# 2. Intelligence

## Learning objectives :

1. To summarise and describe the perspectives on intelligence.

2. To demonstrate an understanding of the History of Measurement of Intelligence and various concepts related to it.

3. To categorize the different types of intelligence tests and analyse their characteristics and advantages.

4. To develop an understanding on the usefulness of intelligence testing and its application in diverse fields.

5. To evaluate the new trends in intelligence eg Social, Emotional and Artificial intelligence and apply its importance in daily life.

### 2.1 Introduction :

If you are asked to choose only one of the three options viz. (1) Lot of money (2) Good looks and (3) Intelligence, which one will you choose? Why?

Probably majority of you will choose intelligence, as intelligence is essential for getting success in examinations, participating in various competitions, taking decisions, getting job and money and so on. Now, let us see what psychologists say about this attribute of human beings.

Intelligence is a unique and the highest attribute of human species because of which, human is proved to be supreme today. Humans have achieved new horizons of progress by using the gift of intelligence.

### Activity 1

Read the following sentences and decide whether the given sentences are the facts or just beliefs about intelligence :

1. Intelligence is something that is inborn.

2. Students who are intelligent can get good marks in examinations.

3. Students who do not get good marks in examinations are less intelligent.

4. People who are intelligent are very smart.

5. Intelligent people can impress anyone by their talk.

By reading the sentences given in the above box, you must have started thinking about the nature of intelligence. What intelligence is in reality is unveiled in this chapter. Intelligence means a capacity to understand the world, think rationally, and use available resources effectively when faced with challenges. Different psychologists have defined intelligence in different ways depending upon their perspectives. **Some of the definitions of intelligence are as follows :**

1. According to Lewis Terman, 'An ability to think on an abstract level is called Intelligence.'

2. According to David Wechsler, 'Intelligence is the aggregate or global capacity of an individual to act purposefully, to think rationally, and to deal effectively with his environment.'

### 2.2 Perspectives on intelligence :

Many psychologists believe that intelligence is a single, global ability. On the other hand, many other psychologists believe that intelligence encompasses several different abilities. These two main perspectives on intelligence are as follows :

1. **Intelligence as a single, general ability :** Psychologists who believe in the unitary notion of intelligence explain that only the functions of intelligence take different forms but basically it is the same ability. Alfred Binet, Lewis Terman, David Wechsler believed that intelligence is a single entity.

2. **Intelligence as a set of multiple abilities :** Psychologists like E. L. Thorndike, Louis Thurstone, Charles Spearman, etc. came up with the notion that multiple abilities are involved in intelligence. This perspective on intelligence is explained in the following table :

- **E. L. Thorndike :** E. L. Thorndike put forth three independent abilities that can be called intelligence. These abilities are (1) Abstract intelligence (2) Social intelligence and (3) Concrete intelligence.

- **Louis Thurstone :** Louis Thurstone proposed seven primary abilities, each independent of the other that can be called intelligence. These seven primary abilities are (1) Verbal comprehension (2) Word fluency (3) Number facility (4) Spatial visualization (5) Associative memory (6) Perceptual speed and (7) Reasoning. Louis Thurstone also devised the test to measure these abilities.

- **Charles Spearman :** In 1927, Charles Spearman with the help of statistical method called factor analysis separated and identified two different factors of intelligence viz. (1) General factor (g) and (2) Specific factor (s). According to him, General factor is the minimum competence required to carry out daily work. Whereas specific factor includes abilities which are required to solve problems in specific areas.

- **Raymond Cattell and John Horn :** Raymond Cattell with his student John Horn proposed a theory of intelligence explaining two types of intelligence viz. (1) Fluid intelligence and (2) Crystallized intelligence. According to them, fluid intelligence is dependent on neurological development and it is relatively free from the influences of learning and experiences. However, crystallized intelligence is not dependent on one's neurological development and it is a function of one's educational attainment, acquired experiences and stock of knowledge.

- **Howard Gardner :** Howard Gardner in his theory of multiple intelligence asserted that there are nine independent types of intelligence that grow and develop differently in different people, depending upon the individuals heredity characteristics or environmental experiences. These nine types of intelligences are (1) Linguistic intelligence (2) Logical-mathematical intelligence (3) Spatial intelligence (4) Musical intelligence (5) Bodily-kinesthetic intelligence (6) Interpersonal intelligence and (7) Intra-personal intelligence (8) Naturalistic intelligence and (9) Existential intelligence.

