CHAPTER
19

Data Sufficiency

LEARNING OBJECTIVES

- How does a typical Data Sufficiency question look like
- Similarity/Dissimilarity between Data Sufficiency questions and Quantitative Aptitude questions
- Various do's and don'ts of solving Data Sufficiency questions
- Process of solving the questions

DATA SUFFICIENCY QUESTIONS

Data Sufficiency questions are designed to test the student's ability to reason with a limited set of data and to reach a valid conclusion. To solve data sufficiency questions, we should have a clear understanding of the different situations that might come with the questions. Besides, we should be clear with the format of the possible questions and various do's and don'ts related to the above situation and solution.

In most of the cases, a data sufficiency question will have the following structure:

Q. A question will be asked.
Statement 1 – One set of information will be given.
Statement 2 – Another set of information will be given.

On the basis of the statements, four or five different options will be provided. One of those options will be the most probable choice and hence the answer.

Significance of Data Sufficiency

In post MBA life, a manager is virtually burdened with the weight of the data—sometimes organized and sometimes unorganized. DS questions test the ability of the future managers to prune the data to make decisions. Apart from testing the decision making ability of the individual, DS questions also try to evaluate the ability of the student to see into the future that is visualize and predict what can happen in the next 2–3 minutes. Try to understand this—We might find the answer to the question asked in 2–3 minutes time with the help of the given statements, but can we find out the answer right away without actually investing those 2–3 minutes. So, the question now is—Can we predict correctly what is going to happen in the next 2–3 minutes without actually living those 2–3 minutes?

A data sufficiency question is designed—by virtue of its design and content—in such a way that it essentially checks students' ability to reason out. In most of the cases of DS questions, basic concepts of Quantitative Aptitude will be required.

Various do's and don'ts of Data Sufficiency

The process to solve the DS questions is a bit different from the process involved in solving the QA or LR/DI questions. There are certain key things that we should keep in mind before solving the DS questions. Let us look at them one by one:

1. Understanding the Options

This is the first step in solving the DS questions. One must go through the options and understand them clearly. Sometimes, the options given in data set themselves can become a perennial source of problem.

Let us understand the statements given in the options:

If the option statement reads like—"If the question can be solved by using only one of the statements alone, but not by the other statement alone".

It means—Out of the given two (or, more) statements, only one statement can answer the question given, and the other statement cannot give the answer to the question given. In this case either the first statement will give the answer or the second one, but not both simultaneously i.e., if the first statement can give the answer, then second statement cannot give the answer and vice-versa.

If the option statement reads like— "If the question can be solved by using either of the statements alone".

It means—Out of the given two (or more) statements, the question can be solved by using any one of the statements

alone. In this case either first statement will give the answer or the second one used individually and independently.

If the option statement reads like — "If the question can be solved by using both (or all) the statements together, but not by either of the statements alone".

It means—Out of the given two (or more) statements, the question can be solved only if the information given in both (or all) the statements is used together. And, using only one of the statements alone cannot solve the given question.

If the statement reads like— "If the question cannot be solved by even using both the statements together".

It means—Out of the given two (or more) statements, the question cannot be solved even by using the information given in both (or all) the statements together.

Once you have understood the statements given in the options, you must not forget to see which statement corresponds to which option. CAT is known to introduce the surprise element quite often, and this also can be one of those surprises which might catch you unaware if you are not careful about this basic fact.

2. General Awareness/Assumptions are not Allowed

As an unproclaimed rule, the element of general awareness cannot be used to solve the DS questions. However this is also true for QA and LR /OI, but its importance in DS increases manifold.

Let us understand this with an example:

Example 1 Is New Delhi the most polluted city in India?

Statement 1 – The Capital of India is the most polluted city in India.

Statement 2 – New Delhi is the capital.

Solution Well, we can understand that statement 1 alone cannot answer the question, as it is not given that New Delhi is the capital of India.

If your answer is "Both the statements together can answer the question", think again. It is not given in statement 2 that New Delhi is the capital of India.

So, answer to this question is "Cannot be determined."

However, we should have a clear idea regarding the differences between a universal fact like "Pythagoras theorem" and general awareness like "New Delhi is the capital of India".

Universal facts like mathematical principles are not the general awareness stuff, and hence can be used.

Example 2 In how many days A and B working together can finish a work?

Statement 1—A can finish the same work alone in 10 days.

Statement 2—B can finish the same work alone in 15 days.

Solution Understandably, we cannot have a unique answer to this question by using the statements alone. However, in this case we cannot solve this question even by using both the statement together.

FLAW DETECTOR—Had this question been a question in Quantitative Aptitude, we must have got the answer by using the methods of time and work. However, in this case of data sufficiency, since it is not given that A and B start working together and kept on working together till the work is finished, we cannot solve this question even by using both the statements together.

And we cannot make assumptions that they started working together and kept on working till the work is finished.

Answer should be Unique

This is one aspect that makes the process of solving the DS questions different from the process of solving QA or DI/LR questions. While in case of QA, we can have multiple values of a variable; in DS there should be only one value of any variable or constant given.

Example 3 What is the value of x?

Statement 1— $x^2 - 5x + 6 = 0$

Statement 2— $x^2 + 2x - 15 = 0$

Solution Using statement 1, value of x = 2, 3

Since we are not getting unique value of x using statement 1 alone, we will say that statement 1 alone is not sufficient to give the answer.

Using statement 2, value of x = –5, 3

Since we are not getting unique value of x using statement 2 alone, we will say that statement 2 alone is not sufficient to give the answer.

