

# Bkd vkdkjka dk fp=k.k

## 15.1 Hkfedk%ry&vkÑfr; kj vkj Bkd vkdkj

bl vè;k; e; vki vc rd n[ kh xbZ vkÑfr; ka dks mudh foekvka oè : i ea (dimensions) oxhÑr djæA

viusnud thou e; ge vius ifjok lsfofHku vkdkjæ dh vuod olrq; n[ krs g; t s i hroè] xæ; vki Øhe 'køø] br; kfn A vf/dkkr% bu l Hkh olrq; kæa, d dr l o'u" B (common) g; og ; g g; fd buæ ls iR; d dh oqN yækb] pkb/kb] mqpkbZ ; k xgjkBz gSA

bl h dkj.k] ; s l Hkh LFkkv ?kjrs gæ vkj budh rhu foek; j gæA bl hf; ] ; s f-foeh; vkdkj (threedimensional shapes) dgykrs gæ

D;k vki dks fi Nyh d{kvæan[ks x, oqN f-foeh; vkdkjka (Bkd vkdkjæ) oè djsæ; kn g\

i; kl dhft,

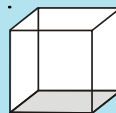
vkdkjka dk ukeal s feyku (match) dhft, %

(i)



(a) ?kukHk

(iv)



(d) xlyk



(ii)



(b) csyu

(v)



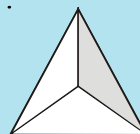
(e) fi jkfeM

(iii)



(c) ?ku

(vi)


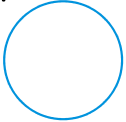





(f) 'køø

vkÑfr 15.1

mijkDr ea l s i R; d vkdkj t s h o q N o L r y k a d h i g p k u d j u s d k i z R u d h f t , A

bl h i z d k j o e r o d } k j k ge dg l d r s g s f d , d d k x i j [ k r o h t k l d u s o k y h v k N f r ; k a ( f t u d h o s o y y a c k z v k s p k s m k b z g k r h g s ) d k s f } f o e h ; ( t w o d i m e n s i o n a l ) ( ; k r y ) d g u k p k f g , A ge n l s f o e k v k a d h o q N v k N f r ; k a d k s f i N y h d { k k v l e a H k h n s k p p e g s f } f o e h ; v k N f r ; k a d k u k e a o e l k f k f e y k u d h f t , ( v k N f r 15.2):

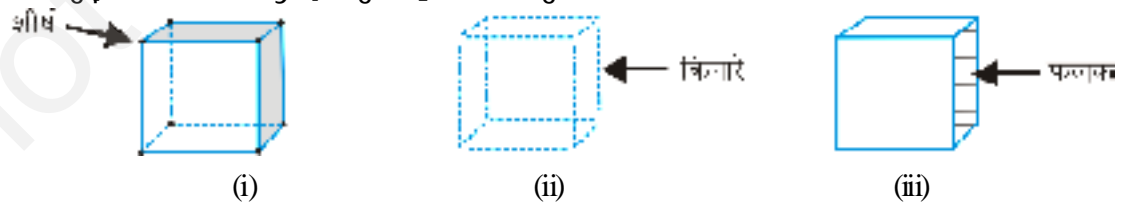
- (i)  (a) o l k
- (ii)  (b) v k ; r
- (iii)  (c) o x l
- (iv)  (d) p r i k t
- (v)  (e) f - k h k t

vkNfr 15.2

fVli . k n % ge l a k i e j f } f o e h ; d k s 2-D v k s f - k f o e h ; d k s 3-D f y [ k l d r s g s A

### 15.2 i Q y d ] f d u k j s v k s ' k h " k z

D ; k v k i d k s i g y s i < s g g B k d v k d k j k a o e l i Q y d k j ' k h " k s v k s f d u k j k a o e l c k j s e a o q N ; k n g s A ; g k j , d ? k u o e l f y , ] b l g a f n [ k k ; k x ; k g s %



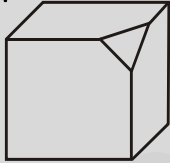
vkNfr 15.3


? k u o e l 8 d k s m l o e l ' k h " k z ( v e r t i c e s ) g s A ? k u o e l < k p s d k s c u k u s o k y s 12 j s k k [ k a m m l o e l f d u k j s ; k d k j ( e d g e s ) d g y k r s g s A 6 l i k v o x k z d k j i " B ] t k s ? k u d h [ k k y ; k R o p k g s m l o e l i Q y d ( f a c e s ) d g y k r s g s A

blga dhft ,

fuEufyf[kr I kj.kh dks ijk dhft , %

I kj . kh 15.1

				
i Qyd (F)	6	4		
fduks (E)	12			
'kh"lz (V)	8	4		

D;k vki ns[k I drsgfd f}foeh; vkÑfr; ka o : i ea f=foeh; vdkjka o i Qydka dh i gpk dh tk I drh gS\ mnkj.kkFkZ , d csy [ ] o nks i Qyd , d sg tks o k g rFk n'kkz x, fijkeM  o i Qyd f=khkt gA



vc ge ;g ns[kus dk iz Ru djgsfd fdl izdkj o 3-D vdkjka dks 2-D vkÑfr; (vFkZ~dkx A

, d k djsoo fy,] ge f=foeh; oLrpkal sfudVre : i I sijfpr gsk pgsA vkb, bu oLrpkadks mul s cukus dk iz kl dj tks buo tky (net) dgykrsgA

15.3 3-D vdkj cukus o fy, tky (u/v)

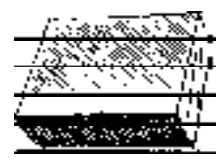
, d x lks dk cDI k (box) yft, A bl dks o n fdujka o vufn'k dkV dj I i kv (flat) cuk yft, A vc vkioo ikl bl cDI s dk tky gA tky 2-D ea, d izdkj dk , d k <kpk (; k : i js[kk) gkrk gS (vkÑfr 15.4 (i)) ft I s ekMus ij (vkÑfr 15.4 (ii)) A ifj.kkeLo: i , d 3-D vdkj i klr gk tkrk gS (vkÑfr 15.4 (iii)) A



(i)

