvKv‡i cÖKvk Kiv †hZ bv| k~b¨ I Ab¨ †h-‡Kv‡bv msL¨vi AbycvZ, gv‡b k~b¨‡K †h †Kv‡bv msL¨v‡K w`‡q fvM w`‡j cÖvß msL¨v n‡e k~b¨B| Ab¨ msL¨vwU‡K k~b¨ G‡Kev‡iB wM‡j †d‡j| Avi Gw`‡K †Kv‡bvwKQy I k~‡b¨i AbycvZ, gv‡b †Kv‡bv GKwU msL¨v‡K k~b¨ w`‡q fvM Ki‡j hyw³B wejyß n‡q †h‡Z cv‡i| cwi”Qbœ wc\_v‡Mvixq gnvwe‡k¦ k~b¨ GKUyLvwb gqjv Rwg‡q †`q| G Kvi‡YB k~b¨‡K mn¨ Kiv nqwb|

Avm‡j wMÖKiv Av‡iKwU AmyweavRbK MvwYwZK aviYv‡KI N„Yv K‡i G‡mwQj| g~j` msL¨v| wc\_v‡Mvixq wPšÍvq cÖ\_g evav wQj GwUB| Zviv GUv‡K jywK‡q ivL‡Z †P‡qwQj| Avi GB wRwbmUv cÖKv‡k¨ P‡j G‡j Zviv mwnsm n‡q I‡V|

Ag~j` msL¨vi aviYv wMÖK MwY‡Zi g‡a¨ jywK‡q wQj UvBg †evgvi g‡Zv| msL¨v I AvK…wZi ˆØZZvi Kvi‡Y wMÖK‡`i Kv‡Q MYbv Avi †iLvi ˆ`N¨© gvcv wQj GKB KvR| G Kvi‡Y `ywU msL¨vi AbycvZ †ei Ki‡Z wfbœ ˆ`‡N¨©i `ywU †iLv‡K Zyjbv KivB h‡\_ó wQj| Z‡e †h‡Kv‡bv ai‡bi cwigvc Ki‡Z †M‡jB GKwU Av`k© gvcKvwV `iKvi nq| Ggb GKwU gvcKvwV, †hUv w`‡q `ywU †iLvi AvKvi Zyjbv Kiv hv‡e| D`vniY wn‡m‡e aiæb, GKwU †iLvi ˆ`N¨© GK`g GK dzU| Gi GK cÖvšÍ †\_‡K mv‡o cuvP BwÂ `~‡i GKwU `vM w`‡jb| Gi d‡j Av‡Mi GK dzU GLb `ywU Amgvb L‡Ð wef³ n‡jv| wMÖKiv GB AbycvZ †ei Kivi R‡b¨ †iLvwU‡K L‡Ð fvM KiZ| Aa©-BwÂ ev Ggb wKQy‡K e¨envi KiZ Av`k© ev gvcKvwV wn‡m‡e| d‡j GK As‡k \_vK‡e 11wU `vM, Avi Av‡iK As‡k 13wU|5 AZGe, `yB As‡ki AbycvZ n‡e 11:13|

wc\_v‡Mviv‡mi cÖZ¨vkv Abymv‡i gnvwe‡k¦i mewKQy‡K AbycvZ †g‡b Pj‡Z n‡j gnvwe‡k¦i A\_©en mewKQy‡K my›`i I mij Abycv‡Zi mv‡\_ m¤úwK©Z n‡Z n‡e| Zv‡K n‡Z n‡e g~j` ev †hŠw³K msL¨v (rational number)6| AviI ¯úó K‡i ej‡j, GB AbycvZ¸‡jv‡K a/b AvKv‡i wjL‡Z nZ| †hLv‡b a I b n‡e 1, 2 ev 47-Gi g‡Zv †`L‡Z my›`i I cwi”Qbœ MYbv (¯^vfvweK7) msL¨v| (MwYZwe`iv G R‡b¨ e‡jB iv‡Lb, b Gi gvb k~b¨ nIqv m¤¢e bq| KviY †m‡¶‡Î fvM w`‡Z n‡e k~b¨ w`‡q, hv GK fqvbK KvR|) ejvB evûj¨, gnvwek¦ GZUv mvRv‡bv-‡MvQv‡bv bq| wKQy wKQy msL¨v‡K a/b ai‡bi mij fMvsk AvKv‡i †jLv m¤¢e nq bv| GB Ag~j` msL¨v¸‡jv wQj wMÖK MwY‡Zi Awbevh© dj|

eM© R¨vwgwZi Ab¨Zg mij GKwU wPÎ| wc\_v‡Mvixqiv G‡K h\_vh\_ m¤§vbI w`Z| (PviwU †gŠwjK Dcv`v‡bi Av`‡j Gi wQj PviwU evû| GUv wQj wbLyuZ msL¨vi cÖZxK|) wKš‘ e‡M©i mvi‡j¨i g‡a¨B jywK‡q Av‡Q g~j` msL¨v| e‡M©i wecixZ †KvYv‡K hy³ K‡i KY© AuvK‡jB P‡j Av‡m Ag~j` msL¨v| g‡b Kiæb, GKwU e‡M©i me¸‡jv evûi ˆ`N¨© 1 dzU K‡i| g‡b g‡b (ev ev¯Í‡eB) GUv Gu‡K †djyb| wMÖK‡`i g‡Zv Abycv‡Z wbgMœ \_vKv gvbyl e‡M©i evû I K‡Y©i w`‡K wR‡Ám Ki‡e: GB `ywU †iLvi AbycvZ KZ?

Av‡Mi g‡ZvB cÖ\_g KvR n‡jv GKwU Av`k© gvcKvwV ˆZwi Kiv| †mUv n‡Z cv‡i Aa©-BwÂi GKwU †QvÆ iæjvi| Gevi KvR n‡jv †mB gvcKvwV w`‡q cÖwZwU evû‡K mgvb mgvb fv‡M wef³ Kiv| Aa©-BwÂi gvcKvwV w`‡q Avgiv GK dz‡Ui (12 BwÂ) evû‡K 24 LÐ Ki‡Z cvie, hvi cÖwZwU Aa©-BwÂ j¤^v| wKš‘ KY©‡K gvc‡j Kx n‡e? GKB gvcKvwV w`‡q K‡Y©i ˆ`N¨©‡K gvc‡j 34wUi g‡Zv LÐ cvIqv hv‡e| wKš‘ cy‡ivcywi wgj‡e bv| 34Zg LÐwU n‡e mvgvb¨ †QvU| Aa©-BwÂi iæjvi e‡M©i †KvYv w`‡q GKUyLvwb †ewi‡q \_vK‡e| Avgiv AviI fv‡jvfv‡eI gvc‡Z cvie| †iLvwU‡K AviI †QvU †QvU fv‡M wef³ Ki‡jB n‡e| aiæb, Avgiv e¨envi Kijvg GK BwÂi 6 fv‡Mi GK fvM mgvb GKwU iæjvi| Gevi e‡M©i evû 72 L‡Ð wef³ n‡e| Avi K‡Y© LÐ cvIqv hv‡e 101wUi †ewk| Z‡e 102wUi Kg| Gev‡iI cwigvc wbLyuZ n‡e bv| AviI A‡bK †QvU gvcKvwV wb‡j Kx n‡e? GK BwÂi `k †KvwU fv‡Mi fvM mgvb ˆ`‡N¨©i gvcKvwV wb‡j? e‡M©i evû n‡e 1 †KvwU 20 j¶ LÐ| Avi K‡Y©i ˆ`N¨© n‡e 16,97,05,63 L‡Ði †P‡q GKUy Kg| GB iæjvi w`‡qI †iLv `yBwUi g‡a¨ mgš^q Kiv hv‡”Q bv| Avmj K\_v n‡jv, †Kv‡bv iæjvi w`‡qB mwVK cwigvc cvIqv hv‡e bv|

Avm‡j Avcwb iæjvi hZ †QvUB K‡ib bv †Kb, e‡M©i evû I KY© Dfq‡K wbLyuZfv‡e gvcvi g‡Zv GKwU gvcKvwV KL‡bvB cvIqv hv‡e bv| KY© I evû GKB mv‡\_ Awb‡Y©q| wKš‘ GKB gvcKvwV bv n‡j `ywU †iLv‡K AbycvZ AvKv‡i cÖKvk KivI m¤¢e bq| GKK (1 GKK) mvB‡Ri GKwU e‡M©i R‡b¨ Gi A\_© `uvovq, Avgiv GKg †Kv‡bv MYb msL¨v a I b cve bv hviv e‡M©i h\_vµ‡g evû I KY© n‡e Ges hv‡`i‡K a/b AvKv‡i cÖKvk Kiv hv‡e| Ab¨ K\_vq, GB e‡M©i KY© GKwU Ag~j` msL¨v| eZ©gv‡b G‡K Avgiv `yB‡qi (2) eM©g~j ev √2 wn‡m‡e wPwb| (e‡M©i KY© I mswkøó `yB evû wg‡j mg‡KvYx wÎfyR nq| †hLv‡b KY© AwZfyR| AZGe wc\_v‡Mviv‡mi Dccv`¨ †\_‡K K‡Y©i ˆ`N¨© = √(12 + 12) = √2|)

GUv wc\_v‡Mvixq MwY‡Zi R‡b¨ Akwb m‡¼Z| cÖK…wZ Kxfv‡e AbycvZ w`‡q cwiPvwjZ n‡e, †hLv‡b e‡M©i g‡Zv GKwU mij wRwbmB Abycv‡Zi fvlv‡K †Mvj‡g‡j †Kv‡i †dj? GB wRwbmwU wek¦vm Kiv wc\_v‡Mvixq‡`i R‡b¨ KwVbB wQj| wKš‘ G‡K A¯^xKvi Kivi †Zv †Rv †bB| GUv Zv‡`i wcÖq MvwYwZK wewaiB GKwU dj| MwY‡Zi BwZnv‡mi Ab¨Zg cÖ\_g GKwU cÖgvYB n‡jv e‡M©i K‡Y©i Acwigvc‡hvM¨Zv ev Ag~j`Zv|

wc\_v‡Mviv‡mi Kv‡Q Ag~j` msL¨viv wQj fqven| KviY, AbycvZ w`‡q Mov gnvwek¦ c‡o wM‡qwQj ûgwKi gy‡L| Kwd‡b Av‡iKwU †c‡iK hy³ K‡i †mvbvjx AbycvZ| wc\_v‡Mvivm †`L‡jb my›`i G msL¨vUvI Ag~j` msL¨v| A\_P GB msL¨vwUB wc\_v‡Mvixq‡`i Kv‡Q †mŠ›`h© I hyw³i P~ovšÍ cÖZxK wQj| GB fqvbK msL¨v¸‡jv hv‡Z wc\_v‡Mvixq gZev‡`i ¶wZ bv cv‡i †mR‡b¨ G‡`i‡K †Mvcb ivLv n‡jv| wc\_v‡Mvixq m‡•Ni mevB‡K Ggwb‡ZB Kg K\_v ej‡Z nZ| GgbwK wjwLZ †bvU ivLvi AbygwZI wQj bv KviI| `yB‡qi eM©g~‡ji Acwigvc‡hvM¨Zv n‡q DVj me‡P‡q eo I KjywlZ †Mvcbxq welq|

Z‡e wMÖKiv Ag~j` msL¨v‡K k~‡b¨i g‡Zv GZ mn‡R Ae‡njv K‡i \_vK‡Z cv‡iwb| me ai‡bi R¨vwgwZK wP‡Î Ny‡iwd‡i G‡`i †`Lv cvIqv hvw”Qj| R¨vwgwZ I AbycvZ wb‡q GZUv wbgMœ \_vKv GKUv RvwZi KvQ †\_‡K Ag~j` msL¨v‡K Lye †ewk w`b jywK‡q ivLv KwVb| GKw`b bv GKw`b †KD GKRb e¨vcviUv duvm K‡i †djZB| GB †KD GKRb wQ‡jb †gUvc›Uvg GjvKvi wncvmvm| wZwbI wQ‡jb wc\_v‡Mvixq m‡•Ni GKRb MwYZwe`| Ag~j` msL¨vi inm¨ duvm K‡i Zv‡K gvivZ¥K wecv‡K co‡Z n‡qwQj|

wncvmv‡mi wek¦vmNvZKZv I P~ovšÍ cwiYwZ wb‡q cÖPwjZ Mí¸‡jv Lye A¯úó I ci¯úiwe‡ivax| MwYZwe`iv AvRI Ag~j` msL¨vi inm¨ duvm Kiv `~f©vMv GB MwYZwe‡`i K\_v e‡jb| †KD †KD e‡jb wc\_v‡Mvivm Zv‡K RvnvR †\_‡K †d‡j w`‡q Wywe‡q †g‡iwQ‡jb| Zuvi g‡Z, bv›`wbK GK MvwYwZK ZË¡‡K Amy›`i Z\_¨ w`‡q aŸsm Kivi DwPZ kvw¯Í GUvB| cÖvPxb m~Î †\_‡K Rvbv hvq, cv‡ci kvw¯Í wn‡m‡e mgy‡`ª Wy‡e g‡iwQ‡jb wncvmvm| †KD †KD Avevi ej‡Qb, Zv‡K mgvRPy¨Z Kiv nq Ges Zvi R‡b¨ GKwU Kei wbg©vY Kiv nq| Gfv‡e Zv‡K mgvR †\_‡K Avjv`v K‡i †djv nq| Z‡e wncvmv‡mi mwZ¨Kvi cwiYwZ hvB †nvK bv †Kb, GUv mwZ¨ †h Zvi m½xiv Zv‡K wZi¯‹vi K‡iwQj| wZwb hv duvm Ki‡jb †mUv wc\_v‡Mvixq gZev‡`i wfZ‡KB Kuvwc‡q †`q| wKš‘ Ag~j` msL¨v‡K GKwU e¨wZµg e‡j Pvwj‡q w`‡qB wc\_v‡Mvixqiv gnvwek¦ m¤ú‡K© wb‡R‡`i fvebv‡K KjywlZ nIqv †\_‡K euvPv‡Z cviZ| Ges mwZ¨ ej‡Z mg‡qi mv‡\_ mv‡\_ wMÖKiv Ag~j` msL¨v‡K wb‡R‡`i msL¨vi Ask evwb‡q wb‡Z wbgivwR nq| wc\_v‡Mvivm‡K Ag~j` msL¨viv gv‡iwb| †g‡i‡Q wkg (mewR)|

wncvmv‡mi g‡ZvB wc\_v‡Mviv‡mi g„Zy¨i eY©bvI A¯úó| Z‡e me¸‡jvB ej‡Q, g„Zy¨Uv n‡qwQj A¯^vfvweK Dcv‡q| †KD †KD e‡jb, wc\_v‡Mvivm Dcevm †\_‡K †\_‡K gviv wM‡q‡Qb| Z‡e M‡íi me‡P‡q †ewk cÖPwjZ ms¯‹iY Abymv‡i Zvi g„Zy¨i KviY wQj wkg| M‡íi GKwU ms¯‹iY Abymv‡i, GKw`b kÎæiv (hv‡`iK wc\_v‡Mviv‡mi mvg‡b Avm‡Z †`Iqvi †hvM¨ g‡b bv Kivq Zviv †i‡M wQj) Zvi evwo‡Z Av¸b jvwM‡q †`q| Avi m‡•Ni †jv‡Kiv cÖvYf‡q Gw`K-‡mw`K Qy‡U hvq| D‡ËwRZ RbZv wc\_v‡Mvixq‡`i G‡Ki ci GK RevB Ki‡Z \_v‡K| åvZ„m•N aŸsm n‡q hvw”Qj| wc\_v‡Mvivm wb‡RI Rxeb euvPv‡Z cvjv‡Z jvM‡jb| cvwj‡q †h‡Z cvi‡Zb| hw` bv AvU‡K co‡Zb wkg‡¶‡Z| †mLv‡bB †\_‡g †M‡jb wZwb| †NvlYv w`‡jb, gviv †M‡j hv‡eb, wKš‘ wkg‡¶‡Z cvwo †`‡eb bv| †cQb †cQb Avmv gvbyl¸‡jv †Zv Lye Lywk| w`j Mjv †K‡U|

m•N wew¶ß n‡q †Mj| †bZv gviv †M‡jb| wKš‘ wc\_v‡Mviv‡mi g~j wk¶v †eu‡P iBj| Aí w`‡bi g‡a¨B †mwU cvðvZ¨ BwZnv‡mi me‡P‡q cÖfvekvjx `k©‡b cwiYZ n‡jv| †mB `k©‡bi bvg A¨vwi÷Ujxq gZev`| hv wU‡K †\_‡KwQj c‡ii `yB nvRvi eQi| k~‡b¨i mv‡\_ GB gZev‡`i msNl© nq| Z‡e Ag~j` msL¨v‡K D‡c¶v Kiv bv †M‡jI k~b¨‡K D‡c¶v Kiv m¤¢e wQj| wMÖK msL¨vc×wZi msL¨v I AvK…wZi ˆØZiƒc KvRwU‡K mnR K‡i †`q| KviY k~‡b¨i †Zv Avi †Kv‡bv AvK…wZ wQj bv| d‡j Gi c‡¶ msL¨v nIqvI m¤¢e wQj bv|

ZeyI k~‡b¨i ¯^xK…wZ wKš‘ wMÖK msL¨vc×wZ †VwK‡q iv‡Lwb| iv‡Zi AvKvk wb‡q gMœ \_vKvi Kvi‡Y wMÖKiv k~b¨ wb‡q Rvb‡Z †c‡iwQj| †ewkifvM cÖvPxb gvby‡li g‡ZvB wMÖKiv iv‡Zi AvKvk †`LZ| Avi iv‡Zi AvKv‡k mevi Av‡M nvZ cvwK‡qwQj e¨vwejbxqiv| Zviv m~h© I P›`ªMn‡Yi c~e©vfvm †`Iqvi Dcvq RvbZ| cÖ\_g wMÖK †R¨vwZwe©` \_¨vwjm GUv wk‡LwQ‡jb e¨vwejbxq‡`i KvQ †\_‡K| wKsev nqZ wgkixq‡`i gva¨‡g wk‡L \_vK‡eb| ejv n‡q \_v‡K, L„óc~e© 585 mv‡j wZwb GKwU m~h©MÖn‡Yi c~e©vfvm cÖ`vb K‡iwQ‡jb|

e¨vwejbxq †R¨vwZwe©`¨vi mv‡\_ mv‡\_ G‡mwQj e¨vwejbxq msL¨vI| †R¨vwZwe©`¨vi cÖ‡qvR‡b wMÖKiv lvUwfwËK msL¨vc×wZ MÖnY K‡iwQj| NÈv‡K fvM K‡iwQj 60 wgwb‡U| Avi wgwbU‡K 60 fv‡M| L„óc~e© 500 mv‡ji w`‡K e¨vwejbxq †jLv‡jwL‡Z k~‡b¨i Avwef©ve N‡U| ¯^vfvweKfv‡eB wMÖK †R¨vwZwe©`ivI Gi e¨envi ïiæ K‡i †`b| cÖvPxb †R¨vwZwe©`¨vi ¯^Y©hy‡M wMÖK †R¨vwZwe©`¨vi †Uwej¸‡jv‡Z k~‡b¨i e¨envi wQj Lye mvaviY NUbv| Gi cÖZxK wQj †QvU nv‡Zi IgvB‡µvb o-Gi g‡Zv| hv †`L‡Z A‡bKUvB AvaywbK hy‡Mi k~‡b¨i g‡ZvB| hw`I GUv nqZ wbQKB KvKZvjxq NUbv| (m¤¢eZ IgvB‡µv‡bi e¨envi ïiæ n‡q‡Q 'wKQy bv' Gi wMÖK cÖwZkã ouden-Gi cÖ\_g A¶i †\_‡K| wMÖKiv k~b¨‡K †gv‡UB cQ›` KiZ bv| e¨envi KiZ hZUv m¤¢e Kg| e¨vwejbxq cÖZxK w`‡q wnmve-wbKvk K‡ii c‡i wMÖK †R¨vwZwe©`iv mvaviYZ msL¨v¸‡jv‡K AveviI ¸iæM¤¢xi wMÖK msL¨vq iƒcvšÍi K‡i wbZ| †hLv‡b k~b¨ \_vKZ Abycw¯’Z| cÖvPxb cvðvZ¨ msL¨vc×wZ‡Z k~b¨ KL‡bvB ¯’vb cvqwb| G Kvi‡Y IgvB‡µvb k~‡b¨i (o) Avw`iƒc nIqvi m¤¢vebv Kg| wnmve Ki‡Z wM‡q wMÖKiv k~‡b¨i ¸iæZ¡ eyS‡Z †c‡iwQj| ZeyI cÖZ¨vL¨vb Ki‡Z euv‡awb|

Zvi gv‡b wMÖKiv wKš‘ AÁZvi Kvi‡Y k~b¨‡K cÖZ¨vL¨vb K‡iwb| K‡iwb msL¨v-AvK…wZi mxgve×Zvi Kvi‡YI| GUv wQj Zv‡`i `k©‡bi dj| cvðv‡Z¨i †gŠwjK `vk©wbK wek¦v‡mi mv‡\_ k~‡b¨i m•NvZ nq| KviY k~‡b¨i g‡a¨ Ggb `ywU aviYv Av‡Q hv cvðvZ¨ gZev‡`i R‡b¨ ûgwK| Ges GB aviYv¸‡jvB A¨vwi÷Ujxq `k©‡bi `xN© mgq a‡i Pjv cÖfve‡K †kl K‡i †`q| GB fqvbK aviYv¸‡jv n‡jv k~b¨Zv I Amxg|

Amxg, k~b¨Zv I cvðvZ¨

*cÖK…wZwe`iv gvwQ ch©‡e¶Y K‡ib*

*Av‡Q Gi †P‡q †QvU gvwQ hv Zv‡K wkKvi K‡i*

*Zvi †P‡qI †QvU gvwQI Av‡Q hv Zv‡K Kvgo †`q|*

*Gfv‡eB P‡j Amxg ch©šÍ...*

-‡Rvbv\_b myBdU, Ab c‡qwUª A¨vÛ ivdmwW

Amxg I k~b¨Zvi kw³ wb‡q wMÖKiv AvZw¼Z wQj| me ai‡bi MwZ‡K Am¤¢e K‡i ZyjwQj Amxg| Ab¨ w`‡K k~b¨Zv ûgwK w`w”Qj ¸”Qe× gnvwek¦‡K LÐ LÐ K‡i †djvi| k~b¨‡K A¯^xKvi Kivi gva¨‡g wMÖKiv Zv‡`i gnvwek¦‡K `yB nvRvi eQi wUwK‡q ivL‡Z m¶g nq|

wc\_v‡Mviv‡mi gZev` cvðvZ¨ `k©‡bi †K›`ªxq e¯‘ n‡q I‡V| gnvwe‡k¦i me¸‡jv Z‡Ë¡ wQj AbycvZ I AvK…wZi QovQwo| MÖniv PjZ AvKv‡ki †Mvj‡K| Pj‡Z Pj‡Z ˆZwi KiZ m½xZ| wKš‘ GB †MvjK¸‡jvi evB‡i Kx Av‡Q? AviI AviI †MvjK? cÖwZUv Av‡Mi †P‡q eo eo? bvwK †kl †Mvj‡KB gnvwe‡k¦i mgvwß? A¨vwi÷Uj I Ab¨vb¨ `vk©wbKiv †Rvi w`‡q ej‡Zb, G‡Ki ci GK AmxgmsL¨K †MvjK \_vKv m¤¢e bq| GB `k©b †g‡b wb‡q cvðvZ¨ wek¦ Amxg‡K gv\_v †\_‡K ev` w`‡q w`‡qwQj| Zviv G‡K GKvev‡iB A¯^xKvi KiZ| Iw`‡K Bwjqv kn‡ii †R‡bvi Kj¨v‡Y Amxg cvðvZ¨ wPšÍvaviv‡K Kz‡i Kz‡i †L‡q †dj‡Z ïiæ K‡i w`‡qwQj| †R‡bvi mgmvgwqK gvbyliv Zv‡K cvðv‡Z¨i me‡P‡q weiw³i gvbyl e‡j g‡b KiZ|

‡R‡bvi Rb¥ L„óc~e© 490 mv‡ji w`‡K| GKB mg‡q cÖvP¨ I cvðv‡Z¨i g‡a¨ msNwUZ cÖPÐ †mB cviwmK hy×¸‡jvi m~Pbv N‡UwQj| wMÖm cvim¨‡K civwRZ K‡i| wMÖK `k©b †R‡bv‡K KL‡bvB †mfv‡e civwRZ Ki‡Z cv‡iwb| KviY †R‡bvi Kv‡Q wQj GKwU c¨vivW·| GKwU hyw³wfwËK auvav hv wMÖK `vwk©wbKiv hyw³ w`‡q eyS‡Z A¶g wQ‡jb| GUvB wQj wMÖ‡mi me‡P‡q eo hš¿Yv`vqK ZK©: †R‡bv Am¤¢e‡K cÖgvY K‡i‡Qb|

‡R‡bvi g‡Z, gnvwe‡k¦i †KvbI wKQyB PjvPj Ki‡Z cv‡i bv| Ae&k¨B GwU GKwU †Q‡jgvbywl K\_v| GKUyLvwb †nu‡U †h †KDB G‡K fyj cÖgvY K‡i w`‡Z cv‡ib| mevB RvbZ †R‡bvi K\_v fyj| wKš‘ hyw³i fyjUv †KDB †`Lv‡Z cv‡iwb| wZwb GKwU c¨vivW· wb‡q Av‡mb| †R‡bvi hyw³i auvauv¸‡jv wMÖK `vk©wbK‡`i weg~p K‡i †`q| ev` hvq cieZ©x hy‡Mi `vk©wbKivI| cÖvq `yB nvRvi eQi ch©šÍ †R‡bvi auvauv¸‡jv MwYZwe`‡`i Kcv‡j wPšÍvi fuvR †djwQj|

me‡P‡q weL¨vZ auvauvUvi K\_v ejv hvK| GUvq wZwb †`Lvb, ax‡i ax‡i GwM‡q Pjv GKwU K”Qc MwZgvb GwKwj‡mi †P‡q GKUy Av‡M Pjv ïiæ Ki‡j GwKwjm KL‡bvB Avi Zv‡K †cQ‡b †dj‡Z cv‡ib bv| AviI fvj K‡i eyS‡Z wKQy msL¨v e¨envi Kwi| aiæb, GwKwjm †m‡K‡Û GK dzU Pj‡Qb| Avi K”Qc hv‡”Q Zvi A‡a©K MwZ‡Z| AviI aiæb, K”Qc GwKwj‡mi GK dzU mvg‡b †\_‡K Pjv ïiæ Kij|

GwKwjm Zxeª †e‡M GwM‡q †M‡jb| GK †m‡K‡Ûi g‡a¨B wZwb †cuŠ‡Q †M‡jb †hLv‡b GKUy Av‡M K”QcwU wQj| Z‡e K”QcwUI †Zv Pj‡Q| d‡j GwKwjm Kc”Q‡ci Av‡Mi Ae¯’v‡b †h‡Z †h‡Z K”Qc AviI GK Aa©dzU mvg‡b P‡j †M‡Q| Zv‡Z Kx? GwKwjm †Zv AviI `ªæZ P‡jb| ZvB GB Aa©dzU `~iZ¡ †m Aa©‡m‡K‡ÛB cvi n‡q †Mj| wKš‘ ZZ¶‡Y K”Qc AviI mvg‡b P‡j †M‡Q| Gevi †M‡Q wmwK dzU| wmwK †mK‡ÛB GwKwjm †mUvI cvi n‡jv| wKš‘ K”Qc ZZ¶‡Y AveviI mvg‡b P‡j †M‡Q| Gevi GK dz‡Ui AvU fv‡Mi GK fvM| GwKwjm †`Š‡oB Pj‡Qb| wKš‘ K”Qc \_vK‡Q mvg‡bB| GwKwjm K”Q‡ci hZB Kv‡Q hvb, K”Qc ZZB Av‡Mi RvqMvq †\_‡K AviI mvg‡b P‡j hvq| GK dz‡Ui AvU fv‡Mi GK fvM, Zvici †lvj fv‡Mi GK fvM, ... µgk †QvU †QvU `~iZ¡| GwKwjm KvQvKvwQ n‡”Qb, wKš‘ K”Qc‡K ai‡Z cvi‡Qb bv| mvg‡b memgq K”QcB|

mevB Rv‡bb, ev¯Í‡e GwKwjm K”Qc‡K cvi n‡q hv‡eb wbwg‡lB| wKš‘ †R‡bvi hyw³ †\_‡K g‡b nq †mUv n‡e bv KLbI| †m hy‡Mi `vk©wbKiv †m hyw³‡K fyj cÖgvY Ki‡Z cv‡ibwb| Rvb‡Zb †R‡bvi hyw³i dj fyj| wKš‘ cÖgv‡Yi MvwYwZK fyjUv‡K awi‡q †`Iqv m¤¢e nqwb (wPÎ 10)|

mgm¨vwU wMÖK‡`i Kz‡cvKvZ K‡i †`q| Z‡e mgm¨vwUi g~j Drm wKš‘ Zviv Lyu‡RB cvqwb| †mUv n‡jv Amxg| †R‡bvi c¨vivW‡·i †fZi jywK‡q Av‡Q Amxg| †R‡bv Pjgvb MwZ‡K AmxgmsL¨Kevi fvM K‡i‡Qb| GLv‡b AmxgmsL¨K c`‡¶c `iKvi †R‡b wMÖKiv a‡i wb‡qwQj †im wPiKvj a‡i Pj‡Z \_vK‡e| hw`I cÖwZ c`‡¶‡c avc¸‡jv †QvU n‡”Q| Zviv g‡b K‡iwQj, †im KL‡bvB †kl n‡e bv| Avm‡j Amxg wb‡q KvR Kivi MvwYwZK nvwZqvi cÖvPxb gvby‡li Kv‡Q wQj bv| wKš‘ AvaywbK MwYZwe`iv †m DcvqUv †ei K‡i‡Qb| Amxg wb‡q KvR Ki‡Z nq Lye mveav‡b| Zvn‡j G‡KI G‡K e‡k Avbv hvq| jvM‡e k~‡b¨i mvnvh¨| 2,400 eQ‡ii MvwYwZK PP©vi Kuv‡a fi K‡i †R‡bvi GwKwjm auvauvq wd‡i hvIqv GLb Avi KwVb bq|

wMÖK‡`i Kv‡Q k~b¨ wQj bv| wKš‘ Avgv‡`i Kv‡Q Av‡Q| Avi †R‡bvi auvauv mgvav‡bi g~j nvwZqviB k~b¨| A‡bK mgq AmxgmsL¨K c` †hvM K‡iI mmxg GKwU dj cvIqv hvq| Z‡e †mUv n‡Z n‡j c`¸‡K µ‡gB k~‡b¨i KvQvKvwQ †h‡Z n‡e| GwKwjm I K”Q‡ci †¶‡Î GUvB n‡q‡Q| GwKwj‡mi Pjvi c\_¸‡jv †hvM Ki‡Z ïiæ Ki‡Z nq 1 w`‡q| Zvici †hvM n‡e 1/2, Zvici 1/4, Zvici 1/8,... Gfv‡eB Pj‡e| c`¸‡jv µ‡gB †QvU n‡e| Avi KvQvKvwQ n‡e k~‡b¨i13| cÖwZwU c` †hb †Kv‡bv åg‡Yi Ask| hvi MšÍe¨ k~b¨| wKš‘ wMÖKiv k~b¨‡K Gwo‡q P‡jwQj e‡j eyS‡Z cv‡iwb GB åg‡Yi †kl †Kv\_vq| Zv‡`i Kv‡Q g‡b nqwb, 1/2, 1/4, 1/8,... msL¨v¸‡jv wbw`©ó †Kv‡bv GKwU msL¨vi wbKUeZ©x n‡”Q bv| †bB †Kv‡bv MšÍe¨| Zviv ïayB †`‡L‡Q, c`¸‡jv µgk †QvU n‡”Q| nvwi‡q hv‡”Q msL¨vi RMr †\_‡K `~‡i †Kv\_vI|

AvaywbK MwYZwe`iv Rv‡bb, c`¸‡jvi GKwU mxgv (limit) Av‡Q| 1, 1/2, 1/4, 1/8, 1/16, „ msL¨v¸‡jvi mxgv n‡jv k~b¨, hvi w`‡K Giv GwM‡q hv‡”Q| GB GwM‡q Pjvi GKUv MšÍe¨ Av‡Q| †Kv‡bv åg‡Yi MšÍe¨ †\_‡K \_vK‡j wR‡Ám Kiv †h‡ZB cv‡i, MšÍe¨Uv KZ `~‡i Av‡Q| Avi †mLv‡b †cuŠQ‡Z KZ mgq jvM‡e| GwKwj‡mi Pjvi c‡\_i `~iZ¡¸‡jv †hvM Kiv KwVb bq| 1+1/2+1/4+1/8+1/16+...| GKBfv‡e GwKwj‡mi cÖwZwU c`‡¶c µ‡gB †QvU †\_‡K AviI †QvU n‡”Q| n‡”Q µ‡gB k~‡b¨i AviI KvQvKvwQ| c`‡¶c¸‡jvi †hvMdj µ‡gB 2 Gi KvQvKvwQ n‡”Q| GUv Avgiv Kxfv‡e Rvbjvg? Av”Qv, 2 †\_‡K ïiæ K‡i †`Lyb| Gevi †hvMd‡j G‡K G‡K c`¸‡jv‡K we‡qvM w`‡Z \_vKzb| cÖ\_‡g we‡qvM n‡e 1| Zvic‡i 1/2| evwK \_vK‡e evwK 1/2| Gevi we‡qvM Kiæb 1/4| Zvn‡j Avi evwK \_vK‡e 1/4| GLvb †\_‡K 1/8 we‡qvM Ki‡j \_vK‡e 1/8| Avgviv Avgv‡`i †Pbv avivq wd‡i hvw”Q| Avgiv RvwbB, 1, 1/2, 1/4, 1/8, ... avivi mxgv n‡jv k~b¨ (0)| (gv‡b avivi c`¸‡jv µ‡gB k~‡b¨i w`‡K hv‡”Q) AZGe, c`¸‡jv‡K 2 †\_‡K we‡qvM Ki‡Z \_vK‡j wKQyB Avi evwK \_vK‡e bv| 1 + 1/2 + 1/4 + 1/8 + 1/16 + ... avivi †hvMd‡ji mxgv n‡jv 2 (wPÎ 11)| K”Qc‡K ai‡Z GwKwjm‡K 2 dzU †h‡Z n‡e| hw`I Gi g‡a¨B Zv‡K Amxg msL¨K c`‡¶c †dj‡Z n‡e| GQvovI mg‡qi w`‡KB †`Lyb bv| K”Qc‡K cvi n‡Z GwKwj‡mi KZUyKz mgq jvM‡e †`Lyb: 1 + 1/2 + 1/4 + 1/8 + 1/16 + ...| gv‡b 2 †m‡KÛ| GKwU mmxg `~iZ¡ cvi n‡Z GwKwjm GKB mv‡\_ AmxgmsL¨K c`‡¶c †d‡jb, Avevi †mB `~iZ¡ cvi nb gvÎ 2 †m‡K‡ÛB|

wPÎ 11: 1 + 1/2 + 1/4 + 1/8 + 1/16 + ... = 2

`viæY GB MvwYwZK eyw×Uv wMÖK‡`i gv\_vq Av‡mwb| mxgvi aviYv Zv‡`i Rvbv wQj bv| KviY Zviv k~b¨‡K wek¦vm K‡iwb| Zviv g‡b KiZ, Amxg avivi †Kv‡bv mxgv ev MšÍe¨ \_vK‡Z cv‡i bv| Ggb avivi c`¸‡jv ïayB †QvU n‡Z \_v‡K| wKš‘ wbw`©ó †Kv‡bv msL¨vi w`‡K hvq bv| G R‡b¨B wMÖKiv Amxg wb‡q KvR Ki‡Z cviZ bv| Zviv k~b¨Z wb‡q fveZ, wKš‘ k~b¨‡K msL¨v wn‡m‡e †g‡b †bqwb| Iw`‡K Zviv Amxg wb‡qI †Ljv K‡i‡Q| wKš‘ Amxg‡K ev †hme wRwbm Amxg cwigvY †QvU ev eo Zv‡`i‡K msL¨vi RM‡Z Avm‡Z †`qwb| wMÖK MwY‡Zi me‡P‡q eo e¨\_©Zv GUvB| G Kvi‡YB Zviv K¨vjKzjvm Avwe®‹vi Ki‡Z cv‡iwb|

Amxg, k~b¨ I mxgvi aviYv G‡K Ac‡ii mv‡\_ GKwU ¸‡”Q wg‡k Av‡Q| wMÖK `vk©wbKiv †mB ¸‡”Qi wMuU Lyj‡Z cv‡iwb| G Kvi‡Y †R‡bvi auvauv mgvav‡bi R‡b¨ fvj †Kv‡bv DcKiY Zv‡`i nv‡Z wQj bv| wKš‘ †R‡bvi c¨vivW‡·i †Rvi wQj A‡bK †ewk| wMÖKiv evievi †Póv K‡i‡Q †mLvb †\_‡K Amxg‡K Zywo †g‡i Dwo‡q †`Iqvi| wKš‘ mwVK aviYvi Afv‡e e¨\_©ZvB †jLv wQj Zv‡`i Kcv‡j|

‡R‡bvi wb‡Ri Kv‡QI mgm¨vwUi fvj †Kv‡bv mgvavb wQj bv| wZwb mgvavb †Luv‡RbIwb| Zvi `k©‡bi R‡b¨ c¨vivW·wU Lye gvbvbmB| wZwb wQ‡jb Bjxq fveavivi wPšÍvwe`| GB gZev‡`i cÖwZôvZv cvg©vwbwWR g‡b Ki‡Zb, gnvwek¦ †gŠwjKfv‡e cwieZ©bnxb I wbðj| †`Lv †Mj, †R‡bvi auvav cv‡g©wbwW‡Ri hyw³i c‡¶ K\_v ej‡Q| †evSv †Mj, cwieZ©b I MwZ LyeB c¨vivWw·‡Kj e¨vcvi| wZwb gvbyl‡K †evSv‡Z †P‡qwQ‡jb, mewKQy GKB wRwbm| Ges cwieZ©bnxb| †R‡bv mwZ¨B wek¦vm Ki‡Zb, MwZ Am¤¢e| Avi GB K\_vi c‡¶ me‡P‡q eo cÖgvY Zvi wb‡Ri c¨vivW·|

wKš‘ Ab¨ gZev‡`i c‡¶I wQ‡jb wKQy wPšÍvwe`| †hgb, cigvYywe`iv wek¦vm Ki‡Zb, gnvwek¦ cigvYy bv‡g †QvU †QvU KYv w`‡q MwVZ| cigvYy wPišÍb, hv‡K Avi fvOv hvq bv| Zv‡`i g‡Z MwZ n‡jv GB †QvU †QvU cigvYyi PjvPj| GB cigvYy‡`i‡K PjvPj Ki‡Z n‡j `iKvi Lvwj RvqMv, †hLv‡b Zviv wM‡q ¯’vb K‡i †b‡e| f¨vKzqvg ev duvKv ¯’vb e‡j wKQy bv \_vK‡j cigvYyiv µgvMZ G‡K Ac‡ii mv‡\_ av°v Lv‡e| mewKQyB wPiKvj GKB RvqMvq AvU‡K \_vK‡e| PjvPj Kiv nZ Am¤¢e| d‡j cigvYy ZË¡ mwVK n‡Z n‡j gnvwe‡k¦ \_vK‡Z n‡e e¨vcK duvKv ¯’vb| Amxg GK k~b¨Zv| cigvYyev`xiv Amxg f¨vKzqv‡gi aviYv‡K jy‡d wb‡qwQj| GB aviYvi g‡a¨B Amxg I k~b¨ GKvKvi n‡qwQj| G GK AevK Kiv djvdj| wKš‘ cigvYy Z‡Ë¡ e¯‘i AwefvR¨ †gŠwjK Ask †R‡bvi c¨vivW·‡K fv‡jvfv‡eB mvgvj w`‡qwQj| cigvYyiv AwefvR¨ e‡j Ggb GKwU we›`y Av‡Q hvi c‡i †Kv‡bvwKQy‡K Avi fvOv hv‡e bv| †R‡bvi fvOvi KvR Amxg ch©šÍ †h‡Z cv‡i bv| wKQy c`‡¶c †djvi ci GwKwj‡mi c`‡¶c¸‡jv GZ †QvU n‡e, hvi c‡¶ AviI †QvU nIqv m¤¢e bq| GKUv mgq wZwb Ggb GKwU c`‡¶c †dj‡eb hv K”Q‡ci AwZµvšÍ c‡\_i †P‡q †ewk| evievi nvZ dm‡K †ewi‡q hvIqv K”Qc †kl‡gk aiv co‡eB|

cigvYy Z‡Ë¡i mv‡\_ U°i jv‡M Av‡iKwU `k©‡bi| GLv‡b Amxg f¨vKzqv‡gi g‡Zv A™¢yZ wKQy wQj bv| G aviYv Abymv‡i gnvwek¦ wQj GKwU bv`ymby`ym †QvÆ wRwbm| †bB †Kv‡bv Amxg| bv Av‡Q †Kv‡bv k~b¨Zv| Av‡Q ïay my›`i wKQy †MvjK| hviv †eób K‡i Av‡Q c„w\_ex‡K| Ae‡PZbfv‡eB c„w\_ex‡K gnvwe‡k¦i †K‡›`ª ¯’vb †`Iqv n‡qwQj| GUv wQj A¨vwi÷Ujxq aviYv| c‡i Av‡j·v›`ªxq †R¨vwZwe©` U‡jwg G‡K cwigvwR©Z K‡ib| GUv cvðvZ¨ we‡k¦i me‡P‡q cÖfvekvjx `k©‡b cwiYZ nq| k~b¨ Avi Amxg‡K cÖZ¨vL¨vb Kivi gva¨‡g A¨vwi÷Uj †R‡bvi c¨vivW·¸‡jv‡K evwZj evwb‡q †`b|

A¨vwi÷Uj wbQK ej‡jb, MwYZwe`‡`i Amxg‡K `iKvi †bB| Zviv e¨enviI K‡ib bv| n¨uv, MwYZwe`‡`i g‡b m¤¢ve¨ wKQy Amx‡gi Aw¯ÍZ¡ \_vK‡Z cv‡i| †hfv‡e \_v‡K GKwU †iLv‡K AmxgmsL¨K evi fvM Kivi aviYv| wKš‘ †m KvRwU †Zv Avi Kiv m¤¢e bq| GKBfv‡e AmxgI ev¯Í‡e †bB| GwKwjm mn‡RB K”Qc‡K cvi n‡q hvb| KviY AmxgmsL¨K we›`yi welqwU wbQK †R‡bvi KvíwbK Zywji AuvPo| GUv ev¯Íe RM‡Zi wKQy bq| Amxg‡K wbQK g‡bi g‡a¨ Aw¯Í‡Z¡ \_vKv GKwU wRwbm `vwe K‡i A¨vwi÷Uj Amxg‡K Zywo †g‡i Dwo‡q w`‡Z PvB‡jb|

G aviYv †\_‡K AZ¨šÍ PgKcÖ` GKwU wRwbm †ewi‡q Av‡m| A¨vwi÷Ujxq gnvwe‡k¦i (I cieZ©x‡Z U‡jwgi Kiv cwigvR©b) aviYvi wfwË wQj wc\_v‡Mvixq gnvwek¦| G aviYvq g‡b Kiv nZ, MÖniv ùwU‡Ki g‡Zv †Mvj‡Ki g‡a¨ Nyi‡Q| Z‡e Amx‡gi Aw¯ÍZ¡ †bB e‡j GB †Mvj‡Ki msL¨v mxgvnxb bq| AšÍZ GKUv Aek¨ \_vK‡eB| me‡P‡q evB‡ii †MvjK wQj ga¨iv‡Z †`Lv GKwU bxj †M­v‡ei g‡Zv| hv †QvU †QvU R¡jR¡‡j Av‡jvKwe›`y w`‡q Ave„Z| GB Av‡jvKwe›`yiv n‡jv b¶Î| me‡P‡q evB‡ii †Mvj‡Ki evB‡i Avi †Kv‡bv wKQyi Aw¯ÍZ¡ wQj bv| me©evB‡ii GB ¯Í‡ii c‡i nVvr K‡i †kl n‡q †M‡Q| gnvwek¦Uv †hb Ave× wQj GK ev`v‡gi †Lvmvq| hv w¯’i b¶Î‡`i †Mvj‡Ki †fZ‡ii my›`ifv‡e Ae¯’vb KiwQj| gnvwek¦Uv mmxg| e¯‘ w`‡q cwic~Y©| Amxg ej‡Z wKQy †bB| k~b¨Zv ej‡ZI wKQy †bB| Amxg †bB e‡j †bB k~b¨I|

GB hyw³ †\_‡K AviI GKwU dj cvIqv †Mj| Ck¦‡ii Aw¯Í‌‌‌‡Z¡i cÖgvY| Avi nqZ G Kvi‡Y A¨vwi÷U‡ji `k©b GZ¸‡jv eQi wU‡K \_vK‡Z †c‡iwQj|

AvKv‡ki †MvjKiv wb‡R‡`i ¯’v‡b ax‡i ax‡i Nyi‡Q| G‡Z myó m½xZ Qwo‡q hvq gnvwek¦Ry‡o| wKš‘ †MvjK‡`i GB †Nvivi †cQ‡b wbðqB †Kv‡bvwKQy f~wgKv ivL‡Q| wbðj c„w\_ex †mB ¶gZvi Drm n‡Z cv‡i bv| Zvn‡j me‡P‡q †fZ‡ii †MvjK wbðq Zvi wVK evB‡ii †MvjK Øviv MwZkxj n‡”Q| †mB †MvjK Avevi Zvi c‡ii †Mvj‡Ki gva¨‡g MwZkxj| Gfv‡eB Pj‡Q| wKš‘ Amxg †Zv †bB| †Mvj‡Ki msL¨v wbw`©ó| G‡K Aci‡K MwZkxj ivLvi R‡b¨ Av‡Q mmxg msL¨K e¯‘| MwZi wbðqB P~ovšÍ †Kv‡bv Drm Av‡Q| wbðqB wKQy GKUv w¯’i b¶Î‡`i †MvjK‡K †Nviv‡”Q| †mUvB cÖavb MwZ`vZv Ck¦i| cigvYyev`x‡`i bvw¯ÍK e‡j AvL¨vwqZ Kiv n‡jv| A¨vwi÷Ujxq gZ wb‡q cÖkœ †Zvjv wQj Ck¦‡ii Aw¯ÍZ¡ wb‡q cÖkœ †Zvjvi mvwgj|

A¨vwi÷Ujxq gnvwe‡k¦i aviYv AZ¨šÍ mdj wQj| Zuvi me‡P‡q RbwcÖq wk‡l¨i bvg Av‡jKRvÛvi `¨ †MÖU| wZwb ¸iæi gZev` cÖPvi Ki‡Z e¨vcK f~wgKv cvjb K‡ib| 323 L„óc~‡e© wb‡Ri AKvj g„Zy¨i Av‡M Qwo‡q †`b cÖv‡P¨i fviZ ch©šÍ| Av‡jKRvÛv‡ii mvgªv‡R¨i cZb NU‡jI wU‡K \_v‡K A¨vwi÷U‡ji gZev`| wU‡K \_vKj †lvok kZ‡Ki GwjRv‡e‡\_i mgq ch©šÍ| GB `xN© mgq a‡i A¨vwi÷Uj‡K †g‡b †bIqv mv‡\_ mv‡\_ cÖZ¨vL¨vb K‡i Avmv n‡q‡Q Amxg I k~b¨Zv‡K| KviY A¨vwi÷Ujxq gZev‡` Amxg‡K A¯^xKvi Ki‡Z n‡j k~b¨I \_vK‡Z cv‡i bv| k~b¨Zvi Dcw¯’wZ e‡j Amxg e‡jI wKQy GKUv Av‡Q| Avi hvB †nvK, k~b¨Zvi †Zv ïay `ywUB m¤¢ve¨ w`K Av‡Q| Avi `y‡UvB ej‡Q AmxgI \_vK‡e| cÖ\_gZ, k~b¨Zvi cwigvY n‡Z cv‡i Amxg| gv‡b Amx‡gi Aw¯ÍZ¡ Av‡Q| wØZxqZ, k~b¨Zvi cwigvY mmxg ev wbw`©ó| Avi k~b¨Zv gv‡b e¯‘i Abycw¯’wZ| AZGe k~b¨Zvi cwigvY mmxg n‡Z n‡j e¯‘i cwigvY Amxg n‡Z n‡e| ZvI Amx‡gi Aw¯ÍZ¡ \_v‡K| `yB †¶‡ÎB k~b¨Zvi Aw¯ÍZ¡ Amx‡gi Aw¯ÍZ¡‡K Awbevh© K‡i †Zv‡j| k~b¨ ev k~b¨Zv A¨vwi÷U‡ji my›`i hyw³Uv‡K †kl K‡i †`q| evwZj K‡i †`q Zuvi Kiv †R‡bvi e³‡e¨i LÐb Avi Ck¦‡ii Aw¯Í‡Z¡i cÖgvY8| d‡j wMÖKiv A¨vwi÷U‡ji K\_v gvbvi Kvi‡Y k~b¨, k~b¨Zv I Amxg‡K cÖZ¨vL¨vb Ki‡Z eva¨ nq|

GKUv mgm¨v wKš‘ wQjB| Amxg I k~b¨ `y‡Uv‡KB Ae‡njv Kiv GZ mnR bv| mg‡qi myo½ w`‡q AZx‡Z wd‡i ZvKv‡bv hvK| BwZnv‡mi cvZvq KZ KZ NUbv| Amxg e‡j wKQy bv \_vK‡j AmxgmsL¨K NUbv \_vKv m¤¢e bq| Zvn‡j cÖ\_g NUbv e‡j wKQy GKUv \_vK‡Z n‡e| †mUv n‡e m„wói m~Pbv| wKš‘ Zvi Av‡M Kx wQj? k~b¨Zv? wKš‘ A¨vwi÷U‡ji Kv‡Q Zv MÖnY‡hvM¨ bq| Avevi †Kv‡bv cÖ\_g NUbv bv \_vK‡j gnvwek¦ wbðq memgq Aw¯Í‡Z¡ wQj| fwel¨‡ZI \_vK‡j wPiKvj (Amxg mgq ch©šÍ)| Amxg A\_ev k~b¨‡K †g‡b wb‡ZB n‡e| `y‡Uvi AšÍZ GKUv bv \_vK‡j gnvwek¦ A\_©nxb n‡q hvq|

A¨vwi÷Uj k~b¨Zvi aviYv‡K `y‡Pv‡L †`L‡Z cvi‡Zb bv| d‡j wZwb k~b¨Zvavix gnvwe‡k¦i e`‡j wPi I Amxg gnvwe‡k¦i c¶ wb‡jb| Zuvi g‡Z, mg‡qi wPiengvbZv †R‡bvi Amxg wefvR‡bi9 g‡Zv GKwU m¤¢ve¨ Amxg|

fyj †nvK Avi hvB †nvK, c`v\_©weÁv‡bi A¨vwi÷Ujxq aviYv AZ¨šÍ cÖfvekvjx wQj| GK nvRvi eQ‡ii †ewk mgq a‡i Ab¨ †Kv‡bv gZev` gv\_v DuPy K‡i `uvov‡Z cv‡iwb| evwZ‡ji LvZvq D‡V‡Q Gi †P‡q ev¯Íe ZË¡I| A¨vwi÷U‡ji evbv‡bv c`v\_©weÁvb Avi †R‡bvi Amxg‡K A¯^xKv‡ii cÖeYZv †\_‡K m‡i Avmvi Av‡M weÁvb Avi AMÖMwZ Ki‡Z cv‡iwb|

eyw×i weo¤^bvq †R‡bv Rwo‡q c‡owQ‡jb eomo Sv‡gjvq| L„óc~e© 435 mv‡j wZwb Bwjqvi ˆ¯^iPvix ivRv wbqviKm‡K DrLvZ Kivi Kv‡R Zrci nb| D‡Ïk¨ mva‡b wZwb A¯¿ mieiv‡ni KvR K‡ib| †R‡bvi `~f©vM¨: wbqviKm loh‡š¿i K\_v †R‡b hvb| †R‡bv‡K †MÖdZvi Kiv nq| lohš¿Kvix‡`i †ei Ki‡Z †R‡bvi Ici wbh©vZ‡bi LoM †b‡g Av‡m| Aí‡ZB †R‡bv †f‡O co‡jb| mnPi‡`i awi‡q w`‡Z ivwR n‡jb| wbqviKm †R‡bvi Kv‡Q Avm‡j †R‡bv Zv‡K AviI Kv‡Q Avm‡Z ej‡jb, hv‡Z bvg¸‡jv †Mvcb \_v‡K| wbqviKm mvg‡b Syu‡K †R‡bvi w`‡K gv\_v evovj| AvPgKv †R‡bv wbqviK‡mi Kv‡b `uvZ ewm‡q w`‡jb| wbqviKm †PuwP‡q I‡V| wKš‘ †R‡bvi Kvgo Qvovi †Rv †bB| cv‡ki wbh©vZbKvixiv †R‡bv‡K QywiKvNvZ K‡i g„Zy¨ wbwðZ K‡i wbqviKm‡K D×&evi K‡i| Avi Gfv‡eB g„Zy¨ nq Amx‡gi gnvbvq‡Ki|

‡kl ch©šÍ Aek¨ Av‡iKRb wMÖK `vk©wbK Amx‡gi e¨vcv‡i †R‡bv‡K Qvwo‡q hvb| wZwb AvwK©wgwWm| wmivwKD‡mi †Lcv MwYZwe`| †m mg‡qi wPšÍvwe`‡`i g‡a¨ †Kej wZwbB Amxg wb‡q wPšÍv Ki‡Z †c‡iwQ‡jb|

wmwmwj Øx‡c wmivwKDm wQj me‡P‡q cÖvPyh©gq kni| AvwK©wgwWm wQ‡jb GLvbKvi me‡P‡q weL¨vZ evwm›`v| Zuvi cÖv\_wgK Rxeb m¤ú‡K© †ewk wKQy Rvbv hvq bv| Z‡e m¤¢eZ wZwb L„óc~e© 287 mv‡ji w`‡K mv‡gv‡m Rb¥MÖnY K‡ib| wc\_v‡Mviv‡mi Rb¥I GKB ¯’v‡b| R‡b¥i ci AvwK©wgwWm wmivwKD‡m cvwo Rgvb| ivRv‡K cÖ‡KŠkjMZ mgm¨vi mgvavb w`‡Z \_v‡Kb| wmivwKD‡mi ivRvB AvwK©wgwWm‡K gyKzU cix¶v Ki‡Z w`‡qwQ‡jb| ej‡Z n‡e gyKz‡U LvwU †mvbv Av‡Q bvwK Av‡Q mxmvi wgkªY| G KvRwU ZrKvjxb weÁvbx‡`i mv‡a¨i AZxZ wQj|

AvwK©wgwWm †Mvm‡ji mgq cvwbi Uv‡e em‡jb| †`L‡jb, Uv‡ei wKbvi w`‡q cvwb Mwo‡q evB‡i coj| nVvr wZwb eyS‡Z cvi‡jb, gyKzUwU cvwb‡Z Wywe‡q Gi NbZ¡ Ges Avmj‡Z¡i cix¶v K‡i †djv hvq| †Lqvj Ki‡Z n‡e KZUyKz cvwb evB‡i c‡o hv‡”Q| `viæY Dcjw×i cÖfv‡e AvwK©wgwWm bMœ Ae¯’vqB Uve †\_‡K jvwd‡q †b‡g wmivwKD‡mi iv¯Ív a‡i QyU‡jb, "BD‡iKv! BD‡iKv!Ó

AvwK©wgwW‡mi †gav wmivwKD‡mi mvgwiK evwnbxiI Kv‡R G‡mwQj| L„óc~e© 3q kZ‡K wMÖK‡`i Avwac‡Z¨i BwZ N‡U| Av‡jKRvÛv‡ii mvgªv‡R¨i cZb n‡q Avjv`v Avjv`v ivR¨ ˆZwi nq| hviv G‡K Ac‡ii mv‡\_ weev` Ki‡Z \_v‡K| cvðv‡Z¨ †ivgKiv bZyb kw³ wn‡m‡e Avwef©~Z n‡Z ïiæ K‡i| †ivgKiv wmivwKD‡mi w`‡K bRi †`q| M‡í Av‡Q, AvwK©wgwWm †ivgK‡`i †\_‡K wmivwKDm‡K i¶v Ki‡Z bMievmx‡K A‡jŠwKK A‡¯¿i †hvMvb †`q| Gi g‡a¨ wQj cv\_i wb‡¶cK| wQj †µb, hv †ivgK‡`i RvnvR‡K k~‡b¨ Zy‡j c‡i †d‡j w`‡Z cvwb‡Z| wQj AZ¨šÍ DuPy gv‡bi `c©Y| m~‡h©i Av‡jv‡K cÖwZdwjZ K‡i G `c©Y A‡bK `~i †\_‡K †ivgK‡`i Rvnv‡R Av¸b awi‡q †`q| †ivgK ˆmb¨iv Gme h‡š¿i †Lj †`‡L AvZw¼Z n‡q c‡o| Ae¯’v Ggb n‡jv, Gme ˆmb¨iv †`qv‡ji Ici w`‡q †Kv‡bv iwk ev Kv‡Vi wPý †`L‡jI f‡q cvwj‡q †hZ| bv Rvwb AvwK©wgwWm †Kvb A¯¿ ZvK Ki‡e Zv‡`i w`‡K!

AvwK©wgwWm Amx‡gi †`Lv cÖ\_g †c‡qwQ‡jb Zvi hy‡×i `c©‡Yi Kuv‡P| KwbK ev †Pv‡Oi g‡Zv wRwb‡mi cÖwZ wMÖKiv eû kZvãx a‡iB AvK…ó wQj| GKwU †Kvb wb‡q G‡K e¨vmva© eivei KvUyb (‡Kvb n‡jv Svjgywoi c¨v‡K‡Ui g‡Zv| Kjvi †gvPvI GKB AvK…wZi|---Abyev`K)| Kxfv‡e KvU‡Qb Zvi Ici wbf©i K‡i cvIqv hv‡e e„Ë, Dce„Ë, cive„Ë ev Awae„Ë| cive„‡Ëi GKwU we‡kl ˆewkó¨ Av‡Q| m~h© ev `~ieZ©x †Kv‡bv Dr‡mi Av‡jv‡K GwU GKwU we›`y‡Z wgjb NUvq| d‡j Av‡jvi meUyKz kw³ GKwU RvqMvq cyÄxf~Z nq| RvnvR‡K †cvov‡bvi R‡b¨I cive„‡Ëi g‡Zv †`L‡Z GKwU `c©Y jvM‡e| AvwK©wgwWm cive„‡Ëi ˆewkó¨ †R‡bwQ‡jb| Avi wVK GLv‡bB Amxg wb‡q Zuvi †Ljvi ïiæ|

cive„Ë eyS‡Z wM‡q AvwK©wgwWm‡K G‡K cwigvc Kivi Dcvq wkL‡Z n‡qwQj| cive„‡Ëi LwÐZ As‡ki †¶Îdj †ei Kivi wbqg Kv‡ivB Rvbv wQj bv| wÎfyR I e„‡Ëi cwigvc Lye mnR wQj| wKš‘ Gi †P‡q †ewk welg (irregular) evûi Kv‡f©i cwigvc †m mgqKvi wMÖK MwYZwe`‡`i mv‡a¨i AZxZ wQj| cive„ËI wQj ZvB| Z‡e Amx‡gi Avkªq wb‡q AvwK©wgwWm cive„‡Ëi †¶Îdj †ei Kivi eyw× †ei K‡i †d‡jb| cÖ\_g KvR n‡jv cive„‡Ëi †fZ‡i GKwU wÎfyR ewm‡q †`Iqv| Gi d‡j `yB w`‡K `ywU †QvU duvKv RvqMv ˆZwi n‡e| duvKv RvqMv `ywU‡Z AvwK©wgwWm AviI wÎfyR emv‡jb| Gi d‡j duvKv RvqMv cvIqv †Mj PviwU| emv‡bv n‡jv AviI wÎfyR| Gfv‡eB Pjj †Ljv| (wPÎ 12)

G †hb GwKwjR I K”Q‡ci M‡íi g‡Zv| †hLv‡b i‡q‡Q Amxg msL¨K Kv‡Ri avc| cÖwZwU avc Av‡Mi av‡ci †P‡q †QvU| †QvU †QvU wÎfyR¸‡jvi †¶Îdj Lye `ªæZ k~‡b¨i KvQvKvwQ P‡j Av‡m| A‡bK¸‡jv RwUj wnmve-wbKvk †k‡l AvwK©wgwWm AmxgmsL¨K wÎfy‡Ri †¶Îd‡ji mgwó †ei K‡ib| †c‡q hvb cive„‡Ëi †¶Îdj| †mmg‡qi MwYZwe`‡`i Kv‡Q KvRUv nvm¨Ki| AvwK©wgwWm Amxg wb‡q †Ljv K‡i‡Qb| Zuvi MwYZwe` eÜy‡`i Kv‡Q G GK wbwl× KvR| Zv‡`i‡K Lykx ivL‡Z Aek¨ AvwK©wgwWm GKwU cÖgvYI nvwRi K‡i‡Qb| †mg‡qi ¯^xK…Z MvwYwZK aviYvB Kv‡R jvwM‡q‡Qb Zv‡Z| G‡Z e¨envi K‡i‡Qb Z\_vKw\_Z AvwK©wgwW‡mi Dccv`¨| AvwK©wgwWm Aek¨ ¯^xKvi K‡i‡Qb, GB Dccv`¨ Av‡Mi MwYZwe`‡`i `vb| Avcbv‡`i nqZ g‡b Av‡Q, GB Dccv`¨ ej‡Q, †h‡Kv‡bv msL¨v‡K wb‡Ri mv‡\_ evievi †hvM Ki‡j †hvMdj †h‡Kv‡bv msL¨v‡K Qvwo‡q †h‡Z cv‡i| Z‡e k~b¨ Aek¨B GB wbq‡gi g‡a¨ co‡e bv|

wjwgU I K¨vjKzjvm cÖK…Z A‡\_© Avwe®‹v‡ii Av‡M AvwK©wgwW‡mi wÎfy‡Ri gva¨‡g Kiv GB cÖgvYB GB aviYv¸‡jvi me‡P‡q KvQvKvwQ wRwbm| cieZ©x‡Z AvwK©wgwWm †iLvi mv‡c‡¶ N~Y©vqgvb cive„Ë I e„‡Ëi AvqZbI †ei K‡i †`Lvb| eZ©gv‡b K¨vjKzjv‡mi wk¶v\_©xiv K¨vjKzjvm †kLvi ïiæ‡ZB Gme mgm¨v wb‡q KvR K‡i| wKš‘ AvwK©wgwW‡mi Dccv‡`¨ wQj bv k~‡b¨i VuvB| A\_P k~b¨B mmxg I Amx‡gi ga¨Kvi †mZy| Ggb GK †mZy, hv K¨vjKzjvm I D”PZi MwY‡Zi R‡b¨ Acwinvh©|

mgKvjxb‡`i g‡Zv AvwK©wgwWmI A‡bKmgq Amxg‡K Zvw”Qj¨ K‡i‡Qb| wQ‡jb A¨vwi÷Ujxq gnvwe‡k¦ wek¦vmx| G gnvwek¦ wQj wekvj GK †Mvj‡Ki Af¨šÍ‡i| GKevi Zvi gv\_vq Pvcj A™¢yZ GK †Lqvj| wZwb fve‡jb, cy‡iv (‡MvjKxq) gnvwe‡k¦ KZwU evjyKYv AuvU‡e Zv wnmve Ki‡eb wZwb| m¨vÛ †i‡Kvbvi †jLvq wZwb wnmve K‡l †`L‡jb, GKwU †cv¯Í`vbvq (Avwd‡gi exR) KqwU `vbv ai‡e| Gici †ei Ki‡jb KqwU †cv¯Í`vbv Av½y‡ji mgvb PIov n‡e| Av½y‡ji cÖ¯’ †\_‡K †M‡jb †÷wWqv‡gi (‡ekx `~iZ¡ gvc‡Z GUvB wQj wMÖK‡`i cÖavb GKK) ˆ`‡N¨©| Gfv‡e †cuŠ‡Q †M‡jb gnvwe‡k¦i mvBR ch©šÍ| AvwK©wgwW‡mi wnmve Abymv‡i cy‡iv gnvwek¦‡K 1051 wU evjyKYv w`‡q Kvbvq Kvbvq c~Y© Kiv hv‡e| hvi d‡j (A¨vwi÷Ujxq gnvwe‡k¦i) evB‡ii w¯’i ZviKvi †MvjKI evjy‡Z cwic~Y© n‡q IV‡e| (1051 wKš‘ Avm‡jB eomo GK msL¨v| aiæb Avcbvi Kv‡Q 1051 wU cvwbi AYy Av‡Q| eZ©gv‡b c„w\_ex‡Z hZ gvbyl Av‡Q mevB wg‡j cÖwZ †m‡K‡Û GK Ub K‡i cvwb cvb Ki‡j meUyKz cvwb †kl Ki‡Z 1 j¶ 50 nvRvi eQi jvM‡e|) GB msL¨v GZB eo wQj †h wMÖK‡`i MYbvwe`¨v Gi Kv‡Q G‡m civ¯Í nq| wekvj eo msL¨v‡`i cÖKvk Kivi R‡b¨ AvwK©wgwWm‡K G‡Kev‡i bZyb GKwU c×wZ Avwe®‹vi Ki‡Z nq|

wMÖK msL¨vc×wZ‡Z 10,000 (AhyZ) wQj me‡P‡q eo ¸”Q| Ahy‡Zi mvnv‡h¨ wMÖKiv AhyZ AhyZ (10 †KvwU) msL¨v‡KI cÖKvk Ki‡Z cviZ| AviI wKQyUvI †h‡Z cviZ AviI eo msL¨vi w`‡K| wKš‘ GKwU bZyb wPšÍvi m~Pbv K‡i AvwK©wgwWm GB evav †cwi‡q hvb| wZwb ïiæ K‡ib Lye mijfv‡e| ïiæ‡Z 100 †KvwU‡K a‡i wb‡jb 1| Avevi MYbv ïiæ K‡i msL¨v¸‡jv‡K bvg w`‡jb wØZxq µ‡gi msL¨v| (AvwK©wgwWm 100,00,00,001-‡K 1 a‡ibwb| 100,00,00,000-‡KI 0 a‡ibwb| AvaywbK MwYZwe‡`iv hw`I †mUvB Ki‡eb| AvwK©wgwWm †Lqvj K‡ibwb, 0 †\_‡K ïiæ KivB †ewk hyw³hy³ nZ|) wØZxq µ‡gi msL¨viv AhyZ AhyZ †\_‡K P‡j Gj AhyZ AhyZ AhyZ Ahy‡Z| Z„Zxq µ‡gi msL¨viv n‡jv AhyZ AhyZ AhyZ AhyZ AhyZ AhyZ ev 10,00,00,00,00,00,00,00,00,00,00,000| Gfv‡e †h‡Z †h‡Z wZwb †M‡jb 10 †KvwUZg µg ch©šÍ| G‡`i‡K wZwb bvg †`b cÖ\_g hy‡Mi msL¨v| KvRwU myLKi wQj bv| Z‡e KvR Zv‡Z n‡q †M‡Q| wb‡Ri wPšÍb cix¶v Ki‡Z AvwK©wgwW‡mi hv cÖ‡qvRb wQj Zvi †P‡q †ewkB n‡q‡Q| wKš‘ msL¨v¸‡jv eo n‡jI wQj mmxg| gnvwek¦‡K evjy w`‡q fwZ© Ki‡Z hZ evjy jvM‡e †m msL¨vi †P‡q †ewk| wMÖK gnvwe‡k¦ Amx‡gi `iKvi c‡owb|

AviI mgq †c‡j nqZ AvwK©wgwWm Amxg I k~‡b¨i AvKl©Y †`L‡Z ïiæ Ki‡Zb| wKš‘ m¨vÛ †i‡Kvbvi (evjy MYbvKvix) evjy ¸b‡Z ¸b‡Z wbqwZi mv¶vr †c‡q †M‡jb| †ivgK‡`i †gvKv‡ejv Kivi ¶gZv wmivwKDmevmxi wQj bv| wmivwKD‡mi ch©‡e¶Y UvIqv‡ii Rbej wQj `ye©j| †`qvj¸‡jv †e‡q mn‡RB Gcv‡i P‡j Avmv †hZ| Gi d‡j †ivgvbiv wKQy ˆmb¨‡K kn‡ii †fZ‡i cvwV‡q †`q| Avi Zv eyS‡Z †c‡iB wmivwKDmevmx AvZw¼Z n‡q c‡o| AvZ¥i¶vi g‡bvej †Mj †f‡O| †ivgvbiv knigq Qwo‡q coj| wKš‘ AvwK©wgwW‡mi †mw`‡K gb †`Iqvi mgq †bB| wZwb gvwU‡Z e‡m evjy‡Z e„Ë AuvKwQ‡jb| †Póv KiwQ‡jb GKwU Dccv`¨ cÖgvY Ki‡Z| GK †ivgK ˆmb¨ 75 eQi eqmx Avjy\_vjy AvwK©wgWm‡K †`‡L †cQb †cQb †h‡Z ejj| AvwK©wgwWm gvb‡jb bv| KviY cÖgvY ZLbI †kl nqwb| ˆmb¨wU †i‡M wM‡q Zuvi M`©vb †K‡U †djj| Gfv‡eB †ivgK‡`i AcÖ‡qvRbxq nZ¨vi wkKvi n‡q gviv hvb cÖvPxb we‡k¦i me‡P‡q †gavex gvbylwU|

MwY‡Zi RM‡Z †ivgvb‡`i Ab¨Zg eo Ae`vbB AvwK©gwW‡mi nZ¨v| Zviv cÖvq mvZ kZvãx kvmb ¶gZvq wQj| GB cy‡iv mg‡q MwY‡Zi eo †Kv‡bv AMÖMwZ †bB| mgq †Zv Avi †\_‡g \_v‡Kwb| BD‡iv‡c wLªóa‡g©i cÖmvi n‡q‡Q| †ivgvb‡`i cZb n‡q‡Q| Av‡j·vw›`ªqvi jvB‡eªwi cy‡o‡Q| ïiæ n‡q‡Q AÜKvi hyM| AviI mvZ kZvãx c‡i cvðv‡Z¨ k~b¨ wd‡i Av‡m|

Gi gv‡S Avevi `yRb mbœ¨vmx k~b¨ QvovB GKUv K¨v‡jÛvi evbvb| hv Avgv‡`i‡K wPiKv‡ji R‡b¨ weåvwšÍi mvM‡i Wywe‡q †`q|

AÜ Awfmvi

*G GK Zy”Q I wkïmyjf Avjvc| Avgv‡`i e³‡e¨i we‡ivaxZvKvix‡`i wbe©yw×ZviB ewntcÖKvk GwU|*

- `¨ UvBgm (jÛb), 26 wW‡m¤^i, 1799

GB 'Zy”Q I wkïmyjf' AvjvcwU n‡jv bZyb kZvãxi m~Pbv wb‡q| bZyb kZvãx wK 00 †Z ïiæ n‡e, bvwK 01 †\_‡K| GB AvjvcwU GK k eQi cici Nwoi KuvUvi g‡Zv wd‡i wd‡i Av‡m| ga¨hyMxq mbœ¨vmxiv k~‡b¨i K\_v Rvb‡j K¨v‡jÛvi wb‡q GB Sv‡gjvq cov jvMZ bv|

Z‡e bv Rvbvi Rb¨ mbœ¨¨vmx‡`i †`vl †`Iqv hvq bv| Avm‡j ga¨ hy‡Mi cwð‡g ïay wLªóvb mbœ¨vmxivB MwYZ wb‡q cov‡kvbv K‡i‡Q| ïay Zv‡`i g‡a¨B wKQy weÁ †jvK Lyu‡R cvIqv †hZ| `ywU Kvi‡Y Zv‡`i MwY‡Zi cÖ‡qvRb c‡owQj| cÖv\_©bv Avi A\_©| UvKv ¸b‡Z Zv‡`i Rvb‡Z nq Kxfv‡e...ûg...UvKv ¸b‡Z nq| Gi R‡b¨ Zviv e¨envi KiZ A¨vevKvm ev KvDw›Us †evW©| KvDw›Us †evW©I A¨vevKv‡mi g‡Zv wQj| †hLv‡b cv\_i ev Ggb wKQy‡K †Uwe‡ji Ici PvjvPvwj Kiv nZ| KvRUv Ki‡Z Lye GKUv `¶Zv \_vKv jvMZ bv| Z‡e †m mg‡qi Zyjbvq †mUvB wQj AZ¨vaywbK GK hš¿| Avevi cÖv\_©bvi Rb¨ c~Rvix‡`i mgq I ZvwiL Rvbv jvMZ| d‡j c~Rvix‡`i ag©xq Abyôv‡bi Rb¨ mgqMYbv wQj Acwinvh©| wbqwgZ weiwZ‡Z wfbœ wfbœ mg‡q wfbœ wfbœ cÖv\_©bv Ki‡Z nZ| (Bs‡iwR noon ev `ycyi kãwU G‡m‡Q nones †\_‡K| hvi A\_© n‡jv ga¨hy‡Mi w`‡bi ga¨fv‡Mi cÖv\_©bv) mgq bv Rvb‡j iv‡Zi cÖnix Kxfv‡eB ev m½x‡`i Aviv‡gi Nyg †\_‡K RvwM‡q w`‡bi Kv‡Ri Rb¨ cÖ¯‘Z n‡Z ej‡e? GKUv fvj K¨v‡jÛvi bv \_vK‡j Kxfv‡e Rvbv hv‡e KLb B÷vi10 D`hvcb Ki‡Z n‡e? GUv wQj GK eo mgm¨v|

