T.I.M.E.
Triumphant Institute of Management Education Pvt. Ltd.

Solutions for ICET2010 [Exam held on 27th May 2010]
(According to Booklet Code : C)

Section – A
(1-75): Analytical Ability

(1-20):

1. Statement I
5a, 5b and 5c are in A.P.
If the numbers are divided by 5, the resultant numbers will be in A.P. ; $\Rightarrow$ a, b, c are in A.P.
I alone is sufficient. Choice (1)

2. Statement I
LCM (24, 30) = 120
If n is divisible by 24 and 30, it means n is divisible by 120. however, it is not necessarily divisible by 720.
I alone is not sufficient.
Statement II
n = (a) (a + 1)(a+2)(a+3)(a+4)(a+5)
The product of 6 consecutive integers is always divisible by 6! or 720.
II alone is sufficient. Choice (2)

3. Statement I
No information about 'c' is given
I alone is not sufficient
Statement II
No information about 'a' is given. II alone is not sufficient. Combining both, sufficient information about each of the three numbers is given so, a : b : c can be obtained.
Choice (3)

4. Statement I:
The initial or the final price of A is not given.
I alone is not sufficient.
Statement II:
The initial or the final price of B is not given.
II alone is not sufficient.
Combining both also we cannot answer since the initial and final prices of A and B are not known. Choice (4)

5. Statement I:
Any one of three numbers can be even,
I alone is not sufficient.
Statement II
Given b + c = odd
One of the numbers of b and c is even. That implies 'a' cannot be even, a must be odd.
II alone is sufficient. Choice (2)

6. In the expression $15n^2 + 8n + 6$.

Let $p = \frac{15n^2 + 8n + 6}{n} = 15n + 8 + \frac{6}{n}$.

When n is factor of 6, p is natural number otherwise p is not natural number.
From statement I
n divides 10
n is a factor of 10.
n = 1, 2, 5, 10
If n = 1, 2, then n divides 6.
n = 5, 10 'n' does not divide 6.
I alone is not sufficient.
Statement II
n divides 3!. That means n divides 6. Hence the given expression is divisible by 6. II alone is sufficient.
Choice (2)

7. Statement I
No information about $\angle C$
I alone is not sufficient.
Statement II
No information about $\angle A$
II alone is not sufficient.
Combining both, the answer can be obtained.
Choice (3)

8. Statement I
$A \cap B = \{1, 2, 3, 4, 5\}$
Set B can not be uniquely determined.
I alone is not sufficient.
Statement II
A – B = {7, 8, 9, 10}
II alone is not sufficient.
Combining both, we can only say that B has at least five elements $\rightarrow$ 1, 2, 3, 4, 5.
Also, B does not have the following elements 7, 8, 9, 10.
$\therefore$ combining both also we cannot answer the question.
Choice (4)

9. Statement I
|a| > b
Let a = 2, b = 1
So, |a| > b
Also a > b
Let a = –2, b = 1
So, |a| > b
But a < b
I alone is not sufficient.
Statement II
|a| = b
a = b or a = –b
'b' is always non negative.
In either case a is not greater than 'b'.
II alone is sufficient. Choice (2)

10. From statement I, the given matrix is not invertable

$$\therefore \begin{vmatrix} \sin\theta & 0 & 0 \\ 2 & 2 & 0 \\ 3 & 4 & 1 \end{vmatrix} = 0$$

$= \sin\theta (2 – 0) = 0 ; \Rightarrow \sin\theta = 0$
Statement I alone is sufficient. Choice (1)

11. Statement I:
The length of any of the sides is not given
I alone is not sufficient.
Statement II:
The height of the triangle is given. Area of the equilateral triangle is $\frac{h^2}{\sqrt{3}} = \frac{144}{\sqrt{3}}$
II alone is sufficient Choice (2)

12. Statement I:
$a^2 + b^2 = 0$
'a' and 'b' are real numbers.
So, a = 0, b = 0
$\Rightarrow a^3 + b^3 = 0$
I alone is sufficient. Choice (1)

13. Statement I:
Let us take the following two cases.
Case (i):
x = –3

y = 2
So, $x^2 > y^2$
Case (ii):
x = –3
y = 4
So, $x^2 < y^2$
I alone is not sufficient.
Statement II is not sufficient since x and y are not given.
Combining I and II, we can say x – y < 0
$\Rightarrow$ (x + y) (x – y) < 0
[Since x, y are non negative real numbers, and x + y > 0]
So, $x^2 - y^2 < 0$. Choice (3)

14. Statement I:
$a = 10 k_1 + 5$
a = 105, 115, 125, 135, 145, 155……
I alone is not sufficient.
Statement II:
$a = 8k_2 + 3$
a = 107, 115, 123, 131, 139, 147, 155.
II alone is not sufficient.
Combining both, there is no unique solution.
Choice (4)

15. Statement I:
$\sin^2\theta = 1$
$\sin\theta = \pm 1$
$\theta = \pi/2, -\pi/2$
I alone is not sufficient.
From statement II $\theta \in (0, \pi)$
II alone is not sufficient.
Combining I and II statements $\theta = \pi/2$.
Both I and II are together sufficient to answer the question.
Choice (3)

16. Let P be the set of prime numbers.
Consider statement I. A is a subset of R^+.
A could be {2, 3} or {2, 3, 4} (among many other possibilities).
If A = {2, 3}, then $A \subseteq P$
If A = {2, 3, 4}, then $A \not\subseteq P$.
In the second case $A \not\subseteq P$.
Hence statement I is not sufficient.
Consider statement II
$A \subseteq (-\infty, 0]$
If A is a non-empty subset of $(-\infty, 0]$, then $A \not\subseteq P$
If A is the null set, $A \subseteq P$.
$\therefore$ Statement II alone is not sufficient.
By combing the two statements, we can conclude that A is the null set.
$\therefore A \subseteq P$. Choice (3)

17. Statement I
$a^3 < 0$
So, a < 0
The real number is not positive.
I alone is sufficient.
Statement II:
$a^2 - 5a + 6 < 0$
(a – 2) (a – 3) < 0
2 < a < 3
a is positive.
Thus, II alone is also sufficient. Choice (1) or (2)
Note: This question can be answered from I alone or II alone. Hence the answer choice can be either (1) or (2).