Till now we have seen that using the statements alone is not sufficient to find the answer. Hence, we will move on to using both the statements together.

Using statement 1 and 2 simultaneously, we get a common unique value of $x = 3$.

Hence, "both the statements together are needed to answer the question."

Example 4 What is the value of x, where x is the length of a rectangle?

Statement 1— $x^2 - 5x + 6 = 0$

Statement 2— $x^2 + 2x - 15 = 0$

Solution Using statement 1, value of $x = 2, 3$

Since we are not getting unique value of x using statement 1 alone, we will say that statement 1 alone is not sufficient to give the answer.

Using statement 2, value of $x = -5, 3$

x being the length of the rectangle, it cannot be negative. Hence, $x = 3$ is the unique answer that we are getting using statement 2 alone.

Concern for the Answer, and not the Technicalities

Quite a few times it has been observed that students, rather than solving the questions, tend to get into the technicalities of the data. This furthers students' 'emotional attachment' with the question ending up in the wastage of time and efforts.

Example 5 Can we fill up a big drum of 2000 litres capacity with exactly 88 litres of water (there is unlimited supply of water)?

Statement 1—There is a bucket having a of capacity 20 litres.

Statement 2—There is a bucket having a of capacity 50 litres and a mug of 3 litres capacity.

Solution Using statement 1, we can fill anything in the multiples of 20 litres only. And it can never be ascertained that the drum has exactly 88 litres of water. So, answer to the question is—We may or may not be able to fill up a big drum with exactly 88 litres of water. And whatever the quantity of the water in the drum is, we can not be sure if this is exactly 88 litres of water.

Using statement 2, we can fill the drum exactly with 88 litres of water (50 + 50 – 3 – 3 –3 –3). Hence, answer to the question is—Yes, we can fill up a big drum with exactly 88 litres of water.

So, we can find the answer using statement 2 alone.

Example 6 Is $y > x$?

Statement 1— $x^2 > y^2$.

Statement 2— $x^3 > y^3$.

Solution Using statement 1, assuming some of the values of x and y can tell us that in some cases $x > y$ and in some of the cases $y > x$.

x	y	Remarks
5	4	$x > y$
–5	–4	$y > x$

While assuming the values, we can take only those values of x and y that satisfy the given statement.

Using statement 2,

$$x^3 > y^3$$
$$\Rightarrow \quad x > y$$

Now look at the question. Obviously, we are getting an answer that y is not greater than x.

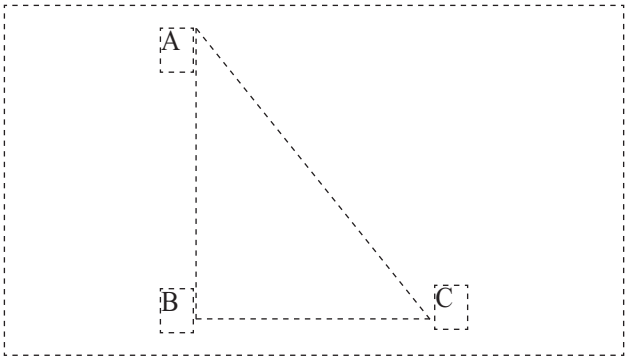
Hence, statement 2 alone is sufficient to answer the question.

Look for the Obvious, but don't Miss the Hidden

Looking at any of the statements gives us an idea of the facts given, and sometimes we get so enamored with these obvious facts that we fail to see something hidden. Evidently, there is no point saying that "You should not make silly mistakes" (because nobody does it intentionally anyway. However, we can reduce the incidences of these silly mistakes or missing some hidden information.

Some of the precautions that must be taken while tackling any DS question:

1. While assuming the values, take different set of values (like positive, negative, fractions between 0 and 1) to make an informed decision.
2. Any geometrical figure should not be taken as accurate unless it is given. For example, the below given triangle ABC given below cannot be taken as a right-angled triangle even though it appears to be so.



Hence, no conclusion should be drawn by finding proportionate value of length or the angle in any geometrical figure unless such are clearly stated.

Example 7 Is Arvind the father of Puja?

Statement 1 — Puja is the daughter of Arvind.

Statement 2 — Arvind is the aunt of Abhishek.

Solution Using statement 1, despite the fact that Puja is the daughter of Arvind, we cannot conclude that Arvind is the father of Puja. Arvind can be the mother too.

Using statement 2, in first impression statement 2 seems to be irrelevant, but looking closely at this statement gives us an idea that Arvind is a woman (only women can be aunts). And hence, we can conclude that Arvind is not the father of Puja.

Therefore, statement 2 alone is sufficient to answer the question.

PRACTICE EXERCISES

EXERCISE 1

Directions for questions 1 to 25: ***Each item is followed by two statements, A and B. Answer each question using the following instructions.***

Choose (a) If the question can be answered by one of the statements alone and not by the other.

Choose (b) If the question can be answered by using either statement alone.

Choose (c) If the question can be answered by using both the statements together, but cannot be using either statement alone.

Choose (d) If the question cannot be answered even by using both the statements together.

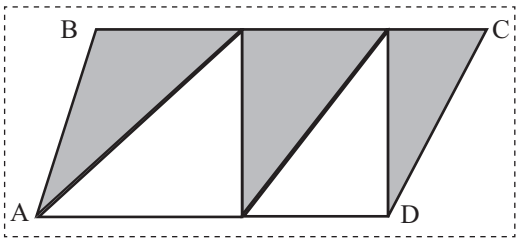
Q.1 Is the point P on the circle with center O?
A. Q is a point on the circle and the distance from P to Q is equal to the distance from O to Q.
B. Q is on the circle and PQO is an equilateral triangle.