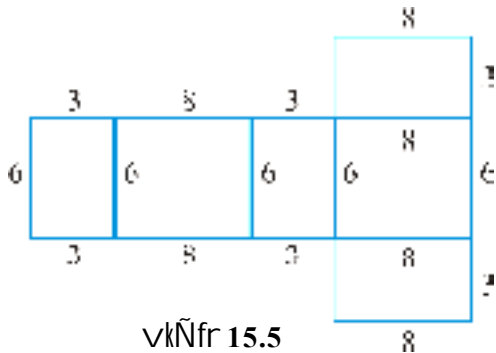


(ii)



(iii)

vkÑfr 15.4



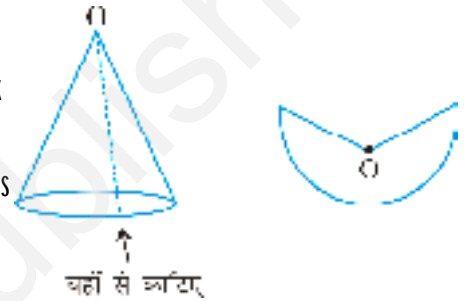
vkÑfr 15.5

;gk; vki usfdukjka dks mi ; Ør : i l si fkoØ djoØ , d tky iklr fd;k gSA D;k bl dh foijhr ifØ;k l hko gS\ ;gk; , d cDl soØ tky dk ifr: i fn;k gS (vkÑfr 15.5) A bl dk ifr: i cukdj ml dk foLrkj (enlarge) dj yHft, A fi Oj bl smi ; Ør izdkj l sekM+ dj vks; fpidk dj , d cDl k cukb, A

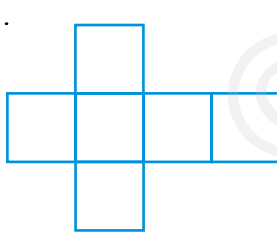
vki mi ; Ør bdkb; ka ; k ek=kdka (units) dk iz;ksx dj l drs gSA iklr cDl k , d Bkl gSA ; g ?kukHk (cuboid) oØ vkdkj dh , d 3-D oLrqgSA bl h izdkj] vki , d 'kØØ dks ml oØ fr; d i "B

oØ vufn'k , d iryh i vto (; k f > jh) dM dj] bl dk tky iklr dj l drs gSA (vkÑfr 15.6) A

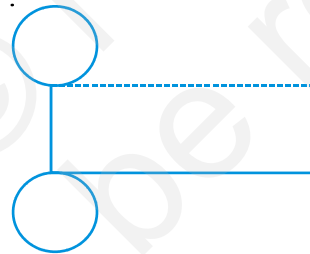
fHkuu&fHkuu vkdkjka oØ fy,] fHkuu&fHkuu tky gksrsgSA fn, gq tkyka oØ ifr: i cukb, vks; mudk foLrkj dhft,] vFkok fn, gq tkyka oØ foLrkfjr : i ka oØ ifr: i cukb, (vkÑfr 15.7) fi Oj buoØ uhps fy [ka 3-D vkdkjka dks cukusdk iz;kl dhft, A vki xÜks dh iryh ifeØ;k; yd; vks; mlga dks fDyika (clips) l sd; / dj vkdkjka oØ < kpsHkh cukuk pkg l drs gSA



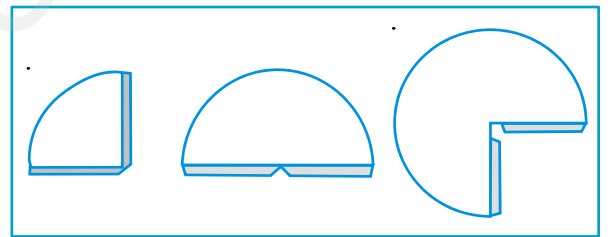
vkÑfr 15.6



?ku (i)



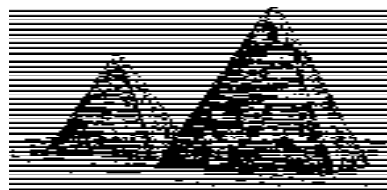
csyu (ii)



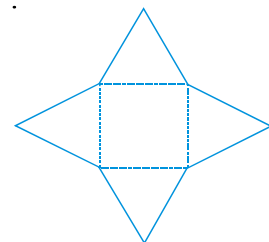
vkÑfr 15.7

'kØØ (iii)

ge fx (Great Pyramid) (vkÑfr 15.8) oØ izdkj oØ fijkfeM oØ fy, Hkh tky cukusdk iz;kl dj l drs gSA bl fijkfeM dk vk/kj , d oxl gS rFkk pkjka Hkq; kvka ij f=Hkq; cusgq gSA nf[k, fd D;k vki fn, gq tky (vkÑfr 15-9) l s bl fijkfeM dks cuk l drs gSA



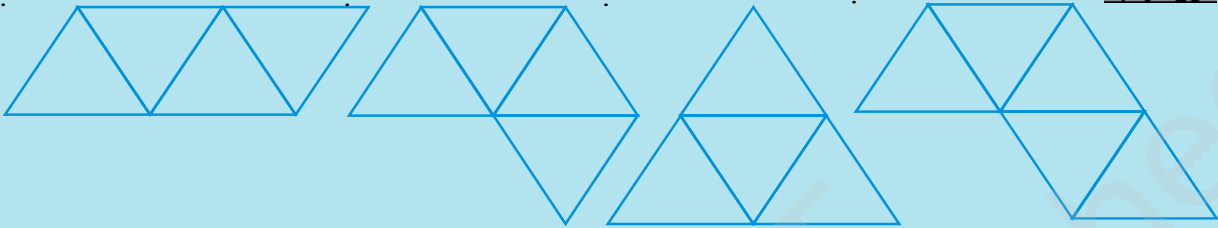
vkÑfr 15.8



vkÑfr 15.9

izkl dhft,

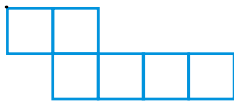
;gk vki plj tkyk dks n[ k jgs gA (vkNfr 15.10)A , d prti Qyd (tetrahedron) cukus o[ fy,] bu eal snk tky l gh gA n[ k, fd D;k vki ;g Kkr dj l drsgA fd fdu&fdu tkyk l sprti Qyd cu l drk gSA