18. Statement I:
It is not given whether the year is leap or non-leap year.
I alone is not sufficient.
Statement II:
This is sufficient as 1st January, 2088 is taken as Monday.
Choice (2)

19. Let the length of rectangle be 'ℓ' m and breadth be 'b' m.
Let the rate be Rs.K per metre.
Statement I:
Ib = 10,000
The value of ℓ and b cannot be obtained.
Statement II:
Total cost = Rs.1,00,000 = $2(\ell + b)(K) = 1,00,000$
Combining I and II, there are two equations and 3 unknowns, the answer cannot be obtained.
Choice (4)

20. Statement I:
33886 is not divisible by 3.
If $a \geq 1$, 3^a will not divide 33886.
But given $3^a = 1$ divides 33886
$\Rightarrow$ a must be = 0
I alone is sufficient. Choice (1)

(21-25):

It is given that for the n^{th} letter in the English alphabet the code is 3n + 2.

(mod 26) indicates that, incase 3n + 2 is more than 26, the value obtained after subtracting 26 should be taken.
For n = 1 = A, its code is $3 \times 1 + 2 = 5 = E$,
n = 2 = B, its code is $(3 \times 2) + 2 = 8 = H$,
n = 3 = c, its code is $(3 \times 3) + 2 = 11 = K$
and so on.
Similarly, the codes for the remaining letters can be determined.

Letters:	A B C D E F G H I J K L M
Codes:	E H K N Q T W Z C F I L O
Letters:	N O P Q R S T U V W X Y Z
Codes:	R U X A D G J M P S V Y B

21. STATE is coded as GJEJQ. Choice (2)

22. RADIO is coded as DENCU. Choice (1)

23. COMPUTER is coded as KUOXMJQD. Choice (2)

24. CKQJ is the code to the word ICET. Choice (4)

25. FULLY is coded as JOLLY. Choice (3)

(26-30):

It is given that for vowels, their next vowels are given as their codes. For consonants their previous consonants, is are given as their codes.
The letters and their corresponding codes are as follows.

Letter:	A B C D E F G H I J K L M
Code:	E Z B C I D F G O H J K L
Letter:	N O P Q R S T U V W X Y Z
Code:	M U N P Q R S A T V W X Y

26. The code for EVEREST is ITIQIRS. Choice (1)

27. The code for ENERGY is IMIQFX. Choice (4)

28. The word RANGER is coded as QEMFIQ. Choice (2)

29. The code for CRICKET is BQOBJIS. Choice (3)

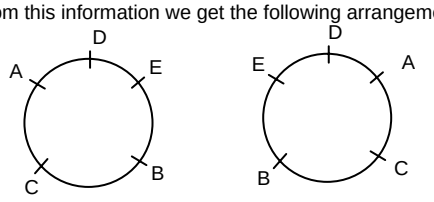
30. DISCOVER is coded as CORBUTIQ. Choice (4)

(31-40):

31. Given the present age of the daughter is 20 years. The age of daughter fifteen years ago is 5 years.
Given their ratio fifteen years ago is 6 : 1
$\therefore$ The age of the mother fifteen years ago is = 30 years.
$\therefore$ The present age of the mother is 45.
$\therefore$ The age of the mother after 5 years from now is 45 + 5 = 50 years. Choice (3)

32. The men and women can be arranged as follows.
W_1M_1 W_2M_2 W_3M_3 W_4M_4,W_5. The five women can be arranged in their respective positions in 5! ways. The four men can be arranged in their respective positions in 4! ways.
$\therefore$ The total number of arrangements = $5! \times 4! = 2880$.
Choice (3)

33. It is given that five persons – A, B, C, D and E are sitting around a circular table.
D is in-between A and E and C is in-between A and B. From this information we get the following arrangements.



In both the cases, E is between B and D. Choice (4)

34. If the first day of a month is Sunday, then the first Saturday is on 7^{th}.
$\therefore$ The second Saturday is on 14^{th}.
Hence, the date of the Monday after the second Saturday is 16^{th}. Choice (4)

35. The number of odd days from 1^{st} January to 2^{nd} March in a leap year.
Month: January + February + March
Odd days: 2 + 1 + 2
Total number of odd days is five.
Five days to Tuesday is Sunday. Choice (1)

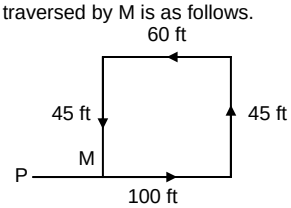
36. The man's wife's brother is the son of the women's only brother. Hence, the women's brother is the man's father-in-law. So, the person in the photograph is the sister of this man's father-in-law. Choice (4)

37. $x * y = 2x + y$
$2 * a = 2(2) + a = 4 + a$
$a * 3 = 2(a) + 3$
$\therefore$ Given $2 * a = a * 3$
$4 + a = 2a + 3$
$\therefore a = 1$ Choice (3)

38. The least 3 digit number that leaves a remainder 5 when divided by 7 is 103. Greatest 3 digit number that leaves a remainder 5 when divided by 7 is 999.
The above series is in A.P with common difference 7, the first term 103 and the last term 999.
$\therefore$ $tn = a + (n - 1)d$
$999 = 103 + (n - 1)7$
$896 = (n - 1)7$
$128 = n - 1$
$129 = n$ Choice (3)

39. In 12 hours the two hands coincide for 11 times. Hence, in 24 hours they coincide for 22 times. Choice (1)

40. The path traversed by M is as follows.



Distance between M and P is 100 – 60 = 40 ft.
Choice (4)

(41-55):

41. The given numbers are in the following pattern.
$(2 + \sqrt{5})$, $(2 + \sqrt{5})^2$, $(2 + \sqrt{5})^3$, $(2 + \sqrt{5})^4$, _____
$\therefore (2 + \sqrt{5}) = 38 + 17\sqrt{5}$ is the required number.
Choice (2)

42. The given series is an alternate series
1^{st} letter: A^{+4}, E^{+4}, $\underline{I^{+4}}$, M^{+4}, Q
2^{nd} latter: B^{+4}, F^{+4}, $\underline{J^{+4}}$, N^{+4}, R
3^{rd} letter: D^{+4}, H^{+4}, $\underline{L^{+4}}$, P^4, T
$\therefore$ IJL is the missing term. Choice (3)

43. 99 : 120 : : _____ : 63
$10^2 - 1 : 11^2 - 1 : :$ _____ : $8^2 - 1$
$\therefore$ $7^2 - 1 = 48$ is the missing number. Choice (2)

