

- (1) $2r\sqrt{pq}$ (2) $2pq\sqrt{3}$ (3) $-2r\sqrt{pq}$ (4) \sqrt{pqr}

17. If 'a' is a positive integer, then the number of values satisfying

$$\int_0^{\pi/2} \left\{ a^2 \left(\frac{\cos 3x}{4} + \frac{3}{4} \cos x \right) + a \sin x - 20 \cos x \right\} dx \leq \frac{-a^2}{3} \text{ is}$$

- (1) only one (2) two (3) three (4) four

18. Find $\frac{d}{dx} \left(\sqrt{x} - \frac{5}{\sqrt{x}} \right)$

- (1) $\frac{1}{2\sqrt{x}} + \frac{3}{2}x^{-3/2}$ (2) $2x - \frac{5}{2}x^{3/2}$ (3) $2x + \frac{5}{2}x^{-3/2}$ (4) none of these

19. $\lim_{x \rightarrow \infty} \sqrt{\frac{(x + \sin x)}{(x - \cos x)}}$ equals to

- (1) 0 (2) 1 (3) -1 (4) none of these

20. If $f(x) = \int_0^x t \sin t dt$, then $f'(x)$ is

- (1) $\cos x + x \sin x$ (2) $x \sin x$ (3) $x \cos x$ (4) $x^2/2$

21. The value of $\sin 30^\circ \cos 45^\circ + \cos 30^\circ \sin 45^\circ$

[no correct answer was given in choices, correct answer should be $\frac{\sqrt{3}+1}{2\sqrt{2}}$]

- (1) $\frac{1-\sqrt{3}}{2}$ (2) $\frac{1-\sqrt{3}}{2\sqrt{2}}$ (3) $\frac{2}{\sqrt{3}}$ (4) $\frac{\sqrt{3}}{2}$

22. The solution of ΔABC given that $B = 45^\circ$, $C = 105^\circ$ and $c = \sqrt{2}$ is

- (1) $B = 30^\circ$, $C = \sqrt{3} - 1$, $b = \sqrt{2}(\sqrt{3} - 1)$ (2) $B = 30^\circ$, $C = \sqrt{3} + 1$, $b = \sqrt{2}(\sqrt{3} + 1)$
 (3) $B = 30^\circ$, $C = 1 - \sqrt{3}$, $b = \sqrt{2}(\sqrt{3} + 1)$ (4) $B = 30^\circ$, $C = \sqrt{3} - 1$, $b = \sqrt{2}(\sqrt{3} + 1)$

23. If $\tan \theta = \frac{b}{a}$, then the value of $a \cos 2\theta + b \sin 2\theta$ is

- (1) b (2) a (3) $\frac{a}{b}$ (4) $\frac{a}{a+b}$

24. The general solution of $\sqrt{3} \cos x + \sin x = 3$ is:

- (1) $2n\pi \pm \frac{\pi}{6}$ (2) $2n\pi \pm \frac{\pi}{3}$ (3) No solution (4) $n\pi \pm \frac{\pi}{6}$

25. The value of $\frac{1 - \tan^2 15^\circ}{1 + \tan^2 15^\circ}$ is

- (1) 1 (2) $\sqrt{3}$ (3) $\frac{\sqrt{3}}{2}$ (4) 2

26. $\int_0^{1/2} \frac{dx}{\sqrt{x-x^2}} =$

[no correct answer was given in choices, correct answer should be $\pi/2$]