## 2.3 Measurement of intelligence :

### 2.3.1 History of measurement of intelligence :

Paul Broca and Sir Francis Galton were among the first scientists to think about measuring intelligence. In mid 1880s, Sir Francis Galton administered a battery of tests measuring variables such as head size, reaction time, visual accuracy, auditory threshold, breathing capacity, etc. He thought he could determine intelligence by measuring the size of the human skull. He assumed that the larger the skull, the smarter the person. But Sir Francis Galton's test did not prove very useful for the measurement of intelligence.

In the early 1890s, Raymond Cattell, an assistant in Sir Francis Galton's laboratory, established similar laboratories in the United States. During this time, Raymond Cattell used the term 'mental test' for the first time in the psychological literature. Raymond Cattell shared Sir Francis Galton's view that intelligence is best measured through sensory tasks, but expanded his mentor's ideas by emphasizing that test administration must be standardized so that results are comparable from person to person and from time to time.

In the beginning of the 20th Century, the school authorities in Paris were keenly interested in knowing the reasons for repeated failure of certain students in the examination as no medical reason or any environment factor was found to be associated with their failure. The result was the Binet- Simon Intelligence Scale. In collaboration with Theodore Simon, French Psychologist, Alfred Binet published the first scale of intelligence in 1905. So Alfred Binet is considered as the 'Father of Intelligence Test'. Binet- Simon Intelligence Scale consists of several components such as logical reasoning, finding rhyming words and naming objects. This scale was revised in 1908 and again in 1911.

Lewis Terman from Stanford University revised the Binet-Simon Intelligence Scale in 1916. He adapted few items, added other items, established new age norms and extended the upper age limit of the scale. This revised test was known as Stanford Binet Test. This test was revised in 1937, 1960, 1972, 1986 and 2004.

The first World War began in 1914. Later on in 1917, Robert Yerks with the help of his colleagues prepared Army Alpha and Army Beta intelligence tests. These intelligence tests were used while recruiting soldiers in the army. In the Post First World War period the importance of intelligence testing increased. In 1939, during the Second World War, again while recruiting soldiers in the army, an intelligence test named Army General Classification Test was used on a large scale.

David Wechsler, in 1939, published the Wechsler- Bellevue Intelligence Scale. This scale was revised in 1955 and was renamed as Wechsler Adult Intelligence Scale (WAIS). WAIS is a test designed to measure intelligence of adults and older adolescents. The fourth edition of this test (WAIS-IV) was released in

2008 by Karl Pearson. David Wechsler also developed an intelligence test to measure the intelligence of children. This test is known as Wechsler Intelligence Scale for Children (WISC).

Besides these tests, many other psychologists have developed various intelligence tests. The number of intelligence tests and applications of intelligence testing are increasing day by day.

### 2.3.2 Concepts related to measurement of intelligence :

1. **Mental Age :** The concept of mental age was introduced by Alfred Binet. He assumed that mental development need not correspond to chronological age. He devised a test comprising of items specified for different age group levels and measured mental age of various people. Mental age can be defined as the age at which individual performs successfully on all items on the test prepared for that age. The concept of mental age is explained with the help of the following examples :

| Individual | Chronological Age (in years) | The age at which individual performed successfully on all items on the test prepared for that age | Mental Age (in years) |
|---|---|---|---|
| Esha | 10 | 12 | 12 |
| Ankit | 10 | 10 | 10 |
| Rajesh | 10 | 08 | 08 |

2. **Intelligence Quotient :** The concept of Intelligence Quotient (I.Q.) was introduced by German psychologist William Stern in 1912 as a ratio of Mental Age (M.A.) to Chronological Age (C.A.). Stern computed I.Q. by the formula. Later, Terman refined the formula of I.Q. by multiplying the ratio of M.A. and C.A. by 100. This formula is as follows :

$$\text{Intelligence Quotient (I.Q.)} = \frac{\text{(Mental Age (M.A.)}}{\text{(Chronological Age (C.A.)}} \times 100$$