Q.2 Is Arvind the father of Puja?
A. Puja is the daughter of Arvind.
B. Arvind is the brother of Abhishek.

Q.3 If the ratio of boys to girls attending school in 2000 was 1/3, what was the ratio of boys to girls attending school in 2001?
A. 100 more boys were attending school in 2001 than in 2000.
B. 150 more girls were attending school in 2001 than in 2000.

Q.4 If a and b are positive numbers, is $b > a$?
A. $a^2 > b$
B. $a^2 > b^2$

Q.5 What is the area of the unshaded region in the given figure (Points E, F are on the line BC and point G is on the line AD)?



A. ABCD is a parallelogram.
B. Area of ABCD is 50 square units.

Q.6 If the integer P divisible by 15?
A. Sum of the digits of P equals 15.
B. Unit digit of P is 6.

Q.7 Is Q a positive number?
A. $4Q + 24 > 0$
B. $4Q - 24 < 0$

Q.8 How many chocolate bars, 2 inches wide and 4 inches long can be packed into carton C?
A. The inside dimension of carton C are 8 cm by 12 cm.
B. The width of carton C is equal to the height and 3/4 of the length.

Q.9 What are the values of x and y?
A. $3x + 2y = 45$
B. $y = 22.5 - 1.5x$

Q.10 Is x an even number?
A. $4x + 3y$ is an even number.
B. $3x + 4y$ is an even number.

Q.11 What is the ratio of the number of boys and girls in a school (Number of boys and girls are natural numbers)?
A. Number of boys is 40 more than girls.
B. Number of girls is 80% of the number of boys.

Q.12 What is the difference between two numbers?
A. First number is 60% of the other number.
B. 50% of the sum of first and second number is 24.

Q.13 How many marks did Arpit Sinha obtain in mathematics?
A. Arpit Sinha secured on an average 55% marks in mathematics, physics, and chemistry together.
B. Arpit Sinha secured 10% marks more in mathematics than the average of mathematics, physics and chemistry.

Q.14 Is $x > y$?

A. $\dfrac{(x^4 - y^4)}{x^3 + y^3} > 0$

B. $\dfrac{x^3 - y^3}{x^4 + y^4} > 0$

Q.15 What is a two digits number?
A. The number obtained by interchanging the digits is smaller than the original number by 63.
B. Sum of the digits is 11.

Q.16 x, y, and z are integers, is x an odd number?
A. an odd number is obtained when x is divided by 5.
B. $(x + y)$ is an odd number.

Q.17 What is the number x?
A. The LCM of x and 18 is 36.
B. The HCF of x and 18 is 2.

Q.18 Is y greater than x?
A. $x + y = 2$
B. $x/y = 2$

Q.19 Which of the four numbers w, x, y, and z is the largest?
A. The average of w, x, y and z is 25.
B. The numbers w, x, and y are each less than 24.

Q.20 P, Q, R, and S are four consecutive even integers. What is the value of the largest integer among these?
A. The average of the four numbers is the first prime number greater than 10.
B. The ratio between the largest and the smallest of the number is less than 10.

Q.21 Is A greater than B?
A. (A + 3) is greater than (B + 2).
B. Fourth power of A is greater than third power of B.

Q.22 Which of the following is greater: $\frac{a+x}{b+x}$ or $\frac{a}{b}$?
A. $\frac{a}{b} > 1$
B. x is positive.

Q.23 How many boys and girls are there in the family of 7 children?
A. Each boy in the family has as many sisters as brothers.
B. Each girl in the family has as many brothers as sisters.

Q.24 In how many days does Binod finish a certain work?
A. Binod is twice as efficient as Amar.
B. Akshay is twice as efficient as Binod.

Q.25 What is the equation of the straight line AB?
A. Straight line AB is perpendicular to another straight line $3x + 5y = 10$
B. Straight line AB passes through the point (1, 2).

Exercise 2

Directions for questions 1 to 20: ***Each item is followed by two statements, A and B. Answer each question using the following instructions.***

Choose (a): If the question can be answered by one of the statements alone and not by the other.

Choose (b): If the question can be answered by using either statement alone.

Choose (c): If the question can be answered by using both the statements together, but cannot be using either statement alone.

Choose (d): If the question cannot be answered even by using both the statements together.

Q.1 A, B, C, D are playing cricket and scored 96 runs together. Did A score the maximum runs?
A. A scored 23 runs.
B. B and C together scored 42 runs.

Q.2 Is ab an even number?
A. a is divisible by 3.
B. (b + 1) is divisible by 4.

Q.3 Three teams of woodcutters took part in a competition (to cut the maximum quantity of wood). Which team could win the competition?
A. The first and the third teams cut twice as much as the second team cut.
B. The second and the third teams cut three times as much as the first team cut.

Q.4 If m and n are integers, is m divisible by 11?
A. mn is divisible by 110.
B. n is divisible by 2.

Q.5 On a fishing trip, Sanju and Ajay each caught some fishes. Who caught more fish?
A. Sanju and Ajay caught fishes in the ratio 2 : 3.
B. After Sanju stopped fishing, Ajay continued fishing until he caught 12 fishes.

Q.6 What are the ages of three brothers (ages are natural numbers)?
A. The product of their ages is 21.
B. The sum of their ages is not divisible by 3.