- (1) $1/2$ (2) π (3) $\pi/3$ (4) $\pi/4$

27. If the area bounded by $y = x^2$ and $y = x$ is A sq. units then the area bounded by $y = x^2$ and $y = 1$ is
 (1) $2A + 1$ sq. units (2) $2A$ sq. units (3) $2A + 2$ sq. units (4) $A + 2$ sq. units
28. If a, b and c are unit coplanar vectors, then the scalar triple product $[2a - b, 2b - c, 2c - a] =$
 (1) 0 (2) 1 (3) $-\sqrt{3}$ (4) $\sqrt{3}$
29. Let $\vec{a} = x\vec{i} - 3\vec{j} - \vec{k}$ and $\vec{b} = 2x\vec{i} - x\vec{j} - \vec{k}$. Suppose that the angle between \vec{a} and \vec{b} is acute and the angle between \vec{b} and the positive direction of the y -axis lies between $\frac{\pi}{2}$ and π , then the set of all possible values of x is
 (1) $\{1, 2\}$ (2) $\{-2, -3\}$ (3) $\{x : x < 0\}$ (4) $\{x : x > 0\}$
30. Let $\vec{v} = 2\vec{i} + \vec{j} - \vec{k}$ and $\vec{w} = \vec{i} + 3\vec{k}$. If \vec{u} is a unit vector, then the maximum value of the scalar triple product $[\vec{u} \vec{v} \vec{w}]$ is
 (1) -1 (2) $-\sqrt{10} - \sqrt{6}$ (3) $\sqrt{59}$ (4) $\sqrt{10} + \sqrt{6}$
31. If $2x + 3y - 6 = 0$ and $9x + 6y - 18 = 0$ cuts the axes in concyclic points, then the center of the circle is: [no correct answer was given in choices, correct answer should be $(5/2, 5/2)$]
 (1) $(2, 3)$ (2) $(3, 2)$ (3) $(5, 5)$ (4) $(5/5, 5/2)$
32. The number of distinct solutions (x, y) of the system of equations $x^2 = y^2$ and $(x - a)^2 + y^2 = 1$ where 'a' is any real number, can only be
 (1) 0, 1, 2, 3, 4 or 5 (2) 0, 1 or 3 (3) 0, 1, 2 or 4 (4) 0, 2, 3 or 4
33. The vertex of parabola $y^2 - 8y + 19 = 0$ is
 (1) $(3, 4)$ (2) $(4, 3)$ (3) $(1, 3)$ (4) $(3, 1)$
34. The eccentricity of ellipse $9x^2 + 5y^2 - 30y = 0$ is
 (1) $\frac{1}{3}$ (2) $\frac{2}{3}$ (3) $\frac{3}{4}$ (4) $\frac{1}{4}$
35. If the function $f: [1, \infty) \rightarrow [1, \infty)$ is defined by $f(x) = 2^{x(x-1)}$, then $f^{-1}(x)$ is
 (1) $\left(\frac{1}{2}\right)^{x(x-1)}$ (2) $\frac{1}{2} \left\{ 1 + \sqrt{1 + 4 \log_2 x} \right\}$
 (3) $\frac{1}{2} \left\{ 1 - \sqrt{1 + 4 \log_2 x} \right\}$ (4) not defined
36. A random variable X has the following probability distribution

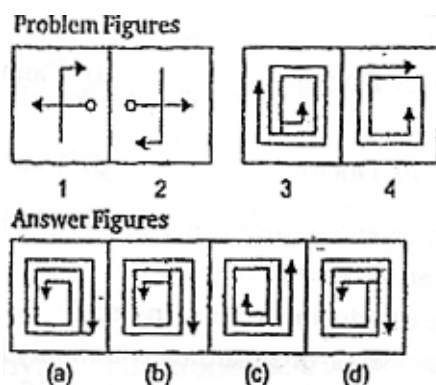
x	0	1	2	3	4	5	6	7	8
P(X=x)	a	3a	5a	7a	9a	11a	13a	15a	17a

- Then the value of 'a' is
 (1) $1/81$ (2) $2/82$ (3) $5/81$ (4) $7/81$
37. The sum of $11^2 + 12^2 + \dots + 30^2$
 (1) 8070 (2) 9070 (3) 1080 (4) 9700
38. If A and B are two square matrices such that $B = -A^{-1}BA$, then $(A + B)^2 =$
 (1) 0 (2) $A^2 + 2AB + B^2$ (3) $A^2 + B^2$ (4) $A + B$
39. Consider the system of linear equations
 $3x_1 + 7x_2 + x_3 = 2$
 $x_1 + 2x_2 + x_3 = 3$
 $2x_1 + 3x_2 + 4x_3 = 13$
- The system has
 (1) infinitely many solutions (2) exactly 3 solutions
 (3) a unique solution (4) no solution