**The concept of I.Q. is explained with the help of the following examples :**

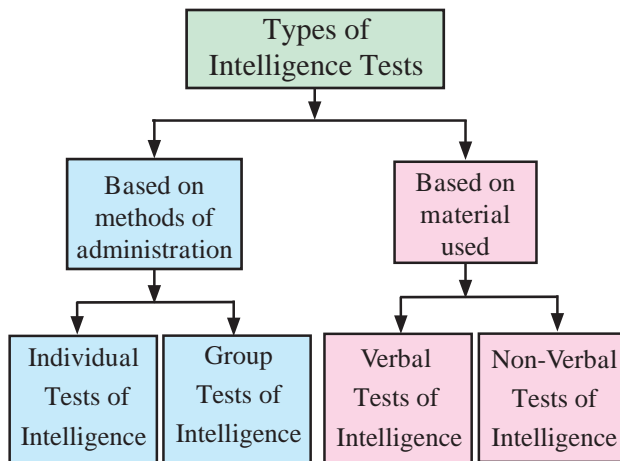| Individual | Mental Age (in years) | Chronological Age (in years) | Relation between mental age and chronological age | Intelligent Quotient (I.Q.) |
|---|---|---|---|---|
| Esha | 12 | 10 | M.A. is greater than C.A. | 120 (Above Average) |
| Ankit | 10 | 10 | M.A. is equal to C.A. | 100 (Average) |
| Rajesh | 08 | 10 | M.A. is less than C.A. | 80 (Below Average) |

**Activity 2**

Read the following examples. Using the formula, calculate the I.Q. of the following students :

1. Aabha is a genius girl. Her chronological age is 8 years and her mental age is 14 years. Find out her I.Q.

2. Mayur has learning disabilities. His chronological age is 8 years and his mental age is 6 years. Find out his I.Q.

## 2.4 Types of intelligence tests :

Today psychologists use a variety of intelligence tests to measure intelligence. All these tests are classified into the following main categories:

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        ┌─────────────────┐
        │    Types of     │
        │ Intelligence Tests│
        └────────┬────────┘
          ┌──────┴──────┐
 ┌────────────┐   ┌────────────┐
 │  Based on  │   │  Based on  │
 │ methods of │   │  material  │
 │administration│   │   used    │
 └──────┬─────┘   └─────┬──────┘
    ┌───┴───┐       ┌───┴───┐
┌────────┬────────┐ ┌────────┬────────┐
│Individual│ Group │ │ Verbal │Non-Verbal│
│Tests of │Tests of│ │Tests of│Tests of │
│Intelligence│Intelligence│ │Intelligence│Intelligence│
└────────┴────────┘ └────────┴────────┘
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### 1. Individual tests of intelligence :

Intelligence tests that can be administered to a single individual at a time are called individual tests of intelligence. Binet's Scale of Intelligence, Wechsler Scale of Intelligence, Dr. Bhatia's Performance Test of Intelligence, Arthur Point Scale, Koh's Block Design, etc. are some of the examples of individual tests of intelligence.

**Advantages of individual tests of intelligence:**

1. The test administrator can establish a rapport with a client .

2. The test administrator can get additional information about the client's feelings, moods and expressions during testing.

3. Individual tests are more capable of measuring creative thinking, compared to group test.

**Disadvantages of individual tests of intelligence:**

1. Individual tests are time consuming and costly to administer.

2. Individual tests require a trained and skillful examiner to administer, score and interpret them.

### 2. Group tests of intelligence :

Intelligence tests that can be administered to more than one person at a time are called group tests of intelligence. Group tests of intelligence were devised to recruit large number of soldiers in the army during the First World War. Group tests are useful mainly for mass testing. Army Alpha Test , Army General Classification Test, Raven's Standard Progressive Matrices, etc. are some of the examples of group tests of intelligence.

**Advantages of group tests of intelligence :**

1. Group tests are less time consuming and economical.

2. In administrating group tests, the role of the examiner is minimal. So he need not go through any specialized training.

**Disadvantages of group tests of intelligence:**

1. The test administrator has much less opportunity to establish rapport, obtain co-operation and maintain interest of the clients.

2. Compared to individual tests, group tests are less capable of measuring creative aspect of intelligence.

### 3. Verbal tests of intelligence :

Intelligence tests that use language (words or numbers) for measuring intelligence are called verbal tests of intelligence. In these tests

subjects are required to respond verbally to test items. Army Alpha Test, Wechsler's Adult Intelligence Scale (WAIS), etc. are some of the examples of verbal tests of intelligence.

