chth; 0;td

vè;k; 12

12.1 Hkfedk

ge $x + 3$, y ï 5, $4x + 5$, $10y$ ï 5] bR;kfn tl ljy chth; 0;tdk l ifjfpr gk poQ g A d{kk VIe] geu n[kk Fkk fd ; 0;td fdl idkj igfy;k vkj leL;kvk dk ,d l0;ofLFkr idkj l iLrr dju e lgk;d gkr g A ge ljy lehdj.kk oky vè;k; e Hkh 0;tdk oQ vud mnkgj.kk dk n[k poQ g A

chtxf.kr e 0;tdk (expressions) dk ,d oQnh; vo/kj.kk ekuk tkrk g A ;g vè;k; chth; 0;tdk l lc¼ gkxk A tc vki bl vè;k; dk i< yx] rk vkidk Kkr gk tk,xk fd chth; 0;td fdl idkj cur g] bUg fdl idkj l;kftr fd;k (feyk;k) tkrk g] buoQ eku ge oQl Kkr dj ldr g rFkk budk fdl idkj mi;kx fd;k tk ldrk g A

12.2 0;td fdl idkj cur g\

vc ge Hkyh Hkkfr tkur g fd ,d pj (variable) D;k gkrk g A ge pjk dk 0;Dr dju oQ fy,] v{kjk $x, y, l, m, \ldots$ bR;kfn dk i;kx djr g A ,d pj oQ fofHkUu eku gk ldr g A bldk eku fuf'pr ugh gkrk g A bloQ nljh vkj vpj (constant) dk ,d fuf'pr eku gkrk g A vpjk oQ mnkgj.k 4]100]&17] bR;kfn g A

ge pjk vkj vpjk dk l;kftr djoQ chth; 0;tdk dk cukr g A bloQ fy, ge ;kx] 0;odyu] x.ku vkj foHkktu dh lfØ;kvk dk i;kx djr g A ge] $4x + 5$, $10y$ ï 20 tl 0;tdk dk igy gh n[k poQ g A 0;td $4x + 5$, óxô pj oQ i;kx l cuk g] ftle igy pj x dk vpj 4 l x.kk djoQ vkj fiQj bl x.kuiQy e vpj 5 tkM dj ikIr fd;k tkrk g A blh idkj] $10y$ ï 20 igy pj y dk vpj 10 l x.kk djoQ vkj fiQj bl x.kuiQy e l 20 ?kVk dj ikIr fd;k tkrk g A

mijkDr 0;td pjk vkj vpjk dk l;kftr djoQ ikIr fd, x, Fk A ge 0;tdk dk] pjk dk Lo; mu pjk l vFkok vU; pjk l l;kftr djoQ Hkh ikIr dj ldr g A

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nf[k, fd fuEufyf[kr 0;td fdl idkj ikIr fd, tkr g \

$x^2, 2y^2, 3x^2 - 5, xy, 4xy + 7$

(i) 0;td x^2 pj x dk Lo; x l x.kk djoQ ikIr fd;k tkrk g A
vFkkr $x \times x = x^2$ g A
ftl idkj $4 \times 4 = 4^2$ fy[kk tkrk g] mlh idkj ge $x \times x = x^2$. fy[kr g A bl lkekU;r% x dk ox (x squared) i<k tkrk g A
¼ckn e] tc vki ^?kkrkd vkj ?kkr* oky vè;k; dk vè;;u djx] rc vki vuHko djx fd x^2 dk x oQ mQij ?kkr 2 Hkh i<k tk ldrk gSA
blh idkj] ge fy[k ldr g % $x \times x \times x = x^3$
lkekU;r%] x^3 dk x dk ?ku (x cubed) i<k tkrk g A ckn e] vki ;g vuHko djx fd x^3 dk x oQ mQij ?kkr 3 Hkh i<k tk ldrk g A
$x, x^2, x^3, \ldots$ e l iR;d x l ikIr ,d chth; 0;td g A

(ii) 0;td $2y^2$ dk y l bl idkj ikIr fd;k tkrk g% $2y^2 = 2 \times y \times y$
;gk] ge y dk y l x.kk djoQ y^2 ikIr djr g vkj fiQj bl x.kuiQy y^2 dk 2 l x.kk djr g A

(iii) $(3x^2 - 5)$ e] ge igy x^2 ikIr djr g vkj fiQj ml 3 l x.kk djoQ $3x^2$ ikIr djr g A vr e] $3x^2 - 5$ ij igpu oQ fy,] ge $3x^2$ e l 5 dk ?kVkr g A

(iv) xy e] ge pj x dk ,d vU; pj y l x.kk djr g A bl idkj] $x \times y = xy$A

(v) $4xy + 7$ e] ge igy xy ikIr djr g_ ml 4 l x.kk djoQ $4xy$ ikIr djr g vkj fiQj fn;k gvk 0;td ikIr dju oQ fy,] $4xy$ e 7 tkMr g A

i;kl dhft,

crkb, fd fuEufyf[kr 0;td fdl idkj ikIr fd, tkr g %

$7xy + 5, x^2y, 4x^2 - 5x$

12.3 ,d 0;td oQ in

vHkh rd mQij geu i<k g fd 0;td fdl idkj cuk, tkr g] vc ge ml ,d l0;ofLFkr :i e j[kx A bl dk; oQ fy,] ge ;g tkuu dh vko';drk g fd ,d 0;td oQ in (terms) vkj muoQ x.ku[kM (factors) D;k gkr g] vFkkr muoQ vFk D;k g A

0;td $(4x + 5)$ ij fopkj dhft, A bl 0;td dk cuku oQ fy,] igy geu vyx l 4 vkj x dk x.kk djoQ $4x$ cuk;k Fkk vkj fiQj ble 5 tkM fn;k Fkk A blh idkj] 0;td $(3x^2 + 7y)$ ij fopkj dhft, A ;gk] geu igy vyx l 3, x vkj x dk x.kk djoQ $3x^2$ cuk;k FkkA fiQj geu vyx l 7 vkj y dk x.kk djoQ $7y$ cuk;k Fkk A $3x^2$ vkj $7y$ cuku oQ ckn] geu fn;k gvk 0;td ikIr dju oQ fy,] budk tkM fn;k Fkk A

vki ik,x fd ge ftru Hkh 0;tdk ij dk; djr g o lHkh blh :i e n[k tk ldr g A buoQ Hkkx gkr g tk vyx l cuk, tkr g vkj fiQj tkM fn, tkr gA 0;tdk oQ bl idkj oQ Hkkx] tk igy vyx l cuk, tkr g vkj fiQj tkM fn, tkr g] bl 0;td oQ in dgykr g A 0;td $4x^2 - 3xy$ dk nf[k, A ge dgr g fd bloQ nk in $4x^2$ vkj $-3xy$ g A in $4x^2$; 4, x vkj x dk x.kuiQy g rFkk in $-3xy$; -3, x vkj y dk x.kuiQy g A

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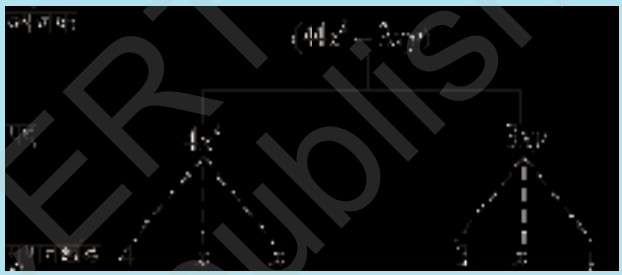
0;tdk dk cuku oQ fy, ink dk tkMk tkrk gA ftl idkj 0;td $(4x + 5)$ dk cuku oQ fy, $4x$ vkj 5 dk tkMk tkrk g] mlh idkj 0;td $(4x^2 ï 3xy)$ dk cuku oQ fy, $4x^2$ vkj $(ï 3xy)$ dk tkMk tkrk gA bldk dkj.k $4x^2 + (ï 3xy) = 4x^2 ï 3xy$ gkrk gA

è;ku nhft, fd in e Í.k *(minus)* fpÉ lfEefyr gkrk gA 0;td $4x^2 ï 3xy$ e] geu in dk $3xy$ u ydj $(ï 3xy)$ fy;k FkkA blfy,] ge ;g dgu fd vko';drk ugh g fd ,d 0;td dk cuku oQ fy,] ink dk tkMk ;k ?kVk;k tkrk gA bloQ fy, oQoy ;g dguk gh i;kIr g fd ink dk tkMk tkrk gA