44. The given letters are in the following pattern.
T^{+3}, W^{+3}, Z^{+3}, C^{+3}, $\underline{F^{+3}}$, I
$\therefore$ F is the missing letter. Choice (3)

45. The given numbers can be expressed as follows.
5, 10, 26, 50, 122, _____, 290, 362
$2^2 + 1$, $3^2 + 1$, $5^2 + 1$, $7^2 + 1$, $11^2 + 1$, $\underline{13^2 + 1}$, $17^2 + 1$, $19^2 + 1$
$\therefore$ $13^2 + 1 = 170$ is the missing number.
Choice (2)

46. The given numbers can be expressed as follows.
$22\frac{2}{9}$, 25, $28\frac{4}{7}$, _____, 40
$\frac{200}{9}$, $\frac{200}{8}$, $\frac{200}{7}$, $\frac{200}{6}$, $\frac{200}{5}$
$\therefore$ $\frac{200}{6} = 33\frac{1}{3}$ is the missing number. Choice (1)

47. The given series is an alternate series
1^{st} number: 2^{+3}, 5^{+5}, 10^{+7}, $\underline{17}$
2^{nd} number: 0^{+3}, 3^{+5}, 8^{+7}, $\underline{15}$
$\therefore$ (17, 15) is the missing term. Choice (4)

48. The Given numbers can be expressed as follows.
$4^0 + 3$, $4^1 + 3$, $4^2 + 3$, $4^3 + 3$, $\underline{4^4 + 3}$, $4^5 + 3$.
$\therefore$ $4^4 + 3 = 259$ is the required number. Choice (3)

49. Numerators are in the following pattern,
3^{+5}, 8^{+7}, $\underline{15^{+9}}$, 24^{+11}, 35
The differences are consecutive odd numbers.
Denominator is two more than the numerator.
$\therefore$ $\frac{15}{17}$ is the missing term. Choice (4)

50. 1^{st} term: A B C
logic -1 -2 -3
2^{nd} term: Z Y X
Similarly, EFG : DCB
$\therefore$ DCB is the missing term. Choice (2)

51. Each number can be expressed as $(2n + 1)^2$ when n is a prime number.
25, 49, 121, 225, _____
$(2 \times 2 + 1)^2$, $(2 \times 3 + 1)^2$, $(2 \times 5 + 1)^2$, $(2 \times 7 + 1)^2$, $(2 \times 11 + 1)^2$
$(2 \times 11 + 1)^2 = 23^2 = 529$ is the missing number.
Choice (3)

52. This question is a deviation from the regular analogy logic. This should be answered by applying principle of ratios:
i.e., $\frac{1800}{1675} = \frac{3600}{x}$
$\therefore$ x = 3350 is the next number. Choice (3)

53. The given numbers are in the following pattern.
2^{-3}, -1^{+6}, 5^{-12}, -7^{+24}, $\underline{17^{-48}}$, –31
$\therefore$ 17 is the missing number. Choice (4)

54. The given series is an alternate series
1^{st} letter: B^{+3}, E^{+4}, I^{+5}, $\underline{N}$
2^{nd} letter: A^{+3}, D^{+4}, H^{+5}, $\underline{M}$
3^{rd} letter: T^{+3}, W^{+4}, A^{+5}, $\underline{F}$
$\therefore$ NMF is the next term. Choice (4)

55. The given series is an alternate series
1st letter: $\underline{Y}^{+10}$, I^{+10}, $S^{+10,}$ C
2nd letter: $\underline{X}^{+10}$, H^{+10}, $R^{+10,}$ B
3rd letter: $\underline{D}^{+10}$, N^{+10}, $X^{+10,}$ H
∴ YXD is the missing latter. Choice (2)

(56-65):

56. Except RTUS, others follow similar pattern
F^{+3} I^{-1} H^{-1} G, K^{+3} N^{-1} M^{-1} L, R^{+2} T^{-1} U^{-2} S, V^{+3} Y^{-1} X^{-1} W
Choice (3)

57. Except 163, other numbers can be expressed in $n^2 - 1$ form.
$80 = 9^2 - 1$, $99 = 10^2 - 1$ and $120 = 11^2 - 1$.
Choice (4)

58. Except Cinema hall, other places are related to travel.
Choice (2)

59. Except in 2T1, in other terms the digits on either side of the latter makeup its place value.
V = 22, X = 24 and Z = 26.
T = 20 Choice (1)

60. Except mouth, all others are in pairs.
OR
Except hand all others are a part of the face.
Here, the logic that eye, ear, mouth are a part of face is in accordance with the logic of odd man out, that out of the given items, except one all the other belong to a group. Hence choice (1) is the appropriate answer. Choice (1)

61. Except $x^2 - x - 12 = 0$, all others have complex roots.
Choice (4)

62. Except T, all others belong to first half the English alphabet.
Choice (4)

63. Except FLUTE, other are string instruments.
Choice (4)

64. Except 72, all other numbers are product of two prime numbers.
$35 = 5 \times 7$, $46 = 2 \times 23$, $72 = 8 \times 9$ and $91 = 7 \times 13$.
OR
Except 46, other numbers can be expressed as the some of the cubes of two numbers.
$35 = 2^3 + 3^3$, $72 = 2^3 + 4^3$, $91 = 3^3 + 4^3$ but 46 cannot be expressed in Choice (2) or (3).

65. Except 216, other numbers can be expressed in $n^3 + 1$ form.
$28 = 3^3 + 1$, $65 = 4^3 + 1$ and $126 = 5^3 + 1$.
$216 = 6^3$ Choice (4)

(66-70):

66. Let the total cost be x.
6% of x + 8% of x = 70,000
14% of x = 70,000
$\therefore x = \frac{100}{19} \times 70{,}000 = 5{,}00{,}000$. Choice (2)

67. Given 2% of total cost = 10,000
∴ total cost = 5,00,000
For a profit of 4%, the sales must be 5,20,000
$\therefore$ cost per book = $\frac{5{,}20{,}000}{13{,}000} = 40$ Choice (1)

68. Given 12% of total cost = 60,000
If transportation charges are reduced by half, the total cost is reduced by 4%
4% = $\frac{60{,}000}{3} = 20{,}000$ Choice (4)

69. If the total cost is x,
30% of x – 24% of x = 30,000
∴ 6% of x = 30,000
Advertising charges = 18% of x = 90,000 Choice (4)