B÷v‡ii ZvwiL †ei Kiv AZ mnR †Kv‡bv KvR wQj bv| GK K¨v‡jÛv‡i ZvwiL Av‡m G‡KKUv| wMR©vi †K›`ª wQj †iv‡g| Avi wLªóvbiv e¨envi KiZ †ivgvb †mŠi K¨v‡jÛvi| G‡Z w`‡bi msL¨v wQj †gvUvgywU 365| wKš‘ whï ev Cmv (Av) wQ‡jb RvwZ‡Z Bû`x| wZwb ZvB e¨envi Ki‡Zb Bû`x‡`i Pv›`ª cwÄKv| †hUvq w`‡bi msL¨v gvÎ 354-Gi g‡Zv| whïi (Av) Rxe‡b eo NUbv¸‡jv Pv›`ª gv‡mi ZvwiL w`‡q bw\_f~³ Av‡Q| wKš‘ ˆ`bw›`b Rxe‡b m~‡h©i f~wgKv †ewk| K¨v‡jÛvi `ywUi Zvwi‡L Miwgj memgq n‡ZB \_v‡K| d‡j QywUi w`b †ei Kiv KwVb KvR n‡q `uvovq| B÷viI Ggb GKwU mgm¨vgq QywUi w`b| G Kvi‡Y 100 eQ‡ii B÷v‡ii ZvwiL †ei K‡i ivLvi Rb¨ K‡qK cÖRb¥ ci ci GKRb mbœ¨vmx‡K `vwqZ¡ †`Iqv nZ|

w`IwbwmDm Gw·¸m wQ‡jb Ggb GKRb mbœ¨vmx| lô kZ‡K †cvc 1g Rb Zv‡K B÷v‡ii ZvwiL¸‡jv AviI †ewk †ei K‡i ivLvi Rb¨ e‡jb| ZvwiL¸‡jv‡K iƒcvšÍi I bZyb wnmve Ki‡Z wM‡q w`IwbwmDm GKUy M‡elYv Pvjv‡jb| wZwb eyS‡Z cvi‡jb, wZwb whïi (Av) Rb¥ZvwiLI †ei Ki‡Z cvi‡eb| wKQy mgq MvwYwZK wnmve-wbKvk K‡i wZwb wVK Ki‡jb ZrKvjxb eZ©gvb eQi n‡jv whïi (Av) R‡b¥i 525Zg eQi| w`IwbwmDm fve‡jb, whïi Rb¥ eQiB 1g eQi ev 1g wLªóvã nIqv DwPZ| Aek¨ w`IwbwmDm e‡jwQ‡jb, wLª‡ói Rb¥ n‡qwQj Av‡Mi eQ‡ii 25 wW‡m¤^‡i| wKš‘ wZwb 1 Rvbyqvwii 1 Zvwi‡L K¨v‡jÛvi ïiæ K‡ib †ivgvb e‡l©i mv‡\_ wgj ivLvi Rb¨| Zvi cieZ©x eQi wQj 2q wLªóvã, c‡iiUv 3q wLªóvã BZ¨vw`| Gi gva¨‡g Av‡Mi eûj cÖPwjZ `ywU ZvwiL wba©viY c×wZi RvqMvq bZyb G wbqg Avmj11| wKš‘ mgm¨v GKUv †\_‡K †Mj| Avm‡j `ywU|

cÖ\_g K\_v n‡jv, w`IwbwmDm whïi (Av) fyj Rb¥ZvwiL †ei K‡i| wewfbœ m~‡Îi HKgZ¨ †\_‡K Rvbv hvq, ivRv †n‡ivW beRvZK gmxn (Av) m¤ú‡K© GKwU fwel¨ØvYx ï‡bwQ‡jb| G Kvi‡Y †gwi I †Rv‡md ivRvi Av‡µvk †\_‡K euvP‡Z cvwj‡q hvb| wKš‘ †n‡ivW gviv hvb wLªóc~e© wZb mv‡j| gv‡b wLª‡ói (Av) R‡b¥i K‡qK eQi Av‡MB| ¯úóB †evSv hv‡”Q, w`IwbwmD‡mi fyj n‡q wM‡qwQj| eZ©gv‡b †ewkifvM we‡klÁ g‡b Ki‡Qb, wLª‡ói (Av) Rb¥ n‡qwQj PZy\_© wLªóc~e© mv‡j| w`IwbwmD‡mi wnmv‡e K‡qK eQ‡ii fyj n‡qwQj|

mwZ¨ ej‡Z G fyj wKš‘ AZ gvivZ¥K wKQy bq| K¨v‡jÛv‡ii cÖ\_g eQi evQvB Kivi †¶‡Î †Kvb eQi evQvB Kiv n‡jv Zv AZ ¸iæZ¡c~Y© bq| Z‡e c‡ii me wnmve n‡Z n‡e wbf©yj| Pvi eQ‡ii fy‡j †Kv‡bv ¶wZ †bB, hw` mevB fyjUvi e¨vcv‡i †g‡b †bq| †hgb Avgiv gvbjvg| wKš‘ w`IwbwmD‡mi K¨v‡jÛv‡i AviI gvivZ¥K GK mgm¨v wQj| Avi Zv n‡jv k~b¨|

k~b¨Zg eQi wQj bv G‡Z| Ggwb‡Z G‡Z †Kv‡bv Amyweav †bB| †m mg‡qi †ewkifvM K¨v‡jÛvi cÖ\_g eQi †\_‡K ïiæ| k~b¨ bq| k~b¨‡Z ïiæ Kivi †Kv‡bv DcvqB w`IwbwmD‡mi wQj bv| wZwb k~‡b¨i K\_v Rvb‡ZbB bv| wZwb †e‡o I‡Vb †ivgvb mvgªv‡R¨i cZ‡bi ci| †ivgvb‡`i ¯^Y©hy‡MI Zviv MwY‡Z fvj wKQy K‡i †`Lv‡Z cv‡iwb| 525 mv‡j ïiæ AÜKvi hy‡Mi| cwðgviv †Mvj‡g‡j †ivgvb c×wZi msL¨vi e¨envi Kiv ïiæ Kij| GB MYbvc×wZ‡Z †Kv‡bv k~b¨ wQj bv| ¯^vfvweKfv‡eB w`IwbwmDm whïi (Av) R‡b¥i cÖ\_g eQi‡K a‡ib eQi bs 1 (I)| c‡ii eQi n‡e II| Avi w`IwbwmDm G wm×všÍ †bb DXXVZg eQ‡i| †ewkifvM †¶‡ÎB G‡Z †Kv‡bv Amyweav †bB| Avi ZvQvov w`IwbwmD‡mi K¨v‡jÛvi ZL‡bv AZ RbwcÖq nqwb| 525 mv‡j †ivgvb ivR `iev‡ii eyw×Rxweiv GK gnv mgm¨vq coj| †cvc Rb gviv †M‡jb| ¶gZvi cvjve`j n‡jv| me `vk©wbK I w`IwbwmD‡mi g‡Zv MwYZwe`‡`i‡K `ievi †\_‡K Zvwo‡q †`Iqv n‡jv| ZvI fvM¨ fv‡jvB ej‡Z n‡e| AšÍZ cÖvY wb‡q cvjv‡Z †ci‡Qb| (Ab¨iv GZ fvM¨evb wQ‡jb bv| A¨vwbwmDm †evw\_Dm wQ‡jb cÖfvekvjx `ievix| ga¨hy‡Mi Ab¨Zg cvðvZ¨ MwYZwe` I D‡jøL‡hvM¨ GK e¨w³Z¡| w`IwbwmDm‡K Awdm †\_‡K Zvwo‡q †`Iqvi cÖvq GKB mg‡q †evw\_qvmI ¶gZv nvivb| e›`x Kiv nq Zv‡K| †evw\_qvm BwZnv‡m VuvB Aek¨ MwY‡Zi Rb¨ cvbwb| †c‡q‡Qb Zvi `¨ K‡Ýv‡jkb Ae wd‡jvmwd (`k©‡bi mvšÍ¡bv) MÖ‡š’i Rb¨| GLv‡b wZwb A¨vwi÷Ujxq ai‡bi `k©b wb‡q Av‡jvPbv K‡i‡Qb| cieZ©x‡Z Zv‡K wcwU‡q gviv nq|) hvB †nvK,eQ‡ii ci eQi GB `ye©jZv wb‡q Pj‡Z \_v‡K bZyb cwÄKv|

bZyb cwÄKvq k~b¨ †bB| mgm¨v †`Lv w`‡Z ïiæ K‡i `yB kZvãx c‡i| 731 mv‡ji w`‡K w`IwbwmD‡mi B÷vi †Uwej dzwi‡q Avm‡Q| DËi Bsj¨v‡Ûi µ‡gB kª‡×q n‡q IVv mbœ¨vmx weW †UwejUv‡K AveviI eo Ki‡jb| m¤¢eZ Gfv‡eB wZwb w`wbIwmD‡mi K\_v Rvb‡Z †c‡iwQ‡jb| weW weª‡U‡bi wMR©vi BwZnvm wj‡LwQ‡jb `¨ B‡K¬wm‡qmwUK¨vj wnw÷ª Ae `¨ Bswjk wccj eB‡q| GLv‡b wZwb e¨envi K‡i‡Qb bZyb cwÄKv|

eBwU AmvaviY mvdj¨ cvq| wKš‘ G‡Z wQj g¯Í eo GK fyj| weW wLªóc~e© 60 mvj †\_‡K BwZnvm ïiæ K‡ib| gv‡b w`wbIwmD‡mi g~j el© †\_‡K A‡bK Av‡MB| weW bZyb ZvwiL c×wZ Gwo‡q †h‡Z Pvw”Q‡jb bv| wZwb wZwb w`wbIwmD‡mi cwÄKv‡K †cQb w`‡K j¤^v K‡i wb‡jb| weWI wKš‘ k~‡b¨i K\_v Rvb‡Zb bv| cÖ\_g wLªóv‡ãi Av‡Mi eQiwU ZvB wQj wLªóc~e© GK| k~b¨Zg eQ‡ii Aw¯ÍZ¡ wQj bv|

cÖ\_g `„wó‡Z GB µwgK c×wZ‡K Lvivc wKQy g‡b n‡e bv| wKš‘ GUv Sv‡gjv wVKB euvwa‡q‡Q| wLªóvã¸‡jv‡K abvZ¥K Avi wLªóc~e© mvj¸‡jv‡K FYvZ¥K mvj g‡b Kiæb| we‡Wi MYbvc×wZ wQj: ..., -3, -2, -1, 1, 2, 3, ...| k~‡b¨i RvqMv nIqv DwPZ wQj -1 I 1 Gi gv‡S| wKš‘ k~b¨‡K ivLv nqwb| mevB‡K hv †V‡j w`j fy‡ji w`‡K| 1996 mv‡j IqvwksUb †cv‡÷ cwÄKv wb‡q GKwU †jLv cÖKvwkZ nq| GLv‡b †jLK mevB‡K mnmªvã weZK© (wg‡jwbqvg K‡›Uªvfvm©vwi) wb‡q wPšÍv Kivi Dcvq evZ‡j †`b| Gici †Kv‡bv wKQyB bv †f‡e e‡j w`‡jb, †h‡nZy whïi (Av) Rb¥ PZy\_© wLªóc~e© mv‡j, 1996 n‡jv Zuvi R‡b¥i 2000Zg eQi| †`‡L G‡KB mwVK g‡b nq| (1996-(-4)) = 2000| wKš‘ fyj| Avm‡j GUv n‡e 1999Zg eQi|

aiæb GKwU ev”Pvi Rb¥ n‡jv PZy\_© wLªóc~e© mv‡ji Rvbyqvwii 1 Zvwi‡L| Z„Zxq wLªóc~e© mv‡j Zvi eqm GK eQi| wØZxq wLªóc~e© mv‡j eqm `yB| wLªóc~e© GK mv‡j eqm wZb| cÖ\_g wLªóv‡ã Zvi eqm `uvovj Pv‡i| wØZxq wLªóv‡ã Zvi eqm n‡e cuvP| wØZxq wLªóv‡ãi Rvbyqvwii 1 ZvwiL ch©šÍ Zvi R‡b¥i ci KZ eQi mgq AwZevwnZ n‡jv? Aek¨B cuvP eQi| wKš‘ eQi we‡qvM K‡i GUv cvIqv hv‡e bv| 2-(-4) = 6| fyj n‡”Q k~b¨Zg eQi bv \_vKvi Kvi‡Y|

Avm‡j k~b¨Zg wLªóv‡ãi Rvbyqvwi gv‡m ev”PvwUi eqm Pvi nIqvi K\_v| cÖ\_g wLªóv‡ã cuvP I wØZxq wLªóv‡ã Qq| Gfv‡e wnmve K‡i †M‡j me msL¨v wVKfv‡e KvR Ki‡e| ev”Pvi eqm †ei Ki‡Z n‡j mij GKwU we‡qvM Ki‡Z n‡e| 2 †\_‡K -4| wKš‘ Zv bq| wVK dj †c‡Z n‡j †hvMdj †\_‡K AviI evowZ GK we‡qvM Ki‡Z n‡e| AZGe, 1,996 mv‡j whïi (Av) eqm 2,000 eQi wQj bv| wQj 1,999| e¨vcviUv weåvwšÍKi| Zvi †P‡qI Lvivc Avm‡j|

aiæb GKwU ev”Pvi Rb¥ n‡jv cÖ\_g eQ‡ii cÖ\_g w`‡bi cÖ\_g †m‡K‡Û| cÖ\_g wLªóv‡ãi Rvbyqvwii 1 Zvwi‡L| wØZxq eQ‡i Zvi eqm n‡e GK, Z„Zxq eQ‡i `yB BZ¨vw`| 99Zg eQ‡i Zvi eqm n‡e 98| 100Zg eQ‡i 99 eQi| Gevi aiæb ev”Pvi bvg †`Iqv n‡jv kZK| 100Zg eQ‡i kZ‡Ki eqm 99| †m Zvi 100Zg Rb¥w`b cvjb Ki‡e 101Zg eQ‡ii Rvbyqvwii 1 Zvwi‡L| Zvi gv‡b wØZxq kZvãx ïiæ n‡e 101 mv‡j| GKBfv‡e Z„Zxq kZvãx ïiæ n‡e 201 mv‡j| Avi wesk kZvãx 1901 mv‡j| Gi A\_© n‡jv GKwesk kZvãx ev Z„Zxq mnmªvã ïiæ n‡e 2,001 mv‡j| mn‡R nqZ e¨vcviUv †Pv‡L c‡o bv|

1,999 mv‡ji wW‡m¤^‡ii 31 Zvwi‡L me †nv‡Uj-‡i÷y‡i›U AwMÖg eyK n‡q †Mj| 2000 mv‡ji 31 wW‡m¤^‡i bq wKš‘| mnmªvã Drme mevB Kij fyj Zvwi‡L| DrmeKvix‡`i Drmv‡ni Kv‡Q nvi gvbj i‡qj wMÖbDBP gvbgw›`iI| A\_P c„w\_exi mgq msi¶Y I Zvwi‡Li †Mvjgvj mgvav‡bi AvbyôvwbK `vwqZ¡ Zv‡`iB| gvbgw›`‡ii cvigvYweK Nwo GwM‡q Pj‡Q| Avi wb‡P Iw`‡K gvbyl Avkvq e‡m Av‡Q, miKvwi A\_©vq‡b g‡nvrme n‡e| n‡e ¯§iYxq GK D‡Øvabx Abyôvb| Av‡qvRKiv ZvwiL wVK K‡i †i‡L‡Q 31 wW‡m¤^i, 1,999| Abyôvb †kl 2,000 mv‡ji 31 wW‡m¤^i, hLb wKbv gvÎ gvbgw›`‡ii †R¨vwZwe©`iv mnmªvã Drme ïiæ K‡i‡Qb|

‡R¨vwZwe©`iv Ab¨‡`i g‡Zv K‡i mgq wb‡q †Lj‡Z cv‡ib bv| Zviv bRi iv‡Lb gnvKv‡k| gnvKv‡ki Nwo Awae‡l© av°v Lvq bv| gvbyl cwÄKv e`jv‡Z PvB‡jB e`‡j hvq bv gnvKvk| G Kvi‡Y †R¨vwZwe©`iv gvby‡li cwÄKv‡K Gwo‡q Pj‡jb| Zviv whïi (Av) Rb¥ †\_‡K eQi MYbv K‡ib bv| Zviv MYbv ïiæ K‡ib wLªóc~e© 4713 mv‡ji Rvbyqvwii 1 ZvwiL †\_‡K| G mvjUv †gvUvgywU Sv‡gjvwenxb msL¨v| 1583 mv‡j cwÐZ †Rv‡md ¯‹¨vwjMvi ZvwiLwU wVK K‡ib| Zvi evbv‡bv Ryjxq (Julian) ZvwiL gnvKv‡ki NUbvi Zvwi‡Li wnmve ivLvi gvb`Ð n‡q `uvovq| Ryjxq bvgUv G‡m‡Q ¯‹¨vwjMv‡ii evevi bvg †\_‡K| Rywjqvm wmRvi bq| G ZvwiL¸‡jv‡Z G‡Ki ci GK ms‡kvab Ki‡Z \_vKv cwÄKv¸‡jvi g‡Zv Sv‡gjv wQj bv| c‡i Aek¨ G c×wZ‡Z GKUy cwieZ©b G‡m‡Q| cwigvwR©Z Ryjxq ZvwiL GK`g 24,00,000 w`b I 12 NÈv Kg| G‡Z k~b¨Zg NÈv c‡o‡Q 1,71,858 mv‡ji ga¨iv‡Z| GUvI †gvUvgywU mvaviY GK msL¨v| ///////////

‡R¨vwZwe©`iv nqZ cwigvwR©Z 51,542 Ryjxq ZvwiL D`hvcb Ki‡Z PvB‡eb bv| Bûw`iv Gwo‡q hv‡e 5760 mv‡ji 23 †Z‡fZ (Bûw` cwÄKvi `kg gvm)| gymjgvbiv fy‡j hv‡e 1,420 mv‡ji 23 igv`vb| Z‡e wØZxqevi fve‡j nqZ Zviv GgbUv Ki‡e bv| mevB eyS‡Z cvi‡e ZvwiLUv n‡jv Avm‡j 1,999 mv‡ji 31 wW‡m¤^i| Avi 2,000 mvjUvi g‡a¨ Av‡Q we‡kl wKQy GKUv|

wVK Kx Kvi‡Y Zv Rvbv bv †M‡jI Avgiv gvbyliv my›`i msL¨v fv‡jvevwm| fv‡jvevwm Ggb msL¨v hv‡Z Av‡Q A‡bK A‡bK k~b¨| Avgiv 99-Gi c‡i 100 †`Lvi Rb¨ e‡m \_vwK| 999-Gi c‡i e‡m \_vwK 1,000 Gi Rb¨| ev”Pviv 100, 1000 †`L‡j Avb‡›` wPrKvi K‡i I‡V|

k~b¨Zg msL¨v

*‡cvwjk MwYZwe` IqvK¬ wm‡qwcÝwK wPwšÍZ n‡q fve‡Qb jv‡M‡Ri Av‡iKUv e¨vM †Kv\_vq †Mj| ¯¿x ejj, "wcÖq, QqwU e¨vMB †Zv Av‡Q|" "Zv Kxfv‡e nq? Avwg †Zv K‡qKevi ¸bjvg: 0, 1, 2, 3, 4, 5|*

~ `¨ eyK Ae bv¤^vim, Rb KIb‡q I wiPvW© MvB

w`IwbwmDm I weW cwÄKvq k~b¨‡K bv †i‡L fyj K‡i †d‡jwQ‡jb| e¨vcviUv ïb‡Z nqZ A™¢yZ jvM‡e| KviY ev”Pvi GK, `yB, wZb ... Gfv‡e †Mv‡b| k~b¨, GK, `yB... Gfv‡e bv| gvqvbiv Qvov Avi KviI k~b¨Zg eQi wQj bv| †KD gv‡mi ïiæ K‡iwb k~b¨ w`b †\_‡K| G‡K A¯^vfvweK jv‡M| Z‡e †cQb w`‡K ¸b‡Z †M‡j †mUvB Avevi ¯^vfvweK n‡q `uvovq|

`k, bq, AvU, mvZ, Qq, cuvP, Pvi, wZb, `yB, GK| ïiæ!

‡¯úm kvUj gnvk~‡b¨ Qy‡U hvevi Av‡M k~‡b¨i R‡b¨ A‡c¶v K‡i| k~b¨Zg NÈvq N‡U GK ¸iæZ¡c~Y© NUbv| cÖ\_g NÈvq bq| †evgvi we‡ùviY¯’‡ji w`‡K †h‡Z \_vK‡j Avcwb †h‡Z \_v‡Kb MÖvDÛ wR‡ivi w`‡K|

fv‡jvfv‡e †Lqvj Ki‡j †`Lv hv‡e, gvbyl Avm‡j k~b¨ †\_‡KB MYbv ïiæ K‡i| ÷cIqvP Pj‡Z ïiæ K‡i 0:00:00 †\_‡K| GK †m‡KÛ c‡i †`Lv hvq 0:01:00| bZyb Mvwoi A‡WvwgUv‡i (`~iZ¡ cwigvcK) †jLv \_v‡K 00000| hw`I †Kbvi Av‡M wKQy c\_ MvwoUv P‡j cix¶v-wbix¶vi Rb¨| †mbvevwnbx‡Z AvbyôvwbKfv‡e w`b ïiæ nq 0000 NÈvq| wKš‘ †Kv‡bv wKQy ¸Y‡Z †M‡jB Avgiv GK †\_‡K ïiæ K‡i †Rv‡i †Rv‡i ¸Y‡Z \_vwK| Z‡e MwYZwe` ev Kw¤úDUvi †cÖvMÖvgviiv12 Avjv`v|

1, 2, 3,... BZ¨vw` MYbvevPK msL¨v wb‡q KvR Ki‡j mn‡RB µg Abymv‡i mvRv‡bv hvq| GK n‡jv cÖ\_g MYbvevPK msL¨v, `yB n‡jv wØZxq MYbvevPK msL¨v Avi wZb n‡jv Z„Zxq| msL¨v Avi µg wb‡q †Kv‡bv weåvwšÍ †bB| `y‡Uv GKB| eû eQi a‡i Gfv‡eB me PjwQj| mevB Zv‡Z Lykx| wKš‘ k~‡b¨i AvMg‡b msL¨v Avi µ‡gi wb‡f©Rvj m¤ú‡K© †Q` coj| msL¨viv n‡jv Ggb: 0 , 1, 2, 3,...| cÖ\_g msL¨v k~b¨| wØZxqwU GK| Z„Zxq msL¨v n‡jv `yB| msL¨v Avi µg GK \_vKj bv| cwÄKvi mgm¨vi g~j KviY GUvB|

w`‡bi cÖ\_g NÈv ïiæ nq ga¨iv‡Zi c‡ii k~b¨Zg †m‡K‡Û| wØZxq NÈvi ïiæ ivZ GKUvq| Avi Z„Zxq NÈv ïiæ ivZ `y‡Uvq| Avgiv ¸wb µgevPK msL¨v w`‡q (cÖ\_g, wØZxq, Z„Zxq)| wKš‘ mg‡qi wnmve nq msL¨vevPK (0, 1, 2)| †hgb, ivZ 2Uv 30 wgwbU gv‡b n‡jv Z„Zxq NÈvi 30 wgwbU cvi n‡q‡Q| cQ›` Kwi Avi bvB Kwi, GUv Avgiv mevB †g‡b wb‡qwQ| GKwU ev”Pv 12 gvm cvi Ki‡j Avgiv ewj Zvi GK eQi n‡q‡Q| †m Zvi Rxe‡bi cÖ\_g 12 gvm c~Y© K‡i‡Q| GK eQi c‡i eqm GK n‡q \_vK‡j Zvi Av‡M eqm wK k~b¨ n‡e bv? n¨uv, Avgiv ej‡ZB cvwi ev”PvwUi eqm 6 mßvn ev 9 gvm BZ¨vw`| k~b¨‡K Gwo‡q hvIqvi eyw×Uv fv‡jvB!

w`wbIwmDm k~‡b¨i K\_v RvbZ bv| Zvi cwÄKv ZvB ïiæ nq GK (1) bs eQi †\_‡K| wVK †hfv‡e KvRUv K‡i‡Q Zvi c~e©cyiæliv| †m mg‡qi gvbyliv cyi‡bv c×wZi msL¨v I µ‡gi mgZyj¨Zvi wfwË‡Z wPšÍv-fvebv KiZ| G‡Z Zv‡`i †Kv‡bv Amyweav nZ bv| Zv‡`i gv\_vq k~b¨ bv Avm‡j G e¨vcviwU‡Z †Kv‡bv mgm¨vB wQj bv|

wekvj k~b¨Zv

*Zv GK`g k~b¨Zv wQj bv| †mUv wQj msÁvnxb GK ai‡bi AvKvinxbZv| ... mwZ¨Kvi hyw³ Avgv‡K eywS‡q †`q, cig AvKvinxbZv‡K eyS‡Z n‡j me ai‡bi AvKv‡ii Aewkóvsk Avgv‡K gb †\_‡K cy‡ivcywi gy‡Q †dj‡Z n‡e| Avwg Zv cvwiwb|*

~ †m›U AMvw÷b, Kb‡dkbm

mbœ¨vmx‡`i‡K Gi Rb¨ Avm‡j †`vl †`Iqv hvq bv| w`Iwbmyqm Gw·wMDm, †evw\_qvm I weW‡`i c„w\_ex wQj AÜKvi| †iv‡gi cZ‡bi ci cwðgv mf¨Zv Gi AZxZ HwZ‡n¨i Qvqv n‡q iBj| fwel¨Z‡K AZx‡Zi †P‡q fq¼i g‡b nw”Qj| Áv‡bi mÜv‡b ga¨hy‡Mi cwÐZiv mgmvgwqK‡`i w`‡K bv ZvwK‡q A¨vwi÷Uj I be¨‡cø‡Uvbxq gZev‡`i w`‡K Avkªq wb‡qwQj| cÖvPxb mgq †\_‡K `k©b I weÁvb Avg`vwb Kivi mv‡\_ mv‡\_ Giv Amxg I k~b¨Zvi fq‡KI Avg`vwb K‡i wb‡q Av‡m|

ga¨hy‡Mi cwÐZiv k~b¨Zv‡K ev‡R wRwbm g‡b KiZ| Avevi ev‡R wRwbm‡KI g‡b KiZ k~b¨| Av¶wiK A‡\_©B kqZvb wQj k~b¨| †evw`qv‡mi hyw³ wQj G iKg: Ck¦i me©kw³gvb| Ggb wKQyB †bB hv wZwb Ki‡Z cv‡ib bv| wKš‘ cig gnvb Ck¦i KLbI g›` KvR Ki‡Z cv‡ib bv| AZGe, g›` n‡jv k~b¨| ga¨hyMxq gb G‡KB ¯^vfvweK e‡j †g‡b †bq|

Z‡e ga¨hyMxq `k©‡bi AšÍiv‡j GKwU Ø›Ø jywK‡q wQj| A¨vwi÷Ujxq gZev` wQj wMÖKag©x| wKš‘ m„wói Bûw`-wLªóvb aviYv wQj †m‡gwUK| Avi †m‡gwUK‡`i k~b¨Zv wb‡q †Zgb fq wQj bv| m„wói m~PbvB n‡q‡Q GKwU wek„•Lj k~b¨Zv †\_‡K| PZy\_© kZ‡Ki ag©ZvwË¡K †m›U AMvw÷b Gi GKwU e¨vL¨v `uvo Kwi‡qwQ‡jb| Zuvi g‡Z, m„wói Av‡Mi Ae¯’vq k~b¨ k~b¨ ai‡bi wKQy GKUv wQj| hv GK`g cy‡ivcywi k~b¨Zvi †P‡q LvwbK †ewk| Zey k~‡b¨i fxwZ wQj gvivZ¥K iK‡gi| wLªóvb cwÐZiv ZvB evB‡ej‡K ms‡kvab K‡i A¨vwi÷Ujxq gZev‡`i mv‡\_ †gjv‡bvi †Póv Pvjvq| A\_P Kivi K\_v D‡ëvUv|

Z‡e Avkvi K\_v n‡jv, me mf¨Zv k~b¨‡K GZUv fq K‡iwb|

**Z\_¨wb‡`©k**

1| wMÖK `vk©wbK †R‡bv Zvi wb‡Ri I cviwgwbwW‡mi wKQy gZev` cÖgv‡Yi R‡b¨ †ek wKQy c¨vivW· ˆZwi K‡ib| g~jZ wZwb cÖgvY Ki‡Z †P‡qwQ‡jb, MwZ ej‡Z wKQy †bB| meB †Pv‡Li fyj| c¨vivW·¸‡jvi g‡a¨ Ab¨Zg weL¨vZ GKwU n‡jv GwKwjR I K”Qc c¨vivW·| Ggb †ek wKQy c¨vivW· wb‡q Rvbv hv‡e Abyev`‡Ki Amxg mgxKiY eB‡q| GQvovI coyb: www.statmania.info

2| K\_vwU evB‡e‡ji wbD †U÷v‡g›U ev beweav‡bi R‡bi mymgvPvi (Gospel)-Gi cÖ\_g Aa¨v‡qi cÖ\_g Aby‡”Q`| Z‡e g~j ms¯‹i‡Y 'AbycvZ' k‡ãi e`‡j 'kã' ejv n‡q‡Q| Z‡e wMÖK fvlvq AbycvZ‡K ejv nq †jv‡Mvm| Avevi kã †evSv‡ZI GKB kã †evSv‡bv nq| hvi d‡j cÖ\_vMZ Abyev‡`i †P‡q AbycvZ ejvUvB †kªq|

-‡jL‡Ki †bv‡Ui Av‡jv‡K Abyev`K|

3| c„w\_exi iv‡Zi AvKv‡k Lvwj †Pv‡L ïay cuvPwU MÖnB †`Lv m¤¢e| eya, ïµ, g½j, e„n¯úwZ I kwb| G Kvi‡YB cÖvPxbKv‡j gvbyl MÖn ej‡Z GB cuvPwU‡KB wPbZ|

4| me‡P‡q my›`i msL¨v Aek¨B G‡KR‡bi Kv‡Q G‡KKwU| KviI Kv‡Q cvB (3.1416) me‡P‡q my›`i| KviI Kv‡Q (Avwgmn) Avevi my›`i Aqjvi msL¨v (2.718...)|

5| KviY Aa©-BwÂ‡K Av`k© evbv‡j †gvU `vM n‡e 24wU| Zvn‡j mv‡o cuvP BwÂ‡Z co‡e 10+1 wU = 11wU `vM| evwK AskI Gfv‡e|

6| g~j` msL¨vi Bs‡iwR bvg rational number, hv‡K Av¶wiK evsjv Ki‡j nq †hŠw³K msL¨v|

7| 1, 2, 3, ... BZ¨vw` msL¨v¸‡jvi †mU ev ¸”Q‡K ejv nq ¯^vfvweK ev MYbv msL¨v|

8| G kZ©Uv cÖ‡qvRbxq, Z‡e h‡\_ó bq| c`¸‡jv Lye ax‡i k~‡b¨i w`‡K AMÖmi n‡j †hvMdj mmxg msL¨vq wM‡q bvI wgj‡Z cv‡i|

9| †R‡bv †hfv‡e †h‡Kv‡bv mmxg wRwbm‡K Amxg evwb‡q w`‡Zb| aiæb evm ai‡Z n‡j Avcbv‡K 1 gvBj nuvU‡Z n‡e| 1 gvBj †h‡Z n‡j Av‡M 500 wgUvi †h‡Z n‡e| 500 wgUvi †h‡Z n‡j 250 wgUvi †Zv Av‡M †h‡Z n‡e| †mR‡b¨ Avevi 125 wgUvi| Gfv‡e wPšÍv Ki‡j Amxg msL¨K `yiZ¡ cvwo w`‡Z n‡e| hv Avm‡j GKwU K…wÎg Amxg| KviY me¸‡jv `~iZ¡ †hvM Ki‡j `uvovq H GK (1) gvBjB|

10| wLª÷vb‡`i wek¦vm Abymv‡i whï‡K (Av) µykwe× Kivi (ïµevi) c‡i Zuvi g„Zy¨ nq| Z‡e Z„Zxq w`‡b (iweevi) wZwb cybiæwÌZ nb| G NUbvi bvgB B÷vi| eZ©gv‡b cÖ‌‌‌wZ eQi 20 GwcÖj B÷vi mvb‡W cvwjZ nq|

11| GKwU c×wZ‡Z 1g el© wba©viY Kiv n‡qwQj †ivg kn‡ii cÖwZôv‡K wfwË a‡i| Av‡iKwU‡Z mgªvU Wv‡qvwK¬kv‡bi wmsnvm‡b Av‡ivnY‡K wfwË aiv nq| wLªóvb‡`i Kv‡Q Zv‡`i bexi Rb¥ GKwU kni cÖwZôvi †P‡q ¸iæZc~Y©| †h kni‡K Avevi f¨vÛvj I M\_iv K‡qKevi jyÉb K‡i‡Q| Avevi †Kv‡bv mgªv‡Ui kvmbKv‡ji m~Pbv wb‡qI Zv‡`i †Kv‡bv Drmvn wQj bv| hvi Avevi wQj GK `~f©vM¨RbK kL: wLªóvb‡`i †fv‡Ri Rb¨ †m A™¢yZ A™¢yZ cÖvYx‡`i‡K e›`x K‡i a‡i ivLZ|

12| Kw¤úDUvi †cÖvMÖvgviiv †Kv‡bv KvR evievi Kivi Rb¨ †cÖvMÖvg wjL‡j k~b¨ †\_‡K ïiæ K‡ib| aiv hvK †Kv‡bv KvR `k evi Kiv n‡e| Zvn‡j k~b¨ †\_‡K ïiæ K‡i bq ch©šÍ| †Kv‡bv †cÖvMÖvgvi g‡bi fy‡j GK †\_‡K ïiæ K‡i bq ch©šÍ †h‡Z cv‡i| d‡j `k av‡ci e`‡j KvRwU n‡e bq avc| 1998 mv‡j A¨vwi‡Rvbvq Ggb GKwU fyjB GKwU jUvwi fÐyj K‡i †`q| evievi †Zvjvi c‡iI bq DVwQj bv| c‡i GK gyLcvÎ weeªZ e`‡b ¯^xKvi K‡i, 'fyjekZ bq †cÖvMÖv‡g ev` c‡owQj|"

Z„Zxq Aa¨vq

k~‡b¨i eiY

[cÖv‡P¨ k~‡b¨i AvMgb ]

*Amx‡gi gv‡SB Av‡Q Avb›`| mmx‡gi gv‡S †Kv‡bv gRv †bB|*

~ Qv‡›`vM¨ Dcwbl`

cwð‡gi k~‡b¨i fxwZi gv‡SI cÖvP¨ k~b¨‡K ¯^vMZ Rvbvq| BD‡iv‡c k~b¨ wQj wbM„nxZ| wKš‘ fvi‡Z I c‡i Avi‡e k~‡b¨i weKvk N‡U| †klevi hLb Avgiv k~b¨‡K †`‡LwQ, †mLv‡b k~b¨ wQj ïayB GKwU ¯’vbxq gvb| e¨vwejbxq MYbvc×wZ‡Z k~b¨ wQj GKwU duvKv `vM| k~b¨ wKQy Kv‡R †j‡MwQj, wKš‘ wb‡R †Kv‡bv msL¨v wQj bv| Gi †Kv‡bv gvb wQj bv| Gi euv‡qi A¼¸‡jvB G‡K A\_©en K‡i ZyjZ| wb‡R GKv \_vK‡j Av¶wiKfv‡eB Gi †Kv‡bv A\_© nZ bv| fvi‡Z G‡m Ae¯’v cvëvj|

wLªóc~e© PZy\_© kZ‡Ki K\_v| A¨v‡j·vÛvi `¨ †MÖU Zuvi cvim¨ evwnbx wb‡q e¨vwejb †\_‡K fvi‡Zi w`‡K AMÖmi n‡jb| GB AvMÖvm‡bi mgq fviZxq MwYZwe`iv cÖ\_gev‡ii g‡Zv e¨vwejbxq msL¨vc×wZ m¤ú‡K© Rvb‡Z cv‡i| Rvb‡Z cv‡i k~‡b¨i K\_vI| 323 wLªóc~e© mv‡j A¨v‡j·vÛvi gviv hvb| cvi¯úwiK Ø‡›Ø wjß †Rbv‡ijiv mvgªvR¨‡K UyK‡iv UyK‡iv K‡i †d‡j| wØZxq wLªóc~e© mv‡j †ivg ¶gZvq Av‡ivnY K‡i| wMÖm †iv‡gi \_vevq AvU‡K c‡o| Z‡e Av‡jKRvÛvi hZUv G‡mwQ‡jb, †ivgK‡`i ¶gZv ZZUv c~e© ch©šÍ †cuŠQ‡Z cv‡iwb| d‡j PZy\_© I cÂg kZ‡Ki wLªóa‡g©i DÌvb I †iv‡gi cZ‡bi cÖfve †\_‡K `~‡ii fviZ gy³ iBj|

fviZ A¨vwi÷U‡ji cÖfve †\_‡KI gy³ iBj| n¨uv, Av‡jKRvÛvi A¨vwi÷U‡ji wkl¨ wQ‡jb| Zuvi `k©bI Aek¨B wb‡q Av‡mb fvi‡Z| Z‡e wMÖK `k©b fvi‡Z KL‡bvB †mfv‡e ¯’vb K‡i wb‡Z cv‡iwb| wMÖ‡mi g‡Zv fvi‡Z Amxg ev k~b¨Zv wb‡q †Kv‡bv fxwZ wQj bv| eis GLv‡b G aviYv‡K eiY Kiv nq|

wn›`y a‡g© k~b¨Zv ¸iæZ¡c~Y© ¯’vb `Lj K‡i Av‡Q| wn›`y a‡g©i m~Pbv eû‡k¦iev‡`i aviYv †\_‡K| A‡bK w`K †\_‡KB wMÖK iƒcK\_vi g‡Zv GLv‡bI †hv×v †`eZv‡`i Mí cÖPwjZ Av‡Q| Z‡e Av‡jKRvÛv‡ii AvMg‡bi eû kZvãx Av‡M †\_‡KB kZvãxi ci kZvãx a‡i †`eZviv GKxf~Z n‡Z ïiæ K‡i| wn›`y a‡g©i ag©xq AvPvi-Abyôvb I †`eZv‡`i cÖwZ fw³ A¶ybœ \_vK‡jI †gŠwjKfv‡e GwU G‡Kk¦iev`x I AšÍe©x¶Yg~jK ag© n‡q †M‡Q| mKj †`eZv me©`ªóv eªþvi wewfbœ Ask wn‡m‡e Dc¯’vwcZ n‡”Q| cwð‡g wMÖK‡`i DÌv‡bi cÖvq GKB mg‡q wn›`y ag© cwðgv iƒcK\_vi mv‡\_ wgj nvivw”Qj| ¯^Zš¿ †`eZv‡`i f~wgKv nvwi‡q hvw”Qj| Ava¨vwZ¥K kw³ ag©Uvq Abyf~Z nw”Qj| wbtm‡›`‡n, Ava¨vwZ¥KZvi Drm cÖvP¨|

cÖv‡P¨i A‡bK a‡g©i g‡ZvB wn›`y a‡g© Av‡Q ˆØZev‡`i K\_v| cvðv‡Z¨I gv‡Sg‡a¨ Gi D`q N‡UwQj| Z‡e G ai‡bi wPšÍv‡K GKN‡i K‡i ivLv n‡qwQj| Ggb GKwU wecixZ wPšÍv n‡jv gvwbwKRg ev gvwb ag©| GLv‡b ejv nq, c„w\_exUv mgvb I wecixZ cwigvY fv‡jv I Lvivc Øviv cÖfvweZ| `~icÖv‡P¨i Bb I Bqvs Ges wbKUcÖv‡P¨i Ri\_y‡mªi fv‡jv I Lviv‡ci g‡Zv m„wó I aŸsm wQj GKB gy`ªvi GwcV-IwcV| †`eZv wke GKBmv‡\_ RM‡Zi m„wó I aŸs‡mi bvqK| Qwe‡Z †`Lv‡bv nq, Zvi GK nv‡Z m„wói XvK, Av‡iK nv‡Z aŸs‡mi wkLv| Z‡e wke Avevi k~b¨ZviI cÖwZwbwaZ¡ K‡i| GB †`eZvi GKwU w`K n‡jv wb®‹j wke| Av¶wiKfv‡e GB wk‡ei A\_©B n‡jv Askwenxb wke| P~ovšÍ f‡qW ev k~b¨Zv I cig bvw\_s‡bm| cÖvYnxbZvi ev¯Íe ewntcÖKvk| Z‡e gnvwe‡k¦i m„wóI f‡qW ev k~b¨ †\_‡K| †hfv‡e Rb¥ Amx‡gi| wn›`y a‡g©i gnvwek¦ cvðv‡Z¨i aviYv †\_‡K Avjv`v wQj| GLv‡b gnvwe‡k¦i cwiwa Amxg| Avgv‡`i gnvwek¦ †cwi‡q Av‡Q AviI eû eû gnvwek¦|

Iw`‡K gnvwek¦ Avevi Zvi k~b¨Zv‡KI fy‡j hvqwb| k~b¨Zv †\_‡K gnvwe‡k¦i Rb¥| Avevi k~b¨Zvi cÖvwß n‡q `uvovj gvby‡li P~ovšÍ j¶¨| GK M‡í AvZ¥v m¤ú‡K© g„Zy¨ GK wkl¨‡K ej‡Q, Òme cÖvYxi ü`‡q jyKvwqZ Av‡Q AvZ¥v, ¯^KxqZv| me‡P‡q ¶y`ª cigvYyi †P‡q ¶y`ª, mywekvj gnvKv‡ki †P‡q eo|" G AvZ¥v evm K‡i me wRwb‡mi g‡a¨| G AvZ¥v gnvwe‡k¦i wbh©v‡mi Ask| Gi †bB g„Zy¨| †KD gviv †M‡j AvZ¥v †`n †\_‡K gy³ nq| cÖ‡ek K‡i Av‡iK †`‡n|1 AvZ¥vi ¯’vbvšÍ‡ii gva¨‡g gvbylUvi beRb¥ nq| wn›`y a‡g©i D‡Ïk¨ n‡jv AvZ¥v‡K cybR‡b¥i Pµ †\_‡K cy‡ivcywi †ei K‡i Avbv| g„Zy¨i cÖvšÍ‡i cÖvšÍ‡i Ny‡i giv †\_‡K cÖvYnxbZvi gva¨‡g P~ovšÍ gyw³ AR©‡bi c\_ n‡jv ev¯ÍeZvi åg †\_‡K m‡i Avmv| †`eZvi K\_v n‡jv, ÒAvZ¥vi evwo †`n| Avb›` I K‡ói kw³ G‡K wbqš¿Y K‡i| gvbyl †`‡ni wbqš¿‡Y \_vK‡j KLbI gyw³ cv‡e bv| gyw³i Rb¨ i³-gvs‡mi Pvwn`v †\_‡K gy³ n‡q AvZ¥vi k~b¨Zv I wbieZv‡K MÖnY Ki‡Z n‡e| AvZ¥v ZLb gvbweK Pvwn`v Z¨vM K‡i D‡o P‡j hv‡e| †hvM w`‡e mw¤§wjZ †PZbvi mgv‡e‡k| †h Amxg AvZ¥v cy‡iv gnvwe‡k¦ we¯Í„Z| GKBmv‡\_ †hUv me RvqMvq, Avevi †Kv\_vI bv| GKBmv‡\_ Amxg (infinity) I k~b¨ (nothing)| Gme Kvi‡Y fviZxq mgv‡R f‡qW (k~b¨Zv) I BbwdwbwUi RM‡Z wePiY wQj| ¯^vfveKfv‡eB k~b¨‡K Zviv MÖnY Kij|

k~‡b¨i cybRb¥

‡`eZv‡`i GK`g m~PbvKv‡j Aw¯Í‡Z¡i Rb¥ nq Abw¯ÍZ¡ †\_‡K|

-F‡M&e`

fviZxq MwYZwe`iv k~b¨‡K MÖnY K‡iB e‡m \_vK‡jb bv| Zviv Gi f~wgKvI cv‡ë w`‡jb| ¯’vb-wb‡`©kK (placeholder) †\_‡K msL¨vq iƒcvšÍi Ki‡jb| GB cybRb¥B k~‡b¨i kw³i Drm|

fviZxq MwY‡Zi Drm mg‡qi Pv`‡i XvKv| 476 mv‡j †iv‡gi cZ‡bi eQ‡i †jLv GKwU fviZxq eB‡q wMÖK, wgkixq I MwY‡Zi cÖfv‡ei K\_v Rvbv hvq| †h cÖfv‡ei m~Pbv A¨v‡jKRvÛvi| wgkixq‡`i g‡Zv fviZxqiv `wo w`‡q Rwgi wnmve I gw›`‡ii bKkv KiZ| Zv‡`i wQj †R¨vwZwe©`¨viI Awfbe †KŠkj| wMÖK‡`i g‡ZvB Zuviv m~‡h©i `~iZ¡ †ei Kivi †Póv K‡ib| Gi Rb¨ cÖ‡qvRb wÎ‡KvYwgwZ| fviZxq ms¯‹iY m¤¢eZ wMÖK‡`i D™¢vweZ c×wZ †\_‡K avi Kiv|

cÂg kZ‡Ki †Kv‡bv GK mg‡q fviZxq MwYZwe`iv msL¨v †jLvi c×wZ cv‡ë †d‡jb| wMÖK c×wZ ev` w`‡q Zuviv e¨vwejbxq c×wZ MÖnY K‡ib| ZeyI e¨vwejbxq c×wZi mv‡\_ GKwU ¸iZ¡c~Y© cv\_©K¨ wQj| fviZxq msL¨v n‡jv `k-wfwËK| e¨vwejbxqiv wjLZ lvU-wfwËK msL¨v| Avgiv GLb †hme msL¨v wjwL (0, 1, „, 9 w`‡q) G¸‡jvi weKvk N‡U‡Q fviZxq‡`i e¨eüZ wPý †\_‡K| G‡`i‡K Aviwe msL¨v bv e‡j fviZxq msL¨v ejvB h\_v\_© nZ|

‡KD Rv‡b bv, KLb fviZxqiv e¨vwejbxq‡`i g‡Zv ¯’vbxq-gvb wfwËK msL¨v c×wZi e¨envi ïiæ K‡i|2 wn›`y msL¨vi me‡P‡q cÖvPxb Z\_¨ cvIqv hvq GK wmwiq wek‡ci †jLvq| 662 mv‡ji Zuvi †jLvq †`Lv hvq, Kxfv‡e fviZxq 'bqwU wP‡ýi mvnv‡h¨' wnmvewbKvk KiZ| bqwU, `kwU bq| cwi®‹vi †evSv hv‡”Q, k~b¨B GLv‡b Abycw¯’Z| Z‡e wbwðZ K‡i Zv ejv hv‡e bv| wek‡ci GB †jLvi Av‡MB wn›`y msL¨vi cÖPjb wQj| H mg‡qiAv‡MB fviZxqiv k~b¨‡K wewfbœ AvKv‡i e¨envi K‡i‡Q Zv cÖgvwYZ| wekc nqZ Zv Rvb‡Zb bv| `k-wfwËK msL¨vq †cøm †nvìvi wn‡m‡e wP‡ýi gva¨‡g k~‡b¨i e¨envi beg kZ‡Ki Av‡MB n‡q‡Q Zv‡Z †Kv‡bv m‡›`n †bB| ZZw`‡b fviZxq MwYZwe`iv wekvj gvBjdjK AR©b K‡i †d‡j‡Qb|

wMÖK R¨vwgwZi mvgvb¨ AskB Zviv avi K‡iwQ‡jb| wMÖKiv mgZj AvK…wZ¸‡jv‡K fvjevmZ| wKš‘ fviZxq‡`i Gm‡e AvMÖn wQj wQj bv| e‡M©i KY© g~j` bvwK Ag~j` msL¨v Zv wb‡q Zviv gv\_v Nvgvqwb| AvwK©wgwW‡mi g‡Zv KwbK ev †Kv‡Yi wefvRb wb‡qI fv‡ewb| Z‡e msL¨v wb‡q †Lj‡Z wk‡L wM‡qwQj Zviv|

msL¨vi fviZxq c×wZ Zv‡`i nv‡Z `viæY me A¯¿ Zy‡j †`q| A¨vevKv‡mi e¨envi QvovB †hvM, we‡qvM, ¸Y, fvM n‡q hv‡”Q| ¯’vbxq msL¨v c×wZi myev‡` Zviv eo eo msL¨vi †hvM-we‡qvM Ki‡Zb Aejxjvq| A‡bKUv Avgiv GLb †hgb cvwi| GKUy wk‡L wb‡jB †h †KD fviZxq msL¨vi mvnv‡h¨ A¨vevKv‡mi †P‡q `ªæZ ¸Y Ki‡Z cvi‡Zb| A¨vevKvmev`x I fviZxq msL¨v e¨enviKvix A¨vj‡Mvwi÷‡`i g‡a¨ nZ cÖwZØw›ØZv| Avi w`b †k‡l wRZZ A¨vj‡Mvwi÷ivB|

wPÎ 14: msL¨vi weeZ©b

fviZxq msL¨v †hvM I ¸‡Yi g‡Zv ˆ`bw›`b Kv‡Ri Rb¨ Kvh©Ki n‡jI G‡`i g~j Ae`vb wQj AviI A‡bK eo| †kl ch©šÍ msL¨v R¨vwgwZ †\_‡K Avjv`v n‡jv| msL¨vi KvR Avi wbQK e¯‘i cwigv‡ci g‡a¨ mxgve× iBj bv| wMÖK‡`i g‡Zv K‡i fviZxqiv eM© msL¨vi g‡a¨ eM©wPÎ Kíbv K‡iwb| A\_ev †`‡Lwb `yB msL¨vi ¸‡Yi g‡a¨ AvqZ‡¶Î‡K| Zviv eis †`‡L‡Q `yB msL¨vi †Ljv| †h msL¨viv R¨vwgwZK ¸iæZ¡ †\_‡K gy³| Avgiv GLb hv‡K A¨vj‡Reiv ev exRMwYZ ewj Zvi Rb¥ GLv‡bB| G ai‡bi wPšÍvi Kvi‡Y Aek¨ fviZxqiv R¨vwgwZ‡Z Lye †ewk Ae`vb ivL‡Z cv‡ibwb| Z‡e Gi wQj Av‡iKwU AcÖZ¨vwkZ cÖfve| Gi d‡j fviZxqiv wMÖK‡`i wPšÍvi mxgve×Zv †\_‡K gy³ nb| wR‡iv‡K cÖZ¨vL¨vb K‡i †h mxgve×Zvq Rwo‡q c‡owQj wMÖKiv|

wPÎ 15: A¨vj‡Mvwi÷ ebvg A¨vevKvmev`x

d‡j msL¨viv R¨vwgwZK Zvrch© †\_‡K gyw³ †cj| Gevi Avi †hvM-we‡qvM‡K R¨vwgwZKfv‡e e¨vL¨v Ki‡Z n‡e bv| `yB GKi Rwg †\_‡K †K‡U wZb GKi †bIqv hv‡e bv| wKš‘ `yB †\_‡K wZb‡K we‡qvM Ki‡Z †Zv †Kv‡bv evav †bB| GLbKvi w`‡b Avgiv Rvwb: 2 – 3 = - 1 ev gvBbvm 1| Z‡e cÖvPxbKv‡j G fvebv GZ mnR wQj bv| Zviv eû mgxKiY mgvavb K‡i‡Qb| Z‡e FYvZ¥K mgvavb †c‡jB fve‡Zb GB mgvav‡bi †Kv‡bv ev¯Íe A\_© †bB| mnR K\_v: R¨vwgZ¨Kfv‡e wPšÍv Ki‡j FYvZ¥K †¶Îd‡ji Kx-Bev A\_© n‡Z cv‡i! wMÖK‡`i Kv‡Q ZvB GUv wQj A\_©nxb|

fviZxq‡`i Kv‡Q FYvZ¥K msL¨v e¨vcK mgv`i †cj| Avm‡j fviZ I Px‡bB FYvZ¥K msL¨vi Avwef©ve| mßg kZ‡Ki fviZxq MwYZwe` eªþ¸ß GK msL¨v‡K Av‡iK msL¨v w`‡q fvM Kivi wbqg evwb‡qwQ‡jb| wbq‡gi MwÐi g‡a¨ wQj FYvZ¥K msL¨vivI| wZwb †j‡Lb, "abvZ¥K‡K abvZ¥K ev FYvZ¥K‡K FYvZ¥K w`‡q fvM Ki‡j abvZ¥K Av‡m| abvZ¥K‡K FYvZ¥K w`‡q fvM Ki‡j FYvZ¥K n‡e| FYvZ¥K‡K abvZ¥K w`‡q fvM Ki‡jI ZvB|"

Gme wbqg Avgiv AvRKvj mn‡RB Rvwb| `yB msL¨v‡K fvM w`‡j abvZ¥K n‡e, hw` Zv‡`i wPý GKB nq|

2 - 3 †hgb GKwU msL¨v, †Zgwb 2 – 2 Av‡iKwU msL¨v| GUv n‡jv k~b¨| A¨vevKv‡mi k~b¨Zvi cÖwZwbwa wn‡m‡e ïayB ¯’vb `LjKvix †cøm‡nvìvi bq| eis msL¨v wn‡m‡e k~b¨| ïay Ae¯’vb bq, Gi Av‡Q wbw`©ó gvb| Av‡Q msL¨v‡iLvq GKwU wbw`©ó RvqMv| k~b¨ mgvb 2 - 2 e‡j G‡K (2 - 1) I (2 – 3) Gi gv‡S ¯’vb w`‡Z n‡e| gv‡b 1 I (-1) Gi gv‡S| Avi †Kv‡bv RvqMv †bB| k~b¨‡K 9-Gi c‡i emv‡bvi my‡hvM †bB| hw`I Kw¤úDUvi wK‡ev‡W© Zv Kiv nq| msL¨v‡iLvq k~‡b¨i Av‡Q wbR¯^ ¯’vb, hv Zvi GKvšÍB wb‡Ri| `yB‡K ev` w`‡q †hgb msL¨v‡iLv nq bv, †Zgwb nq bv k~b¨‡K ev` w`‡qI| †kl ch©šÍ k~‡b¨i AvMgb N‡U‡Q|

Z‡e fviZxqivI k~b¨‡K Lye A™¢yZ msL¨v g‡b KiZ| KviYI Av‡Q| k~b¨‡K †h‡Kv‡bv wKQy w`‡q ¸Y Ki‡j k~b¨ Av‡m| †hb GwU mevB‡K †kvlY K‡i †bq| Avi k~b¨‡K w`‡q fvM Ki‡Z †M‡j †hb biK ¸jRvi! eªþ¸ß 0 ÷ 0 I 1 ÷ 0 Gi gvb †ei Ki‡Z †Póv K‡i e¨\_© nb| wZwb †j‡Lb, "mvBdvi‡K (k~b¨) mvBdvi w`‡q fvM w`‡j wKQyB \_v‡K bv|" gv‡b wZwb g‡b Ki‡Zb k~b¨‡K wb‡R‡K w`‡q fvM w`‡j k~b¨ \_v‡K| Zuvi wPšÍv fyj wQj, hv Avgiv c‡i †`Le| 1 ÷ 0 †K wZwb Kx fve‡Zb Zv Rvbv †bB| KviY Zuvi wKQy K\_v A¯úó| Avm‡j wZwb nvZ †`vjvw”Q‡jb Avi Avkv KiwQ‡jb mgm¨v †K‡U hv‡e|

G fyj Aek¨ †ewkw`b ¯’vqx nqwb| †kl ch©šÍ fviZxqiv eyS‡jb 1 ÷ 0 n‡jv Amxg| Øv`k kZ‡Ki fviZxq MwYZwe` fv¯‹i †j‡Lb, Ò‡h fMœvs‡ki ni mvBdvi, Zv GK Amxg ivwk|" Gi mv‡\_ wKQy †hvM Ki‡j Kx n‡e ZvI e‡jb wZwb, Òeû wKQy †hvM ev we‡qvM Ki‡jI G‡Z †Kv‡bv cwieZ©b n‡e bv| wVK †hfv‡e Amxg I AcwieZ©bxq Ck¦i e`jvb bv|"

Ck¦i‡K cvIqv †Mj Amx‡gi g‡a¨| Ges k~‡b¨i g‡a¨|

Aviwe msL¨v

gvbyl wK fy‡j †M‡Q, Avwg Zv‡K k~b¨ †\_‡K m„wó K‡iwQ?

- cweÎ KziAvb

mßg kZ‡K †iv‡gi cZ‡bi mv‡\_ mv‡\_ cwðgI cÖfve nvivj| Z‡e cÖvP¨ µ‡gB mg„× nw”Qj| cÖv‡P¨i Av‡iKwU mf¨Zv fviZ‡K Qvwo‡q †Mj| cwð‡gi Zviv Wye‡Z Wye‡Z Av‡iKwU Zvivi D`q NUj| †mUv Bmjvg ag©| Bmjvg k~b¨‡K fviZ †\_‡K wb‡q wbj| †kl ch©šÍ cwðgI Bmjvg †\_‡K k~b¨‡K wb‡qwQj| Z‡e k~‡b¨i ivRZ¡ ïiæ n‡qwQj cÖv‡P¨|

610 mv‡ji GK mÜ¨v| Pwjøk eQi eqmx gynv¤§v` (mv) †niv ce©‡Z a¨vbgMœ| gymjgvb‡`i wek¦vm Abymv‡i, wReivBj (Av) G‡m ej‡jb, "coyb|" gynv¤§v` (mv) co‡jb| Gici Zuvi evYx Qwo‡q coj `vevb‡ji g‡Zv| 632 mv‡j Zuvi B‡šÍKvj nq| Gi GK `k‡Ki g‡a¨B Zuvi Abymvixiv wgki, wmwiqv, †g‡mvc‡Uwgqv I cvim¨ AwaKvi K‡i| Bûw` I L„óvb‡`i cweÎ kni †RiæRv‡j‡gi cZb nq| 700 mv‡ji g‡a¨ Bmjvg c~‡e©i wmÜy b`x ch©šÍ †cuŠ‡Q hvq| cwð‡g †cuŠ‡Q AvjwRqvm© ch©šÍ| 711 mv‡j gymjgvbiv †¯úb `Lj K‡i| †cuŠ‡Q hvq d«vÝ ch©šÍ| Iw`‡K cÖv‡P¨ 751 mv‡j Pxbviv civwRZ nq| Zv‡`i mvgªv‡R¨ mxgvbv GZ eo nq hv †Lv` Av‡jKRvÛv‡ii Kv‡QI AKíbxq g‡b n‡e| Pxb hvIqvi c‡\_ c`vbZ nq fviZ| Avi GLv‡bB Avieiv fviZxq msL¨v m¤ú‡K© Rvb‡Z cv‡i|

gymjgvbiv Aí w`‡bi g‡a¨B wewRZ GjvKvi gvby‡li Ávb AvqË¡ K‡i †djZ| cwÐZiv eBcÎ Aviwe‡Z Abyev` Ki‡Z jvM‡jb| beg kZ‡K Lwjdv gvgyb evM`v‡` `viæj wnKgvn ev Áv‡bi Ni bv‡g mywekvj GK jvB‡eªwi M‡o †Zv‡jb| GUv cÖv‡P¨i wk¶v‡K‡›`ª cwiYZ nq| GLvbKvi Ab¨Zg cwÐZ e¨w³ wQ‡jb gynv¤§v` Beb gymv Avj LvIqvwiRwg|

LvIqvwiRwg A‡bK¸‡jv ¸iæZ¡c~Y© eB †j‡Lb| Gi g‡a¨ Av‡Q Avj Rvei Iqvj gyKvevjv| mvaviY mgxKiY¸‡jvi mgvavb Kivi Dcvq ejv Av‡Q GLv‡b| AvR Rvei A\_© m¤ú~Y© Kiv| GLvb †\_‡KB Avgiv A¨vj‡Reiv ev exRMwYZ kãUv †c‡qwQ| wn›`y msL¨vc×wZ wb‡qI wZwb GKwU eB †j‡Lb| Gi d‡j Avie we‡k¦i gva¨‡g msL¨vi G bZyb ˆkjx Qwo‡q coj `ªæZ| Qwo‡q coj wn›`y msL¨v‡K `ªZ ¸Y I fvM Kivi wbqgI (A¨vj‡Mvwi`g)| Avm‡j A¨vj‡Mvwi`g kãUv Avj †LvqvwiRwgi bvg †\_‡KB G‡m‡Q| msL¨vi cÖZxK¸‡jv Avieiv fviZ †\_‡K wb‡jI evwK wek¦ G‡`i‡K Aviwe msL¨v bvg w`‡q w`j|

wR‡iv kãUvi g‡a¨B Av‡Q wn›`y I Aviwe †Quvqv| wn›`y-Aviwe msL¨v MÖnY Kivi mgq Avieiv k~b¨‡KI MÖnY K‡i †bq| wR‡ivi fviZxq bvg ïwbqv ev k~b¨| hvi A\_© duvKv| Avieiv G‡K ej‡jb wmdi| cwð‡gi cwÐZiv mnKg©x‡`i Kv‡Q G‡K cwiwPZ Ki‡Z wM‡q G‡K j¨vwUb iƒc `vb Ki‡jb| d‡j wmdi n‡jv †Rwdiæm| wR‡iv (zero) kãUvi g~j GB †Rwdiæm-B| cvðv‡Z¨i Ab¨ MwYZwe`iv kãUv‡K GZUv e`jvbwb| Giv wR‡iv‡K ej‡Zb wmdiv| GUvB c‡i n‡jv mvBdvi (cipher)| msL¨vi bZyb ¸‡”Q wR‡iv GZ ¸iZ¡c~Y© n‡q `uvovj †h gvbyl me msL¨v‡KB mvBdvi ejv ïiæ Kij| G †\_‡K Av‌‌‌‡m divwm kã wk‡d« ev wWwRU (A¼)|

Z‡e LvIqvwiRwgi wn›`y msL¨v c×wZ wb‡q †jLv‡jwLi eû c‡i cwðgviv k~b¨‡K MÖnY Ki‡Z ïiæ K‡i| GgbwK gymwjg wek¦ cÖv‡P¨i HwZn¨ jvjb Ki‡jI A¨vwi÷U‡ji wk¶v Øviv e¨vcKfv‡e cÖfvweZ wQj| Gi KviY Av‡jKRvÛvi `¨ †MÖ‡Ui weRq¸‡jv| Iw`‡K fviZxq MwYZwe`iv Av‡MB †`wL‡q w`‡q‡Qb, k~b¨ n‡jv f‡qW ev k~b¨Zvi ewntcÖKvk| d‡j gymjgvbiv k~b¨‡K MÖnY Ki‡j A¨vwi÷Uj‡K Z¨vM Ki‡Z nq| Zuviv †mUvB Ki‡jb|

gymv gvqgwbwWR ev‡iv kZ‡Ki GKRb Bûw` cwÐZ| wZwb AvZ‡¼i mv‡\_ gymwjg ag©ZvwË¡K‡`i K\_v †j‡Lb| wZwb †`‡Lb, gymjgvbiv A¨vwi÷U‡ji mªóvi Aw¯Í‡Z¡i cÖgvY ev` w`‡q cigvYyev`x‡`i kiYvcbœ n‡jb| Av‡M †\_‡KB A¨vwi÷Ujcš’x‡`i mv‡\_ cigvYyev`x‡`i we‡iva| cÖwZKzj Ae¯’vqI Zv‡`i gZev` nvwi‡q hvqwb| Zv‡`i K\_v n‡jv, cigvYy bv‡gi ¯^Zš¿ KYv w`‡q e¯‘ MwVZ| GB KYviv PjvPj Ki‡Z cvi‡j G‡`i g‡a¨ \_vK‡e f¨vKzqvg ev k~b¨¯’vb| Avi Zv bvn‡j cigvYyiv G‡K Ac‡ii mv‡\_ av°v †L‡Z \_vK‡e| Ab¨ KYvi MwZc\_ †\_‡K mi‡Z cvi‡e bv|

Avwg hv ZvB: k~b¨

k~b¨ZvB cÖvY Avi cÖvYB k~b¨Zv... Avgv‡`i mxgve× gb Zv Dcjwä Ki‡Z cv‡i bv, KviY GwU Amx‡gi mv‡\_ hy³|

- AvRwi‡qj

k~b¨ n‡q †Mj bZyb wk¶v, A¨vwi÷U‡ji cÖZ¨vL¨vb Ges f‡qW I BbwdwbwU‡K MÖnY K‡i †bIqvi cÖZxK| Bmjv‡gi cÖmv‡ii mv‡\_ mv‡\_ gymjgvb-kvwmZ AÂ‡j k~b¨ Qwo‡q coj| me©Î Gi msNl© n‡jv A¨vwi÷U‡ji gZev‡`i mv‡\_| gymjgvb cwÐZivI †Q‡o K\_v ej‡jb bv| GMv‡iv kZ‡Ki gymwjg `vk©wbK Avey nvwg` Avj Mvhvwj †Zv †NvlYvB w`‡jb, A¨vwi÷Ujxq gZev` jvjb Ki‡j g„Zy¨`Ð †`Iqv DwPZ| Gic‡iB weZ‡K©i Aemvb n‡jv|

k~b¨ wb‡q G weZ‡K© AevK nIqvi wKQy †bB| cÖvP¨ †\_‡K Avmv Bmjvg GKwU †m‡gwUK3 ag©| gymjgvb‡`i wek¦vm, Avjøvn gnvwek¦ m„wó K‡i‡Qb f‡qW ev k~b¨ †\_‡K| Iw`‡K f‡qW I BbwdwbwUi cÖwZ A¨vwi÷U‡ji i‡q‡Q mxgvnxb N„Yv| d‡j A¨vwi÷U‡ji gZev` †hLv‡bB \_vK‡e, †mLv‡b k~b¨ †\_‡K m„wói gZev` †g‡b †bIqv m¤¢e bq| Avie f~wg‡Z k~b¨ Qwo‡q co‡j gymjgvbiv G‡K mv`‡i MÖnY Kij| Avi Qyu‡o †d‡j w`j A¨vwi÷Uj‡K| G `‡j c‡i †hvM w`j Bûw`iv|

nvRvi eQi a‡i Bûw`‡`i RxebhvÎvi †K›`ª wQj ga¨cÖvP¨| `kg kZ‡K †¯úb Zv‡`i Rb¨ m¤¢vebvi `yqvi Ly‡j w`j| Lwj`v Z„Zxq Avãyi ingv‡bi wQj GK Bûw` gš¿x| wZwb e¨vwejb †\_‡K eû eyw×Rxwe‡K wb‡q Av‡mb| Aíw`‡bi g‡a¨B wecyjmsL¨K Bûw` Rb‡Mvôx †e‡o DVj †¯ú‡b|

‡¯úb I e¨vwejb `yB RvqMv‡ZB ga¨hy‡Mi ïiæi w`‡Ki Bûw`iv A¨vwi÷U‡ji gZev` g‡bcÖv‡Y wek¦vm Ki‡Zb| L„óvb‡`i g‡ZvB ZvivI Amxg I f‡qW‡K †g‡b †bbwb| Z‡e Bmjvgx wk¶vi g‡ZvB Bûw` ag©Z‡Ë¡i mv‡\_I A¨vwi÷U‡ji `k©‡bi we‡iva wQj| G Kvi‡YB ev‡iv kZ‡Ki Bûw` ivweŸ wekvj GK cy¯ÍK iPbv K‡ib| D‡Ïk¨ n‡jv cÖv‡P¨i †m‡gwUK evB‡e‡ji mv‡\_ cvðv‡Z¨i wMÖK `k©‡bi we‡iva `~i Kiv|

gvqgwbwWR k~b¨‡K cÖZ¨vL¨v‡bi gva¨‡g Ck¦‡ii Aw¯Í‡Z¡i cÖgvY †k‡Lb A¨vwi÷U‡ji KvQ †\_‡K| wMÖK hyw³‡K wZwb Gevi bZyb iƒc `vb Ki‡jb| c„w\_exi Pvicv‡ki duvcv †MvjK‡`i wKQy GKUv bvov‡”Q| nq‡Zv ev c‡ii †MvjKwU Zv Ki‡Q| Zvn‡j c‡ii †MvjK‡K †K bvov‡”Q? Aek¨B Zvi c‡ii †MvjK| wKš‘ Amxg †MvjK †Zv \_vKv m¤¢e bq, KviY Amxg Am¤¢e| Zvi gv‡b me©‡kl †MvjK †KD GKRb bvov‡”Q| GUvB n‡jv cig PvjK Ck¦i|

gvqgwbwW‡Ri hyw³ Avm‡jI Ck¦‡ii Aw¯Í‡Z¡i GKwU cÖgvY| ag©Z‡Ë¡ GwU A‡bK g~j¨evb| Z‡e GKBmv‡\_ evB‡ej I Ab¨vb¨ †m‡gwUK ms¯‹„wZ‡Z Amxg I f‡q‡Wi cÖPyi D`vniY Av‡Q| gymjgvbiv Gi g‡a¨B †m¸‡jv‡K mv`‡i MÖnY K‡i‡Qb| 800 eQi Av‡Mi †m›U AMvw÷‡bi g‡Zv gvqgwbwWRI †m‡gwUK evB‡ej‡K bZyb iƒc w`‡q wMÖK gZev‡`i mv‡\_ Lvc LvIqv‡bvi †Póv K‡ib| †h gZev` †Kv‡bv KviY QvovB f‡qW‡K fq cvq| cÖ\_g hy‡Mi wLªóvbiv wMÖK‡`i gZev‡`i mv‡\_ Lvc LvIqv‡bvi Rb¨ evB‡e‡ji Iì †U÷v‡g›U‡K iƒcK ej‡Zb| Z‡e gvqwgwbwWR wb‡Ri ag©‡K cy‡ivcywi wMÖK Av`‡j e¨vL¨v Ki‡Z B”QyK wQ‡jb bv| ag©xq HwZn¨MZ Kvi‡Y wZwb evB‡e‡ji k~b¨ †\_‡K m„wói weeiY †g‡b wb‡Z eva¨| Avi Gi mnR A\_© n‡jv A¨vwi÷U‡ji wec‡¶ hvIqv|

A¨vwi÷Uj e‡jwQ‡jb, gnvwe‡k¦i Aw¯ÍZ¡ memgq wQj| gvqgwbwWR ej‡jb, G hyw³i cÖgv‡Y fyj Av‡Q| ag©MÖ‡š’i mv‡\_B †Zv we‡iva Gi! d‡j A¨vwi÷U‡ji gZev`‡K we`vq wb‡ZB n‡e| gvqgwbwWR ej‡jb, m„wói m~Pbv n‡q‡Q k~b¨ †\_‡K| G wel‡q GKwU cÖPwjZ K\_v n‡jv wµ‡qwkI G· wbwn‡jv| hvi A\_© e¯‘i m„wó Ck¦‡ii m„wókxj Kv‡Ri dj| A¨vwi÷Uj hZB f¨vKzqvg‡K wbwl× K‡i wM‡q \_v‡Kb, Zv‡Z wKQy Av‡m hvq bv| Gi gva¨‡g f‡qW ev k~b¨Zv Aag© †\_‡K cweÎZvq iƒcvšÍwiZ nj|

Bûw`‡`i Rb¨ gvqgwbwW‡Ri cieZ©x mgqUv n‡jv k~‡b¨i hyM| †Z‡iv kZ‡K bZyb Av‡iK gZev‡`i cÖmvi n‡jv| Gi bvg KvevwjRg ev Bûw` giwgev`| Kvevjxq wPšÍvi †K›`ªxq GKwU welq n‡jv Mv‡gwÎqv| e¨vcviUv n‡jv evB‡e‡ji †jLvi g‡a¨ mv‡¼wZK evZ©v AbymÜvb| wMÖK‡`i g‡Zv wneªæ RvwZi †jv‡KivI eY©gvjvi A¶i w`‡q msL¨v cÖKvk KiZ| AZGe me k‡ãi Av‡Q mvswL¨K gvb| Gi gva¨‡g k‡ãi jyKv‡bv A\_© †evSv †hZ| †hgb DcmvMixq hy‡×i (Gulf war) AskMÖnYKvixiv RvbZ mvÏvg k‡ãi gvb: mv‡gK (60) + Av‡jd (1) + `v‡j` (4) + Av‡jd (1) + †gg (600)| †gvU 666| †h msL¨v‡K wLªóvbiv Aïf cÖvYxi msL¨v g‡b K‡i| †h cÖvYx gnvcÖj‡qi mgq Avwef©~Z n‡e| mvÏvg k‡ã GKUv bvwK `ywU `v‡j` A¶i n‡e Zv wb‡q Kvevjx‡`i wPšÍv †bB| †hvMdj wgwj‡q w`‡Z Zviv k‡ãi evbvb Gw`K-‡mw`K K‡i †bq| Kvevjxq‡`i wek¦vm, GKB gv‡bi kã I kã¸‡”Qi g‡a¨ Ava¨vwZ¥K m¤úK© Av‡Q| †hgb evB‡e‡ji †R‡bwmm ev Avw`cy¯Í‡Ki 49 Aa¨v‡qi 10 bs Aby‡”Q` ej‡Q, "ivR`Ð RyWvni KvQ †\_‡K mi‡e bv, ... hZw`b bv wkjn Av‡m|" wneªæ fvlvq "hZw`b bv wkjn Av‡m" K\_vUvi gvb 358| wneªæ‡Z gvmvqvn ev gmxn k‡ãi gvbI GKB| AZGe G Aby‡”Q` gmxni AvMg‡bi c~e©vfvm w`‡”Q| wKQy msL¨v‡K cweÎ ev Aïf g‡b Kiv nZ| Kvevjxqiv evB‡e‡j LyuRZ Gme msL¨v| AbymÜvb K‡i †`LZ †Kv‡bv ¸ß evZ©v cvIqv hvq wKbv| mv¤cÖwZK †e÷‡mjvi eB `¨ evB‡ej †KvW G c×wZ‡Z c~e©vfvm †`Lv‡Z †P‡q‡Q|

Kvevjvn wRwbmUv wbQK msL¨vi †Ljvi g‡a¨ mxgve× wQj bv| G ms¯‹„wZ‡Z Ava¨vwZ¥KZvi cÖfve wQj cÖKU| †h Kvi‡Y A‡bK cwÐZ g‡b K‡ib, Gi mv‡\_ wn›`y a‡g©i `viæY wgj i‡q‡Q| GB †hgb Kvevjvn gZev‡` Ck¦‡ii ˆØZ cÖK…wZi aviYvi e¨envi Av‡Q| wneªæ K\_v AvBb md A\_© Amxg| GUv Øviv Ck¦‡ii m„wói w`K †evSv‡bv nq| Ck¦‡ii †h w`K gnvwek¦ m„wó K‡i‡Qb| gnvwe‡k¦i cÖwZwU Avbv‡P-Kvbv‡P i‡q‡Q hvi cÖfve| GKBmv‡\_ Gi Av‡Q Av‡iKwU bvg: AvBb (ayin) ev k~b¨Zv| Amxg I f‡qW GKvKvi| `ywUB Ck¦‡ii Ask| AviI PgKcÖ` e¨vcvi Av‡Q| AvBb k‡ãi A¶i¸‡jv‡K Nywi‡q wjL‡j (A¨vbvMÖvg) nq AvbB (aniy)| wneªæ‡Z hvi A\_© "Avwg"| Gi †P‡q mnR K‡i Avi Kxfv‡e evZ©v †`Iqv hvq: 'Avwg wKQyB bv,Õ Avevi 'Avwg Amxg|'

GKw`‡K Bûw`iv cÖv‡P¨i evB‡e‡ji Rb¨ cwðgx Av‡eM‡K `~‡i †V‡j w`‡”Q| Iw`‡K GKB jovB Pj‡Q L„óvb mgv‡R| GKw`‡K Zviv gymjgvb‡`i mv‡\_ jovB K‡i‡Q| beg kZ‡K kv‡j©‡g‡bi kvmbvg‡j jovB n‡q‡Q| µy‡mW n‡q‡Q GMv‡iv, ev‡iv I †Z‡iv kZ‡K| Z‡e Gme jovB‡qi mgq †hv×v, mbœ¨vmx, cwÐZ I ewYKiv Bmjvgx aviYv¸‡jvI cwð‡g wb‡q †M‡Q| mbœ¨vmxiv †`Lj Avie‡`i b¶‡Îi DbœwZ gvcvi hš¿ A¨v‡÷ªv‡jBe| Avie‡`i D™¢vweZ G hš¿ mÜ¨vq mg‡qi wnmve ivL‡Z `viæY Kv‡R Av‡m| d‡j mgqgZ bvgvR cov hvq| hš¿wU‡Z †ewkifvM mgq Aviwe msL¨v †jLv nZ|

bZyb msL¨v †Zgb RbwcÖqZv cvqwb| hw`I `kg kZ‡Ki †cvc wØZxq wmj‡f÷vi G¸‡jv †`‡L gy» nb| m¤¢eZ GK åg‡Y †¯úb wM‡q wZwb msL¨v¸‡jv †`‡Lb| BZvwj‡Z wd‡i Avmvi mgq wb‡q Av‡mb m‡½ K‡i| Z‡e Zvi G ms¯‹i‡Y k~b¨ wQj bv| \_vK‡j †mUv AviI Kg RbwcqZv †cZ| wMR©vq ZLbI A¨vwi÷U‡ji Zxeª cÖfve| wMR©vi †miv wPšÍvwe`iv ZLbI Amxg cwigvY eo ev †QvU e¯‘ I f‡qW‡K †g‡b †bbwb| †Z‡iv kZ‡K Aek¨ µy‡mWviiv G aviYv¸‡jvi KvQvKvwQ wM‡qwQj| ZeyI †m›U \_gvm A¨vKzBbvm †NvlYv †`b, Ck¦i †Kv‡bv cwÐZ †Nvov †hgb evbv‡eb bv, †Zgwb Amxg AvKv‡ii eo wKQyI evbv‡eb bv| wKš‘ GiB Avevi A\_© `uvovq, Ck¦i me©kw³gvb bb| L„óxq ag©Z‡Ë¡ †mI GK wbwl× wPšÍv|

1277 mv‡j d«v‡Ýi wekc GwUu‡q †Uw¤ú‡q Ávbx e¨w³‡`i GK mfv Wv‡Kb| D‡Ïk¨ A¨vwi÷Ujxq gZev‡`i Av‡jvPbv| AviI mwVK K‡i ej‡j G gZev‡`i cÖwZ AvµgY| Ck¦‡ii me©kw³i ¸‡Yi wecixZ A‡bK¸‡jv A¨vwi÷Ujxq e³e¨ †Uw¤ú‡q evwZj K‡ib| Ggb GKwU K\_v n‡jv, "Ck¦i AvKvk‡K mij‡iLv eivei miv‡Z cvi‡eb bv, KviY †m‡¶‡Î †cQ‡b GKwU f¨vKzqvg ˆZwi n‡e|" (N~Y©vqgvb †Mvj‡Ki G Amyweav †bB, KviY Nyi‡jI †MvjK GKB ¯’vb `Lj K‡i \_v‡K| †MvjK‡K bvwo‡q AvKv‡ki bZyb ¯’v‡b wb‡q †M‡j Av‡Mi RvqMvq wKQy \_vK‡e bv| ïay †m‡¶‡ÎB f¨vKzqvg ˆZwi n‡e|) Avm‡j Ck¦i PvB‡jB f¨vKzqvg ˆZwi Ki‡Z cv‡ib| d‡j nVvr K‡iB f‡qW wb‡q Av‡jvPbvi `yqvi Ly‡j †Mj| KviY me©kw³gvb Ck¦i A¨vwi÷U‡ji evbv‡bv wbqg eva¨ bb|

‡Uw¤ú‡qi †NvlYv‡ZB A¨vwi÷U‡ji `k©‡bi g„Zy¨ nqwb—wVK| Z‡e wbwðZfv‡eB †mUv wQj DËi MM‡b Kv‡jv †gN| AviI K‡qK k eQi wMR©v A¨vwi÷U‡ji gZev` AuvK‡o a‡i †i‡LwQj| Z‡e A¨vwi÷U‡ji cZb Ges f‡qW I BbwdwbwUi DÌvb ïiæ n‡q wM‡qwQj| cvðv‡Z¨ k~‡b¨i AvMg‡bi Rb¨ Gi †P‡q AbyK‚j cwi‡ek Avi nq bv| ev‡iv kZ‡Ki gvSvgvwSi mg‡qi K\_v| Avj-LvIqvwiRwgi AvjRvei eB‡qi cÖ\_g iƒcvšÍi¸‡jv †¯úb I Bsj¨vÛ n‡q BD‡iv‡ci evwK AÂj¸‡jv‡Z Qwo‡q cowQj| k~b¨ Av‡MB iIqvbv w`‡qwQj| wMR©v A¨vwi÷U‡ji wkKj †f‡O w`‡Z w`‡Z k~b¨ G‡m †cuŠ‡Q †Mj|

k~‡b¨i weRq

... k~b¨ GKwU e¨vcK I ¸iZ¡c~Y© aviYv| Avgiv G‡K mij fvwe, KviY Gi Avmj ¸Y Avgiv †Lqvj Kwi bv| Z‡e wnmve-wbKv‡ki g‡a¨ †¶‡Î GB mnR-mij ¸YwUi Kvi‡YB cÖ‡qvRbxq D™¢ve‡bi †¶‡Î MwYZ †miv‡`i KvZv‡i ¯’vb †c‡qwQj|

-wc‡q‡i wm‡guv jvcøvm

L„óvbiv ïi‡Z k~b¨‡K cÖZ¨vL¨vb K‡iwQj| Z‡e evwYwR¨K Kvi‡Y Aíw`‡bi g‡a¨B Gi cÖ‡qvRb n‡q coj| wcmvi wjIbv‡`©v k~b¨‡K cybivq cwð‡g wb‡q Av‡mb| BZvjxq ewY‡Ki GB †Q‡jwU DËi Avwd«Kv ågY K‡iwQ‡jb| wjIbv‡`©v bv e‡j wd‡evbvwP ej‡j gvbyl Zuv‡K mn‡R †P‡b| wZwb gymjgvb‡`i Kv‡Q MwYZ †k‡Lb| Aíw`‡bi gv\_vq wb‡RB fv‡jv MwYZwe` n‡q I‡Vb|

Zuvi wj‡ei Avevwm eB‡qi GKwU †QvU I mvgvb¨ MvwYwZK mgm¨vi Rb¨B wZwb me‡P‡q cwiwPwZ cvb| eBwU 1202 mv‡j cÖKvwkZ nq| aiæb GKRb K…l‡Ki GK †Rvov ev”Pv Li‡Mvk Av‡Q| eq¯‹ n‡Z ev”Pv Li‡Mv‡ki `yB gvm mgq jv‡M| Gici †\_‡K Zviv cÖwZ gv‡m GK †Rvov K‡i ev”Pv Rb¥ w`‡Z \_v‡K| ev”PvivI eq¯‹ n‡j Avevi ev”Pv w`‡Z \_v‡K| Gfv‡eB Pj‡Z \_v‡K| GLb cÖkœ n‡jv, wbw`©ó GKwU gv‡m Kq †Rvov Li‡Mvk †`Lv hv‡e?

