NIMCET-2019

I. For two ctrel .. 1"+:J'·16and ,' +:r°-2.1sO, thm, ia/are
(a) One pair Cl(oomnion tBnge.nta.
(b) Two pttlra of cammon ln.ngant.t,
(c) Three eemeson lang:ent:..
(d) No common tMgenta.

2. u,, (:R .. 11 bo d•flncd by f<•)•j••l•(!l I >0 lf• so

Them,
(a) f J.# ne.lLher conLlnuou& nor diJJ'ei:enllable at. O. .
(b) f la contlnuou1 111\d d1ffercndable AL 0.
(e) f YIcoou.nuoui. but noLdiflero.ntl•bl" t1L O.
(d) f it noL continuom but diffrenUable at 0. .

3. A particle P atarts from th6 p()lote Zo-= l+ 2i, where i =J=T moves fl.rat. hortzonta.Uy away from the or1giD by 5 un11'1 and then verticalcy away from the oriiln by 3 UJ'lll.1 to teach lo point. z1• From z1 the particle mo'IIH ../2 uniUI in the dtreetton of the vector i+ ja.nd. then moves throua:h an angle i rn the anti--clockwise direction on a circle with eeoee at t.he origin. to reach point zt.· The poin, NJ 1.8 gtven by
(a)6+7i (b)-7+6i
(c)7+61 (d)-6+71

4. If 6 •a' -(...here .r.\la the area of the MBC. then tan A ...uat
(&)16 (b).! 15
(e)i, 8 (d)! 2

5.. Two no.mbor,o nnd bore eh0&en at random from a •t. of nra, SO natural numbers, Lhen the probablll(Y Lhat •' -tr •• divl•iblo by U 1,
(,)£ 87 (h) 87
12 9
(0)87 (d)87

6. A man uikes a ,step forwa.rd with probability 0.6. Tho probob1lity that 1l..rdn) point ra a, theencf o{ elfl"l·m ateps, he II eee from the rn e-p awi.y
(•J 462(03-0' (bl462COJl4)'
(c1<82COHJ' (d)462(024J'

7. Let .r,. I• l. l •. ,. n bo nobMrvat.lon1 and i • L 2,. •••• n where p and.tan eonJl.a.OLl. If 1.he mean or z, LI 48 and 1t.andu,td«vfallon It 12. wbc.ron• the mean ot w, '• 11 and 1tandarcb dovittilon ti ... lho volu .. of p and i ahould bo
(olp•l.25,A•-O (b)p••l.21),i•
(c)p•1.5.i•-O (d)p•25,i•G

8. I y. z: 81'8 di&UD.Cl real nwnbera and 2•. 1 :I 2 + y1=0.then., ,,t equall.o ' ,,. 2.,'
(a)l (b)-1 (cl2 (d)-2

9. Let f(rt,w) be a polynomial satiafying. ((0) =2, f'(0) = 3 and lw. 'num, ((4) lo is equal
<rEte• - (b) oe' -]
(cl 2e 2,e1
21' (dJ&,'+1)

10. If o., a,, a,, ... , ai. _ t• b ere in AP, c, bi, bi, .. ,#Ji._ 1, ba.reln GP and.ea ;ci,..-1· bare in RP, where o., b are posiih•e, then the equation a,.r' - "-" •e. • 0 hu 11.t roou
(•) ...i and-"'
(b) ..... and u-1
(d itna(UUU'7
(d) one rtal a.nd one ary

11. Solution'°' tJi.1noqual1\ylog,(x + 2)(x + 4) • .... .tr • 2) <ilotr./17<•
(ol(-2.-1) (b)(-2.3) (c)(-L3) (d)(S,«>)

12. ffo.,b,coruinOl'•11dlO(o-l<s2b,Jo«2b Jos3cond log 3c - logo nrc In *AP.* then e. *b.,* AM th• lenathl qt tho 81doe or u lrianglo wWcb 11

r.i eeute angle (b) obt- an,lecl

(c) right angled (di uquilalOrol

13. If *x.* 2,; • 2. *ax* • 8 .,. the On tbr-.. """""" of a goometrlc Pl'OW'ion, then "4tb t mm the pomct.nc progression Is

(n) - 13.5 (I>) 13.6

\c) - 27 (dl 27

14. lf(l+x-:zr'>" =1-o,..+Clt" + ...+o. I.hen the value a.,+ "" + 06 + ... + al2 ¡5

(al 29 (b) 80 !<) 31 (cl) 32

15. If *a* and bare the Jest values or'l•c, o..nd 2• - -c, respecuvely, then

(al• =*2b* (b) *b* = 24

((}(I ***=-b*** (d)c.f 1 •2b'2

16. Let ***U*** and ***V*** be two e t8 *ol •* ample spaces Sand P(A) denote the probabilliy of N'I evem ***A.*** Which of tbe following stat menta Ul 1J"Oe?

tat lf ***I'fU)=*** I'(***V)*** then *u* = ***V***

<bl tr ***P(U)*** cO then tr = S

{c) rru ***("lV"-*** qi Lhen ***U*** Mtd ***V*** are 1ndepoodenl...

(d) If ***U*** o.nd veee tndeptndenl the-n to aN *tr* and

17. lll'o man purch3ae a raffle ticket.dn can wfn • Onl ll seox,nd p,tb.e ***of*** f 2000 with prol><1blllti.. 0.00 I ond *0.003* ""l*'llvtly. What •hould be • fai. prl"' to pay ,,,, lhe tid<et?

(AIT 11 (b)(10

lclt2000 (dlN..,.ol.-

,,. If tho ouoon deviation or I.he nwnber I. I• *d,* 1 + 2d, ..• , 1-. lOOd from tbeir mean a 265. t.Mn *d* Is cqunl to

(•) 10. l (l>J 10.2

le) 10 3 (dl 10.4

19.]l'(-so and ***tx'*** = 400. lhena po&Slbl••alueor,. among the foOowmg is

(a) 9 (b) 12 (c)15 (cl) 18

20. Let S be tbe set[• e Z + *:a* s !OQ. If tbe equatloo (tan' ***x)-*** ton .r ***=O*** has real rool6 (where U ls the greatest mteger function). then lhe number of el onts in S I@

loJ 10 (b) 8

lcl9 (d)O

21. If sin2 *x* tan *s:* + c062 zeo1:1 -sin 2.r=l .... tan *x" cotx* *x* e(O. 11), then *x*

(3rt Sit (b) 5-x *111*

a)li' 12 12· 12

(c).!(11)' 11)11! (d) ***1. v1*** •9, 1'1

22. o and *b* arc non-1.01•non•tolllnear vectors .uch 1hat lo 1•2.o.b • I nnd Lhc ang.le between ondbil3,

1J r It ony vec1or8 81.ltl8.fyin,3 •2. *r.b* • 8. (r ***+2a*** -lOb)·(a • b) •6und *r•2o-10a* •llo • b), then).. i• 4'qUld IA)

(•1- 1 (b)2 (dJ 3

2

23. In a cbess t.ou.mumcat. " m.en and 2 worneo pl.ayen partkipal.(id. Each player pl ys 2 games again,&. ***"'Cr'I*** of her player. Also. the total number of games played by lbe rnen au)ong themselves exceeded by 66 the number of games thut the men played apin.11 the women. Then the IA>tal number of players in Ule tournament *is*

la) 13 (b) 11 (c) 9 (di ***1***

24. Suppose Al, A"' ... , ..A30 are thirty sets eaeh baVJng 5 elQruent.s With no common element across the sets Bi,B_i, •... ***B*** re a sete each having3 e.Jtmenu.wtthn common element acroee the eelet. UA, • U B, • S ,4 _,-t

and each element of *S* belong to exac ly 10 or *A,* 'sand

1

(a)16 (b)30 (dJ 5

(e)ac:dy 9 o f a. The valu oC *n* is equ et to

I, *fix)* [oosl<l !t< 0, where (xi denw,, the

1,rreat.e&L lnl.uger S.t, ahould be continuous at *x* •O. 1.htn ***r:i*** muet be

lo)O (b)l lc)2 (dJ-1

x'-x I tt

,4,z .. 1

26. If.c111 renl, then the mtntmum vctue or

<•>I 2- (b) 2 (cl S

21. If Jco1XC082xeo&6.idx •A1tln2.t .. 4.i1ln4.X +A31tU) Ox -i J\.i sJn + *c,* then t.be valut• o(***A,,*** At,A3, A.bre

(a) ***A,*** • A, • .lj• *A,* • 6.11.,

(b) A, 8I ' =16'*A,* =24-A, =32

(e) *Ai=* 6I ' *A.i* -=12· AJ-= t8" *A-1* •24.

(d)A, =:1*i* =sl. Ao Ao· 12· *A..*=16

28. If *dr* =!:, then eqnal to

hic-i,cx-1 6

{a)log 2 (b)2 loQ: 2

{c)3 log2 (d)4la«2

19. Equation of the tf'ngents from the. polnt(3, -1) to the ellip.. = 9y' =318

lal2t-3y-3 :0 (b)2. • 3y-3 =0

Cc)2.t +-y-3 =0 (d) Nooeo.rt.hese

30. 1be po1.tUon vedoN! of Uut v@rll«\IJ *A, B. C* uf u letr8.hedron *ABCD* are i, J+ i l and 3i rc,ipectJvely aod the anuude rom the vertex *Oto* the oppoatt.(o face *ABC* meets the face otB. lf<heleugtb edgeED la 4 11.nd volu..tne <>C the tct.tahcdrM i& 2, then he length of *DE* is

(all lb) 2 <cl 3 Cd)•

31. If Sand 8 ore fool of the ellipse a' + = L Il I• the end of the minor B.Xi.& and *BSS* is an equilateral Lri.angle, then the eccentricity of the ellipse

(2 Cb)! 3 (c)! 4 Id)! 5

3.2, The equation of the ctrele J)a.slri.ng through the point (4.6).-nd wbOi;Odiam&t.er&a aJongx + 2y -6=0and 3,-,-1-01,

(a).< 2 • ,'-2x-6y-20=0

(b)x'• ,r-6x 2y-20=0

().Jt2 - ?-2x -•y-20 =0

ldl•' i :/-4r-2y-20:0

l.3. In a parallelogram *AllCD,* Pis Lhe mid-point. of AD. Alio, *BP* and *AC* interaect atQ. Then *AQ :QO* is equa!

Wl:8 Cb)S:l (<)2,1 td)l:2

J,. Tho med.Ian *NJ* of &|*BC* la bloooteil a,. *E* end *BE* I• **AC** In ***F,*** ,hen AF: ***F'C*** •• •

Cb)2:I (c)l:2 Cd)3:l

lS. Let p;rl be a quadratic polynominl 8Uch lhqt p(O) • L 11 p(.r) Je.a,·ct remainder 4 when divided by *x* -1 o.nd It lieavo1 rtma.1nde.r 6 whoo dh1dcd by *x* + l, tbcn

lo)p(-2)•!1 (b)p(2)•11

le)p(2)al0 (d)p(-2)• lO

36. The lAl18(,n\ , th• potnl (2, -2) 10 Che curve x',* -2< • 40 - ***,v)*** d... not 1,a88 iltro"gb Ibo poln,

(a)(-2.- 7) (b)(-4.-9)

(<) t, I/3 Cd) (8. 6)

31. The in j,/1 *d,* (0<.r <teig cra2cbbe(c0tie< +oolx) lJa whereof integration) is equal te

CaJ21qi(;1ni)+c (b)21og(oooi)+c

(el4lcwi)+c (d)4log(stni)+c

38. If all the words wu.h or wit.bout meauin.¥, are written osini: the Ieners of the word QUEEN and are arranllf'(l .. 1n English dictionary, then the position of lhe wonl QUEEN ts

la) 47th Cb> 44tll Ccl 4Sth (d) "6th

39. Tho cune. ••b.tif.n \he atffL'renbal equation. *yd•-(••* 3,'ldy •O and P""n& through tho p0int (I, l) alao •• through the polt>t ..

(•>(! !) 4'2 (b)a(!_!) ... 2.

(<)(-.! .!) 3 3 (d)(! _!) a· a

,n li *Jai* -3 tn K{u.ai' to

-i ,rzx-• :· ti>)

(ol § **.ti** 2

Ce) 2 (dl *Jz*

41. The wm. ofintmife te:nn& of decreasing GP is equ.a) the greates:L va1uesofthe fund.ion ***f(x) ,=x****8* + 3x-9 in the interval (-2, 3 J and the difference between th fint two terms is *rc0.* Then the common rane -Of the *GP* ls

(a)-- 2 23 (b)! 3

le)- e Id)-- • S

42. Number *al* onto (mrjedi\'e) fuAC'UOr\ hm *A* IO *B* lf "CA) =6 and n(B) •8 ls

(a}2 1 -2 Cbl3•-a (d340 td)!MO

43. lrJ•l<.f.f-1,wn1;.-2..,o•C1liB

(a)te...than2 O,l./3•1

(cl ,/3 -J (d)No.. or.h...