70. Angle for miscellaneous charges = 100 – (24 + 30 + 18 + 12 + 8 + 6) = 100 – 98 = 2%
$= \frac{2}{100} \times 360 = 7°12'$ Choice (3)

(71-75):

71. The number of literate workers with at least 3 dependants = 15 + 20 + 5 +5 = 45. Choice (4)

72. Total Number of dependents = $(40 \times 1) + (60 \times 2) + (35 \times 3) + (40 + 4) + (15 \times 5) + (10 \times 6)$
= 40 + 130 + 105 + 160 + 75 + 60 = 560. Choice (1)

73. Percentage of illiterate workers
$= \frac{95}{200} \times 100 = 47.5\%$ Choice (2)

74. Total number of workers = 40 + 60 + 35 + 40 + 15 + 10 = 200. Choice (2)

75. Number of literate workers = 105
Number of illiterate workers = 95
Required ratio = 105 : 95 = 21 : 19 Choice (3)

Section – B

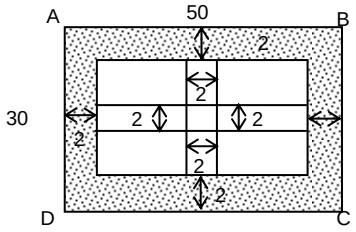
(76-150): Mathematical Ability

76. Let R and r be the outer and inner radii of the ground.
Given that
$2\pi(R - r) = 66 ; \Rightarrow 2 \times \frac{22}{7} (R - r) = 66$
$\Rightarrow R - r = 10.5$ m
∴ width of the road = R – r = 10.5 m Choice (2)

77. Given, the height of cone (h) = 84 cm and the area of base = 3850 sq.cm
$\Rightarrow \pi r^2 = 3850 ; \Rightarrow \frac{22}{7} r^2 = 3850 ; \Rightarrow r^2 = 1225$
$\Rightarrow$ r = 35 cm
The slant of the cone (ℓ) = $\sqrt{h^2 + r^2}$ = 91 cm
The CSA of the cone = $\pi r \ell = \frac{22}{7} \times 35 \times 91$
= 10010 sq cm Choice (3)

78. Given that the ratio of weights of three solid spheres = 8 : 27 : 64
The weight and volume of spheres are in direct variation.
∴ The ratio volumes of the spheres = 8 : 27 : 64
$\Rightarrow r^3, r_2^3, r_3^3 = 8 : 27 : 64$
$\Rightarrow r, : r_2 : r_3 = 2 : 3 : 4$
$\Rightarrow 2r, : 2r_2 : 2r_3 = 4 : 6 : 8$ Choice (4)

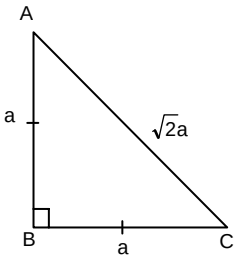
79.



Given that the dimensions of the plot are 50m x 30m
The width of the plot is given as 2 m. From the figure the required area = (50 x 30 – (50 – 4) (30 – 4)) + ((50 – 4) (2) + (30 – 4) 2 – 2 x 2) = 1500 – 1196 + 92 + 52 – 4
= 444 sq.m Choice (1)

80. Given that the parallel sides of trapezium are a = 20m and b = 35 m.
The distance between parallel sides (h) = 8m.
Area of trapezium
$= \frac{h}{2}(a+b) = \frac{8}{2}(20+35) = 220$ sq m Choice (2)

81.



Given that $\frac{a^2}{2} = 4.5 \Rightarrow a^2 = 9 ; \Rightarrow a = 3$

The perimeter of right isosceles triangle = $2a + \sqrt{2}a$
$= 2(3) + \sqrt{2}(3) = \left(6+3\sqrt{2}\right)$ m Choice (1)

82. The required number should be of the form 8 k + 3 . The least 3 digit number of the required form = 8 × 13 + 3 = 107. Choice (2)

83. 9 (mod 2) = 2 k + 9 $\Rightarrow$ x + 8 = 2k + 9.
$\Rightarrow x \in$ = 2 k + 1.
$\therefore$ The required set of numbers are odd numbers = Z – 2Z.
Choice (4)

84. Let the length and breadth of the rectangle be 2x, x respectively.
Area of the rectangle = $2x^2 = 8^2$ [same as that of square with side 8] $\Rightarrow x^2 = 32$
$\Rightarrow x = \sqrt{32} = 4\sqrt{2}$.
Perimeter of rectangle = 2 (l + b) = 2 (2x + x) = 6x
$= 6 \times \sqrt{32} = 24\sqrt{2}$. Choice (1)

85. $36000 = 2^5 \times 3^2 \times 5^3$
$\therefore$Number of divisors = (5 +1) (2 + 1) (3 + 1)
$= 6 \times 3 \times 4 = 72$ Choice (2)

86. $\sqrt{47-4\sqrt{33}} = \sqrt{47-2\sqrt{132}} =$
$\sqrt{44+3-2\sqrt{44}\times\sqrt{3}} =$
$\sqrt{\left(\sqrt{44}\right)^2+\left(\sqrt{3}\right)^2-2\sqrt{44}\times\sqrt{3}} = \left(\sqrt{44}-\sqrt{3}\right)^2$
$= \sqrt{44}-\sqrt{3}$. Choice (3)

87. Number of diagonals of an sided polygon = $^nC_2 - n$
$\therefore$Required number of diagonals = $^{18}C_2 - 18$
$= \frac{18\times17}{2} - 18 = (17\times9) - 18 = 153 - 18 = 135.$
Choice (4)

88. The volume of a cylinder = $\pi r^2{}_c\, h_c$ [r_c = radius, h_c = height]
The volume of cone = $\frac{1}{3}\pi r_i^2 h_i$ (r_i = radius, h_i = height).
The ratio of their volumes = $\pi r_c^2 h_c : \frac{1}{3}\pi r_i^2 h_i = 3:1$
[$\because r_c = r_i$ and $h_c = h_i$ (given)] Choice (2)

89. Total surface area of a cube = $6a^2 = 6$ (side)^2
$= 6(5)^2 = 150$ sq. cm. Choice (3)

90. $\frac{8^{\frac{3}{4}}\times9^{\frac{4}{3}}}{27^{\frac{3}{2}}\times16^{\frac{2}{3}}} = \frac{2^{\frac{9}{4}}\times3^{\frac{8}{3}}}{3^{\frac{9}{2}}\times2^{\frac{8}{3}}} = 2^{\frac{9}{4}-\frac{8}{3}}\times3^{\frac{8}{3}-\frac{9}{2}}.$
$= 2^{\frac{-5}{12}}\times3^{\frac{-11}{6}} = 2^a\times3^b$ …… (1)
$\therefore a = -5/12, b = -11/6$ …. (2)
$\therefore a - b = \frac{-5}{12}+\frac{11}{6} = \frac{17}{12}$. Choice (3)

Note : We concluded (2) from (1) as we assumed a and b as rational numbers.