,d in oQ x.ku[kM

geu mQij n[kk Fkk fd 0;td $(4x^2 ï 3xy)$ oQ nk in $4x^2$ vkj $ï 3xy$ gA in $4x^2; 4, x$ vkj x dk x.kuiQy gA ge dgr g fd $4, x$ vkj x in $4x^2$ oQ x.ku[kM (factors) gA ,d in viu x.ku[kMk dk ,d x.kuiQy gkrk gA in $ï 3xy$, x.ku[kMk $ï 3, x$ vkj y dk ,d x.kuiQy gA



ge ,d 0;td oQ ink rFkk ink oQ x.ku[kMk dk ,d lfo/ktud vkj vkd"kd idkj l ,d 0;td iM vkj[k (tree diagram) }kjk fu:fir dj ldr gA 0;td $(4x^2 ï 3xy)$ dk iM lyXu vkÑfr e n'kk;k x;k gA

è;ku nhft, fd iM vkj[k e] geu x.ku[kM oQ fy, ¯cnfdr j[kkvk dk i;kx fd;k rFkk ink oQ fy, lrr j[kkvk dk i;kx fd;k gA ;g buoQ fefJr u gku oQ fy, fd;k x;k gA

vkb, 0;td $5xy + 10$ dk iM vkj[k [khp A x.ku[kM ,l fy[k tk, fd ftuoQ vkx x.ku[kM u gk loQA bl idkj] ge $5xy$ dk $5 \times xy$ oQ :i e ugh fy[kr g] D;kfd xy oQ vkx vkj Hkh x.ku[kM gk ldr gA blh idkj] ;fn x^3 ,d in gkrk] rk bl $x \times x^2$ u fy[k dj $x \times x \times x$ fy[kk tk, A lkFk gh] ;kn jf[k, 1 dk vyx l x.ku[kM ugh fy;k tkrk gA

i;kl dhft,

1. fuEufyf[kr 0;tdk e dku&dku l in g\ n'kkb, fd ; 0;td oQl cuk, tkr gA iR;d 0;td oQ fy, ,d iM vkj[k Hkh [khfp, A
   $8y + 3x^2, 7mn ï 4, 2x^2 y$
2. ,l rhu 0;td fyf[k,] ftue l iR;d e pkj in gkA

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x.kkd

ge ,d in dk mlo Q x.ku[kMk oQ ,d x.kuiQy oQ :i e fy[kuk lh[k poQ g A bue l ,d x.ku[kM l[;kRed (numerical) gk ldrk g rFkk vU; chth; (algebraic) gk ldr g (vFkkr bue pj gkr g) A bl l[;kRed x.ku[kM dk in dk l[;kRed x.kkd **(numerical coefficient)** ;k oQoy x.kkd dgr g A bl 'k"k in (tk Li"Vr% chth; x.ku[kMk dk x.kuiQy g) dk x.kkd Hkh dgr g A bl idkj] in $5xy$ e] xy dk x.kkd 5 g A blh idkj] in $10xyz$, e xyz dk x.kkd 10 g rFkk in $-7x^2y^2$ e x^2y^2 dk x.kkd -7 g A

tc fdlh in dk x.kkd +1 gkrk g] ik;% ml fy[kr le; NkM fn;k tkrk g A mnkgj.kkFk] $1x$ dk x fy[kk tkrk g] $1x^2y^2$ dk x^2y^2 fy[kk tkrk g] bR;kfn A lkFk gh] x.kkd (-1) dk oQoy Í.k fpÉ (&) l n'kk;k tkrk g A bl idkj] $(-1)x$ dk $-x$ fy[kk tkrk g] $(-1)x^2y^2$ dk $-x^2y^2$ fy[kk tkrk g] bR;kfn A

dHkh&dHkh 'kCn x.kkd dk i;kx ,d vf/d O;kid :i e i;kx fd;k tkrk g A bl :i e] ge dgr g fd in $5xy$ e] xy dk x.kkd 5 g] $5y$ dk x.kkd x g rFkk $5x$ dk x.kkd y g A $10xy^2$ e] xy^2 dk x.kkd 10 g] $10y^2$ dk x.kkd x g rFkk $10x$ dk x.kkd y^2 g A bl idkj] bl vf/d O;kid :i e] x.kkd ,d l[;kRed x.ku[kM gk ldrk g ;k ,d chth; x.ku[kM gk ldrk g ;k nk ;k vf/d x.ku[kMk dk x.kuiQy Hkh gk ldrk g A bl 'k"k x.ku[kMk oQ x.kuiQy dk x.kkd dgk tkrk g A

i;kl dhft ,

fuEufyf[kr O;tdk oQ ink oQ x.kkdk dh igpku dhft ,%

$4x - 3y$, $a + b + 5$,

$2y + 5$, $2xy$

mnkgj.k 1 fuEufyf[kr O;tdk e] o in NkfV, tk vpj ugh g A muoQ l[;kRed x.kkd Hkh fyf[k, %

$xy + 4$, $13 - y^2$, $13 - y + 5y^2$, $4p^2q - 3pq^2 + 5$

gy

Øe l[;k	O;tdk	in (tk vpj ugh g)	l[;kRed x.kkd
(i)	$xy + 4$	xy	1
(ii)	$13 - y^2$	$-y^2$	-1
(iii)	$13 - y + 5y^2$	$-y$ $5y^2$	-1 5
(iv)	$4p^2q - 3pq^2 + 5$	$4p^2q$ $-3pq^2$	4 -3

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mnkgj.k 2

(a) fuEufyf[kr 0;tdk e *x*oQ D;k x.kkd g \
$4x$ ï $3y$, 8 ï $x + y$, y^2x ï y, $2z$ ï $5xz$

(b) fuEufyf[kr 0;tdk e *y*oQ D;k x.kkd g \
$4x$ ï $3y$, $8 + yz$, $yz^2 + 5$, $my + m$

gy

(a) iR;d 0;td e] ge x.ku[kM *x* oky in dk n[kr g A ml in dk 'k"k Hkkx *x* dk okfNr x.kkd gkxk A

Øe l[;k	0;td	x.ku[kM *x* okyk in	*x* dk x.kkd
(i)	$4x$ ï $3y$	$4x$	4
(ii)	8 ï $x + y$	ï x	ï 1
(iii)	y^2x ï y	y^2x	y^2
(iv)	$2z$ ï $5xz$	ï $5xz$	ï $5z$

(b) bldh fof/ mijkDr (a) dh fof/ tlh gh g A

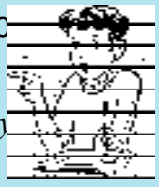
Øe l[;k	0;td	x.ku[kM *y* okyk in	*y* dk x.kkd
(i)	$4x$ ï $3y$	ï $3y$	ï 3
(ii)	$8 + yz$	yz	z
(iii)	$yz^2 + 5$	yz^2	z^2
(iv)	$my + m$	my	m

12.4 leku vkj vleku in

tc ink oQ chth; x.ku[kM ,d tl gh gk] rk o in leku in **(like terms)** dgykr gA tc ink oQ chth; x.ku[kM fHkUu&fHkUu gk] rk o vleku in (unlike terms) dgykr g A mnkgj.kkFk 0;td $2xy$ ï $3x + 5xy$ ï 4, e ink $2xy$ vkj $5xy$ dk nf[k, A $2xy$ oQ x.ku[kM $2, x$ vkj y g A $5xy$ oQ x.ku[kM $5, x$ vkj y g A bl idkj] buoQ chth; (vFkkr o ftue pj g) x.ku[kM ,d gh g vkj blhfy, ; leku in g A bloQ foijhr] ink $2xy$ vkj $-3x$ e fHkUu&fHkUu chth; x.ku[kM g A ; vleku in g A blh idkj] in $2xy$ vkj 4 vleku in g A lkFk gh] ï $3x$ vkj 4 Hkh vleku in g A

i;kl dhft,

fuEufyf[kr e] leku ink c leg cukb, %



$12x, 12, ï 25x, ï 25, ï 25y$
$1, x, 12y, y$

12.5 ,dinh] f}in] f=kin vkj cgin

og chth; 0;td ftle oQoy ,d in gk] ,dinh (monomial) dgykrk g] tl $7xy$, ï $5m$, $3z^2$, 4 bR;kfn A

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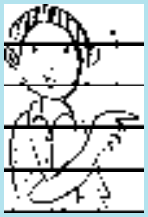
i;kl dhft,



fuEufyf[kr 0;tdk dk ,dinh] f}in vkj f=kin oQ :i e oxhÑr dhft, % *a*, *a* + *b*, *ab* + *a* + *b*, *ab* + *a* + *b* ï 5, *xy*, *xy* + 5, $5x^2 - x + 2$, $4pq$ ï $3q + 5p$, 7, $4m$ ï $7n + 10$, $4mn + 7$.