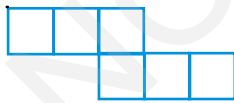
vkNfr 15.10

izukoyh 15.1

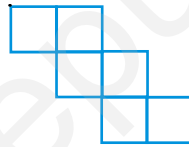
1. mu tkyk dks igpkfu, jftudk iz, kx djo[ vki ?kuk dks cuk l drsgA (bu tkyk o[ ifr: i dkV dj , d k djus dk izkl dhft,):



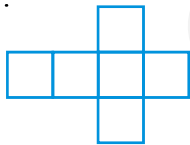
(i)



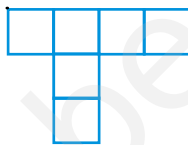
(ii)



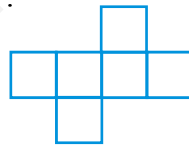
(iii)



(iv)



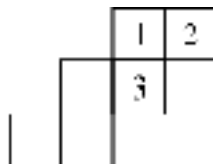
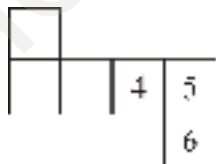
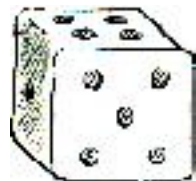
(v)



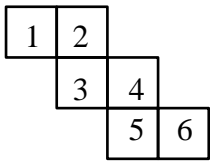
(vi)



2. ikl s (dice) , d s?ku gkrs gA ftuo[ iR; d i Qyd ij ^cnq (dots) v[ dr gkrs gA , d ikl s o[ l Ee[ k i Qydka ij v[ dr ^cnq/ka dh l a[; kvka dk ; kx l n[ 7 gkrs gSA ;gk ikl s (?kuk) dks cukus o[ fy,] nks tky fn, tk jgs gA iR; d oxzeafy [kh l a[; k ml cDI s o[ ^cnq/ka dks n'kkzh gSA

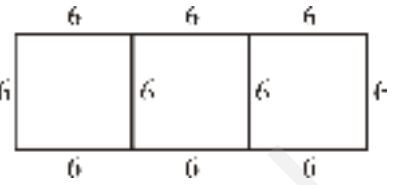


;g ;kn j [krs g fd ikl s o[ l Ee[ k i Qydka dh l a[; kvka dk ; kx l n[ 7 gkrs g fjdR LFKkuka ij mi ; r l a[; k, j fyf[ k, A

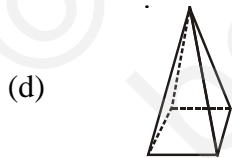
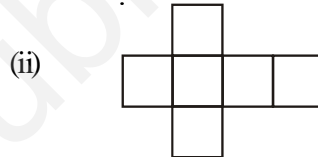
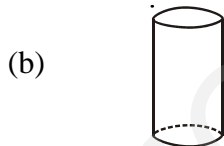
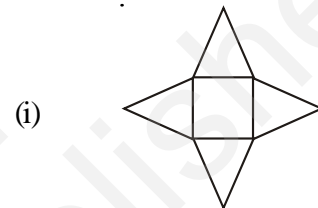
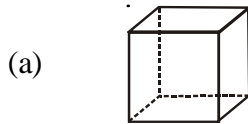


3. D;k ;g ikl sfd fy, ,d tky gks l drk gS\ vius mukj dks Li"V dhft, A

4. ;gk ;d ?ku cukus o? fy,] ,d v/jk tky fn;k x;k gSA bl dks de&l &de nks fofHkku fof/; ka l s ijk dhft, A ;kn jf[k, fd ?ku o? 6 iQyd gkrs gSA ;gk bl tky eafdrusiQyd fn, gq gSA (nks iFko&iFko? fp=k nhft, A dk;Z dks l jy cukus o? fy,] vki oxk?dr dkx dk iz;ks dj l drs gSA)



5. tkyka dks mi;?r Bkl ka l sfeyku dhft, %

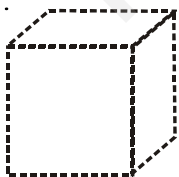


;g [ky [ky, %

vki vkj vkidk fe=k ijLi j ihB&l &ihB feyk dj cBs gSA vki ea l s ,d 0; fDr dkbZ 3-D vkdkj cukus o? fy, ,d tky i<rk g\$ tcf d nh jk 0; fDr bl dk ifr: i cuk dj] dks x, 3-D vkdkj dks [kpus ;k cukus dk iz;Ru djrk gSA

### 15.4 ,d LiKV i"B ij Bkl ka dks [khpuk

vkidk ;g LiKV i"B ,d dkx A tc vki ,d Bkl vkdkj dks [khp rsg\$ rks ifrfo?ka dks o?N fo?r (Vsk) dj fn;k tkrk g\$ rkd osf=foeh; fn[kkbZ naA ;g ,d nf"VHk? gSA ;gk vki dh l gk;rk o? fy,] nks rduho? nh tk jgh gSA



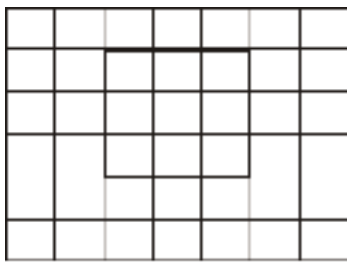
#### 15.4.1 fr;?d ;k vfu;fer fp=k

;gk ;d ?ku dk fp=k fn;k gS vkÑfr 15.11) A tc bl sl keus l sn\$kk tk, rks bl l s ;g Li"V vkÑfr 15.11 irk pyr gSfd ,d ?ku o?l k fn[krk g\$ vki bl o? o?N iQyd ka dks n\$[k ugha ikrS gSA

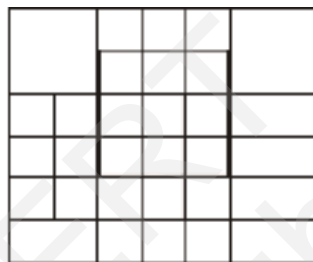
[khp s x, bl fp=k ea yækbz cjkcj ugha gâ tçfd ?ku ea ;g cjkcj gksih pkfg, A fi Uj Hkh vki ;g igpku dj yrsr gâfd ;g , d ?ku gâ fd l h Bkl dk , d k fp=k , d fr; Zl (;k vfu;fer) fp=k (oblique sketch) dgykrk gSA vki , d sfp=k fd l izdkj [khp l drsgâ\ vkb, bl dh rduhd dks l h [kus dk iz Ru djaA vki dks , d oxkædr (jçkkædr ;k çnfçdr) dkx