‡`Lv hvK| cÖ\_g gv‡m \_vK‡e GK †Rvov Li‡Mvk| eq¯‹ bv nIqvq Giv mšÍvb Rb¥ †`‡e bv|

wØZxq gv‡mI GK †RvovB \_vK‡e|

Z„Zxq gv‡m Li‡Mv‡ki †RvovwU mšÍvb Drcv`b K‡i‡Q| GLb Li‡Mvk Av‡Q `yB †Rvov|

PZy\_© gv‡mi ïiæ‡Z cÖ\_g †RvovwU Avevi mšÍvb Rb¥ w`‡q‡Q| Z‡e wØZxq †Rvov GLbI eq¯‹ nqwb| d‡j GLb Li‡Mvk Av‡Q wZb †Rvov|

c‡ii gv‡m cÖ\_g †RvovwU AveviI GK †Rvov Li‡Mvk Dcnvi w`‡q‡Q| wØZxq †RvovI eq¯‹ n‡q mšÍvb †c‡q †M‡Q| Z‡e Z„Zxq †Rvov GLbI eq¯‹ nqwb| Zvn‡j mewgwj‡q Li‡Mvk GLb cuvP †Rvov|

Gfv‡e Pj‡Z \_vK‡j Li‡Mv‡ki †Rvovi msL¨v wewfbœ gv‡m GiKg n‡e: 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, ...| †Kv‡bv wbw`©ó gv‡mi Li‡Mv‡ki msL¨v †c‡Z n‡j Av‡Mi me gv‡mi Li‡Mv‡ki msL¨v¸‡jv †hvM Ki‡Z n‡e| MwYZwe`iv gyn~‡Z©B GB avivi ¸iæZ¡ Dcjwä Ki‡jb| †h‡Kv‡bv msL¨v wb‡q G‡K Zvi Av‡Mi msL¨v w`‡q fvM w`b| †hgb 8/5 = 1.6| 13/8 = 1.625| 21/13 = 1.61538...| AbycvZ¸‡jv GKwU `viæY msL¨vi w`‡K AMÖmi n‡”Q| Gi bvg †mvbvjx AbycvZ (Golden ratio)| hvi gvb 1.61803...|

wc\_v‡Mvivm †Lqvj K‡iwQ‡jb, cÖK…wZ m¤¢eZ †mvbvjx AbycvZ Øviv PvwjZ n‡”Q| wd‡evbvwP Gi †cQ‡bi wbqvgK avivwU Avwe®‹vi Ki‡jb| kvgy‡Ki †Lvj‡mi AvKvi †g‡b P‡j G aviv| †g‡b P‡j Avbvi‡mi WvbveZ©x I evgveZ©x LuvR¸‡jv| G Kvi‡YB cÖK…wZi G wRwbm¸‡jv †mvbvjx Abycv‡Zi KvQvKvwQ †h‡Z \_v‡K|

GB avivi Rb¨B wd‡evbvwP me‡P‡q †ewk weL¨vZ| Z‡e Zuvi wj‡ei Avevwm cïLvgv‡ii †P‡q eo D‡Ïk¨ enb K‡i| wd‡evbvwP MwYZ wk‡LwQ‡jb gymjgvb‡`i Kv‡Q| d‡j wZwb Aviwe msL¨v m¤ú‡K© Rvb‡Zb| Rvb‡Zb k~‡b¨i K\_vI| GB bZyb c×wZ wZwb Zuvi wj‡ei Avevwm eB‡q D‡jøL K‡ib| BD‡ivc †kl ch©šÍ Rvbj k~‡b¨i K\_v| eB‡q wZwb RwUj wnmve Kivi †¶‡Î Aviwe msL¨vi PgrKvi w`KwU Zy‡j a‡ib| BZvjxq ewYK I e¨vsKviiv `ªæZB bZyb c×wZUvi myweav MÖnY Ki‡jb| mv‡\_ wb‡jb k~b¨‡KI|

Aviwe msL¨v Avmvi Av‡M e¨vs‡Ki KvD›Uv‡ii †jv‡Kiv A¨vevKvm ev KvDw›Us †evW© e¨envi Ki‡Zb| Rvg©vbiv KvDw›Us †evW©‡K ejZ †i‡kbe¨vsK| GRb¨B Avgiv FY`vZv‡`i e¨vsK ewj| †mmgq e¨vswKs e¨e¯’v wQj LyeB Avw`g| F‡Yi wnmve ivL‡Z KvDw›Us †ev‡W©i cvkvcvwk e¨envi wQj U¨vjx w÷‡Ki| w÷‡Ki GK cv‡k A‡\_©i cwigvY †jLv nZ| Gici G‡K `yB fvM Kiv nZ (wPÎ 16)| FY`vZvB ivLZ `yB L‡Ði eo AskwU| Gi bvg ÷K| Avi `vZv‡K ejv nZ ÷K‡nvìvi|4

wPÎ 16: U¨vwj w÷K

Aviwe msL¨v BZvjxq ewYK‡`i gb Rq K‡i †bq| e¨vsKviiv KvDw›Us †evW© †\_‡K gyw³ †c‡jb| e¨emvqxiv G msL¨vi DcKvi †Ui †c‡jI ¯’vbxq miKvi G‡`i †`Lj N„Yvi †Pv‡L| 1299 mv‡j †d¬v‡i‡Ý Aviwe msL¨v wbwl× nq| AvcvZ`„wó‡Z Gi KviY wQj Aviwe msL¨v‡K mn‡RB cv‡ë †djv hvq I fyj msL¨v †`Lv‡bv hvq| (‡hgb Aviwe 0-‡K Kj‡gi †LuvPvq mn‡RB 6 evwb‡q †djv hvq|) Z‡e k~b¨ Ges Ab¨vb¨ Aviwe msL¨vi myweavUyKz AZ mn‡RB Dwo‡q †`Iqvi my‡hvM †bB| BZvjxq ewYKiv G¸‡jvi e¨envi Qv‡obwb| Zviv G¸‡jv w`‡q cvVv‡Zb mv‡¼wZK evZ©vI| Avi G Kvi‡YB mvBdvi (cipher) k‡ãi A\_© n‡q‡Q ¸ß m‡¼Z|

‡kl ch©šÍ evwYwR¨K Pv‡ci Kv‡Q bZ n‡Z nq miKvi‡K| BZvwj‡Z Aviwe cÖZxK Aby‡gv`b cvq| µ‡gB Zv Qwo‡q c‡o BD‡ivcRy‡o| †cuŠ‡Q †Mj k~b¨| Ges f‡qW| gymjgvb I wn›`y‡`i cÖfv‡e A¨vwi÷U‡ji `~M© †f‡O LvbLvb n‡q hvw”Qj| PZy`©k kZ‡Ki ïi‡ZB BD‡iv‡c A¨vwi÷Ujxq gZev‡`i Ruv`‡ij mg\_©KI G gZev`‡K m‡›`‡ni †Pv‡L †`LZ| K¨v›Uvi‡ewii †m mg‡qi cieZ©x AvP©wekc \_gvm eª¨vWIqvwW©b A¨vwi÷Ujxq g‡Zi cyi‡bv kÎæ cigvYyev`‡K fyj cÖgvY Kivi †Póv Pvjvb| GKBmv‡\_ wZwb GI fv‡eb, wb‡Ri hyw³wU wVK Av‡Q †Zv! KviYI Av‡Q| Zuvi hyw³i wfwË wQj R¨vwgwZ| hvi AmxgmsL¨K evi wefvRb‡hvM¨ †iLv ¯^qswµqfv‡eB cigvYyev`‡K evwZj K‡i †`q| Z‡e A¨vwi÷U‡ji civRq ZLbI `~‡i evwZNi|

Z\_¨wb‡`k©

1| GLv‡b D‡jøwLZ Z\_¨ me g‡Zi gvby‡li aviYvi mv‡\_ wgj‡e bv| cÖvmw½K welq wn‡m‡e ivLv n‡q‡Q|

2| ¯’vbxq gv‡bi D`vniY: 12 msL¨vwU‡Z `ywU A¼ 1 I 2| 2-Gi ¯’vbxq gvb 1 I 1-Gi gvb 10| Gfv‡e 432-Gi †¶‡Î 2-Gi 1, 3-Gi 10 I 4-Gi 100| ¯’vbxq gvb w`‡q me msL¨vi gvb †ei Kiv hvq| †hgb 432 = 4 × 100 + 3 × 10 + 2 × 1 = 400 + 30 + 2 = 432|

3| Bûw`, L„ó I Bmjvg ag©‡K GKm‡½ †m‡gwUK ag© e‡j|

4| w÷‡Ki e¨envi Ki‡Z Sv‡gjvi AšÍ wQj bv| Bs‡iR A\_©gš¿bvjq 1826 mvj ch©šÍ GK ai‡bi U¨vwj w÷‡K wnmve ivLZ| Pvj©m wW‡KÝ cÖvPxb G c×wZi cwiYvg m¤ú‡K© e‡jb, Ò1834 mv‡j †`Lv hvq, A‡bK w÷K Rgv n‡q †M‡Q| cÖkœ `uvovj, ¶‡q hvIqv, †cvKvq LvIqv I cyi‡bv Gme w÷K‡K Kx Kiv n‡e? G¸‡jv ivLv wQj I‡q÷wgwb÷v‡i| †h‡Kv‡bv eyw×gvb gvbyl eyS‡eb, G¸‡jv‡K jvKwo wn‡m‡e e¨envi KivB me‡P‡q mnR n‡e| cv‡ki cvovi †Kv‡bv Mwie gvbyl‡K Zv w`‡q w`‡jB n‡jv| Z‡e G¸‡jv †Kv‡bv Kv‡RB Av‡mwb| mivKvwi AvBb ej‡Q, G¸‡jv e¨enviB Kiv hv‡e bv| ZvB, wb‡`©k Gj, G¸‡jv‡K †Mvc‡b cywo‡q †dj‡Z n‡e| †kl ch©šÍ Bsj¨v‡Ûi msm‡`i D”PK¶ nvDm Ae jW©‡mi Pyjvq G¸‡jv‡K R¡vwj‡q †`Iqv nq| cyi‡bv w÷‡K `vD`vD K‡i Av¸b R¡‡j I‡V| Av¸b a‡i hvq †`qvj I Qv‡`| †m Av¸b P‡j hvq nvDm Ae KgÝ (wb¤œK¶) ch©šÍ| `yB nvDmB cy‡o QvB n‡q hvq| cybtwbg©v‡Yi Rb¨ ¯’cwZ †W‡K Avbv nq| Avi Zvi LiP eZ©gv‡b wek jvL †cwi‡q †M‡Q|

PZy\_© Aa¨vq

k~‡b¨i Amxg Ck¦i

[k~‡b¨i ag©ZË¡]

bZyb `k©b m‡›`n ˆZwi K‡i‡Q

Av¸b wb‡f †M‡Q

nvwi‡q †M‡Q m~h© I c„w\_ex

‡KD Rv‡b bv LyuR‡e †Kv\_vq

me †f‡O Pyigvi

me †hvMvb, me m¤úK©

ivRcyÎ, cÖRv, evev, †Q‡j n‡q‡Q we¯§„Z

~ Rb Wb, A¨vbvUwg Ae `¨ Iqvì©

k~b¨ I Amxg wQj †i‡bmuviI Ab¨Zg ¸iæZ¡c~Y© Ask| BD‡ivc ax‡i ax‡i †R‡M DVj AÜKvi †\_‡K| †R‡M DVj k~b¨ I Amxg| Ab¨ fvlvq 'wKQyB bv' I 'mewKQy'| wMR©vi A¨vwi÷Ujxq wfwË ¸wo‡q †Mj| c\_ Lyjj ˆeÁvwbK wecø‡ei|

hvRK‡kªYx wec`Uv cÖ\_‡g eyS‡Z cv‡iwb| eo eo hvRKiv k~b¨ I Amx‡gi fqvbK aviYv wb‡q cix¶v Pvjvq| hw`I wMR©vi cQ‡›`i G aviYv¸‡jv wQj cÖvPxb wMÖK `k©‡bi g~‡j KzVvivNvZ| †i‡bmuv hy‡M AuvKv me wPÎK‡g©i †K‡›`ª \_vKZ k~b¨| Avi wekc †NvlYv K‡iwQ‡jb, gnvwek¦ Amxg| mxgvbvwenxb| wKš‘ k~b¨ I Amx‡gi cÖwZ fvjevmv ¯’vqx n‡Z cvij bv|

wMR© ûgwKi gy‡L co‡j wd‡i †Mj †mB cÖvPxb wMÖK `k©‡b| AveviI MÖnY Kij eû eQi a‡i mg\_©b w`‡q Avmv A¨vwi÷U‡ji gZev`| wKš‘ eÇ †`wi n‡q †M‡Q ZZw`‡b| k~b¨ ZZ¶‡Y cvðv‡Z¨ Avmb †Mu‡o e‡m‡Q| wMR©vi AvcwË Avi †KD Kv‡b wbj bv| k~b¨‡K Qvo‡Z ivRx bq weÁvbmgvR|

Lyjj iæ×Øvi

‡n Ck¦i, Kz‡qvi R‡j e›`x n‡q wb‡R‡K Amxg RM‡Zi ivRv fve‡j wK Avwg Lvivc ¯^cœ †`LwQ?

--- DBwjqvg †k·wcqvi, n¨vg‡jU

‡i‡bmuvi ïiæ‡Z †evSv hvqwb k~b¨ †h wMR©vi Rb¨ ûgwK n‡q `uvov‡e৷ k~b¨ wQj wbQK GKwU ˆkwíK nvwZqvi৷ GKwU Amxg k~b¨Zv, wPÎwk‡íi gva¨‡g hv cÖùywUZ n‡Z \_v‡K৷

c‡bi k kZ‡Ki Av‡Mi wPÎwkí I A¼b wQj cÖvYnxb৷ Qwe¸‡jv wQj weK…Z, wØgvwÎK I wekvj AvKv‡i৷ †QvÆ I wekªx cÖvmv` †\_‡K P¨vÞv bvBU‡`i DuwK gvi‡Z †`Lv †hZ (wPÎ 17)| †miv wkíxivI ev¯Íeag©x `„k¨ AuvK‡Z cvi‡Zb bv৷ Zviv k~‡b¨i kw³i e¨envi Rvb‡Zb bv|

wPÎ 17: P¨vÞv bvBU I wekªx cÖvmv`

BZvjxq ¯’vcZ¨we` wdwj‡cv eªæ‡b‡jwk cÖ\_g Amxg k~‡b¨i e¨envi †`Lvb৷ wgwj‡q hvIqv we›`y (vanishing point) e¨envi K‡i wZwbB cÖ\_g GKwU ev¯ÍewfwËK Qwe Auv‡Kb৷

gvÎvi aviYv †\_‡K Avgiv Rvwb, GKwU we›`y GKwU k~b¨৷ ˆ`bw›`b Rxe‡b Avgiv wÎgvwÎK e¯‘ wb‡q KvR Kwi৷ AvBÝUvBb †`Lvb, RMZUv Avm‡j PZyg©vwÎK| GUv wb‡q Avgiv c‡iI K\_v eje৷ Avcbvi †`qvj Nwo, Kwdi gM wKsev G eBwU meB wÎgvwÎK wRwbm৷ GLb GKUy Kíbv Kiæb: GKwU wekvj nvZ eBwU‡K Pvcv w`j| wÎgvwÎ‡Ki e`‡j eBwU GLb wØgvwÎK GK AvqZ৷ eBwUi GKwU gvÎv (D”PZv) nvwi‡q †M‡Q| Gi GLb ïay ˆ`N¨© I cÖ¯’ Av‡Q৷ D”PZv †bB৷ Gevi aiæb †mB ˆ`Z¨vKvi nvZ eBwU‡K cvk †\_‡K Pvcv w`j৷ eBU GLb Avi AvqZ‡¶‡Îi g‡Zv †bB৷ n‡q †M‡Q jvBb ev †iLv৷ Av‡iKwU gvÎv Kg GLb| †bB cÖ¯’ I D”PZv৷ Av‡Q ïay ˆ`N¨©৷ GUv GLb GKgvwÎK e¯‘৷ GB gvÎvUv‡KI DavI K‡i †`Iqv hv‡e৷ jvBb eivei Avevi Pvcv w`‡j jvBb n‡q hv‡e we›`y৷ GK Amxg k~b¨Zv, hvi ˆ`N¨©, cÖ¯’ ev D”PZv wKQyB †bB৷ we›`y Avm‡j k~b¨gvwÎK e¯‘৷

1425 mv‡j eªæ‡b‡jwk weL¨vZ †d¬v‡i›UvBb feb e¨vcwU‡÷wii GKwU wP‡Îi †K‡›`ª Ggb GKwU we›`y emvb৷ wgwj‡q wM‡q we›`y‡Z cwiYZ G k~b¨gvwÎK e¯Í K¨vbfv‡mi Ici AwZkq ¶y`ª GKwU WU| Gi gv‡b n‡jv ch©‡e¶K †\_‡K Amxg `~‡ii e¯‘ (wPÎ 18)| wP‡Îi `~‡ii `„k¨¸‡jv µ‡gB GB we›`yi KvQvKvwQ nq৷ ch©‡e¶K †\_‡K `~‡i †M‡j n‡Z \_v‡K †QvU †\_‡K AviI †QvU৷ gvbyl, MvQ ev wewìs-- mewKQyB h‡\_ó `~‡i †M‡j n‡q hvq k~b¨gvwÎK we›`y| nvwi‡q hvq `„wói mxgvbv †\_‡K৷ wP‡Îi †K‡›`ªi k~b¨ Amxg ¯’vb‡K aviY K‡i৷

AvcvZ we‡ivax GB e¯‘B eªæ‡b‡jwki wPÎ‡K Rv`yi g‡Zv cv‡ë w`j৷ wPÎUv e¨vwÞ‡÷wi wÎgvwÎK feb‡K AmvaviYfv‡e dzwU‡q Zyjj৷ Avmj e¯‘i mv‡\_ †hb cv\_©K¨B †bB৷ gRvi e¨vcvi n‡jv eªæ‡b‡jwk Avqbvq febwU‡K †`‡L wP‡Îi mv‡\_ Zyjbv K‡ib৷ cÖwZdwjZ Qwei mv‡\_ AuvKv wPÎ ûeû wg‡j wM‡qwQj৷ GB f¨vwbwks c‡q›U ev wgwj‡q hvIqv we›`y wØgvwÎK A¼b‡K wÎgvwÎK fe‡bi wbLyuZ bK‡j cwiYZ Kij|

wPÎ 18: wgwj‡q hvIqv we›`y

wgwj‡q hvIqv we›`y‡Z k~b¨ Avi Amx‡gi m¤úK© †Kv‡bv KvKZvjxq e¨vcvi bq| k~b¨ w`‡q ¸Y msL¨v‡iLv‡K †QvU K‡i we›`y evwb‡q †`q| GKBfv‡e f¨vwbwks c‡q›U gnvwe‡k¦i cÖvq cy‡ivUv‡K GKwU W‡Ui g‡a¨ ewm‡q w`‡q‡Q| G we›`yi bvg wms¸jvwiwU| weÁv‡bi BwZnv‡m cieZ©x‡Z G aviYv A‡bK ¸iæZ¡c~Y© n‡q I‡V| Z‡e H mg‡q MwYZwe`iv k~‡b¨i ˆewkó¨ m¤ú‡K© wPÎwkíx‡`i †P‡q †ewk wKQy Rvb‡Zb bv| c‡bi kZ‡K †Zv Avm‡j wPÎwkíxivB wQ‡jb †mŠwLb MwYZwe`| wjIbv‡`©v `¨ wfwÂ A¼‡bi `„wó‡KvY (perspective) wb‡q GKwU mnvwqKv wj‡LwQ‡jb| wPÎwkí wb‡q Zuvi Av‡iK eB‡q Av‡Q GK mZK©evYx, ÒMwYZwe` Qvov †KD Avgvi †jLv co‡eb bv|" G MwYZwe`-wPÎwkíxivB `„wó‡KvY c×wZ‡K wbLyuZ K‡i †Zv‡jb| Aí w`‡bi gv\_vq †`Lv †Mj, Giv †h‡Kv‡bv e¯‘‡K wZb gvÎvq dzwU‡q Zyj‡Z cvi‡Qb| wkíxiv gyw³ †c‡jb mgZ‡ji g‡Zv wP‡Îi nvZ †\_‡K| k~b¨ e`‡j w`‡q‡Q wk‡íi RMZ‡K||

Av¶wiK A‡\_©B k~b¨ eªæ‡b‡jwki wP‡Îi †K‡›`ª Ae¯’vb KiwQj| wMR©vI k~b¨ Ges Amxg wb‡q GKUy bvovPvov K‡i †`Lj| hw`I wMR©vi gZev` ZLbI A¨vwi÷U‡ji Ici wbf©ikxj| Rvg©vb KvwW©bvj wb‡Kvjvm Ae wKDmv eªæ‡b‡jwki mgmvgwqK gvbyl| wZwb Amx‡gi aviYv †`‡LB †NvlYv K‡ib, Ò‡Uiv bb G÷ †m›Uªv gywÛ|" | c„w\_ex gnvwe‡k¦i †K›`ª bq| wMR©v ZLbI eyS‡Z cv‡iwb, G aviYv KZ ˆecøweK n‡Z cv‡i|

ga¨hyMxq A¨vwi÷Ujxq gZev‡`i GKwU cyi‡bv I kw³kvjx K\_v wQj, Ògnvwe‡k¦i g‡a¨ c„w\_ex Abb¨ I we‡kl GKwU wRwbm, hvi g‡Zv †bB Avi wKQy|" G K\_vUvI f¨vKzqv‡gi wb‡lavÁvi g‡ZvB kw³kvjx wQj| G K\_v Abymv‡i, c„w\_ex Av‡Q gnvwe‡k¦i †K‡›`ª| gnvwe‡k¦i †K‡›`ª Ae¯’v‡bi Kvi‡Y ïay c„w\_ex‡Z cÖvY avi‡Yi Dc‡hvMx cwi‡ek Av‡Q| A¨vwi÷Uj g‡b Ki‡Zb, me e¯‘ Zv‡`i cÖK…Z Ae¯’vb Lyu‡R †c‡Z Pvq| cv\_i ev gvby‡li g‡Zv fvix wRwb‡mi ¯’vb f~wg| evZv‡mi g‡Zv nvjKvi e¯‘ \_vK‡e AvKv‡k| G K\_vi wQj bvbvb djvdj| Gi A\_© `ovq, MÖniv evqyi g‡Zv nvjKv wRwbm w`‡q ˆZwi| Av‡iKwU A\_© n‡jv AvKv‡ki gvbyl f~wg‡Z c‡o hv‡e| d‡j ev`v‡gi g‡Zv gnvwe‡k¦i †Lvj‡mi †fZ‡ii †K‡›`ªB ïay cÖvYxiv evm Ki‡Z cvi‡e| Ab¨ MÖ‡n cÖvY \_vKvi fvebv GK †Mvj‡Ki `yB †K›`ª \_vKvi g‡ZvB nvm¨Ki|

‡Uw¤ú‡q †NvlYv K‡iwQ‡jb, me©kw³gvb Ck¦i PvB‡jB f¨vKzqvg ev k~b¨¯’vb ˆZwi Ki‡Z cv‡ib| †Uw¤ú‡qi †Rvi w`‡q ej‡jb, Ck¦i A¨vwi÷U‡ji †h‡Kv‡bv wbqg fvO‡Z cv‡ib| Ck¦i PvB‡jB Ab¨ c„w\_ex‡Z cÖvY mÂvi Ki‡Z cv‡ib| nvRvi nvRvi Ab¨ c„w\_exi Aw¯ÍZ¡ \_vK‡Z cv‡i| me¸‡jv‡Z \_vK‡Z cv‡i cÖv‡Yi Aw¯ÍZ¡| GUv Ck¦‡ii c‡¶ Aek¨B m¤¢e| A¨vwi÷Uj Kx ej‡jb Zv‡Z wKQy hvq-Av‡m bv|

wb‡Kvjvm Ae wKDmv †Zv AviI †ewk mvnmx| wZwb ej‡jb, Ck¦‡i Avm‡j †mUvB K‡i‡Qb| wZwb e‡jb, ÒAb¨ Zvivi AÂj Avgv‡`i g‡Zv GKBiKg| Avgv‡`i wek¦vm, G‡`i †Kv‡bvUvB cÖvY †\_‡K ewÂZ nqwb|" AvKv‡k Av‡Q AmxgmsL¨K Zviv| AvKv‡k R¡jR¡j K‡i MÖniv| Puv` I m~h© †\_‡K Av‡m Av‡jv| AvKv‡ki Zviviv †Kb Avgv‡`i MÖn, P›`ª ev m~‡h©i g‡Zv n‡Z cvi‡e bv? nq‡Zvev Zviv c„w\_ex‡K D¾¡jfv‡e R¡j‡Z †`‡L, †hfv‡e Avgiv †`wL Zv‡`i‡K|" wb‡Kvjvm wbwðZ wQ‡jb, Ck¦i Avm‡jB AmxgmsL¨vK Ab¨ c„w\_ex m„wó K‡i‡Qb| c„w\_ex m‡i †Mj gnvwe‡k¦i †K›`ª †\_‡K| wb‡Kvjvm‡K ZeyI ag©‡`ªvnx ejv nqwb| bZyb fvebvi cÖwZI cÖwZwµqv †`Lvqwb wMR©v|

Gevi Kv‡R bvg‡jb Av‡iK wb‡Kvjvm| wZwb wb‡Kvjv‡mi `k©b‡K ˆeÁvwbK Z‡Ë¡i iƒc w`‡jb| wb‡Kvjvm †Kvcvwb©Kvm †`Lv‡jb, c„w\_ex gnvwe‡k¦i †K›`ª bq| Nyi‡Q eis m~h©‡K †K›`ª K‡i|

mbœ¨vmx I wPwKrmK †Kvcvwb©Kv‡mi evwo †cvj¨vÛ| MwYZ wk‡LwQ‡jb †R¨vwZlwe`¨vi KvR mnR Kivi Rb¨| hv‡Z K‡i Zuvi †ivMx‡`i wPwKrmv AviI fvj Kiv hvq| d‡j KvR Ki‡Z n‡jv MÖn-b¶Î wb‡q| Avi Zv Ki‡Z wM‡q †`L‡jb MÖn‡`i MwZwewai wnmve ivLvi wMÖK wbqg A‡bK A‡bK RwUj| U‡jwgi Nwom`„k AvKvk wQj `viæY wbLyuZ| †hLv‡b c„w\_ex wQj †K‡›`ª| Z‡e G g‡Wj wQj gvivZ¥K RwUj| eQiRy‡o MÖniv AvKv‡k PjvPj K‡i| Z‡e gv‡Sg‡a¨ †\_‡g hvq| Pj‡Z \_v‡K †cQb w`‡K|1 MÖn‡`i GB A™¢yZ AvPiY e¨vL¨v Ki‡Z wM‡q U‡jwg wb‡q Av‡mb g›`e„‡Ëi (epicycle) aviYv| e„‡Ëi cwiwai Ic‡i †K›`ªwewkó Ab¨ †QvU e„Ë Giv| G‡`i gva¨‡g MÖn‡`i †cQbgyLx MwZ e¨vL¨v Kiv m¤¢e n‡qwQj (wPÎ 19)| //////

‡Kvcvwb©Kv‡mi fvebvi kw³kvjx w`K wQj Gi mijZv| †K‡›`ª c„w\_ex I Gi Pvicv‡k g›`e„‡Ë cwic~Y© gnvwe‡k¦i e`‡j wZwb m~h©‡KB †K‡›`ª Kíbv Ki‡jb| hvi Pvicv‡k MÖniv †Nv‡i mij e„Ëc‡\_| K¶c‡\_ c„w\_ex †Kv‡bv MÖn‡K †cQ‡b †dj‡j †m MÖn †cQ‡b Pj‡Q e‡j g‡b n‡e| g›`e„‡Ëi †Kv‡bv `iKvi †bB| †Kvcvwb©Kv‡mi wPšÍv ev¯Íe Dcv‡Ëi mv‡\_ cy‡ivcywi †g‡jwb| K¶c\_ Avm‡j e„ËvKvi bq| Z‡e m~h©‡Kw›`ªK aviYv wQj mwVK| U‡jwgi bgybvi †P‡q Zuvi bgybv wQj A‡bK mij| c„w\_ex †Nv‡i m~‡h©i Pviw`‡K| †Uiv bb G÷ †m›Uªv gywÛ|

wb‡Kvjvm Ae wKDmv I wb‡Kvjvm †Kvcvwb©Kvm A¨vwi÷Uj I U‡jwgi mxgve× gnvwek¦‡K †f‡O w`‡jb| c„w\_ex m‡i †Mj gnvwe‡k¦i †K‡›`ªi Avivg`vqK RvqMv †\_‡K| gnvwek¦‡K wN‡i †bB †Kv‡bv †Lvjm| gnvwek¦ we¯Í„Z Amxg Aewa| Av‡Q AmsL¨v wew¶ß RMZ| me¸‡jv‡Z nq‡Zv Av‡Q inm¨gq cÖvYx| wKš‘ Ab¨ †mŠiRM‡Z cÖfve ivL‡Z bv cvi‡j †ivg Kxfv‡e GKgvÎ mwVK wMR©vi `vwe`vi n‡e? Ab¨ MÖ‡n wK Z‡e Ab¨ †cvc Av‡Q? K¨v\_wjK wMR©vi Rb¨ AmyweavRbK GK Ae¯’v| †m Amyweav AviI eo n‡q‡Q wb‡R‡`i N‡ii †jvK‡`iB wPšÍvi cwieZ©b ïiæ nIqvi Kvi‡Y|

1543 mv‡j †Kvcvwb©Kvm Zuvi †miv Kg©wU cÖKvk K‡ib g„Zy¨kh¨vq ï‡q| Gi wVK ciciB wMR©v bZyb wPšÍv¸‡jv‡K `gb Kiv ïiæ K‡i w`‡qwQj| wb‡Ri †W †i‡fvDjkwbevm eBUv †Kvcvwb©Kvm †cvc Z„Zxq c‡ji bv‡g DrmM©I K‡iwQ‡jb| Z‡e wMR©vI ZLb AvµvšÍ| d‡j bZyb wPšÍv I Gwii÷Uj‡K wb‡q cÖkœ †Zvjv Avi mn¨ Kiv n‡jv bv|

wMR©vi Ici AvµgY Zxeª nq 1517 mv‡j| †KvôKvwV‡b¨ AvµvšÍ GK Rvg©vb mbœ¨vmx DBUvbev‡M©i wMR©vi `iRvq GK ¸”Q AvcwËi ZvwjKv muvwU‡q †`b| (jy\_vi †KvôKvwV‡b¨i Rb¨ cÖwm× n‡q wM‡qwQ‡jb| †Kv‡bv †Kv‡bv cwÐZ g‡b K‡ib, Zuvi wek¦v‡mi N‡i Av‡jv R¡‡jwQj †kŠPvMv‡i emv Ae¯’vq| GB ZË¡ wel‡q †jLv GKwU eB‡qi gšÍe¨ GiKg, ÒgvbwmK msKxY©Zv I †KvôKvwVb¨ (A‡š¿i msKxY©Zv) †\_‡K wZwb gyw³ cvb GKBmv‡\_|Ó Gfv‡eB ïiæ nq ms¯‹vi-Av‡›`vjb| eyw×Rxweiv mKj w`‡K †cv‡ci KZ„Z¡‡K A¯^xKvi Ki‡Z ïiæ Ki‡jb| 1530-Gi `k‡K mn‡R wmsnvm‡b e‡m hvIqv wbwðZ Ki‡Z Aóg †nbwi †cv‡ci KZ„Z¡‡K Zy”QZvw”Qj¨ K‡ib| wb‡R‡KB †NvlYv K‡ib Bsj¨v‡Ûi cÖavb hvRK|

wPÎ 19: g›`e„Ë, †cQbgyLx MwZ I †mŠi‡Kw›`ªK bgybv

K¨v\_wjK wMR©vI cvëv AvNvZ nv‡b| K‡qK kZK a‡i wb‡RivI wewfbœ `k©b wb‡q cix¶v-wbwi¶v Pvjvw”Qj wVKB, Z‡e wb‡R‡`i g‡a¨ gZ‡f‡`i ûgwK †`Lv w`‡j Zviv cybivq A\_©W· ev cÖPwjZ avivq wd‡i †Mj| MÖnY K‡i wbj cÖPwjZ wk¶v‡K| AMvw÷b I †evw\_qv‡mi g‡Zv A¨vwi÷Ujxq `k©‡bi cwÐZ‡`i w`‡K I A¨vwi÷U‡ji †`Iqv Ck¦‡ii cÖgv‡Yi w`‡K Syu‡K †Mj| KvwW©bvj I hvRK‡`i Rb¨ cÖvPxb gZev` wb‡q cÖkœ †Zvjvi my‡hvM ivLv n‡jv bv| k~b¨ n‡jv ag©‡`ªvwnZvi cÖZxK| Ave× gnvwek¦‡K †g‡b †bIqv eva¨Zvg~jK Kiv n‡jv| f‡qW I BbwdwbwU‡K cÖZ¨vL¨vb Ki‡Z n‡e| Gme wk¶v cÖPv‡ii Rb¨ †ek wKQy †Mvôxi Avwef©ve N‡U| 1530-Gi `k‡K m„ó Ggb GKwU Ab¨Zg †Mvôxi bvg †RmyBU m¤cÖ`vq| G `‡j wQj mycÖwkw¶Z GK`j eyw×Rxwe, hv‡`i KvR cÖwZev`x †cÖv‡U÷¨v›U‡`i AvµgY Kiv| ag©‡`ªvwnZvi mv‡\_ jovB Kivi AviI A¯¿I wQj wMR©v Kv‡Q| ¯ú¨vwbk BbKzBwRkb 1543 mv‡j †cÖv‡U÷¨v›U‡`i †cvov‡bv ïiæ K‡i| †h eQi gviv wM‡qwQ‡jb †Kvcvwb©Kvm| H GKB eQi †cvc Z„Zxq cj wbwl× eB‡qi ZvwjKv cÖKvk K‡ib| wMR©vi GB cÖwZ-ms¯‹v‡ii j¶¨ wQj bZyb wPšÍv `gb K‡i cyi‡bv gZev` cybtcÖwZôv| wekc GuwU‡q †Uw¤ú‡q I KvwW©bvj wb‡Kvjvm Ae wKDmv †h aviYv †Z‡iv kZ‡K mv`‡i MÖnY K‡iwQ‡jb, GKB aviYvi Rb¨ †lv‡jv kZ‡K Zv‡`i g„Zy¨`Ð n‡Z cviZ|

nZfvMv wRIiWv‡bv eªæ‡bvi †¶‡Î †mUvB NUj| eªæ‡bv wQ‡jb mv‡eK WwgwbKvb hvRK| 1580-Gi `k‡K cÖKvk K‡ib Ab¨ `¨ BbdvBbvBU BDwbfvm© A¨vÛ `¨ Iqvì©m eB| GLv‡b wZwb wb‡Kvjvm Ae wKDmvi g‡Zv GKB K\_v e‡jb| c„w\_ex gnvwe‡k¦i †K›`ª bq| Avgv‡`i g‡Zv Av‡Q AviI Amxg RMZ| 1600 mv‡j Zuv‡K LyuwUi mv‡\_ †eu‡a cywo‡q †`Iqv nq| M¨vwj‡jI M¨vwj‡jB †Kvcvwb©Kvm gZev‡`i weL¨vZ Abymvix| 1616 mv‡j wMR©v Zuv‡K ˆeÁvwbK AbymÜvb eÜ Kivi wb‡`©k †`q| GKB eQi †Kvcvwb©Kv‡mi †W †i‡fvDjkwbevm wbwl‡×i LvZvq hy³ nq| A¨vwi÷Uj‡K AvµgY gv‡bB wMR©vi Ici AvµgY|

wMR©vi cÖwZ-ms¯‹vi bZyb `k©b‡K mn‡R aŸsm Ki‡Z cv‡iwb| mg‡qi mv‡\_ mv‡\_ eis Gi kw³ evoj| Gi †cQ‡b Ae`vb †i‡L‡Qb †Kvcvwb©Kv‡mi DËim~wiiv| m‡Zi kZ‡K GwM‡q Avm‡j †R¨vwZlwe`-mbœ¨vmx †Rvnv‡bm †Kcjvi| †Kvcvwb©Kv‡mi ZË¡‡K cwiï× Ki‡jb wZwb| U‡jwgi bgybvi Zyjbvq GUv Av‡Mi †P‡qI wbLyuZ n‡jv| c„w\_exmn wefbœ MÖn e„‡Ëi e`‡j Dce„Ë (ellipse) c‡\_ m~‡h©i Pviw`‡K Nyi‡Q| Gi gva¨‡g AvKv‡k MÖn‡`i Awek¦vm¨ iKg wbLyuZfv‡e e¨vL¨v Kiv †Mj| m~h©‡Kw›`ªK bgybv‡K f~‡Kw›`ªK bgybvi †P‡q Lvivc ejvi Avi my‡hvM \_vKj bv| †Kcjv‡ii bgybv U‡jwgi bgybvi †P‡q mij| Avi A‡bK †ewk wbLyuZ| wMR©vi AvcwË cv‡q `‡j †Kcjv‡ii m~h©‡Kw›`ªK bgybv wU‡K †Mj| KviY †Kcjvi mwVK, Avi A¨vwi÷Uj fyj|

cyi‡bv gZev‡`i fyj¸‡jv wVK Kivi †Póv wMR©v Kij e‡U! Z‡e ZZw`‡b A¨vwi÷Uj, f~‡Kw›`ªK bgybv I mvgšÍZvwš¿K mgv‡Ri Kwd‡b †kl †c‡iKwU gviv n‡q †M‡Q| `vk©wbKiv †hme K\_v nvRvi eQi a‡i webv ev‡K¨ †g‡b wb‡qwQ‡jb, Zvi me¸‡jv‡K cÖ‡kœi gy‡L coj| A¨vwi÷Ujxq e¨e¯’vi cÖwZ Av¯’v ivLv †Mj bv| Avevi Zv‡K evwZjI Kiv hv‡”Q bv| Zvn‡j †KvbUv †g‡b wb‡Z n‡e? Av¶wiKfv‡e ej‡j, wKQyB bv|

k~b¨ Ges f‡qW

GK A‡\_© Avwg Ck¦i I k~‡b¨i gvSvgvwS wKQy GKUv|

- †ib †WKvU©

‡lv‡jv I m‡Zi kZ‡Ki `k©b hy‡×i GK`g †K‡›`ª wQj k~b¨ I Amxg| f‡qW A¨vwi÷U‡ji `k©b‡K †Luvov K‡i w`‡qwQj| Avi Amxg eo gnvwe‡k¦i aviYv mxgve× gnvwek¦‡K †f‡O Pyigvi K‡i †`q| c„w\_ex Ck¦‡ii m„wói †K‡›`ª \_vK‡Z cv‡i bv| Abymvixiv Avi \_vKj bv wMR©vi cÖfvevaxb| K¨v\_wjK wMR©v Gevi Av‡Mi †P‡q Zxeª AvKv‡i k~b¨ I f‡qW‡K A¯^xKvi Ki‡Z PvBj| wKš‘ k~b¨ †Zv Avmb †Mu‡o e‡m †M‡Q| †RmyBU m¤cÖ`v‡qi g‡Zv wMR©vi cÖwZ wbôvevb eyw×RxweivI †`vjvP‡j c‡o †M‡jb| †KD A¨vwi÷Uj‡K AuvK‡o \_vK‡jb| †KD Avevi bZyb `k©b †g‡b wb‡jb, †hLv‡b Av‡Q k~b¨, f‡qW I Amxg| ////////

‡ib †WKvU©I cÖwkw¶Z †RmyBU wQ‡jb| wZwbI bZyb I cyi‡bv gZev` wb‡q fvebvq c‡o †M‡jb| k~b¨‡K cÖZ¨vL¨vb Ki‡jb, Avevi ivL‡jb wb‡Ri Kv‡Ri †K›`ªwe›`y‡ZI| 1596 mv‡j d«v‡Ýi †K‡›`ª Zuvi Rb¥| wZwb k~b¨‡K wb‡q G‡jb msL¨v‡iLvi gv‡S| Amxg I k~b¨Zvi gv‡S Ck¦‡ii cÖgvY LyuR‡jb wZwb| Avevi A¨vwi÷Uj‡K cy‡ivcywi Qvo‡ZI cvi‡jb bv| Zvi g‡a¨ k~b¨Zvi fxwZ wQj cÖej| †m f‡q Zvi Aw¯ÍZ¡B wZwb A¯^xKvi Ki‡jb|

wc\_v‡Mviv‡mi g‡Zv †WKvU©I `vk©wbK-MwYZwe`| Zuvi me‡P‡q Agi KvR m¤¢eZ GKwU MvwYwZK D™¢veb| hv‡K GLb Avgiv ewj Kv‡Z©mxq ¯’vbv¼| ¯‹y‡j R¨vwgwZ cov †h †KD Zv †`‡L‡Q| eÜbxi †fZ‡ii GK ¸”Q msL¨v w`‡q ¯’v‡bi Ici we›`yi Ae¯’vb cvIqv hvq| †hgb (4,2) w`‡q †evSvq 4 GKK Wv‡b I 2 GKK Dc‡i| wKš‘ Kvi Wv‡b ev Dc‡i? GUvB g~jwe›`y| k~b¨ (wPÎ 20)|

A¶‡iLv 1 w`‡q ïiæ Kiv hv‡e bv--GUv †WKvU© eyS‡jb| Zv Ki‡Z †M‡j fyj n‡q hv‡e| †h fyj weW K‡iwQ‡jb K¨v‡jÛvi wVK Ki‡Z wM‡q| Z‡e we‡Wi mv‡\_ †WKv‡U©i cv\_©K¨ Av‡Q| †WKv‡U©i mgq BD‡iv‡c Aviwe msL¨vi cÖPjb ïiæ n‡q‡Q| AZGe, wZwb k~b¨ †\_‡K MYbv ïiæ Ki‡jb| ¯’vbv¼ e¨e¯’vi GK`g †K‡›`ª emv‡jb k~b¨‡K| †hLv‡b `yB A¶ G‡K Aci‡K AwZµg K‡i †M‡Q| g~jwe›`y (0,0) n‡jv Kv‡Z©mxq ¯’vbv¼ e¨e¯’vi †gŠwjK wfwË| (Avgiv GLb †h wPý e¨envi Kwi, †WKv‡U©i wPý Zv †\_‡K GKUy Avjv`v wQj| cÖ\_gZ, Zuvi ¯’vbv¼ e¨e¯’vq FYvZ¥K msL¨vi VuvB wQj bv| hw`I Zuvi mnKg©xiv Kw`b c‡iB Zuvi n‡q KvRUv K‡i †`b|

wPÎ 20: Kv‡Z©mxq ¯’vbv¼

‡WKvU© Aí mg‡qi g‡a¨B wb‡Ri ¯’vbv¼ e¨e¯’vi kw³ Abyfe Ki‡jb| GUv Kv‡R jvwM‡q wZwb Qwe I AvK…wZ‡K mgxKiY I msL¨vq cwiYZ Ki‡jb| Kv‡Z©mxq ¯’vbv‡¼i gva¨‡g eM©, wÎfyR, Zi½vKvi †iLvi g‡Zv me R¨vwgwZK e¯‘‡K MvwYwZK m¤ú‡K©i mgxKiY w`‡q cÖKvk Kiv m¤¢e n‡jv| †hgb aiæb, g~j we›`y‡Z †K›`ªwewkó GKwU e„Ë| G‡K cÖKvk Kiv hv‡e GK †mU we›`y w`‡q, hv‡`i Rb¨ x2 + y2 – 1 = 0 mgxKiYwU mZ¨| cive„Ë n‡Z cv‡i y – x2 = 0| msL¨v I AvK…wZi wgjb NUv‡jb †WKv‡U©| cwð‡gi R¨vwgwZ wkí Avi cÖv‡P¨i exRMwYZ wk‡íi g‡a¨ e¨eavb Ny‡P †Mj| me AvK…wZ‡KB f(x , y) = 0 AvKv‡ii mgxKiY wn‡m‡e †jLv hvq (wPÎ 21)| ¯’vbv¼ e¨e¯’vi †K‡›`ª wQj k~b¨| Avi †h‡Kv‡bv R¨vwgwZK AvK…wZ‡Z †fZ‡i †fZ‡i k~b¨ jyKvwqZ wQj|

‡WKv‡U©i gb ejZ, Ck¦‡ii mvgªv‡R¨I k~b¨ Av‡Q †fZ‡i †fZ‡i| wVK †hgb Av‡Q Amxg| Iw`‡K A¨vwi÷Ujxq †`qvj †n‡j hvw”Qj| †WKvU© Avevi †RmyBU m¤cÖ`v‡qi wb‡ew`Z ˆmwbK| ZvB wZwb Ck¦‡ii Aw¯Í‡Z¡i cyi‡bv cÖgv‡Yi e`‡j k~b¨ I Amxg w`‡q bZyb cÖgvY cÖwZôv Ki‡Z †Póv Pvjv‡jb|

cÖvPxbKv‡ji gvby‡li g‡Zv †WKvU©I g‡b Ki‡Zb k~b¨ †\_‡K †Kv‡bv wKQy ˆZwi Kiv hvq bv| GgbwK ÁvbI bv| Gi A\_© `uvovq, mKj wPšÍv-fvebv, mKj `k©b, fwel¨‡Zi me Avwe®‹vi R‡b¥i mgq gvby‡li gw¯Í‡®‹i g‡a¨B \_v‡K| ÁvbvR©b gv‡b Avm‡j gnvwe‡k¦i wµqv‡KŠkj m¤ú‡K© Av‡M †\_‡K ¯’vwcZ †mB m~Î¸‡jv †ei K‡i Avbv| †WKv‡U©i g‡Z, Avgv‡`i g‡bi g‡a¨ AmxgiKg wbLyuZ GK mËvi aviYv Av‡Q| AZGe, GB AwZkq wbLyuZ mËv ev Ck¦i Aek¨B Av‡Qb| Ab¨ mevi g‡a¨ Zvi Zyjbvq KgwZ Av‡Q| Zviv mmxg| Ae¯’vb k~b¨ I Ck¦‡ii gvSvgvwS †Kv\_vI| Amxg I k~‡b¨i wgkªY|

‡WKv‡U©i `k©‡b k~b¨‡K evievi †`Lv †M‡Q| Z‡e g„Zy¨i AvM ch©šÍI wZwb g‡b Ki‡Zb f‡qW ev P~ovšÍ k~‡b¨i Aw¯ÍZ¡ †bB| †WKvU© cÖwZ-ms¯‹vi Av‡›`vj‡bi mg‡qi mšÍvb| wZwb A¨vwi÷Uj m¤ú‡K© †R‡b‡Qb Ggb GK mg‡q hLb wMR©v Zvi g~jbxwZ¸‡jvi Ici me‡P‡q †ewk wbf©ikxj wQj| d‡j A¨vwi÷U‡ji gZev` †WKv‡U©i gv\_vq Avmb †Mu‡o †bq| Zv‡Z cÖfvweZ n‡q wZwb f¨vKzqvg‡K A¯^xKvi K‡ib|

wPÎ 21: GKwU cive„Ë, e„Ë I Dce„ËvKvi †iLv

G mgq Avm‡j †Kv‡bv GKwU c¶ †e‡Q †bIqv KwVb wQj| f¨vKzqvg‡K cy‡ivcywi A¯^xKvi Kivi Awawe`¨vMZ mgm¨v †WKv‡U©i Aek¨B Rvbv wQj| Rxe‡bi †k‡li w`‡K wZwb cigvYy I f¨vKzqvg m¤ú‡K© †j‡Lb, Òwe‡ivac~Y© welq¸‡jv m¤ú‡K© Ae¨k¨B ejv hvq, G¸‡jv NU‡e bv| Z‡e GUvI †KD A¯^xKvi Ki‡Z cvi‡e bv, G¸‡jv Ck¦iB Ki‡Z cv‡ib| †hgb, wZwb cÖK…wZi wbqg cwieZ©b Ki‡Z cv‡ib|" ZeyI Zuvi Av‡Mi ga¨hyMxq cwÐZ‡`i aviYvB jvjb Ki‡Zb wZwb| wek¦vm Ki‡Zb, †Kv‡bv wKQyB mijc‡\_ Pj‡Z cv‡i bv| KviY Zv‡Z K‡i †cQ‡b f¨vKzqvg ev k~b¨¯’vb ˆZwi n‡e| eis gnvwe‡k¦i mewKQy P‡j e„ËvKvi c‡\_| GUv Avm‡j wQj A¨vwi÷Ujxq wPšÍv| Zey hZ wKQyB †nvK, †kl ch©šÍ f‡qW ev k~b¨Zv wKQyw`‡bi g‡a¨B A¨vwi÷Uj‡K wPiZ‡i Wywe‡q †`q|

AvR‡Ki w`‡bI wkï‡`i †kLv‡bv nq, ÒcÖK…wZ k~b¨¯’vb cQ›` K‡i bv|" wk¶Kiv nq‡Zv wVK Rv‡bb bv G K\_vUvi DrcwË †Kv\_vq| GUv wQj A¨vwi÷Ujxq `k©‡bi m¤cÖmvwiZ GKwU Ask: k~b¨¯’v‡bi Aw¯ÍZ¡ †bB| †KD k~b¨¯’vb ˆZwi Ki‡Z PvB‡j cÖK…wZ Zv †VKv‡bvi Rb¨ m¤¢ve¨ me wKQy Ki‡e| K\_vUv‡K fyj cÖgvY K‡ib M¨vwj‡jIi mnKvwi Bfvb‡Rwj÷v Uwi‡mwj| wZwbB cÖ\_g f¨vKzqvg ˆZwi K‡ib|

BZvwji kªwgKiv Kzqv I Lvj †\_‡K cvwb Zyj‡Z GK ai‡bi cv¤ú e¨envi KiZ, hv A‡bKUv eo wmwi‡Äi g‡Zv KvR KiZ| cv‡¤úi g‡a¨ wQj GKwU wc÷b, hv GKwU b‡ji †fZ‡i Auv‡Uvmuv‡Uv K‡i jvMv‡bv \_vKZ| b‡ji wb‡Pi gv\_v cvwb‡Z †Wvev‡bv \_vKZ| wc÷b‡K Dc‡i †Zvjv n‡j cvwbi ¯Íi bj †e‡q D‡V AvmZ|

GK kªwg‡Ki Kv‡Q M¨vwj‡jI Rvb‡Z †c‡iwQ‡jb, G cv‡¤ú GKwU mgm¨v nw”Qj| GwU w`‡q cvwb IVv‡bv †hZ gvÎ 33 dzU| Gic‡i Dc‡ii Pvc`Ð hZB DV‡Z \_vKzK, cvwbi ¯Íi GKB \_vKZ| mgm¨vUv †KŠZ~n‡ji Rb¥ w`j| M¨vwj‡jI Zuvi mnKvwi Uwi‡mwji Kv‡Q cvwV‡q †`b mgm¨vwU| KvR †c‡q Uwi‡mwj cix¶v-wbwi¶v ïiæ Ki‡jb| Zuv‡K Rvb‡ZB n‡e cv‡¤úi inm¨gq mxgve×Zvi inm¨| 1643 mv‡ji K\_v| Uwi‡mwj cix¶v Pjv‡bvi Rb¨ j¤^v GKwU bj wb‡jb| GK gv\_v eÜ K‡i cvi` w`‡q fwZ© Ki‡jb G‡K| Gevi Dcyo K‡i †Lvjv gv\_v cvi` fwZ© GKwU cv‡Îi g‡a¨ Wywe‡q w`‡jb| bjUv‡K evqyi g‡a¨ Dcyo Ki‡j cvi` c‡o wM‡q evZvm w`‡q fwZ© nZ bj| f¨vKzqvg ev k~b¨¯’vb ˆZwi nIqvi †Kv‡bv my‡hvM †bB| wKš‘ Uwi‡mwj †Zv Zv bv K‡i bjwU‡K Wywe‡q‡Qb cvi‡`i g‡a¨| b‡ji cvi‡`i RvqMv `L‡j †bIqvi Rb¨ evZv‡mi Avmvi my‡hvM †bB| cÖK…wZ mwZ¨B k~b¨¯’vb‡K AcQ›` Ki‡j b‡ji cvi` Dc‡iB Sy‡j \_vKZ| wb‡P c‡o †M‡jB †Zv Dc‡i k~b¨¯’vb ˆZwi n‡e| wKš‘ cvi` Zv K‡iwb| †b‡g †Mj LvwbKUv| Dc‡i \_vKj duvKv ¯’vb| GB ¯’v‡b Kx \_vKj? wKQyB bv| BwZnv‡m GB cÖ\_g †KD k~b¨¯’vb a‡i ivL‡Z cvi‡jb|

bj hZ eo-‡QvU hvB †nvK, cvi` wb‡P †b‡g hv‡”Q| †\_‡g hv‡”Q cvÎ †\_‡K cÖvq 30 BwÂ Dc‡i G‡m| Ab¨fv‡e ej‡j, Dc‡ii k~b¨¯’v‡bi mv‡\_ jovB K‡i cvi` 30 BwÂ ch©šÍ Dc‡i DV‡Z cv‡i| cÖK…wZ m‡e©v”P 30 BwÂi f¨vKzqvg AcQ›` K‡i| e¨vcviUv e¨L¨v w`‡qwQ‡jb †WKvU© we‡ivax Av‡iK cwÐZ|

1623 mv‡j †WKv‡U©i eqm 27 eQi| †WKv‡U©i fwel¨r cÖwZØ›Øx †eøR c¨vm‡Kji eqm ZLb k~b¨| c¨vm‡K‡ji evev GuwU‡q wQ‡jb ¸Yx weÁvbx I MwYZÁ| ZiæYI c¨vm‡KjI wQ‡jb evevi g‡ZvB †gavex| ZiæY eq‡m wZwb c¨vmKvwjb bv‡g GKwU hvwš¿K wnmve-hš¿ evbvb| B‡jKUªwbK K¨vjKz‡jUi Avmvi Av‡M cÖ‡KŠkjx‡`i e¨eüZ wKQy K¨vjKz‡jU‡ii mv‡\_ Gi wgj wQj|

c¨vm‡K‡ji eqm 23 eQi \_vK‡Z Zvi evev eidL‡Ði Ici wcQ‡j c‡o wM‡q Diæ fv‡Ob| GK`j R¨vb‡mbev`x Zvi hZœ †bb| K¨v‡\_vwjK GB †MvôxwU M‡o I‡VwQj g~jZ †RmyBU m¤cÖ`v‡qi cÖwZ we‡Ø®ú~Y© g‡bvfve wb‡q| wKQyw`‡bi g‡a¨B c¨vm‡K‡ji cy‡iv cwiev‡ii gb Rq K‡i †bq Zviv| c¨vm‡KjI †RmyBU we‡ivax n‡q †M‡jb| cÖwZ-cÖwZ-ms¯‹viev`x| bZyb cvIqv ag©Uv c¨vm‡K‡ji Rb¨ gvbvbmB wQj bv| G †Mvôxi cÖwZôvZv wQ‡jb wekc R¨vb‡mb| wZwb †NvlYv K‡ib weÁvbPP©v cvc| cÖvK…wZK we‡k¦i cÖwZ †KŠZ~nj GK ai‡bi jvjmv| fvM¨ fvj, c¨vm‡K‡ji G jvjmv wKQy mg‡qi Rb¨ n‡jI Zuvi ag©xq Av‡e‡Mi †P‡q †ewk ¸iæZ¡ †c‡qwQj| wZwb weÁvb w`‡qB f¨vKzqv‡gi inm¨ Avwe®‹vi K‡ib|

c¨vm‡K‡ji ag©všÍ‡ii mgq GuwU‡qi GK eÜy Zv‡`i evwo‡Z G‡jb| †ckvq mvgwiK cÖ‡KŠkjx| wZwb Uwi‡mwji cix¶v K‡i †`Lv‡jb c¨vm‡Kj‡K| c¨vm‡Kj Zv‡Z gy»| cvwb, g` I Ab¨vb¨ cÖevnx c`v\_© wb‡q wb‡RB cix¶v ïiæ Ki‡jb| Gi djvdjB 1647 mv‡j wbD G·‡cwi‡g›Um KÝvwb©s f¨vKzqvg (k~b¨¯’vb m¤ú‡K© bZyb cix¶v) wn‡m‡e cÖKvwkZ nq| Z‡e G‡ZI g~j cÖkœwUi DËi Gj bv| cvi` †Kb 30 BwÂ I‡V Avi cvwb 33 dzU? †m mg‡qi wKQy ZË¡ A¨vwi÷U‡ji `k©‡bi wKQy Ask‡K euvPv‡bvi †Póv K‡i| ejv nq, cÖK…wZi k~by¨¯’vb fxwZ mxwgZ| k~b¨¯’v‡bi wbw`©ó wKQy AskB †Kej bó Kiv hvq| Z‡e c¨vm‡K‡ji fvebv wQj Avjv`v|

1648 mv‡ji kirKvj| c¨vm‡K‡ji gv\_vq nVvr GKUv fvebv Gj| Zvi k¨vjK‡K cvwV‡q w`‡jb cvnv‡oi Ici| mv‡\_ cvi` fwZ© bj| cvnv‡oi P~ovq cvi` 30 BwÂi †P‡q A‡bK Kg DVj (wPÎ 22)| cÖK…wZ wK Z‡e mgZ‡ji †P‡q cvnv‡o k~b¨¯’vb Øviv Kg cÖfvweZ nq?

wPÎ 22: c¨vm‡K‡ji cix¶v

c¨vm‡K‡ji g‡Z, AvcvZ`„wó‡Z A™¢yZ G AvPiY cÖgvY K‡i, cvi‡`i bj †e‡q IVvi KviY f¨vKzqvgfxwZ bq| Avmj KviY n‡jv evqygÐ‡ji IRb cv‡Îi cvi‡`‡K wb‡Pi w`‡K Pvc w`‡”Q| Avi Zv‡Z cvi` duvKv bj †e‡q Dc‡i D‡V hv‡”Q| cvwb ev cvi` hvB †nvK, evqyi Pv‡c Zv Lvwj bj †e‡q D‡V hv‡e Dc‡i| wVK †hfv‡e Uy\_‡c‡÷i b‡ji wb‡P Avj‡Zv Pvc w`‡j †c÷ Dci w`‡q †ei n‡q Av‡m| GLb, evqyi Pvc †Zv mxwgZ| G Pvc cvi`‡K Pvc w`‡q 30 BwÂ ch©šÍ IVv‡Z cv‡i| cvnv‡oi P~ovq evqyi Pvc Kg| ZvB †mLv‡b 30 BwÂI cv‡i bv|

GLv‡b GKwU m~² e¨vcvi Av‡Q| k~b¨¯’vb wKQy‡K †U‡b †bq bv| eis evqygÐj Pvc †`q| c¨vm‡K‡ji G mij cix¶v A¨vwi÷U‡ji e³e¨‡K Dwo‡q w`j| cÖK…wZ k~b¨¯’vb‡K N„Yv K‡i bv| c¨vm‡Kj †j‡Lb, ÒGLb ch©šÍ †KD e‡jwb, k~b¨¯’v‡bi mv‡\_ cÖK…wZi †Kv‡bv kÎæZv †bB| cÖK…wZ k~b¨¯’vb‡K Gwo‡q Pjvi †Kv‡bv †Póv K‡i bv| eis k~b¨¯’vb‡K webv ev‡K¨ I webv evavq †g‡b †bq|" A¨vwi÷Uj civwRZ n‡jb| weÁvbx‡`i f‡qWfxwZ `~i n‡jv| ïiæ Ki‡jb f‡q‡Wi we‡kølY| wbôvevb R¨vb‡mbev`x c¨vm‡Kj k~b¨ Ges Amx‡gi gv‡SB Ck¦‡ii Aw¯Í‡Z¡i cÖgvY LyuR‡jb| KvRwU Ki‡jb GK ai‡bi AeÁvi ga¨ w`‡q|

Ck¦i wb‡q evwR

cÖK…wZ‡Z gvbyl Kx?Amx‡gi Zyjbvq wKQyB bv| k~‡b¨i Zyjbvq mewKQy| k~b¨ I mewKQyi gvSvgvwS wKQy GKUv|

-- †eøR c¨vm‡Kj, †cbwmm|

c¨vm‡Kj GKBmv‡\_ weÁvbx I MYZZwe`| weÁvbx wn‡m‡e K‡i‡Qb k~b¨¯’v‡bi AbymÜvb| f‡q‡Wi ˆewkó¨| MwY‡Z Ae`vb †i‡L‡Qb G‡Kev‡i bZyb GKUy kvLv ˆZwi‡Z| m¤¢vebv ZË¡| m¤¢vebv ZË¡‡K k~b¨ I Amx‡gi mv‡\_ wgwj‡q wZwb †c‡jb Ck¦‡ii Aw¯ÍZ¡|

m¤¢vebv ZË¡ ˆZwi n‡qwQj AwfRvZ abx †jvK‡`i Ryqvq †ewk jvf Ki‡Z mnvqZv Kivi D‡Ï‡k¨| c¨vm‡K‡ji ZË¡ wQj `viæY mdj| wKš‘ Zuvi MwYZPP©v †ewkw`b ¯’vqx nqwb| 1654 mv‡ji 23 b‡f¤^i| c¨vm‡K‡ji g‡a¨ Zxeª GK Ava¨vwZ¥K AwfÁZv nq| nq‡Zvev GUv R¨vb‡mbev`x‡`i weÁvbwe‡ivwaZvi cÖfve| Z‡e KviY hvB †nvK, c¨vm‡K‡ji bZyb Av‡eM Zuv‡K MwYZ I weÁvb †\_‡K cy‡ivcywi `~‡i mwi‡q w`j| (Pvi eQi c‡i GKevi Gi e¨wZµg n‡qwQj| †mmgq Amy¯’Zvi Kvi‡Y Zuvi Ny‡gi mgm¨v nw”Qj| MwYZPP©v ïiæ Ki‡j e¨\_v K‡g hvq| c¨vm‡Kj g‡b Ki‡Zb Gi gva¨‡g Ck¦i Zuv‡K evZ©v w`‡q‡Qb, Zvi ÁvbPP©vq wZwb bv‡Lvk bb|) wZwb n‡q †M‡jb ag©ZvwË¡K| wKš‘ wb‡Ri g~j cwiPq Qvo‡Z cvi‡jb bv| Ck¦‡ii Aw¯ÍZ¡ cÖgvY Ki‡Z wM‡qI evievi wZwb †evKv divwm Ryqvwo‡`i Kv‡Q wd‡i †M‡jb| c¨vm‡Kj wek¦vm Ki‡Zb, Ck¦i‡K wek¦vm KivB fvj| KviY Av¶wiK A‡\_©B evwR Ck¦‡ii c‡¶|

wVK Ryqvi cÖZ¨vwkZ jvf wnmve Kivi g‡Zv K‡iB wZwb Ck¦i‡K †g‡b †bIqvi wnmve Kl‡jb| k~b¨ I Amx‡gi MwY‡Zi gva¨‡g wZwb wm×v‡šÍ Avm‡jb, Ck¦i Av‡Qb e‡jB a‡i †bIqv DwPZ|

evwRi wnmve †`Lvi Av‡M mnR Av‡iKwU †Ljv †`‡L †bIqv hvK| aiæb K I L bv‡g `ywU Lvg Av‡Q| Avcbv‡K Lvg †`Lv‡bvi Av‡M K‡qb Um K‡i wVK Kiv n‡jv †Kvb Lv‡g KZ UvKv \_vK‡e| U‡m †nW co‡j K Lv‡g 100 UvKv \_vK‡e| Avi †Uj co‡j UvKv \_vK‡e L Lv‡g| cwigvY 10, 000,000| Avcwb †Kvb LvgwU †b‡eb?