**Advantages of verbal tests of intelligence :**

1. Verbal tests of intelligence are useful to measure higher mental abilities.

2. Verbal tests of intelligence are useful to differentiate between people having average intelligence and people having above average intelligence.

**Disadvantages of verbal tests of intelligence:**

1. These tests cannot be given to people having different linguistic background, illiterate people and small children.

2. These tests are culture bound and therefore cannot be used in other cultures.

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**Activity 5**

Study the specimen of verbal test of intelligence given below:

**Verbal test of intelligence**

**Choose the correct option :**

(1) Shoe – Foot  : : Hat - ……………
  (i) Kitten    (ii) Head      (iii) Knife

(2) Eye – Head : : Window - ………...
  (i) Key        (ii) Floor      (iii) Room

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**4. Non-verbal test of intelligence :**

Intelligence tests that use pictures, designs, material objects, etc. to measure intelligence are called non-verbal tests of intelligence. In these tests language is not used to measure intelligence. In these tests subjects are not required to respond verbally to test items. Non-verbal tests are of two types viz. (1) Performance tests and (2) Paper-pencil tests. Koh's Block Design Test, Alexander's Pass-along test, Merril Palmer

Block Building test, Dr. Bhatia's Non-Verbal Test of Intelligence, etc. are some of the examples of performance tests of non-verbal tests of intelligence. Raven's Standard Progressive Matrices, Raven's Coloured Progressive Matrices, etc. are some of the examples of paper pencil tests of non-verbal tests of intelligence.

**Advantages of non-verbal tests of intelligence:**

1. Non-verbal tests can be given to people having different linguistic background, illiterate people and small children. Performance tests are especially useful to measure intelligence of differently abled people.

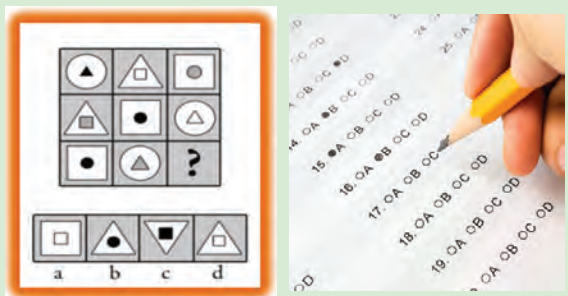2. These tests are culture free and therefore can be used in other cultures.

**Disadvantages of non-verbal tests of intelligence:**

1. Non-verbal tests of intelligence are less suitable to measure higher and subtle mental abilities.

2. Non-verbal tests of intelligence are less suitable to differentiate between people having average intelligence and people having above average intelligence

**Specimen of performance tests of intelligence**

## 2.5 Applications of intelligence testing in various areas :

Measurement of intelligence began with the need of knowing individual differences. Today, intelligence testing has its applications in diverse fields such as educational institutes, child guidance centres, industries, recruitment centres, diagnostic clinics etc. Following are some of the areas, where intelligence testing proves helpful.

1. **Effective schooling :** The intelligence tests enable teachers and other authorities to identify the educationally backward students and solve their problems. On the basis of periodic test scores, teachers are able to classify pupils into different intellectual categories, to help them by devising special instructional programs suited to their mental development and thereby enhancing the process of their development to the adequate normal level.

2. **Mental health aiding :** Intelligence tests enables clinicians to measure the intellectual levels of their clients. Intelligence tests are helpful to clinicians for diagnostic purposes, prognosis and deciding the therapeutic or rehabilitative programs.

3. **Effective parenting :** Intelligence tests help parents to know the intellectual capacities of their children. IQ scores help parents in providing relevant educational facilities to their children and to have realistic expectations from their children.

4. **Career counselling :** Intelligence tests helps students to select the right educational course which is suitable to their intellectual capacities. This helps in reducing the problems of failure, waste of time and money, etc. and increase the possibilities of being successful.

5. **Vocational counselling :** Intelligence tests help people to choose the suitable vocation for themselves. This helps in reducing the problems of absenteeism, job dissatisfaction, etc. and increases the possibilities of living a satisfied and happy life.

## 2.6 New trends in intelligence : (Social Intelligence, Emotional Intelligence and Artificial Intelligence)

### 2.6.1 : Social intelligence :

**Activity 6**

**Read the following examples :**

1. Chetan, a very intelligent adult, fails to cope up with the simple challenges in life. He feels very lonely. His relations with parents, wife and colleagues are extremely problematic.