.U, A computer produdnc factory hat only twe plant.a *1j* end *1;.* Plant *1j* prod.uew 2C)II; and p1ent. 7j pr<iduoo1 80\0I or "•• «>lal comput,r produced 7... or th• computert Pf'O(IONod ln be fii.ctory mm out LO be dfcetlve. It •• k.nown th•t .P(to,m.pu1.er t.wn8 out 10 l.he defetlhe given th.st ii, I& produced in planl. 1;) • lOP(coinputer 1.umeouLt.o be ddcc:Uvc gi\1bt1 tihul (I produced.u, plant *T,* A compu r produced In the fod.ory ,11 randomly ee.ki,c«.!d. and Its does nolum oul t.o the dert.,cth·o. 'Tben, the probah01t7 thaLrt t. prOdd bl. pl

(o) 86/73 (b) 79 47 (e) 78/93 (d) 76/83

45. >0.B >0andA• *B=i,* then the mirumum value oftanA+tanBi.

(ah'3 1i l'i. (bJ4 -2.Jii

(el Cdl 2 -./3

46. The mean o(6 OibHrva.Uo£ 5 and th ir varlanco is 12-L If three of IMoboeM•,ntoos are 1, 2. 6, then the mean devia.tto.n from the mean of the data is

(al 2.5 Cb)2.6

(cJ 2.8 Cdl 2.4

47. Io a beauty ccntest, bait lM number of exp,,rts voted Mr. A and two-third *voled* for Mr. B 10 voted for both and 6 did not for either. How many experta were there te all?

(a) 3 (b)36
(cl 24 (d} None of the..

48. The value of k'a!ar o.and Osuch that for all non-cclltnear vectors o.and *bSU<:th*at.
rda + 2bl -tl(4b-a) =O,.

(a)a =0.=0 (b)a=-2.P=-3
(c)a =l,=3 (dla •-2.P=3

49. A foreu of 78 grams aces at the potn1 (2, S. 6). TM direction ratios of the Ilneof nctaod bet.ng 2, 2, L The magnitude or Its momentabout the line **joiniog** the origin to tho paint (12, 3, 4). ;,

(a) 2 (b)-136
(cl 36 (d) 0

50. Number of real solution of the equation sin(ex};;5x +5·• 1$

(a) 0
(b) l
(c) 2 (d) lolloiteb' maey

[Analytical Ability & Logical Reasoning)

51. Whkh one or the given opuons fits coJTCCtly *IDt* blnnk space !M>that *tht* pattern it maintained?

S 4 6
25 2 493 ? 3

(a) 49 (b) 6'l (<)81 (di 100

51. Statement I Out *ot* t.otal of 200 i'Md<tS, 100 read Indian F.xpreu. 120 read Tim .. of Indio •nd 60 read Hindu.

Stooment rr Out. Ola<>UI 200 roade,.., 100 read Indian £J<pru1,121 roads Tim .. orlndi.a and 60 road notthor.

1wvcyod)N>Ad beth

lo) The quenlon con be an,--,d w;.i, the help or Siocemcnt Ileee,

lb) Boil,. Stotoment I and&•....,. .. , 11.,. nooded co 4Ul8WCfc.ho qutetaon.

Ce) 1'be quee,Uoo can **be** wlth the help or Sta.t.ew•nt *l* alone.

(d) The qui!:!!tlon **tan.DOE** even **with** Lhe bc]p of both I.he fillten'l@nta

53. lf137 + 276=435, bow much i•73l +672?

(o) 534 (b) 1403 (c) lffl (d) 1531

Dirootion (Q. No. 54) *Stud:, the ln{onna,n co.refu/Jy o.nd answer the* ***quu.tlo11s gi(,Vl*** *below.*

54. U we arrange the alphabela w the word•RATE" in the En.gli•h alphabetical order. word •A.f:RT" is fonncd. Then the third alphabet m,m 1he left in thio word in "R". Similarly, from the word *OPEN' we got "ENOP" and the third alphabet &om leflci.s --o". Prom the word "CHEF' we get - "CEFH" and lhe dw-d alphabet from left is "F". From tbeword '1'\.;R"we get- •ER'J'Y'' and the third alphabet m,m left ia "?. From tho word "TOY" we get- •orr and lhe third alphabet from left.

is "'Y"'. lr use all these letters, then ca met1ningful English word "YORTY" can be formed.
Now, lind which of I.be followtng ward set doea not give a mcaningf\11 word tn thie. similar wa_.J

(a) SAME, RO<)M, BEST, AUTO
(bl COAT, PEST. WA'M', ARMY
(c) MALE, FIND. 1,0ST, THAT
(d) JUMP, LIME, DUMB, SOME

55. Novjlvon Exprc•• frorn Ahm<dobod t.6bennai loo,-. Aluncdabud at 6:30 AM and trovels 11 60lanph **tow11rd11 Dorodn** alnu.u.ea **away 100 km 00 AM** Howroh • Al1m,'<lnbod E,pn,M le1"'Baroda AJ,mcdabod and truvel• at 40 im>pb At 7:30 AM Mr. Shnh. I.he tm(l;c 00111.rOIJ<r aBaroda, rtall..,. lhot buch <he lruln1 are running oo tho oametrack. I luw much Umo doo1 he 1ave to a,;tn. *o* head on **coJJ1ttt be**tween **1hc** two tmln1?

(u) 15min (bl 20 min (c) 2S aun (d) 30 aun

56. lf A, Buod Cure sete, th•n(A -(8-C)equala

(o)(A-D)v(AnC) (b)(A-8)-C
(cl(A-nln(A-C) (d)(A-Blv(A-C)

57. Some friends planned to ccnl.r!bu «1ua!b10 Jolnlly buy u OD player. l:lo-wever. **Lwo** o.r lhem decided t withdraw **nt. the** Wit **minute. Ali a** result. **e.ch c** bad to shell out. *one* rupee more than what they 1>lauoed for. If tbe prioo (In {) o(the CD playu ts an Integer between 1000 nod 1 lOO, find the number of friends who actually contributed

(o) 44 (b) 23 (c) 21 (d) 46

SB. Two liquid ***A*** and ***B*** are in the ratio 5 : 1 in container **J** and 1 : 3 in container 2 ruped:ively. **ill** what ratio should the eonteut, of the two containers **be** mix as to obtam a mixture ***of A*** and.Bin the rauol: I?

(a)2:3 \b)4:3
(<)3:2 (d)3:4

59. In llvt flats., eee alxwe the other, live proresmon:als. The !AS officer friend and bu tnJtineer whose flat lives the pro(eaor'& friend. From the ground noor to the top 0-. In what onlor pro(ee.sionaJa llve!

(a) En;,n-. p,-or-,doctor, IA$ oCf>«r, Ml.A
lbl P,or...., .•...,_,doft«. IASofflcor, MIA
(c) lAS oflictr, .,,,,_,, doctor, pni(ct00r. ML\
!dJ Pror-,. tlljllnttr. doct.... Ml.A. IAS .moor

60. Fro1b grapo1 contoln1 Wllter by weight while dried grape1 OOnt.aln 20li water by "'lihL l Ll the wt!ght of dry grapoo anllable Crom 20 kg offruh gropoo?

(ol 2.5q {b) 2.4 lqi
(c) 2 kg (oil lOkg

Directions (Q. Noo. 61 and 62) ***Anllcu*** *tM* ***qumlon,*** on *the basl, ofth• informotu>n 81"'"* ***l>tlow.***

A, B, C, D. E and P are a group ***of*** mends. There are two beusewtves, one professor, ooe en.gknttr, one accountant and one lawyer lo the group. There are onJy i:wo married couples in the group. The lawyer- is married to 0who housewife. No woman in the group ts either an engineer or an accountant. C, the act'OU:ntanl. is married to F, who is prefesser. A is married toa housewife.Eis not housewife..

61. What is E's profemon?

(a) Acc:ountant (b)l.awyer
(<) Prof....,, tdl £,,gineer

62. flow many members of the group are malH?

(al 2 (b)a
(c) 4 Id) Connot be determined

63. Find the W!"OnC number in •Htri.. 7, 8. 18, 67, 228, 1166, 6996

<•)228 (b) 18 (c)67 (di 8

Dlrectfon, (Q. Noo. 64 aod 66) ***Eacli of*** *th,* ***qut,tfon1*** *gtr.,.n btlow con,t1l1* ***of*** *o ttoJtm a.Ad /or* ***q*** *ut1llon and tu:o,uatcmant umbtred 1 and lg wn bdow II.* Y°" *haw* ***t.t>*** *declchd wh,th,r th• dato P"'"ldtd In ,,,. 11<,um,ntl,I Iii/an. 1u/ficltnl* ***U>*** *on1wtr lht* 81l¥n *qu,1/ion. lltod J.M. both tlOltntC'nta and*

Qjve answer (U) if the data in Statement 1 alooe are .sufficient to anawer the questloo" while the date: m St.at.ement U alone are not 1>Uffic:ieot to answer Lhe question.

Give aMWeT (V) if I.he data in Statemto.t. U alone are aufficlt:nt to answer I.he question., while tbe data in Statement I alone are not suflident *to* answer tbe question.

Gl\·e answer (W) if tho data either in Statement l or in Statement D alone are sut"D.clc:nt to answer the question.

Olve answer (X) i.f the data Is both Stat.ements 1 and Ir together are not sufficient t.o answer the Question.

Give answer (Y) if the dnt.a in both St.atcmentfl I and U together are neceasary t.o answer the question.

64. How much t1mo will tl,e leak take to empty tho full clatern?

I. The ciBlem I• normally Riied in 9 hn,

11. It take, one hour more thon the usual u lho ci•tcm h«nuao orn leak In th• boitoro

(a) V (b) U (C) x (d) Y

65. I low long will IL tnke lo omply tho tonk If both ihe Inlet pipe *P,* nnd ihe outlet pipe *P,* ere opened aimultnneously'f

1. *P.* co.n fl.ll the tonk io l6 minute&
11. ***P,*** con empty tha full tank lo 8 minu .....

la) X (b) U (c) Y (oil V

66. How many posl.Uvo l.tttogor le,:is than 10,000 are s thaL the product or their digita u, 210?

(•) 36 (b) *42* (c)48 (di 54

67. Each ***o(*** the five poop!• K, L, M. P and Q is or a different woighl It is known that the nwnber ***o(*** people heavier than P ls the same as the number of people lighter than Q. L i• the heaviest and K is oot the lightest. Who is the lightest?

(a) M '(bl L (c) Q (d) P

68. John. Johny and Jtinnrdan partidpated tn a race and each won o different medal umoeg Gold. Silver and Bronze, not ncccssnrily in thaL order. Each penon among them giVt'!A two replies to any que1tion, one ***o{*** which Ii true find the other ti fahie (in any onler).

When asked about tho dctoll1 or medals obtolned by them, tho following were their replies :

John : I won ii.he Oold modal. Joh.ny won the Bronze medal.
Johny : John won Lbo Sliver onedol. I won 1ht Gold modnl.
Janardun : Johny won Lha Sliver modal. l won the Gold medal.

Wbleh nntong the following 11 tho con-eel order of tho people who won thoGold medal, the Silver mQdaJ and Lhe Bronze Jllod[tl, respe,ttively.

(a) John. Johny, Janardan (h) J.:inardan, John. Johny
k) Johl't.)'. Janardan, Joh.n (d,) Ja.o.ardan, Johny, John

69. Bach of ***A, B,*** and C is different djgit amoog 1 to 9. How many ditTerent value-& of the IWlll of ***A, Band C*** are poosible it *AIM, AA =ACCA?*

(oJ l (b) 3 (c) 7 (d) *8*

10. In a certain code language, if the won! 'BASKET ts coded aa ·UFL' !'BC', ,hen how is the wvrd 'SIMPLE" coded in that language'?

(a) FMQNJ'r (b)FMQGNJ

(c)PMQNJH ldJMFNQTJ

71. A grocer sells half of the egg& that he bas and another half an egg to Anurl!J{. Then be ◆II• half of the balance 6gg and another hair an egg to Dttpak. Then he ,;ells hair of the belanee ejtp and another half an eggs to Shtvaru. In Lbe end he it ten wtlb JU-'1. 7 e,ggs and he c;laim8 that he never brob an ea. How many epR did he 1U1rt. wllh'>

(al 60 (bl 63 (cl 67 (d) 69

72. Thol'O urc 01gtn potu, nt1mC1ly 0. P. Q. R. S. U. V a.nd W. In rospett or whom quctt1on nre bean,r uktd in the 4.\XtlffU.I'lt\IJOU, 1'hC RrtL (our ate AnatnI pottA and the 11131 four urc rnodcrn p◆LII The qutt:uon on ande:nt 11.nd modern 1>C1Cl8 I& betng a8ked In alt.t.m.te ,..... . Those who llko W o.1111> V, thOff who 1111.t S hh R al.lO. Tho Lut) aT • ◆ffl◆n eKam.ner who 1ked que1Jtion ll.ke S. Wl\l asked on U. consideration thtee r3cu.on whJch poet the queetton ia mos\ ltktlY lo he asked thu year?