Q.7 Is $5x + 25$ is divisible by 50?
A. x is divisible by 5.
B. x is divisible by 10.

Q.8 How many of a, b, c, d are odd, given that all of them are positive integers?
A. $ad + bc$ is odd.
B. $ac + bd$ is odd.

Q.9 A is not shorter than B, who in turn, is not taller than C who is shorter than D. who among A, B, C and D is the tallest?
A. C and A are of equal height.
B. B and A are of equal height.

Q.10 If Bhushan or Charan passed the examination, then neither Sujan nor Tarun passed the examination. Did Bhushan pass the examination?
A. Tarun did not pass the examination.
B. Sujan passed the examination.

Q.11 Six people—A through F—sit around a circular table, not necessarily in the same order. B and E sit opposite each other. Does C sit opposite D?

A. If C and E interchange their positions, then E will be to the immediate left of B.
B. If A and B interchange their positions, then B will be to the immediate left of E.

Q.12 Average age of a, b, c, and d is 46 years. Who is the oldest among them?
A. c is 91 years old.
B. Ages (in years) of all of them are distinct natural numbers.

Q.13 Product of a, b, c, and d is 1003 (a, b, c and d are all natural numbers). Which one is the largest among them?
A. $a > b > c$
B. $a > b > d$

Q.14 What is the least common multiple of $a \times b$, $b \times c$ and $c \times a$ (a, b, c are all natural numbers)?
A. least common multiple of a, b and c is 30.
B. The highest common factor of a, b and c is 2.

Q.15 What are the values of m and n?
A. n is an even integer, m is an odd integer, and m is greater than n.
B. Product of m and n is 30.

Q.16 On a given day, a boat ferried 1500 passengers across the river in 12 hours. How many round trips did it make?
A. The boat can carry 200 passengers at any time.
B. It takes 40 min each way and 20 min of waiting time at each terminal.

Q.17 What is the value of x?
A. x and y are unequal even integers, less than 10, and x/y is an odd integers.
B. x and y are even integers, each less than 10, and product of x and y is 12.

Q.18 What are the ages of two individuals, x and y?
A. The age difference between them is 6 years.
B. The product of their ages is divisible by 6.

Q.19 If m and n are consecutive positive integers, is $m > n$?
A. $m - 1$ and $n + 1$ are consecutive positive integers.
B. m is an even integer.

Q.20 Which of a, b, c and d is/are odd?
A. $ad + bc$ is odd.
B. $ac + bd$ is odd.

Exercise 3

Directions for questions 1 to 17: ***Each item is followed by two statements, A and B. Answer each question using the following instructions.***

Choose (1): If the question can be answered by first statement (statement A) alone but not by the second statement (statement B) alone.

Choose (2): If the question can be answered by second statement (statement B) alone but not by the first statement (statement A) alone.

Choose (3): If the question can be answered by using either statement alone.

Choose (4): If the question can be answered by using both the statements together, but cannot be using either statement alone.

Choose (5): If the question cannot be answered even by using both the statements together.

Now Choose the answer from the given options.

Q.1 Is the integer y greater than 4?
A. 2^y is a factor of 8
B. 2^4 is a factor of y
(a) 1 (b) 3
(c) 4 (d) 2
(e) 5

Q.2 A sum of ₹215 is distributed among three persons A, B and C. Who gets the least?
A. A gets 2/3rd of what (B + C) are getting.
B. B gets 1/5th of what (A + C) are getting.
(a) 1 (b) 3
(c) 4 (d) 2
(e) 5

Q.3 What is the HCF of natural numbers A and B?
A. LCM of the natural numbers A and B is 101.
B. A and B are distinct natural numbers.
(a) 1 (b) 4
(c) 2 (d) 3
(e) 5

Q.4 Ram is the son of Shyam and father of Dharam. All of these people—Ram, Shyam and Dharam are politicians. Is Shyam an honest politician?
A. Sons of all the honest politicians are honest politicians. Ram is an honest politician.
B. Son of only a dishonest politician is a dishonest politician. Dharam is a dishonest politician.
(a) 1 (b) 4
(c) 2 (d) 3
(e) 5

Q.5 $y = f(x)$ is said to be an even function if $f(x) = f(-x)$. Is $y = f(x)$ an even function?
A. Graph of $y = f(x)$ lies in only two quadrants and both these quadrants are adjacent to each other.
B. Graph of $y = f(x)$ lies in only two quadrants and both these quadrants are opposite to each other.
(a) 1 (b) 2
(c) 3 (d) 4
(e) 5

Q.6 In an examination of five papers, marks obtained by Pranav are in the ratio 4 : 5 : 6 : 7 : 8 across the five papers. Each paper carries the same maximum marks. In how many papers did Pranav obtain more than 50% of the maximum marks?

A. Total marks obtained by Pranav in all the papers together is 300 marks.

B. Lowest percentage of marks obtained by Pranav in any of the papers of this examination is 30%.

(a) 1 (b) 3
(c) 2 (d) 4
(e) 5

Q.7 N is a natural number. Is N a perfect square?

A. When N is divided by 100, remainder obtained is 2.

B. Total number of factors of N is odd.

(a) 1 (b) 3
(c) 2 (d) 4
(e) 5

Q.8 What is the respective speed of two trains of lengths 70 m and 75 m?

A. They take 35 seconds to cross each other when they are running in the same direction.

B. They take 10 seconds to cross each other when they are running in the opposite direction.

(a) 1 (b) 3
(c) 2 (d) 4
(e) 5

Q.9 Vijay and Rupesh are two friends working in the same company. Sum of their monthly salaries is more than ₹1 lac per annum. Who saves more per month?