A ikjækk ea bl izdkj oê dkx

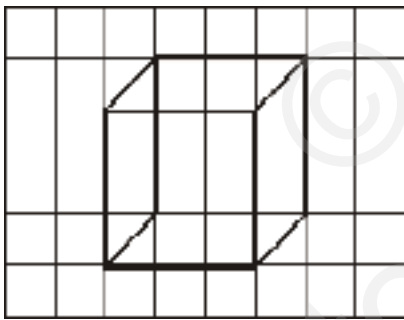
oê çkn] vki fcuk bl izdkj oê dkx [khp l drsgâA vkb, , d 3×3×3 dk , d fr; Zl fp=k (, d , d k ?ku ft l dk i R; çl fdukjk 3 bdkbz g) [khp us dk iz Ru dja (vkÑfr 15.12)A



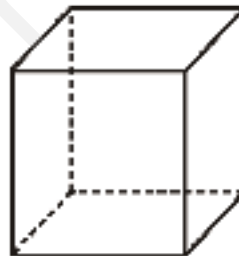
pj. k 1  
l keus dk i Uyd [khp,



pj. k 2  
l keus oê i Uyd dk l Eeçk i Uyd [khp, A i Uydæ oê eki cjkcj gksih pkfg, A ijærq ;g fp=k pj. k 1 oê fp=k dks oê N f[kl dk dj gh cuk; k x; k gS



pj. k 3  
l ær dksæ dks feykb,



pj. k 4  
fNisgg fdukjæ oê fy,] fp=k dks çnfçdr jçkkædr dk iz l x djrs gg i q% [khp, (;g , d ijæk ;k ifjiK/h g) vc vHh"V fp=k rçkj gS

vkÑfr 15.12

mi jkDr fr; Zl fp=k e) D;k vki fuEufyf[kr çkrka dks nçk jga gâ\

- (i) l keus oê i Uyd vç ml oê l Eeçk i Uyd oê eki l eku gâ rFkk
- (ii) ?ku oê fdukjs tks cjkcj gksr gâ fp=k ea Hkh cjkcj&cjkcj i rhr gksr gâ ; | fi buçks cjkcj ugha fy; k x; k gSA

vc vki ,d ?kukHk dk fr;Zl fp=k cukus dk iz kl dj l drsgd (;kn jf[k, bl fLFkr e] iOyd vk;r gSA

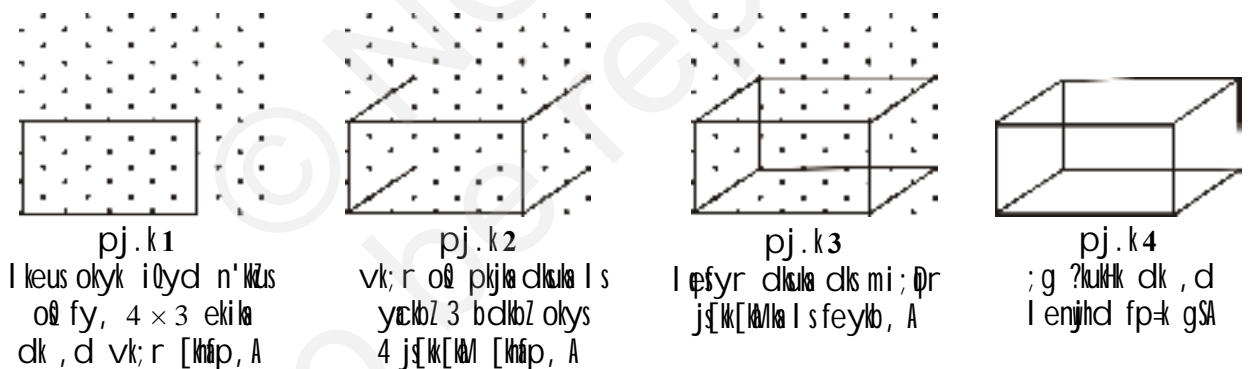
fVli .kh% vki ,d sfp=k Hkh [khp l drsgd ftuaeeki (;k ekiu)] fn, gq Bkd o] eki ka o] vuq kj (vuqOy) gh gSA ,d k djus o] fy, gea ,d ,d s dx vko';drk gksh] ft l slenjhd 'khV (isometric sheet) vFKZ~l eku nfi;kaokyh 'khV) dgrs gSA vkb, ge ,d lenjhd 'khV ij ,d k ?kukHk cukus dk iz kl djrs gdf t l dh yackbz 4 cm] pkb/kbz 3 cm vks] Apkbz 3 cm gA

15.4.2 lenjhd fp=k

D;k vki us ,d lenjhd cnfdr 'khV nsh gs\ (bl dk ,d ifrn'kz (sample) bl iqr o] v r eafn;k gSA) bl izdkj dh 'khV e] ijk dx

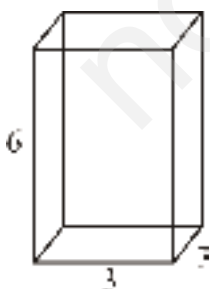
cusNkV&NkV sl eckgf-fHkq ka ea q/ trk gSA ,d sfp=k [khp us o] fy, ftuo] eki fn, gq Bkd dh eki ka o] vuq kj gk] ge bu cnfdr lenjhd 'khV ka dk iz kx dj l drsgd

vkb, foekvka 4 x 3 x 3 okys ,d ?kukHk (ft l dk vFKZ gsf d bl dh yackb] pkb/kbz vks] mOpkbz 0e'k% 4] 3 vks] 3 bdkb;ka dh g) dk ,d lenjhd fp=k cukus dk iz Ru dja (vkNfr 15.13)A



vkNfr 15.13

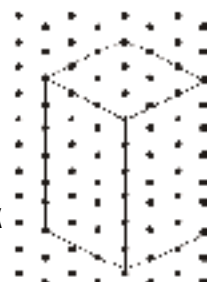
e;ku nhft, fd ,d lenjhd fp=k e] eki u Bhd (;FkkFKZ e] Bkd dh nh gpz eki ka o] gkrs g] tcf d fr;Zl fp=k dh fLFkr ea ,d k ughagkrk gSA



vkNfr 15.14 (i)

mngj.k 1 ;gk fdl h ?kukHk dk ,d fr;Zl fp=k fn;k gs (vkNfr 15.14 (i))A bl fp=k l s feyku djus okyk ,d lenjhd fp=k [khp, A

bl dk gy vkNfr 15.14 (ii) eafp=k [khp dj n'kz k x;k gSA e;ku nhft, fd fdl izdkj eki ka o] vuq kj fp=k [khp k x;k gSA