91. Perimeter of a regular hexagon = 6 × (side)
= 6(a) = 24 $\Rightarrow$ a = 4 cm.
$\therefore$ Area of the regular hexagon = $6\times\frac{\sqrt{3}}{4}\times a^2$
$= 6\times\frac{\sqrt{3}}{4}\times4\times4 = 24\sqrt{3}$. Choice (4)

92. Let the number of boys = b.
Number of girls = 70 – b.
Total amount distributed = b × 30 + (70 – b) × 35 = 2350.
$\Rightarrow$ 30 b + (35 × 70) – 35 b = 2350.
2450 – 2350 = 5 b.
100 = 5 b
b = 20. Choice (4)

93. As the units digit of n^5 is always n, (when n is a natural number less than 9), the units digit of RHS is n.
$\therefore$ b = n
Alternative solution:
Given, $n^5 = 10a + b$, where a, b and n are from N.
We know that $n^5 - n$ is always divisible by 10.
$\therefore$ b = n Choice (2)

94. $(3^4)^x = (3^{-5})^y$; $\Rightarrow 4x = -5y \Rightarrow 4$ Choice (4)

95. $\frac{q}{p} = \frac{7}{10}\times\frac{5}{3} = \frac{7}{6} \Rightarrow p : q = 6 : 7$ Choice (1)

96. $\left[\frac{\left(\sqrt{7}+\sqrt{5}\right)^2+\left(\sqrt{7}-\sqrt{5}\right)^2}{\left(\sqrt{7}\right)^2-\left(\sqrt{5}\right)^2}\right]^3$
$= \left[\frac{2\left(\left(\sqrt{7}\right)^2+\left(\sqrt{5}\right)^2\right)}{7-5}\right]^3 = \left(\frac{24}{2}\right)^3 = 12^3 = 1728$
Choice (1)

97. $16^{\frac{3}{4}} - 8^{\frac{1}{3}} + 49^{\frac{1}{2}} = \left(2^4\right)^{\frac{3}{4}} - \left(2^3\right)^{\frac{1}{3}} + \left(7^2\right)^{\frac{1}{2}}$
$= 2^3 - 2^1 + 7^1 = 13$ Choice (2)

98. $\frac{ab^{\frac{1}{2}}-a^{\frac{1}{2}}b}{a^{\frac{1}{2}}-b^{\frac{1}{2}}} = \frac{a^{\frac{1}{2}}b^{\frac{1}{2}}[a^{\frac{1}{2}}-b^{\frac{1}{2}}]}{a^{\frac{1}{2}}-b^{\frac{1}{2}}} = a^{\frac{1}{2}}b^{\frac{1}{2}} = (ab)^{\frac{1}{2}} = \sqrt{ab}$
Choice (3)

99. The difference between the remainders and the divisors is constant i.e. 11
$\therefore$Required number will be of the form
K x LCM (36, 48, 64) - 11
$= K \times LCM\,(3^2 x 2^2; 3 x 2^4; 2^6) - 11$
$K(3^2 x 2^6) - 11 = 576k - 11$
$\therefore$ The least positive integer = $1 \times 576 - 11 = 565$
Choice (4)

100. $\frac{54}{n^3} = \frac{2 \times 3^3}{n^3}$,

$\therefore$ for the number to be even the least value is n should be – 3 Choice (3)

101. Given that $\frac{1}{A}+\frac{1}{B}=\frac{1}{12}$ .... (1)

$\frac{1}{B}+\frac{1}{C}=\frac{1}{15}$ ..... (2) and $\frac{1}{C}+\frac{1}{A}=\frac{1}{20}$

(1) + (2) + (3) $\Rightarrow 2\left[\frac{1}{A}+\frac{1}{B}+\frac{1}{C}\right]=\frac{1}{12}+\frac{1}{15}+\frac{1}{20}$

$\Rightarrow \frac{1}{A}+\frac{1}{B}+\frac{1}{C}=\left[\frac{5+4+3}{60}\right]\frac{1}{2}$

$\therefore \frac{1}{A}+\frac{1}{B}+\frac{1}{C}=\frac{1}{10}$

$\therefore$A, B and C can complete the work in 10 days Choice (4)

102. 25% of CP – 20% of CP = 35 $\Rightarrow$ 5% of CP = 35.
The total price of the article is Rs.700. Choice (2)

103. Ratio of the profits of X, Y and Z is
(6000 x 2) : (7000 x 4) : (6400 x 5)
= 60 x 2 : 70 x 4 : 64 x 5 = 120 : 280 : 320 = 3 : 7 : 8

$\therefore$ Share of X $= \frac{3}{3+7+8}\times 900 = \frac{3}{18}\times 900 = Rs.150$

Choice (2)

104. Speed of the train $= \frac{L_t + L_b}{time}$ where L_t is the length of the train (say x m) and L_b is the length of the bridge (given as 150 m) ; $\Rightarrow 90 \times \frac{5}{18} = \frac{x+150}{20}$

500 – 150 = x ; $\Rightarrow$ x = 350 Choice (1)

105. Given numbers are
a = 1152 and b = 1664
HCF (a, b) = 128

$\therefore$ LCM $= \frac{a \times b}{HCF} = \frac{1152 \times 1664}{128} = 14976$ Choice (3)

106. Rem $\left(\frac{2^{13416}}{5}\right)$ is equivalent to Rem $\left(\frac{2^4}{5}\right) = 1$

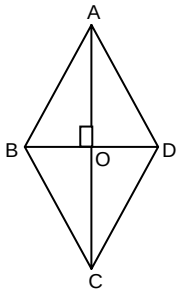
Choice (4)

107. Given P $\left(1+\frac{R}{100}\right)^4 = 4P$; $\Rightarrow \left(1+\frac{R}{100}\right) = 4^{\frac{1}{4}}$

Let $\left(1+\frac{R}{100}\right)^n = 64$; $\Rightarrow \left(4^{\frac{1}{4}}\right)^n = 64 = 4^3 = \frac{n}{4} = 3$

$\Rightarrow$ n = 12 Choice (4)

108. The perimeter of the rhombus = 100 cm.



The side of the rhombus = $\frac{100}{4} = 25\,cm$

Let AB = 25 cm

Let AC = 40 cm ; $\Rightarrow$ AO = $\frac{40}{2}$ = 20 cm

BO = $\sqrt{AB^2 - AO^2} = \sqrt{25^2 - 20^2} = \sqrt{15^2}$ = 15 cm

$\Rightarrow$ BD = 2(BO) = 30 cm

Area of the rhombus = $\frac{AC \times BD}{2} = \frac{40 \times 30}{2}$ = 600 sq cm.