A. Ratio of monthly income of Vijay and Rupesh is 3 : 5.

B. Ratio of monthly expenses of Vijay and Rupesh is 1 : 2.

(a) 1 (b) 3
(c) 2 (d) 4
(e) 5

Q.10 Is triangle ABC a right-angled triangle?

A. Ratio of length of side AB and side BC = 3 : 2

B. Ratio of length of side BC and side CA = 4 : 5

(a) 1 (b) 3
(c) 2 (d) 4
(e) 5

Q.11 A bus is running with a uniform speed from Patna to Gaya. It met with an accident somewhere enroute. What is the speed of this bus?

A. Due to this accident, speed of bus got reduced by 22%. And Due to this one bus reached Gaya 40 minutes late.

B. Had the accident occurred 5 km ahead of the point where the accident occurred, it would have reached Gaya only 20 minutes late.

(a) 1 (b) 3
(c) 2 (d) 4
(e) 5

Q.12 There are five members—P, Q, R, S and T in a family. How many members of this family are male?

A. T has two sisters—Q and S.

B. P is the father of T and R is the only son of T.

(a) 1 (b) 3
(c) 2 (d) 4
(e) 5

Q.13 Which month is the current month?

A. Sum of dates of last Monday of previous month and 1st Thursday of next month is 38 and both the dates are of the same year.

B. Current year is a leap year and the month in the question is from current year.

(a) 5 (b) 4
(c) 3 (d) 2
(e) 1

Q.14 1st January 19PQ is Monday, where P and Q are the last two digits of the year in such a way that maximum value of P and Q each is 6. Which is the next year when 1st January will be a Monday?

A. 19PQ is a leap year.

B. 19PQ is a non-leap year.

(a) 1 (b) 3
(c) 2 (d) 4
(e) 5

Q.15 A triangle is circumscribed by a circle. Is this triangle a right-angled triangle?

A. Triangle is isosceles triangle.

B. One side of the triangle is the largest possible chord of the circle.

(a) 1 (b) 3
(c) 2 (d) 4
(e) 5

Q.16 Triangle ABC is a right angled triangle. What is the distance between circumcentre and the centroid of this triangle ABC?

A. Inradius of Δ ABC = 5 units

B. Two smaller sides of the Δ ABC are 3 units and 4 units.

(a) 1 (b) 3
(c) 2 (d) 4
(e) 5

Q.17 What is the HCF of (5a – 1) and (5b – 1)?

A. HCF of a and b = 5

B. a and b are natural numbers.

(a) 1 (b) 3
(c) 2 (d) 4
(e) 5

Directions for questions 18 to 20: ***Each item is followed by three statements, A, B and C. Answer each question using the following instructions.***

Mark (a): if the question can be answered by using any two statements together but not by using any statement alone

Mark (b): if the question can be answered by using either of the statements alone.

Mark (c): if the question can be answered only by using all the three statements together and neither by any pair of statements nor by any statement independently.

Mark (d): if the question cannot be answered using the statements in any case.

Mark (e): if none of the above four options are correct.

Q.18 A football is kept inside a circular field. What is the probability of this ball being closer to the center of the circle than to the periphery of the ground?

A. Radius of the circular field is 15 m.

B. Radius of the football is 5 cm.

C. Ratio of circumference and diameter of the circle is constant.

Q.19 A and B are running continuously around a circular track with respective uniform speed. They start running from the same point at the same time. After how much time will they meet at the diametrically opposite point of their starting point?

A. Speed of A is 20 m/s and speed of B is 35 m/s.

B. Length of the track is 1000 m.

C. Both A and B are running in the same direction.

Q.20 At how many different points, graph of $f(x) = ax^2 + bx + c = 0$ will cut X- axis?

A. $a > 0$, $b > 0$ and $c > 0$.

B. Discriminant of $f(x) < 0$

C. $a < 0$.

ANSWER KEYS

EXERCISE 1

1. (a)	**2.** (a)	**3.** (d)	**4.** (a)	**5.** (b)	**6.** (a)	**7.** (d)	**8.** (c)	**9.** (d)	**10.** (d)
11. (a)	**12.** (c)	**13.** (d)	**14.** (a)	**15.** (c)	**16.** (a)	**17.** (d)	**18.** (c)	**19.** (a)	**20.** (a)
21. (d)	**22.** (c)	**23.** (b)	**24.** (d)	**25.** (c)					

EXERCISE 2

1. (a)	**2.** (d)	**3.** (c)	**4.** (d)	**5.** (a)	**6.** (d)	**7.** (a)	**8.** (c)	**9.** (b)	**10.** (a)
11. (c)	**12.** (c)	**13.** (c)	**14.** (d)	**15.** (d)	**16.** (a)	**17.** (d)	**18.** (d)	**19.** (a)	**20.** (c)

EXERCISE 3

1. (b)	**2.** (c)	**3.** (b)	**4.** (c)	**5.** (b)	**6.** (c)	**7.** (b)	**8.** (e)	**9.** (d)	**10.** (d)
11. (d)	**12.** (e)	**13.** (e)	**14.** (a)	**15.** (c)	**16.** (c)	**17.** (a)	**18.** (e)	**19.** (e)	**20.** (e)

EXERCISE 1

1. Using statement A alone, since it is given that the centre of the circle is O, hence OQ is the radius of the circle. But point Q can be inside the circle or on the circle or outside the circle and in all these cases OQ = PQ. Hence, statement A alone does not give the answer.