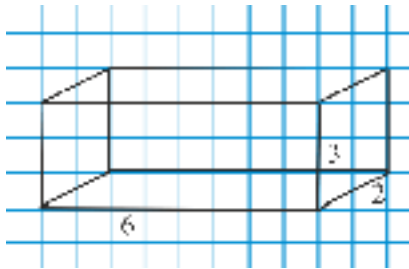
vkNfr 15.14 (ii)



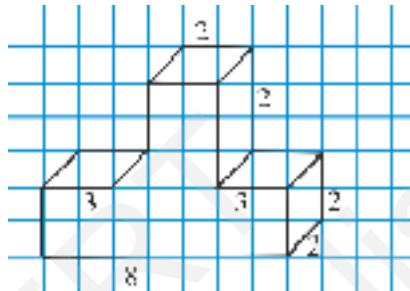
vki us (i) yackbz (ii) pK&Mkbz vKš (iii) mQpkbz ea l s i R; d oš vufn'k fdruh&fdruh bclkb; k; yh gš\ D; k ; s fr; d fp=k ea n'kkbz xbz bclkb; ka l s l ešfyr gš\

**iž ukoyh 15.2**

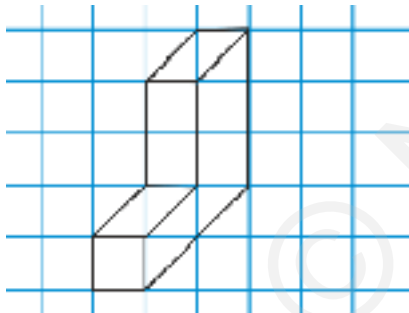
1. ,d lenjhd ĩcnfdr dkx dk ,d lenjhd fp=k [křp, %



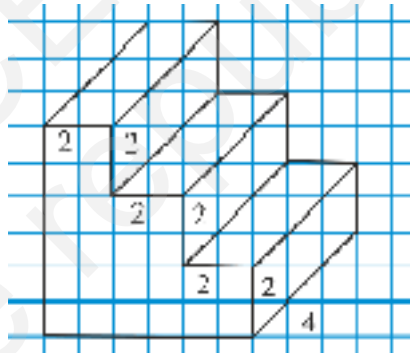
(i)



(ii)



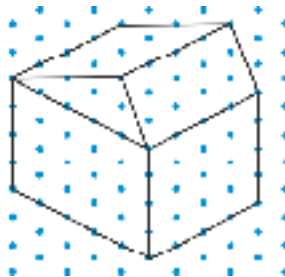
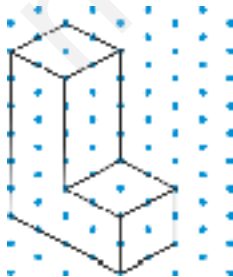
(iii)



(iv)

vKřfr 15.15 (i)-(iv)

2. fd l h ?kukHK dh foek; 5 cm 3 cm vKš 2 cm gšA bl ?kukHK oš rhu fhku&fhku lenjhd fp=k [křp, A
3. 2 cm fdukjka okys rhu ?kuka dks i jLi j l vK dj j [krs gq , d ?kukHK cuk; k x; k gšA bl ?kukHK dk , d fr; d vFkok , d lenjhd fp=k [křp, A
4. fuEufyf [kr lenjhd vdkjkka ea l s i R; d oš fy, , d fr; d fp=k [křp, %



5. fuEufyf [kr ea l si R; d oð fy,] (i) , d fr; ð fp=k vlf (ii) , d l enjhd fp=k [krip, % (a) 5 cm] 3 cm vlf 2 cm foekvkaokyk , d ?kukHk (D; k vki dk fp=k vf}rh; gS\ (b) 4 cm yæsfduks okyk , d ?ku A bl iþrd oð vr eþ , d l enjhd 'khV yxh gSA vki bl ij viusfe=k }kjk fuþn"V foekvka oð ?ku ; k ?kukHk [krip l drsgðA

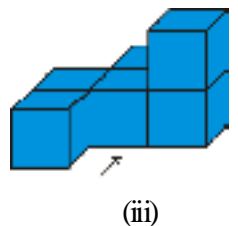
15.4.3 Bld oLrþvka dk fp=k.k

blga dhft ,



dHkh&dHkh tc vki l a kstr ; k t m/gg vkdkjka dks nq [krs g] rks bu ea l s oþN vki dh n"V l sfNi t krs g] vFkkZ~vki dks fn [kkbZ ugha nrs gðA

; gk; oþN fO; kdyki fn, tk jgs g] ftlga vki vius [kkyh l e; ea djus dk iz kl dj l drsgðA bul svki dks oþN Bld oLrþvka oð fp=k.k ; k muoð ckjs ea ; g dYiuk djus ea l gk; rk feyxh fd os oð l s fn [kkbZ nrs gðA