,d 0;td ftle oQoy nk in gk vkj o vleku in gk og f}in (binomial) dgykrk g] mnkgj.kkFk $x + y, m$ ï 5, $mn + 4m$, a^2 ï b^2 f}in g A 0;td 10*pq* ,d f}in ugh g ;g ,d ,dinh g A 0;td $(a + b + 5)$,d f}in ugh g A ble rhu in g A ,d 0;td ftle rhu in gk] ,d f=kin (trinomial) dgykrk g] mnkgj.kkFk $x + y + 7$, $ab + a + b$, $3x^2$ ï $5x + 2$, $m + n + 10$ f=kin g A ijr 0;td $ab + a + b + 5$,d f=kin ugh g ble rhu in u gkdj pkj in g A 0;td $x + y + 5x$,d f=kin ugh g D;kfd in *x* vkj 5*x* leku in g A 0;kid :i e] ,d ;k] vf/d ink okyk 0;td ,d cgin (Polynomial) dgykrk g A bl idkj] ,dinh] f}inh vkj f=kinh Hkh cgin g A

mnkgj.k 3 dkj.k lfgr crkb, fd ink oQ fuEufyf[kr ;Xek e dku&dku l ;Xe leku ink oQ g rFkk dku&dku l ;Xe vleku ink oQ g %

(i) 7*x*, 12*y* (ii) 15*x*, ï 21*x* (iii) ï 4*ab*, 7*ba* (iv) 3*xy*, 3*x*
(v) $6xy^2$, $9x^2y$ (vi) pq^2, ï $4pq^2$ (vii) mn^2, 10*mn*

gy

Øe l[;k	;Xe	x.ku[kM	chth; x.ku[kM ,d gh g ;k fHkUu&fHkUu g	leku@ vleku in	fVli.kh
(i)	$7x$ $12y$	7, x 12, y	fHkUu&fHkUu	vleku	ink e pj fHkUu&fHkUu g
(ii)	$15x$ ï $21x$	15, x ï 21, x	,d gh g	leku	
(iii)	ï $4ab$ 7 ba	ï 4, a, b 7, b, a	,d gh g	leku	;kn jf[k, $ab = ba$
(iv)	$3xy$ $3x$	3, x, y 3, x	fHkUu&fHkUu	vleku	pj y oQoy igy in e g
(v)	$6xy^2$ $9x^2y$	6, x, y, y 9, x, x, y	fHkUu&fHkUu	vleku	nkuk ink e pj rk ,d tl g_ ijr budh ?kkr vyx vyx g
(vi)	pq^2 ï $4pq^2$	1, p, q, q ï 4, p, q, q	,d gh g	leku	è;ku nhft, l[;kRed x.kkd 1 fn[kk;k ugh tkrk g

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fuEufyf[kr ljy pj.k vkidk ;g fu.k; yu e lgk;d gkx fd fn, g, in leku in g ;k vleku in g %

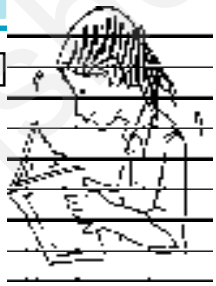
(i) l[;kRed x.kdk ij è;ku u nhft, A ink oQ chth; Hkkx ij viuk è;ku oQfnr dhft, A

(ii) ink e pjk dh tkp dhft, A ; ,d gh gku pkfg, A

(iii) vc] ink e iR;d pj dh ?kkrk dh tkp dhft, A ; ,d gh gkuh pkfg, A

è;ku nhft, fd leku ink oQ ckj e fu.k; yr le;] bu nk ckrk l dkb iHkko ugh iMrk g % (1) ink oQ l[;kRed x.kd rFkk (2) ink e pjk oQ x.kk dju dk Øe A

i'ukoyh 12.1



1. fuEufyf[kr fLFkfr;k e] pjk] vpjk vkj vd xf.krh; lfØ;kvk dk i;kx djr g,] chth; 0;td ikIr dhft, %

(i) l[;k y e l z dk ?kVkukA

(ii) l[;kvk x vkj y oQ ;kx dk vk/k A

(iii) l[;k z dk Lo; mll x.kk fd;k tkrk g A

(iv) l[;kvk p vkj q oQ x.kuiQy dk ,d&pkFkkb A

(v) nkuk l[;kvk x vkj y oQ oxk dk tkMk tkrk g A

(vi) l[;kvk m vkj n oQ x.kuiQy oQ rhu xu e l[;k 5 tkMuk A

(vii) 10 e l l[;kvk y vkj z x.kuiQy dk ?kVkuk A

(viii) l[;kvk a vkj b oQ x.kuiQy e l muoQ ;kx dk ?kVkuk A

2. (i) fuEufyf[kr 0;tdk e ink vkj muoQ x.ku[kMk dk NkfV, A ink vkj muoQ x.ku[kMk dk iM vkj[kk }kjk Hkh n'kkb, A

(a) x ï 3 (b) $1 + x + x^2$ (c) y ï y^3

(d) $5xy^2 + 7x^2y$ (e) ï $ab + 2b^2$ ï $3a^2$

(ii) uhp fn, 0;tdk e] ink vkj muoQ x.ku[kMk dk NkfV, A

(a) ï $4x + 5$ (b) ï $4x + 5y$ (c) $5y + 3y^2$

(d) $xy + 2x^2y^2$ (e) $pq + q$ (f) $1.2\,ab$ ï $2.4\,b + 3.6\,a$

(g) $\frac{3}{4}x + \frac{1}{4}$ (h) $0.1\,p^2 + 0.2\,q^2$

3. fuEufyf[kr 0;tdk e ink oQ l[;kRed x.kkdk] tk vpj u gk] dh igpku dhft,A

(i) 5 ï $3t^2$ (ii) $1 + t + t^2 + t^3$ (iii) $x + 2xy + 3y$

(iv) $100m + 1000n$ (v) ï $p^2q^2 + 7pq$ (vi) $1.2\,a + 0.8\,b$

(vii) $3.14\,r^2$ (viii) $2\,(l + b)$ (ix) $0.1\,y + 0.01\,y^2$

4. (a) o in igpkfu, ftue x g vkj fiQj bue x dk x.kkd fyf[k, A

(i) $y^2x + y$ (ii) $13y^2$ ï $8yx$ (iii) $x + y + 2$

(iv) $5 + z + zx$ (v) $1 + x + xy$ (vi) $12xy^2 + 25$

(vii) $7 + xy^2$

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(b) o in igpkfu, ftue y^2 g vkj fiQj bue y^2 dk x.kkd fyf[k, A

(i) $8 - xy^2$ (ii) $5y^2 + 7x$ (iii) $2x^2y - 15xy^2 + 7y^2$

5. fuEufyf[kr 0;tdk dk ,dinh] f}in vkj f=kin oQ :i e oxhoQr dhft, %

(i) $4y - 7z$ (ii) y^2 (iii) $x + y - xy$ (iv) 100

(v) $ab - a - b$ (vi) $5 - 3t$ (vii) $4p^2q - 4pq^2$ (viii) $7mn$

(ix) $z^2 - 3z + 8$ (x) $a^2 + b^2$ (xi) $z^2 + z$ (xii) $1 + x + x^2$

6. crkb, fd fn, g, ink oQ ;Xe leku ink oQ g ;k vleku ink oQ g %

(i) 1, 100 (ii) $-7x, \frac{5}{2}x$ (iii) $-29x, -29y$

(iv) $14xy, 42yx$ (v) $4m^2p, 4mp^2$ (vi) $12xz, 12x^2z^2$

7. fuEufyf[kr e leku ink dk NkfV, %

(a) $-xy^2, -4yx^2, 8x^2, 2xy^2, 7y, -11x^2, -100x, -11yx, 20x^2y, -6x^2, y, 2xy, 3x$

(b) $10pq, 7p, 8q, -p^2q^2, -7qp, -100q, -23, 12q^2p^2, -5p^2, 41, 2405p, 78qp, 13p^2q, qp^2, 701p^2$