40. If α, β are the roots of the equation $x^2 - 2x + 4 = 0$ then the value of $\alpha^6 + \beta^6$ is
 (1) 64 (2) 128 (3) 256 (4) 132
41. If θ is the angle between \mathbf{a} and \mathbf{b} and $|\mathbf{a} \times \mathbf{b}| = |\mathbf{a} \cdot \mathbf{b}|$, then θ is equal to:
 (1) 0 (2) π (3) $\pi/2$ (4) $\pi/4$
42. ABCD is a parallelogram with AC and BD as diagonals. Then $\vec{AC} - \vec{BD}$ is equal to:
 (1) $4\vec{AB}$ (2) $3\vec{AB}$ (3) $2\vec{AB}$ (4) \vec{AB}
43. If $\sin x, \cos x$ and $\tan x$ are in GP, then the value of $\cot^6 x - \cot^2 x$ is:
 (1) 2 (2) -1 (3) 1 (4) 0
44. The greatest angle of the triangle whose three sides are $x^2 + x + 1, 2x + 1$ and $x^2 - 1$ is
 (1) 150° (2) 90° (3) 135° (4) 120°
45. The general value of θ satisfying the equation $2\sin^2 \theta - 3\sin \theta - 2 = 0$ is
 (1) $n\pi + (-1)^n \frac{\pi}{6}$ (2) $n\pi + (-1)^n \frac{\pi}{2}$ (3) $n\pi + (-1)^n \frac{5\pi}{6}$ (4) $n\pi + (-1)^n \frac{7\pi}{6}$

ANALYTICAL ABILITY AND LOGICAL REASONING

46. Correct the following equations by inter-changing two signs. $3 - 9 \ 0 \times 27 + 9 \div 3 = 3$
 (1) + and (2) \times and + (3) \times and \div (4) \times and -
47. Pushpa is twice as old as Rita was two years ago. If the difference between their ages be 2 years, how old is Pushpa today? (Printing mistake it must be ago in place of age)
 (1) 6 years (2) 8 years (3) 10 years (4) 12 years
48. A clock is set right at 8 a.m. The clock gains 10 minutes in 24 Hrs. What will be the right time when the clock indicates 1 p.m. on the following day?
 (1) 11.40p.m. (2) 12.48 p.m. (3) 12 noon (4) 10p.m.
49. Choose the best answer figure to substitute element 4 in die problem figures so that element 3 is related to element 4 in the same way as element 1 is related to element 2.



Directions: Q. 50: In the following question three statements are followed by a conclusion. Study the statements and the conclusion and point out which statement studied together will bring to the conclusion.

50. Statements:
 i) Price rise is a natural phenomenon
 ii) If production increases prices fall
 iii) High prices affect the poor
 Conclusion: If production rises the poor feel relieved. Answer choices:
 (1) Only i and ii (2) Only i and iii (3) Only ii and iii (4) Data Insufficient
51. In how many different ways can the letters of the word "DETAIL" be arranged in such a way that the vowels occupy only the odd positions?
 (1) 32 (2) 36 (3) 48 (4) 60
52. If from 4 to 55 the number which are divisible by 3 and the numbers which contain 3 as one of the digits, are removed, then how many numbers will be left?
 (1) 24 (2) 23 (3) 22 (4) 25
53. In the following number-series, one term is wrong. Which term is wrong?
 5, 12, 19, 33, 47, 75, 104
 (1) 33 (2) 47 (3) 75 (4) 104
54. The position of A in a class is 5th from the top and position of B is 7th from the bottom. If C is at 6th place after A and 6th place before B, how many students are there in the class?
 (1) 25 (2) 23 (3) 21 (4) 22
55. Suppose $X = 2^{100}$, $Y = 3^{100}$ and $Z = 4^{100}$, exactly one of the following is true. Which is it?
 (1) $X + Y = Z$ (2) $X + Y < Z$ (3) $X + Y > Z$ (4) $XY = Z$

Directions: Q. 56-59: Study the following information to answer the given questions;

- i) In a family of 6 persons, there are two couples
 ii) The lawyer is the head of the family and has only two sons-Mukesh and Rakesh - both teachers,
 iii) Mrs, Reena and her mother-in-law both are lawyers.

iv) Mukesh's wife is a doctor and they have a son, Ajay.

56. What is the profession of Rakesh's wife?
 (1) Teacher (2) Doctor (3) Lawyer (4) None of these
57. How many male members are there in the family?
 (1) Two (2) Three (3) Four (4) None of these
58. What is/was Ajay's grandfather's occupation?
 (1) Teacher (2) Lawyer (3) Doctor (4) cannot be determined
59. What is the profession of Ajay?
 (1) Teacher (2) Lawyer (3) Doctor (4) Cannot be determined

Directions: Q 60: In the following question below are given two statements followed by four conclusions numbered I, II, III, IV. You have to take the two given statements to be true even if they seem to be at variance from commonly known facts. Read all the conclusions and then decide which of the given conclusions logically follows from the two given statements, disregarding commonly known facts.