Aek¨B L| G‡Z Av‡Q A‡bK †ewk UvKv| m¤¢vebvi Z‡Ë¡i cÖZ¨vkv (expectation) ej‡Z GKwU nvwZqvi Av‡Q| hv w`‡q Avgiv eyS‡Z cvie cÖwZwU Lv‡gi gvb KZ n‡e e‡j Avgiv cÖZ¨vkv Ki‡Z cvwi| K Lv‡g 100 UvKv \_vK‡ZI cv‡i, bvI \_vK‡Z cv‡i| Lv‡gi GKUv `vg Av‡Q—wVK| Z‡e †mUv cy‡ivcywi 100 bq| KviY Avgiv wbwðZ K‡i Rvwb bv, G‡Z UvKv Av‡Q wKbv| MwYZwe` Lv‡gi m¤¢ve¨ cwigvY¸‡jv †hvM Ki‡eb| ¸Y Ki‡eb H cwigv‡Yi m¤¢vebv w`‡q|

0 †c‡j: †RZvi m¤¢vebv 1/2 × 0 UvKv = 0 UvKv

100 †c‡j: †RZvi m¤¢vebv 1/2 × 100 UvKv = 50 UvKv

‡gvU cÖZ¨vkv = 0 + 50 = 50 UvKv

d‡j K Lv‡gi cÖZ¨vwkZ gvb 50 UvKv|

GKBfv‡e L Lv‡gi cÖZ¨vwkZ gvb †ei Kiv hv‡e|

0 †RZvi m¤¢vebv 1/2 × 0 UvKv = 0 UvKv

10,000,000 UvKv †RZvi m¤¢vebv 1/2 × 10,000,000 UvKv = 5,00,000 UvKv

‡gvU cÖZ¨vkv = 5,00,000 UvKv

wnmveUv GK bR‡i †`Lyb †Uwe‡j:

gvb

UvKv \_vK‡j (m¤¢vebv 1/2)

UvKv bv \_vK‡j (m¤¢vebv 1/2)

cÖZ¨vwkZ gvb

100

1/2 × 100 = 50

1/2 × 0

0 + 50 = 50 UvKv

10,000,000

1/2 × 10,000,000 = 5,00,000

1/2 × 0

0 + 5,00,000 UvKv

AZGe L Lv‡gi cÖZ¨vwkZ gvb K Lv‡gi 10,000 ¸Y| cwi®‹vi †evSv hv‡”Q, `yB Lv‡gi g‡a¨ †e‡Q †bIqvi my‡hvM \_vK‡j L Lvg wb‡Z n‡e|

c¨vm‡K‡ji evwRI GB †Ljvi g‡ZvB| cv\_©K¨ n‡jv GLv‡b `yB Lv‡gi e`‡j Av‡Q L„óvb I bvw¯ÍK| Avm‡j c¨vm‡Kj ïay L„óvb gZ wb‡q wnmve K‡iwQ‡jb| Z‡e hyw³i m¤cÖmvi‡Y bvw¯Í‡Ki wek¦vmI P‡j Av‡m|) hyw³i LvwZ‡i AvcvZZ a‡i wbb, Ck¦‡ii Aw¯Í‡Z¡i m¤¢vebv 50-50| (c¨vm‡Kj Aek¨ Ck¦i ej‡Z L„óvb‡`i Ck¦i‡KB eywS‡q‡Qb) GLb, L„óxq Lvg †bIqv gv‡b wbôvevb L„óvb nIqvi c\_ †e‡Q †bIqv| G c\_ †e‡Q wb‡j `y‡Uv m¤¢vebv \_v‡K| aiæb, GKRb gvbyl AbyMZ L„óvb n‡q RxebaviY Kij| c‡i †`Lv †Mj Ck¦i ej‡Z †KD †bB| Zvn‡j gvbylUv g„Zy¨i mv‡\_ mv‡\_ k~b¨Zvi Mnx‡b nvwi‡q hv‡e| wKš‘ Ck¦i †\_‡K \_vK‡j †m ¯^‡M© hv‡e| †fvM Ki‡e AbšÍKvjxb myL: Amxg| Zvn‡j L„óv‡bi Rb¨ cÖZ¨vwkZ gvb n‡e:

k~b¨Zvq nviv‡bvi m¤¢vebv 1/2 × 0 = 0

¯^‡M© hvIqvi m¤¢vebv 1/2 × Amxg (∞) = ∞

cÖZ¨vwkZ gvb = ∞

Avi hvB †nvK, Amx‡gi (∞) A‡a©K †Zv AmxgB (∞)| AZGe, L„óvb nIqvi jvf Amxg| GLb, bvw¯ÍK n‡j Kx n‡e? bvw¯ÍK mwVK nIqvi A\_© `uvovq Ck¦‡ii Aw¯ÍZ¡ †bB| gZ mZ¨ e‡j cÖgvwYZ n‡jI Zv‡Z †Kv‡bv jvf †bB| Ck¦i †bB gv‡b ¯^M©I †bB| wKš‘ gZ fyj cÖgvY n‡j Ges Ck¦i †\_‡K \_vK‡j †m AbšÍKvj bi‡K \_vK‡e (FYvZ¥K Amxg)| AZGe bvw¯Í‡Ki Rb¨ cÖZ¨vwkZ gvb n‡e:

k~b¨Zvq nviv‡bvi m¤¢vebv 1/2 × 0 = 0

bi‡K hvIqvi m¤¢vebv 1/2 × Amxg (-∞) = -∞

cÖZ¨vwkZ gvb = -∞

gv‡b FYvZ¥K Amxg| Gi †P‡q Lvivc wKQy n‡ZB cv‡i bv| c¨vm‡K‡ji hyw³‡Z, GKRb Ávbx gvbyl bvw¯ÍK bv n‡q Aek¨B L„óvb n‡e|

Z‡e GLv‡b Avgiv a‡i wb‡qwQ, Ck¦‡ii Aw¯Í‡Z¡i m¤¢vebv 50-50| m¤¢vebv hw` 1/1000 nq Zvn‡j? †m‡¶‡Î L„ôvb nIqvi gvb n‡e:

k~b¨Zvq nviv‡bvi m¤¢vebv 999/1000 × 0 = 0

¯^‡M© hvIqvi m¤¢vebv 1/1000 × Amxg (∞) = ∞

cÖZ¨vwkZ gvb = ∞

gvb GKB Av‡Q| Amxg| Avi bvw¯Í‡Ki cÖZ¨vwkZ gvbI GLbI FYvZ¥K Amxg| G‡¶‡Î L„óvb n‡q \_vKv GLbI A‡bK †ewk myweavRbK| m¤¢vebv 1/10,000 wKsev 1/10,000,000 ev AviI A‡bK †QvU †Kv‡bv msL¨v n‡jI GKB dj †ei n‡e| GKgvÎ e¨wZµg k~b¨|

Ck¦‡ii Aw¯Í‡Z¡i m¤¢vebv k~b¨ n‡j c¨vm‡K‡ji evwR A\_©nxb| L„óvb nIqvi cÖZ¨vwkZ gvb n‡e 0 × ∞ = 0| hv GK A\_©nxb K\_v| Ab¨\_vq k~b¨ I Amx‡gi Rv`y‡Z Ck¦‡i wek¦vm KivB A‡c¶vK…Z fvj wm×všÍ| c¨vm‡Kj Rvb‡Zb evwR‡Z wRZ‡Z Kx Kiv jvM‡e| hw`I Zv Ki‡Z wM‡q MwYZ †Q‡o w`‡qwQ‡jb|

Z\_¨wb‡`©k

1| MÖn‡`i PjvP‡ji e¨wZµgx AvPi‡Yi e¨vL¨v Rvb‡Z coyb

K. Avãy&j¨vn Av‌‌‌w`j gvngy`,'‡mŠiRMr', gnvwe‡k¦i mxgvbv, XvKv: A‡š^lv, 2019, c„. 75

L. Avãy&j¨vn Av‌‌‌w`j gvngy`, wek¦ WU Kg, https://sky.bishwo.com/2024/07/retrograde-motion.html, 14/07/2024

cÂg Aa¨vq

Amxg k~b¨

k~b¨ Ges ˆeÁvwbK wecøe

MwYZ mvaviYZ bxwZ‡Z Abo \_v‡K| wKš‘ Amxg cwigvY eo I †QvU wRwb‡mi AvMgb MwYZ‡K bxwZ‡Z Av‡cvl Ki‡Z Af¨¯Í Kij| MvwYZK welqmg~‡ni cig wm×Zv I ALÐbxq cÖgv‡Yi Avw`g Ae¯’v wPiZ‡i we`vq wbj|weZ‡K©i hy‡Mi D‡Øvab n‡jv| Avgiv †m we›`y‡Z †cuŠ‡Q †Mjvg, †hLv‡b gvbyl AšÍixKiY I †hvMRxKiY K‡i ey‡S-ï‡b bq, eis wek¦v‡mi RvqMv †\_‡K| KviY, GLb ch©šÍ Gi djvdj mwVK cvIqv †M‡Q|

-- wd«`wiL Gs‡Mjm

k~b¨ Ges Amxg A¨vwi÷Ujxq `k©b‡K ¸uwo‡q w`‡qwQj| k~b¨Zv I Amxg ev`v‡gi †LvmvP Ave× gnvwe‡k¦i aviYv evwZj K‡i w`‡qwQj| evwZj K‡i w`‡qwQj cÖK…wZi k~b¨¯’vb‡K AcQ›` Kivi aviYv| cÖvPxb Ávb n‡q †Mj g~j¨nxb| weÁvbxiv cÖK…wZi wµqv‡KŠkj welqK m~Î ˆZwi KiwQ‡jb| Z‡e G ˆeÁvwbK wecø‡ei g‡a¨I GKwU Amyweav †\_‡K †Mj: k~b¨| weÁvb RM‡Z bZyb kw³kvjx nvwZqvi ZLbK¨vjKzjvm| wKš‘ Gi Mfx‡i jywK‡q \_vKj GKwU c¨vivW·1| K¨vjKzjv‡mi D™¢veK AvBR¨vK wbDUb I MUwd«W DBj‡njg wjewbR| k~b¨ w`‡q fvM Avi AmxgmsL¨ k~b¨‡K †hvM K‡i Zviv evwb‡q †d‡jb MwY‡Zi me‡P‡q kw³kvjx A¯¿| `y‡Uv KvRB A‰ea| G †hb 1 + 1 = 3 †jLv| †gŠwjKfv‡e K¨vjKzjvm MvwYwZK hyw³ †g‡b P‡jwb| G‡K MÖnY Ki‡Z n‡j wb‡Z nq wek¦v‡mi Avkªq| weÁvbxiv Zv Ki‡jb| KviY K¨vjKzjvm n‡jv cÖK…wZi fvlv| G fvlvUv fvj K‡i eyS‡Z n‡j Amxg k~b¨‡K Rq Kiv PvB|

BD‡ivc Nywg‡q KuvUvj GK nvRvi eQi| L„óxq dv`viiv `viæY `¶Zvq †m Ny‡gi ewo LvB‡q w`‡qwQj| BD‡ivcxqiv †m Nyg †\_‡K †R‡M DVj k~b¨‡K mv‡\_ wb‡q|

-- †Uvweqvm W¨v›UwmM, bv¤^vi: `¨ j¨vs¸‡qR Ae mv‡qÝ

k~‡b¨i Awfkvc MwYZ‡K `yB nvRvi eQi Zvox‡q †ewo‡qwQj| g‡b nw”Qj A¨vwKwjR‡K AvRxeb K”Q‡ci †cQ‡b QyU‡Z n‡e| ai‡Z cvi‡e bv KL‡bvB| †R‡bvi mij auvauvi g‡a¨ jywK‡q wQj Amxg| A¨vwKwj‡Ri Amxg avc wMÖK‡`i nZeyw× K‡i w`‡qwQj| Zviv Amxg c`‡¶c‡K †hvM Kivi K\_v fv‡ewb KfyI| hw`I A¨vwKwj‡Ri c`‡¶c µ‡gB †QvU n‡q k~‡b¨i w`‡K G‡Mvw”Qj| k~‡b¨i aviYv Qvov Avm‡j G †hvM Kivi mva¨ Zv‡`i wQj bv| Z‡e cwðg k~b¨‡K MÖnY K‡i wb‡j MwYZwe`iv Amxg‡K KivqË¡ Ki‡jb| †kl n‡jv A¨vwKwj‡Ri †im|

‡R‡bvi avivq Amxg Ask Av‡Q, mZ¨| ZeyI Avgiv me¸‡jv c`‡¶c †hvM Ki‡Z cvwi| Gic‡iI cve mmxg gvb| 1 + 1/2 + 1/4 + 1/8 + ... = 2| G †KŠkj cÖ\_g LvUvb weªwUk hyw³we` wiPvW© myB‡m\_| Amxg c`‡K †hvM K‡i mmxg gvb †ei K‡ib wZwb| wZwb msL¨vi GKwU Amxg aviv †bb| 1/2, 2/4, 3/8, 4/16, ..., n/2n,„| Gevi G‡`i‡K †hvM| cvIqv hv‡”Q `yB| †`LvB hv‡”Q, avivi msL¨v¸‡jv µ‡gB k~‡b¨i KvQvKvwQ n‡”Q| †KD nqZ e‡j †dj‡eb, G KviYB †Zv mmxg gvb Avmvi Rb¨ h‡\_ó| nvq! Amxg hw` GZ mij nZ!

cÖvq GKB mg‡qi K\_v| divwm MwYZwe` wb‡Kvj I‡ig KvR KiwQ‡jb Av‡iKwU Amxg msL¨vi aviv wb‡q| Mvjfiv bvg Zi½ aviv|

1/2 + 1/3 + 1/4 + 1/5 + 1/6 + ... †R‡bv Ges myB‡m‡\_i avivi g‡ZvB c`¸‡jv k~‡b¨i w`‡K hv‡”Q| wKš‘ myB‡m\_ G‡`i‡K †hvM Ki‡Z wM‡q †`‡Lb, †hvMdj µ‡gB eo †\_‡K AviI eo n‡”Q| cÖ‡Z¨KUv c` Avjv`vfv‡e k~‡b¨i w`‡K †M‡jI †hvMdj hv‡”Q Amx‡gi w`‡K| c`¸‡jv‡K ¸‡”Q ¸‡”Q †i‡L I‡ig GUv †`Lvb| 1/2 + (1/3 + 1/4) + (1/5 + 1/6 + 1/7 + 1/8) + ...| cÖ\_g ¸‡”Qi gvb 1/2| c‡ii ¸”Q (1/4 + 1/4) ev 1/2-Gi †P‡q eo| (KviY wZb fv‡Mi GK fvM Pvi fv‡Mi GK fv‡Mi †P‡q †ewk) GKBfv‡e c‡ii ¸”Q (1/8 + 1/8 + 1/8 + 1/8) ev 1/2-Gi †P‡q eo| Gfv‡eB Pj‡Q| µ‡gB 1/2 K‡i †hvM n‡”QB| †hvMdjI eo n‡”Q| hv‡”Q Amx‡gi w`‡K| c`¸‡jv k~‡b¨i w`‡K †M‡jI Zv h‡\_ó `ªæZ nv‡i n‡”Q bv| Zvi gv‡b, msL¨viv wb‡Riv k~‡b¨i w`‡K †M‡jI Amxg msL¨vi †hvMdj Amxg n‡Z cv‡i| ZeyI Amxg †hvMd‡ji me‡P‡q we¯§qKi w`K wKš‘ GUv bq| k~b¨ wb‡RI Amx‡gi A™¢yZ ˆewkó¨ †\_‡K gy³ bq|

GB avivUvi K\_v fveyb:

1 - 1 + 1 – 1 + 1 - 1 + 1 – 1 + 1 - ...

Gi †hvMdj k~b¨ †`Lv‡bv KwVb wKQy bq| KZ mnR KvR:

(1 – 1) + (1 – 1) + (1 – 1) + (1 – 1) + (1 – 1) + ... = 0 + 0 + 0 + 0 + 0 + ...

AZGe k~b¨| wKš‘ Ab¨fv‡e †`Lyb|

1 + (-1 + 1) + (-1 + 1) + (-1 + 1) + (-1 + 1) + (-1 + 1) + „

G‡K †jLv hvq

1 + 0 + 0 + 0 + 0 + 0 + „

hvi gvb 1| k~‡b¨i Amxg †hvMdj GKBmv‡\_ 0 I 1 n‡Z cv‡i| BZvjxq cy‡ivwnZ ¸B‡Wv MÖvwÛ †Zv GB aviv w`‡q cÖgvY K‡ib Ck¦i k~b¨ (0) †\_‡K gnvwek¦ (1) m„wó Ki‡Z cv‡ib| Avm‡j GB aviv‡K †h‡Kv‡bv wKQyi mgvb cÖgvY Kiv hvq| Zv Ki‡Z n‡j 1 I (-1) Gi e`‡j 5 I (-5) w`‡q ïiæ Kiæb (A\_ev g~j aviv †\_‡KB 5wU 1 †ei K‡i wb‡q evwK‡`i‡K (1 - 1) + (1 – 1) + ... Gfv‡e wjLyb|

AmxgmsL¨K wRwbm‡K wb‡R‡`i mv‡\_ †hvM Ki‡j A™¢yZ I A¯^vfvweK djvdj cvIqv hvq| KL‡bv msL¨viv k~‡b¨i w`‡K †Mj †hvMdj nq 2 ev 53-Gi g‡Zv bv`ymby`ym †Kv‡bv wbw`©ó msL¨v| KL‡bv Avevi †hvMdj †a‡q P‡j Amx‡gi w`‡K| k~‡b¨i Amxg †hvMdj Avevi †h‡Kv‡bv wKQyi mgvb n‡Z cv‡i| Kx A™¢yZ KvÐ N‡U Pj‡Q! †KD RvbZ bv Kxfv‡e Amxg‡K KivqË¡ Kiv hvq|

fvM¨ fvj †h MvwYwZK RM‡Zi †P‡q †fŠZ RMZUv‡K †ewk A\_©en jv‡M| ev¯Íe RM‡Z KvR Ki‡j Avi AmxgmsL¨K wRwbm‡K †hvM KivUv Kv‡RI Av‡m| †hgb aiæb cv‡Îi AvqZb †ei Ki‡Z †M‡j KvRUv Kiv jvM‡Z cv‡i| 1612 mvj wQj Ggb Kv‡Ri Dchy³ GKwU mgq|

GLv‡bI bvqK †Rvnv‡bm †Kcjvi| whwb MÖn‡`i Dce„ËvKvi c‡\_i cÖgvY w`‡qwQ‡jb| H eQiwU‡Z wZwb cv‡Îi AvqZb wb‡q gMœ \_v‡Kb| wZwb †Lqvj K‡iwQ‡jb cv‡Îi wbg©vZv I e¨enviKvixiv KvRUv K‡i Lye KuvPv nv‡Z| †Kcjvi Zv‡`i mvnv‡h¨ Kv‡R †b‡g co‡jb| g‡b g‡b wZwb cvÎ‡K AmxgmsL¨K Amxg cwigvY ¶y`ª L‡Ð wef³ Ki‡jb| Gici Avevi Zv‡`i‡K †Rvov w`‡q cv‡Îi AvqZb †ei Ki‡jb| cv‡Îi AvqZb cwigv‡ci D‡ëv c×wZ g‡b n‡Z cv‡i G‡K| Z‡e fvebvwU wQj PgrKvi|

mgm¨vUv‡K mnR K‡i ejv hvK| wÎgvwÎK e¯‘i e`‡j `yB gvÎvi GKwU wRwbm Kíbv Kwi| aiæb GKwU wÎfyR| 23 bs wP‡Îi wÎfy‡Ri D”PZv I f~wg 8 GKK K‡i| wÎfy‡Ri †¶Îdj †c‡Z f~wg I D”PZv ¸Y K‡i `yB w`‡q fvM w`‡Z nq| AZGe G wÎfy‡Ri †¶Îdj 32 GKK|

Gevi aiæb Ab¨fv‡e Avgiv †¶Îdj †ei Kie| wÎfy‡Ri †fZ‡i A‡bK¸‡jv AvqZ‡¶Î evwb‡q †m¸‡jvi †¶Îdj †hvM Kie| cÖ\_g †Póvq Avgiv cvw”Q 16 GKK (4×4)| hv g~j †¶Îdj †\_‡K A‡bK Kg| c‡iievi Av‡iKUy fvj dj G‡m‡Q| Gevi wb‡qwQ wZbwU AvqZ| †cjvg 2×2 + 2×4 + 2×6 = 24 GKK| Av‡Mi †P‡qI fvj n‡jI g~j gvb †\_‡K †ek `~‡i GLbI| Z„Zxq †Póvq cvB 28| †evSvB hv‡”Q, AvqZ‡¶Î‡K µgk †QvU Ki‡Z \_vK‡j G‡`i †gvU †¶Îdj wÎfy‡Ri Lye KvQvKvwQ nq| A‡bK †QvU AvqZ‡`i Δx wPý w`‡q cÖKvk Kiv nq| Δx †QvU nIqv gv‡b Avm‡j k~‡b¨i w`‡K hvIqv| (G AvqZ‡`i †hvMdj n‡jv Σf(x), †hLv‡b wMÖK eY© Σ (wmMgv) n‡jv GKwU Dchy³ cwim‡ii †hvMdj ev mgwói cÖZxK| Avi f(x) n‡jv AvqZ‡¶ÎMvgx †iLvi mgxKiY| cÖZx‡Ki AvaywbK c×wZ‡Z Δx k~‡b¨i w`‡K †h‡Z \_vK‡j Σ wPý‡K bZyb Av‡iKwU cÖZxK ∫ w`‡q cÖKvk Kiv nq| Avi ∫-Gi mv‡\_ dx ewm‡q mgxKiY‡K ∫f(x)dx †jLv nq| Gi bvg Bw›UMÖ¨vj ev †hvMR|

wPÎ 23: wÎfy‡Ri †¶Îdj cwigvc

‡Kcjv‡ii G KvRUvi K\_v †ewk gvbyl Rv‡b bv| Z‡e G KvRwUB wZwb K‡iwQ‡jb wZb gvÎvq| e¨v‡i‡ji AvqZb cwigvc Ki‡Z wM‡q| Gi Rb¨ wZwb e¨v‡ij‡K †K‡U wewfbœ Zj evbvb| c‡i G‡`i AvqZb †hvM K‡i cvb cv‡Îi AvqZb| k~b¨ wb‡q GKUv mgm¨v wQj| Z‡e †Kcjvi †m mgm¨vi †PvL ivOvwb Dc‡¶v K‡i KvR Pvwj‡q hvb| Δx-Gi gvb k~‡b¨i w`‡K †h‡Z \_vK‡j AmxgmsL¨K k~b¨‡K †hvM Ki‡Z nq| hvi †Kv‡bv A\_©B †bB| †Kcjvi G mgm¨v D‡c¶v K‡ib| hyw³i wePv‡i AmxgmsL¨K k~b¨‡K †hvM Kiv A\_©nxb KvR n‡jI KvRUvi djvdj cvIqv †Mj h\_vh\_|

e¯‘‡K Amxg cwigvY †QvU a‡i KvR Kiv weL¨vZ weÁvbx †Kcjvi GKv bb| Amxg I Amxg cwigvY ¶y`ª Gme L‡Ði K\_v wb‡q †f‡ewQ‡jb M¨vwj‡jI-I| GB `ywU aviYv Avgv‡`i mmxg Áv‡bi cwiwai evB‡i| wZwb †j‡Lb, ÒcÖ\_gwU Avgiv eyS‡Z cvwi bv Gi wekvjZvi Kvi‡Y, Avi c‡iiwU Gi Zy”QZvi Rb¨|" Z‡e Amxg k~b¨ inm¨gq n‡jI M¨vwj‡jI Gi kw³ Abyfe Ki‡Z †c‡iwQ‡jb, "GKevi fveyb `y‡Uv‡K GKÎ Ki‡j Kx n‡Z cv‡i|" M¨vwj‡jIi QvÎ †evbv‡f›Uyiv Kvfvwj‡qwi G fvebvi AvswkK DËi w`‡qwQ‡jb|

e¨v‡i‡ji e`‡j Kvfvwj‡qwi R¨vwgwZK e¯‘ wb‡q KvR K‡ib| Kvfvwj‡qwii g‡Z wÎfy‡Ri g‡Zv me †¶ÎdjB AmxgmsL¨K k~b¨‰`‡N¨©i †iLv w`‡q MwVZ| Avi AvqZb MwVZ AmxgmsL¨K k~b¨D”PZvi Zj wb‡q| Gme AwefvR¨ †iLv I Zj †¶Îdj I AvqZ‡bi cigvYyi g‡Zv| G‡`i‡K Avi fvM Kiv hv‡e bv| wPKb LÐ w`‡q †Kcjvi wVK †hfv‡e e¨v‡i‡ji AvqZb †g‡cwQ‡jb, Kvfvwj‡qwi †mfv‡eB AmxgmsL¨K AwefvR¨ k~b¨‡K †hvM K‡i R¨vgwZK e¯‘i †¶Îdj ev AvqZb †ei K‡ib|

Kvfvwj‡qwii e³e¨ R¨vwgwZK‡`i weeªZ K‡i| k~b¨ †¶Îd‡ji AmxgmsL¨K †iLv †hvM K‡i wØgvwÎK wÎfyR cvIqv hvq bv| GKBfv‡e AmxgmsL¨K k~b AvqZ‡bi Zj †hvM K‡i wÎgvwÎK KvVv‡gv cvIqv hv‡e bv| mgm¨v Avm‡j GKB RvqMvq: Amxg k~‡b¨i †Kv‡bv A\_© †bB| Z‡e Kvfvwj‡qwii c×wZ memgq mwVK DËi w`w”Qj| Amxg k~b¨‡K †hvM Kivi hyw³MZ I `vk©wbK mgm¨v MwYZ¨we`iv D‡c¶v K‡ib| Gi KviYI Av‡Q| Amxg ¶y`ª ev AwefvR¨ aviYvi gva¨‡g mgvavb wgjj `xN©w`‡bi GK auvauvi| GUv n‡jv ¯úk©‡Ki mgm¨v|

¯úk©K n‡jv GKwU †iLv, hv †Kv‡bv Kvf©‡K ïay ¯úk© K‡i †mvRv P‡j hvq| gm„Yfv‡e †e‡q Pjv GKwU Kv‡f©i †h‡Kv‡bv we›`y‡ZB Ggb GKwU †iLv \_vK‡e hv Kvf©‡K Avj‡Zv K‡i ¯úk© K‡i P‡j hv‡e| Kvf©‡K ¯úk© Ki‡e GKwUgvÎ we›`y‡Z| GUvB ¯úk©K| MwYZwe`iv †`L‡jb, MwZ wb‡q KvR Ki‡Z †M‡j wRwbmUv Lye ¸iæZ¡c~Y©| aiæb, my‡Zvq GKwU ej †eu‡a Avcbvi gv\_vi Pvicv‡k †Nviv‡”Qb| ej Nyi‡e e„ËvKvi c‡\_| n\_vr my‡Zv wQu‡o †M‡j ej GK w`‡K D‡o P‡j hv‡e| Avi G Mgb c\_ n‡e ¯úk©K †iLv eivei|ej wb‡¶‡ci mgq †emej †L‡jvqv‡oi evû e„ËPv‡ci c\_ †e‡q †Nv‡i| ej †Q‡o †`Iqv gvÎB †mUv P‡j ¯úk©K eivei (wPÎ 24)| Avevi aiæb cvnvo w`‡q Mwo‡q cov ej †Kv\_vq G‡m \_vg‡e Rvb‡Z n‡j †ei Ki‡Z n‡e †Kv\_vq ¯úk©K Abyf~wg‡Ki mgvšÍivj| ¯úk©K †iLv Kg-‡ewk Lvov n‡Z cv‡i| G cwigv‡ci bvg Xvj| c`v\_©we`¨vq Av‡Q hvi wKQy ¸iæZ¡c~Y© ˆewkó¨| aiæb, GKwU Kvf© w`‡q GKwU evBmvB‡K‡ji Ae¯’vb cÖKvk Kiv n‡jv| Zvn‡j ¯úk©K †iLvi Xvj e‡j †`‡e †Kv‡bv wbw`©ó we›`y AwZµg Kivi mgq evBmvB‡K‡ji †eM KZ \_vK‡e|

wPÎ 24: ¯úk©K eivei MwZ

G Kvi‡YB m‡Zi kZ‡Ki eû MwYZwe` †Kv‡bv Kv‡f©i wbw`©ó we›`y‡Z ¯úk©K †iLvi cwigv‡ci Rb¨ wewfbœ c×wZ D™¢veb K‡ib| G ZvwjKvq Av‡Qb Bfvb‡Rwj÷v Uwi‡mwj, †ib †WKvU©, divwm f`ª‡jvK wc‡qi †W †dg©v (Zuvi †kl Dccv‡`¨i Rb¨ weL¨vZ) Avi Bs‡iR f`ª‡jvK AvBm¨vK e¨v‡iv| Z‡e Kvfvwj‡qwii g‡ZvB me¸‡jv‡ZB Amxg ¶y‡`ªi mgm¨v cvIqv †Mj|

‡Kv‡bv wbw`©ó we›`y‡Z ¯úk©K AuvK‡Z n‡j me‡P‡q fv‡jv Dcvq n‡jv Abygvb w`‡q ïiæ Kiv| Gevi cv‡kB Av‡iKwU we›`y wb‡q `y‡Uv‡K †hvM K‡i w`b| †h †iLv cvIqv hv‡e †mUvB wVK ¯úk©K bq| Z‡e Kvf©Uv Lye †ewk DuwP-wbPy bv n‡j †iLv `ywU Lye KvQvKvwQ n‡e (wPÎ 25)| we›`y¸‡jvi g‡a¨ `~iZ¡ Kgv‡Z \_vK‡j AbywgZ †iLv ¯úk©K †iLvi Lye KvQvKvwQ n‡Z \_vK‡e (wPÎ 25)| we›`y¸‡jv G‡K Aci †\_‡K k~b¨ `~i‡Z¡ \_vK‡j Abygvb n‡e wbLyuZ| cvIqv †M‡Q ¯úk©K| Z‡e Sv‡gjv GKUv Av‡Q|

wPÎ 25: ¯úk©K †iLvi Abygvb

GKwU †iLvi me‡P‡q ¸iæZ¡c~Y© ˆewkó¨ Gi Xvj| Xvj gvcvi Rb¨ MwYZwe`iv †`‡Lb GKwU wbw`©ó `~i‡Z¡ GKwU †iLv KZ DuPy‡Z DVj| †hgb aiæb, GKwU cvnv‡o Avcwb c~e© w`‡K Mvwo Pvjv‡”Qb| cÖwZ gvBj c~‡e© †h‡Z †h‡Z Avcwb Aa©gvBj gvBj Dc‡i DV‡Qb| Ggb cvnv‡oi Xvj gvcv Lye mnR| Avcwb f~wgi mgvšÍiv‡j †h‡Z GK gvBj wM‡q Dc‡i D‡V‡Qb A‡a©K gvBj| GB A‡a©K gvBjB GB cvnv‡oi Xvj| MwY‡Zi fvlvq G Xv‡ji gvb 1/2| GKB K\_v Lv‡U †iLvi Rb¨I| †iLvi Xvj gvcvi Rb¨ †`L‡Z n‡e wbw`©ó Abyf~wgK `~iZ¡ (Δx) cvi n‡Z n‡Z KZUyKz Ic‡i I‡V (Δy)| †iLvi Xvj ZvB n‡e Δy/Δx|

¯úk©K †iLvi Xvj wnmve Ki‡Z †M‡j k~b¨ KvQvKvwQ gvb †ei Kivi cÖwµqvUv‡K aŸsm K‡i †`q| ¯úk©K †iLvi Avmbœ gvb hZ fvj n‡Z \_v‡K, Avmbœ gvb cvIqvi Rb¨ e¨envi Kiv we›`y¸‡jv ZZ KvQvKvwQ n‡Z \_v‡K| Zvi gv‡b, we›`y¸‡jvi Abyf~wgK `~i‡Z¡i cv\_©‡K¨i (Δx) mv‡\_ mv‡\_ D”PZvi cv\_©K¨I (Δy) k~‡b¨i w`‡K †h‡Z \_v‡K| ¯úk©‡Ki Avmbœ gvb wbLyuZ n‡Z \_vK‡j Δy/Δx-Gi gvb 0/0-Gi w`‡K †h‡Z \_v‡K| k~b¨ w`‡q fvM w`‡j gnvwe‡k¦i †h‡Kv‡bv msL¨v cvIqv m¤¢e| ¯úk©K †iLvi Xv‡ji wK †Kv‡bv A\_© Av‡Q?

Amxg ev k~b¨ wb‡q KvR Ki‡Z †M‡jB MwYZwe`iv hyw³i †MvjKauvavq c‡o hvb| e¨v‡i‡ji AvqZb ev cive„‡Ëi †¶Îdj †ei Ki‡Z Zviv Amxg k~b¨‡K †hvM K‡i‡Qb| Kv‡f©i ¯úk©K †ei Ki‡Z Zviv k~b¨‡K fvM w`‡q‡Qb k~b¨ w`‡qB| ¯úk©K I †¶Îdj †ei Kivi g‡Zv mij KvR‡K k~b¨ I Amxg ¯^we‡ivax Kv‡Ri g‡Zv K‡i evwb‡q Qvoj| †QvU mgm¨v g‡b K‡i G‡`i K\_v nq‡Zv mevB fy‡jB †hZ| wKšÍ gnvwek¦‡K eyS‡Z n‡j †h Amxg I k~b¨B g~j f~wgKv cvjb K‡i|

k~b¨ I giwg K¨vjKzjvm

c`©v DwV‡q A›`ign‡j `„wó wb‡¶c Ki‡j Avgiv †`Le k~b¨Zv, AÜKvi I weåvwšÍ| fyj bv n‡q \_vK‡j Avwg eis eje cy‡ivcywi Am¤¢e I Am½wZ| Giv bv mmxg ivwk, Avi bv Amxg cwigvY †QvU, Avi bv k~‡b¨i mgvb †QvU| Avgiv wK G‡`i‡K g„Z ivwki f~Z ej‡Z cvwi?

-- wekc evK©wj, `¨ A¨vbvwj÷

¯úk©K I †¶Îd‡ji `yB mgm¨vB Amxg I k~‡b¨i mv‡\_ U°i jvMvq| G‡Z AevK nIqviI wKQy †bB| `yB mgm¨v Avm‡j GKB| `y‡UvB K¨vjKzjv‡mi wRwbm| K¨vjKzjv‡mi g‡Zv GZ kw³kvjx ˆeÁvwbK nvwZqvi Gi Av‡M †KD KL‡bv †`‡Lwb| GB †hgb †Uwj‡¯‹vc w`‡q weÁvbxiv Av‡M A‡`Lv Puv` I Zvivi RMZ †`L‡Z m¶g nb| wKš‘ K¨vjKzjv‡mi KvRUv Ab¨ gvÎvi| Gi gva¨‡g gnvRvMwZK e¯‘i MwZ wbY©vqK m~Î¸‡jv‡K cÖKvk Kiv m¤¢e n‡jv| †h m~ÎB †kl ch©šÍ e‡j †`q, Puv` I Zviv ˆZwi n‡qwQj Kxfv‡e| K¨vjKzjvm n‡q †Mj cÖK…wZiB fvlv| wKš‘ GiB ci‡Z ci‡Z Avevi wg‡k Av‡Q Amxg I k~b¨| hv bZyb GB nvwZqv‡ii Rb¨ ûgwK¯^iƒc|

K¨vjKzjv‡mi cÖ\_g D™¢veK R‡b¥i ci cÖ\_g wbtk¦v‡mi Av‡MB A‡íi Rb¨ gviv hvw”Q‡jb| 1642 mv‡ji eow`‡bi w`b Zuvi Rb¥| g‡qi Mf© †\_‡‡K c„w\_ex‡Z P‡j Av‌‌‌‡mb ¯^vfvweK mg‡qi Av‡MB nq| †QvÆ GK kixi gyP‡o c„w\_exi Av‡jv †`‡Lb AvBR¨vK wbDUb| AvKv‡i GZ †QvU wQ‡jb †h GK wjUv‡ii GKwU g‡MB Zvi RvqMv n‡q †hZ| evev wQ‡jb K…lK| gviv hvb wbDU‡bi R‡b¥i `yB gvm Av‡MB|

‡Q‡j‡ejvUv KvwU‡q‡Qb Aw¯’iZvi2 ga¨ w`‡q| gv †P‡qwQ‡jb wbDUbI †hb eo n‡q K…wlKv‡R hy³ nq| 1660-Gi `k‡K K¨vgweª‡R fwZ© nb| cov‡kvbvq fvj K‡ib| K‡qK eQ‡ii g‡a¨B ¯úk©K mgm¨v mgvav‡bi GKwU wbqgZvwš¿K c×wZ †ei K‡ib| †h‡Kv‡bv gm„Y Kv‡f©i †h‡Kv‡bv we›`yi ¯úk©K †ei Ki‡Z cvi‡Zb wZwb| G KvRUv K¨vjKzjv‡mi A‡a©K| bvg AšÍixKiY ev e¨eKjb (differentiation)| Z‡e Avgiv AvR e¨veKjb †hfv‡e wjwL, wbDU‡bi c×wZ Zv †\_‡K A‡bKUvB Avjv`v wQj|

wbDUb e¨veKjb wjL‡Zb d¬y‡·vb ev MvwYwZK ivwkgvjvi cÖevn w`‡q| wZwb Aek¨ G‡`i ej‡Zb d¬y‡q›U| wbDU‡bi d¬y‡·v‡bi GKwU D`vniY bx‡Pi mgxKiY †\_‡K †evSv hv‡e:

y = x2 + x + 1

G mgxKi‡Y d¬y‡q›U n‡jv y I x| wbDUb a‡i †bb, mg‡qi mv‡\_ y I x Gi g‡a¨ cwieZ©b ev cÖevn NU‡Q| G‡`i cwieZ©‡bi nvi ev d¬y‡·vb‡K h\_vµ‡g ẏ I ẋ Øviv cÖKvk Kiv nq| e¨veKjb Ki‡Z wbDUb cÖZxK wb‡q GKUyLvwb PvZyix K‡i‡Qb| wZwb d¬y‡·vb‡`i cwiewZ©Z n‡Z w`‡q‡Qb| Z‡e †mUv Amxg ¶y`ª nv‡i| Zvi gv‡b wZwb Avm‡j G‡`i‡K cwieZ©b NUv‡bvi ev cÖevwnZ nIqvi Rb¨ †Kv‡bv mgqB †`bwb| wbDU‡bi cÖZx‡K gyn~‡Z©i g‡a¨ y n‡q hv‡e (y+Oẏ), †hfv‡e x n‡q hv‡e (x+Oẋ)| (O A¶i w`‡q cÖevwnZ mg‡qi cwigvY †evSv‡bv n‡q‡Q| GUv cy‡ivcywi k~b¨ bv n‡jI cÖvq k~b¨| Avgiv c‡i AviI †`Le|) mgxKiY Zvn‡j nq Ggb:

y + Oẏ = (x + Oẋ)2 + (x + Oẋ) + 1

(x + Oẋ)2 †K †f‡O cvB:

y + Oẏ = x2+ 2x(Oẋ) + (Oẋ)2 + (x + Oẋ) + 1

c`¸‡jv‡K mvwR‡q cvB

y+Oẏ = (x2 + x +1) + 2x(Oẋ) + 1(Oẋ) + (Oẋ)2

GLb y = (x2 + x +1) nIqvq mgxKi‡Yi Dfq cvk †\_‡K GUv‡K ev` †`Iqv hvq| evwK \_v‡K

Oẏ = 2x(Oẋ) + 1(Oẋ) + (Oẋ)2

Avi Gic‡iB Av‡m †mB wekªx †KŠkjUv| wbDUb ej‡jb Oẋ A‡bK †QvU| (Oẋ)2 †m Zyjbvq AviI A‡bK A‡bK †QvU| GwU ivwkgvjv †\_‡K DavI n‡q hv‡e| g~jZ GUv k~b¨ Ges D‡c¶Yxq| Zvn‡j \_v‡K:

Oẏ = 2x(Oẋ) + 1(Oẋ)

Zvi gv‡b Oẏ/Oẋ = 2x +1, hv Kvf©wUi †h‡Kv‡bv we›`y‡Z ¯úk©K †iLvi Xvj (wPÎ 26)| Amxg ¶y`ª mgqKvj O mgxKiY †\_‡K S‡i hvq| Oẏ/Oẋ n‡q hvq ẏ/ẋ| O wb‡q Avi fveviB `iKvi †bB|

G †KŠk‡j †g‡j mwVK DËi| wKš‘ ivwk DavI K‡i †`Iqvi e¨vcviUv weåvwšÍKi| wbDU‡bi K\_v Abymv‡i (Oẋ)2, (Oẋ)3, Oẋ Gi D”PNvZ¸‡jv hw` k~b¨-B, Z‡e †Zv Oẋ wb‡RI k~b¨ n‡e3| Ab¨w`‡K, Oẋ k~b¨ n‡j †k‡li w`‡K Avgiv †h Oẋ w`‡q fvM w`‡qwQ †mUv Avm‡j k~b¨ w`‡q fvM †`Iqvi-B bvgvšÍi| GKB K\_v Lv‡U GK`g †kl av‡ci †¶‡Î| GLv‡bI Oẏ/Oẋ fMvs‡ki ni I je †\_‡K O-‡K ev` †`Iqvi Rb¨ Avgiv k~b¨ w`‡q fvM w`‡qwQ| k~b¨ w`‡q fvM †`Iqv MvwYwZK hyw³‡Z wbwl× KvR|

wPÎ 26: y=x2+x+1 cive„‡Ëi †Kv‡bv we›`y‡Z Xvj †ei Ki‡Z n‡j 2x +1 e¨envi Ki‡Z n‡e|

wbDU‡bi d¬y‡·vb c×wZ wQj LyeB weåvwšÍKi| GUv Ki‡Z wM‡q Avkªq †bIqv n‡q‡Q GKwU A‰ea MvwYwZK cÖwµqvi| wKš‘ Gi wQj wekvj GK myweav| G c×wZ ev¯Í‡e Kvh©Ki| d¬y‡·vb c×wZ mgvavb K‡i‡Q ¯úk©‡Ki mgm¨v| mgvavb K‡i‡Q †¶Îd‡ji mgm¨vI| †Kv‡bv Kvf© ev †iLv Øviv Ave× As‡ki †¶Îdj †ei Ki‡Z n‡j Ki‡Z n‡e e¨veKj‡bi wecixZ KvR| hv‡K Avgiv ewj †hvMRxKiY (integration)| y = x2 + x + 1 mgxKiYK e¨veKjb Ki‡j ¯úk©‡Ki Xvj 2x +1 cvIqv hvq| †Zgwb 2x +1 †K †hvMRxKiY Ki‡j Kvf© Øviv Ave× †¶‡Îi †¶Îd‡ji m~Î cvIqv hvq| G m~Î n‡jv y = x2 + x + 1| `ywU mxgv x = a Ges x = b Gi g‡a¨ Kvf©wUi †¶Îdj n‡e (b2 + b +1) – (a2 + a+1) (wPÎ 27)| (mwVK K‡i ej‡j m~ÎUv Avm‡j y = x2 + x + c), †hLv‡b c GKwU B”Qvg~jK (arbitrary) aªæeK| e¨veKj‡bi gva¨‡g Z\_¨ nvwi‡q hvq| Avi ZvB †hvMRxKiY GK`g wbLyuZ dj w`‡Z cv‡i bv| Zv †c‡Z n‡j `ywU mxgvi (a, b) gvb w`‡q w`‡Z n‡e|)

K¨vjKzjvm n‡jv `ywU DcKi‡Yi mgv‡ek: †hvMRxKiY I AšÍixKiY| n¨uv, k~b¨ I Amxg wb‡q †Lj‡Z wM‡q wbDUb MwY‡Zi wKQy wbqg †f‡O‡Qb| wKš‘ K¨vjKzjvm wQj gvivZ¥K kw³kvjx GK A¯¿| †Kv‡bv MwYZwe`B G‡K D‡c¶v Ki‡Z cvi‡jb bv|

cÖK…wZ K\_v e‡j mgxKi‡Yi fvlvq| A™¢yZ GK KvKZvjxq e¨vcvi| MwY‡Zi wbqg ˆZwi n‡qwQj †fov ¸b‡Z Avi Rwgi cwigvc Ki‡Z wM‡q| Avevi GB wbqg¸‡jv w`‡qB P‡j gnvwe‡k¦i KvR| cÖvK…wZK m~‡Îi cÖKvk cvq MvwYwZK mgxKi‡Yi gva¨‡g| Avi mgxKiY GK A‡\_© GKwU hš¿| hv‡Z GKwU msL¨v w`‡j Av‡iKwU msL¨v cvIqv hv‡e| cÖvPxbKv‡jI gvbyl mgxKi‡Yi wKQy wbqg RvbZ| †hgb wjfvi ev Pvch‡š¿i m~Î| Z‡e ˆeÁvwbK wecø‡ei m~Pbv n‡j G‡Ki ci m~‡Îi Avwef©ve n‡Z \_vKj| †Kcjv‡ii Z„Zxq m~‡Îi K\_vB aiæb| G †\_‡K Rvbv hvq, MÖniv K¶c‡\_ cy‡iv Ny‡i Avm‡Z KZ mgq jvM‡e| G mgqUv n‡jv r3/t2 = k, †hLv‡b t n‡jv mgq, `~iZ¡ r Ges k GKwU aªæeK|

1662 mv‡j ievU© e‡qj †`Lvb, Ave× cv‡Îi M¨v‡m evB‡i †\_‡K Pvc w`‡j †fZ‡i Pvc evo‡e| gRvi e¨vcvi n‡jv Pvc p I AvqZb v-Gi ¸Ydj memgq aªæe \_v‡K| pv = k †hLv‡b k aªæeK| 1676 mvj| ievU© ûK †`‡Lb w¯úªs‡qi ej f cvIqv hvq FYvZ¥K aªæeK (-k) †K `~iZ¡ x w`‡q ¸Y K‡i| gv‡b f = -kx, †hLv‡b x n‡jv w¯úªs‡K †U‡b hZUv evov‡bvi cwigvY| cÖ\_gw`‡Ki GB mgxKiY-m~Î¸‡jv w`‡q mij m¤úK© Lye `viæYfv‡e cÖKvk Kiv m¤¢e nw”Qj| wKš‘ mgxKi‡Yi Av‡Q mxgve×Zv| G‡`i AcwieZ©bxqZvB G‡`i mve©Rbxb m~Î nIqvi c‡\_ evav|

wPÎ 27: 2x+1 †iLv Øviv mxgve× †¶‡Îi gvb †c‡Z x2 + x + 1 e¨envi Ki‡Z n‡e|

D`vniY wn‡m‡e ¯‹yjRxe‡b c‡o Avmv GKUv weL¨vZ mgxKiY †`Lv hvK| GUv †\_‡K †`Lv hvq, GKwU wbw`©ó (constant) †eM v wb‡q Pj‡j t mgq c‡i KZ `~i (x) †cuŠQ‡Z cvi‡eb| †m `~iZ¡Uv n‡jv x = vt| cÖwZ NÈvq AwZµvšÍ `~iZ¡‡K mgq w`‡q ¸Y Ki‡jB cvIqv hv‡e `~iZ¡| GK kni †\_‡K Av‡iK kn‡i wbw`©ó †e‡M †h‡Z KZ mgq jvM‡e Zv †ei Ki‡Z G mgxKiY `viæY Kvh©Ki| †hgb NÈvq 120 gvBj †e‡M Pj‡j 60 gvBj †h‡Z mgq jvM‡e 30 wgwbU| wKš‘ ev¯Í‡e KqUv wRwbm wbw`©ó †e‡M P‡j? Dci †\_‡K GKwU ej †Q‡o w`‡j Gi †eM µ‡gB evo‡e| G‡¶‡Î x = vt m~Î GK`g fyj| (w¯’ive¯’v †\_‡K) cwZZ e‡ji †¶‡Î m~Î n‡e x = gt2/2, †hLv‡b g n‡jv gnvKl©xq Z¡iY| Avevi e‡ji Ici µ‡gB †ewk ej (Ges †m Kvi‡Y Z¡iY, gv‡b †e‡Mi e„w×) cÖ‡qvM Ki‡j x n‡e t3/3-Gi g‡Zv wKQy| †eM‡K mgq w`‡q ¸Y K‡i `~iZ¡ cvIqv mve©Rbxb †Kv‡bv m~Î bq| mKj †¶‡Î G‡K cÖ‡qvM Kiv P‡j bv|

wbDUb K¨vjKzjvm w`‡q G m~Î¸‡jv‡K †Rvov w`‡q GK ¸”Q m~Î evbv‡jb, †h¸‡jv mKj Ae¯’vq I mKj †¶‡Î KvR K‡i| GB cÖ\_g weÁvb mv¶vr †cj mve©Rbxb m~‡Îi| †h m~Î †QvU †QvU AvswkK m~Î¸‡jvi †cQ‡b †\_‡K KjKvwV bvovq| k~b¨ I Amx‡gi Kvi‡Y MwYZwe`iv Rvb‡Zb, K¨vjKzjv‡mi Mfx‡i jywK‡q Av‡Q ÎæwU| ZeyI Zuviv mn‡RB bZyb GB nvwZqvi jy‡d wb‡jb| mZ¨ K\_v n‡jv, cÖK…wZ mvaviY mgxKi‡Yi fvlvq bq, K\_v e‡j AšÍiKxq mgxKi‡Yi (differential equation) fvlvq| Avi AšÍiKxq mgxKiY Dc¯’vcb I mgvav‡bi nvwZqviB n‡jv K¨vjKzjvm|

AšÍiKxq mgxKiY Avgv‡`i †PbvRvbv Avi `kUv mgxKi‡Yi g‡Zv bq| mvaviY mgxKiY n‡jv h‡š¿i g‡Zv| G‡Z GKwU msL¨v w`‡j wdwi‡q †`q Av‡iKwU msL¨v| AšÍiKxq mgxKiYI h‡š¿i g‡ZvB| Z‡e G‡¶‡Î h‡š¿i g‡a¨ †`Iqv nq msL¨vi e`‡j mgxKiY| Avi hš¿ wdwi‡q †`q Av‡iKwU mgxKiY| mgm¨vi Ae¯’vi weeiY †`Iqv mgxKiY w`‡j (‡hgb ej aªæe †e‡M Pj‡Q wKbv ev e‡ji Ici †Kv‡bv ej (force) cÖhy³ n‡jv wKbv) cvIqv hv‡e KvwO&¶Z DË‡ii mgxKiY (‡hgb ej mij‡iLv ev cive„Ë c‡\_ Pj‡Q)| GKwUgvÎ AšÍiKxq mgxKiY AMwYZmsL¨K mgxKiY-m~Î wbqš¿Y K‡i| Avevi Ab¨ mgxKiY-m~‡Îi g‡Zv Giv KLbI mZ¨ Avevi KLbI wg\_¨v bq| Giv me©`vB mZ¨| mve©Rbxb m~Î| G †hb cÖK…wZi KjKâv ch©‡e¶Y|

wbDU‡bi d¬y‡·vb c×wZi K¨vjKzjvm KvRUv Kij Ae¯’vb, †eM I Z¡i‡Yi g‡Zv wRwbm¸‡jv‡K †Rvov w`‡q| Ae¯’vb‡K x PjK w`‡q cÖKvk K‡iB wZwb eyS‡jb †eM Avm‡j d¬y‡·vb Qvov wKQyB bq| GB d¬y‡·vb‡KB AvaywbK MwY‡Z x Gi †Wwi‡fwUf (derivative) ev AšÍiK (ẋ) e‡j| Avi Z¡iY (ẍ) †e‡Mi (ẋ) AšÍiK Qvov Avi wKQyB bq| Ae¯’vb †\_‡K †eM I †mLvb †\_‡K Z¡i‡Y hvIqv Avi Avevi D‡ëv w`‡K wd‡i Avmvi Rb¨ AšÍixKiY (WU evov‡bv) I †hvMRxKiY (WU Kgv‡bv) K‡i †h‡Z n‡e| GB wPý w`‡qB wbDUb GKwUgvÎ mij AšÍiKxq mgxKi‡Yi gva¨‡g gnvwe‡k¦i me e¯‘i MwZ cÖKvk K‡i †d‡jb| mgxKiYUv n‡jv F = mẍ, †hLv‡b F n‡jv e¯‘i Ici cÖhy³ ej Avi m †m e¯‘i fi| (Aek¨ GUv †m A‡\_© mve©Rbxb †Kv‡bv m~Î bq| e¯‘i fi aªæe \_vK‡jB †Kej GUv mZ¨| wbDU‡bi m~Î AviI mvaviY ms¯‹iY n‡jv F = ṗ, †hLv‡b p n‡jv e¯‘i fi‡eM (momentum) c‡i AvBb÷vBb wbDU‡bi m~‡Î AviI cwigvR©b K‡ib|) Avcbvi Kv‡Q †Kv‡bv e¯‘i Ici cÖhy³ e‡ji mgxKiY \_vK‡j AšÍiKxq mgxKiY e‡j †`‡e †m e¯‘Uv wVK Kxfv‡e PjvPj Ki‡e| †hgb gy³fv‡e cošÍ ej cive„Ë c‡\_ Pj‡e| Avevi Nl©Ynxb w¯úªs Gw`K-Iw`K †`vj Lv‡e wPiKvj| Avi Nl©Y \_vK‡j w¯úªs ax‡i ax‡i w¯’i n‡q hv‡e (wPÎ 28)| G djvdj¸‡jv‡K Avjv`v Avjv`v g‡b n‡jI Giv GKB AšÍiKxq mgxKiY †g‡b KvR K‡i|

Avevi GKBfv‡e e¯‘Uv Kxfv‡e Pj‡Q Zv Rvb‡jB AšÍiKxq mgxKiY Avcbv‡K e‡j †`‡e Kx ai‡bi ej Zv‡Z cÖ‡qvM Kiv n‡q‡Q| e¯‘Uv ej †nvK Avi MÖn †nvK Zv‡Z †Kv‡bv Zdvr †bB| (wbDU‡bi mvdj¨ wQj gnvKl© e‡ji mgxKiY w`‡q MÖn‡`i K¶‡`i AvK…wZ †ei Kiv| gvbyl aviYv K‡iwQj GB ej 1/r2 Gi mgvbycvwZK n‡e| c‡i †`Lv †Mj, wbDU‡bi mgxKiY †\_‡K Dce„Ë †ewi‡q Avm‡Q| G‡Z gvbyl wbDUb‡K mwVK e‡j †g‡b wbj|) K¨vjKzjv‡mi GZ ¶gZv cÖ`k©‡bi c‡iI g~j mgm¨v †\_‡KB †Mj| wbDU‡bi Kv‡Ri wfwËUv wQj Lye boe‡o| k~b¨ w`‡q fvM| GKB mgm¨v wQj Zuvi cÖwZØ›Øxi Kv‡RI|

wPÎ 28: GKB AšÍiKxq mgxKiY Øviv wbqwš¿Z wewfbœ MwZ

1673 mvj| GK weL¨vZ Rvg©vb AvBbRxex I `vk©wbK jÛb md‡i hvb| Zuvi bvg MUwd«W DBj‡njg wjewbR| wZwb Ges wbDUb weÁvb RMZ‡K `ywU c‡¶ wef³ K‡i †d‡jb| Z‡e `yR‡bi †KDB K¨vjKzjv‡mi k~‡b¨i mgm¨v mgvavb Ki‡Z cv‡ibwb|

jÛb åg‡Yi mgq †ZwÎk eQi eqmx wjewbR wbDU‡bi AcÖKvwkZ KvR †`‡LwQ‡jb wK bv Zv †KD Rv‡b bv| 1673 †\_‡K 1676 mv‡ji g‡a¨ wjewbR AveviI jÛb hvb| Gmgq wZwbI K¨vjKzjvm Avwe®‹vi K‡ib| Z‡e †mUvi †Pnviv-myiZ LvwbK Avjv`v|

GKUy fve‡j †evSv hvq, wjewbR ¯^Zš¿fv‡eB K¨vjKzjv‡mi wbR¯^ ms¯‹iY evwb‡qwQ‡jb| hw`I e¨vcviUv GLbI weZ‡K©i welq| 1670-Gi `k‡K `yR‡bi g‡a¨ †hvMv‡hvM n‡qwQj| d‡j †K Kv‡K Kxfv‡e cÖfvweZ K‡i‡Qb †Zv †evSv gykwKj| `yB Z‡Ë¡iB djvdj GKB| Z‡e wPý I `k©b cy‡ivcywi Avjv`v|

wbDUb Zuvi d¬y‡·vb mgxKi‡Yi Amxg cwigvY ¶y`ª o ivwk¸‡jv‡K AcQ›`B Ki‡Zb| hviv KLbI k~b¨ Avevi KLbI Ak~‡b¨i g‡Zv AvPiY KiZ| GK A‡\_© G AwZkq ¶y`ª ivwkiv wQj Amxg cwigvY ¶y`ª| wPšÍbxq †h‡Kv‡bv abvZ¥K msL¨vi †P‡qI †QvU| ZeyI Kxfv‡e †hb Avevi k~‡b¨i †P‡q eo| †m mg‡qi MwYZwe`‡`i Kv‡Q G GK A™¢yZ aviYv| wbDUb wb‡RI Zuvi mgxKi‡Yi G AwZkq ¶y`ª ivwk wb‡q wQ‡jb weeªZ| wZwb G mgm¨v‡K jywK‡q ivLviI †Póv K‡ib| Zuvi wnmv‡ei gvSLv‡bB ïay G 0 ¸‡jv AvmZ| wnmv‡ei †kl w`‡K DavI n‡q †hZ A‡jŠwKKfv‡e| Iw`‡K wjewbR †hb ¶y`ªvwZ¶y‡`ªi g‡a¨B Avb‡›` †f‡m †eov‡”Qb| wbDUb †hLv‡b wj‡L‡Qb Oẋ, wjewbR †mLv‡b wj‡L‡Qb dx, Avi A\_© x Gi AwZkq ¶y`ª GKwU Ask| wjewb‡Ri wnmve-wbKv‡ki cy‡iv As‡kB G ¶y`ªvwZ¶y`ªiv AcwiewZ©Zfv‡e wU‡K Av‡Q| Ges x-Gi mv‡c‡¶ y-Gi AšÍiK ¶y`ªvwZ¶y`ª ivwk †\_‡K gy³ AbycvZ d¬y‡·vb ẏ/ẋ bq| GUv eis ¶y`ªvwZ¶y`ª AbycvZ dz/dx|

wjewb‡Ri K¨vjKzjv‡mi mvnv‡h¨ G dz I dx wb‡q B”Qvg‡Zv KvR Kiv †hZ Ab¨ mvaviY msL¨vi g‡ZvB| G Kvi‡YB AvaywbK MwYZwe` I c`v\_©we`iv wbDU‡bi wP‡ýi e`‡j wjewb‡Ri cÖZxK e¨envi K‡ib| wjewb‡Ri K¨vjKzjv‡mi ¶gZvI wbDU‡bi K¨vjKzjv‡mi g‡ZvB| Z‡e cÖZx‡Ki myweavi Kvi‡Y ejv P‡j—GKUyLvwb †ewk| GZ wKQyi c‡iI, MwY‡Zi Af¨šÍ‡i mgm¨v †\_‡KB †Mj| wjewb‡Ri AšÍi‡KI 0/0 w`‡q fv‡Mi g‡Zv wbwl× KvR Av‡Q| †h KvR weZwK©Z K‡iwQj wbDU‡bi d¬y‡·vb‡K| G mgm¨v bv `~i Kiv ch©šÍ K¨vjKzjvm hyw³i wfwËi e`‡j `uvwo‡q \_vK‡e wek¦v‡mi wfwËi Ici| (Avm‡j evBbvwi ev wØwgK msL¨v Avwe®‹v‡ii mgqI wjewb‡Ri g‡b wek¦vm `„pB wQj| †h‡Kv‡bv msL¨v‡K GK ¸”Q 0 I 1 w`‡q †jLv hvq| Zuvi Kv‡Q GUvB wQjcreation ex nihilo (wµ‡qwkI G· wbwn‡jv) ev k~b¨ †\_‡K m„wó| Zuvi g‡Z gnvwek¦ ˆZwi n‡q‡Q 1 (Ck¦i) I 0 (f‡qW ev k~b¨Zv) †\_‡K| wjewbR GgbwK G †Póv K‡iwQ‡jb †hb †RmyBUiv GB we`¨v Kv‡R jvwM‡q Pxbv‡`i L„óvb evbvq|)

K¨vjKzjvm‡K GB giwg wfwË †\_‡K gy³ Ki‡Z MwYZwe`‡`i eû eQi †j‡M hvq| KviY Zviv K¨vjKzjv‡mi Avwe®‹vi wb‡q weZK© K‡i mgq cvi KiwQ‡jb|

fvebvUv †h wbDU‡bi gv\_vqB cÖ\_g G‡mwQj Zv‡Z †Kv‡bv m‡›`n †bB| †mUv 1660-Gi `k‡Ki K\_v| Z‡e wZwb †m KvR cÖKvk K‡ibwb 20 eQi ch©šÍ| wbDUb wQ‡jb Rv`yKi, ag©ZvwË¡K, Avj‡Kwg÷ I weÁvbx (evB‡e‡ji †jLv †\_‡K wZwb fwel¨ØvYx K‡iwQ‡jb Cmvi (Av) wØZxq AvMgb n‡e 1948 mv‡j)| Z‡e Zuvi A‡bK K\_vB wQj cÖPwjZ ag©we‡ivax| G Kvi‡Y wZwb wb‡R‡K ¸wU‡q ivL‡Zb| Awb”QyK wQ‡jb M‡elYv cÖKv‡ki e¨vcv‡i| Iw`‡K wbDU‡bi PycPvc e‡m \_vKvi g‡a¨B wjewbR wb‡Ri g‡Zv K‡i K¨vjKzjvm Avwe®‹vi K‡ib| Kw`b bv †h‡ZB G‡K Ac‡ii weiæ‡× bK‡ji Awf‡hvM Av‡bb| Bs‡iR MwYZ m¤cÖ`vq wbDUb‡K mg\_©b w`‡jb| gyL wdwi‡q wb‡jb gnv‡`‡ki wjewbRcš’x Ab¨ MwYZwe`‡`i †\_‡K| Gi d‡j Bs‡iRiv wbDU‡bi d¬y‡·v‡b Wy‡e iB‡jb| MÖnY Ki‡jb bv wjewb‡Ri DbœZ cÖZxK| d‡j Zviv Av‡e‡Mi e‡k gnv‡`‡ki Ab¨ MwYZwe`‡`i †P‡q wcwQ‡q †M‡jb K¨vjKzjv‡mi PP©v I AMÖMwZ‡Z|

K¨vjKzjvm‡K Av”Qbœ K‡i ivLv k~b¨ I Amx‡gi mgm¨vi †gvKv‡ejvq Bs‡iR †KD GwM‡q G‡jb bv| G‡jb GK divmx| cÖ\_g K¨vjKzjvm co‡Z †M‡jB MwYZwe`iv †jvwcUv‡ji bvg Rvb‡Z cv‡ib| Z‡e A™¢yZ e¨vcvi n‡jv, †h bv‡g †jvwcUv‡ji bvg Rwo‡q Av‡Q, Zv wKš‘ Zuvi Avwe®‹vi bq|

‡jvwcUv‡ji Rb¥ 1661 mv‡j| cy‡iv bvg wMqg d«v‡mvqv Av‡Zuvqv †W †jvwcUvj| AwfRvZ N‡ii mšÍvb †jvwcUvj wQ‡jb Lye abx| Rxe‡bi ïi‡ZB MwY‡Zi cÖwZ AvMÖnx n‡q I‡Vb| wKQyw`b †mbvevwnbx‡ZI KvwU‡q‡Qb| wQ‡jb Ak¦`‡ji K¨v‡Þb| Z‡e kxNªB wd‡i Av‡mb Zuvi g~j fvjevmv MwY‡Zi Kv‡Q| UvKv w`‡q me‡P‡q fvj †h wk¶K cvIqv hvq ZvB †e‡Q wb‡q‡Qb †jvwcUvj| bvg †Rvnvb evb©ywj| myBk MwYZwe` I wjewb‡Ri ¶y`ªvwZ¶y`ª K¨vjKzjv‡mi cÖv\_wgK hy‡Mi GKRb we‡klÁ| 1692 mv‡j evb©ywj †jvwcUvj‡K K¨vjKzjvm †kLvb| bZyb G MwYZ †jvwcUvj‡K gy» K‡i| evb©ywji bZyb MwY‡Zi me Avwe®‹vi Zv‡K †`Iqvi I e¨envi Kivi Rb¨ †jvwcUvj evb©ywj‡K ivwR Kivb| wewbg‡q †`b A\_©| Gi djvdj wn‡m‡e cvIqv hvq GKwU †U·U eB| 1696 mv‡j †jvwcUvj K¨vjKzjvm wb‡q cÖ\_g †U·U eB †j‡Lb| bvg Analyse des Infiniment Petits, hvi evsjv A\_© ¶y`ªvwZ¶y‡`ªi we‡kølY| Gi gva¨‡gB BD‡iv‡ci eo Ask wjewbRxq K¨vjKzjv‡mi mv‡\_ cwiwPZ nq| G eB‡q †jvwcUvj K¨vjKzjv‡mi †gŠwjK welq¸‡jv e¨vL¨v K‡iB †\_‡g \_v‡Kbwb, D‡jøL K‡i‡Qb bZyb `viæY djvdjI| Gi g‡a¨ me‡P‡q weL¨vZ wRwbmUvi bvg †jvwcUv‡ji wbqg (lÕHôpitalÕs rule)|

G wbqg cÖ\_‡gB AvNvZ K‡i K¨vjKzjv‡mi me©Î D`q nIqv Sv‡gjvgq ivwk 0/0-‡K| GKwU MvwYwZK dvsk‡bi gvb †Kv‡bv we›`y‡Z 0/0-Gi w`‡K †h‡Z \_vK‡j Zvi cÖK…Z gvb †ei Kivi GKwU Dcvq e‡j †`q wbqgwU| wbqgwU e‡j, GiKg fMœvs‡ki gvb †c‡Z n‡j j‡ei AšÍiK‡K n‡ii AšÍiK w`‡q fvM w`‡Z n‡e|4‡hgb aiæb x/sinx ivwkwU| gvb x = 0 n‡j je k~b¨| Avevi niI k~b¨ (sin0 = 0)| d‡j ivwkwUi gvb nq 0/0| Z‡e †nvwcUv‡ji wbqg †\_‡K Gi gvb cvIqv hvq 1/cosx| KviY x Gi AšÍiK 1 Ges sinx Gi AšÍiK cosx| x = 0 n‡j cosx Gi gvb nq 1| AZGe, ivwkwU nq 1/1 = 1| GKUy eyw× LvUv‡jB †nvwcUv‡ji wbqg Ab¨ A™¢yZ ivwk¸‡jvi gvbI w`‡q †`q| GB †hgb ∞/∞, 00, 0∞ Ges ∞0| G me¸‡jv ivwk †\_‡KB (we‡klfv‡e 0/0) Avcbvi B”Qvg‡Zv gvb †c‡Z cvi‡eb| GUv wbf©i Ki‡e je I n‡ii dvsk‡bi Ici| G Kvi‡YB 0/0-‡K Awb‡Y©q e‡j| GUv Avi cy‡ivcywi in‡m¨i Pv`‡i XvKv \_vKj bv| Lye mveav‡b 0/0-Gi w`‡K G‡Mv‡j MwYZwe`iv Gi wKQy Z\_¨ Rvb‡Z m¶g n‡”Qb| k~b¨ Avi Ggb †Kv‡bv kÎæ bq, hv‡K Gwo‡q Pj‡Z n‡e| GUv PP©v Kivi g‡ZvB GKUv auvauv|

1704 †nvwcUvj gviv hvb| evb©ywj Gevi ej‡Z ïiæ Ki‡jb, †nvwcUvj Zuvi KvR Pywi K‡i‡Qb| †m mgq MwYZ mgvR G `vwe Dwo‡q †`b| †nvwcUvj wb‡R‡K m¶g MwYZwe` wn‡m‡e cÖwZwôZ K‡i‡Qb| Iw`‡K evb©ywji Avevi Z¶Y fveg~wZ© Lye Lvivc| Gi Av‡M wZwb Av‡iK MwYZwe‡`i cÖgvY wb‡Ri e‡j `vwe K‡iwQ‡jb (Ab¨ MwYZwe` Avi †KD bb, wQ‡jb ZuviB fvB R¨vKe evb©ywj|) Z‡e G‡¶‡Î Aek¨ Zuvi `vwei mZ¨Zv †g‡j| †nvwcUv‡ji mv‡\_ Zuvi †hvMv‡hv‡Mi aib †\_‡K Zuvi e³e¨ cÖgvwYZ nq| Z‡e `~f©vM¨ Zuvi| ZZw`‡b †nvwcUv‡ji bvg wbqgUvi mv‡\_ Rwo‡q †M‡Q|

0/0 welqK †ek wKQy mgm¨vi mgvav‡b †nvwcUv‡ji wbqg `viæY ¸iæZ¡c~Y©| Z‡e g~j mgm¨v †\_‡K †Mj| wbDUb I wjewb‡Ri K¨vjKzjvm k~b¨ w`‡q fv‡Mi Ici wbf©ikxj| wbf©ikxj Ggb msL¨viI Ici, hv‡`i‡K eM© Ki‡j DavI n‡q hvq| †jvwcUv‡ji wbqg 0/0 -Gi mgm¨v wb‡q KvR K‡i Ggb nvwZqvi w`‡q hv wb‡RB 0/0 †K w`‡q ˆZwi| GUv GKwU e„ËvKvi hyw³| GKw`‡K cy‡iv c„w\_exi MwYZ I c`v\_©we`iv cÖK…wZ‡K e¨vL¨v Ki‡Z K¨vjKzjv‡mi e¨envi ïiæ K‡i‡Qb| Aciw`‡K cÖwZev‡`i aŸwb †a‡q Avmj wMR©v †\_‡K|

1734 mvj| wbDU‡bi g„Zy¨i eû eQi c‡ii K\_v| AvBwik wekc RR© evK©wj `¨ A¨vbvwj÷ bv‡g GKwU eB †j‡Lb| eBwUi Aci bvg A¨v wWm‡Kvm© A¨v‡WªmW Uy A¨vb Bbwd‡Wj g¨v‡\_g¨vwUwkqvb| (Bbwd‡Wj ev Awek¦vmx ej‡Z Lye m¤¢e GWgÛ n¨vwj‡K †evSv‡bv n‡qwQj, whwb memgq wQ‡jb wbDUbcš’x|) `¨ A¨vbvwj÷ eB‡q wZwb wbDU‡bi (I wjewb‡Ri) k~b¨ wb‡q KzU‡KŠk‡ji Zxeª mgv‡jvPbv K‡ib|

¶y`ªvwZ¶y`ª‡K wZwb AvL¨v †`b 'g„Z ivwki f~Z'| GQvov †`Lvb, G ¶y`ªvwZ¶y`ª ivwk¸‡jv‡K GZ mn‡R gyw³ w`‡j Am½wZ ˆZwi nq| Gici K\_vi BwZ Uv‡bb Gfv‡e, "Avwg g‡b Kwi, †h ev hviv wØZxq I Z„Zxq d¬y‡·vb ev wØZxq I Z„Zxq e¨eavb †g‡b wb‡Z cv‡i, Zvi Ck¦‡ii e¨vcv‡i KLbI m‡›`n Kivi †Kv‡bv †hŠw³K wfwË †bB|"

mgmvgwqK MwYZwe`iv evK©wji hyw³i mgv‡jvPbv K‡ib| Z‡e Zuvi hyw³ wQj cy‡ivcywi mwVK| aiæb †KD †`Lv‡Z Pvb wÎfy‡Ri wZb †Kv‡Yi mgwó 180 wWwMÖ| BDwK¬‡Wi wKQy m~Î mveav‡b av‡c av‡c Kv‡R jvwM‡q GKRb MwYZwe` †mUv mn‡RB †`Lv‡Z cvi‡eb| Ab¨ †Kv‡bv R¨vwgwZK mZ¨I Gfv‡e cÖgvY Kiv hv‡e| wKš‘ K¨vjKzjv‡mi e¨vcviUv D‡ëv| GUv wQj cy‡ivcywi wek¦vm-wbf©i|

eM© Ki‡j ¶y`ªvwZ¶y`ª ivwk¸‡jv †bB n‡q hvq †Kb Zvi e¨vL¨v †bB KviI Kv‡Q| mevB GUv †g‡b wb‡q‡Qb| KviY GKUvB: wVK mg‡q G‡`i‡K DavI K‡i w`‡j mwVK DËi cvIqv hvq| k~b¨ w`‡q fvM Kiv wb‡q KviI AvcwË †bB, KviY myweavRbKfv‡e MwY‡Zi wbqg D‡c¶v K‡i cošÍ Av‡cj †\_‡K AvKv‡k MÖn‡`i K¶c\_-- mewKQyi e¨vL¨v cvIqv hvw”Qj| Z‡e DËi mwVK n‡jI K¨vjKzjvm wQj Ck¦i‡K gvbvi g‡ZvB wek¦vm-wbf©i KvR|

giwgev‡`i BwZ

GKwU ivwk nq Ak~b¨ (wKQy GKUv) n‡e bvnq k~b¨ n‡e| Ak~b¨ nIqv gv‡b GUv GLbI wU‡K Av‡Q| k~b¨ n‡j GUv †bB n‡q hv‡e| G `y‡Uvi gv‡S wKQy \_vKvi `vwe D™¢U GK Kíbv|

--Ru evwU÷ W¨v‡jg‡eqvi

divwm wecø‡ei Z‡j Z‡j K¨vjKzjvm †\_‡K giwgev` we`vq wbj| wfwËUv boe‡o n‡jI AvVv‡iv kZ‡Ki †kl w`‡K cy‡iv BD‡iv‡ci MwYZwe`iv bZyb G nvwZqvi w`‡q AmvaviY me mvdj¨ cvw”Q‡jb| gnv‡`‡ki Ab¨ Ask †\_‡K wew”Qbœ \_vKvi mg‡qi †miv weªwUk MwYZwe` m¤¢eZ Kwjb g¨vKjwib I eªæK †UBji| K¨vjKzjvm e¨envi K‡i Zuviv wewfbœ dvskb‡K m¤úyY© bZybfv‡e †jLvi c×wZ Avwe®‹vi Ki‡jb| †hgb MwYZwe`iv eyS‡jb, K¨vjKzjv‡mi wKQy †KŠkj LvwU‡q 1/(1-x) dvskb‡K †jLv hvq Gfv‡e: 1 + x + x2 + x3 + x4 + „

`yB ivwk‡K m¤úyY© Avjv`v g‡b n‡jI Zviv cy‡ivcywi GKB (wKQy kZ© mv‡c‡¶)|

kZ©¸‡jvi DrcwË Amxg I k~b¨ †\_‡K| Z‡e kZ©¸‡jv Lye ¸iæZ¡c~Y© n‡q DV‡Z cv‡i| Amxg I k~‡b¨i gva¨‡g GZ mnR iƒcvšÍi myBk MwYZwe` wjIbnvU© Aqjvi‡K e¨vcviUv Drmvnx K‡i †Zv‡j| †UBji I g¨vKjwi‡bi g‡Zv GKB hyw³ †`wL‡q wZwb 'cÖgvY K‡ib'

...1/x3 + 1/x2 + 1/x + 1 + x2 + x3 + ...

avivwUi mgwó k~b¨| (wbðq eyS‡Z cvi‡Qb, wKQy GKUv Sv‡gjv Av‡Q| cix¶v K‡i †`L‡Z x = 1 ewm‡q †`Lyb Kx nq|) MwYZwe` wn‡m‡e Aqjvi wQ‡jb AmvaviY| MwYZ PP©vq Zuvi mgK¶ Kg †jvKB Av‡Qb| MwY‡Zi †miv cÖfvekvjx‡`i KvZv‡iI Av‡Qb wZwb| Z‡e G‡¶‡Î k~b¨ I Amxg‡K Amveav‡b e¨envi Ki‡Z wM‡q c\_ nvivb wZwb|