Using statement B alone, PQ = QO = PO = Radius of the circle.

Hence, point P is on the circle.

Hence, option (a) is the correct answer.

2. Using statement A alone, Arvind can be father or mother of Puja.

Using statement B alone, obviously it cannot be solved.

Using both the statements together, since Arvind is the brother of Abhishek, hence Arvind is a male. Hence Arvind is the father of Puja.

Hence, option (a) is the correct answer.

3. Using statement A alone, nothing can be concluded.

Using statement B alone, nothing can be concluded.

Using both the statements together, if the ratio of boys to girls in 2000 = $x/3x$, then the new ratio of boys to girls in 2001 = $\frac{x+100}{3x+150}$

Now everything depends upon the value of x. Hence cannot be determined uniquely.

Hence, option (d) is the correct answer.

4. Using statement A alone, depending upon the values of A and B, either can be greater (A = 10, B = 1 or A= 5, B = 10) according to the condition given in the statement.

Using statement B alone, since both the numbers a and b are positive, and a2 > b2, hence a > b.

So, the answer to the question is – No, b is not greater than a.

Hence, option (a) is the correct answer.

5. Using both the statements together, since the base and height of ABCD and unshaded region are same, hence the area of unshaded region is half of area (ABCD).

Hence, option (b) is the correct answer.

6 Using statement A alone, nothing can be concluded. Numbers can be 195 or 159 etc. Otherwise also, we know that if any number is divisible by 5 and 3 both, then the number will be divisible by 15. If the sum of the digits is 15, then the number is divisible by 3 but nothing can be said about the divisibility of this number by 5.

Using statement B alone, since the unit digit of P is 6, hence this number is not divisible by 5, and hence not divisible by 15.

Hence, option (a) is the correct answer.

7. A. $4Q + 24 > 0$ Or, $4Q > -24$, or, $Q > -6$

Hence, Q can be negative or positive or zero as well.

B. $4Q - 24 < 0$

Or, $4Q < 24$, or, $Q < 6$

Hence, Q can be negative or positive or zero as well.

Hence, option (d) is the correct answer.

9. Using statement A alone, since the equation is in two variables and there is one equation nothing can be concluded.

Using statement B alone, since the equation is in two variables and there is one equation nothing can be concluded.

Using both the equations together, both the equations are same. Hence, cannot be determined.

Hence, option (d) is the correct answer.

10. Is x an even number?

A. $4x + 3y$ is an even number.

B. $3x + 4y$ is an even number.

Using statement A alone, if $4x + 3y$ is an even number then both $4x$ and $3y$ should be either odd or both should be even. Both $4x$ and $3y$ cannot be odd (as $4x$ is even) and hence both of $4x$ and $3y$ are even.

Now even if $4x$ is even, then we cannot conclude that x is even or odd.

Using statement B alone, if $3x + 4y$ is an even number then both $3x$ and $4y$ should be either odd or both should be even.

If each of $3x$ and $4y$ is even, then x can take values like $x = 4/3$, which is neither odd nor even.

If each of $3x$ and $4y$ is odd, then $3x$ is odd. But using this we cannot conclude that x is also odd. X may be a fraction also like $x = 1/3$ or even it can be an odd number.

FLAW DETECTOR—Whenever we are required to assume the values, we should assume the different values viz. Positive nos., negative nos., fractional values and definitely the fractional values between zero and one before validating our result.

Hence, option (d) is the correct answer.

11. Using statement A alone, we cannot determine the ratio of boys and girls.

Using statement B alone, Number of girls = 4/5 Number of boys, now we can find out the ratio of boys and girls in the school.

Hence, option (a) is the correct answer.

12. Using statement A, we get the ratio between the two numbers but not the difference between the numbers. Statement B gives the sum of the numbers but not the difference. Using both the statements together gives the difference between the numbers.

Hence, option (c) is the correct answer.

13. In none of the statements given marks have been given in terms of numbers, hence we cannot find the marks obtained in mathematics.

Hence, option (d) is the correct answer.

14. Using statement A, we cannot determine if $(x^4 - y^4)$ is greater than zero or less than zero since we do not have the sign of $(x^3 + y^3)$. Hence we cannot determine anything.

Using statement B, we cannot determine if

$(x^3 - y^3) > 0$ since $(x^4 + y^4) > 0$.

$(x^3 - y^3) > 0$, so, $x > y$.

Hence, option (a) is the correct answer.

15. Using statement A alone gives that the difference between the digits of the number is 7. This gives the possibility of many numbers like 81, 92 etc.

Using statement B alone also gives the possibility of many numbers.

Using both the statements together, we get a unique number.

Hence, option (c) is the correct answer.

16. Using statement A alone, we get that the quotient obtained when x is divided by an odd number is odd. Hence x has to be odd.

Using statement B alone, one of x and y will be odd and other one will be even. So we cannot determine that which of x or y is even?

Hence, option (a) is the correct answer.

17. Using statement A, value of x can be $22 \times 30 - 1$. Hence, two values of x are possible.

Using statement B, value of x can be

$21 \times 30 \times 5N \times 7N \times \ldots$,

where value of N can be any real number.

Using both the statements together, we can see that no unique value of X is possible.

Hence, option (d) is the correct answer.

18. Using statement A alone cannot give us any result.

Using statement B alone cannot give us any result since the values of x and y can be positive as well as negative too.

Using both the statements together will give us the result.