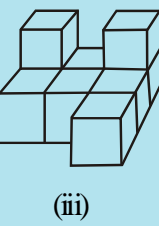
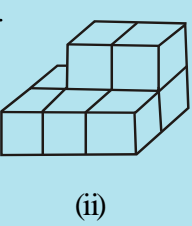
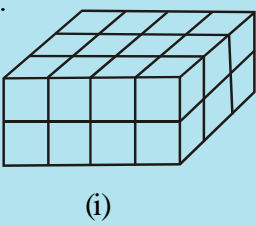
vkÑfr 15.16

oþN ?ku yfht , rFkk mlga vkÑfr 15-16 ean'kkZ vuq kj 0; ofLFkr dhft, A vc vius fe=k l si nN, fd og bl dk vuþku yxk, fd rhj oð fpÉ oð vuq kj bl dks nq [kusij fdrus ?ku fn [kkbZ nrs gð\

iz kl dhft ,

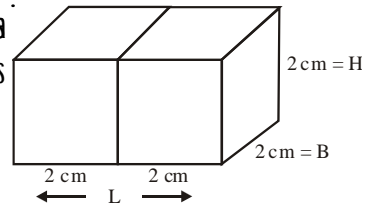


; g vuþku yxkus dk iz Ru dhft, fd fuEufyf [kr 0; oLFkkvka ea ?kuka dh l a ; k fdruh gS (vkÑfr 15.17) A



vkÑfr 15.17

bl izdkj dk fp=k; dj.k cgr l gk; d gkrk gSA eku yhft, vki , d s?kuka dks tkM+dj , d ?kukHk cukrsgA bl fLFkr e? vki ;g vu?ku yxk l drs gA fd ml ?kukHk dh y?kb? pkb/kbz v? m?pkbz D;k gksch \



**mnkgj.k 2** ;fn 2 cm × 2 cm × 2 cm foekv?okys n?kuka dks ijLij l V?k dj j [kk tk,] r?k ifj.kkeh ?kukHk dh foek; D;k gksch \

vkÑfr 15.18

**gy** t? kfd vki n?k l drsgA (vkÑfr 15.18) t? ?kuka dks l V?k dj j [kk tkrk g? r?k?by y?kb? gh , d , d k ekiu gSft lea of 1/4 gh?z gSA ;g 2 + 2 = 4 cm g? tkrh gSA ?kukHk dh pkb/kbz = 2 cm g? v? m?pkbz Hkh = 2 cm gSA

**izkl dhft,**

1. n?k ikl l dks vkÑfr ean'kk? vuq[kj] ijLij l V?k dj j [kk x; k gSA D;k vki crk l drs gA fd fuEufyf[kr i?ydk? o? foijhr i?ydk? ij v?dr t?n?/la dk ;ks? D;k gksch \



- (a) 5 + 6
- (b) 4 + 3

(;kn jf[k, fd , d ikl s ij l Eed[k i?ydk? ij v?dr l ?;kv?dk ;ks? l n? 7 gkrk gSA)

vkÑfr 15.19

2. 2 cm fdukj?okys rhu ?kuka dks ijLij l V?k dj j [krs gq] , d ?kukHk cuk; k x; k gSA bl ?kukHk dk , d fr;?d fp=k cukus dk izkl dhft, v? crkb, fd bl dh y?kb? pkb/kbz v? m?pkbz D;k gks l drh gSA

**15.5 fdl h Bkl o? fofHkku Hkkxka dks n?kuk**

vkb, vc bl ij ppz djafd , d 3-D oLrq dks fdl izdkj fofHkku fof/;ka l sn?kk tk l drk gSA

**15.5.1 fdl h oLrq dks n?kus dh , d fof/ g?ml s d?kuk ; k ml o? i r?y V?dM? djuk**



**V?dM? djus oky [ksy**

;gk, d Mcy jk?h (bread) nh gh?z gS (vkÑfr 15.20)A ;g oxk?dkj vk/kj okys, d ?kukHk t? k gSA vki pko? l s bl o? V?dM? dhft, A

vkÑfr 15.20

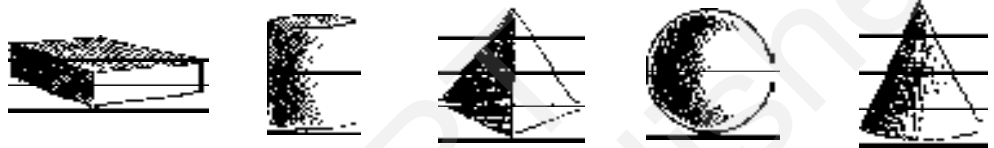
t? vki bl s m?ok?Zj : i l s d?kVrs g? r?k vki dks vu?d V?dM? i?kr g?k tkr? g? t? k vkÑfr 15-20 ean'kk? k x; k gSA , d V?dM? dk i?;?d i?yd , d oxz gSA ge bl i?yd dks Mcy jk?h dh , d vuqLFk&d?V (cross section) dgrsgA oLrq? bl fLFkr e? vuqLFk d?V yxHkx , d oxz gSA è;ku jf[k, ! ;fn vki dk ;g d?kuk ; k d?ko ^m?ok?Zj\* ughag?k? r?k vki dks , d fHku vuqLFk&d?V i?kr g? l drh gSA bl o? d?seal k?p, ! vki o? }k?k i?kr vuqLFk&d?V dh ifj l hek , d ry&vkÑfr gSA D;k vki bl sn?k jgs gSA

,d j l kbz [ky

D;k vki us l fct; ka oq vuq LFk&dkV oq vkdkjka ij e; ku fn; k g\$ tc mlga j l kbz ea i dkus oq fy, dkVv tkrk g\$ fofHkuu VpMka dks n\$[k, rFkk l fct; ka dks dkVus l s i klr vuq LFk&dkV oq vkdkjka l s i f j p r g k s t k b, A

bl s [ky,

fuEufyf[kr Bkl ka oq feVh ( ; k lykflVd dh feVh) oq ekMy (models) cukb, rFkk budks mQokZj ; k {k\$rt : i l s d k V, A vius }kjk i klr vuq LFk&dkVka oq j i e (rough) fp=k [k\$rt, A t g k j H k h l h k o g k \$ b u o q u k e H k h f y f [k, A



vkNfr 15.21

izukoyh 15.3



- 1. vki dks dks l k vuq LFk&dkV i klr g k s h g \$ t c v k i f u E u f y f [k r B k l k a d k s
  - (i) mQokZj : i l s v k \$ (ii) {k\$rt : i l s d k V r s g \$ \
  - (a) , d b \$ (b) , d x k y l c (c) , d i k l k
  - (d) , d c s y u k d k j i k b i (e) , d v k b l Q h e ' k o q



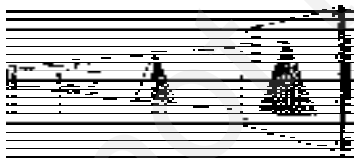
vkNfr 15.22

15.5.2 ,d vl; fof/ Nk; k [ky okyh g\$

,d Nk; k [ky

; g l e > k u s o q f y, f d f d l i z d k j f - f o e h; o L r p k a d k s f } f o e h; v k d k j k a o q : i e a n \$ [ k k t k l d r k g \$ N k ; k , j b u o q v P N s ( ; k l q j ) m n k g j . k g \$ A