K¨vjKzjv‡mi k~b¨ I Amxg †kl ch©šÍ ekxf~Z nq †eIqvwik wn‡m‡e †e‡o GKUv GK wkïi Kv‡Q| giwgev` Avjv`v nq MwYZ †\_‡K| 1717 mv‡j d«v‡Ýi c¨vwi‡mi Ru evU÷ †j iu wMR©vi wmuwo‡Z GKwU wkï‡K Lyu‡R cvIqv hvq| wkïi bvg ivLv nq Ru †j iu| †kl ch©šÍ wZwb W¨v‡jg‡eqvi bvg MÖnY K‡ib| wbt¯^ GK †L‡U-LvIqv `¤úwZ Zuv‡K jvjb-cvjb K‡ib| Zviv cvjK wcZv wQ‡jb `iRv-Rvbvjvi Kv‡Pi KvwiMi| c‡i Rvbv wM‡qwQj, evev wQ‡jb †Rbv‡ij Avi gvI AwfRvZ GK gwnjv|

mvaviY Áv‡bi weL¨vZ GKwU wek¦‡Kvl iPbvi Rb¨ wZB me‡P‡q †ewk cwiwPwZ cvb| mn‡jLK †Wwb wW‡W‡ivi mv‡\_ wg‡j 20 eQ‡i KvRUv K‡iwQ‡jb wZwb| Z‡e W¨v‡jg‡eqvi wbQK wek¦‡Kvl †jLK wQ‡jb bv| W¨v‡jg‡eqviB eyS‡Z cv‡ib, ågY I MšÍe¨ `y‡UvB ¸iZ¡c~Y©| wZwbB MwY‡Zi wjwg‡Ui aviYvi cÖeZ©K| mgvavb K‡ib K¨vjKzjv‡mi wjwg‡Ui mgm¨v|

Avevi wd‡i hvB A¨vwKwjR I K”Q‡ci M‡í| †hLv‡b A¨vwKwjR‡K Amxg avc cvi n‡Z nq| cÖwZwU av‡ci ˆ`N¨© µ‡gB k~‡b¨i Kv‡Q hvq| Amxg †hvMdj wb‡q KvR Ki‡Z wM‡qB Am½wZc~Y© dj cvw”Q‡jb MwYZwe`iv| A¨vwKwj‡Ri mgm¨v, Kvf© Øviv Ave× †¶‡Îi †¶Îdj ev MvwYwZK dvsk‡bi weKí iƒc—me¸‡jv‡ZB GKB mgm¨v|

W¨v‡jg‡eqvi eyS‡jb, cÖwZ‡hvwMZvq wjwgU we‡ePbv Ki‡j A¨vwKwj‡Ri mgm¨v `~i n‡q hvq| A¨vwKwj‡Ri mgm¨vq (10 bs Qwe) Avgiv †`wL, cÖwZwU av‡c A¨vwKwjR µ‡gB `yB dzU j‡¶¨i KvQvKvwQ n‡”Qb| †Kv‡bv avcB Zv‡K Av‡Mi †P‡q wcwQ‡q †`q bv, ev iv‡L bv Av‡Mi RvqMvqB| cÖwZ gyn~‡Z© †m hvq AviI mvg‡b| Zvi gv‡b cÖwZ‡hvwMZvi wjwgU ev P~ovšÍ MšÍe¨ n‡jv `yB dz‡Ui `vM| wVK GLv‡bB A¨vwKjwR K”Qc‡K cvi n‡q hvq|

wKš‘ GB cÖwZ‡hvwMZvi wjwgU †h Avm‡jB `yB dzU Zv Kxfv‡e cÖgvY Ki‡eb? Avgv‡K P¨v‡jÄ Kiæb Zvn‡j| Avgv‡K GKwU `~iZ¡ ejyb| `~iZ¡Uv hZ ¶y`ªB †nvK, Avwg Avcbv‡K e‡j †`e KLb A¨vwKwjR Ges K”Qc `yR‡bB wjwgU †\_‡K †mB ¶y`ª `~iZ¡ †\_‡KI Kg `~‡i Av‡Q|

‡hgb nqZ Avcwb Avgv‡K †`‡eb GK dz‡Ui GK nvRvi fv‡Mi GK fvM| wKQy wnmve K‡i Avwg e‡j †`e, GMviZg avc †k‡l A¨vwKwjR \_vK‡e `yB dz‡Ui j¶¨gvÎv †\_‡K GK dz‡Ui `k j¶ fv‡Mi 997 Ask `~‡i| †hLv‡b K”Qc \_vK‡e †m `~i‡Z¡i A‡a©K `~‡i| Avcbvi P¨v‡jÄ Avwg c~iY K‡iwQ| GK dz‡Ui `k j¶ fv‡Mi 23 Ask †ewkB cvi n‡qwQ| Avcwb Avgv‡K GK dz‡Ui GK k †KvwU fv‡Mi GK fvM `~iZ¡ w`‡j Kx n‡e? 31 avc †k‡l A¨vwKwjR \_vK‡e j¶¨gvÎv †\_‡K GK dz‡Ui GK j¶ †KvwU fv‡Mi GK fvM `~‡i| Avi K”Qc Av‡Mi g‡ZvB †m `~i‡Z¡i A‡a©K `~‡i| Avcwb Avgv‡K †h P¨v‡jÄB †`b, †mUv Avwg c~iY Ki‡Z cvie| ejZ cvie KZ mgq c‡i A¨vwKwjR `iKv‡ii †P‡qI j¶¨gvÎvi †ewk Kv‡Q \_vK‡e| G‡Z †evSv hvq, cÖwZ‡hvwMZv G‡Mv‡Z \_vK‡j A¨vwKwjR `yB dz‡Ui j¶¨gvÎvi B”Qvg‡Zv KvQvKvwQ †cuŠ‡Q hv‡”Qb| cÖwZ‡hvwMZvi wjwgU n‡jv `yB dzU|

GLb G cÖwZ‡hvwMZv‡K Amxg As‡ki †hvMdj bv †f‡e mmxg As‡ki wjwgU wn‡m‡e wPšÍv Kiæb| †hgb cÖ\_g cÖwZ‡hvwMZvq A¨vwKwjR †Mj GK dz‡Ui `vM ch©šÍ| Zvn‡j c\_ †kl n‡jv

1

c‡ii cÖwZ‡hvwMZvq A¨vwKwjR †Mj cÖ\_g `yB Ask| cÖ\_‡g GK dzU I c‡i A‡a©K dzU| Zvn‡j c\_ †kl n‡jv

1 + 1/2

‡gvU 1.5 dzU| Z„Zxq cÖwZ‡hvwMZvq hv‡e 1 + 1/2 + 1/4 †gvU 1.75 dzU| cÖwZ‡hvwMZvi G me¸‡jv AskB mmxg I mymsÁvwqZ| Amx‡gi mv‡\_ KLbI †`Lv nq bv|

W¨v‡jg‡eqvi

1 + ½ + ¼ + 1/8 + „ + 1/2n + „

avivUv‡K wjL‡jb Gfv‡e:

limn→∞(1 + ½ + ¼ + 1/8 + „ + 1/2n)

wP‡ýi Lye mvgvb¨ cwieZ©b| wKš‘ G‡ZB i‡q‡Q wekvj e¨eavb|

‡Kv‡bv ivwk‡Z Amxg \_vK‡j ev k~b¨ w`‡q fvM \_vK‡j †hvM, we‡qvM, ¸Y, fv‡Mi g‡Zv mij MvwYwZK KvRmn mewKQy AKvh©Ki n‡q hvq| mewKQy n‡q c‡o A\_©nxb| d‡j †Kv‡bv avivq Amxg c` \_vK‡j †hvM wPýUv (+) ch©šÍ Avi mij-‡mvRv \_v‡K bv| wVK G Kvi‡YB Aa¨v‡qi ïiæ‡Z †`Lv 1 – 1 + 1 – 1 + ... Gi †hvMdj GKBmv‡\_ 0 I 1|

Z‡e avivi ïiæ‡Z wjwgU wPý w`‡q cÖwµqvUv‡K j¶¨ †\_‡K Avjv`v Kiv nq| Gfv‡e Gov‡bv hvq Amxg I k~b¨| A¨vwKwj‡Ri cÖwZ‡hvwMZvi Ask¸‡jv †hgb mmxg, GLv‡bI cÖ‡Z¨KwU AvswkK †hvMdj mmxg| Avcwb †hvM Ki‡Z cv‡ib, fvM Ki‡Z cv‡ib, eM© Ki‡Z cv‡ib| hv B”Qv| MwY‡Zi wbqg ZLbI Lv‡U| KviY mewKQy mmxg| G KvR¸‡jv †kl n‡j †b‡eb wjwgU| †ei Ki‡Z cvi‡eb ivwkwUi MšÍe¨| KLbI Avevi wjwg‡Ui Aw¯ÍZ¡ \_v‡K bv| 1 – 1 + 1 – 1 + ... avivi wjwgU †bB| AvswkK †hvMdj¸‡jv 1 I 0-Gi gv‡S †`vj †L‡Z \_v‡K| wbw`©ó †Kv‡bv j‡¶¨i w`‡K hv‡”Q bv| Z‡e A¨vwKwj‡Ri cÖwZ‡hvwMZvq †hvMdj Ggb: 1 †\_‡K 1.5, 1.75, 1.875, 1.9375 BZ¨vw`| µ‡gB KvQvKvwQ n‡”Q 2-Gi| †hvMdj¸‡jvi Av‡Q GKwU wjwgU, GKwU MšÍe¨|

AšÍi‡Ki Rb¨I GKB K\_v cÖ‡hvR¨| wbDUb I wjewbR fvM K‡iwQ‡jb k~b¨ w`‡q| wKš‘ AvaywbK MwYZwe`iv fvM K‡ib k~‡b¨i Lye KvQvKvwQ GKwU msL¨v w`‡q| d‡j Zuv‡`i fvM m¤úyY© ˆea| KviY GZ †bB †Kv‡bv k~b¨| Zviv wjwgU †bb| AšÍiK †c‡Z ¶y`ªvwZ¶y‡`ªi eM©‡K k~b¨ a‡i †bB K‡i †djv I k~b¨ w`‡q fvM Kivi K‚U‡KŠk‡ji Avi `iKvi †bB (‡`Lyb cwiwkó M)| G hyw³‡KI wbDU‡bi hyw³i g‡ZvB g‡b n‡Z cv‡i| Z‡e ev¯Í‡e Zv bq| MvwYwZK hyw³i K‡Vvi bxwZ GUv †g‡b P‡j| wjwg‡Ui aviYvi †cQ‡b Av‡Q `„p I m½wZc~Y© wfwË| wjwgU‡K msÁvwqZ Kivi Ab¨ DcvqI Av‡Q| †hgb G‡K `ywU msL¨vi Awfmvi ag© wn‡m‡e †`Lv‡bv hvq| lim sup I lim inf| (Gi `viæY GKwU cÖgvY Av‡Q| Z‡e G eB‡qi †QvU cwi‡mi †mUv D‡jøL Kijvg bv|) AZGe AšÍi‡Ki gva¨‡g wjwgU‡K cÖKvk Ki‡Z †Kv‡bv Amyweav †bB| Gi gva¨‡g K¨vjKzjvm k³ wfwËi Ici `uvwo‡q †Mj|

k~b¨ w`‡q fvM †`Iqvi cÖ‡qvRb dz‡ivj| MwY‡Zi RMr †\_‡K we`vq wbj giwgev`| AveviI Rq n‡jv MwYZ I hyw³i| kvwšÍ wUKj divwm wecø‡ei †iBb Ae †Uii ev fqKvjxb kvmbvgj ch©šÍ|

Z\_¨wb‡`©k

1| ¯^we‡ivax e³e¨ ev †`L‡Z GK Avm‡j Av‡iK Ggb wRwbm‡K c¨vivW· e‡j| †hgb, †KD ejj, "Avwg wg\_¨vev`x|" Zvn‡j wK †jvKwU Avm‡j wg\_¨vev`x bvwK mZ¨ev`x? G wel‡q we¯ÍvwiZ Rvb‡Z coyb †jL‡Ki eB: Amxg mgxKiY, Zvgªwjwc, 2019|

2| wbDU‡bi eqm wZb eQi n‡j Zvi gv Avevi we‡q K‡i Avjv`v n‡q hvb| Gic‡i Zv‡`i mv‡\_ Zuvi Avi †`Lv nqwb| bv, bv, n‡q‡Q| †hw`b wbDUb Zv‡`i evwo‡Z wM‡q Zv‡`i‡K N‡ii †fZ‡i †i‡LB cywo‡q gvivi ûgwK w`‡q Av‡mb|

3| `ywU msL¨vi ¸Ydj k~b¨ n‡j Zv‡`i GKwU ev `ywUB k~b¨ n‡e| MvwYwZK fvlvq ej‡j, ab = 0 n‡j nq a = 0 ev b = 0 n‡e| Gi gv‡b n‡jv a2 = 0 n‡j a = 0 n‡e|

4| G wbqg eyS‡Z †`Lyb wb‡Pi D`vniY|

wPÎ 28.1

Ggwb‡Z G wjwg‡Ui gvb 0/0 Av‡m, hv Awb‡Y©q I A\_©nxb| †nvwcUv‡ji wbqg †\_‡K Gi gvb cvIqv hvq| wjwg‡Ui A\_© n‡jv dvsk‡bi gvb Avm‡j †Kvb w`‡K hv‡”Q Zv †evSv| G dvsk‡b x-Gi gvb (-2) Gi w`‡K †h‡Z \_v‡K dvskbUv †h‡Z \_vK‡e (-1) Gi w`‡K| †nvwcUv‡ji wbqg gvb cvIqv mnR K‡i w`j|

lô Aa¨vq

Amx‡gi hgR

[k~‡b¨i Amxg ˆewkó¨]

Ck¦i c~Y©msL¨v m„wó K‡i‡Qb| evwK me gvby‡li Kg©|

-- wjI‡cvì †µv‡bKv

k~b¨ Avi Amxg‡K memgq mgRvZxq wRwbm e‡j m‡›`n nZ| †Kv‡bvwKQy‡K k~b¨ w`‡q ¸Y w`b| cv‡eb k~b¨| Amxg‡K †Kv‡bvwKQy w`‡q ¸Y w`‡jI k~b¨| †Kv‡bv msL¨v‡K k~b¨ w`‡q fvM w`‡j Avm‡e Amxg| Avi Amxg w`‡q fvM w`‡j k~b¨| †Kv‡bv msL¨vi mv‡\_ k~b¨ †hvM Ki‡j Zv‡Z †Kv‡bv cwieZ©b Av‡m bv| Amx‡gi mv‡\_I KvD‡K †hvM Ki‡j †Kv‡bv cwieZ©b †bB|

‡i‡bmuvi mgq †\_‡KB G wgj¸‡jv ¯úó †`Lv hvw”Qj| Z‡e k~‡b¨i eo inm¨ D‡b¥vPb Ki‡Z MwYZwe`‡`i‡K A‡c¶v Ki‡Z n‡q‡Q divwm wecøe †kl nIqv ch©šÍ|

k~b¨ Avi Amxg GKB gy`ªvi `yB wcV| mgvb I wecixZ| Bb I Bqvs1| msL¨v‡iLvi `yB gv\_vq mgkw³gvb `yB cÖwZc¶| k~‡b¨i Sv‡gjvgq ˆewkó¨ Zvj wgwj‡q P‡j Amx‡gi A™¢yZ ¶gZvi mv‡\_| k~b¨‡K eyS‡Z cvi‡jB Amxg‡KI †evSv m¤¢e n‡q hvq| GUv eyS‡Z wM‡q MwYZwe`‡`i cv w`‡Z nq KvíwbK GK A™¢yZ RM‡Z| †hLv‡b e„Ëiv †iLv, †iLviv e„Ë| Avi Amx‡gi Ae¯’vb `yB wecixZ †giæ‡Z|

KvíwbK msL¨v

¯^M©xq †PZbvi GK `viæY I we¯§qKi Avkªq¯’j| Aw¯ÍZ¡ I Abw¯Í‡Z¡i cÖvq wgjb †hLv‡b|

-- MUwd«W DBj‡njg wjewbR

eû kZK a‡i MwYZwe`‡`i Ae‡njvi cvÎ k~b¨ GKv nqwb| k~b¨ †hfv‡e wMÖK‡`i Kzms¯‹v‡ii Av¸‡b cy‡o‡Q, Ab¨ msL¨vI n‡q‡Q Ae‡njvi wkKvi| †h msL¨v‡`i wQj bv R¨vwgwZK A\_© (wMÖKiv msL¨vi R¨vwgwZK w`KUvB eySZ ïay)| Ggb GKwU msL¨v i| k~‡b¨i A™¢yZ ˆewk‡ó¨i g~‡j G msL¨vUviI f~wgKv Av‡Q|

exRMwY‡Zi gva¨‡g msL¨v‡K †evSvi Av‡iKUv `„wófw½ cvIqv †Mj| hv wMÖK‡`i R¨vwgwZK aviYv †\_‡K cy‡ivcywi Avjv`v| wMÖK‡`i g‡Zv cive„‡Ëi †¶Îdj cwigv‡ci e`‡j exRMwYZwe`iv wewfbœ msL¨vi m¤ú‡K©i mgxKi‡Yi mgvavb †LuvRvi c‡\_ nuvU‡jb| †hgb 4x – 12 = 0 mij mgxKiYwUi K\_v fveyb| G mgxKiY ej‡Q 0, 4 I 12-Gi mv‡\_ ARvbv msL¨v x-Gi m¤ú‡K©i K\_v| exRMwY‡Zi Qv‡Îi KvR n‡jv x-Gi gvb †ei Kiv| G mgxKi‡Y x-Gi gvb 3| mgxKi‡Y x-Gi e`‡j 3 ewm‡q †`Lyb mgxKiY ï× n‡”Q| 4x – 12 = 0 mgxKi‡Yi mgvavb ev g~j ZvB 3|

wewfbœ wPý‡K †Rvov w`‡q mgxKiY evbv‡Z \_vK‡j AcÖZ¨vwkZ wRwb‡mi gy‡LvgywL n‡Z nq| †hgb Ic‡ii mgxKi‡Y we‡qvM wPý (-) DwV‡q †hvM wPý (+) ewm‡q w`b| cvIqv hv‡e mij-`k©b GK mgxKiY: 4x +12 = 0| Z‡e G mgxKi‡Yi mgvavb (-3), hv FYvZ¥K msL¨v|

fviZxq MwYZwe`iv hLb k~b¨‡K MÖnY Ki‡jI BD‡ivcxqiv eû kZK a‡i G‡K AeÁv K‡i †M‡Qb| GKBfv‡e cÖvP¨ hLb FYvZ¥K msL¨v‡K ey‡K †U‡b wbj, cwðg Zv‡KI Ae‡njv Ki‡Z PvBj| GgbwK m‡Zi kZ‡K G‡mI †WKvU© mgxKi‡Yi mgvavb wn‡m‡e FYvZ¥K msL¨v‡K †g‡b wb‡Z ivwR nbwb| wZwb G‡`i‡K bvg †`b bKj mgvavb ev g~j| Avi wVK G Kvi‡YB ¯’vbv¼ e¨e¯’v‡K FYvZ¥K msL¨v ch©šÍ ewa©Z K‡ibwb| Z‡e †WKvU© msKxY© aviYvi cZb hy‡Mi gvbyl| exRMwYZ I R¨vwgwZi wgj‡bi mdjZvi wkKvi wZwb| exRMwYZwe`‡`i Kv‡Q FYvZ¥K msL¨v A‡bK Av‡MB †\_‡KB Kv‡Ri wRwbm| cwð‡gi MwYZwe`ivI Kv‡R jvwM‡q‡Qb msL¨v¸‡jv‡K| mgxKiY mgvavb Ki‡Z †M‡j ni`g †`Lv wgjwQj FYvZ¥K msL¨vi| Ggb GK ai‡bi mgxKiY n‡jv wØNvZ (quadratic) mgxKiY|

4x – 12 = 0 ai‡bi mij‰iwLK mgxKiY mgvavb Kiv Lye mnR| Z‡e G ai‡bi mgm¨v exRMwYZwe`‡`i †ewkw`b e¨¯Í ivL‡Z cvij bv| Zv‡`i PvB AviI KwVb mgm¨v| KvR ïiæ Ki‡jb wØNvZ mgxKiY wb‡q| G mgxKiY ïiæ nq x2 w`‡q| †hgb x2 – 1 = 0| mvaviY mgxKi‡Yi †P‡q Giv RwUj| cÖ\_gZ, G‡`i g~j \_v‡K `ywU| †hgb x2 – 1 = 0 Gi g~j `ywU n‡jv 1 I (-1)| mgxKi‡Y 1 ev (-1) ewm‡q †`Lyb Kx nq| d‡j mgxKi‡Y 1 ev (-1) `y‡UvB KvR K‡i| x2 – 1 †\_‡K Avgiv cvB (x + 1)(x – 1), hv †\_‡K †evSv hvq 1 ev (-1) emv‡j ivwkUv k~b¨ nq|

wØNvZ mgxKiY mij‰iwLK mgxKi‡Yi †P‡q RwUj n‡jI G‡`i g~j †ei Kivi GKwU mnR Dcvq Av‡Q| G‡K e‡j wØNvZ m~Î, hv D”Pgva¨wgK cvk Kiv †h‡Kv‡bv wk¶v\_©x ¸iæZ¡mnKv‡i c‡o| ax2 + bx + c wØNvZ mgxKi‡Yi g~j n‡e x = (- b ± √(b2 – 4ac))/2a| abvZ¥K wPý (+) †\_‡K GKwU I FYvZ¥K wPý (-) †\_‡K cvB Av‡iKwU g~j| eû eQi a‡i gvbyl wØNvZ mgxKi‡Yi K\_v Rv‡b| beg kZ‡Ki MwYZwe` Avj-‡LvqvwiRwg cÖvq me wØNvZ mgxKiY mgvavb Ki‡Z cvi‡Zb| Z‡e m¤¢eZ wZwb FYvZ¥K msL¨v‡K g~j wn‡m‡e gvb‡Zb bv| Aek¨ Zuvi mg‡qi ci `ªæZB FYvZ¥K msL¨v‡K mgvavb wn‡m‡e MÖnY K‡i †bb exRMwYZwe`iv| Z‡e KvíwbK msL¨vi K\_v GKUy Avjv`v|

mij‰iwLK mgxKi‡Y KvíwbK msL¨v Av‡m bv| Z‡e wØNvZ mgxKi‡Y G‡`i †`Lv †h‡Z \_vKj| x2 + 1 = 0 mgxKiYUvi K\_v fveyb| †`‡L g‡b nq †Kv‡bv msL¨v ewm‡qB Gi mgvavb cvIqv hv‡e bv| -1, 3, 500 ev 30.24 hvB emvb mgxKiY wm× n‡e bv2| Avcbvi B”Qvg‡Zv †h‡Kv‡bv abvZ¥K ev FYvZ¥K msL¨vB emvb bv †Kb, G mgxKi‡Yi g~j cv‡eb bv| Gi †P‡q KiæY K\_v n‡jv, wØNvZ mgxKiY cÖ‡qvM Ki‡Z †M‡j `ywU A™¢yZ DËi †g‡j| +√(-1) I -√(-1) |

‡`‡L G‡`i †Kv‡bv A\_© Av‡Q e‡j g‡b nq bv| ev‡iv kZ‡K fviZxq MwYZwe` fv¯‹i e‡jwQ‡jb, FYvZ¥K msL¨vi eM©g~j †bB| KviY FYvZ¥K msL¨v eM©msL¨v bq| fv¯‹i Ges Ab¨iv eyS‡Z †c‡iwQ‡jb, abvZ¥K msL¨vi eM© abvZ¥K| 2-‡K 2 w`‡q ¸Y Ki‡j 4 nq| FYvZ¥K msL¨vi eM©I abvZ¥K| (-2)-‡K (-2) w`‡q ¸Y Ki‡jI 4 nq| k~‡b¨i eM© k~b¨| abvZ¥K msL¨v, FYvZ¥K msL¨v I k~b¨ mevB AFYvZ¥K eM© †`q dj wn‡m‡e| cy‡iv msL¨v‡iLv GB wZbwU m¤¢vebv w`‡qB c~Y©| Zvi gv‡b, msL¨v‡iLvq Ggb †Kv‡bv msL¨v †bB, hv‡K eM© Ki‡j FYvZ¥K msL¨v Avm‡e| FYvZ¥K msL¨vi eM©‡K g‡b nw”Qj nvm¨Ki GK fvebv|

‡WKvU© G msL¨v‡`i FYvZ¥K msL¨vi †P‡qI Lvivc g‡b Ki‡Zb| FYvZ¥K msL¨vi eM©g~‡ji GKwU Zy”Q bvgI †`b wZwb: KvíwbK msL¨v (imaginary number)| G bvgwUB c‡i †\_‡K hvq3| (-1) Gi eM©g~‡ji cÖZxK GLb i|

exRMwYZwe`iv i-‡K fvjevm‡jb| evwK cÖvq mevB G‡K N„Yv Ki‡jb| x3 + 3x + 1 ivwkwUi g‡Zv eûc`xi mgvav‡b KvíwbK msL¨v `viæY Kv‡R jvMj| Avm‡j i-‡K msL¨v wn‡m‡e †g‡b wb‡j me eûc`x mgvavb Kiv hvq| x2 + 1 fvM n‡q nq (x + i)(x - i)| mgxKi‡Yi g~j nq i I (-i)| x3 – x2 +x – 1 Gi g‡Zv wÎNvZ mgxKiY fvM nq wZbfv‡M| (x – 1) (x + i) (x- i)| x4 w`‡q ïiæ PZyN©vZx ivwk fvM nq Pvifv‡M| x5 w`‡q ïiæ cÂNvZxiv cuvP fv‡M| n Nv‡Zi eûc`xiv ïiæ nq xn w`‡q, Avi Giv wef³ nq nwU Avjv`v (A‡bKmgq `yB g~j GKB n‡Z cv‡i| †hgb x2 – 2x + 1 = 0 ev (x-1)2 = 0 mgxKi‡Yi `ywU g~jB 1| Z‡e g~‡ji msL¨v wKš‘ 2-B|) ivwk‡Z| G‡K e‡j exRMwY‡Zi †gŠwjK Dccv`¨|

‡lv‡jv kZ‡Ki ïiæ †\_‡KB MwYZwe`iv i-hy³ msL¨v e¨envi KiwQ‡jb| wÎNvZ I PZyN©vZx mgxKiY mgvavb Ki‡Z wM‡q Z\_vKw\_Z GB RwUj4 msL¨v‡`i e¨envi P‡j Av‡m| A‡bK MwYZwe` RwUj msL¨v‡K GKwU myweavRbK Kíbv wn‡m‡e †g‡b †bb| Z‡e Gi g‡a¨B evwKiv Lyu‡R cvb Ck¦i‡K|

wjewbR g‡b Ki‡Zb, i n‡jv Aw¯ÍZ¡ I Abw¯Í‡Z¡i gv‡S GK A™¢yZ wgjb| A‡bKUv †hb Zuvi evBbvwi5 msL¨vi 1 (Ck¦i) I 0 (k~b¨Zv) Gi wgjb| wjewbR i-‡K cweÎ AvZ¥vi6 mv‡\_ Zyjbv K‡ib| `y‡UviB Aw¯ÍZ¡ Ae¯‘MZ I bv‡g gvÎ g~Z©| Z‡e GgbwK wjewbRI eyS‡Z cv‡ibwb, i msL¨vwU GKmgq k~b¨ I Amx‡gi m¤úK© cÖKvk Ki‡e| Aek¨ †m m¤ú‡K©i RU Lyj‡Z MwY‡Z AviI `y‡Uv ¸iæZ¡c~Y© AMÖMwZ cÖ‡qvRb n‡qwQj|

we›`y I cÖwZwe›`y

G aviYv¸‡jv KZ mn‡R cwiwPZ ˆewkó¨ I AviI AmxgmsL¨K wRwb‡mi w`‡K Bw½Z K‡i Zv ZLb mn‡RB †evSv hv‡e, mvaviY R¨vwgwZ mn‡R mn‡R hvi VuvB Lyu‡R cvq bv|

-- Ru wf±i cum‡j

cÖ\_g AMÖMwZ wQj cÖ‡¶cYg~jK R¨vwgwZ (projective geometry)| kvLvUvi Rb¥ hy‡×i Wvgv‡Wv‡ji g‡a¨| 1700 mv‡ji cÖ\_g `k‡Ki K\_v| d«vÝ, Bsj¨vÛ, Aw÷ªqv, cÖywkqv, †b`vij¨vÛ I Ab¨vb¨ †`k ¶gZvi jovB‡q wjß| G‡Ki ci GK †RvU Mo‡Q I fvO‡Q| wewfbœ Dcwb‡ek wb‡q ˆZwi n‡”Q AvÂwjK weev`| †`k¸‡jv wbD Iqv‡ì©i (bZyb Avwe®‹„Z A¨v‡gwiKv gnv‡`k) mv‡\_ evwYwR¨K AvwacZ¨ a‡i ivL‡Z jo‡Q| AvVv‡iv kZ‡Ki cÖ\_gva©Ry‡o d«vÝ, Bsj¨vÛ I Ab¨vb¨ †`k LÐhy‡× wjß n‡Z \_v‡K| wbDUb gviv hvIqvi cÖvq wmwKkZK c‡i hy× cy‡iv`‡g Qwo‡q c‡o| d«vÝ, Bsj¨vÛ, †¯úb I ivwkqv Bsj¨vÛ I cÖywkqvi mv‡\_ j‡o bq eQi|

1763 mv‡j d«vÝ AvZ¥mgc©Y K‡i| Aemvb nq mvZ eQ‡ii hy‡×i (hy× AvbyôvwbKfv‡e †NvwlZ nIqvi Av‡MB `yB eQi hy× n‡q wM‡qwQj)| hy‡× R‡qi gva¨‡g Bsj¨vÛ ¸iæZ¡c~Y© kw³ wn‡m‡e Avwef©~Z nq| Z‡e Zvi Rb¨ g~j¨I w`‡Z nq| d«vÝ I Bsj¨vÛ `yB †`kB wbt¯^ n‡q hvq| RR©wiZ nq F‡Yi fv‡i| `ywU †`kB Zvi cwiYwZI †fvM K‡i| N‡U wecøe| mvZ eQie¨vcx hy‡×i GK `k‡Ki wKQy c‡i ïiæ nq gvwK©b wecøe| Bsj¨vÛ nvivq Zvi me‡P‡q eo Dcwb‡ek| 1789 mv‡j RR© IqvwksUb bZyb Rb¥ †bIqv hy³iv‡óªi kvmb ïiæ K‡ib| Avi Iw`‡K ïiæ nq divwm wecøe| Pvi eQi c‡i weíexiv divwm ivRvi M`©vb †K‡U †d‡j|

M¨vmcv gÄ bv‡g GK MwYZwe` ivRvi g„Z¨`Ð Kvh©K‡ii bw\_‡Z ¯^v¶i K‡ib| M¨vmcv wQ‡jb c~Y©v½ GK R¨vwgwZK| we‡kl `¶Zv wQj wÎgvwÎK R¨vwgwZ‡Z| ¯’cwZ I cÖ‡KŠkjx‡`i feb I hš¿ wbg©vYc×wZi †cQ‡b Ae`vb wQj g‡Äi| Zviv bKkv‡K Dj¤^ I Abyf~wgK Z‡j cÖ‡¶cY (project) K‡i| e¯‘Uv‡K dzwU‡q †Zvjvi Rb¨ m¤ú~Y© Z\_¨ msiw¶Z \_v‡K †m cÖ‡¶c‡Y| mvgwiK evwnbxi Kv‡Q g‡Äi Kv‡Ri wQj we‡kl ¸iæZ¡| ZvB Kv‡Ri eo AskB wecøex miKvi ivóªxq †Mvcbxq bw\_ wn‡m‡e e¨envi K‡i| cieZ©x b¨v‡cvwjq‡bi miKviI †m aviv eRvq iv‡L|

Ru wf±i cum‡j wQ‡jb g‡Äi QvÎ| b¨v‡cvwjq‡bi evwnbx‡Z cÖ‡KŠkjx wn‡m‡e cÖwk¶Y †bIqvi mgq wZwb wÎgvwÎK R¨vwgwZ m¤ú‡K© Rvb‡Z cv‡ib| cuum‡ji `~f©vM¨: wZwb evwnbx‡ZI XyK‡jb, Avi b¨v‡cvwjqbI hvÎv Ki‡jb ivwkqvi w`‡K| GUv 1812 mv‡ji K\_v|

g‡¯‹v †\_‡K †divi c‡\_ b¨v‡cvwjq‡bi evwnbx `ywU wech©‡qi gy‡L c‡o| GKwU n‡jv KbK‡b kxZ| Av‡iKwU GKBiKg fqvbK iæk evwnbx| G‡Z evwnbx A‡bK †QvU n‡q hvq| µvmb‡qi hy‡× cum‡j‡K g„Z †f‡e mevB hy×‡¶‡Î †d‡j hvq| Z‡e gviv bv †M‡jI c‡i iæk evwnbxi nv‡Z aiv c‡ob wZwb| iæk KvivMv‡i cuP‡Z cuP‡Z cum‡j Áv‡bi bZyb GKwU kvLvi mÜvb cvb: cÖ‡¶cYg~jK R¨vwgwZ|

cum‡ji Kv‡Ri gva¨‡g c‡bi kZ‡Ki wkíx I ¯’cwZ‡`i KvR c~Y©Zv cvq| GB wkíx‡`i g‡a¨ Av‡Q wdwj‡cv eªæ‡b‡jw¯‹| Av‡Qb wjIbv‡`©v `v wfwÂ, whwb AvbycvwZK AvKvi (perspective) a‡i †i‡L ev¯Íe wPÎ AuvKvi c×wZ Avwe®‹vi K‡ib| †Kv‡bv wP‡Î "mgvšÍivj" †iLviv wgwj‡q hvIqv we›`yi w`‡K AMÖmi n‡j ch©‡e¶‡Ki Kv‡Q g‡b n‡e, †iLviv KL‡bvB wgwjZ n‡e bv| †g‡Si eM© wP‡Î cwiYZ nq UªvwcRq‡W| mewKQy g„`yfv‡e weK…Z nq| Z‡e `k©‡Ki Kv‡Q Zv cy‡ivcywi wbLyuZ jv‡M| Amxg `~‡ii we›`yi ˆewkó¨B GUv| Amx‡g Aew¯’Z GK k~b¨|

‡Rvnv‡bm †Kcjvi GB aviYvUv Kv‡R jvMv‡jb| wZwb Avwe®‹vi K‡iwQ‡jb, MÖniv Dce„ËvKvi c‡\_ P‡j| Amxg `~‡ii fvebv‡K wZwb AviI GK avc GwM‡q wb‡jb| Dce„‡Ëi (ellipse) Av‡Q `ywU †K›`ª| hv‡`i bvg †dvKvm ev Dc‡K›`ª (focus)| Dce„Ë hZ j¤^v n‡e, Dc‡K›`ªiv \_vK‡e ZZ `~‡i| me Dce„‡ËiB Av‡Q G ˆewkó¨| aiæb Avcbvi Kv‡Q Dce„ËvKvi GKwU `c©Y (Avqbv) Av‡Q| Gi GKwU Dc‡K‡›`ª GKwU evwZ ewm‡q Zvi Av‡jv¸‡jv Av‡iK Dc‡K‡›`ª wgwjZ n‡e| Dce„Ë hZ j¤^vB †nvK G e¨vcviUv NU‡eB (wPÎ 29)|

g‡b g‡b †Kcjvi Dce„Ë‡K A‡bK j¤^v Ki‡jb| Dc‡K›`ª`ywU‡K wb‡q †M‡jb A‡bK A‡bK `~‡i| Gici Kíbv Ki‡jb, GKwU AciwU †\_‡K Amxg `~‡i| wØZxq Dc‡K›`ª Amx‡gi GK we›`y| nVvr Dce„Ë n‡q †Mj cive„Ë (parabola)| Av‡Mi †h †iLviv GKwU we›`y‡Z wgwjZ n‡jv Zviv GLb n‡q †Mj mgvšÍivj| cive„ËI ZvB Ggb GK Dce„Ë, hvi GKwU Dc‡K›`ª Av‡Q Amx‡g (wPÎ 30)|

wPÎ 29: Dce„‡Ëi †fZ‡i Av‡jvKiwk¥

GKwU d¬¨vkjvBU w`‡q Avcwb GUv mn‡RB †`L‡Z cvi‡eb| GKwU AÜKvi K‡¶ hvb| †`qv‡ji Kv‡Q Kv‡Q `uvwo‡q †mvRv Av‡jv †djyb Zv‡Z| my›`i GKwU †Mvj e„Ë †`L‡Z cv‡eb| †`qv‡j cÖ‡¶wcZ Av‡jv ˆZwi K‡i‡Q G e„Ë| Gevi jvB‡Ui gv\_v GKUy K‡i Ic‡i DVv‡Z \_vKzb (wPÎ 31)| †`L‡eb, e„Ë j¤^v n‡q µ‡gB eo †\_‡K AviI eo Dce„Ë n‡q hv‡”Q| Gici nVvr †`L‡eb, Dce„Ë †bB Avi| n‡q †M‡Q cive„Ë| d‡j †Kcjv‡ii Amx‡gi we›`y †\_‡K †`Lv †Mj, cive„Ë Ges Dce„Ë Avm‡j GKB| Gi gva¨‡g m~Pbv nq cÖ‡¶cYg~jK R¨vwgwZi| MwYZwe`iv GLv‡b †`‡Lb R¨vwgwZK AvK…wZi Qvqv I cÖ‡¶cY| Gi gva¨‡g Rvbv hvq eû ¸ß mZ¨| †h mZ¨ Dce„Ë Avi cive„‡Ëi mgZyj¨Zvi †P‡q kw³kvjx| Z‡e mewKQyB wbf©i K‡i Amx‡g Aew¯’Z we›`y‡K †g‡b †bIqvi g‡a¨|

wPÎ 30: Dce„Ë‡K eo Ki‡jB cvIqv hvq cive„Ë

wPÎ 31: Av‡jv †R¡‡j Dce„Ë I cive„Ë †`Lv hvq

wRivi †WRvM© wQ‡jb m‡Zi kZ‡Ki divwm ¯’cwZ| cÖ‡¶cYg~jK R¨vwgwZi cÖv\_wgK GK AMÖbvqK wZwb| Amx‡gi we›`y Kv‡R jvwM‡q wZwb A‡bK¸‡jv ¸iæZ¡c~Y© bZyb Dccv`¨ cÖgvY K‡ib| Z‡e †WRv‡M©i mnKg©xiv Zuvi †jLvi A‡bK kã eyS‡Z cv‡ibwb| d‡j a‡i wb‡qwQ‡jb, †jvKUv m¤¢eZ cvMj n‡q †M‡Q| e¨wZµgI Av‡Q| †eøR c¨vm‡Kjmn wKQy MwYZwe` †WRv‡M©i KvR GwM‡q wb‡qwQ‡jb| Z‡e gvbyl Zv fy‡j hvq|

Ru wf±i cum‡ji Kv‡Q Gm‡ei †Kv‡bv ¸iæZ¡ wQj bv| g‡Äi QvÎ wn‡m‡e cum‡j †Kv‡bv wPÎ‡K `ywU Z‡j cÖw¶ß Kivi †KŠkj wk‡LwQ‡jb| Avi hy×e›`x wn‡m‡e nv‡Z wQj cÖPyi Aemi mgq| KvivMv‡i e›`x \_vKvi mgq wZwb Amx‡gi we›`y cybivq Avwe®‹vi K‡ib| G‡K †Rvov †`b g‡Äi Kv‡Ri mv‡\_| Gi gva¨‡g n‡q hvb cÖ\_g cÖ‡¶cYg~jK R¨vwgwZK| ivwkqv †\_‡K †divi mgq †m †`‡ki GKwU A¨vevKvm m‡½ wb‡q Av‡mb| mg‡qi Zyjbvq hw`I †mUv cyi‡bv GK A™¢~Z hš¿| hvB †nvK, Gi gva¨‡gB wZwb cÖi‡¶cYg~jK R¨vwgwZ‡K DuPy wk‡íi ch©v‡q wb‡q hvb7| Z‡e cum‡ji aviYvB Ki‡Z cv‡ibwb, cÖ‡¶cYg~jK R¨vwgwZ k~‡b¨i inm¨gq ˆewkó¨ †ei K‡i Avb‡e| KviY Gi Rb¨ wØZxq Av‡iKwU ¸iæZ¡c~Y© AMÖMwZ ZLbI cÖ‡qvRb| †mwU n‡jv RwUj4 (msL¨vi) Zj| auvauvi G As‡ki Rb¨ Avgv‡`i‡K wd‡i †h‡Z n‡e Rvg©vwb‡Z|

Kvj© wd«`wiP MvD‡mi Rb¥ 1777 mv‡j| Aí eq‡mB †gavi ¯^v¶i ivLv ïiæ K‡ib wZwb| MwY‡Zi c\_Pjv ïiæ nq KvíwbK msL¨vi KvR w`‡q| Zuvi wcGBPwW w\_wm‡mi welq wQj exRMwY‡Zi †gŠwjK Dccv‡`¨i cÖgvY| n Nv‡Zi eûc`xi n msL¨K g~j (mgvavb) Av‡Q| †hgb wØNvZ mgxKi‡Yi `ywU, wÎNvZ mgxKi‡Yi wZbwU, PZyN©vZ mgxKi‡Yi PviwU BZ¨vw`| GUv mZ¨ n‡e ev¯Íe g~‡ji cvkvcvwk KvíwbK msL¨v‡KI g~j wn‡m‡e †g‡b wb‡j|

RxebRy‡o MvDm bvbvb wel‡qi Ici KvR K‡i‡Qb| eµZv wb‡q Zuvi KvR AvBb÷vB‡bi Av‡cw¶KZvi mvwe©K Z‡Ë¡i ¸iæZ¡c~Y© Dcv`vb| Z‡e RwUj msL¨v‡K †jLwP‡Î Dc¯’vc‡bi gva¨‡gB MvDm MwY‡Zi bZyb GKwU KvVv‡gv †ei K‡i Av‡bb|

1830-Gi `kK ZLb| cÖwZwU RwUj msL¨v‡K (‡hgb - 3 + 2i) Kv‡Z©mxq Q‡K cÖ`k©b Kiv hvq| RwUj msL¨vi ev¯Íe Ask‡K (-3) Abyf~wgK I KvíwbK Ask‡K Dj¤^ A‡¶ (2) emv‡bv hvq (wPÎ 32)| G KvVv‡gvi bvg RwUj Zj| mij G KvVv‡gvB msL¨v‡`i f~wgKv m¤ú‡K© A‡bK K\_v e‡j w`j| †hgb aiæb i msL¨vwU| i I x-A‡¶i g‡a¨ †KvY 90 wWwMÖ (wPÎ 33)| i-‡K eM© Ki‡j Kx n‡e? msÁv Abymv‡i, i2= - 1, hvi mv‡\_ x-A‡¶i †KvY 180 wWwMÖ (mij †iLv)| gv‡b †KvY wØ¸Y n‡q‡Q| i3-Gi gvb -i| x-A‡¶i mv‡\_ †KvY 270 wWwMÖ| †KvY n‡q‡Q wZb¸Y| i4 -Gi gvb 1| 360 wWwMÖ Ny‡iwQ| g~j †Kv‡Yi Pvi¸Y (wPÎ 34)| GUv †Kv‡bv KvKZvjxq e¨vcvi bq| †h‡Kv‡bv RwUj msL¨v wb‡q Gi †KvY gvcyb| †Kv‡bv msL¨vi NvZ n ch©šÍ evov‡bv Avi Gi †KvY‡K n w`‡q ¸Y †`Iqv GKB K\_v| msL¨vUvi NvZ evov‡Z \_vK‡j GwU †cuwP‡q †fZ‡i ev evB‡ii w`‡K †h‡Z \_vK‡e| †mUv wbf©i Ki‡e msL¨vUv GKK e„‡Ëi (g~jwe›`y‡Z e¨vmva© GK GKK wewkó e„Ë) †fZ‡i bvwK evB‡i Zvi Ici (wPÎ 35)| RwUj Z‡j ¸Y I m~PK †cj R¨vwgwZK aviYv| e¨vcvi¸‡jv NU‡Z †`Lv hv‡”Q †Pv‡Li mvg‡b| GUvB wQj wØZxq eo AMÖMwZ|

wPÎ 32: RwUj Zj

wPÎ 33: 90 wWwMÖ‡Z i-Gi Ae¯’vb

wPÎ 34: i-Gi wewfbœ NvZ

G fvebv¸‡jv‡K †Rvov †`b MvD‡mi QvÎ RK© wd«`wiP evb©vU wigvb| wigvb cÖ‡¶cYg~jK R¨vwgwZ‡K RwUj msL¨vi mv‡\_ GKxf~Z K‡ib| Avi G‡ZB nVvr †iLviv n‡q †Mj e„Ë| Avi e„Ëiv †iLv| Avi k~b¨ I Amxg n‡q †Mj msL¨v w`‡q fwZ© †Mvj‡Ki `yB wecixZ †giæ|

wPÎ 35: GKK e„‡Ëi †fZ‡i I evB‡i c¨uvP

wigvb RwUj Z‡ji Ici GKwU Av‡jvK-‡f`¨ †MvjK Kíbv Ki‡jb| `w¶Y †giæ k~b¨‡K ¯úk© K‡i Av‡Q| aiæb D‡ëv cv‡ki DËi †giæ‡Z GKwU ¶y`ª Av‡jv ivLv n‡jv| G‡Z K‡i †Mvj‡K AuvKv †h‡Kv‡bv wP‡Îi Qvqv co‡e wb‡Pi Z‡j| `yB †giæi gv‡S Av‡Q welye‡iLv| Gi †iLvi `v‡Mi Qvqv n‡e g~jwe›`yi mv‡c‡¶ GKwU e„Ë| `w¶Y †Mvjv‡a©i †h-‡Kv‡bv Qwei Qvqv co‡e e„‡Ëi †fZ‡i| Avi DËi †Mvjv‡a©i Qvqv¸‡jv n‡e e„‡Ëi evB‡i (wPÎ 36)| g~jwe›`y (0) Av‡Q `w¶Y †giæ‡Z| RwUj Z‡j †Mvj‡Ki cÖwZwU we›`yiB Qvqv co‡e| d‡j †Mvj‡Ki cÖwZwU we›`yB Z‡ji Qvqvi mgZyj¨| Avevi Z‡ji cÖwZwU e„ËB †Mvj‡Ki e„‡Ëi †Kv‡bv e„‡Ëi Qvqv| †Mvj‡Ki e„‡Ëi wecix‡Z Av‡Q Z‡ji e„Ë| Z‡e e¨wZµg Av‡Q GKwU|

aiæb GKwU e„Ë †Mj †Mvj‡Ki DËi †giæi Ici w`‡q| Gi Qvqv wKš‘ e„Ë bq| GKwU †iLv| DËi †giæ †hb †Kcjvi I cum‡ji KwíZ Amx‡gi we›`y| Z‡j Aew¯’Z †iLv †Mvj‡Ki DËi †giæ w`‡q hvIqv e„Ë Qvov wKQyB bq| Amx‡gi we›`y (wPÎ 37)|

wPÎ 36: wÎgvwÎK †Mvj‡Ki Qvqv wØgvwÎK Z‡j cÖ‡¶cY (‡÷wiIMÖvwdK †cÖv‡RKkb)

wigvb ey‡S †dj‡jb, (Amx‡gi we›`ymn) RwUj Zj Avi †MvjK Avm‡j GKB| Gevi MwYZwe`iv †`L‡jb †Mvj‡Ki N~Y©b I weK…wZi g‡a¨B jywK‡q Av‡Q ¸Y, fvMmn Ab¨vb¨ RwUj MvwYwZK Acv‡ikb| †hgb i w`‡q ¸Y Kiv Avi †MvjK‡K Nwoi KuvUvi D‡ëv w`‡K 90 wWwMÖ Nywi‡q †`Iqv GKB K\_v| GKwU msL¨v x wbb| G‡K cv‡ë wjLyb (x – 1)/ (x + 1)| GUv Kiv Avi m¤ú~Y© †MvjK‡K 90 wWwMÖ Nywi‡q †`Iqv GKB K\_v| hvi d‡j DËi I `w¶Y †giæ \_vK‡e welye †iLvq (wPÎ 38, 39 I 40)| Z‡e me‡P‡q gRvi wRwbm †`Lv hvq GKwU msL¨v x wb‡q G‡K 1/x w`‡q cv‡ë w`‡j| Gi gva¨‡g †MvjKUv cy‡ivcywi D‡ë hvq| DciUv wb‡P Avi wbPUv Dc‡i| GK K\_vq `c©YwPÎ| DËi †giæ n‡q †Mj `w¶Y †giæ Avi `w¶Y †giæ DËi| k~b¨ n‡q †Mj Amxg Avi Amxg k~b¨| †Mvj‡Ki R¨vwgwZUvB Ggb| 1/∞= 0 Ges 1/0 = ∞| Amxg Avi k~b¨ wigvb †Mvj‡Ki wecixZ †giæ| Avi Giv G‡K Ac‡ii RvqMvq †h‡Z cv‡i gyn~‡Z©i g‡a¨| Zv‡`i kw³ mgvb I wecixZ|

wPÎ 37: †iLv I e„Ë GKB wRwbm

RwUj Z‡ji me¸‡jv msL¨v‡K `yB w`‡q ¸Y Kiæb| KvRUv †hb Ggb: Avcbvi nvZUv `w¶Y †giæ‡Z ivL‡jb, Gici †Mvj‡Ki Ic‡ii ivev‡ii GKwU AveiY‡K `w¶Y †giæ †\_‡K †U‡b DËi †giæi w`‡K wb‡q †M‡jb| A‡a©K (1/2) w`‡q ¸Y Kivi cÖfve Gi wecixZ| Gi gv‡b n‡jv iveviUv‡K DËi †giæ †\_‡K `w¶Y †giæi w`‡K wb‡q Avmv| Amxg w`‡q ¸Y Kiv gv‡b `w¶Y †giæ‡Z myuB dzwU‡q †`Iqv; meUyKz ivevi D‡ë wM‡q Dc‡ii DËi †giæi w`‡K P‡j hv‡e| †h‡Kv‡bv wKQy‡K Amxg w`‡q ¸Y Ki‡j Amxg Av‡m| k~b¨ w`‡q ¸Y Kiv gv‡b DËi †giæ‡Z myuB dzwU‡q †`Iqv| mewKQy G‡m Rgv n‡e `w¶Y †giæ‡Z| †h‡Kv‡bv wKQy‡K k~b¨ w`‡q ¸Y Ki‡j k~b¨B nq| Amxg Avi k~b¨ mgvb I wecixZ| Avi mgvbfv‡e aŸsmvZ¥K|

wPÎ 38: wigvb †MvjK

wPÎ 39: i w`‡q iƒcvšÍwiZ wigvb †MvjK

wPÎ 40: (x – 1)/ (x + 1) w`‡q iƒcvšÍwiZ wigvb †MvjK

k~b¨ Avi Amxg me msL¨v‡K MÖvm K‡i †bIqvi GK AbšÍ msMÖv‡g wjß| gvwb a‡g©i `yt¯^‡cœi g‡Zv `yB‡qi Ae¯’vb msL¨v‡Mvj‡Ki `yB †giæ‡Z| ¶y`ª eø¨vK‡nv‡ji g‡Zv wMj‡Q msL¨v‡`i| msL¨vi Zj †\_‡K †h‡Kv‡bv msL¨v wbb| †hgb aiæb wbjvg i/2| G‡K eM© Kiæb| Nb Kiæb| NvZ Pvi Kiæb| cuvP, Qq, mvZ| ¸Y Ki‡Z \_vKzb| GwU †cuwP‡q µ‡gB k~‡b¨i w`‡K hv‡”Q| †hfv‡e cvwb Movq †Wª‡bi w`‡K| msL¨vUv 2i n‡j Kx nZ? wVK D‡ëv| G‡K eM© Kiæb| Nb Kiæb| NvZ Pvi Kiæb| GUv †cuwP‡q evB‡ii w`‡K hv‡”Q (wPÎ 41)| Z‡e msL¨v‡Mvj‡K `yB Kvf© G‡K Ac‡ii bKj| G‡K Ac‡ii `c©Y wPÎ (wPÎ 42)| RwUj Z‡ji me msL¨vi GKB fvM¨ eiY Ki‡Z nq| k~b¨ I Amx‡gi w`‡K Giv GwM‡q hvq AcÖwZ‡iva¨ Dcv‡q| G‡`i †\_‡K †eu‡P \_v‡K ¸wUK‡qK msL¨v| hv‡`i `~iZ¡ `yB cÖwZØ›Øx †\_‡K mgvb `~‡i| †h msL¨viv Av‡Q welye‡iLvq| GB †hgb 1, (-1) I i| k~b¨ I Amx‡gi `wo Uvbv †Ljvq Giv welye‡iLvi Pvicv‡k AbšÍKvj cvK †L‡Z \_v‡K| gy³ n‡Z cv‡i bv †KvbwUiB eÜb †\_‡K| (K¨vjKz‡jU‡iI Avcwb GUv hvPvB K‡i †`L‡Z cv‡ib| G‡Z †h‡Kv‡bv GKwU msL¨v emvb| G‡K eM© Kiæb| Avevi Kiæb| Avevi| GwU µ‡gB Amxg ev k~‡b¨i w`‡K P‡j hv‡e| e¨wZµg n‡jv 1 I (-1)| GLv‡b ïiæ Ki‡j †bB †Kv‡bv MwZ|

Amxg k~b¨

Avgvi ZË¡ cv\_‡ii g‡Zv `„p| Gi cÖwZ †Quvov cÖwZwU Zxi D‡ëv w`‡K Ny‡i wd‡i hv‡e Zxi›`v‡Ri w`‡K| Avwg Kxqv‡fe Zv Rvwb? Avwg GUv wb‡q c‡owQ| Lyu‡RwQ Gi wkK‡oi mÜvb| mZ¨B ej‡Z, m„ó wRwb‡mi g‡a¨ cÖ\_g Ae¨\_© wRwbm GUv|

-- RK© K¨v›Ui

Amxg \_vKj bv Avi AZxw›`ªq| GUv n‡q †Mj mvaviY GK msL¨v8| cÖ¯‘Z we‡køl‡Yi Rb¨| MwYZwe`ivI `ªæZB G‡K wb‡q KvR ïiæ Ki‡jb| Z‡e Amx‡gi Mfxi †\_‡K msL¨vi wekvj ivR¨ †\_‡K k~b¨‡K evievi D`q n‡Z †`Lv †Mj| AviI fqvbK K\_v n‡jv, Amxg wb‡RB k~b¨ n‡Z cv‡i|

wPÎ 41: Z‡ji g‡a¨ c¨uvP †L‡q †fZ‡i I evB‡i hvIqv

wPÎ 42: †Mvj‡Ki g‡a¨ Amxg I k~b¨ G‡K Ac‡ii `c©Y-wPÎ|

wigvb †`L‡jb, RwUj Zj Avm‡j GKwU †MvjK| Zvi Av‡Mi cyi‡bv w`‡b 1/x-Gi g‡Zv dvskb¸‡jv fvebvq †d‡jwQj MwYZwe`‡`i| x k~‡b¨i w`‡K †M‡j 1/x eo n‡Z \_v‡K| †kl ch©šÍ Amx‡g wM‡q we‡ùvwiZ nq| Amxg ch©šÍ hvIqv‡K cy‡ivcywi MÖnY‡hvM¨ K‡i †Zv‡jb wigvb| KviY, †Mvj‡Ki Ic‡ii Avi `kUv we›`yi g‡ZvB AmxgI GKwU we›`y| Amxg‡K fq cvIqvi w`b †kl| mwZ¨ ej‡Z, MwYZwe`iv we‡kølY K‡i K‡i dvsk‡bi we‡ùvwiZ n‡q hvIqv we›`y¸‡jv‡K Avjv`v Ki‡Z ïiæ Ki‡jb| G we›`y¸‡jvi bvg wms¸jvwiwU ev Abb¨Zv (singularity)|

1/x Kv‡f©i wms¸jvwiwU cvIqv hv‡e x = 0 we›`y‡Z| LyeB mij GK wms¸jvwiwU, hv‡K MwYZwe`iv bvg †`b †giæ (pole)| Ab¨ ai‡bi wms¸jvwiwUI Av‡Q| †hgb sin(1/x) Kv‡f©i Acwinvh© wms¸jvwiwU Av‡Q x = 0 we›`y‡Z| Acwinvh© wms¸jvwiwUiv GK A™¢yZ `vbe| G ai‡bi wms¸jvwiwUi KvQvKvwQ RvqMvq Kvf© cvM‡ji g‡Zv AvPiY K‡i| wms¸jvwiwUi KvQvKvwQ †M‡j Kvf©Uv µ‡gB `ªæZ †\_‡K `ªæZZi ¯úw›`Z n‡Z \_v‡K| GKevi abvZ¥K †Zv Avevi FYvZ¥K—Pj‡Z \_v‡K Gfv‡e| wms¸jvwiwUi me‡P‡q ¶y`ª `~i‡Z¡ Kvf© Kíbv‡hvM¨ me gvbB MÖnY Ki‡Z \_v‡K| wms¸jvwiwUi AvPiY GZUv A™¢yZ g‡b n‡jI MwYZwe`‡`i Kv‡Q Zv Avi inm¨ \_vKj bv| Zuviv Amxg‡K e¨e‡”Q` Kivi Dcvq †R‡b †d‡j‡Qb|

‡m KvRwUi bvqK RK© K¨v›Ui| Rb¥ 1845 mv‡j ivwkqvq| Z‡e Rxe‡bi †ewkifvM †K‡U‡Q Rvg©vwb‡Z| †h f~wg MvDm I wigv‡bi ¯§„wZweRwoZ| Avi G Rvg©vwb‡ZB Amx‡gi inm¨ D‡b¥vwPZ nq| `yf©v‡M¨i e¨vcvi, GB Rvg©vwb‡ZB evm Ki‡Zb wjI‡cvì †µv‡bKv| hvi †nb¯’vi wkKvi n‡q K¨v›U‡ii ¯’vb nq gvbwmK wPwKrmvj‡q|

K¨v›Ui I †µv‡bKvi Ø‡›Øi g~j KviY Amxg wb‡q GKwU aviYv| GKwU auvauvi gva¨‡g aviYvwU †evSv hvq| aiæb GKwU †÷wWqv‡g A‡bK gvby‡li mgvMg n‡q‡Q| Avcwb Rvb‡Z Pvb, †÷wWqv‡g wmU †ewk bvwK Avmb †ewk, bvwK `y‡UvB mgvb| GUv Rvbvi GKwU Dcvq n‡jv gvbyl I Avm‡bi msL¨v ¸‡Y †djv| Gici `yB msL¨v Zyjbv Ki‡jB n‡jv| Z‡e Zv‡Z mgq jvM‡e A‡bK| A‡bK fvj Av‡iKwU Dcvq Av‡Q| mevB‡K Avm‡b e‡m †h‡Z ejyb| Lvwj Avmb †`Lv †M‡j gvby‡li msL¨v Avm‡bi †P‡q Kg n‡e| Avi gvbyl‡K `uvwo‡q \_vK‡Z †`Lv †M‡j eyS‡Z n‡e, Avm‡bi †P‡q gvbyl †ewk| †Kv‡bv Avmb Lvwj \_vK‡j Ges †KD `uvwo‡q bv \_vK‡j gvbyl Avi Avm‡bi msL¨v mgvb|

K¨v›Ui †KŠkjUv‡K AviI mvwe©K iƒc †`b| msL¨vi `ywU †m‡Ui AvKvi GKB n‡e hw` GKwU †mU‡K Av‡iKwU †m‡Ui Ici ewm‡q †`Iqv hvq Ges †KD evwK bv \_v‡K| †hgb {1, 2, 3} I {2, 4, 6} †mU `ywUi AvKvi GKB| KviY GKwU‡K Av‡iKwUi Ici wbLyuZfv‡e ewm‡q †`Iqv hv‡e| †Kv‡bv Avmb evwK \_vK‡e bv| evwK \_vK‡e bv †Kv‡bv msL¨vI|

1 2 3

| | |

2 4 6

wKš‘ {2, 4, 6, 8} †mUwUi AvKvi Avjv`v| KviY GLv‡b 8 wmUwU duvKv c‡o Av‡Q|

1 2 3

| | |

2 4 6 8

Z‡e Amxg †mU wb‡q KvR Ki‡Z †M‡j e¨vcviUv gRvi n‡q I‡V| ¯^vfvweK msL¨vi †mUwUB aiæb: {1, 2, 3, „}| wbtm‡›`‡n †mUUv wb‡Ri mgvb| mevB‡K wb‡Ri Ici ewm‡q w`‡j n‡jv|

1 2 3 4 5 ...

| | | | | ...

1 2 3 4 5 ...

GLv‡b †Kv‡bv jy‡KvPywi †bB| me †mUB wb‡Ri mgvb| wKš‘ †mU †\_‡K wKQy msL¨v mwi‡q w`‡j Kx n‡e? GB †hgb mwi‡q w`jvg 1-‡K| A™¢yZ e¨vcvi n‡jv 1-‡K mwi‡q w`‡jI †m‡Ui AvKvi cwieZ©b nq bv| Avmbweb¨vm GKUy cv‡ë wb‡jB me msL¨vi Rb¨ GKUv K‡i Avmb cvIqv hvq| Avi me Avm‡bB msL¨v †`Iqv hvq|

1 2 3 4 5 ...

| | | | | ...

2 3 4 5 6 ...

‡m‡Ui AvKvi GKB| hw`I Avgiv GKwU msL¨v Kwg‡q w`‡qwQ| Avm‡j Avgiv AmxgmsL¨K msL¨v‡K mwi‡q w`‡Z cvwi| Avgiv me¸‡jv †e‡Rvo msL¨v‡K mwi‡q w`‡Z cvwi| †m‡Ui AvKvi ZvI AcwiewZ©Z \_vK‡e| GLbI me msL¨vi Rb¨ Avmb \_vK‡e, Avi me Avm‡b msL¨v \_vK‡e|

0 2 4 6 8 10 ...

| | | | | | ...

0 1 2 3 4 5 ...

GUvB Avm‡j Amx‡gi msÁv| GUv †\_‡K KvD‡K we‡qvM Ki‡j AvKvi GKB \_v‡K| †e‡Rvo msL¨v, †Rvo msL¨v, c~Y©msL¨v meviB AvKvi mgvb| K¨v›Ui G‡`i‡K cÖKvk K‡iwQ‡jb ℵo w`‡q| ℵ (Av‡jd) n‡jv wneªæ eY©gvjvi cÖ\_g A¶i (Aviwe fvlvq hv Avwjd)| G‡`i AvKvi MYbvevPK msL¨vi mgvb e‡j ℵo Gi mgvb AvKv‡ii †mU‡K MYbv‡hvM¨ (countable) ejv nq (Aek¨ ev¯Í‡e G‡`i‡K ¸‡b †kl Kiv hv‡e bv| †mUv Ki‡Z n‡j PvB Amxg mgq|) g~j` (rational) msL¨viv (hv‡`i‡K a/b fMœvsk AvKv‡i †jLv hvq, †hLv‡b a I b c~Y©msL¨v) wQj MYbv‡hvM¨| GUv Ki‡ZI K¨v›Ui‡K eyw× †ei Ki‡Z n‡qwQj| g~j` msL¨v‡`i Zv‡`i cÖK…Z Avm‡b ewm‡q K¨v›Ui †`Lvb, GivI ℵo AvKv‡ii †mU (‡`Lyb cwiwkó N)|

Z‡e wc\_v‡Mvivm Av‡MB †`wL‡q‡Qb, g~j` msL¨vivB me bq| Z\_vKw\_Z ev¯Íe msL¨vi g‡a¨ Av‡Q g~j` I Ag~j` `yB ai‡bi msL¨vB| K¨v›Ui Avwe®‹vi K‡ib, ev¯Íe msL¨vi †mU g~j` msL¨vi †mU †\_‡K A‡bK A‡bK eo| †hgb Avgv‡`i Avmbweb¨vm Ggb n‡Z cv‡i:

Avmb ev¯Íe msL¨v

1 0.3125123

2 0.7843122

3 0.9999999

4 0.6261000

5 0.2671123

K¨v›Ui †KŠkjUv †c‡jb G ZvwjKvi evB‡ii GKwU ev¯Íe msL¨v ˆZwi Ki‡Z wM‡q| cÖ\_g msL¨vi cÖ\_g A‡¼i w`‡K †Lqvj Kiæb (`kwg‡Ki Av‡Mi k~b¨‡K ev` w`‡q| 0 mevi Av‡MB Av‡Q, bv w`‡jI msL¨v GKB \_v‡K|)| Avgv‡`i D`vni‡Y A¼Uv 3| Avgv‡`i bZyb msL¨v cÖ\_g msL¨vi mgvb n‡j 3 w`‡q ïiæ nZ| Avgiv †mUv mn‡RB Gwo‡q †h‡Z cvwi| aiæb Avgv‡`i bZyb msL¨vi cÖ\_g A¼ n‡e 2| Av‡Mi msL¨v 3 w`‡q ïiæ Avi Avgv‡`i bZyb msL¨v 2 w`‡q ïiæ e‡j Avgiv Rvwb msL¨v `ywU Avjv`v n‡eB| (G K\_vqI duvK Av‡Q| †hgb 0.3000„ = 0.2999„| A‡bK g~j` msL¨v‡KB `yBfv‡e †jLv hvq| Z‡e GUv †MŠY e¨vcvi| AvcvZZ Avgiv G e¨wZµg D‡c¶v Kie|9)

wØZxq msL¨vq Avwm| Avgiv Kxfv‡e wbwðZ ne †h bZyb msL¨vUv wØZxq msL¨v †\_‡KI Avjv`v n‡e? Avgiv bZyb msL¨vi cÖ\_g A¼ wb‡q wb‡qwQ| GLb Avi †m KvR Kiv hv‡e bv| Z‡e GKBiKg eyw× Kiv hv‡e| wØZxq msL¨vi wØZxq A¼ 8| Avgiv 8-Gi e`‡j bZyb msL¨v 7 wb‡jB bZyb msL¨v wfbœ n‡q hv‡e| Gfv‡e Pj‡Z Pj‡Z ZvwjKvi wb‡Pi w`‡K †h‡Z \_vwK| Z„Zxq msL¨vi Z„Zxq A¼ cv‡ë †be| PZy\_© msL¨vi PZy\_© A¼| Gfv‡eB Pj‡e|

Avmb

ev¯Íe msL¨v

bZyb msL¨vi Rb¨ A¼

1

0.3125123

2

2

0.7843122

7

3

0.9999999

8

4

0.6261000

0

5

0.2671123

0

d‡j Avgv‡`i bZyb msL¨v n‡e 0.27800...|

GUv cÖ\_g msL¨v †\_‡K Avjv`v (cÖ\_g A‡¼ Awgj)|

GUv wØZxq msL¨v †\_‡K Avjv`v (wØZxq A‡¼ Awgj)|

GUv Z„Zxq msL¨v †\_‡K Avjv`v (Z„Zxq A‡¼ Awgj)|

GUv PZy\_© msL¨v †\_‡K Avjv`v (PZy\_© A‡¼ Awgj)|

GUv cÂg msL¨v †\_‡K Avjv`v (cÂg A‡¼ Awgj)|

Gfv‡e KY© eivei wM‡q Avgiv bZyb GKwU msL¨v evbvjvg| Gfv‡e evbv‡bvq wbwðZ n‡jv msL¨vUv ZvwjKvi me msL¨v †\_‡K Avjv`v| ZvwjKvi me msL¨v †\_‡K Avjv`v n‡j GUv ZvwjKvq \_vK‡Z cv‡i bv| Z‡e Avgiv B‡Zvg‡a¨ a‡i wb‡qwQ, Avgv‡`i ZvwjKvq me ev¯Íe msL¨v Av‡Q| KviY Avmbweb¨vm wQj wbLyuZ| wKš‘ GLb ˆZwi n‡jv Am½wZ| wbLyuZ Avmbweb¨v‡mi Aw¯ÍZ¡B †bB|

ev¯Íe msL¨viv g~j` msL¨vi †P‡q eo Amxg| G ai‡bi Amx‡gi Rb¨ cÖZxK eivÏ n‡jv ℵ1| cÖ\_g AMYbv‡hvM¨ (uncountable) Amxg| (cvwifvwlKfv‡e ev¯Íe †iLvi Amx‡gi cÖZxK wQj C (continuum infinity ev Amxg ci¤úiv)| Avm‡jB C-B ℵ1 wKbv Zv Rvbvi Rb¨ MwYZwe`iv eû eQi mvabv K‡ib| G auvauvi bvg Z\_vKw\_Z ci¤úiv AbyKí (continuum hypothesis)| 1963 mv‡j MwYZwe` cj †Kv‡nb cÖgvY K‡ib, AbyKíwU‡K fyj ev mwVK †Kv‡bvUvB cÖgvY Kiv m¤¢e bq| GUv cÖgvY Ki‡Z Kv‡R jvMv‡bv †Mv‡`‡ji Am¤ú~Y©Zv Dccv`¨ (Gödel's incompleteness theorem)| eZ©gv‡b †ewkifvM MwYZwe` ci¤úiv AbyK‡í mZ¨ g‡b K‡ib| Z‡e †KD Avevi A-K¨v›Uixq Amxg msL¨vi Av‡jvPbvq ci¤úiv AbyKí‡K fyj g‡b K‡ib|) K¨v›U‡ii g‡b wQj AmxgmsL¨K Amxg| G‡`i‡K ejv nq UªvÝdvBbvBU bv¤^vi| GK Amxg †m‡Ui †fZi Av‡iK Amxg †mU| ℵ1 eo ℵo-Gi †P‡q| ℵ2 Avevi eo ℵ1-Gi †P‡q| ℵ2-Gi †P‡q eo ℵ3 BZ¨vw`| mevi Ic‡i Av‡Q P~ovšÍ Amxg| hv MÖvm K‡i Av‡Q Ab¨ me Amxg‡K| Ck¦i, whwb mKj Dcjwäi D‡aŸ©|

Z‡e K¨v›U‡ii `~f©vM¨| Ck¦‡ii aviYv mevi Kv‡Q GK wQj bv| wjI‡cvì †µv‡bKv wQ‡jb evwj©b wek¦we`¨vj‡qi bvgKiv Aa¨vcK| GKBmv‡\_ K¨v›U‡ii wk¶K| †µv‡bKv g‡b Ki‡Zb, Ck¦i KL‡bvB wekªx Ag~j` msL¨v‡K Aw¯ÍZ¡ †`‡eb bv| Avi µ‡gB eo nIqv G‡Ki †fZi Ab¨ Amx‡gi †Zv my‡hvMB †bB| Zuvi g‡Z, c~Y©msL¨vivB Ck¦‡ii weï×Zvi cÖZxK| Avi Ag~j` I A™¢yZ †m‡Uiv N„wYZ e¯‘| hv gvby‡li ÎæwUc~Y© wPšÍvi dmj| Avi K¨v›U‡ii UªvÝdvBbvBU bv¤^vi Gi g‡a¨ me‡P‡q Lvivc e¯‘|

‡µv‡bKv K¨v›U‡ii cÖwZ Pig wei³ nb| ïiæ K‡ib Zxeª AvµgY| K¨v›U‡ii M‡elYv cÖKvk Kiv‡K K‡i †Zv‡jb KwVb| 1883 mv‡j K¨v›Ui evwj©b wek¦we`¨vj‡qi GKwU c‡`i Rb¨ Av‡e`b K‡ib| Zuv‡K †mLv‡b †bIqv nqwb| c‡i wZwb Aa¨vcbvi PvKwi †bb Zyjbvg~jK wb¤œgv‡bi n¨vwj wek¦we`¨vj‡q| g‡b Kiv nq, evwj©‡bi cÖfvekvjx e¨w³ †µv‡bKv-B G Rb¨ `vqx| GKB eQi wZwb †µv‡bKvi Avµg‡Yi Reve †`b| Gici Av‡m 1884 mvj| K¨v›Ui gvbwmK wech©‡qi me©‡kl av‡c †cuŠ‡Q hvb|

Z‡e K¨v›U‡ii Rb¨ ¯^všÍ¡bvi e¨vcvi n‡jv, ZuviB KvR †mU w\_Iwi bv‡g MwY‡Zi bZyb GKwU kvLvi wfwË iPbv K‡i †`q| †mU ZË¡ w`‡q MwYZwe`iv GK`g k~b¨ †\_‡K Avgv‡`i Rvbv me msL¨v ˆZwi Ki‡Z cv‡ib| ïay ZvB bq, ˆZwi Kiv hvq Av‡M †kvbv hvqwb Ggbme msL¨vI| AmxgmsL¨K Amxg| hv‡`i‡K mvaviY msL¨vi g‡ZvB Ab¨ Amx‡gi mv‡\_ †hvM, we‡qvM, ¸Y, fvM Kiv hvq| K¨v›Ui msL¨vi bZyb GK gnvwek¦ Db¥y³ K‡i w`‡jb| Rvg©vb MwYZwe` WvwfU wnjevU© e‡jwQ‡jb, "Avgv‡`i‡K K¨v›U‡ii ˆZwi Kiv ¯^M© †\_‡K †KD Zvov‡Z cvi‡e bv|" wKš‘ ZZw`‡b eÇ †`wi n‡q †M‡Q| K¨v›U‡ii evwK Rxeb Kv‡U gvbwmK †K‡›`ª hvIqv-Avmv Ki‡Z Ki‡Z| 1918 mv‡j n¨vwji gvbwmK nvmcvZv‡jB Zuvi g„Zy¨ nq|

K¨v›Ui I †µv‡bKvi jovB‡q †kl ch©šÍ K¨v›UiB Rqx nb| K¨v›U‡ii ZË¡ †\_‡K †`Lv hvq, †µv‡bKvi g~j¨evb c~Y©msL¨v Ges GgbwK g~j` msL¨vivI wKQyB bq| Giv Amxg k~b¨|

g~j` msL¨viv msL¨vq Amxg| †h‡Kv‡bv `ywU msL¨vi gv‡SI Av‡Q AmxgmsL¨K msL¨v| msL¨v `ywU hZ KvQvKvwQB †nvK bv Zv‡Z wKQy Av‡m hvq bv| Giv Av‡Q me©Î| Z‡e K¨v›U‡ii Amx‡gi ¯Íi e‡j wfbœ K\_v| GUv †\_‡K †`Lv hvq, g~j` msL¨viv msL¨v‡iLvq KZ Kg RvqMv `Lj K‡i|