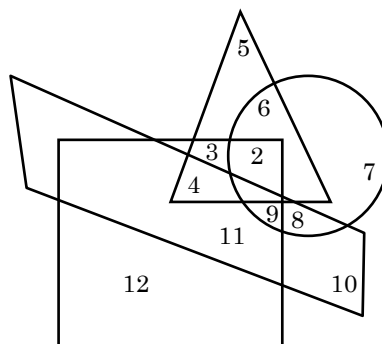
60. Statements:
 (A) Some green are blue (B) No blue is white
- Conclusions
 (I) Some blue are green (II) Some while are green
 (III) Some green are not white (IV) Ail white are green
- (1) Only I follows (2) Only II and III follows
 (3) Only I and III follows (4) Only I and II follows

Directions: Q. 61-63: Read the information given below and answer the questions that follow:

Four persons A, B, C and D play a cards game. They put Rs. 500 as stake money. When the game is over 'C' receives Rs. 19 more than 'D' and 'B' receives Rs. 21 less than 'A' whose amount was Rs. 2 less than the quarter of Rs. 500

61. How much money did 'C' get?
 (1) Rs. 147 (2) Rs. 136 (3) Rs. 144 (4) Rs. 159
62. How much money did 'B' get?
 (1) Rs. 102 (2) Rs. 107 (3) Rs, 108 (4) Rs. 110.
63. Who get highest amount?
 (1) A (2) B (3) C (4) D

Directions: Q.64- 66; In The following diagram circle stands for 'educated', square for 'hardworking', triangle for 'urban people', and rectangle for 'honest'. Different regions in the diagram are numbered from 2 to 12. Study the diagram carefully and answer.



64. Educated, hard-working and urban people are indicated by
 (1) 7 (2) 2 (3) 3 (d) 4

65. Non-urban educated people who are neither hardworking nor honest are indicated by
 (1) 5 (2) 7 (3) 10 (4) 12
66. Honest, educated and hardworking non urban people are indicated by
 (1) 3 (2) 4 (3) 6 (4) 9
67. Five persons A, B, C, D and E were travelling in a car. There were two ladies in the group. Two knew car driving, of them one was a lady. A is brother of D. B, wife of D drove at the beginning. E drove at the end. Who was the other lady in the group?
 (1) D (2) B (3) C (4) E
68. Choose which pair of numbers carries next in the following sequence:
 61, 57, 50, 61, 43, 36, 61
 (1) 29, 61 (2) 27, 20 (3) 31, 61 (4) 29, 22

Directions: Q. 69-71: In each of the 3 questions below, are given four statements followed by four conclusions numbered I, II, III, IV. You have to take the given statements to be true if they seem to be at variance from commonly known facts. Read all the conclusions and then decide which of the given conclusions logically follows from the given statements disregarding commonly known facts,

69. Statements: Some doctors are lawyers. All teachers are lawyers. Some engineers are lawyers. All engineers are businessman.
- Conclusions:**
 (I) Some teachers are doctors. (II) Some businessmen are lawyers.
 (III) Some businessmen are teachers. (IV) Some lawyers are teachers
- (1) none follows (2) only II follows (3) Only III follows (4) Only I and IV follow
70. Statements: All plastics are glasses. Some sponges are glasses. All sponges are clothes. All clothes are liquids.
- Conclusions:**
 (I) All liquids are sponges. (II) Some plastics are clothes.
 (III) All glasses are plastics. (IV) All liquids are clothes,
- (1) none follows (2) only either II or IV follows
 (3) only III and IV follow (4) only I and IV follow
71. Statements: All sands are beaches, All shores are beaches. Some beaches are trees. All trees are hotels.
- Conclusions:**
 I) Some shores are hotels. (II) All beaches are shores.
 III) Some beaches are hotels. (IV) Some sands are trees
- (1) only III follows (2) only II follows (3) only IV follows (4) none of these
72. In a certain code, RIPPLE is written as 6133S2 and LIFE is written as S192. How is FILLER written in that code?
 (1) 318826 (2) 318286 (3) 618826 (4) 328816
73. A doctor said to his compounder "I go to see the patients at their residence after every 3:30 hours. I have already gone to the patient 1:20 hours ago and next time I shall go at 1.40 pm". At what time this information was given to the compounder by the doctor?
 (1) 10.10 a.m. (2) 11.30 a.m. (3) 11.20 a.m. (4) none of these
74. Mr. X left his entire estate to his wife, his daughter, his son and the cook. His daughter and son got half the estate, sharing in the ratio of 4 to 3. His wife got twice as much as the son. If the cook received a bequest of 500, then the entire estate was
 (1) ` 3,500 (2) ` 5,500 (3) ` 6,500 (4) ` 7,000
75. At a dance party a group of girls and boys exchange dances as follows:
 One boy dances with 5 girls. Second boy dances with 6 girls, and so on last boy dances with all girls. If b represents then number of boys and B represents then number of girls, then
 (1) $b = g$ (2) $b = g/5$ (3) $b = g - 4$ (4) $b = g - 5$