(a) Q Cb) R (<IS fdl V

73. A team mu.st be seleesed rrom the ten probable players. A. B, C. D, E, P. C, H. I and J are forwarda. B, G and Hare points guards and D. F' and I are defends.. The t.e.a.m must have at least one forv..•ard. one point guard and one: defender. ***IC*** lb.e team indudes J. 1t must also include F. The team must include E. The team roust include exactly ene a mong C. C I and F (remember members of the same game. D and H cannot be on the team at the same time. The pair of t1. include both A and O or neither of th◆m. There Is rio restriction on the number of membe:r 111 the ◆.am. What could be the maximum uze of lhe team t.htt.t include *a·,*

(a)◆ (b)5

(c) 6 fd) "'o" lhan 6

74. Haw muny 4 digit riu01btra am be formed from lhe dlgltM 2, 3, 5, 6, 7 und 9. wh,chare d"'Cllbl• br 6 and u, eaeh ot.he.r but not on the ten, neno of the dlgite u, reptoied'>

(0)216 (b)GO f<)2A fd)26

75. P, O. R, S. T and U are 6 members of family in which there 81'8 two married couples. T. a teacher, ,a marncd to a doctnr who ia mutherofR and U. Q. tbe lawyer. i.11 married t..o P. P has one ecn and oo.e grandson. Of the two married Indies one is a hou.sew.afc. There1$ also one student and one male engineer m the f,amily.

Which ***o(*** c.he follov.ing 18 true about the granddaughter of the family?

(a) She is a lawyer Cb) She is an en.giooe:r

(() She is a student. (d) She 1s :l doctor

76. L All ehtckens are birds.

2. Some chickens are hens.

3. Female birds lay eggs

If the above three statements are facu., which ***of*** the following statement must also be a fact?

I. All bird• lay egg,,

Tl Some hena are birds

111. Som•t her)& are chickens

(hi II and I rl only

(c) I, 11 ond Ill

(d> None ofLhe 1totement111 ◆c.nowrffl

77. 'T'hc number- LhatcOm<'i neiL lo theaerh'.u, l. 2. 3, 6. 1 20, 37, 68 .....

(o) >06 (b) L24

ft) 1◆5 (d) l2ll

18. Using only t, 5, 10. :!5 und 50 plll1e coin. the ,-11 .. number of coin rcqwred I.ti pay uactly 78 paj&e. 69 paJse and t 1.01 Lo three different pert0ns W

fa) 17 (1>) 20

(c) 19 (d) 18

79. What. pa.Ir comes next i11 the foUowin.g seque:oOf' 99. 90. SS. 78 ....

(a) 75, 7.t (bl 69, 57

(c.◆67. 59 fell 69: 63

80. A dealer offers a cash discount of◆ and m11 makes a profit of 20% when he (urther allows 16 articles to a dozen to be charged for the price at which he has marked the articles?

(b)SOO.

(d) 6611,

Directions (Q. No•. 81.a:ll *R,ad th• {ollow,"6 tnformatton ccmtfully a,nd tJn,a◆r tht* ***q1"$IU3*** *bo#d* on *u,*

Twelve cla.. ono,oe A. B. C. D, E, F, G, H, I, J, Kand Lare 11n1ng on a square tnble wtth 3 pcrtone on each ••de. ABC a.nd OJK ore aitUng on opp06lta a,du, A and Lare •dJace.n1. aide but. not 11djr1ccnt to each other. K l1 eitUng diagonally oppo11te to C.

Bl. If P Is el<<l◆g between D ond E, who la .,lllng •• tht dcl1 of K?

ta) H fbl I

{r) H or I (d) None of1heet

12. If H 1s sitting betwe,on L nnd F, theo hewdl be fanng

(al O fb) E (c) G fd) I

83. ff G and E are racuig C and H ◆peclh·ely, the neighbours of Kare

Ca)J and H (b)J and E

(dB andJ (d) Ha .◆

84. The integers 34041 and 32506 when divided by a 3-digit integer n leave the same remainder. What is the value of n?
(a) 289 (b) 307 (c) 367 (d) 493

85. The number of solid spheres, each of diameter 3 cm that could be moulded to form a solid cylinder of height 54 cm and diameter 4 cm is
(a) 16 (b) 24 (c) 36 (d) 48

86. A clock is set right at 5 A.M. The clock loses 16 min in 24 h. What will be the right time when the clock indicates 10 PM on the 4th day?
(a) 11:15 PM (b) 11:00 PM
(c) 12:00 PM (d) 12:30 PM

87. A train overtakes two persons who are walking in the same direction in which the train is moving, at the rate of 2 kmph and 4 kmph and passes them completely in 9 and 10 seconds respectively. Then length of the train is
(a) 72 m (b) 54 m
(c) 50 m (d) 45 m

88. Decide which of the given conclusions logically follow from the given statement(s).

Statements
All suns are moons.
Some moons are planets.

Conclusions
I. All moons are suns.
II. At least some moons are planets.
(a) Either conclusion I or II is true
(b) Neither conclusion I nor II is true
(c) Both conclusion I and II are true
(d) Only conclusion II is true

89. Ten points are marked on a straight line and eleven points are marked on another straight line. How many triangles can be constructed with vertices from the above points?
(a) 495 (b) 550 (c) 1045 (d) 2475

90. The greatest number which on dividing 1657 and 2037 leaves remainders 6 and 5 respectively, is
(a) 123 (b) 127 (c) 235 (d) 305

Computer Awareness

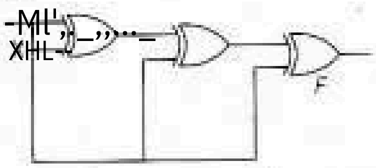
91. In IEEE single precision floating point representation, exponent is represented in ....
(a) 8 bit sign magnitude representation.
(b) 8 bit 2's complement representation.
(c) Biased exponent representation with a bias value of 127.
(d) Biased exponent representation with a bias value of 128.

92. With 4 bit 2's complement arithmetic, which of the following additions will result in an overflow?
(a) 1111 + 1101
(b) 0110 + 0110
(c) 1101 + 0101
(d) 0101 + 1011

93. If we can generate a maximum of 4 boolean functions using n boolean variables, then what will be the minimum value of n?
(a) 65536 (b) 16
(c) 1 (d) 4

94. If the 2's complement representation of a number is $(01010)_2$, what is its equivalent hexadecimal representation?
(a) $(10)_{16}$
(b) $(1A)_{16}$
(c) $(16)_{16}$
(d) $(26)_{16}$

95. For the circuit shown below, the component of the output F is



(a) 0 (b) XY (c) X' (d) 1

96. If N is a 16 bit signed integer, the 2's complement representation of N is $(F87B)_{16}$. The 2's complement representation of $8*N$ is
(a) $(C3D8)_{16}$ (b) $(187B)_{16}$ (c) $(F878)_{16}$ (d) $(987B)_{16}$

97. The base (or radix) of the number system such that the following equation holds $312/20 = 13.1$ is
(a) 3 (b) 4 (c) 5 (d) 6

98. Which of the following is wrong representation of $(D4)_{16}$?
(a) $(4A1)_{16} - (158)_{16}$ (b) $(441)_{16} - (711)_{16}$
(c) $(15C)_{16} + (6D)_{16}$ (d) $(1E6)_{16} - (A7)_{16}$

99. How many Boolean expression can be formed with 3 Boolean variables?
(a) 16 (b) 1024 (c) 32 (d) 256

100. In an 8 bit representation of computer system, the decimal number 47 has to be subtracted from 38 and the result in binary 2's complement is ....
(a) 11110111 (b) 10001001
(c) 11000101 (d) 01110001

[General English J

101. Choose a phrasaJ verb replace the explanation in broctets "wemust<be quick) or we'll be late for school".

la) ae< up (b) burry up
(c) fasten on (d) speed in

102. Ann-e had to pay for everything because as usual, Peter b1s wallet at home.

la) had left (bl wns leov1ng
(cl ltft (d) leave

103. Extreme old are when a man I>oht1vc1:1 hkc a c:hild.

(a) lmbec1h,y (bl Seolll<y
(c) Ooute Cd} SupcrimnuaUon

104. Identify tho word Lhat. mcun o11.o try ,u:hfeve ill ,omet.htnr In difficult cl"1u0>$1.0nceo deoplle or M!tbocks" (b> PerAcvuro

(a) Per1uade
(c) PitC\W"MQUfl (d) Peepeeuve

105. ln the (oUowing a purl. of t.J1e sentence it u.oderlined. four d.afTerent. wt1y• or phrastng the underlined part are tndlcoted below. Choose the be&t alternative among the *(our* e:hoice given.

When he entered the house, it was at. sixes and seyens.

(a) It was six O'clock when he entered the hocse,
Cb) Inmate$ were eulogtsed when be entered.
(c)Hou.156 was in pandimonium.
(cl) House was blissful.

106. Fill in the blank choosing the correct adjective : The phoenix la a .....- Bird.

(a) My,.hieal (b) E:thic•I
(c) Natural (d) Comivcm

101. Which of the followmg is the correct passive of the .. nunce •JOHN HAS EATEN THE: APPLES?•

<•> The applet are being enten by ,John.
Cb) The applet an eatto by ,John.
(d The apple• h•ve been coton by John.
(d) 1be applet will bl cot.en by Juhn.

10,. Choo&ono or Lhe •Nonie Lhat ie most uoorlynmcat meaningoftbe gtv•o ***word*** lndemnify,

(a) lnaure (b) Ccmpenaate for loes
(c)A""u"' (d) Sure for damage.

109. Stied. a word from the given alternative.a which hne the same meaning as the underlint!d word.

He baa a propen§:ity for getdng into dtbt.

(a)Teodeney (bl Aptlludo
(t) . (d) Quality

110. Select lhe most swtable synonym from the given ebciees Cor lhe word : ("ANTEDILlJVlAN"J

(al Recluse (bl Mav,nck (cl Atdw< (d) 8"11Jcoee

111. Select lhe most sultable anu.nym from the given choices for the weed : rs.ANGFROID"J

(a) Equanimity
(b) Steadineu
(el Aplomb
(d) Turbulen<e

112. The ***word*** PIN i1used ,n fourdirrereni w•y•. Choose the option i.n wb.lch 1he uug:e oft.he word 111ncorrec or inappropriate.

(a) Sh• combed her hair backward. and Heu.rod it wftJ • pin.
(bl Jook IIMINCt<I "'gn1b lhe thi<!rand pln him •S thewtll until lhe pola arrived oo cbe ooone.
(d It UJnprude.nL t.opln ,-our hopes on 110mex>ne to he you out o(th1.111tuataon.
(cl) You can't pin tho l>l8JM •• t.nYO•• without verifying C.. ...

113. Pick lhe most appropriate !iubstit.ute to t.bo capitaliud word In the following sentence.

The weapon i:napeccor''s report was not expected to provid• lNCONTROVERTlBLE evldenee of weapons of mass desuuccion..

(a)Condusiw
Cb) D!Jpuiable
(c) lnc:onvenienl
(d) Indecisive

Direction (Q. No. 114) /11*the 1tn.Untt* giw.n *below o port ofunten«* i.f *unduli11ed. Four di/fen.nt* "'-'OJ'S *phrasing lM u11derliMd part an indimtrd aa four chaittJ.. Choose the Mst alumallvt end ma.r* ll4 •ponding lett•a, your nn,u'f?,r,* in

114. A nation it built not by lmalotJoa bus by et.imnQ'l &.he bCill:tl of lht RC:SUdC.

(•l By loe!tlali<ln and bul)lrailon.
(bl Not by laWI bu, b), the uctumentoft.ho pcoplo.
(<)Bylaw ond b), U>OUnJ ***cbo*** people.
Id) Mo"' by 1he-lon In the hNIU or ,ho poopl• reee byl•-

115. Select lhe mooL awtable 1ynooym for the underlined word in the i,entence.

AU the member8 or organiption eepreesed impl oppos1Uoo &o the move.