12.6 chth; 0;tdk oQ ;kx vkj 0;odyu

fuEufyf[kr leL;kvk ij fopkj dhft, %

1. lfjrk oQ ikl oQN oQp g A vehuk oQ ikl mll 10 oQp vf/d g A vli dgrk g fd mloQ ikl lfjrk vkj vehuk oQ ikl oQy ftru oQp g mll 3 vf/d oQp g A vki vli oQ oQpk dh l[;k oQl Kkr djx \

pfd ;g ugh fn;k x;k g fd lfjrk oQ ikl fdru oQp g] blfy, ge bUg x eku yr g A vehuk oQ ikl bul 10 vf/d] vFkkr $x + 10$ oQp g A vli dgrk g fd mloQ ikl lfjrk vkj vehuk oQ oQy oQpk l 3 vf/d oQp g A vr% ge lfjrk vkj vehuk oQ oQpk dk ;kx Kkr djr g vkj ml ;kx e 3 tkMr g] vFkkr ge x, $x + 10$ vkj 3 dk tkMr gA

2. jke oQ firk dh oreku vk; jke dh vk; dh rhu xuh g A jke oQ nknkth dh vk; jke vkj jke oQ firk dh vk; oQ ;kx l 13 o"k vf/d g A vki jke oQ nknkth dh vk; fdl idkj Kkr djx \

pfd jke dh vk; nh gb ugh g] blfy, vkb, bl y o"k eku y A rc] mloQ firk dh vk; $3y$ o"k g A jke oQ nknkth dh vk; Kkr dju oQ fy,] ge jke dh vk; (y) vkj mloQ firk dh vk; $(3y)$ dk ;kx Kkr djoQ bl ;kx e 13 tkMuk gkxk] vFkkr ge $y, 3y$ vkj 13 dk ;kx Kkr djuk iMxk A

3. ,d ckx e] xykc vkj xn oQ ik/ oxkdkj D;kfj;k e yxk, tkr g A ftl oxkdkj D;kjh e xn oQ iQy yxk, tkr g mldh Hktk dh yckb ml oxkdkj D;kjh dh Hktk dh yckb l 3 ehVj vf/d g] ftle xykc oQ ik/ yxk, x, g A xn dh D;kjh xykc dh D;kjh l {k=kiQy e fdruh cMh g \

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vkb, xykc dh D;kjh dh Hktk dk l ehVj eku yr g A rc xn dh D;kjh dh Hktk $(l+3)$ ehVj gkxh A buoQ {k=kiQy (ox ehVj e) Øe'k% l^2 vkj $(l+3)^2$ gkx A bu nkuk dk vrj gh ;g crk,xk fd xn oQ ik/k okyh D;kjh xykck okyh D;kjh l {k=kiQy e fdruh cMh g A

mijkDr rhuk fLFkfr;k e] ge chth; 0;td dk tkMuk ;k ?kVkuk iMk Fkk A nfud thou e] blh idkj dh vud ,lh fLFkfr;k gekj lEe[k vkrh g] tgk ge chth; 0;td dk i;kx djuk iMrk g rFkk mu ij vdxf.krh; lfØ;k, djuh iMrh gA bl vuPNn e] ge ;g n[kx fd chth; 0;td dk fdl idkj tkMk vkj ?kVk;k tkrk g A

i;kl dhft,

de l de ,lh nk fLFkfr;k oQ ckj e lkfp, ftuesa l iR;d e vkidk nk chth; 0;td dk cuku dh vko';drk iM vkj mUg tkMuk ;k ?kVkuk iM A

leku ink dk tkMuk vkj ?kVkuk

ljyre 0;td ,dinh gkr g A bue oQoy ,d gh in gkrk g A ikjHk dju oQ fy,] ge ;g lh[kx fd leku ink dk fdl idkj tkMk ;k ?kVk;k tkrk g A

- vkb, $3x$ vkj $4x$. dk tkM A ge tkur g fd x ,d l[;k g rFkk blhfy, $3x$ vkj $4x$ Hkh l[;k, g A.

  vc, $3x + 4x = (3 \times x) + (4 \times x)$

  $= (3 + 4) \times x$ forj.k ;k cVu x.k oQ i;kx l

  $= 7 \times x = 7x$

  ;k $3x + 4x = 7x$

pfd pj] l[;k, gh g] blfy, ge forj.k x.k dk i;kx dj ldr gA

- vkb, vc vkx $8xy$, $4xy$ vkj $2xy$ dk tkM A

$$8xy + 4xy + 2xy = (8 \times xy) + (4 \times xy) + (2 \times xy)$$
$$= (8 + 4 + 2) \times xy$$
$$= 14 \times xy = 14xy$$

;k $8xy + 4xy + 2xy = 14\,xy$

- vkb, $7n$ e l $4n$ dk ?kVk, A

$$7n - 4n = (7 \times n) - (4 \times n)$$
$$= (7 - 4) \times n = 3 \times n = 3n$$

;k $7n - 4n = 3n$

- blh idkj] $11ab$ e l $5ab$ dk ?kVkb, A

$$11ab - 5ab = (11 - 5)\,ab = 6ab$$

blh idkj] nk ;k vf/d leku ink dk ;kx ,d leku in gkrk g] ftldk l[;kRed x.kkd lHkh leku ink oQ x.kkdk oQ ;kx oQ cjkcj gkrk g A

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blh idkj] nk leku ink dk vrj ,d leku in gkrk g] ftldk l[;kRed x.kkd nkuk leku ink oQ l[;kRed x.kkdk oQ vrj oQ cjkcj gkrk g A

è;ku nhft, fd vleku ink dk ml idkj tkMk ;k ?kVk;k ugh tk ldrk] ftl idkj fd leku ink dk tkM ;k ?kVk fy;k tkrk g A blQ mnkgj.k ge igy gh n[k poQ g A tc x e 5 dk tkMk tkrk g] rk ge bl ifj.kke dk $(x+5)$ fy[kr g A è;ku nhft, fd $(x+5)$ e 5 vkj x nkuk gh in igy tl gh g A blh idkj] ;fn ge vleku ink $3xy$ vkj 7 dk tkM] rk ;kx $3xy+7$ g A

;fn ge $3xy$ e l 7 ?kVk,] rk ifj.kke $3xy$ ï 7 g A

0;kid chth; 0;tdk dk tkMuk vkj ?kVkuk

vkb, oQN mnkgj.k y %

- $3x+11$ vkj $7x$ ï 5 dk tkfM, A

  okfNr ;kx $= 3x+11+7x$ ï 5

  vc] ge tkur g fd in $3x$ vkj $7x$ leku in g rFkk 11 vkj ï 5 Hkh leku in g A lkFk gh] $3x+7x=10x$ vkj $11+(ï\ 5)=6$ g A vr%] ge mijkDr ;kx dk uhp fn, vuqkj ljy dj ldr g%

  ;kx $= 3x+11+7x$ ï 5

  $= 3x+7x+11$ ï 5 (ink dk iu0;ofLFkr dju ij)

  $= 10x+6$

  vr%] $3x+11+7x$ ï $5 = 10x+6$

- $3x+11+8z$ vkj $7x$ ï 5 dk tkfM, A

  ;kx $= 3x+11+8z+7x$ ï 5

  $= 3x+7x+11$ ï $5+8z$ (ink dk iu0;ofLFkr dju ij)

  è;ku nhft, fd geu leku ink dk ,d lkFk j[kk g rFkk voQyk vleku in $8z$ mlh idkj jgrk g A

  vr%] ;kx $= 10x+6+8z$

- $3a$ ï $b+4$ e l a ï b dk ?kVkb, A

  vrj $= 3a$ ï $b+4$ ï $(a$ ï $b)$

  $= 3a$ ï $b+4$ ï $a+b$

  è;ku nhft, fd fdl idkj geu a ï b dk dk"Bdk e j[kk A rFkk fdl idkj dk"Bdk dk [kkyr le; fpÉk dk è;ku j[kk g leku ink dk ,d lkFk j[ku oQ fy,] ink dk iu0;ofLFkr dju ij]

  vrj $= 3a$ ï a ï $b+b+4$

  $= (3$ ï $1)\,a$ ï $(1$ ï $1)\,b+4$

  vrj $= 2a+(0)\,b+4 = 2a+4$

  ;k] $3a$ ï $b+4$ ï $(a$ ï $b) = 2a+4$

> è;ku nhft, %
>
> tl ï $(5$ ï $3) =$ ï $5+3$ g] mlh idkj ï $(a$ ï $b) =$ ï $a+b$ gA chth; ink oQ fpÉk ij mlh idkj dk; fd;k tkrk g] tlkfd l[;kvk oQ fpÉk oQ lkFk fd;k tkrk gA