Choice (3)

109. $\frac{3}{7}^{th}$ of the cistern is filled in 6 hours, so the cistern is filled in $\frac{7}{3}\times 6 = 14\,hours$ Choice (1)

110. In 5 minutes the part of the tank filled is

$5\left(\frac{1}{20}+\frac{1}{25}\right) = 5\left(\frac{9}{100}\right) = \frac{9}{20}$

Remaining, 1 - $\frac{9}{20} = \frac{11}{20}$ of the tank is filled by the first tap. This tap can fill the complete cistern in 20 minutes and so, $\frac{11}{20}$ can of the cistern is filled in $\frac{11}{20}\times$ 20 i.e. 11 minutes. Choice (2)

111. $\sec\theta - \tan\theta = 5$ .... (1)

$\Rightarrow \sec\theta + \tan\theta = \frac{1}{5}$ ..... (2)

Solving (1) and (2) $\Rightarrow \sec\theta = \frac{13}{5}$ and $\tan\theta = \frac{-12}{5}$

$\sin\theta = \frac{\tan\theta}{\sec\theta} = \frac{-12}{13}$ Choice (3)

112. $\frac{\sin\theta}{\sec\theta - 1} - \frac{\sin\theta}{\sec\theta + 1} = \frac{\sin\theta(\sec\theta+1) - \sin\theta(\sec\theta-1)}{(\sec\theta-1)(\sec\theta+1)}$

$\sin\theta\left[\frac{\sec\theta + 1 - \sec\theta + 1}{\sec^2\theta - 1}\right] = \sin\theta \ \frac{2}{\tan^2\theta}$

$= 2\cot^2\theta\sin\theta = 2\cot\theta\cos\theta$.

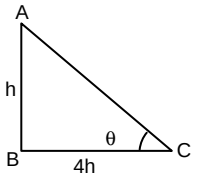
Choice (1)

113. Let AB be the height of tower and BC, the length of shadow of tower.

In ΔABC $\tan\theta = \frac{AB}{BC}$

$\tan\theta = \frac{h}{4h}$

$\theta = \tan^{-1}\left(\frac{1}{4}\right)$



Choice (4)

114. Given A $= \begin{bmatrix} 3 & -1 \\ 0 & 5 \end{bmatrix}$, B $= \begin{bmatrix} 2 & 1 \\ 4 & -1 \end{bmatrix}$

2A $= \begin{bmatrix} 6 & -2 \\ 0 & 10 \end{bmatrix}$ 3B $= \begin{bmatrix} 6 & 3 \\ 12 & -3 \end{bmatrix}$

2A + 3B $= \begin{bmatrix} 6+6 & -2+3 \\ 0+12 & 10-3 \end{bmatrix}$

2A + 3B $= \begin{bmatrix} 12 & 1 \\ 12 & 7 \end{bmatrix}$

|2A + 3B| = $\begin{vmatrix} 12 & 1 \\ 12 & 7 \end{vmatrix}$ = 84 – 12 = 72

Choice (2)

115. $A = \begin{bmatrix} \cos\theta & \sin\theta \\ \sin\theta & -\cos\theta \end{bmatrix}$

$\det A = -\cos^2\theta - \sin^2\theta = -(\cos^2\theta + \sin^2\theta) = -1$

If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, then $A^{-1} = \frac{1}{\det A}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

$= -1\begin{bmatrix} -\cos\theta & -\sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix} = \begin{bmatrix} \cos\theta & \sin\theta \\ \sin\theta & -\cos\theta \end{bmatrix}$ Choice (2)

116. $\sin75° = \sin(45° + 30°) = \sin45°\cos30° + \cos45°\sin30°$

$= \frac{1}{\sqrt{2}}\frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}}\frac{1}{2} = \frac{\sqrt{3}+1}{2\sqrt{2}}$ Choice (4)

117. The minimum value of a cosx + bsinx + c is $c - \sqrt{a^2+b^2}$

$\therefore$ The minimum value of 7 – 5cosx – 12sinx is

$7 - \sqrt{5^2+12^2} = -6.$ Choice (3)

118. $\tan(85° + 50°) = \frac{\tan85^o + \tan50^o}{1 - \tan85^o\tan50^o} = -1$

$\Rightarrow \tan80°\tan50° - \tan85° - \tan50° = 1$ Choice (1)

119. Using L. Hospitals rule

$\lim_{x\to0} \frac{7\cos\theta - \cos\theta}{10\cos10\theta - 7\cos7\theta} = \frac{7-1}{10-7} = \frac{6}{3} = 2$

Choice (1)

120. Let T_{r+1} contain the coefficient of x in $\left(x^p + \frac{1}{x^q}\right)$. Then

$r = \frac{np-k}{p+q}$ here n = 4, p = 1, q = 2, k = –2

$r = \frac{4\times1-(-2)}{2+1} = 2$

$\therefore$ Third term contains the coefficient of x^{-2}

$\therefore$ required coefficient $(T_3) = T_{2+1} = {}^4C_2(-3)^2(2)^2 = 216$

Choice (3)

121. $\frac{d}{dx}\left(\frac{\log10}{\log x}\right) = \log10\frac{d}{dx}(\log x) = \frac{-\log10}{(\log x)^2}\frac{d}{dx}(\log x)$

$= \frac{-\log10}{x(\log x)^2}$ Choice (2)

122. $\lim_{x\to5} \frac{(x+1)^2(x-5)^2}{|x-5|}$

$\lim_{x\to5} \frac{(x+1)^2(x-5)^2}{-(x-5)} = 0$ and $\lim_{x\to5^+} \frac{(x+1)^2(x-5)^2}{(x-5)} = 0$

$\lim_{x\to5} \frac{(x^2-4x-5)^2}{|x-5|} = 0$ Choice (3)