GZ m~² wnmve Ki‡Z GKUy PvjvwK Ki‡Z n‡q‡Q| welg ev Ge‡ov‡\_e‡ov AvK…wZi e¯‘i cwigvc Lye RwUj| †hgb aiæb Avcbvi N‡ii †g‡S‡Z GKUv †bvsiv `vM coj| G `v‡Mi †¶Îdj KZ? GUv †evSv mnR KvR bq| AvK…wZ e„Ë, eM© ev wÎfy‡Ri g‡Zv n‡j mn‡RB ejv †hZ| GKwU gvcKvwV wb‡q e¨vmva© ev f~wg I D”PZv †g‡c †dj‡jB n‡jv| wKš‘ A¨vwgev cÖvYxi g‡Zv AvK…wZi †¶Îdj gvcvi †Kv‡bv m~Î †bB| Z‡e Dcvq GKUv Av‡Q|

GKUv AvqZvKvi Kv‡c©U w`‡q `vMwU †X‡K w`b| `vM cy‡ivcywi XvKv co‡j eySe `v‡Mi †¶Îdj Kv‡c©‡Ui †¶Îd‡ji †P‡q Kg| Kv‡c©‡Ui †¶Îdj GK eM©dzU n‡j `v‡Mi †¶Îdj n‡e GK eM©dz‡Ui Kg| AviI †QvU Kv‡c©U e¨envi Ki‡j Avgv‡`i Abygvb fvj dj w`‡Z \_vK‡e| nq‡Zvev GK eM©dz‡Ui GK-Aógvsk AvKv‡ii cuvPwU Kv‡c©U w`‡q `vMwU †X‡K hv‡e| ZLb ejv hv‡e, Kv‡c©‡Ui †¶Îdj GK dz‡Ui AšÍZ cuvP-Aógvsk| †h †¶Îdj Av‡Mi GK eM©dz‡Ui Abygv‡bi †P‡q Kg| Kv‡c©U‡K µ‡gB †QvU Ki‡Z \_vK‡j `vM AviI fvjfv‡e XvKv hv‡e| Avi Kv‡c©‡Ui †¶ÎdjI `v‡Mi mwZ¨Kvi †¶Îd‡ji KvQvKvwQ n‡e| Ges Avm‡j `v‡Mi AvKvi‡K Kv‡c©‡Ui AvKv‡ii k~b¨Mvgx wjwgU wn‡m‡e cÖKvk Kiv hv‡e (wPÎ 43)|

Gevi GKB KvR Kwi g~j` msL¨v wb‡q| Z‡e GLb Avgv‡`i Kv‡c©U n‡jv msL¨vi †mU| †hgb aiæb 2.5 msL¨vwU‡K XvKv n‡e Ggb Kv‡c©U w`‡q, hv‡Z \_vK‡e, aiæb 2 I 3-Gi ga¨eZ©x me msL¨v| gv‡b Kv‡c©‡Ui AvKvi 1| G ai‡bi Kv‡c©U w`‡q g~j` msL¨v‡`i XvK‡Z †M‡j A™¢yZ me djvdj †`Lv hvq| †hgbUv K¨v›Ui †`wL‡q‡Qb Avmbweb¨v‡mi Q‡Ki gva¨‡g| G Q‡K Av‡Q me g~j` msL¨v| cÖwZwU g~j` msL¨v cvq GKwU K‡i Avmb| AZGe Avgiv G‡`i‡K Avmb bs Abymv‡i GKwU GKwU K‡i µgvbymv‡i ¸b‡Z cvie| cÖ\_g g~j` msL¨vwU wb‡q G‡K msL¨v‡iLvq Kíbv Kiæb| G‡K GK (1) mvB‡Ri GKwU Kv‡c©U w`‡q †X‡K w`b| H GKB Kv‡c©U w`‡q AviI eû msL¨v †X‡K hv‡e| Z‡e †mUv wb‡q Avgv‡`i wPšÍv Ki‡Z n‡e bv| cÖ\_g msL¨vUv XvKv n‡jB Avgiv Lywk|

wPÎ 43: `vM XvKvi cÖwµqv

GLb wØZxq msL¨vwU wbb| G‡K 1/2 AvKv‡ii Kv‡c©U w`‡q †X‡K w`b| Z„Zxq msL¨v‡K XvKzb 1/4 AvKv‡ii Kv‡c©U w`‡q| Gfv‡e K‡i hvb| cÖwZwU g~j` msL¨vB Avmbweb¨v‡mi Q‡K Av‡Q| d‡j cÖwZwU g~j` msL¨vB GKwU Kv‡c©U w`‡q XvKv co‡e| Kv‡c©‡Ui †gvU AvKvi KZ n‡e? msL¨vUv Avgv‡`i cwiwPZ| A¨vwKwj‡Ri †hvMdj| Kv‡c©‡Ui AvKvi †hvM K‡i Avgiv cve 1 + 1/2 + 1/4 + 1/8 + ... + 1/2n | n Amx‡gi w`‡K G †hvMdj hv‡e 2-Gi w`‡K| d‡j GK †mU Kv‡c©U w`‡q Avgiv Amxg AmxgmsL¨K g~j` msL¨v †X‡K w`‡Z cvwi| Avi Kv‡c©‡Ui AvKv‡ii †hvMdj n‡e 2| Zvi gv‡b g~j` msL¨viv 2 GK‡Ki †P‡q Kg RvqMv `Lj K‡i|

`v‡Mi †¶‡Î †hgb K‡iwQ, g~j` msL¨vi AvKv‡ii AviI fvj Abygvb †c‡Z Kv‡c©‡Ui AvKvi AviI †QvU Ki‡Z cvwi| 1 AvKv‡ii Kv‡c©‡Ui e`‡j Avgiv 1/2 AvKv‡ii Kv‡c©U w`‡qB ïiæ Ki‡Z cvwi| G‡Z K‡i Kv‡c©‡Ui AvKv‡ii †hvMdj n‡e 1| g~j` msL¨viv RvqMv `Lj Ki‡e 1 GK‡Ki Kg| 1/1000 AvKv‡ii Kv‡c©U w`‡q ïiæ Ki‡j RvqMv `Lj n‡e 1/500 GK‡Ki Kg| me g~j` msL¨v wb‡qI GKUv iæ‡gi 1/500 GK‡Ki Kg `Lj Kiv hv‡e| GKwU cigvYyi A‡a©K AvKv‡ii Kv‡c©U wb‡q XvKv ïiæ Ki‡jI msL¨v‡iLvq me g~j` msL¨v‡`i †X‡K †`Iqv hv‡e| d‡j G‡`i †gvU AvKvi n‡e GKUv cigvYyi †P‡q †QvU| ZeyI GKUv cigvYyi g‡a¨ Gu‡U hvIqv G ¶y`ª Kv‡c©UB me g~j` msL¨v‡`i †X‡K w`‡Z cv‡i (wPÎ 44)|

Avgiv PvB‡j AviI AviI †QvU n‡Z cvie| Kv‡c©U¸‡jvi AvKvi †hvM Ki‡j cigvYy, wbDUªb ev †Kvqv‡K©i A‡a©K n‡e Ggb Kv‡c©U w`‡qI me g~j` msL¨v‡K †X‡K †`Iqv hv‡e| Avgiv hZ †QvU Kíbv Ki‡Z cvwi †m AvKv‡ii Kv‡c©U w`‡qB Kiv hv‡e KvRUv|

Zvn‡j g~j` msL¨viv wVK KZ eo? Avgiv AvKvi‡K GKwU wjwgU AvKv‡i cÖKvk K‡iwQ| GUv n‡jv Kv‡c©‡Ui AvKv‡ii †hvMdj, †hLv‡b cÖwZwU Avjv`v Kv‡c©‡Ui AvKvi k~‡b¨i w`‡K AMÖmigvb| Gic‡iI Avgiv †`‡LwQ, Kv‡c©‡Ui AvKvi †QvU Ki‡Z \_vK‡j XvKv cov As‡ki †¶Îdj †QvU †\_‡K AviI †QvU n‡Z \_v‡K| cigvYy, †KvqvK© ev †Kvqv‡K©i j¶ ev †KvwU¸‡Yi GK fv‡Mi †P‡qI †QvU| ZeyI Avgiv g~j` msL¨v‡`i †X‡K w`‡Z cvwi| †h wRwbm bv †\_‡g †KejB †QvU n‡ZB \_v‡K Zvi wjwgU KZ?

wPÎ 44: g~j` msL¨vi XvKv cov

k~b¨| g~j` msL¨viv KZ eo? Giv Avm‡j †Kv‡bv RvqMvB `Lj K‡i bv| K\_vUv nRg Kiv KwVb| wKš‘ GUvB mZ¨|

msL¨v‡iLvi me©Î g~j` msL¨v \_vK‡jI Giv RvqMv `Lj K‡i bv| msL¨v‡iLvq WvU© Qyu‡o gvi‡j †m WvU© KL‡bvB g~j` msL¨v‡K AvNvZ Ki‡e bv| KL‡bvB bv| g~j` msL¨viv Aí n‡jI Ag~j`iv msL¨vq wekvj| Zv‡`i Rb¨ †Kv‡bv Avmbweb¨v‡mi QK evwb‡q mevB‡K GK GK K‡i †X‡K †`Iqv m¤¢e bq| memgq †KD bv †KD Db¥y³ n‡q \_vK‡e| †µv‡bKv Ag~j`‡`i N„Yv Ki‡Zb| wKš‘ msL¨v‡iLvi meUyKz ¯’vb Zv‡`iB `L‡j|

g~j‡`i Amxg k~‡b¨i †\_‡K †ewk wKQy bq|

Z\_¨wb‡`©k

1| Pxbv `k©‡b Bb I Bqvs n‡jv `yB wecixZ ˆewkó¨| Bb gv‡b Lvivc, AÜKvi| Avi Bqvs fvj, D¾¡j|

2| G mgxKiY‡K mvwR‡q cvB x2 + 1 = 0| ev x2 = - 1, hvi A\_© n‡jv †Kvb msL¨v‡K eM© Ki‡j (-1) cvIqv hv‡e| 1-‡K eM© Ki‡j 1 cvIqv hvq| (-1)-‡K eM© Ki‡jI ZvB| Zvn‡j (-1) Kxfv‡e cve? Avm‡j Ggb †Kv‡bv ev¯Íe msL¨v †bB| Z‡e n¨uv, msL¨v Av‡Q| Zvi bvg KvíwbK msL¨v| bvgUv 'KvíwbK' n‡jI G msL¨vivI Av‡Q ev¯Íe RM‡ZB|

AviI coyb: Avãyj¨vn Avw`j gvngy`, "KvíwbK msL¨v wK Avm‡jB KvíwbK?", ÷¨vU g¨vwbqv, https://www.statmania.info/2019/07/imaginary-number.html, 2019

3| †hfv‡e we›`y †\_‡K 'we‡ùvi‡Yi' gva¨‡g m„ó gnvwe‡k¦i aviYv‡K †d«W n‡qj e¨½ K‡i bvg †`b 'weM e¨vs'| G bvgwUB c‡i wU‡K hvq|

4| ev¯Íe I KvíwbK msL¨vi wgkªY‡K RwUj msL¨v e‡j| GB †hgb 3 + 4i msL¨vq 3 n‡jv ev¯Íe Avi 4 KvíwbK Ask|

5| wjewbRB cÖ\_g †`Lvb, Avgv‡`i †PbvRvbv `kwfwËK ev `kwgK msL¨v‡K `ywU A¼ (0 I 1) w`‡qI †jLv hvq| Gfv‡e 0 = 0, 1 = 1, 2 = 10, 3 = 11, 4 = 100 BZ¨vw`| G‡`i‡KB e‡j evBbvwi ev wØwgK msL¨v| wZwb AviI †`Lvb, `kwgK msL¨vi g‡ZvB wØwgK msL¨vi †¶‡ÎI †hvM, we‡qvM, ¸Y, fvMmn me MvwYwZK Acv‡ikb Kiv hvq|

6| Bûw` a‡g© †nvwj w¯úwiU ev cweÎ AvZ¥v‡K ¯^M©xq kw³, ¸Y ev cÖfve g‡b Kiv nq| L„óvb a‡g©i GKUv eo As‡k G‡K Zv‡`i wÎZ¡ev` gZev‡`i Z„Zxq e¨w³ g‡b Kiv nq| Ab¨w`‡K Bmjvg a‡g© iæûj Kz`ym ev cweÎ AvZ¥v g‡b Kiv nq nhiZ wReivBj‡K (Av)|

7| cum‡ji cÖ‡¶cYg~jK R¨vwgwZ MwY‡Zi cyi‡bv GK A™¢yZ aviYv wdwi‡q Av‡b| Gi bvg ˆØZ bxwZ| ¯‹y‡j Avgiv wkwL, `ywU we›`y †hvM K‡i †iLv cvIqv hvq| Z‡e Amx‡gi we›`y †g‡b wb‡j `ywU †iLv GKwU we›`y ˆZwi K‡i| we›`y I †iLv G‡K Ac‡ii ˆØZ iƒc| BDwK¬Wxq wØgvwÎK R¨vwgwZi cÖwZwU Dccv`¨‡K ˆØZ Dcv‡q cÖgvY Kiv hvq cÖ‡¶cYg~jK R¨vwgwZ‡Z| d‡j cÖ‡¶cYg~jK R¨vwgwZi mgvšÍivj gnvwe‡k¦ GK ¸”Q bZyb Dccv‡`¨i Rb¥ n‡jv|

8| Amxg‡K A‡bKmgq msL¨v aiv nq| Z‡e ev¯Íe msL¨v ev ¯^vfvweK msL¨v ejv nq bv|

9| G wel‡q AviI Rvb‡Z coyb: Avãyj¨vn Avw`j gvngy`, ÷¨vU g¨vwbqv, 0.999... = 1 Kxfv‡e?, https://www.statmania.info/2017/05/0.999...equals-one.html, 2017

mßg Aa¨vq

cig k~b¨

[c`v\_©we`¨vq k~b¨]

MwY‡Z †Kv‡bv ivwk AwZkq eo I AbvKvwO&¶Z n‡j bq, eis ivwk †QvU n‡j Zv‡K D‡c¶v Kiv mywe‡ePbvi KvR| — cj wWivK

‡kl ch©šÍ e¨vcviUv my¯úó n‡q †Mj| Amxg Avi k~b¨ Awe‡”Q`¨| MwY‡Zi Acwinvh© Ask| MwYZwe`iv eyS‡jb, G‡`i‡K †g‡b wb‡qB Pj‡Z n‡e| Z‡e c`v\_©we`‡`i Kv‡Q g‡b nw”Qj, gnvwe‡k¦i KvRK‡g© k~‡b¨i †Kv‡bv f~wgKv †bB| Amxg‡K †hvM Kiv I k~b¨ w`‡q fvM Kiv MwY‡Zi KvR n‡Z cv‡i| wKš‘ cÖK…wZ G¸‡jv wb‡q gv\_v Nvgvq bv|

weÁvbxiv AšÍZ GgbUvB Avkv K‡iwQ‡jb| GKw`‡K MwYZwe`iv k~b¨ I Amx‡gi m¤úK© Avwe®‹vi Ki‡Qb| Iw`‡K k~b¨ MwY‡Zi †PŠnwÏ †cwi‡q P‡j Gj c`v\_©we`¨vq| ZvcMwZwe`¨vq (thermodznamics) k~b¨ n‡q †Mj AbwZµg¨ GK evav| me©wb¤œ m¤¢ve¨ ZvcgvÎv| AvBb÷vB‡bi Av‡cw¶KZvq (relativity) k~b¨ n‡q †Mj K…òMnŸi (black hole| `vbexq †h Zviv wM‡j Lvq eû b¶Î| †Kvqv›Uvg ejwe`¨vq (quantum mechanics) k~b¨ kw³i GK A™¢yZ Drm| MfxiZg f¨vKzqv‡gI (k~b¨¯’vb) Av‡Q hvi Dcw¯’wZ| ˆZwi K‡i GK f~Zy‡o ej, hvi †bB †Kv‡bv Drm|

k~b¨ Zvc

cwigv‡ci welq‡K msL¨vq cÖKvk Kiv †M‡j GUv m¤ú‡K© wKQy Rvbv hvq| wKš‘ G‡K cwigvc Kiv bv †M‡j I msL¨vq cÖKvk Kiv bv †M‡j Ávb \_v‡K bMY¨ I AZ„wß`vqK| nq‡Zvev GUv Áv‡bi m~Pbv| Z‡e Gme wPšÍv Avcvb‡K weÁv‡bi c‡\_ †ewk`~i GwM‡q †b‡e bv|

— DBwjqvg \_gmb, jW© †Kjwfb

c`v\_©we`¨vq k~‡b¨i cÖ\_g Awbevh© Dcw¯’wZ †`Lv hvq Aa©kZK a‡i e¨eüZ GKwU m~‡Î| 1787 mv‡j divwm c`v\_© K¨vK Av‡jKRvÛvi Pvj©m m~ÎUv Avwe®‹vi K‡ib| nvB‡Wªv‡Rb †ejy‡b D‡o wZwb ZZw`‡b Ggwb‡ZB weL¨vZ| Z‡e DÇqb †Z‡jmgvwZi Rb¨ bq, wZwb BwZnv‡m Agi nb Zuvi bv‡g bvg †`Iqv m~ÎUvi (Pvj©‡mi m~Î) Kvi‡Y|

M¨v‡mi bvbvb ai‡bi ˆewkó¨ mgKvjxb A‡bK c`v\_©we‡`i g‡Zv Pvj©m‡KI Awff~Z K‡i| Aw·‡Rb Kqjv‡K wkLvq cwiYZ K‡i| Kve©b-WvB-A·vBW Avevi Zv‡K wbwf‡q †`q| cÖvYNvZx †K¬vwi‡bi is meyR| bvBUªvm A·vB‡Wi is bv \_vK‡jI gvbyl nvmv‡Z I¯Ív`| Z‡e Avjv`v Avjv`v G M¨vm¸‡jvi wKQy †gŠwjK ˆewkó¨ GKBiKg| Zvc w`‡j Giv cÖmvwiZ nq| Avi VvÐv Ki‡j nq m¼ywPZ|

Pvj©m Avwe®‹vi K‡ib, G AvPiY AZ¨šÍ wbqwgZ I Abygvb‡hvM¨| †h‡Kv‡bv `ywU Avjv`v M¨vm mgvb cwigv‡Y wbb| ivLyb GKB ai‡bi †ejy‡bi †fZ‡i| Zv‡`i‡K GKB cwigvY Zvc w`b| †`L‡eb, Zviv mgvbfv‡e cÖmvwiZ n‡”Q| VvÐv Ki‡jI GKBmgvb m¼ywPZ n‡”Q| GQvovI ZvcgvÎv cÖwZ wWwMÖ evov ev Kgvi Rb¨ AvqZ‡bi GKwU wbw`©ó kZvsk evo‡e ev Kg‡e| Pvj©‡mi m~Î †\_‡K M¨v‡mi ZvcgvÎv I AvqZ‡bi m¤úK© cvIqv hvq|

Z‡e 1850-Gi `k‡K weªwUk c`v\_©we` DBwjqvg \_gmb Pvj©‡mi m~‡Î GKwU A™¢yZ e¨vcvi j¶ K‡ib| mgm¨vUv k~b¨ wb‡q| ZvcgvÎv Kgv‡j †ejy‡bi AvqZb µ‡gB Kg‡Z \_v‡K| ZvcgvÎv wbw`©ó nv‡i Kgv‡Z \_vK‡j †ejybI wbw`©ó nv‡i Pyc‡m †h‡Z \_vK‡e| Z‡e †mUv wPiKvj m¤¢e bq| ZvwË¡Kfv‡e Ggb GKwU we›`y Av‡Q, †hLv‡b M¨vm †Kv‡bv RvqMvqB `Lj K‡i bv| Pvj©‡mi m~Î e‡j, GKwU M¨vm †ejyb Pyc‡m wM‡q Aek¨B k~b¨ cwigvY ¯’vb `Lj Ki‡e| wbtm‡›`‡n me©wb¤œ m¤¢ve¨ AvqZb k~b¨| G we›`y‡Z †cuŠ‡Q M¨vm Avi †Kv‡bv RvqMv `Lj K‡i bv| (M¨v‡mi AvqZb FYvZ¥K †Zv Avi n‡Z cv‡i bv|) M¨v‡mi AvqZb Gi ZvcgvÎvi mv‡\_ m¤úwK©Z weavq me©wb¤œ AvqZb \_vK‡j me©wb¤œ ZvcgvÎvI \_vK‡e| GKwU M¨vm AbšÍKvj a‡i kxZj n‡Z \_vK‡e—‡mUv m¤¢e bq| GKUv mgq †ejyb‡K Avi †QvU Kiv bv †M‡j ZvcgvÎvI Avi Kgv‡bv hv‡e bv| GUvB cig k~b¨ (absolute zero)| me©wb¤œ m¤¢ve¨ ZvcgvÎv| hvi gvb cvwbi wngv‡¼i wb‡P 273 wWwMÖ †mjwmqv‡mi GKUy †ewk| Ab¨ K\_vq (-273) wWwMÖ †mjwmqvm|

\_gmb jW© †Kjwfb bv‡gB †ewk cwiwPZ| Avi †Kjwf‡bi bv‡gB ZvcgvÎvi mve©Rbxb †¯‹‡ji bvg †`Iqv n‡q‡Q| †mjwmqvm †¯‹‡j k~b¨ wWwMÖ n‡jv cvwbi wngv¼| †h ZvcgvÎvq cvwb R‡g eid nq| †Kjwfb †¯‹‡j k~b¨ n‡jv cig k~b¨|

cig k~b¨ Ae¯’vq GK cvÎ M¨v‡mi meUyKz kw³ wbt‡kl n‡q hvq| ev¯Í‡e GUv KL‡bvB Kiv hv‡e bv| GKUv e¯‘i ZvcgvÎv Kwg‡q KL‡bvB cig k~b¨ Kiv hv‡e bv| Z‡e Lye KvQvKvwQ hvIqv hv‡e| GKwU Dcv‡qi bvg †jRvi Kzwjs| GK wWwMÖ‡K K‡qK j¶ fvM Ki‡j hv n‡e, G cwµqvq cig k~‡b¨i ZZUv KvQvKvwQ ch©šÍ hvIqv hvq| Z‡e H we‡kl we›`ywU‡Z †cuŠQ‡Z PvB‡j gnvwe‡k¦i mewKQy GK‡RvU n‡q evav †`‡e| KviY kw³ Av‡Q Ggb †h‡Kv‡bv wKQy Gw`K-‡mw`K jvdv‡e| Av‡jv wewKiY Ki‡e| †hgb gvby‡li †`‡ni Dcv`vb wb‡q fveyb| wKQy cvwbi AYy I wKQy ˆRe wgkªY w`‡q Avgiv MwVZ| GB me¸‡jv cigvYy ¯’v‡bi g‡a¨ Gw`K-‡mw`K jvdv‡”Q| ZvcgvÎv hZ †ewk n‡e, jvdv‡e ZZ `ªæZ MwZ‡Z| jvwd‡q †eov‡bv G AYy¸‡jv G‡K Ac‡ii mv‡\_ av°v Lvq| jvdv‡Z eva¨ K‡i cvk¦©eZ©x AYy‡KI|

aiæb Avgiv GKwU Kjvi ZvcgvÎv cig k~b¨ Ki‡Z PvB| Kjv †\_‡K me kw³ †ei K‡i wb‡Z n‡j Gi cigvYy¸‡jvi bovPov \_vgv‡Z n‡e| GKwU e‡· †i‡L Kgv‡Z n‡e Gi ZvcgvÎv| Z‡e e·UvI †Zv cigvYy w`‡qB ˆZwi| †m cigvYyI jvdv‡”Q| Zviv Kjvi cigvYy‡KI av°v †`‡e| bwo‡q †`‡e Zv‡`i‡K| eva¨ Ki‡e jvdv‡Z| e‡·i †K‡›`ª GKwU wbLyuZ f¨vKzqvg ˆZwi K‡i †mLv‡b Kjv‡K fvwm‡q ivL‡jI Kjvi KYviv bovPov Ki‡e| KviY Pjbkxj KYv Av‡jv wewKiY K‡i| e· †\_‡K cÖwZ gyn~‡Z© Av‡jv †ei n‡”Q| hv av°v †`‡e Kjvi AYy‡K| eva¨ Ki‡e PjvP‡j|

‡iwd«Rv‡iU‡ii K‡q‡ji UyBRv‡ii me¸‡jv cigvYy bo‡Q Avi wewKiY w`‡”Q| GKB KvR Ki‡Q GK cvÎ Zij bvB‡Uªv‡R‡bi cigvYyiv| d‡j e‡·i K¤úb I wewKiY †\_‡K Kjv cÖwZwbqZ kw³ †kvlY Ki‡Q| kw³ wb‡”Q UyBRvi I †iwd«Rv‡iU‡ii K‡qj †\_‡K| e· †\_‡K Kjv‡K eg© w`‡q wew”Qbœ K‡i ivLv m¤¢e bq| bq UyBRvi ev K‡qj †\_‡K| †mB eg©I bo‡Q I wewKiY w`‡”Q| cÖwZwU e¯‘ Zvi cvwicvwk¦©K cwi‡ek Øviv cÖfvweZ| AZGe, gnvwe‡k¦i †h‡Kv‡bv wKQyi ZvcgvÎv cig k~‡b¨ wb‡q Avmv Am¤¢e| PvB †mUv Kjv, eidLÐ wKsev Lvev‡ii UyK‡iv †nvK| G GK AbwZµg¨ evav|

cig k~‡b¨i Avwe®‹v‡ii cÖfve wbDU‡bi m~‡Îi †P‡q GK`g wfbœ| wbDU‡bi m~Î¸‡jv c`v\_©we`‡`i †`q ¶gZv| G‡`i gva¨‡g MÖ‡ni K¶c\_ I e¯‘i MwZi c~e©vfvm †`Iqv hvq Lye wbf©yjfv‡e| Iw`‡K †Kjwf‡bi cig k~‡b¨i Avwe®‹vi c`v\_©we`‡`i ejj, Kx Zviv Ki‡Z cvi‡e bv| cig k~‡b¨ KLbI †cuŠQv m¤¢e bq| c`v\_©we`‡`i Kv‡Q G evav wQj GK nZvkvRbK evav| Z‡e Gi gva¨‡g ïiæ nq ZvcMwZwe`¨v (thermodznamics) bv‡g c`v\_©we`¨vi bZyb GK kvLv|

ZvcMwZwe`¨vq Zvc I kw³i AvPiY wb‡q KvR Kiv nq| †Kjwf‡bi cig k~‡b¨i Avwe®‹v‡ii g‡Zv ZvcMwZwe`¨vi m~Î¸‡jv GKwU AbwZµg¨ †`qvj Lvov Kij, hv AwZµg Kiv kZ‡Póvi c‡iI †Kv‡bv c`v\_©we‡`i c‡¶B m¤¢e bq| GB †hgb ZvcMwZwe`¨v e‡j, Aweivg-MwZ hš¿ (perpetual-motion machine) evbv‡bv Am¤¢e| Drmvnx Avwe®‹viKiv c`v\_©weÁvb wefvM I weÁvb g¨vMvwR‡b AmvaviY G h‡š¿i bKkv cvVv‡Z jvM‡jb| †h hš¿ †Kv‡bv kw³ QvovB wPiKvj Pj‡Z cv‡i| Z‡e ZvcMwZwe`¨vi m~Î e‡j Ggb hš¿ evbv‡bv Am¤¢e| GUv Av‡iKwU Am¤¢e KvR| Ggb hš¿I evbv‡bv m¤¢e bq, hv †Kv‡bv kw³ AcPq bv K‡iB Pj‡Z cv‡i| Zvc AvKv‡i wKQy kw³ AcPq wn‡m‡e gnvwe‡k¦ †hvM n‡q hv‡eB| (ZvcMwZwe`¨v K¨vwm‡bvi †P‡q Lvivc| hZ †PóvB Kiæb, Avcwb wRZ‡Z cvi‡e bv| Avcwb cv‡eb bv wb‡Ri cyuwRUvI|)

ZvcMwZwe`¨v †\_‡K Gj cwimsL¨vwbK MwZwe`¨v (statistical mechanics) bvgK kvLv| GK ¸”Q cigvYyi mvgwóK MwZ †`‡L c`v\_©we`iv c`v‡\_©i AvPi‡Yi c~e©vbygvb Ki‡Z cv‡ib| †hgb M¨v‡mi cwimsL¨vwbK weeiYB Pvj©‡mi m~‡Îi e¨vL¨v †`q| M¨v‡mi ZvcgvÎv evov‡j AYyiv M‡o `ªæZ †\_‡K AviI `ªæZ PjvPj K‡i| cv‡Îi †`qv‡j av°v †`q †Rv‡i †Rv‡i| †dj M¨vm †`qv‡j †Rv‡i av°v †`q| Pvc evo‡Z \_v‡K| KYvi bovPovi ZË¡ cwimsL¨vwbK MwZwe`¨v †gŠwjK wKQy ˆewkó¨ e¨vL¨v Kij| GgbwK g‡b nw”Qj, GwU Av‡jvi cÖK…wZiI e¨vL¨v w`‡q †`‡e|

Av‡jvi cÖK…wZi mgm¨v weÁvbx‡`i eû kZvãx ch©šÍ hš¿Yv †`q| AvBR¨vK wbDUb g‡b Ki‡Zb, Av‡jv ˆZwi KYv w`‡q| †h KYv wbM©Z nq me D¾¡j e¯‘ †\_‡K| Z‡e ax‡i ax‡i weÁvbxiv wek¦vm Ki‡Z ïiæ Ki‡jb, Av‡jv KYv bq eis Zi½| 1801 mv‡j GKRb weªwUk c`v\_©we` Avwe®‹vi K‡ib, Av‡jv wb‡Ri mv‡\_ e¨wZPvi K‡i| †`‡L g‡b n‡qwQj, Av‡jvi KYvag© eywS wPiZ‡i evwZj n‡q †Mj|

me ai‡bi Zi‡½B e¨wZPvi nq| cyKz‡i wXj Qyuo‡j e„ËvKvi †XD ev Zi½ ˆZwi nq| cvwb Ic‡i-wb‡P †`vj Lvq| Avi e„ËvKvi fw½‡Z Zi‡½i P~ov I LuvR evB‡ii w`‡K Pj‡Z \_v‡K| GKBmv‡\_ `ywU wXj Qyuo‡j G‡K Ac‡ii mv‡\_ e¨wZPvi K‡i| GKwU cv‡Î `ywU ¯ú›`bkxj wc÷b †Wvev‡jI GUv †`Lv hv‡e| GK wc÷‡bi P~ov Av‡iK wc÷‡bi Luv‡Ri mv‡\_ wgwjZ n‡j G‡K Aci‡K evwZj K‡i †`q| †XD‡qi bKkvq fvj K‡i †PvL ivL‡j wbðj Zi½nxb cvwb †`Lv hv‡e (wPÎ 45)|

Av‡jvi †¶‡ÎI GKB K\_v mZ¨| `ywU wQ`ª Av‡jv cÖ‡ek Ki‡j AÜKvi I Zi½nxb AÂj ˆZwi nq (wPÎ 46)| (evmvq e‡mB A‡bKUv GKBiKg GKwU wPÎ Avcwb †`L‡Z cv‡ib| `yB Av½yj‡K GK K‡i aiæb| gv‡S \_vK‡e mvgvb¨ duvK, †hLvb w`‡q Av‡jv PjvPj Ki‡Z cvi‡e| †m duvK w`‡q Av‡jvi w`‡K ZvKvb| †`L‡eb wKQy AÜKvi †iLvi Dcw¯’wZ| we‡kl K‡i duv‡Ki Dci I wb‡Pi w`‡K| Gme †iLvI Av‡jvi Zi½‰ewk‡ó¨i dj|) Zi½ Gfv‡eB e¨wZPvi (interference) NUvq| KYviv Zv K‡i bv| d‡j Ae¯’v`„‡ó g‡b n‡jv, e¨wZPv‡ii NUbv Av‡jvi cÖK…wZ m¤ú‡K© me weåvwšÍi mgvavb K‡i †djj| c`v\_©we`iv wm×všÍ wb‡jb, Av‡jv †Kv‡bv KYv bq| eis Zwor I PygK‡¶‡Îi Zi½|

1880-Gi `k‡Ki gvSvgvwS mg‡q GUvB wQj me‡P‡q AvaywbK aviYv| cwimsL¨¨vwbK MwZwe`¨vi mv‡\_ GwU cywic~Y©i~‡c wg‡j hvw”Qj e‡jB g‡b nw”Qj| cwimsL¨vwbK MwZwe`¨v e‡j †`q e¯‘i AYyiv Kxfv‡e jvdvq| Av‡jvi Zi½ ZË¡ ejj, GB AvYweK K¤úb †Kv‡bvfv‡e wewKi‡Yi †XD ev Av‡jvKZi½ ˆZwi K‡i| Gi †P‡qI ¸iæZ¡c~Y© K\_vI e‡j: GKwU e¯‘ hZ DËß nq, Gi AYyiv ZZ `ªæZ jvdvq| GKBmv‡\_ GKwU e¯‘ hZ DËß nq, Gi Av‡jvi †XD‡qi kw³ ZZ †ewk nq| GK`g wbLyuZ fvebv| Av‡jvi Zi½ hZ `ªæZ DVv-bvgv Ki‡e, Gi K¤úv¼ ZZ †ewk| (Avevi K¤úv¼ hZ †ewk, Zi‡½i `yB P~ovi gv‡Si `~iZ¡ ev Zi½‰`N¨© ZZ Kg|) ZvcMwZwe`¨vi Ab¨Zg ¸iæZ¡c~Y© m~Î †÷dvb-‡evjRg¨vb mgxKiY| G mgxKiY Av‡jvi K¤úb‡K AYyi K¤ú‡bi mv‡\_ †Rvov †`q| GUv †\_‡K e¯‘i ZvcgvÎvi mv‡\_ Gi wewKwiZ †gvU kw³i cwigv‡Yi m¤úK© cvIqv hvq| GUvB wQj cwimsL¨vwbK MwZwe`¨v I Av‡jvi Zi½ Z‡Ë¡i me‡P‡q eo weRq| (G mgxKiY e‡j, wewKwiZ kw³ ZvcgvÎv PyZy\_© Nv‡Zi mgvbycvwZK| GKwU wbw`©ó cwigvY kw³ cÖ`vb Ki‡j GKwU e¯‘ Kx cwigvY wewKiY wbM©Z Ki‡e| cvkvcvwk GI e‡j †`q, e¯‘wU KZUv DËß n‡e| c`v\_©we`¨vi G m~Î I evB‡e‡ji whkvBq cy¯Í‡Ki (Book of Isaiah) GKwU Aby‡”Q` Kv‡R jvwM‡q c`v\_©we`iv wnmve K‡iwQ‡jb, ¯^‡M©i ZvcgvÎv 500 wWwMÖ †Kjwf‡bi †ewk|

wPÎ 45: cvwb‡Z e¨wZPv‡ii `„k¨

wPÎ 46: Av‡jvi e¨wZPvi| eBUv‡K cv‡k Nywi‡q c„ôv eivei ZvKv‡j e¨wZPvi bKkv †`Lv hv‡e|

Z‡e G weRq †ewkw`b ¯’vqx n‡jv bv| kZvãx cvi n‡j `yRb weªwUk c`v\_©we` Zi½ ZË¡ Kv‡R jvwM‡q GKwU mij mgm¨v mgvavb Ki‡Z PvB‡jb| wnmveUv †gvUvgywU †mvRvmvÞvB wQj| Zuviv †ei Ki‡Z PvB‡jb, GKwU duvKv MZ© KZUyKz Av‡jv wewKiY K‡i| e¨envi Ki‡jb cwimsL¨vwbK MwZwe`¨vi †gŠwjK mgxKiY| hv e‡j †`q, AYyiv KZUyKz jvdvjvwd K‡i| cvkvcvwk e¨envi Ki‡jb Zwor I Py¤^K‡¶‡Îi wg\_w¯Œqvi mgxKiY, hv e‡j †`q, Av‡jv Kxfv‡e jvdvq| Gi gva¨‡g Zuviv †c‡jb Av‡iKwU mgxKiY| hv e‡j w`j, wbw`©ó ZvcgvÎvq M‡Z©i Av‡jv †Kvb Zi½‰`‡N¨© wewKiY †`‡e|

`yB c`v\_©we` jW© †iwj I †Rgm wR‡Ýi bv‡g G mgxKi‡Yi bvg †iwj-wRÝ m~Î| †ek fvj KvR KiwQj m~ÎUv| DËß e¯‘ †\_‡K eo Zi½‰`N¨© I Kg kw³i Av‡jvi cwigvY †ei Ki‡Z m~ÎUv fv‡jvfv‡e KvR KiwQj| wKš‘ D”Pkw³‡Z mgxKiYUv fyj dj w`‡q †d‡j| †iwj-wRÝ m~Î e‡j, GKwU e¯‘ †QvU Zi½‰`‡N¨© µ‡gB †ewk K‡i Av‡jv wbM©Z Ki‡Z \_v‡K| d‡j kw³I †ewk †ewk wbM©Z K‡i| d‡j k~‡b¨i KvQvKvwQ Zi½‰`‡N¨© e¯‘wU Amxg cwigvY D”Pkw³i Av‡jv cÖ`vb K‡i| †iwj-wRÝ mgxKiY Abymv‡i cÖ‡Z¨KwU e¯‘ cÖwZ gyn~‡Z© Amxg cwigvY kw³ wewKwiZ Ki‡Q| GUv e¯‘i ZvcgvÎvi Ici wbf©i K‡i bv| GgbwK GKwU eidLÐI cÖPyi cwigvY AwZ‡e¸wb, G· I Mvgv iwk¥ wewKwiZ K‡i| hv w`‡q Pvicv‡k mewKQy‡K Dwo‡q †`Iqv hv‡e| G mgm¨vi bvg wQj AwZ‡e¸wb wech©q (ultraviolet catastrophe)| k~b¨ Zi½‰`N¨© Amxg kw³i mgvb| GK ¸”Q my›`i m~Î‡K aŸsm Kivi ûgwK w`w”Qj k~b¨ I Amxg| G mgm¨vUvB Aíw`‡bi g‡a¨ c`v\_©we`¨vi cÖavb auvauv n‡q †Mj|

‡iwj I wRÝ fyj wKQy K‡ibwb| Zviv †h mgxKiY e¨envi K‡i‡Qb, c`v\_©we`iv Zv‡K mwVK e‡jB Rvb‡Zb| Zviv mgxKiY wb‡q KvR K‡i‡Qb wbqg †g‡bB| wKš‘ †h DËi †c‡jb Zv ev¯Íe we‡k¦i cÖwZwbwaZ¡ K‡i bv| eidLÐ Mvgv iwk¥ w`‡q mf¨Zv aŸsm K‡i bv| hw`I †mmg‡qi c`v\_©we`¨vi m~Î Ggb djvd‡ji w`‡K †V‡j †`q| c`v\_©we`¨vi GKwU m~Î‡K †Zv Zvn‡j fyj n‡ZB n‡e| †mwU †KvbwU?

‡Kvqv›Uvg k~b¨: Amxg kw³

c`v\_©we`iv g‡b K‡ib f¨vKzqv‡gi g‡a¨ me KYv I ej myß Av‡Q| `k©‡bi k~‡b¨i †P‡q GUv A‡bK A‡bK †ewk mg„×|

— m¨vi gvwU©b wiR

AwZ‡e¸wb wech©q †\_‡K Rb¥ †Kvqv›Uvg wecø‡ei| Av‡jvi wPivqZ ZË¡ †\_‡K k~b¨‡K we`vq Kij †Kvqv›Uvg ejwe`¨v| gnvwe‡k¦i cÖwZwU e¯‘LÐ †\_‡K †ei nIqv Amxg kw³ `~i n‡jv| Z‡e GUv †Zgb eo †Kv‡bv weRq wQj bv| †Kvqv›Uvg ejwe`¨vq k~‡b¨i A\_© n‡jv cy‡iv gnvwek¦—GgbwK f¨vKzqv‡gI Av‡Q Amxg cwigvY kw³| Gi bvg k~b¨-we›`y kw³| Avi G †\_‡KB gnvwe‡k¦i me‡P‡q A™¢yZ k~‡b¨i DrcwË| k~b¨Zvi f~Zy‡o kw³|

1900 mv‡j Rvg©vb cix¶vg~jK weÁvbxiv AwZ‡e¸wb wech©q wb‡q Rvbvi †Póv K‡ib| Zviv wbweofv‡e cwigvc Ki‡jb, wewfbœ ZvcgvÎvq GKwU e¯‘ †\_‡K Kx cwigvY wewKiY †ei nq| †`Lv †Mj, †iwR-wRÝ m~Î w`‡q Avm‡j e¯‘ †\_‡K Avmv Av‡jvi mwVK cwigvY †ei Kiv hvq bv| ZiæY c`v\_©we` g¨v· cø¨v¼ bZyb DcvË LwZ‡q †`L‡jb| K‡qK NÈvi g‡a¨B ˆZwi Ki‡jb bZyb GKwU mgxKiY| †iwj-wRÝ m~Î‡K nwU‡q RvqMv `Lj Kij G mgxKiY| cø¨v‡¼i m~Î bZyb ch©‡e¶‡Yi e¨vL¨v w`‡Z m¶g n‡jv| Zvi‡P‡q eo K\_v n‡jv, mgvavb Kij AwZ‡e¸wb wech©q| Zi½‰`N¨© Kgvi mv‡\_ mv‡\_ cø¨v‡¼i m~Î jvd †g‡i Amx‡g P‡j †Mj bv| Zi½‰`N¨© Kgvi mv‡\_ mv‡\_ kw³ eo †\_‡K AviI eo nIqvi e`‡j Kg‡Z \_vKj (wPÎ 47)| Z‡e `~f©vM¨ wcQy †j‡MB iBj| cø¨v‡¼i m~Î wVKB wQj| Z‡e Gi bZyb m„ó mgm¨vi mgvav‡b Av‡Q AwZ‡e¸wb wech©‡qi †P‡qI eo Sv‡gjv|

wPÎ 47: †iwj-wRÝ m~Î Amx‡gi w`‡K wb‡q hvq| Z‡e cø¨v‡¼i m~Î mmxg \_v‡K|

mgm¨v m„wói KviY, cø¨v‡¼i m~Î c`v\_©we`¨vi cwimsL¨vwbK MwZwe`¨vi mvaviY Abygvb (assumption) †\_‡K Av‡mwb| cø¨v‡¼i m~Î ˆZwi Ki‡Z wM‡q c`v\_©we`¨vi m~‡Î cwieZ©b Avb‡Z n‡q‡Q| cø¨v¼ c‡i e‡jwQ‡jb, KvRwU wZwb K‡i‡Qb gwiqv I †ec‡ivqv n‡q| KviY †ec‡ivqv bv n‡j GKRb c`v\_©we` c`v\_©we`¨vi m~‡Î Ggb `„k¨Z Lvg‡Lqvjx KvR Ki‡eb bv| cø¨v‡¼i g‡Z, AYy‡`i Rb¨ †ewkifvM c‡\_ PjvPj wbwl×| †Kvqv›Uv bv‡g ïay wbw`©ó wKQy ¯^xK…Z kw³‡Z Zviv Kw¤úZ n‡Z cv‡i| GB ¯^xK…Z gv‡bi gvSvgvwS Ab¨ †Kv‡bv gvb \_vKv G‡`i c‡¶ m¤¢e bq|

GUv‡K A™¢yZ †Kv‡bv Abygvb g‡b bvI n‡Z cv‡i| Z‡e wek¦‡K †`‡L Gfv‡e KvR K‡i e‡j g‡b nq bv| cÖK…wZ jvwd‡q jvwd‡q P‡j bv| cuvP dzU Avi Qq dz‡Ui gvSvgvwS D”PZvi †Kv‡bv gvbyl \_vK‡e bv—GgbUv fvev †evKvwg| GKUv Mvwo NÈvq 30 gvBj †e‡M Pj‡e, A\_ev 40 gvBj, wKš‘ 33 ev 38 gvB‡j Pj‡e bv—GUv A™¢yZ K\_v| Z‡e †Kvqv›Uvg Mvwo wVK Gfv‡eB P‡j| nq‡Zv Avcwb NÈvq 30 gvBj †e‡M Pj‡Qb| wKš‘ A¨vw·jv‡iU‡i Pvc w`‡jB eyg! †cuŠ‡Q hv‡eb 40 gvBj †e‡M| Gi gv‡S Ab¨ †Kv‡bv †eM †bB| d‡j 30 †\_‡K 40-G †h‡Z n‡j Avcbv‡K w`‡Z n‡e †Kvqv›Uvg jvd| GKBfv‡e †Kvqv›Uvg gvbyl GZ mn‡R eo n‡Z cv‡i bv| K‡qKeQi Zviv \_vK‡e Pvi dzU j¤^v| Gici nVvr K‡i †m‡K‡Ûi fMœvsk mg‡q eyg! D”PZv n‡q hv‡e cuvP dzU1| †Kvqv›Uvg AbyKí Avgv‡`i ˆ`bw›`b Rxe‡bi me AwfÁvi wecixZ|

cÖK…wZi Kv‡Ri mv‡\_ wecixZag©x g‡b n‡jI cø¨v¼ ej‡jb, AvYweK K¤úb †Kvqv›UvwqZ| Z‡e G A™¢yZ AbyK‡íi gva¨‡gB cvIqv †Mj e¯‘ †\_‡K wbM©Z Av‡jvi K¤úv‡¼i mwVK m~Î| m~ÎUv †h mwVK Zv eyS‡Z c`v\_©we`‡`iI mgq jv‡Mwb| wKš‘ Zey Zviv †Kvqv›Uvg AbyKí †g‡b †bbwb| K\_vUv †h eo †ewk A™¢yZ!

‡Kvqv›Uvg AbyKí‡K A™¢yZ aviYv †\_‡K ¯^xK…Z m‡Z¨ iƒc †`b Ggb GKRb gvbyl hvi K\_v †KD KíbvI K‡iwb| wZwb A¨vjevU© AvBb÷vBb| wZwb ZLb c¨v‡U›U Awd‡mi 26 eQi eq¯‹ GK †Kivwb| wZwbB c`v\_©weÁvb wek¦‡K †`Lv‡jb, cÖK…wZ gm„Y e„w×i gva¨‡g bq, KvR K‡i †Kvqv›Uvq| ceeZ©x‡Z wb‡Ri mnvqZvq cÖwZwôZ G Z‡Ë¡i cÖavb we‡ivaxI nb wZwb wb‡RB|

AvBb÷vBb‡K †`‡L †gv‡UI ˆecøweK gvbyl g‡b nqwb| g¨v· cø¨v¼ hLb c`v\_©weÁvb RM‡Z †Zvjcvo jvwM‡q w`‡qwQ‡jb, AvBb÷vBb ZLb PvKwi LyuR‡Z LyuR‡Z RyZvi Zjv ¶q KiwQ‡jb| A‡\_©i Afv‡e c‡o myBk c¨v‡U›U Awd‡m GKwU A¯’vqx PvKwi †bb| KvwO&¶Z wek¦we`¨vj‡qi PvKwii †P‡q hv A‡bK wb¤œgv‡bi| 1904 mv‡ji g‡a¨ weevneÜ‡b Ave× nb I cyÎmšÍv‡bi evev nb| c¨v‡U›U Awd‡m †L‡U gi‡Qb| gnvb wKQy Kivi c\_ Kv‡jf‡`ªB Ggb nq| wKš‘ 1905 mv‡ji gv‡P© wZwb Ggb GKwU M‡elYvcÎ cÖKvk K‡ib, hv †kl ch©šÍ Zuv‡K †bv‡ej cyi¯‹vi G‡b †`q| G M‡elYvc‡Î wZwb Av‡jvKZwor wµqvi (photoelectric effect) e¨vL¨v †`b| Gi gva¨‡g †Kvqv›Uvg MwZwe`¨vI mevi bRi Kv‡o| †Kvqv›Uvg MwZwe`¨vi ¯^xK…wZi mv‡\_ mv‡\_ ¯^xK…wZ †cj k~‡b¨i inm¨gq kw³I|

1887 mv‡j Av‡jvKZwor wµqv Avwe®‹„Z nq| Avwe®‹viUv K‡ib Rvg©vb c`v\_©we` nvBbwiP nvr©m| wZwb †`L‡jb, AwZ‡e¸wb Av‡jvi GKwU iwk¥ †cø‡U ùywj½ (spark) ˆZwi Ki‡Z cv‡i| avZe †cø‡U Av‡jv co‡j †mLvb †\_‡K B‡jKUªb mn‡RB wQU‡K †ewi‡q Av‡m| Av‡jvKiwk¥ w`‡q ùywj½ ˆZwii G e¨vcviUv wPivqZ c`v\_©weÁvbx‡`i auvauvq †d‡j w`‡qwQj| AwZ‡e¸wb Av‡jvq \_v‡K cÖPyi cwigvY kw³| d‡j weÁvbxiv ¯^fvweKfv‡eB a‡i wb‡jb, cigvYy †\_‡K B‡jKUªb‡K †ei Ki‡Z †ek fv‡jv cwigvY kw³i cÖ‡qvRb| Z‡e Av‡jvi Zi½ ZË¡ Abymv‡i, D”Pkw³i Av‡jv ˆZwii Av‡iKUv Dcvq Av‡Q| Av‡jv‡K Ki‡Z n‡e D¾¡j| GB †hgb A‡bK D¾¡j bxj is‡qi Av‡jv| Gi kw³I Aby¾¡j AwZ‡e¸wb Av‡jvi kw³i mgvb n‡Z cv‡i| AZGe, GKwU D¾¡j bxj Av‡jvI B‡jKUªb‡K cigvYy †\_‡K †ei Ki‡Z cviv DwPZ| wVK †hgb cv‡i Aby¾¡j AwZ‡e¸wb Av‡jv|

wKš‘ ev¯Í‡e e¨vcviUv †gv‡UI Zv bq| cix¶vi gva¨‡g †mUv Rvb‡Z mgq jv‡Mwb| (D”P K¤úv‡¼i) Aby¾¡j AwZ‡e¸wb Av‡jvI avZe †cøU †\_‡K B‡jKUªb‡K †ei Ki‡Z cv‡i| wKš‘ K¤úv¼ Kwg‡q GKwU wbw`©ó µvwšÍ gv‡bi wb‡P Avb‡j—Av‡jv‡K wKQyUv †ewkB jv‡ji w`‡K wb‡q Avm‡j—nVvr K‡i ùywj½ ˆZwi eÜ n‡q hvq| Av‡jv hZB D¾¡j †nvK, Av‡jvi is mwVK bv n‡j B‡jKUªb AvU‡KB \_v‡K| †KD †ei nq bv| Av‡jvi Zi½ Ggb KvR Kivi K\_v bq|

Av‡jvKZwor wµqvi G auvauvi mgvavb Ki‡jb AvBb÷vBb| Z‡e Zuvi mgvavb cø¨v‡¼i AbyK‡íi †P‡q †ewk ˆecøweK wQj| cø¨v¼ cÖ¯Íve K‡iwQ‡jb, AYyi K¤úb †Kvqv›UvwqZ| AvBb÷vBb ej‡jb, Av‡jv wbM©Z nq †dvUb bv‡gi †QvU †QvU c¨v‡KU Ae ¸”Q AvKv‡i| G aviYv Av‡jvi ¯^xK…Z a‡g©i wecixZ| KviY AvBb÷vB‡bi K\_v gvb‡j gvb‡Z nq, Av‡jv Zi½ bq|

wKš‘ Ab¨w`‡K Av‡jvKkw³‡K ¶y`ª c¨v‡K‡Ui ¸”Q a‡i wb‡j Av‡jvKZwor wµqvi e¨vL¨v mnR n‡q hvq| Av‡jv KvR K‡i †QvÆ ey‡j‡Ui g‡Zv| AvNvZ nv‡b avZy‡Z| ey‡jU wM‡q B‡jKUªb‡K av°v †`q| ey‡j‡Ui h‡\_ó kw³ \_vK‡j—K¤úv¼ h‡\_ó eo n‡j—GwU B‡jKUªb‡K gy³ K‡i Av‡b| Ab¨w`‡K Av‡jvKKYvi kw³ h‡\_ó bv n‡j Gi av°vq B‡jKUªb gy³ nq bv| Av‡jvKKYv eis av°v †L‡q m‡i hvq|

AvBb÷vB‡bi G wPšÍvi gva¨‡g Av‡jvKZwor wµqvi `viæY e¨vL¨v wgjj| Av‡jv †dvUb KYvq †Kvqv›UvwqZ| hv Zi½Z‡Ë¡i mivmwi we‡ivax| A\_P Av‡Mi GK k eQ‡ii †ewk mgq a‡i ZË¡Uvi ivRZ¡| Avm‡j †`Lv hv‡”Q, Av‡jvi KYv I Zi½ `yB iKg ag©B Av‡Q| Av‡jv KLbI KYvi g‡Zv AvPiY Ki‡jI Ab¨mgq Avevi Zi‡½i g‡Zv AvPiY K‡i| mwZ¨ ej‡Z Av‡jv bv KYv, bv Zi½| `yB‡qi GK A™¢yZ wgkªY| G aviYvUv †evSv mnR KvR bq| Z‡e †Kvqv›Uvg Z‡Ë¡i GK`g †K›`ªxq AskB GUv|

‡Kvqv›Uvg ZË¡ e‡j, Av‡jv, B‡jKUªb, †cÖvUb, KzKzi—meviB KYv I Zi½ ˆewkó¨ Av‡Q| wKš‘ e¯‘ GKBmv‡\_ KYv I Zi½ n‡j Avm‡j †mwU Kx wRwbm? MwYZwe`iv G‡`i mgxKiY Rv‡bb| G‡`i bvg Zi½ dvskb| †kªvwWsMvi mgxKi‡Yi AšÍiK mgvavb| Z‡e `~f©v‡M¨i K\_v n‡jv, G MvwYwZK eY©bvi †Kv‡bv mnRvZ e¨L¨v †bB| G Zi½ dvskb¸‡jv‡K ev¯Í‡e †`Lv Am¤¢e2| Gi †P‡q Lvivc K\_v n‡jv, c`v\_©we`iv †Kvqv›Uvg MwZwe`¨vi †fZ‡i †h‡Z †h‡Z A™¢yZ †\_‡K A™¢yZZi wRwb‡mi †`Lv †c‡Z jvM‡jb| Z‡e †Kvqv›Uvg MwZwe`¨vq k~b¨B m¤¢eZ me‡P‡q A™¢yZ e¨vcv‡ii Rb¥ w`‡q‡Q| e¨vcviUvi bvg wR‡iv-c‡q›U GbvwR©|

A™¢yZ G ej †Kvqv›Uvg we‡k¦i MvwYwZK mgxKi‡Yi g‡a¨B †Mu‡\_ Av‡Q| 1920-Gi `k‡K Rvg©vb c`v\_©we` fvb©v nvB‡RbevK© †`‡Lb, G mgxKiY¸‡jv AevK Kiv GK dj †`q| G¸‡jvq wg‡k Av‡Q AwbðqZv| k~‡b¨i kw³i Rb¥ †`q nvB‡Rbev‡K©i AwbðqZv bxwZ| weÁvbx‡`i KYvi ˆewkó¨ Rvbvi m¶gZvi mxgv †eu‡a †`q AwbðqZv bxwZ| †hgb aiæb, GKwU wbw`©ó KYv m¤ú‡K© Rvb‡Z n‡j Gi Ae¯’vb I †eM Rvbv cÖ‡qvRb| Rvb‡Z n‡e KYvUv †Kv\_vq Av‡Q| Gi †eM KZ| nvB‡Rbev‡K©i AwbðqZv bxwZ e‡j, G †mvRv KvRUvI Avgiv Ki‡Z cvie bv| Avgiv kZ‡Póv K‡iI GKBmv‡\_ GKwU KYvi †eM I Ae¯’vb kZfvM wbf©yjfv‡e Rvb‡Z cvie bv| KviY cwigvc Kivi †PóvB Avgv‡`i Kvw•LZ Z\_¨‡K bó K‡i †`q|

‡Kv‡bvwKQy gvc‡Z †M‡j G‡K ¯úk© Ki‡Z nq| aiæb, Avcwb GKwU †cwÝ‡ji ˆ`N¨© gvc‡Qb| †cwÝj eivei Av½yjUv †i‡L Gi ˆ`N¨© gvcv †h‡Z cv‡i| Z‡e †mUv Ki‡Z wM‡q †cwÝ‡j GKUy av°v jvM‡Z cv‡i| d‡j †cwÝ‡ji †eM nvjKv e`‡j hv‡e| Av‡iKUy fvj †KŠkj n‡e †cwÝ‡ji cv‡k Avj‡Zv K‡i GKwU iæjvi ivLv| Z‡e Avm‡j wKš‘ `ywU e¯‘i ˆ`N¨© Zyjbv Ki‡Z †M‡jB †cwÝ‡ji †eM wKQyUv cv‡ë hv‡e| Avcwb †cwÝj‡K †`L‡eb GUv †\_‡K Avmv Av‡jv †`‡L| †cwÝj †\_‡K Avmv Av‡jvI †cwÝj‡K D‡ËwRZ K‡i| G D‡ËRbv Lye g„`y n‡jI Zv †cwÝj‡K LvwbKUv mwi‡q †`q| wKwÂZ cv‡ë hvq †cwÝ‡ji †eM| †h Dcv‡qB Avcwb †cwÝ‡ji †eM gvcyb bv †Kb, G‡Z nvjKv av°v jvM‡eB| nvB‡Rbev‡K©i AwbðqZv bxwZ e‡j, †cwÝj ev B‡jKUª‡bi ˆ`N¨© I †eM GKBmv‡\_ kZfvM wbf©yj K‡i Rvbvi †Kv‡bv Dcvq †bB| Ae¯’vb hZ fvj Rvb‡eb, †eM m¤ú‡K© ZZ Kg Rvb‡eb| Avevi †eM fvjfv‡e Rvb‡j, Ae¯’v‡bi Z‡\_¨ †j‡M hv‡e Moeo| GKwU B‡jKUª‡bi Ae¯’vb wbf©yjfv‡e (k~b¨ fyj) Rvb‡j Rvbv hv‡e GwU wbw`©ó GKwU mg‡q wVK †Kv\_vq Av‡Q| †m‡¶‡Î GwU Kx †e‡M Pj‡Q †m m¤ú‡K© †Kv‡bv Z\_¨B Rvbv hv‡e bv (k~b¨ Z\_¨)| Avi Gi †eM Amxg wbf©yjfv‡e Rvb‡j (k~b¨ fyj) Gi Ae¯’v‡bi cwigv‡c n‡e Amxg fyj| GUv wVK †Kv\_vq Av‡Q Zv GKUyI Rvbv hv‡e bv3,4| Avcwb KL‡bvB `y‡Uv GKm‡½ Rvb‡Z cvi‡eb bv| GKUv m¤ú‡K© †Kv‡bv Z\_¨ Rvb‡jB Av‡iKwU AwbwðZ n‡q hv‡e| GUv Av‡iKwU Aj•Nbxq (unbreakable) m~Î|

nvB‡Rbev‡K©i AwbðqZv bxwZ †h ïay gvby‡li cwigv‡cB evMov †`q Zv bq| ZvcMwZwe`¨vi m~‡Îi g‡ZvB G m~ÎUvI cÖK…wZ‡K cÖfvweZ K‡i| AwbðqZvi Kvi‡Y gnvwek¦ kw³‡Z ficyi \_v‡K| ¯’v‡bi Lye ¶y`ª GKwU As‡ki K\_v Kíbv Kiæb| aiæb, A‡bK A‡bK †QvU GKwU e·| e‡·i g‡a¨ Kx Pj‡Q †mUv wb‡q KvR Ki‡j Avgiv wKQy Abygvb Ki‡Z cvwi| †hgb Avgiv A‡bKUv wbf©yjfv‡e KYv¸‡jvi Ae¯’vb m¤ú‡K© Rvwb| Avi hvB †nvK, Giv †Zv e‡·i †fZ‡iB Av‡Q| Avgiv Rvwb, Giv wbw`©ó GKwU AvqZ‡bi g‡a¨ Ave× Av‡Q| evB‡i \_vK‡j †Zv Avi Avgiv G‡`i w`‡K ZvKvZvg bv| Gi A\_© `uvovj, Avgiv KYv¸‡jvi Ae¯’vb m¤ú‡K© wKQy Z\_¨ Rvwb| ZvB nvB‡Rbev‡K©i AwbðqZv bxwZ Abymv‡i, KYv¸‡jvi †eM I kw³ m¤ú‡K© Avgiv AwbwðZ n‡q hve| e·‡K AviI †QvU Ki‡Z \_vK‡j Avgiv KYvi kw³ m¤ú‡K© Rvbe AviI AviI Kg|

GB hyw³ gnvwe‡k¦i me©ÎB mZ¨| PvB Zv c„w\_exi †K‡›`ª, wKsev ¯’v‡bi MfxiZg f¨vKzqv‡g| Gi A\_© `uvovq, h‡\_ó ¶y`ª ¯’v‡bi, GgbwK f¨vKzqv‡giI kw³ m¤ú‡K© wKQy AwbðqZv Av‡Q| wKš‘ f¨vKzqv‡gi kw³i AwbðqZvi e¨vcviUv nvm¨Ki †kvbvq| msÁv Abymv‡iB f¨vKzqv‡g wKQy †bB| †bB †Kv‡bv KYv, Av‡jv ev Ab¨ wKQy| AZGe, f¨vKzqv‡gi †Zv †Kv‡bv kw³B \_vKvi K\_v bq| Gic‡iI nvB‡Rbev‡K©i AwbðqZv bxwZ ej‡Q, †Kv‡bv wbw`©ó mg‡q f¨vKzqv‡gi GKwU AvqZ‡b KZUyKz kw³ Av‡Q Zv Avgiv ej‡Z cvie bv| ¶y`ª AvqZ‡bi GKwU f¨vKzqv‡gi kw³I cÖwZ gyn~‡Z© IVvbvgv (fluctuation) Ki‡Z \_vK‡e|

f¨vKzqv‡g †bB †Kv‡bvwKQy| †mLv‡b Avevi kw³ \_vK‡Z cv‡i Kxfv‡e? DËiUv Av‡m Av‡iKwU mgxKiY †\_‡K| AvBb÷v‡bi weL¨vZ fi-kw³ mgxKiY: E = mc2| mij G m~Î fi I kw³‡K †Rvov †`q| e¯‘i fi GKwU wbw`©ó cwigvY kw³i mgZyj¨| (KYvc`v\_©we`iv B‡jKUª‡bi g‡Zv KYvi fi cvDÛ ev †KwR‡Z gv‡cb bv| fi ev IR‡bi cÖPwjZ Ab¨ †Kv‡bv GKKI e¨envi K‡ib bv| Zuviv e‡jb, B‡jKUª‡bi wbðj fi n‡jv 0.511 †gMvB‡jKUªb †fvë—MeV)| f¨vKzqv‡gi kw³i IVvbvgv Avi f‡ii IVvbvgv GKB K\_v| KYviv cÖwZ gyn~‡Z© Aw¯ÍZ¡ cv‡”Q I nviv‡”Q| jyB K¨v‡iv‡ji A¨vwjm Bb `¨ IqvÛvij¨vÛ Dcb¨v‡mi †Pkvqvi weov‡ji g‡Zv| f¨vKzqvg KL‡bvB mwZ¨Kv‡ii k~b¨ bq| eis fvP©yqvj KYvq fwZ©| ¯’v‡bi cÖwZwU we›`y‡Z Amxg KYv cÖwZ gyn~‡Z© Avwef©~Z n‡”Q Avi nvwi‡q hv‡”Q| GUvB wR‡iv-c‡q›U GbvwR© ev k~b¨-we›`yi kw³| †Kvqv›Uvg Z‡Ë¡i m~‡Îi g‡a¨ jywK‡q \_vKv Amxg| my¯úó K‡i ej‡j k~b¨-we›`yi kw³i cwigvY mxgvnxb| †Kvqv›Uvg MwZwe`¨vi mgxKiY Abymv‡i, Kqjv Lwb, †Zj‡¶Î ev wbDK¬xq A‡¯¿i †P‡q †ewk kw³ Av‡Q GKwU KvwVi †fZ‡i|

mvaviYZ mgxKi‡Y Amxg \_vK‡j c`v\_©we`iv a‡i †bb, †Kv\_vI fyj n‡q‡Q| Amx‡gi †bB †Kv‡bv †fŠZ ev ev¯Íe A\_©| k~b¨-we›`yi kw³I e¨wZµg bq| †ewkifvM weÁvbx G‡K cy‡ivcywi D‡c¶v K‡ib| Zviv a‡iB †bb, k~b¨-we›`yi kw³i gvb k~b¨| hw`I Zuviv Rv‡bb GUv Avm‡j Amxg| GUv GKwU myweavRbK Kíbv| mvaviYZ Gi †Kv‡bv ¸iæZ¡B †bB| Z‡e KLbI Avevi Av‡Q| 1948 mv‡j `yRb WvP c`v\_©we` †mUv eyS‡Z cv‡ib| †nbwWªK KvwRwgi I WvK© †cvìvi eyS‡Z cv‡ib, k~b¨-we›`yi kw³‡K memgq D‡c¶v Kiv hv‡e bv| Zuviv cigvYyi g‡a¨ wµqvkxj ej wb‡q KvR KiwQ‡jb| †`L‡jb, cwigvcK…Z ej wgj‡Q bv m~‡Îi Abygv‡bi mv‡\_| e¨vL¨v LyuR‡Z wM‡q KvwRwgi †Ui cvb, wZwb k~‡b¨i kw³ Abyfe K‡i‡Qb|

KvwRwgi e‡ji (casimir force) inm¨ Zi‡½i ˆewk‡ó¨i mv‡\_ m¤úwK©Z| cÖvPxb wMÖ‡m wc\_v‡Mvivm Zvi †U‡b Dc‡i-wb‡P IVvbvgv Kiv Zi‡½i A™¢yZ ˆewkó¨ m¤úK© †R‡bwQ‡jb| †`‡LwQ‡jb, wKQy myi I‡V, wKQy Avevi wbwl×| GKwU Zvi‡K evRv‡j cwi®‹vi myi †kvbv hvq| Gi bvg †gŠwjK myi| Av½yj‡K Avj‡Zv K‡i Zv‡ii gv‡S †i‡L Uvb w`‡j Av‡iKwU my›`i I cwi®‹vi myi †kvbv hv‡”Q| Gev‡ii myiUv †gŠwjK my‡ii Ic‡i AóK| GKZ„Zxqvsk wb‡P Av‡Q Av‡iKwU my›`i myi| wKš‘ wc\_v‡Mvivm eyS‡Z cv‡ib, meLv‡b myi m„wó m¤¢e bq| Zv‡ii g‡a¨ B”Qvg‡Zv †Kv\_vI Av½yj ivL‡j Lye KgB cwi®‹vi myi cvIqv hvq| Zv‡i ïay wbw`©ó wKQy myiB m¤¢e| †ewkifvM RvqMvqB myi †bB (wPÎ 48)|

‡ewkifvM Zi½B Zv‡ii Zi‡½i g‡Zv K‡iB KvR K‡i| wbw`©ó AvKv‡ii wMUv‡ii Zvi m¤¢ve¨ me iKg myi Zyj‡Z cv‡i bv| wKQy wKQy Zi½ "wbwl×"| GKBfv‡e KYvi wKQy Zi‡½i Rb¨ e‡·i †fZ‡i \_vKv wbwl×| GB †hgb, `ywU avZe †cøU‡K KvQvKvwQ ivL‡j me ai‡bi KYv‡K G‡`i gvSLv‡b RvqMv †`Iqv hv‡e bv| e‡·i AvKv‡ii mv‡\_ Zi‡½i AvKvi wg‡j †M‡jB ïay †m Zi½ e‡·i †fZ‡i \_vKvi my‡hvM cv‡e (wPÎ 49)|

wPÎ 48: wMUv‡ii Zv‡i wbwl× myi|

KvwRwgi eyS‡Z cv‡ib, wbwl× KYvZi½ f¨vKzqv‡gi k~b¨-we›`yi kw³‡K cÖfvweZ Ki‡e| KviY KYviv me©Î Avwef©yZ I DavI n‡”Q| `ywU avZe †cøU‡K KvQvKvwQ ivL‡j wKQy wKQy KYv `yB †cø‡Ui gvSLv‡b \_vKvi AbygwZ cv‡e bv| d‡j †cø‡Ui †fZ‡ii †P‡q evB‡i KYvi msL¨v †ewk| †cø‡Ui evB‡ii KYvi SuvK †cøU‡K evB‡i †\_‡K av°v †`‡e| †fZ‡i †\_‡K †m av°vi Reve †`Iqvi g‡Zv KYvi Afve \_vKvq †cøU `y‡Uv G‡K Ac‡ii w`‡K avweZ n‡e| KvRUv NU‡e MfxiZg f¨vKzqv‡gI| GUvB f¨vKzqv‡gi kw³| †h kw³i Drm k~b¨Zv| GUvB KvwRwgi cÖfve|

wPÎ 49: KvwRwgi cÖfve

KvwRwgi cÖfv‡ei K\_v ïb‡Z KíKvwnbx g‡b nq| wKš‘ k~b¨Zv †\_‡K m„ó G inm¨gqi f~Zy‡o e‡ji Aw¯ÍZ¡ ev¯Íe| G e‡ji cwigvY Lye ¶y`ª| cwigvc KivI `ytmva¨| wKš‘ 1995 mv‡j w÷‡fb j¨v‡gvi mivmwi GUv cwigvc K‡ib| wZwb ¯^Y© w`‡q Ave„Z `ywU †cøU‡K ms‡e`bkxj †gvPo-cwigvc‡Ki g‡a¨ ¯’vcb K‡ib| cwigvc K‡i †`‡Lb, KvwRwgi ej‡K cÖwZnZ Ki‡Z KZUyKz ej cÖ‡qvRb nq| cÖvß DËi wg‡j hvq KvwRwgi Z‡Ë¡i mv‡\_| GKwU wccov‡K wÎk nvRvi fvM Ki‡j Gi hZUv IRb n‡e Zvi cÖvq mgvb G ej5| j¨v‡gvi k~b¨¯’v‡bi ˆZwi ej cwigvc Ki‡jb|

Av‡cw¶Kxq k~b¨: eø¨vK‡nvj

[b¶ÎUv] †Pkvqvi weov‡ji g‡Zv `„wói Avov‡j P‡j †Mj| GKwU †cQ‡b †i‡L †Mj Gi †`u‡Zv nvwm| Av‡iKwU †i‡L †Mj ïay gnvKl©xq AvKl©Y|

—Rb ûBjvi

‡Kvqv›Uvg MwZwe`¨vq k~b¨ f¨vKzqv‡g Amxg kw³ mieivn K‡i| Av‡iK AvaywbK ZË¡ Av‡cw¶KZvq k~b¨ Ab¨ GKwU c¨vivW‡·i Rb¥ †`q| eø¨vK‡nv‡ji Amxg k~b¨Zv| †Kvqv›Uvg MwZwe`¨vi g‡ZvB Av‡cw¶KZvi Rb¥ Av‡jvi g‡a¨| G‡¶‡Î mgm¨v ˆZwi K‡i Av‡jvi MwZ| gnvwe‡k¦i †ewkifvM e¯‘i MwZ m¤ú‡K©B me ch©‡e¶K GKgZ n‡eb bv| aiæb, GKwU †Q‡j wewfbœ w`‡K cv\_i Qyuo‡Q| †Q‡jwUi w`‡K GwM‡q Avmv ch©‡e¶‡Ki Kv‡Q `~‡i miv ch©‡e¶‡Ki †P‡q cv\_‡ii MwZ †ewk g‡b n‡e| cv\_‡ii †eM wbf©i K‡i ch©‡e¶‡Ki MwZ I w`‡Ki Ici| GKBfv‡e Av‡jvi †eMI ch©‡e¶‡Ki †e‡Mi mv‡\_ mv‡\_ e`‡j hvIqv DwPZ| 1887 mv‡j gvwK©b c`v\_©we` A¨vjevU© gvB‡Kjmb I GWIqvW© gwj© G cÖfve cwigvc Kivi †Póv K‡ib| Av‡jvi †e‡M †Kv‡bv cv\_©K¨ bv †c‡q Zuviv nZeyw× n‡q hvb| mKj w`‡KB Av‡jvi MwZ GKB| GUv Kxfv‡e m¤¢e?