(a) Indlgn:aot (b)Adamant
(cl Unified (d)Qu-

Directions (Q. Nos.116 and 117)1'hereantwo ***1,/qn,b In*** *the sentences gilJ'tn below. From tlr* ***pain of*** *worda gie>e:n be.lowthe sen.um«, c.hooeM pair I.hat* ***fill•*** *blank* ***me.f appropr fr1tfly.***

necessary of year, if necessary alone. At any rate. thaL what. we are going to try ro do tha, ts resolve of h Majesty's OovernmenL-every man of them. Thal. is the of Parlfament and the nation. The B'ritiah Empiro and

116. Private compani.. •upplying 'breakfuL cereah' have French Republic linked together in thetr eause and In t 1tt.Ar1,ed tk agriculture tn poorer counu1ea. need, will defend to the death their nauve SOil, aiding e This hos tho spectre ofland gn,ho and poUtlcal other like good comrode1 to tho uLmost ***of*** their 6tNO conflicts. Even thought Jorge Lrac:UI of Europe and roan_y old an ramoua swtay hnve fallen or may faU into the grip of u. Gceta!)D ond all the odrout opporntue or Nod rute, we aha noL Rag or fall. We shall go on to the Prance, wo •holl Oght on tho oeu.

(n) S1><mdhlJl, lntendlflod.

(b) Oonllng, lnfloWtd

(c) Proughing, tnero<ue<I

(d) Inve8Uhig,ot1ed

117. UM! the opproprlal<l phrnlltll "trb and complete the eontence given below.

Tho new aystem In education ht aimed al •..... the dlfferonc:e:, between thrich and poor.

(a) Goof uround lb) Evening OUL

(c) Glosstng over Cd) Gi-ve'-er

Direction (Q. Nos. 118-120) *&ad th• fo/lowi"IJ pauage end aMwer* ***the*** *given. qu.e,.t.i.onJJ.*

I have myself, full confidence tha, if all do their duty. of nothing is neglected, and if the best. a.rrsngements are made ea they are being made, we shall preve ounelvu once again able to defend our island home, to ride out storm of war and to outlive the menace of tyranny if

118. WI1at doo•t.he term ride out the at.orm mean?

<•) Ho.ndl• • crl•I• •uOCUAfully

(b) l{ldo lh>m u •t<>rm

(c) HJdv In sonic l)laCQ where 011e cannot be found

(d) Ride on bout at the tame a storm

119. What does subjugate mean?

Ca) Surrender (bJ Compare

(c) Control (d) Ahandnn

120. "That is die resolve of his &I,,jesty'a Gon,mment' What 111 their resolve?

(a) Surrender l;o the Nazis

(b) Negotialb with Lhe Nam

(c) Run away from IJte Na.2.iR

(d) Fight t.he Nazis

Answers

M•them•tlcs

1. (d)	2. (0)	3. (d)	•• (b)	5. (a)	e. 1•1	7, (OJ	8. (d)	9. (b)	10. (c)
11. (b)	12. (I)	13. (a)	14, (c)	15. (I)	16. (bj	17. (o)	18. (a)	19. (d)	20. (I)
21, (C)	22. (b)	23. (&)	24. (d)	25. le)	28. (d)	27. (b)	28. (b)	29, (b)	30. (b)
31. (8)	32. (c)	33, (d)	34, (CJ	3$. (')	38. (8)	37. (0)	:Ji. (C)	39. (I)	40. (d)
41. (c)	42. (cf)	43. (1)	.... fc)	45. (b)	46. (c)	47. le)	48. (0)	49. (b)	50. (I)

An•lyllcal Al>8llty Loglc•l Reasoning

51. (b)	52. (o)	53. (c)	154. ld)	55. (b)	56. (a)	67. (d)	SB. (d)	59, (d)	eo.<o>
81. (d)	62. (b)	83. (a)	.... (dl	SS. fc)	88. (d)	67. (a)	ea. c•>	69. (C)	70. (a)
71. (b)	72. \b)	711. (C)	7... (b)	75. (Cl	76. (b)	*n.* (c)	78. (c)	79. (1)	80. (I)
81. (c)	82. (d)	83. (I)	···_ (b)	85. (d)	86. \b)	87. (C)	88. (d)	89, (cl	80. \bl

Computer Awaren•sa

!tt. (c)	92. (b)	93. (c)	94. (d)	95. (a)	96. <•)	97. (c)	98. (b)	99. (d)	100. ta)

General English

101. (b)	102. (c)	103. (C)	104. \b)	105. (C)	HJ&. (a)	107. (c)	108. (b)	109. (>)	110. (c)
111. (d)	112. *(d)*	113. (a)	11 ...(<I)	115. \b)	118. (di	117. (b)	118. (a)	119. (C)	120. (di

('> No anyi;jven optloo lsC<>l't9Ct.

Answer *with* Explanations

Mathematics

1. *(d)* Given, $x^2 + y^2 = 16$

Centre $(0, 0)$, $r_1 = 4$

$x^2 + y^2 - 2y = 0$

$(x - 0)^2 + (y - 1)^2 = 1$

Centre $(0, 1)$, $r_2 = 1$

Distance between their centres $= \sqrt{(0-0)^2 + (1-0)^2}$

$= \sqrt{0 + 1} = 1$

$|r_1 - r_2| = |4 - 1| = 3$

$C_1C_2 < |r_1 - r_2|$

∴ No common tangent.

2. *(c)* We have,

$$f(x) = \begin{cases} x \sin\left(\frac{1}{x}\right), & x \neq 0 \\ 0, & x = 0 \end{cases}$$

∴ (RHL at $x = 0$)

$$= \lim_{h \to 0} h \sin\left(\frac{1}{h}\right) = 0 \times [-1, 1] = 0$$

(LHL at $x = 0$) = 0 and $f(0) = 0$

∴ RHL = LHL = $f(0)$

Hence, $f(x)$ is continuous at $x = 0$

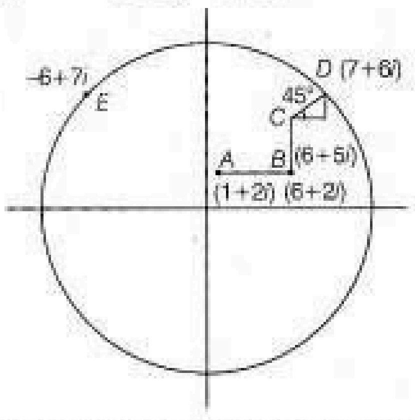
Again, RHD = $\lim_{h \to 0} \frac{h \sin\left(\frac{1}{h}\right) - 0}{h} = \lim_{h \to 0} \sin\left(\frac{1}{h}\right)$

$\lim_{x \to 0} \sin\left(\frac{1}{x}\right) = \lim_{h \to 0} \sin\left(-\frac{1}{h}\right)$ and $f(0) = 0$

∴ RHD ≠ LHD

Hence, $f(x)$ is not differentiable at $x = 0$

3. *(d)* Given, $A = Z_1 = 1 + 2i$



Moving horizontally 5 units we reach at $B(6 + 2i)$, then moving vertically 3 units, we reach $C = Z(6 + 5i)$, then moves $\sqrt{2}$ units in the direction of $\hat{i} + \hat{j}$, we reach at $D(7 + 6i)$ and then moves through an angle $\frac{\pi}{2}$ with anti-clockwise direction, we reach the $E Z_1(-6 + 7i)$.

∴ The point $Z_1 = -6 + 7i$

4. *(b)* Given, $\Delta = a^2 - (b - c)^2$

⇒ $\sqrt{s(s-a)(s-b)(s-c)} = (a - b + c)(a + b - c)$

⇒ $\sqrt{s(s-a)(s-b)(s-c)} = (2s - 2b)(2s - 2c)$

⇒ $\sqrt{s(s-a)(s-b)(s-c)} = 4(s-b)(s-c)$

⇒ $\frac{1}{4} = \frac{(s-b)(s-c)}{\sqrt{s(s-a)(s-b)(s-c)}}$

⇒ $\frac{1}{4} = \sqrt{\frac{(s-b)(s-c)}{s(s-a)}} = \tan\frac{A}{2}$

⇒ $\tan\frac{A}{2} = \frac{1}{4}$

Now, $\tan A = \frac{2\tan A/2}{1 - \tan^2 A/2} = \frac{2 \times \frac{1}{4}}{1 - \left(\frac{1}{4}\right)^2} = 8/15$

5. *(a)* We have, first 30 natural numbers.

Two numbers are selected a and b such that $a^2 - b^2$ is divisible by 3.

$n(S) = {}^{30}C_2$

∴ $a^2 - b^2$ is divisible by 3

∴ $(a - b)(a + b) = 3m$

If $(a - b)$ is multiple of 3, then $a - b$ is multiple of 3

∴ Such numbers are

(1, 4, 7, ..., 28), (2, 5, ..., 29), (3, 6, ..., 30) are possible.

∴ ${}^{10}C_2 + {}^{10}C_2 + {}^{10}C_2 = 45 \times 3 = 135$

$(a + b)$ is multiple of 3 then ...

Such numbers are possible

((1, 2), (1, 5) ... (1, 29), (2, 1), (2, 4) ... (28, 2) ... (28, 29))

Total $= 10 \times 10 = 100$

Total number $= 135 + 100 = 235$

∴ Required probability $= \frac{235}{{}^{30}C_2} = \frac{235 \times 2}{30 \times 29} = \frac{47}{87}$

6. *(d)* The man is one step away from starting point after eleven steps. This can happen in two ways:

(i) He takes 6 steps forward and 5 steps backward.

(ii) He takes 5 steps forward and 6 steps backwards.

∴ Probability of first case

$= {}^{11}C_6 (0.4)^6 (0.6)^5$

Probability of second case

$= {}^{11}C_5 (0.4)^5 (0.6)^6$

Hence, required probability

$= {}^{11}C_6 (0.4)^6 (0.6)^5 + {}^{11}C_5 (0.4)^5 (0.6)^6$

$= {}^{11}C_5 (0.4)^5 (0.6)^5 (0.4 + 0.6)$

$= {}^{11}C_5 (0.24)^5 = 462 (0.24)^5$

7. **(a)** Given, $W = pa + k$

$k = 48$, $a = 12$ and $W = 63$

$W = pa + k$

$\Rightarrow \quad 63 = 48p + k \quad$ ...(i)

$\Rightarrow \quad 15 = 12p$

$\Rightarrow \quad p = 1.25$

On putting the value of p in Eq. (i), we get

$k = -5$

8. **(d)** Given,

$$\begin{vmatrix} x & x^2 & 2+x^3 \\ y & y^2 & 2+y^3 \\ z & z^2 & 2+z^3 \end{vmatrix} = 0$$

$$\Rightarrow \begin{vmatrix} x & x^2 & 2 \\ y & y^2 & 2 \\ z & z^2 & 2 \end{vmatrix} + \begin{vmatrix} x & x^2 & x^3 \\ y & y^2 & y^3 \\ z & z^2 & z^3 \end{vmatrix} = 0$$

$$\Rightarrow 2\begin{vmatrix} x & x^2 & 1 \\ y & y^2 & 1 \\ z & z^2 & 1 \end{vmatrix} + xyz\begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix} = 0$$

$$\Rightarrow (xyz + 2)\begin{vmatrix} x & x^2 & 1 \\ y & y^2 & 1 \\ z & z^2 & 1 \end{vmatrix} = 0$$

$\Rightarrow \quad xyz + 2 = 0$

$\Rightarrow \quad xyz = -2$

9. **(b)** Given, $f(0) = 2$, $f'(0) = 3$

and $f''(x) = f(x)$

$\Rightarrow \quad \frac{d^2y}{dx^2} - y = 0 \quad [\because y = f(x)]$

Auxiliary equation, $m^2 - 1 = 0$

$m = \pm 1$

Solution of given differential equation is

$y = ae^x + be^{-x}$

$\Rightarrow \quad f(x) = ae^x + be^{-x}$

$f(0) = a + b = 2 \quad$ ... (i)

$f'(x) = ae^x - be^{-x} \quad$ ... (ii)

$f'(0) = a - b = 3 \quad$ ... (iii)

On solving Eqs. (i) and (iii), we get

$a = \frac{5}{2}, \; b = -\frac{1}{2}$

$\therefore \quad f(x) = \frac{1}{2}(5e^x - e^{-x})$

$f(4) = \frac{1}{2}(5e^4 - e^{-4})$

$f(4) = \frac{1}{2}\left(\frac{5e^8 - 1}{e^4}\right)$

$f(4) = \frac{5e^8 - 1}{2e^4}$

10. **(c)** Given, $a, a_1, a_2, \ldots, a_n, b$ in AP

$a, b_1, b_2, \ldots, b_n, b$ are in GP

$a, c_1, c_2, \ldots, c_n, b$ are in HP

$a_1 = \frac{a+b}{2}, \; b_1 = \sqrt{ab}$

$c_1 = \frac{2ab}{a+b}$

Now, $a_1x^2 + b_1x + c_1 = 0$

$D = (b_1)^2 - 4a_1c_1$

$D = ab - 4\frac{(a+b)}{2}\frac{2(ab)}{a+b}$

$D = ab - 4ab$

$D = -3ab < 0$

$\therefore$ Roots are imaginary.