Hence, option (c) is the correct answer.

19. Using statement A alone cannot give us any result.

Using statement B alone gives that value of three of the given numbers is less than the average. Hence, fourth number will be greater than the average. So, this fourth number is largest.

Hence, option (a) is the correct answer.

20. Using statement A alone, average of the given four numbers = 11, hence their sum = 44, hence the numbers will be 8, 10, 12, 14. Hence, the value of largest integer, whichever is that, is 14.

Using statement B alone is not going to give us the result.

Hence, option (a) is the correct answer.

Exercise 2

1. Using statement A alone, since the average runs scored by all of them = 24, and runs scored by A = 23, hence we can conclude that at least one of remaining three persons must have scored more than the score of A. So, A didn't score maximum runs.

Using statement B alone cannot give us any result.

Hence, option (a) is the correct answer.

2. Using statement A alone cannot give us any result.

Using statement B alone gives that b is an odd number.

Using both the statements together we get ab is an odd number.

Hence, option (d) is the correct answer.

3. Let teams be a, b, c.

$a + c = 2b$

$b + c = 3a$

Subtracting:

$a - b = 2b - 3a$; $b = 4a/3$;

Putting this in eqn 2

$c = 3a - 4a/3$; $c = 5a/3$

Hence, option (c) is the correct answer.

4. Using statement A, at least one of m or n will be divisible by 11, but we are not sure that which of m or n will be divisible by 11.

Using statement B, n is divisible by 2 but it does not give that which of m or n is divisible by 11.

Using both the statements together, we cannot find if m is divisible by 11 or not.

Hence, option (d) is the correct answer.

5. Using statement A alone, we can find out that Sanju caught more fishes than Ajay whereas using statement B alone, we cannot find that who caught more fishes.

Hence, option (a) is the correct answer.

6. Using statement A alone, ages of the brothers can be–21, 1, 1 or 1, 7, 3. Hence, using statement A alone will not give us the unique answer.

Using statement B alone also will not give us the result.

Even after using both the statements together, we cannot find the ages of the brothers as both the possibilities (21 + 1 + 1) and (1 + 7 + 3) are not divisible by 3.

Hence, option (d) is the correct answer.

7. Using statement A alone, assuming some values of x (= 5 or = 10) gives that $5x + 25$ is sometimes divisible and sometimes not divisible.

Using statement B alone, whatever values of x we take, we see that $5x + 25 = 5(x + 5)$ is not divisible by 10.

Hence, option (a) is the correct answer.

8. Using both the statements together, we can find the answer.

Hence, option (c) is the correct answer.

9. This question can be answered by using either statement alone.

Hence, option (b) is the correct answer.

10. Question can be answered by using the statement B alone but not by statement A alone.

Hence, option (a) is the correct answer.

11. Question can be answered by using both the statements together but not by any of the statements alone.

Hence, option (c) is the correct answer.

12. Sum of their ages = 184 years.

Using statement A alone, since the age of C = 91 years, hence sum of ages of rest of them = 93 years. Using this we cannot find that who is oldest of them.

Using statement B alone we cannot get the answer.

Using both the statements together, since the age has to be natural number, so minimum possible age of any one of them = 1 year. So, the youngest of them can be 1 year old, second youngest of them can be 2 years old, hence the maximum age of third person can be 90 years.

So, C is the oldest of them.

Hence, option (c) is the correct answer.

13. $1003 = 1 \times 1 \times 17 \times 59$

Using both the statements together, 'a' is the largest one.

Hence, option (c) is the correct answer.

14. Using statement A alone, values of a, b and c can be-2, 3, 5 or 2, 3, 30. Hence, answer cannot be obtained using statement A only.

Using statement B alone, values of a, b and c can be 2, 4, 6 or 4, 6, 8 etc. Hence, answer cannot be obtained using statement B only.

Using both the statements together, values of a, b and c can be – 2, 6, 10 or 6, 10, 30. And we can see that we are not getting a unique value of $a \times b$, $b \times c$ and $a \times c$.

Hence, option (d) is the correct answer.

15. (Don't forget to take the negative values of m and n)

Hence, option (d) is the correct answer.

16. This question can be answered by using statement B alone but not by using statement A alone.

Hence, option (a) is the correct answer.

17. (Don't forget to take the negative values of x and y)

Hence, option (d) is the correct answer.

18. Using statement A alone will not give us the answer.

Using statement B alone will not give us the answer.

Using both the statements together also will not give us the answer.

Hence, option (d) is the correct answer.

19. This question can be solved by using statement A alone but not by using statement B alone.

Hence, option (a) is the correct answer.

EXERCISE 3

1. Using statement A, y can have any integer value from 0–3, hence can be determined using statement A alone.

Using statement B, minimum value of y can be 16. And hence y is greater than 4.

Hence, option (b) is the correct answer.

2. Obviously, using the statements alone will not give the result. However, if we use both the statements together, then we will get the result that who is earning the least.

Hence, option (c) is the correct answer.

3. Using statement A only gives us two different sets of values of A and B – (101, 101) and (101, 1). So, unique value of HCF cannot be obtained.

Using the statement B only also does not give us a unique number.

However, using both the statements together gives us the values of A and B as – (101, 1). And HCF of these two numbers = 1.

Hence, option (c) is the correct answer.

4. Using statement A, we cannot find if the fathers of all the honest politicians are honest or not? It is only said that if the father is honest, then the son will be honest; however, it does not mean that son of dishonest politicians cannot be honest. [For more, see the chapter—Logical Link in the 1st part of this book]. So, nothing can be determined on the basis of this statement alone.