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vc] ge vH;kl oQ fy,] 0;tdk oQ ;kx vkj 0;odyu ij oQN vkj mnkgj.k gy djx A

mnkgj.k 4 leku ink dk ,df=kr djoQ] 0;td $12m^2 - 9m + 5m - 4m^2 - 7m + 10$ dk ljy dhft, %

gy ink dk iu0;ofLFkr dju ij] ge ikIr gkrk g%

$12m^2 - 4m^2 + 5m - 9m - 7m + 10$

$= (12 - 4)\, m^2 + (5 - 9 - 7)\, m + 10$

$= 8m^2 + (-4 - 7)\, m + 10$

$= 8m^2 + (-11)\, m + 10$

$= 8m^2 - 11m + 10$

i;kl dhft,

tkfM, vkj ?kVkb,%

(i) $m - n, m + n$

(ii) $mn + 5 - 2, mn + 3$

è;ku nhft, fd ,d in ?kVku dk vFk g fd mloQ ;kT; ifryke dk tkMukA vr%] $-10b$?kVku dk vFk g fd $+10b$ tkMuk] $-18a$?kVku dk vFk g fd $+18a$ tkMuk rFkk $24ab$?kVku dk vFk g fd $-24ab$ dk tkMukA ?kVk, tku oky 0;td oQ uhp n'kk, x, fpÉ] ?kVku dh ifØ;k dk mfpr :i l dju e lgk;d gkr gA

mnkgj.k 5 $30ab + 12b + 14a$ e l $24ab - 10b - 18a$ dk ?kVkb, A

gy $30ab + 12b + 14a - (24ab - 10b - 18a)$

$= 30ab + 12b + 14a - 24ab + 10b + 18a$

$= 30ab - 24ab + 12b + 10b + 14a + 18a$

$= 6ab + 22b + 32a$

odfYid :i l] ge 0;tdk dk ,d oQ uhp ,d djoQ bl idkj j[kr g fd leku in ,d gh lh/] vFkkr LrHkk e jg] tl uhp n'kk;k x;k g%

$$\begin{array}{r} 30ab + 12b + 14a \\ 24ab - 10b - 18a \\ - \quad + \quad + \\ \hline 6ab + 22b + 32a \\ \hline \end{array}$$

mnkgj.k 6 $2y^2 + 3yz, - y^2 - yz - z^2$ vkj $yz + 2z^2$ oQ ;kx e l $3y^2 - z^2$ vkj $-y^2 + yz + z^2$ oQ ;kx dk ?kVkb, A

gy igy ge $2y^2 + 3yz, - y^2 - yz - z^2$ vkj $yz + 2z^2$ dk tkMr g A

$$\begin{array}{rrrrr} & 2y^2 & + & 3yz & \\ - & y^2 & - & yz & - z^2 \\ & & + & yz & + 2z^2 \\ \hline & y^2 & + & 3yz & + z^2 \\ \hline \end{array} \qquad (1)$$

fiQj ge] $3y^2 - z^2$ vkj $-y^2 + yz + z^2$ dk tkMr g A

$$\begin{array}{rrrrr} & 3y^2 & & & - z^2 \\ - & y^2 & + & yz & + z^2 \\ \hline & 2y^2 & + & yz & \\ \hline \end{array} \qquad (2)$$

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vc ge ;kx (1) e l ;kx (2) dk ?kVkr g A

$$\begin{array}{rrrr} & y^2 & + 3yz & + z^2 \\ & 2y^2 & + yz & \\ \text{ï} & & \text{ï} & \\ \hline & \text{ï}\ y^2 & + 2yz & + z^2 \\ \hline \end{array}$$

i'ukoyh 12.2

1. leku ink dk l;kftr (feyk) djoQ ljy dhft, %

(i) $21b$ ï $32 + 7b$ ï $20b$

(ii) ï $z^2 + 13z^2$ ï $5z + 7z^3$ ï $15z$

(iii) p ï $(p$ ï $q)$ ï q ï $(q$ ï $p)$

(iv) $3a$ ï $2b$ ï ab ï $(a$ ï $b + ab) + 3ab + b$ ï a

(v) $5x^2y$ ï $5x^2 + 3yx^2$ ï $3y^2 + x^2$ ï $y^2 + 8xy^2$ ï $3y^2$

(vi) $(3y^2 + 5y$ ï $4)$ ï $(8y$ ï y^2 ï $4)$

2. tkfM, %

(i) $3mn,$ ï $5mn, 8mn,$ ï $4mn$

(ii) t ï $8tz, 3tz$ ï z, z ï t

(iii) ï $7mn + 5, 12mn + 2, 9mn$ ï $8,$ ï $2mn$ ï 3

(iv) $a + b$ ï $3, b$ ï $a + 3, a$ ï $b + 3$

(v) $14x + 10y$ ï $12xy$ ï $13, 18$ ï $7x$ ï $10y + 8xy, 4xy$

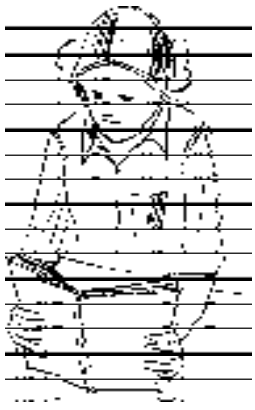
(vi) $5m$ ï $7n, 3n$ ï $4m + 2, 2m$ ï $3mn$ ï 5

(vii) $4x^2y,$ ï $3xy^2,$ ï $5xy^2, 5x^2y$

(viii) $3p^2q^2$ ï $4pq + 5,$ ï $10\ p^2q^2, 15 + 9pq + 7p^2q^2$

(ix) ab ï $4a, 4b$ ï $ab, 4a$ ï $4b$

(x) x^2 ï y^2 ï $1, y^2$ ï 1 ï $x^2, 1$ ï x^2 ï y^2



3. ?kVkb, %

(i) y^2 e l ï $5y^2$

(ii) ï $12xy$ e l $6xy$

(iii) $(a + b)$ e l $(a$ ï $b)$

(iv) $b\ (5$ ï $a)$ e l $a\ (b$ ï $5)$

(v) $4m^2$ ï $3mn + 8$ e l ï $m^2 + 5mn$

(vi) $5x$ ï 10 e l ï $x^2 + 10x$ ï 5

(vii) $3ab$ ï $2a^2$ ï $2b^2$ e l $5a^2$ ï $7ab + 5b^2$

(viii) $5p^2 + 3q^2$ ï pq e l $4pq$ ï $5q^2$ ï $3p^2$

4. (a) $2x^2 + 3xy$ ikIr dju oQ fy,] $x^2 + xy + y^2$ e D;k tkMuk pkfg, \

(b) ï $3a + 7b + 16$ ikIr dju oQ fy,] $2a + 8b + 10$ e l D;k ?kVkuk pkfg, \

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5. ï x^2 ï $y^2 + 6xy + 20$ ikIr dju oQ fy,] $3x^2$ ï $4y^2 + 5xy + 20$ e D;k fudky yuk pkfg, \

6. (a) $3x$ ï $y + 11$ vkj ï y ï 11 oQ ;kx e l $3x$ ï y ï 11 dk ?kVkb, A

(b) $4 + 3x$ vkj 5 ï $4x + 2x^2$ oQ ;kx e l $3x^2$ ï $5x$ vkj ï $x^2 + 2x + 5$ oQ ;kx dk ?kVkb, A

12.7 fdlh 0;td dk eku Kkr djuk

ge tkur g fd ,d chth; 0;td dk eku ml 0;td dk cuku oky pjk oQ ekuk ij fuHkj djrk g A ,lh vud fLFkfr;k g] tgk ge 0;tdk oQ eku Kkr dju gkr g] tl fd ge ;g tkp djuk pkgr g fd pj dk ,d fo'k"k eku ,d fn, g, lehdj.k dk lr"V djrk g ;k ugh A

tc ge T;kfefr vkj ifrfnu dh xf.kr oQ l=kk dk i;kx djr g] rk Hkh ge 0;tdk oQ eku Kkr djr g A mnkgj.kkFk] Hktk *l* oky ox dk {k=kiQy l^2 gkrk g A ;fn $l = 5$ cm g] rk {k=kiQy 5^2 cm^2 = 25 cm^2 g A ;fn Hktk = 10 cm g] rk {k=kiQy 10^2 cm^2 ;k 100 cm^2 g] bR;kfn A ,l oQN vkj mnkgj.kk dk ge vxy vuPNn e n[kx A

mnkgj.k 7 fuEufyf[kr 0;tdk oQ eku $x = 2$ oQ fy, Kkr dhft,%

(i) $x + 4$ (ii) $4x$ ï 3 (iii) 19 ï $5x^2$

(iv) 100 ï $10x^3$

gy

(i) $x + 4$ e, $x = 2$ j[ku ij] ge $x + 4$ dk fuEufyf[kr eku ikIr gkrk g%

$x + 4 = 2 + 4 = 6$

(ii) $4x$ ï 3 e, $x = 2$ j[ku ij] ge ikIr gkrk g%

$4x$ ï $3 = (4 \times 2)$ ï $3 = 8$ ï $3 = 5$

(iii) 19 ï $5x^2$ e, $x = 2$ j[ku ij] ge ikIr gkrk g%

19 ï $5x^2 = 19$ ï $(5 \times 2^2) = 19$ ï $(5 \times 4) = 19$ ï $20 = $ ï 1

(v) 100 ï $10x^3$ e, $x = 2$ j[ku ij] ge ikIr gkrk g %

100 ï $10x^3 = 100$ ï $(10 \times 2^3) = 100$ ï (10×8) [è;ku nhft, fd $2^3 = 8$ g]