11. **(b)** We have,

$\log_3(x+2)(x+4) + \log_{1/3}(x+2) < \frac{1}{2}\log_{\sqrt{3}} 7$

$\Rightarrow \log_3(x+2)(x+4) - \log_3(x+2) < \log_3 7$

$\Rightarrow \log_3\frac{(x+2)(x+4)}{x+2} < \log_3 7$

$\Rightarrow \log_3(x+4) < \log_3 7$

$\Rightarrow \quad (x+4) < 7$

and $\quad x + 2 > 0$

$x < 3$ and $x > -2$

$\therefore \quad x \in (-2, 3)$

12. **(a)** Given, a, b, c are in GP and $\log a - \log 2b, \log 2b - \log 3c$ and $\log 3c - \log a$ are in AP

$\therefore \quad b^2 = ac$

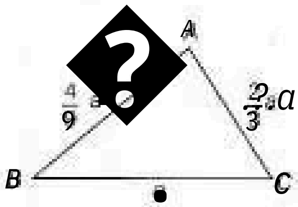
and $\quad 2(\log 2b - \log 3c) = \log 3c - \log a + \log a - \log 2b$

$\Rightarrow \quad 2\log\frac{2b}{3c} = \log\frac{3c}{2b}$

$\Rightarrow \quad 2\log\frac{2b}{3c} = -\log\frac{2b}{3c}$

$\Rightarrow \quad 3\log\frac{2b}{3c} = 0$

$\Rightarrow \quad \frac{2b}{3c} = 1$



$\Rightarrow \quad \frac{c}{b} = \frac{2}{3}$

$\therefore \quad r = 2/3$

$\therefore$ Sides are $a, \frac{2}{3}a, \frac{4}{9}a$

$\cos A = \frac{a^2\left(\frac{4}{9} + \frac{16}{81} - 1\right)}{2a^2 \times \frac{2}{3} \times \frac{4}{9}} < 0$

$\therefore$ Triangle is acute angle.

13. **(a)** Given, $x, 2x + 2, 3x + 3$ are the first three terms of GP.

$\therefore \quad (2x + 2)^2 = x(3x + 3)$

$\Rightarrow \quad 4x^2 + 8x + 4 = 3x^2 + 3x$

23. (c) We have, n men and 2 women

Total number of games played by men among themselves $= 2\cdot {^nC_2} = \frac{2n(n-1)}{2}$

$$= n^2 - n$$

Total number of games played by men against women $= 2(2n) = 4n$

$\therefore$ $n^2 - n - 4n = 66$

$\Rightarrow$ $n^2 - 5n - 66 = 0$

$(n-11)(n+6) = 0$

$n = 11$

$n \neq -6$

$\therefore$ Total number of players $= 11 + 2 = 13$

24. (d) We have,

$n(A_i) = 5, \; i = 1, 2, 3, \ldots, 30$

$\bigcup_{i=1}^{30} A_i = S$

But each element of S belongs to exactly 10 of A_i's

So, $\frac{150}{10} = 15$ distinct elements in S.

Also each element of S belongs to exactly 9 elements of B_j's and each B_j contains 3 elements.

$\therefore$ Thus n elements in B_j

then $\frac{3n}{9} = 15$

$\Rightarrow$ $n = 45$

25. (c) Given,

$$f(x) = \begin{cases} \ldots, & x \geq 0 \\ \ldots, & x < 0 \end{cases}$$

Since f is continuous at $x = 0$

$\lim_{x \to 0} f(x) = f(0)$

$\ldots = 1$

$a - 1 = 1$

$\Rightarrow$ $a = 2$

26. (d) Let $y = \frac{x^2 - x + 1}{x^2 + x + 1}$

$x^2y + xy + y = x^2 - x + 1$

$x^2(y-1) + x(y+1) + y - 1 = 0$

$\forall x \in R$

$\therefore$ $(y+1)^2 - 4(y-1)^2 \geq 0$ $\quad [\because D \geq 0]$

$y^2 + 2y + 1 - 4y^2 + 8y - 4 \geq 0$

$\Rightarrow$ $3y^2 - 10y + 3 \leq 0$

$3y^2 - 9y - y + 3 \leq 0$

$(3y - 1)(y - 3) \leq 0$

$y \in \left[\frac{1}{3}, 3\right]$

Hence, minimum value is $\frac{1}{3}$.

27. (d) Let

$I = \int \cos x \cos 2x \cos 5x \, dx$

$I = \frac{1}{2}\int 2\cos 5x \cos x \cos 2x \, dx$

$I = \frac{1}{2}\int (\cos 6x + \cos 4x)\cos 2x \, dx$

$I = \frac{1}{4}\int (2\cos 6x \cos 2x + 2\cos 4x \cos 2x) \, dx$

$I = \frac{1}{4}\int (\cos 8x + \cos 4x + \cos 6x + \cos 2x) \, dx$

$I = \frac{1}{4}\left[\frac{\sin 8x}{8} + \frac{\sin 4x}{4} + \frac{\sin 6x}{6} + \frac{\sin 2x}{2}\right] + C$

$I = \frac{1}{8}\sin 2x + \frac{1}{16}\sin 4x + \frac{1}{24}\sin 6x + \frac{1}{32}\sin 8x + C$

$\therefore$ $A_1 = \frac{1}{8}, A_2 = \frac{1}{16}, A_3 = \frac{1}{24}, A_4 = \frac{1}{32}$

28. (b) Let

$$I = \int \frac{dx}{\sqrt{e^x - 1}}$$

Put $e^x - 1 = t^2$, $e^x dx = 2t \, dt$

$\Rightarrow$ $dx = \frac{2t}{t^2 + 1} dt$

$\therefore$ $I = \int \frac{2t}{(t^2+1)t} dt$

$= 2\int \frac{dt}{t^2 + 1} = 2\tan^{-1} t$

$\therefore$ $2\left[\tan^{-1}\sqrt{e^x - 1}\right] = \frac{\pi}{6}$

$\Rightarrow$ $\tan^{-1}\sqrt{e^a - 1} = \frac{\pi}{12} + \frac{\pi}{4} = \frac{\pi}{3}$

$\Rightarrow$ $\sqrt{e^a - 1} = \tan\frac{\pi}{3} = \sqrt{3}$

$\Rightarrow$ $e^a - 1 = 3$, $e^a = 4$

$x = \log_e 4 = 2\log 2$

29. (b) Equation of ellipse

$2x^2 + 9y^2 = 3$

$\Rightarrow$ $\frac{x^2}{3/2} + \frac{y^2}{1/3} = 1$

Here, $a = \sqrt{\frac{3}{2}}, \; b = \frac{1}{\sqrt{3}}$

Equation of tangent of ellipse is

$$y = mx \pm \sqrt{\frac{3}{2}m^2 + \frac{1}{3}}$$

Since, this is passes through $(3, -1)$

$\therefore$ $-1 = 3m \pm \sqrt{\frac{9m^2 + 2}{6}}$

$\Rightarrow$ $(3m + 1)^2 = \frac{9m^2 + 2}{6}$

$\Rightarrow$ $6(9m^2 + 6m + 1) = 9m^2 + 2$

$\Rightarrow$ $45m^2 + 36m + 4 = 0$

$\Rightarrow$ $45m^2 + 50m + 6m + \ldots = 0$

$\Rightarrow$ $(3m+2)(15m+2) = 0$

$\Rightarrow$ $m = -2/3$ or $-2/15$

∴ Equation of tangent

$y = -\frac{2}{3}x \pm \ldots$

$y = -\frac{2}{3} \ldots$

$2x + 3y - 3 = 0$

30. (ii) The position vectors of vertices of tetrahedron $ABCD$ are $\hat{i} + \hat{j} + \hat{k}$, $\hat{k}$ and $3\hat{i}$

∴ $A = (\hat{i} + \hat{j} + \hat{k})$

$B = \hat{i}$

$C = \ldots$

$AB = -\hat{j} - \hat{k}$

$AC = 2\hat{i} - \hat{j} - \hat{k}$

$$AB \times AC = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & -1 & -1 \\ 2 & -1 & -1 \end{vmatrix} = \ldots - 2\hat{j} + 2\hat{k}$$

Volume of tetrahedron $= \frac{1}{6} \times h \times |AB \times AC|$

$\frac{2}{3} = \frac{1}{6} \times h \sqrt{4 + 4}$

$\frac{2}{3} = \frac{1}{6} \times h \times 2\sqrt{2}$

$h = 2$

∴ Length $DE = 2$

31. (i) Since, we know that

$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

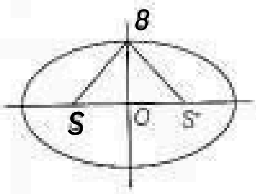
$SS' = 2ae$

$OB = b$

Given, SBS' is an equilateral triangle.

∴ $OB = \frac{\sqrt{3}}{2} SS'$

$b = \frac{\sqrt{3}}{2} 2ae \Rightarrow \frac{b}{a} = \sqrt{3}e$



We know, $e^2 = 1 - \frac{b^2}{a^2}$

$e^2 = 1 - 3e^2$

$4e^2 = 1$

$e^2 = \frac{1}{4}$

$\Rightarrow$ $e = \frac{1}{2}$

32. (i) Diameters of circle are

$x + 2y - 5 = 0$ ...(i)

and $3x - y - 1 = 0$ ...(ii)

Solving Eqs. (i) and (ii), we get

$x = 1, y = 2$

∴ Centre of circle is $(1, 2)$

Since, circle passes through $(4, 6)$

∴ $r = \sqrt{(4-1)^2 + (6-2)^2} = \sqrt{9 + 16} = \sqrt{25} = 5$

Equation of circle

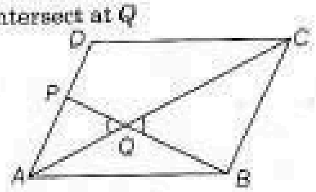
$(x-1)^2 + (y-2)^2 = 25$

$x^2 + y^2 - 2x - 4y - 20 = 0$

33. (ii) Given,

$ABCD$ is a parallelogram and P is mid-point of AD,

BP and AC intersect at Q



In $\triangle APQ$ and $\triangle CBQ$

$\angle AQP = \angle CQB$

$\angle QAP = \angle BCQ$

∴ $\triangle APQ \sim \triangle CBQ$

$\frac{AP}{BC} = \frac{AQ}{CQ}$

$\frac{AP}{2AP} = \frac{AQ}{CQ}$ $\left[\because AP = \frac{1}{2}AD = \frac{1}{2}BC\right]$

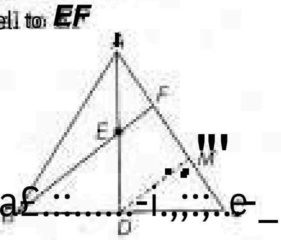
$\frac{AQ}{QC} = \frac{1}{2} = 1:2$

34. (i) Given, AD is median of $\triangle ABC$

∴ D is mid-point of BC

and E is mid-point of AD

Draw DM parallel to EF



In $\triangle ADM$,

By midpoint theorem,

F is mid-point of AM

∴ $AF = \frac{1}{2}AM = FM$

In $\triangle BFC$,

DM is parallel to BF and D is mid-point of BC.