123. When f(x) is divided by x – a, the remainder is f(a)

Required remainder $f(3) = 3^3 - 2(3)^2 - 3 = 27 - 18 - 3 = 6$

Choice (4)

124. $\begin{vmatrix} 4a & 4b \\ 3c & 3d \end{vmatrix} = 12ad - 12bc = 12(ad - bc) = 12|A|$

$= 12 \times 5 = 60$ Choice (4)

125. $\lim_{x\to0} \frac{\sqrt{4+x} - \sqrt{4-x}}{x} \times \frac{\sqrt{4+x} + \sqrt{4-x}}{\sqrt{4-x} + \sqrt{4+x}}$

$\lim_{x\to0} \frac{4+x-4+x}{x\left(\sqrt{4-x} + \sqrt{4-x}\right)} = \lim_{x\to0} \frac{2x}{x\left(\sqrt{4-x} + \sqrt{4-x}\right)}$

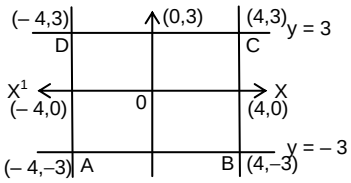
$= \frac{2}{4} = \frac{1}{2}$ Choice (3)

126. $f(x) = 2^{\cot x} \Rightarrow f^{-}(x) = 2^{\cot x}.\log2\frac{d}{dx}(\cot x)$

$\therefore 2^{\cot x}\log2.(-\text{cosec}^2x)$

$f^1(\pi/4) = 2.\log2.(-2) = -4\log2$ Choice (2)

127.



AB = 8 units

BC = 6 units.

Area of ABCD = AB × BC = 48 sq units.

Choice (2)

128. $f(x) = \frac{1}{\sqrt{x}} = x^{-\frac{1}{2}}$

$f^1(x) = -\frac{1}{2}.x^{-\frac{1}{2}-1} = -\frac{1}{2}x^{-\frac{3}{2}}$

$f^{-1}(4) = -\frac{1}{2}(4)^{-3/2} = \frac{-1}{2}.\frac{1}{8} = \frac{-1}{16}$ Choice (1)

129. We know that harmonic mean of a, b is $\frac{2ab}{a+b}$.

$\therefore$ The harmonic mean of 15 and 10 is $= \frac{300}{25} = 12$

Choice (4)

130. Consider second option

p	q	$p \wedge q$	$(p \wedge q) \to p$
T	T	T	T
T	F	F	T
F	T	F	T
F	F	F	T

$\therefore (p \wedge q) \to p$ is tautology. Choice (2)

131. We know $3^1 = 3$, $3^2 = 9$, $3^3 = 7$, $3^4 = 1$

$3^{741} = (3^4)^{185}.3$

The unit of $\left(3^4\right)^{185}$ is 1.

$\therefore$hence the unit digit of 3^{741} is 3 Choice (1)

132. $A - (B \cap C) = (A - B) \cup (A - C)$

(standard result) Choice (3)

133. $x^2 + x + 1 = 0$

The roots of the above question are ω, ω^2 where ω is the complex cube root of unity. Let $\alpha = \omega$, $\beta = \omega^2$

$\alpha^{28} - \beta^{56} = (\omega^2)^{28} - \omega^{56} = 0.$ Choice (4)

134. Given A_n = Set of all positive integral divisions of n.

$A_{18} = \{1, 2, 3, 6, 9, 18\}$ and $A_{24} = \{1, 2, 3, 4, 6, 8, 12, 24\}$

$A_{18} \cap A_{24} = \{1, 2, 3, 6\}$

$\therefore n(A_{18} \cap A_{24}) = 4$ Choice (1)

135. We know that the number of bijections from A to A when A has n elements is n!

Here n = 5

$\therefore$ Required number of bijections = 5! Choice (3)

136. The equation of a straight line in intercept from is $\frac{x}{a}+\frac{y}{b}=1$

Here a = 1/5; b = 1/7

The required equation of the line is $\frac{x}{1/5}+\frac{y}{1/7}=1$

$\Rightarrow 5x + 7y = 1$ Choice (2)

137. The perpendicular distance from (x_1, y_1) to ax + by + c = 0 is $\frac{|ax_1+by_1+c|}{\sqrt{a^2+b^2}}$.

The required distance = $\frac{|3(2)+4(-3)-4|}{\sqrt{3^2+4^2}}$

$= \frac{|6-12-4|}{\sqrt{25}} = 2$ units Choice (2)

138. Equation of the line passing through (4, –5) and (5,1) is

$y + 5 = \frac{1-(-5)}{5-4}(x-4)$

$y + 5 = 6(x – 4)$

$\Rightarrow 6x – y – 29 = 0$

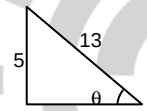
x – intercept = $\frac{29}{6}$ Choice (1)

139. Required number of subsets of A = total subsets of A – subset which contain 5 elements = $2^5 – 1 = 31$

Choice (1)

140. $\cos\theta = \frac{-12}{13}$

Since $\theta \notin Q_3$ and cosθ° is negative



$\therefore \theta \in Q_2 \Rightarrow \sin\theta = \frac{5}{13}$ and $\tan\theta = \frac{-5}{12}$

$\sin\theta + \tan\theta = \frac{5}{13} + \frac{-5}{12} = 5\left(\frac{12-13}{156}\right) = \frac{-5}{156}$

Choice (4)

141. We know that if the AM of n_1 observations is x_1 and n_2 observations x_2, then the AM of total observations is $\frac{n_1x_1+n_2x_2}{n_1+n_2}$

Here $n_1 = 24$; $n_2 = 16$; $x_1 = 10$, $x_2 = 15$

$\therefore$ required combined mean = $\frac{24\times10+16\times15}{24+16}=\frac{480}{40}$

= 12. Choice (2)

142. Total number of 3 digit numbers that can be formed using the digits 0, 1, 2, 3, 4 is $\square\square\square$

$4 \times 4 \times 3 = 48$

n(s) = 48

If a number ends with an even digit then it is divisible by 2

Consider 3 blanks - - -

If units place is filled with '0', then the other two places can be filled in 4 × 3 = 12 ways

If units place is filled with 2 or 4 the remaining two places can be filled in 3 × 3 ($\because$ first place never be zero) ways