$= 100$ ï $80 = 20$

mnkgj.k 8 fuEufyf[kr 0;tdk oQ eku Kkr dhft,] tc $n = $ ï 2

(i) $5n$ ï 2 (ii) $5n^2 + 5n$ ï 2 (iii) $n^3 + 5n^2 + 5n$ ï 2 g %

gy

(i) $5n$ ï 2 e] $n = $ ï 2 j[ku ij] ge ikIr gkrk g%

5(ï 2) ï $2 = $ ï 10 ï $2 = $ ï 12

(ii) $5n^2 + 5n$ ï 2 e $n = $ ï 2 oQ fy,] $5n$ ï $2 = $ ï 12 g]

vkj] $5n^2 = 5 \times ($ ï $2)^2 = 5 \times 4 = 20$ [pfd $($ ï $2)^2 = 4$]

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nkuk dk feyku ij] ge ikIr gkrk g %

$5n^2 + 5n$ ï 2 = 20 ï 12 = 8

(iii) vc] n = ï 2 oQ fy,

$5n^2 + 5n$ ï 2 = 8 g rFkk

$n^3 = (ï 2)^3 = (ï 2) \times (ï 2) \times (ï 2) = ï 8$ gA

nkuk oQ feyku ij]

$n^3 + 5n^2 + 5n$ ï 2 = ï 8 + 8 = 0

vc ge nk pjk oQ 0;tdk] tl $x + y, xy$ bR;kfn ij fopkj djx A nk pjk oky ,d 0;td dk l[;kRed eku Kkr dju oQ fy,] ge ble nkuk pjk oQ eku j[ku dh vko';drk gkrh g A mnkgj.kkFk] $x = 3$ vkj $y = 5$ oQ fy, $(x + y)$ dk eku 3 + 5 = 8 g A

mnkgj.k 9 $a = 3$ vkj $b = 2$ oQ fy,] fuEufyf[kr 0;tdk oQ eku Kkr dhft ,%

(i) $a + b$ (ii) $7a$ ï $4b$ (iii) $a^2 + 2ab + b^2$

(iv) a^3 ï b^3

gy fn, g, 0;tdk e] $a = 3$ vkj $b = 2$ j[ku ij] ge ikIr gkrk g %

(i) $a + b = 3 + 2 = 5$

(ii) $7a$ ï $4b = 7 \times 3$ ï $4 \times 2 = 21$ ï $8 = 13.$

(iii) $a^2 + 2ab + b^2 = 3^2 + 2 \times 3 \times 2 + 2^2 = 9 + 12 + 4 = 25$

(iv) a^3 ï $b^3 = 3^3$ ï $2^3 = 3 \times 3 \times 3$ ï $2 \times 2 \times 2 = 9 \times 3$ï $4 \times 2 = 27$ï $8 = 19$

i'ukoyh 12.3

1. ;fn $m = 2$ g] rk fuEufyf[kr oQ eku Kkr dhft , %

(i) m ï 2 (ii) $3m$ ï 5 (iii) 9 ï $5m$

(iv) $3m^2$ ï $2m$ ï 7 (v) $\frac{5m}{2}$ï 4

2. ;fn $p = ï 2$ g] rk fuEufyf[kr oQ eku Kkr dhft , %

(i) $4p + 7$ (ii) ï $3p^2 + 4p + 7$ (iii) ï $2p^3$ ï $3p^2 + 4p + 7$

3. fuEufyf[kr 0;tdk oQ eku Kkr dhft ,] tc $x = ï 1$ g %

(i) $2x$ ï 7 (ii) ï $x + 2$ (iii) $x^2 + 2x + 1$

(iv) $2x^2$ ï xï 2

4. ;fn $a = 2$ vkj $b = ï 2$ g] rk fuEufyf[kr oQ eku Kkr dhft , %

(i) $a^2 + b^2$ (ii) $a^2 + ab + b^2$ (iii) a^2 ï b^2

5. tc $a = 0$ vkj $b = ï 1$ g] rk fn, g, 0;tdk oQ eku Kkr dhft , %

(i) $2a + 2b$ (ii) $2a^2 + b^2 + 1$ (iii) $2a^2b + 2ab^2 + ab$

(iv) $a^2 + ab + 2$

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6. bu 0;tdk dk ljy dhft, rFkk buoQ eku Kkr dhft,] tc x dk eku 2g %

(i) $x + 7 + 4 (x ï 5)$ (ii) $3 (x + 2) + 5x ï 7$

(iii) $6x + 5 (x ï 2)$ (iv) $4(2x ï 1) + 3x + 11$

7. bu 0;tdk dk ljy dhft, rFkk buoQ eku Kkr dhft,] tc $x = 3, a = ï 1$ vkj $b = ï 2$ g%

(i) $3x ï 5 ï x + 9$ (ii) $2 ï 8x + 4x + 4$

(iii) $3a + 5 ï 8a + 1$ (iv) $10 ï 3b ï 4 ï 5b$

(v) $2a ï 2b ï 4 ï 5 + a$

8. (i) ;fn $z = 10$ g] rk $z^3 ï 3(z ï 10)$ dk eku Kkr dhft, %

(ii) ;fn $p = ï 10$ g] rk $p^2 ï 2p ï 100$ dk eku Kkr dhft, A

9. ;fn $x = 0$ ij $2x^2 + x ï a$ dk eku 5 oQ cjkcj g] rk a dk eku D;k gksuk pkfg, \

10. 0;td $2(a^2 + ab) + 3 ï ab$ dk ljy dhft, vkj bldk eku Kkr dhft,] tc $a = 5$ vkj $b = ï 3$ g A

12.8 chth; 0;tdk oQ i;kxµl=k vkj fu;e

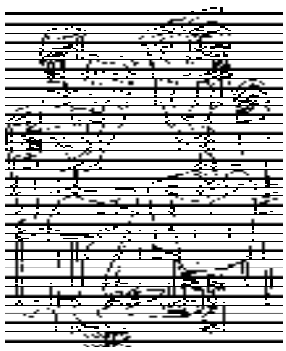
ge igy Hkh n[k poQ g fd xf.kr e l=kk (formulas) vkj fu;e (rules) dk lf{kIr vkj 0;kid :i e] chth; 0;tdk dk i;kx djoQ fy[kk tk ldrk g A ge uhp vud mnkgj.k n[kx %

- ifjeki l=k

1. ,d leckg f=kHkt dk ifjeki $= 3 \times$ mldh Hktk dh yckb gkrk g A ;fn bl leckg f=kHkt dh Hktk dh yckb dk l l 0;Dr dj] rk mldk ifjeki $= 3l$ dk gkxk A
2. blh idkj] ,d ox dk ifjeki $= 4l$ gkrk g] tgk l ox dh Hktk dh yEckb g A
3. ,d le ipHkt (regular pentagon) dk ifjeki $= 5l$ gkrk g] tgk l mldh Hktk dh yckb g] bR;kfn A

- {k=kiQy l=k

1. ;fn ge ,d ox dh Hktk dk l l 0;Dr dj] rk ox dk {k=kiQy $= l^2$ gkrk g A
2. ;fn ge ,d vk;r dh yckb vkj pkMkb dk Øe'k% l vkj b l 0;Dr dj] rk vk;r dk {k=kiQy $= l \times b = lb$ gkrk g A
3. blh idkj] ;fn ,d f=kHkt dk vk/kj b vkj mQpkb h g] rk f=kHkt dk {k=kiQy $= \frac{b}{2} \cdot h = \frac{bh}{2}$ gkrk g A