∴ By mid-point theorem,

M is mid-point of FC

∴ $FM = \frac{1}{2}FC$

∴ $AF = \frac{1}{2}FC$ $[\because AF = FM]$

$\frac{AF}{FC} = \frac{1}{2}$

$AF : FC = 1:2$

35. (*) Given, $p(x) = ax^2 + bx + c$

$$p(0) = c = 1$$
$$p(1) = a + b + 1 = 4$$
$$\Rightarrow \quad a + b = 3 \quad \ldots \text{(i)}$$
$$p(-1) = a - b + 1 = 6$$
$$\Rightarrow \quad a - b = 5 \quad \ldots \text{(ii)}$$

On solving Eqs. (i) and (ii), we get

$$a = 4, \; b = -1$$
$$\therefore \quad p(x) = 4x^2 - x + 1$$
$$p(-2) = 16 + 2 + 1 = 19$$
$$p(2) = 16 - 2 + 1 = 15$$

36. (a) We have, $x^2y^2 - 2x = 4(1 - y)$

On differentiating with respect to x, we get

$$2xy^2 + 2x^2y\frac{dy}{dx} - 2 = -4\frac{dy}{dx}$$
$$\frac{dy}{dx} = \frac{2 - 2xy^2}{2x^2y + 4} = \frac{1 - xy^2}{x^2y + 2}$$
$$\left(\frac{dy}{dx}\right)_{(2,-2)} = \frac{1 - 2(-2)^2}{(2)^2(-2) + 2} = \frac{-7}{-6} = \frac{7}{6}$$

Equation of tangent at $(2, -2)$ is

$$y + 2 = \frac{7}{6}(x - 2)$$
$$7x - 6y = 26$$

$(-a, ?)$ does not lie on the line $7x - 6y = 26$

37. (*) Let

$$I = \int \sqrt{1 + 2\cot x(\operatorname{cosec} x + \cot x)}\, dx$$
$$I = \int \sqrt{1 + 2\cot x \operatorname{cosec} x + 2\cot^2 x}\, dx$$
$$I = \int \sqrt{1 + \cot^2 x + 2\cot x \operatorname{cosec} x + \cot^2 x}\, dx$$
$$I = \int \sqrt{\operatorname{cosec}^2 x + 2\cot x \operatorname{cosec} x + \cot^2 x}\, dx$$
$$I = \int \sqrt{(\operatorname{cosec} x + \cot x)^2}\, dx$$
$$I = \int |\operatorname{cosec} x + \cot x|\, dx$$
$$I = \int (\operatorname{cosec} x + \cot x)\, dx \qquad \left[\because x \in \left(0, \frac{\pi}{2}\right)\right]$$
$$I = \log(\operatorname{cosec} x - \cot x) + \log \sin x + C$$
$$I = \log\{(\operatorname{cosec} x - \cot x)(\sin x)\} + C$$
$$I = \log(1 - \cos x) + C$$
$$I = \log 2\sin^2\frac{x}{2} + C \Rightarrow I = 2\log\left(\sin\frac{x}{2}\right) + C$$

38. (c) Given, QUEEN

Starting with E, the total number of words formed $= 4! = 24$

Starting with $N = \frac{4!}{2!} = 12$

Starting with $QE = 3! = 6$

Starting with $QN = \frac{3!}{2} = 3$

The position of word QUEEN $= 24 + 12 + 6 + 3 + 1 = 46$

39. (*) We have,

$$y\,dx - (x + y^2)\,dy = 0$$
$$y\,dx - x\,dy = y^2\,dy$$
$$\frac{y\,dx - x\,dy}{y^2} = dy$$
$$\int d\left(\frac{x}{y}\right) = \int dy$$

On integrating both sides, we get

$$\frac{x}{y} = y + c$$

This curve is passes through $(1, 1)$

$$\therefore \quad \frac{1}{1} = 1 + c \Rightarrow c = 0$$

$\therefore$ Curve is

$$\frac{x}{y} = y \Rightarrow y^2 = x$$

$\left(\frac{1}{4}, \frac{1}{2}\right)$ lie on curve.

40. (d) Let

$$L = \lim_{x \to 3} \frac{\sqrt{3x} - 3}{\sqrt{2x - 4} - \sqrt{2}}$$
$$= \lim_{x \to 3} \frac{(\sqrt{3x} - 3)(\sqrt{3x} + 3)(\sqrt{2x - 4} + \sqrt{2})}{(\sqrt{2x - 4} - \sqrt{2})(\sqrt{2x - 4} + \sqrt{2})(\sqrt{3x} + 3)}$$
$$= \lim_{x \to 3} \frac{(3x - 9)(\sqrt{2x - 4} + \sqrt{2})}{(2x - 4 - 2)(\sqrt{3x} + 3)}$$
$$= \lim_{x \to 3} \frac{3(x - 3)(\sqrt{2x - 4} + \sqrt{2})}{2(x - 3)(\sqrt{3x} + 3)}$$
$$= \frac{3}{2} \cdot \frac{2\sqrt{2}}{6} = \frac{1}{\sqrt{2}}$$

41. (c) We have,

$$f(x) = x^3 + 3x - 9$$
$$f'(x) = 3x^2 + 3 > 0 \;\forall\, x \in R$$
$$\therefore \quad f(-2) = (-2)^3 + 3(-2) - 9$$
$$= -8 - 6 - 9 = -23$$
$$f(3) = (3)^3 + 3(3) - 9$$
$$= 27 + 9 - 9 = 27$$
$$\therefore \quad f_{max} = f(3) = 27$$
$$f'(0) = 3$$

Let the G.P. is $a, ar, \ldots, |r| < 1$

$$S_\infty = \frac{a}{1 - r}$$
$$27 = \frac{a}{1 - r} \qquad [\because S_\infty = f_{max} = 27]$$

and $\quad a - ar = 3 \qquad [\because f'(0) = 3]$

$$a(1 - r) = 3 \Rightarrow a = \frac{3}{1 - r}$$
$$\therefore \quad 27 = \frac{3}{(1 - r)^2} \Rightarrow (1 - r)^2 = \frac{1}{9}$$
$$\Rightarrow \quad 1 - r = \frac{1}{3}, \; r = \frac{2}{3}$$

42. (d) Number of onto functions from A to B when $n(A) = 6$ and $n(B) = 3$ is

$$\sum_{r=1}^{3}(-1)^{3-r}\,{}^3C_r(r)^6 = {}^3C_3(3)^6 - {}^3C_2(2)^6 + {}^3C_1(1)^6$$

$$= 3^6 - 3 \times 64 + 3 = 729 - 192 + 3 = 540$$

43. (a) Given,

$$|z| < \sqrt{5} - 1$$

$$|z^2 + 2z\cos\alpha| \le |z|^2 + 2|z||\cos\alpha|$$

$$\le |z|^2 + 2|z|$$

$$< (\sqrt{5} - 1)^2 + 2(\sqrt{5} - 1)$$

$$< 5 + 1 - 2\sqrt{5} + 2\sqrt{5} - 2$$

$$< 2$$

44. (c) Let T_1 and T_2 be the event that computer is produced by plant T_1 and T_2 respectively. Again, let D and ND be the event that computer produced is defective and non-defective respectively.

$$\therefore \quad P(T_1) = \frac{20}{100},\ P(T_2) = \frac{80}{100},\ P(D) = \frac{7}{100}$$

Again let $P(D/T_1) = 10\,P(D/T_2) = k$

$$\therefore \quad P(D/T_1) = k \text{ and } P(D/T_2) = \frac{k}{10}$$

Now, $P(D) = P(T_1)\,P(D/T_1) + P(T_2)\,P(D/T_2)$

$$\Rightarrow \quad \frac{7}{100} = \frac{20}{100}k + \frac{80}{100}\left(\frac{k}{10}\right)$$

$$\Rightarrow \quad 7 = 20k + 8k$$

$$\Rightarrow \quad k = \frac{1}{4}$$

$$\therefore \quad P(D/T_1) = \frac{1}{4} \text{ and } P(D/T_2) = \frac{1}{40}$$

Now, required probability $P(T_2/ND)$

$$= \frac{P(T_2)P(ND/T_2)}{P(T_1)P(ND/T_1) + P(T_2)P(ND/T_2)}$$

$$= \frac{\frac{80}{100}\times\left(1-\frac{1}{40}\right)}{\frac{20}{100}\left(1-\frac{1}{4}\right)+\frac{80}{100}\left(1-\frac{1}{40}\right)} = \frac{4\times\frac{39}{40}}{\frac{3}{4}+4\times\frac{39}{40}}$$

$$= \frac{4\times 39}{30 + 4\times 39} = \frac{156}{186} = \frac{78}{93}$$

45. (b) Given, $A > 0$, $B > 0$

$$A + B = \frac{\pi}{6}$$

$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$\tan\frac{\pi}{6} = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$1 - \tan A \tan B = \sqrt{3}(\tan A + \tan B)$$

$$\tan A \tan B = 1 - \sqrt{3}(\tan A + \tan B)$$

By AM ≥ GM

$$\therefore \quad \frac{\tan A + \tan B}{2} \ge \sqrt{\tan A \tan B}$$

$$\Rightarrow \quad \tan A + \tan B \ge 2\sqrt{1 - \sqrt{3}(\tan A + \tan B)}$$

$$\Rightarrow \quad (\tan A + \tan B)^2 \ge 4(1 - \sqrt{3}(\tan A + \tan B))$$

$$\Rightarrow \quad x^2 + 4\sqrt{3}x - 4 \ge 0, \text{ where } x = \tan A + \tan B$$

Now, $x^2 + 4\sqrt{3}x - 4 = 0$

$$x = \frac{-4\sqrt{3} \pm \sqrt{48 + 16}}{2}$$

$$x = \frac{-4\sqrt{3} \pm 8}{2}$$

$$x = -2\sqrt{3} \pm 4$$

$$(x + 2\sqrt{3} - 4)(x + 2\sqrt{3} + 4) \ge 0$$

Minimum value of $\tan A + \tan B = 4 - 2\sqrt{3}$

46. (c) Let the numbers are $1, 2, 6, x, y$.

$$\therefore \quad 5 = \frac{1 + 2 + 6 + x + y}{5}$$

$$\Rightarrow \quad 5 = \frac{9 + x + y}{5}$$

$$\Rightarrow \quad x + y = 16$$

$$M.D.(\bar{x}) = \frac{|1-5| + |2-5| + |6-5| + |x-5| + |y-5|}{5}$$

$$M.D.(\bar{x}) = \frac{4 + 3 + 1 + x + y - 10}{5}$$

$$= \frac{8 + 16 - 10}{5} = \frac{14}{5} = 2.8$$

47. (c) Let the total number of experts be x.

$$n(A) = \frac{x}{2}$$

$$n(B) = \frac{2x}{3}$$

$$n(A \cap B) = 10$$

$$n(A' \cap B') = 6$$

$$n(A \cup B) = x - 6$$

$$n(A \cup B) = n(A) + n(B) - n(A \cap B)$$

$$x - 6 = \frac{x}{2} + \frac{2x}{3} - 10$$

$$\frac{x}{2} + \frac{2x}{3} - x = -10 + 6$$

$$x = 24$$

48. (c) We have $\alpha(\alpha + 2b) - \beta(b - a) = 0$ [illegible]

$\Rightarrow$ [illegible] $= 0$

$\Rightarrow$ $\alpha + \beta = 0$ [illegible] $= 0$

$\Rightarrow$ $\alpha = -\beta \ne 0$

49. (c) Let F be the force.

Then $\vec{F} = 78\dfrac{(2\hat{i} + 2\hat{j} + \hat{k})}{\sqrt{4 + 4 + 1}} = \dfrac{78}{3}(2\hat{i} + 2\hat{j} + \hat{k})$

$$\vec{F} = 26(2\hat{i} + 2\hat{j} + \hat{k})$$

Force acts at point $P(2, 3, 6)$, the moment of $\vec{F}$ acting at P about a line in the direction $(12\hat{i} + 3\hat{j} - 4\hat{k})$ is equal to resolved part along the line of moment of $\vec{F}$

$$\vec{OP} = 2\hat{i} + 3\hat{j} + 6\hat{k}$$

$$M_O = \vec{r}\times\vec{F} = 26\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 3 & 5 \\ 2 & 2 & 1 \end{vmatrix}$$

$$= 26(-7\hat{i} + 8\hat{j} - 2\hat{k})$$

Let $\hat{a}$ be unit vector in the direction $12\hat{i} + 3\hat{j} + 4\hat{k}$.

$$\hat{a} = \frac{12\hat{i} + 3\hat{j} + 4\hat{k}}{|12\hat{i} + 3\hat{j} + 4\hat{k}|} = \frac{1}{13}(12\hat{i} + 3\hat{j} + 4\hat{k})$$

The moment of F about the given line

$$= M.\hat{a} = 26(-7\hat{i} + 8\hat{j} - 2\hat{k}) \cdot \frac{1}{13}(12\hat{i} + 3\hat{j} + 4\hat{k})$$

$$= 2(-84 + 24 - 8) = -136$$

50. *(a)* We know that,

$$AM \geq GM$$

$$\Rightarrow \frac{5^x + 5^{-x}}{2} \geq \sqrt{5^x \cdot 5^{-x}}$$

$$\Rightarrow 5^x + 5^{-x} \geq 2$$

Now, $\sin(e^x) = 5^x + 5^{-x}$

$\Rightarrow \sin(e^x) \geq 2$

Which is not possible.

∴ No solution exists.