D;k vki us d H k h , d N k ; k [ k y ( s h a d o w p l a y ) n \$ [ k k g \$ \ ; g , d i z d k j d k e u k j a t u g o f t l e a l q i " V B k l v k N f r ; k a d k s , d i z d k ' k e ; l k r o q l k e u s j [ k d j m u o q x f r e k u i f r f c a k a o q H k e m R i l u f d , t k r s g \$ A b l e a x f . k r d h v o / k j . k k v k a d k o q N v i e ; { k : i l s i z k s g k r k g \$ A



vkNfr 15.23

vki dks b l f Q ; k d y k i o q f y, , d i z d k ' k o q l k r r F k k o q N B k l v k d k j k a d h v k o ' ; d r k g k s h A ( ; f n v k i o q i k l , d v k o j g M i k s t D V j ( o v e r h e a d p r o j e c t o r ) g \$ r k s B k l d k s c Y c o q v r x r j f [k, v k \$ b u d h [ k s t d h f t, A ) , d ' k o q o q B h d l k e u s , d V k p z d k i z d k ' k M k f y, A ; g i n \$ i j f d l i z d k j d h N k ; k n ' k k z k g \$ ( v k N f r 15-23 ) \ B k l r h u f o e k v k a o k y k g \$ A b l d h N k ; k d h f d r u h f o e k , j g \$ \



; f n v k i b l [ k y e j ' k o q o q L F k k u i j , d ? k u d k s V k p z o q l k e u s j [ k j r k s v k i d k s f d l i z d k j d h N k ; k i k l r g k s h \



(i)

i zkl'k o@ lkr dh fofHklu fLFkfr; ka rFkk Bkl oLrq dh fofHklu fLFkfr; ka dks yd j iz kx dhft, A iklr dh xbz Nk; kvka o@ vdkjk arFkk eki ka ij buo@ iHkkoka dk ve; ; u dhft, A ; gk; , d vks eukj d iz kx fn; k tk jgk gS

ftlslHkor% vki igys gh dj p@ gksA , d oukdkj pk; o@ l; kys dks [kys ea j [k nhft,] tc nki gj 12 ctso@ le; l wZml o@ Bhd moij gksA bl s vkNfr 15-24 ea fn [kk; k x; k gSA vki dks ml dh Nk; k o@ h fn [kkbz nrh gS\

D; k ; g Nk; k , d gh izklj dh jgrh gS



(a) ikr%dky

vks

(b) lka dky



(ii)



vkNfr 15.24 (i) - (iii)

(iii)



l wZ dh fLFkfr; ka vks izk.k o@ le; ka o@ vuq kj] Nk; kvka dk ve; ; u dhft, A

### izukoyh 15.4

- fuEufyf[kr Bkl ka o@ Bhd moij , d tyrk g@k cYc j [kk x; k gSA iR; d fLFkfr ea iklr Nk; k o@ vdkj dk uke crkb, A bl Nk; k dk , d ji@ fp=k cukus dk izkl dhft, A (igys vki iz kx djus dk izkl dja vks fiOj mukj naA)



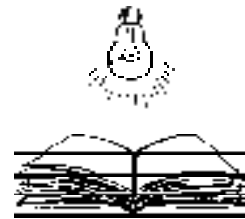
, d xn

(i)



, d cyukdj i kb i

(ii)



, d iqr d

(iii)



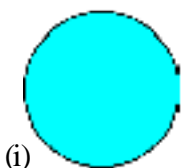
- ; gk; o@N 3-D oLrq ka dh Nk; k; , j nh xbz g@ tksmlga , d vkogM i stDVj o@ y@ (cYc) o@ vaxr ; k unps j [k dj iklr dh xbz g@A iR; d Nk; k lsfeyku okys Bkl dh igpku dhft, A (buea , d lsvf/d mukj gS l drsg@!)

, d ouk

, d oxl

, d f-Hkt

, d vk; r



(i)



(ii)



(iii)



(iv)

3. tlp dhft, fd D;k ;sdFku lR; g&A
  - (i) ,d ?ku ,d vk;r o& vkdj dh Nk;k ns l drk gSA
  - (ii) ,d ?ku ,d "kMHk& o& vkdj dh Nk;k ns l drk gSA

**15.3** ,d rhl jh fof/ ;g g& fd bl o& fofHku n'; ns[kus o& fy, bl s o&N fo'k&k dks kka l s ns[k& tk,

dkbZ Hkh 0; fDr fd l h oLrqdks ml o& l keus l s ;k ml dh ,d vkj (ik'o&) l s ;k ml o& m&ij l s ns[k l drk gSA i&; d ckj ml s ,d fHku n'; feysk (vk&fr 15.25)A



l keus l s n';



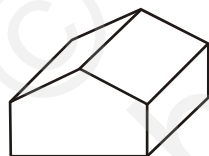
ik'o&n';

vk&fr 15.25

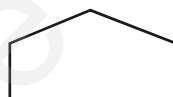


m&ij l s n';

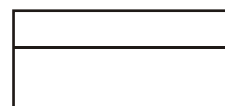
;g& ,d m&kgj.k fn;k tk jgk g& ft l ea dkbZ 0; fDr ,d Hkou o& fofHku n'; i&lr dj l drk g&(vk&fr 15.26)A



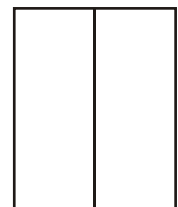
Hkou



l keus dk n';