2. Sagar, a bank manager has good relations with others. But, sometimes he becomes angry without reason and talks rudely to his subordinates.

3. Anil, a young entrepreneur, got very less marks in his degree examination. However, by his hard work, excellent communication skills and ability to maintain friendly relations with all, he has become successful in his business and is living his life very happily.

By reading the examples given in the above box, you must have started thinking about the

nature of social intelligence. Many a times we see people who are less qualified, or who did not do well in school are quite successful, happy and popular in their lives. Thus, it is not merely the cognitive abilities but some other factors that determine the success and social intelligence is one of those factors.

E.L. Thorndike, a psychologist from Columbia University proposed the term social intelligence for the first time in 1920. Howard Gardner included 'inter personal intelligence' in his multiple intelligence theory. According to Karl Albrecht, "Social intelligence is the ability to get along well with others, and to get them to cooperate with oneself."

According to Karl Albrecht our behavior towards others falls somewhere on a spectrum between toxic behaviour and nourishing behaviour. Devaluing others, refusing cooperation to others, negative talking, discouraging others, etc. are some of the examples of toxic behaviors. A continued pattern of toxic behavior indicates a low level of social intelligence. Respecting others, cooperating with others, positive talking, encouraging others, etc. are some of the examples of nourishing behavior. A continued pattern of nourishing behavior indicates a high level of social intelligence :

**Activity 7**

Read the examples given in Activity 6 again and decide the positions of Chetan, Sagar and Anil on the following spectrum of behaviour :



| Toxic Behaviour | | | | Nourishing Behaviour |
|---|---|---|---|---|
| Low Level of Social Intelligence | | Average Level of Social Intelligence | | High Level of Social Intelligence |

**The following are some of the characteristics of people having high social intelligence :**

(1) They are good at understanding and interacting with other people.

(2) They have ability to monitor their verbal and non-verbal expressions while communicating with others.

(3) They are good speakers and good listeners.

(4) They are skilled at assessing the emotions, motivations, desires, and intentions of those around them.

(5) They understand social dynamics in an effective way.

(6) They are flexible in their approach while dealing with others.

(7) They are goal orientated, persistent and self-confident.

(8) They can resolve conflicts in social contexts.

(9) They are successful negotiators.

(10) They enhance personal and professional relationships with others.

### 2.6.2 : Emotional intelligence :

**Activity 8**

**Read the following examples :**

(1) Megha is always afraid of getting less marks in examinations. Therefore, she always becomes restless and avoids going to college.

(2) Shailesh, an ordinary worker in a textile mill earns 10,000 salary per month. Though having some financial problems, he never feels anxious, he understands the problems of others, helps needy people and lives his life happily.

By reading the examples given in the above box, you must have started thinking about the nature of emotional intelligence. In our pursuits

to be successful in a competitive world, all of us face socially, economically, occupationally or academically challenging situations. To cope up with these challenging situations effectively, it is very important to be aware of and to manage our emotional reactions in such challenging situations.

John Mayer and Peter Salovey used the term emotional intelligence for the first time. Daniel Goleman (1995) popularized the concept of emotional intelligence on a large scale.

Researchers like John Mayer and Peter Salovey defined Emotional Intelligence as the 'ability to perceive and monitor one's own and others emotions, to discriminate among them and to use this information to guide one's thinking and action.' They presented an ability based model of emotional intelligence and defined emotional intelligence as a set of following cognitive abilities :

1. **Perceiving emotions** : The ability to identify and interpret emotions of self and others.

2. **Using emotions :** The ability to use emotions to facilitate various cognitive activities such as thinking and problem solving, etc.

3. **Understanding emotions :** The ability to understand emotional language and comprehending relationships among various emotions.

4. **Managing emotions :** The ability to regulate emotions of self and others.

| Characteristics of people having high emotional intelligence | Characteristics of people having low emotional intelligence |
| --- | --- |
| Emotionally stable, Patient | Emotionally unstable, Impatient |
| Optimistic, Independent | Pessimistic, Dependent |
| Happy, Enthusiastic | Sad, Apathetic |
| Calm, Satisfied | Restless, Dissatisfied |

### 2.6.3 Artificial Intelligence :

Artificial Intelligence is enabling machines or the software programmes running those machines to think and learn through experience just like human's intelligence. Artificial intelligence is a field of study that combines the sciences of computer science, algorithms, languages, philosophy and psychology.