Analytical Ability & Logical Reasoning

51. *(b)* The pattern is as follows,

$$a \quad b \quad c \Rightarrow (a + b)^2 = c$$

As, $(3 + 2)^2 = 25$ and $(4 + 3)^2 = 49$

So, missing number $= (5 + 3)^2 = 8^2 = 64$

52. *(a)* **From statement II**

Total readers = 200

Number of readers who read Indian Express = 100

Number of readers who read Times of India = 121

Number of readers who neither read Indian Express nor Times of India = 50

∴ $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

$= 100 + 121 - (200 - 50)$

$= 221 - 150 = 71$

∴ Required number of people who read both Indian Express and Times of India = 71

53. *(c)* $187 + 276 = 435$

$(1 \times 8^2 + 8 \times 8^1 + 7 \times 8^0) + (2 \times 8^2 + 7 \times 8^1 + 6 \times 8^0)$

$= 95 + 190 = 285$

Now,

8	285
8	35 – 5
	4 – 3

$\Rightarrow 435$

Similarly, $731 + 672 = ?$

$(7 \times 8^2 + 3 \times 8^1 + 1 \times 8^0) + (6 \times 8^2 + 7 \times 8^1 + 2 \times 8^0)$

$= 473 + 442 = 915$

Now,

8	915
8	114 – 3
8	14 – 2
	1 – 6

$\Rightarrow 1623$

54. *(d)* From option (a),

AEMS ⇒ M (3rd)

MOOR ⇒ O (3rd)

BEST ⇒ S (3rd)

AMUT ⇒ T (3rd)

∴ Meaningful word = MOST

From option (b),

ACOT ⇒ O (3rd)

EAST ⇒ S (3rd)

AWTT ⇒ T (3rd)

AMRY ⇒ R (3rd)

∴ Meaningful word = SORT

From option (c),

AEJM ⇒ L (3rd)

OFIN ⇒ I (3rd)

LOST ⇒ S (3rd)

AHTT ⇒ T (3rd)

∴ Meaningful word = LIST

From option (d),

JMPO ⇒ P (3rd)

EILM ⇒ L (3rd)

BDMU ⇒ M (3rd)

EMOS ⇒ O (3rd)

No meaningful word can be formed from P, L, M and O.

55. *(b)* Distance covered by Navjivan Exp. in $\frac{1}{2}$ hr

$= \text{Speed} \times \text{Time} = 60 \times \frac{1}{2} = 30$ km

According to the question,

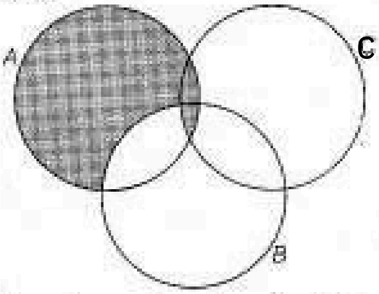
$$\text{Relative speed} = \frac{\text{Remaining distance}}{\text{Time}}$$

$$\Rightarrow (60 + 30) = \frac{(300 - 30)}{\text{Time}}$$

∴ Time $= \frac{75}{90} = \frac{5}{6}$ hr $= \frac{5}{6} \times 60 = 50$ min

Hence, required time to avoid a head on collision between the two trains $= 50 - 30 = 20$ min

56. *(a)* If A, B, and C are sets, then they can be represented as



From the above figure, the only option that satisfied is option (a), i.e. (A – B) ∪ (A ∩ C)

57. *(d)* Let the number of diamonds and amount of each be x and y respectively. Then,

Total money $= xy$

According to the question,

$(x-2)(y+2) = xy$

$\Rightarrow xy + 2x - 2y - 4 = xy$

From option (d), $x = 46$

then, $46 - 2 = 44$, $2y = 44$

$\therefore y = 22$

Hence, price (ℓ) $= 46 \times 22 = ₹ 1012$

(₹ 1000 < ₹ 1012 < ₹ 1100)

58. *(d)* Let both container milk be x : 1. Then

According to the question

$$\frac{5x}{6}+\frac{1}{4} = \frac{x}{6}+\frac{3}{4}$$

$$\Rightarrow \frac{5x}{6}-\frac{x}{6} = \frac{3}{4}-\frac{1}{4} \Rightarrow \frac{4x}{6} = \frac{2}{4}$$

$$\therefore x = \frac{12}{16} = \frac{3}{4}$$

$\therefore$ Required ratio $= x : 1 = \frac{3}{4} : 1 = 3 : 4$

59. *(d)* The order is as follows

4th → IAS officer

3rd → M.L.A

2nd → Doctor

1st → Engineer/Professor

Ground → Professor/Engineer

But from the given options, only option (d) follows, i.e. from ground floor → professor, engineer, doctor, MLA, IAS officer.

60. *(a)* Total quantity of grapes = 20 kg

According to the question,

$\therefore$ Total quantity of dry grapes $= 20 \times \frac{(100-90)}{100} \times \frac{100}{(100-20)}$

$= 20 \times \frac{10}{100} \times \frac{100}{80} = 2.5$ kg

Sol. (61 and 62) According to the question.

(+) A (Wife) ← Married Couple → (–) D (House Wife)

(–) C (Lawyer) ← Married Couple → (–) F (Professor) [(+) Male, (–) Female]

(+) E (Engineer)

(–) B (House Wife)

61. *(d)* E is an Engineer.

62. *(b)* The two married couples of the group are ...

63. *(a)* The pattern of the series is as follows

$1 \times 1 + 1$, $2 \times 2 + 2$, $3 \times 3 + 3$, $4 \times 4 + 4$, $5 \times 5 + 5$, $6 \times 6 + 6$

Hence, 27 is the wrong term.

64. *(d)* From statement I and II.

Let the leak empties full tank in x h, then part emptied in 1 h by leak $= \frac{1}{x}$

According to the question,

$$\frac{1}{9} - \frac{1}{x} = \frac{1}{9+1} \Rightarrow \frac{1}{9} - \frac{1}{x} = \frac{1}{10}$$

$$\frac{1}{x} = \frac{10-9}{90} = \frac{1}{90}$$

Hence, leak will empty the full tank in 90 h.

65. *(c)* From statement I and II.

Part filled by pipe A alone in 1 min $= \frac{1}{16}$

Part emptied by pipe P, alone in 1 min $= \frac{1}{8}$

According to the question, $\frac{1}{16} - \frac{1}{8} = \frac{1-2}{16} = -\frac{1}{16}$

(–ve sign means P, empties the will)

Hence, the full tank will empty in 16 min

66. *(d)* From statement I and II, ...

So, four digit numbers with combination of the digits (1, 6, 7) ... and three digit numbers with combinations of digits ...

Combination of four digits (1, 6, 6, 7) = 4! = 4 × 3 × 2 × 1 = 24

Combination of four digits (2, 3, 6, 1) = 4! = 4 × 3 × 2 = 24

Combination of three digits (3, 6, 7) = 3! = 3 × 2 × 1 = 6

Hence, total combination = 24 + 24 + 6 = 54

67. *(a)* According to the question.

L > Q > K > P > M or L > P > K > Q > M

Clearly, M is the lightest.

68. *(b)* If we consider John's first statement is true and second statement false, then John won Gold Medal and Johny won silver medal. But this makes Johny's both statements false. Now, we consider John's first statement false and second statement true.

So, according to this, John won silver medal, Johny won Bronze Medal and Jaswardan won Gold Medal.

Now, from this, Johny's first statement is true and second statement is false.

Also Jaswardan's first statement is false and second statement is true.

69. *(d)* [illegible]

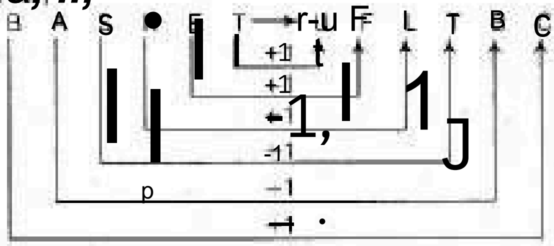
$$\frac{18 \times 1}{[illegible]}$$

So, different combinations of values of *A*, *B* and *C*

= (1, 2, 3), (1, 3, 4), (1, 4, 5), (1, 5, 6), (1, 6, 7), (1, 7, 8), (1, 8, 9)

Hence, 7 different values of *A*, *B* and *C* are possible.

70. *(a)*



Similarly,

71. *(b)* It is better to solve the question from the last. As, we are given that after selling half of the total number of eggs plus half an egg to Anurag, the grocer was left with 7 eggs. Therefore before selling eggs to Anurag the grocer had $\left(7+\frac{1}{2}\right) \times 2$ i.e. 15 eggs.

So, after selling half and half more than half the number of eggs to Deepak, the grocer was left with 15 eggs.

Therefore, before selling the eggs to Deepak, the grocer had $\left(15+\frac{1}{2}\right) \times 2$ i.e. 31 eggs.

Similarly, before selling eggs to Anurag (i.e. at the start) the grocer had $\left(31+\frac{1}{2}\right) \times 2$ i.e. 63 eggs.

72. *(a)* Ancient – O, P, Q, R

Modern – S, T, U, V, W

Last year question was asked on *U* i.e. on Modern.

So, this year the question will be asked on Ancient. The examinee who set the question likes *S* but *S* is a modern poet. Hence, the question on *R* is most likely to be asked this year because the one who likes *S* also likes *R*.

73. *(c)* The maximum persons in the team could be 6 i.e. G, F, J, A, D, E, C, P, F, A, O, B, D, B

74. *(c)* Here, it is mentioned that repetition of digits is not allowed.

Now, for any number to be divisible by 6, its unit place must be occupied by 3.

So, the number of ways to fill unit place = 1

and the number of ways to fill remaining places = $^5P_4$

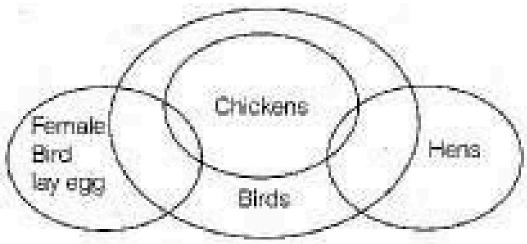
∴ Required number = $^5P_4$

$= \frac{5!}{(5-4)!} = \frac{5 \times 4 \times 3 \times 2!}{2!} = 120$

75. *(c)* According to the given information, arrangement is as follows

So, the granddaughter of the teacher is a student and that of R is a midwife.

76. *(b)*



(i) All birds lay eggs. (✗)

(ii) Some hens are birds. (✓)

(iii) Some hens are chickens. (✓)

77. *(c)* The pattern of the series is as follows

1 + 2 = 3

1 + 2 + 3 = 6

2 + 3 + 6 = 11

3 + 6 + 11 = 20

6 + 11 + 20 = 37

11 + 20 + 37 = 68

20 + 37 + 68 = 125

78. (c) For 71 pti i1(Ix &O+ 2 x lO.,.4 x 2 = 7 coins

For Gopal's to.

1 x (&Cl+1)1'10+1X& + 2 X 2 = 6 coins

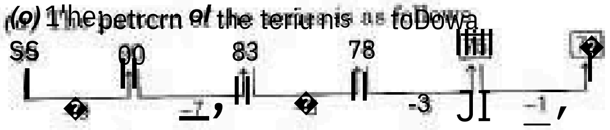
For LOI purse,

Ix SO o-1 x (26+2 x 10 ,3 X 2 = 7 COI..M

Hence, required total number of coins

=7+6+7=t U 19

79. (c) The pattern of the terms is as follows



80. (a) Let the CP of the article = ₹ x

Then, the SP of the article = x × (100 + 20)/100 = ₹ 1.2x

∴ He incurs a loss because, he allows 16 articles to 1.2 articles,

Loss% = (16-12)/16 × 100 = 4/16 × 100 = 25%

∴ His SP = SP × (100 - 25)/100 = ₹ 0.75 SP

Hence, 0.75 SP = 1.2x

∴ SP = ₹ 1.6x

This SP is come after giving a discount of 20% on MP

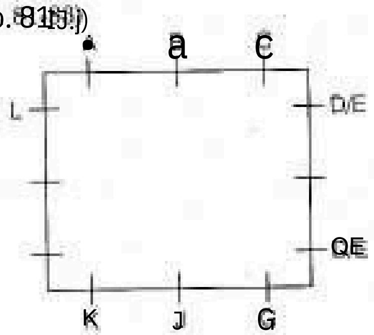
∴ MP × (100 - 20)/100 = SP

⇒ MP × 20/100 = 1.6x

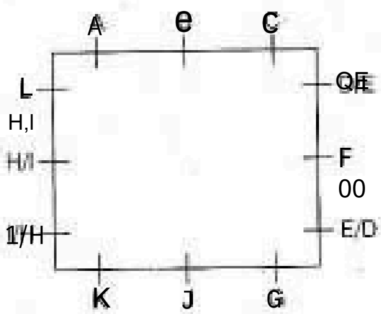
∴ MP & b..

It means that the article has been marked 100% above the cost price.

Sol. for (Q. No. 81-83)

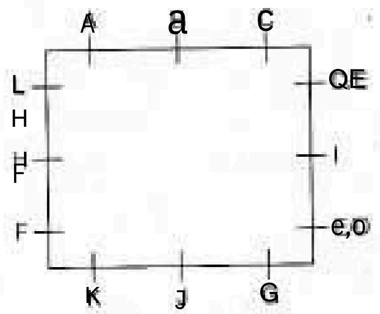


81. (C)



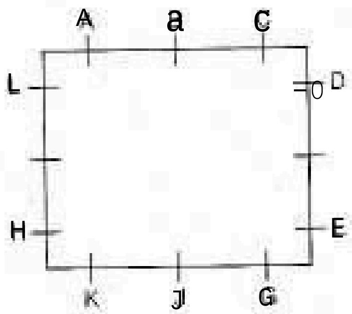
Clearly, either ... is sitting to the left of K.