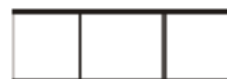
ik'o&n';



m&ij dk n';

vk&fr 15.26

vk& bl&g& ?kuka dks tk&us l s cuh vk&fr; ka o& fy, Hkh dj l drs g&A



vk&fr 15.27

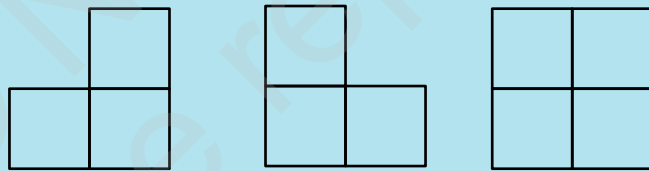
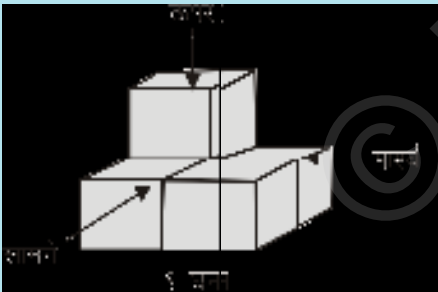
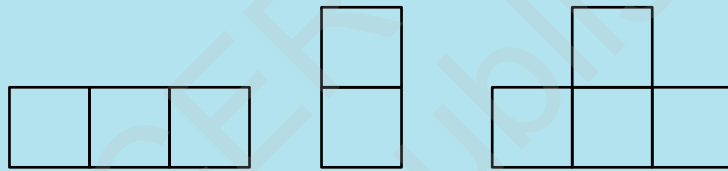
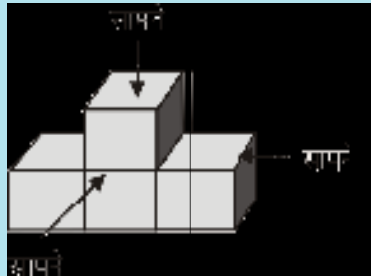
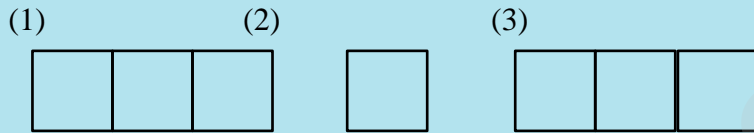
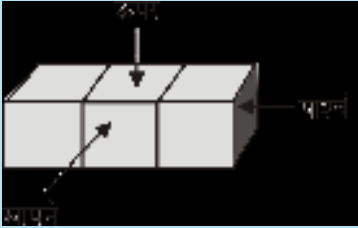
?kuka dks ,d l kFk j[kdj Bkd cukb, vk& fi Oj ml&ga fofHku fn'kkvka l s ns[kdj muo& Åij crk, vu&kj fp=k cukus dk izRu dhft,A

iz kl dhft,

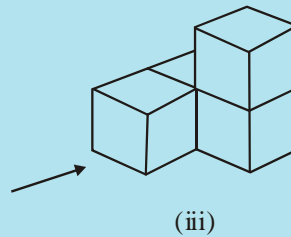
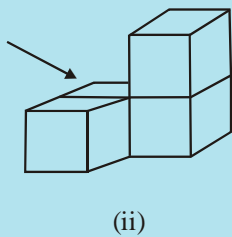
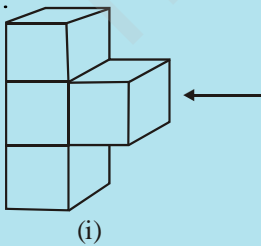
1. iR;sd Bkd oð fy,] rhu n'; (1)] (2) vkš (3) fn, gðA iR;sd Bkd oð fy, l ær mli j oð l keus oð vkš ik'oz n'; kadh igpku dhft, A

Bkd

ml oð n';



2. ulpsfn, iR;sd Bkd dk] rhj jkjk l for fn'kk l sm l sn[kus ij], d n'; [kfo, A



## geus D; k pphz dh \

1. oũk] ox] vk;r] pphz] vk] f-Hkq I ery vkÑfr; ka oũ mnkgj.k gũ rFkk ?ku] ?kukHk] xksyk] cyu] 'kũq vk] fi jkfeM Bkd vkdkjka oũ mnkgj.k gũA
2. I ery vkÑfr; ka dh nks foek, j (I f{klr ea 2-D) gkrh gũ rFkk Bkd vkdkjka dh rhu foek, j (I f{klr ea 3-D) gkrh gũA
3. Bkd vkdkj oũ dks ml oũ 'kh'k] ml oũ <kp a oũ j[kk[kM ml oũ fdukjs (; k dkj) rFkk ml oũ I ikv i"B ml oũ iQyd dgykrs gũA
4. Bkd dk ,d tky nks foekvka ea ,d ,d k <kp k (; k : i j[kk) gũ ftlsekMdj og Bkd iklr gks tkrk gũA ,d gh Bkd oũ vuod izdkj oũ tky gks ldrs gũA
5. okLrfod : i I j Bkd vkdkjka dks I ikv i"Bka (tS s d kx A ge bl s 3-D Bkd dk 2-D fu: i .k dgrs gũA
6. ,d Bkd oũ nks izdkj oũ fp=k cukuk I lko gS%
  - (a) ,d fr; d fp=k] ftl ea yackb; k; I ekuj krh ugha gkrh gũA fi Qj Hkh ; g Bkd oũ # i oũ ckjs ea I Hkh egRo iwz tkudkjh inku dj nrk gũA
  - (b) ,d I enjhd fp=k dks ,d I enjhd cnfdr dks ,d ifrn'kz bl iQrd oũ var ea fn; k x; k gũA fd I h Bkd oũ ,d I enjhd fp=k ea yackb; ka dks I ekuj krh j[kk tkrk gũA
7. Bkd vkdkjka dk fp=k.k ,d cgr gh mi ; kxh dksky gũA vki dks Bkd vkdkj oũ fNi s gq Hkkx fn[kkbz ns tkus pfg, A
8. ,d Bkd oũ fofHku Hkkxka dks vuod fof/; ka I s n[kk tk I drk gũA
  - (a) ,d fof/ ; g gSfd fn, gq vkdkj dks dKv fy; k tk, A bl s gea Bkd dk ,d vuq LFk&dKv iklr gks tkrh gũA
  - (b) ,d vU; fof/ ; g gSfd ,d 3-D vkdkj dh ,d 2-D Nk; k n[kh tk, A
  - (c) rhl jh fof/ ; g gSfd Bkd vkdkj dks fofHku dks ka I s n[kk tk, A n[ks x, vkdkj dk I keus dk n'; ] ik'o z n'; vk] Åij dk n'; gea ml vkdkj oũ ckjs ea cgr vf/d tkudkjh inku dj ldrs gũA