Using statement B, since son of only a dishonest politician can be a dishonest politician, hence we can conclude that if a politician is dishonest, then his father will also be dishonest. On the basis of this, if Dharam is dishonest politician then his father Ram is dishonest politician and if Ram is dishonest politician then his father Shyam is dishonest politician. And this answers our question.

Hence, option (c) is the correct answer.

5. Using statement A, nothing can be inferred about the even or odd nature of the function $y = f(x)$.

Using statement B, since the graph lies in only two quadrants opposite to each other, it cannot be the graph of any even function. Hence, $y = f(x)$ is not an even function.

Hence, option (b) is the correct answer.

6. Using statement A, since it is not given that what are the maximum marks for each of the papers, hence just by knowing that 300 marks are obtained by Pranav does not provide us with any other information.

Using statement B, Let us assume that the marks obtained by Pranav are $4x$, $5x$, $6x$, $7x$ and $8x$. Now, $4x = 30\%$. Hence, now we can find out that in how many papers Pranav has scored more than 50% marks.

Hence, option (c) is the correct answer.

7. Using statement A, if the remainder obtained when N is divided by 100 is 2, then the unit digit of N is 2. Hence, N cannot be a perfect square.

Using statement B, since the total number of factors of N is odd, hence N is a perfect square. [Total number of factors of any perfect square is odd and vice-versa is also true.]

Hence, option (b) is the correct answer.

8. Using statement A and B independently, we cannot find the speed of the trains. Even using both the two statements together, we get two speeds but we cannot find that which speed corresponds to which train.

Hence, the speed of the trains cannot be determined.

Hence, option (e) is the correct answer.

9. Obviously, it can be seen that using the statements alone will not give us the solution.

Using both the statements together, since the ratio of expenses is more than the ratio of income and both the fractions are proper fractions, hence it can be concluded on the basis of the data given that Rupesh is saving more than Vijay in all the cases.

Hence, option (d) is the correct answer.

10. Obviously, it can be seen that using the statements alone will not give us the solution.

Using both the statements together will give us the ratio of sides of the triangle. Using that we can find out if the triangle ABC is right-angled or not?

Hence, option (d) is the correct answer.

13. Using statement A alone,

Sum of dates of last Monday of previous month and 1st Thursday of next month is 38 is possible only if last Monday is 31st and 1st Thursday is 7th. (Since if we take 30 + 8 = 38, then 30 can be last Monday of any month but 8th can not be the 1st Thursday of any month)

So, 31st of last month is a Monday. Hence 7th of current month—14th of current month—21st of current month—28th of current month will be a Monday.

Now, if current month is a month with 30 days, then 5th of next month will be a Monday, so 7th of next month cannot be a Thursday.

If current month is a month with 31 days, then 4th of next month will be a Monday, so 7th of next month will be a Thursday.

Finally, we can conclude that previous month and current month, both are having 31 days. Since both the dates are of the same year, so current month is August.

We cannot find the answer using statement B alone.

Hence, option (c) is the correct answer.

14. We know that any leap year and leap year +5 will have same 1st January. Hence, 19(PQ + 5) will have its 1st January as Monday. Hence, question can be solved using statement A alone. However, statement B alone will not give us a unique result.

Nature of year	No. of years after which 1st January will be same
Leap year	5
Leap year + 1	6
Leap year + 2	6
Leap year + 3	11

Hence, option (a) is the correct answer.

15. Using statement A alone will not answer this question. Using statement B alone tells that one side of the triangle is the diameter of the circle and hence will be the hypotenuse of the circle. Hence, the triangle is right-angled triangle.

Hence, option (c) is the correct answer.

16. Using statement A alone, we cannot find the circum radius of the triangle ABC.

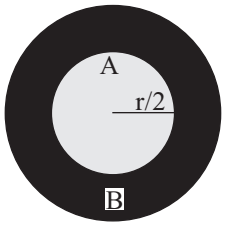
Using statement B alone, since the circum radius of the right-angled triangle is half the hypotenuse of the triangle, so we can find out the circum radius of the triangle. And 1/3rd of this circum radius will be the distance between circum centre and the centroid. In short, 1/6th of the hypotenuse will be the distance between circum centre and the centroid.

Hence, option (c) is the correct answer.

18. This question can be solved without using any of the statements given.

Football will be closer to the center than to the circumference if point is lying in the segment A.

Area of segment A = $1/4\pi r^2$



So, probability of point being closer to the circumference = $1/4\ \pi r^2/\pi r^2 = 1/4$

[The probability of ball being closer to the center = Area of the smaller circle inside/Area of the larger circle (A/ A+ B) = 1/4]

Hence, option (e) is the correct answer.

19. This question can be solved by using statement A individually. Since ratio of speed of A and speed of B = 4 : 7, hence total number of meeting points = 3 (if they are running in the same direction) and total number of meeting points = 11 (if they are running in the opposite direction). In none of these cases, A and B will meet at diametrically opposite point of their starting point.

Using statement B or statement C alone will not give us the result.

Hence, option (e) is the correct answer.

20. This question can be solved by using statement B alone. Since discriminant < 0, hence this equation $f(x) = 0$ will not have any real root, and hence graph of $f(x) = 0$ will not cut X-axis.

So, graph of f(x) = 0 cuts X-axis at 0 point.

Using statement B or statement C alone will not give us the unique result.

Hence, option (c) is the correct answer.