**Activity 10**

Discuss how the following devices use Artificial Intelligence :

1. Computers
2. Self-driving cars
3. Robots
4. Medical diagnostic tools
5. Translation devices
6. Automatic Missiles
7. Chatbots, etc.

Artificial Intelligence is an innovation created by human intelligence. There are comparatively no limitations to human intelligence, but there are certain limitations to Artificial Intelligence.

Due to upgraded knowledge based on experiences, imagination, emotions, ethics,

**Activity 9**

Study the differences between the characteristics of people having high emotional intelligence and low emotional intelligence and think about what you can do to develop your emotional intelligence ?

social values, etc. human intelligence can take comparatively more relevant decisions, Artificial Intelligence can take decisions only on the basis of stored information.

In comparison to Artificial Intelligence, human intelligence is superior in nature. Therefore, Artificial Intelligence cannot be an option to human intelligence in a real sense.

Today, Artificial Intelligence is used on a large scale to perform various daily routine tasks as well as to solve various critical problems. For example, it is used for :

(1) Speech recognition

(2) Natural language processing

(3) Spam filtering from emails

(4) Medical diagnosing

(5) Detecting frauds in economic transactions,

(6) Weather forecasting, etc.

## Summary

- Intelligence means a capacity to understand the world, think rationally, and use available resources effectively when faced with challenges.

- The two major perspectives to intelligence are that - intelligence is a single entity and intelligence comprises of multiple abilities.

- In 1905, Alfred Binet developed the first intelligence test. He is considered to be the 'Father of Intelligence Test.'

- Today, the intelligence tests are used in diverse fields such as educational institutes, child guidance centres, industries, recruitment centres, diagnostic clinics etc.

- In today's competitive world, the importance of social intelligence and emotional intelligence is increasing from the point of view of becoming successful in a real sense.

- Today, Artificial Intelligence is used on a large scale to perform various daily routine tasks as well as to solve various critical problems.

## Important Concepts

- Mental age
- Intelligence Quotient
- Performance tests
- Social Intelligence
- Emotional Intelligence
- Artificial Intelligence

- **Alfred Binet :** Alfred Binet devised the first intelligence test in 1905. He is considered as the 'Father of Intelligence Test'.

- **Lewis Terman :** Lewis Terman was from Stanford University. He revised the Bind-Simon Intelligence Scale in 1916.

## Exercises

**Q.1. Choose the correct option and complete the following statements :**

1. ………….…….. has given formula of I.Q.
   a. Binet          b. Stern
   c. Wechsler

2. ……………. has given the concepts of fluid intelligence and crystallized intelligence.
   a. Cattell          b. Thorndike
   c. Salovey

3. …………… is an individual test of intelligence
   a. Army Alpha Test  b. Army Beta Test
   c. Block Building Test

**Q.2. State whether the following statements are true or false :**

(1) Verbal tests of intelligence can be given easily to illiterate people.

(2) It is possible to increase emotional intelligence.

(3) There are certain limitations to Artificial Intelligence.

(4) Group tests of intelligence are less expensive.

**Q.3. Answer the following in one sentence each:**

(1) What is meant by intelligence?

(2) Who is considered as the father of intelligence test?

(3) What is meant by verbal tests of intelligence?

(4) What is meant by individual test of intelligence?

**Q.4. Define the following concepts :**

(1) Mental age

(2) Social intelligence

(3) Emotional intelligence

**Q.5. Write short notes on the following :**

(1) Intelligence Quotient

(2) Charles Spearman's theory of intelligence

(3) Verbal tests of intelligence

(4) Non-verbal tests of intelligence

(5) Artificial Intelligence

**Q.6. Answer the following questions with the help of the given points :**

(1) Write in brief about individual tests of intelligence
   (i) Meaning          (ii) Advantages
   (iii) Disadvantages

(2) Write in brief about group tests of intelligence
   (i) Meaning          (ii) Advantages
   (iii) Disadvantages

**Q.7. Answer the following questions in detail:**

(1) Write in detail about the history of intelligence testing.

(2) 'Intelligence testing has a wide usage in various areas'. Justify with examples.

(3) Explain the characteristics of people having high social intelligence.