,d ckj fdlh nh gb jkf'k oQ fy, l=k] vFkkr chth; 0;td Kkr gk tk,] rk ml jkf'k dk eku okfNr ifrc/k oQ vrxr ifjdfyr fd;k tk ldrk g A

mnkgj.kkFk] yckb 3 cm dh Hktk oky ,d fn, g, ox dk ifjeki] ox oQ ifjeki oQ 0;td] vFkkr $4l$ e $l = 3$ cm j[ku ij ikIr fd;k tkrk g A

fn, g, ox dk ifjeki $= (4 \times 3)$ cm $= 12$ cm

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blh idkj] bl ox dk {k=kiQy] ox oQ {k=kiQy oQ 0;td] vFkkr l^2 e $l = 3$ cm j[k dj ikIr fd;k tkrk gA

fn, g, ox dk {k=kiQy = $(3)^2$ cm = 9 cm^2

- l[;k ifr:ik (Patterns) oQ fy, fu;e

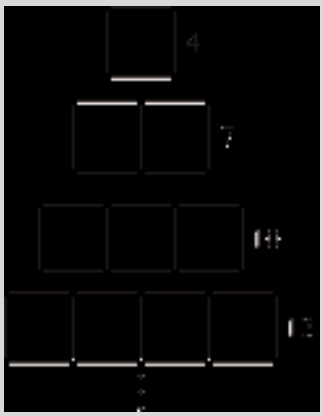
fuEufyf[kr dFkuk dk vè;;u dhft, %

1. ;fn fdlh ikÑr l[;k dk n l 0;Dr fd;k tk, rk mldk ijorh (successor) $(n + 1)$ gkrk gA ge bldh tkp fdlh Hkh ikÑr l[;k oQ fy, dj ldr gA mnkgj.kkFk] ;fn ikÑr l[;k 10 g] rk mldk ifjorh 10 + 1 = 11 g] tk lofofnr g (Kkr g) A
2. ;fn fdlh ikÑr l[;k dk n l 0;Dr fd;k tk,] rk $2n$,d le l[;k gkrh g rFkk $(2n + 1)$,d fo"ke l[;k gkrh gA vkb, bldh tkp dkb Hkh ikÑr l[;k] ekuk 15 ydj dj A vc] $2n = 2 \times 15 = 30$ g] tk okLro e ,d le l[;k g rFkk $2n + 1 = 2 \times 15 + 1 = 30 + 1 = 31$ g] tk okLro e ,d fo"ke l[;k gA

bUg dhft,

ekfpl dh rhfy;k] nkr lkiQ dju dh lhdk ;k ljdMk oQ cjkcj yckb oQ VdMk oQ NkV j[kk[kMk dk yhft, A mUg vkÑfr;k e n'kk, vulkj ifr:ik (patterns) e tkfM, %

1. vkÑfr 12-1 e cu iVu dk nf[k, A ble pkj j[kkvk l cu vkdkj ▄ dh iujkofÙk gk jgh gA tlk fd vki n[k ldr g fd ,d vkdkj dk cuku oQ fy, pkj j[kk[kMk dh vko';drk gkrh g] nk vkdkjk oQ fy, 7] rhu vkdkjk oQ fy, 10] bR;kfn j[kk[kMk dh vko';drk gkrh gA ;fn vkdkjk dh l[;k n gk] rk mUg cuku oQ fy, vko';d j[kk[kMk dh l[;k $(3n + 1)$ gkxh A vki bldh lR;rk dh tkp $n = 1, 2, 3,...,10,...$ bR;kfn ydj dj ldr gA ;fn cuk, x, vkdkjk dh l[;k 3 g] rk vko';d j[kk[kMk dh l[;k $3 \times 3 + 1 = 10$ gkrh] tlkfd vkÑfr l Hkh n[kk tkldrk gA



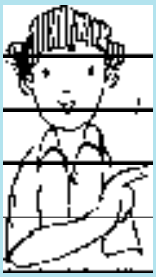
vkÑfr 12-1

vkÑfr 12-2

2. vc vkÑfr 12-2 e fn, iVu ij fopkj dhft, A ;gk vkdkj ▄ dh iujkofÙk gk jgh gA vkdkjk 1]2]3]...dk cuku oQ fy, vko';d j[kk[kMk dh l[;k, Øe'k% 3]5]7]9]--- gA Øe'k% ;fn $n$cuk, x, vkdkjk dh l[;k dk 0;Dr djrk g rk vko';d j[kk[kMk dh l[;k 0;td $(2n + 1)$ l ikIr gkxh A 0;td lgh g ;k ugh] dh tkp vki noQ fdlh Hkh eku dk ydj dj ldr gA mnkgj.kkFk] $n = 4$ yu ij] okfNr j[kk[kMk dh l[;k] $2n + 1 = (2 \times 4) + 1 = 9$, gkxh] tk okLro e 4▄ oQ cuku oQ fy, vko';d gA

i;kl dhft,

n'kk, x, vk/kjHkr vkdkjk dk ydj mijkDr idkj oQ iVu cukb, %



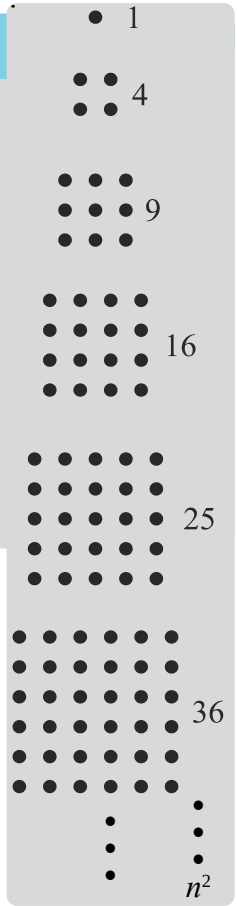
¹vkdkjk dk cuku oQ fy, vko';d j[kk[kMk dh l[;k nkb vkj fy[kh gb g A lkFk gh n vkdkjk dk cuku oQ fy, vko';d j[kk[kMk oQ n'kku okyk 0;td Hkh nkb vkj fn;k gvk g Aº

vkx cf<, vkj ,lh gh vkj iVuk dh [kkt dhft, A

bUg dhft,

vkÑfr e n'kk, vulkj] ¯cnvk (dots) oQ iVu cukb, A ;fn vki ,d vky[k dkx (dot paper) y] rk iVuk dk cukuk ljy jgxk A

nf[k, fd fdl idkj ¯cnvk dk ,d ox oQ vkdkj e 0;ofLFkr fd;k x;k g A ;fn fdlh fof'k"V vkdkj e ,d ifDr ;k ,d LrHk e ¯cnvk dh l[;k pj n yr g] rk vkdkj e oQy ¯cnvk dh l[;k 0;td $n \times n = n^2$ l ikIr gkxh A mnkgj.kFk $n = 4$ yhft, A ml vkdkj oQ fy, ftldh iR;d ifDr (;k iR;d LrHk) e 4 ¯cn g] rc oQy ¯cnvk dh l[;k $4 \times 4 = 16$ gkxh] ftl okLro e vkÑfr l n[kk tk ldrk g A vki blh idkj dh tkp n oQ vU; eku ydj Hkh dj ldr g A ikphu ;ukuh xf.krKk u bu l[;kvk 1] 4] 9] 16] ..... dk ox l[;kvk (square numbers) l ukekfdr fd;k A



• oQN vkj l[;k iVu

vkb, l[;kvk oQ ,d vU; iVu ij fopkj dj] ftle gekjh lgk;rk oQ fy, dkb vkÑfr cuh gb ugh g % 3, 6, 9, 12, ..., $3n$, ...