Total ways = 3 × 3 × 2 = 18

Favourable cases ie ending with 0 or 2 or 4 = 18 + 12 = 30

Required probability = $\frac{30}{48}=\frac{5}{8}$ Choice (4)

143. We know that Mode = 3 Median – 2 Mean

$16 = 3 \times 12 – 2$ Mean ; $\Rightarrow$ Mean = $\frac{36-16}{2} = 10$

Choice (3)

144. The given observations are in A.P. with common difference 5

$\therefore$ S.D =cd $\sqrt{\frac{n^2-1}{12}}$ (cd = common difference)

Here n = 7; cd = 5

$\therefore$ S.D = $5\sqrt{\frac{49-1}{12}} = 10$ Choice (4)

145. We know that when n coins are tossed, the probability of getting exactly r heads = $\frac{{}^nC_r}{2^n}$

Here n = 3, r = 1

$\therefore$ Required probability = $\frac{{}^3C_1}{2^3} = \frac{3}{8}$ Choice (2)

146. Arranging the given observations in increasing order we get.

1, 1, 2, 3, 4, 4, 5, 6, 7, 7, 8, 8, 9

We know that middle observation is median = 5

Choice (3)

147. Sum of observations 1^2 , 2^2 , - - - , $15^2 = 1^2 + 2^2 + - - - + 15^2 = \frac{15(15+1)(2.15+1)}{6} = 1240$

Mean of the given observations = $\frac{\text{sum}}{\text{total observations}}$

$= \frac{1240}{15} = \frac{248}{3}$ Choice (1)

148. A leap year contains 366 days. There are 52 full weeks and an extra of two days.

The following are the possibilities for the two days (Mon, Tues), (Tues, Wed), (Wed, Thur), (Thur, Fri), (Fri, sat), (Sat, Sun), (Sun, Mon), which are 7.

Favourable cases for the leap year to have 53 Thursdays are (Wed, Thur), (Thur, Frid) are 2

$\therefore$ The required probability = $\frac{2}{7}$ Choice (2)

149. When two dice are rolled, $n(s) = 6^2$

Favourable cases for the sum to be 7 are (1, 6), (2, 5), (3, 4), (4, 3), (5, 2), (6, 1) i e 6

$\therefore$ The required probability = $\frac{6}{6^2}=\frac{1}{6}$ Choice (2)

150. Here n(s) = 90

The number of numbers less than 90 which are divisible by 4 is 22 = n(A)

The number of numbers less than 90 which are divisible by 6 is 15 = n(B)

The number of numbers less than 90 which are divisible by both 4 and 6 ie divisible by 12, is 7.

$P(A \cup B) = P(A) + P(B) – P(A \cap B) = 22/90 + 15/90 – 7/90$

$\therefore$ Required probability = $\frac{22+15-7}{90}=\frac{30}{90}=\frac{1}{3}$

Choice (3)

Section – C

(151-200): Communication Ability

151. The speaker says, 'I never said that at all'. Hence, 'I beg your pardon' is used to convey his disagreement.

Choice (1)

152. When B says, 'I had no choice', he means that he dropped the person home because he had to, not because he wanted to. So the words show his resentment (annoyance or indignation). Choice (3)

153. The words used are decisive, in the nature of an order; hence command. Choice (1)

154. The idiom 'to raise a hue and cry' means to make a big show to draw attention, hence clamour. Choice (2)

155. To burn your fingers means to be hurt by your own actions. Choice (3)

156. To 'make a clean breast of' means to confess fully. Choice (3)

157. To build castles in the air means to day-dream. Choice (3)

158. To stick to means to confine yourself to. Choice (2)

159. 'Will the seminar come off? is right. To come off means to be successful. Choice (1)

160. Only 'rose' can fit since the other three imply done by somebody else. Choice (4)

161. Only 'laid' is right–the past tense of lay. Choice (2)

162. The right word is 'flowed' (Flow – flowed – flowed) since flown is the past participle of fly (fly – flew – flown). The blank takes 'has flowed'. Choice (4)

163. You take 'into' custody. 'Into' suggests movement. Choice (1)

164. Something is done 'in' a period of time. Choice (3)

165. You jump 'to' conclusions. Choice (2)

166. Refer to the first lines of para 1 and 2. Choice (1)

167. Refer to lines 5-6 of para 2. 'They are made as much by what we think as by what we see'. Choice (1)

168. 'Without' is also the opposite of 'within'. The stimuli (agent that affects the living organism) comes from the out side environment, that is, without. Choice (2)

169. Refer to lines 5-6 of para 2. So the image is modified by what we think. Choice (1)

170. Refer to the penultimate sentence '…. The mind projects its ideas of things on the screen of what we call memory…..' Choice (1)

171. Since the para talks mainly about recycling of paper even if only as an element in the making of paper and since there is hardly a difference between papr "production" and "manufacture" the appropriate title for the passage would be paper recycling. Choice (2)

172. Refer to line 1. Choice (3)

173. Refer to lines 4-6. Choice (4)

174. Refer to the third line from the end of the passage – '…. The paper industry has …. Utilization of used fibre'. Choice (1)

175. Choices 1, 3 and 4 are mentioned in lines 4 and 3 from the end of the para. Choice (2)

176. Refer to line 2 – unclear speech is <u>usually</u> due to unclear thought'. Which means that it may not be due to unclear though (confused thinking) also. Choice (2)

177. The passage says some people fail to impress the audience because 'they are nervous in public', that is, they are overpowered by fear. Choice (3)

178. Refer to line 5. Choice (3)

179. The passage says the audience may be annoyed by difficult words (they cannot understand). He says the construction of the sentence should be simple. Choice (3)

180. Refer to the last line '…. leave the hall'. Choice (4)

181. Rapture means great happiness or ecstasy. Choice (2)

182. To downsize is to reduce the scale of operations. Choice (4)

183. Visage means the face or countenance. Choice (2)

184. Equanimity means to be balanced or composure. Choice (4)

185. To apprehend is to arrest. Choice (3)

186. To optimize is to make the best use of resources or what you have. Choice (3)

187. A tornado 'strikes' a place. Choice (2)

188. The message 'saddened' her, so she broke down (cried). Choice (1)

189. 'Trespassers will be prosecuted' is the common notice. Choice (2)

190. To daunt is to frighten. Choice (2)

191. Choice (2)

192. Choice (2)

193. Choice (2)

194. Choice (1)

195. Choice (3)

196. Choice (3)

197. Choice (4)

198. Choice (1)

199. Choice (2)

200. Choice (1)