82. (d)



Clearly, H will be facing I.

83. (c)



Clearly, the neighbours of K are B and J.

84. (b) The difference between both 34041 and 32606

= 34041 - 32606 = 1635

So, n should be a factor of 1635.

Factors of 1635 = 1, 3, 5, 15, 109, 327, 545, 1635

Here, 327 is the largest factor of 1635.

So, n = 327

84041 and 32606 divided by 327 then remainder is 21.

85. (d) According to the question,

n × Volume of sphere = Volume of cylinder

⇒ n × 4/3 π × (2)³ = π × (2)² × M

⇒ n = (4 × M × 3)/(4 × 4)

∴ n = 48

86. (b) Time from 5 AM of a particular day to 10 PM on the 4th day, is 89 hr. Now, the clock loses 16 min in 24 hr or in other words, we can say that 23 hr 44 min of this clock is equal to 24 hr of the correct clock.

(23 + 44/60) = 356/15 hr of this clock = 24 hr of the correct clock.

∴ 89 hr of this clock = (24 × 15/356 × 89) hr of the correct clock

= 90 hr of the correct clock

or 89 hr of this clock = 90 hr of the correct clock.

Therefore, it is clear that in 90 hr, this clock loses 1 hr and hence, the correct time is 11 PM when this clock shows 10 PM.

87. *(d)* Let the speed and length of train be v and d respectively. Then

$$v - 2 = \frac{d}{9} \quad \text{...(i)} \quad \left[\because \text{Speed} = \frac{\text{Distance}}{\text{Time}}\right]$$

$$v - 4 = \frac{d}{10} \quad \text{...(ii)}$$

From Eqs. (i) and (ii),

⇒ $\frac{v-2}{v-4} = \frac{10}{9}$

⇒ $9v - 18 = 10v - 40$

∴ $v = 22$ km/h

From Eq. (i), we get

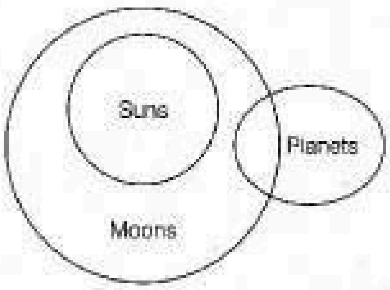
$$(22 - 2) \times \frac{5}{18} = \frac{d}{9}$$

$$20 \times \frac{5}{2} = d$$

∴ $d = 50$ m

∴ Length of train = 50 m

88. *(d)*



Conclusions I — ✗

II — ✓

89. *(c)* We can select the triangles in two different ways: taking two points from the line having 10 points (in $^{10}C_2$ ways, i.e. 45 ways) and one point from the line consisting of 11 points (in 11 ways).

So, the number of triangles = 45 × 11 = 495

Now, taking two points from the line having 11 points (in $^{11}C_2$ i.e. 55 ways) and one point from the line consisting of 10 points (in 10 ways), the number of triangles is 55 × 10 = 550

Hence, required number of triangles = 495 + 550 = 1045

90. HCF of (1661 − 10) and (2037 − 5) = HCF of 1651 and 2032

```
1651)2032(1
     1651
     ----
      381)1651(4
          1524
          ----
           127)381(3
               381
               ---
                ×
```

∴ Required greatest number = 127

Computer Awareness

91. *(c)* The corresponding single precision floating number can be represented as shown below.

32 bits

Sign	Exponent	Mantissa
1 bit	8 bits	23 bits

The exponent field needs to represent both positive and negative exponents. To do this, a bias is added to the actual exponent in order to get the stored exponent. For IEEE single precision floats, this value is 127. Thus, to represent an exponent of 0, 127 is stored in the exponent field.

92. *(b)* In 2's complement representation, numbers range from −8 to 7. When two numbers are added, overflow occurs if there is a carry out of the sign bit.

In Option (b), 6 is the number added with −1, so no overflow occurs.

93. *(c)* For n independent boolean variables, each of which can take a particular boolean value, there are 2^n different possible combinations. A boolean function has to assign a boolean value 1 or 0 to each one of these combinations. This brings the number of different possible boolean functions of n variables to 2 to the power 2^n.

When $n = 1$, we have only one boolean variable that can take either boolean value, so we have only $2^1 = 2$ different cases. This produces $2^2 = 4$ boolean functions of one boolean variable.

94. *(d)* Given binary number = $(011010)_2$

One's complement = 100101

Two's complement = 100101 + 1 = 100110

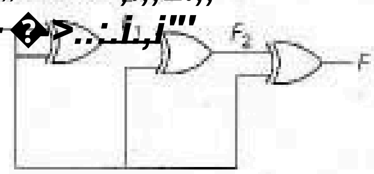
Converting this two's complement to hexadecimal form,

1 0	0 1 1 0
2	6

We get $(26)_{16}$

95. *(c)* Output of first XOR gate, $F_1 = x \oplus x = 0$

Output of second XOR gate, $F_2 = 0 \oplus x = x$



$F_2 = 0 \oplus x = x$

Now, if $F_2 = 1$, then output is 1

If $F_2 = 0$, then output is 0

$F_2 = 0$

Output of third XOR gate $F = 0 \oplus x = 0$

96, **(a)** *N* • (F876X. lll l l 11 lOOU 011 l 1011 in bin.,y. N010 1.hu.11Mi1 1 1 1 cn•fac:ant an lht binary repn:tMDt.auon 1-t l, wh1fh lfflpli1.·• 1l11u 1ht numbtt • oerpuv. To ae<thu "•lut of tho numbtr perf'orm tho r. OOfflplement.. o(the nuntbflr. W• llfl Nu - 19U•nd 8.i\' u ·16400. i-....J..o Mgaliv11. •·t nNd lo 6nd 2'•(.'(lfflpm tof'tt S, t- 10400).

Buury ol 16'00- 0011110000101000

2'a rompltmiet,t • I IOOOOl l l 101 lOOO• *tc30$.,*

97. **{cJ** Let 'i Lhe h•.no, or ndU' *ol.* &benwnl,,i_.r -,.e..t.m. •n, e eque 000 3,r, I ,' • 2 *I'*

= l·x' +3-..-• Ix

ac1 *+Jl²* :x_. 3-+ *l/x*

2 · •

+_!+2.T+3.r+l

:Ir •

3t1 • *z+* 2-=-21' .. 6.rt 2

z' ...(-)-=0

>(%-51+0

.r•QxcS

AllibaH or n.clix *d* a nUJXI.Mr system cannotb here

- 6,

98. **(b)** From option {b).

Bii:s,ary rep.rtientarion oi (1..(£),..0010U)01110

Hi.nary reptt:SCnitalioa or (7A.).-= - 00000111 !010 0000110101()0

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So, !14£),,-(7A\, -(D<).,

99. **(d)** Forlblff boolean 'lariables(n-= 3). meNI uo 2' dirterent. CHN, givtog • 1otal or=2.s.6boolean fur,ons or 3 variable&.

100. **(a)** o.tdmal number 47 hti tobe .subuancd from S &. 3d•<l7•-9

We •t.irt. with po.itiv'" Wl'ilionc,/tl!e number 1-91 =1l

In biL repretent11don, binary form of I)

• OOOOIC>Ol

t•a tomp1vment • t t 110110

2'• complement• 11 l lOl 10

•

11110111

General *Engllsh*

101. *(b)* Rurey up lf thf torrtct &UW'41:r u phraMl 'hurry up' mun11 '•howtn, h•ll• or ursenc,·' wb.1C'b 1mpli.et the N(luired me-amna ti. qukk.

102. (!Aft. th(! fWl'«t an,wcr .- e lh 6,-i C'lau,o ,n 1M l Cln ll Nrtrtln& lO lfl.\O.'l(IChat• (I) put, to M'<:.OOd ff form *o(* the \'Crb l• apPf'OPri•te bff.t.

103. **(f!)** Dot.aft* u I.be COl'J'«l an&w r "dot ·ineao11a ***MA*** or penc>d or d«n)· m.a.rked b dma• alertne ..,' whk-h u s11111h1r 10 a *trE* •duld..

1tU. ***Cb)*** Persevere it th4:1 cor cl. flnllWt!i' a• '11<l,tHtvtto' m "lO oontlnuo df'MJ)lhi diilic:ultJoe,', «>PJ)Oillt.lon or dilOOUrtgomC'nf whlth I• 11ilnilt1,r to the 1n 1he •cnCU1\.

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106. ***(n)*** M hic1)I i• the'! eorroct 11n1wor till thu pbc)l;nbii,1 1,,QUQV('d lO ho HM>C:1ot with the sun WJd obt.,i.ot oew li b)' a.nsinll from LJ1e a1.1he11 or it1, pn1d'1c Eg)1>1ian Mythuluu.

101, ***(c}*** The appJe9 hevo bcmn eaten by John is tho com.-c:t snewee Alt J>,auive fbrm oi' 1, pri!el'nt ptirfot.:I. t eeneene ls: paN1ve eubr,(:t (obj(.'()t) + htuu'bavo+becn+VtUI}+ itt.tive object (aubjcct) + o,h'"'"·

108. ***(b)*** Coma;en.ute for loM ia correct aa 'Indemnify• nu.rRO& 't provide (someone) with n j\1e.t pOytne,ufor ION' or injury which iii 11i.mill.l..l' LO oompcmHllt,ion.

109. ***(a)*** Ttmdmcy ***is*** correct 11• 'pro Mity' means an effttblih d pattern of behaviour• wbkh implie@ h:11de1icy

110. ***(e)*** Archaic je. ()Ol'te(:t as '.antidiluvian• mE1an11 'datlJ\¥ surj\--i.ngf.rom d.istanl; p<1t;t' which i.!i !limilar to 'a.reluuc'.

111. ***(d)*** Tu.rbu.lenot i& correc.t tLil 'llangfroi.d' mea.ns evannes' ·emot.ion.s or temper' "'hile "turbulence' means ·a state of vlOJence. agitation and disorder' which implies oppoaite to t.he gi-..en word.

112. ***(d)*** You can't pin tbe blame at an}•one wid1out verifytng farts is oorrocl as '·J))n t1t' ii. i\O meaningful phrMal verb whilP. 'pin c:,n' and ·pin agairnst.' are m1;11nin l. To blam someone 'pin on' i• ¢()r're.et.

113. ***(a)*** Condusivo i11 correct 1li8 'incomrove.rdble' means. "nc eip&bte of OOing cllallcnged or pron.-d wro!U(whieh implies condu&ivo.

114. ***(d)*** Mcn-e b)' passion in Lhe he4.rU1 of J'l-plo than by la rorrac:C l)S ·1.irring11• mean11 passion llnd legulot.lon 111w'. So, a. nauon 1a not mc:rtl)• buill. by Ji;iwii nnher by p.auion ***m*** 1>ie heartil ofita peoplo

f 15. ***(b)*** Adamant. u, tOl'h'leL oa 'impl &11 opinfon. purr,o1oe or c:oun:o of action i11811h(l ***of*** tea 11r;uincni6 or p11n1.1uion' which it sumaln,r lo ·adnrnunt'

116. ***(dJ*** IMeiling •nd roitcd i1 corr(IM n11 'inw,nn1i in t11Jric"1turo' l(i\'ttt • mel'nlnlt which re,uh• h1 'rl\iSt:d Lh• i tre of!end ,:rab•, So. thv l'WO 1we 1,pt end ,nl.c-r-rel,.tC'd,

111. ***tb)*** Evonln1 ou1 1• cofNl'<:t oa ·ovonmg ou1.' rueMJ 'a or rccalnintc bi,lan. 11w.,blli1y nr.al uniforinlt:)'. wblth m1.lcet 1h<i ,,·nH.+1,00" meanfo,rut 1i..ui.emc1u.

f f8. ***(o)*** Hand lo n1l, t\lCOC.t(ully ill corN<:t 1La pnn115l11 Q\)Oudc,:ilin"with Lhe hardthlJ>l!I withwnfldence. dctnn1ination "nd hopv,

9. ***(r)*** Conl.J><>I i11 cur ct. u 't1uhj111uu.(.' 1ni!1U\il 'to b on vn&rol by run: ol' 1u m.11' which i1u1.1-ni

120. '"' FiJh\ I.he Nu.l11 \s correct 01 tho concludintc tin J)1u11,.age cll!Dthaghlii,cht du,t. chi, f' oc.b ti.I'll dclttrtum fl.I li!!,bl 41.tldot.Hag nr fall.