; l[;k, 3 oQ x.kt (multiples) g vkj bUg 3 l ikjHk djr g, vkjkgh Øe e 0;ofLFkr fd;k x;k g A no LFkku ij vku oky in dk $3n$ l 0;Dr fd;k x;k g bldh lgk;rk l] vki ljyrkiod 10o LFkku ij vku oky in (tk $3 \times 10 = 30$ g) rFkk 100o LFkku ij vku oky in (tk $3 \times 100 = 300$ g)] bR;kfn Kkr dj ldr g A

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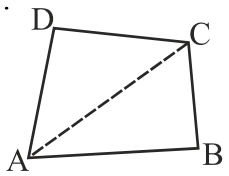
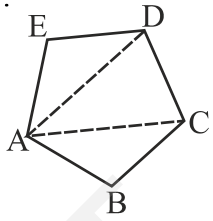
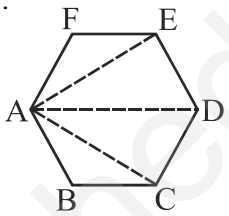
● T;kfefr e iVu

,d prHkt oQ fdlh 'kh"k l mloQ fdru fod.k [khp tk ldr g\ tkp dhft, fd budh l[;k ,d gA

,d ipHkt oQ ,d 'kh"k l mloQ fdru fod.k [khp ldr g\ tkp dhft, fd budh l[;k nk gA





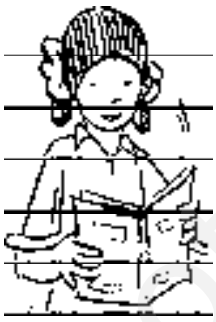


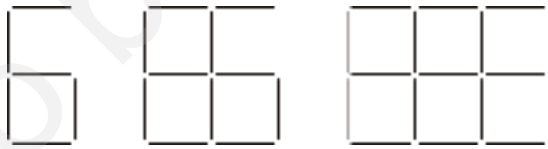
,d "kVHkt oQ ,d 'kh"k l mloQ fdru fod.k [khp tk ldr g\ tkp dhft, ;g l[;k 3 gA

n Hktk oky fdlh cgHkt oQ ,d 'kh"k l ge oQy (*n* ï 3) fod.k [khp ldr gA ,d llrHkt (7 Hktk,) vkj v"VHkt (8 Hktk,) oQ fy,] mudh vkÑfr;k [khp djoQ bldh tkp dhft, A ;g l[;k ,d f=kHkt (3 Hktk,) oQ fy, D;k g\ è;ku nhft, fd fdlh cgHkt oQ fdlh ,d 'kh"k l [khp x, fod.k ml mru vukfu0;kih (non-overlapping) (tk ,d nlj dk u <dr gk) f=kHktk e foHkkftr djr g ftruh fod.kk dh l[;k l vf/d 1 l[;k gkrh gA

i'ukoyh 12.4

1. cjkcj yckb oQ j[kk[kMk l cuk, x, vdk oQ iVu dk nf[k, A vki j[kk[kMk l cu g, bl idkj oQ vdk dk byDVkfud ?kfM;k ;k oQyD;yVjk ij n[k ldr gA



(a) 

6 11 16 21 ... (5*n* + 1) ...

(b)

4 7 10 13 ... (3*n* + 1) ...

(c)

7 12 17 22 ... (5*n* + 2) ...

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;fn cuk, x, vdk dh l[;k *n* yh tk,] rk mloQ fy, vko';d j[kk[kMk dh (*n*) l[;k n'kku okyk chth; 0;td iR;d iVu oQ nkb vkj fy[kk x;k g A

┌, └, ┌ oQ idkj oQ 5]10]100 vdk dk cuku oQ fy, fdru j[kk[kMk dh vko';drk gkxh \

2. l[;k iVuk dh fuEufyf[kr lkj.kh dk ijk dju oQ fy,] fn, g, chth; 0;tdk dk i;kx dhft, %

Øe l[;k	0;td	in									
		igyk	nljk	rhljk	pkFkk	ikpok	...	nlok	...	lkok	...
(i)	$2n$ ï 1	1	3	5	7	9	-	19	-	-	-
(ii)	$3n + 2$	2	5	8	11	-	-	-	-	-	-
(iii)	$4n + 1$	5	9	13	17	-	-	-	-	-	-
(iv)	$7n + 20$	27	34	41	48	-	-	-	-	-	-
(v)	$n^2 + 1$	2	5	10	17	-	-	-	-	10,001	-

geu D;k ppk dh \

1. pjk vkj vpjk l chth; 0;td cur g A 0;tdk dk cuku oQ fy,] ge pjk vkj vpjk ij ;kx] 0;odyu] x.ku vkj foHkktu dh lfØ;k, djr g A mnkgj.kkFk] 0;td $4xy + 7$ pjk x vkj y rFkk vpjk 4 vkj 7 l cuk;k x;k g A vpj 4 rFkk pjk x vkj y dk x.kk djoQ $4xy$ cukdj mle 7 tkM dj $4xy + 7$ cuk;k tkrk g A

2. 0;td ink l feydj cur g A ink dk tkM dj 0;td cuk;k tkrk g A mnkgj.kkFk] ink $4xy$ vkj 7 dk tkMu l 0;td $4xy + 7$ cu tkrk g A

3. ,d in] x.ku[kMk dk ,d x.kuiQy gkrk g A 0;td $4xy + 7$ e in $4xy$ x.ku[kMk x, y vkj 4 dk ,d x.kuiQy g A pjk oky x.ku[kM chth; x.ku[kM dgykr g A

4. in dk x.kkd mldk l[;kRed x.ku[kM gkrk g A dHkh&dHkh in dk dkb Hkh ,d x.ku[kM in oQ 'k"k Hkkx dk x.kkd dgykrk g A

5. ,d ;k vf/d ink l cuk 0;td ,d cgin dgykrk g A fof'k"V :i l] ,d in okyk 0;td ,dinh] nk ink okyk 0;td f}in rFkk rhu ink okyk 0;td f=kin dgykrk g A

6. o in ftue chth; x.ku[kM ,d tl gk] leku in dgykr g rFkk fHkUu&fHkUu chth; x.ku[kMk oky in vleku in dgykr g A bl idkj $4xy$ vkj $-3xy$ leku in g] ijr $4xy$ vkj $-3x$ leku in ugh g A

7. nk leku ink dk ;kx (;k vrj) ,d vU; leku in gkrk g] ftldk x.kkd mu leku ink oQ x.kkdk oQ ;kx (;k vrj) oQ cjkcj gkrk g A bl idkj] $8xy$ ï $3xy = (8$ ï $3)xy$, vFkkr $5xy$ A

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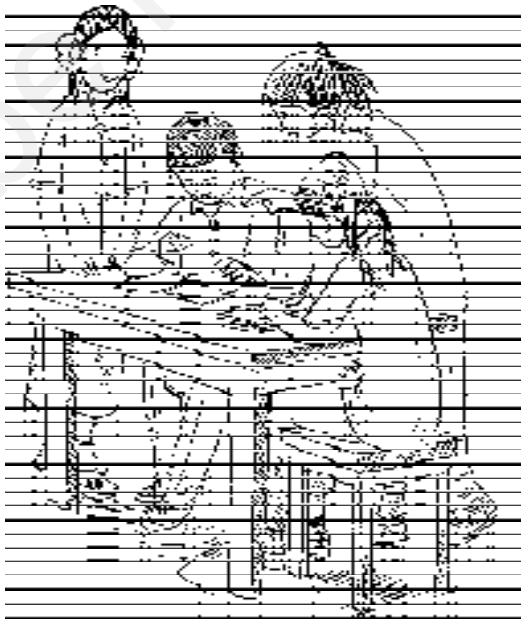
8. tc ge nk chth; 0;tdk dk tkMr g] rk leku ink dk] mQij o£.kr fu;e oQ vulkj tkMk tkrk g_ tk leku in ugh g mUg ol gh NkM fn;k tkrk gA bl idkj] $4x^2 + 5x$ vkj $2x + 3$ dk ;kx $4x^2 + 7x + 3$ g A ;gk leku in $5x$ vkj $2x$ tM dj $7x$ cu tkr g rFkk vleku ink $4x^2$ vkj 3 dk ol gh NkM fn;k tkrk g A

9. ,d lehdj.k dk gy dju vkj fdlh l=k dk i;kx dju tlh fLFkfr;k e] ge ,d 0;td dk eku Kkr dju dh vko';drk gkrh g A chth; 0;td dk eku mu pjk oQ ekuk ij fuHkj djrk g] ftul og cuk;k x;k g A bl idkj] $x = 5$ oQ fy, $7x$ ï 3 dk eku 32, g D;kfd 7×5 ï $3 = 32$ g A

10. xf.kr e] chth; 0;tdk dk i;kx djr g,] fu;ek vkj l=kk dk lf{kIr vkj 0;kid :i e fy[kk tkrk g A

bl idkj] vk;r dk {k=kiQy = *lb*, g] tgk *l* vk;r dh yckb rFkk *b* vk;r dh pkMkb g A

,d l[;k iVu (;k vuØe) dk 0;kid (*n*ok) in] *n* e ,d 0;td gkrk g A bl idkj] l[;k iVu 11, 21, 31, 41, . . . dk *n* ok in $(10n + 1)$ g A



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