76. The average age of husband and wife was 22 years when they were married five years back. What is the present average age of the family if they have a three year old child?
 (1) 19 Years (2) 25 Years (3) 27 Years (4) $28^{1/2}$ Years
77. Which of the following will be acceptable for establishing a fact?
 (1) Opinion of large number of people
 (2) Traditionally in practice over a long period of time
 (3) Availability of observable evidences
 (4) References in the ancient literature

Directions: Q. no. 78-81: Six scientists A, B, C, D, E and F are to present at paper each at a one-day conference. Three of them will present their papers in the morning session before the lunch break whereas the other three will be presented in the afternoon session. The lectures have to be scheduled in such a way that they comply with the following restrictions:

B should present his paper immediately before C's presentation; their presentations cannot be separated by the lunch break. D must be either the first or the last scientist to present his paper.

78. In case C is to be the fifth scientist to present his paper, men 8 must be
 (1) first (2) second (3) third (4) fourth
79. B could be placed for any of the following places in the order of presenters EXCEPT
 (1) second (2) third (3) fourth (4) fifth
80. In case F is to present his paper immediately after D presents his paper, C's could be scheduled for which of the following places in the order of presenters?
 (1) second (2) third (3) fourth (4) fifth
81. In case F and E are the fifth and sixth presenters respectively then which of the folio wing must be true?
 (1) A is first in the order of presenters (2) A is third in the order of presenters
 (3) A is fourth in the order of presenters (3) B is first in the order of presenters
82. Assume that the following three statements arc true:
 I. All freshmen are human
 II. All students are human
 III. Some students think
- Given the following four statements:
- (1) All freshmen are students (2) Some humans think.
 (3) No freshmen think (4) Some humans who think are not students
- Those which are logical consequences of 1, II and III are
 (1) 2 (2) 4 (3) 2, 3 (4) 1, 2

Directions: Q. 83-85:

Mrs. Thomes received a large order for stitching school uniforms from Mayflower school and Little flower school. She has two cutters who will cut the fabric, five tailors who will do the stitching and two assistants to stitch the buttons and button holes. Each of these nine persons will work for exactly 10 hours a day. Each of the Mayflower uniforms requires 20 min for cutting the fabric, one hour for stitching, and 15 min for stitching buttons and button holes, whereas the Little flower uniform require 30min, 1 hour and 30 min respectively for these activities.

83. What is the number of Little flower uniforms that Mrs. Thomes can complete in a day?
 (1) 50 (2) 20 (3) 40 (4) 30
84. On a particular day, Mrs. Thomes decided to complete 20 Little flower uniforms. How many Mayflower uniforms can she complete on that day?
 (1) 30 (2) 40 (3) 20 (4) 0
85. If she hires one more assistant, what is the maximum number of May flower uniforms that she can complete in a day?
 (1) 40 (2) 50 (3) 60 (4) 30

GENERAL ENGLISH

Answer following **four** questions based on the given paragraph:

A recent experimental study showed for the first time that pulmonary exposure to the Particulate Matter (PM) within diesel exhaust enhances atherogenesis. The human blood vessel endothelium is a sensitive target for air pollutants. The interactions of the inflammation and coagulation systems are of the main mechanisms involved in impairment of endothelial function and eventually cardiovascular diseases. The effect of air pollution on inflammation, oxidative stress and cardiovascular risk factors has been demonstrated not only in older adults, but also in young adults as well as in children and adolescents. The inflammation process stimulates the coagulation system and result in increased secretion of Tissue Factor (TF). Endothelial function has key roles in anticoagulant and fibrinolytic systems. In vitro studies have demonstrated significant decrease in endogenous anticoagulation activity, Thrombo Modulin (TM), endothelial protein C receptor antigen and culture of endothelial cells during the inflammation process. A growing body of evidence suggests that the effects of air pollution on the inflammation and the coagulation systems may have a role in endothelial dysfunction and in turn in the progression of cardiovascular diseases. Findings of experimental studies suggest that exposure to air pollution may result in increase in TF and decrease in TM. Atherogenesis starts from the fetal life through interrelations of traditional risk factors with inflammatory, immune and endothelial biomarkers. Air pollution has various harmful effects on this process from early life. Studying the effects of environmental factors on early stages of atherosclerosis in early life can help identify the underlying mechanisms.

96. Choose the option for the human system mechanisms whose interactions: eventually result into cardiovascular diseases due to air pollution?
(1) inflammation (2) Coagulation (3) Antigen (4) Both (1) and (2)
97. Which is the central syndrome talked about in the paragraph?
(1) Inflammation (2) Atherogenesis
(3) Secretions of tissue factors (4) Thrombo Modulin
98. Which of the following is true?
i) Exposure to air pollution may result in increase in TF and decrease in TM
ii) Effect of air pollution is severe on humans and occurs after adolescence
iii) Endothelial cells are sensitive target for air pollutants
(1) All are true (2) Only (i) and (ii) are true
(3) Only (i) and (iii) are true (4) Only (ii) and (iii) are true
99. The primary cause of cardiovascular disease due to factors discussed in paragraph is
(1) Lack of immunity (2) Anticoagulation
(3) Thrombomodulin (4) Endothelial Dysfunction
100. **RETROGRADE**
[no correct answer was given in choices, correct answer should be reclining]
(1) progressing (2) veclining (3) evaluating (4) directing

Directions: Q. 101-105: For each numbered blank space in the paragraph given below, choose the correct response.

Paragraph

Books are 101 the most 102 product of human effort. Temples 103 to ruin, pictures and statues 104; but books 105.

101. Answer choices
(1) decidedly (2) definitely (3) by far (4) certainly
102. Answer choices
(1) lasting (2) everlasting (3) temporary (4) permanent
103. Answer choices
(1) break down (2) fall (3) broken (4) crumble

104. Answer choices
 (1) die (2) decay (3) fade (4) disappear
105. Answer choices
 (1) live (2) survive (3) last (4) disappear
106. **Profound**
[directions for this question is missing]
 (1) Shallow (2) Sonorous (3) Superficial (4) Lofty
107. Give the analogy for ELSUSIVE : CAPTURE :
 (1) Elastic: Stretch (2) Headstrong: Control
 (3) Sensible: Decide (4) Persuasive: Convince
108. The meaning of word EGRESS is
 (1) Entrance (2) Exit (3) Double (4) Program
109. Choose the wrongly spelt word
 (1) Deficient (2) Efficient (3) Magnificent (4) Reticent
110. I have been working here _____ six months.
 (1) since (2) by (3) for (4) in
111. Defile
 (1) Pollute (2) Disapprove (3) Delay (4) Reveal

Directions: Q.112 to 115: Each question consists of a word printed in capital letters, followed by four words or phrases. Choose the word or phrase that is most similar in meaning to the word in capital letters:

112. **POLEMIC**
 (1) black (2) magnetic (3) grimace (4) controversial
113. The synonym for word **FOOLHARDY** is
 (1) Erudite (2) Unwise (3) Rusty (4) Roll
114. **Deep**
 (1) low (2) distracted (3) flat (4) awake
115. Give the antonym for **CRYPTIC**
 (1) Futile (2) Candid (3) Famous (4) Indifferent
116. The people _____ you socialize are called friends.
 (1) with whom (2) who (3) with who (4) whom
117. Every one of them _____ to the music every day
 (1) Listen (2) Listening (3) Listens (4) None of these
118. I didn't work hard when I was _____ school.
 (1) in (2) on (3) at (4) by
119. Where are you _____?
 (1) from (2) by (3) of (4) to
120. Which of these is an adjective in "It is _____"
 (1) Hard (2) Hardly (3) Hardship (4) Harden