‡mB 1905 mv‡jB †mB ZiæY AvBb÷vBbB DËiUv w`‡jb| AveviI †`Lv †Mj, mij wKQy Abygvb eo djvdj cÖ`vb K‡i| AvBb÷vB‡bi cÖ\_g AbygvbUv †gvUvgywU cwi®‹vi †evSv hvq| AvBb÷vBb ej‡jb, wKQymsL¨K gvbyl GKwU NUbv ch©‡e¶Y Ki‡j †m NUbvq c`v\_©we`¨vi m~Î mevi Rb¨ GKB n‡e| †hgb aiæb, GKUy KvK gvwU †\_‡K D‡o Mv‡Q P‡j †Mj| Avcwb G NUbv m¤ú‡K© `yRb gvby‡li eY©bv wb‡jb| GKRb gvbyl Av‡Qb f~wg‡Z| Av‡iKRb PjšÍ †Uª‡b| `yR‡bi Rb¨ c`v\_©we`¨vi m~Î GKB n‡e| Z‡e Zviv Kv‡Ki I Mv‡Qi MwZ m¤ú‡K© wfbœ gZ †`‡e| hw`I Kv‡Ki DÇq‡bi †kl cwiYwZ `yR‡bi Kv‡Q GKB| K‡qK †m‡KÛ c‡i KvK †cuŠ‡Q hv‡e Mv‡Q| †kl d‡ji e¨vcv‡i `yB ch©‡e¶K GKgZ| hw`I wKQy e¨vcv‡i `yR‡bi g‡Zi cv\_©K¨ \_vK‡e| GUvB Av‡cw¶KZvi bxwZ| (AvcvZZ Avgiv Av‡cw¶KZvi we‡kl ZË¡ (special theory of relativity) wb‡q K\_v ejwQ| G Z‡Ë¡ MwZi ai‡b wKQy wewawb‡la Av‡Q| cÖ‡Z¨K ch©‡e¶K‡K mij †iLvq wbwa©ó †e‡M Pj‡Z n‡e| Ab¨ K\_vq, Zv‡`i †e‡Mi nªvm-e„w× nIqv Pj‡e bv| Av‡cw¶KZvi mvwe©K Z‡Ë¡ G wewawb‡la `~i Kiv nq|)

wØZxq AbygvbU‡K Av‡iKUy †ewk †Mvj‡g‡j g‡b nq| Zvi Ici †`‡L g‡b n‡e, GwU Av‡cw¶KZvi wbq‡giB weiæ‡× hv‡”Q| AvBb÷vBb ej‡jb, †eM hvB †nvK bv †Kb, f¨vKzqvg ev k~b¨¯’v‡b Av‡jvi †e‡Mi e¨vcv‡i mevB GKgZ n‡e| G †e‡Mi gvb †m‡K‡Û wZb j¶ wK‡jvwgUvi| aªæe G gvb‡K c w`‡q cÖKvk Kiv nq| †KD Avcbvi w`‡K Av‡jv †dj‡j †m Av‡jv Avcbvi w`‡K Qy‡U Avm‡e c †e‡M| Av‡jv †djv gvbylUv w¯’i `uvwo‡q Av‡Q, bvwK Avcbvi w`‡K ev wecixZ w`‡K QyU‡Q †mUv AcÖvmw½K| Av‡jvKiwk¥ memgq Avcbvi ev †hKv‡iv `„wó‡Z c †e‡M P‡j|

e¯‘i MwZ m¤ú‡K© c`v\_©we`‡`i Rvbv mewKQy‡K P¨v‡j‡Äi gy‡L †d‡j w`j G Abygvb| KvK Av‡jvi g‡Zv AvPiY Ki‡j †Uª‡b I evB‡i `uvov‡bv `k©K Kv‡Ki MwZ m¤ú‡K© GKgZ n‡Z n‡e| Gi A\_© n‡e, Kv‡Ki Mv‡Q †cuŠQv‡bvi mgq m¤ú‡K© `yB ch©‡e¶K wfbœ K\_v ej‡eb (wPÎ 50)| AvBb÷vBb eyS‡jb, G mgm¨v `~i Kivi GKwU Dcvq Av‡Q| a‡i wbZ n‡e, ch©‡e¶‡Ki MwZi Ici wbf©i K‡i mg‡qi cÖevn cv‡ë hvq| w¯’i Nwoi Zyjbvq †Uª‡bi Nwoi KuvUv ax‡i Pj‡e| f~wg‡Z AwZevwnZ `k †m‡KÛ †Uª‡b \_vKv KviI Kv‡Q gvÎ cuvP wgwbU g‡b n‡Z cv‡i| `ªæZ †e‡M Qy‡U Pjv KviI Kv‡QI GKB e¨vcvi g‡b n‡e| Zvi nv‡Z \_vKv ÷cIqv‡Pi cÖwZwU wUK w¯’i ch©‡e¶‡Ki Kv‡Q GK †m‡K‡Ûi †ewk mgq c‡i n‡e e‡j g‡b n‡e| aiæb, GKRb gnKvkPvix Av‡jvi †e‡Mi 90 fvM †e‡M 20 eQi (Zvi wb‡Ri Nwo Abymv‡i) ågY K‡i G‡jb| 20 eQi eqm evwo‡q wZwb c„w\_ex‡Z wd‡i Avm‡eb| GUvB †Zv nIqvi K\_v| wKš‘ c„w\_ex‡Z \_vKv evwK mevi eqm evo‡e 46 eQi|

wPÎ 50: Kv‡Ki MwZ‡eM aªæe \_vKvi A\_©, mgq Aek¨B Av‡cw¶K n‡e|

MwZi mv‡\_ mv‡\_ ïay mgqB e`jvq bv, e`‡j hvq ˆ`N¨© Ges fiI| MwZ evovi mv‡\_ mv‡\_ e¯‘i ˆ`N¨© K‡g Ges fi ev‡o| Av‡jvi 90 fvM MwZ‡Z w¯’i `k©‡Ki Kv‡Q GK M‡Ri KvwVi ˆ`N¨© n‡e gvÎ 0.44 MR| GK †KwR f‡ii GK e¨vM wPwb n‡e 2.3 †KwR| (Z‡e Gi gv‡b G bq, Avcwb GKB e¨vM w`‡q †ewk we¯‹yU evbv‡Z cvi‡eb| e¨v‡Mi `„wó‡KvY †\_‡K cwigvY I fi GKB \_vK‡e|)

mgqcÖev‡ni G cwieZ©b Awek¦vm¨ jvM‡Z cv‡i| wKš‘ ch©‡e¶‡Y Gi cÖgvYI cvIqv †M‡Q| AwZcvigvYweK KYviv `ªæZ Pj‡j ¶q n‡q hvIqvi Av‡M GwU cÖZ¨vkvi †P‡q †ewk mgq wU‡K \_v‡K| KviY Gi mgq ax‡i P‡j| `ªæZ‡e‡M Pjv wegv‡bi g‡a¨ m~² Nwo‡K ax‡i Pj‡Z ev¯Í‡e †`Lv †M‡Q6| AvBb÷vB‡bi ZË¡ KvR K‡i| wKš‘ ZvI GKwU mgm¨vi D™¢e N‡U| †mUv Avi wKQyB bq, k~b¨|

hv‡bi †eM Av‡jvi †e‡Mi KvQvKvwQ n‡j mgq A‡bK A‡bK †ewk axi n‡q hvq| hvb Av‡jvi †e‡M Pj‡j hv‡bi †fZ‡ii Nwoi GKwU wUK n‡Z n‡Z evB‡i Amxg mgq AwZevwnZ n‡q hv‡e| GK †m‡K‡ÛiI A‡bK ¶y`ª mg‡qi g‡a¨ j¶-‡KvwU eQi cvi n‡q hv‡e| ZZw`‡b gnvwek¦ Gi AwšÍg fvM¨ eiY K‡i †dj‡e| n‡q hv‡e aŸsm| hv‡bi †fZ‡ii gnvKvkPvixi Rb¨ mgq †\_‡g hv‡e| mg‡qi cÖevn ¸b n‡e k~b¨ w`‡q|

Z‡e mgq‡K \_vwg‡q AZ mnR K\_v bq| hv‡bi †eM evov‡Z \_vK‡j mgq µ‡gB axi n‡Z \_v‡K| Z‡e GKBmv‡\_ hv‡bi fiI evo‡Z \_v‡K| e¨vcviUv †hb Ggb: Avcwb GKwU †ewe K¨vwi‡qR‡K †Vj‡Qb| Avi ev”PvUv µ‡gB eo n‡”Q| wKQy¶Y ci †Zv Avcwb hv‡K †Vj‡Qb, †m †Kv‡bv ev”Pv bq, GK my‡gv Kzw¯Íwew`| GLb Avi Zv‡K †V‡j †bIqv mnR bq| Gic‡iI Zvi †eM evov‡bv †M‡j ev”Pvi fi †e‡o n‡e Mvwoi mgvb| Zvici RvnvR I Zvici cy‡iv GK MÖ‡ni mgvb| Avi Zvici...b¶Î, Qvqvc\_| ev”Pvi fi eo nIqvi mv‡\_ mv‡\_ †Vjvi cÖfve Kg‡Z \_vK‡e| GKBfv‡e gnvKvkhv‡biI †eM evwo‡q evwo‡q µ‡gB Av‡jvi †e‡Mi KvQvKvwQ wb‡Z cvi‡eb| wKš‘ GK mgq Gi fi n‡e wekvj| d‡j Avi †eM evov‡bv m¤¢eB n‡e bv| gnvKvkhvb ev fiwewkó †h‡Kv‡bv e¯‘B Avm‡j KLbI Av‡jvi †eM‡K ai‡Z cvi‡e bv| Av‡jvi †eM n‡jv †e‡Mi P~ovšÍ mxgv| Avcwb KL‡bvB Gi mgvb †eM AR©b Ki‡Z cvi‡eb bv| Qvwo‡q hvIqv †Zv AviI c‡ii K\_v| cÖK…wZ wb‡R‡K `yó k~‡b¨i nvZ †\_‡K euvwP‡q‡Q|

Z‡e cÖK…wZ wK Avm‡jB k~‡b¨i mv‡\_ †c‡i I‡V‡Q? AvBb÷vBb wb‡RB Av‡cw¶KZv‡K ewa©Z K‡i gnvKl©‡K hy³ K‡ib7| wZwb fy‡jI fv‡ebwb, Av‡cw¶KZvi mvwe©K Z‡Ë¡i G bZyb mgxKiY¸‡jv P~ovšÍ k~b¨‡K †W‡K wb‡q Avm‡e| AviI Avb‡e me‡P‡q Lvivc Amxg‡K| ejwQ eø¨vK‡nv‡ji K\_v|

AvBb÷vB‡bi mgxKiY ¯’vb I Kvj‡K GKB wRwb‡mi wfbœ wfbœ w`K wn‡m‡e †`‡L| Ggwb‡ZB Avgiv Rvwb, †eM evov‡j (Z¡iY AR©b Ki‡j) ¯’vb g‡a¨ w`‡q hvIqvi ai‡b cwieZ©b Av‡m| †eM evo‡Z ev Kg‡Z cv‡i| AvBb÷vB‡bi mgxKiY †`Lvj, Z¡iY ¯’v‡bi cvkvcvwk mg‡qi ga¨ w`‡q hvIqvi ai‡bI cwieZ©b Av‡b| Z¡i‡Yi Kvi‡Y mgq `ªæZ ev ax‡i cÖevwnZ n‡Z cv‡i| d‡j †Kv‡bv e¯‘‡K ej cÖ‡qvM K‡i Z¡iY w`‡j (‡mUv †nvK gnvKl© wKsev Ab¨ †Kv‡bv Z¡iY ev cwieZ©bkxj †eM) ¯’vb I mg‡qi g‡a¨ Gi MwZ e`‡j hv‡e| gv‡b e`‡j hv‡e ¯’vb-Kvj|

aviYvUv †evSv mnR bq| Z‡e ¯’vb-Kvj †evSvi me‡P‡q mnR Dcvq n‡jv GKwU Dcgv| ¯’vb-Kvj wekvj GK LÐ ivev‡ii Pv`‡ii mv‡\_ Zyjbxq| MÖn, b¶Î I evwK mewKQy †m Pv`‡i Aew¯’Z| d‡j Pv`i GKUy weK…Z nq| Pv`‡i Aew¯’Z e¯‘i m„ó weK…wZ ev eµZvB gnvKl©| Pv`‡i hZ fvix e¯‘ \_vK‡e, Pv`‡ii weK…wZI ZZ †ewk n‡e| e¯‘Uvi Pvicv‡kI ZZ eo †Uvj co‡e|

ivev‡ii Pv`‡ii eµZv ïay ¯’v‡bi bq, mg‡qiI eµZv| fvix e¯‘ ïay ¯’vb‡K euvKvq bv, mgq‡KI euvKvq| eµZv evovi mv‡\_ mv‡\_ eµZv eo †\_‡K AviI eo n‡ZB \_v‡K| f‡ii †¶‡ÎI GKB NUbv N‡U| ¯’v‡bi †ewk euvKv‡bv AÂ‡j cÖ‡ek Ki‡j fiI ev¯ÍweK A‡\_©B †e‡o hvq| G NUbvi bvg fi ùxwZ (mass inflation)|

G Dcgvi gva¨‡g MÖ‡ni K¶c‡\_i e¨vL¨v cvIqv hvq| Pv`‡ii g‡a¨ m~‡h©i myó †Uv‡ji g‡a¨ c„w\_ex †f‡m Pj‡Q| b¶‡Îi Pvicv‡k Av‡jv mijc‡\_ P‡j bq, P‡j euvKv c‡\_| 1919 mv‡j weªwUk †R¨vwZwe©` Av\_©vi GwWsUb GK Awfhv‡b GUv ev¯Í‡e ch©‡e¶Y K‡ib| wZwb m~h©MÖn‡Yi mgq GKwU b¶‡Îi Ae¯’vb cwigvc K‡ib| †`L‡Z cvb AvBb÷vB‡bi c~e©vbywgZ eµZvi wb`k©b (wPÎ 51)|

AvBb÷vB‡bi mgxKiY AviI fq¼i wRwb‡miI c~e©vfvm †`q| G wRwb‡mi bvg eø¨vK‡nvj| Ggb GK b¶Î, hvi NbZ¡ GZ †ewk †h Gi nvZ †\_‡K †KD gy³ n‡Z cv‡i bv| KvRwU cv‡i bv GgbwK Av‡jvI|

wPÎ 51: gnvKl© m~‡h©i KvQ w`‡q hvIqv Av‡jv‡K euvwK‡q †`q|

Ab¨me b¶‡Îi g‡ZvB eø¨vK‡nv‡ji8 Rxeb ïiæ nq DËß M¨v‡mi wekvj †MvjK wn‡m‡e| M¨v‡mi g‡a¨ me‡P‡q †ewk \_v‡K nvB‡Wªv‡Rb| ¯^vaxbfv‡e †Q‡o w`‡j M¨v‡mi h‡\_ó eo GKwU †MvjK wb‡Ri gnvKl©xq IR‡b Pyc‡m hv‡e| ¸wU‡q wM‡q †QvÆ GKwU L‡Ð iƒc †b‡e| Avgv‡`i fvM¨ fvj, b¶Î ¸wU‡q hvq bv| KviY G‡Z KvR K‡i AviI GKwU ej| wbDK¬xq wdDkb| M¨vmxq †gN ¸wU‡q †h‡Z \_vK‡j ZvcgvÎv I NbZ¡ evo‡Z \_v‡K| nvB‡Wªv‡Rb cigvYyiv G‡K Ac‡ii mv‡\_ av°v Lvq `ªæZ †\_‡K `ªæZZi e‡j| GKmgq b¶Î GZ †ewk DËß I Nb nq †h nvB‡Wªv‡Rb cigvYyiv G‡K Ac‡ii mv‡\_ wg‡k hvq| ˆZwi nq wnwjqvg| G mgq wbM©Z nq wecyj cwigvY kw³| G kw³i Drm b¶‡Îi †K›`ª| Gi d‡j b¶Î Avevi wKQyUv cÖmvwiZ nq| Rxe‡bi †ewkifvM mgq b¶Î G Aw¯’wZkxj mvg¨e¯’vq (equilibrium) \_v‡K| gnvK‡l©i gva¨‡g ˆZwi ¸wU‡q hvIqvi cÖeYZvi wecix‡Z KvR K‡i †K‡›`ªi nvB‡Wªv‡Rb wdDkb †\_‡K m„ó kw³|

G mvg¨ve¯’v wPiKvj \_v‡K bv| wb‡R‡K R¡vjv‡bvi Rb¨ b¶‡Îi Kv‡Q \_vKv nvB‡Wªv‡R‡bi cwigvY †Zv mxwgZ| wKQy mgq c‡i wdDkb cÖwµqv †\_‡g Av‡m| bó nq mvg¨ve¯’v| (G cÖwµqvq KZ mgq jvM‡e Zv wbf©i K‡i b¶‡Îi AvKv‡ii Ici| wbg©g cwinvm! eo b¶‡Î †ewk nvB‡Wªv‡Rb \_v‡K wVKB, wKš‘ Zv‡Z RxebKvj nq †QvU| KviY G b¶Î R¡‡jI `ªæZ| m~‡h©i nv‡Z AviI 500 †KvwU eQi R¡jvi g‡Zv R¡vjvwb Av‡Q| Z‡e GZ `xN© mgq †`‡L Lywk nIqvi wKQy †bB| Zvi Av‡MB m~‡h©i ZvcgvÎv ax‡i ax‡i evo‡Z \_vK‡e| hv‡Z D‡o hv‡e mgy‡`ªi cvwb| c„w\_ex n‡q hv‡e ïµ MÖ‡ni g‡Zv ev‡mi A‡hvM¨ GK giæf~wg| c„w\_ex‡Z AviI 100 †KvwU eQi cÖv‡Yi Aw¯ÍZ¡ wU‡K \_vK‡jB Avgiv wb‡R‡`i‡K fvM¨evb fve‡Z cvwi|) G‡Ki ci GK giYhš¿bv †k‡l P~ovšÍ cwiYwZ AveviI wbf©i Ki‡e f‡ii Ici| b¶‡Îi wdDkb hš¿ eÜ n‡e| gnvK‡l©i Pv‡c b¶Î AveviI Pycmv‡Z \_vK‡e|

Z‡e b¶Î‡K Pyc‡m wM‡q we›`yi mgvb n‡q hvIqv †VKvq †Kvqv›Uvg MwZwe`¨vi GKwU m~Î| bvg cvDwji eR©b bxwZ (Pauli exclusion principle)| 1920-Gi `k‡Ki gvSvgvwS‡Z Rvg©vb c`v\_©we` fjdM¨vs cvDwj m~ÎUv Avwe®‹vi K‡ib| bxwZUvi e³e¨ A‡bKUv GiKg: `ywU wRwbm GKBmv‡\_ GKB RvqMvq \_vK‡Z cv‡i bv| we‡kl K‡i, GKB †Kvqv›Uvg Ae¯’vi `ywU B‡jKUªb‡K †Rvi K‡iI GKB RvqMvq ivLv hv‡e bv| 1933 mv‡j fviZxq c`v\_©we` myeªþY¨b P›`ª‡kLi eyS‡Z cv‡ib, gnvK‡l©i Pv‡ci wecix‡Z cvDwji eR©b bxwZi ¶gZvI Zy”Q|

b¶‡Îi †fZ‡i Pvc evo‡Z \_vK‡j cvDwji eR©b bxwZ e‡j, B‡jKUªbiv G‡K Aci‡K Gov‡bvi Rb¨ `ªæZ †\_‡K `ªæZZi PjvPj Ki‡Z \_v‡K| wKš‘ PjvP‡ji MwZi †Zv GKwU mxgv Av‡Q| B‡jKUªb Av‡jvi †P‡q †ewk †Rv‡i Pj‡Z cv‡i bv| d‡j GKwU e¯‘L‡Ð h‡\_ó Pvc cÖ‡qvM Kiv n‡j G‡K Pyc‡m hvIqvi nvZ †\_‡K euvPv‡Z n‡j B‡jKUªb‡`i hZ †Rv‡i †QvUv `iKvi Zviv †mUv cv‡i bv| P›`ª‡kLi †`Lvb, Pyc‡m †h‡Z \_vKv b¶‡Îi fi m~‡h©i 1.4 ¸b n‡j gnvKl© cvDwji eR©b bxwZ‡K civwRZ Ki‡e| P›`ª‡kLi mxgvi Ic‡i gnvKl© n‡e fqvbK kw³kvjx| B‡jKUª‡bi wKQyB Kivi \_vK‡e bv| n‡q hv‡e cy‡ivcywi Amnvq| B‡jKUªb wM‡q av°v Lv‡e cigvYyi †K‡›`ªi †cÖvU‡bi mv‡\_| ˆZwi n‡e wbDUªb| fvix b¶ÎUv †kl ch©šÍ wbDUªb w`‡q Mov GK ˆ`Z¨vKvi †Mvj‡K cwiYZ n‡e| GiB bvg wbDUªb b¶Î|

wnmve GLv‡bB †\_‡g \_v‡Kwb| †`Lv hvq, ¸Uv‡Z \_vKv b¶‡Îi fi P›`ª‡kLi mxgvi wKQyUv †ewk n‡j B‡jKUªb‡`i g‡ZvB wbDUªb‡`i Pvc b¶Î‡K AviI †ewk ¸wU‡q hvIqv †\_‡K euvwP‡q †`q| wbDUªb b¶‡Î GUvB N‡U| G mgq wbDUªb b¶‡Îi NbZ¡ GZ †ewk nq †h GK PvgP cwigvY c`v‡\_©i fi nq K‡qK †KvwU Ub| Z‡e wbDUªb b¶‡ÎiI Pvc mvgjv‡bvi GKwU mxgv Av‡Q| †Kv‡bv †Kv‡bv †R¨vwZc©`v\_©we` wek¦vm K‡ib, Av‡iKUy †ewk Pv‡c wbDUªb Avjv`v n‡q Gi Dc`vb †KvqvK© ˆZwi nq| ˆZwi nq †KvqvK© b¶Î| wKš‘ GUvB cÖwZ‡iv‡ai †kl we›`y| Gici N‡U hvq biK ¸jRvi|

gvÎvwZwi³ fvix b¶Î Pyc‡m wM‡q DavI n‡q hvq| gnvKl©xq ej n‡q hvq Pig| c`v\_©we`iv gnvwe‡k¦ Ggb †Kv‡bv e‡ji K\_v Rv‡bb bv, hv wKbv b¶‡Îi m‡¼vPb †VKv‡Z cv‡i| B‡jKUª‡bi weKl©Y ev wbDUªb ev †KvqvK©‡`i G‡K Ac‡ii w`‡K Pvc †Kv‡bv wKQyB KvRUv Ki‡Z cvi‡e bv| gyg~l©y b¶Î †QvU †\_‡K AviI †QvU n‡ZB \_vK‡e| †kl ch©šÍ ... k~b¨| b¶ÎUv wb‡R‡K †V‡m †V‡m k~b¨ AvqZ‡bi RvqMvq ewm‡q †`q| GUvB eø¨vK‡nvj| †hLv‡b N‡U A™¢yZ me NUbv| †Kv‡bv †Kv‡bv weÁvbxi †Zv wek¦vm, eø¨vK‡nvj Kv‡R AvwM‡q Av‡jvi †P‡q †ewk MwZ‡Z PjvPj Kiv hv‡e| hvIqv hv‡e AZx‡Zi w`‡K|

eø¨vK‡nv‡ji A™¢yZ ˆewk‡ó¨i KviY Gi ¯’vb-Kv‡ji eµZvi aib| eø¨vK‡nvj G‡Kev‡iB †Kv‡bv ¯’vb `Lj K‡i bv| wKš‘ Gi fi Av‡Q| fi \_vKvq GwU ¯’vb-Kvj‡K euvKvq| Ggwb‡Z G‡Z †Kv‡bv mgm¨v †bB| fvix b¶‡Îi Kv‡Q †M‡j eµZv evo‡Z \_vK‡e| wKš‘ b¶‡Îi evB‡ii cÖvšÍ AwZµg Ki‡j eµZv Avevi Kg‡e| b¶‡Îi †K‡›`ª eµZv n‡e me‡P‡q Kg| wecixZfv‡e eø¨vK‡nvj n‡jv GKwU we›`ygvÎ| GwU `Lj K‡i k~b¨ cwigvY RvqMv| †bB †Kv‡bv ewnt¯’ cÖvšÍ| Ggb †Kv‡bv ¯’vb †bB, †hLv‡b eµZv Avevi Kg‡Z \_vK‡e| eø¨vK‡nv‡ji Kv‡Q †h‡Z \_vK‡j ¯’v‡bi eµZv †KejB evo‡Z \_v‡K| KL‡bvB K‡g bv| eø¨vK‡nv‡ji †Kv‡bv RvqMv †bB e‡j eµZv nq Amxg| ¯’vb-Kv‡ji g‡a¨ b¶ÎwU GKwU wQ`ª ˆZwi K‡i (wPÎ 52)| eø¨vK‡nv‡ji k~b¨ GKwU wms¸jvwiwU| gnvwe‡k¦i KvVv‡gvq GK Db¥y³ ¶Z|

aviYvUv Lye AmyweavRbK| ¯’vb-Kv‡ji gm„Y I Awew”Qbœ KvVv‡gvq Av‡Q ¶Z| Avi †KD Rv‡b bv Gme ¶‡Zi AÂ‡j wVK Kx N‡U| AvBb÷vBb wb‡RI wms¸jvwiwUi aviYvi cÖwZ wei³ wQ‡jb| A¯^xKvi K‡iwQ‡jb eø¨vK‡nv‡ji Aw¯ÍZ¡B| wKš‘ wZwb wQ‡jb fyj| eø¨vK‡nv‡ji Aw¯ÍZ¡ Av‡Q| Z‡e eø¨vK‡nv‡ji wms¸jvwiwU Lye wekªx I fq¼i| cÖK…wZ G‡K Avjv`v K‡i iv‡L| eø¨vK‡nv‡ji †K‡›`ªi k~b¨wU‡K †m KvD‡K †`L‡Z †`q bv| ILv‡b GKevi †KD †M‡j Zv‡K wd‡i Avm‡ZI †`q bv| cÖK…wZi Av‡Q wbR¯^ GK gnvRvMwZK cÖwZi¶v e¨e¯’v|

wPÎ 52: eø¨vK‡nvj Ab¨ b¶Î †\_‡K Avjv`v| ¯’vb-Kv‡ji g‡a¨ ˆZwi K‡i wQ`ª|

G cÖwZi¶v cÖ`vb K‡i gnvKl© wb‡RB| Dc‡ii w`‡K GKwU cv\_i Qyuo‡j c„w\_exi AwfKl© G‡K Avevi †U‡b gvwU‡Z wb‡q Avm‡e| Z‡e h‡\_ó †Rv‡i Qyuo‡j GwU Avi †diZ Avm‡e bv| c„w\_exi evqygÐj †cwi‡q GwU gy³ n‡q hv‡e c„w\_exi AwfKl© †\_‡K| g½‡j hvb cvVv‡bvi mgq bvmv †gvUvgywU G KvRUvB K‡i| b¨~bZg †h †e‡M Qyuo‡j †Kv‡bv e¯‘ `~‡i P‡j hvq Zvi bvg gyw³‡eM (escape velocity)| eø¨vK‡nvj GZ Nb †h Gi KvQvKvwQ †M‡j gyw³‡eM n‡e Av‡jvi MwZi †P‡q †ewk| G we‡kl mxgvbvi bvg NUbv w`MšÍ (event horizon)| NUbv w`M‡šÍi Icv‡i gnvKl© GZ kw³kvjx, ¯’vb GZ eµ †h Av‡jvmn †Kv‡bv wKQyB Gi †fZi †\_‡K †ei n‡Z cv‡i bv|

n¨uv, eø¨vK‡nvjI GKUv b¶Î| Z‡e Gi †Kv‡bv Av‡jvB NUbvi w`M‡šÍi Gcv‡i Avm‡Z cv‡i bv| GRb¨B GUv eø¨vK ev Kv‡jv| eø¨vK‡nv‡ji wms¸jvwiwU †`Lvi GKgvÎ Dcvq n‡jv NUbv w`MšÍ cvi n‡q ¯^P‡¶ †`‡L Avmv| †mUv Ki‡Z †M‡jI Amyweav Av‡Q| Zxeª gnvKl© gnvKvkPvix †U‡b j¤^v K‡i wekvj AvKv‡ii †mgvB‡qi g‡Zv evwb‡q †dj‡e| ZvI aiv hvK, Ggb GKUv †¯úmmy¨U evbv‡bv n‡jv hv w`‡q j¤^v nIqv †VKv‡bv m¤¢e n‡jv| ZeyI Avcbvi †`Lv `„k¨ KvD‡K G‡m ejvi my‡hvM cv‡eb bv| NUbv w`MšÍ cvi n‡q Icv‡k hvIqvi ci Avcvbvi cvVv‡bv †Kv‡bv m‡¼Z Gcv‡k †cuŠQ‡e bv †Kv‡bvw`b| cvi n‡q Avm‡Z cvi‡eb bv Avcwb wb‡RI| NUbv w`MšÍ cvi nIqv †hb gnvwe‡k¦i mxgvbv cvi n‡q P‡j hvIqv| †diZ Avmvi Avi †Kv‡bv my‡hvM †bB| gnvRvMwZK G cÖwZi¶v GZUvB kw³kvjx|

cÖK…wZ eø¨vK‡nv‡ji wms¸jvwiwU‡K †Mvcb ivLvi †Póv Ki‡jI weÁvbxiv Rv‡bb eø¨vK‡nv‡ji Aw¯ÍZ¡ ev¯Í‡e Av‡Q| m¨vwR‡Uwiqvm ZvivgÐ‡ji w`‡K Av‡Q Avgv‡`i Qvqvc‡\_i †K›`ª| Avi Qvqvc‡\_i wVK †K‡›`ª Av‡Q GKwU AwZfvix (supermassive) eø¨vK‡nvj| Gi fi 20 †\_‡K 25 j¶ m~‡h©i mgvb| †R¨vwZwe©`iv wKQy wKQy b¶Î‡K A`„k¨ GK m½xi mv‡\_ bvP‡Z †`‡L‡Qb| m½x Zvivi MwZ †`‡L eø¨vK‡nv‡ji Dcw¯’wZ †evSv hvq| hw`I eø¨vK‡nvj wb‡R A`„k¨| Z‡e weÁvbxiv eø¨vK‡nvj †`L‡jI GLb ch©šÍ †`‡Lbwb †K‡›`ªi k~b¨| KviY wekªx G wms¸jvwiwU‡K †Mvcb K‡i †i‡L‡Q NUbv w`MšÍ|

GUv GKUv fvj w`K| NUbv w`MšÍ bv \_vK‡j wms¸jvwiwU \_vKZ gnvwe‡k¦i w`‡K Db¥y³| G‡Z K‡i NUZ A™¢yZ me NUbv| ZvwË¡Kfv‡e NUbv w`MšÍwenxb GKwU Db¥y³ wms¸jvwiwU Av‡jvi †P‡q †ewk MwZ‡Z åg‡Yi my‡hvM ˆZwi Ki‡e| Pj‡Z †`‡e AZx‡Zi w`‡K| GUv Kiv hv‡e Iqvg©‡nvj bv‡g GKwU wRwb‡mi gva¨‡g|

ivev‡ii Pv`‡ii Dcgvq wd‡i Avwm| wms¸jvwiwU njI Amxg eµZvi we›`y| ¯’vb-Kv‡ji KvVv‡gvq GKwU MZ© Ae wQ`ª| wKQy wKQy wbw`©ó Ae¯’vq G‡K †U‡b we¯Í„Z Kiv hv‡e| MvwYwZKfv‡e †`Lv †M‡Q, eø¨vK‡nv‡ji N~Y©b ev ˆe`y¨wZK PvR© \_vK‡j wms¸jvwiwU †Kv‡bv we›`y n‡e bv| n‡e ¯’vb-Kv‡ji g‡a¨ GKwU ejq (ring)| weÁvbx‡`i Abygvb, Ggb `ywU cÖjw¤^Z wms¸jvwiwU‡K myo‡½i gva¨‡g hy³ Kiv †h‡Z cv‡i| G myo‡½i bvg Iqvg©‡nvj (wPÎ 53)| Iqvg©‡nv‡ji AwfhvÎx ¯’vb I m¤¢eZ Kv‡ji Ab¨ we›`y‡Z wM‡q †cuŠQ‡eb| ZvwË¡Kfv‡e Iqvg©‡nvj Avcbv‡K †Pv‡Li cj‡K gnvwe‡k¦i Ab¨ cÖv‡šÍ †cuŠ‡Q w`‡Z cv‡i| cv‡i †cQb ev mvg‡bi †Kv‡bv mg‡qI †cuŠ‡Q w`‡Z (‡`Lyb cwiwkó O)| Avcwb Avcbvi `v`x‡K ZiæYx Ae¯’vqI †`‡L †dj‡Z cv‡ib| `v`vi mv‡\_ Zvi we‡qi Av‡M Zv‡K †g‡i †dj‡Z cv‡ib| Zv‡`i we‡q n‡jv bv| Avcbvi evev ev AvcbviI Avi Rb¥B n‡jv bv| Rb¥ n‡jv eis fqvbK GK c¨vivW‡·i|

n¨uv, GKwU c¨vivW·B| hvi Rb¥ †`q mvwe©K Av‡cw¶KZvi (general relativity) mgxKi‡Yi k~b¨| Iqvg©‡nvj ev¯Í‡e Av‡Q wKbv Zv mwZ¨ K‡i †KD Rv‡b bv| Z‡e bvmv Avkv Ki‡Q Iqvg©‡nvj †hb \_v‡K|

wPÎ 53: GKwU Iqvg©‡nvj

webv cyuwR‡Z jvf?

wd« jvÂ ej‡Z wKQy †bB|

—ZvcMwZwe`¨vi wØZxq m~Î

bvmv Avkv Ki‡Q, `~‡ii b¶Î åg‡Yi PvweKvwV nq‡Zv k~‡b¨i nv‡ZB Av‡Q| 1998 mv‡j bvmv GKwU wm‡¤úvwRqv‡gi Av‡qvRb K‡i| welq wQj wdwR· di `¨ \_vW© wg‡jwbqvg| GLv‡b weÁvbxiv Iqvg©‡nv‡ji ¸bv¸Y, eµ c‡\_ ågY, f¨vKzqvg GbvwR© w`‡q ˆZwi hš¿ I AcÖ\_vMZ aviYv wb‡q weZK© K‡ib|

gnvk~b¨ åg‡Yi Amyweav n‡jv av°v w`‡q GwM‡q hvIqvi g‡Zv wKQy †bB| cy‡j muvZvi KvUvi mgq Avgiv cvwb‡Z av°v †`B| cvwb P‡j hvq †cQ‡b, Avi Avgiv mvg‡b| gvwU‡Z nuvUvi mgq cv w`‡q av°v †`B| †m av°v Kv‡R jvwM‡q GwM‡q hvB mvg‡b| gnvk~‡b¨ †cQb w`‡K av°v †`Iqvi g‡Zv wKQy †bB| PvB‡j ˆeVv Pvjv‡bv hv‡e| Z‡e Zv‡Z †Kv‡bv MwZ Avm‡e bv|

i‡KU ZvB †cQ‡b av°v ˆZwii Rb¨ wb‡RB mv‡\_ iv‡L wRwbm| i‡K‡Ui R¡vjvwb BwÄ‡bi g‡a¨ R¡‡j †cQb w`K w`‡q †ei n‡q hvq| hvb‡K av°v w`‡q †V‡j †`q mvg‡b| wVK †hfv‡e †ejyb †\_‡K wbM©Z evZvm G‡K K‡¶i Gw`K-‡mw`K Dwo‡q wb‡q hvq| Z‡e åg‡Yi Rb¨ R¡vjvwb †ei K‡i av°v w`‡q G‡Mv‡bv Lye e¨qeûj I Kómva¨ KvR| Kvw•LZ mg‡qi g‡a¨ `~‡ii b¶‡Î Awfhvb cvVv‡bv Gfv‡e Am¤¢e| AvaywbKKv‡j ivmvqwbK BwÄ‡bi DbœwZ n‡q‡Q| AvaywbK BwÄb we`y¨‡Zi gva¨‡g i‡KU †\_‡K †cQb w`‡K M¨vm †ei K‡i †`q| ZeyI G¸‡jv h‡\_ó djcÖm~ bq| me‡P‡q Kv‡Qi b¶‡Î †cuŠQ‡ZI i‡K‡Ui Rb¨ mywekvj cwigvY R¡vjvwb jvM‡e| R¡vjvwbi Gi †P‡q eo AcPq Avi n‡Z cv‡i bv|

G eB †jLvi mgq gvK© gvBwjm bvmvi †eªK\_ªæ †cÖvcvjmb †cÖv‡R‡±i cÖavb wQ‡jb| Zuvi Avkv wQj, k~‡b¨i †fŠZ ˆewk‡ó¨i gva¨‡g G Amyweav `~i Kiv hv‡e| Z‡e `~f©vM¨RbK K\_v n‡jv, wbKU fwel¨‡Z eø¨vK‡nv‡ji k~b¨ I wm½yjvwiwU wb‡q Avkvi Av‡jv †`Lv hv‡”Q bv| cÖ\_g K\_v n‡jv, Iqvg©‡nv‡ji Rb¨ cÖ‡qvRbxq Db¥y³ wms¸jvwiwU ˆZwi KivB mxgvnxb KwVb KvR| Zvi Ici, Ggb wms¸jvwiwU AwfhvÎx‡K kixi‡K wQbœwew”Qbœ K‡i †`‡e| 1998 mv‡j †RiæRv‡j‡gi wneªæ wek¦we`¨vj‡qi `yB c`v\_©we` G wel‡q GKwU KvR K‡ib| Zuviv †`Lvb, fi ùxwZi Kvi‡Y my›`i ejq AvK…wZi wms¸jvwiwUi GKwU N~Y©qgvb ev PvR©avix eø¨vK‡nvjI gnvKvkPvix‡K nZ¨v Ki‡e| wms¸jvwiwUi w`‡K †h‡Z \_vK‡j eø¨vK‡nv‡ji fi †e‡o Amx‡gi KvQvKvwQ n‡e e‡j g‡b n‡e| gnvKl©xq Uvb n‡e fqvbK kw³kvjx| GK †m‡K‡Ûi fMvsk mg‡qB gnvKvkPvix P~Y©-weP~Y© n‡q hv‡e| Iqvg©‡nvj ¯^v‡¯’¨i Rb¨ gvivZ¥K SyuwKc~Y© wRwbm|

gnvKvk åg‡Yi Rb¨ eø¨vK‡nv‡ji †K‡›`ªi k~b¨ mnR †Kv‡bv c\_ ˆZwi K‡i bv| Z‡e †Kvqv›Uvg ejwe`¨vi k~b¨ weKí GKwU `iRv Ly‡j w`‡q‡Q| k~b¨-we›`yi kw³B nq‡Zvev cig R¡vjvwb| GLv‡b G‡m c`v\_©we`¨vi g~j aviv †Q‡o Avgiv Abygv‡bi iv‡R¨ cÖ‡ek KiwQ|

gvBwj‡mi g‡Z gnvKvkPvixiv hvb‡K †V‡j †bIqvi Rb¨ f¨vKzqv‡gi kw³ Kv‡R jvMv‡Z cv‡ib| bvweK †hfv‡e evZvm Kv‡R jvwM‡q RvnvR Pvjvb| wZwb e‡jb, "Avwg KvwRwgi cÖfv‡ei mv‡\_ GKUy Zyjbv w`w”Q| †cøU‡K cvkvcvwk †i‡L Avgiv f¨vKzqvg †\_‡K `„k¨gvb wewKiY Pvc cvw”Q| GLvb †\_‡K †Kv‡bvfv‡e AcÖwZmg (wØgyLxi e`‡j GKgyLx) ej cvIqv †M‡j AMÖmigvb ej cvIqv hv‡e|" `ytLRbKfv‡e, GLb ch©šÍ KvwRwgi cÖfve‡K cÖwZmgB g‡b n‡”Q| `yB †cøU Kv‡Q Av‡m I G‡K Aci‡K AvKl©Y K‡i| G‡Ki wµqv Ac‡ii cÖwZ mgvb I wecixZgyLx| †Kv‡bv ai‡bi †Kvqv›Uvg cvj \_vK‡j KvRUv mnR nZ| †hUv nZ GKgyLx `c©‡Yi g‡Zv| GKcv‡ki fvP©yqvj KYv‡K hv cÖwZdwjZ KiZ| wKš‘ Aci cvk w`‡q P‡j †h‡Z cv‡i webv evavq| f¨vKzqvg kw³ ZLb cy‡iv e¯‘Uv‡K AcÖwZdwjZ cv‡ji w`‡K †V‡j wb‡q †hZ| gvBwjm ¯^xKvi Ki‡Qb, GUv Kivi †Kv‡bv Dcvq KviI gv\_vq Avm‡Q bv| Ggb GKwU hš¿ ˆZwi Kivi g‡Zv †Kv‡bv ZË¡ †bB|

Avmj mgm¨v n‡jv c`v\_©we`¨vi m~Î Avcbv‡K webvg~‡j¨ wKQy †c‡Z †`‡e bv| RvnvR †hfv‡e evZv‡mi MwZ Kwg‡q †`q, †Zgwb †Kvqv›Uvg cvj‡KI f¨vKzqv‡gi kw³ Kgv‡Z n‡e| wKš‘ k~b¨Zv‡K Kxfv‡e Avcwb e`jv‡eb?

n¨viì cyUnd Aek¨ Avkv Qvo‡Z bvivR| f`ª‡jvK †U·v‡mi Aw÷‡b Aew¯’Z BÝwUwUDU Ae A¨vWfvÝW ÷vwWR cÖwZôv‡bi cwiPvjK| †Kvqv›Uvg cvj f¨vKzqv‡gi ˆewkó¨‡K e`‡j †`‡e| (1974 mv‡j †bPvi Rvb©v‡j GKwU M‡elYvcÎ cÖKvk K‡i cyUnd weL¨vZ nb| Zuvi M‡elYv cÖgvY Ki‡Z †Póv K‡i, hv`yKi Dwi †Mjvi I Ab¨ c`v\_©weÁvb †Pv‡Li mvnvh¨ QvovB `~i †\_‡K e¯‘‡K †`L‡Z cv‡i| G wm×všÍ g~j avivi weÁvb MÖnY K‡iwb|) wZwb e‡jb, "f¨vKzqvg ¶q n‡q GKUy wb¤œ Ae¯’vq †b‡g Av‡m|" hw` ZvB nq, Zvn‡j †Kvqv›Uvg cvj m~Pbv gvÎ| Ggb BwÄbI evbv‡bv hv‡e, hv Pj‡e ïay k~b¨-we›`yi kw³ w`‡qB| G‡`i GKgvÎ Amyweav n‡jv gnvwe‡k¦i KvVv‡gv †f‡O Pyigvi n‡q hv‡e| hw`I KvRUv n‡e ax‡i| KvVv‡gvi g‡a¨ KLbI MZ© ˆZwi n‡e bv| cyUn‡di g‡Z, "GUv gnvmgy`ª †\_‡K GK Kvc cvwb †bIqvi g‡Zv NUbv|"

GUv gnvwek¦‡K aŸsmI K‡i w`‡Z cv‡i| f¨vKzqv‡gi kw³ Av‡Q—GUv wb‡q †Kv‡bv m‡›`n †bB| KvwRwgi ejB Zvi ¯^v¶x| wKš‘ f¨vKzqv‡gi kw³B wK mwZ¨Kvi A‡\_© me©wb¤œ m¤¢ve¨ kw³| Zv bvn‡j wKš‘ f¨vKzqv‡gi g‡a¨B wec` jywK‡q \_vK‡Z cv‡i| 1983 mv‡j `yRb weÁvbx †bPvi mvgwqKx‡Z e‡jb, f¨vKzqvg wb‡q KvimvwR Ki‡Z †M‡j gnvwek¦ AvZ¥nbb Ki‡Z cv‡i| †m M‡elYvq ejv nq, Avgv‡`i f¨vKzqvg nq‡Zvev bKj f¨vKzqvg| nq‡Zvev GUv Av‡Q A¯^vfvweK †ZR¯^x Ae¯’vq| cvnv‡oi cv‡k SyuwKc~Y©fv‡e GKwU ej †i‡L †`Iqvi g‡Zv Ae¯’v| f¨vKzqvg‡K h‡\_ó `yjywb w`‡j nqZ cvnvo †e‡q †mUv bvg‡Z ïiæ Ki‡e| VuvB †b‡e AviI wb¤^kw³i †Kv‡bv Ae¯’vq| Avgiv †mUv \_vgv‡Z cvie bv| G‡Z K‡i Aegy³ n‡e kw³i GK wekvj eyØy`| hv cÖmvwiZ n‡e Av‡jvi MwZ‡Z| †cQ‡b †i‡L aŸsmh‡Ái wPý| GUv GZUvI Lvivc n‡Z cv‡i †h GgbwK Avgv‡`i †`‡ni cÖwZwU AYy-cigvYy GB wech©‡qi mgq P~Y©-weP~Y© n‡q hv‡e|

Z‡e GUv NUv m¤¢vebv A‡bK A‡bK Kg| Avgv‡`i gnvwek¦ wU‡K Av‡Q eû wewjqb eQi hveZ| Avgiv Ggb SyuwKc~Y© Ae¯’vq \_vKe Zvi m¤¢vebv Lye KgB| Ggb GKwU wech©q m¤¢e n‡q \_vK‡j Zv NUv‡bvi Rb¨ gnvRvMwZK iwk¥i mv‡\_ m•Nl©B h‡\_ó wQj| Z‡e G hyw³ wek¦vmx‡`i `gv‡Z cv‡iwb| Zv‡`i g‡a¨ Av‡Qb c`v\_©we`I| dvwg©j¨v‡ei g‡Zv D”Pkw³i cix¶vMv‡ii M‡elYv cÖwZnZ Kivi †Póv Kiv n‡q‡Q| Zv‡`i wek¦vm, D”Pkw³i msN‡l© f¨vKzqv‡gi ¯^Ztù~Z© fvOb ïiæ n‡e| Gme fvebv¸‡jv mwVK n‡jI k~b¨-we›`yi kw³ w`‡q gnvKvkhvb‡K †V‡j wb‡Z cvivi m¤¢vebv mvgvb¨| Z‡e cyUn‡di wek¦vm, Zuvi Kv‡Q k~b¨Zvi kw³ msMÖ‡ni Dcvq Av‡Q|

ZvwË¡Kfv‡e weÁvbxiv KvwRwgi cÖfve †\_‡K kw³ msMÖn Ki‡Z cv‡ib| GgbwK f¨vKzqv‡gi me‡P‡q wb®úªf we›`y cig k~b¨ †\_‡KI| `yB †cø‡Ui msN‡l© Zvc Drcbœ nq| †m Zvc‡K we`y¨‡Z iƒcvšÍi Kiv hvq| Z‡e `yB †cøU‡K Avjv`v Ki‡Z †M‡j Av‡Mi Drcvw`Z kw³i †P‡q †ewk kw³ LiP nq| †ewkifvM weÁvbxi wek¦vm, G NUbvB k~b¨¯’v‡bi kw³ w`‡q evbv‡bv Aweivg MwZ h‡š¿i aviYv‡K evwZj K‡i †`q| Z‡e cyUnd g‡b K‡ib, G mgm¨vi †ek wKQy mgvavb Av‡Q Zuvi Kv‡Q| GKwU Dcvq n‡jv †cø‡Ui e`‡j cøvRgvi e¨envi|

cøvRgv n‡jv PvwR©Z KYv w`‡q ˆZwi M¨vm| KvwRwgi cÖfv‡ei †¶‡Î GUv AvPiY Ki‡e avZe †cø‡Ui g‡ZvB| wmwjÛvi AvK…wZi GKwU cwievnx M¨vm‡K k~b¨-we›`yi d¬vKPy‡qkb ev IVvbvgv w`‡q m¼ywPZ Kiv n‡e| wVK †hfv‡e †cøU‡K ejcÖ‡qv‡M GKÎ Kiv nq| G m‡¼vPb cøvRgv‡K DËß Ki‡e| wbM©Z n‡e kw³| cyUn‡di g‡Z, avZe †cø‡Ui †P‡q cøvRgv evbv‡bv mnR KvR| we`y¨‡Zi GKwU eëy w`‡qB Zv Kiv hvq| †cøU‡K †Zv c‡i Avjv`v Ki‡Z nq| †mLv‡b cøvRgvi "QvB"‡K D‡c¶v Ki‡jB n‡jv| cyUnd Drmv‡ni mv‡\_ `vwe K‡i‡Qb, G cÖwµqvq mieivnK…Z kw³i 30 ¸b †diZ cvIqv hvq| wZwb e‡jb, "GUv cÖgvwYZ| GUv wb‡q Avgv‡`i GKUv c¨v‡U›UI Av‡Q|" Z‡e cyUn‡di hš¿I webvg~‡j¨ kw³ mieivn Kivi eû hš¿¸‡jviB GKwU| AZx‡Z G¸‡jvi †Kv‡bvUvB ˆeÁvwbK cix¶vq DËxY© nqwb| cyUn‡di k~b¨ kw³i hš¿ Avjv`v n‡e †m m¤¢vebv †bB ej‡jB P‡j|

‡Kvqv›Uvg MwZwe`¨v I mvwe©K Av‡cw¶KZv e‡j, k~‡b¨i ¶gZv Amxg| d‡j gvbyl Gi my‡hvM Kv‡R jvMv‡bvi †Póv Ki‡eB| Zv‡Z AevK nIqvi wKQy †bB| wKš‘ GLb ch©šÍ g‡b n‡”Q, k~b¨Zv †\_‡K wKQyB cvIqv hv‡e bv|

Z\_¨wb‡`©k

7g Aa¨vq

1| ev¯Í‡e Avm‡j `yB ai‡bi NUbvB Av‡Q| wew”Qbœ I Awew”Qbœ `yB ai‡bi PjK Av‡Q| †h PjK wbw`©ó gv‡bi evB‡ii †Kv‡bv gvb MÖnY Ki‡Z cv‡i bv †mwU wew”Qbœ| †hgb GKwU wµ‡KU g¨v‡P KqwU Q°v n‡e? 0, 1 ev 2 ev Zvi †ewk| 1 I 2-Gi gv‡S wKQy †bB| ˆ`wbK `~N©Ubv ev Kj †m›Uv‡i Avmv K‡ji msL¨vI Ggb wew”Qbœ (discrete) PjK| gvby‡li IRb, D”PZv Avevi Awew”Qbœ (continuous)| KviI IRb 65.3 †KwR †hgb n‡Z cv‡i, †Zgwb n‡Z cv‡i 65. 31-I| G `yB msL¨v ev †h‡Kv‡bv `yB msL¨vi gv‡Si †h‡Kv‡bv msL¨vB n‡Z cv‡i| —Abyev`K

2| Zi½ dvskb eyS‡Z gv‡Sg‡a¨ GKwU wRwbm Kv‡R Av‡m| (cvwifvwlK A‡\_© Avm‡j †mUv Zi½ dvsk‡bi eM©|) G dvskb n‡jv KYvi Ae¯’v‡bi m¤¢vebvi cwigvc| †hgb GKwU B‡jKUªb ¯’v‡bi wewfbœ As‡k we¯Í„Z \_v‡K| wKš‘ Ae¯’vb cwigvc Ki‡Z †M‡j Zi½ dvskb G‡K wbw`©ó †Kv‡bv we›`y‡Z Lyu‡R cvIqvi m¤¢vebv e‡j †`q| cÖK…wZi G AwbðqZviB we‡ivwaZv K‡iwQ‡jb AvBb÷vBb| wZwb e‡jwQ‡jb, "Ck¦i gnvwek¦ wb‡q cvkv †L‡jb bv|" G K\_vi gva¨‡g wZwb †Kvqv›Uvg MwZwe`¨vi m¤¢vebvwfwËK c×wZ‡K A¯^xKvi K‡iwQ‡jb| AvBb÷vB‡bi `yf©vM¨! †Kvqv›Uvg MwZwe`¨vi m~Î Awek¦vm¨iKg fvjfv‡e KvR K‡i| cÖPwjZ wPivqZ c`v\_©weÁvb w`‡q †Kvqv›Uvg cÖfve mdjfv‡e e¨vL¨v Kiv hvq bv|

3| mwVK K‡i ej‡j Avm‡j AwbðqZv bxwZ †e‡Mi e`‡j KvR K‡i fi‡eM (momentum) wb‡q| hv e¯‘i fi I †e‡Mi ¸Ydj| c`v\_©weÁv‡bi fvlvq MwZi e`‡j †eM ej‡j PjvP‡ji w`KI †evSvq| †hgb †Kv‡bv wKQy wK DËi w`‡K bv `w¶Y w`‡K Pj‡Q| A\_ev Kv‡Q Avm‡Q bvwK `~‡i hv‡”Q| d‡j fi‡e‡Mi g‡a¨ e¯‘i fi, MwZ I c‡\_i w`‡Ki Z\_¨ \_v‡K| Z‡e G‡¶‡Î fi‡eM, MwZ I GgbwK kw³‡KI G‡Ki e`‡j Ab¨‡K e¨envi Kiv hvq|

4| †gŠwjKfv‡e AwbðqZv bxwZ †ek wKQy †Rvov ˆewk‡ó¨i Rb¨B Lv‡U| Gi g‡a¨ GKwU n‡jv Ae¯’vb I fi‡eM| Av‡iKwU †Rvov n‡jv e¯‘i kw³ I mgqKv‡ji (¯’vwqZ¡) AwbðqZv| bxwZwU ej‡Q, Ôk~b¨Õ ¯’v‡bI cÖPyi cwigvY fvP©yqvj KYv I cÖwZKYvi †Rvov i‡q‡Q| hw` Zv bv nZ, gv‡b Ôk~b¨Õ ¯’vb hw` Avm‡jB m¤ú~Y© Lvwj nZ, Zvn‡j Zvi A\_© nZ gnvKl©xq Ges Zwo”Py¤^Kxq †¶Îmn me¸‡jv †¶‡Îi gvb G‡Kev‡i k~b¨ nZ| wKš‘ GKwU †¶‡Îi gvb I mg‡qi mv‡\_ Zvi cwieZ©‡bi nvi GKwU KYvi Ae¯’vb I †e‡Mi (Ae¯’v‡bi cwieZ©b) mv‡\_ Zyjbxq| AwbðqZv bxwZ ej‡Q, Avcwb GB `ywU ivwki GKwU‡K hZ †ewk mwVKfv‡e cwigvc Ki‡Z PvB‡eb, Av‡iKwU‡Z fy‡ji cwigvY ZZB †e‡o hv‡e| AZGe, k~b¨¯’v‡bi †Kv‡bv †¶‡Îi gvb hw` cy‡ivcywi k~b¨ nq, Zvi gv‡b GKB mv‡\_ Gi gvb (A\_¨©vr k~b¨) Ges cwieZ©‡bi nvi (GUvI k~b¨) `y‡UviB GKwU m~² wnmve cvIqv hv‡e| GwU AwbðqZv bxwZi weiæ‡× hv‡”Q| AZGe, †¶‡Îi gv‡bi g‡a¨ wKQy cwigvY AwbðqZv \_vK‡ZB n‡e| G‡K ejv nq †Kvqv›Uvg d¬vKPy‡qkvb|—Abyev`K

\* AviI we¯ÍvwiZ Rvb‡Z coyb: Avãyj¨vn Avw`j gvngy`, 'cÖK…wZi ejmg~n Ges c`v\_©we`¨vi GKxfeb', A¨v weªdvi wnw÷ª Ae UvBg, XvKv: A‡š^lv , 2017, c„. |

5. IRb GK cÖKvi ej| gnvKl© Kv‡bv e¯‘‡K †h e‡j Uv‡b ZvB IRb| Avgiv cÖPwjZ A‡\_© hv‡K IRb ewj †mUv Avm‡j e¯‘i fi, hvi gv‡b n‡jv e¯‘‡Z Dcw¯’Z †gvU c`v‡\_©i cwigvY|c„w\_ex‡Z †Kv‡bv e¯‘i IRb †ei Ki‡Z fi‡K 9.81 (cÖvq) w`‡q ¸Y Ki‡Z nq| gvbUv n‡jv c„w\_exi AwfKl©R Z¡iY| †Kv‡bv e¯‘‡K Ici †\_‡K †Q‡o w`‡j cÖwZ †m‡KÛ G cwigvY nv‡i (evZv‡mi evav bv \_vK‡j) †eM evo‡Z \_vK‡e|—Abyev`K

6| e¨vcviUv Avm‡j Nwoi hvwš¿K †Kv‡bv welq bq| mgq ax‡i Pjvi cÖfveUvB Nwo‡Z †`Lv hv‡”Q|—Abyev`K

7| we‡kl Av‡cw¶KZv ïay aªæe ev wbw`©ó †eM wb‡q KvR K‡i| Z¡iY I gnvKl© wb‡q KvR K‡i mvwe©K Av‡cw¶KZv|—Abyev`K

8| eø¨vK‡nvj‡`i g‡a¨ GLv‡b bv¶wÎK eø¨vK‡nv‡ji K\_v ejv n‡”Q| †h eø¨vK‡nvj ˆZwi nq fvix b¶‡Îi Rxe‡bi †k‡l| Z‡e mycvig¨vwmf ev AwZfvix eø¨vK‡nvj Gfv‡e ˆZwi nq bv| Giv \_v‡K Qvqvc‡\_i †K‡›`ª| GQvovI K‡qK iKg eø¨vK‡nvj Av‡Q| Z‡e bv¶wÎK eø¨vK‡nvjivB †ewk Av‡jvwPZ|

Aóg Aa¨vq

MÖvDÛ wR‡ivi k~b¨Zg NÈv

[¯’vb-Kv‡ji mxgvbvq k~b¨]

‡`‡L g‡b n‡qwQj wfbMÖnevmx

‡`L‡Z cvi‡e bv †Kv‡bv gZ©evmx

Zv‡`i †k‡li BwZnv‡mi wbweo wewbg©vY

—\_gvm nvwW©, `¨ Kbfvi‡RÝ Ae `¨ †Uv‡qb

AvaywbK c`v\_©weÁvb †hb `yB `vb‡ei jovB| wekvj eo eo e¯‘i RM‡Z AvwacZ¨ mvwe©K Av‡cw¶KZvi| GUv KvR K‡i gnvwe‡k¦i me‡P‡q fvix e¯‘¸‡jv wb‡q| GB †hgb b¶Î, †mŠiRMr I Qvqvc\_| †Kvqv›Uvg MwZwe`¨vi kvmb AwZkq ¶y`ª RM‡Z| cigvYy, B‡jKUªb I AwZcvigvYweK KYviv †g‡b P‡j Gi wbqg| †`‡L g‡b n‡Z cv‡i, `yB ZË¡ wg‡jwg‡k KvR Ki‡Z cv‡i| gnvwe‡k¦i Avjv`v Avjv`v w`K cwiPvjbvi Rb¨ c`v\_©we`¨vi wbqg †eu‡a w`‡Z cv‡i|

wKš‘ Ggb e¯‘I Av‡Q hvi Aw¯ÍZ¡ `yB RM‡Z Ry‡oB Av‡Q| eø¨vK‡nv‡ji fi mywekvj| AZGe, Av‡cw¶KZvi Av‡jvP¨e¯‘ GUv| GKBmv‡\_ Avevi eø¨vK‡nvj AwZkq ¶y`ª AvKv‡ii wRwbm| d‡j Zv †Kvqv›Uvg MwZwe`¨vi Av‡jvP¨welq| wgj †Zv `~‡ii K\_v, `yB m~Î eø¨vK‡nv‡ji †K‡›`ª Ø‡›Ø wjß nq|

‡Kvqv›Uvg MwZwe`¨v I mvwe©K Av‡cw¶KZvi wgjbwe›`y‡Z k~‡b¨i evm| Avi k~b¨B `yB ZË¡‡K Ø‡›Ø Rovq| mvwe©K Av‡cw¶KZvi mgxKi‡Y eø¨vK‡nvj GKwU k~b¨| †Kvqv›Uvg Z‡Ë¡i MwY‡Z f¨vKzqv‡gi kw³ k~b¨| gnvwe‡k¦i BwZnv‡m me‡P‡q inm¨gq NUbv weM e¨vs (big bang)| `yB Z‡Ë¡B weM e¨vs k~b¨| gnvwe‡k¦i Rb¥ k~b¨ †\_‡K| gnvwe‡k¦i m~Pbv e¨vL¨v Ki‡Z †M‡j `yB ZË¡B AKvh©Ki n‡q hvq|

weM e¨vsM‡K eyS‡Z n‡j †Kvqv›Uvg ZË¡‡K Av‡cw¶KZvi mv‡\_ †Rvov w`‡Z n‡e| MZ K‡qK eQ‡i mvdj¨I cvIqv hv‡”Q| ˆZwi n‡q‡Q GK `vbexq ZË¡| hv gnvK‡l©i e¨vL¨v †Kvqv›Uvg ag© e¨vL¨v Ki‡Z cv‡i| d‡j c`v\_©we`iv gnvwe‡k¦i m„wói gyn~‡Z© `„wó w`‡Z cvi‡Qb| GRb¨ GKUvB KvR Ki‡Z n‡q‡Q| k~‡b¨i wbe©vmb| GKxf~Z G Z‡Ë¡i bvg w\_Iwi Ae Gfwiw\_s ev mvwe©K ZË¡|

mwZ¨ ej‡Z, mvwe©K ZË¡ Avm‡j k~‡b¨i ZË¡|

k~‡b¨i wbe©vmb: w÷ªs ZË¡

mgm¨v n‡jv Avgiv wnmve Ki‡Z Ki‡Z k~b¨ `~i‡Z¡ †cuŠ‡Q †M‡j mgxKiY we‡ùvwiZ n‡q hvq| †`q A\_©nxb me DËi| Amx‡gi g‡Zv wRwbm| †Kvqv›Uvg ZworMwZwe`¨vi R‡b¥i ci GUv wb‡q e¨vcK Sv‡gjv m„wó nq| weÁvbxiv †hw`‡KB wnmve KiwQ‡jb, cvw”Q‡jb ïay Amxg Avi Amxg|

—wiPvW© dvBbg¨vb

mvwe©K Av‡cw¶KZv I †Kvqv›Uvg MwZwe`¨vi g‡a¨ we‡iva Awbevh©| Av‡cw¶KZvi gnvwek¦ n‡jv gm„Y GK ivev‡ii Pv`i| gnvwek¦ Awew”Qbœ I cÖengvb| Zx¶&Y ev we›`ym`„k bq| Ab¨w`‡K †Kvqv›Uvg MwZwe`¨v e‡j Ge‡ov‡\_e‡ov I wew”Qbœ L‡Ð wef³ gnvwe‡k¦i K\_v| k~b¨ `yB Z‡Ë¡B Av‡Q| Avi †mUvB Zv‡`i Ø‡›Øi KviY|

eø¨vK‡nv‡j Av‡Q GK Amxg k~b¨| k~b¨ cwigvY ¯’v‡b Rgv n‡q‡Q me fi| ¯’vb †eu‡K‡Q Amxg cwigvY| gm„Y ivev‡ii Pv`‡i ˆZwi K‡i‡Q GKwU MZ©| mvwe©K Av‡cw¶KZvi mgxKiY k~‡b¨i Zx¶&YZv‡K fq cvq| eø¨vK‡nv‡j ¯’vb I Kv‡ji †bB †Kv‡bv A\_©|

‡Kvqv›Uvg MwZwe`¨vI GKB mgm¨vq AvµvšÍ| mgm¨vUv k~b¨-we›`yi kw³ wb‡q| †Kvqv›Uvg MwZwe`¨vi m~Î B‡jKUª‡bi g‡Zv KYv‡`i‡K we›`y g‡b K‡i| Zvi gv‡b, Giv †Kv‡bv ¯’vb `Lj K‡i bv| B‡jKUªb GKwU k~b¨gvwÎK e¯‘| Gi k~b¨m`„k ˆewk‡ó¨i Kvi‡YB weÁvbxiv Gi fi I PvR© Rv‡bb bv|

K\_vUv‡K nvm¨Ki g‡b n‡e| cÖvq GK k eQi Av‡M B‡jKUª‡bi PvR© I fi cwigvc Kiv n‡q‡Q| cwigv‡ci c‡iI GKUv wRwbm Kxfv‡e weÁvbx‡`i ARvbv \_v‡K? DËi Av‡Q k~‡b¨i Kv‡Q|

‡h B‡jKUªb weÁvbxiv †`‡Lb cix¶vMv‡i, †h B‡jKUªb‡K c`v\_©we`, imvqbwe` I cÖ‡KŠkjxiv hy‡Mi ci hyM fvj‡e‡m G‡m‡Qb, †mwU Avmj B‡jKUªb bq| †mwU GK Rvj ev bKj B‡jKUªb| Avmj B‡jKUªb XvKv c‡o Av‡Q KYvi AveiY w`‡q| †h KYv‡`i Rb¥ k~b¨-we›`yi IVvbvgvi gva¨‡g| cÖwZ gyn~‡Z© m„wó I aŸsm nq G KYviv| f¨vKzqv‡g Aew¯’Z B‡jKUªb gv‡Sg‡a¨B GKwU KYv †kvlY ev wbM©Z K‡i| GB †hgb †dvUb KYv| GB KYvi SuvK B‡jKUª‡bi fi I PvR© cwigv‡ci c‡\_ evav| KviY G KYviv wnmv‡e n¯Í‡¶c K‡i| †X‡K †`q B‡jKUª‡bi mwZ¨Kvi ˆewkó¨| c`v\_©we`‡`i †`Lv B‡jKUª‡bi †P‡q Avmj B‡jKUª‡bi fi I PvR© Av‡iKUy †ewk|

B‡jKUªb‡K Av‡iKUy KvQ †\_‡K ch©‡e¶Y Kiv †M‡j mwVK fi I PvR© AviI fv‡jvfv‡e Rvbv †hZ| KYvi †g‡Ni ga¨Kvi AwZkq msKxY© c\_ w`‡q hvIqvi g‡Zv ¶y`ª hš¿ Avwe®‹vi Kiv †M‡j B‡jKUªb‡K AviI fv‡jvfv‡e †`Lv †hZ| †Kvqv›Uvg ZË¡ ej‡Q, cwigvc hš¿ †g‡Ni cÖ\_g K‡qKwU fvP©yqvj KYv cvi n‡j B‡jKUª‡bi fi GKUy evo‡Z †`Lv hvq| hš¿ B‡jKUª‡bi AviI Kv‡Q †M‡j cvi n‡e AviI fvP©yqvj KYv| d‡j B‡jKUª‡bi ch©‡e¶YK…Z fi I PvR© AviI evo‡e| hš¿ B‡jKUªb †\_‡K k~b¨ GKK `~i‡Z¡ †M‡j GwU cvi nq AmxgmsL¨K KYv| d‡j h‡š¿i cwigvcK…Z fi I PvR©I nq Amxg| †Kvqv›Uvg ejwe`¨vi wbqg ej‡Q, k~b¨gvwÎK B‡jKUª‡bi fi I PvR© Amxg|

k~b¨-we›`yi kw³i g‡ZvB weÁvbxiv B‡jKUª‡bi Amxg fi I AvR© D‡c¶v Ki‡Z wk‡L‡Qb| Zuviv cy‡iv c\_ cvwo w`‡q B‡jKUª‡bi k~b¨ `~iZ¡ ch©šÍ hvb bv| wVK Zvi Av‡Mi †Kv‡bv GK RvqMvq †\_‡g hvb| KvQvKvwQ GKwU myweavRbK `~iZ¡ †e‡Q wb‡j B‡jK‡Uªi Avmj fi I Pv‡R©i me wnmve wg‡j hvq| G cÖwµqvi bvg wibg©vjvB‡Rkb ev cyb¯^vfvweKxKiY| wiPvW© dvBbg¨vb e‡jb, "Avwg eje GUv GK Lvg‡Lqvjx KvR|" hw`I wZwb wb‡R †bv‡ej cyi¯‹vi †c‡q‡Qb wibg©vjvB‡Rkb cÖwµqvi DbœwZ NwU‡q|

mvwe©K Av‡cw¶KZvi gm„Y Pv`‡i k~b¨ MZ© ˆZwi K‡i| Avevi B‡jKUªb‡K Kzqvkvq †X‡K w`‡q B‡jKUª‡bi Zx¶&Y we›`y PvR©‡K Qwo‡q gm„Y K‡i †`q| Z‡e †Kvqv›Uvg MwZwe`¨v †Zv KvRB K‡i B‡jKUª‡bi g‡Zv k~b¨gvwÎK we›`yKYv wb‡q| d‡j †Kvqv›Uvg Z‡Ë¡i KYvq-KYvq nIqv me wg\_wl&µqv‡ZB Amxg P‡j Av‡m| G¸‡jvB wms¸jvwiwU| †hgb `ywU KYv wgwjZ nq GKwU we›`y‡Z| hv GKwU k~b¨gvwÎK wms¸jvwiwU| †Kvqv›Uvg MwZwe`¨v ev mvwe©K Av‡cw¶KZvq G k~‡b¨i †Kv‡bv A\_© †bB| `yB gnvb ZË¡‡K boe‡o K‡i †`q k~b¨| d‡j c`v\_©we`iv G‡K ev` w`‡qB KvR K‡i †M‡jb|

Z‡e k~b¨‡K ev` †`Iqvi cÖwµqvUv wVK ¯úó bq| ¯’vb I Kv‡ji ci‡Z ci‡Z †`Lv †g‡j k~‡b¨i| eø¨vK‡nvj k~b¨gvwÎK wRwbm| B‡jKUª‡bi g‡Zv KYvivI ZvB| B‡jKUªb I eø¨vK‡nvj ev¯Íe wRwbm| PvB‡jB G‡`i‡K ev` †`Iqv hvq bv| Z‡e eø¨vK‡nvj I B‡jKUªb‡K weÁvbxiv GKwU evowZ gvÎv w`‡Z cv‡ib|

G aviYv †\_‡KB Rb¥ w÷ªs Z‡Ë¡i (string theory)| 1970-Gi `k‡K ZË¡Uvi Rb¥| c`v\_©we`iv †`L‡jb, KYv‡K we›`yi e`‡j K¤úbkxj w÷ªs ev myZv a‡i wb‡j myweav n‡”Q| G Z‡Ë¡ B‡jKUªb I eø¨vK‡nvj‡K k~b¨gvwÎK we›`yi e`‡j w÷ªs‡qi jyc ev P‡µi g‡Zv GKgvwÎK wRwbm g‡b Kiv nq| Avi G‡Z K‡i mvwe©K Av‡cw¶KZv I †Kvqv›Uvg MwZwe`¨vi Amxg A‡jŠwKKfv‡e DavI n‡q hvq| wibg©vjvB‡Rkb (renormalization) Ki‡Z nq bv| B‡jKUª‡bi fi I PvR© Amxg Av‡mB bv| k~b¨gvwÎK B‡jKUª‡bi fi I PvR© Amxg, KviY GwU GKwU wms¸jvwiwU| Gi Kv‡Q †h‡Z \_vK‡j cwigvc eo n‡q Amx‡gi w`‡K P‡j hvq| Z‡e B‡jKUªb‡K w÷ªs‡qi jyc a‡i wb‡j KYvwU Avi wms¸jvwiwU \_v‡K bv| d‡j fi I PvR©I Amxg nq bv| KviY GLb Avi B‡jKUª‡bi Kv‡Q †h‡Z AmxgmsL¨K KYvi †gN cvwo w`‡Z nq bv| ZvQvov `ywU KYvi wgjb GLb Avi we›`ym`„k wms¸jvwiwU‡Z nq bv| ¯’vb-Kv‡ji g‡a¨ Zviv ˆZwi K‡i my›`i, gm„Y I Awew”Qbœ c„ô|

wPÎ 54: we›`y KYv ˆZwi K‡i wms¸jvwiwU|

wPÎ 55: w÷ªs KYv wms¸jvwiwU ˆZwi K‡i bv|

w÷ªs Z‡Ë¡ KYviv Avm‡j GKB ai‡bi w÷ªs| ïay Kuv‡c wfbœfv‡e| gnvwe‡k¦i mewKQy G w÷ªs w`‡q ˆZwi| 10-33 †mw›UwgUvi PIov Giv| w÷ªs‡qi AvKv‡ii wbDUªb KYvi mv‡\_ Zyjbv Kiv Avi wbDUªb‡K †mŠiRM‡Zi mv‡\_ Zyjbv Kiv GKB K\_v| G‡`i ¶y`ª AvKv‡ii Kvi‡Y Avgv‡`i g‡Zv eo cÖvYxi `„wó‡KvY †\_‡K w÷ªs‡K we›`yi g‡Zv jv‡M| jy‡ci AvKv‡ii †P‡q †QvU `~iZ¡ I mg‡qi †Kv‡bv ¸iæZ¡ †bB| Zvi †bB †Kv‡bv ev¯Íe A\_©| w÷ªs ZË¡ k~b¨‡K gnvwek¦ †\_‡K AcmviY K‡i| k~b¨ `~iZ¡ ev k~b¨ mgq ej‡Z wKQy †bB| Gi gva¨‡g †Kvqv›Uvg MwZwe`¨vi me Amx‡gi mgvavb n‡q hvq|

k~b¨‡K wbe©vm‡b cvVv‡j mvwe©K Av‡cw¶KZvi Amx‡giI mgvavb n‡q hvq| eø¨vK‡nvj‡K w÷ªs g‡b Ki‡j e¯‘iv Avi ¯’vb-Kv‡ji KvVv‡gvi †Uvj †e‡q cwZZ nq bv| GKwU KYvi jyc eø¨vK‡nv‡ji jy‡ci w`‡K †h‡Z †h‡Z cÖmvwiZ nq| ¯úk© K‡i eø¨vK‡nvj‡K| `yB jyc †Ku‡c I‡V| †f‡O wM‡q ˆZwi K‡i bZyb GKwU jyc| hv Avm‡j AviI fvix GKwU eø¨vK‡nvj| (‡Kv‡bv †Kv‡bv ZvwË¡‡Ki wek¦vm, KYv‡K eø¨vK‡nv‡ji mv‡\_ wgkv‡j U¨vwKqb (tachyon) bv‡g GK ai‡bi A™¢yZ KYv ˆZwi nq| G‡`i fi KvíwbK msL¨v (KvíwbK msL¨v wb‡q 6ô Aa¨v‡q Av‡jvPbv Kiv n‡q‡Q|)| ågY K‡i AZx‡Zi w`‡K| Avi MwZ Av‡jvi MwZi †P‡q †ewk| w÷ªs Z‡Ë¡i wKQy wKQy ms¯‹i‡Y Ggb KYvi Aw¯ÍZ¡ ¯^xKvi K‡i †bIqv nq|)

gnvwek¦ †\_‡K k~‡b¨i AcmviY‡K nVKvix GKwU KvR g‡b n‡Z cv‡i| Z‡e we›`yi †P‡q w÷ªs mn‡R K\_v †kv‡b| k~b¨‡K Acmvi‡Yi gva¨‡g w÷ªs ZË¡ †Kvqv›Uvg ejwe`¨vi LÐ LÐ, KYvm`„k ˆewkó¨‡K gm„Y K‡i †Zv‡j| mvwe©K Av‡cw¶KZvq eø¨vK‡nv‡ji m„ó ¶Z mvwi‡q †Zv‡j| G mgm¨v¸‡jv `~i n‡j `yB Z‡Ë¡i we‡iva Avi \_v‡K bv| c`v\_©we`iv wek¦vm Ki‡Z ïiæ Ki‡jb, w÷ªs ZË¡ †Kvqv›Uvg MwZwe`¨v‡K Av‡cw¶KZvi mv‡\_ †Rvov †`‡e| Zuv‡`i wek¦vm wQj, GUv †\_‡K cvIqv hv‡e †Kvqv›Uvg gnvKl© (quantum gravity) ZË¡| †h mvwe©K ZË¡ e¨vL¨v w`‡Z cvi‡e gnvwe‡k¦i me NUbvi| Z‡e w÷ªs Z‡Ë¡i wQj †ek wKQy Amyweav| GKwU mgm¨v n‡jv, ZË¡wUi cÖ‡qvRb 10wU gvÎv (dimension)|

‡ewkifvM gvby‡li Kv‡Q PviwU gvÎvB evovevwo| G‡`i g‡a¨ wZbwU gvÎv †`Lv Lye mnR| Wvb-evg, mvg‡b-‡cQ‡b Avi Dci-wbP n‡jv Avgv‡`i PjvP‡ji wZbwU w`K| PZy\_© gvÎvi AvMgb N‡U AvBb÷vB‡bi nvZ a‡i| wZwb †`Lv‡jb, mgqI G wZb gvÎvi g‡ZvB GKwU gvÎv| Avgiv cÖwZwbqZ mg‡qi ga¨ w`‡q GwM‡q hvw”Q| †hfv‡e Mvwo nuvwK‡q GwM‡q hvB moKc‡\_| Av‡cw¶KZv ZË¡ e‡j, wVK †hfv‡e Avgiv gnvmoK a‡i Pjvi MwZ wbqš¿Y Ki‡Z cvwi, †Zgwb cvwi mgqMvwo w`‡q Pjvi MwZ cwieZ©b Ki‡Z| ¯’v‡bi ga¨ w`‡q hZ `ªæZ Pje, mg‡qi ga¨ w`‡qI Pje ZZ `ªæZ| AvBb÷vB‡bi gnvwek¦ eyS‡Z n‡j Avgv‡`i‡K †g‡b wb‡Z n‡e, mgq n‡jv PZy\_© gvÎv|

Pvi gvÎv bvnq †g‡b wbjvg| ZvB e‡j 10? PviwU gvÎv Avgiv cwigvc Ki‡Z cvwi| wKš‘ Ab¨ Qq gvÎv †Kv\_vq Av‡Q? w÷ªs ZË¡ e‡j, †m gvÎv¸‡jv †QvÆ e‡ji g‡Zv ¸wU‡q Av‡Q| G¸‡jv GZ †QvU †h †`Lv hvq bv| GK c„ôv KvMR‡K wØgvwÎK g‡b nq| Gi ˆ`N¨© I cÖ¯’ †`Lv hvq| Z‡e D”PZv †evSv hvq bv| Z‡e KvM‡Ri cÖvšÍ‡K AvZk Kv‡Pi wb‡P wb‡q †`L‡j Gi D”PZv †Pv‡L aiv †`q| GUv †`L‡Z hš¿ `iKvi n‡q‡Q| wKš‘ GB Z„Zxq gvÎvi Aw¯ÍZ¡ Av‡Q| hw`I †`Lv hvq bv mvaviY Ae¯’vq| H QqwU gvÎvi †¶‡ÎI GKB K\_v cÖ‡hvR¨| G‡`i AvKvi ¶y`ª e‡j ˆ`bw›`b Rxe‡b Avgiv G‡`i †`wL bv| Giv GZB †QvU †h wbKU fwel¨‡Zi ˆZwi m¤¢ve¨ me‡P‡q kw³kvjx hš¿ w`‡qI G‡`i †`Lv hv‡e bv|

G QqwU evowZ gvÎvi Kx A\_©? Avm‡j †Kv‡bv A\_©B †bB| ˆ`N¨©, cÖ¯’, D”PZv ev mg‡qi g‡Zv Avgv‡`i †PbvRvbv †Kv‡bvwKQyi cwigvc bq G¸‡jv| G¸‡jv wbQK MvwYwZK KvVv‡gv| hvi gva¨‡g w÷ªs Z‡Ë¡i MwYZ †hfv‡e KvR Kiv `iKvi Zv K‡i †`q| KvíwbK msL¨vi g‡ZvB Avgiv G‡`i‡K †`L‡Z cvB bv| Abyfe Kwi bv ev MÜI cvB bv| hw`I wnmve Kivi Rb¨ G¸‡jv cÖ‡qvRb| aviYvUv ev¯Í‡e A™¢yZ| ZeyI weÁvbxiv AvMÖnx n‡q I‡V‡Qb| KviY mgxKiY¸‡jv †eva¨Mg¨ bv n‡jI ZË¡wU Abygvb ev c~evf©vm w`‡Z cvi`k©x| Avi evowZ QqwU gvÎv †Zv Avi MvwYwZKfv‡e KviI cvKv av‡b gB †`q bv| mgm¨v n‡e nq‡Zvev G‡`i‡K †`Lv †M‡j| (AvRKvj †Zv `kI Kg g‡b n‡”Q| MZ K‡qK eQ‡i c`v\_©we`iv eyS‡Z cv‡ib, w÷ªs Z‡Ë¡i wewfbœ iKg ms¯‹iY Avm‡j GK A‡\_© GKB| weÁvbxiv eyS‡Z cvi‡Qb, G ZË¡¸‡jv G‡K Ac‡ii ˆØZ iƒc| †hfv‡e cum‡j ey‡SwQ‡jb, †iLv I we›`y G‡K Ac‡ii ˆØZ iƒc| weÁvbx‡`i GLb wek¦vm, cÖwZØ›Øx me Z‡Ë¡i †cQb †\_‡K KjKvwV bvo‡Q `vbexq GK ZË¡| Gi bvg Z\_vKw\_Z Gg-ZË¡ (M-theory)| hv Avevi evm K‡i `‡ki e`‡j GMv‡iv gvÎvq|

w÷ªs‡K AviI mvaviY A‡\_© ejv nq †eªBb (brane)| eûgvwÎK †gg‡eªBb †\_‡K bvgUv Avmv| Giv GZ ¶y`ª †h †Kv‡bv hš¿ w`‡qB G‡`i‡K †`Lvi †Kvb Avkv †bB| AšÍZ Avgv‡`i mf¨Zv AviI A‡bK A‡bK †ewk DbœZ bv nIqv ch©šÍ A‡c¶v Ki‡Z n‡eB| KYvc`v\_©we`iv AwZcvigvYweK RMZ †`‡Lb KYvZ¡i‡Ki (‡h hš¿ KYv‡K wekvj †e‡M PvwjZ K‡i) mvnv‡h¨| Py¤^K‡¶Î ev Ab¨ †Kv‡bv †¶Î Kv‡R jvwM‡q ¶y`ª ¶y`ª KYv‡K A‡bK †ewk †e‡M avweZ Kiv nq| G KYviv G‡K Ac‡ii mv‡\_ msNl© K‡i wewfbœ Ask Avjv`v n‡q hvq| KYvZ¡iK (Particle

accelerator) n‡jv AwZcvigvYweK RM‡Zi gvB‡µv‡¯‹vc| Gme KYvq hZ †ewk kw³ †`Iqv n‡e, gvB‡µv‡¯‹vc ZZ kw³kvjx n‡e| Avi ZZB ¶y`ª e¯‘ †`Lv hv‡e|

Ggb GK KYvZ¡i‡Ki bvg mycvKÛvw±s mycvi †KvjvBWvi| 1990-Gi `k‡Ki ïiæ ch©šÍ eû wewjqb Wjv‡ii G hš¿ evbv‡bvi cwiKíbv wQj| wbwg©Z n‡j GwU nZ me©Kv‡ji me‡P‡q kw³kvjx KYvZ¡iK| 54 gvBj j¤^v jy‡ci g‡a¨ 10,000 Py¤^K \_vKvi K\_v wQj G‡Z| GZ kw³kvjx hš¿I ¸wU‡q \_vKv gvÎv¸‡jv ev w÷ªs †`Lvi Rb¨ h‡\_ó bq| n¨uv, KYvZ¡yiK w`‡q w÷ªs †`Lvi e¨e¯’v Kiv hv‡e| †mRb¨ KYvZ¡iK‡K n‡Z n‡e 60 †KvwU-‡KvwU gvB‡ji GKwU jyc| GKwU KYv Av‡jvi †e‡M Pj‡jI GZ eo `~iZ¡ cvwo w`‡Z mgq jvM‡e 1,000 eQi|

eZ©gv‡b Kíbv‡hvM¨ †Kv‡bv hš¿ w`‡qB weÁvbxiv mivmwi w÷ªs †`Lvi Avkv Ki‡Z cv‡ib bv| Ggb †Kv‡bv cix¶vi mÜvb †KD w`‡Z cvi‡e bv, hvi gva¨‡g hvPvB K‡i †`Lv hv‡e eø¨vK‡nvj I KYv Avm‡jB w÷ªs wKbv| w÷ªs Z‡Ë¡i weiæ‡× GUvB me‡P‡q eo AvcwË| weÁvb n‡jv ch©‡e¶Y I cix¶v wbf©i| ZvB †KD †KD e‡jb, w÷ªs ZË¡ Avm‡j weÁvb bq, eis `k©b| (mv¤cÖwZK GK ¸”Q ZË¡ ej‡Q, wKQy msKxY© gvÎv j¤^vq 10-19 †mw›UwgUvi ev AviI eo n‡Z cv‡i| †m‡¶‡Î G¸‡jv cix¶v‡hvM¨ n‡e| Z‡e GLb ch©šÍ G ZË¡¸‡jv‡K fyjB g‡b n‡”Q| fvebv¸‡jv PgrKvi| wKš‘ mwVK nIqvi m¤¢vebv mvgvb¨|

wbDUb gnvKl© I MwZm~Î Avwe®‹vi K‡iwQ‡jb| Gi gva¨‡g gnvwe‡k¦i ga¨ w`‡q MÖn I Ab¨vb¨ e¯‘i PjvP‡ji e¨vL¨v †c‡qwQ‡jb c`v\_©we`iv| bZyb a~g‡KZy Avwe®‹„Z n‡jB wbDU‡bi wnmv‡ei c‡¶ mg\_©b †Rviv‡jv nZ| Z‡e wKQy mgm¨v wQj| GKwU mgm¨v wQj eya MÖ‡ni K¶c\_| MÖnwUi K¶c\_ †hfv‡e `y‡j I‡V Zv †g‡j bv wbDU‡bi c~e©vfv‡mi mv‡\_| Z‡e mvwe©Kfv‡e wbDU‡bi ZË¡ G‡Ki ci G‡K cix¶vq DËxY© nw”Qj|

AvBb÷vB‡bi ZË¡ wbDU‡bi fyj¸‡jv ms‡kvab K‡i| mgvavb nq eya MÖ‡ni MwZi| G ZË¡¸‡jv gnvKl© m¤ú‡K© cix¶v‡hvM¨ c~e©vbygvbI K‡i| m~h©MÖn‡Yi mgq GwWsUb b¶‡Îi Av‡jvi euvK ch©‡e¶Y K‡ib| mZ¨ cÖgvwYZ nq GKwU Abygvb|

Ab¨w`‡K w÷ªs ZË¡ A‡bK¸‡jv cÖPwjZ ZË¡‡K my›`ifv‡e †Rvov †`q| eø¨vK‡nvj I KYvi AvPiY m¤ú‡K© †ek wKQy c~e©vfvmI †`q| Z‡e G¸‡jvi †Kv‡bvwUB cix¶v‡hvM¨ bq| bq ch©‡e¶Y‡hvM¨| MvwYwZKfv‡e nqZ ZË¡Uv mym½Z| GgbwK my›`iI| Z‡e GUv GLbI weÁv‡bi Ask bq1|

AvMvgxi fwel¨r m¤ú‡K© hZUv Abygvb Kiv hvq, Zv‡Z g‡b n‡”Q w÷ªs ZË¡ GKwU `vk©wbK fvebv wn‡m‡eB \_vK‡e| ˆeÁvwbK ZË¡ n‡e bv| ZË¡Uv mwVKI n‡Z cv‡i| Z‡e †mUv hvPvB Kivi †Kv‡bv Dcvq Avgiv Lyu‡R bvI †c‡Z cvwi| k~b¨ GLbI gnvwek¦ †\_‡K DavI nqwb| eis g‡b n‡”Q k~b¨B gnvwe‡k¦i m„wói Rb¨ `vqx|

k~b¨Zg NÈv: weM e¨vs

nve‡ji ch©‡e¶Y †\_‡K †evSv †Mj, weM e¨vs bv‡g GKwU mg‡q gnvwek¦ m¤¢eZ AwZkq ¶y`ª I Nb wQj| GiKg Ae¯’vq weÁv‡bi me m~Î A‡K‡Rv n‡q c‡o| fwel¨r m¤ú‡K© Abygvb Kivi me `iRv eÜ n‡q hvq|

—w÷‡db nwKs, A¨v weªd wnw÷ª Ae UvBg

gnvwe‡k¦i Rb¥ n‡q‡Q k~b¨ w`‡q| R‡b¥i Av‡M wQj bv †Kv‡bvwKQyB| GK`g k~b¨Zv †\_‡K n‡jv AvKw¯§K GK we‡ùviY| Avi Zv †\_‡K m„wó n‡jv cy‡iv gnvwe‡k¦i me c`v\_© I kw³| A‡bK weÁvbx I `vk©wbK weM e¨vs‡qi G aviYv‡K D™¢U g‡b Ki‡Zb| gnvwek¦ mmxg I Gi GKwU m~Pbv Av‡Q—G K\_vq GKgZ n‡Z †R¨vwZc©`v\_©we`‡`i eû mgq †j‡M hvq|

mmxg gnvwe‡k¦i cÖwZ N„Yv cÖvPxbKvj †\_‡KB P‡j AvmwQj| A¨vwi÷Uj f‡qW ev k~b¨Zv †\_‡K gnvwe‡k¦i m„wói aviYv †g‡b †bbwb| KviY, Zuvi wek¦vm wQj k~b¨Zvi Aw¯ÍZ¡ \_vKv Am¤¢e| wKš‘ G‡Z GKwU c¨vivW‡·i D™¢e nq| gnvwe‡k¦i Rb¥ f‡qW †\_‡K n‡q bv \_vK‡j, R‡b¥i Av‡M wbðqB wKQy GKUv wQj| gnvwe‡k¦i Av‡M `iKvi Av‡iKwU gnvwek¦| A¨vwi÷U‡ji Kv‡Q G auvauvi GKUvB mgvavb: gnvwek¦ wPišÍb| AZx‡Z memgq Gi Aw¯ÍZ¡ wQj| fwel¨‡ZI Pj‡Z \_vK‡e †m aviv|

GKUv mgq G‡m cvðvZ¨ mf¨Zv‡K A¨vwi÷Uj I evB‡e‡ji g‡a¨ GKwU †e‡Q wb‡Z n‡jv| evB‡ej e‡j, mmxg gnvwe‡k¦i Rb¥ n‡q‡Q k~b¨Zv †\_‡K| GKmgq gnvwek¦ aŸsm n‡q hv‡e| †m‡gwUK evB‡e‡ji gnvwe‡k¦i aviYv A¨vwi÷U‡ji aviYv‡K we`vq K‡i w`j| Z‡e wPišÍb I AcwieZ©bkxj gnvwe‡k¦i aviYv cy‡ivcywi evwZj nqwb| wesk kZ‡K G‡mI wU‡K wQj aviYvwU| G aviYvB AvBb÷vBb‡K Zuvi wb‡Ri fvl¨g‡Z wb‡Ri Rxe‡bi †miv fyj KvRUvi w`‡K †V‡j †`q|

AvBb÷vB‡bi g‡b nZ, Zuvi mvwe©K Av‡cw¶KZvq eo GK fyj Av‡Q| ZË¡Uv e‡j, gnvwek¦ GKmgq aŸsm n‡q hv‡e| mvwe©K Av‡cw¶KZvi mgxKi‡Y gnvwek¦ Aw¯’wZkxj| m¤¢vebv Av‡n `ywU| Gi †Kv‡bvwUB myLKi bq|

GKUv m¤¢vebv n‡jv, gnvwek¦ wbR¯^ gnvK‡l©i Pv‡c ¸wU‡q hv‡e| msKxY© n‡Z n‡Z DËß n‡Z \_vK‡e gnvwek¦| R¡‡j R¡‡j D¾¡j wewKiY ˆZwi Ki‡e| aŸsm n‡e me ai‡bi cÖvY I e¯‘i me Dcv`vb cigvYy| g„Zy¨ n‡e Av¸‡bi gva¨‡g| †kl ch©šÍ gnvwek¦ msKxY© n‡q eø¨vK‡nv‡ji g‡Zv k~b¨gvwÎK we›`y‡Z cwiYZ n‡e| DavI n‡q hv‡e wPiZ‡i|

Ab¨ m¤¢vebvUv AviI wbg©g| gnvwek¦ wPiKvj cÖmvwiZ n‡Z \_vK‡e| Qvqvc\_iv G‡K Aci †\_‡K `~‡i mi‡Z \_vK‡e| gnvwe‡k¦i me †ZR¯^x wewµqvi Rb¨ `vqx bv¶wÎK Dcv`vb¸‡jv nvjKv n‡q hv‡e| R¡jvwb dzwi‡q b¶Î wb‡f hv‡e| Qvqvc\_ n‡e AÜKvi †\_‡K AviI AÜKvi| Avi Zvici kxZj I bxie| b¶‡Îi kxZj I g„Z c`v\_© ¶q n‡q hv‡e| †cQ‡b c‡o \_vK‡e ïay Svcmv wewKiY| hv ficyi \_vK‡e cy‡iv gnvwe‡k¦| gnvwek¦ n‡e ¶xqgvb Av‡jvi GK kxZj my¨c| GUv n‡e GK kxZj g„Zy¨|

AvBb÷vB‡bi Kv‡Q G fvebv¸‡jv‡K RNb¨ g‡b nZ| A¨vwi÷U‡ji g‡ZvB wZwb a‡iB wb‡qwQ‡jb gnvwek¦Uv w¯’i, aªæe I wPišÍb| Zuvi mvwe©K Av‡cw¶KZvi mgxKiY¸‡jv‡K "wVK Kivi" GKgvÎ Dcvq n‡jv Avmbœ aŸsm‡K cÖwZnZ Kiv| KvRUv wZwb Ki‡jb mgxKi‡Y GKwU aªæeK ewm‡q w`‡q| gnvRMvwZK aªæeK (cosmological constant) bv‡gi G ej KvR K‡i gnvK‡l©i wecix‡Z| G aªæe‡Ki av°v gnvK‡l©i Uvb‡K †VwK‡q †`‡e| ¸wU‡q bv wM‡q gnvwek¦ fvimv‡g¨ \_vK‡e| m‡¼vPb ev cÖmviY †Kv‡bvUvB n‡e bv| Ggb GK inm¨RbK e‡ji cÖ¯Íve KivUv GK `ytmvnwmK KvR wQj| wZwb e‡jb, ÒAvwg gnKl© Z‡Ë¡ ... AveviI Ggb GKwU KvR K‡i e‡mwQ, hvi Kvi‡Y Avgv‡K cvMjvMvi‡` ew›` nIqv jvM‡Z cv‡i|" ZeyI gnvwe‡k¦i Avmbœ aŸs‡mi `ywðšÍv †\_‡K gyw³ †c‡Z Ggb bvUKxq c`‡¶c †bb wZwb|

AvBb÷vBb‡K cvMjvMvi‡` †h‡Z nqwb| Gi Av‡M AviI A™¢yZ wRwbm cÖKvk K‡iI wZwb mwVK cÖgvwYZ n‡qwQ‡jb| Z‡e Gevi Avi Zuvi fvM¨ ZZ fvj wQj bv| b¶Îiv wb‡RivB AvBb÷vB‡bi w¯’i I wPišÍb RM‡Zi fvebv‡K ¸uwo‡q †`q|

1900 mv‡j AvKvkM½vB (Milky way galaxy) wQj gnvwe‡k¦i GKgvÎ cwiwPZ AÂj| b¶‡Îi G a~wjgq PvKwZi evB‡iI †h wKQy \_vK‡Z cv‡i †m m¤ú‡K© †R¨vwZwe©Ávbx‡`i †Kv‡bv aviYvB wQj bv| n¨uv, eû `~‡i R¡jR¡j Kiv KzwÂZ †gN Zuviv †`‡L‡Qb| Z‡e †m¸‡jv‡K Qvqvc‡\_i †fZ‡ii M¨vm g‡b bv Kivi †Zgb †Kv‡bv KviY wQj bv| 1920-Gi `k‡K mewKQy e`‡j †Mj| Avi Gi †cQb Ae`vb A¨v‡gwiKvb †R¨vwZwe©` GWDBb nve‡ji|

nvej wmwdW welg Zviv (Cepheid variable) wb‡q KvR K‡ib| G¸‡jvi gva¨‡gB wZwb eû`~‡ii e¯‘i `~iZ¡ cwigvc K‡ib| G Zviv¸‡jvi we‡kl GKwU ˆewkó¨ Av‡Q| Giv AbywgZ Dcv‡q ¯úw›`Z nq| Pj‡Z \_v‡K D¾¡j I Aby¾¡j nIqvi Pµ| G‡`i ¯ú›`‡bi mv‡\_ m¤úK© Av‡Q wbM©Z Av‡jvi cwigv‡Yi| G‡`i‡K ZvB e‡j Av`k© evwZ (standard candle)| †h e¯‘i D¾¡jZv Avgiv Rvwb| nve‡ji Kv‡Ri g~j Ask wQj G¸‡jvB| G‡`i AvPiY wQj †Uª‡bi †nWjvB‡Ui g‡Zv|

GwM‡q Avmv †Uª‡bi w`‡K ZvKv‡j †`L‡eb, †nWjvB‡Ui Av‡jv µ‡gB D¾¡j n‡”Q| GLb aiæb †Uª‡bi Av‡jvUv GKUv Av`k© evwZ| Avgiv Rvwb, GUv †\_‡K KZUyKz Av‡jv †ei n‡”Q| Zvn‡j KZ `~‡i \_vK‡j KZ D¾¡j n‡e ZvI Avgiv ej‡Z cvie| hZ Kv‡Q Avm‡e, ZZ D¾¡j n‡e| GKB hyw³ D‡ëvfv‡eI KvR K‡i| †nWjvBU KZUyKz Av‡jv w`‡”Q Zv Rvb‡j Avgiv Gi AvcvZ D¾¡jZv cwigvc K‡i †mLvb †\_‡K †Uª‡bi `~iZ¡ †ei Ki‡Z cvie|

wmwdW Zviv w`‡q nvej wVK G KvRUvB K‡ib| Zuvi †`Lv †ewkifvM b¶Î wQj `k †\_‡K K‡qK nvRvi Av‡jvKel© (light year) ch©šÍ `~‡ii| Z‡e A¨vb‡WªvwgWv bxnvwiKv (ZLb G bvgUvB cÖPwjZ wQj) †`‡L wZwb Pg‡K †M‡jb| KzwÂZ G †g‡Ni †fZi GKwU wmwdW Zviv wgUwgU KiwQj| Av‡jvi cwigvc †\_‡K wnmve K‡i †`L‡jb, bxnvwiKvwUi `~iZ¡ 10 jvL Av‡jvKel©| hv Avgv‡`i Qvqvc‡\_i †kl mxgvbv †\_‡KI `~‡i| A¨vb‡WªvwgWv R¡jR¡‡j M¨v‡mi †Kv‡bv †gN bq| GUv b¶‡ÎiB GK †gN (Qvqvc\_)| `~i‡Z¡i Kvi‡Y b¶Î¸‡jv Avjv`v Av‡jvKwe›`y wn‡m‡e aiv †`q bv| †`L‡Z Svcmv jv‡M| Ab¨vb¨ KzwÂZ Qvqvc\_ wQj AviI `~‡i| eZ©gv‡b weÁvbx‡`i wek¦vm, gnvwe‡k¦i me©Î Qvqvc\_cyÄ w`‡q cwic~Y©|

nve‡ji G Avwe®‹vi wQj Af~Zc~e©| †`Lv †Mj, Av‡Mi aviYvi †P‡q gnvwek¦ en j¶ ¸Y eo| Z‡e G ch©‡e¶Y AmvaviY n‡jI nvej G Kvi‡Y ¯§iYxq nbwb| nve‡ji wØZxq Avwe®‹vi AvBb÷vB‡bi wPišÍb gnvwek¦‡K †f‡O Pyigvi K‡i †`q|

wmwdW Zvivi mvnv‡h¨ nvej G‡Ki ci GK Qvqvc‡\_i `~iZ¡ †ei Ki‡Z jvM‡jb| Zv‡Z wemg&qKi GK web¨vm Lyu‡R †c‡ZI mgq jvMj bv †ewkw`b| me¸‡jv Qvqvc\_ D”P‡e‡M AvKvkM½v †\_‡K `~‡i m‡i hv‡”Q2| cÖwZ †m‡K‡Û m‡i hvIqvi †eM K‡qK k gvBj ev ZviI †ewk| Qvqvc\_¸‡jv GZ `~‡i †h G‡`i wekvj †eMI mivmwi cwigvc‡hvM¨ bq|

Qvqvc‡\_i `~iZ¡ gvcvi GKgvÎ c\_ Wcjvi cÖfve (Doppler effect)| gnvmo‡Ki cywjk G bxwZ Kv‡R jvwM‡qB Mvwoi MwZ gv‡c| nq‡Zvev †Lqvj K‡i \_vK‡e, †ijMvwo Avcvb‡K AwZµg K‡i †M‡j Gi k‡ãi wcP e`‡j hvq| †Uªb Kv‡Q Avmvi mgq Gi wcP †ewk \_v‡K| AwZµg K‡i P‡j †M‡j wcP nUvr K‡i A‡bK wbPy n‡q hvq| GUv nIqvi KviY †Uª‡bi MwZi Kvi‡Y mvg‡bi kãZi½ †cQ‡bi Zi‡½i Pv‡c eo n‡q hvq| d‡j K¤úv¼ I wcP †Uvb eo nq| Avi †cQ‡bi Zi½‡K j¤^v K‡i †`q| K¤úv¼ I wcP †Uvb K‡g hvq (wPÎ 56)| GUvB Wcjvi cÖfve| GUv Av‡jvi †¶‡ÎI KvR K‡i| b¶Î c„w\_exi w`‡K Avm‡j Av‡jv Pvcv †L‡q ¯^vfvwe‡Ki †P‡q †ewk K¤úv¼ ˆZwi nq| eY©vwji bxj is‡qi w`‡K m‡i hvq Av‡jv| Gi bvg bxjmiY (blue shift)| b¶Î `~‡i m‡i †M‡j N‡U D‡ëvUv| Av‡jv j¤^v n‡q hvq| N‡U †jvwnZmiY (red shift)|

cywjk Gfv‡eB Mvwoi MwZ eyS‡Z cv‡i| Kvw•LZ Mvwo †\_‡K cÖwZdwjZ †eZvi Zi‡½i (radio wave) miY †\_‡K wnmveUv Kiv nq| GKBfv‡e b¶‡Îi eY©vjx (spectrum) †`‡L †evSv b¶Î KZ †Rv‡i Pj‡Q| Avgv‡`i w`‡K Avm‡Q, bvwK `~‡i P‡j hv‡”Q|

nvej `~i‡Z¡i DcvË‡K Wcjvi MwZi Dcv‡Ëi mv‡\_ wgwj‡q †`L‡jb| djvdj †`‡L nZevK n‡q †M‡jb| mew`‡Ki Qvqvc\_ Avgv‡`i KvQ †\_‡K ïay `~‡iB mi‡Q bv, †ewk `~‡ii Qvqvc\_ †ewk `ªæZ m‡i hv‡”Q|

wPÎ 56: Wcjvi cÖfve

GUv Kxfv‡e m¤¢e? aiæb, GKwU †ejy‡b GKB AvKv‡ii A‡bK¸‡jv WU Av‡Q| G WU¸‡jv Qvqvc‡\_i mv‡\_ Zyjbxq| Avi †ejyb wb‡R n‡jv ¯’vb-Kv‡ji KvVv‡gv| †ejyb eo n‡j WU¸‡jv G‡K Aci †\_‡K `~‡i mi‡Z ïiæ K‡i| †h‡Kv‡bv WU †\_‡K †`L‡jB Ab¨ WU¸‡jv‡K Qy‡U †h‡Z †`Lv hv‡e| `~‡ii WU¸‡jv Kv‡Qi W‡Ui †P‡q `ªæZ MwZ‡Z m‡i hv‡”Q (wPÎ 57)| gnvwek¦‡KI †`‡L †ejy‡bi g‡Zv cÖmvwiZ nw”Qj e‡j g‡b nw”Qj| (‡ejy‡bi Dcgvq wKQy ÎæwU Av‡Q| †ejyb eo nIqvi mv‡\_ mv‡\_ †ejy‡bi WU¸‡jvI eo nq| Z‡e Qvqvc‡\_i AvKvi e`jvq bv| AvU‡K \_v‡K wb‡Ri gnvK‡l©i euva‡b|)

wPÎ 57: cÖmviYkxj gnvwek¦

mgq Movevi mv‡\_ mv‡\_ gnvwek¦ cÖmvwiZ n‡qB P‡j| wRwbmUv‡K Ab¨fv‡eI Kíbv Kiv hvq| aiæb Avcbvi Kv‡Q gnvwe‡k¦i BwZnv‡mi GKwU Pjw”PÎ Av‡Q| G‡K †cQb w`‡K Pvwj‡q w`‡j †`Lv hv‡e, gnvwek¦ ¸wU‡q hv‡”Q| GKUv mgq G‡m †ejyb KzuP‡K ïwK‡q hv‡e| †QvU †\_‡K n‡e AviI AviI †QvU| Avi †kl ch©šÍ GKwU we›`y n‡q DavI n‡q hv‡e| GUvB n‡jv ¯’vb I Kv‡ji m~Pbvi wms¸jvwiwU| GUvB me‡P‡q Avw`g k~b¨| gnvwe‡k¦i Rb¥¯’vb| GUvB weM e¨vs| GK fq¼i we‡ùviY, hvi gva¨‡g Rb¥ nq gnvwe‡k¦i| G wms¸jvwiwU †\_‡KB †ewi‡q Av‡m gnvwe‡k¦i me c`v\_© I kw³| Rb¥ nq Qvqvc\_, b¶Î I MÖ‡ni| hv wKQy ˆZwi n‡q‡Q I hv fwel¨‡Z n‡e mewKQyi Dc`vb cÖ¯‘Z nq| gnvwe‡k¦i GKwU ïiæ Av‡Q| hv cÖvq 1500 †KvwU eQi (AviI m~² wnmv‡e 1380 †KvwU eQi) Av‡Mi K\_v| Avi ZLb †\_‡KB ¯’vb cÖmvwiZ n‡q P‡j‡Q| AvBb÷vB‡bi w¯’i I wPišÍb gnvwe‡k¦i Avkv †kl n‡q †Mj|

‡kl Avkvi wKiY wQj weM e¨vs‡qi weKí GK Z‡Ë¡| Gi bvg w¯’ive¯’v ZË¡ (steadz-state theory)| †Kv‡bv †Kv‡bv †R¨vwZwe©` ej‡jb, Ggb Ggb †dvqviv Av‡Q †hLvb †\_‡K wbM©Z nq c`v\_©| Qvqvc\_iv Gme †dvqviv †\_‡K `~‡i m‡i hvq| eqm †e‡o GKmgq g„Zy¨i †Kv‡j X‡j c‡o| Avjv`v Avjv`vfv‡e Qvqvc\_¸‡jv `~‡i wM‡q g‡i †M‡jI mvwe©Kfv‡e cy‡iv gnvwek¦ AcwiewZ©Z \_v‡K| memgq GKwU mvg¨e¯’v eRvq \_v‡K| KviY cÖwZwbqZ bZyb c`v\_© ˆZwi nq| A¨vwi÷U‡ji wPišÍb gnvwek¦ ZLbI wU‡K iBj|

wKQy mgq ch©šÍ weM e¨vs I w¯’ive¯’v ZË¡ cvkvcvwk Ae¯’vb KiwQj| weÁvbxiv wbR wbR `k©b Abymv‡i †h‡Kv‡bv GKwU †e‡Q wb‡Zb| 1960-Gi `k‡K cv‡ë †Mj mewKQy| g„Zy¨ n‡jv w¯’ive¯’v Z‡Ë¡i| †m g„Zy¨i m‡¼Z‡K weÁvbxiv cÖ\_‡g †f‡ewQ‡jb KeyZ‡ii gj (m¤ú~Y© Av¶wiK A‡\_©)|

1965 mv‡ji K\_v| wcÖÝUb wek¦we`¨vj‡qi c`v\_©we`iv wnmve Kivi †Póv KiwQ‡jb, Kx n‡qwQj weM e¨vs‡qi wVK cici| cy‡iv gnvwek¦ wbðqB wQj DËß I Nb| R¡jR¡j KiwQj D¾¡j Av‡jvq| †ejyb gnvwe‡k¦i cÖmvi‡Yi mv‡\_ mv‡\_ †m Av‡jv wbðq nvwi‡q hvqwb †Kv\_vI| Z‡e ¯’vb-Kv‡ji ivev‡ii KvVv‡gvi mv‡\_ mv‡\_ †m Av‡jv j¤^v n‡q wM‡q \_vK‡e| wKQy wnmve-wbKvk †k‡l wcÖÝU‡bi weÁvbxiv eyS‡jb, †m Av‡jv \_vK‡e eY©vjxi gvB‡µvI‡qf AÂ‡j3| Avi wbM©Z n‡e PZyw`©K †\_‡K| G Av‡jvi bvg gnvRMwZK cUf~wg wewKiY| GUv weM e¨vs we‡ùviY-cieZ©x Av‡jv| Gi Aw¯ÍZ¡ kbv³ Kiv †M‡jB weÁvbxiv weM e¨vs‡qi c‡¶ cÖ\_g †Kv‡bv cÖZ¨¶ cÖgvY nv‡Z cv‡eb| AviI cÖgvY n‡e, w¯’ive¯’v ZË¡ fyj|

wcÖÝU‡bi weÁvbx‡`i‡K †ewkw`b A‡c¶v Ki‡Z nqwb| Zuv‡`i Abygv‡bi c‡¶ cÖgvY P‡j Gj| wcÖÝU‡bi cv‡kB Av‡Q wbD Rvwm© A½iv‡R¨i gv‡i wnj GjvKvi †ej j¨vem M‡elYvMvi| GLv‡b `yB ZiæY BwÄwbqvi ms‡e`bkxj gvB‡µvI‡qf iwk¥ kbv‡³i hš¿ wb‡q cix¶v Pvjvw”Q‡jb| wKš‘ kZ †Póvi c‡iI hš¿ K\_v ïbwQj bv| †iwWI Abyôv‡bi wnm wnm k‡ãi g‡Zv GKwU kã evRwQj| †Kv‡bvfv‡eB G‡K `~i Kiv hvw”Qj bv| cÖ\_‡g fve‡jb, A¨v‡›Ubvi evmvq \_vKv KeyZ‡ii gj GRb¨ `vqx| cvwL‡K Zvov‡bv n‡jv| gj cwi®‹vi Kiv n‡jv| ZeyI †Mj bv wnm wnm kã| †Póvi †Kv‡bv KgwZ Ki‡jb bv `yRb| wKš‘ wKQy‡ZB wKQy n‡jv bv| Gi g‡a¨ Zuviv wcÖÝU‡bi M‡elK `‡ji Kv‡Ri e¨vcv‡i Rvb‡Z cvi‡jb| eyS‡jb, Zuviv †c‡q †M‡Qb gnvRMwZK cUf~wg wewKiY (cosmic background radiation)| G b‡qR KeyZ‡ii gj †\_‡K Av‡mwb| GUv weM e¨vs‡qi Av‡jvi wnm wnm| j¤^v I weK…Z n‡q G Ae¯’v n‡q‡Q| (G Avwe®‹v‡ii Rb¨ †m `yB BwÄwbqvi Av‡b©v †cbwRqvm I ievU© DBjmb †bv‡ej cyi¯‹vi cvb| wcÖÝUb M‡elYv `‡j Kv‡Ri AMÖfv‡M wQ‡jb ee wWK wRg wcejm| Zuviv wKQyB †c‡jb bv| †ewkifvM weÁvbxB g‡b K‡ib, AwePvi Kiv n‡q‡Q Zuv‡`i cÖwZ| †bv‡ej KwgwU ¸iæZ¡c~Y© ZË¡‡K Avg‡j †bq bv| cyi¯‹vi †`q wbweo h‡Zœ Kiv cix¶v‡K|)

f¨vKzqv‡gi k~b¨ nqZ gnvwe‡k¦i fuv‡Ri e¨vL¨v w`‡Z cvi‡e| gnvwe‡k¦i cÖwZwU RvqMvi f¨vKzqvg fvP©yqvj KYv w`‡q cwic~Y©| d‡j gnvwe‡k¦i KvVv‡gvq k~b¨-we›`yi kw³ Amxg| Dchy³ Ae¯’vq G kw³ e¯‘‡K av°v w`‡Z cv‡i| cÖv\_wgK gnvwe‡k¦ nqZ †mUvB n‡q‡Q|

1980-Gi `k‡K c`v\_©we`iv e‡jb, cÖv\_wgK gnvwe‡k¦i ïb¨-we›`yi kw³ nqZ GLbKvi †P‡q †ewk wQj| G evowZ kw³ mew`‡K cÖmvwiZ nIqvi †Póv K‡i \_vK‡e| hvi d‡j ¯’vb I Kv‡ji KvVv‡gv wekvj MwZ‡Z evB‡ii w`‡K Pvc Abyfe Ki‡e| kw³i wekvj we‡ùviY †ejyb‡K ùxZ ev eo K‡i †Zv‡j| gnvwe‡k¦i fuvR¸‡jv gm„Y n‡q hvq| wVK †hfv‡e †ejy‡b evZvm w`‡j Gi KzuPKv‡bv Ask¸‡jv gm„Y n‡q hvq| G †\_‡K gnvwek¦ Zyjbvg~jK gm„Y nIqvi KviY †evSv hvq| Z‡e cÖ\_g wKQy gyn~‡Z©i f¨vKzqvg n‡jv bKj f¨vKzqvg| Gi k~b¨-we›`yi kw³ A¯^vfvweK iKg †ewk| k~b¨-we›`yi D”P kw³i Ae¯’v G‡K †fZ‡i †fZ‡i Aw¯’wZkxj K‡i †Zv‡j| Lye `ªæZ †m bKj f¨vKzqvg †f‡O c‡o| G‡Z mgq jv‡M GK †m‡K‡Ûi eû‡KvwU fv‡Mi GK fv‡MiI Kg| bKj f¨vKzqvg aŸsm n‡q wd‡i Av‡m Avmj f¨vKzqvg| Avgiv GLb gnvwe‡k¦ GiB k~b¨-we›`yi kw³ †`wL| GUv wQj GK †evZj cvwbi g‡Zv| gyn~‡Z©i g‡a¨ hv AwZDËß n‡q I‡V| Avmj f¨vKzqv‡gi †QvU †QvU eyØy` ˆZwi nq| cÖmvwiZ nq Av‡jvi †e‡M| Avgv‡`i ch©‡e¶Y‡hvM¨ gnvwek¦ GgbB GK eyØy‡`i g‡a¨ Av‡Q| A\_ev Av‡Q GKm‡½ hy³ K‡qKwU eyØy‡`i mgv‡e‡ki g‡a¨| cÖmviYkxj Gme eyØy` I Zv‡`i mgv‡e‡ki AcÖwZmg ˆewk‡ó¨i gva¨‡g gnvwe‡k¦i AcÖwZmv‡g¨i (asymmetry) e¨vL¨v cvIqv hvq| G ùxwZ ZË¡ (theory of inflation) ej‡Q, k~b¨-we›`yi Ak~b¨ kw³B b¶Î I Qvqvc‡\_i m„wói Rb¨ `vqx|

gnvwe‡k¦i m„wói inm¨I nqZ k~‡b¨i g‡a¨B wbwnZ| f¨vKzqvg I k~b¨-we›`yi k~b¨Zv KYvi Rb¥ w`‡Z cv‡i| Zvn‡j gnvwe‡k¦i Rb¥ †Kb w`‡Z cvi‡e bv? KYviv ¯^Ztù~Z©fv‡e m„wó I aŸsm nq| Gi bvg †Kvqv›Uvg †dv‡gi †dbv| GUvB nqZ gnvwe‡k¦i m„wói Rb¨ `vqx| gnvwek¦ nq‡Zvev eo AvKv‡ii GK †Kvqv›Uvg d¬vKPy‡qkb| gnvwek¦Uv GK wekvj A™¢yZ KYv, hvi Rb¥ cig f¨vKzqvg †\_‡K| G gnvRvMwZK wW¤^ we‡ùvwiZ n‡q cÖmvwiZ nq| ˆZwi K‡i Avgv‡`i gnvwe‡k¦i ¯’vb-Kvj| GgbI n‡Z cv‡i, Avgv‡`i gnvwek¦ eû d¬vKPy‡qk‡bi g‡a¨ GKwU| †Kv‡bv †Kv‡bv c`v\_©we‡`i wek¦vm, eø¨vK‡nv‡ji †K‡›`ªi wms¸jvwiwU w`‡q weM e¨vs‡qi Av‡Mi Avw`g †Kvqv›Uvg †dv‡g cÖ‡ek Kiv hv‡e| eø¨vK‡nv‡ji †K‡›`ªi †dv‡gi †dbvq mgq I ¯’vb A\_©nxb| Avi ZvB G †dbv nqZ AMwYZ bZyb gnvwek¦ ˆZwi Ki‡Q| †h¸‡jv eyØy` AvKv‡i †ewi‡q Av‡m I ùxZ nq| ˆZwi K‡i wb‡R‡`i b¶Î I Qvqvc\_| Avgv‡`i Aw¯Í‡Z¡i inm¨ nqZ k~‡b¨i g‡a¨B jywK‡q Av‡Q| jywK‡q Av‡Q AviI AmxgmsL¨K gnvwe‡k¦i inm¨|

k~b¨ GK kw³kvjx wRwbm, KviY GwU c`v\_©we`¨vi m~Î¸‡jvi fvimvg¨ bó K‡i †`q| weM e¨vs‡qi k~b¨ NÈv I eø¨vK‡nv‡ji MÖvDÛ wR‡iv‡Z Avgv‡`i gnvwe‡k¦i AvPiY e¨vL¨v Kiv MvwYwZK mgxKiY¸‡jv A\_©nxb n‡q c‡o| Z‡e k~b¨‡K D‡c¶v Kiv hv‡e bv| k~b¨ ïay Avgv‡`i Aw¯Í‡Z¡i Rb¨B `vqx bq, gnvwe‡k¦i †kl cwiYwZi Rb¨I `vqx|

Z\_¨wb‡`©k

1| n¨uv, MwYZ my›`i n‡Z cv‡i Avevi wekªxI n‡Z cv‡i| m½xZ ev wPÎKg©‡K bv›`wbKfv‡e iæwPkxj Kivi †KŠkj wVK Kiv †hgb KwVb, †Zgwb KwVb MvwYwZK Dccv`¨ ev c`v\_©we`¨vi ZË¡‡K my›`i K‡i †Zvjvi c×wZ †ei Kiv| my›`i ZË¡ n‡e mij Ges †QvU I msw¶ß| GwU GK ai‡bi c~Y©v½Zv dzwU‡q Zyj‡e| cÖvqkB \_vK‡e cÖwZmv‡g¨i inm¨RbK Zvrch©| AvBb÷vB‡bi ZË¡¸‡jv we‡klfv‡e my›`i| my›`i g¨v·yI‡q‡ji mgxKiY¸‡jv| Z‡e A‡b‡Ki g‡ZB Aqjv‡i Avwe®‹„Z GKwU mgxKiY MvwYwZK †mŠ›`‡h©i me‡P‡q wbLyuZ D`vniY| mgxKiYUv n‡jv eiπ+1=0| KviY AwZmij I †QvÆ GB m~Î m¤úyY© AcÖZ¨vwkZfv‡e MwY‡Zi me‡P‡q ¸iæZc~Y© msL¨v¸‡jv‡K GKB my‡Zvq Muv‡\_|

m~ÎwU wb‡q AviI Rvb‡Z coyb: Avãyj¨vn Avw`j gvngy`, ÒAqjv‡ii dg©yjv GZ `viæY †Kb?Ó, ÷¨vU g¨vwbqv, https://www.statmania.info/2020/09/euler2.html

2| e¨wZµgI Av‡Qb| †hgb A¨vb‡WªvwgWv Qvqvc\_B| gnvwe‡k¦i cÖmviY duvwK w`‡q gnvK‡l©i cÖfv‡e GUv AvKvkM½vi Kv‡Q Avm‡Q|

3| gnvwe‡k¦i cÖmvi‡Yi mv‡\_ mv‡\_ wewKiY `ye©j n‡q c‡o| P‡j Av‡m eY©vjxi gvB‡µvI‡qf AÂ‡j| `„k¨gvb Av‡jvi †P‡q G Av‡jvi Zi½‰`N¨© eo, K¤úv¼ Kg| ZvB kw³I Kg|

wPÎ 57.1: Zwo”Py¤^Kxq eY©vjx

beg Aa¨vq

k~‡b¨i P~ovšÍ weRq

[‡kl mgq]

Gfv‡eB aŸsm n‡e wek¦

we‡ùvi‡Yi gva¨‡g bq, Kvbœvi gva¨‡g|

—wU Gm GwjqU, Ò`¨ n‡jv g¨vbÓ

wKQy wKQy c`v\_©we` mgxKiY †\_‡K k~b¨‡K ev` w`‡Z †Póv Ki‡Qb| Ab¨iv Avevi †`Lv‡”Qb, k~b¨B nqZ nvm‡e †kl nvwm| weÁvbxiv nq‡Zv †Kv‡bvw`bB gnvwe‡k¦i Rb¥inm¨ Rvb‡eb bv| Z‡e gnvwe‡k¦i g„Zy¨ m¤ú‡K© cÖvq Rvbv n‡q †M‡Q| gnvwe‡k¦i P~ovšÍ cwiYwZ Av‡Q k~‡b¨i nv‡ZB|

AvBb÷vB‡bi gnvKl©xq mgxKi‡Y w¯’i I cwieZ©bkxj gnvwe‡k¦i ¯’vb †bB| Z‡e AviI †ek wKQy cwiYwZi my‡hvM Av‡Q| G¸‡jv wbf©i K‡i gnvwe‡k¦i f‡ii cwigv‡Yi Ici| gnvwek¦ nvjKv n‡q \_vK‡j ¯’vb-Kv‡ji †ejyb cÖmvwiZ n‡ZB \_vK‡e| eo †\_‡K AviI eo n‡ZB \_vK‡e| b¶Î I Qvqvc\_ G‡Ki ci `c K‡i wb‡f hv‡e| gnvwek¦ n‡q hv‡e kxZj| n‡e Zvcxq g„Zy¨| Z‡e fi †ewk n‡j Avevi wfbœK\_v| b¶Î I Qvqvc‡\_i `j I A‡`Lv WvK© g¨vUvi †VwK‡q †`‡e weM e¨vs‡qi cÖv\_wgK avc| †ejy‡bi ùxwZ Pj‡e bv wPišÍb| Qvqvc\_iv G‡K Aci‡K Kv‡Q †U‡b †b‡e| †kl ch©šÍ ¯’vb-Kv‡ji KvVv‡gv KvQvKvwQ n‡q Avm‡e| †ejyb Pyc‡m †h‡Z ïiæ Ki‡e| G cÖwµqv µ‡gB `ªæZ †\_‡K `ªæZZi n‡e| gnvwek¦ µ‡gB DËß n‡Z \_vK‡e| †kl ch©šÍ Gi mgvwß NU‡e †cQbgyLx we‡ùviY w`‡q| hvi bvg gnvm‡¼vPb (big crunch)| Avgv‡`i fvM¨ †KvbUv Av‡Q? gnvm‡¼vPb, bvwK Zvcxq g„Zy¨ (heat death)? DËi P‡j G‡m‡Q nv‡Z|

`~‡ii Qvqvc‡\_i w`‡K ZvKv‡j AZxZ †`Lv hvq| aiæb, Kv‡Qi †Kv‡bv Qvqvc\_ Av‡Q 10 jvL Av‡jvKel© `~‡i| H Qvqvc\_ †\_‡K †ei nIqv Av‡jv c„w\_ex‡Z Avm‡Z 10 jvL eQi mgq jvM‡e| Avgiv †h Av‡jv GLb †`Le, Zv Qvqvc\_ †\_‡K †ei n‡q‡Q 10 jvL eQi Av‡M| AviI `~‡ii e¯‘i w`‡K ZvKv‡j †`Lv hv‡e AviI `~‡ii AZxZ|

gnvwe‡k¦i cwiYwZ wbf©i Ki‡Q ¯’vb-Kv‡ji †ejy‡bi cÖmvi‡Yi MwZi Ici| cÖmviY `ªæZ K‡g †M‡j †evSv hv‡e weM e¨vs‡qi mgq m„wó kw³ cÖvq wbt‡kl n‡q †M‡Q| gnvwek¦ GwM‡q hv‡e gnvm‡¼vP‡bi w`‡K| Avi cÖmviY Lye †ewk bv Kg‡j †evSv hv‡e weM e¨vs‡qi kw³ ¯’vb-Kv‡ji KvVv‡gv‡K m‡Rv‡i av°v w`‡qwQj| hvi d‡j cÖmviY Pj‡e wPiKvj|

‡R¨vwZwe©`iv gnvwe‡k¦i cÖmvi‡Yi cwieZ©b cwigvc ïiæ K‡i‡Qb| UvBc-Iqvb G bv‡g GK ai‡bi mycvi‡bvfv (we‡ùvwiZ Zviv) Av‡Q| GivI nve‡ji wmwdW Zviv‡`i g‡Zv Av`k© evwZ wn‡m‡e KvR K‡i| G mycvi‡bvfviv cÖvq GKBfv‡e we‡ùvwiZ nq| D¾¡jZv \_v‡K GKBiKg| nve‡ji Aby¾¡j wmwdW Zvivi mv‡\_ G‡`i cv\_©K¨ Av‡Q| G‡`i‡K cy‡iv gnvwe‡k¦i A‡a©K `~iZ¡ ch©šÍ †`Lv hvq|

1997 mv‡j Gj Av‡iK we‡kl Avwe®‹vi| †R¨vwZwe©`iv G mycvi‡bvfv¸‡jv w`‡q †ek wKQy Aby¾¡j I cÖvPxb Qvqvc‡\_i `~iZ¡ cwigvc K‡ib| Qvqvc‡\_i `~iZ¡ Gi eqmI e‡j †`q| Avi Gi Wcjvi miY e‡j †`q Gi †eM| AZx‡Zi wewfbœ mg‡qi Qvqvc‡\_i `~‡i mivi MwZi Zyjbv Ki‡jb weÁvbxiv| Gi gva¨‡g Rvbv †Mj ¯’vb-Kv‡ji cÖmviY †eM| Avi †mUv LyeB A™¢yZ GK dj|

gnvwe‡k¦i cÖmviY \_vg‡Q bv| cÖmviY †eM eis m¤¢eZ †e‡o hv‡”Q| mycvi‡bvfvi DcvË ej‡Q, gnvwek¦ µ‡gB †ewk `ªæZ nv‡i eo n‡”Q| GUv mwVK n‡q \_vK‡j gnvm‡¼vPb NUvi m¤¢vebv †bB ej‡jB P‡j| gnvK‡l©i wecix‡Z KvR Ki‡Q †Kv‡bv GKwU ej| c`v\_©we`iv AveviI wd‡i †M‡jb gnvRvMwZK aªæe‡Ki Kv‡Q| †h aªæeK AvBb÷vBb †hvM K‡iwQ‡jb Zuvi mgxKi‡Y gnvK‡l©i av°v‡K fvimv‡g¨ Avb‡Z| AvBb÷vB‡bi me‡P‡q eo fyjwU nqZ fyjB wQj bv|

inm¨gq †m ej nqZ AveviI †mB f¨vKzqvg| ¯’vb-Kv‡ji ci‡Z ci‡Z jywK‡q \_vKv ¶y`ª ¶y`ª KYviv nqZ av°v w`‡”Q evB‡ii w`‡K| Abbyfe‡hvM¨vfv‡e cÖmvwiZ K‡i w`‡”Q ¯’vb-Kv‡ji KvVv‡gv‡K| eû †KvwU eQ‡i †m cÖmviY Rgv n‡q gnvwek¦‡K `ªæZ †\_‡K `ªæZZi ùxZ Ki‡Q| gnvwe‡k¦i cwiYwZ gnvm‡¼vPb bq| eis wPicÖmviY, kxZjvqb I Zvcxq g„Zy¨| Avi Gi Rb¨ `vqx k~b¨-we›`yi kw³| †Kvqv›Uvg MwZwe`¨vi †h k~b¨ f¨vKzqvg‡K AmxgmsL¨K KYv w`‡q fwZ© K‡i †`q|

‡R¨vwZwe©`iv GLbI mveav‡b cv Pvjv‡”Qb| mycvi‡bvfv †\_‡K cÖvß G dj †\_‡K cÖv\_wgK GKwU wm×všÍ cvIqv hvq| cÖwZwU ch©‡e¶Y †k‡l G wm×všÍ AviI †Rviv‡jv n‡”Q| wKQy M‡elYvq Avevi wbw`©ó †Kv‡bv †¶‡Î M¨v‡mi P~ov ev gnvKl©xq eµZvi msL¨v †`Lv nq| †mme ch©‡e¶Y †\_‡KI mycvi‡bvfvi djvd‡ji c‡¶ mg\_©b cvIqv †M‡Q| d‡j g‡b n‡”Q gnvwek¦ wPiKvj cÖmvwiZ n‡e| g„Zy¨Uv n‡e kxZj, Dò bq|

cwiYwZ n‡e wng, Av¸b bq| Avi Gi K…wZZ¡ k~‡b¨i|

Amxg I Zvi c‡i

GKwU GKxf~Z ZË¡ Avwe®‹vi Kiv m¤¢e n‡j †mUv mvaviY gvby‡li c‡¶ †evSvi Dc‡hvMx n‡Z n‡e| ïay wKQy weÁvbx‡K eyS‡jB Pj‡e bv| ZLb weÁvbx, `vk©wbK Ges mvaviY gvbyl- mevB gnvwe‡k¦i Aw¯ÍZ¡ wb‡q Av‡jvPbv Ki‡Z cvi‡eb| Gi DËi †c‡j Z‡eB Zv n‡e gvby‡li eyw×i RM‡Zi P~ovšÍ weRq| KviY ZLbB Avgiv Ck¦‡ii gb (mind of God) Rvb‡Z cvie|

—w÷‡db nwKs

c`v\_©we`¨vi me auvauvi Rb¨ `vqx k~b¨| eø¨vK‡nv‡ji Amxg Nb‡Z¡ Av‡Q k~b¨ w`‡q wefvRb| k~b¨Zv †\_‡K weM e¨vs‡qi gva¨‡g m„wó‡ZI Av‡Q k~b¨ w`‡q fvM| k~b¨ w`‡q fvM Av‡Q f¨vKzqv‡gi Amxg kw³‡Z| ZeyI k~b¨ w`‡q fvM Ki‡j MwY‡Zi KvVv‡gv aŸsm n‡q hvq| †f‡O Pyigvi nq hyw³i cvUvZb| weÁv‡bi wfwËB aŸsm n‡q hvIqvi †hvMvo|

wc\_v‡Mviv‡mi hy‡M ivRZ¡ KiZ weï× hyw³| ZLbI k~‡b¨i Rb¥ nqwb| gnvwek¦ wQj myk„•Lj I Abygvb‡hvM¨| Gi wfwË wQj g~j` msL¨v| †R‡bvi †Mvj‡g‡j c¨vivW·¸‡jv‡K e¨vL¨v †`Iqvi Rb¨ Amxg I k~b¨‡K msL¨vi RMZ †\_‡K ev` †`Iqv nq|

Gici Gj ˆeÁvwbK wecøe| ev¯Íe AwfÁZvi Kv‡Q nvi gvbj weï× hyw³| `k©‡bi ¯’vb `Lj Kij ch©‡e¶Y| gnvwe‡k¦i m~Î e¨vL¨v Ki‡Z wM‡q wbDUb‡K D‡c¶v Ki‡Z n‡q‡Q Zuvi K¨vjKzjv‡mi Kzhyw³| †h Kzhyw³i Rb¥ w`‡qwQj k~b¨ w`‡q wefvRb|

K¨vjKzjv‡mi k~‡b¨i fvM †Zv MwYZwe` I c`v\_©we`iv mgvavb Ki‡jb| cybivq G‡K hyw³i wfwËi Ici `uvo Kiv‡jb| wKš‘ k~b¨ wd‡i Gj †Kvqv›Uvg MwZwe`¨v I mvwe©K Av‡cw¶KZvi mgxKi‡Y| AveviI weÁvb‡K KjywlZ Kij Amxg w`‡q| gnvwe‡k¦i k~‡b¨ hyw³ nvi gv‡b| †f‡O c‡o †Kvqv›Uvg MwZwe`¨v I mvwe©K Av‡cw¶KZv| GUv mgvavb Ki‡Z wM‡q weÁvbxiv AveviI k~b¨‡K wbe©vm‡b cvVv‡bvi Awfhv‡b bv‡gb| gnvwe‡k¦i m~Î¸‡jv‡K †Rvov w`‡Z PvB‡jb|

weÁvbxiv G Kv‡R mdj n‡j eyS‡Z cvi‡eb gnvwe‡k¦i m~Î¸‡jv| ¯’vb-Kv‡ji cÖvšÍmxgv ch©šÍ mewKQyi wbqš¿K m~Î¸‡jv ZLb Rvbe Avgiv| Rvbe gnvwe‡k¦i m~Pbv I mgvwßi Mí| Rvbe, †Kvb cwiw¯’wZ‡Z Rb¥ n‡qwQj gnvwe‡k¦i| Avgiv Rvbe Ck¦‡ii gb| Z‡e Gevi Avi k~b¨‡K nviv‡bv GZ mnR bvI n‡Z cv‡i|

‡Kvqv›Uvg MwZwe`¨v I mvwe©K Av‡cw¶KZv‡K †Rvov †`Iqvi †ek wKQy ZË¡ Av‡Q| G¸‡jv eø¨vK‡nv‡ji †K›`ª I weM e¨vs‡qi wms¸jvwiwUi e¨vL¨v †`q| Z‡e G ZË¡¸‡jv ev¯Íe cix¶v‡hvM¨Zv †\_‡K †hvRb †hvRb `~‡i Av‡Q| G‡`i †KvbUv wVK Avi †KvbUv fyj Zv Rvbv m¤¢e bvI n‡Z cv‡i| w÷ªs ZË¡ I Km‡gvjwR÷‡`i e³e¨ nqZ MvwYwZKfv‡e wbf©yj| Avevi GKBmv‡\_ n‡Z cv‡i wc\_v‡Mviv‡mi `k©‡bi g‡Zv g~j¨nxb| MvwYwZKfv‡e G¸‡jv †`L‡Z my›`i I mym½Z n‡Z cv‡i| my›`ifv‡e e¨vL¨vI Ki‡Z cv‡i gvnwe‡k¦i ˆewkó¨‡K| Zvic‡iI n‡Z cv‡i cy‡iv`¯‘i fyj|

weÁvbxiv ïay Rv‡bb, gnvwek¦ G‡m‡Q k~b¨ †\_‡K| Avevi wd‡iI hv‡e k~‡b¨| †hLvb †\_‡K GwU G‡m‡Q|

k~b¨ w`‡qB ïiæ I †kl gnvwe‡k¦i|

cwiwkó K

cÖvYx, mewR, bvwK gš¿x?

aiæb a I b mgvb 1| Zvn‡j a I b mgvb|

AZGe, Avgiv wjL‡Z cvwi

b2 = ab (mgxKiY ... 1)

Avevi a †Zv wb‡Ri mgvb| AZGe, wjL‡ZB cvwi

a2 = a2 (mgxKiY ... 2)

2 bs mgxKiY †\_‡K 1 bs mgxKiY we‡qvM K‡i cvB

a2 – b2 = a2 – ab (mgxKiY ... 3)

mgxKi‡Yi Dfqc¶‡K Drcv`‡K we‡kølY Kwi|

a2 – b2 = (a + b) (a - b)

Avevi a2 – ab = a (a – b)

(GLb ch©šÍ A‰ea wKQyB Kwiwb| mewKQyB MvwYwZKfv‡e wbf©yj| cix¶v K‡i †`L‡Z PvB‡j msL¨v ewm‡q †`Lyb|) Zvn‡j 3 bs mgxKiY †\_‡K cvw”Q

(a + b) (a – b) = a (a – b) (mgxKiY ... 4)

GLbI me wVK Av‡Q| Gevi Dfq c¶‡K (a – b) w`‡q fvM Kwi|

a + b = a (mgxKiY ... 5)

`yB c¶ †\_‡K a we‡qvM Kwi|

b = 0 (mgxKiY ... 6)

Z‡e ïiæ‡ZB b mgvb 1 a‡iwQjvg| Zvi gv‡b

1 = 0 (mgxKiY ... 7)

GUv Lye ¸iæZ¡c~Y© GK djvdj| AviI mvg‡b hvIqv hvK| Avgiv Rvwb, û‡mBb gynv¤§` Gikv‡`i GKwU gv\_v wQj| wKš‘ 7 bs mgxKiY ej‡Q, GK Avi k~b¨ mgvb| Zvi gv‡b Gikv‡`i †Kv‡bv gv\_v †bB| Avevi Gikv‡`i cvÄvwe †bB| Zvi gv‡b GKwU cvÄvwe Av‡Q| 7 bs mgxKi‡Yi `yB c¶‡K 2 w`‡q ¸Y Kwi|

2 = 0 (mgxKiY ... 8)

Gikv‡`i `ywU cv wQj| Zvi gv‡b Zvi †Kv‡bv cv wQj bv| `ywU evû wQj| gv‡b GKwUI wQj bv| Gevi 7 bs mgxKiY‡K Gikv‡`i †Kvg‡ii mvBR w`‡q ¸Y Kwi|

Gikv‡`i †Kvg‡ii mvBR = 0 (mgxKiY ... 9)

gv‡b Zvi †KvgiB wQj bv|

Gevi Avmyb Zvi Mv‡qi is †`wL| Zvi Mv †\_‡K Avmv GKwU Av‡jvKiwk¥ wbb| GKwU †dvUb KYv wbb| 7 bs mgxKiY‡K Zi½‰`N¨© w`‡q ¸Y Kiæb|

Gikv‡`i †dvU‡bi Zi½‰`N¨© = 0 (mgxKiY ... 10)

Z‡e 7 bs mgxKiY‡K 640 b¨v‡bvwgUvi w`‡q ¸Y Ki‡j cvB

640 = 0 (mgxKiY ... 11)

10 I 11 mgxKiY wgwj‡q cvB

Gikv‡`i †dvU‡bi Zi½‰`N¨© = 640 b¨v‡bvwgUvi

Gi gv‡b Gikv‡`i Mv †\_‡K Avmv †dvU‡bi is Kgjv (hvi Zi½‰`N¨© 640 b¨v‡bvwgUvi)| Zvigv‡b Gikv‡`i Mv‡qi is Kgjv|

mviK\_v n‡jv, Avgiv MvwYwZKfv‡e cÖgvY Kijvg, Gikv‡`i †Kv‡bv evû ev cv †bB| Gikv‡`i †Kv‡bv gv\_v †bB| Z‡e GKwU cvÄvwe Av‡Q| †bB †Kv‡bv †Kvgi| Avi Mv‡qi is n‡jv Kgjv| Gikv` Aek¨B GKwU MvRi| (GUv cÖgvY Kivi mnR Dcvq Av‡Q| 7 bs mgxKi‡Yi `yB cv‡k 1 †hvM Ki‡j cve

2 = 1

Gikv` Avi MvRi `ywU Avjv`v wRwbm| AZGe, Zviv GKB wRwbm|)

G cÖgv‡Y Amyweav †Kv\_vq? fyj n‡q‡Q GKwUgvÎ RvqMvq| 4 bs mgxKiY †\_‡K 5 bs mgxKi‡Y hvIqvi mgq G fyjUv n‡q‡Q| Avgiv fvM w`‡qwQjvg (a – b) w`‡q| wKš‘ fvj K‡i †Lqvj Kiæb| a Ges b `y‡UviB gvb 1| AZGe a – a = 1 – 1 = 0| Avgiv k~b¨ w`‡q fvM K‡iwQ| Avi †c‡qwQ nvm¨Ki mgxKiY 1 = 0| GLvb †\_‡K Avgiv hv B”Qv ZvB cÖgvY Ki‡Z cvie| †nvK Zv mZ¨ ev wg\_¨v| MwY‡Zi cy‡iv KvVv‡gv aŸ‡m c‡o‡Q Avgv‡`i †Pv‡Li mvg‡b|

k~‡b¨i fyj e¨envi hyw³‡K aŸsm K‡i w`‡Z cv‡i|

cwiwkó L

‡mvbvwj AbycvZ

GKwU †iLv‡K `yB fvM Kiæb| KvRUv Kiæb GKwU wbqg †g‡b| fvM Kivi c‡i †QvU I eo As‡ki AbycvZ eo I Ask I cy‡iv As‡ki Abycv‡Zi mgvb n‡Z n‡e|

wnmve mnR Ki‡Z g‡b Kiæb, †QvU Ask 1 dzU j¤^v| Avi eo Ask‡K aiæb x dzU| Zvn‡j cy‡iv †iLvi ˆ`N¨© (x + 1) dzU|

exRMwYZ LvwU‡q †`Lv hv‡e †QvU I eo As‡ki AbycvZ 1/x|

Avi eo Ask I cy‡iv †iLvi AbycvZ x / (x + 1)|

Avgiv Rvwb, †QvU I eo As‡ki AbycvZ eo I Ask I cy‡iv As‡ki Abycv‡Zi mgvb| AZGe

x/(x +1) = 1/x

Avgiv GLvb †\_‡K x-Gi gvb †ei Kie| GUvB †mvbvwj AbycvZ (golden ratio)| Dfqc¶‡K x w`‡q ¸Y K‡i cvB

x2 / (x + 1) = 1

Gevi ¸Y †`e (x + 1) w`‡q| Zvn‡j cve

x2 = x + 1

Dfq c¶ †\_‡K (x + 1) we‡qvM w`‡j

x2 - x - 1 = 0

Gevi Avgiv wØNvZ mgxKiYUv mgvavb Ki‡Z cvwi| cve `ywU mgvavb| (1+√5)/2 Ges (1 - √5)/2| G `ywUi ïay cÖ\_gwUB abvZ¥K| hvi gvb 1.618| wMÖK‡`i Kv‡Q ïay abvZ¥K msL¨v‡KB A\_©cyY© g‡b nZ| AZGe †mvbvjx Abycv‡Zi Avmbœ gvb 1.618|

cwiwkó M

AšÍi‡Ki AvaywbK msÁv

eZ©gv‡b AšÍiK Lye gReyZ wfwËi Ici `uvwo‡q Av‡Q| KviY Gi msÁv †`Iqv nq wjwg‡Ui gva¨‡g| f(x) dvsk‡bi AšÍi‡Ki (hv‡K fÕ(x) Øviv cÖKvk Kiv nq) msÁv n‡jv

fÕ(x) = limε→0 {f(x+ε) – f(x)}/ε

Gi gva¨‡g Avgiv Kxfv‡e wbDU‡bi K‚U‡KŠkj †\_‡K gyw³ cvB Zv eyS‡Z n‡j wbDU‡bi d¬y‡·v‡bi D`vniYUv †`Lv hvK| †mLv‡b wQj f(x) = x2 + x +1| Zvi AšÍiK n‡e

fÕ(x) = limε→0 {(x + ε)2 + (x + ε) + 1 – (x2 + x + 1)}/ ε

we¯Í„Z K‡i cvB

fÕ(x) = limε→0 (x2 + 2εx + ε2 + x + ε + 1– x2 - x - 1)/ ε

GLb x2, x I 1 KvUvKvwU P‡j hvq| evwK \_v‡K

fÕ(x) = limε→0 (2εx + ε + ε2)/ε

je I ni‡K ε w`‡q fvM K‡i cvB (g‡b ivL‡Z n‡e ε memgq Ak~b¨| Avgiv GLbI wjwgU emvBwb)

fÕ(x) = limε→0 (2x + 1 + ε)

Gevi Avgiv wjwgU †be| ε-‡K k~‡b¨i Kv‡Q †h‡Z †`e| Zvn‡j cve

fÕ(x) = 2x + 1 + 0 = 2x + 1

GUvB Avgv‡`i Kvw•LZ djvdj| wPšÍvi mvgvb¨ cwieZ©b| wKš‘ G‡ZB N‡U †Mj KZ eo e¨eavb!

cwiwkó N

g~j` msL¨vi MYbvq K¨v›Ui

Avgiv GLb †`Le, g~j` msL¨v Avi ¯^vfvweK msL¨v‡`i AvKvi mgvb| K¨v›Ui GUv cÖgvY Ki‡Z GKwU Awfbe Avmbweb¨vm cÖ¯Íve K‡ib|

Avcbv‡`i nq‡Zv g‡b Av‡Q, g~j` msL¨v‡`i‡K a/b fMvsk AvKv‡i †jLv hvq, †hLv‡b a I b c~Y©msL¨v (b Aek¨B Ak~b¨)| abvZ¥K c~Y©msL¨v¸‡jv w`‡q ïiæ Kiv hvK|

msL¨vi GKwU wMÖW Kíbv Kiæb| †hLv‡b `ywU msL¨v‡iLv G‡K Aci‡K k~b¨we›`y‡Z †Q` K‡i| e¨vcviUv Kv‡Z©mxq ¯’vbv¼ e¨e¯’vi g‡ZvB| k~b¨‡K g~jwe›`y‡Z emvB| evwK we›`y¸‡jvq emvB g~j` msL¨v‡`i| hv‡`i‡K Avgiv x/y Øviv cÖKvk Kie| GLv‡b x n‡jv we›`yi X A‡¶i ¯’vbv¼ Avi y n‡jv Y A‡¶i ¯’vbv¼| msL¨v‡iLv P‡j †M‡Q Amxg ch©šÍ| d‡j x I y-Gi cÖwZwU m¤¢ve¨ gvb wMÖ‡Wi g‡a¨ GKwU RvqMv cv‡e (wPÎ 58)|

Gevi abvZ¥K g~j` msL¨v‡`i Rb¨ Avmbweb¨vm evbvB| cÖ\_g wmUwU wMÖ‡Wi 0 (g~jwe›`y) w`‡q ïiæ Kwi (‡hLv‡b A¶ `ywU †Q` K‡i‡Q)| c‡i cve 1/1| GUv wØZxq Avmb| Gevi hvB 1/2 Ae¯’v‡b (wZiwPý †Lqvj Kiæb)| Avmb bs 3| Gevi 2/1, hv Avm‡j 2-B| GUv n‡jv 4\_© Avmb| Gevi Av‡Q 3/1| Avmb bs 5| Gevi wZiwPý a‡i †h‡Z †h‡Z mevB‡K GKwU K‡i Avmb †`e| Gfv‡e Avmbweb¨vm ˆZwi n‡q hv‡e|

wPÎ 58: ¯^vfvweK msL¨vi MYbv

Avmb

1

2

3

4

5

6

7

8

9

...

g~j` msL¨v

0

1

1/2

2

3

1

1/3

1/4

2/3

...

‡kl ch©šÍ me msL¨vB Avmb cv‡”Q| †Kv‡bv †Kv‡bv msL¨v Avevi 2wU Avmb cv‡”Q| GKB Avmb †Kv‡bvmsL¨v‡K wØZxqvevi bv w`‡jB Gi mgvavbI n‡q †Mj| c‡ii KvRUv n‡jv ZvwjKv‡K wØ¸Y Kiv| hv‡Z abvZ¥K g~j‡`i RvqMvq \_vK‡e FYvZ¥K msL¨viv| Zvn‡j Avgiv cve Av‡iKwU Avmbweb¨vm|

Avmb

1

2

3

4

5

6

7

8

9

...

g~j` msL¨v

0

1

-1

1/2

-1/2

2

-2

3

-3

...

GLb abvZ¥K, FYvZ¥K I k~b¨—me g~j` msL¨vB Avmb †c‡q †Mj| Avmbwenxb †KD †bB| †Kv‡bv Avmb duvKvI †bB| Zvi gv‡b g~j`msL¨v Avi MYbvmsL¨v‡`i AvKvi mgvb|

cwiwkó O

Iqvg©‡nvj UvBg †gwkb evbv‡bvi Dcvq

KvRUv Lye mnR| ïay G PviwU avc †g‡b Pjyb|

avc 1: †QvÆ GKwU Iqvg©‡nvj ˆZwi Kiæb| Gi `yB cÖvšÍ GKB mg‡q Ae¯’vb Ki‡e|

wPÎ: 59

avc 2: Iqvg©‡nv‡ji GK cÖvšÍ‡K fvix wKQyi mv‡\_ Muv\_yb| Av‡iKcÖvšÍ‡K euvayb GKwU gnvKvkhv‡bi mv‡\_, hvi MwZ Av‡jvi MwZi 90 fvM| Zvn‡j hv‡bi cÖwZ GK eQi c„w\_exi 2.3 eQ‡ii mgvb n‡e| Iqvg©‡nv‡ji `yB cÖv‡šÍi Nwo `yB MwZ‡Z Pj‡e|

wPÎ 60

avc 3: wKQy¶Y A‡c¶v Kiæb| c„w\_exi 46 eQi cvi n‡j Iqvg©‡nvj‡K GK my›`i MÖ‡n wb‡q hvb| Iqvg©‡nv‡ji †fZi w`‡q ågY Ki‡j Avcwb c„w\_exi 2046 mvj †\_‡K wRj· MÖ‡ni 2020 mv‡j P‡j †h‡Z cvi‡eb| cvi‡eb D‡ëvUvI Ki‡Z|

wPÎ 61

avc 4: GKUy eyw× LvUv‡jB Avcwb G Awfhvb AviI A‡bK Av‡MB ïiæ Ki‡Z cvi‡eb| hvÎv ïiæi A‡bK Av‡MB wRj· MÖ‡n GKwU evZ©v cvwV‡q †`‡eb, hv‡Z wdiwZ hvÎvi Rb¨ (wRj· MÖ‡ni 1974 mvj) gnKvkhvb cÖ¯‘Z K‡i iv‡L| Gevi (wRj· MÖ‡ni) 2020 mv‡j Ab¨ Iqvg©‡nvj Avcbv‡K c„w\_ex‡Z †diZ cvVv‡e| hv n‡e c„w\_exi 1994 mvj| `yB Iqvg©‡nvj GKm‡½ e¨envi Ki‡j Avcwb 2046 (c„w\_exi mgq) †\_‡K 2020 (wRj· mgq) n‡q 1994 mv‡j (c„w\_exi mgq) †h‡Z cvi‡eb| Avcwb AZx‡Z P‡j wM‡q‡Qb Aa©kZK eQ‡iiI †ewk|

wPÎ 62